2.9 Wildlife and Fisheries

The Rondout watershed is literally teeming 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 - 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 provides critical habitat, steady moisture, and food for a multitude of mosses, fungi, trees, and vascular plants. For each fallen tree removed either during land use changes or during cleanup efforts after falling, ramifications reverberate throughout the emphasizing that if enough fallen trees are removed, the structure of the overall community would likely change.

The fallen tree example demonstrates the complexity of the web of life, and how eliminating one organism or habitat ultimately affects many more. It is very difficult to predict the consequences of removing individual strands from the web of life. Recognizing these relationships, many people work toward the protection and preservation of the 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).

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. A few examples of this are the bees that pollinate about a trillion apple blossoms each year in New York State; micro-organisms that biodegrade much of our garbage as well as fallen leaves, sticks and other dead animal and plant matter; soil bacteria that turn nitrogen into nitrate fertilizer; and plants use up carbon dioxide and produce oxygen. One stunning example that affects us locally is forest fragmentation, which can increase white-footed mouse populations, which in turn increase the human risk of exposure to Lyme disease (Allan et al. 2003).

In the United States 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 Rondout hasn't been calculated, but anecdotally considering its 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 Rondout watershed are suited to the habitats provided by our temperate climate. The other major factor is human alteration of the landscape. Pre-European

colonization of 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 98% of the Rondout-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 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 barberry (*Berberis thunbergii*) is native to Asia, but has run rampant in the Rondout basin choking out native species and diminishing recreation opportunities. The woolly 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 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, actions that import and release invasive species can cause unintentional yet drastic changes in our ecological communities.

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 nonnative 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 Rondout, 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). Annually NYS DEC stocks the Rondout Creek with nearly 3,000 brook trout in the spring and stocks the Rondout Reservoir with over 4,400 brown trout in June.

Wildlife of Stream Corridors and Conservation Recommendations for the Upper Rondout Watershed, Sullivan & Ulster County

The Upper Rondout Watershed contains a high degree of biological diversity with a unique and unusual species assemblage. Forests with features such as talus slopes, cliffs, and mature forests 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 hermit thrush and red-eyed vireo).

Figure 1 Northern Monk's-hood is a state and federally threatened species that occurs along streambanks in the Catskills.

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 Blackburnian warbler and the rare Bicknell's thrush to name some.

In the Upper Rondout watershed, abundant streams with cobble beds, undercut banks, and streamside wetlands and forests are habitat for damselflies, dragonflies, stream salamanders, turtles, frogs and the threatened Northern Monk's-hood (Fig. 1). Riparian forests are particularly important breeding habitat for birds such as the Louisiana waterthrush, yellow warbler and warbling 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 shrub land bird species, like the Veery, that are declining in New York State as old farms revert to forests. Young forests are habitat for Canada warbler, while open shrub lands and dense thickets are preferred by Northern cardinals.

Many species, like Black-and-white warbler, 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.

Management Recommendations
Stream managers can 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 shrub land 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. Landowners who maintain shrubby thickets in uplands adjacent to stream corridors can support shrub land 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 can thrive if 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. Seeking to create a minimum 500 ft forested buffer around stream corridor wetlands will provide terrestrial habitat required by stream- and vernal pool-breeding amphibians to complete their life cycles, and to protect wetlands from adjacent land uses;
- If Buffer widths of 30-100 ft are maintained, riparian forest canopies will provide enough shading and cooling of streams to maintain trout populations. These buffers need to be nearly continuous to be effective. 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.

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

- Stream salamanders are generally sensitive to siltation, scouring, nutrient enrichment, channelization, and diversion of water. Maintaining natural stream processes and riparian buffers protects salamander habitats.
- There are only 10 rivers in NYS with populations of Appalachian tiger beetle. This beetle is typically found on riverside sand and cobble bars at the edges of forested streams where stream management practices maintain natural stream processes, including the 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.

Figure 2 Appalachian tiger beetles live on cobble stream banks and bars near forests. They have only been documented along 10 rivers in New York State. (Stephen Cresswell, NY Natural Heritage Program website)

Predicted Terrestrial Vertebrate Species

Terrestrial, vertebrate species that are predicted to occur within the watershed based upon presumed associations of species with habitats (Table 1).

Table 1 Species predicted to occur in the Rondout Creek watershed based on habitats, NYNHP

Mammals

Common Name	Scientific Name		Common Name	Scientific Name
Eastern Pipistrelle	*Pipistrellus subflavus*		River Otter	*Lutra canadensis*
Eastern Red Bat	*Lasiurus borealis*		Bobcat	*Lynx rufus*
Hoary Bat	*Lasiurus cinereus*		Fisher	*Martes pennanti*
Silver-haired Bat	*Lasionycteris noctivagans*		Beaver	*Castor canadensis*
Woodland Jumping Mouse	*Napaeozapus insignis*		Porcupine	*Erethizon dorsatum*
Long-tailed Shrew	*Sorex dispar*		Black Bear	*Ursus americanus*
Southern Bog Lemming	*Synaptomys cooperi*			

Amphibians

Common Name	Scientific Name		Common Name	Scientific Name
Jefferson Salamander	*Ambystoma jeffersonianum*		Northern Spring Salamander	*Gyrinophilus p. porphyriticus*
Spotted Salamander	Ambystoma maculatum		Northern Red Salamander	*Pseudotriton ruber ruber*
Red spotted newt	*Notophthalmus v. viridescens*		Northern Two-lined Salamander	*Eurycea bislineata*
Northern Dusky Salamander	*Desmognathus fuscus*		Eastern American Toad	*Bufo a. americanus*
Allegheny Dusky Salamander	*Desmognathus ochrophaeus*		Northern Spring Peeper	*Pseudacris c. crucifer*
Northern Redback Salamander	*Plethodon c. cinereus*		Bullfrog	*Rana catesbeiana*
Northern Slimy Salamander	*Plethodon gultinosus*		Green Frog	*Rana clamitans melanota*
Four-toed Salamander	Hemidactylium scutatum		Wood Frog	*Rana sylvatica*
Northern Leopard Frog	*Rana pipiens*			

Reptiles

Common Name	Scientific Name		Common Name	Scientific Name
Northern Water Snake	*Nerodia s. sipedon*		Common Snapping Turtle	*Chelydra s. serpentina*
Northern Brown Snake	*Storeria d. dekayi*		Northern Black Racer	*Coluber c. constrictor*
Northern Redbelly Snake	*Storeria o. occipitomaculata*		Black Rat Snake	*Elaphe o. obsoleta*
Common Garter Snake	*Thamnophis sirtalis*		Eastern Milk Snake	*Lampropeltis t. triangulum*
Northern Ringneck Snake	*Diadophis punctatus edwardsii*		Northern Copperhead	*Agkistrodon contortrix mokasen*
Timber Rattlesnake	*Crotalus horridus*			

Observed Breeding Birds (source: 2000-2005 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 5363B, 5363D and 5463A that overlap the watershed. Parties using these data for environmental review purposes do so at their own risk.

Table 2 Known or suspected breeding bird species in the Rondout Creek watershed

Common Name (Scientific Name)		Common Name (Scientific Name)
Canada Goose (Branta canadensis)		Magnolia Warbler (Dendroica magnolia)
Wood Duck (Aix sponsa)		Black-throated Blue Warbler (Dendroica caerulescens)
Mallard (Anas platyrhynchos)		Yellow-rumped Warbler (Dendroica coronata)
Common Merganser (Mergus merganser)		Black-throated Green Warbler (Dendroica virens)
Wild Turkey (Meleagris gallopavo)		Blackburnian Warbler (Dendroica fusca)
Great Blue Heron (Ardea herodias)		Black-and-white Warbler (Mniotilta varia)
Turkey Vulture (Cathartes aura)		American Redstart (Setophaga ruticilla)
Red-tailed Hawk (Buteo jamaicensis)		Ovenbird (Seiurus aurocapilla)
Killdeer (Charadrius vociferus)		Louisiana Waterthrush (Seiurus motacilla)
Pigeons & Doves (Columbidae)		Mourning Warbler (Oporornis philadelphia)
Rock Pigeon (Columba livia)		Common Yellowthroat (Geothlypis trichas)
Mourning Dove (Zenaida macroura)		Scarlet Tanager (Piranga olivacea)
Black-billed Cuckoo (Coccyzus erythropthalmus)		Eastern Towhee (Pipilo erythrophthalmus)
Yellow-billed Cuckoo (Coccyzus americanus)		Chipping Sparrow (Spizella passerina)
Barred Owl (Strix varia)		Field Sparrow (Spizella pusilla)
Chimney Swift (Chaetura pelagica)		Song Sparrow (Melospiza melodia)
Ruby-throated Hummingbird (Archilochus colubris)		Dark-eyed Junco (Junco hyemalis)
Red-bellied Woodpecker (Melanerpes carolinus)		Northern Cardinal (Cardinalis cardinalis)
Yellow-bellied Sapsucker (Sphyrapicus varius)		Rose-breasted Grosbeak (Pheucticus ludovicianus)
Downy Woodpecker (Picoides pubescens)		Indigo Bunting (Passerina cyanea)
Northern Flicker (Colaptes auratus)		Red-winged Blackbird (Agelaius phoeniceus)
Pileated Woodpecker (Dryocopus pileatus)		Common Grackle (Quiscalus quiscula)
Eastern Wood-Pewee (Contopus virens)		Brown-headed Cowbird (Molothrus ater)
Least Flycatcher (Empidonax minimus)		Orchard Oriole (Icterus spurius)
Eastern Phoebe (Sayornis phoebe)		Baltimore Oriole (Icterus galbula)
Great Crested Flycatcher (Myiarchus crinitus)		Purple Finch (Carpodacus purpureus)
Eastern Kingbird (Tyrannus tyrannus)		House Finch (Carpodacus mexicanus)
Blue-headed Vireo (Vireo solitarius)		American Goldfinch (Carduelis tristis)
Warbling Vireo (Vireo gilvus)		Golden-crowned Kinglet (Regulus satrapa)
Red-eyed Vireo (Vireo olivaceus)		Blue-gray Gnatcatcher (Polioptila caerulea)
Blue Jay (Cyanocitta cristata)		Eastern Bluebird (Sialia sialis)
American Crow (Corvus brachyrhynchos)		Veery (Catharus fuscescens)
Common Raven (Corvus corax)		American Robin (Turdus migratorius)
Tree Swallow (Tachycineta bicolor)		Hermit Thrush (Catharus guttatus)
Cliff Swallow (Petrochelidon pyrrhonota)		Gray Catbird (Dumetella carolinensis)
Barn Swallow (Hirundo rustica)		European Starling (Sturnus vulgaris)
Black-capped Chickadee (Poecile atricapillus)		Cedar Waxwing (Bombycilla cedrorum)
Tufted Titmouse (Baeolophus bicolor)		Northern Parula (Parula americana)
Red-breasted Nuthatch (Sitta canadensis)		Yellow Warbler (Dendroica petechia)
White-breasted Nuthatch (Sitta carolinensis)		Chestnut-sided Warbler (Dendroica pensylvanica)
Brown Creeper (Certhia americana)		House Wren (Troglodytes aedon)
Carolina Wren (Thryothorus ludovicianus)		Winter Wren (Troglodytes troglodytes)

Observed Rare Species and Significant Ecological Communities
(source: NY Natural Heritage Program, accessed February 2010)

Rare plant and animal species with known populations and documented examples of rare and high quality ecosystems occur within the Rondout Creek watershed (Fig. 3; Table 3). 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. See Appendix B for a description of the protection status or rankings.

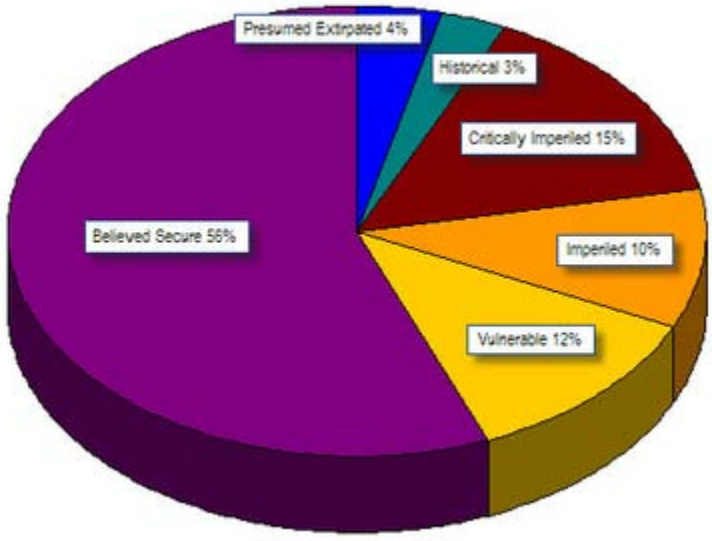

Figure 3 Status of biodiversity in New York State, from New York State Natural Heritage Program

Table 3 Rare plant and animal species with known populations within the watershed and documented examples of rare and high quality ecosystems within the watershed

Rare Birds

Common Name	Scientific Name	State Protection	Federal Protection	State Rarity Rank	Global Rarity Rank
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened		
Bicknell's Thrush	*Catharus bicknelli*	Specieal Concern Species	Migratory Bird Treaty Act	S2B	G4
Peregrine Falcon	*Falco peregrinus*	Endangered	Migratory Bird Treaty Act	S3B	G4

Rare Invertebrates

Common Name	Scientific Name	State Protection	Federal Protection	State Rarity Rank	Global Rarity Rank
Appalachian Tiger Beetle	*Cicindela ancocisconensis*	Unprotected	Not listed	S2	G3

Rare Plants

Common Name	Scientific Name	State Protection	Federal Protection	State Rarity Rank	Global Rarity Rank
Appalachian Firmoss	*Huperzia appressa*	Threatened	Not listed	S2	G4G5
Blunt-lobe Grape Fern	*Botrychium oneidense*	Endangered	Not listed	S2	G4Q
Button-bush Dodder	*Cuscuta cephalanthi*	Endangered	Not listed	S1	G5
Hooker's Orchid	*Platanthera hookeri*	Endangered	Not listed	S1	G4
Jacob's-ladder	*Polemonium vanbruntiae*	Rare	Not listed	S3	G3G4
Nodding Pogonia	*Triphora trianthophora*	Endangered	Not listed	S2	G3G4
Northern Monk's-hood	*Aconitum noveboracense*	Threatened	Threatened	S1	G3
Northern Wild Comfrey	*Cynoglossum virginianum* var. *boreale*	Endangered	Not listed	S1	G5T4T5
Squashberry	*Viburnum edule*	Threatened	Not listed	S2	G5

Plant Communities with Known Locations in Rondout Watershed

Common Name	State Protection	Federal Protection	State Rarity Rank	Global Rarity Rank
Beech-Maple Mesic Forest	Not Listed	Not Listed	S4	G4
Chestnut Oak Forest	Not Listed	Not Listed	S4	G5
Hemlock-Northen Hardwood Forest	Not Listed	Not Listed	S4	G4G5
Ice Cave Talus	Not Listed	Not Listed	S1	G3?
Mountain Fir Forest	Not Listed	Not Listed	S2	G3
Mountain Spruce-Fir Forest	Not Listed	Not Listed	S2	G3
Spruce-Fir Rockey Summit	Not Listed	Not Listed	S3	G4

Spruce-Northern Hardwood Forest	Not Listed	Not Listed	S3	G3G4

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NYS Amphibian and Reptile Atlas
Online at: http://www.dec.ny.gov/animals/7140.html

NYS Breeding Bird Atlas
Online at: http://www.dec.ny.gov/animals/7312.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 Online at:
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