

## **Acknowledgments**

Original project written and designed by:

**Ernest Keller**

*Director , Lackawanna County Conservation District*

**Tim Eichner**

*Keystone Graduate*

Trail improvements provided by:

**Shaun Arbaugh, Andrew Shaffer**

*1998 Trail Projects Coordinators*

Additional enhancements were made possible by an  
additional **Growing Greener Grant.**

Project Director:

**Professor Howard Jennings**

Growing Greener Project Coordinator:

**Tim Eichner**

Revision of Trail guide:

**Deanna Haluska**

2009 Trail & Guide Revisions by:

**Samantha Watkins**

*Keystone Graduate*

2013 Trail Guide Revisions by:

**Nora Dillon**

*Assistant Director*

*Keystone College Environmental Education Institute*

# **Streamside Trail**

## Interpretive Guide



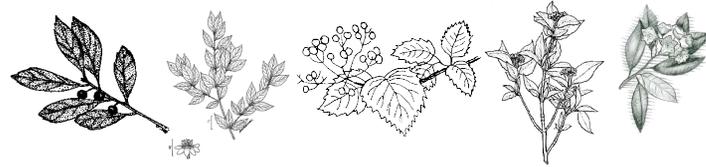
**Keystone  
College**  
*La Plume, PA*

Keystone College Streamside Trail



Congratulations! You have reached the end of the Streamside Interpretive Trail. To return to the trail head, turn around and take a leisurely stroll back through the forest and enjoy all that nature has to offer!

**Greenway**



Station 15  
**Bailey Field**

As you enter Bailey Field, notice the change in land use from the mature forest canopy to this recreational and multi-use playing field. Why do you suppose this site was chosen as a playing field? Is this a good use of the land here? Does the lawn provide a good riparian buffer for the stream?

Many years ago, before powerful earthmoving equipment, level flood plains could easily be developed into large fields with little work. Areas along streams and rivers were converted from the forest to other land uses. Cities, large commercial facilities, farming, and recreational facilities like Bailey Field displaced native forests. Besides level topography, streamside areas are desirable because soils are usually well-drained sand and gravel that was deposited by years of periodic flooding.

**W**elcome to the Keystone College Streamside Interpretive Trail.\* This 1/3 mile loop trail begins behind the Miller Library, leading you on a streamside interpretive hike into mature woods. This station-numbered guide will help you understand the natural resource functions of streamside or *riparian* ecology. Maintaining water quality is perhaps the most important natural resource issue facing communities right here at home as well as worldwide. You will learn first-hand the important interface between the management of land and how it impacts the water. Forestry, recreational, agricultural, and urban land uses are also observed during your trek. Keystone College's beautiful Creek-side Campus includes more than one mile of the South Branch Tunkhannock.

Estimated time: 30 minutes with interpretation; 15 minutes total walking time.

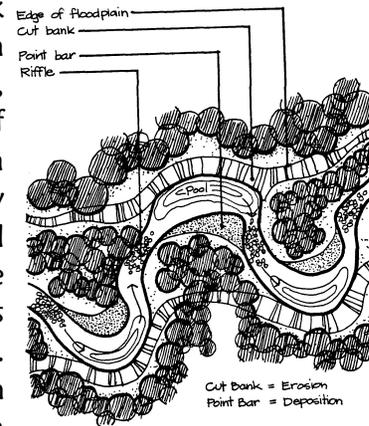
*\*This trail is Handicap Accessible*

**Leave Only Footprints,  
Take Only Pictures**

active streambank erosion occurring, a widening of this area, and the beginnings of formation of a meander. The study of water flow and how it affects the channel is known as **stream hydrology**.

Reduced stream velocity in this section allowed gravel to

deposit and build up. This bar is beneficial and can help catch woody debris and increase scouring. These are desirable roughness elements helping to maintain habitat diversity and complexity of the stream system.



EROSION AND DEPOSITION

From here you can also get a good look at the three **rootwads** embedded into the opposite bank.

Education to offer baccalaureate degree programs. Currently, the College offers 19 bachelor's degrees, 13 associate degrees and enrolls a diverse student body from throughout the U.S. and more than 10 countries. The College also participates in Division III athletics, fielding 15 men's and women's teams.

Today, with its career-oriented liberal arts in place, Keystone College is a leader in education. The faculty, board of trustees, administration, and staff are committed to making your experience here something special. By choosing Keystone, with over 141 years of experience, you commit yourself to that goal as well.

Station 14

### **Gravel Bar**

If the water is low enough, go out beyond the station marker and onto the gravel bar. This “point bar” is a natural occurrence in the stream. Look across to the opposite side and you can see

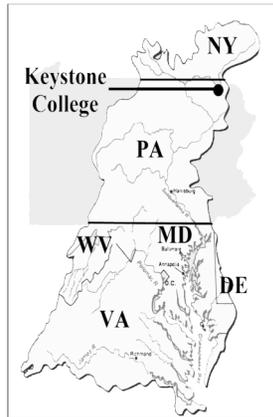
## **Table of Contents**

Station #	Page #
1. From Here to the Chesapeake.....	6
2. Riparian.....	7
3. Riparian Forest Buffer.....	9
4. An Invasive Species.....	10
5. Eastern Hemlock.....	11
6. Stream Ford.....	13
7. Ponds and Groundwater.....	16
8. Suspension Bridge.....	18
9. Riparian Restoration Project.....	19
10. Tree Identification.....	22
11. Riparian Shrubs; Hard vs. Soft Armor.....	25
12. Outdoor Classroom; Keystone’s Early Graduation Stage.....	28
13. History of Keystone College.....	30
14. Gravel Bar.....	32
15. Bailey Field.....	34

Station 1

## From Here to the Chesapeake

Locally known as Nokomis Creek, the South Branch of the Tunkhannock Creek collects and transports water to Chesapeake Bay 300 miles downstream. Moreover, this stream is very important to the local residents who use its high quality waters for fishing, swimming, irrigation, and enjoyment. Flowing downstream through the town of Factoryville, the creek ultimately makes its way to Tunkhannock, where it joins the mighty Susquehanna River, the largest contributor to the Chesapeake Bay. Research has shown that water quality in the receiving estuaries (like Chesapeake Bay) depends on how well we treat the land in the watershed.



The Chesapeake  
Bay Basin

to the citizens of our area. As a result, Keystone Academy was re-chartered as Scranton-Keystone Junior College in 1934. Ten years later, the name of the College was shortened to Keystone Junior College, and in 1995 to its present form, Keystone College.

During the sixties and early seventies, Keystone experienced a period of unprecedented growth. At that time, many of Keystone's residence halls and its spacious library and classroom building, Miller Library, were built. The science building, Capwell Hall, was expanded, and the Hibbard Campus Center was added on to Evans Hall. Keystone's Thomas G. Cupillari '60 Astronomical Observatory in nearby Fleetville, Pa., also began operations at that time. Keystone's growth and vitality continued in the eighties with the opening of the new multi-million dollar Gambal Athletic Center and the renovation of Keystone's historic Harris Hall.

In 1998, the College received formal approval from the Pennsylvania Department of

Station 13

## The History of Keystone College

Keystone Academy was originally chartered by the Commonwealth of Pennsylvania in 1868, with instruction beginning the following year in the local Baptist church in Factoryville. In 1870, ground was broken on the current site for the Academy's first building, Harris Hall, named after John Howard Harris, first president of Keystone. Harris Hall continues to serve Keystone College today. The Academy flourished during its early years and established a standard of excellence that became a model in the area. Many distinguished scholars, among them the presidents of three universities, have graduated from Keystone.

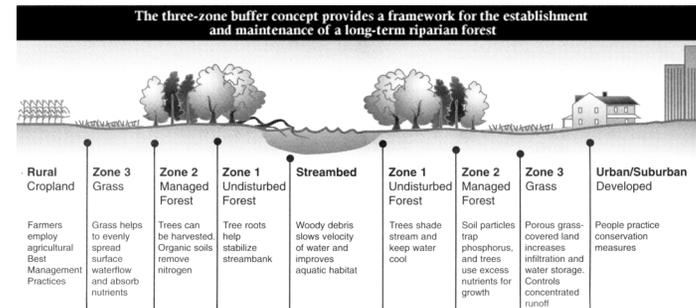
At the time it was chartered, Keystone Academy was the only high school between Binghamton, N.Y., and Scranton, Pa. For over 65 years, the Academy served the secondary educational needs of the region admirably. Nevertheless, the school's trustees came to realize that a quality college education must be available

When dirt, oil, litter, pesticides, and nutrients wash off the land, they not only pollute our local waters, but eventually collect in the Chesapeake Bay. The Bay is like a big shallow sink where water movement is slow and pollution lingers and settles to the bottom. This *non-point* source pollution has significantly hurt the fish and wildlife resources that were once plentiful in North America's largest estuary.

Station 2

## Riparian

All waterways including creeks, streams, and rivers, are surrounded by land. The waterway, along with the adjacent land, is known as the riparian zone. A healthy riparian zone



provides benefits of high water quality for people and wildlife. *Riparian* comes from the Latin word meaning bank or shore, and simply translated, it relates to those lands along a body of water such as the streambank, floodplain, and upslope areas, which vary in width. This area is the vital link between land and water.

A *buffer* is a vegetated area between different areas of land use that isolates or mitigates the negative impacts one might have on the other. Therefore, riparian buffers serve several important functions. in sunlight, moisture and nutrient levels, and other factors that control the type of species that can grow in the forest. The kinds of trees in the forest (its composition) as well as the layers of vegetation (its structure) will change, whether you manage your forest or not. That is, succession will either happen naturally, or you can manage your forest to guide some of the changes you want to occur there.

forested ecosystem. Look at the wildlife habitat in the streamside forest surrounding you. Riparian buffer areas have the potential to provide rich habitats for a variety of wildlife. However, the width and character affect the type of wildlife it will support. Research has shown that songbirds can benefit from even narrow strips of riparian vegetation, while large species like deer and bear require a minimum of 100 to 300 foot wide forest buffers. Can you see or hear any evidence of wildlife nearby?

### Birds of the Riparian Zone

- Common Merganser
- Northern Cardinal
- Swamp Sparrow
- Downy Woodpecker
- American Robin
- Hairy Woodpecker
- Blue Jay
- Great Blue Heron
- Mallard
- Red-winged Blackbird
- Red-eyed Vireo
- Cedar Waxwing
- Gray Catbird
- Common Flicker
- Common Yellowthroat
- Black-capped Chickadee
- Pine Siskin
- Song Sparrow
- Belted Kingfisher



Great Blue

boulders to deflect stream flow and absorb stream energy while quick rooting vegetation holds streambank soil in place. These tend to create habitat diversity and not eliminate it like concrete and steel structures.

Station 12

### **Outdoor Classroom; Keystone's Early Graduation Stage**

Sit in this outdoor classroom area for a minute. The open air stage was once used when Keystone Academy held graduation ceremonies here in the early 1900s. The largest class was 25. Parents and family members came with horses and wagons and made a day of it. A band played the graduation march while the procession came from Bailey Field off to your right. How big do you think the surrounding large maple and tulip trees were at the time?



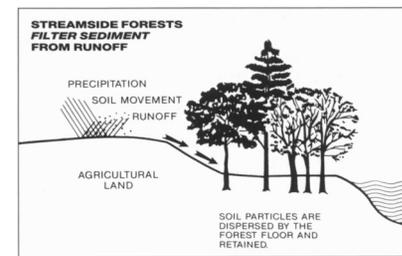
This area is also used as an outdoor classroom where students can learn about this

Station 3

### **Riparian Forest Buffer**

You are standing in a riparian forest buffer separating the developed portion of Keystone College from Nokomis Creek. In addition to many large trees, the understory contains shrub and herbaceous vegetation that forms layers from the ground level to treetops. This forest buffer serves many valuable functions:

- ⇒ Traps and filters sediments, therefore, seedlings can grow under the canopy of other forest trees for a century or more.
- ⇒ Anchors and protects streambanks with soil-holding roots.
- ⇒ Healthy organic forest soils support beneficial microbes that convert and hold nutrients like nitrogen.



Reference: Maryland Department of Natural Resources

- ⇒ Provides shade that moderates water temperatures in the nearby stream.
- ⇒ Plant roots keep the soil porous so water is absorbed which can reducing flooding potential.
- ⇒ In-stream food web is enhanced by adding twigs, leaves, fruit seeds, and organic debris to be consumed by insects and bacteria.
- ⇒ Birds, mammals, and other animals find food, water, nesting sites, and corridors for moving about between areas.

Station 4

## An Invasive Species

If you look across the stream you can locate an extensive stand of **Japanese Knotweed**, *Polygonum cuspidatum*, an introduced species from Eastern Asia. Sometimes known as Mexican Bamboo, it resembles true bamboo with its fast single-stemmed growth sometimes exceeding four feet in one month. In Winter or very early Spring you will see a thicket of the previous years' dead stalks or maybe red asparagus-like shoots

*Carex stricta* / Tussock Sedge  
*Juncus effusus* / Soft Rush  
*Scirpus validus* / Softstem Bulrush



Keep in mind that this type of streambank stabilization is risky because until the trees and shrubs become well established, storm-related erosion damage can occur. It is recommended that you get advice from a professional when planning a stream project.

More old fashioned “hard armor” techniques of concrete-lined channels, gabion (wire) baskets, and vertical stone walls are being put aside and replaced by bioengineering or “soft armoring” methods like the one mentioned previously. Many of these newer methods use combinations of plants, brush, logs, stumps, and

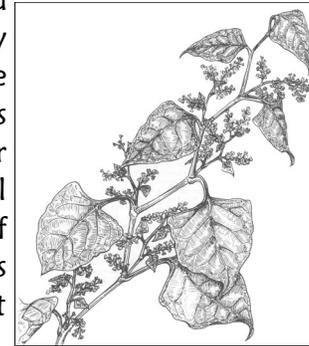
*Sambucus canadensis* / American Elderberry  
*Cornus amomum* / Silky Dogwood

Keystone College's efforts to correct stream-related erosion problems involved reshaping and planting 200 feet of this streambank area. This was completed in the Spring of 1998 as part of the community forestry grant project. Large stockpiles of dredged materials had to be removed first, which were piled high on top of the streambank. But since the integrity of the original streambank remained, it was thought that plantings alone could provide permanent stability.

A bioengineering method using a coir fiber roll was installed at the water's edge. Coconut fibers are used in making this fiber roll because they last for seven or more years before biodegrading. When placed near water, the fibers remain soggy and are excellent for nursing young seedlings until they root into the streambank. This coir fiber roll was planted with wetland seedlings:

emerging from the rhizomes near the soil surface.

This plant is not native to North America and is referred to as an "invasive exotic" because it spreads very aggressively and can dominate a site, outcompeting the native vegetation. Knotweed's favorite sites are loose fill, old railroad beds, ditches, and riverbanks. Although very difficult to control, the spread of invasive exotics must be checked or their dominance of an area will reduce the diversity of native plant communities and seriously impact habitat.



Japanese Knotweed

Station 5

## Eastern Hemlock

Almost everyone will agree that the Eastern Hemlock is one of the most attractive of our native trees. Instead of the stiffness of character

that marks most conifers, it has a feathery airiness with flowing branches, and its top shoot bends gracefully with the wind. Young open-grown hemlocks have a dense pyramid-shaped crown with lower branches that nearly touch the ground. Older trees in the forest develop tall shaft-like trunks like the ones you see here. A long-lived tree, hemlocks reach maturity at 250 to 300 years, but they may live much longer! Although settlers sometimes used the coarse reddish brown wood for construction lumber, it was often cut and stripped of its valuable tannin-rich bark. Logs were left to slowly decay where they were felled. (Tannin, a natural chemical, was used to tan leather, softening and preserving the material).



Eastern  
Hemlock

Cool shady ravines and valleys of rushing mountain streams are home to the hemlock. Hemlocks are extremely shade tolerant.

Station 11

## Riparian Shrubs; Hard vs Soft Armor

Along the South Branch of the Tunkhannock Creek you can experience a variety of shrub and understory trees. Shrubs not only add structure and shade to the riparian buffer but the increased diversity and dense thicket provides cover for many birds and mammals. But many shrub species are intolerant of shade so therefore they're most prolific in open areas or along the "edge" where light can reach them. In sunny areas you'll find Box-elder and Buttonbush. But here along the stream where the large tree canopy and northwestern exposure limits the available sunlight, more shade tolerant species exist.

Here are some to look for:

*Viburnum dentatum* / Arrowwood Viburnum

*Ilex glabra* / Inkberry

*Cornus sericea* / Red-osier Dogwood

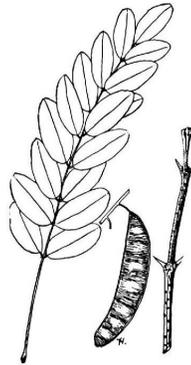
*Ilex verticillata* / Common Winterberry

*Kalmia latifolia* / Mountain Laurel

*Vaccinium corymbosum* / Highbush Blueberry

ripening dark blue berries are actually cones that are relished by birds such as Cedar Waxwings. The Eastern Red Cedar, being a small tree and tolerant of many environments, has gained attention as a landscape tree with many horticultural forms being developed and marketed.

**Black Locust**, *Robinia pseudoacacia* is native over a broad area of the eastern United States. It likes moist well-drained soils but can tolerate extreme conditions like strip mine spoils and roadbanks. This tree is a legume and can fix nitrogen from the air into the soil just like peas or soybeans. The Black Locust is easily spotted during the summer with its compound leaves. This locust also sports a pair of spines at the leaf base. Its orange seeds develop in flat pods.



Black Locust

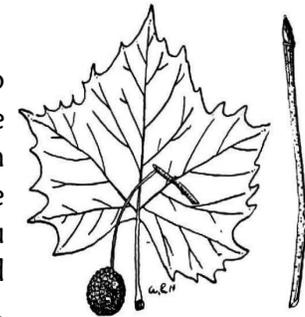
Station 6

## Stream Ford

The side path on the right leads to an old ford of the Nokomis Creek. Fords are used for the occasional crossing of streams and rivers with equipment, vehicles, and cattle. The stream is usually accessed where the banks are low, water depth is shallow, and few obstacles are present. Environmental permits are required to construct this type of feature. Overusing fords can cause erosion and sedimentation impacts from the rutted roads or in areas where cattle approach the streambank. Farmers, loggers, sportsmen, and utility companies often use fords instead of building and maintaining expensive bridges.

Before returning to the main trail, notice some of the more common species here in the streamside forest. Can you find the Sycamore and Black Willow? Sycamore,

Sycamore

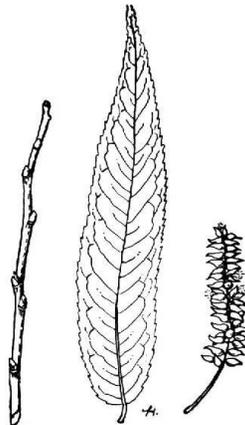


*Platanus occidentalis*, is common along streams and bottomlands in much of the northeastern United States. This massive long-lived tree is distinguished by its glistening white branches and strikingly mottled trunk. The outer bark peels off in large flakes, leaving a patchwork of colors from white and brown to greenish-gray. Sycamore fruit is ball-like, hanging from long slender stalks, giving the trees the nickname, buttonwood. Very large leaves are three to five lobed resembling a maple but exhibiting no fall color.

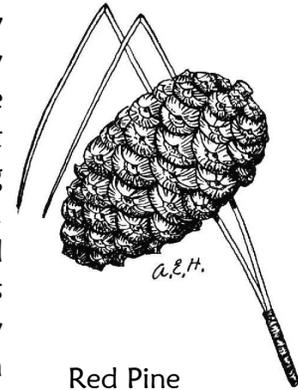
Familiar as a city street tree, London Planetree is a hybrid between Sycamore and Oriental Planetree. The bark is mottled as well and the fruits also ball-like but hanging in twos from slender stalks.

Willow (*Salix*) is one of the most commonplace of trees and shrubs. With new species continuing to be

Black Willow



their natural range. Needles are in pairs, sharply pointed and break easily when bent. They are longer than those of most northern pines, ranging from four to six inches. Often growing tall and straight, demand for this forest tree has recently increased for its use in construction of log homes and as utility poles



Red Pine

Red Cedar

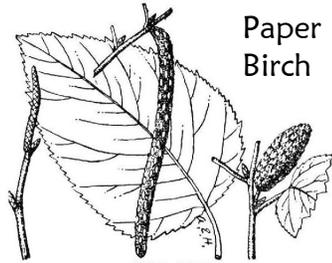


**Eastern Red Cedar, *Juniperus virginiana***, is found over most of the eastern United States on dry hills, in abandoned fields, and along fencerows and roadsides. Belonging to the juniper family, and thus not a true cedar, they have leaves that are either scalelike or awllike. In the fall,

Station 10

## Tree Identification

A variety of unique tree species abound near this trail station. See if you can find them.



**Paper Birch** or **White Birch**, *Betula papyrifera*, is near the southern edge of its natural range. The white-barked trunks populate forests stretching from

here across New England, the Great Lakes and western Canada. Do not confuse this birch with the smaller white-barked Gray Birch which populates strip mine spoils and old pastures as a “pioneer” species.

**Red Pine**, *Pinus resinosa*, is distinctly a northern tree, found from Nova Scotia west to Minnesota and south to Northern Pennsylvania. A few scattered trees can be found in the mountains of West Virginia. Millions of Red Pine seedlings have been set out for forest plantations in and beyond

discovered, the worldwide total now exceeds 300. Only a few attain tree size like the Black Willow, while most are shrublike, growing in clumps. Willows are water-loving and found exclusively along streams and in swamps. In North America there are four imports, including Weeping Willow from Asia, which now reproduces in the wild, hybridizing with our native species.

Regardless of size, willows as a group share a distinctive than broad. They are attached alternately on the twigs. A pair of ear-shaped growths called stipules can be seen at the base of the leaves and sometimes are so prominent on new shoots they often are mistaken for leaves.

In addition to producing many tiny seeds, reproduction readily occurs by sprouting from roots or branches torn from plants following storms or flooding. This ability to sprout from cut stumps or pieces of branch make the willow especially useful in streamside planting for erosion control.

## Ponds and Groundwater

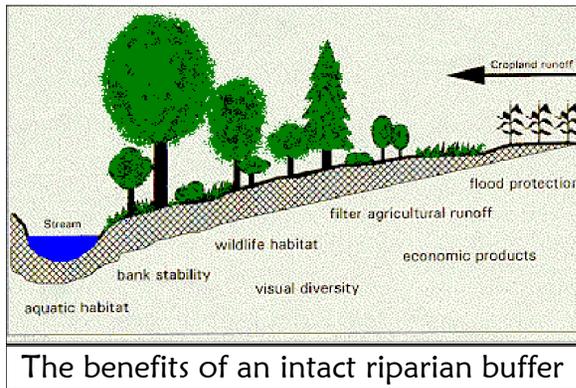
You'll often find constructed ponds like this one adjacent to streams because of the dependable water source. Keystone's "Biology Pond" is a typical example of a dug out pond created by excavating a hole and banking the lower side with a berm or dam. Shallow groundwater, springs, and surface runoff contribute the water. Rainfall that saturates the land above and seeps out of the toe of the hillside supplying water to the pond and stream is shallow groundwater. Riparian forests help to breakup rainfall and hold water in and around the roots, which allows water to be released slowly into streams. Some groundwater finds its way through pores and fractures very deep into the bedrock. Groundwater is a precious resource that needs to be protected as deep wells supply most rural residents with drinking water.

streambank. A mixture of techniques was chosen. "Hard armor," such as riprap (large rocks), was deployed along part of the bank. 'Soft armor' bioengineering techniques were also incorporated, including biologs constructed of plant materials to help hold the bank. Fabric mesh was laid on the graded banks to stabilize the bare soil. Water-loving vegetation such as willows were planted directly into the bank. Quickly developing root masses will provide integrity to the banks. Red-osier Dogwood and Arrowwood Viburnum are among the water tolerant plants that were integrated into the stabilization plans.

Downstream several large downed trees were buried in the streambank with their roots protruding into the channel. These **rootwads** deflect and slow the current, and provide fish cover.

With extensive community and volunteer support, this award-winning project has been a great success and has attracted professional restoration biologists eager to see mitigation techniques at work.

been historically degraded by removing much of the vegetation for farming and recreational purposes. In part, this set the stage for the flood damage.



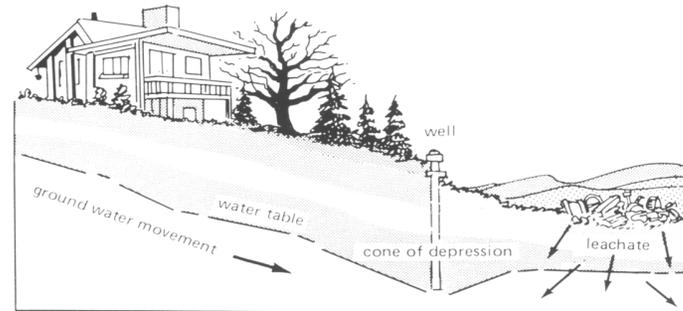
The benefits of an intact riparian buffer

Repair meant reestablishing a more natural riparian buffer zone. This vegetated area would help to reduce and catch erosion and runoff that was now going directly into the stream. Additionally, shade would cool and moderate the water temperature. The vegetation also provides wildlife habitat.

To restore the area and reestablish the riparian buffer zone would require stabilization of the

Community wellhead protection programs are beginning to monitor and clean up regional pollution problems on the land helping to prevent seepage of surface pollution into the water table. Groundwater pollution may come from many sources:

- ⇒ leaking fuel and other storage tanks
- ⇒ seepage from commercial and industrial lagoons and spills
- ⇒ unlined landfills or old dumping grounds
- ⇒ strip mines and quarries
- ⇒ Salt and other bulk storage areas
- ⇒ malfunctioning “on lot” home waste treatment systems

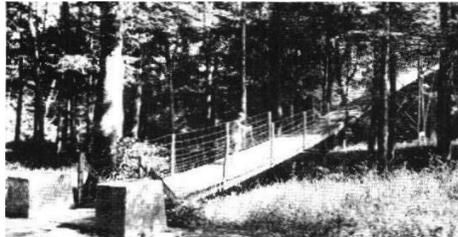


Ground water generally follows flow paths dictated by gravity. A cone of depression around a well may influence high and low points in the water table, changing the direction of the water movement.

Station 8

## Suspension Bridge

These concrete pillars are not steps but an old foundation of a three hundred foot long suspension bridge that spanned the creek valley. It served passengers of the Northern Electric Railroad trolley which stopped at a station across the stream. There the building foundation and cinder rail bed still remain even though the trolley ceased operating in the 1930s. Can you imagine students arriving in this manner from Scranton and nearby communities to attend Keystone Academy (which became Keystone College in 1934). During the snowy winter months, daring local residents used the steeply sloping bridge as a sledding run!



Bridge from campus to station of  
Northern Electric Railway

If you enjoy history, *The History of Keystone* is available in the library or campus bookstore. Continuing on the short loop trail to the stream edge you'll pass two Norway Spruce trees that were probably planted as landscape trees near the bridge years ago. Norway Spruce is a naturalized tree species in our region. That is, they have adapted well.

Station 9

## Riparian Restoration Project

The flood of January 1996 caused extensive erosional damage in this area. Fast moving flood waters tore away tens of feet of stream bank, cutting into the athletic fields and tearing out the original Nokomis bridge behind the library. More unstable stream banks were poised to collapse into the stream. A grant from the Northeastern Pennsylvania Urban Forestry Program allowed the College to repair the damage and develop a model project for restoration techniques.

The **riparian zone** is that area between the stream bank and adjacent forest. This area had