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AMERICAN WATER



Still Falls Watershed Project

Ecological Services, Drinking
Water and Restoration

- **Grade Level:** 7-12
- **Objective:** Students will explore the ecological benefits of protecting and restoring riverbanks through land use management
- **Subjects:** Environmental Studies, Geography, Economics, Mathematics, Politics

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INTRODUCTION

The infrastructure and technology needed to provide drinking water to communities requires continued investment of time and resources. Municipalities are beginning to realize that by adopting proven habitat restoration practices both the natural landscapes and the quality of the surface water within a particular watershed can be protected.

Putting a dollar value on ecological services has historically been difficult to accomplish, but there are methods that can be used to begin to quantify the value that species and ecosystems offer. For example, it is recognized that pollination, soil building, nutrient cycling, carbon sequestration and water purification are fundamental services provided by nature to humans.

These “services” have economic value that can be approximated using market research methods. However, the economic viability of such ventures must be taken into account before they are implemented. The basic question then becomes; “Will the economic value gained from a particular restoration project exceed its monetary investment?”

Drinking water supplies that come from surface sources (rivers, lakes and reservoirs) can be impacted by a variety of anthropogenic activities. Agriculture and suburban runoff increase sediment deposition rates while increasing the concentration of nutrients in local surface water bodies. Under these conditions, eutrophication can occur thereby threatening the ecological integrity of the aquatic system.

Along the banks of fresh water bodies, vegetation plays a critical role in protecting the water from runoff and thus provides a key ecological service. These vegetative areas are known as riparian zones or buffers. In an area where water quality has been compromised, protecting and restoring riparian zones is a critical approach to facilitating the improvement of natural functions.

DID YOU KNOW?

There are over 3.5 million miles of rivers and streams in the United States.

MATERIALS NEEDED

- Piece of paper
- Pen or pencil
- Calculator
- Enclosed data sheets

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EXERCISE

The City of Blainville (Population: 750,000) has relied on the Still Falls Reservoir for drinking water for more than a century. Changes in land use in the Still Falls watershed and the wear and tear of an aging municipal water supply system have left city officials to face a stark reality. Serious investment is needed to improve drinking water quality for the city's residents.

There are two options to consider:

- **Option One** is to allocate \$40 million to improve and replace the city's water treatment facilities. This is based on a thorough assessment of the system's facilities by the city's engineers and plant operators.
- **Option Two** is to protect the watersheds that supply drinking water to the city of Blainville to reduce the pollution impact from land use. This plan calls for a pilot study that involves identifying corridors along the Still Falls River and Reservoir that can be purchased, restored and/or easement restricted. Research from Stroud Water Research Center in Pennsylvania has demonstrated the efficacy of this method and various urban centers have achieved success in implementing watershed protection for addressing drinking water issues.

Local community groups and environmental advocacy organizations have been lobbying Option Two. This will require research. Public Works staff must now categorize land types, review options for water course protection and tally the funds needed to actualize the plan. Because of the additional benefits that will result from the acquisition and protection of riparian sites, including improved habitat for native species and improved aesthetic value for recreation, city officials have agreed that if the cost of the land conservation plan comes in at less than 25% of the cost for system replacement (\$40 million), they will select Option Two.

The following worksheet establishes the property types and associated cost estimates to purchase, restore and/or establish easements. As part of the Green Blainville team, you must complete the proposal, total up the estimated costs for the plan and summarize the land use types and the recommended property outcome – purchase and/or restore and/or easement. A list of tasks to be completed and anticipated questions are found at the bottom of the worksheet.

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STILL FALLS MAP FEATURES

- **Still Falls River:** River that drains into the Still Falls Watershed. Land use varies along the river course.
- **Still Falls Reservoir:** Large lake that supplies drinking water to the communities of Walnut Hill and Unity and the rest of the metropolitan Blainville area.
- **Forest Area:** State forest tract located to the east of Still Falls River and north of Walnut Hill and the Still Falls reservoir.
- **Wood Family Orchards and Dairy Farm:** 3rd generation farm and orchard located along the upper reaches the Still Falls River. Fertilizer, pesticides, sediment and oxygen consuming wastes have been documented in the river downstream of the Wood family property.
- **Caswell Village:** Community of homes and businesses within the watershed. Residents live on large plots of land divided by open space. A golf course is located along the river on the east side of the village.
- **Unity and Walnut Hill:** Heavily populated regions of Blainville, both located on the Still Falls Reservoir.

CALCULATED COSTS

Approximate Costs to Protect the Still Falls Watershed and Blainville Municipal Water Supply

The dollar values referenced establish the approximate cost per square on the land grid to purchase, restore and/or establish easements within that parcel. For some regions, one or two options may not be available and are shown as N/A.

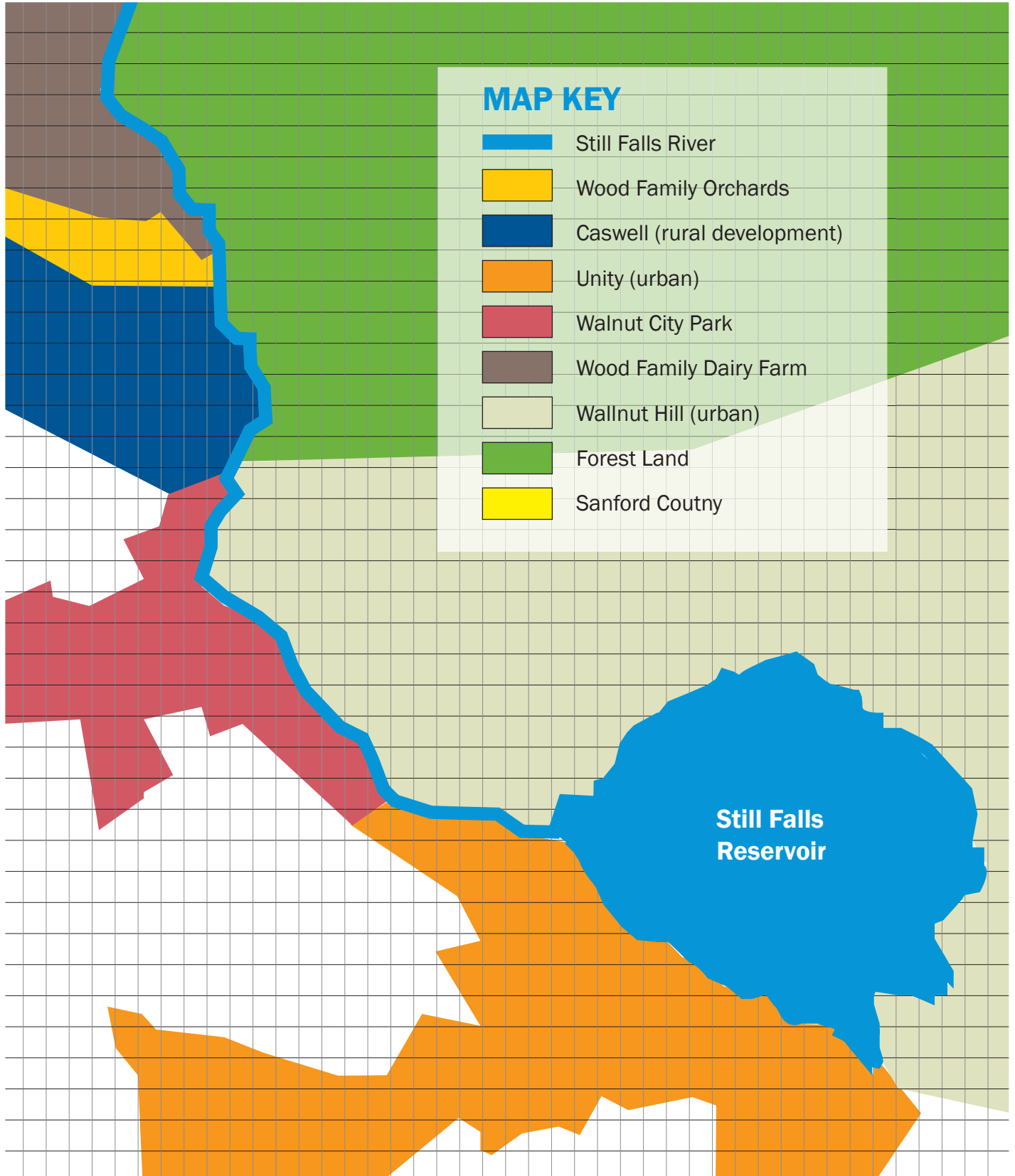
	Purchase	Restore	Easement	Total Cost
Wood Family Orchards/Farm	___ x \$100,000	___ x \$10,000	___ x \$25,000	
Caswell	___ x \$125,000	___ x \$10,000	___ x \$75,000	
Walnut City Park	N/A	___ x \$10,000	N/A	
Forest Land	___ x \$75,000	N/A	___ x \$15,000	
Unity	___ x \$100,000	___ x \$15,000	___ x \$50,000	
Wallnut Hill	___ x \$100,000	___ x \$15,000	___ x \$50,000	

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TASKS

- Determine the number of parcels (squares) in each land type that border the river and reservoir. Summarize this data.
- Decide what will be the best option(s) for the parcels in each land type: purchase, purchase and restore, easement, or easement and restore. Please note that easement and purchase can not go together, any parcel restored must be either purchased or established as easement.
- Based on your selection and categorization, calculate the cost for all parcels. All parcels bordering the river or reservoir must be included. Do not distinguish between a full or partial parcel when calculating the total cost.

QUESTIONS

1. If easements established are only valid for 25 years, would this change your decision to use or not use them? Explain.
2. What are the full ecological benefits of protecting and restoring river banks (Riparian Zones)?
3. Does the cost of protecting the land within the watershed meet the goal of 25% of the \$40 million estimate? If yes, how much was leftover? If not, could you change any categorization to reduce the estimate of the total cost? If yes, show this option.
4. Rank the land use types by importance of protection. Which area would be most important to purchase/restore or establish easement? Least important? Explain your ranking.

EXTENSIONS - AT HOME

- Identify the source of your drinking water. What, if any, are the potential threats to its supply and quality?
- Research the New York City watershed protection project at www.dec.ny.gov/lands/25599.html

NOTES

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DEFINITIONS

- **Aquifer:** Porous, water-saturated layers of sand, gravel or bedrock that can yield an economically significant amount of water.
- **Anthropogenic:** Effects, processes or materials that are derived from human activities as opposed to those occurring in biophysical environments without human influence.
- **Ecological Restoration:** The scientific study and practice of renewing and restoring degraded, damaged or destroyed ecosystems and habitats by active human intervention and action. Restoration ecology specifically refers to scientific studies and their name that was first developed in the 1980s.
- **Ecological Services:** Processes that are supplied by natural ecosystems and that benefit human beings and nature. These services are very difficult to replace if compromised and have a total worth in the trillions of dollars. Examples include pollination, soil building and carbon sequestration.
- **Riparian Vegetation:** The vegetation that is found along the banks of a water body and adjacent habitats between the land and a river or stream. This vegetation provides various ecological services to the water system it borders.
- **Runoff:** Fresh water from precipitation and melting ice that flows on the earth's surface into nearby streams, lakes, wetlands and reservoirs. Runoff may contain pollutants and may be unnatural in areas with extensive impervious services.
- **Surface water:** A water feature that exists and remains at the surface such as streams, rivers, lakes, wetlands and marine basins.
- **Watershed:** Land area that delivers the water, sediment and dissolved substances via small streams to a major stream (river).

RESOURCES

- topomaps.usgs.gov (for maps of land cover for your region)
- www.gis.com (for exploring the technologies and applications of geographic data)
- Nature Conservancy, Autumn 2010 Publication pp. 42 – 49
- *The New Economy of Nature* (chapter 3) by Gretchen Daily and Katherine Ellison
- *Cities in the Wilderness* by Bruce Babbitt

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In a world where everything we touch frequently changes, water is our constant. We've never stopped needing it to drink, to cook, to clean, to live. We'll always need it for sanitation, for fire protection, for watering our lawns and washing our cars.

It's easy to take water for granted. And because so many do, we don't.

We are scientists, environmentalists, innovators, and protectors. We are also residents and employees in the communities we serve. We understand how important, how precious, and how critical water is to daily life.

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A special thanks to Ron Smith for developing the core content of this lesson plan. Ron Smith, a science educator from NJ, has been teaching biology, environmental science and interdisciplinary studies in the classroom, lab and field for 18 years. It was important for us that our lesson plans be crafted by an educator for educators. We appreciate his hard work.

Last updated: 12-2010