The Genesee Valley Bioregion

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The area bordered by the Genesee River to the West, Lake Ontario to the north, the four western Finger Lakes to the south, and the drumlin fields from the most eastern of the Finger Lakes (Honeoye) up toward Lake Ontario, comprises the Genesee River watershed on the Erie-Ontario Plain. This continental landform was influenced heavily by repeated glaciations, with the final recession occurring around 10,000 years ago. These influences can be seen in both the topography and the soil.

All the rocks in the Genesee region are sedimentary (shale, siltstone, sandstone, limestone, dolostones, gypsum and salt) in origin, and represent the Ordovician, Silurian and Devonian periods, with glacial sediment forming the uppermost layer (Van Diver, 1980, p. 76). These early rocks hold fossils which speak of a time some 450 million years ago when the continent lay further south, the global climate was warmer overall, and the region was submerged in "warm, shallow seas, in which coral and other marine life flourished" (Van Diver, 1980, p. 80). As a result, our regional soils are mainly medium to high range in lime (USDA, 1973, p. 9).

The last glaciation (Wisconsin) shaped the land in highly distinctive ways. Notable among them are the Albian-Rochester moraine, which is considered the "most northerly well-defined moraine in the western end of (New York) state" (Fairchild, 1923, p. 142). This landform, created from an accumulation of glacial till at the spot where the glacier paused in its retreat, runs across the southern border of the City of Rochester. It is unquestionably the most outstanding topographic feature of the city. Subject to considerable degradation since European settlement of the region, it now takes the form of a series of variously "developed" hills separated by major north-south urban arteries.

The Genesee River system bisects the city of Rochester. More accurately, the city developed around and because of this life-giving river. It is "the only major river that maintains its preglacial northward flow despite diversions and obstructions introduced by continental glaciation during the ice age" (Van Diver, 1980, p.75). This amazing river, it's pre-Wisconsin path obstructed by a moraine some 80 miles south of present-day Rochester, found a new course, pouring over an escarpment, into and northward through a valley to create what has been called the "Grand Canyon of the east" at Letchworth. Aboriginal peoples clustered their camps on its edges, as did the European settlers who entered the region in the late 18th century and built mills along the mighty waterfall section that is now downtown Rochester.

The glacier also left many footprints in the form of drumlins, north-south trending, low, streamlined hills that are found abundantly from Syracuse to the west beyond Rochester. These distinctive and unusual landforms number in the 10,000 range and comprise one of the world's largest and finest drumlin fields (Van Diver, 1980, p.227).

Finally, the eleven glacially-formed Finger Lakes (the three western lakes being part of the Genesee Valley bioregion) are unique throughout the world in their shape, layout, and drainage. Like the Genesee

River, all eleven lakes drain to the north, in this case due to damming in the south by a moraine (Van Diver, 190, p. 119).

The Genesee Valley bioregion is located in the temperate deciduous forest biome. That this biome exists is largely due to climate, which is moderate in both humidity and summer rainfall, with mild temperatures in the summer and cold winters (Smith, 1986, p. 531). The Genesee Valley region can be categorized as moderate, except perhaps in snowfall, and Rochester receives more snow annually than any other United States city comparably sized or larger (Williams, 1994, p. 15). Local meteorologist Kevin Williams (1994) writes, "The area is in a "cross-country meeting place of storm tracks…" (p.5), and further suffers from what is called *lake effect snow,* caused when cold air passes over the warm surface of Lake Ontario. Other climate data compiled by Williams (1994) for the Genesee Valley includes an average annual rainfall of 32", average snowfall of 90" seasonally, a growing season of 178 days, and southwestern prevailing winds.

Because of these conditions, the region has a preponderance of animal species highly adapted to the seasonal changes. Some, including the brown bear, raccoon, and striped skunk enter into a winter sleep, similar to hibernation but less deep. The woodchuck, eastern chipmunk and brown bats undergo true hibernation. Amphibians and reptiles overwinter by dropping body temperatures to a level just above freezing. Many burrow into the soil to just below the freeze line. The leopard frog is often found close to underwater trees or rocks where they sometimes "construct oval-shaped underwater pits within which they stay for the winter" (Tyning, 1990, p. 85). Reproductive cycles for most of these creatures are in rhythm with the seasons, with mating taking place in the autumn and birthing in spring when food supplies reappear. Other animals, primarily birds and some insects, simply leave the area, migrating south to warmer climates.

Notable plant adaptations to colder weather are coniferous leaves which are waxy and small to limit moisture loss through leaf respiration. Local deciduous species lose their leaves and draw their sap to the roots to overwinter. The herbaceous ground layer survive buried beneath the ground as bulbs and in Spring, bloom before the trees leaf out, a neat survival strategy through which "they accomplish the bulk of their reproduction by the time they are shaded" (Sutton, 1987, p. 51).

The soil that supports the local biosphere is mainly of four types, all originating from the glacier. First are found soils which were formed in glacial till which texturally runs from "gravelly fine sandy loam to clay" (US Soil Conservation Service, 1973, p. 2). Second are gravelly or sandy soils formed in glacial material that was deposited by water (US Soil Conservation Service, 1973, p. 2). Soils formed in lake-laid glacial deposits are composed of silts and sand, and finally, soils formed in clay lakebeds are predominantly clay, sometimes with silt layers (US Soil Conservation Service, 1973, p.6).

These soils, together with the other unique regional aspects of the physical environment, support a number of distinct ecosystems. The dominant ones, which will be described below, are the transitional forest (mixed deciduous and coniferous), the deepwater lake community (represented by Lake Ontario), the dimitic (two seasons of turnover) Finger Lakes, rivers and streams, and shrub-sapling openings. This highly diverse region supports others, including the sandy beaches along the Lake Ontario shoreline, home to

more than 40 different songbirds (Stevenson, 1997), ponds, floodplain forests along parts of the Genesee River, highbush blueberry bogs, northern white cedar and other swamps, rich graminoid fens, and shoals along the lake shore (Reschke, 1990). Some of these communities, particularly bogs and fens, exist because of unique conditions resulting from glacial activity.

The transitional forest is an "overlap zone" (Benyus, 1989, p. 239) for the Canadian coniferous forests and the southern broadleaf communities, both at the limits of their range. Sugar maple is dominant. Its success, according to Janine Benyus (1989) is due in part to its compatibility with the deep rich soil of the regionally widespread glacial moraines, and also its ability as a seedling to tolerate shade until an opening in the canopy stimulates its rapid growth to the canopy level. Common species in association with the sugar maple are yellow and gray birch, Eastern hemlock (often found on north-facing ravine slopes), Eastern white pine, Northern red, white and burr oak, quaking and bigtooth aspen (generally forest edge colonizers), American basswood, black and sweet cherry, American beech, shagbark and other hickories, and shrubs including Eastern hophornbeam, witchhazel and arrow-wood. The rich and diverse ground layer includes ferns, baneberry, early meadow rue, black cohosh, large-leaf aster, and blue-stem goldenrod. Wildlife such as wild turkey, spotted salamander, eastern chipmunk, eastern coyote, deer mouse, gray fox, gray squirrel, pileated woodpecker, white-tailed deer, wood frog and the ruffed grouse find niches in such an environment, where abundant trees provide safety for cavity nesters like woodpeckers or forest floor burrowers such as the wood frog and food for herbivores like the white-tailed deer and gray squirrel. But, far and away "the most active stream of life in the transition forest is that of the billions of microorganisms in the soil (who) digest fallen plant debris and convert it into nutrients required for plant growth" (Sutton, 1987, p. 53).

Notable in the Finger Lakes region are the many side gullies and ravines which form pathways for the drainage of the Bristol Hills. Fish commonly found include blacknose dace, creek chub and sculpin. Rainbow and brook trout are also present as introduced species (Reschke, 1990, p. 10). Aquatic insects like water-striders and crustaceans such as crayfish can be found, as well as larval stages of some aquatic insects. These streams also provide feeding and nesting grounds for amphibians including the spring salamander, red-spotted newt, and the bullfrog (Benyus, 1989, p. 108). Plant life is well adapted to these fast-moving streams. For example, the rounded shape of the cushion moss directs water around rather than over it' s surface, and the slimey algea commonly found on rock surfaces reproduces faster than any other algea species (Benyus, 1989, 104).

Successional shrublands, or shrub-sapling openings are common communities resulting nearly always from man's intervention for farming, logging, or development purposes. Openings can also have origins in natural causes such as lightening fires, wind or ice storms, or disease. These ecosystems are in some stage of the process of returning to forest. The plants which abound are those species, commonly called "pioneers", are hearty sun-loving species, often with adaptations such as deep taproots or prolific reproductive patterns which allow them to survive in these disturbed open areas. Gray dogwood is overwhelmingly the dominant shrub species in this community, in association with Hawthorne,

chokecherry, sumac, raspberries, arrow-wood, and multiflora rose. Common trees are aspen, birch, white pine, and black locust. Many of the herbaceous plants are exotics, like Queen Anne's lace and yarrow, which thrive under disturbed conditions, competing with native species such as common milkweed or black-eyed Susan. Seed and insect-loving songbirds abound in this ecosystem, along with mammals like the woodchuck, white-footed mouse, striped skunk, and red fox, and amphibians like the milk and garter snakes.

The Genesee valley watershed is characterized by abundant water resources, including four Finger Lakes (Honeoye, Canadice, Hemlock and Coneseus), numerous creeks, ponds and wetlands, and several large streams (including Oatka, Honeoye, Black, and Allen's), all of which drain into the Genesee River. The river, in turn, runs northward into Lake Ontario. Lake Ontario is the smallest of the Great Lakes and has the misfortune of being downriver from the others, so it receives their outflow, including any pollutants within (Stevenson, 1997).

The deepwater community of Lake Ontario is an example of a "monomictic lake: they do not freeze over…and are mixed and isothermal in winter, and stratified in summer" (Reschke, 1990, p.14). Lake whitefish, lake trout, white bass, alewife, and rainbow smelt abound in this ecosystem, together with the introduced coho and chinook salmon. Pollution and migrations from the Erie canal have altered the ecosystem. Natives now gone are blue pike, shortnose and shortjaw cisco and deepwater sculpin (Reschke, 1990, p.14).

In contrast, the Finger Lakes in the Genesee Valley watershed freeze over in winter and are stratified in both seasons. Common fish include yellow perch, largemouth bass, bluegill and pumpkinseed, and they "typically have a diverse mixture of submerged macrophytes, such as several species of pondweeds…and tapegrass" (Reschke, 1990, p. 16).

River and stream aquatic communities in the bioregion include the Genesee River and also numerous streams and creeks all characterized by the "lack of persistent emergent vegetation, but may include area with submerged or floating-leaved aquatic vegetation" (Reschke, 1990, p. 10). In cleaner, younger days, the lower Genesee supported native populations of Atlantic salmon; throughout the river as well as the tributaries were native small mouth bass, yellow perch, bullheads, pickerel and pan fish (Democrat & Chronicle, 1983).

The lake is the source of drinking water – 70 million gallons a day -- for all regional residents outside of city boundaries (Stevenson, 1997). City resident's water is drawn from and treated at Hemlock and Canadice Finger Lakes, then piped by gravity flow to three holding reservoirs (one located on top of the previously mentioned Pinnacle moraine) in the city. All wastewater is piped to the Van Lare sewage treatment plant near Lake Ontario. Following treatment, it is discharged into Lake Ontario at a rate of 94 million gallons daily (Stevenson, 1997).

About 40% of the watershed is forest, 52% is farmed, and the rest is suburban and urban (Ireland, 1999, p .5A). Within suburban and urban areas are sites of high technology manufacturing. The watershed suffers degradation from all it's land uses, including silt in runoff from eroding streambeds and logging

roads in forested areas; silt, bacteria from animal wastes, and pesticides and fertilizers in runoff from farms; and from urban/suburban places, discharges from small-scale wastewater treatment plants and faulty septic systems; pesticides from municipal facilities and homes; storm water carrying pollutants including oil and antifreeze, and more (Ireland, 1999, p. 5A).

A comparison between what is known (based on scientific or archeological evidence) about this region as it might have been 1000 years ago with its present status raises many questions about the sustainability of western man's way of life. By 1000 years ago, the last ice sheet had long since receded. The planet had undergone a warming phase, so the climate was probably similar to that of today, with one serious exception. Global warming, primarily caused by carbon dioxide released from the burning of fossil fuels, is now occurring "at a rate more than 10 times faster than it ever has during human history or prehistory" (McKinney, 1998, p. 510).

The topography and landforms that are seen in the region today would have existed 1000 years ago, but intact. The Albian-Rochester moraine described above has been developed almost beyond recognition. It once functioned as the northern border of a major footpath of the indigenous people of this region. It now resembles a series of small hills, two hollowed out for use as city reservoirs, another with houses and an adoption agency constructed on its flanks. Prior to these developments, it was extensively excavated for sand and gravel (Fairchild, 1923, p. 169). No plans were made by city planners to preserve this and other important glacial landforms.

With regard to biome, it is helpful to start with the understanding that "biomes describe what the world would be like if people had not altered the natural environment…what types of vegetation the region would naturally support" (Lean, 1992, p. 11). 1000 years ago, the Genesee Valley region would have been dense temperate forest, broken only by water bodies. The ecosystems described above would have all existed, except that shrub openings would occur only as a result of natural interferences to the forest. The species composition be essentially the same, with differences differ due to both extinctions and foreign introductions. The full implications to the ecosystem of species loss as well as exotic introductions are still not known.

Archeological records tell us something about the human inhabitants of the region 1000 years ago. Considered to be the Middle Woodland stage of aboriginal settlement, these people were the forebears of the Iroquois culture that existed at the time of European invasion in mid-century (Beale, 1992, p. 1). The woodland peoples were a "hunting-fishing-gathering economy with a predilection for large lakes and streams" (Ritchie, 1973, p. 96). According to Ritchie (1973), they followed seasonal cycles, camping and fishing in summer along major waterways where food was abundant, and hunting (mainly deer) and gathering nuts from woodland campsites during the winter. Their remains show no evidence of agriculture or food processing, and the only traces of wild plant foods are nut shells. Symbols of culture include cemeteries and burial mounds, and ornaments such as stone pendants and antler combs.

The same bodies of water existed in these people's time, except that they lacked the artificial systems created by modern man for its movement, storage, and treatment. Water was clean and plentiful, and

ownership of natural resources was not yet a concept. Human waste was returned to and recycled by the ecosystem rather than through mechanical and chemical intervention.

Land use as we conceive it today was undreamed of, as the concept of ownership and development of land had not yet been born. The main use of land was the procurement of food and shelter. At its most fundamental level, our present economy also rests on those needs, but has been expanded to include transportation, entertainment and all the consumer goods that accompany our profit-driven, media-influenced culture. The contrast is startling and brings to sharp relief the senseless quality of our production and consumption patterns, particularly as they erode the environment that supports them, and the quality of life for so many humans on earth.