

Watershed Management: A Concept Evolving to Meet New Needs

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Abstract.—Watershed management is attracting increased attention, not only among persons involved in natural resource management, but even among those with a less specialized interest in such issues. Watershed management is reviewed as a movement with historical, social and political implications, in the past and the present.

Introduction

At first glance, the term watershed management appears to be self explanatory, its meaning apparent. Watershed management is the managing of a watershed. At best, however, this definition is merely the starting point and might appropriately be compared to the initial upland flow of a watershed itself, before becoming part of a complex system covering a broad area. Various interpretations and applied, watershed management, as public policy or field of study, also covers a broad area, to include consideration of social, cultural, and economic affairs as well as natural resource and environmental issues.

A concept well known to natural resource managers, watershed management is gaining wider recognition, with references to it now appearing in the popular press. Its recent and wide application ensures that thoughtful coverage of environmental issues having to do with water will likely refer to watersheds and watershed management. For example, a front-page article in the Sunday "New York Times" discusses an environmental strategy to ensure the overall quality of watersheds. Also, President Clinton's Clean Water Initiative relies on watershed management principles to achieve its goals. An understanding of watershed management is key to comprehending much developing water-related public policy.

Watershed management's relatively recent rise to prominence is due to the interest and support of researchers, policy makers, politicians at various levels of government, community groups and the private sector. Many people from these groups believe that watershed management, with its coordinated, voluntary and consensus-based solutions, helps them first recognize and then address problems and areas of mutual concern. Advocates of

watershed management emphasize that its workings do not represent a new program, but rather is a new approach to solving natural resource problems. Present operations are redirected to better accomplish watershed goals.

Several watershed management initiatives are underway in Arizona. Projects along the Verde and Gila rivers have attracted national attention, and the San Pedro River is the site of varied watershed activities. Meanwhile the Arizona Department of Environmental Quality (ADENQ) is in the process of adopting a statewide watershed management framework, to expand the application of watershed principles and to institutionalize the approach in state government. A review of watershed management, its meaning and application, would be timely and help promote a better understanding of its potential to resolve present and future natural resource problems within the state. An understanding of watershed management begins with an understanding of a watershed.

Watersheds as Geography

In watershed management, a watershed is an administrative unit as well as a geographic designation. Considered either way, administratively or geographically, watershed needs defining. What is this structure or natural feature that conveniently serves this dual purpose?

A watershed is a geographic area defined by the flow and movement of surface water. In a watershed, because of the elevation and contours of the land, all water flows to the same location or water body, such as a stream, pond, lake, wetland or, although not in landlocked Arizona, estuary. An aquifer also might be the common destination for water within a watershed. The flow of water might carry sediment and dissolved minerals. In its flow to a common destination, water sets the boundaries of a watershed. Hydrologists sometimes refer to watersheds as catchments or drainage basins. The term river basin sometimes is used synonymously with watershed.

Some watershed-related terminology, e.g., catchments or drainage basins, conveys an image of plumbing, as if human intent were involved. Watersheds, however, are natural systems of flowing water. Much of the water coursing through a riverbed is the result of runoff and

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flow from the surrounding land, its hills, mountains, mesas and other surfaces that slope toward the river. In higher elevations snow falls, accumulates and melts. Rain also occurs. The runoff from melting snow and rain flows over the land, guided by its varied surfaces and forms, possibly through canyons and arroyos, into a system of tributary streams. Streams merge and in turn merge again, until the cumulative flow enters a larger body of water.

The above describes a watershed in a state of nature. To understand the conditions of a watershed, however, more than a natural flow of water needs to be examined. Various human activities also may occur within a watershed, and these may affect its natural conditions. For example, cattle may graze in certain areas. Waters within a watershed may be used for irrigation, and the return flow may carry fertilizers and salts. Lands may be set aside for various other human activities, from logging to recreational uses, each with a possible effect on water quality. Also the watershed may include urban areas. Centers of diverse and varied human activities, urban centers may be the source of runoff with varied kinds of pollutants that enters the watershed.

Sometimes more than just natural drainage features determine a watershed. In defining watersheds within the state, ADENQ also considered such factors as constructed boundaries (e.g., Painted Rock Dam, Granite Reef Diversion Dam and their associated canal systems.), common cultural and economic bases and location of population centers. For example, ADEQ combined Willcox Playa and Rio Yanqui with San Pedro River.

Watersheds exist at different scales or levels, depending upon a particular point of reference. For example, if the Colorado River is the point of reference then almost the entire state of Arizona consists of a single watershed. This is because almost all of Arizona's land eventually drains to the Colorado River. The only exceptions are certain areas draining through Mexico into the Gulf of California and a few closed basins such as the Wilcox Playa.

(Arizona shares the Colorado River watershed with six other states. The Seven Colorado Basin states' cooperative effort at negotiating and then signing the 1922 Colorado River Compact might be viewed as an early example of watershed or river basin management. The compact apportioned Colorado River water between Upper and Lower Basin states. Basin-wide agreements were not common at that time.)

On its way to the Colorado River, water in Arizona flows through various other drainage systems that are in themselves watersheds. In other words, there are watersheds within watersheds, with smaller watersheds nested within larger ones. For example, in Arizona, the Gila and Little Colorado rivers, each fed by their own watersheds, both eventually drain into the Colorado River. Their wa-

tersheds in turn are fed by others watersheds. Watersheds, therefore, range widely in size and scale, from the local to statewide.

(If flow along the Continental Divide is considered then water also divides the continent. Also known as the Great Divide, the Continental Divide is located at the watershed formed by the Rocky Mountain ranges or tablelands. This watershed marks the dividing of the waters in the United States. On one side water drains eastward into the Atlantic Ocean and on the other side water drains west, into the Pacific Ocean. Most water flowing east drains into the Gulf of Mexico before entering the Atlantic Ocean. Most of the western flows enters the Columbia or Colorado rivers before reaching the Pacific Ocean.)

Watersheds as Administrative Units

That watersheds can be subdivided into various sized segments enhances their value as an appropriate and workable management unit. A hydrologic system unto itself, a watershed provides a more comprehensive and rational setting to resolve water or natural resource problems than areas defined by political boundaries, whether national, state, tribal or local. For example, problems having to do with water quality or quantity or wildlife habitat are not likely to be confined to areas enclosed within political boundaries. Watersheds are more likely to match the geographic scale of such problems.

In developing its statewide watershed framework, ADEQ has identified ten watersheds as management units. The watersheds are ten interlocking sections that together cover the entire state.

The flow of water can determine borders between states and nations as well as the shape and extent of a watershed. The Colorado River is the border between the states of California and Arizona, and the Rio Grande divides Texas and Mexico. The use of rivers to define political borders, however, is profoundly different than their use as watershed boundaries. Water and its flow is the internal logic of a watershed, its prescribed area determined by the movement of water within it. When used as political boundaries, a river is merely a convenient point of reference. The watersheds of the Colorado River and the Rio Grande extend far beyond the political boundaries set by those two rivers.

Watershed management is not the only strategy for defining an area or spatial unit for the purpose of managing its natural resources. Ecosystem management also considers the broad regional context as the appropriate

framework for addressing natural resource issues. Definitions of ecosystem management vary, but the approach generally is based on the occurrence of biota in an area.

The focus of ecosystem management ranges from specific sites to global regions. Debate is ongoing about whether watershed or ecosystem management better provides a framework for managing natural resources. Both, however, share a commitment to move beyond single-issue problems viewed on a micro scale to a holistic consideration of broader regional patterns, along with a consideration of the complex interaction of humans with the environment.

More is involved in a watershed management approach, however, than establishing administrative or organizational units along watershed lines. Topographical ridge lines may define the physical boundaries of a watershed, but the application of various principles, practices and theories within those boundaries determines whether a watershed management approach is in fact in place.

Watersheds in History

The historic roots of watershed management are evident in the Depression Era (1929-1942). This was a time of crisis that called forth new institutional arrangements to meet the ongoing economic emergency. In response to the perilous times, the Tennessee Valley Authority was established, its creation an effort to improve regional water development and management. The TVA reflects the premise that river basins should be managed as a unit and that institutional arrangements are needed for integrating the management of land and water resources.

Also at this time, the establishment of conservation districts, part of a national program administered by the U.S. Soil Conservation Service (renamed in 1994 the Natural Resources Conservation Service), encouraged land-water integration at the regional level. Partnerships among public, private and government interests to control erosion at the watershed level gained prominence during the depression. The influence of these developments is evident in the modern watershed movement.

In serving various needs, watershed management evolved over time, absorbing new ideas and concepts and reflecting shifts in thinking. In Arizona and the West, a version of watershed management that prevailed at one time has colored perceptions of its meaning even into the present. Watershed management was once viewed as primarily a means of increasing water supplies. It thus

served the land use ethic that was dominant in the 1950s. Watersheds were valued as sources of various commodities—water, timber, minerals, etc.—and management practices were adapted to increase the supply of those prized commodities. Thus, a watershed was best managed that delivered a maximum amount of water.

A 1940 government publication on dam construction stresses managing watersheds as a water augmentation strategy. The author complains that dam builders often concentrate on the dam site itself, paying slight, if any attention, to the watershed. In this context the watershed is defined as the surface and subsurface flow that occurs upstream of the dam. The aim of watershed management is to maximize the amount of water available for storage behind the dam while minimizing the amount of sediment carried to the impoundment.

A prime strategy for increasing the supply of water, whether to a dam or to water users, was to manage the vegetation within a watershed. What this in effect meant was destroying or severely reducing vegetative growth within the watershed. This strategy was based on the fact that vegetation, to survive, uses water that otherwise could be put to human uses. Removing the vegetation is a way of redressing this perceived imbalance. Thin out or remove water-using vegetation within a watershed or replace it with a less consumptive species, and a net gain will result; i.e. more water for humans. Chains, cables and chemicals were the means of removing chaparral and pinon-juniper forests; ponderosa and mixed conifer forests were harvested.

In the mid-1950s, studies were done that showed if mixed conifer and ponderosa pine were cleared or thinned in certain areas grasses that use less water than would grow. Clearing of chaparral shrubs also was seen to have water augmentation promise. Since these shrubs readily reseed, however, burning and chemical treatment was the prescribed method of eliminating them. Additional water savings were anticipated by replacing vegetation along riparian areas with more shallow rooted types.

As might be expected this strategy did not go over well with some people. Environmentalists called it “tin roof watershed.” Although some experiments were conducted in Arizona, managing vegetation within watersheds for water augmentation was not done to any great extent within the state, for logistical as well as environmental reasons.

This version of watershed management, which was common in the semiarid West at that time, still lingers in some people’s minds as its dominant rationale. To them water augmentation is so closely linked to watershed management that the terms are more or less synonymous. This at times has worked to discourage a wider acceptance of today’s much different watershed management practices.

Contemporary Watershed Management

Defining watershed management as preached and practiced today is not an easy task. Increased references to watershed management in the natural resource field, in contexts ranging from environmental to regulatory, do not ensure a common understanding of the term. Even among those who advocate its use, who believe watershed management is the wave of the future, may not totally agree on its meaning and application.

Watershed management has been described as a “catch-all phrase,” in its accommodation of different activities. EPA literature refers to it in a more positive light as “an evolving approach with many variations.” Some people take comfort from this lack of precision, claiming that it is an advantage that watershed management does not fit a particular cubbyhole and instead can be creatively applied to serve different needs. Yet, sufficient agreement exists among watershed management advocates to provide a description of some basic working premises that underlie the concept and its application today.

More than just a policy-making strategy, watershed management also advocates a particular way of thinking, an integrated and holistic view of the world that also is influencing thought in a range of other fields. We now tend to be suspicious of any single cause-and-effect explanation for phenomena, especially natural phenomena. We urge taking the wider perspective, to look at various contributing factors and the way they interact, rather than focusing on a single component. Examples of this thinking are evident in various areas, from interdisciplinary studies to integrated pest management. Environmentalists lay special claim to the wisdom of such an approach, often citing John Muir’s remark, “When we try to pick out anything by itself, we find it hitched to everything else in the Universe.”

Today’s understanding of watershed management reflects this view. For example, its literature includes such polysyllabic words as interconnectedness, integrated, interrelationship, multidisciplinary and multi-jurisdictional. What these words have in common, besides an abundance of syllables, is that they go beyond single categories. The phenomena they refer to are not cut from a single piece, but consist of several pieces that fit together creating a more complex whole.

More specifically, watershed management involves recognizing the complex workings of a watershed, its principles based on an awareness that land use, soil and water are all connected, and this land-water connection is an essential factor to consider when managing watersheds. Further, the strategy acknowledges that issues

overlap, that streams are to be studied along with lakes and wetlands; that land uses and community activities are tied to water quality; that groundwater is connected to surface water; that wildlife habitats depend on the condition of water and land; that upstream is linked to downstream; etc.

Recognizing the complexity of the natural world begets awareness that human affairs are not conducted in isolation, nor do they play out as separate and independent acts, but often have implications beyond the immediate situation, to affect other actions and in turn to be affected by them. Human involvement in a watershed, therefore, can have far-reaching implications. As a result, watershed management is concerned with such human-related activities as agricultural practices, urban runoff, private property interests, beneficial uses, sustained economic vitality, net environmental benefit and water quality concerns, especially nonpoint source pollution.

In sum, managing a watershed is a strategy to promote its cooperative use among various, even competing interests, while at the same time protecting the watershed’s natural or environmental values as well as public health. Despite the ambitious goal, practicing watershed management principles should not be viewed as a daunting task. Successful application is really based on a simple premise. Clayton Creager of the CADMUS Group describes the process: “By acknowledging a need to work together, problems are addressed more directly. So what we are basically talking about with watershed management is people cooperating—like in kindergarten.”

People Working Together

Watershed management involves the participation of stakeholders. As defined in Arizona’s watershed framework document, stakeholders are “individuals, organizations, and agencies that are involved in or affected by water resource management decisions for a watershed management zone.” Stakeholders’ interests in watersheds involve political, social and economic considerations. Assembling a watershed management team to speak to these varied interests can involve representatives of all levels of government, public interest groups, industry, academic institutions, private landowners and concerned citizens.

Broad stakeholder involvement has various implications. With power shared at different levels, new types of governance can be established. The previous reliance on specialized agencies too often resulted in inconsistent and fragmented efforts that often conflicted, overlapped or otherwise were insufficient. The result frequently was a

form of institutional paralysis known as decisionmaking gridlock.

By working together and sharing information, stakeholders agree on ground rules to guide their participation in management activities. They come to an understanding about their particular roles and mutually agree on adopted priorities and shared responsibilities. With such broad and varied participation, the focus on environmental issues is thus broadened to also include consideration of social and cultural goals such as economic stability and quality of life issues.

Watershed management often partakes of the tenets of conflict resolution. The consequences of personal confrontations and legal entanglements have been shown to be damaging and costly. Collaboration now is generally viewed as the best way to resolve conflict, especially with regards to environmental issues.

Further, watershed management accommodates the interest of local stakeholders who often have complained of being left out of the policymaking process. The involvement of local and even community interests, however, should not be interpreted to mean that watershed management is a bottom-up approach in contrast to the federal top-down strategy. Instead, all stakeholders are partners in adopting watershed management goals.

Not the least of the benefits derived from having local people—those depending on the natural resources within the watershed—meeting and making decisions is that they become well informed about the issues. If, as is often said, knowledge is power, local individuals and groups become empowered by their participation in the watershed management process. Not only do they learn about the issues, but they also develop communication and leadership skills as well.

Arizona and Watershed Management

Watershed programs are being worked out at the state level throughout the United States, with mixed results. Such efforts are often undertaken with federal support. About one-third of the states either have adopted a statewide watershed management program or are in the process of adopting such a program.

Arizona's official commitment to watershed management began in 1994 when Brian Munson, then head of ADEQ's Water Quality Division, directed staff to explore what implications watershed management would have on ADEQ operations. At the time, watershed management was attracting national attention as an effective strategy for managing water quality.

Supported by EPA funding and technical assistance, an ADEQ work group was formed to look into watershed management possibilities for the state. Membership was limited to ADEQ staff, specifically those involved in water division programs. The intent was first to work out within the agency an understanding of watershed management and its implications, before involving other individuals and groups. A central task of the work group was to develop a statewide watershed framework to guide the state in adopting watershed concepts. In preparing this document, the work group consulted with various outside agencies such as the U.S. Environmental Protection Agency, U.S. Corps of Engineers, U.S. Bureau of Reclamation, Arizona Department of Water Resources and especially local councils of government.

In May 1997, the ADEQ work group issued a draft version of a document titled, "The Arizona Statewide Watershed Framework." The document is a blueprint, the theoretical underpinnings, of an Arizona watershed management program. It is intended to be an adaptive management document, to be adjusted and modified to best meet Arizona conditions and situations.

Along with defining watershed management, both as philosophy and public policy, the document also provides a specific work plan. As previously noted, the document organizes the state into ten management zones. A six-step method is identified for developing and implementing a successful regional watershed plan within the management zones.

- Initiate stakeholder outreach and involvement
- Collect and evaluate watershed data
- List and target environmental concerns
- Develop management strategies and measures of success
- Compile the watershed plan
- Implement and evaluate watershed plan

Along with identifying six essential steps the document also lists various ADEQ operations or activities that are to be performed as part of the watershed framework. Including these activities as part of the framework is consistent with the document's directive that "ADEQ will use the watershed approach as a practical means to consolidate and fulfill many of the department's objectives and activities."

In many ways the framework is a strategy for managing ADEQ programs. For example, the document outlines a schedule of when ADEQ programs and activities will occur within particular watersheds. They are scheduled as part of a sequenced and iterative pattern. For example, detailed monitoring would be scheduled during a par-

ticular year at an individual watershed, to be performed at different watersheds in future years. Other ADEQ programs would be worked out in a similar fashion. As a result, ADEQ operations would be taking place on a rotating basis in different regions of the state. The intent of this cyclical watershed approach is to better budget and allocate ADEQ resources and to enable the agency to perform its duties in a more thorough and consistent manner.

The framework represents the state's most far-reaching and organized effort to adopt watershed management concepts. Related issues that lend momentum to Arizona's consideration of watershed management are control of nonpoint source pollution and determining total maximum daily loads (TMDLs). Both are addressed by the state's watershed framework document.

Nonpoint Source Pollution Program

Watershed management, as generally understood and practiced today, is linked to efforts to control nonpoint source pollution (NPS). Background to the NPS issue therefore sheds light on the current interest in watershed management. More specifically, examining Arizona's operation of a NPS program also shows how experience in managing such a program has benefitted the state in efforts to apply watershed management principles.

The increased interest in watershed management is partly the result of a shifting regulatory focus from point to nonpoint source pollution. At one time, the control of point source pollution was a water quality priority. Point source pollution comes from an identifiable source; e.g., a factory or a mine. Controlling point source pollution involves identifying the source, whether mine, factory or other, with state or federal agencies then enforcing specific requirements on polluters. This is considered a "top-down" approach, with a source of authority enforcing directives on those subject to, or under its authority.

Efforts at controlling point source pollution eventually paid off, with sufficient progress demonstrated to enable regulators to focus on other sources of pollution. Officials then turned their attention to the control of nonpoint source pollution.

In 1986, when NPS pollution problems were attracting special notice, an EPA report stated that nonpoint sources account for 45 percent of the pollution remaining in estuaries, 76 percent of the pollution in lakes and 65 percent of pollution in rivers. Further, 165,000 miles of rivers and 8.1 million acres of lakes in the United States had been assessed to be impacted by various categories of NPS pollution. Clearly NPS pollution was a problem to be reckoned with.

Controlling non-point source pollution presents regulators with a different set of circumstances than point sources of pollution. Unlike point source pollution, NPS is

less readily identified with a particular source or a single source of pollution. Frequently associated with urban or agricultural runoff, NPS pollution develops from many human activities, usually related land uses. Relatively diffuse in its points of entry into the environment, NPS pollution can originate anywhere on the land surface or within a watershed. NPS pollution might then flow with runoff to streams, rivers lakes, and aquifers.

Managing NPS pollution usually involves identifying a land area with a common drainage system and joining forces with other interested and concerned parties within the area to develop a strategy for solving problems. Many different interests need to work together, from the various levels of government—local, state, and federal—to the private sector and individual members of the public. The community needs to be involved because nonpoint source solutions often are voluntary. Consensus-building then becomes important, with an informed and concerned public participating in solving problems. Education and involvement of the public are therefore major concerns in the management of various NPS pollution.

In response to the rising concern about NPS pollution, ADEQ's Division of Water Quality adopted an NPS control program. The stated object of the program is: "To improve the health of the watershed through the development of community-based programs that minimize pollution from nonpoint sources to surface waters." Central to this effort is the Nonpoint Source Management Zone Program (NPSMZ) which divides Arizona into 15 Nonpoint Source Management Areas. These represent areas with certain community and hydrologic consistencies.

ADEQ's later efforts to establish a statewide watershed framework benefitted from the agency's experiences in administering its nonpoint source pollution program. Through its involvement with the NPS program, ADEQ gained familiarity with watershed-based environmental management. Further, managing the NPS program involved working with community groups since NPSMZ was instrumental in establishing local advisory groups in the Verde River Valley and the Upper Gila River Valley.

A task when designing the current state watershed framework was to broaden the focus beyond traditional NPS program concerns, such as impacts of farming, ranching, and urban runoff, to include a greater array of water quality programs. As previously discussed, watershed management is intended as a more comprehensive natural resource strategy.

Total Maximum Daily Load

TMDLs have attracted wide attention lately, even featured on a front page article in a Sunday "New York Times." TMDLs represent a new approach for evaluating

water quality and protecting waters, with EPA heralding their use as “a defining moment.” Enforcement of TMDLs earned EPA’s accolade because it represents a commitment to control water quality on a watershed basis, rather than relying on technological strategies.

In brief, a TMDL is a measure or “budget” of the amount of a specific pollutant that a body of water can receive before it exceeds water quality standards for a designated use. TMDLs generally are set for individual pollutants within specific watersheds. TMDLs owe their prominence to the Clean Water Act and its requirement that loading estimates be set for those watersheds with water quality insufficient to meet designated uses. For example, TMDLs would need to be established for a stream segment that is designated for contact recreation but has high levels of fecal coliform bacteria.

Setting TMDL standards means considering both nonpoint sources and point sources of pollution. As a result, efforts to set TMDL standards require coordination among various regulatory agencies on a watershed basis. ADEQ is planning to establish about 92 TMDLs during the next eight to 13 years.

TMDLs have taken on a special importance lately for several reasons. EPA is viewing the process as an effective tool to improve water quality on a watershed basis. Also, the TMDL issue—or more specifically various states’ failure to develop TMDLs—is providing an opportunity for environmental groups and others to sue EPA for its failure to enforce Clean Water Act directives in some states. In effect, TMDL is an issue for rethinking water quality on a watershed basis.

Critics Question Arizona’s Watershed Commitment

Arizona has undoubtedly made a start in adopting a watershed approach for managing various state water quality programs. The work that went into developing “The Arizona Statewide Watershed Framework” demonstrates a commitment to applying watershed principles within the state. Many observers, however, view progress accomplished thus far as only the beginning, faulting ADEQ for not more actively promoting watershed management initiatives. Critics often refer to watershed work being done in other western states, especially Utah, California, Oregon and Washington, to demonstrate that Arizona could and should be making greater progress.

For example, Utah appears to be making impressive progress in adopting watershed management. The state is divided into ten watershed management units. A coordinator is assigned to each unit, and each unit also has a local

steering committee and a technical advisory group. Unit coordinators act as a liaison between state government and local communities. At the state level, the statewide watershed management coordinator is part of a team consisting of representatives from various sections within the Utah water quality division. Chaired by the water quality division director, the team works to align various operations with watershed principles.

Critics claim that part of the problem in Arizona has been the administrative instability within ADEQ. An excessive number of personnel changes, especially at senior management levels, has left the state without effective leadership to promote watershed management initiatives. For example, in the last four years, four different directors have headed the Water Quality Division within ADEQ. This is a key position to ensure state commitment to watershed policy. This rapid turnover does not bode well for consistent and long-term attention to watershed affairs; not to mention other water quality matters.

In contrast, others believe Arizona already has demonstrated a leadership role among states in watershed management by organizing and implementing its NPSMZ program. They don’t necessarily view NPSMZ as a precursor to a watershed management program, but a watershed program unto itself, embodying its essential principles. Those disagreeing with this view argue that watershed management involves much more than controlling nonpoint source pollution; that it operates with a broader focus, guided by a holistic, synergistic interpretation of watersheds and their workings. This is the approach they advocate for Arizona.

Some critics identify various characteristics of what they call the state’s political culture as working against statewide watershed management. For example, they claim Arizona has an inordinate devotion to control at the local level, to the extent that it is the defining political philosophy of the state. This position often is interpreted to mean that not only is federal involvement resented, but even directives from state government are unwelcome. Applying such principles to efforts at cooperative governance, such as watershed management, can present problems.

For example, locals who grapple with complex watershed issues likely lack the scientific and technical expertise to make appropriate decisions. If government, which can be a source of such expertise, is suspect, where can local community members turn for help? If even state officials are reluctant to take action lest they impose upon local communities, citizen groups may be left to their own limited resources. Some critics fault ADEQ for not having worked out suitable procedures for building bridges to local communities to enable the agency to better work with advisory groups and respond to their needs.

Some people view Arizona’s commitment to the property rights movement as hampering efforts to work out watershed initiatives. Property rights is an expression of

local control, with individual property owners claiming certain inviolable rights to determine the use of their land, regardless of government policies. Whether viewed as a social, cultural or political movement, a property rights position often is at odds with the collective planning and negotiating of watershed management.

Finally, some people claim that Arizona is lukewarm in its commitment to watershed management for hydrological or water supply reasons. Tucson, which is Arizona's second largest city, relies on groundwater, with the Central Arizona Project supplying the city's only surface water supply. Without a direct vested interest, Tucson officials may not be overly concerned with the condition of adjacent watersheds. In Phoenix, the Salt River Project claims the watersheds of the Salt and Verde rivers. Its involvement with these watersheds, which are managed by the U.S. Forest Service, is said to discourage extensive watershed management activity.

If Arizona has in fact been slow to adopt principles of watershed management, the situation may be changing. Arizona, along with other Western states, is confronting change, some say it faces a transformation, the effects of which will become more evident in the future. Ranching, mining, agriculture and timber, once the economic mainstays of the west, are being replaced by recreation, exploitation of scenic resources and a concern for urban affairs. The effects of this shift undoubtedly will be evident in debates about the best strategy to deal with publicly owned land and water. Watershed organizations may be the pressure point to deal with these issues and as result may gain in importance in the future.

Federal Watershed Support

Various federal agencies are committed to watershed management as a strategy to further U.S. natural resource management objectives. Agencies such as the U.S. Army Corps of Engineers, the U.S. Department of Interior and especially the U.S. Environmental Protection Agency provide both financial and technical support to encourage watershed management planning and implementation.

Other federal agencies have adopted various aspects of the watershed approach, but often without the community involvement component. For example, the U.S. Bureau of Land Management and the U.S. Forest Service are using watershed analysis, but often without community participation. (The question then arises whether this in fact is watershed management. The watershed approach is multifaceted, involving a range of activities. Some proponents feel sufficiently protective about watershed management principles to be wary of agencies claiming to use

the strategy, but without adopting what they consider to be a key component; i.e., community involvement. Supporters are quick to point out that more is involved in watershed management than organizing activities within watershed boundaries and government agencies are increasing their commitment to collaboration with local communities as mandated by the new draft rule for National Forest Management Act planning.)

When considering the federal role in watershed management, the Natural Resources Conservation Service merits special mention. Founded in 1935 as the U.S. Soil and Conservation District, this agency actively promoted regional federal-state-local partnerships. It was instrumental in establishing about 3,000 soil conservation districts that almost cover the entire nation. The agency's adoption of a "small watershed program" and its development of a "natural resource management" framework promoted regional cooperation in erosion and flood control issues. In 1994, the agency became the Natural Resources Conservation Service. The NRCS is a lead agency in the promotion of watershed management, its conservation districts providing the framework for many current watershed initiatives.

Various pieces of federal legislation refer to watershed management. For example, the Clean Water Act (CWA) mentions watershed management and includes options for watershed-based activities. The 1996 amendments to the Safe Drinking Water Act include new requirements for source water protection activities; in effect, this means watershed and associated groundwater basin protection. Also, in 1991, EPA released plans for a new watershed protection approach to confront nonpoint pollution problems. In 1994, EPA Region 9 came up with a watershed strategy plan, with various goals including setting clear watershed target priorities, supporting local, state, and federal watershed efforts, and tracking and evaluating the success of watershed management initiatives.

More recent federal action further promoted watershed management. On October 18, 1997, the 25th anniversary of the passage of the CWA, Vice President Al Gore issued a directive to various federal administrators in honor of the special occasion. He directed EPA administrator Carol Browner and Secretary of the Department of Agriculture Dan Glickman to work with other federal agencies and the public to develop a plan toward fulfilling the CWA's original goal of "fishable and swimmable" waters. A Clean Water Action Plan was duly prepared and forms the core of President Clinton's Clean Water Initiative which he announced in his 1998 State of the Union Address. The plan relies heavily on the watershed approach, referring to it as the "key to the future." Watershed assessments are to be used to identify watersheds to be targeted for FY99 funding, and watershed restoration action strategies will identify causes of water pollution and the actions needed to remedy those problems. In brief,

the watershed approach is to be the guiding light for setting priorities and taking action to clean up the nation's rivers, lakes and coastal waters.

As is appropriate to a watershed approach, the plan calls for a collaborative effort, with federal, state, tribal, and local governments working together as a team, along with the private sector and members of the public. This broad partnership is to ensure public participation in restoration and protection efforts and to promote productive coordination among all levels of government as the preferred strategy for cleaning and protecting the nation's water.

As part of the Clean Water Action Plan, state environmental agencies and conservationists are directed to take the lead in conducting unified watershed assessments. The process also is to involve federal and local agencies, watershed-based organizations and the public. The assessment is to define watershed priorities for those watersheds most in need of restoration. These watersheds would be eligible for priority funding from the FY 1999 budget.

The assessment also calls for developing and implementing watershed restoration action strategies to restore those watersheds most in need of attention. Further, a preliminary schedule is to be set for working on the remaining watersheds. In Arizona, the U.S. Natural Resource Conservation Service and ADEQ are working together to assess and prioritize the state's watersheds.

The President's FY 99 budget proposes \$500 million to implement the action plan. Further, the President said that over the next five years he will set aside \$2.3 billion, in addition to current spending levels. Among other objectives, the federal money is to be spent to "increase direct support to the states and tribes to carry out a watershed approach to clean water, and fund watershed assistance and partnership programs and grants to help local communities and citizens take leadership roles in restoring watersheds."

Some people are skeptical of the initiative, claiming it is politically motivated, its goal to promote Vice President Gore's presidential aspirations. They say much of the funding of the initiative is uncertain, with some of the support depending upon future congressional appropriations. Not taking any chances, the Western Governors Association is actively promoting federal funding for watershed improvement and restoration.

Conclusion

That watersheds provide a framework for managing natural resources seems appropriate for a number of

reasons. The most obvious reason is that watersheds are naturally defined surface areas and provide a focus for observing the effects of human activities on land and water. Managing a watershed often means managing human activities to lessen any damaging effects on natural processes.

Also, however, an acceptance of watersheds as managing units implies less reliance on bureaucratic techniques; instead, the workings of a watershed determine what decisions are made and what actions are taken, at least in theory. Natural watershed processes, rather than bureaucratic structures, provide the rationale for management plans. This is an appealing concept at a time when many people profess belief in an environmental ethic.

This mode of thinking also might lead us to consider what is basic to watersheds, i.e., water, the flow, drip, swirl and rush of water. Although obvious, this still might bear mentioning. Too often theory rules, its interpretation and application of primary importance. Even watershed management, although striving to be user-friendly, can at times seem rather abstract. Those wary of theories and abstractions can derive some comfort knowing that their involvement with watershed management is essentially an involvement with water, in its various states and conditions.

Watershed management, therefore, is more than just an effective management plan, to be studied, interpreted and applied. Part of its appeal extends beyond its use as policy to an awareness that watersheds are in fact systems of flowing water, and that an effective application of watershed management principles begins with an appreciation of river flow. In a memoir of his boyhood Richard Selzer describes the effect rivers have on him, "From each river, there is given off a personal drift that is the confusion of its numberless currents, the curves and recurves of its long trapeze, the strew of its bed." In his feel for rivers, Selzer is effectively expressing one of the first principles of watershed management.

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