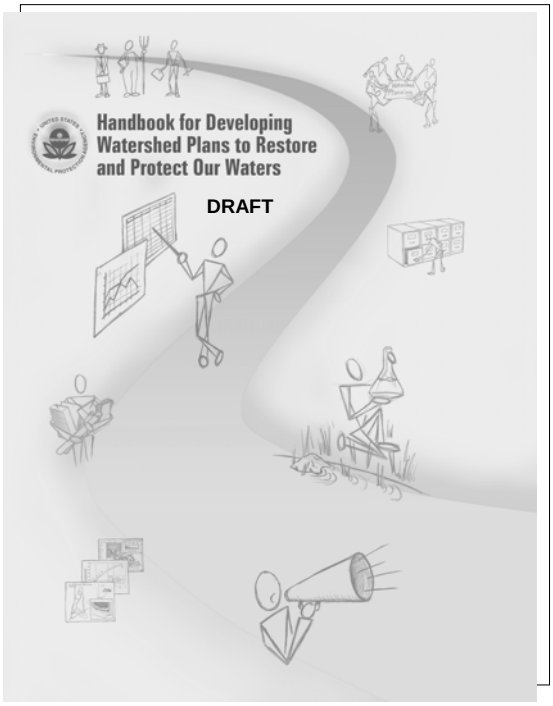


The Watershed Academy

EPA

January 18, 2006
Webcast

Using EPA's Draft *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* to Help Answer Watershed Planning Questions

Tetra Tech, Inc.

1

Cast of Characters

(in order of appearance)

Charlie MacPherson, Tetra Tech

Stuart Lehman, USEPA NPS Control Branch

Leslie Shoemaker, Tetra Tech

Barry Tonning, Tetra Tech

2

Road Map for Webcast

- Handbook Overview
- EPA's perspective
- Step 1: Build Partnerships
- Step 2: Characterize Watershed
- Step 3: Set Goals, Identify Solutions
- Step 4: Develop implementation Program
- Step 5: Implement Plan
- Step 6: Monitor and Evaluate

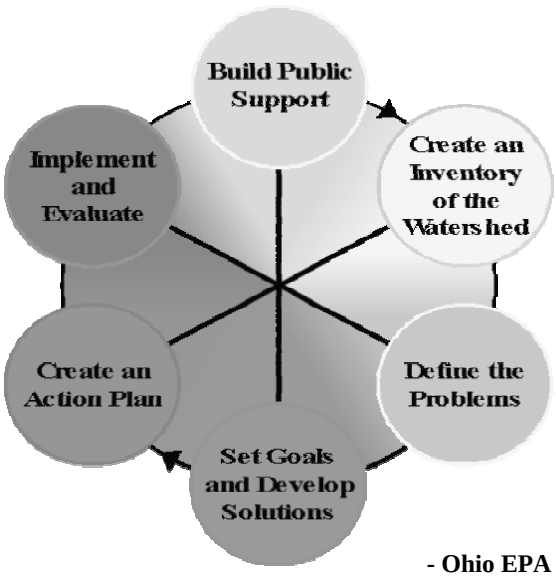
3

Overview of Handbook

www.epa.gov/owow/nps/watershed_handbook

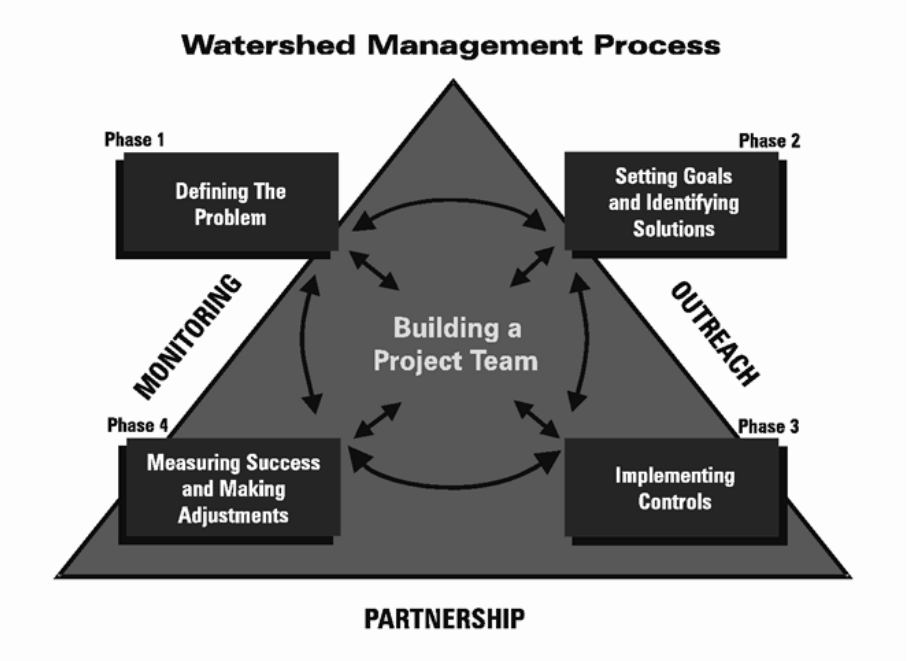
- 13 Chapters
- Worksheets, checklists
- Resources
- Glossary

4


Build Public Support
Create an Inventory of the Watershed
Define the Problems
Set Goals and Develop Solutions
Create an Action Plan
Implement and Evaluate

- Ohio EPA

5



- Watershed Management Guide, 2003

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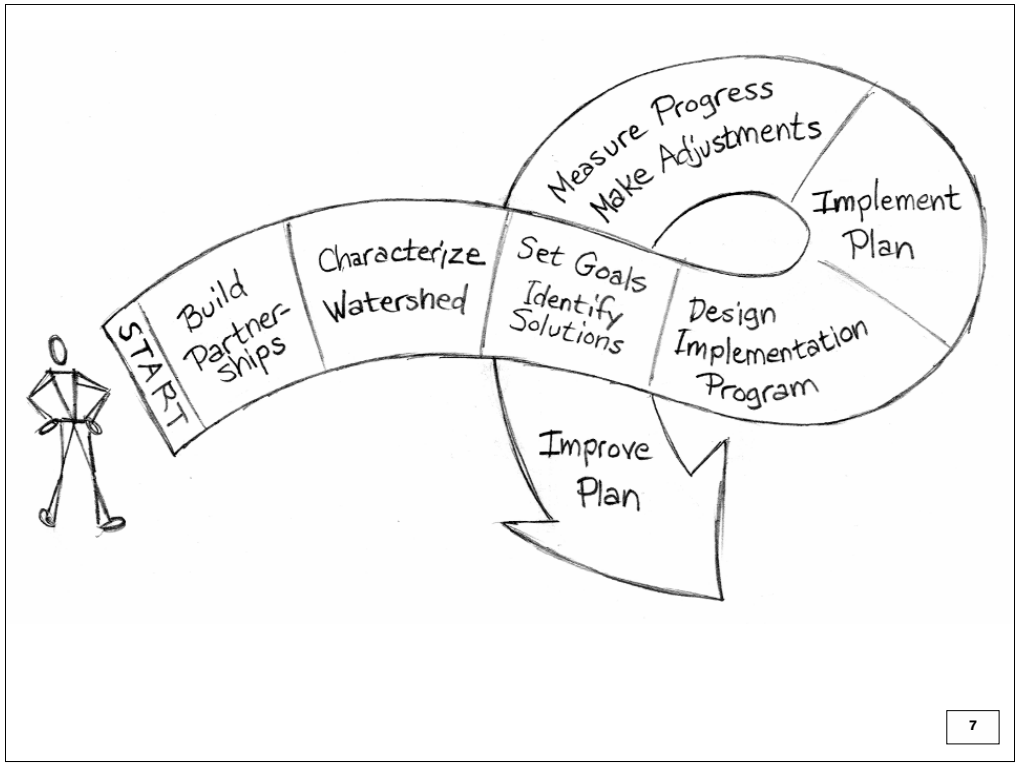
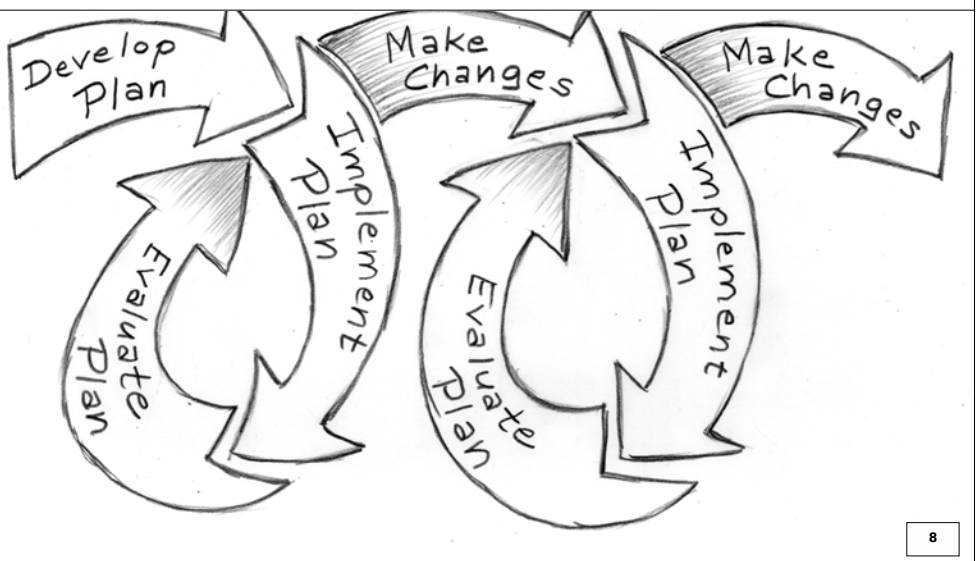

START
Build Partner-ships
Characterize Watershed
Set Goals Identify Solutions
Design Implementation Program
Implement Plan
Measure Progress Make Adjustments
Improve Plan
7

Watershed Planning is Iterative



8

Watershed Planning Steps

STEP 1
BUILD PARTNERSHIPS

- ID stakeholders
- ID issues of concern
- Set preliminary goals
- Develop indicators
- Conduct outreach

9

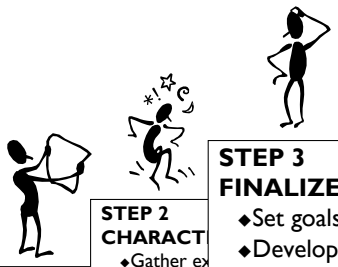
Watershed Planning Steps

STEP 1
BUILD PA
- ID stake
- ID issue
- Set prel
- Develop
- Conduc

STEP 2
CHARACTERIZE WATERSHED
- Gather existing data
- Create data inventory
- ID data gaps
- Collect additional data, if needed
- Analyze data
- ID causes and sources
- Estimate pollutant loads

10

Watershed Planning Steps



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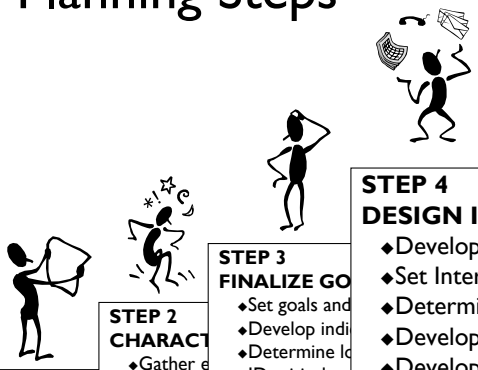
- Collect ac
- Analyze d
- ID causes
- Estimate p

STEP 3
FINALIZE GOALS AND IDENTIFY SOLUTIONS
- Set goals and management objectives
- Develop indicators/targets
- Determine load reductions needed
- ID critical areas
- ID management measures needed

11

Watershed Planning Steps



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STEP 3
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- Develop indi
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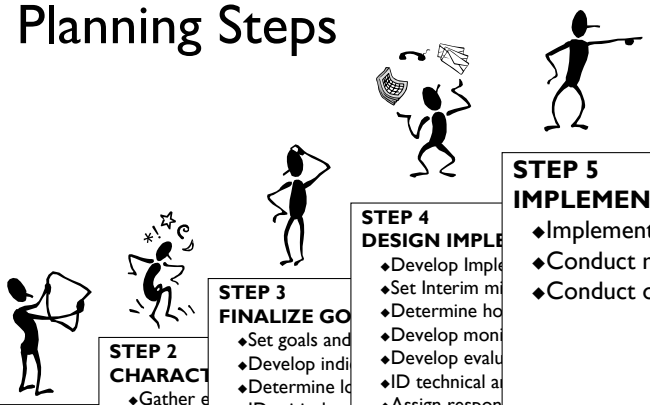
- ID manageme

STEP 4
DESIGN IMPLEMENTATION PROGRAM
- Develop Implementation schedule
- Set Interim milestones
- Determine how you will measure success
- Develop monitoring component
- Develop evaluation process
- ID technical and financial assistance needed
- Assign responsibility

12

Watershed Planning Steps



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- ID technical a
- Assign respon

STEP 5
IMPLEMENT WATERSHED PLAN
- Implement management strategies
- Conduct monitoring
- Conduct outreach activities

13

Watershed Planning Steps

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- ID technical a
- Assign respon

STEP 5
IMPLEMENT
- Implement
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- Conduct o

STEP 6
MEASURE PROGRESS AND MAKE ADJUSTMENTS
- Review and evaluate
- Share results
- Prepare annual plans
- Make adjustments

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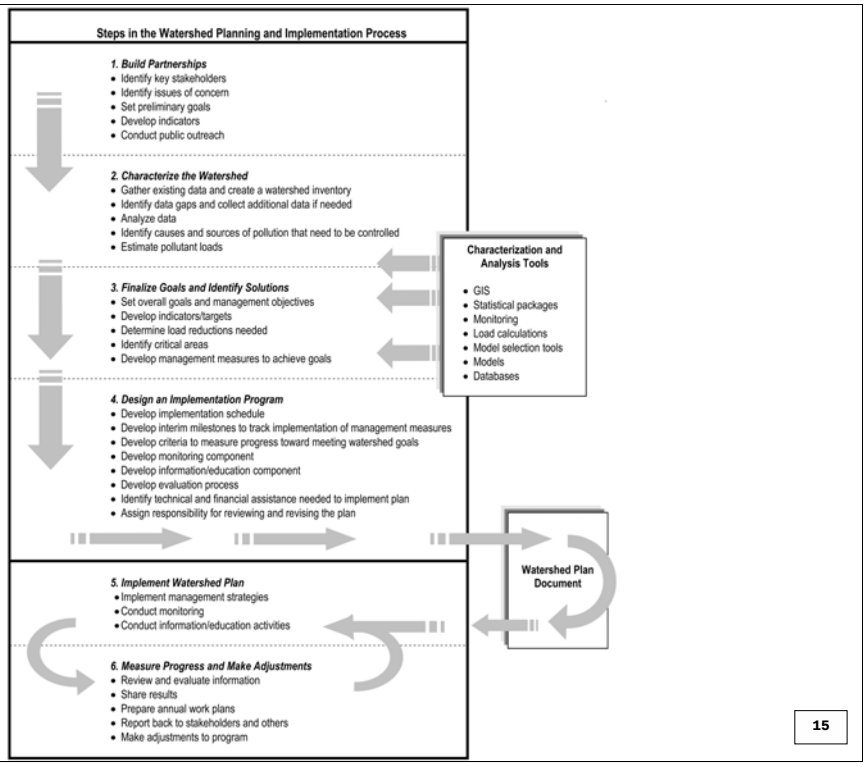
Steps in the Watershed Planning and Implementation Process
1. Build Partnerships
• Identify key stakeholders
• Identify issues of concern
• Set preliminary goals
• Develop indicators
• Conduct public outreach
2. Characterize the Watershed
• Gather existing data and create a watershed inventory
• Identify data gaps and collect additional data if needed
• Analyze data
• Identify causes and sources of pollution that need to be controlled
• Estimate pollutant loads
3. Finalize Goals and Identify Solutions
• Set overall goals and management objectives
• Develop indicators/targets
• Determine load reductions needed
• Identify critical areas
• Develop management measures to achieve goals
Characterization and Analysis Tools
• GIS
• Statistical packages
• Monitoring
• Load calculations
• Model selection tools
• Models
• Databases
4. Design an Implementation Program
• Develop implementation schedule
• Develop interim milestones to track implementation of management measures
• Develop criteria to measure progress toward meeting watershed goals
• Develop monitoring component
• Develop information/education component
• Develop evaluation process
• Identify technical and financial assistance needed to implement plan
• Assign responsibility for reviewing and revising the plan
Watershed Plan Document
5. Implement Watershed Plan
• Implement management strategies
• Conduct monitoring
• Conduct information/education activities
6. Measure Progress and Make Adjustments
• Review and evaluate information
• Share results
• Prepare annual work plans
• Report back to stakeholders and others
• Make adjustments to program
15

The Nine Elements

a. Identify causes & sources of pollution
b. Estimate load reductions expected
c. Describe mgmt measures & targeted critical areas
d. Estimate technical and financial assistance needed
e. Develop education component
f. Develop schedule
g. Describe interim, measurable milestones
h. Identify indicators to measure progress
i. Develop a monitoring component

Source: US EPA, 2004 319 Supplemental Guidelines

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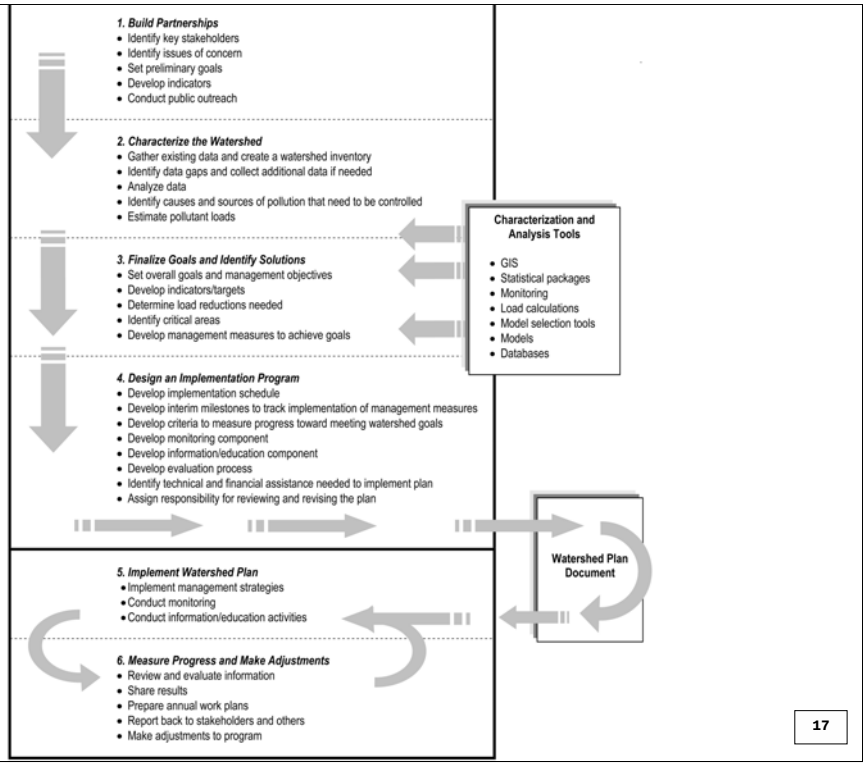
Steps in the Watershed Planning and Implementation Process



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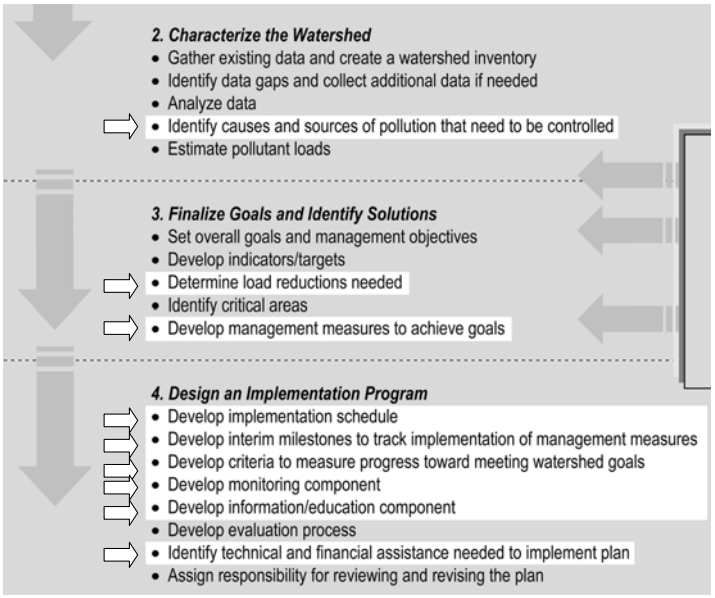
Incorporation of the nine minimum elements



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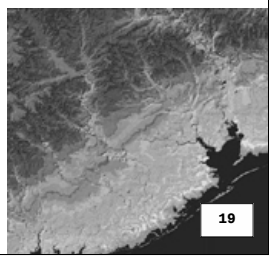
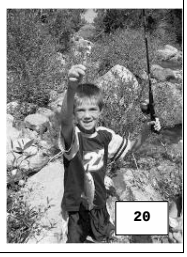
EPA's Perspective

- What are we learning from watershed efforts across the country?
  - Water problems are not spread evenly across the landscape
  - There is a growing vast body of knowledge on BMP effectiveness, as well as, assessment tools
  - Partnerships are imperative, but how does one organize and manage clean-up efforts more effectively?
  - Results are elusive; How do know if you are achieving goals unless you are monitoring for them?



EPA's Perspective

- We think the 9 elements are critical to watershed plans, particularly:
  - Quantifying pollutant sources to guide plan development
  - Understanding what NPS management practices will achieve along with the point source controls
  - Looking ahead to implementing and revising the watershed plan
- Watershed plans should contain more than our 9 elements – e.g. Protection, Drinking Water, Habitats, Fisheries, State Priorities



EPA's Perspective

- What should watershed plans provide?
  - **Clear Purpose & a Roadmap** - needed to coordinate complex scientific, social, and economic activities
  - **Accountability** – What indicators are we going to count and why are they important to watershed resources?
  - **Program Integration thru Partnerships** - TMDLs, 319, NPDES, Source Water Protection, wetlands, Farm Bill Programs, local planning, private investment

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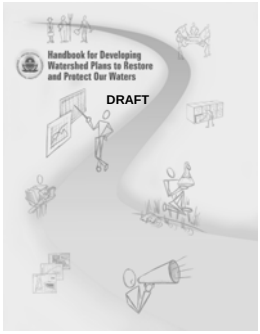
EPA's Perspective



- Our hope it that this handbook will supplement existing guides
- Provides assistance in developing the necessary details of effective plans
- Serves as a starting point for an updateable document on planning across programs and levels of governance.

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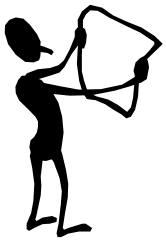

Step 1. Build Partnerships

- ID stakeholders
- ID issues of concern
- Set preliminary goals
- Develop indicators
- Conduct outreach

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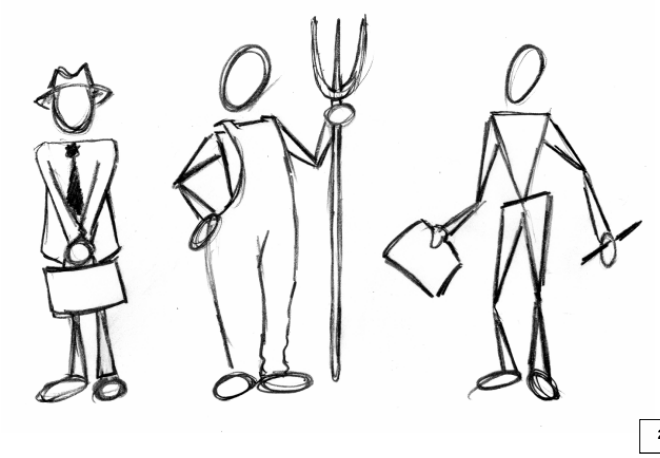
How do I know who to involve in my watershed planning effort?



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Answer the following:

- Who's responsible for implementation?
- Who will be affected?
- Who has information on issues?
- Who can provide technical and/or financial support?

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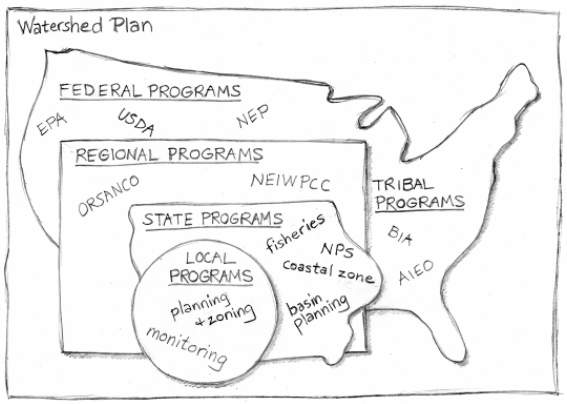
How do I know what other programs I should coordinate my watershed planning efforts with?



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Start Local…go National

- Local programs
  - Planning and zoning
  - Stormwater management
- State/Tribal
  - DOT
  - Fish and Wildlife programs
- National
  - Wetlands protection
  - Public lands

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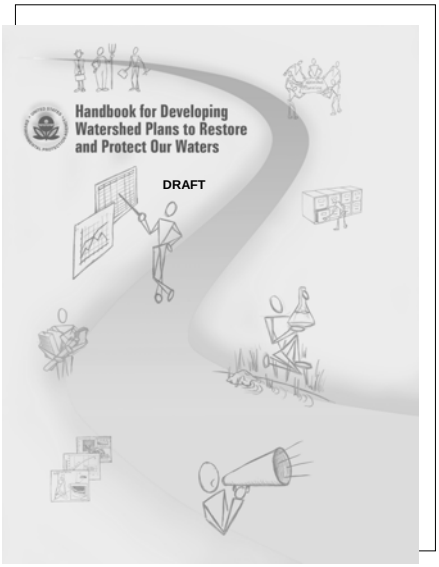
Questions?



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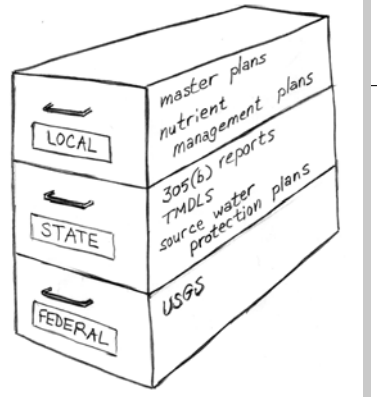
Step 2. Characterize Watershed

- Gather existing data
- Create data inventory
- ID data gaps
- Collect additional data, if needed
- Analyze data
- ID pollution causes and sources
- Estimate pollutant loads



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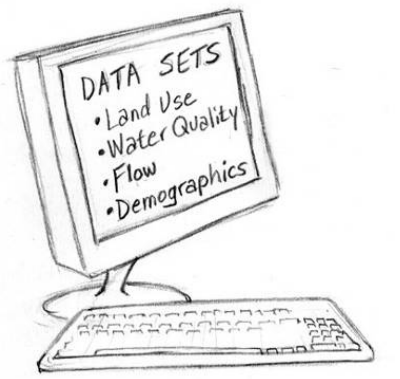
- What do we know about the watershed?
- What does the available information tell us?
- What information is missing?



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Collecting the Data

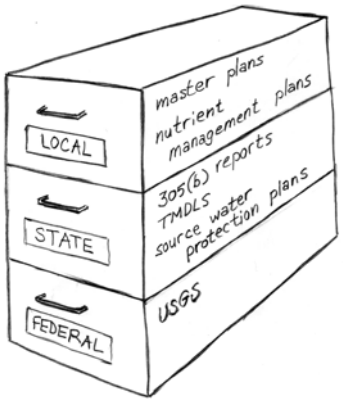
31

Programs that Focus Characterization Needs and Data

32

Collecting the Available Information

- Earlier reports
- Multiple agencies
- Targeted to concerns and current study



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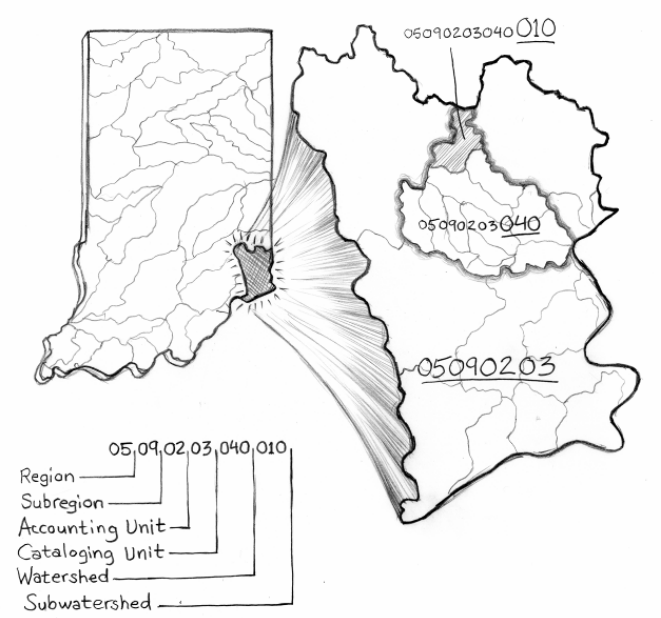
It's all a matter of scale…



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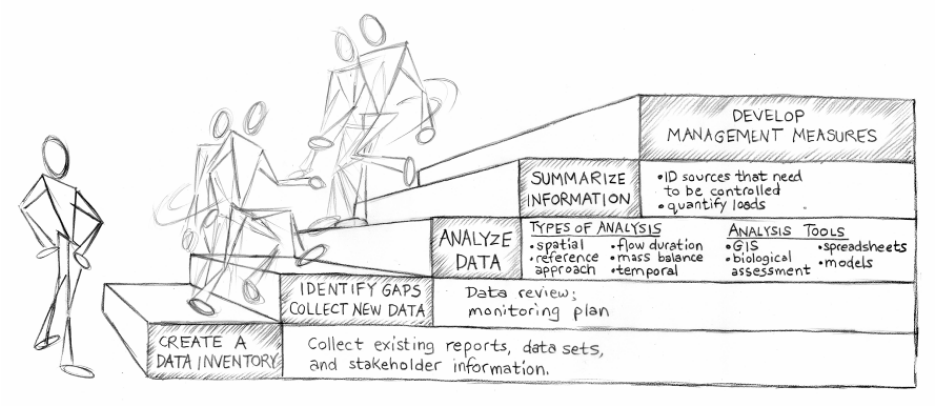
Supplementing available data

- "Windshield Surveys"
- Interviews
- Volunteer monitoring
- Bioassessment
- Targeted sampling
- Chemical/biological sampling

35

… and an ongoing learning process



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Data Analysis Techniques

- Maps
- Statistics
- Graphs
- Interpretation/experience

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Evaluating the water quality

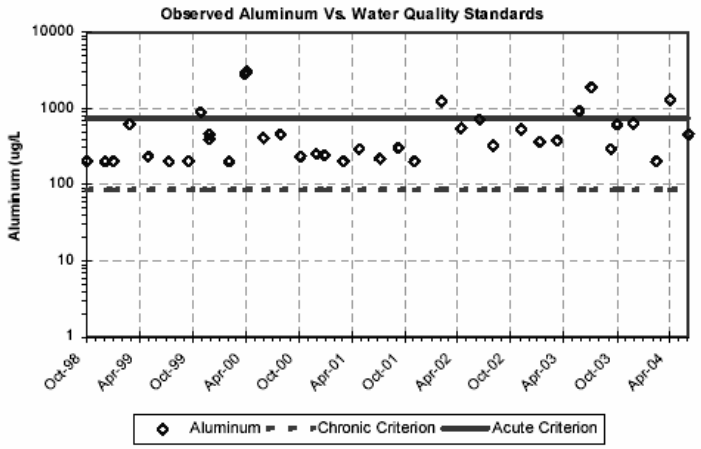

Figure 7-1. Example graph of observed aluminum concentrations compared to water quality criteria.

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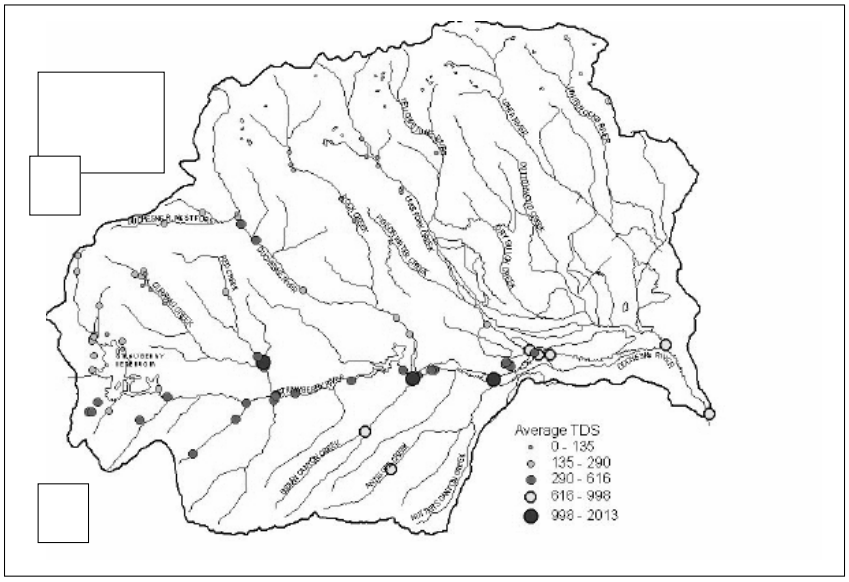
Looking across the watershed…



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Diagnosing Sources…

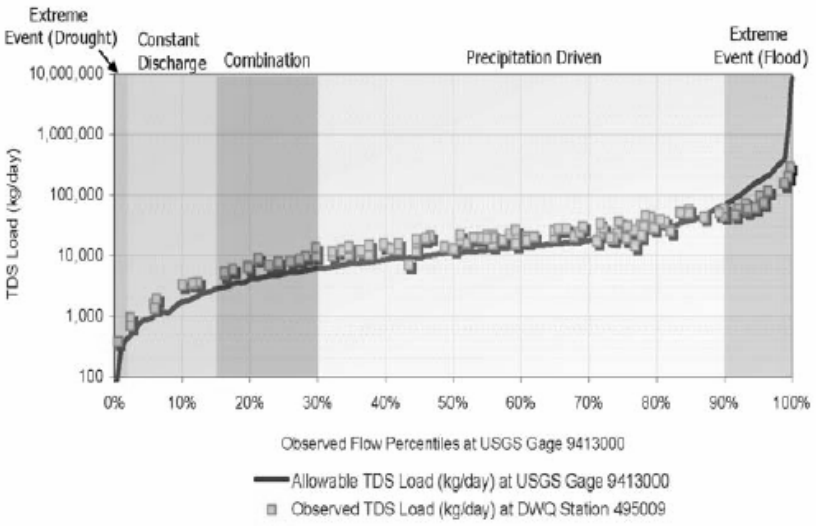

Figure 7-5. Example load duration curve.

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Interpreting Graphs…

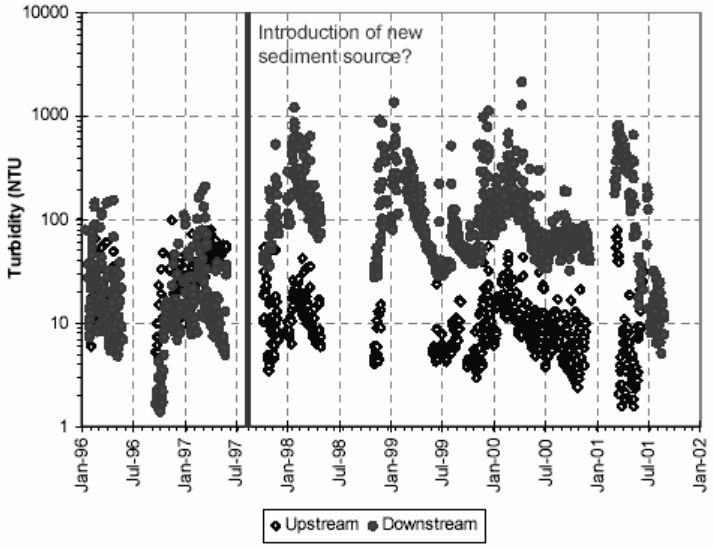

Figure 7-7. Long-term turbidity levels at two stations in Lake Creek, Idaho.

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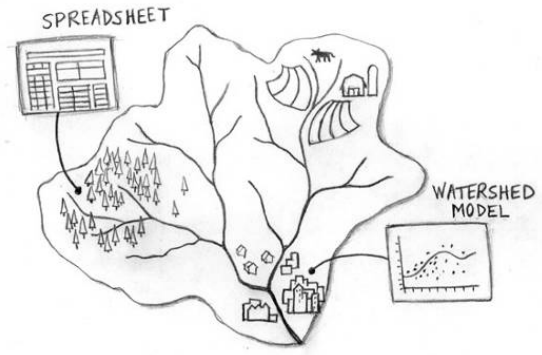
How can we estimate loads?

- Monitoring data
- Mass balance approach
- Modeling



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So….how do we do this???

One of the simplest ways is to use existing monitoring data to determine total loading from a watershed upstream of a monitoring station. Does attribute loads to a particular source, but does give you an overview of what the current loads are. Good for explaining historical or current loads…but no good for predicting future loads b/c conditions could change due development, weather events, fire events…etc.

Another way to estimate loads is the mass balance approach? This approach involves calculating the mass entering and existing the water waterbody.

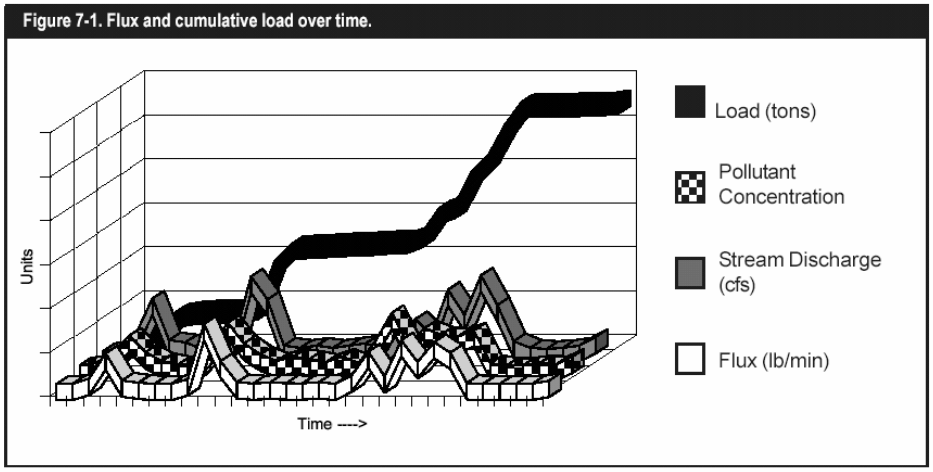
And then there's modeling…which involves using a set of equations to represent or predict processes based on what's happened in the past or what is currently happening.

Who here has experience in water quality modeling? Can you tell us what models you used and some tips or hints on making them work for you?

??

Monitoring data can be used to directly estimate the loading from a watershed. This is an estimate of the total loading from a watershed upstream of a monitoring point. This type of estimate does not attribute loads to particular sources but instead groups all loads into a single category. This generalized loading can help to evaluate downstream impacts, can be used to calculate a per acre loading, and can be used

Is modeling necessary?



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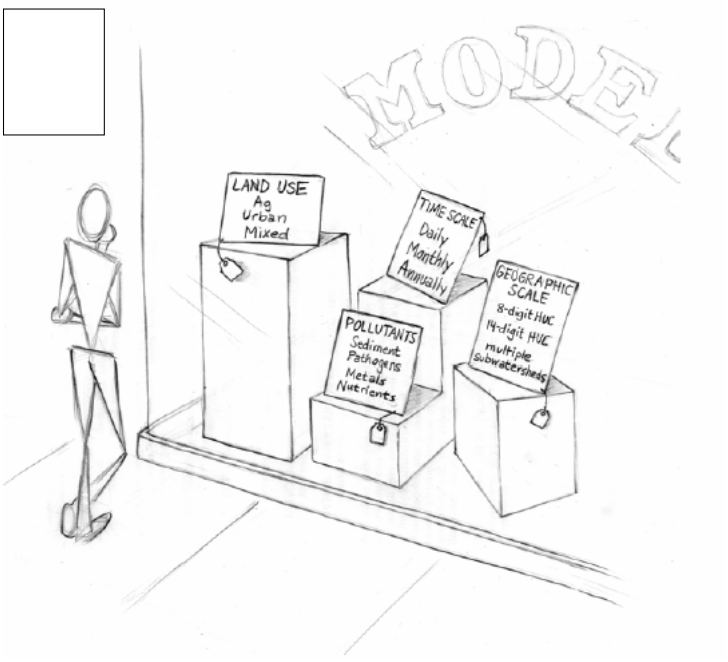
As opposed to estimating loads with direct monitoring data…..modeling can help you separate sources, processes, types of soils, seasons and weather events. It can help you estimate runoff, sediment transport, etc. You've got to decide if the effort and expertise needed in watershed modeling is worth the benefit. Can you reach the same general conclusion simply using monitoring data and best professional judgment? In smaller subwatersheds…that certainly might be the case.

Selecting the Appropriate Model



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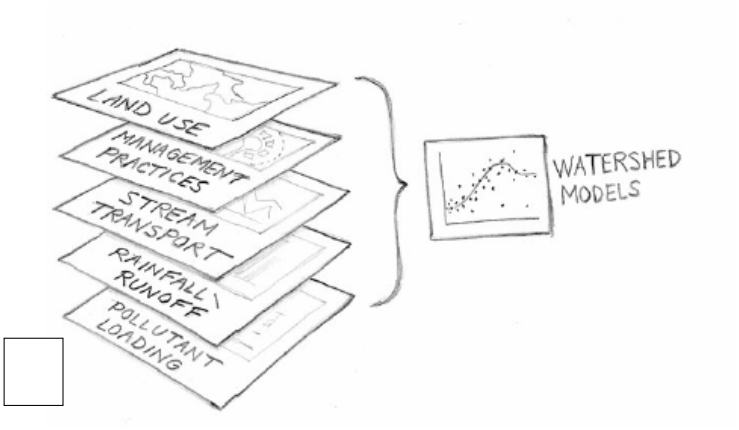
Combining data sources and estimating watershed response



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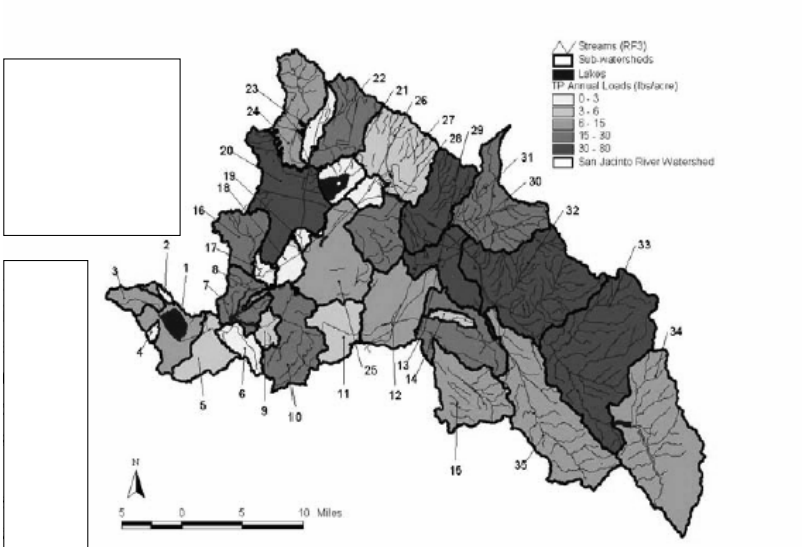

Figure 8-5. Presentation of annual sediment loads (lb/ac) by subwatershed, San Jacinto, California.

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Seven most commonly used models

- STEPL
  - Excel spreadsheet with a BMP calculator
- AGNPS
  - USDA model that predicts nitrogen, phosphorus, and organic carbon
- GWLF Generalized Watershed Loading Function
  - Simulates runoff, sediment, nutrients
- P8
  - Urban model including management practices
- SWAT
  - Agriculture, management practices
- SWMM
  - Detailed urban/stormwater model
- HSPF (Hydrologic Simulation Program-Fortran)
  - Detailed mixed land use model

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I've listed here a few models typically used in watershed planning. This list moved from simple to more complex.

STEPL is a simple spreadsheet model that has a BMP calculator that computes the combined effectiveness of multiple BMPS in a watershed. So in the model, you can select the BMPS you want and it will tell you the expected pollutant load reductions….based on the baseline data you input. You need to know something about hydrology and of course you need to know excel and how to work with formulas in excel.

AGNPS was developed for agricultural or mixed-land-use watersheds. It predicts nitrogen, phosphorus, and organic carbon. It is appropriate for use on watersheds of up to 500 km^2, providing information on the impact on various locations in the watershed, rather than simply various land uses.

STEPL we talked about earlier…

GWLF

The Generalized Watershed Loading Function (GWLF) model simulates runoff and sediment delivery using the SCS curve number equation and the USLE, combined with average nutrient concentration based on land use. GWLF is a good choice for watershed planning where nutrients and sediment are primary concerns. Because of the lack of detail in predictions and stream routing (transport of flow and loads

Relating endpoints to models

Parameter/Endpoint	AGNPS	STEPL	GWLF[a]	HSPF	P8-UCM	SWAT	SWMM
Total phosphorus (TP) load	◗	○	◗	●	●	◗	●
TP concentration	◗	–	◗	●	●	◗	●
Total nitrogen (TN) load	◗	○	◗	●	●	◗	●
TN concentration	◗	–	◗	●	●	◗	●
Nitrate concentration	–	–	–	●	–	◗	●
Ammonia concentration	–	–	–	●	–	◗	●
TN:TP mass ratio	–	–	◗	●	–	◗	●
Dissolved oxygen	◗	–	–	●	–	◗	●
Chlorophyll a	–	–	–	●	–	◗	–
Algal density (mg/m^2)	–	–	–	–	–	–	–
Net total suspended solids load	–	○	–	●	●	–	●
Total suspended solids concentration	◗	–	–	●	●	◗	●
Sediment concentration	◗	–	◗	●	●	–	●
Sediment load	◗	○	◗	●	–	◗	●
Metals concentrations	–	–	–	●	–	◗	●
Pesticide concentrations	◗	–	–	●	–	◗	–
Herbicide concentrations	◗	–	–	●	–	◗	–

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Step 3: Finalize Goals and Identify Solutions

- Set goals and management objectives
- Develop indicators/targets
- Determine load reductions needed
- ID critical areas
- ID management measures needed

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Goals and Objectives

- Refine "big picture goals" set in the characterization phase
  - Restore aquatic habitat in Turtle Creek watershed
  - Meet water quality standards for bacteria
- Translate into Specific Management Objectives
  - Restore aquatic habitat in the upper main stem of Turtle Creek by controlling agricultural sources of sediment
  - Reduce bacteria loads from livestock operations

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Once you've estimated the current loads and how much the loads need to be reduced…you need to identify the management objectives needed to help meet those load reductions.

Select Indicators/Targets

- Measurable parameters to link pollutant sources to environmental conditions
  - Peak flow
  - Nutrient concentration
  - Temperature
- Specific numeric value set as target for each
  - Based on water quality criteria, reference conditions, etc.

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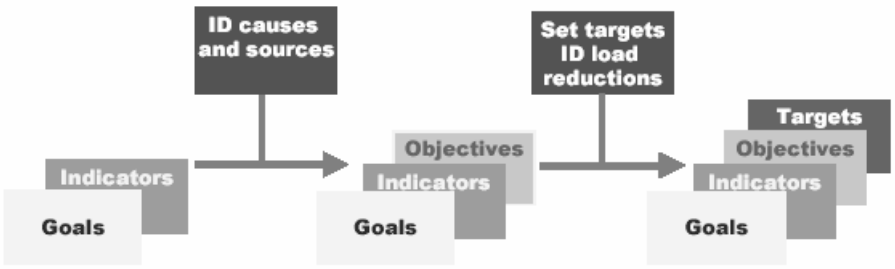
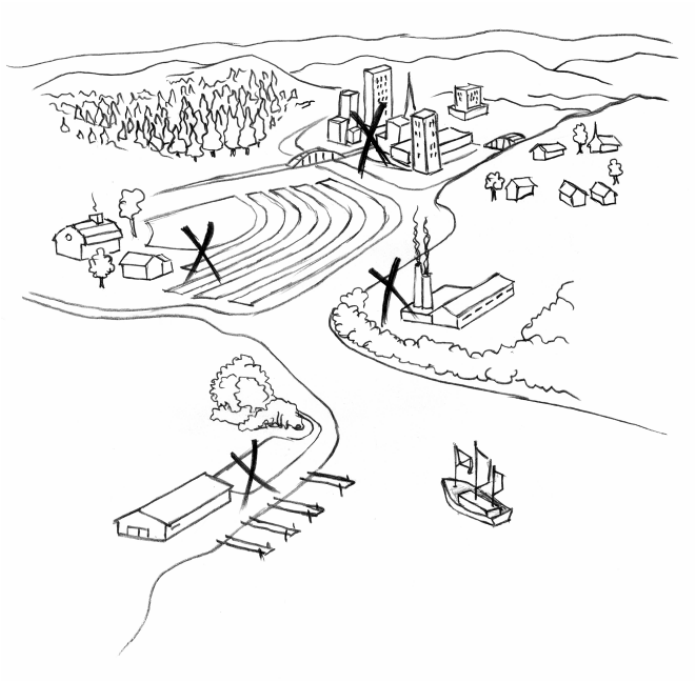
So after you've set up you management objectives you need to identify those milestones…which means selecting some indicators which are things like peak flow, nutrient concentration, etc…..so those are the environmental indicators…and then you identify specific numeric values that you want to reach for each. Now you don't have to set numeric values always,…these could be more narrative targets…like reduce stream temperatures low enough to support cutthroat trout. Maybe you're not sure what that exact temp. is….so you set a more qualitative target instead of a number.



Process for identifying final watershed goals and targets.

52



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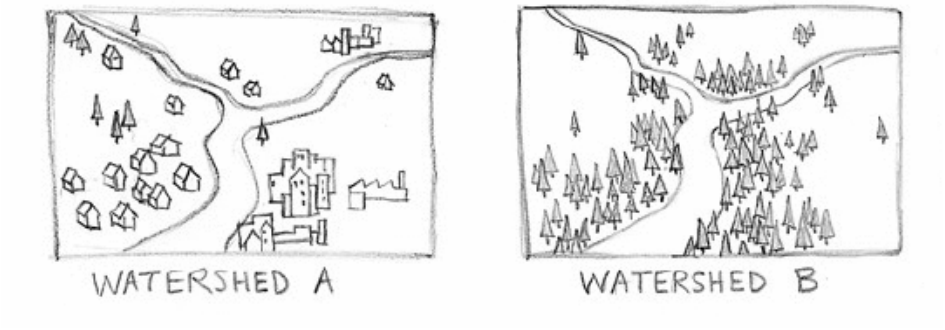
Reference watersheds can be used to set targets



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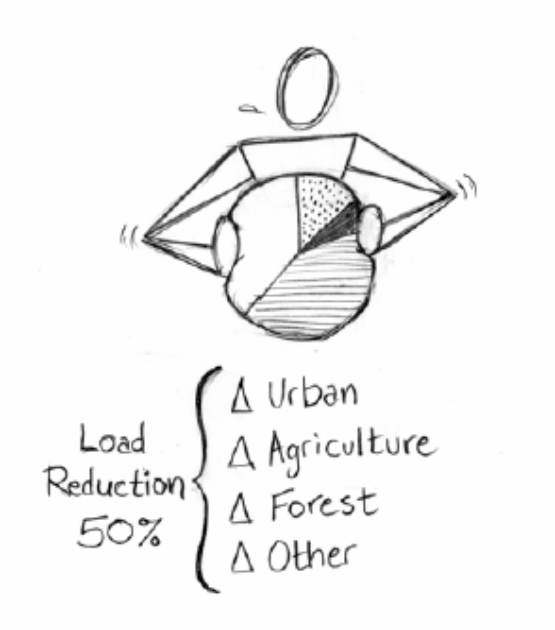

Identify management targets

55

Examples of Different Scenarios to Meet the Same Load Target

Source	Existing Phosphorus Loading (kg/y)	Scenario 1		Scenario 2	
		% Load Reduction	Allowable Load (kg/y)	% Load Reduction	Allowable Load (kg/y)
Roads	78	26	58	20	62
Pasture/Hay	21	26	16	10	19
Cropland	218	26	162	55	98
Forest	97	26	72	0	97
Landfill	7	26	5	0	7
Residential	6	26	5	0	6
Groundwater	111	26	83	0	111
Total	539	26	400	26	400

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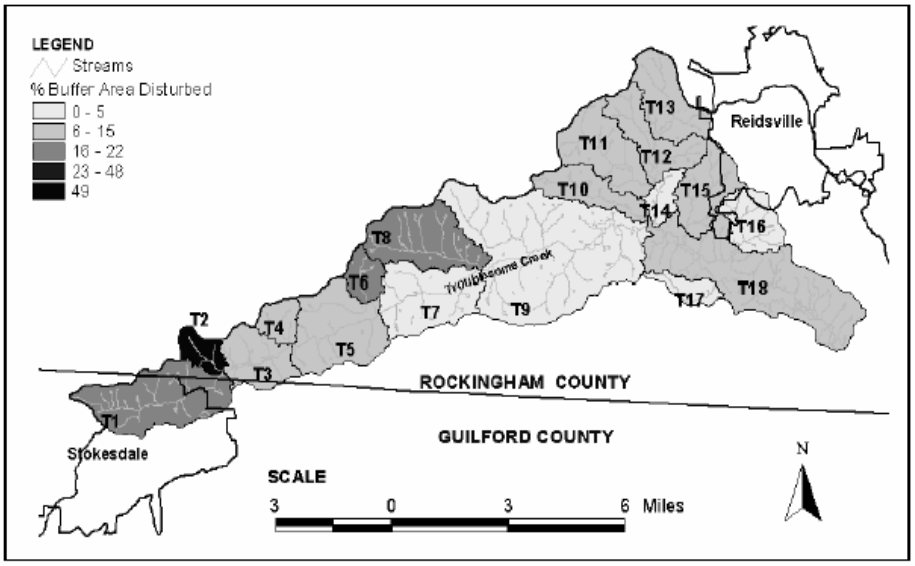
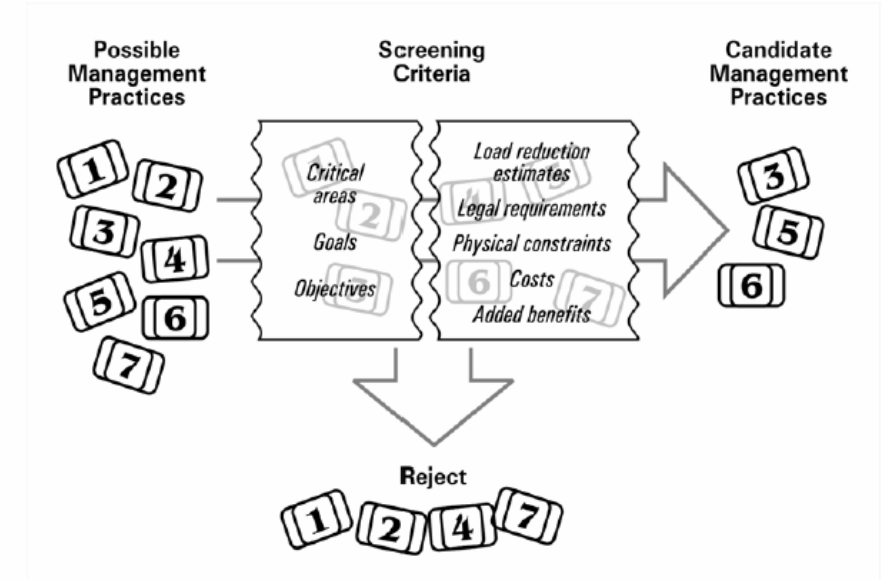


Figure 10-2. Percentage of buffer area disturbed and impaired waters in the Troublesome Creek watersheds.

57

Identify candidate practices



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Select the most appropriate BMPs

- Look at what's worked and what hasn't
- Research effectiveness
- Consider costs/benefits
- Property ownership/site access
- Look for added benefits
- Use a combination of techniques
- Focus efforts on critical areas; use more or better BMPs there

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Selecting Management Practices

Table 10-5. Example Ranking Table to Identify Candidate Management Practices

Management Practice	Pollutant Reduction Effectiveness	Cost	Added Benefits	Public Acceptance	Maintenance	Total
Gradient terraces	2	3	1	2	4	2.4
Grassed swales	3	4	3	4	4	3.2
Wet extended detention ponds	2	3	2	3	3	2.6
Model ordinances	4	3	2	4	4	3.4

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References for determining BMP effectiveness

- Stormwater/Urban (BMP Effectiveness database; Menu of BMPs)
- Agriculture (Ag Management Measure document)
- Forestry (Forestry Management Measures document)
- Mining (Development document for proposed Effluent Guideline for Mining)

www.epa.gov/nps

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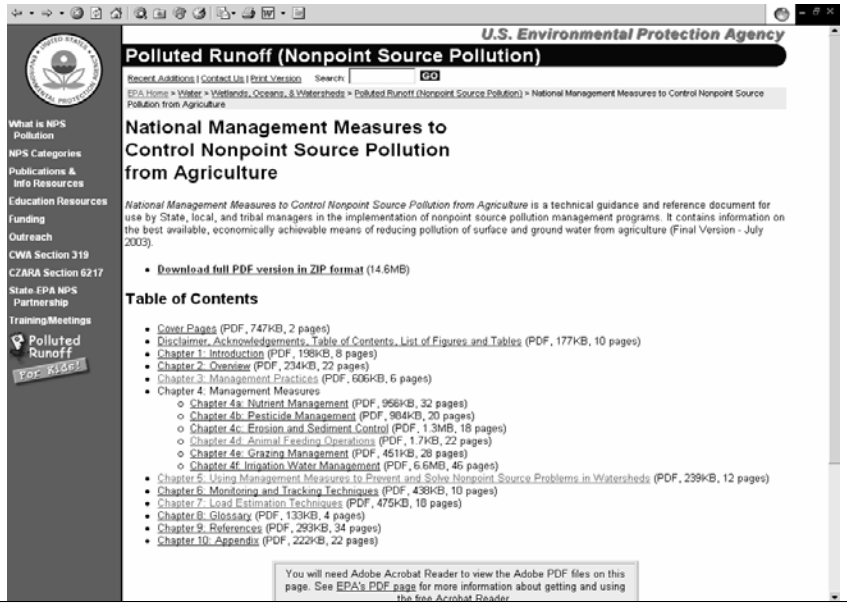
There are a lot of resources to draw on in determining which BMPs will achieve the best results for the site, stressors, and sources identified. Nearly all of these resources can be found on the internet.

www.epa.gov/owow/nps/ agmm/index.html



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www.epa.gov/owow/nps/agmm/ index.html

Table 4d-6. Relative gross effectiveness[a] (load reduction) of animal feeding operation control measures (Pennsylvania State University, 1992b).

Practice[b] Category	Runoff Volume	Total[d] Phosphorus (%)	Total[d] Nitrogen (%)	Sediment (%)	Fecal Coliform (%)
Animal Waste Systems[e]	reduced	90	80	60	85
Diversion Systems[f]	reduced	70	45	NA	NA
Filter Strips[g]	reduced	85	NA	60	55
Terrace System	reduced	85	55	80	NA
Containment Structures[h]	reduced	60	65	70	90

NA = not available.
[a] Actual effectiveness depends on site-specific conditions. Values are not cumulative between practice categories.
[b] Each category includes several specific types of practices.
[d] Total phosphorus includes total and dissolved phosphorus; total nitrogen includes organic-N, ammonia-N, and nitrate-N.
[e] Includes methods for collecting, storing, and disposing of runoff and process-generated wastewater.
[f] Specific practices include diversion of uncontaminated water from confinement facilities.
[g] Includes all practices that reduce contaminant losses using vegetative control measures.
[h] Includes such practices as waste storage ponds, waste storage structures, waste treatment lagoons.

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www.bmpdatabase.org/docs.htm

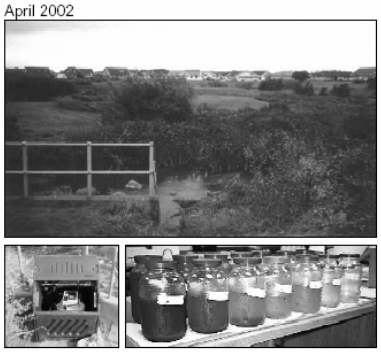
EPA United States Environmental Protection Agency

ASCE American Society of Civil Engineers

Urban Stormwater BMP Performance Monitoring

A Guidance Manual for Meeting the National Stormwater BMP Database Requirements

April 2002



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Sample BMP effectiveness table

Table 6-3. BMPs and removal efficiencies used in Site Evaluation Tool BMP percent efficiency

BMP	Percent Efficiency			
	TSS	Total Nitrogen	Total Phosphorus	Fecal Coliform
Wet pond	85 [d]	33 [a]	51 [a]	70 [a]
Dry detention	47 [a]	25 [a]	19 [a]	78 [a]
Stormwater wetland	76 [a]	30 [a]	49 [a]	78 [a]
Sand filter	87 [a]	32 [a]	59 [a]	37 [a]
Bioretention	87 [i,j]	57 [f,g,h]	76 [f,g,h,i]	90 [k]
Enhancedg Grass swale	93 [a]	92 [a]	83 [a]	- 25 [a]
Grass swale	68 [a]	20 [a]	29 [a]	5 [a]
Infiltration trench	95 [a]	51 [a]	70 [a]	90 [e]
25-ft forest buffer	57 [b,c]	27 [b,c]	34 [b,c]	5 [k]
50-ft forest buffer	62 [b,c]	31 [b,c]	38 [b,c]	5 [k]
75-ft forest buffer	65 [b,c]	33 [b,c]	41 [b,c]	5 [k]
100-ft forest buffer	67 [b,c]	34 [b,c]	43 [b,c]	5 [k]
200-ft forest buffer	72 [b,c]	38 [b,c]	47 [b,c]	5 [k]

[a] Winer, R. 2000. National Pollutant Removal Performance Database for Stormwater Treatment Practices, 2nd ed. Center for Watershed Protection, Ellicott City, MD.

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Analysis of multiple management practices using multiple indicators

	TSS		TP		TN	
	tons/yr	% red.	lb/yr	% red.	lb/yr	% red.
Existing Site	5.11		11.5		70	
Stormwater Pond	1.79	65%	6	48%	50	29%
Bioretention/Ext. Dry Detention	1.97	61%	4.6	60%	36	49%
Forest Conversion	4.1	20%	10.6	8%	66	6%

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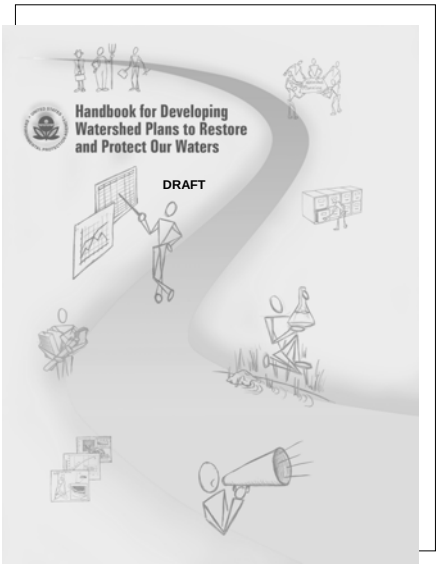
Questions?



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Final Planning and Implementation

- Designing an implementation program
- Implementing the watershed plan
- Measuring progress and making adjustments

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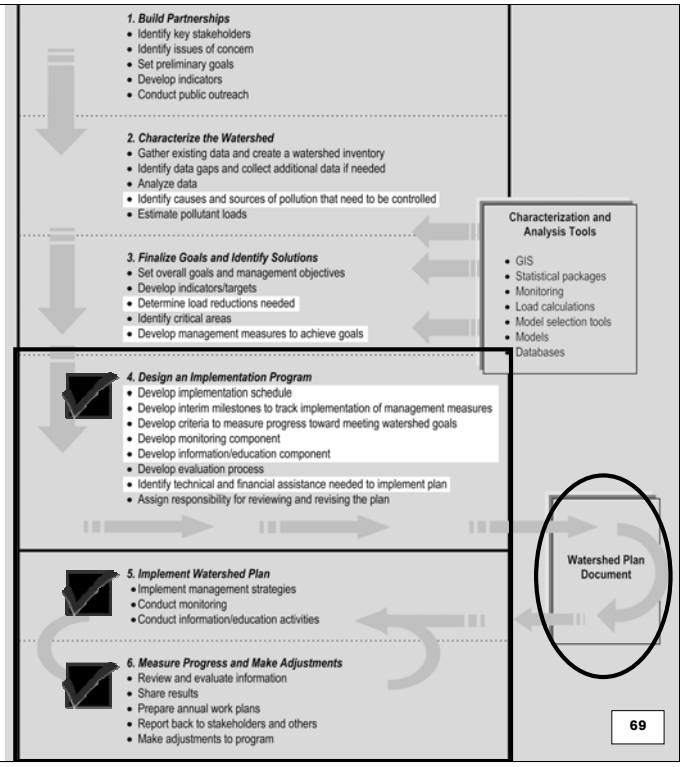
Assigning tasks, implementing actions, and monitoring progress



Step 4: Design Implementation Program

- Develop Implementation schedule
- Set Interim milestones
- Determine how you will measure success
- Develop monitoring component
- Develop evaluation process
- ID technical and financial assistance needed
- Assign responsibility

Documentation of these items completes the plan

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Asking the right questions . . .

- Who can help implement the BMPs or controls?
  - Agencies, businesses, non-profits, citizens
- How can they be implemented?
  - What has been done in the past?
  - How well did it work?
  - Can we do it (or adapt it) here?
- When can we get started?
  - Reasonable short-term actions
  - Long-term or major actions
- How do we know if it's working?
  - And what do we do if it's not?

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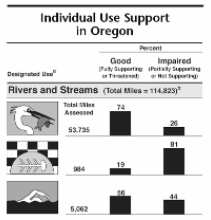
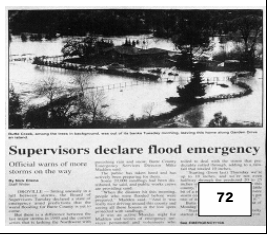
Developing info/ed activities

- Define overall goal and objectives
- Identify and characterize target audience
- Create message(s) for target audience(s)
- Package the messages for distribution
- Distribute messages to the audiences
- Evaluate the information/education effort





Prioritizing management efforts

- Integrate assessment results across objectives
- Example factors to consider:
  - Highest threats to achieving objectives
  - Regulatory requirements
  - Where are existing management regulations, programs, policies, practices falling short
  - Stakeholder preferences

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Setting times and targets

- Develop implementation schedule
  - Think about short term (< 2 yrs) and long-term (> 5 yrs) goals
- Determine how you will measure success
  - What indicators are linked to the problems you're dealing with?
- Set interim milestones
  - What helps to show progress?
  - Can be both water quality & programmatic indicators

27 Critical Actions:
What We Need To Do and Why

Restoration Focus 1:

Protect clean water sources and improve degraded water sources to support fish and wildlife, recreation, human health, and other beneficial uses.

Clean Water

THE PROBLEMS

ACTION 1

Support the Willamette Basin total maximum daily load (TMDL) process, including coordination and communication.

ACTION 2

Support effective implementation of the agricultural water quality management plan process (Senate Bill 1010), and encourage its use to address species needs.

Work from your "big picture" management objectives

Examples

- Restore aquatic habitat by addressing channel instability and sedimentation
- Protect drinking water reservoir from excessive nutrient loads & eutrophication

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Establish indicators & targets for management objectives

INDICATOR = measurable parameter used to evaluate relationship between pollutant sources and environmental conditions

TARGET = value of indicator that is set as the goal to achieve

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Other types of indicators

- Environmental Indicators:
  - # of occurrences of algal blooms
  - miles of streambank restored or fenced off
  - % increase in "healthy-stream" critters
  - Increase in DO
  - # of waterbodies restored
- Administrative/programmatic indicators
  - # of BMPs installed
  - # of newspaper stories printed
  - # of people educated/trained
  - # of public meetings held
  - # of volunteers attending activities
  - # of storm drains stenciled

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Social (surrogate) indicators

- # of calls reporting illegal dumping
- # of people surveyed with increased knowledge of watershed issues
- # of people who report picking up pet waste
- % increase in households who had their septic systems inspected

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Here's an example of a measurable outreach goals developed by a North Carolina municipality "Develop a series of editorial pieces for publication in the City Managers column in the Independent Tribune. Track number of columns and stormwater issues addressed."

In your NPS watershed plans...you don't necessarily need to say...we going to have this many volunteer activities, this many meetings, etc. What you need to say is that you will use the number of meetings, and activities and a programmatic indicator of successfully implementing the plan.

Finalizing the watershed plan

- Develop monitoring component
  - Measuring your chosen indicators
- Develop evaluation process
  - Comparing indicator targets with collected data
- ID technical and financial resources needed
  - Short-term: should be somewhat specific regarding sources
  - Long-term: can be less specific
- Assign responsibility for actions

PHOTO: GORDON ENGLAND

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Indicators & targets: short/long term

✎ Worksheet 12-2

Developing Criteria to Measure Progress in Meeting Water Quality Goals

[Note: Complete one worksheet for each management objective identified.]

Management Objective: Reduce nutrient inputs into Cane Creek by 20 percent

Indicators to Measure Progress	Target Value or Goal	Interim Targets		
		Short-term	Medium-term	Long-term
P load	44 t/yr	52 t/yr	49 t/yr	44 t/yr
# of nuisance algae blooms	0	2	1	0
transparency	5.5 m	4.1 m	4.9 m	5.5 m
frequency of taste and odor problems in water supply	0	1	1	0
hypolimnetic DO	5.0 mg/L	2.5 mg/L	4.0 mg/L	5.0 mg/L

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Example milestones

- Short-term (<1 yr)
  - Achieve 5% reduction in sediment load on 1,000 acres of ag land in the Cross Creek watershed by implementing rotational grazing practices.
- Mid-term (1-4 yrs)
  - Reduce streambank erosion and sediment loading rate by 15% by reestablishing vegetation along 3,600 feet of Cross Creek.
- Long-term (>5 yrs)
  - Restore upper reaches of 6 tributaries and create buffer easements along 15,000 ft of Cross Creek feeder streams.

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Planning to get it done!

✎ Worksheet 12-1

Sample Implementation Plan Matrix

Watershed Goals
Goal 1: Restore water quality to meet designated uses for fishing
Objective 1: Reduce sedimentation by 20 percent

Tasks for G1/O1	Respon. Party	Total Costs	Funding Mechanism	Indicators	Milestones			
					Short < 1 yr	**Med < 3 yr**	**Long < 7 yr**	**Remaining**
Task 1 Seek donation of conservation easements from property owners along Baron Creek	Local land trust	$0		# acres donated	2	7	10	10
I/E Activities Task 1 Hold informational workshop with property owners Develop brochures on how to donate easements	Local land trust	$3,000	Sect. 319 funding	# workshops held # participants # requests for assistance	3 40 2	3 45 4		0
Task 2 Purchase greenway alongside Baron Creek	County park district	$2,000/ mile	County general funds	# miles purchased	2	4	7	5
I/E Activities Task 2 None								

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Identify sources of support

- Funding sources
  - Grants, contracts, donations
- Sources of technical assistance
  - Internal and external
- Matching support sources
  - Be creative!

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Financial resources: examples

- *Catalog of Federal Funding Sources for Watershed Protection, posted at* www.epa.gov/watershedfunding
- *Guidebook of Financial Tools: Paying for Sustainable Environmental Systems*, available for download at www.epa.gov/efinpage/guidbkpdf.htm
- Directory of Funding Sources for Grassroots River and Watershed Groups (www.rivernetwork.org)
- Plan2Fund, directory of watershed resources for federal, state, and private funding sources – see http://sspa.boisestate.edu/efc/Tools_Services/Plan2Fund/plan2fund.htm

84

The watershed plan is done . . .

Now the real work begins!

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Step 5: Implement Watershed Plan

- Implement management strategies
- Conduct monitoring
- Conduct outreach activities

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Who will implement the plan?

Structure can vary widely

- Public agencies
  - Cities, counties
  - Water or wastewater utility
  - State agency or river authority
  - Tribal nations / agencies
- Private entities
  - Watershed association
  - Ag producer council

Any well-organized single or multiple entity approach can coordinate and document the effort

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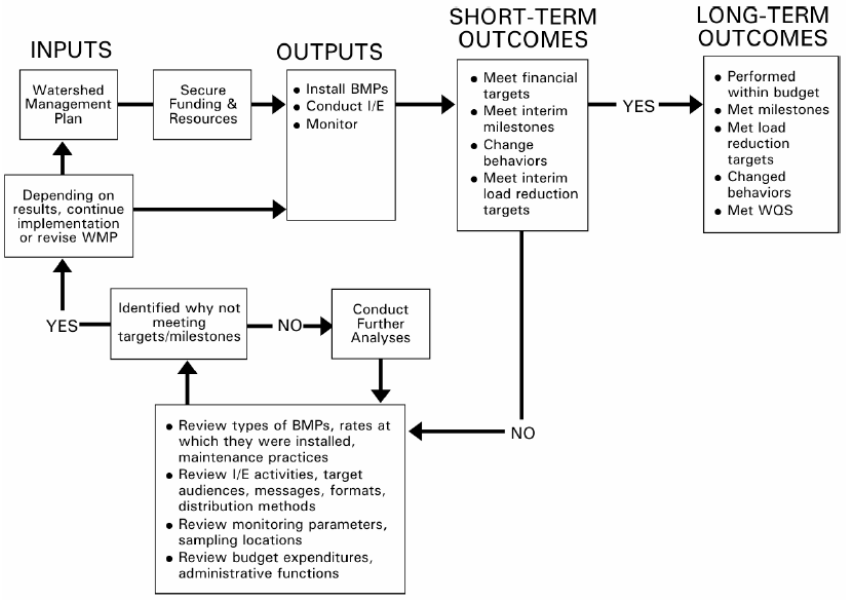
Adaptive Management



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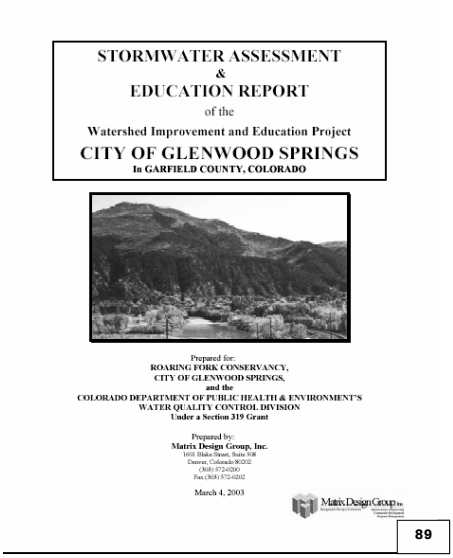
Coordinate with other water resource and land use programs

- Section 303, Water Quality Standards, TMDLs
- Section 319, NPS Program
- Section 402, NPDES Permits, CAFOs, Stormwater I & II
- Source Water Protection Plans
- Wetlands Protection Programs
- EQIP, CRP, BLM, USFS, USFWS
- More…


STORMWATER ASSESSMENT
&
EDUCATION REPORT
of the
Watershed Improvement and Education Project
CITY OF GLENWOOD SPRINGS
In GARFIELD COUNTY, COLORADO

Prepared for:
ROARING FORK CONSERVANCY,
CITY OF GLENWOOD SPRINGS,
and the
COLORADO DEPARTMENT OF PUBLIC HEALTH & ENVIRONMENT'S
WATER QUALITY CONTROL DIVISION
Under a Section 319 Grant

Prepared by:
Matrix Design Group, Inc.
1600 Blake Street, Suite 510
Denver, Colorado 80202
(303) 572-0200
Fax (303) 572-0202

March 4, 2003

Matrix Design Group Inc

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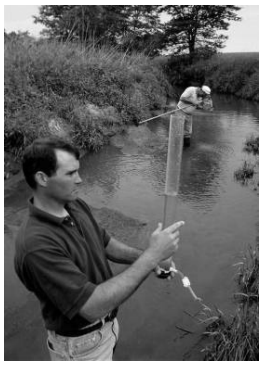
Measuring water quality improvements

- Revisit the parameter(s) you're trying to impact (sediment, nutrients, etc.)
- Identify measurable criteria associated with the parameter(s)
- Check to see if anyone out there is monitoring your parameters
- If not, develop a low-cost & effective monitoring program
- Be selective! Don't monitor everything!



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Implementing a monitoring program

- Staffing
- Equipment procurement
- Training
- Field preparation
- Laboratory coordination
- Data and information management

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The Conservancy's overall water quality monitoring program is based on the following goals and objectives:

GOAL #1: To design and implement a Water Quality Monitoring Program in the Roaring Fork watershed.

Objective 1: Produce an Inventory Report that summarizes water quality monitoring activities in the Roaring Fork watershed.
Objective 2: Identify new sites for monitoring.
Objective 3: Develop a water quality monitoring sample plan.
Objective 4: Establish a data management program.
Objective 5: Partner with existing River Watch monitoring activities and expand River Watch sites.
Objective 6: Establish citizen stream teams.
Objective 7: Establish water quality monitoring at the Roaring Fork Club.
Objective 8: Investigate and evaluate areas of special concern.
Objective 9: Evaluate the program.
Objective 10: Sustain the program over the long term.

GOAL #2: To provide meaningful water quality information to the citizens and decision-makers of the Roaring Fork watershed.

Objective 1: Form partnerships with other organizations and agencies.
Objective 2: Conduct public presentations to gather feedback and disseminate information.
Objective 3: Publish a State of the River Report.

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Sampling Protocols

- Standard Methods for field and laboratory analyses
  - Collection
  - Storage
  - Transport
  - Analysis
  - Reporting
- Quality Assurance Project Plans (QAPPs)

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Extracting CWA 319 Program Workplans from the Watershed Plan

Table 13-1. Comparison of Example Parameters in a Hypothetical Watershed Plan and 319 Work Plan

Parameter	Lake Fraser Watershed Management Plan	319 Work Plan #1
Period	2003–2013	2003–2006
Geographic scope	180,000 acres	24,000 acres
Critical areas	52,000 acres	7,000 acres
Goal statement	Improve watershed conditions to support sustainable fisheries	Reduce sediment loadings from priority subwatershed X
Example objectives and key elements	• Increase the Index of Biotic Integrity (IBI) from 30 to 75 • Identify causes and sources of sediment • Identify load reduction expected • Identify management practices needed • Identify critical areas	• Treat 5,000 acres of cropland with crop residue management (CRM) practices • Install six terraces to treat 1,200 acres • Establish five buffer strips for a total of 8,000 feet
Implementation	• CRM: 2,000 acres of row crop/year into CRM • Terraces: 4 fields/year, 40 fields total • Buffers: restore 1 to 1.5 miles of riparian area/year, 8 miles total • Field buffers: 100 fields total	• Develop training materials on CRM in year 1 • Hold two workshops each in years 2 and 3 • 2 terraces/year • One buffer strip in first year and two each in years 2 and 3
Costs	$4.02 million over 10 years • $800,000 for information and education (I/E) • $600,000 for monitoring and reporting • $1,980,000 for buffers (18,000 acres at $110/acre) • $140,000 for 40 terraces • $500,000 for CRM	$250,000 over 3 years • $50,000 to prepare training materials and give 5 workshops on CRM • $160,000 for management practice cost sharing • $40,000 for monitoring and reporting
Schedule	• Begin slowly and accelerate (build on successes) • Establish interim milestones - Cropland: 2008 – reduce soil erosion by 80,000 tons/year - Streambanks: 2006 – stabilize 10,000 feet of eroding streambanks - 2010 – stabilize 30,000 feet of eroding streambanks • Push I/E early and complete by year 6 • Annual reports that track progress • Coordinate with partners	• See above • Annual progress reports
Monitoring	• Environmental – water quality, IBI, acres treated, tons of soil erosion reduced, feet of streambank stabilized • Administrative – contracts approved, funds expended, and funds obligated • Social - landowners contacted • Changes in public understanding resulting from I/E	• Attendance at CRM training workshops • Acres of cropland using CRM • Feet of stream buffers established • Feet of field buffers established • Number of terraces • Environmental: reduction in sediment loads • Administrative: contracts approved and funds expended • Social: landowners contacted

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Use indicator summary data to communicate with partners and the public

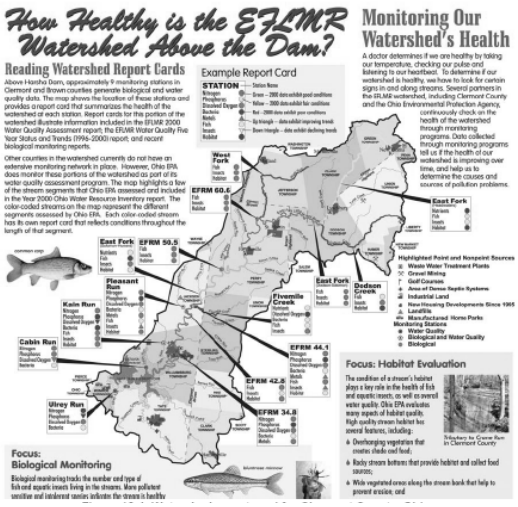

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Table 8-2. Comparison of example parameters in a hypothetical watershed plan and 319 work plan

Parameter	Lake Lehmann Watershed Management Plan	319 Work Plan #1
Period	2003 -2013	2003 - 2006
Geographic scope	180,000 acres	24,000 acres
Goal statement	Improve watershed conditions to support a sustainable fisheries	Reduce sediment loadings from priority subwatershed XY
Example objectives and key elements	• Increase the index of biological integrity from 30 to 75 • Identification of causes and sources of sediment • Identification of load reduction expected • Identification of management practices needed • Identification of critical areas	• Treat 5,000 acres of cropland with crop residue management (CRM) practices • Six terraces to treat 1,200 acres • Five buffer strips established for a total of 8,000 feet
Implementation	• CRM: 2,000 acres of row crop/year into CRM • Terraces: 4 fields/year, 40 fields total • Buffers: restore 1 to 1.5 miles of riparian area/year – 8 miles total • Field buffers: 100 fields total	• Develop training materials on CRM in year 1 • Hold 2 workshop each in years 2 and 3 • 2 terraces/year • 1 buffer strip in first year and 2 each in years 2 and 3
Costs	$4,020,000 over 10 years • $800,000 for information and education (I&E) • $600,000 for monitoring and reporting • $1,980,000 for buffers (18,000 acres at $110 / acre) • $140,000 for 40 terraces • $500,000 for CRM	$250,000 over 3 years • $50,000 to prepare training materials and give 5 workshops on CRM • $160,000 for BMP cost sharing • $40,000 for monitoring and reporting
Schedule	• Begin slowly and accelerate (build on successes) • Establish interim milestones ▸ Cropland: 2008 – reduce soils erosion by 80,000 tons/year	• See above • Annual progress reports

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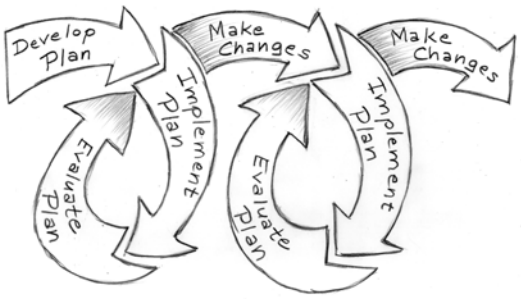
Step 6: Measure Progress and Make Adjustments

- Review and evaluate
- Share results
- Prepare annual plans
- Make adjustments



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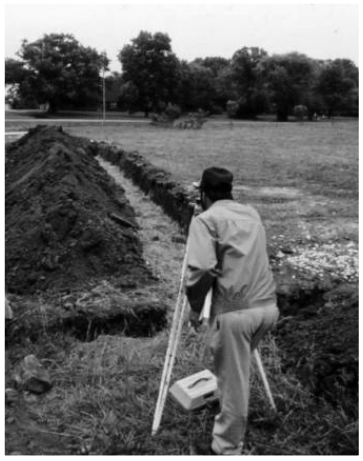
During implementation, remember:

- Plans are guides, not straitjackets
- Be aware of unforeseen opportunities
- Picking the low-hanging fruit is easy, but it helps to build a sense of progress & momentum
- If possible, work quietly for as long as you can on the most contentious issues



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Finally…Make Adjustments

- Monitor water quality and BMPs
- Compare results to goals
- Are you making progress?
- Are you meeting your goals?
- If you aren't meeting implementation milestones
- If you aren't making progress toward reducing pollutant loads….

Then…do it all over again!

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Linking planning to outcomes

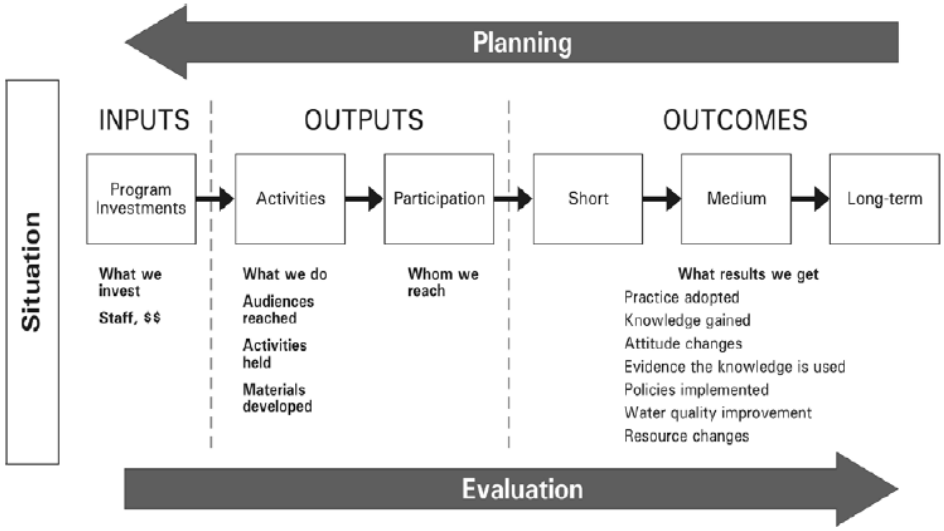

Figure 12-1. Logic model components.

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The Bottom Line:

- Load reduction *estimates* are critical for nonpoint sources
- Preliminary info & estimates can be modified & corrected over time, if necessary
- Clean Water Act, section 319 - funded management measures should proceed only after reasonable estimates are made of how far they will go towards achieving water quality targets.

Most of All, You Need Patience

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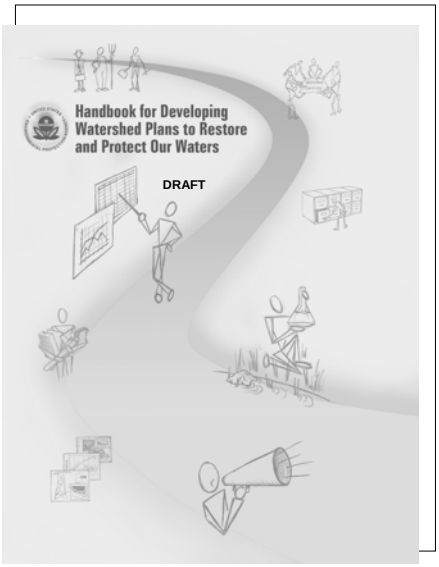
Questions?

Links to additional resources



www.epa.gov/owow/nps/watershed_handbook/

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