Visual Tools for Watershed Education

National Leadership Forum Report

November 17, 1999 | Washington, D.C.

The National Environmental Education & Training Foundation
and The Henry P. Kendall Foundation

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Watershed: a defined land area that captures rainfall and other precipitation and funnels it to a particular river, lake or stream.

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Table of Contents

Foreword: Watersheds — An Important But Often "Impenetrable" Idea 1
Kevin J. Coyle, President, The National Environmental Education and Training Foundation

"Home Watresheds": A Sense of Place and a Sense of Self 2

Setting the Stage for the Forum 3
Deborah Sliter, Vice-President for Programs, NEETF

Special Report: Forum Follow-up Actions 4

Background: A Picture (of a Watershed) Is Worth a Thousand Words 5

Summary of Presentations:

Keynote Address: "An Idea Whose Time Has Come" 8
Louise Wise, Staff Director of Policy and Communication, Office of Wetlands, Oceans & Watersheds, U.S. EPA

The Educator's Insight… Make a "Sign" and Learn the Power of Visual Tools 9
Dr. Jean Gardner, Graduate Department of Architecture and Environmental Design, Parsons School of Design

Using Visual Tools to Connect Community and Local Watershed Opportunities 10
Meg Maguire, President, Scenic America

A Press Perspective…Public Education About Watersheds 11
Peter Eisler, Reporter, USA Today; Paul Dolan, Director, International and Special Services, ABC NewsOne; Deborah Potter, Executive Director, NewsLab

Symbols, Examples and Repetition…A Watershed Communications Primer 13
Gibby Waitzin, Principal, Gibson Creative

Critical Lessons From Meteorology…Eyes on the Weather 14
David Jones, Meteorologist and Principal Investigator, WRC-TV NBC-4

"Junior Rain Drop"…High Crimes and Misdemeanors in the Watershed 16
USDA Forest Service Film (1948)

Putting the Rain Drop "Into Reverse" 16
Glenn Patterson, Hydrologist, Office of Water Quality, United States Geological Survey

Finding Our Ecological Address Through the "Power of Ten" 17
Linda Lilienfeld, Film and Picture Researcher

Cyber-Surfing Your Watershed…Accessing Your Own "Ecological Address" 18
Karen Klima, Internet Team, Office of Wetlands, Oceans & Watersheds, U.S. EPA

An Ecological Address to the North…Cook Inlet, Alaska 19
Robert Shavelson, Executive Director, Cook Inlet Keeper

Applications of Watershed Education... Illinois, Massachusetts, & Washington, DC 19
Liz Raisbeck, Watershed Program Manager, River Network

Conclusion: From Words …To Pictures…To Watershed Awareness 20

Addenda:

Test Your Own Professional Watershed IQ 23

Watershed Resources on the Internet 25

Forum Participants 27

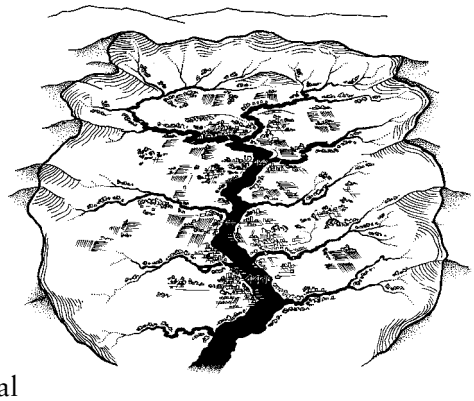
Foreword: Watersheds —— An Important But Often "Impenetrable" Idea

— Kevin J. Coyle, President, The National Environmental Education & Training Foundation

The idea for this forum started over breakfast one day in Cambridge, Massachusetts. Ted Smith, Director of the Kendall Foundation, and I were discussing how difficult it can be to explain the "watershed concept" to people generally unfamiliar with natural resource and ecology issues. We were both taken with the fact that so many of our professional colleagues — like us — tended to rely on verbal explanations for the important and complex natural systems we know as watersheds.

Ted was mulling over the results of a recently completed forum series — called the Four Corners Project — that brought watershed experts in four regions of the nation together to talk about successes in and principles of watershed conservation. The approaches used by these various watershed conservation organizations and agencies were replete with innovation, common sense and skillful constituency development. Still, Ted wondered, "Why haven't these many approaches caught on like a prairie fire and formed the backbone of a nationwide program of local watershed wisdom and conservation?"

Simultaneously, The National Environmental Education and Training Foundation was analyzing the results of some disturbing data from a NEETF/Roper Starch Worldwide study of the environmental knowledge of adult Americans. That survey pointed out that just 23% of Americans know (in a multiple choice quiz format with four prospective answers) that run-off pollution is now the number one cause of water pollution in the United States. Moreover, the same data revealed that just two out of five Americans could select the definition of a watershed from four prospective answers in the same multiple-choice quiz.



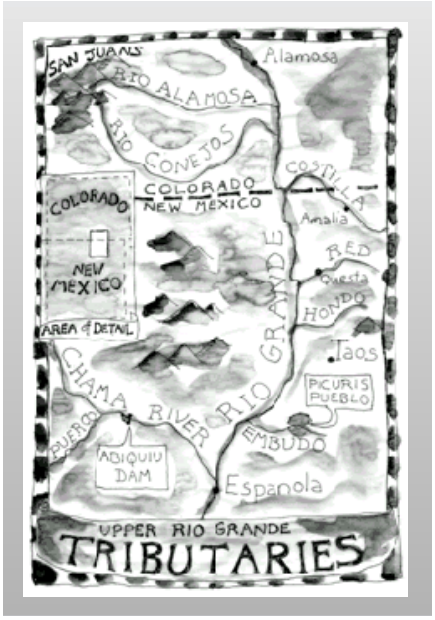
What does all this mean? It means that even when people are supplied specific answers from which to choose, fewer than a majority have any idea what a watershed is or what pollution problems may be cropping up in their areas. To make matters worse, a NEETF-supported focus group effort on watershed education by the leading group River Network, found that none of the local leaders in a New England watershed could define a watershed in response to an open-ended, point blank question. So, without the aid of the multiple-choice format, adult Americans — highly intelligent, educated and community-oriented — are unable to say just what a watershed is! It is no wonder that exciting watershed strategies, and the benefits they can provide, elude most people and come only when there is a deep understanding of what a watershed system is and does.

Is it possible to break through this puzzling lack of awareness of watersheds? We think that at least part of the answer is to amend the way we communicate and educate people about them. An overlooked opportunity is the more effective use of graphics coupled with carefully developed explanations that make the watershed concept vivid and exciting.

"Home Watersheds":
A Sense of Place and a Sense of Self

Where are you on the map? Some refer to an individual's identification with the area he/she lives in as "having a sense of place." Others would refer to it as "knowing your ecological address." In either case, having a real understanding of watersheds and how they affect the daily lives of individuals and the community can translate into increased interest in localized efforts to monitor and protect water quality and riparian habitats.

How Watershed Education Can Help Conserve Important Resources



- Watershed management is a complex undertaking. Better education programs using graphics, maps and other visuals can help focus on critical issues within the area.
- Watershed education can help address a widening gap between what the average person knows about the natural world and what the watershed approach requires him/her to know.
- Education about the watershed can help people to better understand how they impact the watershed — land and water quality — and the people downstream from them.
- Watershed education can improve understanding of the causes (including some root causes) of pollution and environmental degradation.
- It helps people understand what they can do, personally or in the community, to improve environmental quality.
- It can help people understand their connection to the natural world (including drinking water) and that it is not some abstract notion for them or their families.

Setting the Stage for the Forum

— Deborah Sliter, Vice President for Programs, The National Environmental Education & Training Foundation

This national forum was developed in response to a number of questions about how effective educators and conservation leaders are in communicating about watersheds. And, because watershed systems are so complex, we believe that the use of graphics and visual tools would help to improve watershed education efforts.

What we discovered, and what you will see from the presentations in this report, is that there are many useful approaches to the use of visuals in communicating about watersheds and that they have been successful where verbal-only approaches have not been.

The forum also demonstrates that there are important principles about how people learn that are often overlooked by those who work in the professions associated with watersheds. Ironically, many of those most concerned about local leaders and the public adopting watershed conservation strategies tend to vastly overestimate what people know about watersheds as natural systems and as organizing concepts for the conservation of our future resources.

Our premises at the outset

- Complex watershed conservation concepts are too often communicated to the public verbally without the assistance of visual tools and associated examples.
- When graphics of varying kinds have been used to communicate watershed concepts they have been highly successful in building knowledge and support.
- Expertise exists in visual communication and distribution mechanisms — including TV, newspapers, computer and mapping programs, videos and more — which can increase the effective use of graphics in the depiction of watershed concepts and programs.
- There are many agencies, organizations, leaders and corporations interested in, and capable of, joining in a significant watershed education program.

Possible impediments to understanding watersheds

- Most people do not think of the world as an interlocking system of water drainage basins.
- Professionals in the environmental field believe the public knows much more than they actually do about the nature, scope and function of watersheds.
- Watersheds are large, often span many jurisdictions and are hard to grasp conceptually.
- The term, "watershed" is not particularly descriptive and could mean many things.
- The natural processes embodied in a watershed are complex — and beyond the education of most people.
- People are not sure what they can do to affect such a large area.

Special Report:
Forum Follow-up Actions

Not every forum can report on successes less than a year later, but two significant projects have grown out of the November 1999 National Leadership Forum.

NBC-TV/NEETF Weather and Watershed News Initiative

As part of our watershed education forum, we learned, through David Jones, meteorologist with WRC-TV NBC-4, about a golden opportunity to advance watershed awareness through the regular weather reports. NBC-4 in Washington, DC has agreed that it will make a school-based and citizen group-based watershed monitoring program a part of its "Weather Watcher" Program and weather reporting.

Starting with the 13 NBC-owned stations (DC, New York, Philadelphia, Los Angeles, etc.), they can potentially put a program in place that: a) periodically shows three dimensional watershed maps on the air with information on pollution spills, flooding, drought, etc.; b) posts (for each metro area) a corresponding Internet Web site tied to the existing Weather Report site that will have click-on maps and real time data; and c) lets designated "watershed watchers" post their observations on the local NBC-TV Web site.

Such public interest organizations as River Network and Earth Force, which now runs the Global Rivers Environmental Education Network, are on-board to help with implementation. Moreover, the EPA watershed divisions will help to tie this effort to their own Web mapping programs such as Surf Your Watershed. Assuming that this project works with the "test bed" of 13 NBC stations, it can be rolled out to several hundred affiliated stations.

National Forest System as Water Supplier. . . Explaining it to the Public

The USDA Forest Service also came out of the forum highly supportive of watershed education and has asked NEETF to help it with a new public information education program on the national forests as sources of drinking water.

A recent study shows that the National Forest System is the drinking source for some 66 million Americans! Indeed, the national forests are the headwaters for the drinking supplies and reservoirs of many major cities providing $ billions worth of water. This, in essence, makes the Forest Service the largest single "water company" in the nation. The USDA Forest Service and NEETF are working on a joint project to implement a one-year public information and education strategy to tell this important story to the public. We can also tie this effort to the NBC-TV initiative and establish some of the communities in and around the national forests as watershed watchers for local TV stations.

Background:

A Picture (of a Watershed) Is Worth A Thousand Words

On November 17, 1999 some 120 education, environmental and communication leaders from across the nation assembled at the headquarters of the Academy for Educational Development in Washington, DC to take part in a forum that focused directly on how visual tools — maps, graphics, models and stories (mental pictures) — could help policy leaders, teachers, the media, and others to communicate meaningfully on the concept of watersheds.

What's a Watershed?

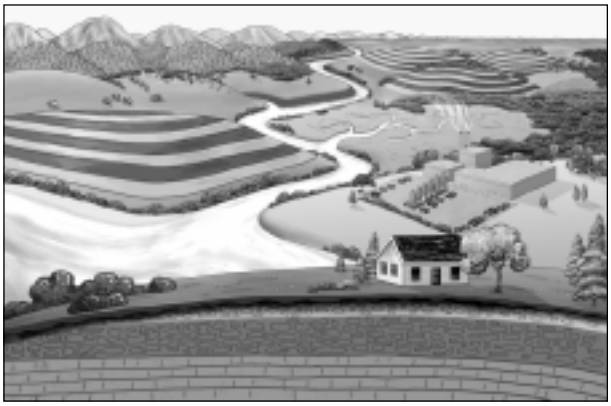
A watershed is a defined land area that captures rainfall and other precipitation and funnels it to a particular river, lake or stream.

The modern need for addressing environmental and natural resource issues more systemically has given rise to greater emphasis on "watershed" approaches in planning, resource assessment and even political activism. It is rare in this day and age to have a discussion of water resources, fish and wildlife conservation, pollution control, flooding, weather, forestry, even land use management without making a mention of watersheds. Many public agencies and private land managers are fully and officially engaged in watershed management approaches. Even major new legislative initiatives discuss watersheds.

Very encouraging news, but . . .

Policy makers, environmental advocates, educators, the media and others who communicate with the public on watershed conservation issues are not as effective as they could be. First, they assume everyone knows what a watershed is! This is not a reasonable assumption because survey research shows that only two of five adult Americans can define a watershed if the definition is given to them as part of a multiple choice quiz and only a small percent can say what a watershed is if they are asked point blank without the aid of the multiple choice format. Simply stated, the majority of Americans do not understand the first thing about watersheds — their nature and form or why they would be a useful focus for conservation programs and activity.

A second issue is that watersheds, which are as complex as any natural system or living organism, are usually only described through written and verbal descriptions. This is like trying to describe a computer program without actually looking at it or using it.



If watershed conservation is ever to be addressed or publicly discussed, the concept must be made vivid to the public. The graphic presentation of watershed concepts and programs to the public can address this need.

More than 120 years of inadequate understanding

How to communicate the wisdom of a watershed focus is far from a new problem. The watershed concept was first officially put forward in the United States by John Wesley Powell, a western explorer and founder of the U.S. Geological Survey. In the late 1800's, he recognized the severe limitations of the U.S Rectangular Survey, a system that divides our land (all but the original colonies) into squares of 640 acres aligned to true North. In the West, he saw that the lack of available surface and ground water would make many of these squares and isolated land parcels unusable except to grow scrub. He recommended reconfiguring the land Survey System so that it would follow natural water drainages (or watersheds) and provide improved landowner access to vital water areas. Members of Congress rejected his proposal in large measure because they did not fully understand its profound logic. It is our first American example of the failure to communicate the watershed concept. Perhaps if Powell had had access to the kind of visual materials and computer maps we have today, he might have turned the Congress around and changed the face of the American West.

Experts define a watershed as an area of land that drains precipitation into a particular stream or lake. They call watersheds "drainages" or "basins" which can be as large as the Mississippi (40 percent of the area of the lower 48 states) or as small as the backyard brook. But how many ordinary Americans ever think about drainages or basins? How many Americans know the

American landscape is divided into an intricate patchwork of land areas draining this way and that into rivers, lakes, bays and aquifers each time it rains or snows? Research says almost none!

When a group of national and New England-based conservation groups took the question to a focus group of educated citizens in the region not one of the group participants was able to actually say what a watershed was. New England is known in the conservation field as the heartland of watershed local activism. And, when NEETF contracted with Roper Starch Worldwide to assess how accurately adult Americans would respond if given a choice of various definitions of a watershed we found that 2 out of 5 Americans were unable to give the correct answer even when it is evident to 100 percent of those educated on the subject. In short, even though public policy is more-and-more geared to watershed approaches, only a small fraction of the public has any idea what those policies are addressing and so constituency and public support is not only lost but never really rallied.

Indeed, the highly complex geographic nature of watersheds — their contours, their large size, and their non-adherence to traditional political boundaries — makes them inherently difficult to comprehend. They are hard to visualize even by those few Americans familiar with contour maps and physiographic features and they are nearly impossible to grasp by those who never see a contour map or ever think about how the land is formed or configured.

For the watershed conservation advocate, the basic inability of Americans to "see" a watershed in the mind's eye presents a serious barrier to obtaining support. For the teacher in school or for the student, this inability is a serious educational challenge. And, for policy makers, it creates a conceptual black hole that can't be filled with a thousand words defining rules and regulations of conduct.

Is there a way to overcome the inability of most Americans to easily grasp the watershed concept? A large part of the answer lies with how the concept is presented.

Common goals of watershed conservation

- Protect water quality and the quality of drinking water.
- Protect and conserve wildlife species and their critical habitats.
- Maintain sustainable farming practices and soil health.
- Promote smart growth and sound economic development.
- Preserve history, landscape and a sense of place.

Keynote Address: "An Idea Whose Time Has Come"

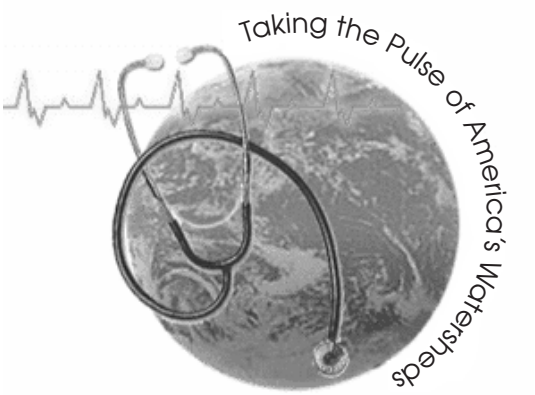
— Louise Wise, Esq., Staff Director of Policy and Communication, Office of Wetlands, Oceans & Watersheds, U.S. EPA

Louise Wise, Policy and Communications Staff Director in EPA's Office of Wetlands, Oceans and Watersheds, strongly supports the use of watershed approaches in national and state environmental issues. Ms. Wise set the stage for the forum on how to best communicate watersheds.

She opened by noting that watershed management is "an idea whose time has come" and commented on the numerous national programs based on watershed management as a key concept. These include: drinking water and source water protection programs, wildlife and ecological protection programs, and more.

Ms. Wise stressed the importance of designing environmental programs and appropriate remedial programs that address watersheds, and noted how watershed efforts have grown in acceptance. Public policy reflects this. She pointed out that the U.S. EPA, in its water protection programs, has been moving steadily toward incorporating watershed policy into its water-related programs. This has helped the Agency to keep up with many of the complex issues arising with respect to water pollution control, wetland restoration, river management and other subjects. She also pointed out how EPA itself has made more of a commitment in recent years to using the Internet — posting maps and graphics — as a tool in public information and communication. A prime example of this new commitment is the EPA "Surf Your Watershed" program which provides local computer maps and supports data to members of the public via the Internet.

Ms. Wise agreed with the premises of the forum and noted, "that the public may not have much of an understanding of watersheds and may actually end up on the outside of many important public discussions of our environmental future." The solution: more emphasis on understanding how to communicate and educate about watersheds with much more focus on the creative use of visual tools such as maps, graphics and schematics.



The Educator's Insight . . .

Make A "Sign" and Learn the Power of Visual Tools

— Dr. Jean Gardner, Graduate Department of Architecture &Environmental Design, Parsons School of Design

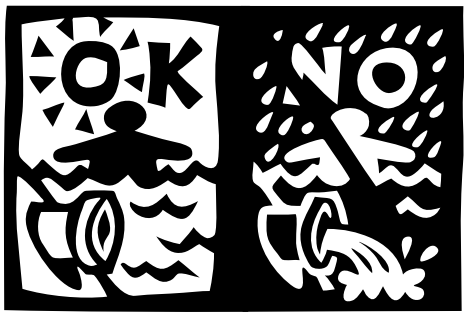
Dr. Jean Gardner, on the Senior Faculty of the Graduate Department of Architecture and Environmental Design, Parsons School of Design, is a leading educator on how people learn and the role of visuals in that learning process. She challenged forum participants to think about how we not only fail to communicate about water and natural systems using anything more than words but also how, in an urban setting, many of these resources — particularly water — are hidden from view.

Dr. Gardner offered an organizational construct about how people learn. She noted that, as a culture, we substitute the ear for the eye and thereby limit learning. Specifically, she noted, people in western society are taught from an early age to hear things described rather than to actually see them. American schools move students toward auditory learning rather than visual organization and learning. Over time we lose our ability to understand entire parts of the world because we think in word outlines instead of flow charts and visual representations. Her overall message — directly applicable to the watershed subject — was that "we think through our displays, and our ability to organize information visually improves our ability to think."

By "display," she means any graphic representation of thought, called "iconic" by academics, as opposed to "indexal" (or written) organization of information.

Dr. Gardner suggests that any visual organization, whether a political statement or a discussion of watersheds, can follow certain rules of visual organization.

- First, "make a sign of something" — a map of a watershed or a drawing of a river valley. The representation or "sign" should encompass all the features that will be needed for the remaining steps.
- Second, the sign should be "about something," — for example, the relationship of rainfall to flooding, or how land use activities within the watershed can produce pollution in a river or stream.
- Third, the sign should be "for someone." It is important to direct the message to a certain audience. This may seem obvious but its importance cannot be over-emphasized. The sign might be an educational message for students or an instructional message to tell teachers how to teach about watersheds. Other messages could be aimed at landowners in a watershed to encourage them to prevent pollution or soil erosion, or aimed at political leaders to show them the importance of sound land use planning within a watershed.
- Finally the sign should be "in some respect" — meaning it should have a clear point of view.



WARNING
SEWAGE

AVOID CONTACT WITH RIVER AFTER RAIN

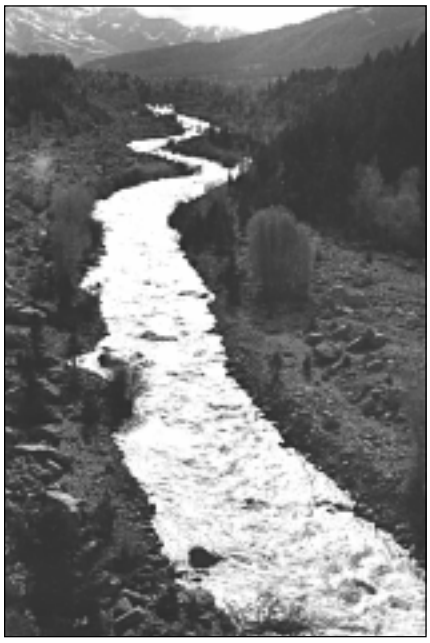
FOR MORE INFORMATION, CALL 823-2479

ENVIRONMENTAL SERVICES, CITY OF PORTLAND

Using Visual Tools to Connect Community and Local Watershed Opportunities

— Meg Maguire, President, Scenic America

As president of Scenic America, Meg Maguire promotes the importance of scenic beauty in the natural and built environment. Scenic America demonstrates that health, the economy, community spirit and even lower crime and vandalism rates can be traced to the positive effects of pursuing and achieving greater local scenic beauty in America. Maguire is a strong believer in community pride and a sense of place.



In order to communicate its message, Scenic America must make abundant use of visual tools and cannot rely on the written word. Maguire is the first to point out that elements of the natural environment, including watershed areas, are spatial by definition. She is a longstanding advocate for telling stories of the environment and the natural world through visual tools.

Maguire also believes in good story-telling and specializes in bringing out the natural pride people take in the places they live. She pointed out that every place — community, natural area, watershed — has a unique story and the challenge is to get that story told both verbally and visually.

Maguire suggests a three-step methodology that Scenic America uses that might be helpful in telling watershed stories visually. The three steps are "real eyes," "photo eyes" and "change before your eyes."

- The "real eyes" step familiarizes leaders in a community or local watershed area with their resources. When such leaders take tours of their areas they begin to understand relationships — drainages, development decisions, parkland and trail opportunities — they may never have appreciated before. Once these leaders have "real eyes" toward their community, they have a greater ability to make sound and balanced decisions about an area's future.
- The "photo eyes" step documents the spatial relationships between certain resources in a community (or a watershed). This ensures a working file of examples to document current activity for local leaders, businesses, landowners and others. Problems such as run-off pollution, habitat destruction, over-development — and opportunities such as conservation areas, trails, landscaping, or historic resources — should be included in the inventory.
- The "change before your eyes" step is the most intriguing and has many interesting implications for watershed management and conservation. Scenic America has found, in today's world of computer graphics, that land use decisions, visual impacts, pollution and other issues can be

depicted through overlay simulations before they occur. Using a computer, virtually any community or watershed area can change before your eyes for a futuristic view.

What Maguire likes most about the three-step process is that each step has independent value and can be highly technical and sophisticated or quite simple. Visual tools as simple as a drawn sketch can be highly effective.

Other names for a "watershed"

(Even if a picture *is* worth a thousand words sometimes it helps to know some good words too!)

- A river or lake basin
- A "drainage"
- A "catchment area"
- A greater (river) valley
- The headwaters area (for upper watershed)
- A river and its tributaries

A Press Perspective . . . Public Education about Watersheds

— ***Peter Eisler, USA Today; Paul Dolan, Director of International and Special Services, ABC News One; moderated by Deborah Potter, Executive Director, NewsLab***

Survey research shows that adult Americans get most of their information on the environment from newspapers, radio and television. The media is the top source of environmental information for Americans of all ages.

As Executive Director of NewsLab, Deborah Potter, a former CBS and CNN correspondent, leads an organization dedicated to producing strong television news programming. She focused discussion on the media's role in communicating watershed conservation and education.

Peter Eisler

Potter started by asking reporter Peter Eisler of *USA Today* about a recent article he wrote on drinking water quality. *USA Today* is renowned for its effective use of graphics in getting the message across to the public. Deborah asked Peter if he felt he had missed an opportunity by not including watershed maps or drawings in his article which suggested that as many as 80% of all pollution level violations in drinking water supplies went unreported.

Eisler acknowledged that his treatment of water pollution issues, particularly such complex issues as run-off water pollution and stream sampling, would benefit from skillful use of maps and graphics including instructional depictions of watersheds. He feels many reporters should address the same need.

Potter described the enormous opportunities available to reporters, due to government programs designed to inform the public about the quality and safety of drinking water. More than 200 million people will receive annual reports from 55,000 water companies and other suppliers on pollution or

impurities in tap water. The press has an unprecedented opportunity to employ graphic tools when writing about these reports.

Eisler pointed out that pictures are best used in conjunction with a compelling story.

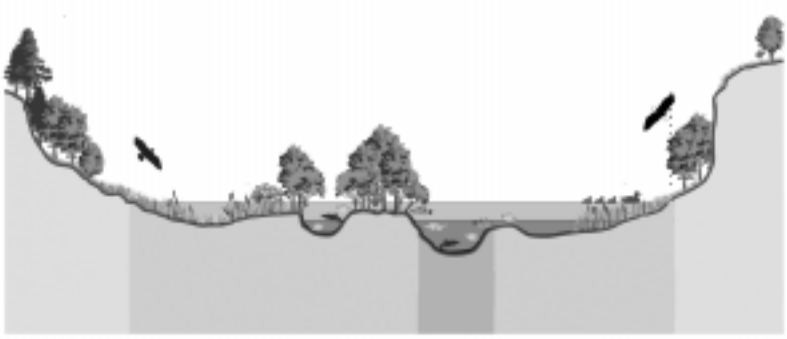
Paul Dolan

ABC News Editor and Producer Paul Dolan agreed with Peter Eisler on the importance of having a good story and suggested that many people who report on environmental topics should refine their story-telling skills and make use of visual tools. He suggested that some environmentally-based stories lend themselves to human interest, in addition to scientific concerns. Paul suggested that watershed advocates look for a "deep hook" and he used an example from his own experience working in the Sterling Forest Area in New York. He pointed out that the need to protect New York City's water supply by protecting Sterling Forest became much more interesting to the public when it was revealed that a local official appeared to be engaged in some illegal dealings regarding land use development in the area. Dolan made the critical point that people can often relate best to an environmental story when it is tied to a subject they already understand — local political corruption in this case.

Deborah Potter referred to this as the "Velcro" method of reporting complex issues. If you can 'stick' a story to something already in the head (a kind of experiential Velcro), the story will have something to stick to and therefore be better understood and remembered.

All members of the panel agreed that conservation organizations and advocates need to become better communicators by using graphics more effectively and translating issues into more "digestible" stories. But the media representatives cautioned advocacy organizations to recognize the duty of reporters to use objective sources and suggested that universities, science institutes and similar organizations having no axe to grind are best suited for supplying underlying data.

Other tips include: slowly orienting reporters on watershed-related subjects but holding off until the most compelling stories are ready to be told; placing much more emphasis on educating editors on the issues in the watershed; and understanding how watershed management affects local communities and public health.



From Sparks. Bioscience, vol. 45, p. 170, March 1995 © American Institute of Biological Science

Symbols, Examples and Repetition . . . A Watershed Communications Primer

— Gibby Waitzkin, Principal, Gibson Creative

Gibby Waitzkin, an expert in public relations and communications and Principal of Gibson Creative, pointed out that there is a discipline and art to good public communication. This is particularly true when it comes to complex concepts such as watershed management and conservation. She provided attendees with a highly useful "communications 101" review that could be employed by the media, public agencies, public interest organizations and others.

Waitzkin noted one of the most useful (and telling) initial techniques: conducting a communications "audit." This can help an organization look at overall capabilities and practices in the public communications area, and provides a useful checklist of tools and approaches before making improvements. These range from simple steps such as actually sending out information to more sophisticated measures such as looking at sources of public opinion research and developing clear, concise, compelling messages, easily digestible by the public who hunger for education and information.

Other communications tips:

Make sure that as a program matures, it is presented to the public and the media in a coordinated way. Too often, advocates for certain issues and educators on certain topics switch back and forth between issues and approaches in the effort to make a point. In so doing, they change the basic message or at least make it confusing. One group concerned about water pollution, for example, might tell the press about health effects on one occasion and hold forth on taxpayer implications another. The next message might be completely different and focus on adverse affects on the biology of the watershed. Waitzkin notes that one can describe an issue many ways, but that the overall message should be coordinated.

Waitzkin reinforced a number of suggestions made by other speakers: First, she noted the importance of using good examples. Too often people think they are describing something when they are really discussing the abstract principles that apply to that subject. Try using precise terms instead: a watershed is a "catch basin" that catches rain and snow from the sky and funnels it into a single body of water. Or… a watershed is nature's version of an immense "drain board." It is the entire area of a stream or "river or lake valley," that includes smaller tributary stream valleys. Remember Deborah Potter's 'velcro' theory and the notion that people better remember an issue if it relates to something they already know.

Symbols can also be important: logos of a three-dimensional stream valley; a schematic picture of a watershed area; a basin and drain; or a slogan like "nature's drainage system."

When it comes to describing the need to address environmental issues occurring in the watershed, Waitzkin, like those before her, suggested the use of before-and-after scenarios. These can range from pictures or descriptions of water quality to maps showing land use and transportation patterns.

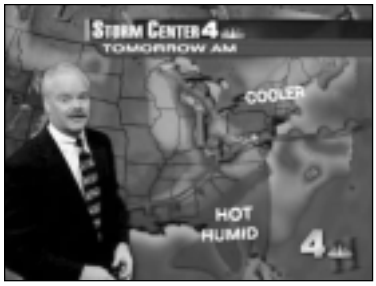
A final note of importance: a good communications strategy repeats the message several times. For obvious reasons, repetition makes a huge difference in the success of a communications program.

Critical Lessons from Meteorology . . . Eyes on the Weather

— David Jones, Meteorologist and Principal Investigator, WRC-TV NBC-4

David Jones, a Washington, D.C. WRC-TV NBC-4 meteorologist, specializes in visual presentation of highly technical issues. He is quick to point out that he needs to get his message across in three minutes. As incoming Chair of the Education Committee of the American Meteorological Society, he is concerned that there seems to be a growing gap between science and journalism that could threaten our future.

Jones quickly answered the question of what weather reporting has to do with watersheds by citing parallels in weather reporting and watersheds. He has a longstanding interest in reporting weather and in the ways people soak up technical information. Jones pointed out that weather reports rely heavily on maps and graphics and provide the best examples of how people absorb technical information on television in short periods of time. The techniques for explaining weather systems also work for watershed systems.



Jones noted that a good weather reporter can always be relied on to say "here we are on the map." Even after reporting for years it is always important to make sure people know exactly where they are. Watersheds are no different. Think how important it might be to start each public discussion with "here we are on the map and here is the watershed around us."

A second guiding principle is that people seem to respond best to information that looks real. Cartoon-like graphics used to report technical information are "taken less seriously than graphics that look realistic," Jones said.

A third principle is that in today's information-based world it is important to have another avenue for people to obtain more detailed information. WRC-TV NBC-4 emphasizes the link between weather reports and weather information on the Internet. Not everyone wants more detail, but

for those who do, it is readily accessible. NBC-4 uses a "Weather Watcher" network to create detailed weather information on certain locales. There are three hundred individuals and schools in the Greater Washington, DC region that regularly supply the station with weather data such as high and low temperature readings, precipitation measurements and more. This network gives NBC-4 "real time" information on what is happening in metro Washington areas.

Television viewers are often advised about the Weather Watcher findings and can log on to the corresponding Website by clicking on a map of their county. This gives them a display of weather data from the "watchers" in their immediate vicinity.

Jones feels it is not too much of a leap from weather-watching to watershed watching and he debuted a new computer graphics program that could build the cornerstone of a new watershed-watcher program. Realistic-looking, three-dimensional maps show the Washington region and its many watersheds, sub-basins and smaller drainages. The new program was initially designed with NASA data to be used (in part) as a flood predictor in cooperation with the Federal Emergency Management Agency (FEMA). Three-dimensional maps can show, for example, that when there is a downpour in one part of the region there could be flooding farther down in the watershed.

Jones indicated a desire to work with NEETF and other public interest organizations and agencies to further develop this mapping program and use it on the air. Events such as oil and chemical spills, pollution run-off problems, floods, droughts, water supply issues and much more could be shown on television as part of the local weather report. This could become a national delivery system. What we initially thought would be a discussion of parallels between reporting complex weather information on TV ended up being a specific road map (with a realistic, three-dimensional mapping appearance) for connecting weather watching with watershed monitoring.

"Junior Rain Drop" . . . High Crimes and Misdemeanors in the Watershed

U.S. Forest Service Film (1948)

Sometimes basic messages and visuals are the most successful. One of the first messages of how to communicate with the public about good watershed conservation derived from a public lands-focused 1948 film that told the story of a rain drop falling from the sky and (eventually) wreaking havoc on the National Forest lands below due to poor land management and resultant erosion. The film used a "gangster" theme, likening the young rain drop character to a juvenile delinquent that got into a criminal gang (made up of other delinquent rain drops) and caused environmental problems.

This film remains ironic and timely 50 years later. The USDA Forest Service has recently begun to put an emphasis on watershed management and the role of forest lands in meeting the nation's demand for clean and abundant water. Jim Sedell, Inter Deputy Water Coordinator of the Forest Service, moderated a panel at the forum and became doubly interested in the public information and education task associated with managing the National Forest System for its watershed values including water supply.

Putting the Rain Drop "Into Reverse"

— Glenn Patterson, Hydrologist, Office of Water Quality, United States Geological Survey

Suppose instead of tracking the raindrop downstream, you were to start at the bottom of a watershed and slowly work your way back up to the top? Along the way you would be taking pictures, making observations, doing tests, and recording data. As a government hydrologist, Glenn Patterson thinks about watersheds as moving resources. He feels it is important to develop strong visual tools and deliver information about watersheds in a variety of ways. He suggested making watersheds more understandable to the public, and proposed an accessible computer graphics program — a kind of computer simulation — that would put the "rain drop" in a kind of symbolic reverse motion to help illustrate how rain starts at the bottom of the watershed and travels upstream.

Finding our Ecological Address Through the "Power of Ten"

— Linda Lilienfeld, Film and Picture Researcher

Linda Lilienfeld, a consultant who specializes in researching classic photographs and images for present day television programs and films, found the 1948 USDA Forest Service Junior Rain Drop film. She believes that people should know their "ecological addresses"— where they live in relation to watersheds around them.

Lilienfeld reminded forum participants of a book written many years ago called *Powers of Ten* by Charles and Ray Eames, in which a kind of virtual journey starts in outer space and travels to Earth. Along the way, the perspective continually narrows by a power of ten. After surprisingly few steps, one moves from outer space to earth to a continent and to a region. A few more steps take the traveler from the region to a person's backyard. From the site, the power of ten moves quickly to the person, to skin cells and into the molecular structure.

Lilienfeld's message was not that we should be moving from outer to inner space, but that we need to be able to move conceptually from one scale to the next and back again with facility. Visualizing where we are on the map as individuals and then seeing the larger setting and how it links to even larger settings is important. Lilienfeld feels we need to be knowledgeable about our position in the watershed — our "ecological address."

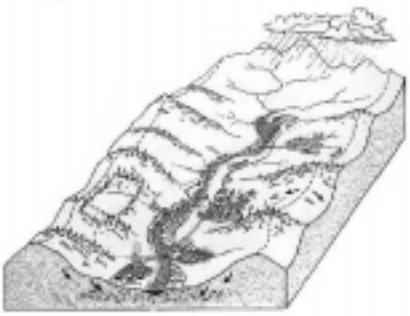
Cyber-Surfing Your Watershed. . . . Accessing Your Own 'Ecological Address'

— Karen Klima, Internet Team, Office of Wetlands, Oceans & Watersheds, U.S. EPA

We live in an age where people have more access to graphics in the home and workplace than ever before. Karen Klima, a member of the U.S. EPA's Internet Team, cautions that computer graphics are not the answer to every visual problem. Computer programs can be confusing and employing sophisticated graphics can require technical training to implement. At EPA, the creation of user-friendly computers and Internet-generated information has been a real priority. EPA's "Surf Your Watershed Program" offers Web users the opportunity to go on-line and learn about the characteristics of their local watersheds or sub-basins.

- First, the program uses computer maps that can resolve down to a specific area with reasonably exact data.
- Second, the data covers a number of different issues and can alert people about preventable environmental problems in their areas and whether any of these problems might pose health threats.
- The third salient feature of the "Surf Your Watershed Program" is that it gives people a much stronger sense of how the "ecological address" — the area in which they live — is affected by natural processes and environmental issues. We all "live downstream." Understanding our ecological address reminds us of our responsibilities to people below us in the watershed and increases our awareness of what is happening above us.

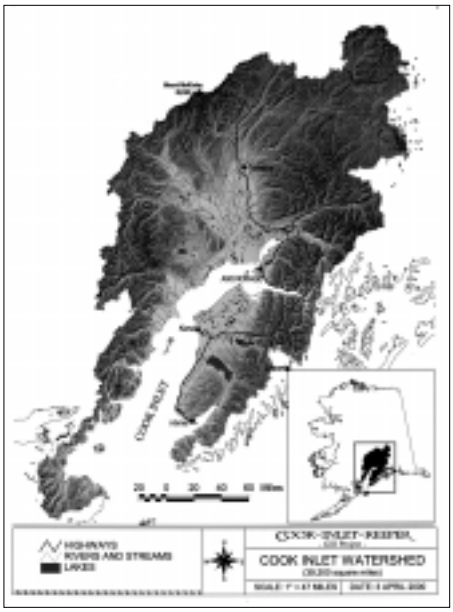
What Is a Watershed?



An Ecological Address to the North . . . Cook Inlet, Alaska

— Robert Shavelson, Executive Director, Cook Inlet Keeper

Applying Visuals on the Ground



The Cook Inlet in Alaska is wild and ecologically sensitive and one of the most developed areas in the state. Fed by a sizeable watershed, the Inlet's future has become a matter of concern to those tracking environmental concerns in the area. Bob Shavelson, Executive Director of Cook Inlet Keeper, is called on each day to discuss the inlet's watershed, an area of thousands of square miles. This job got easier for Bob when he decided to "go graphic."

Designing usable and publicly digestible maps, the Inlet Keeper also developed a CD-ROM program that lets people view incredible amounts of data and use overlays to identify trends, opportunities and problems. The Inlet Keeper's use of graphics and reasonable computer technology helps it communicate with the public more effectively than by hand-waving and hours of explanation. It has the added advantage of letting the public work with the data.

Applications of Watershed Education . . . Illinois, Massachusetts, & Washington, DC

— Moderated by Liz Raisbeck, Watershed Program Manager, River Network

Three local or state-based presentations discussed important principles for watershed education:

- **Anna Eleria**, Environmental Scientist of the Charles River Watershed Association, outlined the Association's longstanding public education efforts and how they worked with local communities, local groups, public agencies and the media to make people aware of issues and opportunities in the Charles River Watershed.
- **William Kennedy**, Washington Suburban Sanitary Commission, discussed the Commission's watershed education efforts including: K-12 curriculum; regular newsletters to residents; Website with information pertinent to the annual Consumer Confidence Reports; and community events to educate the public about ways in which they can protect their watersheds.
- **Rick Cobb,** Illinois EPA's Public Water Supplies Groundwater Section, discussed groundwater management and the fact that watersheds are surface and groundwater systems.

Conclusion:
From Words . . . To Pictures . . . To Watershed Awareness

Graphic programs that emerge from this effort must not be overly computerized or technical. The use of Geographic Information Systems will be essential for communicating with certain key audiences, such as policy leaders or land use decision-makers at the local and state level. But depictions and distribution approaches must also be understood by educators and the general public. Maps, drawings, computer graphics and other modes of presentation at the simplest level will be key to this effort's success.

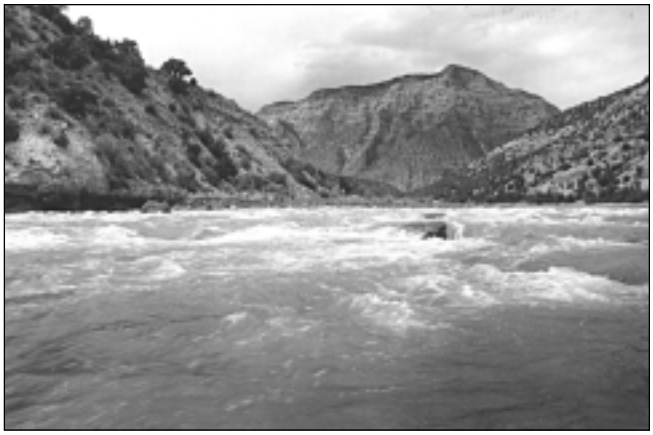
Recommendations:

1. Use better graphics more frequently — don't try to explain complex ideas and systems without them.
2. Target strategic audiences that need to understand watersheds — segment the market and don't try to cover everyone with a one-size-fits-all approach. Tailor the customized graphics for members of the general public, community leaders, and others.
3. Use natural phenomena such as floods, droughts, and major storms to help make the public aware of watersheds.
4. Use the Web as an access tool for maps, graphics and information on local watersheds.
5. Recognize the scattered nature of existing visual resources and integrate where possible — overlays, atlases, etc.
6. Use graphic "templates" that convey basic watershed concepts, made available on the Web.
7. Raise watershed awareness through events that promote ecological address identification and understanding, and help place people in their local environments.
8. Use series of learning concepts ("signs") to facilitate watershed learning that do not rely on graphics alone. Learning concepts should consider:

Learning "Signs:

1. highly familiar analogies to describe watershed components and systems — inkblots, veins and arteries, corridors, etc.
2. "reverse flow" graphics, such as videos that take people up river.
3. simple, user-friendly maps, and diagrams and graphics to convey watershed ideas.
4. appropriate scale of watershed programs and graphics — the more community-focused the better.
5. "journey" stories or watershed quests as a way to convey complex watershed concepts and programs.
6. stories that fit journalistic needs — hooks, local angles and accessible maps and descriptive graphics.
7. watershed graphics and associated concepts that can help teachers meet national science, math and social studies standards.
8. hands-on devices — stencils, models, demonstrations, etc.

Heightened awareness and a better-served public



Does it really matter? This question lingered beyond the forum — not in a ponderous way, but more as a warning signal reminding us not to be too complacent. The adoption of a tool does not necessarily improve a condition. So what if the newspapers and TV stations regularly show pictures and maps of the watersheds? And so what if community leadership discussions are consistently guided by watershed maps and graphics? How much difference would it really make if the population were knowledgeable about watersheds and spatial relationships?

Any good educator will tell you that knowledge alone does not promise appropriate behavior. Nor will prudent actions arise from ignorance. But increased watershed awareness could have practical effects on the condition of a community, the local and regional environments and the world.

Watershed awareness, aided by spatial and visual understanding could:

- Make ***local elected leaders*** aware that a development decision in one part of the jurisdiction might cause run-off pollution for downstream residents and hurt property values.
- Make ***public health officials*** aware of how certain pollution sources affect the intake pipes of local drinking water supply systems and cause an otherwise preventable outbreak of disease.
- Make ***water company representatives*** more thoughtful about local development, business and agriculture, how they can affect drinking water treatment costs, and which upstream lands should be given planning and conservation priority.
- Help ***homeowners*** recognize that spraying lawns with pesticides and fertilizers before predicted rain storms can seriously impact nearby streams (and even much larger distant waters).
- Help ***car owners*** remember that dumping waste oil down a storm drain might hurt local drinking water supplies or pollute a marsh or local wildlife area.
- Help ***farmers near coastal communities*** better understand that failure to control soil loss or application of nutrients could hurt local shellfish beds and put people out of work.
- Alert ***local businesses*** to upstream pollution problems that may affect the quality of water they use or that may tag them for a problem they did not cause.
- Help ***local wildlife agencies and private land trusts*** set priorities for voluntary land acquisition.

- Alert ***public works crews*** to the possibility that applying road salt instead of sand, in certain areas during icy road conditions, could cause serious pollution.
- Help ***local planning and civil defense agencies*** identify likely flooding areas and take preventive steps.

There are *many* other examples of how the public interest is served better when people see the direct causal relationships between decisions and effects on their surroundings. Cause and effect are basic to the spatial understanding that underpins watershed comprehension.

Test Your Own Professional Watershed IQ

1. Define a watershed:

_____
_____
_____
_____

2. Provide three synonyms for a watershed:

_____
_____
_____
_____

3. How many large (100,000 acre average) watersheds, according to the U.S. Geological Survey, exist in the United States?

a) 123 [ ] b) 1012 [ ] c) 2149 [ ] d) 3412 [ ]

4. The Mississippi covers what percentage of the lower 48 states?

a) 10% [ ] b) 25% [ ] c) 40% [ ] d) 65% [ ]

5. What percentage of the United States land area does NOT fall in a watershed?

a) 4% [ ] b) 12% [ ] c) 23% [ ] d) none of these choices [ ]

6. What percentage of U.S. drinking water comes from surface water?

a) 33% [ ] b) 50% [ ] c) 67% [ ] d) none of these choices [ ]

7. What percentage of U.S. water companies and supply agencies must provide annual reports on their local watershed's (or aquifer's) tap water?

a) 10% [ ] b) 50% [ ] c) 100% [ ] d) none of these choices [ ]

8. What percentage of human body weight comes directly from a watershed? (trick question!)

a) 50% [ ] b) 70% [ ] c) 80% [ ] d) 100% [ ]

9. Name two major American cities NOT located next to a river or freshwater lake:

_____
_____
_____

10. Watersheds include groundwater — True or False?

T [ ] F [ ] Usually [ ]

11. The Great Lakes are in a single watershed — True or False?

T [ ] F [ ]

12. What percentage of the American people live in a watershed? (not a trick question!)

a) 100% b) 100% c) 100% d) all of these choices

13. Which of the following federal agencies does NOT use a watershed-based strategy in implementing its programs?

Forest Service	Bureau of Land Management	Park Service
Coast Guard	Fish and Wildlife Service	NASA
Commerce	EPA	Defense
Post Office	Natural Resources Conservation Service	White House

14. How many states currently undertake statewide watershed or drinking water source assessments?

a) 10 [ ] b) 20 [ ] c) 30 [ ] d) 50 [ ]

Correct Answers: 1. For example: "The region draining into a river, river system, or body of water."; 2. drainage, basin, catchment; 3. c) 2149; 4. c) 40%; 5. d) none of these choices; 6. b) 50%; 7.c) 100%; 8. d) 100%; 9. Tucson, AZ; Las Vegas, NV; 10. True; 11. True; 12. c) 100%; 13. Post Office; 14. d) 50

Watershed Resources on the Internet

American Heritage Rivers
http://www.epa.gov/owow/heritage/rivers.html

America's Water Resources
http://www.epa/gov/watrhome/resources/
index/html

Center for Watershed Protection
http://www.cwp.org/

Chesapeake Bay Home Page
www.dep.state.pa.us/Chesapeake/

Clean Water Action
http://www.cleanwateraction.org/

EcoNet
www.igs.org/igc/econet/index.html

EcoNet's Wate, Seas, Oceans,
and Rivers Resources
www.igc.apc.org/igs/www.water.html

Envirolink Library
www.envirolink.org/EnviroLink_Library/Water

Environmental Systems Research Institute, Inc.
http://www.esri.com/

EPA Spatial Data Sources
www.epa.gov/nsdi/pages/nonother.html

EPA's Surf Your Watershed
http://www.epa.gov/surfnewi/text.html

Global Rivers Environmental
Education Network
http://www.igc.apc.org/green/resources.html

Heritage Conservancy
www.heritageconservancy.org

Know Your Watershed
http://www.ctic.purdue.edu/KYW/wspartners/
natlpartners.html

Michigan State University
(Institute of water Research)
www.iwr.msu.edu

Minnesota Association of Watershed Districts
http://www.mnwatershed.org/

MIT & Mass GIS Digital Orthophoto Project
http://ortho.mit.edu/

National Drinking Water Clearinghouse:
West Virginia University
www.ndwc.wvu.udu

National Wildlife Federation: Wetlands
http://www.nwf.org/water

Office of Ground Water and Drinking Water
www.wpa.gov/safewater/consumer/itsyours/html

Planet Neighborhood
http://planetneighborhood.org/

Potomac Adventure
www.potomacadventure.org

Public Broadcasting Service "Taking Action"
www.pbs.org/weta/planet/TakingAction/

Purdue University "Wht is a Watershed?"
www.ctic.purdue./whatisaws.htm

Region 3, Chesapeake Bay
www.epa.gov/r3chespk/

River Network Online
www.rivernetwork.org/

Southwest Watershed Research Center
http://www.tucson.ars.ag.gov/

Surf Your Watershed
www.epa.gov/surf/

The Clean Water Network
http://www.cwn.org/

The Connecticut River Education Initiative
www.wgby.org/crei

The Environmental Information Center
www.igc.apc.org/eic

The National Institute for Water Resources
http://wrri.nmsu.edu/niwr/

The Watershed Management Council
http://watershed.org/wmchome/

United States Geological Survey National Mapping Information
http://mapping.usgs/gov/index.html

United States Geological Survey National Water Conditions
http://h2o.usgs.gov/nwc/

United States Geological Survey Thematic Maps
http://greenwood.cr.usgs.gov/thmaps.html

United States Geological Survey Water Education Resources
http://water.usgs.gov/public/education.html

United States Geological Survey Water Resources Information Home Page
http://h2o.usgs.gov

United States Geological Survey Water Use Data
http://h20.usgs.gov/public/wid/indexlist.html

University of Minnesota "Watershed Game"
www.umn.edu/bellmuse/mnideals

Waternet
http://waternet.com

Watershed Index Network
www.win.org

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