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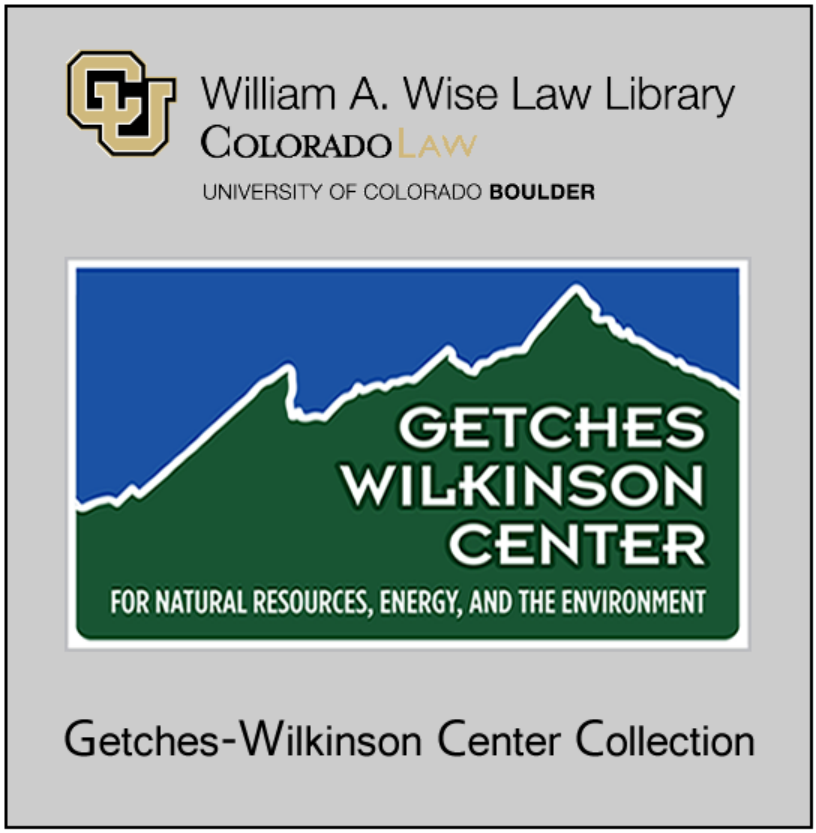

GARY D. WEATHERFORD, FROM BASIN TO "HYDROCOMMONS": INTEGRATED WATER MANAGEMENT WITHOUT REGIONAL GOVERNANCE (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 1990).

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FROM BASIN TO "HYDROCOMMONS": INTEGRATED WATER MANAGEMENT WITHOUT REGIONAL GOVERNANCE

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PREFACE

In 1988 the Natural Resources Law Center initiated the Western Water Policy Project with the support of a grant by the Ford Foundation. This project includes a broad-ranging review of the laws, policies, and institutions governing the allocation and use of water resources in the western United States. It is aimed at addressing the adequacy of western water policy to respond to the needs of the contemporary West.

A major objective of the Western Water Policy Project is to encourage discussion of water policy issues. To further this objective we are initiating this Discussion Paper series. The papers in this series are written in conjunction with periodic workshops primarily involving a water policy working group. The members of this group are F. Lee Brown, James E. Butcher, Michael Clinton, Harrison C. Dunning, John Echohawk, Kenneth Frederick, David H. Getches, Helen Ingram, Edwin H. Marston, Steven J. Shupe, John E. Thorson, Gilbert White, Charles F. Wilkinson, and Zach Willey.

We welcome comments and responses to these papers.

Larry MacDonnell

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From Basin to "Hydrocommons": Integrated Water Management Without Regional Governance

Gary D. Weatherford*

While conceptually sound, most of these attempts at [basin] water management have been failures. The reason is that society is not organized around hydrological boundaries. . . . In considering the best spatial arrangements for water policy, we should remind ourselves of the fact that regions do not have 'truth'—they have only utility. . . . If so, there is an urgent need to define water regions as something other than river basins. Problem-sheds are what we have in mind.[1]

INTRODUCTION

Hydrologic basins are rich repositories of resources and meaning. Altered by hydraulics, and overlain by multiple purpose water projects, most basins are being enlisted into a larger "hydrocommons," an area defined by linkages to common water sources. Past hydrologic basin planning has been episodic, driven by selective sets of purposes which wax and wane politically. The multiple purposes have accumulated to a point where water resources are overtaxed, requiring more deliberate adjustment and integration of the multiple purposes. For consistent integrated-purpose water management to prevail, more public consensus on decision rules and funding is needed. Water quality planning, water scarcity and prohibitive development costs are forcing more integration and consciousness of regional interdependency. The hydrocommons endgame will involve the interworking of voluntary communities of interest, compulsory relationships created by competition and regulation, and mixed-economy federalism. It will involve the crunching and compromising of multiple purposes through clearer decision rules.

RIVER BASIN PHENOMENON

River basins evoke many images. The images are hydrogeological, ecological, cultural, ideological, political and aesthetic. Surface basins are eroding earth forms which catch and, through the efficient forces of gravity, drain and distribute precipitation. They enclose natural systems of life-cycling flora and fauna. They shelter distinctive human settlements and provide the basis for regional identity.

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1 C. Foster and P. Rogers, *Federal Water Policy: Toward An Agenda For Action* (1988).

They present contours and divides which can be adopted as political boundaries. Their crests and valleys inspire painting and poetry. Basins, in short, are viewed as rich repositories of resources and meaning.

Managing any resource, particularly water, within the context of a river basin is a substantial undertaking because there is a vast array of forces and images at work in that natural catchment. It is the purpose of this paper to explore some of the apparent and appealing features of basin-oriented water management against the backdrop of interbasin development, competing multiple purposes and changing federal-state relations. (While the emphasis of the paper is on surface basins, the reader is asked to keep in mind the continuity and linkages, physically and through conjunctive management, between streams and aquifers.)

HYDROLOGIC AND HYDRAULIC CONVERGENCE: THE HYDROCOMMONS

THE HUMAN MARK ON BASINS: A GATHERING OF MULTIPLE PURPOSES

The Flux of Water Values

Social values concerning natural resource use are superimposed on basins. Values underlie the exploration, settlement, development and protection of a basin. Basins therefore are at the mercy of values. Any management of water resources within a basin reflects the values held, minimally, about land and water. Water is valued in an array of ways fundamental to our existence and experience. Water is valued to quench thirst, feed and clothe, to cleanse, to manufacture, to restore and recreate, to transport and dilute, to inspire and beautify, to cool, heat and illuminate, to extract, to etch and carve, and to shelter and propagate aquatic life. Many of these values are closely related and interdependent in the collective belief systems of our society.

The biological indispensability, material utility and spiritual valence of water makes its social importance universal and multi-faceted. The relative weight given by a culture or society to each of the values, and to the relationships between values, changes over time.

The multiple "purposes" of water resource planning, development and management are products of the changing social values. Water management takes its cues from authorized multiple purposes and influential constituencies. Pluralism and the power of elites operate together to drive water management. Realistically, basin-oriented water management can only occur where permitted by authorized multiple purposes reflecting the will of influential constituencies and elites. A brief historical reminder of the imperatives which have driven past forays into river basin planning is in order.

Purposes Propelling Political Action

The initial focal point of our nation's water vision was the "internal improvement" of navigable waterways and canals. Regulating interstate commerce on navigable waters was declared a federal constitutional prerogative. Channel and harbor improvement, and flood control work, became compelling causes for a country promoting settlement and economic expansion.

The agrarian conquest of arid lands added reclamation to the imperatives underlying government involvement in water resource planning and development. Meeting the social and economic demand for hydropower development soon thereafter engaged competing private and public interests. Public hydropower came to be teamed with both reclamation and rural development programs on the social welfare agenda. Reservoirs for flood control, for the carryover storage of irrigation water, and for hydropower heads also became valued for water-based recreation, so yet another purpose entered the multiple purpose gallery.

Urbanization gave rise to a constituency first for the development of drinking water supplies and the control of pollution, then for wild rivers, advanced environmental reporting, and minimum flows for fish, wildlife, and riparian habitat.

These multiple purposes have been gathering for two centuries in the river basins and over the groundwater basins of the nation. They have been thrust upon the basins by impressive social and political resolve and action. They now overcrowd many basins. They have caused hydrologic basins to be reshaped, breached and bonded by hydraulics, resulting in hybrid basins. Let us call these configurations, tied together as they are by man-made plumbing, "hydrocommons." The extra-basin area enclosing the collection and distribution of water is our modern water commons. Not regarding and respecting it as a commons can set us up for management error.

In short, even though basins are staging grounds for such awesome natural forces as gravity, uplift, erosion and climate, they have been altered significantly in a relatively short period of time in the service of multiple human purposes. In the time (presumably measurable in centuries) that remains before individual basins reclaim some of their integrity through the siltation, erosion or deterioration of our water works, the dynamic of changing multiple purposes will drive the management of the water resources occurring within those drainages. Meanwhile, incrementally, basin water management may become viewed as hydrocommons management.

Change as a Constant

The initiation of a purposeful activity perturbs the preexisting order in a basin. Then that activity over time itself becomes part of a preexisting order which is

subject to perturbation by a new purposeful activity. Each preexisting order has a coefficient of resistance to the oncoming threat of change posed by new activity. The resistance is primarily a function of how much institutional protection is accorded the preexisting order. Depending on the degree of scarcity, new water developments or purposes become competitors with old; the old tend to resist the new (at least until mutuality, accommodation or displacement occurs). The resistance tends to be both cultural and economic, and the competition has both cultural and economic consequences.

What is enduring is the multiplicity of purposes (and of their underlying values). In contrast, what appears to be time-bound is the number and ranking of those purposes. (While the proponents of some values may assert that those particular values are timeless, a case for any particular complexion of values being timeless has yet to be persuasively made. Perhaps proponents of integrated water management will offer a timeless formula before the onset of the 21st Century but even that formula would need to be approached with some skepticism.)

Examples of the constancy of change abound. Progressives of the 1930s trumpeted massive public water works which environmentalists of the 1970s targeted as monuments of ecological disaster. In the past, nonstructural solutions were derided by many water managers; with the reduction in subsidy for structural solutions, nonstructural approaches became heralded by many as least-cost alternatives. Public hydropower development was viewed in one era as a means of reducing poverty and expanding the middle class; later it is accused of killing fish and subsidizing uneconomic activity beyond its justifiable life. The belief in water as a collective good led to the rise of public water districts; now the monopoly hold of some of those districts can prevent the needed reallocation of the water. The idling of irrigated acreage to address water pollution was unspeakable and unthinkable a few years ago, but is now thinkable and is becoming doable in some settings.

The object lesson? Today's prevailing water-related values, however impressive and apparently well grounded, will survive only through processes of adaptation that will leave them changed in relevance and, to some extent, form. Basin-oriented management schemes that do not anticipate and accommodate change are doomed to short or ineffective institutional lives.

Multi-Purposes and Natural Systems

In the state of unperturbed nature, a river basin encloses dynamic geologic and biological processes. Major water development significantly affects the natural background of the basin. The transbasin diversion of headwaters, the damming of tributaries or the importation of foreign waters can materially perturb the baseline natural systems.

In the process of altering natural systems, multiple-purpose water development creates its own relationships and interdependencies. Water project systems link one thing to another: native supplies to imported supplies, irrigation releases to power production, downstream development to flood storage capacity, penstock elevations to the introduction of new fish species, peaking releases to riparian habitat and recreation, urban water use to instream flows, return flows to wildlife refuges, and so on. What results from water development in a basin are new relationships within nature and between man and nature. Clearly, many human activities do not conform to or protect baseline natural systems, and the health of those baseline systems often degenerate as a result. New man-induced natural systems typically arise from development. Unlined canals develop riparian habitat. Return-flow salt sinks support introduced species. New networks of causes and effects, and of interdependencies, can arise with each major stage of development or significant change in management practices.

The Breaching and Bonding of Basins

The pattern of settlement and development in the West is one of first exhausting (or at least taxing) local water supplies (surface and ground water) and then importing new supplies from beyond the divide. The transwatershed diversion breaches one drainage and bonds it, in a utilitarian sense, to another. Whether the exporting drainage can ever be left better off is a matter of dispute. Whether the bonding amounts to bondage, in a colonial sense, depends on the social and political conditions surrounding the diversion, the benefits exchanged and costs incurred, and the long-term impact of the exportation on the watershed of origin. What is certain is that, after the linkage, neither drainage is an isolated catchment. In a systems sense, neither drainage can be understood without taking account of the other. The notion of a basin being an enclosure becomes ambiguous once the basin is breached. The natural integrity of each basin is traded off for whatever improvements in human welfare are perceived to flow from linking basins. How meaningful each drainage alone remains as a subject for water resource planning turns on the magnitude of the breaching and bonding.

The Superimposition of Service Areas

In effect, the exportation of water beyond a divide by tunnel or pump figuratively erases the divide and, in a water distribution sense, expands the basin. Service areas, as much as topography, begin to shape the destination of the water. Plotting the pattern of drainage and distribution produces a map different than the map of the natural drainage of origin. Gravity and engineering produce a new hydrocommons. Part or all of one drainage is artificially annexed to another drainage for utilitarian ends. The service area can be a few parcels or a multicounty area. Whatever its size, it becomes identified with and dependent upon the water from the adjacent basin. And the contributing basin likewise becomes identified with the service area; again, it is not self-contained. Its crests do not

now encompass the hydrology of all of the water it captures. It has become an incomplete planning unit apart from its service area.

The creation of service areas wholly within a basin also alter drainage and distribution patterns, of course. Water is variously impounded, moved between watersheds and conjunctively mixed. Hydraulics alters hydrology. Again a hydrocommons is born. As the water works constructed and operated to meet the needs of the service areas become more prominent, some of the natural features of the basin can become less obvious. (It can take special effort, for example, to rediscover old creek channels in an urban area.) So, basins lose some natural integrity with the creation of service areas, whichever side of the divide the service areas occupy. Service areas are the outward manifestation of the multiple purposes discussed above. They are as much a geographical reality as hydrologic basins themselves. With those basins they compose the hydrocommons.

Protecting Natural Systems in the Hydrocommons

The efficiency, productivity and beauty of natural features and natural systems need not be totally decimated by development and management practices. The alteration of the natural background can be controlled to protect varying degrees of the natural background in each basin which is a part of a hydrocommons. Such protection, to be competitive at the front end of water-related development, however, must be a legally recognized and enforced purpose among the initial multiple purposes. Typically it has been an afterthought, making costly restoration and rehabilitation, rather than protection and enhancement, the only options. The ascent of environmental reporting in the 1970s was matched by the descent of water development. The twain are having few opportunities to meet. When they do, the legacy of past unbalanced multiple-purpose development can raise the cost for environmental rehabilitation. There are definite limits to environmental backloading or ecological retrofitting. Yet it holds some promise of qualitatively improving and balancing out the water resource picture in selective drainages.

As incompatible as engineered hydraulic systems and natural systems generally may be, future development in any basin can be more enduring (and arguably more easily managed) if the inherent value and complexity of the background natural systems are understood and, to the extent politically possible, protected in the design of the new development. The altered and new natural systems resulting from a new development (and related management practices) also should be monitored and understood, so that informed judgments can be made over time as to their value and protection. Implicit then in the proper management of the hydrocommons are ongoing monitoring and research functions.

PAST ATTEMPTS AT BASIN-WIDE PLANNING AND MANAGEMENT[2]

BASIN PLANNING AND DEVELOPMENT (1900-1960)

Large scale multipurpose waterway development and planning were proposed by federal commissions formed during Theodore Roosevelt's progressive period. In the 1920s Congress authorized the Federal Power Commission and the Corps of Engineers to conduct surveys of navigable waters for development purposes. A watershed perspective of sorts underlay the 1920 Federal Power Act. The 1928 Boulder Canyon Project Act not only authorized an ambitious array of public works but asked the Secretary of the Interior to do feasibility studies in the remaining states of the basin in anticipation of comprehensive development and management.

New Deal zeal gave birth to the TVA in 1933, as well as thereafter to such entities as the National Resources Board and its successor, the National Resources Committee, whose subunit, the Water Resources Committee, organized 45 river drainage subcommittees that worked with state planning boards. Basin-wide flood control programs were initiated in that era, as were watershed plans and pollution control surveys. Intergovernmental and interagency coordination for planning and constructing public water works became a short-lived reality. In the end, the highly ideological national thrust for regional economic development (subsidized by public hydropower) met with local resistance. Constituency-dictated local projects were more popular over time.

River basin surveys became the objective of the Federal Interagency River Basin Committee ("Firebrick") in 1943, leading to the establishment of regional interagency committees in several basins (e.g., Missouri in 1945, Columbia in 1946, Pacific Southwest in 1948 and the Arkansas-White-Red in 1950). Congress stimulated reservoir projects in several basins (including the Missouri) with the enactment of the Flood Control Act of 1944. Secretary of the Interior Krug's Report on the Colorado River was released in 1947, identifying a host of potential water development projects throughout the basin. The Water Pollution Control Act was passed in 1948, authorizing comprehensive pollution control plans to be developed for interstate waters. Secretary of Agriculture Brannan's Missouri Basin Agricultural Plan in 1949 called for interagency cooperation ranging from erosion control to structural development.

Notable in 1950 was the appointment of the Water Resources Policy Commission (popularly, the Cooke Commission) by President Truman. Among the ideas proposed by that body was the establishment by Congress of an inter-

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[2] This section of the essay relies heavily on B. H. Holmes' two volumes: *A History of Federal Water Resources Programs, 1800-1960* (1972), and *History of Federal Water Resources Programs and Policies* (1979); also, T. M. Shad, "Past, Present, and Future Water Resources Management in the United States" and "Future Water Management Problems: The Federal Role in Their Solution," in Johnson and Viessman (eds.), *Water Management in the 21st Century* (1989).

agency river basin commission, with federal and state representation, for each major river basin. As a corollary the Commission recommended that each water development project be a predicate of a coherent basin program. The recommendations were not adopted. In 1955 President Eisenhower's cabinet-level Advisory Committee on Water Resources Policy favored the creation of regional or basin-level committees, and criticized past river basin planning for its neglect of environmental and water supply needs. Congress did not want to see water planning dominated by the Executive Branch, but it did authorize in 1958 two experimental "United States Study Commissions" covering several basins in the Southeast and in Texas, respectively, for the purpose of fostering economic development through river basin planning.

INTERSTATE BASIN COMMISSIONS UNDER THE 1964 WATER RESOURCES PLANNING ACT

Executive Branch opposition to water projects helped provoke the Senate to create the Senate Select Committee on National Water Resources in 1959. After numerous hearings and almost two years of staff work, the Committee issued a report which called for comprehensive planning, development and management in all major river basins, with environmental and recreational purposes to be recognized along with developmental ones. (Interestingly, the report placed emphasis on reservoir development as a means of augmenting low flow to protect water quality.)

The Senate Select Committee's report inspired President Kennedy's submission to Congress of a proposed water resources planning act in 1961 which would create a cabinet-level water resources council and, among other things, institute river basin planning commissions and planning grants for states. While the proposal toured Congress for four years, the affected Cabinet members oversaw an ad hoc interdepartmental review of policies and principles which resulted in a new statement of water planning objectives, subsequently printed as Senate Document 97. In that formulation, water quality and recreation were elevated to the level of other purposes, and municipal water supply and fish and wildlife were confirmed as purposes. River basin planning units and interagency and intergovernmental coordination were stressed.

While awaiting legislation, the Kennedy Administration scoped out an ambitious plan to cover the nation with 150 comprehensive river basin studies and to produce numerous regional framework plans. A scaled down effort was initiated shortly before the new Water Resources Council, authorized by the 1965 Water Resources Planning Act, began its work. Title II of the Act charted the creation of river basin planning commissions. Pending their creation, the existing regional subcommittees of the Interagency Committee on Water Resources proceeded to work on Type I regional framework plans and Type II basin-level plans (Type III were project level plans). State requests triggered most of the subsequent river basin planning commissions, including the first four (Pacific Northwest, Great

Lakes, Souris-Red-Rainy and New England) which arose in 1967. To follow were the Missouri, Upper Mississippi and the Ohio River basin commissions. The Delaware and Susquehanna basins were each the subject of federal-state compact commissions. The Pacific Southwest, Arkansas-White-Red, and Southeast basins were covered by federal-state interagency committees.

By 1970, when a new conception of planning levels was adopted by the Water Resources Council, about eight of the Type II basin-level studies were substantially done (including the Columbia-North Pacific, California Region, Great Basin, Lower Colorado, Upper Colorado and Missouri River basin). Interestingly, under the new planning parlance, a Level B plan (replacing Type II) did not have to correspond to a hydrologic basin, but could reflect political, economic or other boundaries.

When the National Water Commission issued its report, *Water Policies for the Future* (1972), it took heart from the emerging basin-level activity. Ten years later, as it would turn out, the Title II commissions would be terminated.

The developmental underpinnings of river basin planning were eroded in the 1970s by rising fiscal conservatism and President Carter's stand against water projects. The death knell for the seven river basin commissions created under the Water Resources Planning Act, as well as for the Water Resources Council itself, could be heard soon after the election victory of Ronald Reagan. Little clamor was heard as those institutions evaporated early in his first term. Paralleling the decline in the federal sponsorship of planning was the application of ever-tightening economic criteria (e.g., principles and guidelines) for determining the financial feasibility (e.g., cost-benefit analysis) of water development projects.

WATER QUALITY PLANNING UNDER THE CLEAN WATER ACT

Congress sought coordination between the Level B basin planning under the Water Resources Planning Act and the Section 208 Areawide Management Planning under the Clean Water Act. As noted above, the basin planning program died in the early 1980s. After some implementation in the 1970s and early 1980s, the funding for Section 208 planning withered as well. Among other things, the 208 program had encouraged the designation of regional planning organizations to control point and nonpoint pollution.

The Water Quality Act of 1987 amended the Clean Water Act by adding a Section 319 Nonpoint Source Management Program under which states, with federal financial assistance, are to focus planning and control efforts on nonattainment stream segments. Recent EPA regulations have required each state to formulate and implement a Water Quality Management Plan. These are statewide or area-wide in geographical reach and, along with periodic water quality problem reports, compose the basis of a state's continuing water quality planning process. Although the EPA water quality initiatives have too often been disjunc-

tive and unreliable, they have produced many basin-oriented water quality plans in the western states. In most river basins those plans are probably the closest approximations available to contemporary multiple-purpose water management plans. Selectively, state water plans (other than specialized water quality plans) and FERC plans may also be approximations. The Federal Power Act continues to precondition licensing upon comprehensive plans for river basin development.

The most ambitious and inspiring modern experiment on interstate water planning and management is occurring in the Columbia River basin through the Northwest Power Planning Council. Authorized by the Northwest Electric Power Planning and Conservation Act of 1980 and an interstate compact between Idaho, Montana, Oregon and Washington, the Council is adjusting hydropower operations to rehabilitate, protect and enhance salmon and steelhead populations. It represents an impressive regional initiative to correct an imbalance among multiple purposes in furtherance of sustainability.

INTEGRATED-PURPOSE WATER MANAGEMENT: BASIN ORIENTATIONS FOR THE HYDROCOMMONS

THE GOAL OF INTEGRATED PURPOSES MANAGEMENT

The river basins in the western United States are either developed or developing, meaning that water management in the hydrocommons is driven inexorably by forces promoting the multiple purposes already outlined above. Water management, as used here, means collective activity directed at the protection of the water resource base, the development of reliable supply, the fulfillment of water related values, and the influencing of demand. Water management, simply put, is a process for fulfilling multiple purposes. Because those purposes are varied and value-laden, and vie with one another, one of the major challenges of water management is honoring competing purposes without acting too much at cross-purposes. This might be called "modulating mandates," if you will.

The more that competing purposes are rationalized and balanced by the executive officeholder, legislator or judge, the less discretion has to be exercised, and the less modulation has to be achieved, by the water agency. In practice, however, the enabling acts and charters of water agencies have tended not to be balanced, leaving them ill prepared and not disposed to consider the full range of values.

The water resource simply cannot be managed by attending to water alone. For management purposes water is part of the media through which it moves—air, land and organic material. Largely in response to development pressure upon a specific resource, specialized resource management regimes and agencies have arisen. By definition those regimes and agencies have a narrower focus and set of mandates than government as a whole or than the full spectrum of multiple purposes.

While much of the segmentation can be explained by reference to special interest politics and the influence of elites and organized constituencies, other factors must be recognized. There are fiscal and organizational limits to managing vast and complex natural resource domains. (In some respects it is presumptuous for us to claim that we "manage" them.) Even more fundamental is the fact that people tolerate only so much governance. Resource management comes down to the governance of people. Water resource planners and managers often feel awkward in that role. There is insufficient consensus and little effective growth management in our communities and regions. The notion of regional government has not been accepted for the most part. This puts water agencies, with limited authority and resources to engage in demand management, in a reactive mode. Yesterday, water utility officials lamented only on the outside that "compulsory service" laws left them no choice but the development of new supplies to satisfy any beneficial use presenting itself within district boundaries. Today, those officials agonize inside and out over the problems of responding to growth.

The segmented quality of water management is mirrored in water policy itself. Deliberate and discreet policies concerning water management are important because they focus public concern and influence group behavior. But water policies per se have less influence on the condition and management of water resources than policies which bear more directly on the nature, rate and extent of urbanization, economic development and lifestyle change.

With all of these limitations in mind, the goal of water management, within the context of the hydrocommons, ought to be to integrate and serve multiple-purpose demands while protecting the long-term health of the resource base. Perhaps the most critical task in this formulation is arriving at a working public consensus on two interrelated issues: 1) what ongoing environmental conditions are necessary to sustain the renewable resource base indefinitely and 2) who will pay for the achievement and maintenance of that level of resource health? Until those issues reach a degree of resolution, demand management may lack the imperative needed to make it an effective part of the water supply/demand equation. As long as an assumption lingers that all demands which are physically serviceable are to be serviced, integration is slowed and sustainability is impaired.

For the most part the process of integrating multiple purposes is not one of smooth synergism; rather it is one of displacement and accommodation. The water resource base of the West cannot satisfy all of the demands placed on it. As water demand quickens, one use or purpose is either displaced by, or accommodates to, another. Incentives often exist to find ways for competing demands to co-exist, even interact, to mutual advantage. The investment of Metropolitan Water District of Southern California in the conservation of Imperial Irrigation District's water is illustrative and exemplary; two major service areas, one dominantly urban and the other dominantly rural, have integrated municipal and reclamation purposes in a rough but effective fashion.

FROM AGGREGATION TO INTEGRATION

Multiple purposes have been paired and matched in water development more out of political and economic necessity than inherent compatibility. There generally has been more expedient aggregation of purposes than there has been integration of purposes. And, viewed historically, there has been more rough accommodation among purposes than there has been smooth synergism among them. We could serve the next century well by taking a hard systematic look at all the ways in which multiple purposes are at cross purposes, thereby identifying both areas in which integration is possible and zero-sum choices are unavoidable.

Integration of multiple purposes can be either rough or refined. At the rough end, it involves simply a few corners being knocked off habits and expectations in order to reach an accommodation. At the refined end, it can involve synergism, even symbiosis, where two or more purposes are fulfilled or enhanced by becoming operationally related. Co-generation of electricity and the judicial "physical solution" doctrine illustrate conscious strategies of integration. Perhaps the test is this: Are there feasible ways to modify a design or operation to create new benefits for other valued purposes in the multiple-purpose array while protecting the long-term health of the resource base? If that question is grappled within the context of the planning, regulation and litigation associated with water management, the multiple-purpose dynamic will be more characterized by integration and less by mere aggregation.

APPROACHES TO INTEGRATION

Deductive-Innovative Approach

As we have seen, the natural integrity and efficiency of river basins periodically inspires top-down proposals for comprehensive basin-wide water planning, development or management in the United States. Currently there is limited public support or political interest in comprehensive river basin planning, development or management for interstate streams in the western United States. Climate change of major proportions, catastrophic drought, flooding or contamination could change the political equation on this issue dramatically. Global events of recent months certainly are a reminder that the commonly unexpected can become the common place in very short order. Unless and until events galvanize our political will, however, it is unlikely that anything as ambitious as the TVA, Krug Report, Pick-Sloan Plan, or a water management counterpart will arise. More incremental and less expansive initiatives are possible, however. A combination of energy infrastructure and fishery problems, for example, prompted the creation of the Northwest Power Planning Council in the Columbia River basin.

Ideologically disinclined and economically wounded, the federal government cannot be expected at present to undertake major management initiatives for the

hydrocommons. Rising environmental consciousness is not to be underestimated as an imperative, but whether it can reach proportions great enough to make the environmental management of the hydrocommons a galvanizing imperative in the 21st Century is disputable. Federal and state standards for water quantity (i.e., reasonable beneficial use) and water quality (i.e., nonpoint source control), that have extra-basin reach, can act deductively to influence the management of hydrocommons, as noted below.

Inductive-Incremental Approach

Integration can result from incremental experimentation and problem solving. Much of what is occurring in water management at present, and can be expected for some time, fits this pattern. Basins will become increasingly prominent as integration increases and parts of a basin are linked more together by plumbing and planning. Rather than grand designs, one can expect discreet decisions tending toward the achievement of greater efficiency and the adjustment of priorities.

Admixture: Down and Out/Up and Out Integration

The thesis underlying this essay is that most decisions that integrate multiple management purposes on the ground contribute to an ongoing branching out process which institutionally fills in the hydrocommons. Basin-oriented management is more effect than cause under this view. While the management process appears to be largely inductive, the fact is that many of the rules, principles and standards that influence the outcome of incremental water management decisions and actions are deductive, even innovative, in character. Dam safety standards after the Teton Dam failure, return flow management after Kesterson Reservoir and water right evaluations after the Mono Lake *National Audubon* decision, were not the same. Dramatic events and interventions can alter the pace and direction of gradualism. Nation-wide and state-wide governmental mandates, such as water quality standards and wetlands mitigation requirements, are imposed from above (after input from below) and force the incremental resolution of conflict in a manner which interconnects resource users within a basin. Water management within a hydrocommons, to be effective, must be able to handle both the incremental and innovative approaches to integration.

Deductive/innovative integration will continue to take on a hydrocommons configuration for several reasons. First, state and federal jurisdictions, from which most deductive integration springs, have the geographical reach to cover basins; standards and compromises emanating from those governments also are likely to affect areas that are larger than basins. When the localities and groups within a basin are affected by a common standard, they develop, strengthen or test linkages among themselves as they respond to it. The impetus for change comes "down" and the response involves a branching "out." Second, some deductive integration will continue, from time to time, to be specifically tailored to basins because there is an inherent rationality about using hydrologic basins or multiple

basins as units for planning, standard-setting and enforcement; or because a political coalition with a hydrocommons identity invites special governmental intervention on its behalf (e.g., Colorado River Basin Salinity Forum).

Inductive/incremental integration also moves upstream and downstream and, through hydraulic works, toward a hydrocommons configuration. Conflict and cooperation between multiple purposes occur at ground level, engaging stakeholder groups who are linked to a common water source. Their accommodations can both inspire and directly affect other stakeholders throughout the hydrocommons, in an "up" and (branching) "out" fashion.

These processes are occurring, and will continue to occur, because significant forces (other than grand designs of basin management) are at work. Let us turn to those forces for integration that can be expected to persist into the next century.

FORCES FOR INTEGRATION

Water Quality Planning and Consciousness

Two decades of disjunctive federalism under federal water pollution control legislation have created basin plans that juxtapose and, with varying degrees of success, integrate beneficial uses, water quality standards and control strategies. The process, as complex and frustrating as it is, has provided a framework within which multiple-purpose development and environmental goals can be analyzed and, to a degree, rationalized and adjusted. For the most part, water quantity administration and water quality control remain divorced, however, restricting the level of integration that can be achieved in water quality planning. Forced integration between water rights administration and water quality control is likely over time, as exemplified by the Bay-Delta proceedings now occurring in California pursuant to a controversial court order.

The public awareness of the linkage in water quality between the upstream cause and the downstream effect, between the upgradient spill and the downgradient plume, is growing. More popular information is being generated concerning the water quality impacts caused by seemingly remote activity. The relationship between tilling practices in one county and the siltation of a recreational lake in another is more widely appreciated as are the relationships between logging here and spawning there, diversions in one state and salt concentrations in another, return flows up valley and waterfowl losses below, and so on. Geographically disparate causes and effects in water quality are metaphors for resource regionalism even where institutional regionalism does not exist. Mental conditioning toward regionalism is occurring. Just as the notion of the global village has gained acceptance, so has there been an increased awareness that localities in the same drainage are linked by air, land and water. Such a bioregional or watershed perspective may appear elementary, but it has been slow in coming. Its

wider popularization could facilitate substantially more integrated water management in our lifetimes.

WATER SCARCITY AND PROHIBITIVE DEVELOPMENT COSTS

System Interconnections and Coordinating Agreements

There seems to be a rising willingness to share water storage, treatment and distribution facilities to save costs. Over time this should mean more interconnections, less isolation and a heightened awareness of interdependency among water systems. With more plumbing connections between systems and service areas come increased opportunities for water exchanges, water leasing and drought contingency planning. Connections now exist (through natural channels and transbasin diversions) between Northern California and Southern New Mexico which, theoretically, could be activated by institutions. Cooperative drought dampening between Northern and Southern California, as well as within the Central Valley, was achieved in 1976-77 because of shared project facilities. More laws authorizing the forced sharing of facility capacity also can be expected in the West as water scarcity and development costs heighten. Independent of sharing facilities, opportunities will continue to arise for the coordination of activities by water purveyors using a common source. The most recent Coordinated Operating Agreement between the Central Valley Project and the State Water Project in California is illustrative.

Water Right Quantifications

With scarcity comes greater competition and more second-guessing of the amounts of water covered by existing water rights. Selectively, appropriative rights based on claims of historic use are challenged as being inflated, with more stringent standards of beneficial use being urged. Old decrees are being revisited and modified. Unexercised riparian rights now face the possibility of quantification and, in California, have already lost some priority. Falling water tables in unadjudicated groundwater basins in western states hasten the prospect of adjudication. Pressures continue to mount to complete the quantification of Indian and federal reserved water rights. General stream adjudications, buttressed by the McCarran Amendment, are reaffirming the interconnectedness of senior and junior appropriators throughout drainages, reminding us that watersheds have long been relevant in the West's common law allocations of water.

Quantification, by definition, is contextual; it defines relationships among claimants who are connected to a common source. These legally recognized linkages between water right holders, like a connect-the-dots game, can outline an entire watershed, basin or even multiple basins. Quantification provides a baseline integration of water uses for purposes of certainty and stability, but need not honor or integrate other purposes in the process.

Shortage Sharing

Scarcity highlights the harshness of a prior appropriation system which secures a last drop of water for a senior appropriator before allowing a first drop of water for the next priority holder. The advantage held by the senior is fungible. Exclusiveness is marketable. Given enough benefits (seasonal storage, lining of canals, cleaner water, money, etc.) the senior right holder may decide to share his priority with the next holder in line, enabling them both to obtain some water under drought conditions. The sharing can be equal or fractional; it can favor some uses over others. The formula is negotiable. Whatever the configuration, shortage sharing links users together in terms of a common stake or condition. It reflects adjustment and accommodation; it produces some degree of integration with respect to both water demand management and water supply management.

Water Conservation, Reclamation and Reuse

Integration is a byproduct of greater water use efficiency. To satisfy existing demand with less supply, or meet greater demand with the same supply, or to magnify the reuse of a limited supply, is to enhance the integration of water demand management and water supply management. Cooperative alliances can arise from such efforts, as where the user with the demand finances conservation improvements or advanced water treatment for the user with the supply. Distant or proximate service areas can be thus linked, with coordination and even integration occurring in the process.

Water Reallocation, Marketing and Pricing

Water sales, leases and exchanges create relationships and encourage reciprocity. Information about water supply and demand conditions in one service area is shared with another service area, and vice versa, in the process of reallocating water. Water right leasing broadens the size of the constituency which has a stake in protecting the water source and its quality. The prices set for one-time water right transfers, as well as the rates set for water consumers by utilities, become more publicized and perhaps more influenced by regional trends of evaluation as scarcity and competition become more pronounced. Commerce in water ushers participants into a process of calibrating the value of what they possess and what they want to possess and of communicating with other participants within a market area. This is a process of outreach—reaching out for information and reaching out for buyer or seller. Again, alliances are born; service areas are linked; and some supplies and some demands are integrated in the process.

HYDROCOMMONS ENDGAME: VOLUNTARY COMMUNITIES, COMPULSORY RELATIONSHIPS AND MIXED-ECONOMY FEDERALISM

VOLUNTARY COMMUNITIES OF INTEREST

Special Interest Association Generally

Water stakeholders with mutual interests organize to promote and protect those interests. Participants in such associations, from irrigation project contractors to flycasters, come to realize, willingly or not, that their interests are dependent upon drainage-wide, even extra-basin, conditions and events. Their self-interest, which first is obvious at the watershed level, typically comes to demand a broader basin-wide or even multiple-basin perspective and political presence.

Passive parochialism has no future in the politics of water management, and probably never did. (Any basin inherited by the meek may be too transfigured to be recognizable for their purposes.) By definition, special interest associations mirror purposes within the multiple purpose array. Because of refinements in position, however, they outnumber those purposes. (Witness the competing associations of trout fishermen, for example.) What is important to recognize here is the common role of these associations in creating a basin-wide or multiple-basin identity for their causes and followers.

Topographically Oriented Associations

There are many signs of the rediscovery of a sense of place—the importance of being consciously related to and respectful of a setting. Such a sense seems primal. It is a common denominator for many persons who otherwise disagree about how and when to manage natural resources. Grass-root as well as government-inspired watershed protection groups and resource conservation districts reflect a sense of place. Followers of the bioregional movement orient their lives about a sense of place; they particularly identify with watersheds and seek to protect them. The urban creek movement in the Bay Area of California exemplifies the collective effect of a sense of place. And deliberate and cultivated identity with a river basin can be seen in the innovative work of the Northern Lights Institute in organizing conventions and writing focused on the Missouri River Basin. The International Rivers Network, expressing global opposition to dams, has a strong river basin orientation.

Raising people's consciousness of the role and environmental state of the basin or broader hydrocommons in which they live can give rise to a discernible community of interest possessing enough political power to influence water management. Voluntary associations of individuals and groups centered on the promotion and protection of water drainages are likely to play a greater role in resource management generally in coming years. What remains to be seen is how narrowly or broadly ideological these voluntary associations become. They tend to

be motivated by environmental concerns, and to advance ecologically holistic views while being wary of rampant pluralism in water management. Their intolerance for wide-ranging pluralism mirrors that of other special interest groups whose favorite purposes are being compromised.

The ultimate balancing and integrating of purposes prevailing at any point in time remains largely the task of governmental bodies, whose actions create compulsory relationships within the hydrocommons.

Compulsory Relationships

Water resource scarcity and attendant competition are causing stakeholders to be more assertive in exercising their rights, defending their claims or promoting their values. Active participation in government planning processes, regulatory proceedings, interest group bargaining, mediation and litigation is increasingly required to protect or enhance a stakeholder position in water management. As a consequence, competitive and cooperative relationships are formed around the planning and decision-making fora and institutions that modulate and resolve the conflict. While these relationships tend to be too competitive and adversarial to be regarded as communal, there may be a perceived common interest in fair, efficient and intelligible governance by the decision-making institutions. What is significant for purposes of this discussion is the growing tendency of these relationships to have the boundaries of the hydrocommons. Witness the disputes between Inyo County and the City of Los Angeles over Owens Valley water. Over time, paradoxically, even atomistic competition can highlight the aggregate reality and importance of the hydrocommons in water management.

MIXED-ECONOMY FEDERALISM: THE SEARCH FOR DECISION RULES AND DOLLARS

The multiple-basin water management envisioned in this paper presumes decision rules which resolve conflict, rank purposes and determine long-term health maintenance standards for the resource base. It also presumes dollars to finance management functions.

The decision rules can and will come from all levels of government, and occasionally from the private sector. Water quality standards will continue to be promulgated by federal and state sources. Growth control and demand management guidelines and ordinances first will be the result of local and joint powers arrangements; only selectively and later will regional governance arise. Higher pricing and return flow treatment fees may be the response of water districts to pollution control enforcement orders. New technologies developed by the private sector will tighten notions of reasonable beneficial use.

Presently the weakest source for decision rules probably is the legislative branch, at both the state and federal level, which too often has been paralyzed by the fractious pluralism mirrored in multiple purpose water management.

Running a close second is the executive branch at both levels. In fairness, it must be acknowledged that there is not yet a vocal constituency calling for a more efficient resolution of multiple purpose conflicts or more creative integration of multiple purpose practices.

The financing of integrated-purpose water management is problematic. It was difficult enough obtaining public funding for management functions when water development was in vogue; obtaining such funding when much of the hydraulic infrastructure is depreciating and deteriorating is not promising. More full-cost pricing can help, where politically possible, as could participation in any peace dividend at the federal level. Private investment contributions to produce greater efficiency and conservation and thus augment municipal and industrial supplies, with environmental mitigation and rehabilitation measures incorporated, holds considerable promise. One advantage that the multiple basin-oriented, as opposed to basin-governance, model of water management possesses is that its costs are largely already incorporated in the budgets of existing institutions.

What is called for from our economy and shifting brand of federalism is more focused attention on the combined effects that two centuries of accumulated multiple purposes are having on our air, land, and water resource base; on the need for more and clearer decision rules to determine the status of valued purposes, property rights and equities; and on the last opportunities which exist for achieving greater integration and efficiencies in water management on a hydrocommons scale.

CONCLUSION: ACCELERATED ADJUSTMENT, REALLOCATION AND REALIGNMENT WITHIN THE HYDROCOMMONS

The West has a history of explosive and sustained population growth from its handful of early settlers to its current population of 50 million. Once the least populated region in the country, the West has moved ahead of the Northeast in population, drawing people from other regions of the United States and from all corners of the world. Predictions are that by the year 2010 the West will surpass the Midwest in Population and become the second most populated region in the country following the South. . . . [T]he West was the fastest growing region in the 1980's at a rate double the national average.[3]

Hydrologic basins have been altered by human actions driven by an accumulation of multiple purposes. In many parts of the West the purely hydrologic basin has become an anachronism. The hydrologic and hydraulic have been combined in a growing number of settings to produce the hydrocommons. When a politically powerful purpose (e.g., public power, flood control or water quality), or set of purposes, is served by a promotion of the natural features of the hydrologic basin,

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[2] The Council of State Governments, *The Dynamic West: A Region In Transition* (1989).

then the hydrologic basin becomes honored in water affairs. After that service is rendered, or the underlying political purpose subsides, the hydrologic basin loses status in water planning and management.

The physical reality of hydrologic basins ought not to be appreciated on such a sometime basis. Efficient, equitable and environmentally sensitive water management requires continuous respect for the contours of hydrologic basins. In the last analysis, the secret to greater constancy of basin perspective in water management does not lie in grandiose regional designs for resource management, but in a broad based public awareness that the unavoidable task of adjusting and integrating multiple purposes within the hydrocommons often is more readily achieved with an understanding of and respect for natural hydrologic features than not.

The institutional life of the hydrocommons in the western United States is characterized by a competitive struggle among multiple purposes. The management of that struggle requires more consensus as to decision rules and more financial support. Since water sources are collected and distributed within the hydrocommons, the hydrocommons is a coliseum for the ongoing competition. With greater adjustment and integration of the vying multiple purposes (and of the underlying social values) in the 21st Century, the benefits inherent in multiple basin-oriented management could become more widely accepted and consistently promoted.

The shift from the allocation and development era of western water resources to the reallocation and management era became manifest during the 1980s. Reallocation, in tandem with increasing efficiency and conservation, is now a permanent feature of western water management. Equally permanent will be the adjustment of multiple purposes (variously through displacement, accommodation and integration) and the associated realignment of interest groups and institutions. The transaction costs of such adjustment, reallocation and realignment will continue to be substantial for all stakeholders. The equity problems of rural people are likely to be aggravated. All stakeholders will be pressed and forced to make adjustments. Flexibility, persistence and adaptiveness will be the hallmarks of survival for proponents and beneficiaries of particular purposes in the multiple purpose array of water management.

The multiple purpose crunch of the 21st Century (as with the 1980s and 1990s) will be most apparent in hydrocommons that are dominated by service areas experiencing rapid population growth. (Six hundred fifty thousand additional people became California residents in 1988-89.) Predictably there will be an ongoing dynamic between demand management and the multiple-purpose crunch; the less the demand, the less the crunch.

We live in a world in which we are being conditioned to ask, "Is there any local anymore?" In the world of western water there is a local; local is where the

crunch of multiple purposes is loudest. But the sound reverberates regionally, throughout the hydrocommons. Those within earshot increasingly will realize that they are bound together by water within a distinguishable community that must marshall its wits to hold onto life's qualities. They will become more accustomed to their community's boundaries, part natural, part not. They will come to act more as residents of a hydrocommons, without being formally governed as such. If the quality of their life declines markedly they will look to the pantheon of multiple purposes they have inherited and curse the gods. Water policy makers and managers cannot alone prevent such an outcome. Largely local and regional publics will decide. Resolve and resourcefulness—features of the West's proud self-image (if not hubris)—will be tested. Meanwhile, the hydrocommons will be an important space in the collective consciousness of the westerner.

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