CHAPTER 3:
The State of Onondaga Creek: Findings

The overview of Onondaga Creek's history in Chapter 2 provides critical background for understanding the current state of Onondaga Creek. As the city grew in the creek's *floodplain*, modifications were made to its natural form for sewage disposal and flood prevention. Using the creek as a sewage conduit in the past left a legacy of persistent water quality problems today. Channelizing the creek in the city made flood prevention possible but profoundly impacted both the physical characteristics and *biota*. Fast flows in the creek channel caused drowning hazards and prompted restrictions to creek access in the second half of the twentieth century.

At the creek's headwaters near Tully, salt extraction for industrial uses may have exacerbated the Tully Valley mudboils, in addition to leaving parts of the valley prone to *subsidence*. In their most active period, the mudboils discharged tons of sediment daily into the creek. In addition to mudboils; landslides, streambank erosion, and *runoff* contribute large sediment loads to the creekbed. Sediment is resuspended during storm events and aggravates *turbid*, or muddy conditions in Onondaga Creek.

To revitalize Onondaga Creek, land use choices from the past will need to be addressed as challenges. *Nonpoint source pollution*, carried to Onondaga Creek and its *tributaries* via runoff over the land, degrades water quality. Polluted runoff reaches the creek quickly when creek-side vegetation is reduced or stripped away. In urban portions of the watershed, runoff pollution is magnified by *impervious cover*; roads, roofs, and other hard surfaces that speed stormwater to the creek. Flexible and innovative solutions will be needed to address these kinds of problems.

The following summary explains existing conditions of Onondaga Creek based on a literature review performed by the Onondaga Environmental Institute (OEI) in 2005 and 2006. From the literature review OEI staff assembled a series of fact sheets, which the Onondaga Creek Working Group reviewed in the autumn of 2006.[1] The Working Group used the fact sheets to aid plan development and suggested revisions. The revised versions of the fact sheets (also based on Onondaga Lake Partnership review) are contained in Appendix B; they provide a more thorough treatment of the state of Onondaga Creek than the following summary, and contain complete references. The headings of Chapter 3 correspond with the titles of the associated fact sheets. Readers interested in more detail are encouraged to read Appendix B.

[1] The Onondaga Creek Fact Sheets are located in Appendix B.

Water quality: *findings*

Water Quality: The biological, chemical, and physical conditions of a waterbody, often measured by its ability to support life.

- Since the late 1980's, numerous organizations have collected water quality data for a specific set of parameters, especially in the urban portion of Onondaga Creek. Onondaga County conducts extensive monitoring and in the last few years, has made water quality data available on their website (http://www.ongov.net/WEP/). Fewer water quality data are available for the upper sections of the watershed, with the least amount of data available for the West Branch. Project Watershed Central New York, sponsored by the local chapter of the Izaak Walton League and the State University of New York College of Environmental Science and Forestry, conducts similar water quality testing by working with school groups. The data are posted on the website: http://www.projectwatershed.org/
- The most common water quality parameters monitored in the creek are temperature, salinity, dissolved oxygen, turbidity, phosphorus, alkalinity, and bacterial indicators of pathogens (for example, fecal coliform bacteria).
- Monitoring data for metal and organic chemicals, like those found in pesticides are lacking. While mercury is one of the main pollutants in Onondaga Lake, Onondaga Creek's compliance with mercury standards is unknown. Information is scarce on toxic substances, such as *carcinogenic hydrocarbons* or *heavy metals* in the sediments that make up the channel of Onondaga Creek. No data are available for dissolved pharmaceuticals, caffeine, or chlorine by-products, which indicate sewer inputs to the system.
- Currently, pathogens impair water quality in Onondaga Creek. Pathogens are disease-causing microorganisms. Data analysis shows persistent *exceedances* of the New York State standard for fecal coliform, an indicator bacteria used to assess pathogen contamination from sewage discharge to the creek. Exceedances in the creek occur most regularly at Spencer and Kirkpatrick Street sampling sites, including during periods of dry weather. Exceedances occur on 75 percent of dry weather days, revealing that pathogen contamination, while certainly exacerbated by wet weather and combined sewer overflow (CSO) releases, may also be due to Syracuse's old, leaky sewer network. Some of the oldest sewer pipes are downtown, dating to the nineteenth century. These older pipes typically consist of red brick and clay tile which are fragile and easily crack, break, or are invaded by tree roots, and therefore, are likely to leak during dry weather conditions, and receive large volumes of water when the ground is saturated. Illegal sanitary sewer connections to storm pipes may also be a factor. The exact causes are unknown, although other cities have conducted dye studies and other tests to find contamination sources.
- The rural watershed has less data regarding bacterial indicators of pathogens. Storm event sampling by Onondaga County at Route 20 reveals high levels of fecal coliforms. Intense rainstorms result in greater concentrations of bacteria in the creek. The bacteria source, whether septic leakage or wild or domestic animal wastes, is unknown. Other areas, for example, in the Owasco Lake watershed, have conducted DNA testing to determine the source. Current conditions indicate contact recreation on Onondaga Creek may not be safe many days of the year, especially in lower, urban reaches.

Alkalinity is a measurement of ions that control the *pH* of water. From these measurements we can determine if the creek is acidic or alkaline. Onondaga Creek is dominated by carbonate-enriched glacial sediments, making the water somewhat alkaline. The creek has a stable pH, is not susceptible to acid rain, and remains mostly in an acceptable range for fish populations. On occasion the creek exceeds the New York State standard for pH. Hemlock Creek is a notable exception to this stability. Here the pH is variable and samplings below a landfill site show drops in pH towards acidity greater than those seen at other sampling sites. How this affects resident aquatic life is unknown.

Temperature in Onondaga Creek varies from freezing in the winter to the high 70s (degrees Fahrenheit) in the summer. Temperature is influenced by vegetation on the creek banks, where shading keeps water cool in the summer; the channel form; input from carbonate springs and tributaries; and domestic or industrial wastewater, including input from storm sewers. Highest temperatures in the summer are found at sampling sites with the least vegetative cover and a shallow, wide channel, the conditions found at Dorwin Avenue. Temperatures in the summer are often inhospitable to trout at Dorwin Avenue (summer temperatures equaled or exceeded 77°F in 1995, 1998, and 1999). Summer temperatures stay cool in upper parts of the watershed. At the Spencer and Kirkpatrick Street sampling sites just north of Franklin Square saline springs discharge groundwater to the creek having a cooling effect on warmer surface waters from the middle reaches.

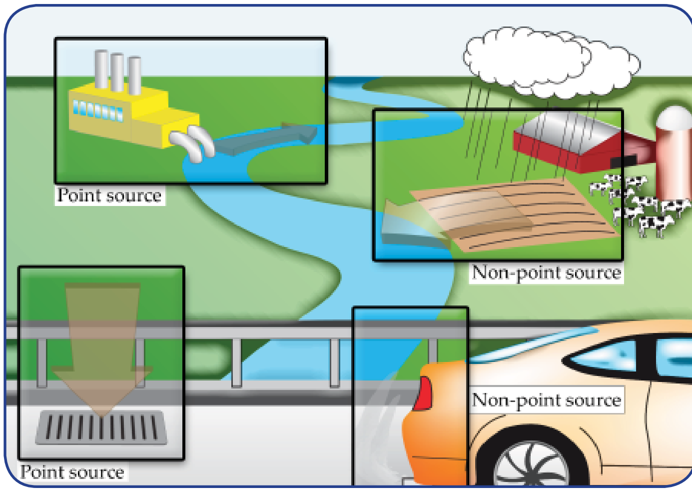


Figure 3.1 Potential sources of nonpoint and point source pollution.

Salinity levels are notably high in Onondaga Creek. Salinity is a measure of the concentration of salts in water. Common salt is comprised of sodium and chloride. Recent data from the Mohawk River provide a rough basis for comparison. Above the mudboils, sodium and chloride concentrations in Onondaga Creek are comparable to the Mohawk River (average sodium [13.2mg/L] and chloride [20.4mg/L] concentrations). As Onondaga Creek flows past the mudboils and the site of the 1993 Tully Valley landslide, sodium (175-340mg/L) and chloride (270-525mg/L) concentrations are considerably higher than levels in the Mohawk River. Salinity levels increase again between Spencer and Kirkpatrick Streets, due to a salt spring in the creek bed. Road salt contributes salt to the creek; however, compared to the groundwater inputs, street salt is not a major contributor. The impact of Onondaga Creek's salinity on aquatic life is unstudied.

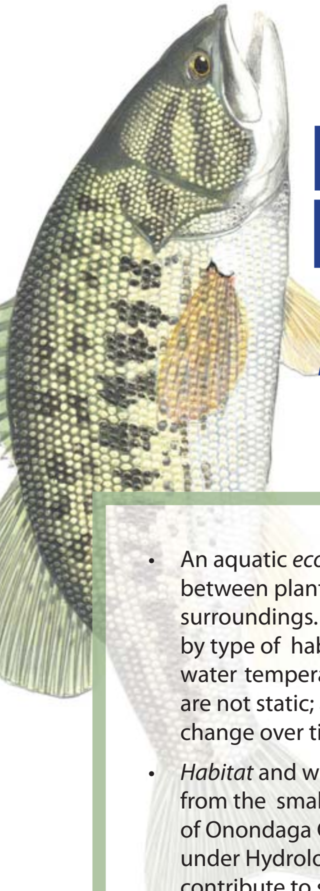
Dissolved oxygen (DO) in the creek is critical to all aquatic life. Temperature and salinity influence DO; higher temperatures and salinity result in less DO in the water. New York State has DO standards for streams, depending on a stream's classification. The DO level in Onondaga Creek is generally healthy (7-15mg/L) throughout its length, supporting the needs of aquatic life. Historical data suggest the Inner Harbor may be one exception; waters near the bottom were below the minimum oxygen standard in the mid-1990s (more recent data are not available).

Phosphorus is another essential nutrient, especially for plants, that exists in natural waters in a variety of forms. High concentrations in water bodies can lead to *eutrophication*, which means excessive plant growth and algae blooms and the potential for widespread variation in oxygen levels[2]. Differing forms of phosphorus are released to Onondaga Creek in runoff, over land and through storm and combined sewers, either attached to sediment or as a constituent of fertilizers, detergents, and human and animal waste. It is another type of nonpoint source pollution. Phosphorus concentrations in Onondaga Creek appear to be high enough to cause excessive plant growth. Onondaga Creek is a major contributor of phosphorus to Onondaga Lake. The daily or yearly amount of phosphorus added to Onondaga Creek is referred to as loading. The phosphorus load is lower in Onondaga Creek tributaries than the main channel. In the main channel, the loading is higher downstream of the mudboils, higher still in the urban segments of the creek than rural. The exact sources of phosphorus loading in Onondaga Creek have not been identified.

Nitrogen is an essential nutrient for all forms of life. However, excess quantities can be detrimental to aquatic systems. Nitrogen enters waterways in several forms, via several pathways, in particular fertilizers (residential and agricultural) and animal wastes mixing with storm runoff. Human waste, from leaky sewer and septic systems and atmospheric deposition from fossil fuel combustion are additional sources. Nitrogen is one of the elements of concern when nonpoint source pollution impairs water quality (see Figure 3.1). High levels of organic nitrogen are found in Onondaga Creek during storm events, likely from the inputs listed above. Just as excessive amounts of certain forms of nitrogen can be toxic to humans (like ammonia or nitrate), fish are also affected. New York State has standards for ammonia, nitrite and nitrate in surface water. Onondaga Creek does not have noteworthy exceedances of the standards. However, occasionally ammonia reaches concentrations close to and nitrite exceeds the standards in the city. Very little data are available about nitrogen outside of the city, making it difficult to draw meaningful conclusions.

Turbidity measures particles, or sediment, in the water column. Water clarity is a persistent challenge in Onondaga Creek. Turbid water is unattractive, detrimental to aquatic life and interferes with recreation on or in the water. The mudboils and landslide erosion are the largest contributors to Onondaga Creek's turbidity in the upper part of the watershed. Urban inputs, from storm sewers and CSOs, contribute turbidity to Onondaga Creek. Sediment deposits remain in the lined creek channel from mudboils, landslides, bank erosion, and runoff inputs and are re-suspended during storm events. Resuspension muddies the creek waters and obscures the bottom from view.

[2] Diminished oxygen levels are due to excessive decay of *detritus*, dead or decaying organic matter.



Fish and aquatic habitat: findings

aquatic habitat: environments characterized by the presence of standing or flowing water.

- An aquatic *ecosystem* is characterized by the interactions between plants, animals and their physical and chemical surroundings. Fish *communities* are usually determined by type of habitat and water quality conditions such as water temperature and oxygen levels. Fish communities are not static; and so can vary from place to place and change over time.
- *Habitat* and water quality make dramatic natural changes from the small, steep headwater tributaries to the mouth of Onondaga Creek. Human induced influences, noted under Hydrology, also impact the watershed. Both contribute to shifts in the fish communities and habitat conditions along the creek *gradient,* or slope.
- Scientists use several categories to group fish into communities or assemblages. A few types of assemblages are temperature preference, diet, or movement pattern. In the Onondaga Creek fact sheets, OEI uses temperature preference (cold, cool or warm water) to describe fish assemblages in Onondaga Creek.
- OEI reviewed data from 15 fish surveys conducted in the Onondaga Creek watershed between 1982 and 2005. Results are interpreted in a map of the watershed (see Fish Fact Sheet). Thirty-four fish species were identified, divided into fairly distinct cold and warm water fish assemblages. Survey results indicate a warm-water fish community exists in the city, downstream of Dorwin Avenue. These fish include bluegill, large mouth bass and other fish species that are also found in Onondaga Lake. A coldwater assemblage occurs south of Dorwin Avenue, upstream in rural sections of the watershed; coincident with those stream stretches that remain natural and have not been channelized. This assemblage includes brown trout (a non-native trout), sculpins, creek chub, dace and white sucker. Wild brook trout were found in appreciable numbers only in small, upper watershed tributaries, including Furnace Brook. The water can be too cold for brown trout in these tributaries. Competition in upper reaches of the creek's main stem between the two trout species favors brown trout. Both trout are stocked in Onondaga Creek for anglers; brown trout are stocked in greater numbers.
- There are a few barriers to fish movement in Onondaga Creek, particularly at Dorwin Avenue (the *drop structure*, see Flood Control). Modification or removal must take into consideration that fish communities will transform as warm and cool water species can spread upstream.
- Significant levels of mercury, *PCBs* and *DDT* were found in white perch, white sucker, and brown trout in a New York State DEC analysis in 1989. Fish were collected from two sites along Onondaga Creek, Webster Road and Spencer Street. These data are old and no further information was located among the available literature. The source of contamination is unknown.
- Public meeting participants expressed interest in reestablishing or protecting *native species* along Onondaga Creek. The possibilities for *restoration* or support of native fish communities vary depending on the species. Some migrating species, e.g. lake sturgeon, Atlantic salmon or American eel, require coordination with habitat improvement efforts throughout the Seneca-Oneida-Oswego system. Other species (e.g., brook trout), may be successfully protected through habitat and water quality improvements and discontinuing the stocking of brown trout. Any restoration or protection effort will require public support, focused goals and further study.
- Various researchers completed different types of *habitat assessments* on various stretches of Onondaga Creek between 1981 and 2005. Results were compiled based on a habitat index using a ranking scale. A map interprets compiled results (see Aquatic Habitat Fact Sheet). Much of the main creek channel was assessed as having poor/fair habitat scores. The most degraded habitat conditions, represented by the worst scores, were located in Vesper, near the old mill impoundment on Route 80, and in Syracuse downstream of Newell Street. Least degraded conditions, represented by high scores, are in Tully Valley, on the main stem of Onondaga Creek, between Woodmancy Road and the mudboils. The next highest scores were found from Route 20 downstream to the flood control dam on the Onondaga Nation. The OEI literature review revealed that much of the watershed, including most of the West Branch and tributaries, had not been assessed.
- Causes of degradation identified in the assessments include channelization, barriers and impoundments, bank erosion, the mudboils, mining, denuded or reduced riparian vegetation, and runoff pollution.

Hydrology: *findings*

The study of the occurrence, distribution, and circulation of the natural waters of the earth.

- Despite human modifications to Onondaga Creek such as channelization (artificial straightening of the creek channel), destruction of wetlands, elimination of creekside vegetation and damming, the creek still functions based on the natural hydrologic cycle. The hydrologic cycle governs the water level and flow rates in the creek, see Figure 3.2.
- Onondaga Creek water flow is measured at U.S. Geological Survey (USGS) gaging stations currently located where the creek intersects with Route 20 (near Cardiff), Dorwin Avenue, and Spencer Street in Syracuse. This information provides a picture of water levels and flow rates in Onondaga Creek, especially in the city. Less data are available for upper, rural parts of the watershed.
- USGS flow data, combined with precipitation data, show Onondaga Creek's general yearly flow cycle: from late fall to spring the ground is frozen or saturated and plants and trees are dormant; water runs quickly over the ground to the creek; which has a high base flow and rises quickly during rain storms and/or snow melt events. From summer to mid-fall, rain is intercepted by vegetation or percolates into the ground; less water is in the creek channel (a low base flow) and the creek does not rise as noticeably from rain events.
- Heavy rainstorms usually cause peak flows (when stream discharge is at its highest point), but rapid snow melt during warm weather can also result in peak flow (usually March and April). Rain on existing snow pack has produced the highest peak flow recorded on Onondaga Creek March 13, 1920 (Holmes 1927).
- Onondaga Creek is characterized by a flashy urban *hydrograph*, which means rapid, high rises throughout the city during rainstorms. Water runs more quickly to Onondaga Creek in the city for several related reasons: the urban area has more impervious cover (roofs and paved areas that do not allow infiltration) than the rural part of the watershed; consequently less soil and vegetation are present to intercept rainfall before it runs off towards the creek; and this resulting runoff, or stormwater, is directed to the creek via a network of separated or combined sewer pipes.
- Compounding the flashy urban hydrograph, Onondaga Creek was deliberately channelized to create faster currents in order to contain and remove raw sewage discharges during low flow periods and to control flooding during high flows (see Flood Control Fact Sheet, Appendix B).
- Over sixty-six tributaries give form to the watershed and feed surface water to Onondaga Creek's main channel. City tributaries include Cold Brook and Furnace Brook. The tributaries are mostly culverted (piped) underground in densely developed parts of the city, and arrive at Onondaga Creek via storm sewers. Springs provide another fresh, or in some cases, *saline* water source into Onondaga Creek throughout the watershed. In the city, springs mostly end up culverted to storm sewers, like urban tributaries.

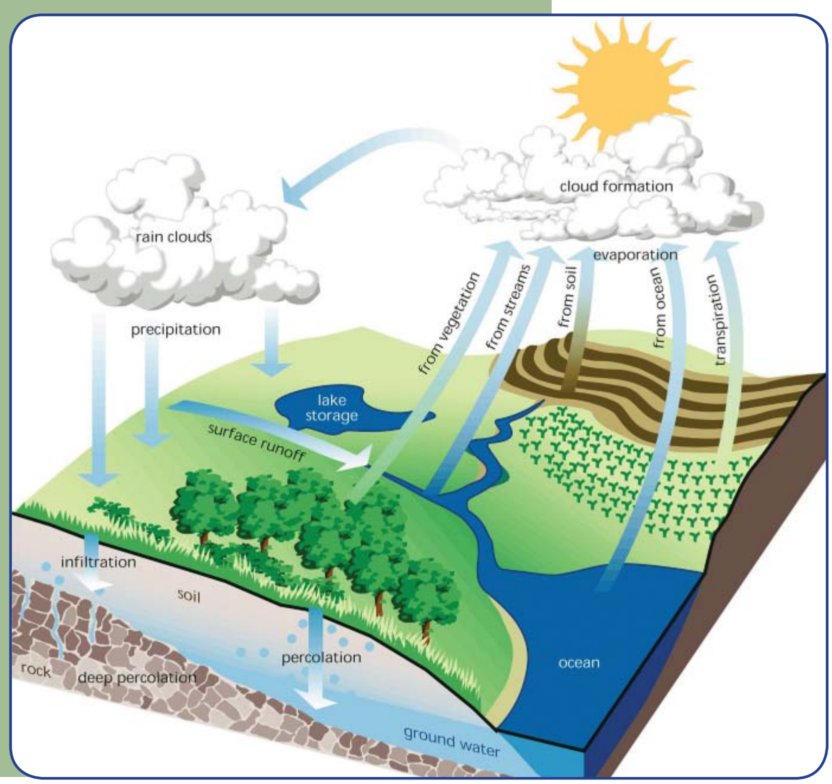


Figure 3.2 Hydrologic Cycle (FISRWG, 1998)

Flood control: *findings*

Measures taken to aid in the prevention of floods

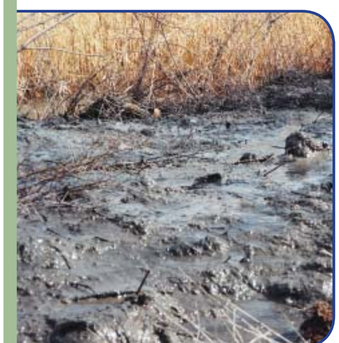
- A sizable portion of Syracuse was developed on the former natural *floodplain* of Onondaga Creek and its tributaries. South of Syracuse, a portion of Nedrow, which is part of the Town of Onondaga, was developed on creek floodplain. The growing city began altering the creek channel beginning in the 1850s. Early straightening by channelization on Onondaga Creek was intended to move raw sewage more quickly to Onondaga Lake.
- Later channelization projects were intended to protect the citizens of Syracuse from regular flooding. A key planning effort, resulting in the 1927 report by the Syracuse Intercepting Sewer Board and G.D. Holmes, emphasized three floods that occurred during a period of *deforestation* in Onondaga County. Since then reforestation, due to a decline in farming, has increased forest cover in the Onondaga Creek watershed.
- Based on the Holmes report, the Army Corps of Engineers built several flood control projects on the creek after World War II, including the Onondaga Flood Control Dam on the Onondaga Nation (1949), the *drop structure* at Dorwin Avenue (1950), and channelization between the northern border of the Onondaga Nation and Ballantyne Road (1950,1963). The dam was designed for a maximum flood volume that has not occurred. The dam is now an essential part of flood control, however alternative measures could be engineered to serve the same function if the dam was modified or removed.
- Flood control projects have been mostly successful; in recent decades, creek flooding rarely endangers or inconveniences citizens of Syracuse and Nedrow. Flood control requires constant maintenance, typically performed by highway departments. In the south, tributaries to Onondaga Creek such as those at State Route 1A and the Tully Farms Road bridge can *aggrade* causing flooding.
- There are negative side effects for flood protection, both for humans and the creek ecosystem.
  - The Onondaga Nation must contend with the loss of land use due to placement of the large flood control dam. The flood control dam and the drop structure at Dorwin both act as barriers to fish migration and boating.
  - Physical access and opportunities to interact with the creek are now restricted in the channelized corridor (e.g., boating, wading). The smooth bottom and sides and deeply cut channel increases water speed, reduces personal safety, and eliminates habitat for vegetation, invertebrates, and fish.
  - Fallen trees are routinely removed in the channelized part of the creek. While considered dangerous "strainers" by boaters, fallen trees serve a natural function of slowing water and creating habitat for aquatic life. Natural flood control features, such as floodplains and wetlands are eliminated in channelized sections.
  - On the stream banks, vegetative growth is restricted and mowing is frequent in channelized sections south of Ballantyne Avenue. This reduces habitat for insects, birds, and wildlife. The lack of vegetation reduces shade; channelization has produced a wide open, shallow stream profile, thus the high water temperatures noted above under water quality are prohibitive to cold-water fish, such as trout, in the summer. Currently, the straight, mowed creek channel in this area defaults to illegal use by all-terrain vehicle riders, thereby disturbing adjacent residents (Anonymous 2008). The mowing regime is executed by the New York State Department of Environmental Conservation and inspected by the U.S. Army Corps of Engineers.

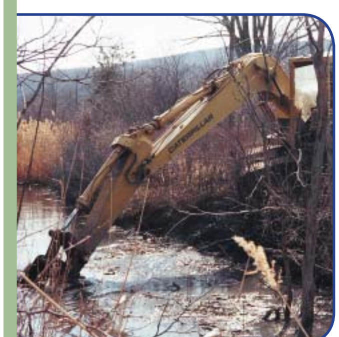
Tully Valley mudboils: *findings*

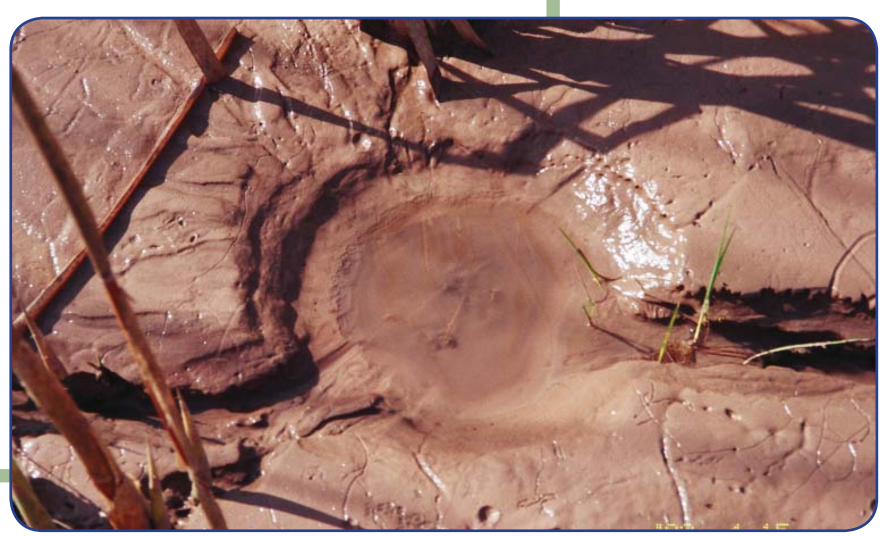
The muddy springs near Onondaga Creek in Tully Valley

- The Tully Valley mudboils are muddy springs located near Onondaga Creek south of Otisco Road in LaFayette, New York. The area of concentrated mudboils and related land subsidence is known as the Mudboil Depression Area (MDA). The MDA is currently 5 acres in size. Timing and location of new mudboils can be unpredictable; "rogue" mudboils have appeared outside of the MDA. The first documented occurrence of mudboils near Onondaga Creek was in 1899, as reported in the Syracuse Post-Standard (1899).
- The mudboils discharge a combination of water, liquefied sediment and dissolved mineral salts at the land surface. *Artesian groundwater* causes the mudboils to flow and forcefully discharge subsurface sediment. As the groundwater erodes and removes fine-grained sediment from below the land surface, the land subsides causing fractures in the unconsolidated sediments that can lead to further mudboil activity. Mudboils are a rare geologic phenomenon.
- The former brine mining fields at the Southern edge of the Tully Valley are another site of land surface subsidence, as well as soil and *bedrock* fracturing. Rain, snow melt, and associated runoff seep into the fractured bedrock, where formerly separate *aquifers* interconnect and add greater artesian pressure to the mudboils-aquifer system. Mudboils appear to have been exacerbated by the brine mining activity.
- In the past, sediment-rich mudboils flowed unchecked to Onondaga Creek, creating turbid conditions in the creek. In the early 1990s, the Onondaga Lake Management Conference (OLMC) installed depressurizing wells, a tributary diversion channel and a dam to detain mudboil discharge.[3] The *remedial* work was performed under the direction of the USGS and administered by OEI (formerly the Onondaga Lake Cleanup Corp.). The OLP and OEI currently maintains these installations in consultation with the USGS. The land containing the MDA, the impoundment and depressurizing wells is owned by Honeywell Corporation. Copious sediments from mudboils, landslides, streambank erosion, and runoff deposited in the creek in the past still remain in the creek channel. As noted under *Water Quality*, sediment is resuspended during storm events. The existing sediment bedload is expected to affect creek water quality for several decades.
- Much of the mudboil discharge is now contained behind the dam, creating an impoundment area where detained water maintains *hydraulic* pressure over the mudboils, reducing mudboil flow. A large portion of sediment brought up to the surface via mudboils settles behind the dam. Finer particles flow to Onondaga Creek, continuing to cause turbidity in the creek. Since the early 1990s, mudboils have transitioned from discharging predominately fresh water to more saline groundwater. Brackish to saline mudboils are the most common type occurring currently, discharging water ranging from slightly salty to very salty. This too affects the creek's water quality.
- The amounts of mudboil sediment and saline water released to Onondaga Creek today are much less than the years before remediation work began. However, several considerations must be taken into account for effective mudboil management.
  - The remedial installations must be maintained and monitored.
  - Current maintenance activity is not financially self-sustaining.
  - *Subsidence* and land loss is expected to continue, affecting nearby agricultural fields.
  - Land owner *liability* is unknown, restricting potential public access to the area.

[3]The OLMC was established by Congress in 1990 to develop a management plan for restoring Onondaga Lake. Congress replaced the OLMC with the OLP in 2000.







Access: *findings*

The right to view or enter and make use of something.

- Currently, physical access to Onondaga Creek is restricted. Physical access can be gained three ways: via public access point, by permission from corridor landowners, or through land that appears unused and is neither fenced nor posted against trespass.
- Rurally, much of the Onondaga Creek corridor is private property, restricting physical access to those with permission from the landowner. Physical access can be gained through public right-of-way at some bridge crossings.
- From Nedrow northward, the creek is channelized, currents are swift during high flow periods, and thus access is restricted by chain link fence for public safety. The fences are owned and maintained by government agencies to prevent citizens, especially children, from falling into the channel and potentially drowning; however, some sections of the fence are routinely vandalized to gain access.
- Once legal access is obtained, the right generally exists to navigate the creek in a watercraft, like a canoe or kayak, although current interpretations of state and federal law make this a legally complex issue.
- Permission is needed from the Council of Chiefs to navigate or gain access to Onondaga Creek on the Onondaga Nation.
- Visual access, or ability to view the corridor, is possible from numerous road bridges over the creek and from some urban parks in the Valley neighborhood and in Nedrow. Although Onondaga Creek Boulevard parallels the creek corridor on the Southside of the city, visual access is restricted because of chain-link fencing, brush and depth of the deeply cut creek channel.
- No easy solutions exist to increase physical access to Onondaga Creek. Multiple factors have to be balanced, such as habitat protection, personal safety, landowner liability (whether private or public), flood control needs, and the complex, long-term process of ecological restoration.

Land use and land cover: *findings*

Land use: ***The way in which humans use the earth's surface;***
Land cover: ***Material on the land surface, either natural or human-made.***

Figure 3.5 Relationship between impervious cover and surface runoff (FISRWG 1998).

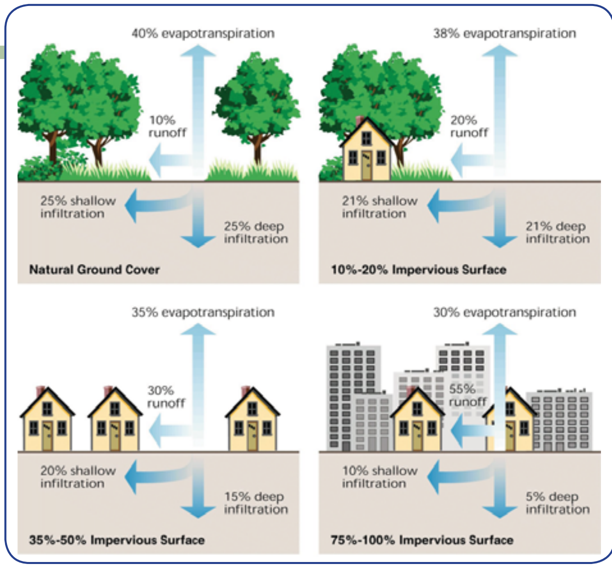
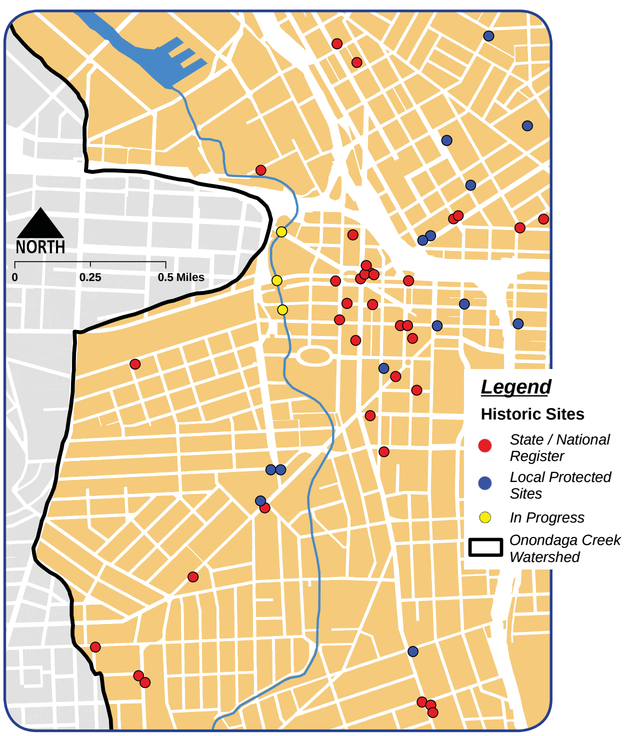


Figure 3.6 Eligible or Registered Historic Sites in Downtown Syracuse.



- The term land use describes human land use, usually related to economic activity. The term land cover describes material, either natural or human-made, on the land surface. On the following pages, two watershed maps compare land use (Figure 3.3) and land cover (Figure 3.4).
- Land uses are primarily agricultural and residential in the rural portion of the Onondaga Creek watershed, including Tully Valley and the West Branch of Onondaga Creek. Land lots tend to be larger; the average agricultural parcel size is about 40 acres, the average residential parcel ranges from two to eight acres.
- In the urban portion of the watershed, from Nedrow through Syracuse, land lots are much smaller, averaging 0.25 acres. There are two distinct types of land use in Syracuse. From its southern border to the edge of the downtown, the city is primarily residential; this is where the greatest population density exists near the creek. Downtown (the central business district, or CBD) is the center of commercial activity, with less residential use.
- Greater concentration of residential and commercial land cover occurs in and near downtown, the northernmost portion of the creek's watershed, readily visible on the land cover map. Greater residential and commercial density correlates to greater impervious surface, see Figure 3.5. Impervious cover increases surface runoff, discussed under Hydrology. Streams can be degraded with as little as 10 percent impervious cover in the watershed (FISRWG 1998).
- In addition to increasing impervious cover and runoff, residential and commercial land use affects Onondaga Creek through placement. In the past, structures (homes and businesses) were built near or even on the banks of Onondaga Creek. In rural areas, farmers maximized field area by planting crops close to the creek's edge. The legacy is a thin buffer between the creek and human land use activity. Current knowledge and practice tells us that *vegetated buffers*, riparian areas and wetlands all serve natural functions protecting the creek from the effects of land use.
- The creek watershed is rich with historic structures, including historic bridges over Onondaga Creek downtown and channel stonework in places such as city parks. Figure 3.6 shows registered historic sites in the Onondaga Creek watershed.

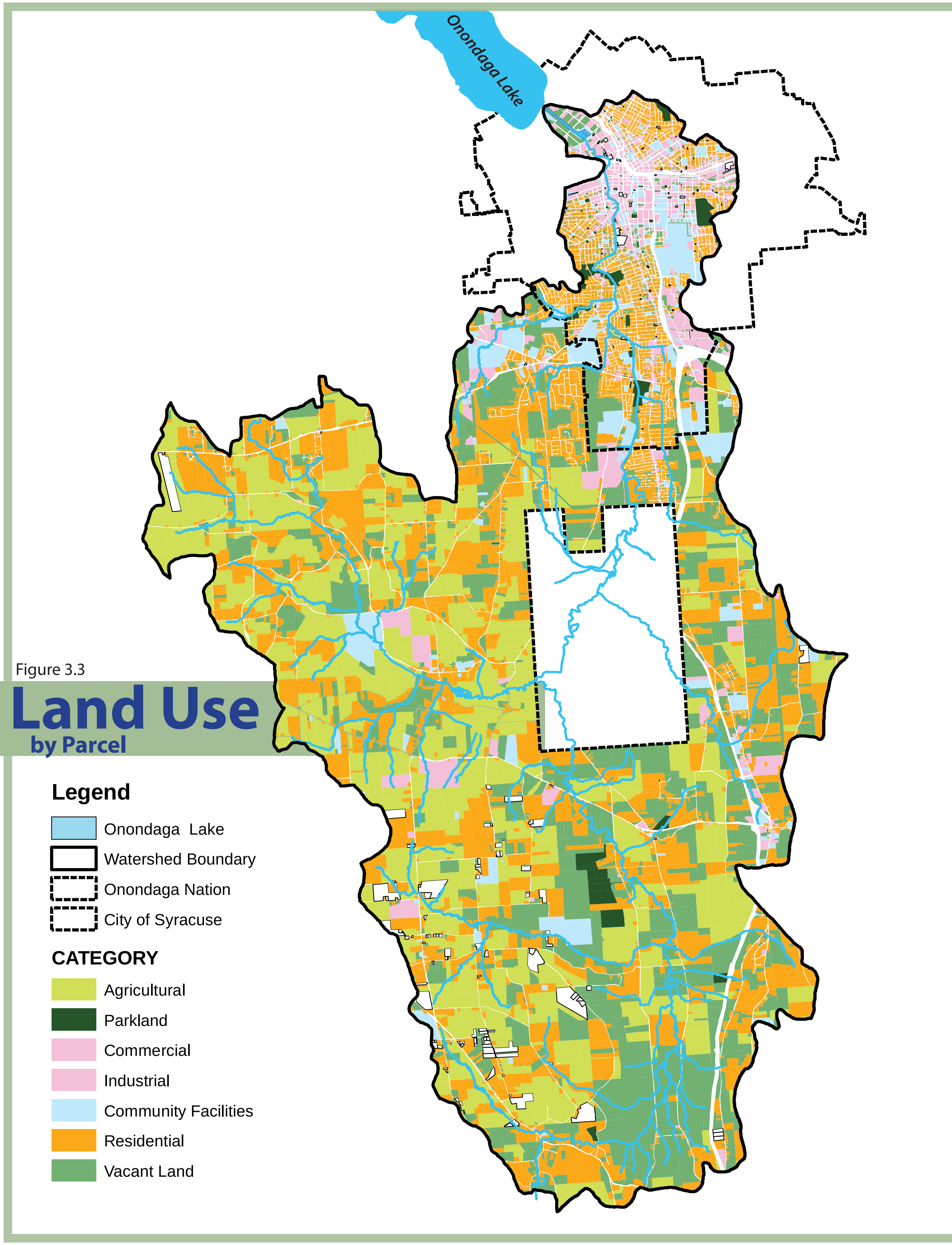


Figure 3.3

Land Use
by Parcel

Category Definitions:

Water - All areas of open water.
Developed - Areas characterized by a high percentage (30 percent or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc).
Barren - Areas characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present.
Forested - Areas characterized by tree cover; tree canopy accounts for 25-100 percent of the cover.
Shrubland - Areas characterized by woody vegetation, generally less than 6 meters tall.
Herbaceous - Areas characterized by herbaceous vegetation, non-woody plants with leaves and stems that die back in winter. Herbaceous vegetation accounts for 75-100 percent of the cover.
Cultivated - Areas characterized by herbaceous vegetation that has been planted. Herbaceous vegetation accounts for 75-100 percent of the cover.
Wetlands - Areas where vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

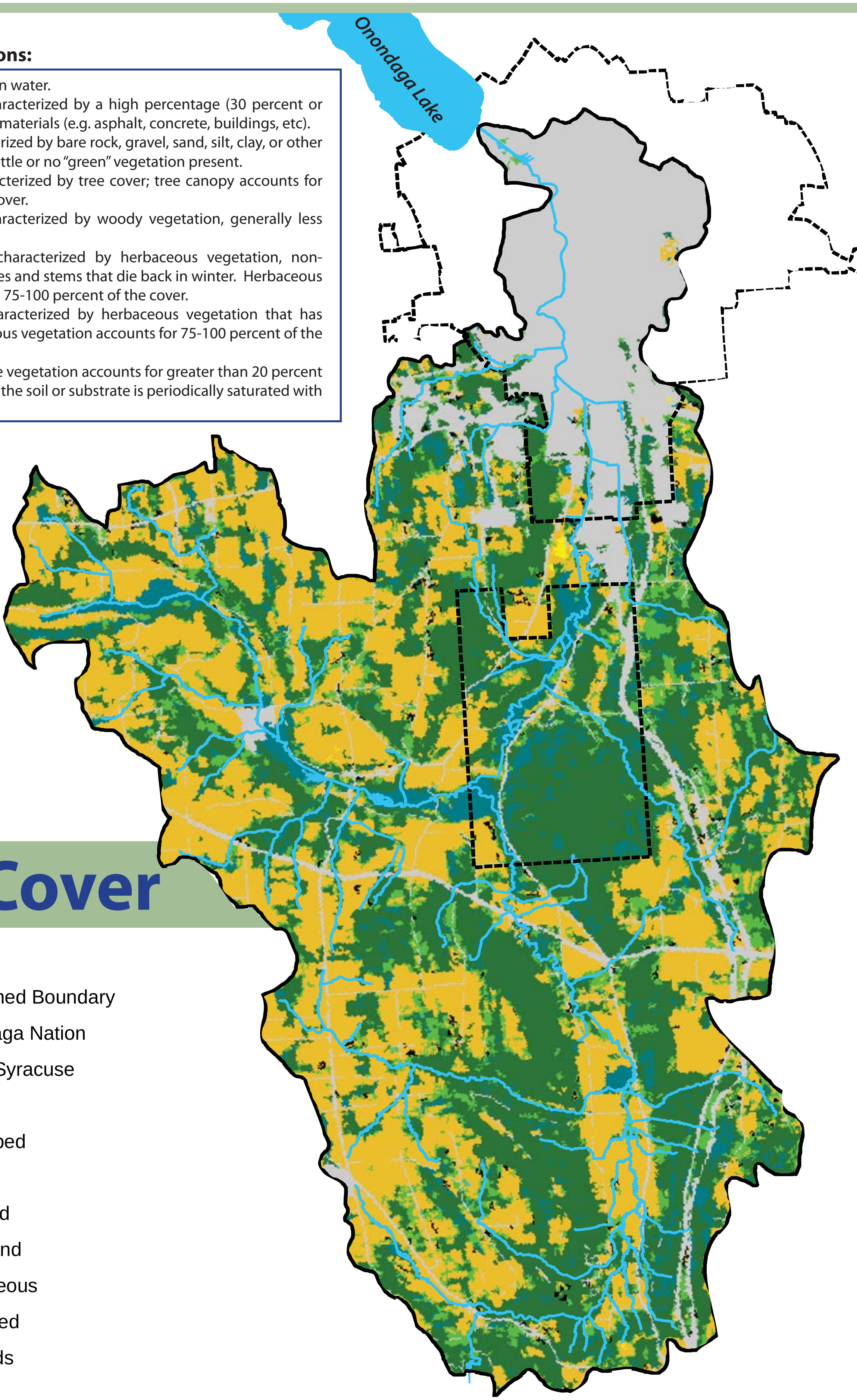


Figure 3.4

Land Cover

Legend

- Watershed Boundary
- Onondaga Nation
- City of Syracuse
- Water
- Developed
- Barren
- Forested
- Shrubland
- Herbaceous
- Cultivated
- Wetlands


onondaga creek
CONCEPTUAL REVITALIZATION PLAN
COMMUNITY
FORUM
MAY 3
5:30 PM
FREE