Indiana Watershed Planning Guide

Indiana Department of Environmental Management

Office of Water Quality

Watershed Management Section

Developed with the participation of:

USDA Natural Resources Conservation Service

Indiana Department of Natural Resources

Indiana Association of Soil & Water Conservation Districts

Purdue University

US Environmental Protection Agency

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Project Manager
Susan McLoud, NRCS

Editing, layout, & printing
Phil Seng • Tim Longwell • Steven Barr

D.J. Case & Associates
607 Lincolnway West • Mishawaka, IN 46544
574-258-0100
info@djcase.com

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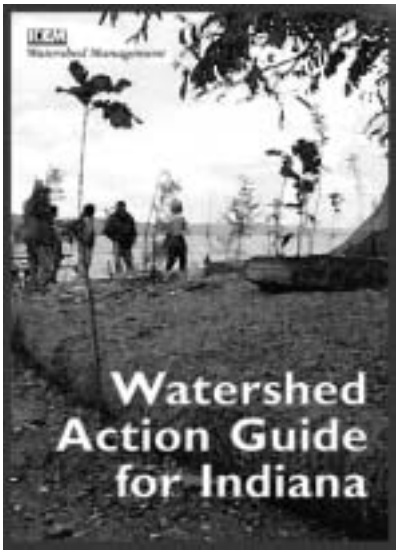
This document replaces the Watershed Action Guide - the "blue book"



For additional copies of this Guide, contact IDEM's Watershed Management Section at 1-800-451-6027 (press 0 and ask for extension 3-1432). Or, write to Indiana Dept. of Environmental Management, Watershed Management Section, P.O. Box 6015, Indianapolis, IN 46206-6015. An interactive version of this Guide is available online at www.in.gov/idem/water/_planbr/wsm.

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Stuff we really want you to pay attention to . . .

1. There's more than one way. Your partnership-building and plan-writing experience probably won't be as orderly as it looks in this Guide. You may complete the steps in different ways or in different order. This is okay. It's not possible to write a one-size-fits-all prescription for watershed planning, and we didn't try.

2. Read the book! This book will do you absolutely no good if you don't open it and read it. The lists of sources and references are starting points - we expect you to add more. Successful groups do their homework.

3. Think small. The smaller the watershed, the better the group can relate to it, and the faster it will react to change. If you are dealing with a large watershed (more than 10,000 acres or so), identify critical areas or priority sub-watersheds to tackle rather than trying to address everything everywhere.

4. Include everyone. Leaving people out creates time bombs. Bring all interests to the table in the beginning. If, along the way, you discover stakeholders who are not represented, bring them in as soon as you can.

5. Find leaders. There are leaders in every community. They're made, not born. Good leaders help the group reach consensus, encourage new ideas, promote open communication, listen patiently and with open minds, and make sure everybody has a chance to talk. They also make sure there's coffee.

6. Teach each other. Everyone is an expert at something. Farmers can teach homeowners about fertilizer. Bankers can help the group develop a budget.

7. Always ask why. This is the easiest way to discover the concern behind an opponent's position, the cause of an environmental problem, or the reason for poor attendance at meetings. If you don't ask, you won't find out.

8. Share your success. Tell each other, the community, your sponsors, everybody. You are doing something important! You deserve the attention, and it can help lead to even greater success.

9. Strive for consensus. Don't ask "Do you like this?" Instead, ask "Can you live with this?" Consensus does not have to mean total agreement, but does need total support.

10. Embrace conflict. Don't dance around it. Conflict = energy. Properly harnessed, conflict can spur new ideas, bring new people into the partnership, and wake up the group.

11. Bite your tongue. Be patient. The watershed didn't get where it is yesterday, and you won't fix it tomorrow. Be nice to each other. You may need that loud guy on your side in a discussion next month, and if he's committed enough to be at every meeting, he deserves your respectful attention.

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Introduction

Ask a watershed group whether they've developed a watershed plan. If they have, they'll proudly pull it out to show you. If they have not, here's what you might hear:

"We can't seem to get started."

"It's not anyone's job, and anyway nobody has the time."

"We have a plan...it's in our heads... well, in somebody's head."

"We're too busy fixing the watershed!"

Why is it important to write a watershed plan???

Watersheds serve as logical landscape units for environmental management, being easily defined (see What's a Watershed?). Approaching nonpoint source pollution problems in a watershed framework helps communities evaluate and prioritize problems affecting ground and surface waters. Watershed planning connects the community's decision-making to sensible data collection and defensible analysis. Recording those decisions in a watershed plan increases the probability that the problems will be addressed.

Here are the top 10 reasons for developing a watershed plan:

#10— To be able to use grant funds to leverage existing programs

#9— To provide the partners with a tangible success story

#8— To make it easier to obtain grant funds

#7— To empower the local community to create change

#6— To enable the community to get additional agency support

#5— To provide a way to track progress with measurable results

#4— To help the project grow bigger and last longer

#3— To inform the community, and market the project to new partners

#2— To record the group's decisions

And the...

#1— reason to write a watershed plan is: To improve the quality of life for people in the watershed by helping ensure clean water and healthy natural resources!

When is a group of people ready to write a plan?

When the group works together with mutual respect and trust;
When all major interests in the watershed are represented;
When the group can make and support their own decisions.

What's the purpose of the Watershed Planning Guide?

- To assist local groups in developing successful watershed plans
- To establish a common approach for watershed planning throughout Indiana
- To help you answer the four great watershed planning questions:
  Where are we now?
  Where do we want to be?
  How are we going to get there?
  How will we know when we've arrived?

What's in the Guide?

The Guide is intended to steer you, the reader, through the process of developing a watershed plan. Lots of similar documents exist; in fact nearly every state has some version. However, this Guide is written for people in Indiana by people in Indiana. It applies to the kinds of plans you can expect to be involved in with the participation of agencies which provide funding in Indiana.

- You'll find step-by-step instructions for each planning phase. Each chapter addresses a different phase. Specific plan components are listed at the end of each chapter. Planning steps are discussed in chronological order, and this is also the order in which the plan elements are usually written.
- In the first Chapter there's information on why watershed groups succeed or fail and how to avoid common pitfalls, to get you started on the right foot.
- At the end of the Guide there's an extensive Resources section, with additional information to help you through your planning journey.
- What you will **not** find here are detailed technical instructions on monitoring, modeling, mapping, or specific implementation measures. So many excellent handbooks and websites already exist on technical topics that we felt it made more sense to point you to the best of them than to recreate them. (Besides, if we included all that you couldn't lift this thing.)

What's the best way to use this Guide?

How much you rely on this Guide depends on your role in the planning process. Here are some ways to use it:

Watershed coordinators: You will probably write sections of the actual watershed plan, and bear responsibility for gathering most of the information and organizing it. Use this guide chapter-by-chapter to tell you what information your plan needs to contain, how to gather it, and what you and the group should do next. There are Internet addresses throughout, and in the Resources section in the back, to help you with planning specifics.

Steering committee members: You will be making decisions that are recorded in the plan. Use this Guide to familiarize yourself with the general content of watershed plans, to see what's coming next, and to help you with goal-setting and analyzing data. This Guide will also help you understand the work that's to be done by others, such as the watershed coordinator and committee members.

Stakeholders: Cruise through this Guide and read the parts that interest you. As the watershed project unfolds, use the Guide as a reference to help you see where you fit in the process, and what you can contribute.

Agency staff: The Guide is a how-to document, and also identifies the contributions that can best be made by agency staff. Use this to become familiar with the project and the local steering committee's needs, so you will know what kinds of assistance they may expect from you.

Absolute Basics: Words

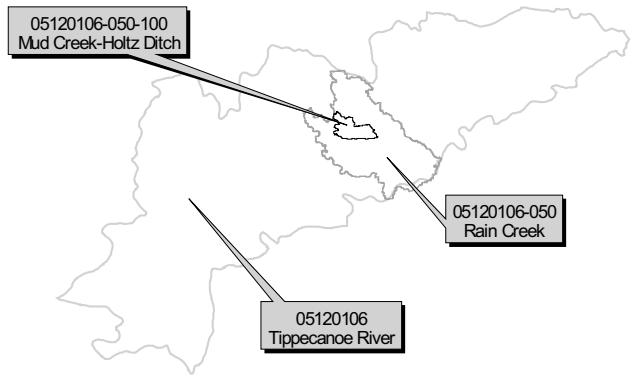
Before we can even have a conversation about watershed planning, there are a few definitions to get out of the way. It's easy to throw around words like watershed and nonpoint source and even planning without realizing that everyone doesn't hear the same thing when you say them. So, here's what we mean by these terms.

Watershed: A watershed is all of the landscape that drains to a specific point. Depending on the scale of the discussion, you could refer to the watershed of the Mississippi River, or the watershed of a farm pond. You may hear terms like 'river basin' or 'drainage' used interchangeably with 'watershed'.

Hydrologic Unit, or "HUC": Hydrologic unit codes were developed by the US Geological Survey (USGS) in cooperation with the US Water Resource Council and the USDA Natural Resources Conservation Service (NRCS). Most federal and state agencies use this coding system. HUCs are a way of cataloguing portions of the

landscape according to their drainage. Landscape units are nested within each other and described as successively smaller units. The hydrologic code attached to a specific watershed is unique, enabling different agencies to have common terms of reference and agree on the boundaries of the watershed. These commonly understood boundaries foster understanding of how landscapes function, where water quality problems should be addressed, and who needs to be involved in the planning process. **Example:** A fourteen-digit hydrologic unit code

Nested Hydrologic Units



might be 05120106-050-100. Each number or group of numbers in the code represents a specific landscape area. *The bigger the HUC number is, the smaller the watershed is.*

The entire country has been mapped to the eight-digit hydrologic unit code level (about 2,211 watersheds). Indiana is divided into 39 watersheds at this level. For example, all of the land area draining into the upper White River is in one eight-digit HUC. [A map showing Indiana's 8-digit watersheds is included in Appendix G]. In Indiana, these larger watersheds have been divided into 11-digit watersheds and smaller 14-digit watersheds. The map of these watershed boundaries is available from the Natural Resources Conservation Service, Indiana Department of Environmental Management, or US Geological Survey.

It is important to remember that watersheds refer to surface water only. Groundwater, which is the source of much of our drinking water, is influenced by surface water but occurs in underground aquifers, not watersheds. The aquifers of Indiana have been mapped in the *Indiana Groundwater Atlas* (available on the Indiana Geological Survey web site: http://igs.indiana.edu/arcims/index.html). They have also been grouped in common hydrogeologic settings according to their geology, vulnerability, etc. (Maps & CD-ROM distributed by Office of the Indiana State Chemist, or the Indiana Geological Survey). When addressing water quality issues, both ground and surface water should be considered.

For general information on your watershed, visit the US Environmental Protection Agency Internet site called *Surf Your Watershed* at www.epa.gov/surf.

Nonpoint source pollution, or "NPS": Pollution of ground and surface water results from the variety of ways that humans use the land. Unlike pollution from factories and sewage treatment plants ("point sources"), NPS comes from many diffuse widespread sources. Soil particles, fertilizers, animal manure, pesticides, oil, roadsalt, fecal material from failing septic systems, pet waste, and debris from paved areas are transported over the landscape by storm runoff, snow melt, and wind. Eventually entering streams, wetlands and lakes, or penetrating into ground water, these pollutants damage aquatic habitat, harm aquatic life, and reduce the capacity of water resources to be used for drinking water and recreation. Because NPS doesn't come out of a pipe that's easily located, it has to be managed differently than facilities with site-specific permits. That's why so many of the measures directed at controlling NPS are voluntary, and why so many people need to be involved.

Planning: An orderly, logical process by which a diverse group of people can reach defensible decisions based on objective data. Done right, planning prevents jumping from the problem directly to the solution without stopping at reality on the way. In the case of watershed planning, planning also means recording the decisions made by the group, along with enough information that the community at large can understand what the group is doing and why they are doing it.

A Quick Guide to "Alphabet Soup"

- *NRCS: Natural Resources Conservation Service*
- *IDNR: Indiana Department of Natural Resources*
- *USF&W (more commonly referred to as USFWS): United States Fish and Wildlife Service*
- *USFS: United States Forest Service*
- *CES: Cooperative Extension Service*
- *IDEM: Indiana Department of Environmental Management*
- *SWCD: Soil and Water Conservation District*
- *NGO: Non-governmental organization*
- *More information about what these agencies are and do is provided in Appendix C : Agencies and Organizations Directory.*

Building Local Partnerships

The watershed planning process doesn't happen in a vacuum. Although you, as a single individual, may be the world's most exciting technical writer and could sit down and crank out a gorgeous watershed plan all by yourself, it's likely that no one would ever pay it any attention. And if an agency or organization writes a plan for the good of the people, or because they are the ones who "know best". the same thing can happen. In fact it has happened, over and over, which is why so many uneven table legs are propped up with attractive spiral bound watershed plans that never changed a thing.

To have a chance at actually restoring and protecting water quality through planning, all of the major interests in the watershed need to be engaged in the process. Building a functional partnership is both the hardest and most rewarding part of watershed projects. Compared to this, the science stuff is easy!

Why form watershed partnerships?

- Strength in numbers - People have identified water-related needs or problems they cannot address alone, and you can get more done when working in a team.
- Increased resources - By pooling resources, partners can tackle the problem more effectively.
- Diverse expertise - Drawing on expertise and information from a wide range of people who live on the land and know the local community.
- Bring everyone along - Involving all the partners with an interest in the project means it will be more acceptable to the community and easier to keep going.
- Create solutions - Working through issues with a diverse group helps find solutions you might not have thought of.

What makes a watershed partnership successful?

- Broad representation - All interests in the watershed are represented. No one is excluded.
- Local knowledge - Many people are involved that actually live and work in the watershed and know how things work on the local level.
- Effective communication - Communication is the primary tool to resolve conflict and reach agreement. Conflict is reduced when everyone understands the issues and each other's needs and concerns.
- Common vision - A shared community vision builds long-term support. With the public fully involved in planning and decision-making, personal responsibility and commitment are increased.
- Collaborative decision-making - Decisions are usually made by consensus, and every one's needs are heard. By working to address all concerns, groups often come up with creative solutions that are widely accepted. (See Chapter 2 for a discussion of consensus)
- Pooled resources - Practical management of resources is improved by meshing the efforts of several agencies and organizations.
- Coordination - Some person, either hired or volunteer, shoulders the job of coordinating meetings, communications, events, relationships with agencies, and other tasks.

What can make a watershed partnership fail?

- Unresolved conflict - Unwillingness of key group members to work at resolving conflict; refusal of opposing groups to talk or associate (e.g., a lake association vs. the farmers in the watershed).
- Lack of clear purpose - Problems are not clearly defined or are not felt to be critical.
- Vague goals - Goals or time frames are either unrealistic or poorly defined.
- Incomplete group - Key interests or decision-makers are not represented or refuse to participate.
- Unequal partnership - Some interests have a disproportionate amount of power, or not all partners stand to benefit, or members are not being given credit for their contributions.
- Lack of commitment - Financial and time requirements outweigh potential benefits, or some members are not comfortable with the level of commitment required.
- Basic value conflict - One or more partners have irreconcilable differences with no room for negotiation.

Bring everyone to the table

The watershed planning process can derail in a hurry if key stakeholders are not invited to the table, or won't stay at the table after being invited. Who's important? Representatives of any group that you expect to change something, gain something, or lose something as a result of watershed plan implementation.

Full and balanced representation of all interests in the watershed promotes trust. This means that all major interests are represented, but no one interest dominates the group. When large audiences need to be represented, or there is a group of organizations with common interests (such as environmental groups or agricultural commodity groups), you can ask that they identify one or two people to represent them all, in order to keep the steering committee from growing unmanageably large.

If water quality problems in the watershed are not obvious, or if they are poorly understood, it can be difficult to persuade people to commit time and energy to the project. Often a small core group, such as an SWCD board or a single interest group wants to get a project rolling, but recognizes that more folks need to be on board.

How to get people to join the project and stay with it

The best way to get people to come to a steering committee meeting is through personal contact. If each member of the core group of stakeholders would personally invite several more people to come to the next meeting, and pick them up and drive them there if necessary, the steering committee would rapidly grow to a workable size. Written invitations are fine, but no piece of paper will ever substitute for a personal visit.

To identify stakeholders to serve on the steering committee, ask:

- Who could be affected, positively or negatively, by the group's decisions?
- Who are the people that may have to change their behavior, or manage their land differently based on the group's decisions?
- Who could provide technical assistance, develop communication pathways, and act as liaison to local political bodies?

Brainstorm a list of all these people. Identify members of your core group who can contact them personally. One personal message is worth a hundred envelopes in the mail. Develop a recruitment package to leave with them after the meeting. A page or two is enough. Include the following information:

- Mission statement - The vision of the watershed group, if one has been developed at this stage.

- Goals & Objectives - These still may be pretty vague; that's OK. Or, you can state that they are being invited to help identify goals.
- Description of the group - Who's the sponsor; why does the group exist?
- Major Issues - 2 or 3 of the major issues/concerns that brought the group together.
- Major programs & activities - If none have occurred yet, mention a few that are planned or that the group is considering.
- Funding sources - Does the group have a grant? Matching funds or services from project partners? District funds? Is the group empowered to handle money?
- Expectations - What are the Steering Committee Members (or subcommittee members, or project volunteers) committing to?
- Benefits of being on the Steering Committee - What's in it for them? For the community?

Sample recruitment package materials

You can copy and customize electronic copies of these materials from www.in.gov/idem/water/_planbr/wsm.

Example of a Recruitment Cover Letter:

Date
Name
Address

Dear _____:

Our watershed project, Clean Up the Crawdad, is seeking committed, enthusiastic volunteers to serve on our steering committee and subcommittees, and during project activities. We are looking for community residents who are interested in conserving natural resources, improving water quality, and enhancing the recreational uses of Crawdad Lake and Crawdad River.

Clean Up the Crawdad is a locally-led initiative formed to restore and protect water resources in the Crawdad Lake watershed, in order to provide high-quality recreational opportunities for area residents. Members and supporters include the Hushpuppy and Mudflat County SWCDs, county commissioners, county health departments, county highway departments, the state Fish & Game Commission, the Hoosierville Rotary and Grange, agricultural commodity organizations, the Crawdad Lake Association, and Infinite Bass.

Please review the attached information and pass it along to others. If you or someone you know is interested in participating in Clean Up the Crawdad, please contact the Watershed Project Coordinator, Sally Coordinator, at 555-555-1234 for more information.

Sincerely,
William B. Chairperson

Example of a Recruitment Attachment or Brochure:

Come join your neighbors to Clean Up the Crawdad!

We're looking for concerned citizens in the Crawdad River Watershed and surrounding communities to help us protect and restore Crawdad Lake.

Who we are: *Clean Up the Crawdad* (CLUC) is a non-profit, volunteer, umbrella group seeking to involve citizens in and around Crawdad Lake. The Riverbank Resource Conservation & Development board and the Mudflat and Hushpuppy County Soil & Water Conservation Districts are our sponsors.

Our Mission: To protect and restore water quality in Crawdad Lake through coordinated community & agency efforts. We want to have a beautiful, healthy lake in a thriving community!

What we're concerned about:

Algae blooms and weeds in the lake
Unrestricted boating activity
Reduced quality of fishing
Beaches closed due to pollution

DRAFT Goals & Objectives: Develop a watershed management plan to help prioritize and organize future activities. Reduce sediment and nutrient loading to the lake. Manage boating, swimming, and fishing on the lake in a sustainable manner that meets the needs of recreational users.

Planned Activities: Annual lake-shore trash pickup —- community hazardous materials collection day —- canoe trip and barbecue on Crawdad Creek next spring. You'll be informed of these events and other project news in the Cry of the Crawdad, our quarterly newsletter.

Funding: A two-year planning grant from IDEM for $250,000. Funds are being used to employ a watershed coordinator, monitor water quality, map the watershed, and develop a watershed management plan. Additional support for CLUC activities is being sought from corporate sponsors.

What's your commitment?

• **Steering committee members** serve a two-year term. The 15-member steering committee discusses and formulates decisions for the watershed project and reviews the work of the Planning and Assessment committees who are developing the watershed plan. The committee meets on the first Tuesday of each month at Pete's Fish & Ribs in Hoosierville, from 6:30 to 8:30 PM. The public is welcome to attend and provide input to the committee's decisions. More frequent meetings are occasionally required. Training workshops are available. ***We currently need three more steering committee members.***

• **Subcommittee members** work with the committee of their choice (Planning, Assessment, or Outreach) for a year (or more, if they want to). Committees may need to meet frequently during some phases of the project. Only the committee chair is expected to attend the monthly steering committee meeting, although others are welcome to come.

• **Project volunteers** participate in an activity such as stream assessment, trash pickup, or a canoe trip, on the day of the event. The Coordinator will take your contact information and let you know when events are planned.

What's in it for you? As a member of Clean Up the Crawdad, you can: Be a voice for citizens of your community.....Have the satisfaction of helping to restore the lake so everyone can enjoy it.....Be recognized as a community leader.....Learn more about water resource protection and restoration.....Contribute your unique knowledge and skills.....Meet and work with great folks, and have a lot of fun!

Want more information? Call Sally Coordinator at 555-555-1234, or drop into the Hushpuppy or Mudflat County SWCD office any weekday from 8:00 to 4:00. **We need you now!**

To keep committees vital and effective:

Ask these questions regularly as the project progresses:

- Should new groups or individuals be brought into the partnership?
- Are there enough interests represented to make good decisions that the community will support?
- Are the best people present to fill the roles that have been identified?

Encourage participation:

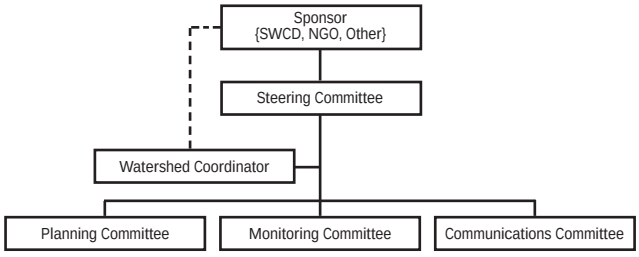
- Establish a clear sense of direction so people know what to expect.
- Give people specific things to do, and support their effort with technical assistance and resources as needed. The group needs to set clear deadlines and identify who is responsible for tasks.
- Appeal to people's sense of stewardship. Show how the problems in the watershed affect residents - in economic and social terms as well as environmental.
- Tell prospective members what will be expected of them and how much time they will be expected to commit.
- Recognize the group and its members publicly so the community knows who is representing them. Use all available media to give the project a presence in the community.
- Hold site visits, stream walks, canoe trips, and driving tours - people need to get outside! Better yet, they need to get in the water!

Prevent burn-out:

- Document and celebrate progress.
- Use rewards and incentives for continued participation - t-shirts, hats, pens, coupons for local restaurants, county road maps... whatever works in your community. A nice shirt is both a reward and an advertisement for the group.
- Do hands-on projects to give members a sense of ownership... tree planting, trash pickups, stream bank plantings.
- Maintain a stable group structure, with accountability by and to members. It is very frustrating to group members when different representatives show up for meetings after a long absence and force the group to spend valuable time bringing them up to speed.
- Identify specific benefits to landowners and participants.
- Keep track of accomplishments and make sure members and the community know about them.
- Start with small projects that will provide early successes. Do something, even if it's just to pile into a van and get to know the watershed.
- Spend enough time together to develop personal relationships in the partnership; this will glue things together when conflicts and obstacles arise.
- Make sure there's plenty of food and coffee, and have some fun!

Partnership Structure

Typically, watershed groups develop a structure that looks something like this:



Sponsor: The Sponsor is usually the body that is administering any grant money or other funding that the group has obtained. It is generally the Sponsor that came up with the idea of having a watershed project to begin with. The Sponsor is responsible for guiding the overall nature of the project but may not be involved in day-to-day operations.

Steering Committee: Since the Sponsor may have other responsibilities, or may not embody all the stakeholders in the project area, a Steering Committee is usually created. (The Steering Committee may also be called an Advisory Group, Taskforce, or whatever you like.) The job of the Steering Committee is to make decisions, to plan, to broadly represent the interests and citizens in the watershed, and to maintain close ties with the sponsor, usually through representation. For example, one or more people from the sponsoring organization can sit on the Steering Committee.

Steering Committees need a Chair, to conduct meetings, lead decision-making, and make sure everything is done fairly.

There also needs to be a Recorder (not the Chair!) who regularly takes minutes at meetings and types them up.

How big? In general, a Steering Committee with an odd number of people, somewhere between 7 and 15, works best, but this is not set in stone. There need to be enough members to be sure that decisions can be made at each meeting. It is helpful for the Steering Committee to have designated members, so that decision making is effective and consistent; however, in most groups the public is welcome to attend and take part in discussions. Determining who is and who is not "on" the Steering Committee is usually wise, because different people may show up at every meeting. It can slow the business of the group if every month sees a re-hash of all previous decisions because someone has not been there for several months.

Sub-committees: The Steering Committee can authorize sub-committees, work groups, or taskforces to carry on its work. While it is important for the sub-committee chair or their designate to sit on the Steering Committee to report on the doings of the group, not all sub-committee members need to be on the Steering Committee or attend its meetings. This allows people with specialized interests to engage in only the activities that they enjoy most. Sub-committees may beongoing, or may last only until their task is completed.

The Watershed Coordinator: If the group has a Coordinator, that person is usually hired or contracted by the Sponsor, but spends most of his or her time working with the Steering Committee and subcommittees. The Coordinator's job is to carry out the wishes of the Steering Committee and the Sponsor. Coordinators should not normally lead or open meetings; nor should they make or participate in the group's decisions. Their primary job is to make sure that all the parties involved in the watershed project know what is going on, and can carry out their responsibilities easily. Coordinators may collect and compile information, take care of the logistics of all activities, distribute newsletters, interact with the media, develop maps, write portions of the watershed plan at the Steering Committee's direction, market the plan to the community, make presentations, and do a lot of the leg work of moving the project forward. Since a Coordinator's job may have a lot of gray areas, frequent and open communication with all participants in the project is extremely important. Frequent networking with other coordinators is also important (and good for morale).

Facilitator: A facilitator is a person who can make a meeting run smoothly, help a group resolve conflict, assist the decision-making process, and guide public meetings. A good facilitator can bring out the best in a group, help meetings stay on track, channel conflict into useful energy, assist a group in developing effective ways to work together, and generally ease the process of partnership formation and decision making. Coordinators are sometimes called on to facilitate, although this can be very tricky; it's best to find someone from outside the group. There are commercially available facilitators; trained facilitators are also available from several federal and state agencies. Contact your local SWCD, or NRCS, IDNR, or IDEM for lists of their personnel who are trained facilitators and will provide this service as their time and other duties permit. Your group may

want to use a facilitator only occasionally, when there are sticky decisions to be made, or for public meetings. Some facilitation duties, such as time keeping and staying on track with the agenda, can be assigned to steering committee members.

Tips for successful Steering Committees:

Leadership: Leadership should emerge from within the group. Leadership roles (Chair, Subcommittee Chairs, etc.) should be filled by citizens from the local community. It is rarely appropriate for a state or federal agency employee to have a leadership role once the partnership is fully developed. Likewise, the Watershed Coordinator is not an appropriate person to lead meetings or make decisions for the group; it would put them into an impossible position. Agency personnel (NRCS, IDNR, USF&W, USFS, CES, IDEM) participate as technical advisors, but do not normally make decisions or "vote".

Ground Rules: Effective committees set ground rules to establish how they will conduct business. Typical ground rules might be:

- Start and end meetings on time.
- Speak one at a time, and do not interrupt each other.
- Everyone has a right to be heard.

Ground rules can also be used to establish meeting dates, specify rotating tasks, and state how the group will make decisions or resolve conflicts. They can be as elaborate or simple as the group wants them to be. The group should develop ground rules themselves, as they are needed.

Information Sources:

- A list of sample ground rules, hints on running a meeting, and other useful partnership-building material can be found in the Resources section.
- Many excellent handbooks and guides are available to assist groups in developing into successful partnerships. Refer to the Resources section in the back of this "Guide" for recommendations.

✔ Planning Checklist - Chapter 1

These are the items you will be able to insert into your plan outline or template after working through the sections in the preceding chapter. The items won't be complete, because you will add information throughout the planning process; but you can get a start on these. You can download a customizable checklist from www.in.gov/idem/water/_planbr/wsm

- ❒ List partners that are developing the actual plan, along with a brief history of how and why they came together and their roles and responsibilities.
- ❒ List the major stakeholder groups represented or engaged in the planning process.
- ❒ Describe the structure of the group that made decisions in the planning process (i.e., Steering Committee, SWCD Board, etc.) Describe supporting sub-committees, and what they accomplished.
- ❒ Information on public meetings, surveys, interviews, or whatever method you used to find out the public's concerns about the watershed; and the results/findings of those investigations.
- ❒ Information on the outreach and education methods used to get the public to participate in the planning.

Thinking Together

Once a group of interested people has decided to work together to develop a watershed plan, they need real work to do... otherwise why have all those meetings? The early work of a group has a lot to do with getting to know and trust each other. In this Chapter, you'll work on airing concerns, starting to construct problem statements to express those concerns, expressing a shared vision and mission, drafting some tentative goals, and generally learning how to work effectively together.

What is your community concerned about?

Airing your concerns, developing a practical, clear vision, and agreeing on measurable goals aren't easy. However, experience shows that groups can't plan successfully unless they plow their way through these steps. When you cut away the jargon, all you are trying to do is answer a fairly simple question: What concerns us about our watershed, and how do we want it to be different?

Concerns

What are the things you want to change? What are you worried about? When people are stirred up enough to attend a public meeting or commit to being a regular member of a group, it is usually because they feel that something is wrong and they want to fix it. They also may be there because they want to prevent their own interests from being compromised. They may be curious, apprehensive, angry, or determined. You can be sure that they have opinions!

Early in the group's formation, it is extremely important to get people's concerns out in the open and onto paper. This is not a time for judgment or criticism. At this stage in the process, all concerns, opinions, worries, reservations, and passionate convictions are created equal. Air these thoughts in a non-threatening forum where people will feel comfortable.

Once all the concerns about natural resources, economic issues, and social issues in the watershed have been expressed, you can go through various exercises to help refine the list and focus on the things that people have in common. If the watershed is large or falls naturally into several different areas, hold meetings in several locations to make sure everyone gets to speak their piece. The core group that is emerging to take the lead in developing a watershed plan should be sure to capture all of these concerns and retain a record of them.

Example:
Clean Up the Crawdad meets to work on their vision and goals. First they list concerns. A recorder writes concerns on flipcharts and tapes them to the wall. They go around the room several times until everyone has said something and no one has anything further to contribute. When side-tracking discussions loom, the facilitator heads the group back on track. There's a list of 32 items on the charts-everything from "I'm afraid to let my kids play in the stream" to "I just bought my house last year and already it dropped in value".

The facilitator asks if some of the concerns can be grouped without losing any important detail. With the agreement of the person offering each concern, he moves the items into clusters. The group might decide to reframe the statements or not.

The facilitator gives everyone 5 sticky paper dots (or 5 post-it notes, or whatever variant is being used) and everyone goes up and "votes" for their most pressing concerns. During a break, the results are tallied and discussed when the meeting resumes. Things are reframed some more, and the end result is a ranked list of concerns, possibly with items similar to these:

- *Fishing has been bad in the last few years.*
- *There might be dangerous pesticides or germs in the lake.*
- *Sediment is making the lake cloudy and choking up the upper end where the creek drains in.*
- *Property values are suffering.*
- *Farmers are under economic stress and farmland is shrinking.*

Positions vs. Concerns

Stress that people should state their needs or interests, not their positions. When someone takes a position, they are 'for' or 'against' something, and likely to be speaking from emotion rather than fact. Position-taking polarizes groups and creates unproductive conflict.

Examples:
Position: "This plan is going to put me out of business!"
Concern: "I'm concerned that this project could result in more regulation."
Position: "Those farmers are poisoning the creeks."
Concern: "I'm worried about whether chemicals in the water could make my children sick."

You can see that the discussion following a concern will be more productive than the discussion (or argument) that follows a position. It's helpful to ask position-takers why they feel the way they do. Keep asking why again and again. Gradually you will get to what the person actually needs, and that can be stated as a concern.

A dairy farmer takes a position about not making him fence his cows out of the creek. He has lots of reasons why it just can't be done, and he'll rally all the farmers against this project if anybody suggests it. Facilitator politely starts to ask why. Farmer: "Because the fences will just wash out anyway," or "Because willows will grow on the banks, and then we'll have floods," or "Because it'll cost too much, " or "Because I won't have any water for my cows." Facilitator rephrases: "You need to be sure that you still have a water source for your cows." It turns out that's the farmer's real, and legitimate, concern. It's added to the list.

Problem statements: picking apart the concerns

What's a problem statement?

A problem statement is a planning tool that helps you bridge the gap from obtaining information to setting concrete goals. Crafting problem statements can clarify your thinking and help a group move forward. A problem statement says:

- What is the problem or issue
- What's believed to cause it
- What the group wants to change
- What information is missing

When do you write problem statements?

They can be used at least twice in the planning process. The group can develop a set of problem statements early, when they have listed their concerns and are trying to formulate a vision and some goals. Later re-visit and probably re-word these draft problem statements after the

watershed inventory and assessment are complete, and the group has better information to work with.

What else do we need to know?

Problem statements are non-judgmental, and promote a clear understanding of the watershed. Note that "problem" does not always mean there is something wrong with the water. The 'problem' may be recognizing a threat to high quality water, acknowledging an economic or social condition, or identifying an area that needs to be protected.

OK— How do we do it?

To create a problem statement, look at each concern on your list. Turn it into a specific, practical, objective, non-emotional statement, which does not contain assumptions. State a cause if you can, but make it clear if there's no data yet to support your supposition by saying "we think" or "it appears". Then decide what the group wants to see change. This will help the group to establish what they want the future condition of the watershed to be.

Example 1:
Concern: Fishing has been bad in the last few years.
Problem statement: The game fish population in Crawdad Lake is declining; we think it's because the fish don't have good breeding habitat.
What you want: A fish population healthy enough to make the lake a good place to fish.
Additional information you need: What is the actual fish population? Is the decline due to lack of breeding habitat, or is it something else? What population would sustain normal fishing pressure?

Example 2:
Concern: Failing septic systems.
Problem statement: The Health Department and residents in the watershed state that many septic systems are not working and pollutants are going into streams. We do not know for sure why this is happening or where these systems are. What you want:

1. To establish the facts concerning septic systems in the watershed.

2. To have all systems functional and non-polluting.
Additional information you need: How many systems are failing? Where are they? Why are they failing? Is pollution entering streams or groundwater?

Notice that there aren't any numbers attached to anything yet. You don't have enough information at this point to be that specific. Can you see how going through this exercise can help the group be more effective in gathering information?

Vision: How do we want things to be in the future?

A group without a vision is similar to a family on vacation without a road map. They may see some neat things and enjoy themselves, but never get where they planned to go... and there could be a lot of conflict about which roads to take!

A vision is a statement about what the future will look like, if all your problems can be solved. Don't make it too long or too fancy, or carve it on stone tablets.

Here are some of the things a vision should do:

- Give meaning to the work that you expect from people.

- Evoke clear and positive mental images of "What it should be like around here."
- Create pride, energy, and a sense of accomplishment.
- Link the project with the results.

Here are some things a vision can be:

- Simple.
- Engaging to the heart and spirit.
- An assertion of what we want to create.
- A living statement that can change and expand.
- A springboard.

Crafting a vision is hard work, since it reaches to the heart of what people believe. Hours have been spent debating the merits of one word against another; that's why a vision should be closer to five words than to fifty! It's important that everyone involved at this stage can live with the vision, even if they don't love the way it turned out.

There are lots of books and websites that can help with the visioning process. It doesn't matter how you go about it as long as the product makes sense at the end. One simple method is to list all the "What you want" statements that the group developed along with each problem statement and string them together, then try to smooth out the language. Using that reasoning, the Crawdad Lake folks could have come up with something like this:

"A clean and healthy Crawdad Lake enjoyed by a thriving community."

They might elaborate on it to encompass the passions of some of the members:

"Our vision of the future: The healthy ecosystem of Crawdad Lake provides recreation for surrounding communities, helping them to maintain a strong economic base and excellent quality of life."

Once a draft vision statement is up on the flipchart, the group can test it by asking:

- Can it be accomplished? Is it doable?
- Has everybody been honest about what they want? Is this vision authentic?
- Is it worth getting excited about? Will people care about it?
- If achieved, will it make this a better place? Do people have something to gain from it?
- Can we put it on a T-shirt? (In other words, is it short, clear, and memorable?)

Every member of the group should be able to remember the vision (another reason to keep it short), and should be able to support it. It is worth the time spent to get to that point, as it will make the rest of your work much easier.

Mission statements

A vision statement expresses how the group wants things to be. A mission statement expresses how the group will do business in order to achieve the vision. If the vision statement is clear, then writing the mission statement should not take long. Some groups bypass this altogether, if their vision and focus are very clear. However, it's worth the time to clarify why this particular group has come together at this time to accomplish this particular work.

Keep in mind that you're not writing vision and mission statements just to have something impressive on the wall. These are working documents that keep the group focused. If they need to change or be made clearer in future, do it... after all, they belong to your group.

To formulate the mission statement, ask:

- Who are we?
- Who or what do we work for?
- What do we offer?

To test the draft statement, ask:

- Is it clear and understandable to all the stakeholders?
- Is it brief and memorable?
- Is it unique to this group?
- Does it reflect the group's core values?

- Is it broad enough to be flexible, without being fuzzy?
- Will it help us make decisions?

Example mission statements:
"The Upper Arkansas Watershed Council, as representatives of interested parties, will foster improved communication, collaboration, education and scientific understanding, and will develop strategies and make recommendations to local communities to conserve, protect and enhance watershed natural resources for the use and enjoyment of present and future generations."

"The Crooked River Partnership will promote stewardship of the Crooked River watershed and its resources to ensure sustainable watershed health, functions, and uses for optimal conservation and economic benefits."

Setting measurable goals: draft phase

So far, the group has defined the problems in the watershed as well as they can with limited information; they've developed a vision and mission; and people are probably itching to go out and do something. But in order to be effective with the actions you take - in order to promote (and achieve) your vision, you need clear and measurable goals. There is an old adage "If you don't know where you're going, any (and every) road will get you there." That is certainly true for watershed management planning. Goals tell you where you are going. The value of clear goals is that they encourage decision-making, motivate people, focus the energy and resources of the group, and make it possible to measure progress. People in the community will want to know what you are going to do; having at least a few concrete goals will help them to understand how you intend to move forward. At this stage, the goals you develop are DRAFT, since the group will be gathering data and information about conditions in the watershed for some time.

The group may choose to simply state some interim goals, such as:

- "Develop an inventory and assessment of the watershed by [date]."
- "Complete and publish a watershed plan by [date]."

On the other hand, the group may feel ready to address some of their perceived concerns by stating some long-term goals.

There is usually some confusion about the difference between missions, goals, objectives, tasks, etc. What you call these components doesn't really matter - different people use different words. What matters is that you go through the process to decide where you want to go and how to get there. Here is a system that works well in most situations:

A **goal** is the purpose toward which effort is directed.

Examples:
Reduce sediment delivery by 10% in three years.
Restore small mouth bass population to fishable levels by [date].
Establish riparian vegetation on 30% of streambanks in 5 years.

An **objective** *is a way of meeting a goal.*

Examples:
Obtain a grant to hire a watershed coordinator.
Implement a cost-share program.
Develop a fish management plan with IDNR Division of Fish & Wildlife.

*A **task** is a specific piece of work assigned to specific people in order to achieve the objectives.*

Examples:
Joe will write a newspaper article each month.
The group will convene a technical advisory committee in March.
Marie will contact all the landowners in two townships by the next meeting.

The important components of goal setting are that the goals agreed upon by the group should be reachable, measurable, and clear. Remember that these are DRAFT goals, since information gathered later in the planning process will certainly lead to additions and modifications.

Goals should:

- State an action (Reduce, restore, establish, educate)
- State the thing to be changed (riparian vegetation, sediment load, number of geese, profit margin, etc.)
- Say how much (10%, to state standard, not to exceed the permitted load, etc.) or what (produce a plan, publish information).
- Say when (in five years, by 2010, prior to adoption of the zoning law, etc.)

What is consensus? Do we need it?

Consensus is a collective opinion arrived at by a group of people working together under conditions that permit open communication and a supportive climate, so that everyone in the group feels they have had their fair chance to influence the decision. When a decision is made by consensus, all members understand the decision and are prepared to support it.

Consensus decision-making is based on the fundamental belief that each person has a piece of the truth. Consensus is the way a group of equals makes decisions. It is built through a web of reciprocal relationships where each individual rules and is ruled by the larger community. "Consensus" means "to give consent."

Consensus decision-making has its limitations. It will not work in every situation, but it can be achieved if these five things are in place:

- A common purpose - all members share a common vision and mission
- A willingness to share power - group members understand and embrace consensus decision-making
- Informed consent - members are willing to go along with a decision, even if they are not totally in favor of it ("I can live with that.")
- A strong agenda - the group is committed to following a structured process
- Effective facilitation - the meetings are kept "on track" and moving forward

The stages of consensus decision making are introduction, discussion, and decision.

Introduction: The introduction of a proposal or course of action focuses only on questions about its content-not on its merits. The introduction establishes the facts.

Discussion: The discussion can start with a clarification of the principles behind the proposal (Why these things are being proposed). Next the group works to resolve any concerns they may have about the proposal. Finally, the facilitator or chairperson should see if it is time to make a decision by testing for consensus. In the consensus process, no votes are taken. As the group arrives at the point of decision, each participant has three options: to **block**, to **stand aside**, or to give **consent**.

- When a participant wishes to **block**, this prevents the decision from going forward for the time being. Blocking is a very serious step and should only be taken when the participant genuinely believes that the pending proposal, if adopted, would violate the morals, ethics or safety of the whole group. When people elect

to block a proposal, ask them to explain their reasons. If possible, the group tries to resolve their concerns. If the person does not remove his or her block, the decision does not move forward: it is dead in the water.

- If there are no blocks or blocks have been resolved, the group is then asked if anyone wishes to **stand aside**. A person stands aside when he or she cannot personally support the proposal, but feels that it would be acceptable for the rest of the group to adopt it. This choice absolves the person from any responsibility for implementing or participating in the decision. The names of those standing aside should be recorded in the minutes. If there are more than a few stand-asides, the group should start over or table the decision, because support for it will be too weak, and may result in loss of members.
- If there are no blocks and not more than one or two stand-asides, the facilitator or chairperson will state "We have **consensus**." To give consent does not necessarily mean that every participant is in total agreement with every aspect of the proposal. It does mean that each person is willing to support the decision and stand in solidarity with the group despite whatever disagreements, if any, they may have. Once consensus decisions are made, they can only be changed by reaching another consensus.

In the real world, consensus means that everybody in the group understands the decision; that everyone has had a chance to say how they feel about it; and that members who still disagree or have doubts nevertheless are willing to say in public that they will give the decision a try, and agree not to sabotage it. Agreeing to do something by consensus does not mean that you love it. It means you can live with it.

If you work toward consensus, people are more likely to commit to the decision. Consensus provides an opportunity for win-win solutions, requires members to listen and understand each other, and helps resolve conflict. The downside is that consensus takes more time than voting, and to be successful, every decision-making member must speak up and participate. Working this way may require you to use an unbiased facilitator, at least while you learn the process and get to trust each other.

Experience has shown that long-term projects are more likely to be successful and have better energy if they operate by consensus. It is worth "going slow now so we can go fast later." You'll learn how to harness the energy of conflict, and how to be open with one another, making it easier to deal with barriers and challenges in the future. Here are some sources for more information on the consensus process:

Selected references on collaborative decision making and natural resource management: www.uwyo.edu/enr/ienr/CDMrefs.html

Real example of consensus-related ground rules for a group: www.ecy.wa.gov/watershed/46pugrndrules.htm

Consensus and group dynamics papers and checklists. www.vernalproject.org/RPapers.shtml#CoopDecMaking

When the people are the problem

It would be naive to think that watershed group members are any more polite, mature, or tolerant than the rest of the population. In any large group, there will be conflict. Open conflict can be managed; sniping, backbiting, and political maneuvering are tougher. As a coordinator, leader, volunteer, or advisor to a watershed group, you may encounter all sorts of less-than-productive behavior. A wise facilitator or leader may be able to defuse some of the effects of conflict, especially if the feuding parties can be brought together to air their differences out loud in a safe setting. Often just getting to know each other better helps to build trust and allows participants to "agree to disagree", instead of being openly hostile to each other.

✔ Planning Checklist - Chapter 2

These are the items you will be able to start inserting into your plan outline or template after working through the sections in Chapter Two. Add to them during the planning process.

- ❒ Describe how concerns were expressed (at meetings, through conversations, in surveys) and list the major concerns.
- ❒ The mission, vision, or purpose statement of the group who developed the plan should be placed so the reader sees it easily.
- ❒ While the format is up to the group, goals need to incorporate the following elements: a problem, pollutant or condition; the present load or nature of that problem, pollutant or condition; the target load or condition; and when the group expects that target to be met. Right now your goals are incomplete.
- ❒ Since discussion of goals can be lengthy, create a table in the text or appendix showing goals; objectives or tasks under each goal; present condition; target condition; target date; and indicator (see chapter 10) to be used for measuring progress. [This is different from an action register, which tells who will carry out tasks (see Chapter 9).]
- ❒ Try to express a clear connection from concerns to problems, causes, sources, goals, targets, and indicators throughout the plan.

Investigation

When you developed problem statements and goals as described in the previous chapter, you probably started to realize how much information you *DON'T* have. This chapter is about filling in those gaps, and building an understanding of how your watershed works, who's doing what, and where everything is. This phase of inventory and assessment will likely take up more time and energy than anything else you do during the first year of your project.

How to investigate a watershed

To find out what the nature and condition of your watershed is today, and analyze any problems or threats you uncover, the group needs to conduct an organized investigation of everything about the project area that could influence your planning decisions. This investigation should include the following steps:

Inventory - this is a collection of information and observations about the watershed, much like a business inventory of assets and liabilities. This can include both existing studies and reports, and the observations and data that the group gathers during the current planning process.

Analysis - after the inventory is completed, you need to analyze what was collected, to assess its scope and accuracy and identify any holes or needs for further information.

Completing Goals - use the results of your inventory and analysis to complete the problem statements and goals that were drafted in Chapter Two.

The remainder of this chapter and the next two chapters describe the inventory process in detail. Chapter Six covers the analysis process, and Chapter Seven helps you use the inventory and analysis to effectively complete your problem statements and goals.

Note: Sometimes the investigation process will show that concerns that were voiced were groundless. For example, a homeowner may worry that the creek his children play in is loaded with pesticides because there are farms in the area. If your investigation finds this is not the case, the concern shouldn't just be dropped. Address it in the plan with an explanation that this legitimate concern was found not to be a problem. In the same way, problems will probably surface that no one voiced as concerns. Address these as well, simply noting that they were not identified until the investigation was completed.

Inventory

A watershed inventory should:

- Provide data that enable a group to make informed resource management decisions.
- Establish benchmark conditions (the current, or existing, condition) that can be used later to determine the effects of installed practices.
- Collect sufficient data and information to analyze and understand the interactions between people and natural resources in the watershed.
- Characterize both land and water resources.

Your inventory does not need to be an exhaustive study. If the information you gather clarifies resource concerns, helps the group understand cause and effect relationships, and gives you confidence in your decisions, then the inventory is sufficient.

Planning an inventory

By now, the group will already have voiced concerns, developed some tentative goals, and probably structured itself into a central decision-making body with some peripheral workgroups or subcommittees.

Before proceeding with an inventory, be sure the group has the answers to these questions:

- What are the community's concerns? What is the "desired future condition"?
- What data are needed to prove or disprove concerns about natural resources, social conditions, and economic trends?
- What do we already know? Before launching into site investigations and monitoring, gather all the studies, reports, and data you can. (Always capitalize on other people's labor!) At a minimum, collect:
  - The current IDEM Water Quality Report (305[b] report); (www.in.gov/idem/water/planbr/wqs/quality/wq305b01.pdf)
  - IDEM Impaired Waters List (303[d] List); (www.in.gov/idem/water/planbr/wqs/303d.html)
  - State designated uses for water bodies in your watershed;
  - IDNR Lake & River Enhancement studies, fisheries reports, etc;
  - IDEM Watershed Restoration Action Strategy for the 8-digit river basin;
  - Riverwatch or other volunteer monitoring data;
  - Monitoring data from water utilities and industries;
  - United States Geological Survey National Water Quality Assessment (NAWQA) reports, if they apply;
  - Any other reports or studies you can find from credible sources.

If the group's concerns, vision, and information needs aren't clear, begin gathering basic inventory information, but also consider going back to Chapter Two for a little more work on those items.

Provide education *for the group when they need it, by bringing in agency technical personnel or other specialists. For example, if no one on the group is a forester, bring in the IDNR District Forester to answer questions about forest resources in the watershed.*

Don't let the data drive the process. *Just because you have information on a topic doesn't mean it's important, and lack of data is no excuse to avoid a concern. Let the concerns, goals, investigation, and the group's growing understanding of the watershed drive your plan. The people who will be working on the inventory should discuss the level of detail and the indicators to be used.*

Level of detail: Should data be sampled from a few key points in the watershed, or should there be total, detailed coverage of the watershed? Think about the type of information you need, and how much work or money will need to be invested. For some issues, it might be well worth it to drive every road in the watershed; for other kinds of information, looking at aerial photos may be sufficient. For example, if only one tributary of a river has development, it would make sense to look carefully for storm drain outlets there. However, such a search might be time wasted in the rest of the watershed. Certainly, you don't want to turn down good info, but concentrate the most effort on what will give you the most return.

Indicators: Indicators are conditions, values and other representations that allow you to assess the condition of the land and water. What are the most useful ones to use? Look to your problem statements and concerns. If "unmanaged growth" is a concern, you could assess it by finding out the

number of building permits, subdivision reviews, or occupancy permits granted in each of the last five years. Be sure to look at indicators that provide information on trends or ongoing conditions. For example, in assessing water quality, chemical measurements of what is in the water are valuable, but are only true for the moment the sample was taken. Therefore, many samples need to be taken over several years in order to get a valid picture of changing water quality. Biological measurements, such as the composition and diversity of macroinvertebrates (small aquatic critters, usually insects but also worms and such) in a stream, can provide more information about the water conditions over time. A single sampling event at key locations may give enough information to compare the health of various streams. Several indicators taken together are usually much better than having only one. You will have to choose what you can afford in terms of money and manpower.

Before conducting water monitoring or intensive land investigation, invite technical assistance staff from appropriate agencies to talk with the group. Consultation at this stage will save you time, money, and aggravation.

How much is enough?

Groups often struggle with deciding how much investigation they need. If the project is funded by a program grant (Section 319 or Lake and River Enhancement), there will be concrete guidelines on what information you need. If the project is not grant-supported, the group needs to decide for itself how far to go. Looking at agency requirements for watershed plans may help.

Be aware of the "endless data loop." It is not possible to ever fully understand *ALL* the processes at work in the watershed. There may be a temptation to continually seek more data before making any decisions. This can go on for years! Rely on visual observation, the input of specialists, the data you can reasonably collect, and the group's judgment.

There is a *Watershed Planning Checklist* in Appendix A. This lists the information you need to include in your plan in order to be considered for future funding from IDEM or IDNR. If you are unsure about documentation, quality control, monitoring parameters, or level of detail, consult the program administrator before you get too deep into your project.

Conducting an inventory: who, what, & how

Who's going to do the work?

Unless your watershed is very small, it's probably not realistic to expect one person to conduct the entire inventory. Even if your project has a full-time coordinator, the task is diverse enough that she/he will have to enlist the help of a subcommittee, several agency personnel, or a multi-disciplinary workgroup formed just for this effort. The Natural Resources Conservation Service, Indiana Department of Natural Resources, Soil & Water Conservation Districts, Cooperative Extension Service, Indiana Department of Environmental Management, and other agencies have specialists who can help with the inventory (see Appendix C for contact information). Group members can recruit volunteers from the organizations they represent. Often, if you put out a call for help, folks who live in the watershed but have no particular connection to the project will be interested in doing windshield surveys, walking streams, or sleuthing out historical information.

The people tapped to work on the inventory can use one or more of the tools listed at the end of this chapter to develop a plan of attack. Since water quality monitoring or bioassessment is time consuming and takes special expertise, it usually makes sense to address the land and water inventories separately, as long as the two groups stay in frequent communication.

In an ideal project where there is plenty of time, the land inventory would be conducted first, and that information would help in selecting water quality monitoring sites, sample parameters, and sample timing.

Regardless of the order, one person should coordinate the overall effort and compile the information in a safe location.

What processes are involved?

Desktop inventory: Much of the material you need is available on the Internet or in libraries. Check the directory at the end of this chapter (and the table in Chapter 4) for websites and phone numbers. The less athletic members of your crew can shine here; or this work can be done when the weather doesn't favor going into the field.

Direct observation: General characteristics of the watershed can be observed by driving or biking the highways and byways, using maps and forms to record what you see. (Best to drive in pairs to help document observations!) This is an exercise that could be done twice, during the growing season and again when the leaves have fallen and crops have been harvested.

Fieldwork: Some resource issues, such as soil erosion on cropland or use of tillage practices, can be addressed with transects or other structured field observation procedures. Some natural resources have very clearly defined inventory methods; an example would be wetland identification. Exact observations on vegetation, soils, and hydrology must be taken, and there are manuals explaining the process. Similar procedures exist for forestry, wildlife habitat, and conservation tillage. Private consulting firms exist to conduct these professional analyses and would appropriately lead fieldwork of this nature. Agency personnel can provide assistance, however, agency staff increasingly do not have time to provide this level of assistance to individual groups. Since access to private land is required, landowner permission should be obtained in writing.

Water quality monitoring: Water resources in streams and lakes can be assessed for biology, chemistry, habitat, riparian condition, sediment load and sediment contamination, hydrologic modification, flow, and other parameters. Consistency and quality control are most important here; otherwise the data will not be defensible. See Chapter Five for more information.

GIS (Geographic Information System): If anyone involved in the project has the capacity to use GIS, by all means use it. While it isn't required for a good plan, being able to store and manipulate information in a GIS is efficient and saves time. You can produce maps and other information products that will help the group reach decisions, and help promote the project in the community. With the addition of a hand-held GPS (Global Positioning System) unit, or even a sharp eye and a good topographic map, you can map the location of sample sites, meeting places, residences, feedlots, pipe outfalls, conservation practices, eroding stream banks, storm sewers, or any other feature you have an interest in.

What is a GIS? *A geographic information system is a computer-based tool for mapping features and events. GIS technology integrates statistical analysis with the unique visual benefits offered by maps. A GIS works by storing information about the world as a collection of thematic layers that can be linked together by geography. For instance, you could develop a GIS for your watershed that had separate layers for land use, water quality, areas of concern, etc. Each bit of information contains either a geographic reference such as latitude and longitude, or an implied reference such as an address, zip code, census tract, or road name. These references allow you to locate features such as cities, and events such as earthquakes, on the earth's surface.*

What can you do with a GIS?

Ask questions! You can ask simple questions like, "Where do the people live and work in my watershed?" or complex analytical questions like, "If we build a new highway here, how will the community be affected?" Two useful tools of a GIS are proximity analysis (How many houses are within 500 feet of this stream and where are they?) and overlay analysis (Show me the soils that coincide with agricultural land use). GIS provides a simple way to compile all your information and present it to the public in an easily digested format that shows the spatial relationships between different components in your watershed.

If your group does not have access to GIS, consider partnering with another group, agency, local government, or university to gain access to this technology.

Modeling: Models allow a peek at future conditions, based on existing conditions. Simple tools such as the RUSLE *(Revised Universal Soil Loss Equation)* can forecast soil loss. (Go to http://topsoil.nserl.purdue.edu/nserlweb/rusle/rusle.htm for more information on RUSLE.) More complex models based on either continuous conditions or storm events can predict sediment delivery, nutrient loads, and pollutant transport. If a Total Maximum Daily Load (TMDL) is being conducted in your watershed (see Chapter Eight), models will be used to predict pollutant loads and transport, and target which parts of the watershed are critical sources. Other models can be used to compare existing conditions with proposed conditions, to develop "what-if" scenarios such as what could happen if land uses change or impervious area increases. Many models are integrated into GIS programs and use spatial data. Agencies, universities, and consultants are usually equipped to run one or more models that could assist you. Be aware that the product of a model is only as good as the quality of the data it was built on, and some models are extremely data-intensive. Modeling is not for the faint of heart.

Commonly used models for watershed planning

RUSLE	Revised Universal Soil Loss Equation	RUSLE is applicable to sheet and rill detachment only. It does not estimate erosion in channels or compute deposition.	Use model online at— www.iwr.msu.edu/rusle/ Take the RUSLE2 tutorial at— http://bioengr.ag.utk.edu/rusle2/
L-THIA	Long-Term Hydrologic Impact Assessment	Analysis tool that provides site-specific estimates of changes in runoff, recharge and nonpoint source pollution resulting from past or proposed land use changes.	Main web site and online use at— www.ecn.purdue.edu/runoff/
WEPP	Water Erosion Prediction	Applies to hillslope erosion processes (sheet and rill erosion), as well as simulation of the hydrologic and erosion processes on small watersheds.	Download model at—- http://topsoil.nserl.purdue.edu/nserlweb/weppmain/wepp.html
SWAT	Soil and Water Assessment Tool	Model computes pollutant loads from subwatersheds. While gathering the data is not too bad, running the model properly is tricky and requires calibration with field data.	Good discussion of choosing & using models—- www.epa.gov/waterscience/basins/b3docs/sec11.pdf

Land Inventory

There are several tools to help you conduct a land inventory. Review them and choose whatever best suits your needs. The purpose of doing a land inventory is to bring together a holistic picture of the watershed, as a dynamic system. This piece of the landscape you've selected for your attention is teeming with life, history, change, and complexity. To understand how it "works" you need to immerse yourself in it.

The majority of concerns that you have about your water resources are probably caused by activities on land. A detailed description of the watershed and what's going on there helps identify potential impacts on water quality and where they are located. To create this description, collect information identifying the watershed boundaries, the location of streams, lakes, residential areas, town limits, county lines, roads, etc. Record all of this information on maps, organized for analysis and comparison with the results of the water quality inventory.

Watershed characteristics and boundaries

Determine the limits of the watershed so you know exactly where you are working and what activities may affect the quality and quantity of your water. This information is usually available through government agencies (see the table of watershed land inventory resources below).

Geology and climate

Develop a description of the watershed, including the geologic history (glaciation, bedrock depth, types of underlying rock). Current geology identifies mining operations, oil or gas drilling, and other activities that cause geological changes. Collect information on the climate, including average annual precipitation, average and extreme (average maximum and minimum) temperatures, and other factors that affect land use potential. This information will help you evaluate different options to address your concerns within the watershed.

Natural history

Describe the native and naturally occurring wildlife. Include the condition of this wildlife (population size, distribution, health, etc.) and its legal status. For example, if a federally listed threatened or endangered animal or plant is located in your watershed, there may be limits to what alternatives you can propose in the watershed management plan. Likewise, if there are problems with aquatic nuisance species, you may be eligible for participation in federal or state programs to address this concern. Note the presence of exotic and invasive species on the land as well.

Describe and map the natural or planted forests, grasslands and prairies, and riparian (stream side) vegetation by type, species, age classes, and distribution. If there are areas with significant problems with exotic or invasive vegetation, these areas should also be identified. In short, collect information on the current state of the natural ecosystems occurring in the watershed. The amount of detail needed will depend on your previously developed problem statements.

Land use

Identify and record the historical, current, and future land use of the area in order to identify what types of human activities have and could affect the water resources in your watershed. Previous uses, such as an abandoned gas station could cause impacts on water resources. Similarly, current land uses such as agricultural production, confined livestock operations, housing developments, or landfills could adversely affect water quality. It is important to collect as much information as possible on these

land uses. Just because a land use has the *potential* to negatively affect water quality does not mean that it *does* affect it.

Potential land use changes will help identify future threats to the watershed. If your watershed is located in an area with the risk of urban sprawl, your management plan will need to address how you will work to protect water quality and overall watershed health in a dynamic landscape.

Information on recreational resources, industrial development, deforestation, reforestation, reclamation, and previous conservation activities help you understand the watershed and the unique situations that need to be considered when developing the management plan.

Soils

Identify the predominant soil types present in the area and the optimal or most suitable land uses for them. Make notes about those soils that are not fit for the current land use. This information is available using the county soil survey.

Topography

Describe the general nature of the land in terms of steep slopes, sinkholes, valleys, flood plains, caves, and other unique land features. Combining information for land use and natural history with the topography information is useful in estimating the risk of stream sedimentation or above-ground pesticide pollution.

Hydrology

Describe the stream systems in the watershed, including alteration of natural waterways through drainage or channelization and presence of dams or reservoirs. Identify and describe drinking water sources, aquifers and their status, and wetlands in the watershed.

Land ownership

The current land ownership in the watershed will have major impacts on the options available for improvements in water quality. Identify large tracts of lands owned by one individual or company, as well as tracts of land in ownership other than "private," including state, federal, parks, and military holdings. Record this information on maps.

Cultural resources

The National Historic Preservation Act of 1966, requires that a cultural resource specialist be consulted about the presence of vulnerable cultural resources in the watershed when public funds are involved in project construction.

The early history of the area and relevant recent history will assist in the decision-making process for the watershed management plan. The IDNR Division of Historic Preservation and Archaeology is one source of this information. For more information on their services, see http://www.in.gov/dnr/historic/pdf/guidetoservices.pdf

Endangered species

Identify threatened and endangered plants and animals that may be in the watershed. If possible, describe what types of habitats they prefer. The IDNR Division of Nature Preserves maintains the state Natural Heritage Database with information on locations of threatened and endangered species and plant communities (http://www.in.gov/dnr/naturepr/).

Tools

The **Watershed Land Inventory List** (see below) is an exhaustive (pun intended) list of inventory data, with sources and directions. It addresses everything except water quality monitoring.

Using the Land Inventory List:

Why a List? Projects often spend a lot of money and energy gathering water quality data, but overlook information about the land in the watershed. Understanding as much as you can about the land and what happens on it will help explain the results of water monitoring. Unless you can know the watershed as a system of interacting stresses and strains, it will be tough to make effective decisions about what to change in order to improve water resources. Remember, too, that most pollutant *sources* are on land, and the inventory will assist you to identify both the sources and the activities associated with them.

Notes on using the List: Gather all the items listed that pertain to your watershed, and you will build a

library that helps your watershed group make solid decisions about water resource restoration and protection. Your investigation of both land and water constitute the whole inventory of the watershed. You can start on this very early in the planning process.

- First, go through the List as a group and identify items that you already have, items you need to collect, and strike out the items not relevant to your watershed.
- For the items that remain (the ones you need), tackle the collection job by assigning people either to specific areas of the watershed (where they will collect everything on the list) or by assigning several people to each category of information, such as forestry or cultural resources.
- Set dates for bringing information back and sharing it with the group.
- The List is not all-inclusive; it contains information that most watershed projects will need, and that is available all over the state. Your group will probably add items that are unique to the local area.

NOTE ON WEB ADDRESSES: We all know that WWW addresses have the life span of a gnat. By the time you get this book in hand, some of the addresses in the list below will already have expired. When you reach a dead end, try shortening the address to reach the home page of the site and proceed from there, or go to your favorite web browser and search on the subject.

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
General geographic information	• National Atlas	• http://nationalatlas.gov/	All sorts of useful facts, from climate to crime rates, at county resolution and above. Printable maps, interactive mapping.	
Geography	• University	• http://www.usra.edu/esse/ford/ESS301/g301www/cornbeltreso.html	Web Resources for Global Geography. Links to climate, history, etc. This address takes you to the section on the Midwestern corn belt. Bring your lunch... you could easily spend the day here.	
Watershed boundaries & area	• USGS • NRCS • IDEM	• http://in.water.usgs.gov • www.in.nrcs.usda.gov • http://www.in.gov/idem/water/planbr/wsm/319main.html	Ask for 14-digit hydrologic area maps. If using the GIS shapefile, the data table will contain the name, HUC code, and area of the watershed.	
Topography	• USGS	• USGS, camping & outdoor stores, map suppliers.	Use topographic maps to determine the watershed boundaries if not using GIS. Record location of landscape features, livestock operations, new development, etc. on topo maps manually as an aid to doing your inventory.	
Satellite imagery	• USGS	• Landsat http://glovis.usgs.gov/	Want to see Indiana from space? This global LANDSAT viewer lets you pick the date and place. Unfortunately can't download from this site.	
Climate	• NOAA • USGS • County & state disaster agencies	• [Purdue Meteorology climate data sets] http://shadow.agry.purdue.edu/sc.index.html • [NOAA main page] http://www.ncdc.noaa.gov/oa/ncdc.html • [Rainfall Frequency Atlas of the Midwest-takes some digging, but if you're a weather buff you'll love it.] http://www.sws.uiuc.edu/pubdoc/B/ISWSB-71.pdf	Is there a history of flooding, severe tornadoes, other disasters? What is the typical rainfall pattern (which could help you understand water quality monitoring data)?	
Karst areas [sinkholes]	• IGS [Indiana Geological Survey]	• http://igs.indiana.edu/ [click on Publications]	Indiana Geological Survey sells, via their website, a bedrock map of Indiana which shows the location of the Mitchell Plain and other features. Soil Surveys also will show the location of soils thinly overlying karst. In the most pronounced karst areas, the sinkholes will be visible on topo maps.	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Cultural Resources	• IDNR Div. Of Historic Preservation • NRCS Cultural Resources Specialist • National Register of Historic Places • Indiana Register of Historic Sites & Structures • Indiana State Museum • County historical societies • Local libraries	• http://www.in.gov/dnr/historic/ • http://www.in.nrcs.usda.gov/PlanningandTechnology/cultural_resources/cultural_resources.html • http://www.cr.nps.gov/nr/ • http://www.historicallandmarks.org/what/register.html • http://www.in.gov/ism/ • http://www.countyhistory.com/	Historical information is used to set the context, the "sense of place", for your watershed plan. Note potentially significant areas of cultural concern: cemeteries, battlefields, CCC (Civilian Conservation Corps) projects, and places of importance in state and local history. Look for information relevant to water quality, such as locations of discontinued animal feeding operations, orchards, or industries operating before environmental regulations. Native American tribal members may be resident in the state (such as the Miami) or may have been relocated to reservations outside of Indiana. IDNR map office in downtown Indianapolis has an inexpensive map showing the locations occupied by various tribes throughout Indiana's history. When was the area settled? Who were the settlers? What was the vegetation before European settlement?	
Area and % of each land use category	• USGS • NASS National Agriculture Statistics	• Land Use/Land Cover (LULC) data mid-'90's http://edc.usgs.gov/products/landcover/lulc.html • http://igs.indiana.edu/arcims/statewide/metadata/Lndcv_USGS_IN.html [1999] • NASS crop data—http://www.nass.usda.gov/research/Cropland/SARS1a.htm	Also use aerial photographs (common version flown in 1998) to digitize present land use or new development, if needed. Calculate area of each land use for proposed or zoned land uses for comparison to present land use. NOTE: most land use data is in grid files; you will need Arcinfo or Arcview 3.x with Spatial Analyst.	
Impervious area	• Center for Watershed Protection • Heinz Center • Purdue L-THIA model • U. Conn NEMO	• http://www.cwp.org/ [Lots of goodies here, spend some time.] • [Heinz Center Report] http://www.heinzctr.org/ecosystems/urban_technotes/urban_ttl_imperv_area.shtml • [L_THIA online allows comparisons of land use impact in a watershed] http://danpatch.ecn.purdue.edu/~sprawl/LTHIA7/ • http://nemo.uconn.edu/index.htm	Impervious area is an indicator of pressure on the aquatic ecosystem, and it is widely held that exceeding 10 - 15% impervious area in a watershed will have negative impact. Calculate impervious area of each sub-watershed and compare to planned impervious area if zoning plans are built out.	
Landscape features	• US Census TIGER files	• [Census page with links to numerous map products] http://www.census.gov/geo/www/maps/	Map power lines, roads, railroads, gas lines, schools, churches, cemeteries, and anything else of interest. If you don't choose to map these in GIS, most are shown on topographic or soils maps.	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Population trends	• US Census Bureau • Indiana State Library • Indiana Univ	• [Census data for Indiana] http://www.census.indiana.edu/	Look at the "block data" maps as well as the tables, to see where concentrations of population are. You can mine a lot of information out of this material, including historical population figures.	
Landscape change		• Some county-level land use change information is available at www.ncrs.fs.fed.us, the USDA Forest Service North Central Research Station.	There is a section called "The Changing Midwest Landscape 1980 to 2000" with some useful background material.	
Stormwater (runoff from developed areas)	• IDEM • Local government	• http://www.in.gov/idem/water/compbr/wetwthr/storm/index.html [for everything about stormwater, "Rule 5", and other wet-weather rules.]	Communities subject to "Stormwater Phase II" regulation need to prepare plans containing some of the same material as watershed plans. Communities with CSOs (combined sewer overflows) need to apply for permits. "Rule 5": construction sites 5 acres & more must implement a sediment & erosion control plan.	
Recreational land	• IDNR Div. Outdoor Recreation • Golf courses • Local parks	• http://www.in.gov/dnr/outdoor/planning/index.html	Note in your inventory any large expanse of green land; these areas will have pollution potential (fertilizers, pesticides, grass clippings) as well as benefits (increased infiltration).	
Urban density	• GAP and other land use data • Aerial photos		Identify areas with industrial/commercial use, high density residential, low density residential, and so forth.	
Subdivisions	• County Planning Office		Locate developed subdivisions and those that are platted but not yet built. Which ones have stormwater retention?	
Sewers	• County Planning • County Health Dept.		Locate where sewers are installed and where they are planned. Any area not sewered is probably served by septic systems (on-site waste disposal) or small package plants.	
Roads	• TIGER files • County maps • County Highway Dept.	• Download roads, churches, cemeteries, pipelines, airports, powerlines, etc. from the Indiana Geological Survey Atlas site http://igs.indiana.edu/arcims/statewide/download.html	Locate roads for your mapping inventory, and check to see if the county plans to widen or extend any roads. Note all bridges that could be used to observe streams or lakes. Find out what the county applies on the roads in winter (salt, sand, etc.)	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Large paved areas	• Visual observation • Aerial photos		You can calculate impervious area just from land use maps, but it's better to visually confirm where large parking lots, roofs, and other surfaces exist. Note whether there is stormwater retention on large sites.	
Industrial expansion	• Local planning office • Chamber of Commerce		Find out if any new industrial or commercial development is planned, and what impact it might have on land use and water resources.	
Working farm land	• GAP data • NASS crop land maps • Visual observation • County Cooperative Extension staff • SWCD, NRCS, and IDNR field staff	• NASS cropland maps for 2000 and 2001 can be ordered free on CD at http://www.nass.usda.gov/research/Cropland/SARS1a.htm	Identify where cropland, pasture, farmsteads and feedlots are with maps; then visually check for changes in agricultural production, such as abandoned fields, expansion of animal production facilities, or operations changing over from one type of production to another. Cropland can also be digitized fairly easily on aerial photos.	
Livestock	• NASS • Visual observation	• Livestock numbers by county, but not the location within the county, at http://www.nass.usda.gov/in/ (can also look at historical trends)	Determine number and type of livestock, or at least where livestock are raised. When inventorying livestock, don't forget horses, sheep, species such as llamas or ostriches, and kennels. Visual observation may be your best source of data.	
Crops	• NASS • Cooperative Extension	• http://www.nass.usda.gov/in/	For relative proportions of crops and types of crops, use the Agriculture Statistics data. The Cooperative Extension Educator or co-op personnel may be able to add to this data, particularly if small amounts of crops are grown that do not show up in the Ag Stats, such as tobacco, organic farming, or seed crops.	
Fertilizers, pesticides	• Cooperative Extension • Local dealers • Crop advisors	• Look for the summary reports of crop nutrients sold by county at http://www.isco.purdue.edu/	Cooperative Extension, NRCS, IDNR (LARE), Co-op, Farm Bureau, commodity organizations, livestock organizations, crop consultants, agricultural suppliers, machinery dealers, and others can help you characterize fertilizer and pesticide use in the watershed. They will also be useful contacts when the watershed plan is implemented.	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Tillage	• Purdue	• Transect tells % corn & soy beans planted as no-till, con ventional till, & minimumtill. www.agry.purdue.edu/swq/ publications.htm	Tillage transects are recorded every 2-3 years and in most counties go back nearly 2 decades.	
Forested land	• IDNR Div. Forestry • Land use maps	• General tree info at http://www.in.gov/dnr/ forestry/index.html • Consulting foresters, tree farmers, RC&D Forestry Committees, USFS, timber industry, Woodlot Owner's Association, and groups interested in bird-watching or hunting can all be contacted for local information on forest & wildlife resources.	Forested areas will be shown on your land use map. Discuss the forest resources with the IDNR District Forester for more information on timbering activity, forest diseases, and who's in the Classified Forest program.	
Riparian buffers	• NRCS • SWCD • Aerial photos • Universities	• Scroll down & click on 'Riparian Forest Buffers' at: www.unl. edu/nac/index.html • Effects of buffers at: www. ext.vt.edu/pubs/forestry/420-151/420-151.html • Description of riparian buffers and general buffer info at: www.na.fs.fed.us/spfo/pubs/n_ resource/buffer/part1.htm • NRCS practice standards for buffers (and all other practices) at: www.in.nrcs.usda.gov/ PlanningandTechnology/fotg/ Section4/section4.htm	Use aerial photos, visual observation, and consult with NRCS to determine where adequate riparian buffers exist along streams, and where buffers are needed.	
Public & private forest land	• USFS	• Roadless area maps at http://roadless.fs.fed.us/ states/in/state3.shtml (click on Hoosier National Forest for a more detailed map; go to http://www.fs.fed.us/r9/ hoosier/ for the local Hoosier NF site)	Identify state and federal forest, national parks, and other large tracts of publicly managed forested lands. Private lands can be assessed by overlaying the county plat maps (if they are digitized) with the land use coverage, to determine where the forest landowners are located and the typical size of forested tracts.	
Mineral deposits & mine sites	• IGS • IDNR Divs of Oil & Gas and Reclamation	• http://igs.indiana.edu/arcims/ index.cfm for all the different data atlases. Data can be downloaded. • http://www.in.gov/dnroil/publi cat.htm for information on oil & gas • http://www.in.gov/dnr/ reclamation/index.html for info on Div. Of Reclamation (coal). Not much here, but the links are useful.	Indiana Geological Survey sells 7.5 minute quadrangle maps showing the location of coal and mineral extraction for $6.00 each. Topographic maps identify location of quarries and gravel pits. Since so many new gravel pits started in the last few years, visually observe to check the maps.	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Miscellaneous	• INLimestone Institute • IN Mineral Aggregates Association • IDEM guide to permits	• http://www.iliai.com/ • http://igs.indiana.edu/geology/minRes/aggregates/index.cfm • http://www.in.gov/idem/guides/permit/nonidem/		
Soils	• NRCS Soil Survey	• Obtain from county NRCS staff in Agriculture Service Center.	List soil units in the watershed. Identify limitations. If the soil survey for the county is digitized, you can do this exercise in Arcview. If not, use the printed survey. The survey also contains narrative information about the geology and landforms in the area.	
Topography	• USGS • IGS • County Surveyor • IDNR Division of Water • US Army Corps of Engineers	• IGS Atlas of GIS layers for Indiana. Also check out the extra maps for Southwestern IN and the Lake Michigan Rim. http://igs.indiana.edu/arcims/index.html • Topographic maps, geologic maps, glacial history, history of when county was drained for agriculture.	What is the terrain like? Have there been significant changes to landforms due to mining, agricultural practices, development, or natural disasters? Are steep slopes, glacial moraines, sinkholes or flat boggy areas typical of the watershed?	
Floodplains & floodways	• FEMA [Federal Emergency Management Agency] • IDNR Division of Water	• http://www.esri.com/hazards/makemap.html [free site allows you to make a map of flood, tornado, earthquake, and other risks for your zipcode or city.]	Each county planning office & SWCD office has copies of printed FEMA flood zone maps used to determine the rate for flood insurance. The IDNR Division of Water is the agency responsible for delineating floodways and new floodplain boundaries when land uses change.	
Dams	• IGS • IDNR	• The IGS atlas (see Topography) has a data layer of dam locations in southern Indiana. • IDNR Div. Of Water has a list of dam locations, you have to call & ask for it.	Locate both existing dams and sites where dams have been abandoned. You can mark these locations on an aerial photo or topo map more accurately than any data layer you might get.	
Aquifers	• IGS • IOSC [Indiana Office of the State Chemist]	• http://igs.indiana.edu/ • http://igs.indiana.edu/survey projects/pesticides/pest/pesthtml/nets_tables.cfm • http://www.isco.purdue.edu/	IGS has maps showing the 22 “hydrologic settings” in the state, with information identifying those which are most vulnerable to contamination from surface pollutants. The Office of the Indiana State Chemist also has similar information as shape files on CD-ROM.	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Wellhead Protection Areas	• IDEM Drinking Water Branch	• www.in.gov/serv/idem_groundwater [search for sta tus of wellhead protection plans in your county] • www.in.gov/idem/water/dwb/whpp/whereare.html [information contacts to find out where WHP sites are.]	Purdue's Safewater program has information on protecting well-heads at http://www.ecn.purdue.edu/SafeWater/	
Drinking water sources	• IDEM Drinking Water Branch • Purdue University	• [Info on individual drinking water suppliers at] www.ai.org/serv/idem_dwb_inventory • www.ecn.purdue.edu/SafeWater/watershed/maps/index.html [for a map of watersheds supplying sourcewater.]	Surface drinking water supplies are protected as "sourcewater". Contact the staff in the IDEM Drinking Water Branch for a map of drinking water surface intakes.	
Stream location, stream miles, and drainage area	• IDEM Assessment Branch • IDNR Division of Water	• www.in.gov/idem/water/assessbr/surveys/index.html [go to "Assistance" for phone numbers] • Stream drainage areas can be found at www.in.gov/dnr/water/suface_water/drainage_area/index.html	The official stream map for Indiana is the EPA-sanctioned Reach File, currently Reach File 3 or RF3. There is also a National Hydrography Data Set. Older data sets will work just as well for your purposes. Small headwaters streams are often un-named.	
Stream context	• Topographic maps, aerial photos, and visual observation		Does the stream run through agri-cultural landscape, urban land-scape, past factories?	
Lakes	• IDEM/IU-SPEA • IDNR	• [2001 lake data summary report of trophic scores] www.spea.indiana.edu/clp/1999_summary_data.htm • [Web page of the Indiana Lakes Management Society] www.nalms.org/ilms/backgrnd.htm	Maps showing streams will usually also show lakes. You can get lake surface acreage from IDNR Div. Of Water, as well as a list of which lakes are public vs. private.	
Lake features	• Topographic maps • IDNR Div. Of Water • Lake associations • Lake shore residents		Identify the streams that feed the lake. Delineate the watershed of the lake if needed. Determine the area of the lakes either from IDNR database or by measurement on the map. Ratio of drainage area to lake area may be significant. Determine if motorized watercraft are allowed on lake; are there no-wake zones? Are they enforced?	

Watershed Land Inventory

Information	Origin	Internet Address or Source	Details	✓
Impaired waters	• IDEM	• www.in.gov/idem/waterplanbr/wqs/303d.html NOTE: 303(d) lists from 1998 & 2002 are available, next list is due in 2004.	Is stream on the 303d list? If so what is the pollutant and is a TMDL scheduled?	
High quality or designated waters	• IDNR	• www.in.gov/nrc/policy/outstand.html contains a list of rivers with special designations.		
Regulated or "Legal" drains	• County Surveyor	• [Useful background info on legal drains] www.bigeastern.com/kankakee/abundance_breeds_contempt.htm	If there are any maps of the legal drain system, they will be in the Surveyor's office. Check the easement width, maintenance schedule, and any local restrictions on trees or other features of riparian zones.	
Wetlands	• USF&WS National Wetlands Inventory	• [Interactive mapping tool for the NWI] wetlands.fws.gov/mapper_tool.htm	About the only recognized source for maps, but be aware that it is not 100% accurate. Land use maps will also help locate wetlands.	
Drinking water		• www.ai.org/serv/idem_dwb_inventory Search by county for every public source... including detailed information about each.		
Conservancy Districts	• IDNR	• www.state.in.us/dnr/water/publications/publicat/Act1002.htm	IDNR Division of Water site has links to a list of Conservancy Districts, floodplain mapping information, rainfall info, and graphs showing water use trends by county.	
Previous projects	• Local county Agriculture Service Center • Local government	• www.nrcs.usda.gov • www.in.gov/dnr/soilcons/programs/lare.html • www.in.gov/dnr/soilcons/programs/lare/sitemap.html • www.in.gov/idem/water/planbr/wsm/319summap.html	Find out if there were any EQIP priority areas (NRCS), Lake & River Enhancement Projects (IDNR), 319 projects (IDEM), or other local restoration or protection projects	
Water quality studies	• IDNR • IDEM • Universities • Local government • SWCDs	• www.in.gov/dnr/soilcons/programs/lare.html • www.in.gov/dnr/soilcons/programs/lare/sitemap.html • http://www.in.gov/idem/water/	Reports, studies, monitoring data, or plans developed in the watershed for either lakes or streams.	
River associations or other interest groups	• IDNR • SWCD office • CTIC Surf Your Watershed • Local outfitters & bait shops.	• Div. Of Outdoor Recreation	Invite representatives of interest groups to your meetings, and ask them to contribute to your inventory.	

Watershed Land Inventory				
Information	**Origin**	**Internet Address or Source**	**Details**	✓
Non-private lands	• USFS • Nature Conservancy • Land trusts • IDNR Heritage Trust	• nationalatlas.gov/fed landsm.html • [Land trusts in Indiana] www.agriculture.pur due.edu/fnr/Extension/Land Use/LandTrusts.htm • [National Land Trust Alliance] www.lta.org/index.shtml	Managed lands and lands in state or federal ownership; land trust holdings; conservancies.	
Endangered & Threatened Species	• IDNR Division Nature Preserves	• www.in.gov/dnr/naturepr/ npdirectory/index.html • www.in.gov/dnr/naturepr/ species/	Drill through site to get lists of species by county, as well as information on how to access Heritage Data (reports of where endangered species occur). This data is protected, and only general info can be given out.	
Wildlife, general	• IDNR Div. Fish & Wildlife	• www.in.gov/dnr/fishwild/ index.html • www.in.gov/dnr/fish wild/endangered/	IDNR Division of Fish & Wildlife, District Biologists, US Fish & Wildlife Service, Quail Unlimited, Pheasants Forever, Audubon Society, Indiana Trapper's Association, Great Lakes Sport Fishing Council, Ducks Unlimited, local hunting & fishing supply dealers are all good contacts for local info on wildlife resources.	

Additional Inventory Tools

- Purdue has developed an Inventory Workbook suitable for groups with very little technical experience. If volunteers are doing most of your inventory work you'll want to use this. Be aware that it does not contain all the items needed for a plan, so you'll still need to peruse the List in this book to make sure you have everything. Download the Land Inventory Workbook at www.ecn.purdue.edu/ SafeWater/watershed/inventoryf.pdf
- Rapid Resource Appraisal: a method leaning heavily on what local people know. See http://.aces.uiuc.edu/tabloid/StepsInARapid. html for an overview, and www.ssi.nrcs.usda. gov/ssi/B_Stories /1_PPCs/PPC024_ Rapid ResourceAppraisalsFinal.pdf for detailed instructions. RRA is very similar to the older Coordinated Resource Management process. The goals of the exercise are to bring the steering committee in tune with the community's needs and concerns, and gain a good feel for the nature of the watershed.
- At www.rpc.windham.vt.us/gis/data/westriv/ you can see an inventory carried out in Vermont for a river system where recreation was the primary concern.
- At http://ohiowatersheds.osu.edu/owa/pdf/09. pdf there's an inventory worksheet adapted by Ohio from Indiana's original Guide. (What goes around comes around.)
- Designed for use in California, these tips on researching your watershed on the web [www.carcd.org/wisp/datatactics.htm] can be applied anywhere. They refer to SWCDs as 'RCDs'. Some of the sites are California-specific, but the principles are universal.
- The EPA's vast website has a set of training modules covering many aspects of watershed planning. Go to www.epa.gov/water train/, and scroll down to "Watershed ecological risk assessment". Studying this module will give you a good overview of what you are trying to do with the inventory process, as well as providing some methods. Bookmark the site so you can come back and take a few more modules later!

✔ Planning Checklist - Chapter 4

When you have worked through one of these suggested inventory tools, you will be able to add the following items to your planning outline:

- ❒ **Watershed map:** Clearly identify watershed boundaries, streams, lakes, towns, county boundaries, roads, and other features. Use more than one map if it is too cluttered.
- ❒ **Location:** Show location of project watershed within the 8-digit USGS boundaries. If the group has designated smaller subwatersheds within the project boundaries, show those as well. Identify watersheds using hydrologic unit code (HUC - see page 3) as well as geographic name.
- ❒ **Watershed description:** The physical setting of the watershed, with a brief description of the present geology and geologic history (for example: was the area glaciated or not, annual rainfall and climate, etc.)
- ❒ **Natural History:** Description of the native vegetation, current vegetation, and anything interesting or unique about the flora and fauna.
- ❒ **Land use:** When the area was settled, historical land use, and current land use. Include areas slated for development, unique recreational resources, and other important features. Include a brief history of deforestation, industrial development, previous conservation efforts, or other activities that help in understanding the watershed and establishing a sense of place.
- ❒ **Soils:** Using the county soil survey, describe or list the predominant soil types. Note characteristics of soils that can affect water quality, such as highly erodible, hydric, poor for septic systems, etc.
- ❒ **Topography:** General nature of the topography; prevalence of steep slopes, valleys, floodplains, etc., and where they are located.
- ❒ **Hydrology:** Major stream systems; how streams have been modified through drainage or channelization; presence of dams, reservoirs, drinking water sources; whether aquifers are vulnerable; what is known about wetlands in the watershed.
- ❒ **Land ownership:** if there are significant tracts of land in ownership other than private, (e.g., state forest, national forest, land trust, parks, reservoirs, military holdings, etc.) they should be shown on a map and acknowledged in the planning process.
- ❒ **Cultural Resources:** Describe the early history of the area and any relevant recent history that will assist in making decisions. To comply with the National Environmental Protection Act document that a cultural resources specialist from the IDNR Division of Historic Preservation and Archaeology, State Historic Preservation Office (SHPO) or the Natural Resources Conservation Service (NRCS) has been consulted about the presence of vulnerable cultural resources.
- ❒ **Endangered Species:** List the threatened or endangered species that could occur in the area. If you can, describe the habitat the species prefer.

Water Resources Monitoring

Why water quality monitoring?

The national water quality goals in the Clean Water Act (CWA) of 1972 include "fishable and swimmable" waters; elimination of polluting discharges; and protection of public water supplies, aquatic life, and recreational activities. The terms "fishable and swimmable" reflect the European settlers' view that recognizes the right of the public to use the water for multiple uses. The Clean Water Act mandates that states report to Congress every two years on progress toward water quality goals; therefore, the states are required to monitor their water resources.

Since 1972, knowledge of water pollution sources and the ability to monitor water quality have expanded. The original CWA urged states to address severe problems caused by point-source pollution, including discharges from industries, sewage treatment plants, and other commercial facilities. The exact sources were easy to identify and measure as "end-of-pipe" discharges.

In the 1980s, the CWA was amended to address non-point sources of pollution in addition to point sources. Non-point sources are sources that don't come from a single, easily identifiable "point" or source, such as a pipe. They include things such as fertilizer or manure runoff, septic system seepage, etc. Section 319 of the CWA requires states to identify water bodies where nonpoint source pollutants have to be controlled in order to meet water quality standards. Under Section 319, funding from USEPA for non-point source projects is channeled through the Indiana Department of Environmental Management. EPA requires these projects to have a monitoring component.

Who does "water monitoring"?

A watershed group needs reliable data to understand and prioritize problems. Although states are required to submit regular reports to Congress on water quality, data may not be available from state agencies at locations in the watershed that are critical to your project success. Due to the accuracy, methodology, consistency and specialized equipment necessary for complete water monitoring programs groups should consider using the expertise of trained professionals. These experts can help local communities working in a watershed obtain localized data to answer s pecific questions and meet the requirements specified by federal and state grants.

Properly trained in monitoring concepts, local volunteers can help educate the community about the connection between resident's actions and the future quality of life in the watershed. Skills in chemistry, biology, and physics can be acquired through the Riverwatch Program (www.hoosierriverwatch.com/) or other training geared to a volunteer audience. Matching volunteer efforts with professional activities can reduce monitoring costs and thus increase the number of monitored sites while allowing the validation of local data with professional efforts.

Physical evidence of accidental spills may be gone before agency personnel can reach the site, and sources of non-point source pollution often are not obvious to off-site consultants. Volunteers usually know their watershed history better than nonresidents, know about potential problem areas, and can reach sampling locations quickly after a significant event such as a heavy rainstorm or a chemical spill. While it may be true that volunteers can reach a site when professionals are unavailable, it still doesn't insure that the test results provided by volunteer monitoring are adequate for a refined problem analysis, especially in situations where legal liability or regulatory violations are involved.

Alert and observant citizens are crucial as the local "eyes and ears" for such events and these volunteers should contact the appropriate law enforcement or agency authorities immediately if they suspect a spill or other rapid, significant decrease in water quality.

Major public "water monitors" in Indiana

- **The Indiana Department of Environmental Management (IDEM)** monitors the streams and lakes of Indiana to comply with federal requirements. The state is divided into five large basins that are sampled in rotation. IDEM collects water chemistry, aquatic biology (both fish & macroinvertebrates), sediment, and fish tissue data. To request copies of data, contact the Surveys Section of the IDEM Assessment Branch. [Scroll through www.in.gov/idem/water/data/]
- **U. S. Geological Survey** (USGS) monitors four river basins in Indiana through the National Water Quality Assessment program (NAWQA), the White River, Miami, Maumee, and Kankakee. For reports on these systems and other USGS publications, browse http://search.usgs.gov/query.html?ct=277859408.
- **Water utilities** and **industry** have water monitoring requirements, and are often willing to share data with you. Drinking water utilities and wastewater treatment utilities may even be willing to assist you with analyzing your samples. For contact information on water utilities, go to EPA's data warehouse called Envirofacts. [www.epa.gov/enviro/] This interactive site lets you look up a wide range of information and map it. Example: you can get a list of all water suppliers in your county, including restaurants and churches, and by clicking on the name, obtain contact information and a compliance report.
- **IDNR Division of Fish & Wildlife** conducts periodic fish community studies, primarily in waters with public access. Contact the Division for details.

Where do we go for guidance?

IDNR Division of Soil Conservation's LARE program has developed numerous resources for doing water quality assessment. Refer to their website for the latest publications on lake assessments and other monitoring information. [www.in.gov/dnr/soilcons/programs/lare.html]

IDEM's Watershed Management Section publishes Quality Assurance Project Plan (QAPP) guidance on their website. A QAPP describes every step of monitoring procedures, and explains the reasoning behind them. Following carefully designed procedures means the data you collect will be credible and repeatable. If you are using IDEM grant money to fund your plan, you are required to complete a QAPP. Even if your group is not using IDEM grants, this guidance is a valuable aid to developing a sound water quality monitoring program. Completion of a QAPP also makes you eligible for future grant money. [www.in.gov/idem/water/planbr/wsm/qapp.html]

NRCS has manuals on the web for conducting stream habitat assessments. In addition, many advocacy and interest groups such as Streamkeepers, Rivernet, Save Our Streams, The Groundwater Foundation, North American Lake Management Society, The Terrene Institute, and others publish water resource assessment manuals and material for volunteers. A few minutes with your favorite Internet browser will turn up these and many more. Start with www.wcc.nrcs.usda.gov/wqam/wqam-docs.html —- NRCS' monitoring handbooks.

What is a 305(b) Report? *State water quality reports are called "305(b)" reports in reference to the section of the Clean Water Act that provides the requirement. The "303(d)" List is the specific list of waters that are impaired and need restoration in order to meet state water quality standards.*

Water Quality - A Brief Overview

Following is a brief description of the major factors that determine or affect water quality. If your watershed group understands these factors, you will be better able to assess the water resources in your watershed, and identify ways to effectively address the problems.

Habitat

"Habitat" encompasses all the physical characteristics of the stream bed, stream banks, vegetation in the stream, vegetation and land use in the area along the banks, and the way the stream moves across the landscape, as well as what is carried into the stream (leaves, sediment, etc.). In lakes, habitat issues include vegetation, water clarity, the nature of the shoreline, and the material along the bottom. Vegetation along the bank of a water body filters nutrients and sediment out of the runoff that enters the water. Trees and large shrubs at the waterline shade the water body, lowering the temperature and reducing algal growth. Tree roots, fallen logs, and large rocks in shallow areas provide cover and spawning sites for fish and other animals. Many sport fish species in Indiana streams require clean sand or gravel for nesting sites. Streams and lakes with muddy water and eroding banks usually have fewer kinds of fish in them, and are dominated by carp and other less desirable species.

Physical characteristics

Temperature: Like humans, plants and animals are adapted to a particular range of temperature. In a hot environment, body processes speed up and organisms need more food and fluids, and use more energy to regulate body temperature. When it's cold, body processes and movement slow down. Animals will move to shaded or deeper, cooler water in summer. In addition, cold water holds more oxygen.

Turbidity: "Turbid" is a fancy word for "muddy". Turbid water is hard for fish to eat and breed in, because it blocks vision and may clog their gills. Turbid waters usually contain a high sediment load which eventually settles out and buries good breeding and feeding sites for aquatic insects and fish.

Shading: Lack of shade provides more sunlight for growing algae, contributing to eutrophication.

Velocity: Water flowing at high speed, such as following storms, will erode stream banks. Water moving too slowly may warm up and become stagnant.

Eutrophication: *This is a five-dollar word that describes the process that occurs when lakes or streams receive an excess of nutrients. This hyperfertility causes rapid growth of open water algae, attached algae, and higher plants. The abundant plant material causes large daily swings in dissolved oxygen (high during day when plants are producing oxygen-low during night when plants consume oxygen); and when the plant material dies, decomposition ties up large amounts of oxygen, resulting in low dissolved oxygen levels (hypoxia). The opposite of this condition is oligotrophy, or waters having a very limited amount of nutrients.*

Pollutants and stressful conditions

Sediment can cause a cascade of negative effects in water.

- Soil particles absorb heat, increasing water temperature.
- Poor water clarity interferes with feeding in predators that hunt by sight (including many sport fish), can cause hybridization of species that select mates by sight (e.g., sunfish), clogs gills during breathing and feeding, smothers nests and eggs, and fills crevices in gravel beds.
- Soil particles can carry nutrients and attached toxic chemicals and phosphorus into the water. Erosion also carries dead plant and animal matter into water, increasing nutrient load and using up oxygen

during decomposition. Insects and other small organisms that thrive on decomposing plant matter increase at the expense of other more desirable organisms.

The **pH** of the water measures relative amounts of dissolved acids and bases. Normal pH in Indiana waters ranges from 7 to 9. When algae or plants consume carbon dioxide and produce oxygen, a chemical reaction may increase pH up to 10. Decay of plant or animal matter also can cause the pH to decrease to 6. Most Indiana waters are naturally hard with a large capacity to buffer changes in the pH. There are some waters in southwest Indiana affected by acid mine drainage, and the resulting low pHs are stressful or even toxic for aquatic life.

Oxygen is critical to sustaining life for plants and animals. Plants produce oxygen during the day but consume oxygen at night or in the absence of light. Low oxygen can disrupt an organism's development; kill eggs and embryos; increase the toxicity of some chemicals; and reduce energy available to find food, fight disease, and reproduce. Animals that live or nest in shallow water are particularly susceptible to rapid changes in the amount of oxygen in water due to heating or decomposition.

Nutrients include any chemical that is required to increase the growth of plant or animal communities. On land, most plant populations are largely limited by the availability of nitrogen. In water, most plant populations are limited by phosphorus. Phosphorus originally comes from certain kinds of rocks, and is recycled in living systems by the process of consumption and decay.

- **Phosphorus** is not directly toxic to plants or animals, but can kill fish or other oxygen-breathing animals through the indirect effect of increasing plant populations. An overabundance of plants can cause so much oxygen in water that gas bubbles are seen on plant stems and leaves on sunny days (supersaturation). The large plant mass consumes an equally large amount of oxygen at night and can drive oxygen levels to almost nothing.
- **Nitrogen** occurs in water in four different chemical forms: organic; nitrate; nitrite; and ammonia. **Ammonia** may have high concentrations in surface and waste waters but is usually low in groundwater because it is the form that is associated with dead organic material and fecal matter. Ammonia can be toxic to fish, especially at high pH and high temperature. Ammonia decomposes into nitrate. **Nitrate** sources are usually low in sur face waters but may be high in groundwater or tile drainage. Nitrate can cause sickness and death of unborn or infant humans and animals through an effect commonly known as "blue baby syndrome." Nitrate can interfere with the ability of the blood to carry oxygen, causing the young animal to chemically suffocate. **Nitrite** is highly toxic but usually is found in small amounts and is rapidly converted into other forms. **Organic nitrogen** is present in carbon-based molecules and byproducts of plant or animal decay.

Natural and human sources of nutrients in water include human sewage, livestock waste, fertilizer, wild animal, and pet waste. Eroding soil can carry phosphorus and ammonia associated with decaying organic matter and animal waste. Drain tiles carry nitrates dissolved in water. Decay of organic matter from leaves, grass clippings, wood, dead plants and animals, and landfills can contribute organic nitrogen and phosphorus.

Pathogens (disease-causing organisms) are small, difficult to sample and identify, and dangerous to maintain for testing in the laboratory. Coliforms and fecal streptococci are two groups of bacteria found in the waste of all warm-blooded animals. Their presence in the water is an indicator of fecal contamination, and perhaps, other disease-causing organisms. Escherichia coli, or E. coli, is a single species of fecal coliform. USEPA recommends using E. coli as the best indicator of health risk in water.

Where should we take samples, and how often?

Samples taken in the wrong place or at the wrong time can confuse your understanding of the watershed. Think carefully about what you want the data to tell you. In most cases, a group wants sampling data to help identify which tributaries carry the greatest and least load of NPS pollutants. This information will indicate where measures should be implemented to reduce those pollutants.

If a lake or reservoir is involved in the project, its health must be determined. If the lake has been sampled in the past for the Clean Lakes Program, or because there is a drinking water intake in the lake, there may already be enough data to identify problems within the lake. In that case, sampling can be concentrated up in the contributing watershed. If little is known about the lake or reservoir water quality, contact both the IDNR Lake & River Enhancement and the IDEM Clean Lakes programs for guidance.

If all the waterbodies in the project area are streams and rivers, the obvious first group of sample sites is where tributaries join the main stem. However, depending on the location of point sources and the nature of land use in the watershed, additional sites may be needed to clarify what's going on.

A complete education in water monitoring is beyond the scope of this document. We strongly suggest you get technical assistance from the IDNR LARE program staff, the IDEM Watershed Management staff, or other agencies or professional consulting firms. In addition, access the following sources:

- National Handbook of Water Quality Monitoring [NRCS]
  www.wcc.nrcs.usda.gov/wqam/
  Click on "Guidance Documents;" it's the second one down.
- Lake & River Enhancement Program Manual [IDNR-online only]
  www.in.gov/dnr/soilcons/programs/lare/sitemap.html
- Hoosier Riverwatch Training Manual
  www.in.gov/dnr/soilcons/riverwatch/vsm/manual.html

What are the Water Quality Standards that our streams and lakes should meet?

Water Quality Standards have been set for water occurring in two different circumstances: drinking water, also called tap water or finished water; and ambient water, which is still in its natural location-sometimes called raw water. Standards are set at the national level, and states adopt and amend those standards to meet their needs. Drinking water standards are designed to protect human health at all ages, and are usually far more stringent than ambient standards. To view the entire National Primary & Secondary Drinking Water Standards, go to www.epa.gov/safewater/mcl.html. For a clear explanation of drinking water standards, Purdue has an article called "Drinking Water Quality Reports" at www.ecn.purdue.edu/SafeWater/drinkinfo/WQ-33.htm.

Ambient water standards are recommended by USEPA and developed by the states to meet their needs. Different states may have different criteria and standards. To see the whole list of recommended standards, with good explanations of each, go to http://epa.gov/water-science/criteria/.

Indiana's water quality standards were revised in 1990. Numerical criteria for all pollutants for which USEPA had developed either human health or aquatic life ambient water quality criteria were added to the standards. All waters must now meet full body contact recreation criteria (E. coli standard.). All waters, with the exception of 34 streams or stream reaches that were designated for limited use, were designated for warm water aquatic life use (and

a few for cold water fishery), full body contact recreational use, public water supply (where there are drinking water intakes from surface waters), industrial uses, and agricultural uses.

Indiana's standards are laid out in Indiana Code, and in each case were developed in rule and adopted by the Water Pollution Control Board. While standards for dissolved oxygen, E. coli, and metals are easy enough to establish as a numeric limit, many potential pollutants are addressed only in narrative standards and do not have an associated number, such as 5 ppm. Unfortunately the NPS pollutants and conditions you are most likely to deal with (nutrients, sediment, habitat) are still in that category. This makes it tricky to set concrete goals for nonpoint source pollution. To quantify these problems, Indiana turns to designated uses. Designated uses are the things society should be able to expect from its water resources. In Indiana, all waters except a few very limited streams are expected to meet all three designated uses: waters should be safe for recreation, support appropriate aquatic life, and be usable for a drinking water source (suitable to be treated for drinking).

Designated Uses *The 305(b) Water Quality Report published by IDEM every two years states whether waterbodies support or do not support designated uses, and why. To view Indiana's standards, go to www.epa.gov/ost/standards/wqslibrary/in/in.html. This will take you to the appropriate section in Indiana Code. Use the 'Find' function in your Adobe Reader to locate the standard you are looking for (such as "dissolved oxygen").*

What's a Metric? What's an Index?

A metric is basically a measurement, or a thing that is measured. An index is a list of metrics that relate a measurement to a level of quality. Numerous indices (the plural of index) have been developed to help assess the health or quality of biological systems. Indices allow valid comparisons from one place to another and from one time to another. Some common indices you'll run across:

QHEI (Qualitative Habitat Evaluation Index): Measurements of habitat characteristics are recorded and a score is derived. The score is calibrated with others around the state to determine what is normal in this region. Indiana uses the Ohio EPA version of this method.

mIBI (Macroinvertebrate Index of Biotic Integrity): Measurements describe the diversity, pollution tolerance, health, and abundance of macroinvertebrates. Used in some types of Rapid Biological Assessment.

fIBI (Fish Community Index of Biotic Integrity): Used to calculate and interpret the results of fish community data. Composed of 12 metrics that assess the species, what they eat, what kind of habitat or conditions they require to breed, and actual fish condition and health.

Indiana Trophic State Index [for lakes]: Physical, chemical, and biological data gathered on each lake are combined into a multi-metric index. Eutrophy points are assigned to each parameter, and then totaled for a final ITSI score ranging from 0 to 75. The lower the score, the lower the levels and effects of nutrients.

✔ Planning Checklist - Chapter 5

- ❒ Summarize monitoring data in the text.
- ❒ Describe the monitoring effort, including methods, protocols, and results. Reference any Quality Assurance Plans.
- ❒ Explain any indices or metrics used to express the results, such as Index of Biotic Integrity, Lake Trophic Score, Qualitative Habitat Evaluation Index, etc.
- ❒ Show where data were collected, on a watershed map.
- ❒ Identify water quality benchmarks (baseline data) for chemical, physical, and biological parameters.
- ❒ Raw data can be included in an appendix, or if there is a great deal of data that would be awkward to present in the plan, let readers know who to contact to view the data.

Analysis

You've completed an inventory of the land and water resources in your watershed. Now what do you do to make sense out of the mountain of collected data?

First, meet with the people who have been working on other aspects of your watershed project. You all need to work together to fit these puzzle pieces into a clear picture of the watershed. It might make sense to establish new or different sub-committees to analyze various aspects of the watershed; just be sure to get back together & compare your conclusions.

Second, be very careful to be objective and non-judgmental in your discussions. It is easy to point fingers or jump to conclusions, and much harder to come up with constructive solutions. Finger pointing and stereotyping will only create adversaries where you need partners.

Analyzing Your Discoveries

For each component of your inventory (land use, forestry, biological, water quality monitoring, etc.) ask yourselves these questions:

- What have we learned about this facet of the watershed that we think is a problem?
- What have we learned that is positive and needs to be maintained or protected?
- Do we know enough to reach a decision about what needs to change?
- If not, what else do we need to find out?
- Who could help us bring about beneficial change?
- What's the priority for this problem or need....is it an emergency, a serious but long-term problem, a minor issue, or some thing that just needs to be watched?
- If we think we have identified a problem, is it one we should address as a group or should we turn it over to somebody else (another interest group or an enforcement agency, for instance)?

In determining whether or not some thing is "a problem", consult standards and criteria if they are available. For example:

- To determine if water chemistry results indicate a problem, see if they violate state water quality standards. You may have to consult with IDEM, IDNR, Riverwatch, and others to establish this.
- To evaluate land (and some water) resources, refer to NRCS Quality Criteria in Volume Three of the Field Office Technical Guide. These criteria establish the minimum conditions that are reasonable to achieve. The entire FOTG is available online at www.in.nrcs.usda.gov/Planning and Technology/fotg/fotg.htm. Note that the Water Quality criteria are divided into quantity issues and quality issues, for both ground and surface water.
- To evaluate aquatic habitat or riparian zone condition, refer to an established assessmentprocess like Riverwatch, NRCS Stream Visual Assessment, USEPA Rapid Bioassessment, an index such as the Qualitative Habitat Evaluation Index, or other tools. Hopefully you will have been using some of these methods all along!

Zooming in - Questions and Suggestions for Further Analysis

Following are some questions and issues your group should consider before you proceed to update your goals and other aspects of your plan (Chapter Seven).

Land Use

1. Find Your Audience-Study the major land uses in the watershed and how they are distributed on the landscape. Identify the primary land use in the headwaters and along the main stem of each subwatershed. Depending on the water quality problems you've identified, these land uses should tell you who the audiences are for your project. For example, if the primary land use in a tributary with a high phosphorous load is crop production, then you need to develop a way to contact that audience (crop producers in that subwatershed) in order to work with them to address water quality concerns. **CAUTION:** Just because there is a predominant land use does NOT mean that those folks are "culprits" or "the problem". The water quality problem could be the result of prior land use, a spill, discharge from a poorly managed point source, or other events. Rule out as many possibilities as you can before settling on a probable cause.

2. Trends-Study the present land use and compare it to the zoned or proposed land use. Take into account what you learned about impervious area, population changes, soils, flooding, and drinking water sources. Which audiences will change? Will some land uses be eliminated? Different land uses have different potential for affecting the environment. What water quality risks might increase? Decrease?

3. What to do-Consider the impacts of each land use you inventoried (agriculture, forestry, residential, or publicly managed) and the kinds of pollution, pressure, or benefit these uses can cause. Think about potential changes that each entity might make to reduce negative impacts, and what resources there are for bringing about change.

Streams & Lakes

1. Study your map of streams and lakes, looking at the location of streams or lakes that you know or suspect are impaired. Can you relate any impact of the land uses with known or suspected impairments? If your project has been monitoring water quality, can you relate what you know from your land inventory to the water chemistry and biology results?

2. Are there streams that you believe may be threatened by existing or changing land uses?

3. Do any sample sites need to be added to future sampling plans based on what you now know about the watershed?

Wetlands

1. Looking at your map of wetlands, does it appear that many wetland locations have the potential to be threatened by land use change? Look at the areas surrounding wetlands, and at areas contributing drainage. Consider overall water supply issues; water in wetlands is a major source of aquifer recharge.

2. Are there areas that used to be wetlands that you think might be suitable for restoration?

Wetlands are Great for Watersheds!

Wetlands provide tremendous benefits in the watershed. Properly managed wetlands can:

- *Collect and store surface water runoff from rain events, reducing or preventing flooding.*
- *Transform or store many nonpoint source pollutants like sediment, nutrients, and certain heavy metals, purifying the water.*
- *Protect stream channels by slowing runoff and evenly distributing its energy.*
- *Recharge the groundwater resources that most Hoosiers use for drinking water.*
- *Provide excellent habitat for countless fish and wildlife species.*
- *Look for opportunities to restore or create wetlands or to link existing wetlands together.*

Residential and Urban Areas

1. Examine the maps of residential areas that are sewered or served by septic systems. Based on what you have learned and on conversations with the county health department, do you think that there are areas that need to be served by new sewers or areas that need improvements or maintenance to existing septic systems?

2. If there are numerous construction sites in the watershed, or areas that are developing rapidly, do you think there is a need to promote

compliance with Rule 5? Do you see a need for changes in the way new homes are sited (e.g., a set-back from streams and lakes or avoiding steep slopes)? Has this need been discussed with the county planning department?

What is "Rule 5?" *The IDEM storm water regulation requiring construction sites to control sediment is called "Rule 5." By coincidence, the rule applies to all projects five acres and above. Pending legislation will require any project greater than one acre to comply. To comply with Rule 5, developers need to apply for a general NPDES permit by submitting erosion and sediment control plans for review by IDNR, and paying a fee to IDEM. (Go to www.in.gov/idem/water/npdes/permits/wetwthr/storm/rule5.html for more information).*

3. If you have calculated the impervious area in sub-watersheds, note whether any areas are approaching or have exceeded 15% impervious area. This is a well-documented break-point; above 15%, the aquatic habitat in streams is degraded by changes in hydrology. A comprehensive stormwater management policy in the county can help to reduce this impact, but it becomes increasingly difficult to "fix" as the percentage of concrete, asphalt, and roofing increases. Retro-fitting existing subdivisions and commercial developments is possible, but planning for stormwater management in new construction is much easier. If this looms as a problem in your watershed, discuss it with the county planning and county engineering departments. For more information about the effects of impervious area, refer to the Center for Watershed Protection at www.cwp.org/pubs_download.htm and go to the Vulnerability Analysis publication. There is a wealth of information on this site, so spend some time!

Regulated Pollutant Sources

Point source pollution isn't usually addressed by local groups, since there is a regulatory agency (IDEM) to oversee it. However, if you believe there are problems with specific discharges, request assistance from IDEM in assessing whether the facilities are in compliance with their permits. You may want to stay in contact with IDEM to be sure those complaints or concerns are followed up.

Identifying Sources

In all the tangle of advice we're presenting, try not to lose sight of the connection between the concerns your group had at the beginning, the problems you identified, what's causing the problems, the sources, and how those sources will be addressed.

Maybe an example will help. *The folks in the Crawdad River watershed were concerned about a declining fish population. Working with the DNR, and conducting an extensive inventory and monitoring program, they established that the cause of the decline in fish was habitat degradation. The degradation was a result of sediment washing into the stream and covering the fish's breeding areas. The source of the sediment might be farming, construction, or streambank erosion. Since the group had walked the streams, they knew the banks were stable. The tributary with the largest TSS (Total Suspended Solids) load was Mudbug Creek, where an extensive highway-widening project had been going on for two years. High loads were spotted in another tributary as well, where cotton production was the only land use. The group concluded that they needed to work with the Cotton Grower's Association and the state highway department to reduce sediment transport to the Creek.*

Certainly your cases will rarely be that simple, and in many watersheds multiple land uses need to be addressed in hopes of "catching" the primary source. However, the point is to continually consider the entire chain of concern, problem, cause and source in order to understand the dynamics of the watershed.

Problem statements: here they are again!

Pull out the problem statements you developed in Chapter Two. Add any new ones necessary to reflect what you learned during the inventory. Remember that a problem statement specifies what, where, and why. Problem statements tell only what you know, and do not make judgments.

List all the problem statements you have developed, and prioritize them based on:

- Urgency...what will happen if the problem isn't fixed?
- Feasibility...is it something that the group can fix or influence? Does it need to be turned over to someone else?
- Location...does the problem occur all over the watershed or only in certain areas? Can you map it or associate it with something on the map?

You may go through this exercise several times as you learn more, incorporate new monitoring data into your decisions, and decide as a group what you are prepared to act on.

The final list of prioritized problem statements will be used to fine-tune the group's goals, and will then evolve into the actions that the group resolves to implement, forming the backbone of the watershed plan.

✔ Planning Checklist - Chapter 6

You can start working the following into your plan outline now:

❒ Information already on record before you started your investigation:
- Describe designated uses and any additional desired uses the local group wants from streams and lakes in the watershed.
- Identify waters on the 303(d) impaired waterbody list; include information about your watershed from the 305(b) report. If there are impairments, summarize the State water quality standards that are violated, including any numeric criteria that need to be included in goals.
- List the studies and reports the group was able to find on the watershed and briefly summarize what they said.

❒ The findings of the land and water inventories. See Chapters Four and Five for details.

❒ Water quality impairments and threats, including specific pollutants, changes in land use, hydrologic changes, and other stressors.
- Include concise problem statements concerning natural resource impairments or threats in the watershed. State the problem clearly, followed by the probable cause, location of the problem, and extent of the problem.

❒ Identify probable sources of pollutants or conditions that are causing water quality impairment. Explain how sources were determined.
- Discuss and identify specific sources for each pollutant or condition that is causing a problem. Document why you believe these to be the sources and what the evidence is.
- Describe the sources in enough detail to show the part of the watershed where they occur. For example, give the number of dairy farms in each subwatershed, or the number of acres of cropland needing improved tillage methods and how those acres are distributed in the watershed, or the number and location of construction sites in each tributary watershed.
- Include enough information to explain the context of the source. For example, state that there are 45 stream miles, of which 17 have good riparian cover, 10 have fair cover, and the remaining 18 miles are in need of restoration. This is more meaningful than just saying 18 miles of stream corridor need restoration.

Goal-setting for Success

The problem statements you developed in the early days of the project have been updated and expanded to reflect the knowledge gained during the investigation phase. Now it's time to craft measurable goals from those statements. These goals will drive the group's decisions, actions, and progress from here forward.

Example list of problem statements:

—Impervious area has increased by 5% in the watershed from 1995 to 2000, now reaching 15% in some areas, a level which is known to negatively affect aquatic habitat. [Urgency-high; feasibility-group can advocate but not implement; location: focused in Mudpuppy and lower Possum Creek subwatersheds.]

—Livestock access to creeks and ponds is increasing the potential for nutrient and sediment loads to surface waters, streambank erosion, and degradation of aquatic habitat. [Urgency - high; feasibility- group can probably implement solution; location- focused in upper reaches of Copper and Possum Creek sub-watersheds and along valleys in Skunk Run.]

—Although macroinvertebrate IBI samples in most stream locations are in the "fair" to "good" excellent range, QHEI measurements show that habitat is degraded in 50% of sample sites. Poor habitat elements include lack of riparian buffer vegetation and siltation of the streambed. [Urgency: moderately high; feasibility- group can influence to some extent; location- spread throughout watershed.]

Each of these statements covers quite a bit of territory. Turning the statements into workable goals would be very difficult without the information gathered during the investigation phase. Let's take one apart and see what can be done with it.

Dissecting a problem statement and re-constructing it as a goal

The following is a problem statement that has been developed from an early concern about aquatic habitat. The statement was expanded and refined, as information became available.

—Macroinvertebrate IBI samples in most stream locations are in the "fair" to "good" range. QHEI measurements show that habitat is degraded in 50% of sample sites. Poor habitat elements include lack of riparian buffer vegetation and siltation of the streambed. *[Urgency: moderately high; feasibility- group can influence to some extent; location- spread throughout watershed.]*

The overall goal for this concern is to improve aquatic habitat. For the goal to be useful, there needs to be information in it that tells the group (and the public):

- How much improvement is sought
- How long it will reasonably take
- How improvement will be measured

From the investigation, the group has a map showing sample locations, the tables of data gathered at each site, information on land use in the subwatersheds, aerial photos, etc. Data show that lack of riparian buffer vegetation is an issue at sites sprinkled throughout the watershed, on both agricultural and residential land. Siltation of the streambed was identified at nearly every sample site, and ranged from silt coatings on leaf mats to silt and sand bars obscuring the bottom entirely.

Since two different things are implicated in this habitat problem, and you can't prove that they

are related, start by crafting two separate goals. Later you can combine them if it makes sense.

Goal-crafting example: *Draft goal #1: Improve aquatic habitat by increasing riparian buffer zone vegetation (By how much? By when? How will it be measured?)*

- *A careful study of aerial photos yielded the information that there was a pretty good riparian buffer along about 30% of the 47 stream miles, with trees, brush, or unmowed grass forming a band at least 50 feet wide. Spot-checking in the field confirmed this.*
- *Another 15% of stream miles had at least a narrow strip of unmowed grass, but it was less than 30 feet wide.*
- *Remaining miles were either lawn, crop field, or asphalt up to the stream bank.*
- *The group decides that an adequate buffer is one that meets NRCS buffer practice standards [on agricultural land], or an unmowed strip at least 50 feet wide [on non-agricultural land].*
- *The group discusses how many riparian landowners might be willing to implement buffers, either with or without incentives. They decide that a 25% cooperation rate is a tough, but reasonable, number to shoot for. Since 70% of stream miles don't presently meet the group's standard, that would amount to an additional 8 miles of buffers.*
- *Additional discussion about incentives, education, and so forth result in consensus that it will reasonably take about five years to bring this about.*

The goal is now more fully developed: "Improve aquatic habitat by establishing eight additional miles of riparian buffer within the next five years." As supporting documentation, a description of the concern and the investigation results is written up for inclusion in the watershed plan. The group notes in their action register that they need to finalize the date in this goal when the plan is near completion. They also will need to develop alternatives for accomplishing the goal, identify more closely the areas on the map where buffers are most urgently needed, and decide the most efficient way to measure whether they are meeting the goal. But for now, this is a good start.

Goal-crafting example: *Draft goal #2: Improve aquatic habitat by decreasing sediment deposition in streams (how much, when, where, etc.)*

- *With the information obtained during the investigation phase, the group knows that the land use in the sub-watersheds is predominantly agricultural in the headwaters and urbanizing nearer the mouth of the watershed, where there is a growing town. There is some streambank erosion, but modeling and visual observation show that the largest volume of sediment is coming from agricultural cropland where soybeans are produced. The most critical non-agricultural erosion problem is from housing construction; although the period of disturbance is relatively short, the volume is worrisome. Since addressing these two areas of concern will take different approaches, the group splits the goal again, into:*
  - *"Improve aquatic habitat by decreasing sediment loads from cropland in corn-bean rotations....." and "Improve aquatic habitat by decreasing sediment loads from residential construction....."*
  - *After considerable discussion, referring back to data, and consulting with state and federal agencies on technical matters, these goals are developed further:*

"Improve aquatic habitat by decreasing sediment loads from cropland in corn-bean rotations by 50% over the next ten years", and so forth. The group notes the items that require further refinement, writes up the discussion, and moves on.

Are all goals created equal?

Prioritizing goals: Once the group has crafted all of its goals, the list may look a little scary. There is no harm in stepping back for a few minutes to determine feasibility, and appropriateness, and relative urgency of each goal.

At the end of the discussion, the group should have a prioritized list of goals that they feel confident in addressing. "Prioritized" may mean ranked from 1 to 8, or just 'high, medium, and low'. With the list of goals on the table, ask yourselves:

- **Can we fix it?** If a problem is clearly beyond the scope of the group, such as cleaning up a Superfund site or bringing back the passenger pigeon, table it. If it is doable, just not by your group, refer it to the appropriate party.
- **Are people willing to do it?** If the "fix" involves land use changes or management changes that are not presently acceptable to the community, or if the residents are just not concerned or committed on this issue, consider postponing the goal until a later date or giving it a lower priority. Concentrate now on developing a track record of successes to increase your profile in the community, or wait until you have more resources at hand.
- **Will it help us realize our vision?** If the goal is manageable, but doesn't clearly relate to your mission and vision, consider finding another home for it.
- **Will the resources stretch that far?** If you expect to receive a $100,000 grant and meeting this goal will probably take $500,000, narrow the critical area, increase the time frame, or recognize the need to pursue additional resources.

If the answer to all these questions is an unqualified "yes," then the goal deserves a high priority. Try not to have a large number of goals that are all high priority, since it may make it tough to allocate funds and manpower.

What happens if we don't meet our goals?

USEPA uses the term "adaptive management" when discussing watershed restoration. It means using the best information you can to develop realistic goals, implementing measures to meet those goals, and then adjusting the plan periodically as monitoring tells you whether progress is being made. Another term is "iterative solution": getting as close as you can to an answer with the methods and information available, and then tweaking the process and adjusting the answer when new information surfaces.

The goals in your watershed plan are as good as you can make them, but no one expects them to perfectly predict the future. Within a five-year span, so many variables (weather, land use, agency programs, personnel, regulations) can enter into the planning process that it would be unrealistic to think that you can achieve every goal on schedule. Through monitoring and annual evaluation of the plan, goals should be adjusted and refined to fit the evolving story of your watershed.

✔ Planning Checklist - Chapter 7

Continue working on these items:

- ❒ While the format is up to the group, goals need to incorporate the following elements: a problem, pollutant or condition; the present load or nature of that problem, pollutant or condition; the target load or condition; and when the group expects that target to be met.
- ❒ Since discussion of goals can be lengthy, create a table in the text or appendix showing goals; objectives or tasks under each goal; present condition; target condition; target date; and indicator to be used for measuring progress. [This is different from an action register, which tells who will carry out each task.]
- ❒ Try to express a clear connection from concerns to problems, causes, sources, goals, targets, and indicators throughout the plan.

Decisions and Actions

By now the group is well on its way to formulating the actions and changes that will be recommended in the plan. To be effective, this decision process needs to be recorded in the plan.

Stating what you finally decide to do is not enough; the plan must show a clear train of thought leading from concerns, fact-finding, and problem identification through to recommended alternatives and monitoring to evaluate progress. The people who read the plan need to see valid cause-and-effect connections in order to have confidence in supporting the plan.

If you have been working your way through this book, you will have already established the connection from public concern to investigation to problem statement to goal. The next step is to determine what actions need to be taken in order to meet the goals.

Critical or target areas

A lot of the watershed planning process consists of making tough choices. Since watershed projects rarely have unlimited resources, it's important to know where in the watershed your dollars and hours can be spent to greatest effect. Prioritizing and targeting enable you to get the biggest bang for your efforts.

For each goal, examine where in the watershed the goal applies. Refer to maps and inventory information. Ask yourselves:

- What is the location or type of land use where the problem is worst or most common?
- What is the audience that has the power of change in this issue?
- Which streams, lakes, or aquifers exhibit documented impairments?
- What can we afford to do in 1, 3, 5, or 10 years? Many watershed plans work within a 3 to 5 year timeframe, reasoning that within 3-5 years, they will make a significant impact on the focus area, and can then move on. It also takes about 3-5 years to see evidence of change.

Example: *Here's a goal that could have been developed by a watershed group:*

"Reduce degradation of aquatic habitat due to livestock traffic in streams."

- *The group knows that dairy and beef cattle are located mostly in the upper reaches of the Copper River. Referring to inventory data, they determine that there are 75 stream miles, including Skunk and Possum Creek and their tributaries, where most of the cattle owners are concentrated. [Location]*
- *Visual observation showed that at least half of the dairy operations, and all of the beef operations, did not fence cattle from the creeks. [Audience]*
- *Water quality indicators for habitat, aquatic life, and recreational use in these watersheds show that there are high sediment levels and E. coli levels. While these problems also exist in other parts of the watershed, the causes and sources are probably different. [Impairment]*
- *Since there are cost-share programs to help cattle owners improve management, it's reasonable to expect change in 3 to 5 years, although it may take up to seven years to reach the goal. [Timeframe]*

Therefore, the critical area, or target area, for this goal is the land drained by Skunk and Possum Creeks.

It is far more effective to promote specific land management changes with a well-defined audience in a target area, than to aim a generalized program at the whole watershed.

Alternatives

Proposing alternatives: With the aid of technical agencies and individuals, try to brainstorm every possible alternative for addressing goals, no matter how wild some of them may sound. Sound out all those folks who have been trying to tell you how to "fix things" since the first meeting! Try to get a variety of alternatives on the table without pre-judging whether they can work.

For the example goal used above, here are some of the alternatives that might be offered:

—Promote a cost-share program that pays for fencing and watering facilities for the cows.

—Hire a grazing specialist to design grazing systems that could exclude cows from the creek and also improve yields.

—Offer easements for establishing riparian areas where cattle are excluded.

—Provide incentives for changing to different operations or reducing number of cows.

—Put articles in the paper telling why cows in the creek are a problem.

—Start a demonstration farm showcasing management alternatives and offering technical assistance.

—Meet with landowners, show them the water quality data, and ask them to offer solutions.

Sifting & choosing: Once the group has listed every conceivable method for reaching its goals, analyze the alternatives and decide which approaches or strategies best fit the situation.

Clarifying questions:

- Does this alternative address our primary concerns?
- Will it help us meet our goal?
- What would be the effects on the environment? [Positive & negative]
- Can we measure the effects?
- How long would it take to see results?
- What would this approach cost in terms of money and manpower?
- Do we have (or can we get) the technical expertise to do this?
- Would this approach be acceptable to the people in this watershed?
- Would this approach complement other projects that we already plan to do?

Based on those questions and the ensuing discussion, the group might select the following alternatives:

1. Meet with landowners in the Skunk and Possum Creek watersheds to share information and ask for reactions to the alternatives we are considering.
2. Seek the assistance of a grazing specialist to develop site-specific conservation plans with cattle owners.
3. Conservation plans may include grazing management BMPs that reduce cattle traffic in the creek, as well as those that eliminate it. Landowners asked to limit cattle access to creeks should be offered assistance with selecting and installing alternative sources of water and shade.
4. Promote existing cost-share programs that can be used to offset the economic burden of implementing changes.

Note: Alternatives that you select to go with a goal are the **objectives** under that goal.

What are BMPs?

The term "Best Management Practice" or "BMP" applies to structural and management practices used in agriculture, forestry, urban land development, and industry to reduce the potential for damage to natural resources from human activities.

Best: In every field of work, there are several methods for reaching a goal. The best practice for a specific site considers the impact on natural resources, efficiency, economics, and the needs of the individual operation. It is not enough simply to present a laundry list of practices. A Best Management Practice must have been selected through a conscious planning process that balances natural resource needs with human needs.

Management: The way we do business or carry out work. A group of practices is incorporated into a *management system*. For instance, a logger implements riparian buffers and water bars to lessen the impact of timber harvesting on natural resources. The logger learns to manage his work differently to protect a valued resource.

Practice: Prescribed manner of doing or building something. A practice has standards and specifications developed by an agency or institution with expertise in the relevant fields. A practice may be structural [something that is built or involves changes in land forms or equipment] or it may be managerial [a specific way of using or handling or resources].

The following references are appropriate for choosing practices to be used in Indiana:

- *NRCS Field Office Technical Guide* (FOTG). Contains standards and specifications for conservation practices, soils information for each county, planning considerations, conservation practice effects, and more. The online-version is the official version. Go to: www.in.nrcs.usda.gov/ PlanningandTechnology/fotg/ fotg.htm

  Adjuncts to the FOTG are the *Engineering Field Handbook*, which contains design methods for the practices described in the FOTG; the *National Agronomy Handbook*; the *Animal Waste Handbook*; and the *National Planning Procedures Handbook*. Local Agriculture Service Centers will have these hardcopy documents. Ask for the assistance of NRCS field staff.

- *Indiana Drainage Handbook*. Developed by a consortium of agencies and organizations, this manual contains practices for all aspects of agricultural and non-agricultural drainage activities. There is a copy in each SWCD county office, or go to: www.in.gov/dnr/water/surface_water/ DrainageHandbook/load.html.

- *Indiana Stormwater Quality Manual*. Developed by IDNR and partner agencies, this resource contains practices for construction sites. There is a copy in each SWCD county office. The document has recently been revised. Go to www.in.gov/dnr/soilcons/publications/

- *Logging and Forestry BMPs for Water Quality in Indiana*. Contains best management practices for the timber industry and private woodlot owners. Available from the IDNR Division of Forestry. Go to www.in.gov/dnr/forestry/bmp/.

Going beyond nonpoint source pollution

In addition to practices aimed at nonpoint source pollution, your group may have concerns about point sources. Point sources have distinct discharge points such as municipal or industrial discharge pipes. Each discharger has a permit on record with the Indiana Department of Environmental Management. Permits are reviewed and adjusted every five years. Changing the amount or nature of point source discharges may be beyond the group's scope, but some alternatives might include getting involved in the public hearing process for new permits, requesting compliance records, or working with local industry to promote more effective technology.

The group may want to change land use trends in the watershed; for example, encourage cluster housing in new subdivisions, promote regional storm water management, advocate rezoning in certain environmentally sensitive areas, or divert planned transportation corridors.

In each case ask the following:

- What is the activity that is causing concern? Why is it a concern?
- Who is responsible for the activity? Who are the contact persons?
- What does the group want to change?
- Is there an existing effort to address this concern that the group could join with or support?
- Is it doable for the group to take on this particular issue? If not, is there a partner who could be encouraged to take it on with the group's support?

Information Resource

The USEPA Office of Watersheds and Wetlands website contains vast amounts of useful information. Go to www.epa.gov/owow/nps/categories.html, where NPS sources are listed by category. Click on any one and you will be taken to another list, of manuals, handbooks, and other resources, including extensive information on alternatives, measures, and BMPs.

Calculating pollutant loads

Current EPA guidance requires that watershed plans contain estimates of the existing pollutant load, and estimates of load reduction. This focus on load reduction is related to the requirements for states to develop Total Maximum Daily Loads (TMDLs) on impaired waters.

Don't panic. Load calculation is just common sense. The biggest hurdle is lack of data. Knowing the load at a certain point in the watershed helps you set targets, express the severity of the problem, and differentiate one tributary from another. First, a definition:

A **pollutant load** is the mass or weight of pollutant transported in a specific unit of time from the source to a waterbody. (e.g., Skunk Creek has a phosphorous load of 200 tons per year at its confluence with the Copper River) You will need flow data (volume of water per unit of time that passes a certain point, such as a bridge) and concentration data (the concentration of the pollutant, usually given as milligrams per liter or micrograms per liter, at the same time that the flow was measured).

Not all problems lend themselves to load calculation. Sediment (Total Suspended Solids), nutrients (Total Kjeldahl Nitrogen or nitrate/nitrite), total phosphorous, metals, and pesticide loads can be developed. However, if the target is an improvement in habitat indicated by the mIBI or an increase in riparian vegetation, the targets won't be expressed in terms of loads. There will normally be some problems you can quantify in loads and some you cannot.

The basic steps for determining pollutant load are:

- Measuring water discharge (e.g., cubic meters per second),
- Measuring pollutant concentration (e.g., milligrams per liter), and
- Calculating pollutant loads (multiplying discharge times concentration over the time frame of interest, usually a day or a year).

The key challenge in measuring loads is to determine when to sample to obtain the best data. Depending on the pollutant, the amount transported into streams and lakes during snowmelt and storm events is often many times greater than during periods of low flow (i.e., dry weather conditions). This is especially true of nonpoint source pollutants. However, this doesn't relieve you of the need to sample during dry weather, because if pollutant loads are high at that time it will tell you that the source is most likely a direct discharge (such as from a faulty septic system or poorly managed wastewater treatment plant).

Note that you also need flow data, which is most easily obtained from the network of USGS flow gauging stations. Check the location of the nearest gauge before finalizing your monitoring plan, if this will be your source of flow data. If you choose to estimate flow through your monitoring program, work with appropriate agency staff to

make sure that the data you'll get will work. There are ways to use USGS gauge data even if the gauge isn't located right where you sample.

For current accepted methods of load calculation, and assistance in developing loads, contact the IDEM Watershed Management Section. If you want to read up on the subject first, a good reference is EPA's suggested methods for calculating pollutant loads from agricultural operations, described in Chapter 7 of the Agricultural Measures Handbook, at www.epa.gov/owow/nps/categories.html.

✔ Planning Checklist - Chapter 8

❒ Locate target areas where the sources of the impairments or threats will be addressed. Show on a map if possible.

- Identify the parts of the watershed — specific subwatersheds, specific land uses, or other defined areas such as "all subdivisions without stormwater control" — where sources of problems can be treated, mitigated, or reduced. Show these areas on a map. Identify critical areas where measures need to be applied most urgently.
- Explain the train of thought for the group's prioritization and targeting approach.

❒ Describe what needs to be implemented or changed to achieve the goals of the watershed plan. This may include planning activities, local ordinances, BMPs, etc. State which alternatives the group has elected to pursue and why.

- Measures should be connected to the appropriate goals.
- For practices (BMPs) recommended in the plan, identify standards and specifications that apply and which agency maintains those standards.
- Describe the impacts of the measures that were considered, both positive and negative. Include economic and social impacts as well as environmental impacts.

❒ Using methods appropriate to your situation, calculate loads for the pollutants that will be reduced. Show how these calculations led to the determination of critical areas and formulation of goals.

- For agricultural land, calculate or model sediment and nutrient loads. Describe the methods or models used to perform calculations, and any considerations necessary to understanding the results.
- For non-agricultural land, calculate impervious area and any pollutant loads for which there is adequate information.
- If loading isn't an appropriate way to measure targets, express the change you are trying to achieve as clearly as possible. An example would be habitat improvement; instead of a load reduction, the change could be expressed as improvement in a habitat index.

Implementation

In the last chapter, your group selected alternatives to go with each goal that you are pursuing. These alternatives are the objectives that go with each goal. Your next step is to flesh out these goals and objectives into an action plan that will serve as the basis of plan implementation. In other words, you need to attach the who, what, why, where and how to each goal, or else nobody will do anything about it!

Action Plans

You might hear this part of a plan referred to as an "action register," "action strategy," or some other name. We'll call it an action plan because that's what it is.... and it's the shortest name! Action plans lay out the details of all the tasks that need to be accomplished for the plan to become reality. This is the how-we're-going-to-get-there part. It's also the part of the planning process where people start hiding behind the chairs to avoid getting tapped for uncomfortable or difficult jobs; and for that reason, many watershed plans fall short of completion because the action plan is left out.

Crawdad Lake Watershed Action Plan

#	Goal	Objective	Task	Start	End	Responsible	Resources	Checkpoints	Products
I	Reduce phosphorous load to the lake 50% by 2015 [from 2001 levels]	1. Enroll 25 new landowners in CRP by 2005, with at least 15 establishing forested riparian buffers	1. Contact each eligible landowner personally and discuss benefits and costs of CRP specific to their farm.	2003	2005	NRCS staff, SWCD Executive Director	NRCS Technical staff, FSA CRP continuous signup	Report progress quarterly at SWCD meetings [verbal] & written rpt. each December for Annual Report	At least 5 miles of riparian buffer, and additional buffer practices
		2. Start a farmer-to-farmer conservation email list	1. Identify a server and host for the list	2004	On-going	Cooperative Extension	Personnel time	Report progress to SWCD Board October 2003 & January 2004 [verbal]	Host for email list server
			2. Gather email addresses for all landowners in watershed	2003	2004	SWCD, Farm Bureau, Cattlemen's Association	Personnel time	Report progress to SWCD Board October 2003 & January 2004	Addresses to populate list
			3. "Prime the pump" with regular information on conservation programs, tillage techniques, and nutrient planning info	2004	On-going	SWCD Board members, cooperating farmers, with asst. from SWCD staff, NRCS, DNR & Coop. Ext.	Personnel time. Address list must also be maintained and landowners given subscribe-unsubscribe info.	Once up & running, review effectiveness annually when Plan is reviewed. Record in Annual Report.	Timely conservation information received by all landowners in watershed.

Why do you need an action plan? Because it will:

- Increase the likelihood that the plan will be implemented effectively and on time.
- Prevent the group from underestimating the time and resources needed to get a task done.
- Show when complex tasks need to be broken down into parts.
- Prevent people from being "volunteered" for work without knowing about it.

Constructing an action plan:

Make a table with column headings something like these: Goal, Objective, Task, Start Date, End Date, Responsibility, Resources, Products, Checkpoints. See the example on page 9-1.

Following are brief descriptions of each column:

Goal: List the goals developed by your group [See Chapter 2].

Objective: List under each goal the alternatives, measures, or BMPs selected by the group.

Task: The work items that have to be carried out to accomplish each objective.

Start Date: Date when work will commence. Month and year are enough.

End Date: Date when the objective is expected to be complete. Year may be enough, if it will take several years.

Responsible: Who (person, organization, or agency) is to carry out each task.

Resources: Money, manpower, equipment, etc. needed to carry out the task.

Checkpoints: When progress should be reported on completing task; who should report, & to whom; whether report is verbal or written; what items should be delivered (or reviewed, measured, whatever) by each checkpoint. Note: if reports need to be made at meetings, have the project coordinator add these items to future agendas.

Products: Products may be practices implemented, or concrete items like plans, newsletters, ordinances passed, or manuals written.

✔ Planning Checklist - Chapter 9

ACTION PLAN: Discuss the proposed sequence of implementing measures, time requirements for implementing the plan, responsibility for carrying out tasks and milestones for checking that implementation is on schedule. Include a schedule for implementing management measures.

- ❒ Create an action plan that lists tasks, when each task will be done, who is responsible for it, and what sources of support there are.
- ❒ Include a timeline showing milestones for about 3 to 5 years of implementation. Show what % of each task will be completed each year, or when programs will be completed; the point is to indicate how you will assess progress in your work.
- ❒ Acknowledge the conditions or pollutants that will take longer than 3-5 years to address, and briefly discuss how they will be handled, e.g., through longer range projects, plan evaluation, follow-up monitoring, etc.
- ❒ Resources: Estimate financial and technical assistance needed to implement the plan.
- ❒ Where feasible, estimate the cost of implementing each part of the plan. At a minimum, estimate the cost of elements that you are seeking support for when the plan is submitted.
- ❒ Include sources for any cost figures used, and the general rationale behind the estimates. Concentrate on developing estimates for the high-priority tasks the group wants to carry out within the next 3-5 years.
- ❒ Where costs are not estimated, indicate what agencies, programs, or organizations you will go to for support for each part of the plan. Also indicate agencies that will be expected or requested to provide technical assistance, such as NRCS or IDNR.

- ❒ Legal matters: Describe any permits, easements, agreements with landowners, land acquisition, or other legal actions that have to happen in order to make the plan work.
- ❒ In your schedule, take into account the time needed to apply for permits, especially for wetland or floodplain work.
- ❒ List the agencies or bodies that have jurisdiction over permits, easements, etc.

Are We There Yet?

You've been writing your plan as you go through the planning process, the action strategy is done, and you're ready to print this puppy and finally start doing stuff, right? Well, take a deep breath, 'cause you're not quite ready for that. The final, and vital, planning component consists of choosing how to monitor progress in the watershed, and deciding how the plan will be updated and adapted to changes in the community and the watershed. Using indicators for each goal, the group should develop a monitoring program and decide how to evaluate progress. Each goal in your plan grew from some concern, and will eventually lead to some action. Remember that watershed planning consists of determining where you are now, where you want to be in the future, how you're going to get there, and **how you will know when you've arrived**.

What Did We Change?

The trick to measuring progress effectively lies in selecting good **indicators**. An indicator is a fact or datum that can be measured to show the rate of change, such as turbidity (the amount of silt or other "stuff" in the water). Indicators tell you whether things have gotten better or worse and by how much. The best indicator may not be the easiest one. At this stage, focus on identifying indicators appropriate to each goal. This chapter helps describe how to use indicators to develop an ongoing monitoring program.

Developing an indicator:
Let's say the group has a goal to reduce sediment load from cropland by 50%. They plan to bring a cost-share program to the watershed to provide an incentive for farmers to increase no-till acreage, reduce fall tillage on conventionally tilled acres, and introduce different crop rotations. It would be easy and convenient to measure the number of acres converted to no-till as your indicator. However, the goal is to reduce sediment load. In order to measure that, the group could monitor a number of different things (the indicators are in bold & italics):

- Return to the sites where QHEIs (see Chapter 5) were completed, and observe ***sediment deposition***. This is a valuable systemic measure, but it may take a very long time for some parts of the stream to show improvement if there is a lot of sediment bed load working its way through the system.
- Directly measure ***turbidity*** and/or ***total suspended solids*** at appropriate points along the stream. While turbidity is usually due to suspended sediment, it can also be due to algae; and it won't be known whether the sediment is new to the system or re-suspended from some area upstream. Also, if samples don't coincide with rainfall, the results may not reflect what is really happening.
- Use models to forecast ***sediment yields*** based on land use, soils, changes in management, installation of practices, and so forth. This is a useful way to predict what may happen ("what-if"). However, it won't tell you what *really* happens.
- Visual observation of ***water clarity*** during rainstorms, at points where sediment load is known to enter the stream. This is useful anecdotal information, but not a very sensitive way to measure change.
- Measure ***total suspended solids*** above and below sites where practices are being implemented, being careful to include samples taken during rainfall events. This is a great way to document localized change, although it may not tell you what is happening in the whole system.

The group needs to weigh the urgency of the goal, information about causes and sources, financial and personnel limitations, and time constraints, and then select one or more indicators and measurement methods that will give them confidence in assessing change. When the group has developed as many goals as they see fit, determined their priorities, and linked each goal to some measure(s) of change, it's likely that certain indicators will overlap or mesh. For instance, visiting a site to assess the biological community, habitat, sediment deposition, and land use change can be combined in one or two events per year, and the results may serve to measure progress for several goals.

Administrative indicators are beans that you can count: the number of permits issued, the number of grassed waterways installed, the number of acres converted to no-till corn, the number of cans collected at a recycling center, and so on. They are usually easy numbers to come up with, but they are often indirect indicators of what you really want to know. Counting the number of feet of grassed waterway is a useful measure of work done, but it will not tell you whether the amount of sediment entering the stream has actually decreased.

Environmental indicators are measurements of water quality, habitat, or some other criterion that tells you something about the health of the environment. They include such things as the amount of phosphorus or nitrogen in the water, macroinvertebrate population diversity, the growth of algae in lakes, the turbidity of the water, occurrences of certain species, or the mercury content in fish tissue. These indicators require more time, resources, and planning than administrative indicators do, but they usually are better for evaluating progress. When the group is developing goals, indicators should be identified that will assist in evaluating progress for each goal. Indicators must be appropriately selected to match the scale of information you are seeking. For instance, macroinvertebrates may tell you more about very local conditions within the past year or two and along one small stretch of stream, whereas fish move more through the stream system and live for a number of years, giving you a more general picture of conditions.

Examples of Indicators

Regulatory or program indicators:

- *Number of permits reissued with new limits*
- *Number of point sources in substantial noncompliance*
- *Elapsed time from permit violation reports to compliance*
- *Amount of fertilizer sold or used*
- *Number of communities enacting storm water ordinances*
- *Number of public water systems with source water protection plans*
- *Number of citizens reached with public education efforts*

Change in threat or potential:

- *Reduction in nutrient loadings from each type of point and nonpoint source*
- *Stability and condition of riparian vegetation*
- *Percent impervious surface upstream*
- *General erosion rate upstream*
- *Amount of toxics discharged by spills*
- *Number of businesses and households that have altered behaviors or processes to reduce pollutants*
- *Size of wetlands or riparian habitat acres*

Water quality change:

- *Pollutant concentrations in the water columns, sediments, and groundwater*
- *Pollutant loads (concentration times flow)*
- *Frequency of restrictions on water uses (beach closings, boil water alerts)*

- *Percent of stream miles supporting each designated use*
- *Percent miles with impaired or threatened uses*
- *Percent of citizens who rate major water bodies as usable for various recreational activities*

Ecosystem health:

- *Macroinvertebrate and fish community indices*
- *Reduction in waterborne disease in humans*
- *Habitat quality indices*

Monitoring Plans

Develop a plan for monitoring the selected indicators. If water quality or biological monitoring have already been part of your project, (to assess the watershed and establish baselines), then you may choose to continue what you have been doing. Add or delete sample parameters, sample locations, sample frequency, etc. as needed to make the monitoring strategy work for you in tracking progress. Recognize that chemical and biological conditions may vary greatly between years due to differences in weather or other conditions not related to land use. A long-term data set is very valuable for distinguishing changes due to land use from natural year-to-year variation in water chemistry and biological communities. Comparisons with carefully-selected "control" streams or watersheds can be vital in making these distinctions.

If water quality standards are being used to quantify goals, then the indicators should include the criteria on which the standards are based. The IDEM Assessment Branch can help you identify these.

Not all indicators will be in the water; you may be monitoring land use change, the width and extent of riparian vegetation, or other factors that could be tracked with aerial photography or satellite imagery.

Still other indicators could be tracked by interviewing agricultural producers, or residents who are targeted by an education campaign.

Whatever the indicators, describe the sampling methods, sample sites, sampling frequency, and analysis methods. Identify who is responsible for each indicator, how and when results will be reported, and where funding will come from (Sound familiar? Yes, this is another action plan.)

Review your plan regularly

Agree on a regular time, perhaps quarterly, when the group will pull out the watershed plan, blow off the dust, and review what it says. Watershed plans should be living documents that can be changed or added to as needed. After all, you wrote it! You have the right to scribble in the margins, add new pages, and cross things out.

Scedule an annual work session when the steering committee will convene and go through the action plan and goals to see what has been accomplished. This is also the time to adjust goals and amend the action plan to reflect new information or changes in the watershed.

When the group accomplishes some piece of the plan, celebrate and let the community know about it.

Recognize the people who helped.

Plan to revise the plan. Plans are often written with a certain time frame in mind. Three to five years seems to be as much of our lives as we want to envision being tied up in a project. State at the end of the watershed plan when it will be revised or considered finished. This lets the community and the members know what to expect.

✔ Planning Checklist - Chapter 10

INDICATORS: Description of indicators selected to determine progress toward each goal of the plan. Include applicable water quality standards. Select interim, measurable milestones as well as final achievement indicators. Include criteria to determine if load reductions are being achieved.

- ❒ Where applicable, select indicators that will show change in the aquatic ecosystem, such as benthic macroinvertebrate indices, fish community indices, or habitat evaluations.
- ❒ If water quality standards are selected as targets, review state water quality criteria and select indicators that will show when water quality has been restored.
- ❒ "Interim, measurable milestones" are criteria levels such as concentration of total phosphorus or dissolved oxygen that can be measured to show how the system is moving toward restoration. The object is to measure continuous change, rather than waiting five years and then finding out whether anything happened. Evaluating the rate of change that is occurring will assist in modifying the plan.
- ❒ For specific load reductions that have been estimated, monitor the parameters (sediment yield, TSS, pesticides, etc.) that will allow you to calculate actual pollutant loads. This may require sampling above and below sites where practices are being installed, or comparing data from similar tributaries. The object is to see whether the estimated load reductions are in fact occurring.

MONITORING: Description of how indicators will be monitored to evaluate the effectiveness of implementation efforts. When water quality standards and criteria are selected as indicators, describe how water quality will be monitored. Monitoring for other goals may include spot-checking, landowner participation, adoption of practices, or other measurements.

- ❒ Describe the sampling methods, sample sites, sampling frequency, and analysis methods.
- ❒ For indicators other than water quality (such as rate of tillage adoption, miles of riparian forest, or indicators of behavior change) describe the measuring methods, including how the location of practices or improvements will be recorded.
- ❒ Operation & Maintenance: Discuss follow-up for installed practices, and who is responsible for maintenance.
- ❒ Plan evaluation: When the watershed plan will be re-evaluated; who will do it; who is responsible for revisions or adaptations to the plan. What will happen if a TMDL is completed or revised?
- ❒ Check the 303(d) list of impaired waters to see when TMDLs are scheduled in the watershed, and discuss with the TMDL program at IDEM. If feasible, integrate sampling and load reductions with the TMDL program activities.

Where to From Here?

Sustaining the Effort

Projects tend to sag a little after the watershed plan is written and accepted by the community. It was a lot of work to get this far! Loss of energy can be the result of having to wait for implementation funding, uncertainty about who's responsible for what, and the natural tendency of folks to drift away after putting in one or two years of effort on one thing.

To avoid too much of an energy crisis, schedule some event or activity that's due to occur two to three months after the plan is completed. This could be a kickoff event for one of the programs or measures in the plan, or a river cleanup, or the beginning of a new round of sampling. Try to inject some fun into the event and open it to as many interested parties as you can.

Following that, remember that people show up for things when they know what they are expected to do... and there needs to be something for them to do! Try to engage people in finite tasks, let them know how long the task will last and what they are contributing by joining in. There's a big difference between "We need someone to market the buffer program in the Mudpuppy watershed" and "Joe, would you visit with the McCoy brothers and Ted McCaskill about the buffer program before next Thursday, and call me back to let me know what they said? Here's a brochure you can give them that has all the program information." The first option is likely to send Joe running out the door because it sounds big and open-ended. The second option is pretty doable, and Joe will probably agree. (Don't ask me why the guinea pig in all these examples is named Joe; I don't know.)

Use all the techniques for keeping people engaged that were suggested for forming groups in the beginning. Communicate regularly with the group and with the community, so the project doesn't sink out of sight. While monthly meetings are probably no longer required, there still need to be a few regular events during the year that get people together to talk and share information. Lastly, don't neglect that annual plan evaluation.

Significance of having a plan

What does it mean to be a community that has a watershed plan? Aside from pride in the accomplishment, the benefits include:

Ability to apply for funding. The largest portion of Section 319 funds requires a plan for eligibility. Foundations and other funding sources will want to see the plan as proof that you are organized and know what you are doing. And, having all your facts in one document will make the act of filling out the forms much easier.

Continuity. When key people move on or fall away from the project, those that take their place will be able to get up to speed by reading the plan. Also, while the plan will adapt to change over time, the original goals will not be lost when new people enter the project, since the will of the community is recorded in the plan.

Seeing progress. By recording specific goals and objectives, progress can be measured and assessed. The community can learn what works and what doesn't, how long it really takes to get things done, and how much things cost.

Agency assistance. The plan makes it clear to agencies what the community wants to accomplish. Agencies can then tell you what programs they offer that may help fulfill goals. Help may be more forthcoming, too, since everything is written down and they can be sure of what the community wants.

The plan as a set of silver spurs

Having written a plan, the sponsors and volunteers who were involved can't easily ignore what it says. After all this effort, it would be awful to let the document gather dust, and if it's a good plan that is not likely. Remember that the plan is not an end in itself! Your whole purpose in writing it was to create change, so the sponsors, movers, shakers, and leaders in the community need to accept responsibility for implementing it. Don't let the plan sink into obscurity.

To help you move upward and onward, the Resources section that follows contains tools, sources, and contacts designed to help with the plan preparation, but they also will help you sustain your project. We wish you the very best, and sincerely hope this Guide was a help.

The End

Appendix A. Watershed Plan Checklist

Watershed Plan Checklist prepared by the **Indiana Department of Environmental Management [IDEM] Watershed Management Section** ~ effective for 2003

The items in this checklist are required in watershed plans prepared with Section 319 or Section 205(j) funds, or submitted for implementation funding under Section 319. These requirements are consistent with USEPA guidance.

Before you start... tips on producing the planning document:

Record-keeping: designate a person or agency to keep all the records and documents for uture reference.

Unless a particular format is required for funding sources other than S319 or S205j, **please follow the outline below.**

Make it easy for the reader to find information by referring to Tables and Figures in the text. Repeat material if necessary in order to make the plan easy to understand.

Make sure the order of events in the plan is clear. Including a brief calendar of when important events occurred, and when future events are planned.

If the plan is weighty and includes a lot of technical information, summarize the concerns and goals in an **executive summary** or brochure to distribute to the public. Provide information on how citizens can get copies of the whole plan if they wish.

Include raw data, survey results, comments, and other space-consuming items in the Appendix.

Include a table of **acronyms**.

Create a **distribution list** to make sure that all the appropriate people get a copy.

Provide a **contact** person, phone #, or at least an address, in an obvious location in the plan, for those wanting more information.

Required Watershed Plan Content

1. Introducing the project:

Describe the process the community went through when developing the plan, list the parties involved, and summarize any important issues that influenced how the plan emerged.

Write an introduction that contains the following points:

- Place the mission, vision, or purpose statement of the group inside the front cover or in the introduction.
- Briefly "introduce" the watershed, so readers will understand the scope of the plan. Include a map near the beginning of the introduction.
- Include a brief history of how and why the group came together to write a plan.

Building partnerships:

- Describe the outreach and information activities that you use to enhance public understanding of the project and encourage their participation.
- Describe how concerns were expressed (at meetings, through conversations, in surveys or interviews) and list the major concerns.
- Describe the structure of the group that made decisions in the plan... i.e. steering committee, SWCD Board, etc. Describe sub-committees and their work.

- List partners that developed the actual plan and include their roles and responsibilities.
- List the major community groups [stakeholders] engaged in the planning process. Explain how you got these groups involved.
- If a TMDL is happening in the watershed, describe how the planning and TMDL activities are integrated, and how the community was involved (or not) in the TMDL development. [NOTE: If a TMDL is developed after the watershed plan is finished, the plan will need to be amended to be consistent with the load allocations in the TMDL, in order to get further S319 funding.]

2. Describing the Watershed:

Describe features of the watershed, including land use, soil types, topographic features, hydrology, and any other information needed to understand the plan.

In this section, describe all the features of the watershed that the reader needs to know in order to understand the decisions the group made.

Refer to the Watershed Inventory Workbook, http://www.ecn.purdue.edu/SafeWater/watershed/inventoryf.pdf, or the Land Inventory Directory in the Indiana Watershed Planning Guide for sources of information.

- Include maps clearly showing watershed boundaries, streams, lakes, towns, county boundaries, roads and other features. Show the location of the project watershed within the larger river basin. Identify watersheds using hydrologic unit code (HUC) as well as geographic name.
- If the group designates smaller subwater sheds or special areas within the project boundaries, show those on maps as well.
- Physical description: include the following...
- The physical *setting* of the watershed, with a brief description of the present geology and geologic history (examples: was the area glaciated or not, annual rainfall and climate.)
- *Natural History:* Description of the native vegetation, current vegetation, and anything interesting or unique about the flora and fauna.
- *Endangered Species:* List species that could occur in the area. Describe the habitat the species prefer.
- *Soils:* Using the soil survey, describe or list the predominant soil types, and note characteristics of soils that can affect water quality, such as highly erodible, hydric, poor for septic systems, etc.
- *Topography:* General nature of the topography; prevalence of steep slopes, valleys, floodplains, etc. and where they are located.
- *Hydrology:* Major stream systems; how streams have been modified through drainage or channelization; presence of dams, reservoirs, drinking water sources; whether aquifers are vulnerable; what is known about wetlands in the watershed.
- Land use: include the following...
- When was the area settled; what was the historical land use; what is the current land use. Identify any important cultural resources.
- Discuss historical events such as deforestation, industrial development, previous conservation projects, dam building, or other activities that help in understanding the watershed and establishing a sense of place.
- Identify areas slated for development, unique recreational resources, and other important features.
- Land ownership: If there are significant tracts of land in public or managed ownership, such as state forest, national forest, land trust, parks, reservoir boundaries, military holdings, and so forth, they should be shown on a map. The owners should be involved in the planning process, if possible.

3. Establishing Benchmarks:

identify waterbody impairments, water quality threats, and baseline data for water quality and biological community parameters.

In this section, list existing information that you gathered to establish 'baseline' or 'benchmark' conditions in the watershed.

Possible sources:

- Quality-assured water chemistry or biological monitoring conducted earlier in the project
- Findings of the Land Inventory conducted during the project
- Stream visual survey results
- Volunteer monitoring data
- LARE diagnostic studies
- IDEM 305b Water Quality Report
- IDEM 303d Impaired Waters List
- NPDES discharge data
- Watershed Restoration Action Strategies
- Any other water quality data, reports, or studies that may be available.

Requirements:

- Existing data: State the source of the data, who collected it, the sampling dates and locations, and the testing methods if known. Summarize the data, and how the group interpreted it, in the text. Include the raw data in an appendix.
- Reference the studies and reports the group found, and briefly summarize what they said- no need to include the whole thing.
- If impairments are listed in the 305(b) report or there are streams or lakes listed on the 303(d) list, note the state water quality standards that have been exceeded. Include any numeric criteria that need to be used later in formulating goals.
- Water quality impairments may involve surface water, ground water, or both. Include well-testing data or other groundwater information if you can.
- If there is not enough water quality data to support a decision, the group will need to develop and carry out a monitoring program. Refer to IDEM Volunteer Monitoring guidance, Quality Assurance Project Plan (QAPP) requirements, the LARE program monitoring guidelines, and other sources for help in doing this.
- If a QAPP was developed for monitoring, reference it in the plan.

4. Identifying Problem Causes & Stressors:

Identify known or probable causes of water quality impairments and threats. stressors (things that are affecting the environment negatively) may include specific pollutants, changes in land use, hydrologic changes, and other factors.

In this section, identify and describe the things that are causing the watershed to fall short of the group's vision.

- Review all the data and information gathered by the group.
- For help in interpreting data, consult state and federal agency technical personnel (IDEM, IDNR, NRCS, USFWS, USGS, etc.).
- Discuss findings with stakeholders and local agencies (Health Dept., Drainage Board, Cooperative Extension, etc.).
- In the previous section, you listed the group's concerns. In this section, note whether you were able to confirm those concerns using the data you have. Some concerns may turn out to be groundless, and new ones may come to light with the data. Don't lose track of valid concerns during the planning process.

Develop concise *problem statements* concerning impairments, threats, and stressors. State the problem clearly, followed by the probable cause, location of the problem, and extent.

Tie concerns, benchmarks, and stressors together so there is a clear thought process throughout the plan. Use tables, bulleted lists, or any other format that makes it easy to see these relationships.

5. Identifying Sources:

Identify the source of the stressors and threats

Identify specific sources for *each pollutant or condition* that is acting as a stressor or threat.

- Explain why you believe these to be the sources. Document the evidence for each source. Conclusions must be clearly supported by data.
- Identify all areas of the watershed — specific subwatersheds, specific land uses, or other defined areas such as "all subdivisions without stormwater control" — where each source exists.
- **A 'source' may be:**
- An activity without a specific location, like car washing or dog walking; to map it, you would identify the geographic areas where the activity happens.
- Associated with a material or structure, such as impervious surfaces or copper roofs. These can also be mapped in a general way.
- All the actions associated with a business or enterprise, such as construction or livestock production. Also, specific actions by a sub-set of operators, such as poor sediment control in subdivisions or inappropriate manure handling by turkey producers. You might not be able to map this easily, but you could identify the land uses where these activities are likely to occur.
- Describe the sources in detail. At a minimum, state [for example] the number of dairy farms in each subwatershed, or the number of acres of cropland needing improved tillage methods, or the trend in the number of impervious acres added each year.
- Include enough information to explain the magnitude of the source. For example, instead of saying that 'some stream corridors need restoration', state that 'there are 45 stream miles in the watershed, of which 17 miles have good riparian cover, 10 have fair cover, and the remaining 18 miles are in need of restoration'.

6. Identifying Critical Areas:

Target areas within the watershed where the sources/stressors are causing the greatest damage, and where applying treatment measures will have the greatest effect.

Targeting: Select the areas to be addressed for each stressor/source. Show these areas on a map.

- Areas selected should be feasible for the group to address
- Select areas small enough to address in 3 to 5 years.
- Consider funding possibilities, willingness of landowners to participate, and whether the impact of treatment can be measured.
- Calculate existing *loads* for pollutants to assist with prioritization. Concentrations alone may be misleading. Load = concentration x flow (volume/time). In order to calculate a load you need flow data for the sample location. Calculating the load at the mouth of each tributary can highlight where practices need to be installed. See also Section 9, below.

Prioritizing: Rank the critical areas, either by the problem they represent or by location, in the order the group plans to address them. At the least, identify the first few things the group plans to tackle.

- Summarize the thought process used for targeting and prioritization.
- Tie the discussion back to the concerns, benchmarks, and stressors.
- Think "worst first"-where can the most impact on a stressor be accomplished?

7. Setting Goals & Selecting Indicators:

State the water quality improvement or protection goals that were agreed on by the group. Goals must include specific, realistic targets for reducing pollutants or mitigating impacts, and identify time-frames for accomplishment.

Use the problem statements developed earlier to craft goals that describe what will be addressed, where it will be addressed, what the targets are, and how long it will take.

- Refer back to the concerns, benchmarks, stressors, sources, and critical areas.
- For each goal, determine what parameters can be measured to track progress toward the goal. These are your indicators.
- State indicators as water quality standards or criteria where appropriate.
- Where applicable, select indicators that will show change in the aquatic ecosystem, such as benthic macroinvertebrate indices, fish community indices, or habitat evaluations.
- For indicators other than water quality (such as rate of tillage adoption, miles of riparian forest, or indicators of behavior change) describe the measuring methods, including how the location of practices or improvements will be recorded.

Goals should incorporate the following elements:

- A problem, pollutant or condition;
- The present pollutant load, baseline level, or benchmark value for the problem;
- The target (desired future) load, level, or value;
- When the group expects that target to be met.

Create a table in the text or appendix listing the goals in order of importance to the group. Include the present level or condition, target level or condition, target date, and the indicator(s) to be used for measuring progress.

Be sure there is a clearly understandable train of thought from concerns to stressors, sources, goals, targets, and indicators.

8. Choosing Measures to Apply:

Describe what needs to be implemented or changed to achieve the goals of the watershed plan. Select an array of measures or alternatives to accomplish this.

Work with state, federal, local, or private specialists as needed to determine one or more measures that will effectively address each goal. Include a discussion of how and why these measures were selected.

Describe how the stakeholders were involved in selecting, designing, and implementing the NPS management measures.

- A "measure" may be a practice, program, or process.
- Measures could include further planning or assessment, developing local ordinances, installing BMPs, establishing an outreach program, or any other organized change to improve water quality.
- Measures must be feasible, and must be acceptable to the community and not cause undue economic distress.
- Measures should be connected to the appropriate goals. There may be overlap between measures & goals; for example, reducing sediment from crop fields will also reduce phosphorous and pesticide loads. You may be able to use a single indicator to track progress for more than one goal.

- Show on a map where measures will be applied: by sub-watershed, as point locations, or whatever is clearest.
- For practices (BMPs) recommended in the plan, identify standards and specifications that apply and which agency maintains those standards.

Discuss what information/education techniques will be used to enhance public understanding and encourage continued participation in implementing the chosen NPS management measures.

Describe the potential impacts of the measures, both positive and negative.

- Include economic and social impacts as well as environmental impacts.
- Where possible, describe effectiveness (for example, "a properly designed filter strip x feet wide can trap x% of sediment in overland flow.")
- Describe the consequences of not doing anything.

9. Calculating load reductions:

Using methods appropriate to your situation, calculate estimated load reductions for the management measures identified.
(See also "Identifying Critical Areas")

Identify the measures for which a load calculation makes sense. Load reduction from agricultural and urban practices such as waterways, buffers, silt fences, manure management planning, seeding & mulching, etc. can usually be calculated. Education and outreach, new ordinances, and changes in habitat or biological composition are not workable for load calculation.

Determine a reasonable method (IDEM Loading Workbook, RUSLE2, SWAT, common sense) to calculate the estimated pollutant load change due to implementing measures. For each calculation, state the method used and the assumptions you made.

- For agricultural practices, calculate sediment yields and nutrient loads. State the methods or models used and assumptions made.
- For non-agricultural land, calculate impervious area, runoff, and any pollutant loads for which there is adequate information.

10. Implementing the measures:

Describe the planned order of implementation, the time requirements for implementing the plan, who is responsible for carrying out tasks, and what milestones to check.

Create an 'action register' (table) that lists **for each goal** what tasks will be performed, when each task will be complete, who is responsible for doing it, and what resources (money & technical assistance) are needed.

- Estimate financial and technical assistance needed to implement the plan over the next 3 to 5 years.
- Include sources for cost figures, and describe the reasoning behind the estimates.
- Concentrate on developing estimates for the high-priority tasks the group wants to carry out in the near future.
- For items difficult to estimate, indicate what agencies, programs, or organizations you will go to for implementation assistance.
- Identify agencies that will be expected to provide technical assistance, such as NRCS, IDNR, or the county Health Department.
- Identify funding sources that will be asked to provide financial assistance, such as foundations, USDA programs, state land treatment programs, or S319 grants.
- Discuss operation and maintenance responsibility for installed practices.

Set dates when progress on each goal will be reported. EPA interprets "interim measurable milestones" as practices installed, people contacted, etc., not as changes in water quality.

Acknowledge which problems will take longer than 3-5 years to address, and briefly discuss how they will be handled, i.e. through longer-range projects, follow-up monitoring, deferring to another agency, etc.

Describe any permits, easements, and agreements with landowners; land acquisition; or other legal actions that have to happen in order to make the plan work. In your schedule, take into account the time needed to apply for permits, especially for wetland or floodplain work.

11. Monitoring indicators:

Describe how indicators will be monitored to evaluate the effectiveness of implementation. If water quality standards and criteria are selected as indicators, describe how water quality will be monitored. Monitoring for other goals may include spot-checking, landowner participation, adoption of practices, or other measurements.

Refer back to the indicators chosen to track progress for each goal (see "Set Goals & Select Indicators"), and develop a *monitoring plan* to track these indicators for at least the next 3 to 5 years.

- Determine how each indicator can be measured, who will be responsible, what equipment is needed, sample locations and sample frequency, when monitoring is to begin and end, who will evaluate the results, and how they will be reported to the group.
- If required, develop a QAPP for monitoring.
- The load reduction calculations that you did should be linked to the monitoring plan, so actual loads can be calculated as the project progresses.

12. Evaluating & adapting the plan:

Describe when the watershed plan will be re-evaluated; who will do it; who is responsible for revisions or adaptations to the plan.

Discuss how the group plans to evaluate plan implementation progress, and how often.

- Assign responsibility for revising the plan as needed.
- If a TMDL is being developed in the watershed and the IDEM staff have been working with the watershed group, describe how coordination will be maintained.
- If a TMDL is completed in the watershed after the plan has been written, the plan will need to be updated to include the provisions of the TMDL.

Submitting Plans to Different Programs

IDEM's S319 & 205(j) Grant Programs

1. If there is a TMDL in the watershed, describe how the community was involved and include the findings and recommendations of the TMDL, as well as load calculations.
2. To be eligible for funding to implement the plan, submit a hardcopy and an electronic copy to the IDEM Watershed Management Section for review against this checklist. The checklist may change slightly with each federal fiscal funding cycle, in response to new EPA program requirements.

Natural Resource Conservation Service (NRCS)

The items in the checklist will correspond to the nine planning steps described in the NRCS Area-wide Planning Manual. With the addition of economic data, this checklist would supply most of the elements of a watershed land treatment plan prepared for PL-566 program funding. Contact the NRCS Indiana State Office for further information about the PL-566 program.

IDNR Lake and River Enhancement (LARE) Program

The LARE program has some special data requirements for their diagnostic studies. If the following material is included in the watershed plan, it is likely that it will meet LARE requirements for funding. To be sure, check with program managers. Include surveys, trends, and management recommendations from IDNR Division of Fish and Wildlife on any species that are dependent upon waterways or riparian areas in the project area. Fisheries reports may be available from IDNR, IDEM or other agencies for selected streams. Include an annotated bibliography of previous studies and data/literature cited. When appropriate, conduct recreational user surveys and/or homeowner surveys to document resource pressures and to understand local perceptions. Professional water quality assessments need to be completed at strategically selected sites, with the following considerations:

- Conduct water quality tests at pertinent sites in selected streams and tributaries, as well as one reference site in a high quality similar watershed (approximately 5-10 sites total). Select sites with input from LARE staff, the watershed steering committee or other local sponsor, participating SWCDs, and IDNR District Fisheries and Non-game Biologists. At each site, collect and analyze data on water quality, biological communities, and habitat, as indicated below.
- Water chemistry : pH, temperature, dissolved oxygen, nitrate+nitrite, organic nitrogen (TKN), ammonia nitrogen, total and dissolved phosphorus, turbidity, conductivity, and rate of flow. Fecal coliform may be sampled at selected sites, if appropriate. Stormflow and baseflow samples are collected at each tributary site. Note the intensity (inches of rain in number of hours) and date of storm events.
- Quality assurance: Water quality analyses must be conducted by a reputable laboratory and should follow analytical methods described in the most recent edition of one of the following publications:

  (a) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WPCF.

  (b) Methods for the Chemical Analysis of Water and Wastes, USEPA, Environmental Monitoring and Support Laboratory.
- Water quality analyses must be conducted using detection limits appropriate for the analysis of lake water samples. Contact LARE staff for details. Quality assurance/quality control procedures (QA/QC) must be a part of the sampling and water quality analysis. A copy of the QA/QC plan from the laboratory(s) conducting the water and sediment sample analysis must be on file in the LARE program office.
- Aquatic biology: Assess benthic macroinvertebrate communities using Rapid Bioassessment Protocol II (EPA). One late summer sample is collected at each site. Upon completion of the analysis, the entire 100-organism subsample must be labeled with site, date, and collector's name, preserved and delivered to the IDNR Division of Soil Conservation.
- Habitat quality: Survey habitat quality using the Qualitative Habitat Evaluation Index (QHEI) once at each site, unless significant changes to habitat are expected (e.g., dredging, riparian clearing). Where indicated, contour sampling for sediment depth may be included at selected sites.

- Wetland inventory (functional assessment). Assess wetland restoration opportunities/needs. Describe the location and conditions of priority wetland restoration or construction sites.

In addition to the requirements listed above, consider the following:

- Analyze trends relating physical, chemical, biological, and habitat factors
- Use statistical analyses to predict the relationships between physical, chemical, habitat, and biological quality and indicate potential limiting factors. Where information is available, compare water quality with similar regional streams and set a reasonable goal for improvement in water quality factors.
- Identify, establish, or recommend volunteer monitoring groups to continue water quality assessment.
- Discuss unusual physical or social characteristics of the watershed or institutions that may support or challenge future watershed land treatment projects.

LARE requests a digital copy of the plan, associated figures, and GIS layers (if available). One unbound photo-ready hard copy should be submitted to the IDNR - Division of Soil Conservation.

Program needs will be satisfied if all of the above elements are included, as well as the creation of a public information fact sheet or brochure. The brochure should include the plan's findings, recommendations, and educational information about improving water quality.

Appendix B. Funding Sources

The following pages contain specific information about a lot of potential funding sources for watershed management work. The USEPA also offers a searchable index of funding sources, all with hot links, at http://cfpub.epa.gov/fedfund/.

Grants

Clean Water Act Non Point Source Grants (Section 319)

Administered: EPA/IDEM

Summary: The Federal Clean Water Act Section 319(h) provides funding for projects that work to reduce nonpoint source water pollution. Funds may be used to conduct assessments, develop and implement TMDLs and watershed management plans, provide technical assistance, demonstrate new technology and provide education and outreach. Organizations eligible for funding include nonprofit organizations, universities, and local, State or Federal government agencies. The majority of Section 319 funds must be used for implementation projects. Only 20 % of the funds are available for planning, assessment and research. In addition, half of the funds must be used in watersheds containing impaired [303(d) listed] waterbodies.

Eligibility: Non-profit groups, universities, local & state government, government agencies.

How Much: Maximum of $300,000 with a 25% match required.

Application Deadline: October 1.

Web Pages/Links:
http://www.in.gov/idem/water/programs/

Clean Water Act Planning Grants (Section 205(j))

Administered: EPA/IDEM

Summary: The federal Clean Water Act Section 205(j) provides funding for water quality management planning. Funds are to be used to determine the nature, extent and causes of point and nonpoint source pollution problems and to develop plans to resolve these problems.

Eligibility: Organizations eligible for funding include municipal governments, county governments, regional planning commissions, and other public organizations. For-profit entities, nonprofit organizations, private associations and individuals are not eligible to receive this assistance.

How Much: Maximum $100,000. No match required.

Application Deadline: January 31

Web Pages/Links:
http://www.in.gov/idem/water/programs/

Clean Water Act Stormwater Grants (Section 104(b) (3))

Administered: EPA/IDEM

Summary: Funding is available for projects that will develop, implement and demonstrate new and innovative concepts that will improve the effectiveness of the NPDES permit program, which regulates point source discharges of water pollution. Competitive projects: have local leadership; strong public involvement and support; comprehensively address how to reduce the pollution source; and seek to demonstrate management practices or processes that are new to the area. There are some restrictions to using 104(b)(3) funds. They cannot be used to fund any of the following: dredging; drainage or flood control; permit fees; or compliance with NPDES permits or enforcement actions.

Eligibility: State water pollution control agencies, interstate agencies, Tribes, colleges and universities, and other public or nonprofit organizations. For-profit entities, private associations and individuals are not eligible to receive this assistance.

How Much: Funds can be requested for up to $100,000. There is a 5% in-kind or cash match required for 104(b)(3).

Application Deadline: January 31

Web pages/Links:
http://www.in.gov/idem/water/programs/

SARE Producer Grant Program

Administered: USDA

Summary: Grants for farm projects such as erosion and runoff control that are economically viable, environmentally sound, and socially responsible.

Eligibility: States and non-profit organizations.
Application Deadline: Mid July

How Much: Awards range from $2,000 - $15,000

Web Pages/Links: http://www.sare.org/

Wetlands Protection Development Grants Program

Administered: EPA

Summary: Provides financial assistance to support wetlands programs/projects or augmentation and enhancement of existing programs.

Eligibility: States, Local Governments
How Much: 1999 grants ranged from $20,000 - $594,000. Federal non-federal cost share is 75% - 25%.

Application Deadline: December 14

Web Pages/Links:
http:// http://www.epa.gov/owow/wetlands/initiative/#financial

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Environmental Education Program

Administered: EPA

Summary: To support environmental education programs and projects.

Eligibility: Non-profit organizations
Application Deadlines: Mid to late November

How Much: $25,000, or less. 25% match required.

Web Pages/Links:
http://www.epa.gov/Region5/enved/grants.html

Core Four Alliance Grants

Summary: Grants are provided to alliances throughout the country implementing programs that will advance the Core 4 Conservation Campaign to realize better soil, cleaner water, greater profits for agriculture, and a brighter future for all of us.

Eligibility: Alliances promoting Core 4 Campaign.

How much: Up to $2500 with a dollar for dollar match from non-federal funds.

Web Pages/Links:
http://www.ctic.purdue.edu/Tammy/Application.pdf

General Challenge Grant

Administered: National Fish and Wildlife Federation

Summary: Funding for projects that address priority actions promoting fish, wildlife, plants and the habitats on which they depend.

Eligibility: Federal, tribal, state, local governments, education institutions, non-profit, and conservation organizations.

How Much: $10,000 - $150,000. The match is 1:1 federal to non-federal.

Web Pages/Links:
http://www.nfwf.org/prgrams/guidelines.htm

North American Wetlands Conservation Act Grants

Administered: U.S Fish and Wildlife Service

Summary: Provides matching grants to private or public organizations or to individuals who have developed partnerships to carry out wetlands conservation projects including acquisition, enhancement, and restoration in the United States, Canada, and Mexico.

Eligibility: Public or private, profit or non-profit agencies.

How Much: Cost share must be at a 1:1 federal to non-federal ratio.

Application Deadline: March 23 and July 6

Web Page/Links:
http://northamerican.fws.gov/NAWCA/grants.htm
http://www.nws.usace.army.mil/pm/cw/planning.cfm

Partners for Fish and Wildlife Program

Administered: U.S. Fish and Wildlife Service

Summary: Provides financial and technical assistance to private landowners through voluntary cooperative agreements. Priority projects include restoration of degraded wetlands, streams, and riparian areas.

Eligibility: Private landowners

How Much: Dollar for dollar federal to non-federal match.

Web Pages/Links:
http://partners.fws.gov/pdfs/partnersfs.pdf

Project Modifications for Improvement of the Environment

Administered: U.S. Army Corps of Engineers

Summary: Used to restore habitat and improve habitat that has been impacted by existing Corps projects.

Eligibility: States and non-governmental groups

How Much: 75% - 25% federal non-federal cost share.

Application Deadlines: Continual sign up

Web Pages and Links:
http://www.swg.usace.army.mil/pep/projmod.asp

Aquatic Ecosystems Restoration

Administered: U.S. Army Corps of Engineers

Summary: Funds can be used for restoration and protection of aquatic habitat and water quality in lakes, rivers, and streams without any connection to existing Corps projects.

Eligibility: State and non-governmental groups.

How Much: 65% 35% federal non-federal cost share.

Application Deadline: Submit request for study at any time.

Web Pages and Links:
http://www.mvp.usace.army.mil/enviro_protection/aqua_eco_rstor/

Urban Forest Conservation Grants

Administered: Indiana DNR

Summary: Projects that help to improve and protect trees and associated resources in urban areas.

Eligibility: Municipalities, non-profit organizations

How Much: One to one matches ranging from $2,000 to $20,000

Web Pages and Links:
http://www.state.in.us./dnr/outdoor/planning/scorp/dnrresourcemanual.pdf

Hometown Indiana Grant Program

Administered: Indiana DNR

Summary: Provides grants for acquisition and or development of recreation sites and facilities, historic preservation and forestry.

Eligibility: Municipal corporations with a five year park and recreation master plan.

How Much: One to one state match of funds ranging from $10,000 - $200,000.

Web Pages and Links: http://www.in.gov/dnr/outdoor/grants/hometown.html

NiSource Environmental Challenge Fund

Administered: NiSource

Summary: Funding for projects designed to preserve, protect, or enhance the environment in areas served by NiSource or a subsidiary.

Eligibility: Non-profit and grassroots organizations and other community groups.

How Much: Awards are usually between $500 and $5000. Funding available for up to 80% of project cost.

Web Pages/Links:
http://www.nisource.com/enviro/ecf.asp

2002 IPL Golden Eagle Environmental Grant

Administered: Indianapolis Power & Light

Summary: Provide funds for projects that will preserve, protect, enhance or restore environmental and biological resources throughout the state.

Eligibility: Municipalities, states, non-for profits, etc.

How Much: Grants will not exceed $10,000.

Web Pages/Links:
http://www.ipalco.com/ABOUTIPALCO/Environment/Golden_Eagle/Golden_Eagle_Application.html

Great Lakes Aquatic Habitat Network & Fund

Administered: Tip of the Mitt Watershed Council

Summary: Provide financial support to advocacy activities that strengthen the role of citizens working locally to protect and restore shorelines, inland lakes, rivers, wetlands, and other aquatic habitats.

Who: Grassroots organizations working to protect habitat in the Great Lakes Basin.

How Much: $500 -$3,500

Web Pages & Links:
http://www.glhabitat.org/Eligibility.html

Great Lakes Basin Program for Soil Erosion and Sediment Control

Administered: Great Lakes Commission...Funding is provided through a cooperative agreement with the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS).

Summary: Funded programs range from information/education programs to physical measures designed to reduce erosion and improve water quality.

Eligibility: Non-profit agencies in the Great Lakes Basin.

How Much: Grants have been awarded for up to $36,000.

Web Pages:
http://www.glc.org/basin/RFP.html
http://www.glc.org/about/about.html

Watershed Assistance Grants

Administered: EPA and the River Network

Summary: Program is designed support the growth and sustainability of local watershed partnerships in the United States. For the purpose of this program, a "watershed partnership" is defined as an inclusive, enduring, diverse, community-based group organized to identify and resolve watershed problems and issues.

Eligibility: Watershed partnerships

How Much: Awards ranging from $1,000 - $3,100

Web Pages/Links:
http://www.rivernetwork.org/howwecanhelp/howwag_2002cri.cfm

Re-Grants

Administered: CS Mott Foundation

Summary: This Program is designed to help staff members, board members, and volunteers develop skills important to their duties with river and watershed organizations. Funding is used to cover travel expenses and/or registration fees for selective river training opportunities.

Eligibility: Non-Profit organizations, watershed staffs, volunteers in the Great Lakes Basin.

How Much: $300-$500

Web pages/links:
http://www.rivernetwork.org/howwecanhelp/howregrant.cfm

National Fish and Wildlife Foundation

Summary: Nonprofit, established by Congress 1984, awards challenge grants for natural resource conservation. Federally appropriated funds are used to match private sector funds. Six program areas include wetland conservation, conservation education, fisheries, migratory bird conservation, conservation policy, and wildlife habitat.

Web Pages/Links:
http://www.nfwf.org.
1120 Connecticut Avenue, NW Suite 900,
Washington DC 20036.

Hoosier Riverwatch Water Quality Monitoring Equipment

Administered: Indiana DNR, Hoosier Riverwatch

Summary: Grant provides equipment for participating in the statewide volunteer stream monitoring program.

Eligibility: Schools, government agencies, non-profit organizations

How Much: Up to $500 worth of water quality testing equipment.

Application Deadline: March 15

Web Pages/Links:
http://www.state.in.us/dnr/soilcons/riverwatch/

Bring Back the Natives

Administered: National Fish and Wildlife Foundation

Summary: Program provides funds to restore damaged or degraded riverine habitats and their native aquatic species through watershed restoration and improved land management.

Eligibility: Local governments, states, and non-profit organizations.

How Much: Non-federal to federal matching is 2:1.

We Pages/Links: http://www.nfwf.org
http://www.epa.gov/owow/watershed/wacademy/fund/natives.html

Tipmont REMC Envirowatts Trust

Administered: Tipmont REMC

Summary: Provide funds to support environmental projects and activities in surrounding communities.

Eligibility: Local groups working on environmental projects.

Application Deadlines: 4 cycles (3rd Monday of December/March/June/September).

Web Pages/Links:
http://www.tipmont.org/services/envirowatts.org.

Cost-share

USDA [go to http://www.nrcs.usda.gov/programs/ where all USDA conservation programs are listed. Application information is included on each program.]

EQIP: Environmental Quality Incentive Program.

Administered: Natural Resources Conservation Service.

Summary: Conservation cost-share program for implementing Best Management Practices.

Eligibility: Agricultural producers.

How Much: Up to $450,000 over a 10 year period, under the 2002-2007 Farm Bill.

WRP: Wetland Reserve Program.

Administered: Natural Resources Conservation Service.

Summary: Easement and restoration program to restore agricultural production land to wetland. Easements may be for 30 years or permanent. Partnerships with other acquisition programs are encouraged. Restoration and legal costs are paid by NRCS. Landowner retains ownership of the property and may use the land in ways that do not interfere with wetland function and habitat, such as hunting, recreational development, and timber harvesting.

CRP: Conservation Reserve Program.

Administered: Farm Service Agency with technical assistance from NRCS.

Summary: Conservation easements in certain critical areas on private property. Agricultural producers are eligible. Easements are for 10 or 15 years depending on vegetative cover, and compensation payments are made yearly to replace income lost through not farming the land. Cost share is available for planting vegetative cover on restored areas.

WHIP: Wildlife Habitat Incentive Program.

Administered: Natural Resources Conservation Service.

Summary: Cost share to restore habitat on previously farmed land. Private landowners who are agricultural producers are eligible. Cost share up to 75%, and contracts are for 10 years.

Lake and River Enhancement Program

Administered: Indiana DNR Division of Soil Conservation.

Summary: Funding to reduce inflow of sediments and nutrients into lakes and rivers.
Eligible projects include water quality monitoring and watershed projects.

Eligibility: Local entities, land planners, and development organizations.

How Much: Financial assistance of up to $100,000 is available. Program also provides up to 80% cost share of approved watershed land treatment practices.

Application Deadline:
Web Pages and Links: http://www.in.gov/dnr/soilcons/pdfs/lare.pdf
http://www.in.gov/dnr/soilcons
While you're there, check out the Lake Michigan Coastal Program.

Easements & Land Trusts

Forest Legacy Program

Administered: USDA Forest Service

Summary: Designed to encourage the protection of privately owned forest lands. The program encourages and supports acquisition of conservation easements. Landowners are required to prepare a multiple resource management plan for the land as part of the conservation easement acquisition.

Eligibility: Private forest landowners

How Much: Federal government may fund up to 75% of program costs, with at least 25% coming from private, state or local sources.

Application Deadline: January 31, for priority but applications are accepted anytime.

Web Pages/Links:
http://www.fs.fed.us/spf/coop/flp.htm

Classified Wildlife Habitat Program

Administered: Indiana DNR

Summary: Incentive program to foster private wildlife habitat management through tax reduction and technical assistance. Landowners need 15 or more acres of habitat to be eligible.

Eligibility: Private landowners with at least 15 acres of land.

How Much: Tax reductions

Web Pages and Links:
http://www.ai.org/dnr/fishwild/about/habitat.htm

Classified Forest Program

Administered: Indiana DNR

Summary: Program allows landowners to set aside at least 10 acres of land as forest. In return owners receive property tax breaks, forestry literature, and technical assistance.

Eligibility: Private landowners with 10 acres of land.

How Much: Lands are eligible for Assessments at $1.00 an acre. Property taxes are then paid based on that assessment.

Web Pages/Links:
http://www.state.in.us/dnr/forestry/privateland/clasfor.htm

The Nature Conservancy

Land acquisition and restoration.
http://nature.org/wherewework/northamerica/states/indiana/

Indiana Heritage Trust

Land acquisition programs
http://www.in.gov/dnr/heritage/apply.html

Land Trusts in Indiana

Land Trust Alliance site directs you to all the private land trusts in Indiana.
http://www.lta.org/findlandtrust/IN.htm

Loans

State Revolving Fund Program

Administered: EPA/IDEM

Summary: Low interest loans designed to assist communities with wastewater and drinking water needs. Projects include traditional wastewater treatment methods as well as some nonpoint source management projects.

Eligibility: Cities, towns, regional sewer districts.

How Much: Fixed low interest loans (20yr) are provided to recipients (80% Federal : 20% State)

Deadlines: February 22

Web Pages/Links:
http://www.in.gov/idem/water/fasb/srflp.html

More Funding Resources

Catalog of Federal Funding Sources for Watershed Protection
EPA Office of Water (EPA841-B-97-008)
September 1997

GrantsWeb:
http://www.srainternational.org/newweb/grantsweb/index.cfm

The Foundation Center: http://fdncenter.org/

Appendix C. Agencies and Organizations Directory

Who Does That? [A Guide to the Alphabet Soup]

Principal agencies and organizations that can assist with watershed protection and restoration in Indiana

	IASWCD	IDNR	IDEM	SWCDs
	Indiana Association of Soil & Water Conservation Districts	**Indiana Department of Natural Resources**	**Indiana Department of Environmental Management**	**Soil & Water Conservation Districts**
Reason for existing	Not for profit organization representing 92 SWCDs	State legislation, relationship with SWCDs, fish and wildlife management	Clean Water Act, State legislation, rules and standards, delegations from USEPA	State legislation
Who is served	SWCDs	Private landowners, local and state government, partner agencies	Citizens of Indiana	Landowners and other citizens in their county
What the agency does	Provide coordination, education, and a unified voice for 92 SWCDs in statewide and national advocacy of resource management issues	Provide technical and financial assistance to conserve & manage fish & wildlife, soil, streams & lakes, woodlands	IDEM Offices of Water, Land, and Air Quality enforce laws & standards; promulgate regulation; promote pollution prevention, provide monetary grants for projects.	Identify local natural resource issues; serve as point of contact for technical, financial, and educational assistance to landowners and citizens to address those issues.
Funding	Dues from SWCDs and grants	State funds, fees, and revenue diversions	State funds, Clean Water Act funds, permit fees and fines	State funds; local county budgets; grants
Structure	Office in Indianapolis	County field offices; state office	Three regional offices and state office	County offices
Who agency reports to	To SWCDs	To Governor and Indiana State Legislature	To Governor, Indiana State Legislature and USEPA	To landowners in the county and county government
Expertise, services, and products	Articulate conservation needs to local, state, and federal decision makers; build relationships with agencies and organizations that provide conservation assistance; provide tools to SWCDs to use in promoting their services; coordinate training and educational opportunities for SWCD Supervisors, employees, and members of the Indiana Conservation Partnership.	Various divisions provide technical guidance for management, conservation & protection of soil, lakes, streams, woodlands, fish & wildlife, urban & agricultural lands. Provide technical, educational & financial assistance for agriculturally-focused "watershed land treatment" projects that effectuate watershed management. Provide administrative guidance to SWCD leaders and staff.	OWQ Watershed Management Section administers the Clean Water Act Section 319 Nonpoint Source (NPS) Program (federal funding for NPS assessment, prevention, education, and restoration); promotes watershed management through education, information transfer, and technical assistance.	Develop and deliver environmental education programs; through partnerships with NRCS and IDNR, enable private lands conservation assistance; promote cost-share and incentive programs to private land owners; assist local government with natural resource conservation.
Contacts	Dean Farr Executive Director Dean-farr@iaswcd.org 317-692-7374 225 S. East Street Suite 740 Indianapolis IN 46206 www.iaswcd.org	Division of Soil Conservation 402 W. Washington Street Room W265 Indianapolis 46204-2739 317-233-3870 FAX 317-233-3882 www.state.in.us/dnr/soilcons	Linda Schmidt Watershed Management Section Chief 317-234-1432 lschmidt@dem.state.in.us Hotline 1-800-451-6027 Watershed information: www.state.in.us/idem/owm/planbr/wsm/index.html	Each county in Indiana elects a Soil and Water Conservation District Board of Supervisors. Contact information for county SWCD offices can be found at www.iaswcd.org, in the Conservation Partnership Directory, or in your local telephone directory.

Who Does That? [A Guide to the Alphabet Soup]

Principal agencies and organizations that can assist with watershed protection and restoration in Indiana

	NRCS	Purdue Extension	EPA
	Natural Resources Conservation Service ~ USDA	**Cooperative Extension Service ~ Purdue University**	**US Environmental Protection Agency**
Reason for existing	Federal conservation legislation, links with local SWCDs, & other agricultural & "Farm Bill" legislation,	Land Grant University legislation to make research and education available to all state citizens.	Clean Water Act, Clean Air Act, other legislation
Who is served	Private landowners, groups & organizations, communities, local, state & federal governments, SWCDs, partner agencies	All residents and businesses of Indiana, Local government, partner agencies	Congress, the States
What the agency does	Provide technical and financial assistance to landowners and local government to conserve natural resources. Program information is available at: http://www.in.nrcs.usda.gov/conservation/programs/indiana_programs.htm . Technical information is available at: http://www.in.nrcs.usda.gov/planningandtechnology.htm	Provide educational information related to agricultural and natural resources needs. Assist individuals, groups, communities, and local and state government in developing and carrying out programs in agriculture, community, youth, and business development.	Administers and enforces regulations requiring states to carry out programs and issue permits related to Clean Water Act, Clean Air Act, and other acts. Administers some permit programs directly.
Funding	US Dept. of Agriculture appropriations bill; Commodity Credit Corporation funds	A "cooperative" effort of federal, state, and county funds; grants	Congressional appropriation
Structure	County USDA service center field offices and multi-county workteam offices, as well as state and regional offices; research and development centers & institutes; plant materials centers; and national office at Washington, DC	State Offices, county offices, research and education teams, cooperative agreements with other agencies and organizations. Water quality "Common Interest Group" focuses water quality efforts	Headquarters and 10 regional offices. Indiana is in Region V, administered from Chicago.
Who agency reports to	To Congress	To state legislature, county government, USDA, and the citizens of Indiana	To Congress
Expertise, services, and products	Soil and water conservation planning and technical assistance including soils, agronomy, biology, engineering, etc for soil erosion control, water quality, nutrient management & pest management, grazing land management; wetland determination, wildlife habitat and wetland restoration. NRCS administers USDA programs for private land conservation (EQIP, CRP, WHIP, FIP, and others)	Education, training, leadership development, and delivery of agricultural and natural resource programs to citizens and local governments. Assistance for farmers (e.g., farm profitability, nutrient and pest management, Farm*A*Syst assessment program) and local government (e.g., land use, fiscal impacts, feasibility studies). Serve on the Area Plan Commission in most counties. Disseminate research findings to clientele.	Passes grant moneys through to the states to assist in implementing some required programs such as Sections 319, 104(b)(3), 205(j), and 106. Promulgates rules to carry out legislation passed by Congress. Develops criteria for the states to use in establishing water quality and air quality standards.
Contacts	State Office: 317-290-3200 www.in.nrcs.usda.gov	County offices can be found at http://www.ces.purdue.edu (Select ANR, then "County offices".) State contacts for water quality: Jane Frankenberger, Extension Water Quality Coordinator, frankenb@purdue.edu or 765-494-1194; Brent Ladd, Farm*A*Syst and Home*A*Syst programs, laddb@ecn.purdue.edu, 765-496-6331; www.ecn.purdue.edu/SafeWater	Region 5, Chicago: 1-800-621-8431 www.epa.gov/region5/water/ or explore EPA's extensive water website at www.epa.gov/owow/

Appendix D. References

General

Gateway to the National Extension Water Quality Database http://hermes.ecn.purdue.edu/water/

NEMO, Nonpoint Education for Municipal Officials, is a program targeted to developing environmentally conscious land use plans and ordinances in growing urban areas. Go to http://nemo.uconn.edu/

National Library for the Environment, hosted by the National Council on Science and the Environment. Go to http://www.ncseonline.org/index.cfm?&CFID=7785776&CFTOKEN=61866334

Building working groups

Partnership Handbook — an excellent on-line source of info from Tucson, Arizona's Water Resources Research Center for groups addressing natural resource, land use or environmental issues. Provides extensive information on creating and maintaining successful partnerships including: traits of a good leader, provides information on active listening, communication skills, meeting hints and over-coming stumbling blocks such as conflict, agency bureaucracies, legal barriers and funding : http://ag.arizona.edu/AZWATER/publications/wrrcpubs.html or contact WRRC, 350 N. Campbell Ave., Tucson, AZ 85721; phone (520) 792-9591 or fax (520) 792-8518.

Program Organizing Guide — Whether organizing a new program or evaluate an existing program, this manual takes you through 11 steps to help organize successful programs in just 24 pages. Cost is $10.00 plus shipping and handling. Call River Network at (503) 241-3506.

USEPA's Capacity Building Website for watershed and restoration projects—- a full toolkit. http://www.epa.gov/owow/nps/capacity/index.htm

Meetings & Ground Rules

Basic guide to conducting meetings—- http://www.mapnp.org/library/misc/mtgmgmnt.htm#anchor639767

One of a set of modules on **reaching consensus**— http://www.hhh.umn.edu/centers/rlc/consensu/unit5.htm

Social Sciences Institute—- helpful **Factsheets** on running meetings, running public meetings, conflict resolution, community listening, focus groups, and any other social skill you might need. http://www.ssi.nrcs.usda.gov/ssi/B_Stories/A_Introduction.htm#ppcs

Outreach & education

EPA NPS outreach page..... http://www.epa.gov/owow/nps/outreach.html

Getting in Step: a guide to effective outreach in your watershed

This revised and updated guide provides the tools needed to effectively identify, engage, and involve stakeholders throughout a watershed to restore and maintain healthy environmental conditions. Key concepts highlighted in the guide include the following:

- Identifying driving forces
- Forming a stakeholder group
- Differentiating between positions and needs
- Keeping the process moving forward
- Dealing with conflict and hidden agendas
- Making decisions using a consensus-based approach

Go to http://www.epa.gov/watertrain/gettingistep/ for an online training module built around this book. To download a .pdf copy, go to http://www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf

Great sites to study:

http://www.serc.si.edu/education/ The Smithsonian Education & Outreach site with a talking "radio duck" giving reports on the Chesapeake Bay.

http://pa.lwv.org/wren/pubs/pubshed.html , the Watershed Restoration Education Network from Pennsylvania.

http://ohiowatersheds.osu.edu/owa/library/libmod11.html , Ohio Watershed Academy's outreach module.

http://www.countyofsb.org/project_cleanwater/public.htm , good education ideas from Santa Barbara County, California.

http://www.usawaterquality.org/newengland/focus_areas/residential/education/outreach.html, community education approach used by Connecticut.

Technical info on monitoring

Basic overview: go to EPA's monitoring site, http://www.epa.gov/owow/monitoring/

Pennsylvania's volunteer monitoring handbook, http://www.dep.state.pa.us/dep/subject/advcoun/pvemp/PA_VOLUNTEER_HANDBOOK.htm

Study Design Workbook — This 39 page book covers decision making during the monitoring process. It provides guidance in selecting water quality indicators, methods and locations, participants, schedules, and quality assurance programs. Cost is $10.00 plus shipping and handling. Call River Network at (503) 241-3506.

Indicators

Measuring community sustainability... site suggests many interesting indicators. http://www.ag.iastate.edu/centers/rdev/Community_Success/outcome4.html

Indicators selected for measuring the health of the Great Lakes ecosystems—- http://www.on.ec.gc.ca/solec/indicators2000-e.html

Environmental Indicators for Agriculture—- http://www1.oecd.org/publications/e-book/5101011E.PDF

Analysis

Seeing the BIG picture

Conservationists working with an individual landowner need to be familiar with the larger landscape where the farm is located; like a hawk on an updraft, they need to "see" the farm fields in the context of land uses all around the farm, perhaps even miles away. In the same way, a watershed plan for 9,000 or 75,000 acres also fits into a larger landscape, and many landuses and ecological niches are interwoven within the watershed. How can we grasp some of the intricacies of these landscapes without drowning in details? These three references can help you gain perspective:

Conservation Corridor Planning at the Landscape Level, NRCS, 8/1999

Written primarily as a wildlife habitat planning tool, this document has a lot to offer watershed planning as well. It looks at linkage of corridors and habitat as a way to gain sustain ability in a landscape. Since streams and rivers are also corridors, much of the material applies whether wildlife is one of your concerns or not. Through case studies and discussion of design principles, the manual leads to a better understanding of why the riparian areas of your watershed are so important to the health of the whole system. Available on web http://www.ms.nrcs.usda.gov/whmi/corridors.htm or from the NRCS State Office.

Understanding the Landscape, NRCS, Colorado State U., Oregon State U. 9/2002

This was developed as a course, with a student workbook and a boxful of videos. There is a

huge amount of information, but the format makes it possible to pull out parts of the material and use them independently. The five case studies, shown on video and with extensive clips from local people, would each make great kick-off pieces for a steering committee diving into a planning project. Available from the NRCS state office or from the NRCS Wildlife Habitat Institute, which coordinated course development.

Stream Corridor Restoration Handbook,

Federal Interagency Stream Restoration Working Group, 10/1998

All the technical and scientific information that's **NOT** in this document you have in your hand is in the *Stream Corridor Restoration Handbook*, from geomorphology & hydrology to indicators and restoration design. A lot of it may go over your head or past your left ear, but there is something here for everyone from the lay person to the consultant. The most important thing you may gain from using it is an understanding of when streambank stabilization is feasible and when it's better to leave well enough alone (and use the dollars to some better purpose). Available through NRCS or on the web at http://www.usda.gov/stream_restoration/

Practices & Measures

NRCS "eFOTG": electronic Field Office technical Guide. Read the intro, then go to the section on practices and standards to become familiar with BMPs, primarily for agriculture. http://www.in.nrcs.usda.gov/PlanningandTechnology/fotg/fotg.htm

Other BMP Sites:

Measures for Stormwater Phase II implementation: http://cfpub.epa.gov/npdes/stormwater/menuof-bmps/BMP_files.cfm

BMPs for Pork Production: http://www.epa.state.il.us/p2/fact-sheets/hog-facts.html

Why the Virtual Library for Sustainable Agriculture is hosted here beats me, but there are a number of very useful links: http://www.floridaplants.com/best.htm

Forestry BMPs: http://www.fnr.purdue.edu/inwood/past%20issues/WhatisaForestryBMP.htm

More agriculture: http://www.epa.gov/agriculture/tpol.html

Appendix E. Glossary of Acronyms used in Discussing Watershed Issues in Indiana

Acronym	Agency/Institution	Federal/State/Private
303(d)	The specific list of waters that are impaired and need restoration in order to meet state water quality standards	State
305(b)	State water quality reports	State
319	Section 319 of the Clean Water Act. provides funding associated with Sections 104 and 205j	Federal, through IDEM
ATSDR	Agency for Toxic Substances & Disease Registry	Federal
BIA	Bureau of Indian Affairs	Federal
BLM	Bureau of Land Management	Federal
BMP	Best Management Practices	Term
CES	Cooperative Extension Service	State
CEQ	Council on Environmental Quality	Federal
CRP	Conservation Reserve Program	Program of NRCS
CTIC	Conservation Technology Information Center	Private
CWA	Clean Water Act	Federal
CZARA	Coastal Zone Administration and Remediation Act	Federal
DC	District Conservationist (of NRCS)	Federal Employees
DI or DOI or USDI	U. S. Department of the Interior	Federal
EPA or USEPA	U. S. Environmental Protection Agency	Federal
EQIP	Environmental Quality Incentive Program	Program of NRCS
fIBI	Fish Community Index of Biotic Integrity	Term
FOTG	Field Office Technical Guide	Water Quality Criteria
FSA	Farm Service Agency	Federal
GIS	Geographic Information System	Term

GPS	Global Positioning System	Term
HEC	Hoosier Environmental Council	Private
HUC	Hydrologic Unit Code	Term
IACT	Indiana Association of Cities & Towns	Private
IASWCD	Indiana Association of Soil & Water Districts	State
IDEM	Indiana Department of Environmental Management	State
IDNR	Indiana Department of Natural Resources	State
IFB	Indiana Farm Bureau	State
ISDH	Indiana State Department of Health	State
IWPG	Indiana Watershed Planning Guide	State Publication
L-THIA	Long-Term Hydrologic Impact Assessment	Analysis tool
LARE	Lake & River Enhancement	Program of IDNR
MACOG	Michigan Area Council of Governments	Public
mIBI	Macroinvertebrate Index of Biotic Integrity	Term
MRBC	Maumee River Basin Commission	Quasi-public
NACD	National Association of Conservation Districts	Private
NEPA	National Environmental Protection Act	Federal
NGO	Nongovernmental Organization	Term for Private organization
NOAA	National Oceanic and Atmospheric Agency	Federal
NPS	National Park Service	Federal
NPS	Nonpoint Source Pollution	Term
NRCS	Natural Resources Conservation Service	Federal
NAWQA	National Water Quality Assessment	Report and Federal Program
OCA or OCAg	Office of the Commissioner of Agriculture	State
OISC	Office of the Indiana State Chemist	State
ORSANCO	Ohio River Sanitary Commission	Quasi-federal
OSM	U. S. Office of Surface Mines	Federal
OWQ	Office of Water Quality at IDEM	State

QAPP	Quality Assurance Project Plan	Term
QHEI	Qualitative Habitat Evaluation Index	Term
RC&D	Resource Conservation & Development (Program of NRCS)	Federal/Private
RD	Rural Development	Federal
RRA	Rapid Resource Appraisal	Term
RUSLE	Revised Universal Soil Loss Equation	Equation
SHPO	State Historic Preservation Office	State
SJRBC	Saint Joseph River Basin Commission	Quasi-public
SPEA	School of Public and Environmental Affairs (IU)	State
SRF	State Revolving Fund	Loan Program through IDEM. Monies are federal, passed through the state
SWAT	Soil and Water Assessment Tool	Model
SWCD	Soil and Water Conservation Districts	State
TMDL	Total Maximum Daily Load	Term
TNC	The Nature Conservancy	Private
TSS	Total Suspended Solids	Term
TVA	Tennessee Valley Authority	Federal/Private
USACE or ACE or COE	U. S. Army Corps of Engineers	Federal
USDA	U. S. Department of Agriculture	Federal
USF&WS	U. S. Fish & Wildlife Service	Federal
USFS	U. S. Forest Service	Federal
USGS	U. S. Geological Survey	Federal
WATER Committee	Watershed Agency Team for Enhancing Resources	Multi-agency group that acts as a forum for watershed issues
WEPP	Water Erosion Prediction	Model
WQ	Water Quality	Term
WRP	Wetland Reserve Program	Program of NRCS

Appendix F. Index

Appendix G.
Map of Indiana's 8-digit Watersheds