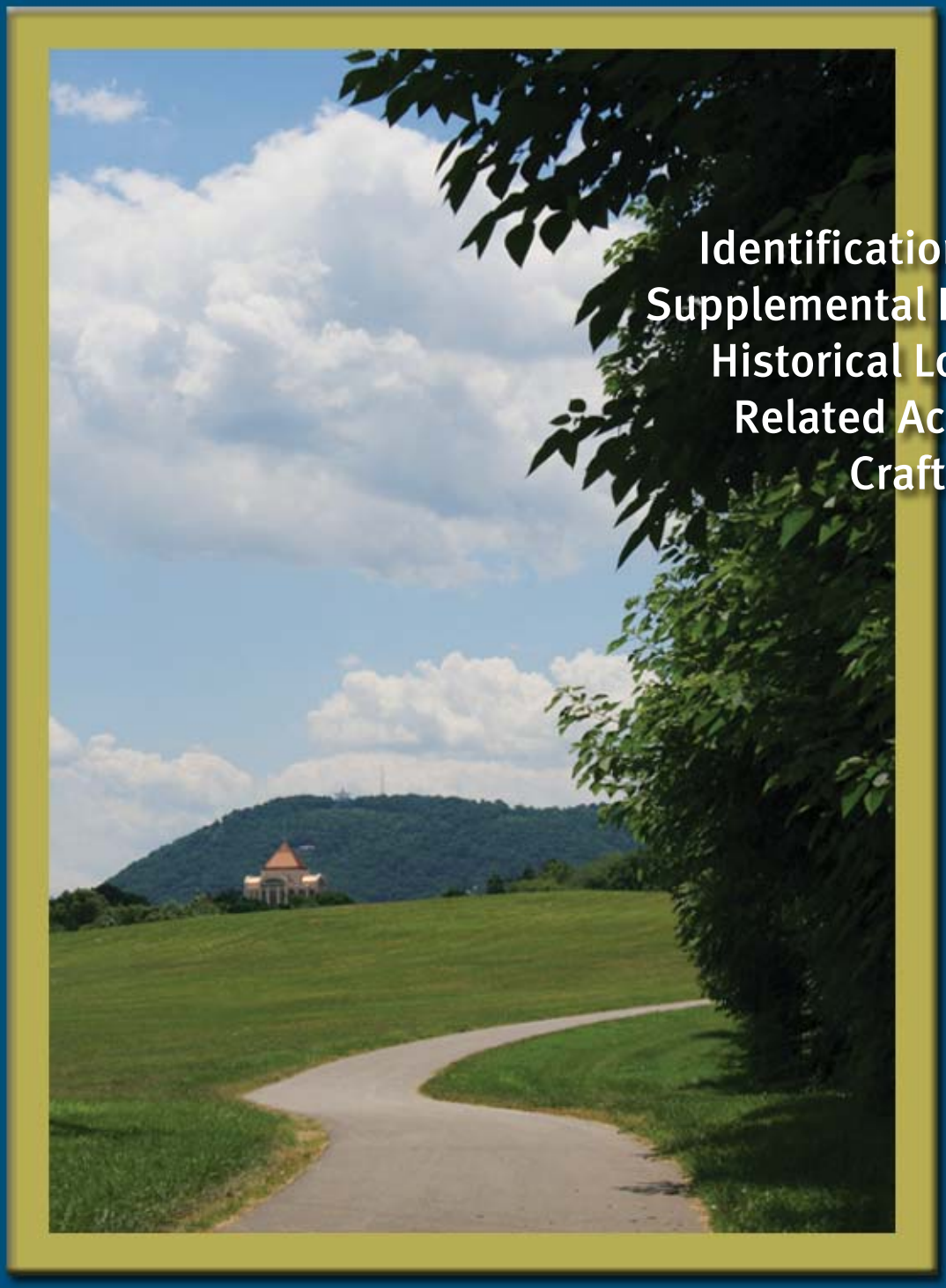
Lick Run Greenway Leader's Guide



Identification Guides
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Historical Locations
Related Activities
Crafts

ROANOKE

2010

KIWANIS INTERNATIONAL

Thanks to a $10,000 donation from the Kiwanis Club of Roanoke the Lick Run Greenway educational program has been implemented. The four interpretive signs along the greenway examine the diverse habitats that the greenway encompasses. This leader's guide will hopefully bring children out into an outdoor laboratory for a hands on experience and education. Roanoke City and the Parks and Recreation department look forward to bringing these types of programs to the greenways across the city.

If you are interested in a program related to the information in this leader's guide, contact the Roanoke Parks and Recreation department for further information on camps, classes, and other opportunities.

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Lick Run Fast Facts

Where will the Greenway take me?

If accessing from downtown Roanoke, the greenway will take you to Valley View Mall and vice versa.

Where can I access the Greenway?

The greenway begins behind the Market Building in downtown, and ends at the entrance to Target, Staples, and Petsmart across from Valley View Grande 16. It can also be accessed at Brown-Robertson Park on 10th Street and Washington Park on Orange Avenue.

What about Parking?

Parking is available in downtown, the Valley View Mall shopping areas, Washington Park, and 10th Street.

How long is the Greenway?

Approximately 3.6 miles.

What landmarks can be seen?

The Market Building; Martin Luther King, Jr. Bridge; Washington Park; Brown-Roberston Park; Hotel Roanoke; and the Railwalk.

Identification Guides

A Guide to the Plants of the Lick Run Greenway

Black Walnut
Juglans nigra

Boxelder
Acer negundo

Sugar Maple
Acer saccharum

Willow Oak
Quercus phellos

Red Oak
Quercus falcata

American Sycamore
Plantanus occidentalis

River Birch
Betula nigra

White Oak
Quercus alba

Indian Strawberry
Duchesnea indica

White Clover
Trifolium repens

Common Dandelion
Taraxacum officinale

Common Blue Violet
Viola sororia

Watercress
Rorippa nasturtium-aquaticum

White Mulberry
Morus alba

Virginia Creeper
Parthenocissus quinquefolia

Raspberry
Rubus strigosus

*The first two rows are large standing trees. The third row shows ground cover species. The fourth row depicts water species, vines, and fruiting species.

A Guide to the Plants and Insects of the Lick Run Greenway

Eastern White Pine
Pinus strobus

Cattail
Typha latifolia

Poison Ivy
Toxicodendron radicans

Crown Vetch
Coronilla varia

Kudzu
Pueraria lobata

Red Clover
Trifolium pratense

Daisy Fleabane
Erigeron annuus

Lily
Lilium sp.

Chicory
Cichorium intybus

Queen Anne's Lace
Daucus carota

Differential Grasshopper
Melanoplus differentialis

Paper Wasp
Polistes annularis

Multicolored Asian Lady Beetle
Harmonia axyridis

Red-spotted Purple
Limenitis arthemis astyanax

Periodical Cicada
Magicicada septendecim

Fork-tailed Bush Katydid
Scudderia furcata

*Keep in mind that few species are depicted in these guides. To supplement, use field guides that show many more species and their relationships to one another.

Guide to the Insects, Mammals, & Amphibians of the Lick Run Greenway

Eastern Carpenter Bee
Xylocopa virginica

Honey Bee
Apis mellifera

Common Whitetail Dragonfly
Libellula lydia

Cabbage White
Pieris rapae

Tawny-Edged Skipper
Polites themistocles

European Mantid
Mantis religiosa

Monarch Butterfly
Danaus plexippus

Eastern Tiger Swallowtail
Papilio glaucus

Woodchuck / Groundhog
Marmota monax

Eastern Gray Squirrel
Sciurus carolinensis

White-Tailed Deer
Odocoileus virginianus

Striped Skunk
Mephitis mephitis

Cottontail Rabbit
Sylvilagus floridanus

Virginia Opossum
Didelphis virginiana

Common Raccoon
Procyon lotor

Eastern Chipmunk
Tamias striatus

Eastern Box Turtle
Terrapene carolina

American Bullfrog
Rana catesbeiana

American Toad
Bufo americanus

Green Frog
Rana clamitans

*The first two rows represent insects. The third and fourth rows, mammals. The bottom row contains a reptile species and three amphibians.

A Guide to the Birds of Lick Run Greenway

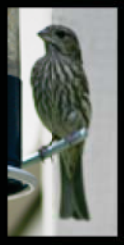
Northern Cardinal
Cardinalis cardinalis

Black-Capped Chickadee
Poecile atricapillus

Tufted Titmouse
Baeolophus bicolor

Carolina Wren
Thryothorus ludovicianus

Eastern Bluebird
Sialia sialis



Song Sparrow
Melospiza melodia

House Finch
Carpodacus mexicanus

Belted Kingfisher
Ceryle alcyon

Rock Pigeon
Columba livia

Mourning Dove
Zenaida macroura

European Starling
Sturnus vulgaris

Blue Jay
Cyanocitta cristata

Gray Catbird
Dumetella carolinensis

Northern Mockingbird
Mimus polyglottos

American Goldfinch
Carduelis tristis

Mallard
Anas platyrhynchos

Downy Woodpecker
Picoides pubescens

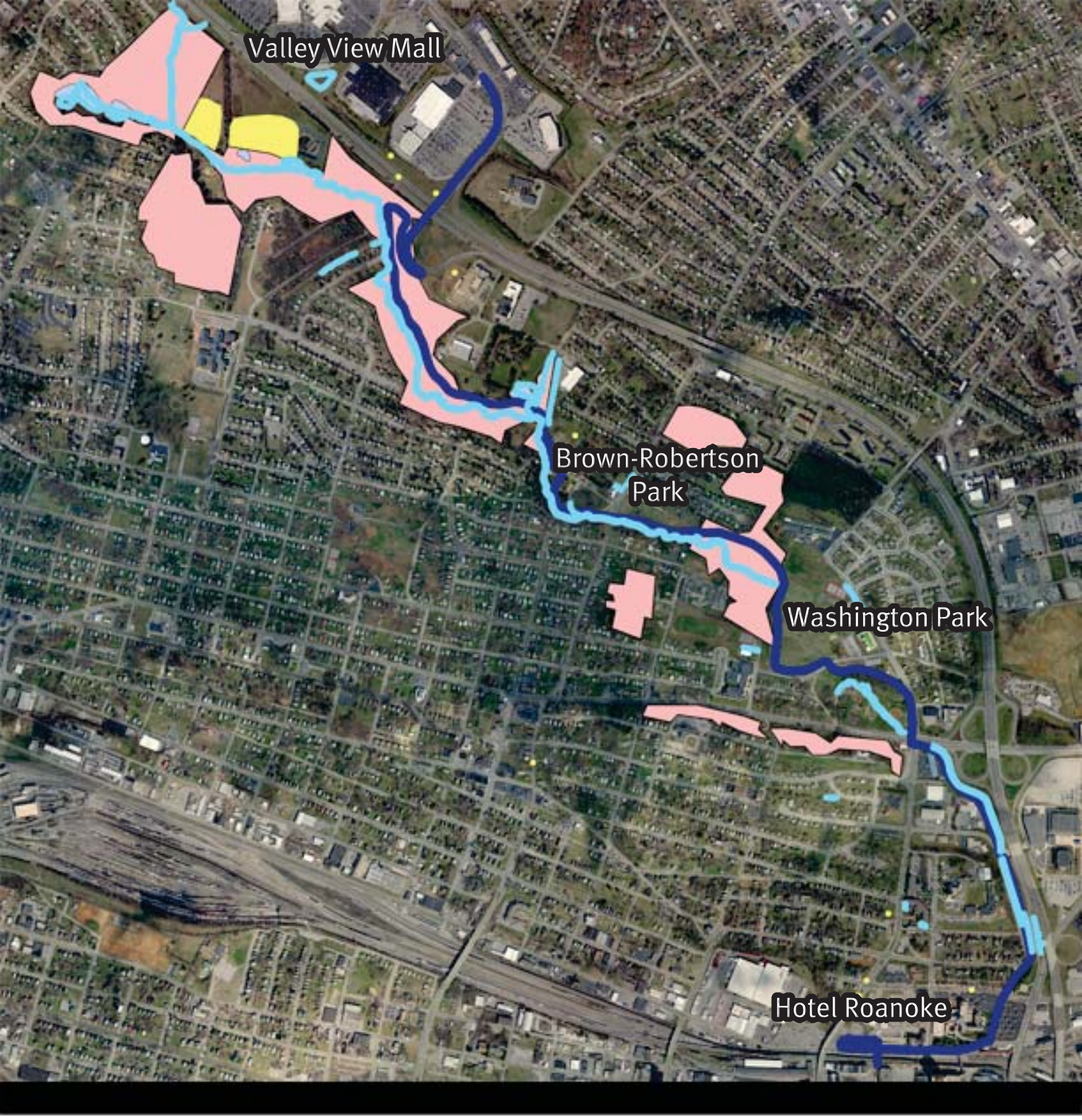
Red-bellied Woodpecker
Melanerpes carolinus

Yellow-bellied Sapsucker
Sphyrapicus varius

White-breasted Nuthatch
Sitta carolinensis

Birds of the Lick Run Greenway, Roanoke, Virginia
Compiled from personal observations by Rupert Cutler
2006-2009

Great Blue Heron
Green Heron
Yellow-crowned Night Heron
Black Vulture
Turkey Vulture
Mallard
Sharp-shinned Hawk
Cooper's Hawk
Broad-winged Hawk
Red-tailed Hawk
American Kestrel
Killdeer
Ring-billed Gull
Rock Dove
Mourning Dove
Barred Owl
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Red-bellied Woodpecker
Yellow-bellied Sapsucker
Downy Woodpecker
Northern Flicker
Easter Wood Pewee
Least Flycatcher
Eastern Phoebe
Great Crested Flycatcher
Eastern Kingbird
Blue-headed Vireo
Philadelphia Vireo
Red-eyed Vireo
Blue Jay
American Crow
Rough-winged Swallow
Barn Swallow
Bank Swallow
Carolina Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown Creeper
Carolina Wren
House Wren
Ruby-crowned Kinglet
Golden-crowned Kinglet
Blue-gray Gnatcatcher
Eastern Bluebird
Veery
Wood Thrush
American Robin
Gray Catbird
Northern Mockingbird
Brown Thrasher
Cedar Waxwing
European Starling
Nashville Warbler
Chestnut-sided Warbler
Magnolia Warbler
Yellow-rumped Warbler
Black-throated Green Warbler
Prairie Warbler
Palm Warbler
Black-and-white Warbler
American Redstart
Ovenbird
Common Yellowthroat
Canada Warbler
Scarlet Tanager
Eastern Towhee
Chipping Sparrow
Song Sparrow
White-throated Sparrow
Dark-eyed Junco
Northern Cardinal
Indigo Bunting
Red-winged Blackbird
Common Grackle
Brown-headed Cowbird
Baltimore Oriole
House Finch
American Goldfinch
House Sparrow



Greenway Path
Lick Run Creek
Forest Cover
Archaeological Sites

Features of the Lick Run Greenway

Supplemental Information

The Roanoke Star

The Indians who traveled through the area named it the Shenandoah Valley, “daughter of the stars.” Therefore it is only fitting that Roanoke be the “Star City of the South.” The Roanoke Star made this possible when it was first lit up on November 23, 1949 by then mayor of Roanoke, A.R. Minton. Its purpose was at the time seasonal, a Christmas decoration. The Roanoke Merchants Association sponsored the project and Kinsey Sign Company was responsible for building the star, which remains the largest freestanding, illuminated star in the world.

Star Facts

-Height: 88.5 Feet
-Weight: 10,000 Pounds
-Height Above Sea Level: 1,857 Ft
-Height Above City: 1,045 Ft
-Visibility: 60 Miles
-Cost: $28,000

Big Lick

In 1834, Gainsborough became the first town in the valley; soon to be renamed Big Lick. The name came from the exposed salt licks in the valley visited by both Indians and animals. Buffalo, elk and deer, all rich sources of food for the Indians, resided in these salt marshes.

Around 1838 Big Lick held a population of fifty people. This small community moved to the railroad tracks in 1852. The old residence then took on the name Old Lick, and the new Big Lick was chartered in 1874 with the help of several men, including Henry S. Trout. By 1880, Big Lick had a population of 669 due to its three hotels, five tobacco factories, post office, bank, newspaper, ten stores, two saloons, five churches and a cigar factory. Professionals were developing in the art of shoe and harness making, pharmacy, medicine, and law.

In 1881 Big Lick became known as Roanoke, an Algonquian word for "shell money" used for trading goods. This newly named city became a crossroads for the Shenandoah Valley and Norfolk and Western railroads thanks to John Moomaw who developed a petition for right of way and a terminal site for the railroad. The city rapidly grew and was chartered under its new name in 1884.

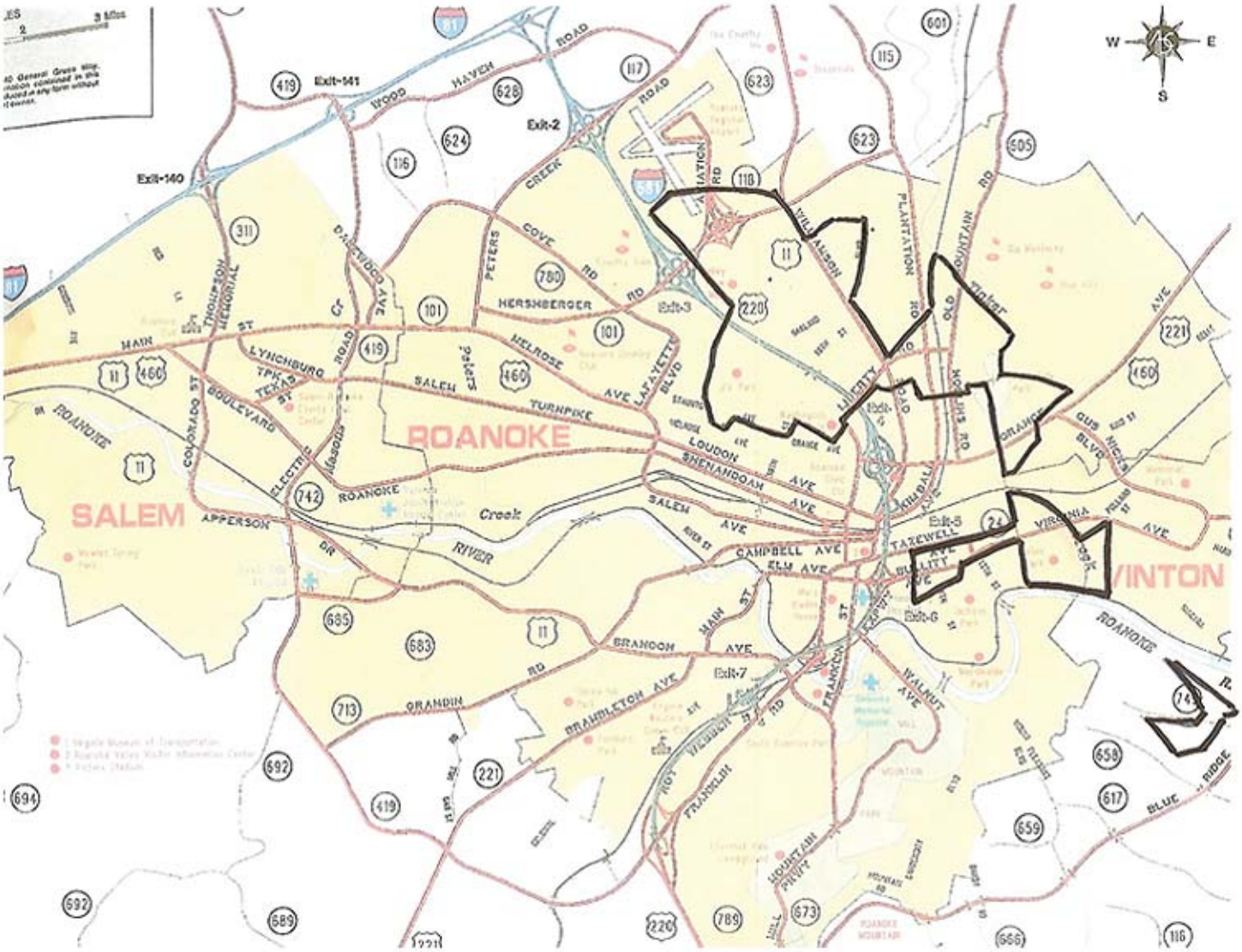
Jefferson and Campbell intersection in 1927.

The first city market building ca. 1890

Oaklands

Lick Run Greenway now passes through much of what was known as Oaklands, the residence of the Watts family. The original house was built in 1817 by Edward Watts (1779-1859), and throughout his life, Edward added tracts of land to the plantation, as did his son William (1817-1877). By around 1870 Oaklands plantation extended from the present Roanoke municipal airport on the west, Round Hill on the north, Orange Avenue on the south, to Tinker Creek on the east, and it included land on both sides of Tinker Creek southward to where it flows into the Roanoke River, and from that point also included a large tract extending into Southeast Roanoke. Edward Watts served as a general in the U.S. Army during the War of 1812, and besides running his plantation; he was a lawyer, businessman, and civic leader. His son William Watts served as a colonel in the Confederate Army, and followed in his father's footsteps in his other roles as well. William's son, John Allen Watts (1855-1904), also a noted lawyer, moved with his family into Roanoke City, and was living there in 1899 when the original house at Oaklands burned. A new house was built, and the descendants of J. Allen Watts lived at Oaklands throughout the twentieth century.

Courtesy of English Showalter (Jr)



The image above depicts a recent map of Roanoke and the surrounding areas. In dark outline, the boundaries of the Oaklands plantation can be seen, based on the Hildebrand map of Roanoke County farms (1875). Watts left his land to his five children whose last names were Carr, Holcombe, Robertson, Sorrel and Watts.

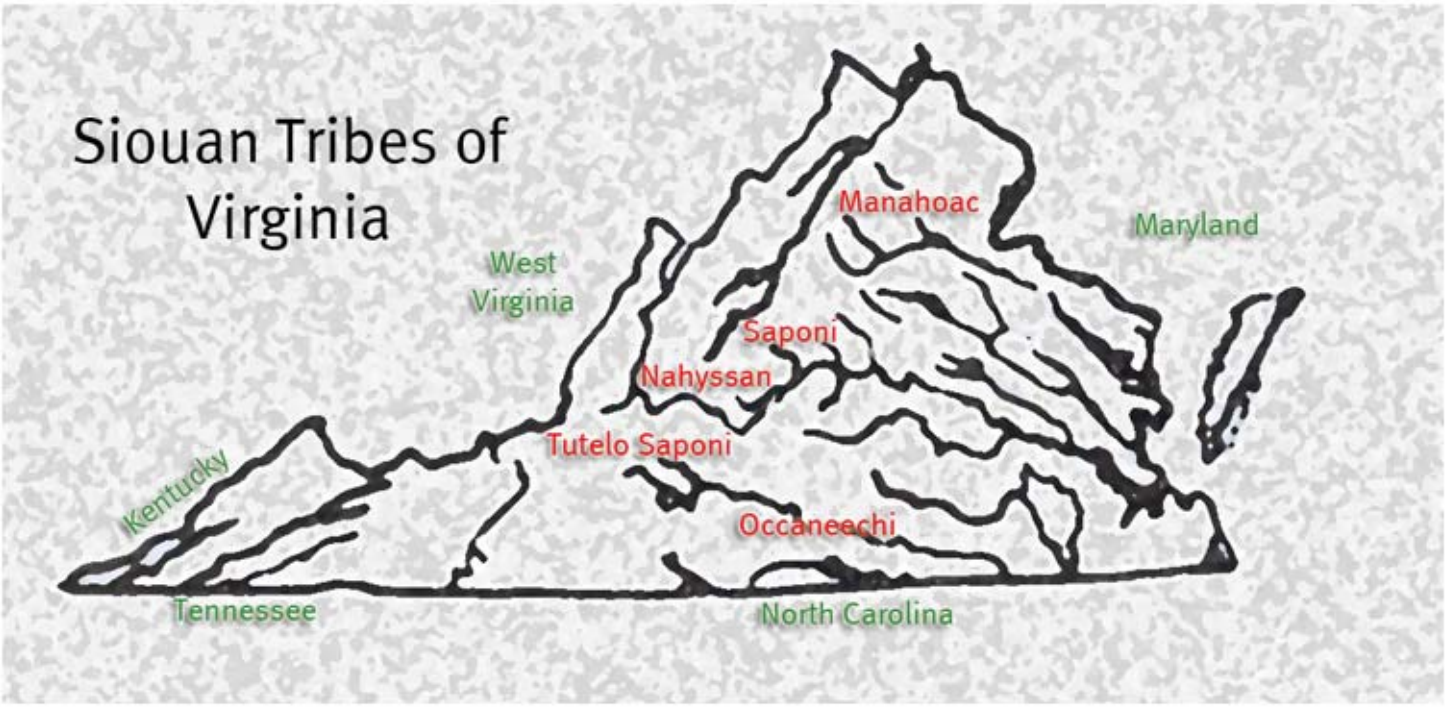
Tutelo Tribe

Several Indian encampments occupied the area in which Interstate 581 now passes Valley View Mall. It is likely that they were seasonal hunting areas for the Tutelo tribe during the Late Woodland period (ca. 1,000-300 years ago). The tribe was a part of the Siouan tribes in the Eastern United States. Lick Run, along with other nearby springs, provided a clean water source, as well as both aquatic and terrestrial life for hunting.

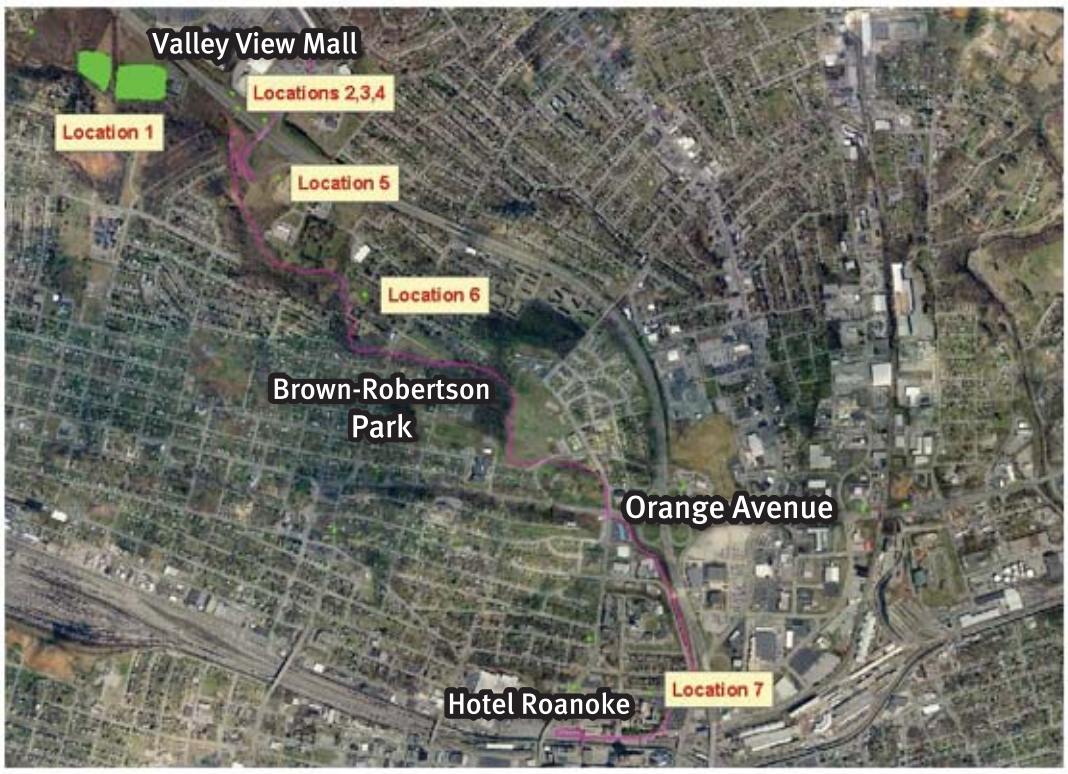
The Iroquois used the term Tutelo as a representation of the Virginia and North Carolina Siouan tribes. The tribe was very close to the Saponi; their languages similar enough to communicate.

The tribe fought with the Powhatan Indians, while fearing the Iroquois. Government in 1722 caused peace between the Iroquois and the Tutelo, but it also ended in the movement of the Tutelo to areas in Pennsylvania.

Nikonha was the last full-blood Tutelo. His death occured in 1871, but much of the linguistic information of the Tutelo tribe came from him. Subsequently, the last speaker of the Tutelo language died in 1990, but ancestors are persistent in reviving the language for cultural reasons.



The above map illustrates the Siouan tribes in the Virginia area. The Tutelo resided in the Roanoke Valley. Below is a map of Lick Run Greenway's archaeological locations. The Tutelo were located near locations 2,3, and 4 on this map. Older tribes with unknown ancestry were located at locations 1 and 6.



Invasive Species

Animals and plants are dependent on their daily food chains and energy transfer, but when a new species is introduced, it takes over the niche of another. These new, non-native species are known as invasive species. They consist of any species that is not native to a particular area. Invasives can cause eco system imbalance if added to a foreign location.

Examples of invasive species are Kudzu and the gypsy moth. Kudzu was introduced to the United States in 1876 from Japan. The plant quickly took over the Southeastern U.S. Kudzu poses a danger because although it minimizes soil erosion, it also blankets lanscapes leaving no room for competing species. Thus, native species are lost and kudzu continues on.

The gypsy moth has caused damaging effects on forested areas. The moth originated in Europe and Asia, but is known here for
defoliating hardwood forests in areas as large as 440,000 acres in Virginia in one year alone! In order to keep populations low, soybean oil and water may be sprayed on the eggs to reduce hatch levels in the area.

How to Avoid Invasives

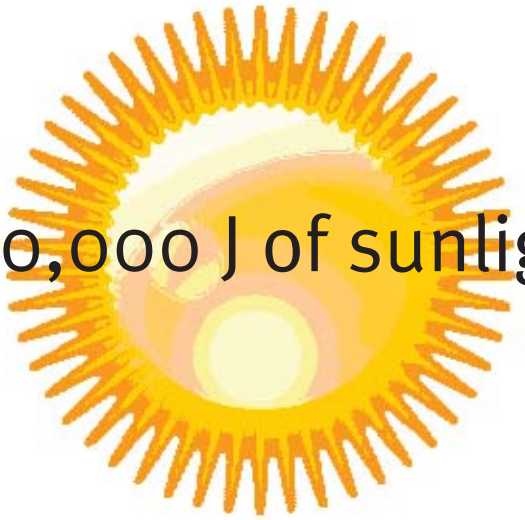
One of the easiest ways for invasives to be introduced into a community is through residential landscaping. Nurseries often offer plant species that are non-native, such as Japanese Maples. These trees drop their seeds in the surrounding area, and begin to populate. They then compete with oaks, maples, and other native trees for light within this area. When beautifying the landscape at home, school, or work it is important to choose native species. If invasives are used, make sure to plant them in containers, or in an area that is isolated from natural surroundings.

Energy Pyramid

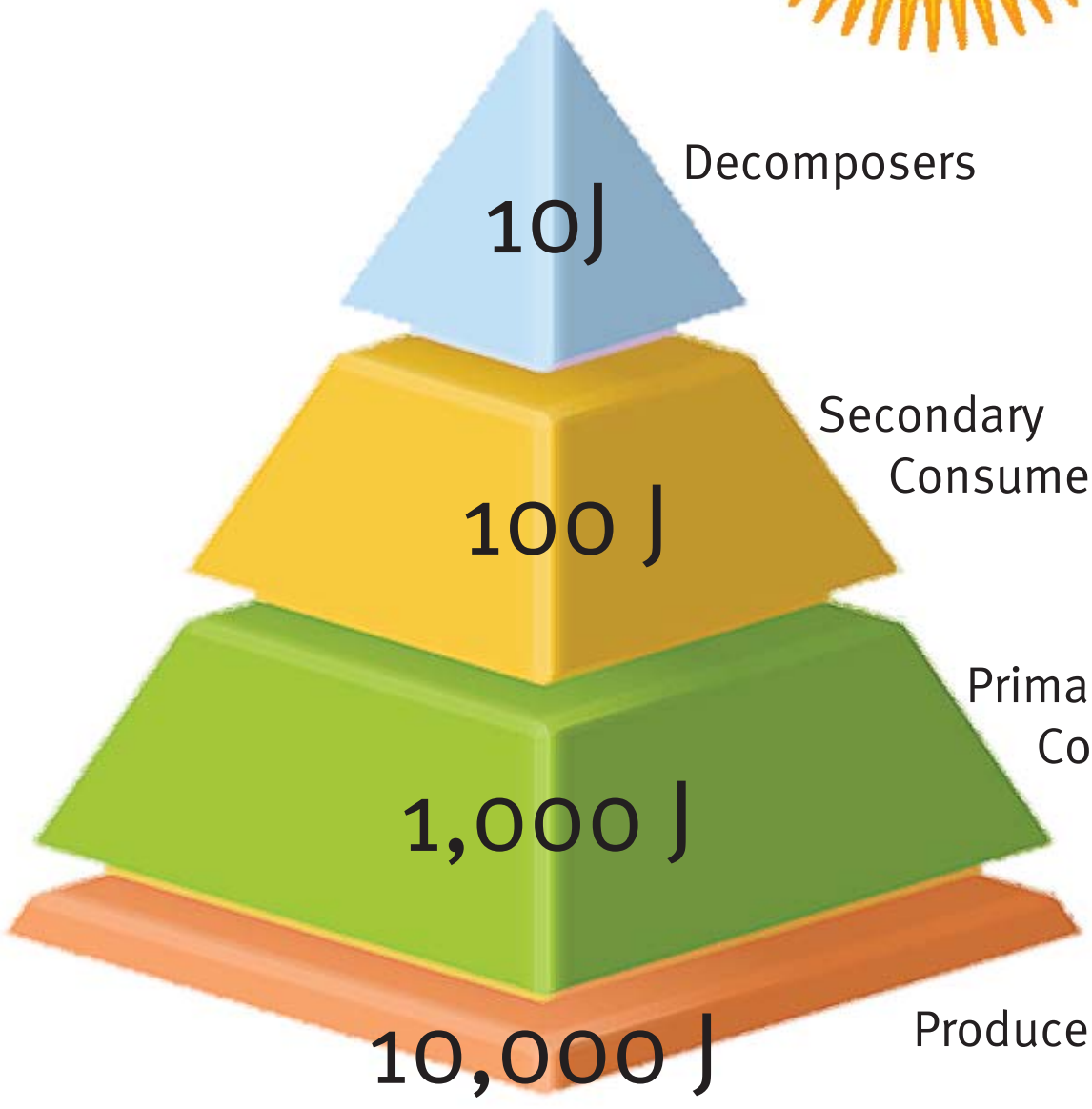
Energy that fuels the earth comes from the sun's solar radiation. Primary producers are known as photoautotrophs, meaning that they capture light energy to make organic molecules. Light energy is absorbed as photons in the plants chlorophyll. This energy spurs chemical reactions that converts CO2 into carbohydrates, releasing oxygen as a by product. At each level, this energy decreases by 10% because not all of it goes into making biomass. Much of the energy is lost to respiration. Biomass, weight of living material, follows this same trend. There are many more plants in ecosystems than there are large mammals and other consumers. This is due to the allotment of energy, and the small amount of energy available for secondary and tertiary consumers.

To understand this concept, measure out a liter of water. This liter represents the sun's energy. Pour 100mL into another container, pouring the excess down the drain. The water left represents the energy the primary consumer receives. Use this 100mL to then fill another container with 10mL, the energy the secondary consumer receives. Pour 1mL of the 10 into another, smaller container. This 1mL represents the energy the tertiary consumer receives. Finally, pour 0.1mL into a container. This amount represents the energy the decomposer receives when the tertiary consumer dies. Children can now see how much energy is lost at each stage, and the necessity for tertiary consumers to consume more to get as much energy as the primary producer.

How Energy Moves through the Pyramid



1,000,000 J of sunlight



Kiosk Information

Washington Park

Washington Park was named for Booker Taliferro Washington of Franklin County, Virginia - an advocate for practical education. In the past, the area was home to two different mills due to Lick Run's close proximity to the land. Today, it is home to many facilities such as the Olympic-size swimming pool located in the upper section, and basketball courts, playground equipment and other amenities in the lower section.

The park's upper level was at one time a functioning quarry, until it became home to a sanitary landfill in the 1950s. The city closed the landfill in 1963; however, the rolling terrain is still evidence of the natural progression of settling as time goes by.

Today, the term "Brownfield" usually identifies an area much like Washington Park that takes a closed landfill area and rehabilitates the resource such that it becomes a more natural and healthy space.

One way to encourage such a transformation is to introduce specific tree and plant materials over time to regenerate the natural systems. Trees can be introduced into the area, but they must maintain a shallow root system so as not to penetrate into the ground. In order to keep the roots growing horizontally, trimming must be done often to cause lateral root growth rather than a large taproot. This maintains a shallow root system which is important for keeping the containment system of the landfill intact.

Native species are best for this type of revegetation because they are adapted to disturbances and changes in the area. Grasses and wild flowers are well suited, as they have a mat like root system that prevents soil erosion over the landfill. Shrubs, such as spreading yews, are also good choices seeing that their roots are larger, but not as invasive as tree roots. However, some trees such as pin oaks, eastern white pines, red maples, American basswood, and ginkgo can tolerate the methane gas production relatively well. If clusters of these species are planted, bird species may then migrate to the area and disperse seeds of other species, developing an understory that will hopefully promote succession.

As a means to help the long-term sustainability and health of Lick Run stream, riparian buffers could be used to help filter stormwater and other run-off materials. Plant materials such as switch-grasses, arborvitae, river birch, and others could be used within thirty to fifty feet on either side of the stream.

As far as reducing future waste in the landfills, household recycling can decrease the amount of waste in landfills greatly. Also, buying in bulk reduces the amount of packaging per item that could end up in the trash. Composting is another alternative for food scraps and lawn trash that can be done per household, and has great benefits when added to garden soil. Taking a few simple steps can go a long way when it comes to recycling and keeping excess trash out of the environment.

Brown-Robertson Park

November 4, 1985 proved to be the worst natural disaster Roanoke has ever seen. Six inches of rain fell in a very short period of time as the remains of Hurricane Juan hit the valley. Had it not rained the weekend before the storm, the six inches from Juan might have been absorbed by the ground. Instead it became immediate runoff.

In the Gulf of Mexico the hurricane reached speeds of eighty five miles per hour in some areas, but was only classified as a category one storm. Ranked as the 8th worst in terms of damage costs in United States history, the storm's worst damage came when it turned into an extratropical cyclone after reaching Virginia and the surrounding states. This type of cyclone develops once the storm reaches middle latitudes; more commonly known as a depression. Even further damage arose when an occluded cyclone spun off from the original storm due to the meeting of cold and warm fronts. This produced extra rain in the Virginia area.

Brown-Robertson Park experienced a great deal of damage in the Flood. At that time it was home to Shadeland Avenue. Lick Run creek outgrew its banks during the flood and engulfed the area; the Roanoke River alone experiencing a rise of 23 feet outside its banks. Dorothy Brown, a generous taxi driver, and Hazel Robertson, a child caregiver, were residents of Shadeland. The two unfortunately became a part of the estimated sixty-three victims lost to the hurricane nationwide.

Woodland Habitats

Woodlands normally have five layers: the canopy, understory, shrub layer, grass layer, and floor. The canopy consists of the tallest trees, and is the main site of solar energy capture. The understory is made up of smaller trees, followed by an even shorter shrub layer. Finally, grasses and other ground cover sit on top of the forest floor organic matter.

Woodland canopy develops through succession; the tree that reaches the sun first has an advantage, and blocks weaker species from direct sunlight. When tree fall gaps occur, however, the understory receives more light, giving understory species more energy to put toward growth. This brings about secondary successional changes in the woodland area.

The woodland floor is a very essential part of the ecosystem. There detritus, organic matter such as dead leaves, decays on the ground floor creating nutrients in a type of natural compost for future plant life. This plant life, when mature, supports herbivores like squirrels and rabbits, which in turn provide food for carnivores such as foxes and hawks.

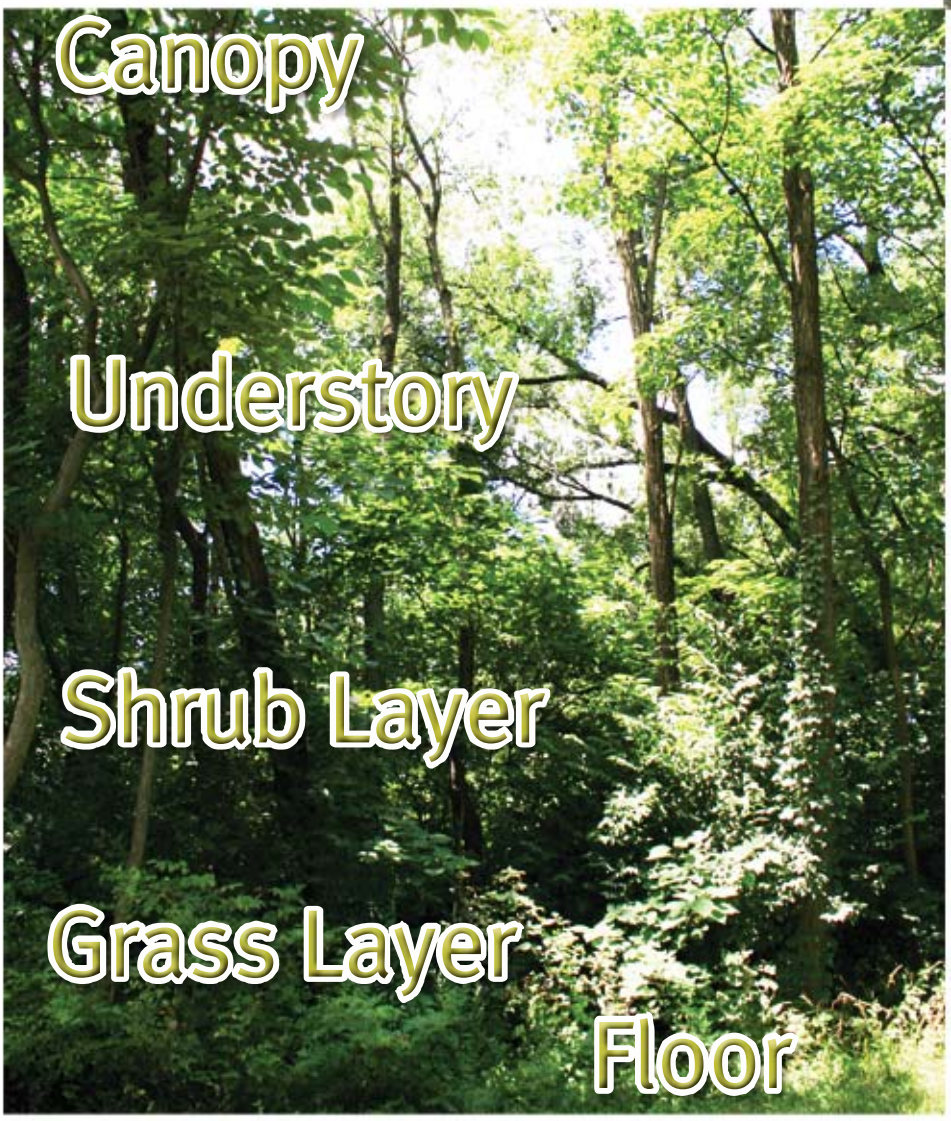
This type of ecosystem is known as open due to the fact that the organisms in the food chain move in and out of the area taking and providing energy. This energy, however, decreases by ten percent at every trophic level, so top predators must eat more to get the same amount of energy that herbivores get directly from plants.

When land is developed areas known as patches are created. Patches are pieces of land that are similar in structure and species. By creating patches, new edges of woodland are also created. These edges are known as induced edges and cause the woodland area to become more vulnerable. Wind, light, temperature, and other natural processes can now have greater impact inside the woodland area.

For many species this fragmentation of land causes dangers in terms of habitat and interaction. Many species only inhabit deep woodland, interior species, or make their home only on the edges of forested areas, edge species. Often times when breaks in landscape occur, species will not cross open areas to get to another patch so communities become limited. Thus resources are decreased and confined. Primary producers are fewer within the area; therefore there is less energy to be distributed. Populations of species must then decrease to meet the resource base. However, when there are greater amounts of energy production, biodiversity greatly increases.

When developing properties, it is important to keep this fragmentation in mind and leave corridors of woodland between patches to maintain a flow. If corridors are not possible, even canopy cover over walkways and roads increases patch-to-patch migration. By constructing greenways in urban environments, corridors of land are left undeveloped on each side of the greenway surface. These areas, if left to natural processes, develop into more livable habitat for woodland species. Also, in locations that were previously cleared, planting trees and shrubs will cause secondary succession to occur.

This aerial map shows fragments and corridors along the Lick Run Greenway trail. Fragments may consist of large expanses of land, or they can be small isolated areas. Roads, buildings, cleared land, and other types of urban barriers are all modes by which fragments are disconnected. Segregated pieces of land may each contain varying ecosystem structures depending on their surroundings and structure.



Woodland Stratification

Riparian Buffers

Riparian buffers are essential to the structure of waterways. The buffer can be defined as the area that runs parallel to a stream or wetland, and contains grasses, shrubs, trees, and other native species. These spaces provide habitat, controlled climate, and filtration of pollutants. By selectively maintaining these areas along waterways a healthier ecosystem evolves naturally.

The buffer typically consists of three zones with total width based on slope and intensity of chemical use, but a narrow buffer is better than none. The zones are known as streamside, middle, and outer. Streamside zones begin at the water's edge and protect against soil erosion and provide habitat for wetland species and upper species as well. Streamside also provides shading over the water, causing cooler temperatures and more oxygen rich habitats; a more satisfactory place for aquatic life.

The middle zone filters out sediments and pollutants that are carried by rainwater and groundwater. It also slows the water down before it hits the natural waterway, keeping it from eroding the bed of the stream. Plants, such as switch grasses, arborvitae, swamp verbena, and northern spicebrush in this zone act as a sink for excess phosphorous and nitrogen carried in runoff water from agricultural and residential fertilizers. These plants also trap sediments that are swept away from nearby land disturbances. River birches and tulip poplars are planted in this area as well due to their large root system that helps prevent soil erosion.

Finally, the outer zone is a managed area where human interaction occurs. This can be in the form of a backyard, recreational area, or a wildflower garden.

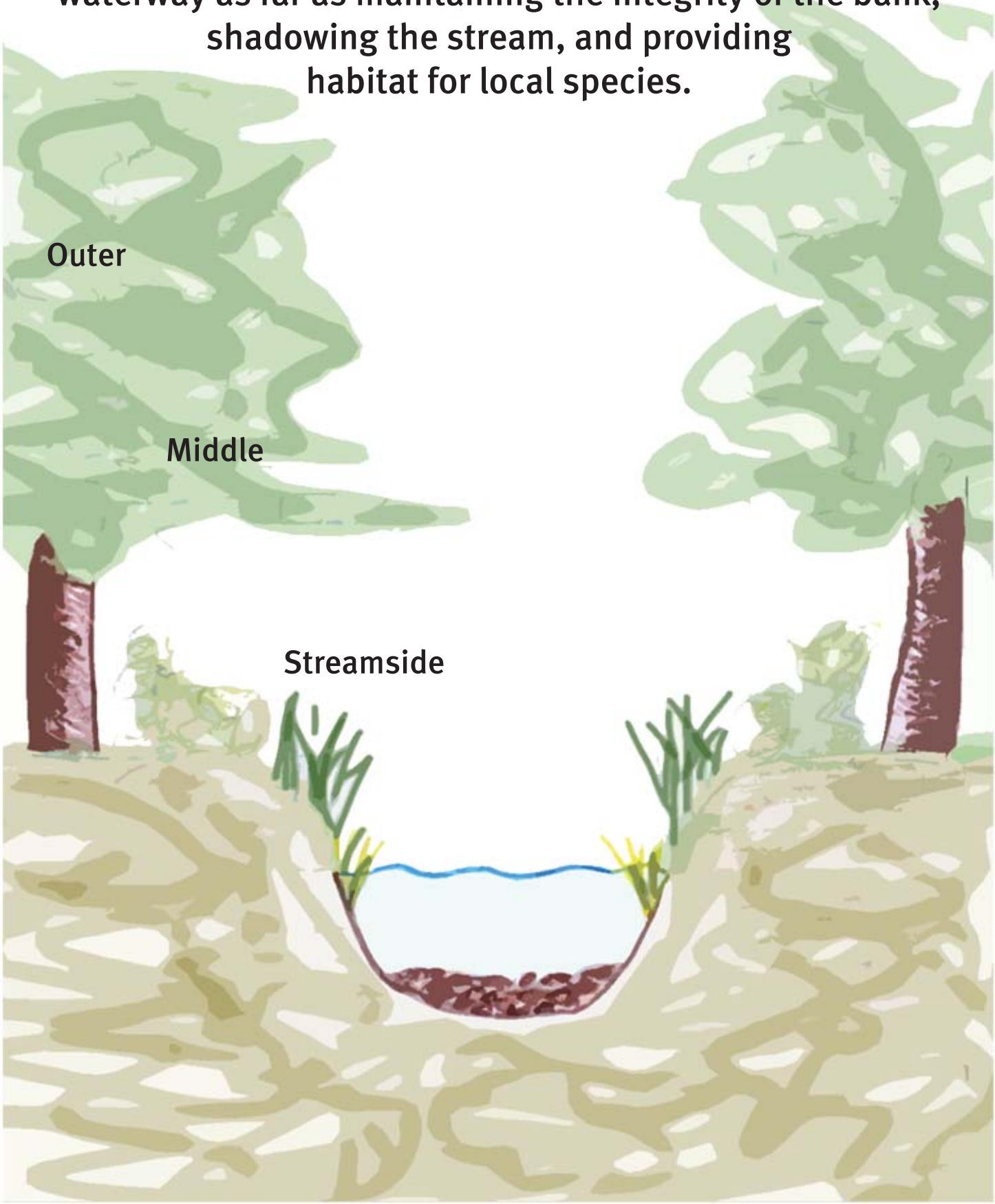
By managing riparian buffers, they become a crucial habitat for many types of wildlife. If large, harmless dead wood, thickets in the understory, and other native areas are left alone, many habitats arise for small animals. The buffer also acts as a protected "greenway" for larger mammals, such as deer, to move through safely.

Leaving these areas to nature provides many benefits, but we must also maintain the buffer to some extent so that waterways do not become clogged and cause flooding. Reinforcement of the bank is also necessary at times, but needs to be done with little disturbance to the natural area.

In areas where land has been intensively manicured, a riparian buffer can be reinstated by leaving a no-mow zone along the water's edge. Slowly grasses will get taller, bushes will take residence, and eventually trees will grow in this zone. Each of these plant types is essential, especially trees because of their large root mass capable of maintaining the integrity of the bank.

By installing greenway paths, the health of buffers can be monitored. In locations that were previously destroyed by urban development, embankments can be restructured. This landscaping not only provides a sanctuary for wildlife in a continuous habitat, but also an aesthetic area that attracts boaters, photographers, and those interested in investigating nearby, native ecosystems.

The illustration below depicts the areas of riparian buffer. It is apparent that the buffer provides great protection for the waterway as far as maintaining the integrity of the bank, shadowing the stream, and providing habitat for local species.



Wetlands

Wetlands are diversity hotspots. Animals ranging from waterfowl, herbivores, amphibians, all the way down to tiny microorganisms inhabit the area. Each of these has a niche, a specified role in a community, causing an interconnection between species. The plants, or primary producers, in the area are very diverse and provide energy for animal life. They are also capable of adapting to times of water saturation, and times when the wetland is drier. This is influenced by what is called a hydroperiod, a compilation of the amount, extent, and timing of the flooding in the area.

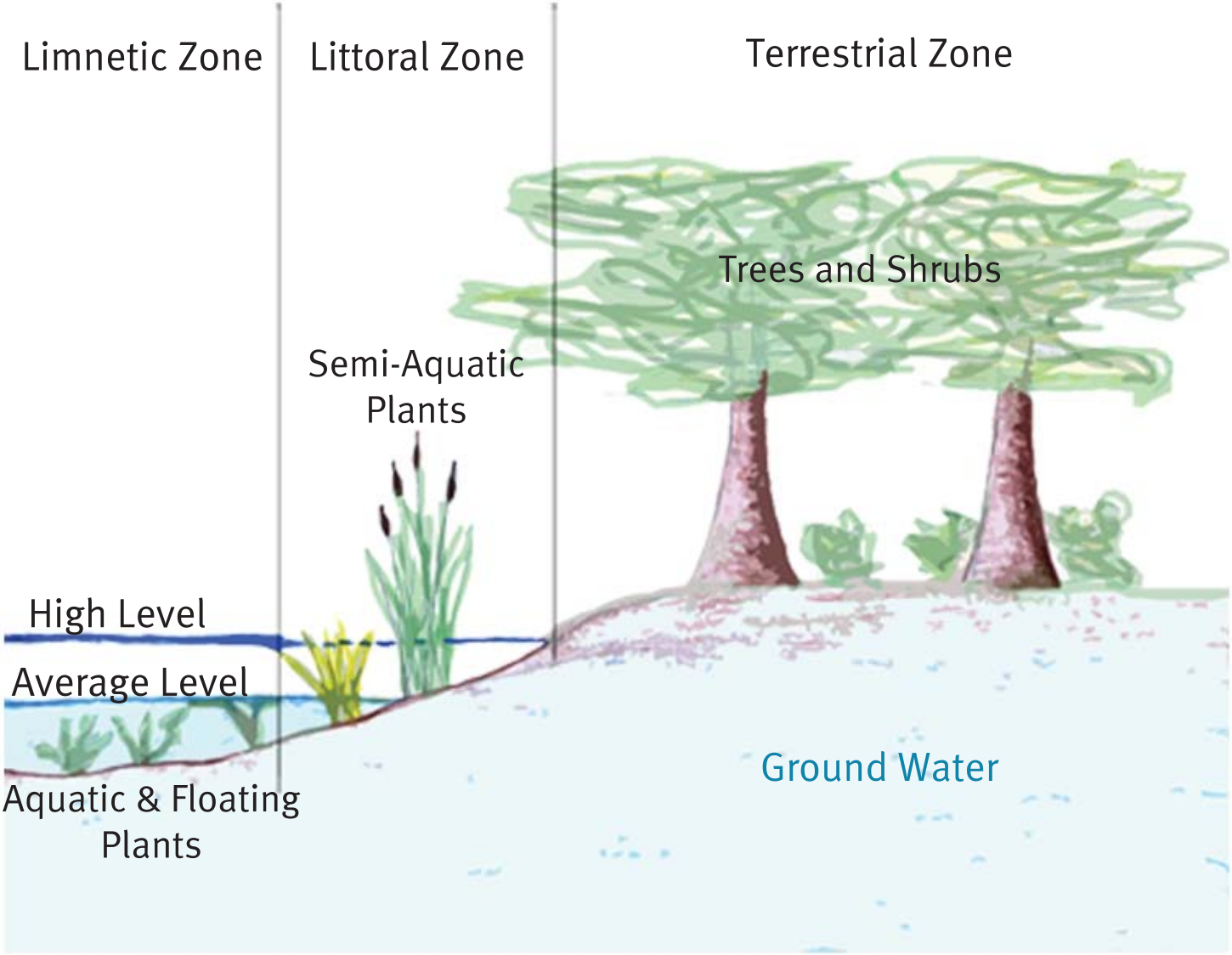
Not only do wetlands provide habitats for the aforementioned species, but they also play a large role in the water cycle. In a single acre, up to one and a half million gallons of water can be stored. This is pertinent in times of flooding, and also in daily urban runoff. However, this floodwater carries with it many pollutants that can contaminate the waterways. The most prevalent type of pollution is Nonpoint Source Pollution, which comes from the moving of water across land, or through the ground, picking up pollutants and carrying them to waterways. Agriculture, disruption of nearby land areas, engine powered water transportation, factories, and pipe systems are all creators of this pollution. Anything, from fertilizers, sewage, and chemicals, easily enters waterways by leaching into the ground or being swept down paved surfaces in times of rain.

How can wetlands help with pollution? Wetlands function as a filter for all of these types of pollutants through its resident plants and animals. Because plants absorb the surrounding water in order to obtain nutrients, excess amounts can be removed from the water, leaving it purer than before. From there, herbivores can obtain energy and nutrients from these plants.

However, if pollutants become overly excessive, the wetland may self destruct. Plants can become overwhelmed by the poor quality of water and begin to decay. This in itself contributes to pollution and makes habitats unfit for aquatic life.

In order to keep pollution out of the waterways, the Environmental Protection Agency proposes that management be used to preserve, restore, and construct systems that purify runoff before it reaches natural sources. In preserving, construction projects need to be managed to keep sediment runoff to a minimum. Restoration can be done by restoring the wetlands initial boundaries and purifying processes. Finally, engineered systems can be implemented to divert contaminated waters away from natural resources by planting grasses and trees that will filter the water before it reaches a wetland.

This illustration shows the stratification of wetland areas. The limnetic zone is the area of open, deeper water. This area is adjacent to the littoral zone, which represents the shallower waters that often experience a rise and fall in water levels. As can be seen, plants must be able to adapt to saturated conditions as well as dry conditions depending on the seasonal time of the year.



The Meadow

Meadows are open areas that provide habitats for many species of birds, foxes, deer, and insects. The plant species in the meadow provide energy for these animals in the forms of leaves and shoots, nectar from flowers, wild fruits, and seeds from grasses.

Meadows exist in two forms. One form is the hay field. Hay fields are a type of meadow that is utilized for agricultural needs. Farmers plant these areas with grasses, such as wheat, that can be sold at market. This type of resource is crucial as an income and also as a way of producing food for populations. Wildflower meadows are another form of meadow. Although the meadow does not produce a financial benefit for the surrounding human community, it does provide an abounding resource for the animal world. Plants here use the sun's energy and carbon dioxide to produce sugar. This plant material when consumed by animals forms the basis of the food chain. Animals and insects also help the meadow to spread and propagate as well. When bees and other pollinating insects visit the flowers of the plants they carry pollen from the male reproduc tive part of the flower to other flowers, and through this method plants reproduce.

Also, when larger animals such as deer, birds, and other seed eaters graze through the area they consume seeds. These seeds are not broken down by the digestive system, and when excreted, germinate in new areas.

Activities

Planning for the Greenway

Greenway development isn't just a one step process. Many levels of government and local organizations are involved in order to come up with the best possible plan for the greenways. Land often has to be acquired for greenway space, and grants found for financial support. Mileposts and kiosks must then be developed to inform the public. The city manager and others must approve this information and layout so that it is best suited for public use. Below is an example of such signage. Each job description is listed to the right. Students can cut out the descriptions and names to create a matching game, or can role play and interview one another to determine which job each holds.

Roanoke City Council:

Approves and votes on proposals. Puts forth a future vision of the city.

City Manager:

Makes sure that each department is working at its best. Makes recommendations to city council to meet future visions of the city. Communicates with communities within the city.

Parks and Greenways Planner:

Develops plans for the greenways. Makes suggestions to city council on land use issues.

Roanoke Valley Greenways Commission:

Gives advice and guidance to local governments. Finds grants, develops standards and agreements.

Sponsor:

Donates money for greenway projects, such as the educational program on the Lick Run Greenway

Non-Profit Organization:

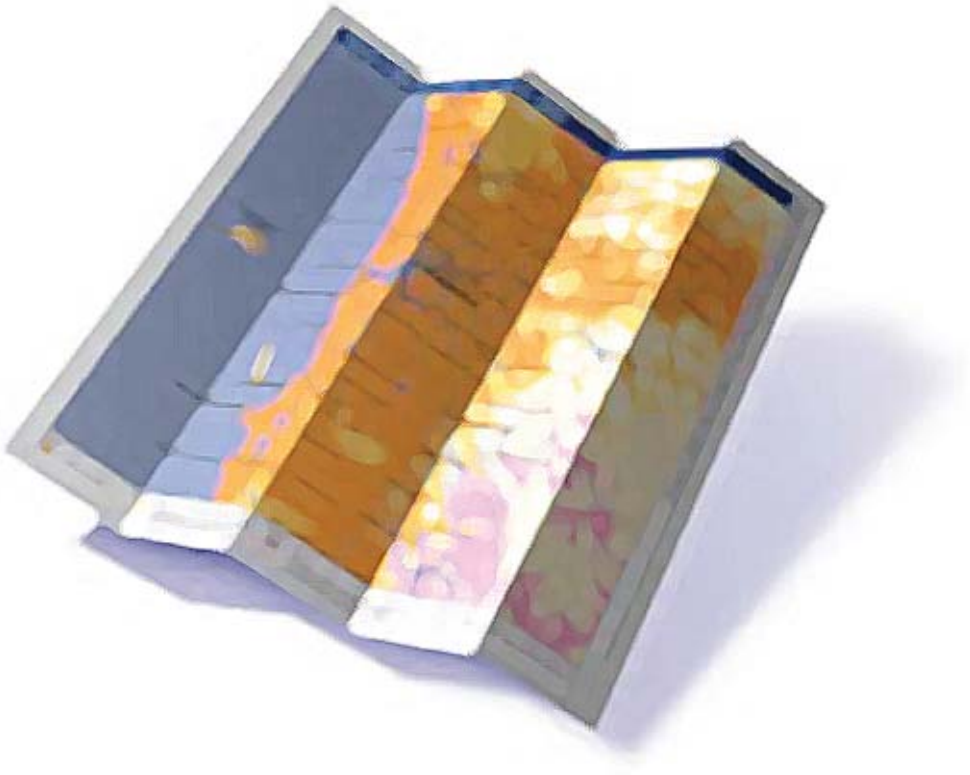
Gets citizens involved, has promotional events and fundraising, and coordinates work days. An example is Pathfinders for Greenways.

Volunteer:

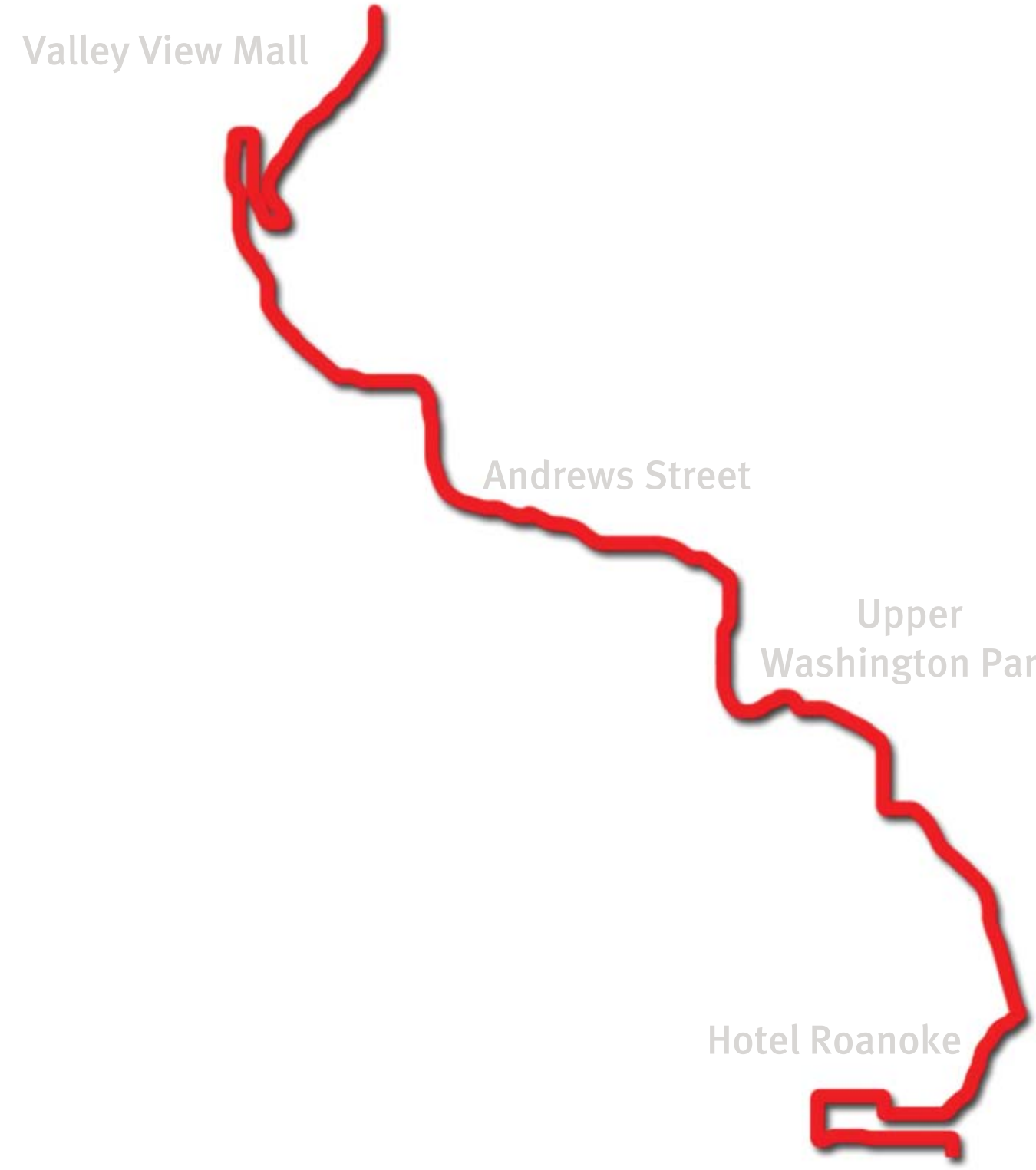
Anyone who gives time, help, or supplies for project development.

Mapping Lick Run Greenway

Mapping is a key way to keep children aware of their location. The map to the right displays the path of Lick Run Greenway. From any starting position, give children their location on the map. From there, have them record any interesting areas, sightings of species, historical locations, or roadways they pass. A pack of colored pencils or crayons can be helpful in differentiating between locations or types of locations. Make sure that each child uses some form of a legend to keep track of their findings. To give them an idea of what to do, display the Lick Run Greenway map in the front of the teacher's guide.



Map of the Lick Run Greenway



Recycling 101

Household recycling is a fairly simple process that can greatly reduce the amount of waste in landfills and materials for production that would otherwise be logged or mined. Recycling is also a job creator and reduces energy consumption from making products out of brand new material. A fair amount of the products we buy can be recycled; it's just a matter of finding a place that recycles them. So where in Roanoke is recycling available?

Magic Lube and the Walmart Super Center at Valley View recycle motor oil, oil filters, and antifreeze. Cycle Systems accepts scrap steel, aluminum, copper, brass, and other metal materials. These recyclers will often compensate the donor for quality scrap. Finally, the easiest method is to participate in curbside recycling systems. Roanoke City's collection includes clear glass, aluminum and steel cans, #1 and #2 plastics. The city also provides pickup for office paper, junk mail, magazines, newspapers, chipboard boxes, and collapsed corrugated cardboard. Finally, plastic bags can be recycled including: dry cleaning, newspaper, grocery, electronic wrap, retail, and almost any other types of clear plastic bags labeled #1 or #2. Kroger, Foodlion, and Walmart are all locations for this type of bag recycling.

How to Get Children Involved

In order to get children motivated to recycle, try planning a school-wide recycling event. The event can last anywhere from a week to a month. Have students recycle their bottles, bags, cans, and other recyclables from their lunch or snack. Three bins or cardboard boxes can hold plastics/cans, bags, and the other paper products. A point system can be used as a way to compete between classrooms. These recycled products can then be added to the usual city recycling pickup at the school, and in the case of plastic bags a volunteer can drop them at the closest recycling location. The same activity can be applied at home. Children can look for household items that might otherwise be thrown away and make sure that they are recycled properly.

Fast Facts about Recycling

An aluminum can in a landfill will still be there in 500 years

If every bit of newspaper were recycled, 250,000,000 trees would be saved per year.

50,000,000 Homes could be heated for 20 years on all the wood and paper thrown away per year.

2,500,000 Plastic bottles are used per hour in the United States alone.

Americans throw away 1,200 pounds of possible compost material per person a year.

One quart of improperly disposed motor oil can contaminate 2,000,000 gallons of water

Dichotomous Key

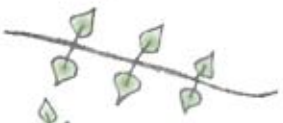
A Dichotomous Key is a tool that is used to identify species. The key groups similar features together, eventually breaking down each until the correct species is determined. These types of keys can be used for trees, flowers, animals, insects, or anything else that needs to be classified.

The tree to the right identifies some of the common species on the Lick Run Greenway. In order to get students involved, go out and pick a sample of each of the tree species indicated. Students can then separate the leaves by the dichotomous key. For verification of their species, they can then use a field guide to see an actual picture of the species. Since not all species are included on the tree given here, students may add branches where necessary. New trees can also be made based on the leaves collected on the trail.

Definitions:

-Alternate: leaves bud from the branch in an offset manner

-Opposite: leaves bud from the branch directly across from one another

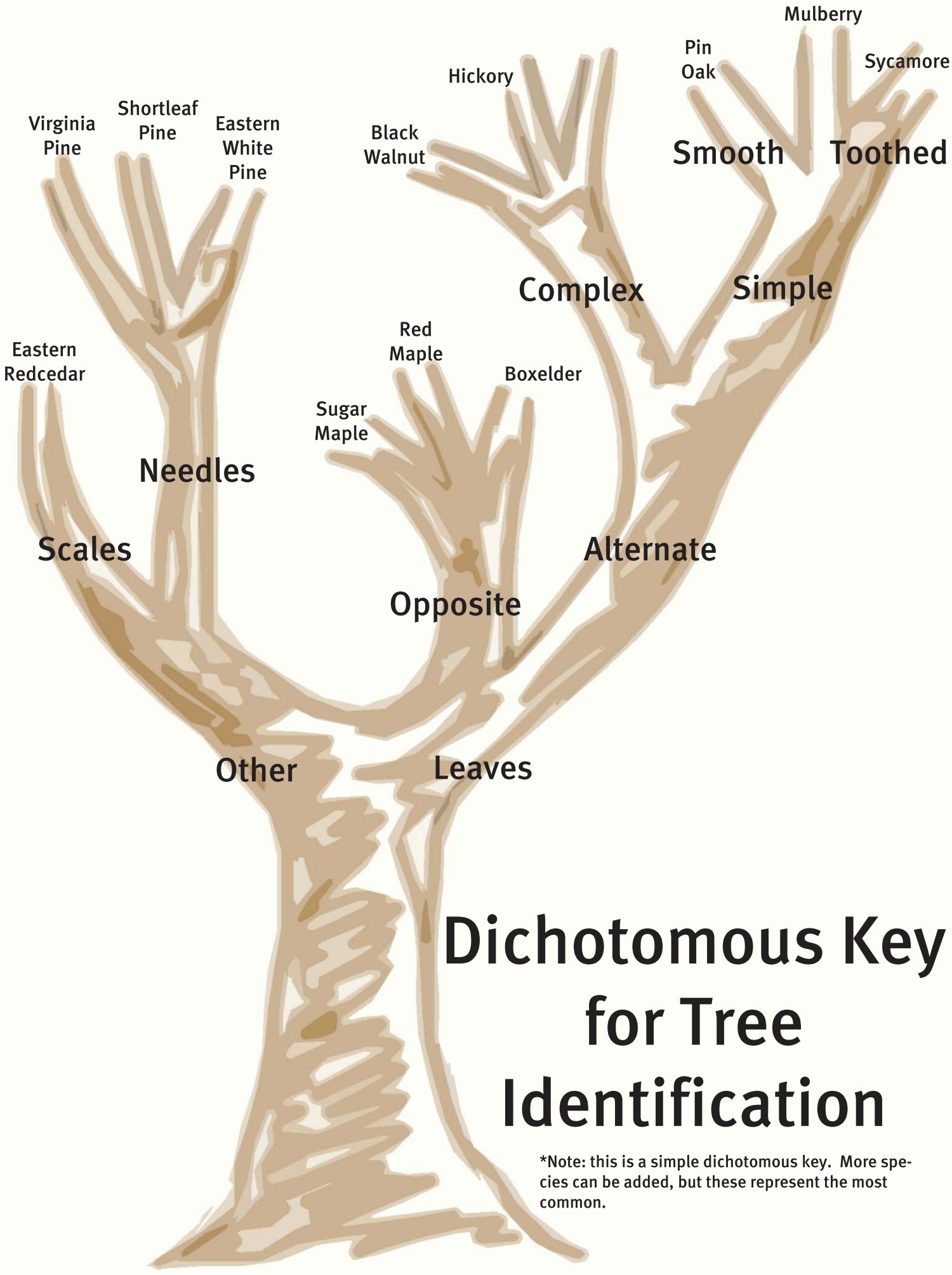


-Complex: leaves are grouped along a small branch

-Simple: single leaves along the branches

-Needle: any long slender leaf like projection

-Scale: leaves are very small and flat against one another, typically look as though they cover the branch.



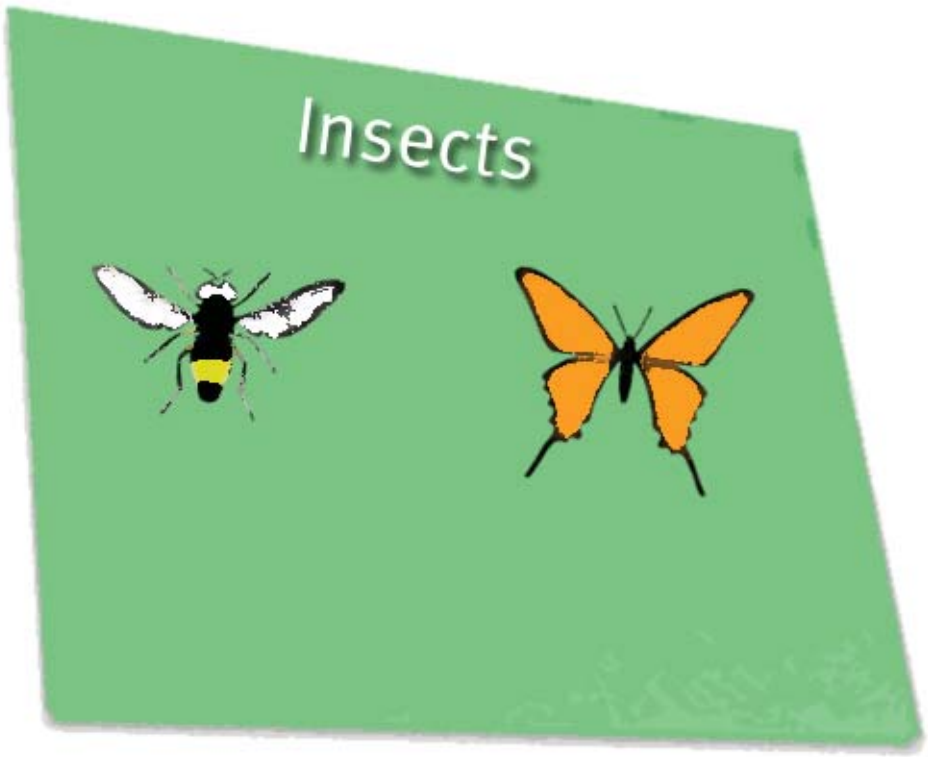
Dichotomous Key for Tree Identification

*Note: this is a simple dichotomous key. More species can be added, but these represent the most common.

Classifying Findings

Being familiar with field guides is a very essential part of getting to know the animals and plants that call the greenway home. An easy way to get children involved is to have them collect leaves or dead insects (or live photos if possible) they find and bring them back to the classroom. For insects, purchase a foam core poster board for the classroom (any color). A sewing pin can then been carefully inserted in each insect so that they can be placed in rows on the board. Cut out small strips of paper that can be used as labels under each insect. Have the children look through the field guide to determine the correct genus and species of the specimen. From there, have them group insects by relation.

Kingdom
Phylum
Class
Order
Family
Genus
Species



*Field guides can be found at the local libraries.

Leaf classification can be done in much the same way. Children can either bring back species of leaves, or they can take crayons, colored pencils, or other writing utensils and create rubbings as they walk along the greenway. Simply place the leaf under a piece of paper and using the crayon on its side, rub firmly over the leaf. The veins, stem, and outline should appear on the paper. When back in the classroom, have the children use the field guide to identify the plant species. The rubbings can also be turned into cards or stationary for students to write information about the species.

For flower species, pressings can be done. Have children pick a flower of interest to them. Bring it back to the classroom. Inside a folded piece of printer paper, lay the flower face up. Close the paper and set a heavy book (dictionary) on top of it. Leave the flower for several weeks. When the flower is ready it will be dried and pressed. Spray them with hairspray to keep them intact. They can then be displayed on a board similar to the insect board.

Pin Oak

Queen Anne's Lace

Carbon Storage

Carbon is emitted daily by human actions in the form of carbon dioxide. It is produced by the burning of fossil fuels, so every time the lawn is mowed, the car is started, or coal is burned more is emitted. Currently more fossil fuels are being used than replaced, so the amount of CO_2 in the atmosphere is becoming excessive. Sinks, locations that store carbon, must now be identified so the release of excess CO_2 can be countered.

Trees are a great way of fighting this excess atmospheric CO_2. Eighty-six percent of the world's above ground carbon is stored in forested areas, and the soil acts as a sink for seventy three percent of the world's soil carbon. Trees take in CO_2 for use in photosynthesis:

$6\ CO_2 + 6\ H_2O + \text{Light} \rightarrow C_6H_{12}O_6 + 6\ O_2$

Therefore, if we plant more trees, more carbon can be stored in them in the form of sugars.

It is also important to understand that if forested areas are logged or stripped, that the amountof carbon stored per tree is how much it will release into the atmosphere when harvested. Future policies like the Kyoto Protocol, or other small "green" initiatives will most likely look for this type of information in the future.

How can it be measured?

Carbon storage per tree can be calculated fairly easily. If a tree is standing, all that needs to be measured is the diameter at breast height (DBH), or 1.4 meters from the ground. DBH tapes can be purchased that calculate the diameter. However, a fabric measuring tape can be used to measure the circumference, and then simply divide by pi (3.14). The equation LN(DAGBIG) = a + b[LN(DBH)] where DAGBIG is the dry, above ground biomass of the tree in grams is used to calculate carbon storage. a and b are constants that are specific to tree species, but for a general idea of carbon storage, the values a=4.938 and b=2.406 can be used. LN simply means natural logarithm, and when using a scientific calculator can be plugged in just as it appears in the equation. Once DAGBIG is calculated, multiply it by 50%. This value equals the above ground carbon stored in the tree. To get a more complete idea of the carbon in the tree multiply DAGBIG by 20% and that gives the root biomass. Then make a final calculation of root biomass multiplied by 50% and that is the amount of carbon stored in the roots. Root carbon plus above ground carbon is the total carbon storage of the tree measured. The chart on the next page simplifies calculation. Take it to the next level by calcu lating storage for an entire tree plot!

DBH	LN(DAGBIG)=4.938+2.406[LN(DBH)]	DAGBIG	x 50% = AGC

Carbon Footprint

Everyone causes the release of greenhouse gases in their activities. There are two forms of carbon footprints. Primary footprints are our daily burning of fossil fuels, releasing CO_2 into the atmosphere. Examples of producers are the lawn mower, the car, boats, and other transportation methods. This type of footprint can be directly altered by the owner. Secondary footprints, however, include the amount of CO_2 produced by the things we consume. We often forget about the processes that make the cars we drive, or the box the cereal came in. The processes used to make these items release greenhouse gases, and when they decompose, even more gases will be released.

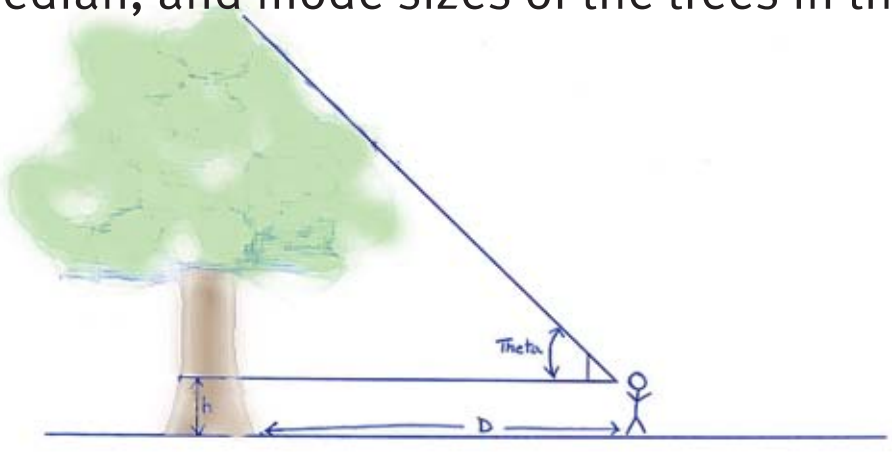
Below is a link that calculates personal carbon footprints. By entering data in different formats it is easy to see where emissions from daily life activities can be decreased, and which activities should be avoided or shortened. Have students find out the amount of their gas, oil, propane, water, and electricity bills. By being aware of their consumption costs, students will be more conscious of how much they use. To further this awareness, have them change their food, fashion, recycling, and electronic preferences to see how small changes in consumption can greatly reduce greenhouse gas emission.

http://www.carbonfootprint.com/calculator.aspx

How Big Is It?

The carbon storage calculation is quite daunting unless a student has completed a higher math level. For younger students, have them simply find the circumference of the tree and its height. The circumference of the tree can be easily measured with a cloth measuring tape, or by using a string and then measuring the string length. This measurement can then be used to find the radius.

Also, students can find the height of the tree by using the Tangent formula for triangles. If a square piece of paper is folded into a right triangle, it can then be used to determine the height of the tree. Walk straight out from the tree until the top is clearly visible. Hold the triangle piece of paper so that the right angle points toward the spot where the trunk meets the ground. The bottom of the triangle should be horizontal to the ground. Using the formula H = h + D x TAN(Theta) the height of the tree can be determined. H is the Height of the tree, h is the distance from eye level to the ground, D is the distance walked outward from the tree, and theta is the angle from the viewpoint to the top of the tree. This angle should equal 45 degrees since it is a right triangle. Have students then use scatter plots, bar graphs, or other graphical forms. This can help them find the nean, median, and mode sizes of the trees in their plot.



A Greater Understanding

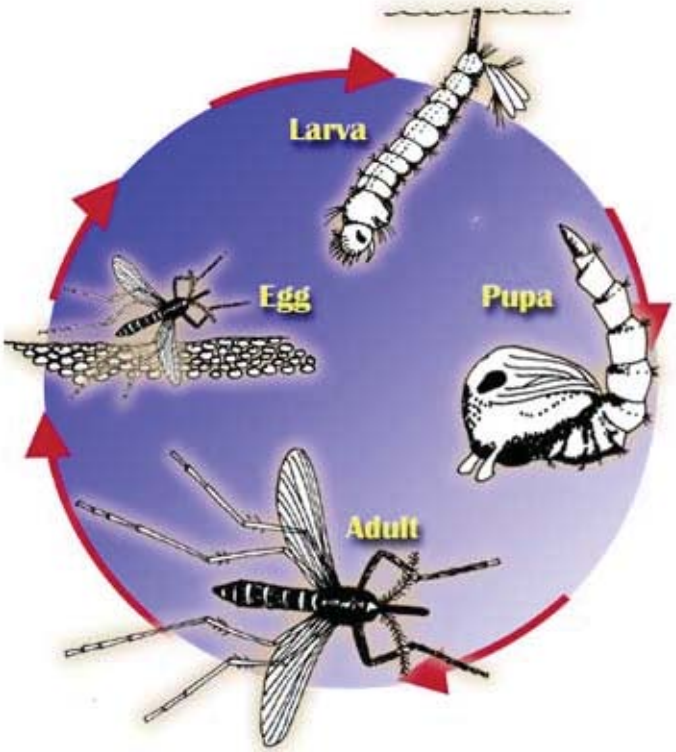
Sometimes an ecosystem isn't just what meets the eye. In this activity have students stake out a 5'x5' area using string and sticks for corner stakes. Have them observe every detail of the ecosystem, be it in the meadow, creek, or wetland. After observation have students present their findings to the class. To take the activity a little further, have children pick a part of the ecosystem they are most passionate about. This could be the water cycle, a certain species and its role in the ecosystem, a study of the geology in the area, or photosynthesis. These topics are easily reseached in a wide range of sources. Have children include a respectable, online source, a written source, and a current event article from a respected newspaper that informs them of the importance of their researched aspect in the ecosystem.

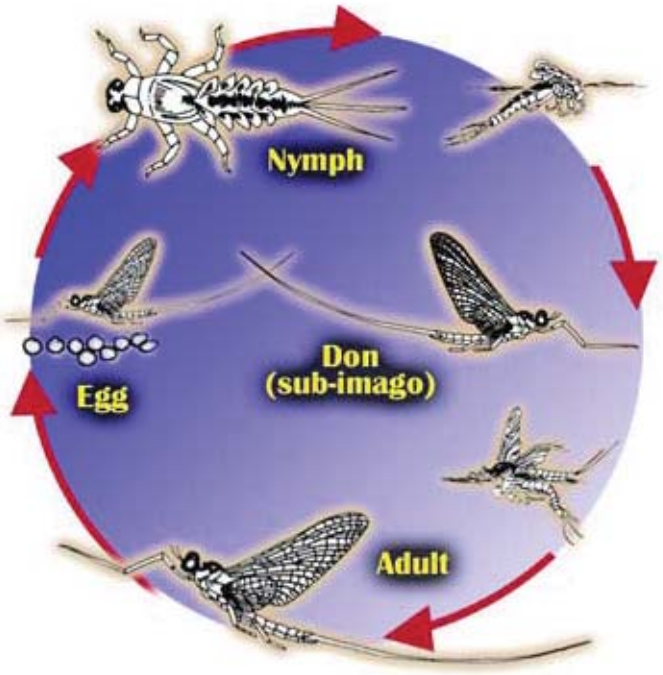
Microscopic Finds

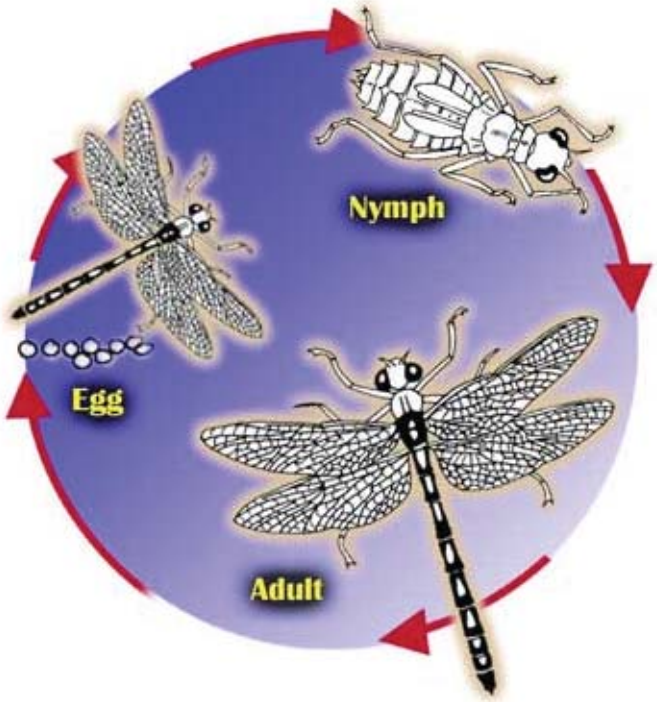
There are many specimens that are not seen when looking at a waterway. Many species live on, under, or in the mud and rocks surrounding the water. Have students go out to the creek and stir up a small area. Take petri dishes, or any other clear plastic container, and scoop up the mud or dirtied water. Back in the classroom, microscopes can be used to see the small larvae, crustaceans, mollusks, or eggs that may have been previously overlooked. There are quite a few aquatic and flying species that lay eggs in the water, and most times the larval stage appears nothing like the adult.

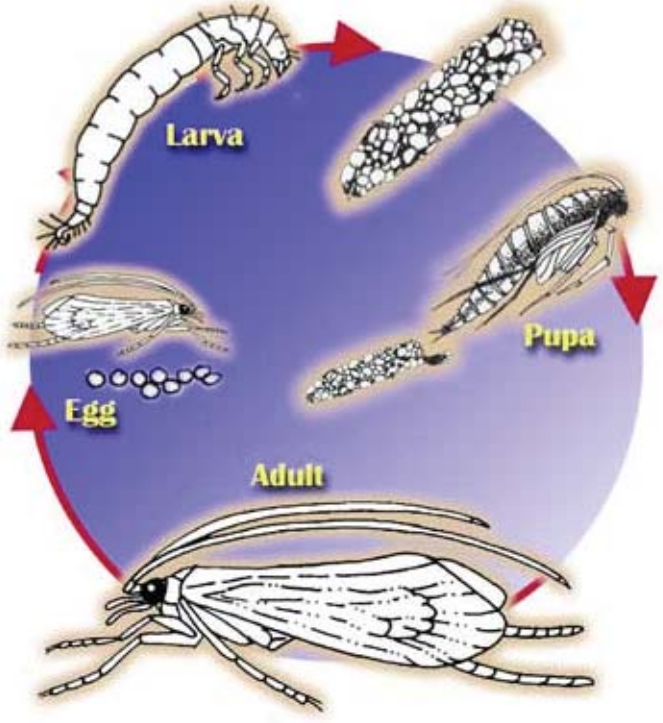
On the next three pages are life cycles, and also biological indicator species. Indicator species are those that give information concerning the quality of an environment. If the water quality is too low, it becomes an unfit habitat for more sensitive species. Have children classify their findings to determine whether Lick Run Creek is a clean water environment. Then have them determine the lifecycle of the specimen.

Life Cycles


Larva
Egg
Pupa
Adult


Nymph
Egg
Don
(sub-imago)
Adult

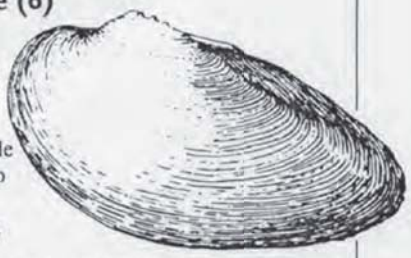

Nymph
Egg
Adult


Larva
Pupa
Egg
Adult

IDENTIFICATION SHEET

The following animals and plants are used in this survey as a way of indicating water quality. Each has been given a 'value' depending on their requirements (this is noted in brackets after the species name). A high value means they require good quality water. A star (★) means they are particularly useful as indicator species.

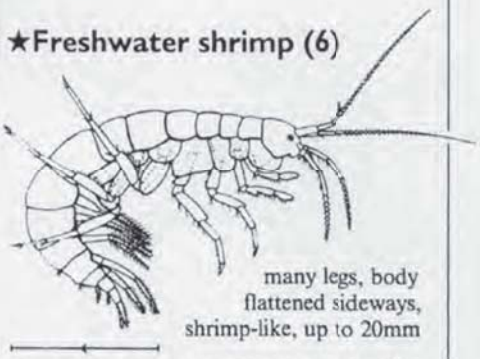
Large freshwater bivalve (6)



shell made up of two halves, over 4cm

Only *large* bivalves indicate quite good quality water.

★Freshwater shrimp (6)

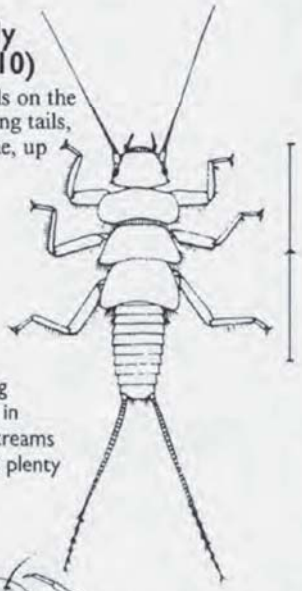


many legs, body flattened sideways, shrimp-like, up to 20mm

A very active swimmer, swimming on its side, and often in pairs. You may get hundreds in your sample if the water is fairly clean and running. They may be absent in water of high acidity because of lack of calcium to build the exoskeleton.

★Stonefly nymph (10)

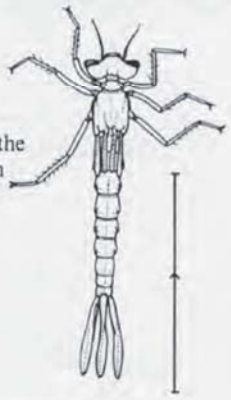
6 legs, no gills on the body, two long tails, long antennae, up to 30mm



Large crawling insects found in clean stony streams when there is plenty of oxygen.

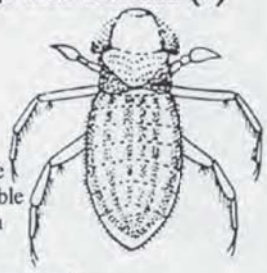
Damselfly nymph (8)

6 legs, no gills on the body, 3 tails which are plate-like, up to 30mm



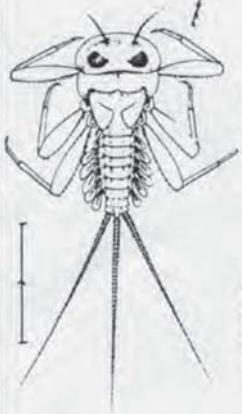
Like clean water but avoid fast currents so may be missed as they will be in deeper waters. Similar to mayfly nymphs but no gills down the body. They swim with *sideways* movements of the body. You may also find dragonfly nymphs which are shorter and fatter, with short projections rather than tails.

Water bugs and beetles (5)



6 legs, hard (wing) case over most of the body, size variable but up to 30mm or more

Bugs and beetles prefer slow water particularly when there are lots of plants. Bugs usually have a triangular head with a pointed beak, sometimes folded underneath (water boatman, pond skaters, water scorpions). Beetles have chewing-type mouths. Beetle *larvae* have *short antennae* and *no gills* on the body and look like 'mini-prehistoric animals'. They do not count as an extra group as they are still beetles!

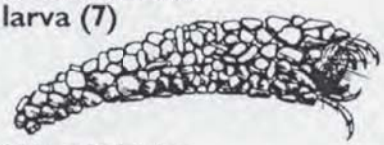


★Flattened mayfly nymph (10)

6 legs, gills on the body, three tails, flattened body and legs, up to 16mm

Crawling insects found in similar conditions to stoneflies. Not all mayflies are clean water indicators, but flat or large crawling mayflies are.

★Cased caddis larva (7)

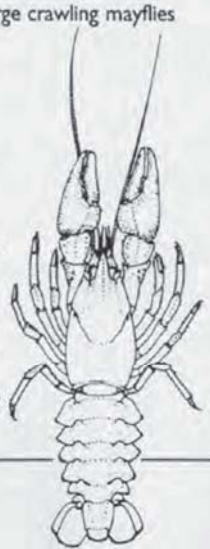


6 legs, cylindrical or flattened case made up of leaf fragments, twigs, sand or small stones, up to 50mm

Most are crawlers but a few are swimmers. They are found in most types of stream bed where the water is of fairly good quality.

Crayfish (8)

more than 6 legs, lobster-like with large pincers, up to 10cm



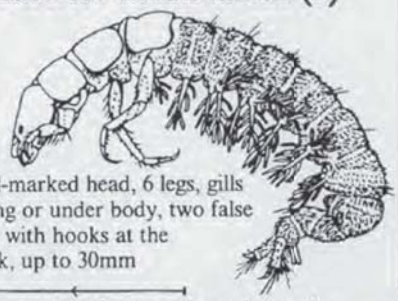
Can't really be mistaken for anything else. They live in stony streams, hiding in crevices. They will probably evade the net so should be looked for separately by turning over stones.

Freshwater limpet (6)

triangular, conical shell, limpet-like, up to 20mm

Found attached to larger stones or rocks so may be missed from scuffle samples. They indicate water of fairly good quality.

★Caseless caddis larvae (5)



well-marked head, 6 legs, gills along or under body, two false legs with hooks at the back, up to 30mm

Like cased caddis but without the case!

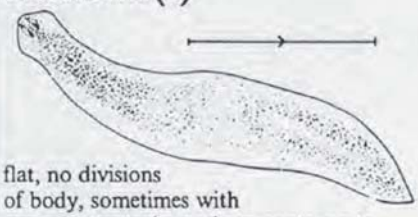
Crawlers not swimmers. The hooks are used to grip rocks. Many spin webs or tunnels of silk. Some can stand poor quality water so the group only scores 5 as a whole. Most prefer running water.

Blackfly larva (5)

small maggot-like body swollen at the base, head with combs of hairs if seen under a lens, up to 15mm

A midge larva found in running water of moderate quality *attached vertically in groups* to stones, filtering out particles.

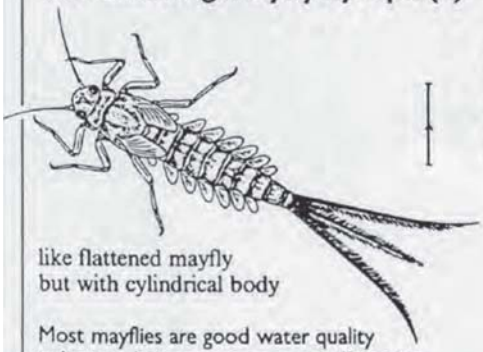
Flatworm (5)



flat, no divisions of body, sometimes with apparent tentacles and eye spots, up to 25mm

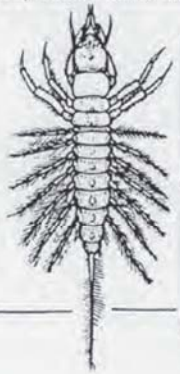
flatworms *glide* over the surface of rocks, stones and vegetation. They are usually found in productive water where snails and crustaceans (shrimps, etc.) are common.

★Swimming mayfly nymph (4)



like flattened mayfly but with cylindrical body

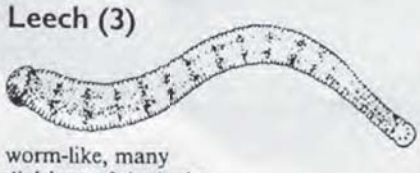
Most mayflies are good water quality indicators but one common one (*Baetis*) is not. So, unless you know your mayflies, swimming mayflies don't score too highly. They swim with *up and down movements* of the body, unlike damselflies.



Alderfly larva (4)

6 legs, large head and jaws, long gills along body, single tapering tail, up to 40mm, fast swimmer.

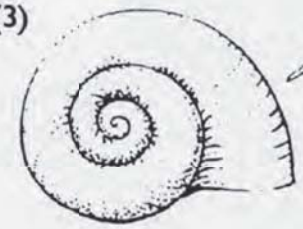
Leech (3)



worm-like, many divisions of the body (segments), suckers at each end — at least one of them obvious, up to 70mm

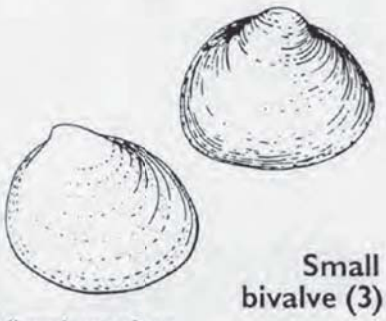
Leeches move either by swimming, or more usually by looping movements using alternate suckers. *They are not bloodsuckers of people.*

Snail (3)



coiled or spiral shell, up to 50mm

Difficult to mistake for anything else. They are not very useful as indicators and may be absent from water of high acidity because of lack of calcium for shell-building.

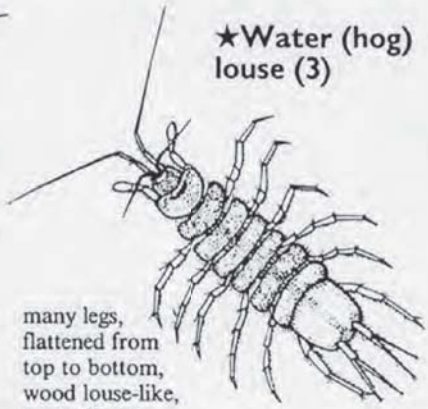


Small bivalve (3)

shell made up of two halves, less than 4cm

Often found in large numbers in water of poor quality.

★Water (hog) louse (3)



many legs, flattened from top to bottom, wood louse-like, up to 12mm

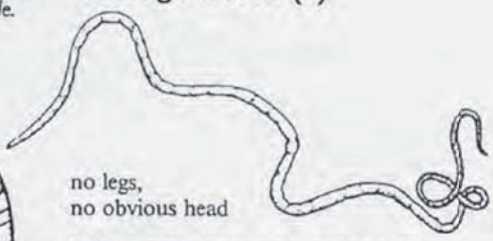
Although a crustacean like the freshwater *shrimp*, the water louse can stand some acidity. It crawls rather than swims and can stand a fair amount of pollution.

Non-red midge larva (2)

worm-like but obvious head, pair of 'false-legs' at both ends, up to 20mm

Many live in thin tubes made of mud particles and prefer muddy or silty conditions.

★Sludge worm (1)



no legs, no obvious head

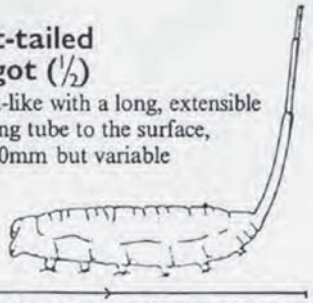
Like a small earthworm but reddish-brown; often occurring in knots with many others. As the name suggests they can stand just about anything! (Also known as Tubifex).

★Bloodworm (1)

like non-red midge larva, bright red.

Not a worm but a midge larva; contains red blood pigment (like ours) which allows it to store oxygen and so live in very polluted conditions. Moves with a 'figure of eight' looping motion.

★Rat-tailed maggot (½)



maggot-like with a long, extensible breathing tube to the surface, up to 50mm but variable

This is a hover-fly larva. It requires fairly still, shallow water so that its snorkel can reach the air. If it is very polluted you may find many of these and nothing else.

SWIMMING MAYFLY NYMPH Courtesy BURKE PUBLISHING CO. LTD. from 'THE YOUNG SPECIALIST LOOKS AT POND LIFE' by W. ENGELHARDT.

All other illustrations Courtesy FIELD STUDIES COUNCIL from 'A KEY TO THE MAJOR GROUPS OF FRESHWATER INVERTEBRATES' by P. S. CROFT.

Natural Water Filter

As discussed on the Riparian Buffer and Wetlands kiosks, plants and soil act as a filter for pollutants and sediments in runoff water. To test this, a small scale experiment can be done to determine a vegetated area's ability to filter out pollutants. Have each child create a planter with rocks, sand, soil, and plants to their liking. Add water to a soda bottle, making sure to include sediment so that the cleanliness of the water can be determined. Test the different plantings to see which has the best filtering ability.

For older students, test the water for pH. If the pH is above or below 7.0, then the water is impure. In the soda bottle, mentioned above, add soda to the water mixture instead of debris to act as pollution. Using pH indicator paper, determine the pH. Slowly pour the solution on the planting. When the liquid comes out the bottom, have students observe any color change or differences from the solution when it was poured in. To test the absorption power of the soil and plants determine the pH of the filtered liquid. Is it more neutral? Clean water has a pH of 7. Does the pH become more neutral when it is re-filtered through the system?

Acid < 7 Neutral=7 Base > 7

Making a Filter

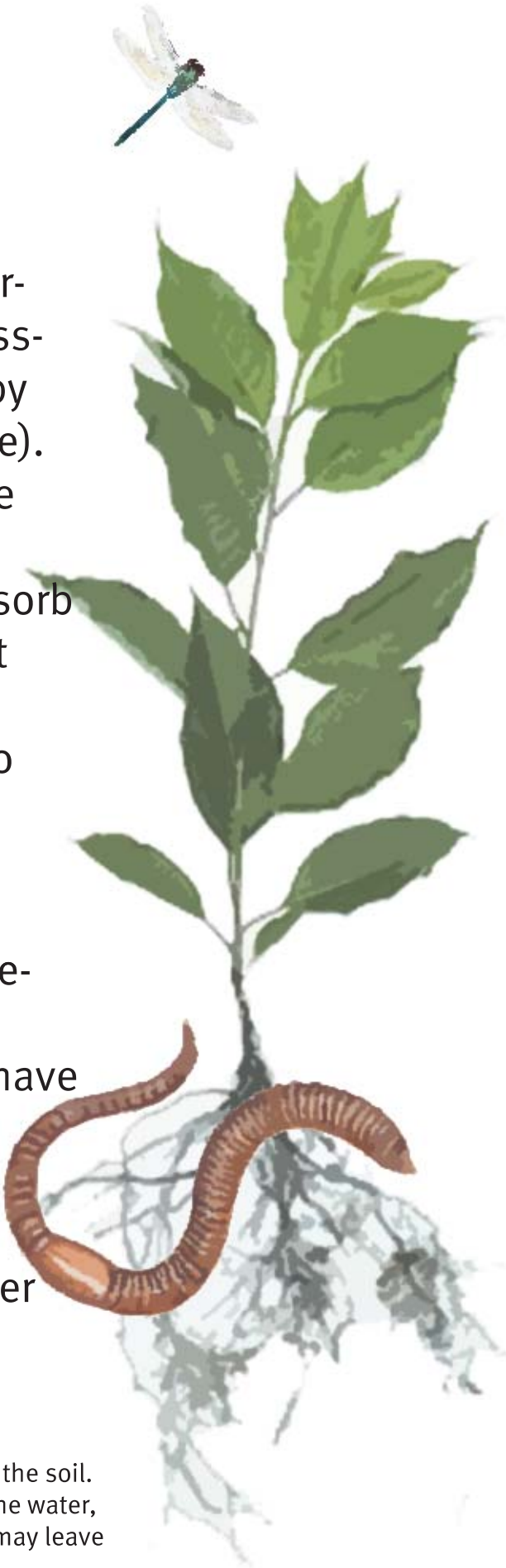
Directions:
1. Place a sheet of paper towel in the bottom of the pot.
2. Fill 1/4 of the pot up with gravel and small rocks
3. Pour sand over the rocks to fill the pot about 1/2 full.
4. Add soil, leaving enough room for plants.
5. Add plants of choice. They can include mosses, grasses, seedlings, or any other plant life.
6. Add about a 1/2 cup of soil to a 2 liter soda bottle.
7. Fill the bottle up with water (To take the experiment to the next level, add soda here).
8. Put the cap on the bottle and shake it up.
9. Measure the pH of the water if desired with pH indicator strips.
10. Slowly pour water onto planting.
11. Wait for water to come out the hole in the bottom of the pot.
11. Observe changes in the water.
12. If testing the pH, use the pH indicator paper to determine the pH of the filtered water.
13. Collect the water and filter it back through. Is it cleaner/more neutral than before?

Terrarium

Terrariums are a great way to see how organisms in a closed ecosystem interact. Mosses, ivys, tree seedlings and other plants are well suited for terrariums. If the terrarium is large enough, a small pond can be included making the habitat suitable for tadpoles, frogs, and turtles. Insects do well in terrariums as well, be it spider, beetle, or flying insect. Worms or other tunneling organisms are good to include because the glass container allows viewing of their below ground habitat.

For this project, collect a few specimens from a walk along the greenway. Insects can be collected by gently sweeping a net through grasses and the edge of bushes. Worms can be dug up from any of the soil surfaces, and tadpoles may be found in smaller stream areas.

How to Create a Terrarium



1. Choose a container that fits the size terrarium you would like to create (for a classroom activity each student can use a baby food jar, or something of comparable size).
2. Add about a half inch of pebbles to the bottom of the container for drainage.
3. Sprinkle charcoal over the rocks to absorb smells (can get in garden section of most stores).
4. Add soil to fill up the bottom quarter to third of the jar.
5. Add ivys, grasses, and seedlings.
6. Add worms if desired.
7. Cover dirt with mosses *(if a pond is desired go to bottom of page).
8. Add any other organisms you wish to have in the terrarium.
9. Mist the terrarium fairly generously.
10. Put a lid on the jar or container.
11. Be sure to mist periodically when water seems to be low.

*A pond can be added by placing a very small plastic container into the soil. Fill with water, and then cover edges with moss. If tadpoles are in the water, make sure that there are rocks or another type of exit ramp so they may leave the water when they mature and need oxygen. Go back to step 8.

Underwater Viewer

Materials:
- Plastic container (ex: Gladware, Milk Jug, etc.)
- Plastic Wrap
- Rubber Band
- Scissors

Directions:
1. Cut off flat bottom of container.
2. Cut off top of container if it is milk jug like in structure.
3. Decorate.
4. Set container down on top of plastic wrap, and pull the edges of the wrap up.
5. Secure plastic wrap with a rubber-band.
6. Insert plastic wrapped end into water. Look through top end and you have a fish eye view of the creek.

Binoculars

Binoculars are often very expensive. This activity provides a simple and fun alternative that will engage children in birdwatching and surveying their natural surroundings.

Materials:

- 1/2 yard of yarn or string
- 2 toilet paper tubes (one paper towel roll can be used if cut in half)
- 2 large beads or other type of spacer
- strong adhesive for attaching beads
- single hole punch

Directions:

1. Punch one hole 1/4" down on each tube
2. Attach string through each hole using a simple knot.
3. Affix beads in between the 2 tubes (tubes can be glued directly together if necessary).
4. Allow to dry.
5. Decorate with markers, construction paper, or any other materials.
6. Instant binoculars.

Personal Wildlife Journal

Materials:
- 1 piece of colored construction paper
- More construction paper for decoration
- Markers, colored pencils, etc.
- 10 sheets of printer paper
- Yarn or String
- Hole Punch

Directions:
1. Lay one piece of construction paper down.
2. Put 10 sheets of printer paper in center of construction paper.
3. Fold all in half.
4. Use hole punch to make three holes like a 3-ring binder.
5. Thread individual pieces of string in each hole and knot on outside.
6. Have each child decorate.
7. Record findings.

Alphabet Identification

Animals & Plants

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

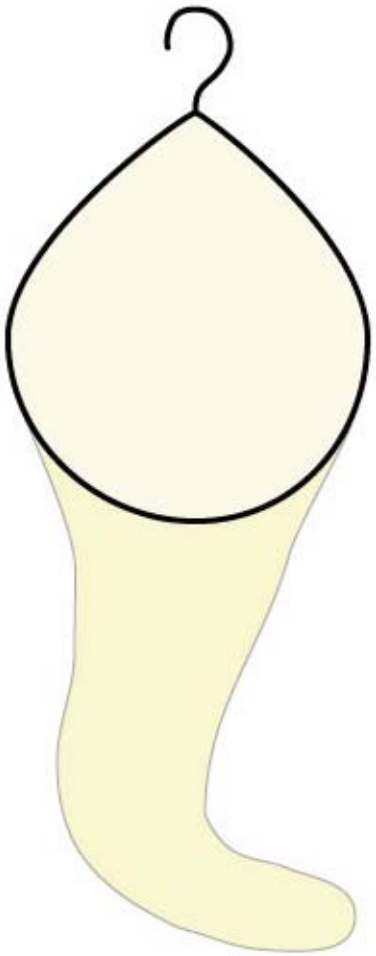
Y

Z

*Use scientific and common names of different species to fill letters A through Z

Specimen Net

Materials:
- Wire Clothes Hanger
- Pantyhose
- Needle and Thread



Directions:
1. Bend triangular part of clothes hanger into a more circular shape. The circle may be too big so pinch the neck to make a smaller circle at the end.
2. Tape any of the pinched hanger together so it will keep its form.
3. Straighten out the hook for additional handle.
4. Cut off foot of pantyhose. The toe of the pantyhose will be the bottom of the net, so the longer the pantyhose, the bigger the net.
5. Match up edge of circular clothes hanger with edge of pantyhose.
6. Stitch pantyhose to clothes hanger, looping the thread over the wire each time.
6. See what you can catch in the stream or in the air.

Decorative Face Paint

Rocks are a natural source of face paint that can be easily wiped off faces. Have groups of students pick one large, flat rock. Then have them pick out ones about the size of a penny. Wet all the rocks, and then rub the penny sized rocks on the flat rock. This should create a paste on the the larger rock. Children can then use their finger to draw on their faces.

INDIAN IN BODY PAINT (no. 52A, cf. pls. 83 (a), 123 (b))

Quiz

Milepost 0.0
-Name the building directly behind you (facing train tracks).
Milepost 0.1 & 0.2
-Name two facts from the Railwalk portion of the trail.
Milepost 0.3
-Who is this bridge named in honor of?
Milepost 0.4
-What street are you currently on?
Milepost 0.5 & 0.6
-What railroad company is this on the right?
Milepost 0.7
-What landmark property are you on?
Milepost 0.8
-Where will this greenway take you?
Milepost 0.9
-Identify 2 bird species.
Milepost 1.0
-Identify 2 other species (flora or fauna).
Milepost 1.1
-Identify a species of plant on the right side of the trail.
Milepost 1.2
-Name a benefit of the greenway system.
Milepost 1.3
-What intersection are you approaching?
Milepost 1.4
-What is the name of the creek running through Washington Park?
Milepost 1.5
-Identify 2 tree species.
Milepost 1.6
-This area was at one time a _____?
Milepost 1.7
-What is one way to reduce trash?
Milepost 1.8
-Who is responsible for turning light energy into energy for herbivores?
Milepost 1.9
-What is the invasive species at this location?

Quiz

Milepost 2.0
-What is a negative effect of invasives?
Milepost 2.1
-What tragedy occured in this area?
Milepost 2.2
-What is the vegetated area along the creek known as?
Milepost 2.3
-A mammal often occupies this area, can you identify it?
Milepost 2.4
-What street did you just cross?
Milepost 2.5
-In between these 2 posts, can you identify 2 types of plants in the wetland area?
Milepost 2.6
-What happens to contaminated runoff when it gets to wetland areas?
Milepost 2.7
-Name 3 species at this location (flora or fauna).
Milepost 2.8
-Name 2 insects at this location.
Milepost 2.9
-Identify the top layer of the forest stratification.
Milepost 3.0
-What is the forest layer above the grass layer?
Milepost 3.1
-Name a mammal here.
Milepost 3.2
-What is the zone closest to the stream known as?
Milepost 3.3
-Name a species of mammal or bird.
Milepost 3.4
-What is this large road?
Milepost 3.5
-What do automobile engines emit that harms the atmosphere?
Milepost 3.6
-What road are you now walking along?

Answers

Milepost 0.0
-Market Building.
Milepost 0.1 & 0.2
-Any facts off of the railwalk signage ex: Named after David R. and Susan S. Goode.
Milepost 0.3
-Martin Luther King, Jr.
Milepost 0.4
-Centre Avenue Northwest.
Milepost 0.5 & 0.6
-Norfolk Southern.
Milepost 0.7
-Hotel Roanoke.
Milepost 0.8
-To Valley View Mall Boulevard Northwest.
Milepost 0.9
-Starling, Mourning Dove, Northern Cardinal, Blue Jay are a few.
Milepost 1.0
-Lily, Grey Squirrel, and many bird species.
Milepost 1.1
-Boxelder, Grey Squirrel, and many bird species.
Milepost 1.2
-Safe walkway, promotes a greener community, etc.
Milepost 1.3
-Orange Avenue and Burrell Street.
Milepost 1.4
-Lick Run Creek.
Milepost 1.5
-Eastern White Pine, White Oak, Red Oak, Boxelder, and Sugar Maple.
Milepost 1.6
-Landfill.
Milepost 1.7
-Recycle, Compost, Reuse.
Milepost 1.8
-Primary Producers.
Milepost 1.9
-Kudzu.

Answers

Milepost 2.0
-Can exclude native species. Causes imbalance in trophic levels.
Milepost 2.1
-Flood of 1985.
Milepost 2.2
-Riparian Buffer.
Milepost 2.3
-Groundhog, Cottontail Rabbit, Opossum, Raccoon, Chipmunk, Gray Squirrel.
Milepost 2.4
-Andrews Street.
Milepost 2.5
-Cattail, Willow, and Boxelder are a few.
Milepost 2.6
-It is filtered through plant processes and sediment layers.
Milepost 2.7
-White Mulberry, Boxelder, Virginia Creeper, Daisy Fleabane, Dandelion are a few.
Milepost 2.8
-Any of the insects located in last 2 rows of page 3 or 1st 2 rows of page 4.
Milepost 2.9
-Canopy.
Milepost 3.0
-Shrub Layer.
Milepost 3.1
-Groundhog, Cottontail Rabbit, Opossum, Raccoon, Chipmunk, Gray Squirrel.
Milepost 3.2
-Streamside.
Milepost 3.3
-Any of the bird species on pages 5 and 6.
Milepost 3.4
-Interstate 581.
Milepost 3.5
-Carbon Dioxide .
Milepost 3.6
-Valley View Boulevard Northwest.

References

Activity	Standards of Learning
Terrarium	Math 1.3, 2.3; Science K.8, BIO.1
Specimen Net	Math K.2; Science K.4, 2.1, 5.1, 6.1, BIO.1
The Roanoke Star	
Recycling	Math K.13, 1.14, 3.17, 5.16, 8.13; English 5.1; Science K.10, 1.8, 3.10, 5.1
A Greater Understanding	English K.3, K.11, K.12, 1.1, 1.3, 1.12, 2.11, 2.12, 3.2, 3.7, 3.9, 3.10, 3.11, 4.1, 4.2, 4.6, 4.7, 4.8, 5.2, 5.3, 5.7, 5.8, 5.9, 6.1, 6.2, 6.6, 7.2, 7.6, 7.7, 7.8, 7.9, 8.2, 8.6, 8.7, 8.8; C/T K-2.5, K-2.6, K-2.7, 3-5.6, 3-5.7, 3-5.8, 6-8.6, 6-8.7, 6-8.8, 6-8.9, 9-12.6, 9-12.7, 9-12.8, 9-12.9; Science K.1, 1.1, 2.1, 3.1, 4.1, BIO.1
Planning for the Greenway	English 2.3, 3.1, 5.1, 7.1, 8.1; HSS K.6, K.7, 1.8, 2.8, 3.9; CE.5, CE.7, CE.9, CE.12, WG.12, GOVT.3, GOVT.8; Science 6.9
Oaklands	
Mapping Lick Run Greenway	HSS K.3, K.4, 1.4, 1.5, 2.6; Science ES.3
Invasive Species	Science 2.5, 4.5, LS.8, LS.9, BIO.1, BIO.9
Water Quality	Math 2.17, 2.18, 2.19; Science 4.8, 5.1, 6.1, 6.5, 6.7, LS.1, LS.5, BIO.1, BIO.7
Tree Height & Circumference	Math K.10, 1.16, 2.11, 2.17, 3.9, 3.15, 4.7, 4.10, 5.9, 5.11, 5.12, 8.13, T.1; English K.3; Science K.1, K.4, 1.1, 2.1, 5.1, 6.1, PS.1
Energy Pyramid	Science 1.4, 1.5, 1.6, 2.5, 3.5, 3.6, 3.10, 3.11, 4.4, 4.5, 6.2, 6.3, LS.4, LS.6, LS.7, LS.9, LS.11, PS.6, BIO.3
Dichotomous Key	Math K.15, 1.16, 8.13; English 2.9; Science K.1, K.8, 2.1, 3.1, 5.1, 6.1, LS.5
Decorative Face Paint	
Classifying Findings	Math 1.14, 2.17, 2.19, 3.17; English K.2, K.3, 2.9, 3.7, 4.1, 4.6, 5.1, 5.7, 6.1, 7.6, 7.7; Science K.6,2.1, 2.4, 3.1, 3.8, 4.1, 5.1, 6.1, LS.5, BIO.1, BIO.7
Carbon Storage	Math 6.10, 7.12, MA.9; Science LS.1, PS.1, BIO.1
Carbon Footprint	English 5.1; Science K.10, 5.1, LS.1, PS.1
Binoculars	English K.3; Science K.1, K.2, K.4, 1.1, 2.1
Big Lick	
Alphabet Identification	
Water Filter	Math 1.3, 2.3, 2.11, 2.18, 3.9, 3.17, 4.8, 8.13; WG.7; Science K.1, K.5, K.9, 1.1, 1.3, 1.8, 2.1, 3.1, 3.10, 4.8, 5.1, 5.7, 6.1, 6.5, 6.7, LS.1, ES.1, BIO.1
Wildlife Journal	English K.11, 1.11, 1.12, 2.1, 2.2, 2.11, 3.8, 3.10, 4.7, 5.8; Science K.1, 1.1, 2.1, 3.1, 4.1
Tutelo	HSS 2.2, 2.3, 2.4, VS.2

Resources

Guide Supplemental Photos

-Striped Skunk: Photo Credit: Kevin Bowman.
http://en.wikipedia.org/wiki/File:Striped_skunk_Florida_2.jpg.
-Cottontail Rabbit: Photo Credit: Harvey Henkelmann-
http://en.wikipedia.org/wiki/File:Wild_rabbit_us.jpg.
-Virginia Opossum: Photo Credit. Cody Pope.
http://en.wikipedia.org/wiki/File:Opossum_2.jpg.
-Common Raccoon: Photo Credit. Darkone.
http://en.wikipedia.org/wiki/File:Raccoon_(Procyon_lotor)_2.jpg.
-Eastern Chipmunk: Photo Credit: Gilles Gonthier.
http://en.wikipedia.org/wiki/File:Tamias_striatus2.jpg.
-Monarch Butterfly: Photo Credit: Kenneth Harrelson
http://en.wikipedia.org/wiki/File:Monarch_In_May.jpg.
-Eastern Box Turtle: Photo Credit: Stephen Friedt.
http://en.wikipedia.org/wiki/File:Eastern_box_turtle_in_florida.JPG
-Belted Kingfisher: Photo Credit. Mike Baird.
http://en.wikipedia.org/wiki/File:Megaceryle_alcyon_femelle.jpg.
-Northern Mockingbird: Photo Credit. Calibas.
http://en.wikipedia.org/wiki/File:Northern_Mockingbird3.jpg.
-Rock Pigeon: Photo Credit. J.M. Garg.
http://en.wikipedia.org/wiki/File:Blue_Rock_Pigeon_(Columba_livia)_in_Kolkata_I_IMG_976
2.jpg.
-Downy Woodpecker. Photo Credit. Wolfgang Wander.
http://en.wikipedia.org/wiki/File:Downy_Woodpecker01.jpg
-Yellow-Bellied Sapsucker. Photo Credit. Dominic Sherony.
http://en.wikipedia.org/wiki/File:Sphyrapicus_varius.jpg.

Planning for the Greenways

-The Greenway Commission. 2008. Roanoke Valley Greenways Commission.
http://www.greenways.org/about_us/commission.asp.
-City Manager. 2008. Roanoke.
http://www.roanokeva.gov/85256A8D0062AF37/CurrentBaseLink/N2555T4B08CFIREN
-Job Position Information. 2008. Roanoke.
http://www.roanokeva.gov/DeptApps/JobPost.nsf/c2fad892250e5baf8525709e0
652ba2/2c3cc5c86fcfbce385256975006ced13?OpenDocument
-Pathfinders for Greenways. 2008. The Volunteer, Nonprofit, Citizens Support
Group. http://www.greenways.org/about_us/pathfinders.asp
-City Council. 2008. Roanoke.
http:www.roanokeva.gov/WebMgmt/ywbase61b.nsf/CurrentBaseLink/N24YAZ4415ASTNEN

The Roanoke Star

-Parks and Recreation. The Roanoke Star. 2008.
http://www.roanokeva.gov/WebMgmt/ywbase61b.nst/vwContentByKey/N25DPNC572LW
ODEN.
-Virginia's Roanoke Valley. Roanoke Star/Overlook.
http:www.visitroanokeva.com/VenueDetail.asp?CAT=2&SCAT=13&ID=279DID=5602.
-Image: Walts Postcards: http://www.thepostcard.com/walt/state/va/va234.gif

Recycling

-A Recycling Revolution. 2009. http://www.recycling-revolution.com/recyclingfacts.html
-Graphic: http://greatergrafton.files.wordpress.com/2008/12/recycle.jpg
-http://www.plasticbagrecycling.org/01.0/s01.1.php

Oaklands

-Mr. English Showalter, Jr.

Carbon Storage

-Education: The Carbon Question. 1997. Goddard Institute for Space Studies. New York, NY.
http://icp.giss.nasa.gov/education/modules/carbon/projects/project2.html

Carbon Footprint

-Carbon Footprint Calculator. 2009. Carbon Footprint.
http://www.carbonfootprint.com/calculator.aspx

- What is a Carbon Footprint? 2009. Carbon Footprint.
http://www.carbonfootprint.com/carbonfootprint.html

Energy Pyramid

-Smith and Smith. Elements of Ecology. Pearson Education, Inc. San Francisco, CA: 2006.
-Energy Flow in Ecosystems. 2000. Utah State 8th Grade Integrated Science Core Curriculum Page.
http://www.usoe.k12.ut.us/CURR/science/sciber00/8th/energy/sciber/ecosys.htm

Invasive Species

-Kudzu. 2009. Wikipedia: The Free Encyclopedia. http://en.wikipedia.org/wiki/Kudzu
-Gypsy Moth in Virginia. 2008. Virginia Tech College of Agriculture and Life Sciences.
http://fubyss.ento.vt.edu/vagm
http://fubyss.ento.vt.edu/vagm/homeowners.html

Tutelo Tribe

-Tutelo Tribe. 2006. Official Website of the Tutelo Nation. http://tutelotribe.com/history.htm
-Tom Klatka. Deparment of Historical Resources.
-Image: Virtual Jamestown. Permission of Crandall Shifflet. "A weroan or great Lorde of Virginia." De Bry.
http://www.virtualjamestown.org/images/white_debry_html/debry47.html
-Map: http://www.lakegaston.us/Lake_Gaston_local_indian_history_files/image002.jpg.

Big Lick

-Roanoke City: http://www.visitroanokeva.com/displayinfo.asp?TOPIC=3&NID=173
-http://xroads.virginia.edu/~CLASS/am485_98/hall/biglick.html
-Photo Credit: George C. Davis, http://www.lva.virginia.gov/public/archivesmonth/2005/roanoke/

Microscopic Findings/Life Cycle Pictures

Images: Kidfish: http://www.kidfish.bc.ca/frames.html

Biological Indicators

-Cornwall Rivers Project:
http://www.cornwallriversproject.org.uk/education/ed_cd/background/diversity/b06b.htm

Water Filter

-Churchill, Loeschnig, and Mandell. 365 Simple Science Experiments with Everyday Materials. Black Dog and Leventhal Publishers. New York: NY, 1997.

Tree Height and Circumference

-http://www.wikihow.com/Measure-the-Height-of-a-Tree

Underwater Viewer

-Image: http://www.gma.org/Tidings/snailtale/viewer.gif

Decorative Face Paint

-Image: Virtual Jamestown. Permission of Crandall Shifflet. "Indian In Body Paint." John White.
http://www.virtualjamestown.org/images/white_debry_html/plate47.html.