Appendix A

WATERSHED TOOLS

- Think Safety!
- Causes and Sources of Water Resource Degradation
- Sample Letter
- Sample Public Outreach
- Reading A Topographic Map
- Dot Grid For Calculating Acreage

Think Safety!{tc "**THINK SAFETY!** " \l 2**}**

To ensure a fun and educational trip to your stream, wetland or lake, please keep these simple precautions in mind:

- Always visit a site with at least one other person so someone can go for help if one person is unable to.

- Never sample if a stream or river is flooding, or even one day after a heavy rain. Fast moving water is very dangerous. Also, avoid steep banks as access points. Wear a life jacket if near deep water.

- When sampling, avoid touching your mouth and eyes and be sure to wash hands before eating. If a waterbody is polluted or water quality is unknown, wear plastic gloves and rubber boots.

- Know the location of the nearest available phone or take a cell phone with you. Have an emergency plan ready if you are taking a group out – who will go for help? Does anyone know CPR? Does anyone have allergies?

- Don't go near the water if there is a strong chemical smell, a fish kill, or other dangerous conditions. Leave immediately and report the condition to appropriate authorities.

- Watch out for snakes, alligators, and snapping turtles. Hit the ground and trees with a stick as you walk to your site to scare snakes and other creatures away. Leave them alone and they will leave you alone.

- Look out for broken glass, poison ivy, ticks, bees, fire ants, and other hazards.

- Be aware of road hazards, both driving to the site and while conducting activities. Vehicles may not see you getting in and out of your car—bridges are narrow. Make sure you have enough room to safely park and walk to your site. If walking under a bridge, watch for objects knocked off the road from overhead.

- Bring a first aid kit.

Causes and Sources of Water Resource Degradation

Causes (pollutant or stressor)	Possible Sources	Potential Adverse Impacts
Sediment and Siltation (sand, silt, clay)	Cropland Forestry activities Pasture Stream banks Construction Roads Mining operations Gullies Livestock operations Other land-disturbing activities	Sediment may destroy fish habitat by: (1) blanketing spawning and feeding areas; (2) eliminating certain food organisms; (3) causing gill abrasion and fin rot; and (4) reducing sunlight penetration, thereby impairing photosynthesis. Suspended sediment decreases recreational values, reduces fishery habitat, adds to mechanical wear of water supply pumps and distribution systems, and adds treatment costs for water supplies. Nutrients and toxic substances attached to sediment particles may enter aquatic food chains, cause fish toxicity problems, impair recreational uses or degrade the water as a drinking water source.
Nutrients (phosphorus, nitrogen)	Erosion and runoff from fertilized fields Urban runoff Wastewater treatment plants Industrial discharges Septic systems Animal production operations Cropland or pasture where manure is spread	Nutrient enrichment may cause excessive algae and aquatic plant growth, which may choke open waters and consume oxygen (primarily from decomposition of dead plants and algae). These conditions will adversely affect fish and aquatic organisms, fishing and boating, and the taste and odor of finished drinking water. Nitrogen contaminants in drinking water significantly above the drinking water standard may cause methoglobinemia (blood disease) in infants, and have forced the closure of many water supplies.
Pathogens (bacteria and viruses)	Human and animal excreta Animal operations Cropland or pasture where manure is spread Wastewater treatment plants Septic systems Urban runoff Wildlife	Waterborne diseases may be transmitted to humans through drinking or contact with pathogen-laden water. Eating shellfish taken from or uncooked crops irrigated with pathogen-laden waters may also transmit waterborne diseases. The principal concern in both surface and ground waters is the potential degradation of public water supply sources. Pathogens reaching a lake or other surface waterbody may limit primary contact recreation, such as swimming.
Pesticides	All land where pesticides are used (forest, pastures, urban/suburban areas, golf courses, waste disposal sites) Sites of historical usage (chlorinated pesticides) Urban runoff Irrigation return flows	Pesticides may enter surface waters either dissolved in runoff or attached to sediment or organic materials, and may enter ground water through soil infiltration. The principal concerns in surface water are their entry into the food chain, bioaccumulation, toxic effects on fish, wildlife and microorganisms, habitat degradation and potential degradation of public water supply sources. Ground water impacts are primarily related to water supply sources.
Organic Enrichment (depletion of dissolved oxygen)	Human and animal excreta Decaying plant/animal matter Discarded litter and food waste	Organic materials (natural or synthetic) may enter surface waters dissolved or suspended in runoff. Natural decomposition of these materials may deplete oxygen supplies in surface waters. Dissolved oxygen may be reduced to below the threshold necessary to maintain aquatic life.

Toxic Substances (heavy metals, oil and petroleum products)	Urban runoff Wastewater treatment plants Industrial discharges	Toxic substances may enter surface waters either dissolved in runoff or attached to sediment or organic materials and may enter ground waters through soil infiltration. Principal concerns in surface water include entry into the food chain, bioaccumulations, toxic effects on aquatic organisms, other wildlife and microorganisms, habitat degradation and degradation of water supplies. Ground water impacts are primarily related to degradation of water supply sources.
Thermal Stress / Sunlight	Riparian corridor destruction Bank destruction Urban runoff Hydrologic modifications Industrial dischargers	Direct exposure of sunlight to streams may elevate stream temperatures, which can exceed fish tolerance limits, reduce dissolved oxygen and promote the growth of nuisance algae. The lack of trees along a stream bank contributes to thermal stress and excessive sunlight. Thermal stress may also be the result of storm water runoff, which is heated as it flows over urban streets. Hydromodifications that create wider, shallower channels create more surface area and allow for quicker temperature changes. Modifications that create pools and increase the storage time of water may also contribute to thermal stress by increasing surface area and not allowing the warmed water to wash out of the watershed. Coldwater fish may be eliminated or only marginally supported in streams affected by thermal stress.
pH (acidic and alkaline waters)	Mine drainage Mine tailings runoff Atmospheric deposition Industrial point source discharges	Acidic or alkaline waters will adversely affect many biological processes. Low pH or acidic conditions adversely affect the reproduction and development of fish and amphibians, and can decrease microbial activity important to nutrient cycling. An extremely low pH will kill all aquatic life. Acidic conditions can also cause the release of toxic metals that were adsorbed to sediments into the water column. High pH, or alkaline conditions, can cause ammonia toxicity in aquatic organisms.
Flow Alterations (hydrologic modifications)	Channeling Dams Dredging Streambank modifications	Hydrologic modifications alter the flow of water through the stream. Structures or activities in the water body that alter stream flow may in turn be the source of stressors, such as habitat modifications, or exacerbate others, such as thermal stress. Dams may also act as a barrier to the upstream migration of aquatic organisms. Stream flow alterations may result from a stressor such as sedimentation, which may change a streambed from narrow with deep pools to broad and shallow.
Habitat Modifications	Channeling Construction Changing land uses in the watershed Stream burial Dredging Removal of riparian vegetation Streambank modifications	Habitat modifications include activities in the landscape or in the water body that alter the physical structure of the aquatic and riparian ecosystem. Some examples include: removal of stream side vegetation that stabilizes the stream bank and provides shade; excavation in the stream and removal of cobbles from the stream bed that provide nesting habitat for fish; stream burial; and development that alters the natural drainage pattern by increasing the intensity, magnitude and energy of runoff waters.
Refuse, Litter and Other Debris	Litter Illegal dumping of solid wastes	Refuse and litter in a stream can clog fish spawning areas; stress aquatic organisms; reduce water clarity; impede water treatment plant operations; and impair recreational uses of the water body, such as swimming, fishing and boating.

Sample Letter To Inform Local OfficialSAMPLE LETTER TO INFORM LOCAL GOVERNMENT {TC "SAMPLE LETTER TO INFORM LOCAL GOVERNMENT " \L 2 }OF ADOPT-A-STREAM PROJECT

February 25, 2006

J. Concerned Citizen
123 Watershed Plaza
Streams, GA 30000

Mayor George Buggs
Rivers City Hall
555 Wetlands Way
Streams, GA 30000

Dear Honorable Mayor Buggs,

I would like to inform you of an interesting and exciting project my neighbors and I are working on. Several of us who live near Ripple Rock Creek decided to learn more about the creek and start protecting it. We have started an Adopt-A-Stream project and registered with the Environmental Protection Division's Georgia Adopt-A-Stream program.

We started the project because we are concerned about the continuing development in our area. Ripple Rock Creek is a beautiful creek and we want to make sure it stays that way. Our Ripple Rock Adoption Project is one way to learn about and protect the creek and share our findings with others.

The Ripple Rock Adoption Project will help protect the creek because we will regularly evaluate water quality, share our results with others, pick up litter, and plant trees to stabilize an eroding streambank. We also know whom to call if a water quality problem is noticed.

We would very much like to send you, or someone you designate, our results. We would like to help in any way to protect our stream's water quality. May we count on your support?

We look forward to hearing from you.

Sincerely,

J. Concerned Citizen
Ripple Rock Adoption Project

Sample Article and Presentation For Public Outreach{tc "SAMPLE ARTICLES AND PRESENTATION FOR PUBLIC OUTREACH " \l 2}

Adopt-A-Stream Group Surveys Beaver Creek

The West End Homeowners Association (WEHA) has completed a one-year Adopt-A-Stream project on Beaver Creek. In partnership with the Johnson County Water Department and Georgia Adopt-A-Stream, the WEHA adopted a one mile section of Beaver Creek. We completed a Watershed Walk, four visual surveys and four litter pickups. Results show the creek generally in good shape, although the group has reported two illegal dumping incidents to the county (which has sent out crews to pick up trash and is investigating the dumper).

The WEHA was started by a group of landowners whose land borders Beaver Creek and wanted to learn more about and protect it. The land surrounding Beaver Creek (the watershed) is generally undeveloped, however, new development upstream concerns us. One upstream builder was polluting the creek with sediment and litter until the WEHA, working with county officials, convinced the builder to put up silt fences and to store construction debris away from the creek.

We've learned a lot about Beaver Creek, the surrounding area, and how we can help protect water quality. For example, we have kept the area next to the creek natural, so that this buffer area will protect the stream from pollutants that may wash into the creek during a storm. We watch how much fertilizer and yard chemicals we put out (especially near the stream) so that these chemicals will not wash into the water. Also, WEHA has sponsored a tour of the creek for other landowners and shared with them our efforts and desire for everyone to pitch in and help protect Beaver Creek.

For more information about the WEHA Adopt-A-Stream project, call J. Concerned at 404-555-1212.

Clear Creek Can Be Improved

A student group at Baldwin High School, the Marshers, took on a new project this year. The Marshers joined the Environmental Protection Division's Adopt-A-Stream Program to learn about and protect Clear Creek. Clear Creek runs behind the high school, so it seemed to be a natural project for the students.

The Marshers started out by conducting a Watershed Walk. Topographical maps of the area were used to study the watershed before the Walk. During the Walk, students recorded land uses and potential impacts to water quality along a one-mile section of the creek upstream from the school. The students found that the creek drains both residential and industrial areas. There are some areas that need to be cleaned up and two places where the streambank is eroding. Also, downstream of the residential area lots of algae was noticed in the water, an indication that excessive nutrients are present in the water. Regular visual surveys confirm that there is a noticeable difference in

water appearance and presence of algae upstream and downstream of the residential area. However, occasional oily sheens were noticed downstream from the industrial area.

Clear Creek is an important resource for the students at Baldwin High School and they plan to act on the information they have obtained. First, the Marshers will conduct a creek cleanup. Working with the local Rotary Club, the Marshers will sponsor the first annual "Clean Clear Creek" day and register with Rivers Alive. The Rotary Club will provide trash bags to volunteers. The first 100 people to bring in a full trash bag will also receive a T-Shirt compliments of the Rivers Alive program.

Next, the Marshers are working with the City of Baldwin to plant trees and other vegetation where the streambank is eroding. The City has contacted property owners and asked for their help to maintain the new plantings. The Marshers will check upstream and downstream of the newly stablized streambanks to see if the plantings have decreased erosion. Finally, the students will send a letter to all the businesses in the industrial park to emphasize the importance of the creek. The letter will include some tips on how the businesses can help keep Clear Creek clean.

Sample Presentation Outline for Public Outreach

I. Introduction
   Describe project--who is involved, what stream, what activities

II. Importance
   Why the stream is important to volunteers and community

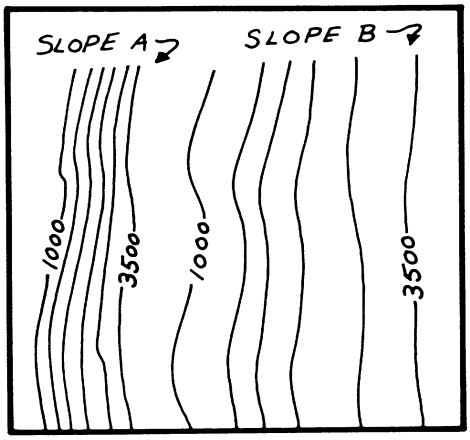
III. Results
   What was found during Watershed Walks, Visual Surveys, and Stream Litter Cleanups.

IV. Potential Improvement Activities
   What are some activities you can do, or several partners can do together, to protect or improve water quality?

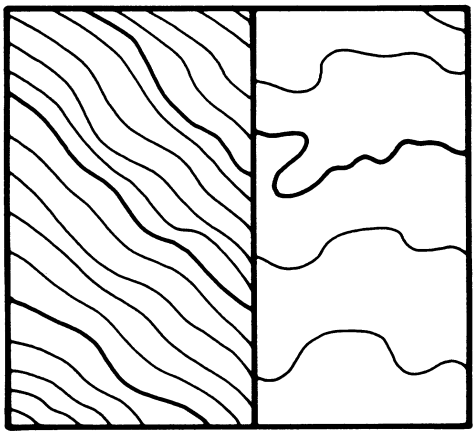
Reading A Topographic Map

Elevation is indicated on topographic maps by contour lines (Figure 1). Elevation can be measured by 10 ft, 20ft, or even 100 ft intervals. The closer the lines are, the steeper the slope (Figure 2). When marking the high points of your watershed, the hills are the easiest features to locate (Figure 3). When connecting the high points of your watershed, be sure to draw your lines crossing the contour lines at right angles, even when the contours are rough (Figure 4).

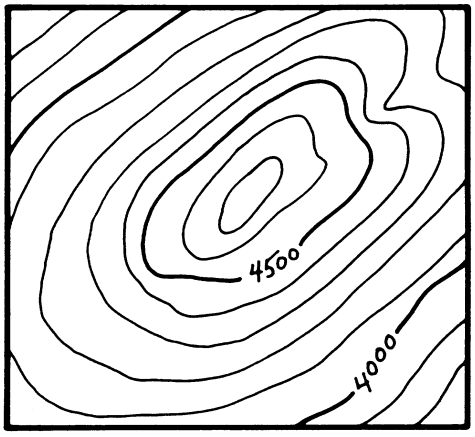
1. Contours are perpendicular to the direction of maximum slope.



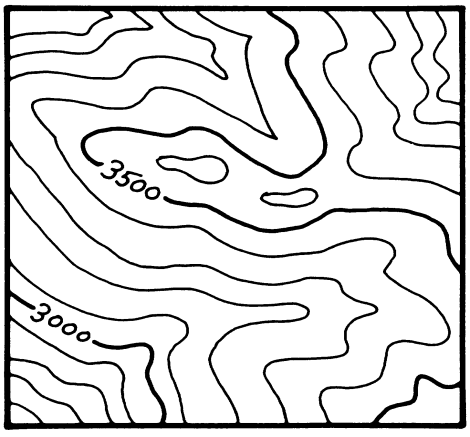
2. The distance between contours indicates the steepness of a slope; close spacing denotes steep slopes; wide spacing denotes gentle slope.



3. Concentric closed contours which increase in elevation represent hills.

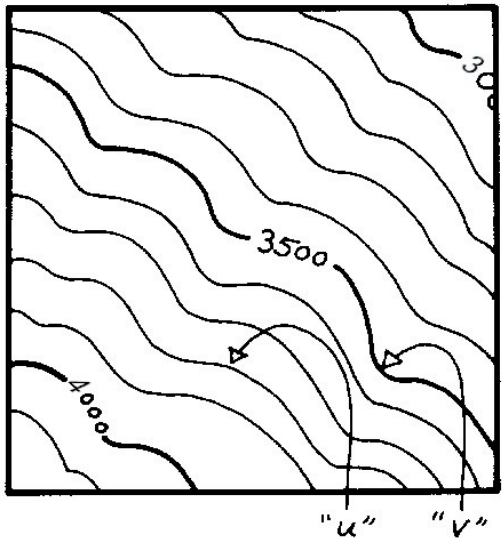


4. Irregular contours signify rough, rugged country. Smooth lines designate gradual slopes and changes.

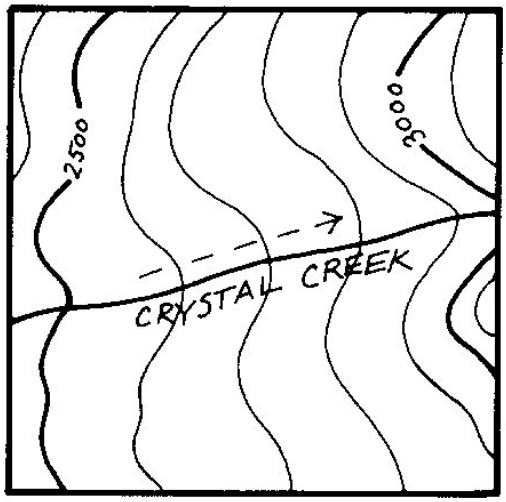


V shaped contour lines indicate a valley. The sharper the V shape, the more pronounced the valley. The point of the V lines point toward higher elevation or upstream (Figure 6). If you follow the V shaped contour lines uphill until they stop, you can assume this is the high point of your watershed. U-shaped contour lines indicate a ridge and point downstream toward lower elevation.

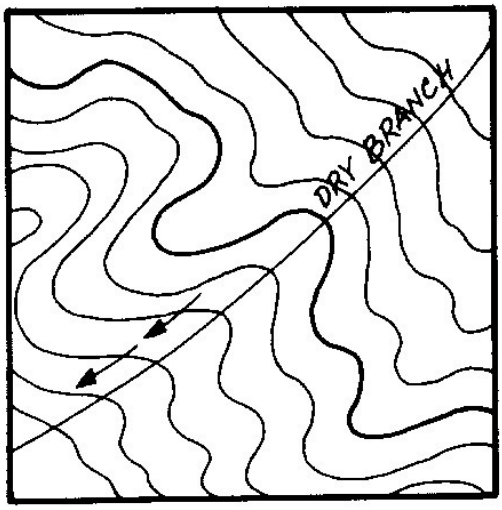
5. Valleys are usually characterized by V-shaped contours, and ridges by U-shaped contours.



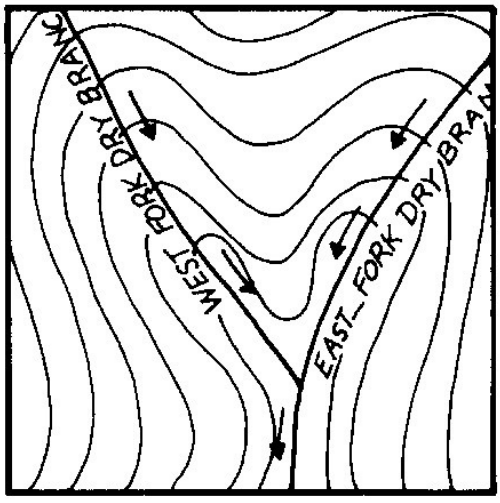
6. The V's formed by contours crossing a stream point upstream.



7. The U's made by contours crossing ridge lines point down the stream.

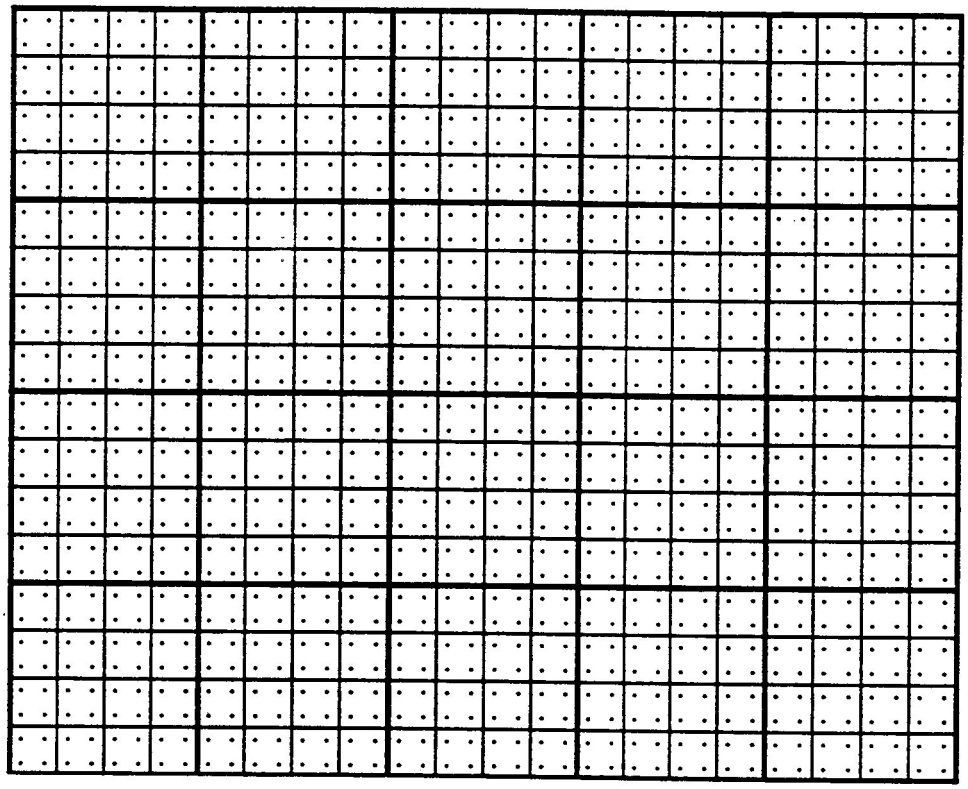


8. Contours tend to parallel streams and have an M-shape just above stream junctions.



Dot Grid for Calculating Acreage

- Photo copy this gird on transparency paper to calculate acreage within your watershed (directions below).



Map Scales and Equivalents

Fractional Scale	Acres per Square Inch	Acres per Dot
1: 24,000 (1inch = 2,000 ft)	91.8	1.43
1: 100,000 (1 inch = 8,333 ft)	1594.0	24.9

1. Delineate watershed.
2. Place dot grid over area to be calculated.
3. Count all dots fully within the area and those dots that fall on the line around the area.
4. Record total number of dots.
5. Repeat three times, randomly placing grid each time to determine accurate average.
6. Multiply by appropriate acres/dot factor noted in the table above.

Note: Areas larger than dot grid may be estimated by breaking down into smaller areas, then totaling dots. Use the same directions when totaling land use coverage.