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The Pollution Prevention Project Guide grew out of our 30+ years combined experience with service-learning and environmental education. In 1995, we launched a partnership between the Minnesota Community Education Association and the Minnehaha Creek Watershed District, supported by the Metropolitan Council. The project has spread to the Rice Creek, Ramsey-Washington Metro, and several smaller watersheds. We wrote this guide in response to the growing demand from teachers and community organizers statewide for detailed practical tips on how to organize successful pollution prevention service-learning projects. We hope you find it useful.

## 3. How to Do Field Reconnaissance

The guide also includes instructions for field reconnaissance (direct observation using a checklist) of local waterbodies. The most powerful learning occurs when students develop projects in response to their investigation of real-world problems. “Give Water a Hand” is another invaluable resource for reconnaissance. (See listing inside of front cover.)





 = Handout







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## 2. How to Do Pollution Prevention Projects

Each section offers step-by-step instructions for school or community-based youth groups to organize popular service projects to prevent nonpoint source pollution. Projects appear in order from simpler to more elaborate.

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## 5. How to Get Agency Support

Any project can improve with the support of professionals in the community. The guide lists potential partner agencies and explains how to build partnerships with them. Water quality testing and habitat restoration projects especially require professional assistance or technical training.

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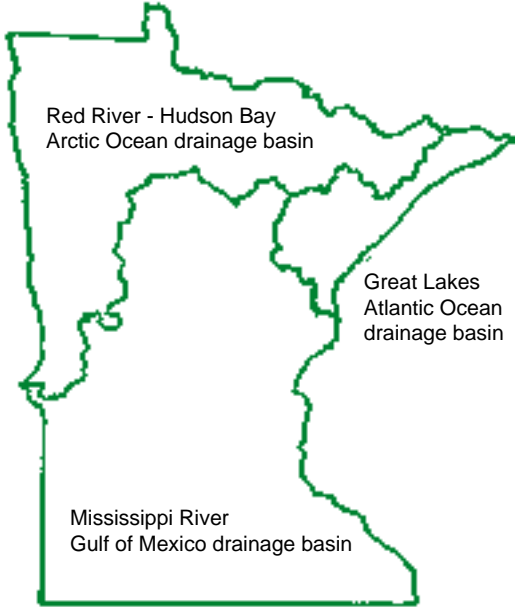
## 6. Resources

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# 1. How to Protect Water Quality

## What Is Your Watershed?

### Continental Divides



Minnesotans love water. Indeed, "Minnesota" itself means "land of sky-blue waters" in the Dakota language. For thousands of years, people fished, swam, and boated on its lakes and rivers. We depend on water for drinking, agriculture, and industry. Minnesotans must protect

this resource to ensure that they and their children continue to enjoy its benefits.

Because water does not follow political boundaries, it makes sense to manage natural resources on a watershed basis. (A watershed is the entire land area that drains to a specific waterbody.) Pollutants on the ground *anywhere* in a watershed can wash into lakes and stream with the next rain. In cities and towns, storm sewer pipes carry polluted water *untreated* directly to the nearest lake or river.

Every Minnesotan lives in one of three major watersheds. (See map above.) Everyone lives also in a smaller, local watershed, perhaps as big as hundreds of square miles or as small as a few acres.

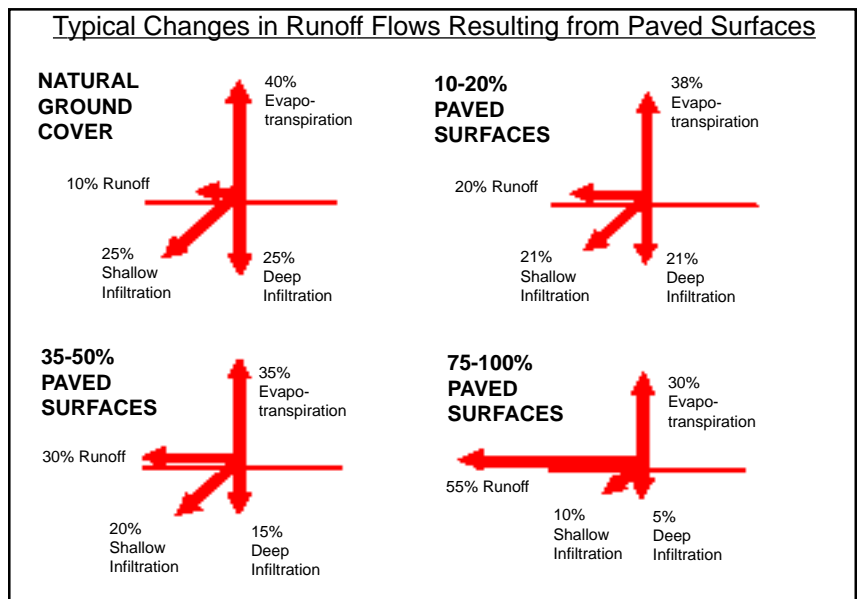
How to identify *your* local watershed?:

- 1) Look at the map on the back of this guide to see if you are in a listed watershed district.
- 2) Ask the agencies listed inside back cover.
- 3) Ask your city public works department, listed in the phone book blue pages.
- 4) Study U.S. Geological Survey topographical maps. (See Minnesota Geological Survey, inside back cover.) "Give Water a Hand," tells step-by-step how to map your watershed using topographical maps. (See inside front cover.)

Note: The Department of Natural Resources has aerial photos of most Minnesota counties: (218) 327-4449 or [www.gis.umnedu/fornet/](http://www.gis.umnedu/fornet/)

## How Development Affects Water Quality

When an undeveloped area changes to support urban land uses, drastic changes in local hydrology (water flow patterns) result. Roads, buildings, and parking lots prevent rainfall from infiltrating or soaking into the soil. Runoff increases. (See diagrams this page and next.) As runoff rates peak higher and more quickly than



## Typical Percentage of Impervious Cover

Land Use	Impervious Cover
Business District or Shopping Center	95-100%
Residential, High Density	45-60%
Residential, Medium Density	35-45%
Residential, Low Density	20-40%
Open Areas	0-10%

"Impervious Cover" means streets, parking lots, roofs, etc.

before, flooding reshapes stream channels and runoff carries more pollution. Between rains, less water percolates through the soil, causing lower stream flows, and drying up aquatic habitats.

## Types of Nonpoint Source Pollution

Hear the word, "pollution," and many people imagine smelly gunk pouring from pipes at factories. Yet the Clean Water Act and other measures have cut such sources of pollution dramatically over the last 30 years. Today the greatest threats to water quality are pollutants from lawns, farms, hazardous wastes, animals, driveways and parking lots, as well as trash. The good news is that the solution to this type of pollution is in our hands!

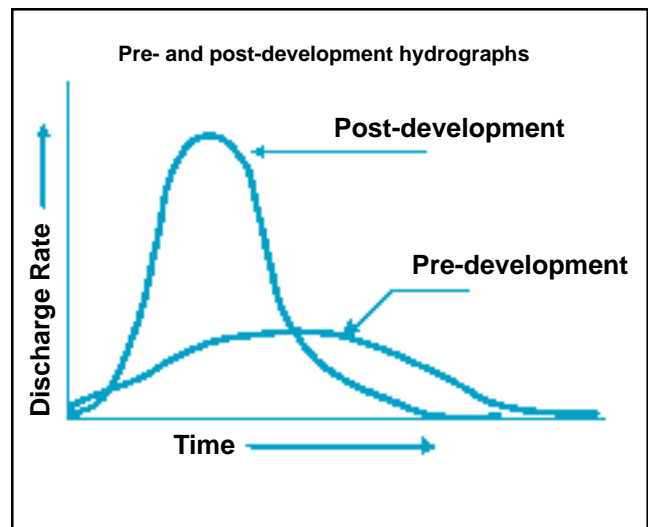
- **Sediment** - Sources: erosion, construction sites, bare earth.  
 Tiny soil particles fill in streams and lakes, smother habitat, reduce light penetration in water, and raise costs for treating drinking water. Sediments also transport other pollutants.
- **Nutrients** - Sources: Lawn clippings, leaves, improper or excessive use of fertilizers, and animal wastes.  
 Phosphorus and nitrogen can feed algal blooms and excessive aquatic plant growth in lakes. As microorganisms eat excess organic matter, they use up dissolved oxygen also, which can kill aquatic life.
- **Bacteria** - Sources: Animal wastes, improper sewage disposal, and faulty septic systems.  
 High coliform bacteria counts often indicate the presence of other pathogens (germs) harmful to human health as well as to aquatic life.

### • Toxins:

- **Toxic Chemicals** - Sources: Improper use or disposal of toxic products, including spills and illegal dumping.  
 Solvents, pesticides, paints and stains, and other toxic products in the water can kill aquatic life.
- **Trace Metals** - Sources: Galvanizing, chrome plating, fallout from auto emissions, wear of automobile parts, and other metals sources.  
 Lead, mercury, zinc, and copper, as well as chromium, cadmium, and nickel are toxic to aquatic life, especially when they accumulate over time in sediments.
- **Hydrocarbons** - Sources: Oil or gasoline spills, leaky crankcases, and improper disposal.  
 Oily rainbow-colored slicks are toxic to aquatic life even in small amounts. Soil quickly absorbs oil and gas.
- **Chloride** - Sources: Improper storage of de-icing salts.  
 Chloride is extremely soluble in water. Still, normal application of road salts for de-icing should not cause chloride levels toxic to freshwater organisms.

Water management agencies can say which pollution sources are most important in your watershed.

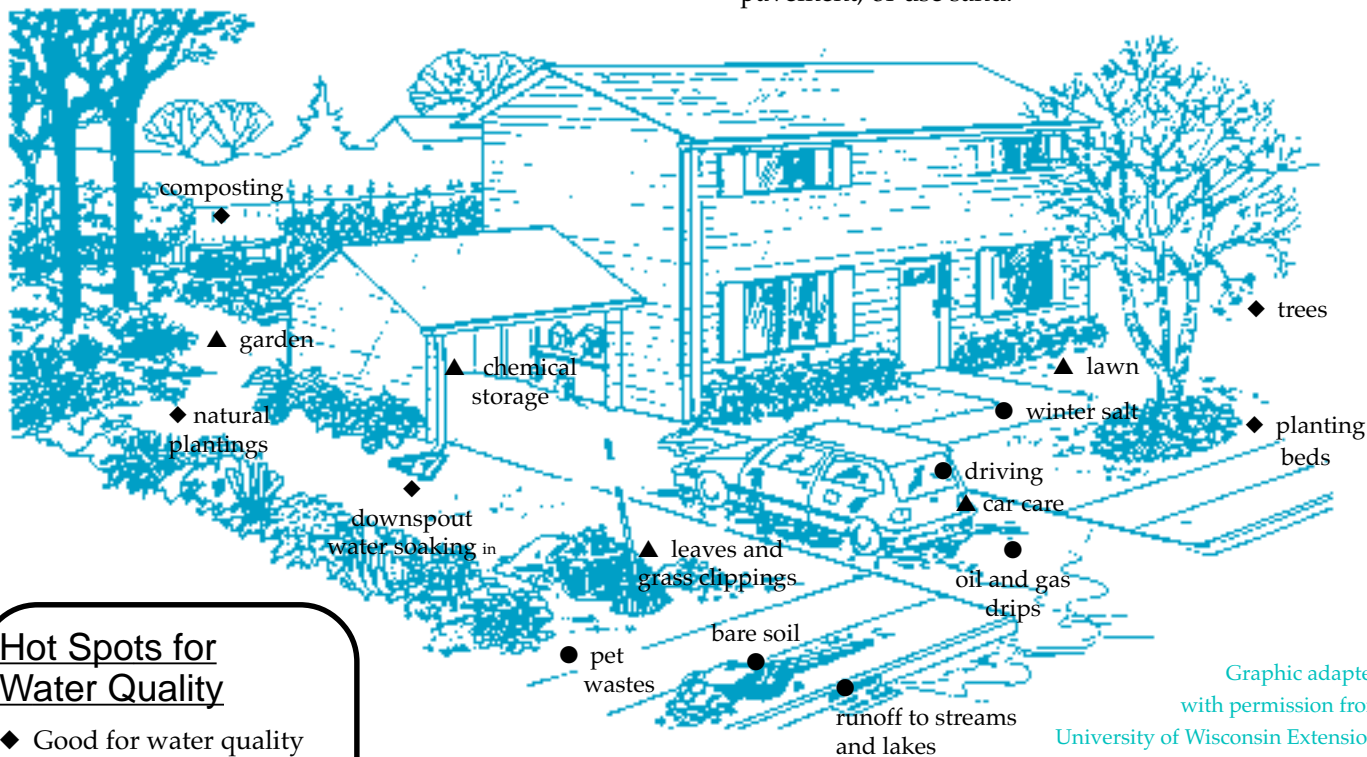
## How Development Affects The Peak of Runoff Flow



# The Solution to Pollution Is in Our Hands

## What ANYONE Can Do to Prevent Pollution

1. Mow often enough so you can leave grass clippings on the lawn as a natural fertilizer. Use clippings as mulch. Compost clippings and leaves that would otherwise "fertilize" local waters.
2. Keep fallen leaves out of gutters or ditches. Use leaves as mulch or compost.
3. Plant an extra tree. Plant wild flowers and grasses, thickets, or other natural landscapes that can catch rain and snowmelt. Let leaves, twigs, and other yard "wastes" decay on the ground as in the forest or prairie.
4. Dig up no more earth than necessary for any project. Seed bare soil and cover with mulch immediately to reduce erosion. Preserve existing vegetation.
5. Point roof downspouts away from foundations and driveways to the yard where water can soak into the ground. Use a rain barrel.
6. Use yard chemicals carefully and sparingly. Follow label directions. Use pesticides and weed killers as last resort after weeding, rotation, etc.
7. In general, use toxic or hazardous products only when you can't do without. Keep them away from storm sewers, lakes and streams. Call county waste management to learn how to dispose of unwanted hazardous products.
8. Collect oil and engine coolant for recycling. Seal well and take to gas stations.
9. Wash cars on the lawn. Soapy water in the street runs to the nearest storm sewer.
10. Keep cars tuned and in good condition. Check for engine drips. Walk, bike, or take the bus.
11. Along the water's edge, grow a "buffer" of dense, natural vegetation to filter pollutants and stabilize the shoreline.
12. Store fuels and chemicals carefully. Check often for leaks. Clean up spills right away.
13. Clean up pet wastes immediately to keep bacteria and nutrients out of lakes and streams.
14. Use salt sparingly in winter. Chip ice off pavement, or use sand.



Graphic adapted with permission from University of Wisconsin Extension. Illustration by Carol Watkins.

### Hot Spots for Water Quality

- ◆ Good for water quality
- Bad for water quality
- ▲ Could be good or bad, depending on your actions

# 2. How to Do Pollution Prevention Projects

## SIX KEYS TO SUCCESS

### Organization

Watershed protection is a complex, long term proposition. This guide aims to ease the process of implementing projects by offering step-by-step tips, checklists, and handouts. Expert help is necessary, *and* readily available.

### Partnerships

Because everyone in the watershed must be informed and involved to prevent pollution, water quality agencies are eager to work with you. See references throughout this guide, and page 36 on forming partnerships. The inside back cover lists agencies that operate statewide.

### Service-Learning

Through service-learning, students gain and apply knowledge, skills, and experience as they meet real community and environmental needs. Academic curriculum that includes service-learning becomes relevant (and fun!) as students apply what they have learned in real-world contexts. The Minnesota Graduation Standards (see box on page 6) and new national science standards call for such opportunities.

Research shows that well-run service-learning programs can strengthen social skills, self-worth, citizenship, workplace-readiness, pro-social behaviors, and academic learning.

Well-run programs include:

- Adequate **preparation**,
- **Meaningful service** that meets a real need, and
- Structured opportunities for **reflection** on service experiences.

### Youth Empowerment

Young people want to contribute. In the process, they gain skills in investigation, problem-solving, communication, and working with adults. As one teacher put it: "Quality is required. This is not a drill."

Not every adult is comfortable tossing the reins to students. Time can be limiting factor. Involve students in leadership as much as possible. Add responsibilities as they – and you – gain skill and confidence. Field Reconnaissance (pages 25-32) and "Give Water a Hand" (see inside front cover) offer key strategies for youth empowerment.

### Community Involvement

Educators cannot do it alone. Older students, senior citizens, agency staff and board members, lake associations, hunters groups, college students, Lions and other civic groups – and of course, parents, can provide invaluable on-site supervision and planning help. Community educators offer extensive skill and contacts.

### Start Small; Build on Success

Make sure your first project is doable.



Put waste in  
it's place



## PROJECT STEPS

Following are basic steps for any project. Each of the detailed project descriptions generally include them. Steps may occur in an order other than the one given. In any case, begin to get students out in the community early so that projects become real for them.

1. Research your watershed.
2. Identify the problem or exploration you want to work on. "Pollution Prevention Project Examples," on the opposite page, offer one way to think of possible issues.
3. Develop partnerships to explore the issue.
4. Investigate key questions about the issue.
5. Organize and take action.
6. Compile and analyze your results and the process you used. What worked well? What should have been done differently?
7. Report your results. What did you discover? Who might want to know? What type of report is appropriate for class or youth group goals? (See the "Public Education" section, pages 8-11.)
8. What comes next? Celebrate accomplishment. Plan for future follow-up.

## PROJECT STRUCTURE

Schools and organizations have included projects in a variety of forms:

- Action team through youth group or community organization
- Interdisciplinary teaching team
- Extracurricular club
- Integration into life science, earth science, biology, chemistry, civics, community service, or other academic course
- Onetime all-grade or all-school project (such as on Earth Day)
- Older students working with younger students
- Summer school, and summer camps and academies
- Environmental learning centers

### **Minnesota Graduation Standards**

Pollution prevention projects can help students achieve the high standards of the Profile of Learning:

- Service-learning projects can be Performance Package tasks. For example, as part of a task to meet the Middle Level Standard, "Write and speak effectively in the English language," a student might write an article on threats to the lakes in her watershed, and submit it for publication in the local media. Environmental service-learning projects apply to *all* standards, not just Environmental Studies or Community Service. Examples of Performance Packages that apply to this type of project include:
  - Expert Interview - Intermediate Level: Students collect information from community meetings, then develop service projects to address an identified need.
  - Exploring Environmental Topics - High School Level: Students conduct scientifically rigorous investigation of an environmental topic, and develop an appropriate action in response.
  - Analyze Water Resource System - High School Level
- Through pollution prevention projects students can also gain skills to prepare them to meet the high standards. For example, students can learn to develop and pursue effective research questions while investigating causes of sedimentation.

# Pollution-Prevention Project Examples

## Public Education

- Windom Elementary School in Minneapolis and Highland Elementary School in Edina studied the history of Minnehaha Creek and produced public theater performances.
- At Southdale Mall, Hopkins North Junior High students used an EnviroScape® Model to show where pollution comes from and tell



how to prevent it. At the spring art and music festival, students displayed maps, artwork, displays, and buttons about water and pollution prevention.

- Roseville High School students

helped Central Elementary School map its watershed and assess water quality needs. Together they put pollution-prevention information on grocery bags.

## Cleanups

- Hundreds of Hopkins Jr. High School eighth graders cleaned up stretches of Minnehaha Creek. They also noted water quality practices.

## Storm Drain Stenciling

- YMCA Service Treks stenciled storm drains around Lake Calhoun in Minneapolis. They created and delivered fliers to homeowners explaining the stencils.
- Retired Senior Volunteers and Roseville Middle School students stenciled storm drains together.

## Soil Testing

- 4th and 5th grade Summer Math and Science Academy students at Pinewood Elementary School in Mounds View tested soil for phosphorus, then informed homeowners that adding phosphorus in fertilizers was unnecessary.

## Water Quality Monitoring

- Students at Minnewashta Elementary School compared samples from different types of wetlands. They created models, games, fliers, and displays about wetlands, and organized a community fair to explain what they had learned.

## Habitat Restoration & Erosion Prevention

- Field and Windom Elementary Schools in Minneapolis, with the Minneapolis Park Board, planted wildflowers to stabilize erosion on Minnehaha Creek.
- Northside Christian School students planted trees and shrubs on the creek bank, adding to a stabilization project by the Rice Creek Watershed District.
- Orono Middle School 7th graders cleaned up and planted wild flowers around a retention pond built by the Minnehaha Creek Watershed District to protect Long Lake.

## Reconnaissance

- 4th - 5th grade Mounds View Summer Math and Science Academy reported results of field reconnaissance to environmental agencies. Students also tested soil and water quality, and stenciled storm drains.
- Forest Lake Alternative Learning Center students did a reconnaissance of Clear Lake. With lake homeowners, they organized cleanups and planned to reduce erosion at a popular fishing spot.

# Public Education

An important part of most water quality service projects is telling how to prevent pollution through best management practices. (See page 4.) A broad consensus of political and scientific opinion supports these practices. Indeed, due to the very nature of nonpoint source pollution, public education is an essential strategy to protect every watershed. In order to reduce pollution, people must become informed and involved.

## ACTION STEPS

Circumstances may set the order in which you do these steps. For example, if you already know your audience and method (such as presenting a skit for senior citizens), you may need to go back to identify the most relevant need and message for this group.

### 1. Identify a need

**Ask local watershed management agencies** what management practices they most want to inform the public about. For example, students in Minneapolis learned from the Minnehaha Creek Watershed District and the city that leaves and grass clippings in the streets – thus in storm drains – pose a great threat to water quality in the Chain of Lakes.



**Student research may uncover a problem** that can be addressed through public education.

### *When is advocacy appropriate?*

Youth may want to speak out on public policy issues such as a proposed road or a new law. Before taking on an advocacy project, consider:

- Have students researched issues thoroughly?
- When there are differences of opinion or competing scientific explanations, have students examined the range of perspectives in a thorough and balanced way?
- Have students explored different perspectives (including social and economic) and formed their own opinions?
- Have students thought creatively and critically about the issues?

The agencies listed inside the back cover offer many excellent fliers, posters, videos, etc. Or investigate the SEEK Web site, also given there. The handout on page 4 identifies basic actions that apply across most of the state. For example, Mounds View students sampled area soil samples and found that most yards had enough phosphorus without application of it in lawn fertilizers. Excess phosphorus feeds algae outbreaks in lakes and streams.

### 2. Target an audience

**Narrow target audience** to a manageable size, by...

- **Geography:** What is your watershed? Does a problem affect part of the watershed or neighborhood, for example, one side of a lake, or a specific town?
- **Behavior:** What is the impact on water quality of a specific group, such as automobile drivers, homeowners, hikers, or even students who snack outside during recess?
- **Demographics:** Do youth have access to a particular audience, such as senior citizens or primary school students? How does this group impact water quality?

### 3. Define the message

#### Identify the purpose of your project:

- What is the main point of your message?
- What do you want the audience to know – or to *do*?
- Why is it important?
- How will you know you have accomplished your goals?

#### Decide how best to speak to the target audience:

- What most interests them? What will their attention?
- Where do they get their information?
- How might they react to this message?
- What might worry or upset the audience? What might calm those fears?
- What arguments or evidence is most likely to convince them? Whom will they believe?

### 4. Choose a method of communication

Based on answers to the questions above, and upon available resources (including time), choose a means to communicate *your* message to *your* audience.

**For each of these nine methods, it is essential to use the guidelines on page 11 under “Ensure Quality.”**

#### A. Make and distribute fliers or posters.

Note: For all distribution methods, an adult must stay in sight of students at all times.

- Deliver fliers door-to-door:
  - Students must pair up.
  - Rubber band fliers to door handles; do not put in mail boxes; do not go into houses.
- Hand out fliers at events:
  - Get permission from event organizers.
  - Put up a banner, posters, balloons, or a display to attract attention.
  - Always be polite.
  - Engage passersby with a question, such as, “What do you think is the greatest source of pollution in our area?”
  - Practice a short speech.
  - Brainstorm questions people might ask. Role play responses.
  - Practice how students should handle people who act rudely or inappropriately. (i.e. Say nothing. Walk away. Go straight to supervising adult.)

#### Put up posters in area businesses:

- Make a list of prospective businesses and organizations. Ask the local business association to endorse your effort.
- Write a brief letter of introduction. Say who you are; list your goals; explain exactly what you are asking for, e.g. to display posters until a given date.
- At each business, ask for the owner or manager. Give a short prepared speech.

Give him or her your letter and a poster.

- Bring thumb tacks, scotch tape, and masking tape. Ask if you may put up poster

or leave it for them to put up.

- Send thank-you notes to each place that puts up a poster.



#### B. Write articles for local weekly newspapers or magazines.

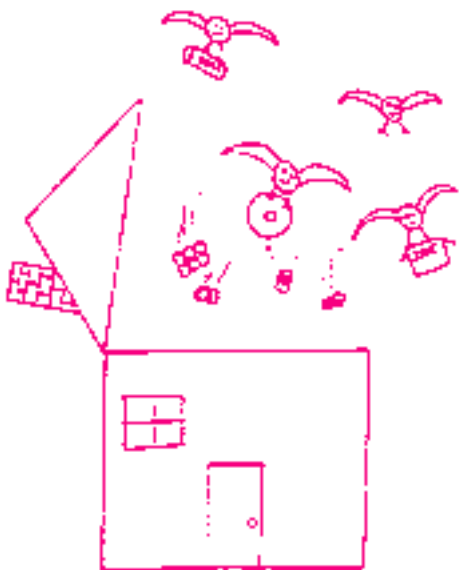
- Ask the school district communications person for suggestions or help.
- Make a list of weekly newspapers or magazines. Look under “newspapers” in the Yellow Pages. Check the library for magazines. Browse the World Wide Web.
- Read a copy of the publication to get a feel for what they look for.
- Call or e-mail potential publications to ask for written guidelines for submissions. These include deadlines, length, format, style, and possible subjects of articles.
- Call the editor to ask if a story idea interests him or her. Offer to illustrate with photographs or drawings.
- When submitting an article, follow guidelines *exactly*. A short cover letter may be o.k.

**C. Present lessons - to peers, elementary school classes, or after school clubs.**

- Contact teachers to discuss what concepts, skills, or information related to water quality fit their curriculum. Work out how many lessons will be presented and how long each will be.
- Students may develop their own lessons, or use pre-existing ones appropriate to the audience. Ask a nature center or museum for activity examples. ("Project WET" and "Aquatic Wild" both require training. Contact Minnesota DNR. See inside back cover.)  
Or contact:
  - "Give Water a Hand" (See inside front cover.)
  - Pauline Langsdorf, Twin Cities Metropolitan Council (Call (612) 602-1805.)
- Practice presentations/lessons. Time practices. Get feedback and revise.

**D. Decorate grocery bags, then return to store for distribution.**

- Contact area grocers to find out if they will put out decorated bags. Discuss how many bags you will need. Arrange for pick-ups.
- Paint or draw directly on each bag. Potatoes make an inexpensive if crude printing plate. Dip in tempera or ink. Wood, linoleum, etc. require technical skill.
- Make fliers to put inside bags.



**TAKE A HINT**  
DUE TO THEIR MIGHT RETURN THE UNCLE TOM'S

Artwork by Peggy Schnack

**E. Stencil storm drains.** (See pages 15-16.)

**F. Write and produce skits or videos.**

- Brainstorm stories ideas that would communicate your message.
- Divide into committees by task:
  - Scripting: writes story; makes list of scenes to be shot (video)/ sets stage directions – who stands where on stage (skits)
  - Equipment: gets equipment/ props, takes responsibility for their care; shoots video; makes scenery, sets it up and takes it down
  - Editing: edits raw video footage into final product (video)
  - Booking: lines up sites to put on skit; lines up public access cable or other video showings
  - Publicity: puts up posters, submits notices to calendars such as newspaper, makes announcements at school, etc.
  - Production: decides production schedule for committees; makes sure each committee is on schedule; solves problems as they come up

**G. Create a display or booth.**

- Design and build display.
- Brainstorm list of display sites: schools, libraries, store fronts, nature centers, shopping malls, houses of worship, agencies, museums, fairs, conferences, or festivals.
- Decide when you want your display in the community. Revise your dates when you have sites confirmed. Make a project calendar.
- Contact sites by phone and letter. Explain your purpose and how long you hope your display or booth will be up. List sites on a calendar.
- Create sign-up list for students to staff booth. Practice a short speech to draw passersby to the booth. Offer "freebie" pencils, bookmarks, or candy.
- Send thank-you notes to all who agree to host display or booth.

#### H. Organize a presentation to watershed district, city council, etc. or community forum

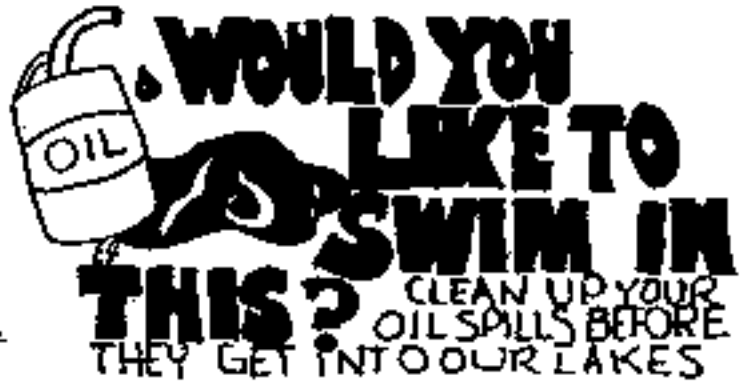
- Identify the public body responsible for policies related to students' concern.
- Establish a contact with someone who can explain procedures and help with scheduling.
- Decide whether to hold a forum at your school or organization or to get on the agenda of a regular meeting of the body.
- Think about inviting the media. Send notices to the media two weeks in advance. Follow up with a phone call.
- Practice your presentation.
- Students must dress appropriately and act with respect.
- Follow up to find out what was done to address students' concerns.
- Send thank you notes.

#### I. Organize a water festival for the community.

Work with an existing science or arts festival.

- Organize a planning committee. Pick a site and date.
- Brainstorm themes, including a catchy slogan and logo.
- Design a flier explaining the theme, and telling what people can do to prevent pollution.
- Make buttons, posters, or "freebies" to give out.
- Be creative with refreshments, such as spring water or little fish crackers.
- Offer music, skits, story tellers, dancers, or other entertainment.
- Create interactive displays, booths, or games, such as: types of wetlands; native plants, fish, and animals; watershed maps; stream table; garbage sculpture from cleanups; watershed district or city water quality projects.
- Send announcements to local media, including school district newsletters.

An excellent resource is the Groundwater Foundation guide to a Children's Groundwater Festival, PO Box 22558, Lincoln, NE 68542-2558 (402) 434-2740 434-2742 fax.



### 5. Ensure quality

Standards of quality for student products will help ensure that their message gets across as they intend. Students might compare information in their drafts with agency literature. (Also see handout on page 4 of this guide.) Students may also wish to ask agencies, parents, or peers to review drafts.

Quality products must be...

- **Accurate:** Information and recommended actions are based on reliable sources, and are appropriate to address identified problems. Identify sources of information in footnotes.
- **Clear:** Give specific details and examples. Materials or presentations identify actions the targeted audience could realistically take. Text is short and to the point. Illustrations tell a story or add valuable ideas and information. Designs are uncluttered. Main points stand out.
- **Attractive:** Products feature a "hook" that draws attention to the message. (A "hook" could be a picture, slogan, sound, etc. that works well in the medium used.) They show creative use of materials or design, and are neatly done.
- **Respectful:** Content and style are appropriate to the audience. Clearly identify your group and any partner groups.

Incorporate a service project as a task to demonstrate learning within a Performance Package of the Minnesota Graduation Standards. (See page 6.)

# Cleanups

Clean-ups do more than make a place look good. They protect aquatic life, curb pollution, and prevent the spread of disease. People treat trash-free areas with greater respect and care.

Building ownership is the key to a successful clean-up. Young people will tackle clean-ups with enthusiasm and creativity *if* they feel ownership for the place or for the process. So involve them in every step of planning. Make trash the subject of in-depth inquiry on the concerns of youth. Research history of the site. Investigate the sources of trash in order to figure out how to prevent pollution in the future. Tie the clean-up to a public education effort.

## ACTION STEPS

### 1. Pick a site; ask for permission

Choose a place that needs a clean-up. It need not be next to water to prevent water pollution. Local resource agencies can help identify sites that need clean-ups, including dump sites. (See inside back cover.) Consider how much time you have to offer.

- ❑ Ask the land owner (public or private) for permission to clean-up the area. The city or county could help you figure out who owns it.
- ❑ Discuss access and likely sites to pile trash for pick-up.
- ❑ Confirm your school or organization's liability insurance coverage. (Check with your insurance agent. You may be able to add off-school/organization sites under a liability insurance rider. If so, you may need to give dates in advance.)
- ❑ If you want to put up a DNR sign for your group, get permission for that too. (See "Adopt-a-River" below.)



Artwork by Katherine Watson

### 2. Scout and map site

Take a notebook, pens, map, measuring tape, and colored plastic flags to mark hazards.

- ❑ Break into teams of four to six.
- ❑ Identify where trash is. Note concentrations or dump sites.
- ❑ Note hazards such as busy roads, steep embankments, deep water, or poison ivy.
- ❑ Note tires, car batteries, full "mystery" barrels, animal carcasses, and any other hazardous materials.
- ❑ Draw a map of the site, marking trash, hazards, pick-up sites, rest rooms, etc.
- ❑ Divide the map into work zones, one per team. Give each team a copy of the map with their zone highlighted.

### 3. Arrange for pick-up of materials

- Ask the city, county or other sponsors to haul trash away (or pay for a hauler).
- Discuss which materials will be recycled. Decide how to tag them for the hauler. Agree on who will receive income (if any) from recycled materials.
- Arrange with county waste management officials to pick up hazardous materials. For dead animals or medical wastes, contact local health or animal control officials. Adopt-a-River may help pay for tire disposal. Get an application in advance.

### 4. Get equipment

Agency partners or local businesses may give or loan equipment. "Adopt-a-River" can provide some items. (See box.)

- Garbage bags (at least one per pair of youth).
- Cotton work gloves for each person. (Must be clean but not necessarily new.)
- Complete first aid kit(s).
- Send home a "What to wear?" list for students: long shirts and pants, sturdy shoes, work gloves (if possible), hat (for sun), and rain gear
- Drinking water (essential on hot days). Two quarts per person/day; more if pop or Kool-aid.
- Arrange for snacks. A place to wash hands is a must.
- Locate the nearest rest rooms and get permission to use them. Port-a-potties may be necessary.
- Adapt/copy the "Clean-up Instructions" on the following page.
- Camera/video.

### 5. Arrange transportation

- Line up buses or cars. Give each driver directions to site and safety instructions.
- If students will walk to site, arrange for crossing guard teams.
- Collect completed permission slips. (See sample, page 34.)

### 6. Complete clean-up day

- Go over "Clean-up Instructions" (page 14) with group. Stress "Safety first!"
- Break into teams – one adult with each team. Hand out site maps, bags, etc. by team.
- Show where to put trash and recycled materials.
- End on time.

### 7. Reflect and celebrate

- Sort and count materials. (What percentage cans, bottles, paper, plastic, etc.?)
- Record count by bag or item. Photograph trash and workers.
- Award prizes for biggest, ugliest, funniest, weirdest, etc. items.
- Build a trash sculpture.
- Analyze sources of trash. (What evidence is there? What percentage blew in from a road or parking lot; dropped by partyers; washed down storm sewers; dropped by boaters; dumped; etc.?)
- Brainstorm ways to prevent future trash. Build on analysis of sources.
- Look for other pollution sources. (See "Reconnaissance," pages 25-32.)
- Send report to DNR Adopt-a-River.
- Educate others. (See "Public Education," pages 8-11.)

#### Join DNR Adopt-a-River

The Minnesota Department of Natural Resources Adopt-a-River program can certify your group's responsibility for a specific stretch of a stream, river, lake, or wetland. At a minimum, you must agree to clean up your stretch at least once a year for two years. Adopt-a-River will send a packet with detailed, helpful handouts such as, "What to Do About Waste Tires and Spent Batteries." They can provide free cleanup bags and gloves (you pay shipping), a video, grants for tire disposal, and advice. After your clean-up, you may request a certificate of recognition and a riverbank sign indentifying your group. Contact Paul Nordell, DNR Building, 500 Lafayette Rd., St. Paul, MN 55155-4052 (612) 297-8291 or (800) 766-6000 toll free (612) 297-5475 fax .

# Clean-Up Instructions

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## 1) SAFETY FIRST!

- Cross streets only with help from the crossing guard or an adult.
- Always wear gloves.
- Do not climb steep banks.
- Stay out of the water.
- Leave these items alone, and tell an adult:
  - Broken glass
  - Sharp metal or splintered wood
  - Dead animals
  - Needles
  - Barrels, cans, or buckets that are full
  - Spray cans
  - Heavy objects
- Walk around poison ivy. "Leaves of three, let it be!"
- Squat to pick up objects to protect your back. "Bend down, not over."

## 2) Let nature be natural

- Leave natural materials: logs, leaves, branches, sticks, etc. (Painted boards or bags of leaves are another story.)
- Do not dig up big items. Digging adds to erosion.

## 3) Recycle

Sort and set aside:

- Aluminum cans.
- Plastic bottles.
- Unbroken glass.

## 4) Pile it on

- Sort trash and recycled bags into the correct piles.

## 5) Ouch!

If you are hurt tell an adult sponsor right away. Even a small cut can become infected.

### Adults note:

- In emergencies, call 911. Tell the organizers as soon as possible.
- Use the first aid kit.



*Drawing by Elizabeth Johnson*

**Thanks!**

# Storm Drain Stenciling

Few people would be so thoughtless as to pour soap suds or piles of leaves directly into a lake. Yet dumping any pollutant into the street is almost as harmful. Painting storm drain stencils alerts people to be careful because these pipes carry untreated runoff directly to the nearest waterbody.

## ACTION STEPS

### 1. Pick a site and get permission

- ❑ Ask the city department of public works for a map of the storm drain system. This map will clearly show your sub-watershed!
- ❑ Identify the drains you wish to stencil. Six students and one adult can paint three to four stencils per hour (not including travel time).
  - Your city or watershed district (see inside back cover) may want to target certain streets.
  - Avoid busy streets.
  - ❑ Get (written) permission from public works to paint sites. Ask a few weeks in advance. Explain your liability coverage.
  - If they say “no,” ask why. It may pay to appeal.



**KEEP CARS  
TUNED UP**

### 2. Get equipment

Public works, other agency partners or local businesses may give or loan equipment. (See inside back cover.)

**For each team of four to six students and one adult, collect:**

- ❑ Plastic stencil with appropriate message, “Do Not Dump Drains to Lake/River/etc.” Cut out in advance.
- Order from Earthwater Stencils, 4425 140th Ave. SW., Dept. V, Rochester, WA 98579 (360) 956-3774.



- Your Conservation District or city may pay for or have site-specific stencils (e.g. “Drains to Clear Lake”).
  - ❑ White paint Ask public works to state a preference between:
    - Liquid latex paint [not oil-based], sponges/foam brushes/rollers BEWARE spills, drips, and smears (excess paint will seep under stencil).
    - or
    - High quality spray paint (Rustoleum or equivalent). Highway paint lasts longest. One can will do about 20 stencils. BEWARE exposure to fumes. Do not use on windy day.
- Check county household hazardous waste program for used paint.
- ❑ Two or more neon orange traffic cones, three reflective vests, crossing guard flag, three pairs safety glasses, three pairs rubber gloves
  - ❑ Stiff bristled broom, wire brush, two plastic trash bags
  - ❑ Rags, masking tape, lots of newspaper
  - ❑ 5-gallon bucket to carry kit into field

Watch for updates on permanent curb stickers as an alternative to paint and stencils. Call REPNET (800) 522-4343 for ordering info.

### 3. Organize teams

- ❑ Collect completed permission slips. (See sample, page 34.)
- ❑ Tell students to wear old clothes that are white or other visible colors.
- ❑ Recruit one or two adults/high school students for each team.

### 4. Make fliers

Agencies or your city can supply fliers. Youth will learn more, and fliers will get more attention, if students create them. (For details on how to make fliers, see “Public Education,” pages 8-11.) Fliers should:

- ❑ Identify the watershed and sub-watershed. (A sub-watershed is a distinct part of a watershed, such as the area draining to one bay of a lake.)
- ❑ Do reconnaissance of sub-watershed. (See pages 25-32.) Include observations in flier.
- ❑ Explain that runoff in storm sewers flows untreated to creek, lake, etc.
- ❑ List things people can *do* to prevent pollution from going into storm sewers.
- ❑ Identify your group and any partners.
- ❑ Make/copy enough fliers for each house on the block by each stencil.

### 5. Paint

- ❑ Safety first:
  - Wear visible clothes and reflective vests.
  - Cross streets with crossing guard.
  - Secure stenciling site with orange cones.
  - Painters should wear gloves and goggles.
  - A responsible person must watch for traffic and do nothing else.
- ❑ Weather must be above 50° F, dry, and – if spray painting – not windy.
- ❑ Practice painting stencil on a piece of newspaper; it takes a knack to avoid smears.
  - Two hold stencil while one paints.
  - Use too little paint rather than too much. (Sponge beats brush with liquid latex.)
  - Lift stencil carefully to avoid smearing.
  - Spray down wind of people.
- ❑ Follow instructions on paint can.
- ❑ Pick best orientation for stencil:
  - Place stencil down stream from opening. On curb or sidewalk will last longer.
  - If owner does not want you to stencil by their property, move to another site.
  - If needed, mask cars, signs, etc. with tape and newspaper.
  - Don't get paint on parked cars!
- ❑ Paint pavement, not dirt: sweep area, wire-brush stubborn spots.
- ❑ Don't spill paint down storm drain! Clean up site after you are done. (To clean dried stencils, freeze, then peel off paint.)
- ❑ Deliver fliers to houses. (For more on delivering fliers, see page 9.)

### 6. Reflect and celebrate

- ❑ Record on a map and date sites of drains painted.
  - ❑ Calculate area of sub-watershed and area served by drains stenciled. What percentage of watershed is contained in the area? Count number of houses.
  - ❑ Take photographs. Send to newspaper with student-written story.
  - ❑ From area reconnaissance, decide what other projects group could do.

*Wash cars on grass not driveways. So soapy water can't run to the sewer as quickly, and picking up pollutants.*



# Soil Testing

Phosphorus is often the limiting nutrient that controls the growth of algae in lakes. Too much phosphorus, and green, foul-smelling algal blooms can occur. (One pound of phosphorus in a lake can yield 500 pounds of algae.) Grass clippings, leaves, and moderate to high levels of phosphorus in fertilizer are major sources of phosphorus entering local water bodies. Many established lawns do not need additional phosphorus. Youth can help protect water quality by taking soil samples and reporting the results to homeowners. They may also report local soil profiles to the public.

Note that properly applied phosphorus binds to the soil. It becomes a pollutant when carelessly applied onto pavement, through spills, when soil washes away, or when leaves or grass clippings are carried away by runoff.

The University of Minnesota Soil Testing Laboratory tests soil samples for \$7 each and reports the results back. Students can analyze these results and inform the community.



Chop leaves with a power mower. A fine layer of chopped leaves provides nutrients for your lawn. And keeps them out of our cities lakes.

## ACTION STEPS

### 1. Identify study area

- ❑ Identify your watershed or sub-watershed. (See page 2 for methods.)
- ❑ Ask your city, county, conservation district, or watershed district to what degree phosphorus is a problem for waterbodies in your watershed. (See "Directory" inside back cover.) They may monitor water quality in area lakes.

- ❑ Choose sites to sample.
  - School: Select various sites on school property.
  - Student homes: Students collect from their own yards, possibly from neighbors' yards.
  - Random sampling: Take one sample per block throughout an area.
- ❑ Plot sites on a map. Discuss whether to add sites to better represent the overall neighborhood or sub-watershed.
- ❑ Get prior permission to sample any site. A letter explaining the reason for the tests also helps educate the community.

### 2. Order kits

- ❑ Call your county University of Minnesota Extension office (See "Directory.") for soil sampling kits. Allow a week or more for delivery.
- ❑ For more than six kits, call the University of Minnesota Soil Testing Laboratory directly: (612) 625-3101.
- ❑ Each kit includes a Soil Sample Bag and detailed instructions.

### 3. Collect samples

- ❑ Read instructions in the kit.
- ❑ Youth practice proper collection technique. **Accuracy** is extremely important.
- ❑ Make a list of all sample sites. Assign a unique four-digit/letter code to each site.
- ❑ Write code numbers on each bag.
- ❑ Write other identifying information on each bag, including name of collector and site. (You may want to do this step in the field so samples don't get mixed up.)
- ❑ Youth collect samples, bring them to class or group meeting.
  - Each collector needs:
    - Soil Sample Bag, from kit
    - Soil Sample Information Sheet, from kit
  - Each collector needs access to (share if possible):
    - Trowel, spade, sampling tube, or soil auger
    - Bucket in which to mix five separate samplings from each site



#### 4. Submit samples

- ❑ Cross check information on bags and code numbers with list of sites.
- ❑ Complete Soil Sample Information Sheets together in class. Note: Give your school/organization address under, "Firm Submitting Samples," *unless* you want results and bill sent directly to property owners.
- ❑ Submit samples to University of Minnesota Soil Testing Laboratory. (Address is in kit instructions.)
- ❑ Enclose \$7 with each. Possible sources of funding include:
  - City, county, conservation district, or watershed district
  - Lake homeowners association
- ❑ Allow two weeks or more to get results.

#### 5. Analyze and report results

The Soil Testing Laboratory will evaluate the makeup of the soil and give fertilizer recommendation for each site. Depending on students' understanding and capabilities, chart and plot actual phosphorus levels from results.

- ❑ Chart results for all sites. Categorize sites according to amount of phosphorus in soil. (i.e. Low, medium, high, very high.) You may also wish to mark new lawns, since they need more phosphorus than established ones.
- ❑ Assign a color to each category. Color sites on map.

- ❑ Write a report summarizing your findings. Ask questions such as: What percentage of sites are in each category? Do any patterns appear on the map? Can some areas use fertilizer and others not? Can you explain why? What would happen to lawns if property owners stop fertilizing with phosphorus? To lakes? What time of year will this have the greatest impact?
- ❑ Communicate results to property owners and public through articles or fliers. (See "Public Education," pages 8-11.)
- ❑ Submit results to local soil and water conservation district and to city.
- ❑ Tell how to get the free, laminated "Application Guide for Lawn and Garden Products" from the Department of Agriculture and Minnesota Extension Service. Call (612) 296-1161; fax (612) 297-2271; e-mail Rick.Hansen@state.mn.us Univ. of Minnesota Extension has many excellent publications on low impact lawn care.

An alternate project would be to identify, map, and publicize soil types. Choosing plants appropriate to soil type can eliminate pollution problems such as over-fertilizing and watering. Local agencies likely have much of this information already. "Wonders of Wetlands" includes simple tests students can do to determine if soil is clay, sand, loam, etc. Contact Environmental Concerns Inc. (410) 745-9620 or on the Internet [www.wetlands.org/wow.htm](http://www.wetlands.org/wow.htm)

# Water Quality Monitoring (Overview)

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This section provides only a *brief* overview of these topics in order to help the reader choose among the options. Several organizations offer extensive training and resource materials for the various types of monitoring. (See Resources, pages 20-21.)

Regular water quality monitoring informs citizens and agencies about the essential health of a waterbody, allowing for the best possible management and policy. By monitoring local water bodies, youth can serve as “watch dogs” for local units of government

and provide useful information on the health of the water bodies. Monitoring is popular, especially with high school biology and chemistry classes. Still, no one monitors 80,000 of Minnesota’s 92,000 river miles. Very few wetlands are monitored anywhere. The need is high.

## ACTION STEPS

### 1. Choose a Site

Are you interested in monitoring a nearby stream, pond, or wetland? First determine your goals in monitoring, how much money you have, what equipment, how much time you are willing to devote to your project, and what resource organizations are available in your area to help you reach your goals.

Typical goals of monitoring programs include:

- Build awareness,
- Establish a baseline of data, and
- Investigate a suspected problem or impact of a land use on a water body.

A site must be safely and legally accessible.

### 2. Types of Monitoring

There are several activities you can choose for your monitoring program, depending on your goals, your resources, and the time you can devote to the project. Every monitoring—from simple to complex—should include field reconnaissance (see pages 25-32), mapping, examination of aerial photographs or surveys to put results in context. Local agencies can say which tests they already do, and what additional tests interest them.

**Physical indicators** - Elements that describe the physical characteristics of a water body are: water flow or levels, channel conditions, riparian vegetation (what grows next to the water), soil types, and land use. This type of monitoring requires about one day’s training and little equipment.

**Biological indicators** - Bottom-dwelling insects (benthic macroinvertebrates) indicate water quality by their type, variety, and numbers. Certain species cannot tolerate poor conditions. Others thrive there. Collect samples with dip or kick nets, or place structures that insects will colonize. Samples can be sorted and identified using keys on site, or returned to the lab for more intensive analysis. Generally test at least twice a year on the same date, and at the same site and time. This type of monitoring requires at least two days’ of training, covering methods and analysis; equipment is less than \$1,000. Monitoring itself takes one half to one day, depending on the analysis performed.



**Chemical indicators** - The U.S. Clean Water Act and the Minnesota Pollution Control Agency suggest temperature, conductivity, turbidity, dissolved oxygen, nitrogen, phosphorus, and fecal coliform as indicators of whether water meets expectations for human contact and use. Samples should be collected monthly in open water season, and can be sampled easily using kits, or using analysis equipment in a lab. This type of monitoring requires at least two days' training, and up to \$6,000 in equipment (if lab analysis methods are used). Analysis will take about one day to complete.

### 3. Reporting and Quality Control

Minnesota Pollution Control Agency will accept data from students in River Watch program; others are interested in surveys and reports of observations. 7th grade students from Aitkin contribute data that is used by the state in its biennial water quality reports to Congress.

Reliable monitoring requires a substantial commitment. Participants must use forms, training, methods that are documented and can be replicated by others under similar circumstances. Monitoring programs should have a quality assurance program that demonstrates that results are accurate, comparable, and complete.

## WATER QUALITY MONITORING RESOURCES

- Rivers Council of Minnesota is a new statewide network of monitoring groups. Call to connect with technical assistance. Currently developing manuals and more. (Thanks to the Council for help with this section.) Rivers Council of Minnesota, 213 Summit Ave. E., Box 1107, Walker, MN 56484 (218) 547-3675 v. 547-3421 fax email: riversmn@eot.com
- Local Conservation Districts aid monitoring networks in some counties. (See inside back cover.) The Hennepin Conservation District offers a "Go to Key with Pictures for Macroinvertebrate Identification in Minnesota Streams." Contact Hennepin Conservation District, 10801 Wayzata Blvd., Ste. 240, Minnetonka, MN 55305 (612) 544-8572 v. 544-9437 fax email: hed@skypoint.com
- Save Our Streams offers publications, equipment, and training, specializing in biological monitoring and wetlands. Izaak Walton League of America, SOS, 707 Conservation Lane, Gaithersburg, MD 20878-2983 (800) BUG-IWLA email: sos@iwla.org Web: www.iwla.org
- Global Rivers Environmental Education Network offers publications, equipment, and extensive training. The Field Manual for Water Quality Monitoring is outstanding. Chapters on chemical and biological monitoring, data management, case studies, etc. ISBN 0-7872-3730-2. Call for catalogue. GREEN, 206 South Fifth Ave., Suite 150, Ann Arbor, MI 48104 (313) 761-8142 v. 761-4951 fax email: green@green.org Web: www.igc.apc.org/green
- The Terrene Institute catalogue is filled with the best-of-the-field publications, models, posters, etc. Especially recommended for biological monitoring: McCafferty's Aquatic Entomology, published by Jones & Bartlett, ISBN 0-86720-017-0 Terrene Institute, 4 Herbert St., Alexandria, VA 22305 (703) 548-5473 v. 661-1501 fax email: terrene@gnn.com Web: www.terrene.org

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## LAKE MONITORING RESOURCES

- Citizen Lake-Monitoring Program volunteers collect water transparency data throughout the summer using Secchi disks. Contact Jennifer Klang, Monitoring and Assessment Section, Water Quality Division, Minnesota Pollution Control Agency, 520 Lafayette Rd. North, St. Paul, MN 55155-4194 (612) 282-2618 or (800) 657-3864
- Many lakes have a lake property owners association. These organizations can be invaluable resources and allies in water quality protection projects. Contact one of the local offices of the organizations inside the back cover. Or contact your city for local names and phone numbers.



# Habitat Restoration & Erosion Prevention (Overview)

This section provides only a *brief* overview of these topics. You *must* get help and technical information for your site from qualified experts. (See list below.)

If you take on such a project, **you must commit for the long term.**

wild plants and animals, improve water quality – all while creating pleasant green spaces. They often also offer unsurpassed opportunity for students to observe and analyze life in nature.

One of the most powerful long term contributions young people can make toward water quality is to restore native habitat. When carefully planned, such projects can prevent flooding and erosion, support



- **Erosion Prevention** - Look for... undermined embankments or streambanks, construction dirt, washed out gullies, or bare soil. You can stabilize and improve these sites with plantings, other landscaping, retention walls, or structures to slow runoff. For example, youth could plant deep-rooted native plants to stabilize a steep hillside. Or they could fill washouts on hilly trails and divert runoff with buried pipe or logs.
- **Habitat Restoration** - Look for... areas of turf grass or non-native weeds (along highways, for example) that could be restored to native prairie or forest; or substantial low areas (including by lakes or next to streams) that could be restored to native wetlands. Nurturing wild ecosystems offers students powerful learning experiences, but should not be taken on lightly. What makes for desirable landscaping may not be obvious at first glance. For example, native prairies do not display their gorgeous array of wild flowers until they are established. Expert

## ACTION STEPS

(This section is distilled in part from the School Nature Area Project's, "A Step by Step Guide for Creating School Nature Areas." See listing on page 25.)

### 1. Choose Your Focus

We combined several types of projects in this section. Decide which best fits your situation.

help is essential. Restoration projects demand a serious commitment to long term follow-through, including watering, weeding, additional plantings, etc.

- **School Nature Area** - Look for... land (of just about any size) that is accessible for ongoing study, where you might be able to secure long term permission to restore native habitat or to manage existing native habitat.

## 2. Get a Qualified Partner

Secure the support of a qualified biologist, horticulturalist, forester, hydrologist, etc. You will need help to identify existing plants, to plan plantings for soil and other conditions, to get necessary permission, and to demonstrate the best planting methods. See "Habitat Restoration Resources" below and inside back cover.



## 3. Organize a Planning Team

You must have broad support to restore and maintain native habitat. This must include affected landowners. In addition to educators and students, bring together maintenance staff, administrators, city parks and recreation and public works staff, business leaders, volunteers, and any other interested stakeholders. Set a regular meeting time to discuss the steps below.

## 4. Gather and Map Site Information

Get or make a large map to record significant features of your chosen site. Possible sources of basic maps include, the land owner, city or county planning office, highway department, or local builders. The Department of Natural Resources may be able to provide aerial photographs of your site.

On the map, draw and label...

- a. Property lines and neighbors.
- b. Measurements of distance, with appropriate scale.
- c. Slopes, hills, high and low spots. For large areas, you may wish to show topographic relief. For topographic maps, contact the Minnesota Geological Survey. (See inside back cover.)
- d. All buildings, roads, parking lots, and other structures.
- e. Utility lines (buried and overhead). Call Gopher State One Call (800) 252-1166. (Required by law before digging.)
- f. Streams, lakes, ponds, down spouts, and storm sewer openings and outlets. Show direction of flow. (Call city public works for storm sewer maps.)
- g. Sports fields, play areas, bicycle racks, bus waiting, outdoor equipment storage, snow piling, etc.
- h. Soil types. Contact the county Soil and Water Conservation District for a soils map of the area.
  - i. Existing vegetation: gardens, shrubs, flowers, trees, aquatic plants, native and non-native. Identify and label each variety or type of ecosystem or plant.

Make special note of any rare or threatened species.

- j. Paths, animal and human. Indicate the condition of trails.
- k. Animal habitat and homes, both existing and potential.

## 5. Analyze the Information

- a. How can you enhance the biological diversity of the site? What plants or animals are "missing" that were likely there prior to development?
- b. How can you reduce the fragmentation of nearby habitat, creating wildlife corridors?
- c. What plants are native to the area? Native plants are hardier, support Minnesota wildlife, and have natural "checks and balances" to keep them from taking over. Eliminate non-native or "exotic" plants, especially aggressive ones such as buckthorn or purple loosestrife.
- d. Can you nurture any species that are endangered or threatened in your region?

- e. How will you provide access for study and enjoyment of the area while keeping the impact on wildlife and water quality to a minimum? Design and creation of trails requires much care. The organizations below can help you identify guides to trail design.
- f. How will you interpret the site for others? Signage should be durable, age-appropriate, engaging, attractive, and unobtrusive.
- g. How will you create access to food, water, breeding areas, and homes for wildlife?
- h. What is the history of the site? Make a time line of fires, building, farming, or other ways the site was used historically. What is the likely natural succession of plants over the years, past and future?

## HABITAT RESTORATION RESOURCES

- The School Nature Area Project (SNAP) publishes a superb guide to creating school nature areas, “Notes on Benefiting the Biomes.” SNAP also has an excellent video and case studies on many existing school nature areas. SNAP, St. Olaf College, 1520 St. Olaf Ave., Northfield, MN 55057 (507) 646-3599 Web: [www.stolaf.edu/other/snap/index.html](http://www.stolaf.edu/other/snap/index.html)
- The School Forests program of the Department of Natural Resources works with 90 schools, mostly in Northern Minnesota, which manage public lands. Laura Ringold, School Forests, DNR, Box 518, 405 Lakeview Blvd., Coleraine, MN 55722 (218) 245-3981.
- Twin Cities Tree Trust, originally focused on trees, has also helped many schools organize teams to create nature areas. Has worked primarily in the Metro area. 6300 Walker St., St. Louis Park, MN 55416 (612) 920-9326 v. 920-4558 fax
- You may secure the aid of a biologist, horticulturalist, forester, etc. through your city, county, local university, gardening store, extension service, watershed district, or state resource agency, etc. (See inside back cover.)

## 6. Choose Projects

- a. Inventory all plants and animals in the area under consideration. Publish it.
- b. Monitor water quality. Analyze the impact of your efforts.
- c. Stabilize bare soils, gullies, or sagging slopes. Consider how you will hold them in place until root systems develop. Always use erosion control measures around construction.
- d. Establish buffer zones of native vegetation around wetlands, streams, and lakes.
- e. Plant native trees, shrubs, aquatic plants, and grasses – as appropriate to the site.
- f. Eliminate non-native “exotic” species such as buckthorn.
- g. Build dikes to create or restore ponds or wetlands. Upstream from lakes or wetlands, create ponds where pollutants can settle out.
- h. Use fertilizers, pesticides, and herbicides sparingly and properly.
- i. Create signs, brochures, tours, videos, web pages... to interpret the site to others.
- j. Build the necessary trails, bridges, board walks, observation blinds and platforms to allow access.
- k. Organize necessary maintenance, including watering, weeding, burns, mowing, etc.

## 7. Plan the Details

Habitat restoration involves many small projects over time. Good management is essential. Rely on the planning team.

- Budget. Include donated “in-kind” labor and equipment as well as cash.
- Funding. Property owners or agencies may be willing to cost share. Also contact agencies listed inside back cover.
- Safety. Analyze all likely risks. Develop plans to head off or respond to each. Make sure everyone knows these procedures.
- Materials and equipment. Quality will pay off in the long run. Borrow tools to avoid costs and storage. Volunteers and agencies are likely sources. The resources listed below suggest several suppliers of native plants.
- Maintenance. Lack of watering and worse – careless mowing – are the bane of habitat restoration projects. Work closely with maintenance staff in advance.
- Evaluation. Monitor implementation of the plan, and revise as necessary.

# 3. How to Do Field Reconnaissance

*Why is there pollution? What effect does it have? What is the quality of water of local streams, lakes, and wetlands? What pollution sources are important in our area? What is being done about it, and by whom? What can WE do about pollution? and when projects are completed, How effective have our efforts been? What else could we do?*

Inquiry into such questions enriches learning in any service project. One method to deepen exploration is a field reconnaissance of local waterbodies, explained on the following pages. Reconnaissance simply means going to look around and report back. Water quality monitoring can deepen this type of field study. (See pages 19-21.)

An alternative approach, "Give Water a Hand," offers checklists for students to conduct audits of practices affecting water quality in homes, school, farms, and community. It also helps students learn the skills necessary to research, plan, work with experts, problem-solve, and evaluate their own projects. (See listing inside front cover.)

The resource agencies listed in this booklet also stand ready to assist in-depth inquiry by students.

## ACTION STEPS

### 1. Organize teams

- Identify the area(s) teams will investigate. Ask city, county, or watershed agencies about their priorities.
- Divide questions by area or by type.
- Go over "Instructions," page 26, together.
- Each team needs:
  - Copy of the relevant parts of the checklist,
  - Maps (e.g. storm sewer map, street map, and site map to record observations),
  - Clip board, pens, (also sketch pads, cameras...).
- Explain safety procedures for field study.
- Get permission prior to go on private (and some public) property.

### 2. Practice questions

- You may choose to answer just a few. Ask, "How you can answer these questions? Do you need experts or background information? What you will do with the data collected in the field?"
- Ask, "How will you know you have done a good job?" As a group, go over items "A" and "B" from the "Reconnaissance Rubric," pages 32-33 to discuss how best to record field observations, including what should be included. If possible, look at professional reports of this kind.
- Discuss how you will prioritize issues. Youth may find it easier to rank priorities after they have completed the rest of their worksheets. What input have you received from agencies that may guide prioritizing?

### 3. Record observations

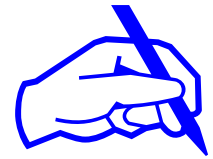
Accuracy is essential. Include lots of details. (See "Reconnaissance Rubric," items "A" and "B.")

### 4. Analyze your findings

- Share between teams. How did it go? What did you find?
- If youth did not do so in the field, rank priorities on worksheets. Share teams' rankings. Discuss why they ranked items as they did. (See "Reconnaissance Rubric," item "C.")
- What recommendations can you make to watershed agencies? Did you discover projects you want to do? How will you follow up? What resources will you need?

### 5. Prepare your report

Add maps, drawings, photos, graphs, etc. to make your report clear and interesting. Review "Reconnaissance Rubric," items "D" and "E." How well does the draft report meet these quality standards? Submit a copy to the watershed agency, and ask for feedback.



# Water Quality Reconnaissance Checklists

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## INSTRUCTIONS

An important way citizens can help ensure the quality of streams, lakes, and wetlands is to go out and look around, recording and reporting observations. Cities, counties, and natural resource agencies across the state seek this type of information.

### Safety First

- Teams stay together.
- Cross streets only with crossing guard and/or proper supervision.
- Stay out of street.
- Stay away from deep water.

### How to Record Quality Observations

How will you know you have done a good job with field observations? Review the "Reconnaissance Rubric," pages 32-33, items "A" and "B." It shows the range of quality from "expert" to "novice." What does it say goes into a quality job? How will you make your observations detailed, consistent, and accurate?

How will you report your data? Who will you report to? What are they interested to know?

### How to Rank Priorities

Complete all your field observations before checking a priority box for each question.

Review the "Reconnaissance Rubric," item "C." How will you make sure your rankings are well-reasoned and well-supported?

Guidelines for ranking:

- A. If a practice will **ADD TO PHOSPHORUS LOADING**, rank it **HIGH**. Phosphorus loading is a key threat to water quality in area lakes and wetlands. Phosphorus is often the limiting factor in a waterbody determining the amount of algae growth. (Other key factors, such as sunlight, we can not control.)
- B. If you can **SEE A POLLUTANT GOING DIRECTLY** into the waterbody, rank it **HIGH**. Pollutants (soil, leaves, grass clippings, chemicals, oil...) that go directly into the waterbody – including storm drains – **where** there are no buffers between the pollution source and the waterbody significantly impact water quality.
- C. If a **RELIABLE SOURCE** tells you a practice is an important problem, rank it **HIGH**. Experts may disagree, but if a person with significant, relevant training or experience identifies a problem, the question merits further research at least.

Rank as **LOW PRIORITIES** things that are being taken care of or will not impact water quality. For example, see item #5, opposite page, "Are gutters free of sand, salt, dirt, or trash?" Rank as a **LOW** priority if gutters are clean, or as a **MEDIUM** priority if they are dirty but you learn that a street sweeping is scheduled in a week.

# Storm Sewers

Call the city public works department to ask for a map of the storm sewer system. Using the map and a regular city street map, walk the area to answer the following.



1) Do storm sewers empty into buffer ponds or wetlands that allow pollutants to settle out before water flows into lakes?  
 What we found. ....

? Need more info. What we need more info. about ..  
 ....

✓ Priority:  low  med.  high

2) Does rainwater flow from parking lots into grass areas or other buffers before flowing into gutters and storm drains?  
 What we found. ....

? Need more info. What we need more info. about ..

✓ Priority:  low  med.  high

3) Are grass clippings and other plant waste materials swept up from paved areas and composted/ bagged so they do not wash into storm drains?  
 What we found. ....

? Need more info. What we need more info. about ..

✓ Priority:  low  med.  high

4) What proportion of pet wastes are picked up and disposed of immediately?  
 What we found. ....

? Need more info. What we need more info. about ..

✓ Priority:  low  med.  high

5) Are gutters free of sand, salt, dirt, or trash? How often are streets swept?  
 What we found. ....

? Need more info. What we need more info. about ..

✓ Priority:  low  med.  high

# Storm Sewers (continued...)

6) Is runoff to storm sewers free of chemicals (e.g. pesticides, fertilizers, oil, paint, waste dumps)? Do property owners test their soil to see what fertilizers are really needed?  
What we found. ....  
.....

? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high

7) Is soil from construction sites kept from washing into storm sewers? Are building sites following erosion prevention ordinances?  
What we found. ....  
.....

? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high

8) Your question... What do you want to know? How can you find answers? Who could help answer such a question?  
What we found. ....  
.....

? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high

9) Your question... What do you want to know? How can you find answers? Who could help answer such a question?  
What we found. ....  
.....

? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high

# Lakes



- 10) Do storm sewers flow into the lake?  yes  no  
 (If they do, see "STORM SEWERS" checklist.)  
 What we found. ....  
 .....  
 ? Need more info. What we need more info. about ..  
 .....  
 ✓ Priority:  low  med.  high

- 11) What proportion of homeowners leave a buffer strip  
 of long grass, shrubs (e.g. willows, dogwood), or trees at lake's edge? (The ideal is 20-30 feet of buffer,  
 but anything is better than nothing.)  
 What we found. ....  
 .....  
 ? Need more info. What we need more info. about .....  
 ✓ Priority:  low  med.  high

- 12) What proportion of homeowners allow aquatic vegetation (e.g. cat tails, lilies, rushes) to grow in the  
 water at lake's edge?  
 What we found. ....  
 .....  
 ? Need more info. What we need more info. about .....  
 ✓ Priority:  low  med.  high

- 13) Are foot/bicycle trails well-maintained to prevent erosion and runoff, especially on hills? Do  
 pedestrians and bicyclists stay on approved trails?  
 What we found. ....  
 .....  
 ? Need more info. What we need more info. about .....  
 ✓ Priority:  low  med.  high

- 14) Is there a lake homeowners association working to protect water quality? What projects are they  
 working on?  
 What we found. ....  
 .....  
 ? Need more info. What we need more info. about .....  
 ✓ Priority:  low  med.  high

- 15) Is the lake's edge free of trash? If not, what is the source? (e.g. illegal dumping, windblown, tossed  
 from cars, spillage around dumpsters, parties)  
 What we found. ....  
 .....  
 ? Need more info. What we need more info. about .....  
 ✓ Priority:  low  med.  high

# Wetlands

- 16) Do storm sewers flow into the wetland?  yes  no (If they do, see questions on "STORM SEWERS" checklist.)  
What we found. ....  
.....  
 ? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high
- 17) Is the area surrounding the wetland free of sources of soil erosion? If there is erosion, what causes it?  
What we found. ....  
.....  
 ? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high
- 18) What is the diversity of plant species?  
What we found. ....  
.....  
 ? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high
- 19) Do trees or shrubs provide a shading over story? Shade cools water, allowing a wider variety of animals, large and small, to survive there.  
What we found. ....  
.....  
.....  
 ? Need more info. What we need more info. about .....  
✓ Priority:  low  med.  high
- 20) Is the wetland free of exotic plant species (e.g. loose strife)? What species are present?  
What we found. ....  
.....  
.....  
 ? Need more info. What we need more info. about .....

# Streams

21) Do storm sewers flow into the stream in this section?

yes  no (If "yes," see questions on "STORM SEWERS" checklist.)

What we found.....  
 .....  
 .....  
 .....  
 .....



? Need more info. What we need more info. about.....

✓ Priority:  low  med.  high

22) Are stream banks stable and free of erosion? Does the stream undercut the banks? Does anything block flow? Do side ditches or storm sewers cut ravines in the banks?

What we found.....  
 .....

? Need more info. What we need more info. about.....

✓ Priority:  low  med.  high

23) Do trees or shrubs hold the banks firmly in place? Shade plants cool water, allowing a wider variety of animals, large and small, to survive there.

What we found.....  
 .....

? Need more info. What we need more info. about.....

✓ Priority:  low  med.  high

24) Is the bank free of trash? If not, what is the source? (e.g. illegal dumping, wind-blown, tossed from cars, spillage around dumpsters, parties)?

What we found.....  
 .....

? Need more info. What we need more info. about.....

✓ Priority:  low  med.  high

25) Your question... What do you want to know? How can you find answers? Who could help answer such a question?

What we found.....  
 .....

? Need more info. What we need more info. about.....

✓ Priority:  low  med.  high

# Water Quality Reconnaissance Rubric

	Expert	Proficient	Emerging	Novice
A. Observations Are Detailed and Consistent	4. Describes many observed practices with many specific and relevant details.	3. Describes a few observations with a few details for each. Descriptions relate generally to each question.	2. Describes a couple of observations. Provides few details. Some descriptions are incomplete or confusing.	1. Describes one or no observations. Gives no details, or details are not relevant.
B. Record of Observations Is Accurate	4. Describes all observations precisely and with no errors. May use evidence from multiple sources to corroborate observations.	3. Describes observations with a high degree of precision and with no errors.	2. Describes observations with few or no errors. Some descriptions may be vague.	1. Descriptions contain obvious errors, or are incomprehensibly vague.
C. Ranking of Priorities Is Well-Reasoned and Well-Supported	4. Reasons for rankings are thorough, relevant and logical. Accurately cites experts and/or concrete evidence for each conclusion. Evidence is clearly relevant and supports conclusions.	3. Explains reasons for rankings. Accurately cites experts or evidence for conclusions. Relevance of some evidence is not immediately clear.	2. Reasons for rankings are unclear or inconsistent. Though accurate, some evidence is not relevant or does not support reasons for rankings.	1. Gives no rankings, gives no reasons for rankings, or evidence obviously contradicts rankings.

# Water Quality Reconnaissance Rubric (continued)

	Expert	Proficient	Emerging	Novice
D. Report Is Well-Organized	<p>4. Sections appear in logical and effective order. Each section makes a clear, logical transition into the next. The report includes a brief summary. Thoroughly explains findings and recommendations. Report includes complete citations of evidence and experts. Materials are neat and attractively formatted. Maps, pictures, and diagrams directly enhance related text. Text is grammatical and free of misspellings or typos.</p>	<p>3. Sections appear in an understandable order. The report includes a summary and citations of evidence and/or experts. Materials are orderly. Maps, pictures, and diagrams may be effective on their own, but are not mentioned in text. Text is grammatical and free of misspellings or typos.</p>	<p>2. Text is understandable, yet lacks a clear and effective order. Lacks summary or citations of evidence. Maps, pictures, and diagrams have nothing to do with accompanying text. Text may contain some grammatical, spelling, or typing errors.</p>	<p>1. Text is not broken into sections. Text is ungrammatical, with misspellings and typos. Elements are missing. Materials are messy. There may be no accompanying graphics.</p>
E. Presentation Is Clear and Effective	<p>4. The main findings and recommendations are clearly stated. The presentation follows a logical order. Attractive audiovisuals provide detail and/or explain specific points. Answers to questions are respectful, thorough, and to the point. Speakers are consistently loud and easy to understand. Clothes and grooming are appropriate to the audience.</p>	<p>3. The presentation states recommendations and important findings. It has a clear beginning and ending. Audiovisuals enhance the presentation. Answers to questions are respectful and complete. Speakers are understandable most of the time. Clothes and grooming are appropriate.</p>	<p>2. The presentation makes a point, but may wander some, or be incomplete and therefore not clear or correct. Audiovisuals may not relate to the rest of the presentation or are not explained. Answers to questions are polite but confusing or incomplete. Speakers sometimes mumble. Clothing and grooming are appropriate.</p>	<p>1. The presentation wanders with no apparent purpose. Audiovisuals are poorly made, or there are none. Does not answer questions or is not respectful of questioners. Speakers are hard to understand. Clothing and grooming are inappropriate to the audience.</p>

# Student Permission Form

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## *What is a Watershed?*

The watershed is the entire area from which rain and snowmelt drains into a lake, stream, or river. Everything carried by this run-off – leaves, grass clippings, fertilizers, soil, or trash – can end up in the water, especially in urban areas where storm drains carry run-off untreated to waterbodies.

## *What will we be doing?*

This year, we will learn about our community and its natural resources as we organize water quality protection projects.

The Watershed Youth Stewardship Project involves thousands of students statewide in projects to protect Minnesota's lakes and streams. Youth learn to research resources and needs. They do service-learning projects such as plantings to control erosion and stenciling "Dump No Waste – Drains to Lake" next to storm drains.

Thank you. Please call for more information. Phone \_\_\_\_\_.

\_\_\_\_\_  
*teacher/project leader*

\_\_\_\_\_  
*title*

\_\_\_\_\_  
*date*

I agree to have my child participate in this project:

\_\_\_\_\_  
*signature*

\_\_\_\_\_  
*child's name*

\_\_\_\_\_  
*parent/guardian name*

\_\_\_\_\_  
*date*

I want to help with service-learning projects.

# Certificate of Recognition

*I*n recognition of a significant contribution through the

\_\_\_\_\_

service-learning project to protect water quality by preventing pollution,

*W*e do hereby declare that

\_\_\_\_\_

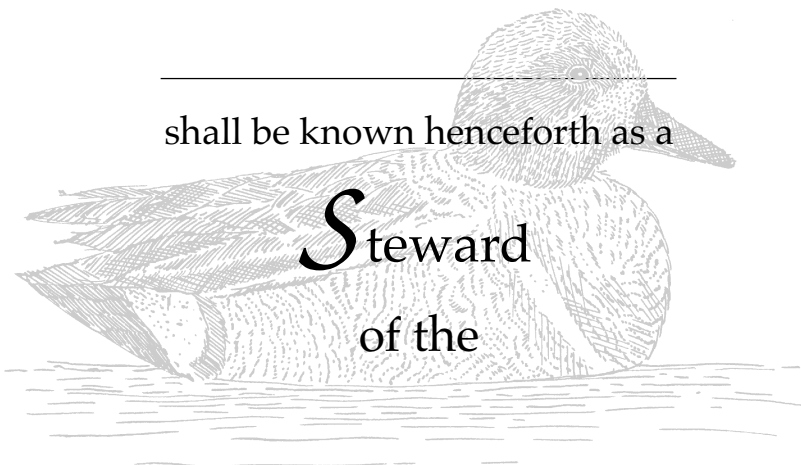
shall be known henceforth as a

*S*teward  
of the

\_\_\_\_\_

*W*atershed.

\_\_\_\_\_



Green-winged teal drawing by Cindie Brunner.

# 5. How to Get Agency Support

## What can agencies offer?

Because Minnesotans value waterways so highly, we have many natural resource organizations to protect them. As part of their missions, these agencies support education. Therefore, most are eager to work with you.

They may be able to provide:

- Opportunities to join ongoing service projects
- Technical assistance with projects (e.g. help design erosion-prevention planting)
- On-site supervision of service projects
- Speakers, field trips, and aid by phone or e-mail
- Materials, videos, curricula, posters, public education fliers, and displays
- Models and activities to demonstrate principles of water quality
- Loan or gift of equipment, from shovels to photospectrometers, from seeds to paint
- Maps and data on water quality, native species, soil types, wetlands, area history, etc.
- Training of teachers, volunteers, and students
- Guidance on student research
- Funding, or information about funding sources

## How do I find partners?

See list of agencies responsible for water quality in Minnesota. Most have county or regional contacts. Call around to find out which agency works most with schools in your area; it varies. State a particular interest up front, such as wild plants, soils, chemical testing, etc.

See additional agencies/organizations under project descriptions in this book.

## Where do we start?

In a first call, introduce yourself and explain how you heard about the agency. Say what ages you work with. Briefly summarize your idea, including what you hope they might help you with. Ask if this fits their programs. If so, propose a meeting. When you meet, be ready to discuss:

- What do you know about the agency?
- What are your goals? What do you expect students will learn from this experience? How will you assess student learning?
- What do you hope to get from the agency?
- What are the agency's goals? What does the agency want students to learn?
- When will project activities take place? (months, days of the week, and times)
- How will students prepare to participate in projects? Who will train them in use of equipment, safety procedures, etc.?
- How will you handle nuts and bolts issues such as transportation, liability, and supervision?
- How often will you and the agency meet/speak by phone? How can the agency reach you? What is your schedule?
- Who are the key stakeholders and decision-makers at your school? How do things happen?

## Water Quality Project Partnership Planning

<u>Objectives</u>	<u>Action Steps</u>	<u>Who?</u>	<u>Deadline</u>

# 6. Resource Directory

Watershed Action Web Site: <http://cgee.hamline.edu/watershed/action>

To identify the local office of these first two agencies, contact the **Board of Soil and Water Resources**, One West Water Street, #200, St. Paul, MN 55107 (651) 296-3767. Also ask for a copy of their directory.

## Watershed Districts or Watershed Management Organizations

are responsible to care for water quality in many of the state's watersheds. In addition to enforcing water quality regulations, they seek to educate the public about best management practices to protect water quality. If your watershed does not have such an agency, the county and/or city will carry this responsibility. (See map on back cover.)

## Soil and Water Conservation Districts

manage and direct conservation programs in every Minnesota county.

**Municipal Governments** - Contact city public works department for maps and other information about storm sewers, drinking water, and waste water treatment. If your city has parks and recreation, environmental services, or planning departments, they may be helpful. See government listings in the phone book.

**County Governments** - Call to find out who at the county is responsible for solid waste management, water quality, and environmental management. See government listings in the phone book.

**Minnesota Dept. of Agriculture**, 90 West Plato Blvd., St. Paul, MN 55107 (651) 297-2200.

**Minnesota Dept. of Natural Resources**, 500 Lafayette Road, St. Paul, MN 55155.

- Financial Assistance Directory lists small grants programs. Call (651) 296-6157 or (800) 766-6000 for Local Grants Unit.

**Minnesota Dept. of Transportation**, Landscape Program, 3485 Hadley Ave. North, #620, Oakdale, MN 55128 (651) 284-3758.

**Minnesota Extension Service** operates in every county. Call (612) 624-2116 to identify your local contact. Or look in the phone book under University of Minnesota Extension Service.

**Minnesota Geological Survey**, 2642 University Ave., St. Paul, MN 55114 (612) 627-4782.

**Minnesota Office of Environmental Assistance** can help access many resources. OEA, 520 Lafayette Rd. N. 2nd Fl., St. Paul, MN 55155-4100 (651) 296-3417 or (800) 657-3843.

- Minnesota environmental education on the Web - [www.seek.state.mn.us](http://www.seek.state.mn.us)

**Minnesota Pollution Control Agency**, 520 Lafayette Rd. North, St. Paul, MN 55155:

- Information number, and speakers bureau (651) 296-6619
- Hazardous waste disposal (651) 296-6300 or (800) 657-3864.

Twin Cities Metropolitan Council, Environmental Services, 230 E. Fifth St., St. Paul, MN 55101 (651) 602-1805, maintains a library of water quality curricula, videos, interactive displays, posters, and more.