

## Lesson 2: Weaving a Mannahatta Muir Web

### *Background for Educators*

Most students are familiar with the idea of a food chain or food web: it shows which species eat which other species in a given ecosystem. One of the innovations of the Mannahatta Project, however, has been Eric Sanderson's reconceptualization of this web of interconnection as incorporating *all* the elements of a given ecosystem – not just connections of predation and prey. Sanderson is calling this web a *Muir web* – named for John Muir, a California naturalist who emphasized the interconnection of all things in nature, and who worked to preserve wilderness in America. A Muir web shows how different species are connected to each other not only in that one may eat the other, but also, for instance, in that one species may provide shelter for another. A Muir web includes not only living species but also abiotic elements, like water, sun, soil and air. Such a web also includes habitats as discrete nodes. Though Sanderson has developed the Muir web model for Mannahatta, a Muir web could be applied to analyze relationships within any other ecosystem.

There were 57 distinct ecological communities on and around the island (listed below, and continuing onto the next page). More information about a number of these communities can be found in the “community guides” section of the New York Natural Heritage Program's website, at <http://www.acris.nynhp.org/>.

Marine deepwater	Coastal plain pond	Pitch pine - scrub oak barrens
Marine eelgrass meadow	Eutrophic pond	Chestnut oak forest
Marine intertidal mudflat	Deep emergent marsh	Coastal oak-beech forest
Marine gravel/sand beach	Shallow emergent marsh	Coastal oak-hickory forest
Marine rocky intertidal	Shrub swamp	Oak-tulip forest
Tidal river	Coastal plain pond shore	Appalachian oak-pine forest
Tidal creek	Highbush blueberry bog thicket	Hemlock-northern hardwood forest
Brackish subtidal aquatic bed	Floodplain forest	Successional old field
Low salt marsh	Red maple-hardwood swamp	Successional shrubland
High salt marsh	Vernal pool	Lenape horticultural fields (cropland/row crops)
Salt panne	Coastal plain Atlantic white cedar swamp	Lenape trail (unpaved road/path)
Coastal salt pond	Maritime beach	Lenape shell middens (landfill/dump)
Brackish tidal marsh	Maritime dunes	Lenape wigwams and long houses (human shelter)
Brackish intertidal mudflat	Maritime shrubland	Lenape village site
Brackish intertidal shore	Hempstead Plains grassland	Terrestrial cave
Salt shrub community	Shoreline outcrop	Talus cave
Midreach stream	Calcareous shoreline outcrop	
Marsh headwater stream	Cliff	
Rocky headwater stream	Calcareous cliff	
Intermittent stream	Serpentine barrens	
Coastal plain stream		

Thousands of plant and animal species thrived across these communities: from the smallest single-celled organisms, through an array of grasses, flowering shrubs, trees, insects, fish and mollusks, birds, reptiles and amphibians, small mammals like bats, mice and beavers, and even a few large animals like wolves and elk. Early explorers of the island wrote rich descriptions of the species present on and around the island. As Dutch colonist Johan de Laet wrote in the 1630s:

“Our countrymen who forest explored this river ...describe the wonderful size of the trees, (a good proof of the luxuriance of the soil,) suitable for edifices and vessels of the largest class. Wild grape vines are abundant, and walnut trees, the fruit of which differs from ours, being smaller and the shell harder and smoother. This is also the case with other trees, shrubs and plants that grow spontaneously; but when cultivated with the labor and industry of man, maize or Indian corn, for example, yields a prolific return.

So with various kinds of pulse, especially beans, which have an admirable variety of colors; pumpkins of the finest species, melons, and similar fruits of a useful character... The forests everywhere contain a great variety of wild animals, especially of the deer kind, and other quadrupeds that are indigenous to this part of North America. Innumerable birds are also found here, both large and small, those that frequent rivers and lakes, as well as the forests, and possess plumage of great elegance and variety of colors. In winter superior turkey cocks are taken, very fat, and with flesh of the best quality. The rivers produce excellent fish, such as salmon, sturgeon and many others."

In this lesson, only a very small sample of the island's life is used to demonstrate the concept of the Muir web. Students are each assigned one element of the Muir web that existed on Mannahatta – a plant or animal species, a habitat, or an abiotic element – and asked to familiarize themselves with the needs and/or traits of their element. Standing in a circle, they are slowly connected to each other with a spool of ribbon, and watch how the web among them all is woven.