

Federal Water Policy in the United States—An Agenda for Economic and Environmental Reform

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I. BACKGROUND

A. *Water Resources and Changing Values*

Water policy in the United States is outmoded and irrational. It is a policy which, at its inception around the turn of the century, served the needs of a developing nation. Not until the past two decades has there been an effort to control the pollution impacts of a half-century of development. During the era of development, water resources were extensively used and depleted, in part because water was available at very low, heavily subsidized prices. Early pro-development government policy essentially gave away resources. Outright land grants and timber, mineral, and grazing leases provided incentives for settlers and developers to risk financial capital as well as their own labor. Water supply and flood control projects were underwritten by the taxpayer to stimulate agricultural and urban developments. Water pollution controls, where achieved, were also heavily supported with federal taxpayers' funds.

Whatever its prior justification, the policy of subsidizing to promote development is no longer appropriate because environmental needs, social values, and economic conditions have changed. An entire array of social and environmental costs resulting from this policy have come to be recognized, making its overall net benefit much less attractive. Habitats and watersheds have been degraded and destroyed;¹ drinking water has been contami-

1. See, e.g., ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, *AMERICA'S CLEAN WATER, THE STATES' NONPOINT SOURCE ASSESSMENT* (1985); Smith, Alexander & Wolman, *Water Quality Trends in the Nation's Rivers*, 235 *SCIENCE* 1607 (1987); 1 U.S. WATER RESOURCES COUNCIL, *THE NATION'S WATER RESOURCES — SECOND NATIONAL WATER ASSESSMENT* (1978).

nated;² water supplies have been exhausted.³ These costs have been exacerbated by a dramatic increase in market and non-market demand for alternative uses of water resources. Satisfaction of these demands, including growing recreational, fisheries, wildlife, human health, tourism, scientific, and aesthetic uses are determined in large part by water availability and quality conditions in the nation's river basins, groundwater aquifers, lakes, deltas, wetlands, and bays.⁴ Agricultural, industrial, and municipal water uses have been, and continue to be, the major causes of degradation of aquatic systems.⁵ In a country long on the availability of water resources and short on developed agricultural and urban water supplies, degradation probably made economic and social sense. Degradation no longer makes sense, however, due to the diminished supply of and increased demand for alternate water resource uses. In the United States, the relative values among alternate water resource uses, urban uses, and agricultural uses have shifted significantly.

B. *Continuing Water Resource Degradation*

United States water policy is premised upon a set of antiquated values which favor agricultural and, to a lesser degree, urban uses. Taxpayer revenues continue to subsidize agricultural water supplies as well as the production of some agricultural commodities.⁶ As a result, water is overallocated to agriculture. More recent events, such as toxic contamination in groundwater from industrial and agricultural chemicals,⁷ acid deposition,⁸ and cli-

2. V. PYE, R. PATRICK & J. QUARLES, *GROUNDWATER CONTAMINATION IN THE UNITED STATES* (1983). An excellent collection of articles on groundwater can be found in 9 J. FRESHWATER (1985).

3. See, e.g., 1 U.S. WATER RESOURCES COUNCIL, *supra* note 1; M. EL-ASHRY & D. GIBBONS, *TROUBLED WATERS — NEW POLICIES FOR MANAGING WATER IN THE AMERICAN WEST* (World Resources Institute, 1986).

4. For an overview, see NATIONAL WATER COMMISSION, *WATER POLICIES FOR THE FUTURE: FINAL REPORT TO THE PRESIDENT AND TO THE CONGRESS* (1973); see also ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, *supra* note 1.

5. See ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, *supra* note 1; see also U.S. GENERAL ACCOUNTING OFFICE, *THE NATION'S WATER — KEY UNANSWERED QUESTIONS ABOUT THE QUALITY OF RIVERS AND STREAMS* 68-69 (1986).

6. Federal irrigation water subsidies are discussed in K. FREDERICK, *WATER FOR WESTERN AGRICULTURE* 66-71 (Resources for the Future, 1982), and in M. EL-ASHRY AND D. GIBBON, *supra* note 3. Crop subsidy programs are reviewed in L. GLASER, *PROVISIONS OF THE FOOD SECURITY ACT OF 1985* (Economic Research Service, U.S. Department of Agriculture, 1986).

7. V. PYE, R. PATRICK & J. QUARLES, *supra* note 2; 9 J. FRESHWATER, *supra* note 2.

mate change,⁹ show the importance of reforms in water and related natural resource policies. These “new” water resource problems are upon us despite the fact that we have yet to effectively address “old” problems. Figure 1 shows estimates of shares of total U.S. freshwater withdrawals and consumption by type of use for 1975 and projected for 2000. Perhaps more important and less obvious, water pollution—particularly from nonpoint sources¹⁰—continues to be significant and the resulting damages and costs large.¹¹ Figures 2 and 3 show nonpoint pollutants: nutrients, pathogens, sediments, toxics, pesticides, acidity, salinity, and oxygen demand, and their sources: primarily agricultural, in impacted water systems with severe or moderate impairment of uses.

C. Federal Agencies — A Key Problem

There are a number of federal agencies which are responsible for various aspects of the nation's water policy. These agencies often fail to operate in a coherent manner in part because their respective authorizing missions are at best in need of modernization and at worst inconsistent. There are many examples of and reasons for the resulting bureaucratic confusion.

The U.S. Bureau of Reclamation and the Army Corps of Engineers, the federal agencies with water project development era missions, have floundered for nearly two decades in search of a new mission.¹² In the Bureau's case, it took 80 years for Congress

8. The acid rain literature has grown enormously during the past few years. See, e.g., U.S. ENVIRONMENTAL PROTECTION AGENCY, ACID RAIN (EPA-600/9-79-036) (1980); Epstein, Oppenheimer & Yuhnke, *Acid Deposition, Smelter Emissions, and the Linearity Issue in the Western United States*, 229 SCIENCE 859, (1985).

9. NATIONAL RESEARCH COUNCIL, CHANGING CLIMATE (1983).

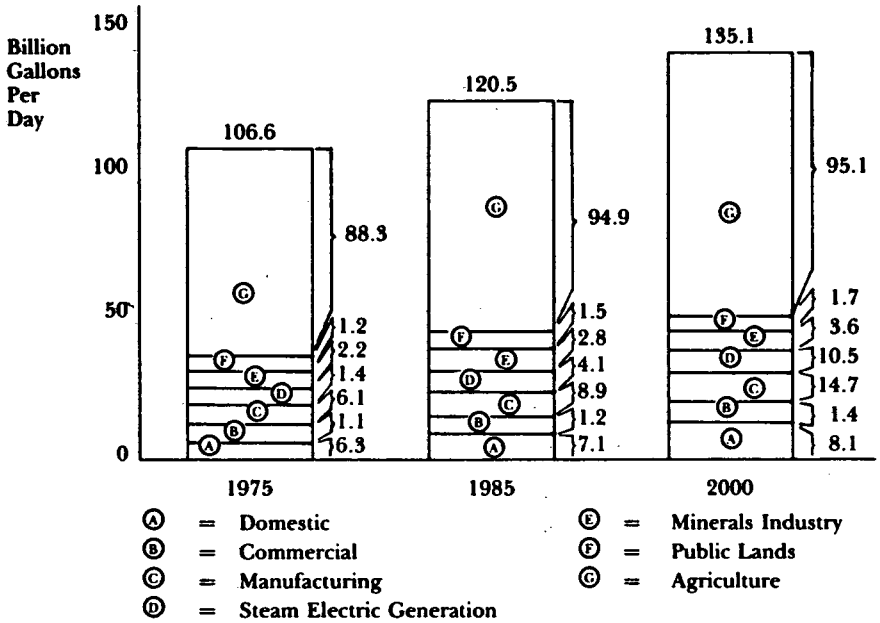
10. “Nonpoint sources” of pollution can be defined as “those diffuse sources of pollution that are not covered by a site-specific Federal permit. The most common nonpoint source activities are agriculture, hydromodification, resource extraction, urban runoff, land disposal, construction, and silviculture.” See ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, *supra* note 1.

11. An excellent collection of papers on nonpoint source pollution issues can be found in *Nonpoint Water Pollution — A Special Issue*, J. SOIL & WATER CONSERVATION Jan.-Feb. 1985.

12. New water project authorizations have become very infrequent for both the Bureau and the Corps. The cost-sharing requirements imposed upon water project beneficiaries during the past decade by the federal administrations have had a significant impact upon the demand for new projects. New agency missions are being sought, as is evidenced in U.S. DEPARTMENT OF INTERIOR, ASSESSMENT '87. . . A NEW DIRECTION FOR THE BUREAU OF RECLAMATION (1987).

Figure 1

Consumptive Uses of Fresh Water
in the United States



Source: U.S. WATER RESOURCES COUNCIL, *supra* Note 1.

Figure 2

Primary Nonpoint Source Pollutants in Use-Impaired
Waters* in the United States

Rivers		Lakes
47%	Sediments	22%
13%	Nutrients	58%
9%	Pathogens	2%
9%	Physical Habitat Alteration	4%
7%	Acidity	4%
6%	Toxics	3%
4%	Oxygen Demand	3%
3%	Pesticides	1%
2%	Salinity	3%

* Waters in which uses are severely or moderately impaired by nonpoint sources or in which nonpoint sources threaten to impair the designated use.

Source: ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, *supra* Note 1.

Figure 3
Primary NonPoint Sources of Pollutants in Use-Impaired
Waters* in the United States

<u>Rivers</u>		<u>Lakes</u>
64%	Agriculture	57%
4%	Hydro-Modification	13%
5%	Urban Runoff	12%
1%	Land Disposal	5%
2%	Construction	4%
9%	Resource Extraction	1%
6%	Silviculture	1%
9%	Other	7%

* Waters in which uses are severely or moderately impaired by nonpoint sources or in which nonpoint sources threaten to impair the designated use.

Source: ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, *supra* Note 1.

to amend the Reclamation Act,¹³ and the resulting reforms now being implemented will have at best a minor effect on the consumptive and polluting aspects of federal reclamation projects. Over its history, the Bureau has developed a tradition of water project expertise that is no longer useful as a federal service. Current attempts to redirect that agency toward a new water management and environmental protection mission seem to be ill-conceived and may result in more duplication and conflict with the missions of other agencies.

Other federal water resource management agencies have problems which are perhaps not as severe as are those of the Bureau of Reclamation but are nevertheless cause for serious concern. The U.S. Fish and Wildlife Service, charged with protection and enhancement of the nation's wildlife resources, still finds itself unable to take the initiative, and continues in a mitigative, low priority role among the Department of Interior agencies.¹⁴ The

13. The Reclamation Act, ch. 1093, 32 Stat. 388 (codified as amended in scattered sections of 43 U.S.C.), was signed into law on June 17, 1902 by President Theodore Roosevelt. The Reclamation Reform Act, Pub L. No. 97-293, 96 Stat. 1263 (codified in scattered sections of 25 & 43 U.S.C.) was enacted in 1982. The 1982 amendments principally addressed issues of project cost repayment and acreage limitations. The Reclamation Project Act of 1939, ch. 418 §§ 1-19, 53 Stat. 1187 (codified as amended in scattered sections of 43 U.S.C.) recognized municipal and industrial water as a multiple-purpose benefit and set standards for cost allocations and interest.

14. The mitigative role of the U.S. Fish and Wildlife Service (USFWS) is exemplified by the consultative procedures utilized in implementing the Fish and Wildlife Coordination Act. Regarding the impacts of federal water projects on fish and wildlife, for example, the USFWS is typically asked to render a "biological opinion" by the Bureau of Reclamation or the Army Corps of Engineers. This process has been viewed by some as fundamentally deficient in protecting fish and wildlife values due to "... a longstanding apparent judicial

U.S. Department of Agriculture, the Forest Service, and the Bureau of Land Management continue to degrade vast areas of the nation's watersheds by using economic calculations which recognize the benefits of crop, timber, and livestock production but do not acknowledge the full array of costs resulting from the degradation of fish and wildlife habitat, recreational, and water supply uses. The federal water projects which were initiated with hydroelectric generation and irrigation as a central goal (such as the Bonneville Project in the Pacific Northwest) continue to operate river basin facilities to provide cheap irrigation water and energy to their selected beneficiaries, often at the expense of other uses such as fisheries, wildlife, and recreation.¹⁵

The federal water pollution control mission, while not burdened with a long and complicated history, is approaching a point at which the feasibility of many of its regulatory programs seems to require careful scrutiny. A long history of failed attempts at water pollution control resulted in the passage of the Federal Clean Water Act in 1972. The Act has subsequently been amended, and yet there is still no credible control of many water pollutants, particularly those emanating from the nonpoint sources. The U.S. Environmental Protection Agency has been engaged since its inception in attempts to design technological standards for water pollution controls, to distribute subsidies to control the point sources of pollutants from cities and industries, and subsequently to implement what have often been symbolic enforcement actions. It is now contemplating the much more difficult problems involved in the control of nonpoint sources of water pollution, including agricultural sources,¹⁶ without the benefit of past generous subsidy programs.

The list of rigidities with which federal water policy is afflicted is long indeed. The growing social and environmental demand for alternative uses of water resources, in addition to the urban and agricultural uses which have characterized economic develop-

hostility to the Coordination Act, perhaps reflecting a fundamental unease with putting fish and wildlife values on a par with other more traditional societal values." M. BEAN, *THE EVOLUTION OF NATIONAL WILDLIFE LAW* 208 (Report to the Council of Environmental Quality, 1977).

15. See Butcher & Wandschneider, *Competition Between Irrigation and Hydropower in the Pacific Northwest*, in *SCARCE WATER AND INSTITUTIONAL CHANGE* 25 (Resources for the Future, K. Fredrick ed. 1986).

16. U.S. ENVIRONMENTAL PROTECTION AGENCY, *NATIONAL WATER QUALITY INVENTORY — 1986 REPORT TO CONGRESS* 121-26 (EPA-440/4-87-008) (1987).

ment in this country, have become widely recognized, but the federal policy response, as embodied in implementation activities by the federal agencies, has been inadequate. Given the momentum of outmoded or ill-conceived federal agency missions, how can these changing demands be incorporated into a reformed set of water policies? A discussion of the dimensions of water resource valuation, followed by a survey of relevant federal agencies and useful reforms, may provide some direction.

II. VALUATION OF WATER RESOURCES

The valuation of alternative water resource uses involves an array of both private and public considerations. The economic value of water resources is well-defined for some uses and not for others. This is a key reason why the allocation of water resources to alternative uses involves a complex mix of market and political processes.

A. *Economic Valuation of Private Uses*

Valuation is achievable when conditions for private ownership and/or control (including an ability to implement use-exclusion) exist and when prices are observable (e.g. through market transactions or direct sales).¹⁷ Such private uses typically involve diversion and storage of water for agricultural, municipal, industrial, or power production purposes, as well as the use of water systems for pollution discharge purposes. In addition, however, private uses can be associated with the maintenance of instream flows or wetland habitats, which can depend upon both water availability and quality. While ownership conditions become more difficult to define in many of these cases, private economic benefits are generated from such activities as fishing, hunting, boating and whitewater rafting.

1. Water Market Prices

There are numerous examples of economic valuation of private water uses. In areas of the western United States where water markets are operative, water prices are directly observable. Table

17. Two interesting and different discussions of private and public values can be found in J. GWARTNEY & R. STROUP, *ECONOMICS — PRIVATE AND PUBLIC CHOICE* (1982) and in R. LIND, *DISCOUNTING FOR TIME AND RISK IN ENERGY POLICY (Resources for the Future, 1982)*.

1 lists prices for water in several western states observed in 1987. These prices vary considerably depending upon site-specific conditions of demand, hydrologic variability, priority of water rights, and costs of alternative supplies. The appropriative rights doctrine, which provides the ownership condition required for such transactions, is the governing legal principle in most western states. In California, for example, over half of the annual use of water is governed by appropriative water rights held either by individual or district appropriators. In addition, large federal and state water supply projects allocate their supplies by contract.¹⁸

Table 1¹⁹
Sample Water Market Transactions/Western States/1987

State	Source/Region	Amounts Per Transaction (Acre-Feet/Year)	Price (\$/Acre-Foot) [\$/Acre-Foot/Year]
Arizona	Ground/Central	500-2000	500-1200 [50-120]
	Surface/Southern	300-400	2000 [200]
California	Ground/South Coast	100-1000	1500 [150]
Colorado	Surface/East	2000-5000	1900-3500 [190-350]
Nevada	Surface/West Central	10-1000	2000 [200]
New Mexico	Surface/North Central	50-300	1000 [100]
Texas	Surface/Southwest	100-2000	500-650 [50-65]

2. Valuation in Production

Water market transactions provide the closest thing to an economic measure of water value available in the United States. Yet, as is noted below, these prices are often not "efficient" in an economic sense due to market failures — where, for instance, com-

18. See Z. WILLEY, *ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN CALIFORNIA'S WATER SYSTEM* (Institute of Governmental Studies, University of California, Berkeley, 1985).

19. 1 *Water Market Update* (data taken from various articles published in 1987).

petitive conditions do not exist, or external effects are not reflected in the observed transaction price. Another method of water valuation, often used in real estate assessment, evaluates income generated from water use and land values associated with water use.²⁰ Income potentials are assessed by calculating the discounted future stream of income associated with the water's use for such purposes as agricultural irrigation, fishery habitat maintenance, or industrial processing. Table 2 illustrates this method for an alfalfa hay production operation in western Nevada, where the "break-even" price of water is calculated from its irrigation production value. In addition, the land valuation method examines, where possible, the difference in land prices of similar parcels with and without water rights.

Table 2²¹
Water Valuation for Alfalfa Hay Irrigation/Western
Nevada/1985*

	Water Use Options	
	Irrigate	Sell
I. Crop Production*		
(\$/Acre/Year)		
— Income	425	—
— Costs		
• Fixed	90	90
• Variable	146	—
• Water	18	18
• Total	254	108
— Profit	171	(108)
II. Average Water Values		
\$/Acre-Foot/Year		
[\$/Acre-Foot]		
— Irrigation	28 [359]	—
— Sell	—	46
(Break-Even)		[585]

* 5 Tons/Acre; \$85/Ton; 7 Year Stand.

20. For an overview, see B. SALIBA & D. BUSH, WATER MARKETS IN THEORY AND PRACTICE: MARKET TRANSFERS, WATER VALUES, AND PUBLIC POLICY (1987).

21. D. YARDAS & Z. WILLEY, LEAST COST WATER SUPPLY PLANNING IN THE TRUCKEE AND

3. Water Costs and Rates

A cost-based (as opposed to a value-based) approach provides another method of water valuation. Throughout the United States, urban water and sewage districts and agricultural water and drainage districts charge rates and assessments in various ways for delivery of water supplies and for conveyance of pollution discharges. Urban rates often are at least an order of magnitude greater than agricultural rates, due in part to the history of federal subsidization of agricultural water supplies and in part to the "first in time, first in right" basis of water appropriation doctrine. This discrepancy in rate levels is common in many regions of the nation,²² and is an indication of changing demands inadequately addressed by federal water policies, and of potentials for water markets to facilitate the reallocation of supplies. In addition, existing rates are useful in providing a floor for water resource valuations since they represent what water consumers actually pay. Finally, the incremental or marginal costs of developing new water supplies or new pollution treatment facilities provide a related lower bound on the values of some uses of water resources. The costs of such new facilities represent, in the absence of subsidies or other economic distortions, a measure of willingness-to-pay for water resources for certain types of users. The data on variations in water rates and on the costs of new water supply projects displayed in Figure 4 illustrate such lower bounds on valuation in California's water system.

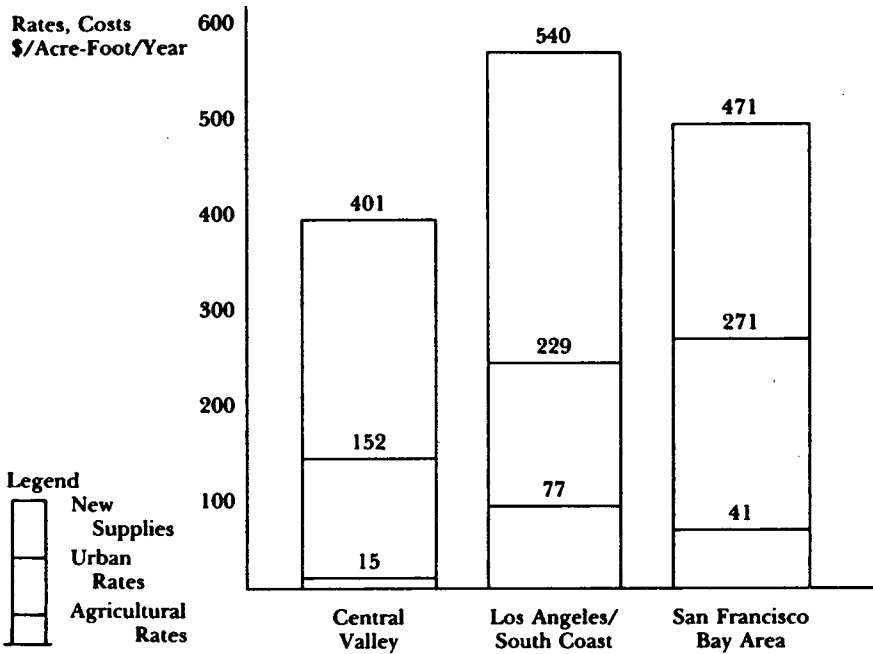
B. *Economic Valuation of Public Water Uses*

The term "public water uses" refers to uses for which the preconditions for private ownership do not exist. Generally, these are caused by "market failures" which have provided the traditional rationale for public intervention, regulation, and even ownership of water resources. Four classes of market failures are typically cited: "third party" effects, public goods, natural monopolies, and equity considerations.

CARSON RIVER BASINS (Paper presented at the Nevada Water Resources Association Annual Conference, Feb. 25, 1987).

22. See D. GIBBONS, *THE ECONOMIC VALUE OF WATER* (Resources for the Future, 1986).

Figure 4
Retail Rates* and Costs of New Surface Supplies** in
California's Water System (1985)



* Averages of area retail rates within each region.

** Average FOB costs of five major new surface water supply facilities proposed during the 1979-82 period.

SOURCE: CALIFORNIA DEPARTMENT OF WATER RESOURCES, BULLETIN 160-83, (1983); WILLEY, *supra* Note 18, at 26.

1. "Third Party" Effects

Externalities or "third party" effects arise whenever outside values are affected by private uses and transactions.²³ The adverse effects of streamflow diversions or pollution discharges on downstream water uses is a classic example of an externality. Less tangible, but perhaps more profound, are the externalities that affect future generations.²⁴ This can occur when certain types of water use (such as groundwater contamination) effectively preclude other types of water use in the future. This affects the interests of

23. See H. VARIAN, *MICROECONOMIC ANALYSIS* 259 (1984).

24. See R. LIND, *supra* note 17.

future generations of users who are not represented in the present-day water market.

2. Public Goods

Some water uses display "public goods" traits. For example, some water uses are non-competitive (one use doesn't impede another use) and there is no effective means of exclusion from use (use admission can't be enforced).²⁵ Public goods traits were a common rationale for taxpayer subsidization of water projects particularly for any associated recreation and flood control benefits.²⁶ These types of justifications for public financial support of water projects appear to have lost considerable influence in recent years given increasing recreational congestion and the recognized ability to assess flood control charges for property which enjoys flood control protection.²⁷

3. Natural Monopoly

The development of water supply and pollution treatment facilities often entails consideration of "natural monopolies" and economies of scale.²⁸ The least-cost scale of many water facilities is so large that entire regional markets are served. The financial requirements for construction require government involvement. An additional consideration is the "common carrier" concern, because water distribution systems, like highway and energy distribution systems, are not amenable to market competition because duplication would be an inefficient use of scarce investment capital.

The scale and financing considerations were relevant during the early stages of economic development in the United States, but are less so today. The best sites for large-scale water supply projects have already been developed.²⁹ Changes in technology, market, and finance conditions relevant to water supply and treat-

25. See H. VARIAN, *supra* note 23, at 253.

26. Two significant early works in this regard are O. ECKSTEIN, *WATER RESOURCE DEVELOPMENT — THE ECONOMICS OF PROJECT EVALUATION* (1965), and J. BAIN, R. CAVES & J. MARGOLIS, *NORTHERN CALIFORNIA'S WATER INDUSTRY* (1966).

27. See discussion throughout U.S. WATER RESOURCES COUNCIL, *ECONOMIC AND ENVIRONMENTAL PRINCIPLES AND GUIDELINES FOR WATER AND RELATED LAND RESOURCES IMPLEMENTATION STUDIES* (U.S. Department of Interior, 1983).

28. 2 A. KAHN, *THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS* ch. 4 (1970).

29. See U.S. DEPARTMENT OF INTERIOR, *supra* note 12, at 2.

ment have been so significant that the federal role has diminished considerably.³⁰ The common carrier argument, however, has a persistent relevance with respect to *distribution* systems.³¹ Thus, water districts throughout the country that were established by state charters along with the federal reclamation and flood control projects inappropriately control such facilities.

4. Equity

Finally, it is argued that creation of a market for water will ignore equity considerations. Markets are inherently calloused to the distribution of income, purchasing power, and access to resources. That claim cannot be denied, but its social significance applies to the working of all markets, not just those involving water resources.³²

5. Government Ownership

The degree to which government ownership and control of water resources is justified is, to say the least, controversial. It can be, and is, argued that water markets frequently fail (or do not exist) because the conditions for failure are established and perpetuated by government agencies with their own agenda for control of the resource.³³ Indeed, if public agencies really want to create conditions conducive to the working of water markets, then the most important first step would be to establish clearly defined private property rights for units of both water supply and quality. Such a step would go a considerable way toward ameliorating the market failures caused by the public goods and natural monopoly characteristics of water. If properly applied, some of the externalities resulting from water use might be partially removed by this kind of reform by providing a mechanism for liability assessment, transfer of rights, and compensation for previously external effects.

30. R. SMITH, *TROUBLED WATERS — FINANCING WATER IN THE WEST* (Council of State Planning Agencies, 1984).

31. The legal rationale for "common carriers" is outlined in I A. KAHN, *supra* note 26, at 5-7. The issue is becoming increasingly important in water allocation policies, as evidenced, for example, in 1986 legislation in California requiring water transfer conveyance facility use. Cal. Water Code §§ 1810-1814 (West Supp. 1988).

32. See H. VARIAN, *supra* note 23, at 284.

33. *WATER RIGHTS — SCARCE RESOURCE ALLOCATION, BUREAUCRACY, AND THE ENVIRONMENT* (T. Anderson ed. 1983).

6. Water Rights Endowments and Distributional Equity

The only way that the establishment of private property rights to water resources can solve the equity problem is by redistributing (or for unallocated rights, distributing) water rights. This type of reform is likely to be resisted by those who now have rights to use, if not to sell, water. Nevertheless, in the many cases in which the actual establishment of water rights, both quantitative and qualitative, is still in question, dispute settlements could address equity concerns as a matter of policy. An important example involves the myriad of unsettled claims to water rights by numerous Native American tribes. Aside from the complex legal questions involved in tribal water rights based on treaties, Winters Doctrine,³⁴ aboriginal uses, and other issues,³⁵ it is clear that the allocation of property rights to water resource uses should, as a matter of equitable policy, give priority to Native American claims. The tribes should also have the right to sell or lease such rights as a source of revenue to insure their economic and cultural survival.³⁶ Establishment of equitable endowments of rights could apply in other circumstances as well, such as in the allocation of tradable water pollution rights in basins in the South in which communities of blacks and Hispanics have been exposed to disproportionate risks from water pollution.³⁷ Further, the competing constituencies often involved in water rights conflicts could be accommodated by considering distributional equity.

III. POLICY REFORMS

A. *The Private-Public Dichotomy*

As noted above, there has been a significant shift in demand for various water uses during the past several decades. There is now

34. The Winters Doctrine derives from *Winters v. United States*, 207 U.S. 564 (1908), and establishes the legal basis for tribal rights to water for reservation lands based upon the "practically irrigable acreage" criterion.

35. For an excellent overview of Native American water issues, see AMERICAN INDIAN RESOURCES INSTITUTE, *TRIBAL WATER MANAGEMENT HANDBOOK* (1987).

36. In a very restricted number of cases, this right has been recognized, but only as a result of a special Congressional act. See, e.g., the Ak-Chin Indian Community Water Rights Act, Pub. L. No. 98-530, 28 Stat. 2698 (1984). This act provides specific allowances for water transfers for this southern Arizona tribal community. A proposal to allow similar water transfer options in the settlement of the claims of the Colorado Ute Tribe was recently opposed in Congress primarily by Lower Colorado water users.

37. Tradable water pollution rights are discussed in Maloney & Yandle, *Building Markets for Tradable Pollution Rights*, in *WATER RIGHTS*, *supra* note 33, at 283.

less demand for consumptive uses, particularly for agricultural production, and more demand for alternate uses such as recreation, drinking water quality, fisheries, and wildlife habitat. Policy reforms must address the manner in which private and public allocation systems can be adjusted in recognition of this shift in demand.

While estimates of economic demand for alternative uses can be made,³⁸ it is difficult to measure the shift in demand over time in a quantitative manner. Acknowledgement of this shift, and pursuit of the needed policy reforms, must take place through the political process. Concerns that must be addressed include (1) the desire for reduction in the taxpayer burden and budget deficit, which is consistent with reduced federal subsidies to private, and perhaps public, water users; (2) the increased demand for non-consumptive uses; (3) decreasing the availability of water resources for inefficient uses resulting from a combination of market failures and ineffective management by public agencies; and (4) a public perception that government management of resources is often ineffective, and that private solutions should be facilitated where possible.

Water resources may be loosely placed into three classes ranging from inherently private uses to inherently public uses. There is a class of water uses which is inherently private, but which could be used more efficiently and with less environmental harm if certain reforms were undertaken. There is a second class of water uses, currently controlled by public agencies, which should be privatized because the rationale for public control is weak. Finally, a third class of water uses appear to require public control, or at least oversight, due to market failure problems. Which policies are appropriate to facilitate both private and public reallocation in water resources uses?

B. *Water Quantity*

Private uses involve both water quantity and quality considerations. Facilitating the voluntary buying and selling of water rights by private interests would accomplish a major portion of the quantitative reallocations for which there is an economic de-

38. For an overview of nonmarket benefit valuation techniques, see A. FREEMAN, *AIR AND WATER POLLUTION CONTROL — A BENEFIT-COST ASSESSMENT* (1982).

mand.³⁹ Several changes in federal water policies would promote such reallocations.

1. Tradable Federal Reclamation Water Contracts and Conveyance

The U.S. Department of Interior should issue a generic policy statement on the transferability of contractual rights to reclamation water supplies.⁴⁰ The Department's current piecemeal approach is to respond to proposals for transfer when presented. Given the inherent conflict in asking reclamation contractors to open transfer discussions when many are unsure of their contractual rights with the United States, it is not surprising that there have been few proposals.⁴¹

One possible means of remedying this situation would be to issue shares in each federal reclamation project, and to allow leases or sales of such shares, which would determine rights to

39. There is a growing literature on this possibility. See, e.g., WATER RIGHTS, *supra* note 33; Vaux & Howitt, *Managing Water Scarcity: An Evaluation of Interregional Transfers*, 20 WATER RESOURCES RES. 785 (1984); Howe, Schurmeier & Shaw, *Innovative Approaches to Water Allocation: The Potential for Water Markets*, 22 WATER RESOURCES RES. 439 (1986); Z. WILLEY, *supra* note 18.

40. During the 1983-86 period, an internal U.S. Department of Interior working group attempted to design such a policy, which would have given reclamation water contractors clear signals regarding water transfer opportunities. The Department failed to release such a policy statement, and cautiously noted that "[a]lthough there continue to be opportunities to market existing water assets or products controlled by the Bureau, water marketing has taken on new meanings and has generated new opportunities. New policy issues also must be considered, such as sales of interim water, facilitating transfers among non-Federal entities, and leasing of project storage or conveyance capacity. These new opportunities offer a chance to break new ground, manage existing Reclamation assets, and to reexamine current policies and practices." DEPARTMENT OF THE INTERIOR, *supra* note 12, at 5.

41. "Reclamation contractors" are organizations, usually irrigation or water districts, which are served water from federal water projects under contract with the U.S. Bureau of Reclamation. The terms of these contracts are negotiated under regulations promulgated by the Bureau under the Reclamation Act as amended in 1982. The right of reclamation water contractors to transfer water appears not to be precluded by federal law, although the Secretary of the Interior has approved those few cases in which such a transfer has actually occurred to users outside the boundaries of the reclamation project. See Roos-Collins, *Voluntary Conveyance of the Right to Receive a Water Supply from the United States Bureau of Reclamation*, 13 ECOLOGY L.Q. 773 (1987). Uncertainty with regard to transaction costs such as legal fees for negotiation with the Bureau and fear of retribution by Bureau employees opposed to water transfers appear to be an important obstacle to formulation of proposals for transfers.

the project's water each year.⁴² The U.S. Bureau of Reclamation would, after the initial issuance of shares, no longer be involved in the water contracting business. Instead, it would allocate the water from each project to the project's shareholders. Where conveyance outside federal reclamation areas was required by such transactions, the provision of such conveyance would be the responsibility of the transactors. However, federal and, where available, state conveyance facilities could be made available as common carriers. Such transportation services could be charged for and could be allocated by a system of priority rights to use.

2. No New Reclamation Projects

Changing conditions have destroyed the principal rationale underlying the Bureau of Reclamation's historic mission of new project planning and development.⁴³ As discussed earlier, the public goods and natural monopoly justifications for public water project development are no longer compelling reasons for such a mission. In addition, the Bureau's project planning procedures are devoid of economic rationality.⁴⁴ The Bureau should no longer have the mission of planning and/or constructing new water resource facilities of any kind.

3. Federal Flood Control and Hydroelectric Functions

A similar set of changes should be made for the water resources managed by the U.S. Army Corps of Engineers and the federal power authorities. The rights to flood protection within the Corps basin projects should be allocated by a share arrangement which could vary over time and result in subsequent variation in the Corps operation of relevant facilities. Federal hydropower projects, such as Bonneville, TVA, and individual facilities such as Hoover, could auction both short- and long-term rights to power. The existing configuration of contracts could become shares in the project's output, and could be traded accordingly. The federal power agencies' role would then become one of operating the facility, and allocating electrical output according to the mar-

42. For a discussion of how such share trading works within mutual irrigation companies, see *Just Rewards: Making Water Marketing Work for Local Interests*, WATER STRATEGIST, July 1987, at 1.

43. "The Bureau's primary role as the developer of large federally financed agricultural projects is drawing to a close." DEPARTMENT OF THE INTERIOR, *supra* note 12, at 1.

44. See Z. WILLEY, *supra* note 18.

ket allocation of shares. Again, no new project planning or development by these federal agencies is appropriate or necessary.

C. *Water Quality*

1. Water Markets — Incentives for Pollution Control

Water quality would be improved by the measures mentioned above. Since the buying and selling of shares (particularly those of federal reclamation projects) would create an opportunity cost to all existing shareholders in the form of the share's sales price, water use for purposes such as irrigation would be subject to a new incentive for conservation. Avoided water uses, and hence income from the selling of shares, would in turn reduce polluted agricultural runoff. In effect, nonpoint source pollution controls, hailed in theory for over a decade under the Clean Water Act as "best management practices," could become the subject of real economic incentives for implementation by irrigators. As a result, the quality of water resources for uses which rely on agricultural return flows would be enhanced, and quantities of water conserved could be made available for such uses.

2. An Example — The Federal Waterfowl Refuges

An important current example of the need for reform in federal water policy is the contamination of federal waterfowl refuges by pollutants in drainage from federal reclamation irrigation project lands. The chemical and biological effects of this contamination are presently being documented in several western states in contamination studies by the U.S. Fish and Wildlife Service and Geological Survey.⁴⁵ For example, irrigation of lands on the west side of California's San Joaquin Valley (Westlands Water District) is the source of contamination in the waters of the Kesterson Wildlife Refuge. The quality of this drainage water could be improved by reducing on-farm water applications, which would significantly reduce leaching of trace elements such as selenium into the drainage runoff.⁴⁶ If a system of voluntary selling of Westlands Water District reclamation contract rights *outside* the district were in

45. An overview can be found in U.S. FISH AND WILDLIFE SERVICE, CONTAMINANT ISSUES OF CONCERN — NATIONAL WILDLIFE REFUGES (1986).

46. For an example of a westside irrigation district study which investigates this possibility empirically, see D. WICHELNS, D. NELSON, & T. WEAVER, FARM-LEVEL ANALYSIS OF IRRIGATED CROP PRODUCTION IN AREAS WITH SALINITY AND DRAINAGE PROBLEMS (U.S. Bureau of Reclamation Cooperative Agreement No. 7-FC-20-04990, 1988).

place, there would be a significant amount of water supply available for other uses, such as waterfowl refuges, along with a reduction in the trace element loading problem. Institutional barriers within the district and the Bureau of Reclamation, however, have effectively prevented this from occurring.

3. Tradable Discharge Permits

A second reform which would serve private and public interests in improved water quality is the institution of a system of economic incentives for water pollution control such as tradable permits. Tradable permit systems have been discussed extensively in the academic literature, and even implemented within several river basins in Europe.⁴⁷ However, the United States experience with such systems is very limited.⁴⁸ With the exception of some limited applications of tradable air pollution permits, U.S. federal pollution laws have relied primarily upon command-and-control approaches.⁴⁹ Under the command-and-control approach, regulatory agencies issue discharge permits, with pollution limits based on available control technologies. While this system has had beneficial effects during the past decade in controlling some conventional point sources of water pollution,⁵⁰ massive federal subsidies were expended through the EPA's Construction Grants Program to achieve these results. Moreover, existing approaches to point source control do not limit the total volume of discharges within a basin, providing little protection for the myriad of uses which rely on water quality. And finally, virtually no one would

47. An overview of tradable pollution permits can be found in Russell, *Controlled Trading of Pollution Permits*, 15 ENVTL. SCI. & TECH. 1 (1981). For discussion of economic incentive systems applied to water pollution in Europe, see Brown & Johnson, *Pollution Control by Effluent Charges: It Works in the Federal Republic of Germany, Why Not in the U.S.*, 24 NAT. RESOURCES J. 929 (1984); Harrison & Sewell, *Water Pollution Control By Agreement: The French System of Contracts*, 20 NAT. RESOURCES J. 765 (1980).

48. A simulation analysis of a system of permit trading, a version of which is now operating, on Wisconsin's Fox River can be found in O'Neill, *Transferable Discharge Permit Trading Under Varying Stream Conditions: A Simulation of Multiperiod Permit Market Performance on the Fox River, Wisconsin*, 19 WATER RESOURCES RES. 608 (1983). The U.S. Environmental Protection Agency has a pilot water pollution trading project for nonpoint sources in Colorado as described in Jaksch & Niedzialkowski, *Speeding Water Cleanup While Saving Money*, EPA J., October 1985, at 24.

49. An excellent survey of federal environmental law and proposed reforms based on economic incentives can be found in Ackerman & Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 COLUM. J. ENVTL. L. 171 (1988).

50. U.S. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL WATER QUALITY INVENTORY — 1986 REPORT TO CONGRESS (EPA-440/4-87-008), (1987).

argue that the command-and-control, technology-based approach has had any significant effect in controlling the nonpoint water pollution sources.

Nonpoint water pollution sources, particularly from agriculture, dispersed toxic sites, and urban runoff, constitute the major American water pollution problem. These pollutants impact both surface and ground water and their control remains to be effectively addressed. In the recent amendments to the Clean Water Act,⁵¹ Congress recognized these problems, but did not provide an effective incentive mechanism for their resolution. Tradable permit systems, with a maximum allowable basinwide pollutant loading set by regulatory authorities, may offer the most feasible means of providing economic incentives to maintain water quality standards in an economically efficient manner.

A viable system of tradable permits presumes, as does any pollution control policy, that identification of polluters and monitoring and enforcement of permit terms are achievable. Given the cost and political difficulty of effective enforcement by government pollution control agencies, serious consideration of private enforcement alternatives is warranted. One possible means of making a system of tradable permits for nonpoint sources workable and politically acceptable would be to establish local institutions to manage the permit system. For example, agricultural drainage districts in the western states might be utilized to manage discharge permits for such pollutants as salinity and trace elements among member irrigation districts and individual farmers.⁵² In the midwest, where sediments are a key problem, soil conservation districts might be utilized in a similar fashion. The incorporation of such local institutions into the tradable permit system would be an important element in establishing verifiable and enforceable conditions.

D. *Clarifying Federal Water Quality Policy*

The lack of clear economic incentives to control surface and ground water pollution in federal law, particularly in the reliance on "best available technology" in the Clean Water Act and in the

51. Federal Water Pollution Control Act, 33 U.S.C. §§ 1251 -1376 (1982 & Supp. III 1985).

52. The concept of a regional drainage institution is now being discussed in California's San Joaquin Valley for the nine irrigation districts which contribute to salinity and trace element loads in the San Joaquin River.

Resource Conservation and Recovery Act,⁵³ and the current serious discussion of still more federal legislation to regulate ground-water indicate that federal water quality policy is in need of reforms which can actually achieve water quality goals. If a rational federal policy is the goal, then clarifying legislation is needed. Such legislation should be comprehensive with regard to federal water quality policies and controls. In amending sections of existing statutes, the following goals should provide guidance.

1. Tradable Permits, Basinwide Standards, and Revised Agency Roles

Tradable water pollution rights systems should be encouraged, not outlawed. It is time to recognize that the command-and-control approach has been at best a limited success in achieving water quality goals, and that environmental and health damages continue. The Environmental Protection Agency should have as a key mission, either within its own regional offices or by delegation to state agencies, the establishment of pollutant load ceilings by hydrologic basin which would, in turn, limit the number of tradable permits to be issued for that particular basin. State delegation is attractive because it provides a mechanism to incorporate differing regional conditions and concerns into implementation of basinwide water quality standards. One likely consequence of this is that some states will allow more pollution than others. Some federal constraints on such *variation* in pollution loadings may be appropriate, although some might argue that if a particular state wishes to become a pollution haven to attract industry, its citizens should have the right to make that choice.

It may be appropriate for EPA to coordinate activities of all federal agencies with particular water quality interests within an area or basin. For example, the U.S. Fish and Wildlife Service, an agency with very little authority, might be given the responsibility of establishing water quality standards for fish and wildlife in the aquatic systems, including wetlands and estuaries, of a given basin. Human health standards might continue to be set by the EPA, or perhaps by another health-related federal agency, such as the U.S. Public Health Service. The EPA's continuing responsibilities could include, in conjunction with federal scientific and research agencies such as the U.S. Geological Survey and the

53. See Ackerman & Stewart, *supra* note 49.

National Research Council, oversight of the periodic adjustment in these allowable ceilings based on scientific and economic information. Where tightening of standards seemed appropriate, public agencies or private interests could purchase and retire discharge permits to improve water quality in the basin.

2. Monitoring and Enforcement

Under these reforms, the EPA and the state agencies would no longer have to concern themselves with the technological and economic issues associated with the command-and-control approach to standard setting and permit issuance for point and nonpoint sources of water pollution. Identification, monitoring, and enforcement of the terms of permits, particularly for the nonpoint sources, would continue to be problems. Identification of sources is a combined research and data collection task which would benefit from a continuing federal role. Monitoring and enforcement, on the other hand, may be performed better by the private sector.

The key to controlling pollution from nonpoint sources is the establishment of workable rules governing the use of permits. In agriculture, for example, collecting information on actual discharges into surface and groundwater may be prohibitively expensive. Permit rules, therefore, may need to be based on observable but indirect measures which are related to actual discharges. For example, in implementing nonpoint controls for trace elements and salinity, permit terms could be based on amounts of irrigation water applied and estimates of consumptive use as indirect measures of polluted runoff and drainage.⁵⁴ In any event, once these permit rules have been established, there is no apparent reason why monitoring and enforcement could not be performed by private firms either on contract with public agencies or on behalf of other private interests affected adversely by the subject pollutants. Such private enforcement arrangements could provide a hedge against the tendency in federal budget deficit re-

54. For an example of an empirical study of the relationship between irrigation water applications and drainage discharge rates, see D. WILCHENS, A. NELSON & T. WEAVER, *supra* note 44. For an overview of agricultural water pollution issues with special reference to California's Central Valley, see Willey, *Managing the Central Valley's Agricultural Salinity and Toxic Water Pollution Problems — Is There a Workable Scenario During the Next Investment Period?*, 2 APPLIED AGRIC. RES. 32 (1987).

duction efforts to cut enforcement expenditures by federal agencies such as the Environmental Protection Agency.

3. Federal Statutory Conflicts

In establishing the framework for administering tradable permits systems, conflicts with and among the federal statutes must be removed. Existing statutes concerned with toxic substances focus on standard-setting;⁵⁵ clean-up and liability for existing toxic contamination sites;⁵⁶ and waste stream monitoring and toxic facility design, closure, and liability.⁵⁷ A number of proposals for groundwater regulation are currently being considered in Congress. It would be undesirable to complicate the situation further by passing new legislation targeted at groundwater only. Instead, groundwater issues should be incorporated along with revisions in the Clean Water Act into comprehensive federal water legislation. A federal role in the provision of technical information related to basin-specific water resources is warranted in such new legislation.

4. The Federal-State Relationship

The policies aimed at the control of groundwater contamination are the least coherent and developed of any federal water policies. The federal-state relationship, which is an important dimension of all water policies, due to the diversity and site-specificity of water problems, is extraordinarily critical in groundwater policies. If such policies are to be based on economic incentives such as tradable discharge permits rather than on traditional command-and-control regulatory approaches, then the federal-state relationship will have to be clearly defined.

State water laws have established rights to use water under appropriative, riparian, correlative, and other conditions. The concept of a water right provides the starting point from which tradable discharge permits could be established. The problem of property rights to groundwater must be solved within such a

55. Federal Water Pollution Control Act, 33 U.S.C. §§ 1311-1330 (1982 & Supp. IV 1986); Safe Drinking Water Act, 42 U.S.C. §§ 300j-300j-3a (1982); Resource Conservation and Recovery Act, 42 U.S.C. §§ 6921-6925 (1982 & Supp. IV 1986).

56. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9605-9607 (1982 & Supp. IV 1986).

57. Resource Conservation and Recovery Act, *supra* note 55; Toxic Substances Control Act, 15 U.S.C. §§ 2603-2607 (1982 & Supp. IV 1986).

water rights framework before a tradable discharge permit system can be substituted for existing (and proposed) toxic legislation aimed at groundwater quality.

In some states, such as Nevada, this problem has already been addressed since groundwater rights have been "adjudicated." Groundwater pumping rights have been assigned to individual private and public interests, usually after an extensive adjudicatory process by state administrative agencies. In other states, such as California, most groundwater has not been adjudicated, although some individual basins (e.g. the San Fernando Basin in southern California) have been adjudicated, usually by special court proceedings. In cases in which groundwater rights have been adjudicated, the need for protective federal controls such as those in RCRA may not be appropriate. The property right which is implicit in the adjudicated right provides a private incentive to seek compensation for groundwater contamination liabilities which may arise. Although these private incentives for groundwater quality protection are strong, there are nevertheless significant transaction costs which the groundwater right holders must bear in order to enforce such protection. A federal research role in the provision of technical information related to source, dispersion, and impact of groundwater pollutants might again be useful.

In aquifers with "common property" status, regulatory structures for water quality protection are necessary. Given the site-specific nature of groundwater problems and management choices, state administration may be more appropriate. Such regulatory systems can be quite expensive, but the only clear alternative which eliminates the need for them is adjudication of groundwater rights, a process which has also proven to be quite expensive, involving lengthy judicial and/or administrative proceedings. The control of groundwater contaminants at the source also appears to require regulatory incentives. In short, there is no easy, low-cost, regulation-free solution to the groundwater contamination problem. Thus, a sensible strategy is to embark upon a long-term plan to develop a system of rights and liabilities for groundwater which will be similar to the public-private system of rights currently evolving for surface waters.

Water legislation containing an incentive provision requiring states to adjudicate groundwater rights in order to avoid federal controls would be a move in this direction. Each groundwater aquifer adjudication process could then occur within the context

of the particular set of water resource demands extant in the aquifer's region or state. Subsequent issues of contamination and liability could be addressed through the resulting property rights allocation. Adjudication of groundwater rights in most areas would be a long-term process requiring as much as several decades. In the interim, state regulatory agencies could be used to (1) control groundwater contamination, and (2) oversee the adjudication process. Most states, particularly in the West, already have agencies which could oversee adjudications. In order to prevent the creation of permanent public bureaucracies while providing the interim regulatory function, state agencies with "sunset" provisions in their authorizing legislation could have the specific interim mission of controlling groundwater contamination until the adjudication processes are complete.

E. *Demand for Public Water Resources*

1. The Public-Private Interface

The above policy reforms are intended to facilitate the efficient allocation of water resources among private uses, impose necessary public constraints on those uses, and remove unjustified public roles in that allocation. In addition, the allocation of water resources among public uses, and the relationship between private and public uses needs to be addressed. There is, and will continue to be, competition for both quantity and quality of water among various uses. It is apparent that the ownership status of at least some types of water resources may never be fully clarified, and that the public-private dichotomy will be with us for some time. At present, conflicts between public and private uses are addressed by a combination of regulatory agencies and court proceedings. Conflicts among public uses are increasingly frequent. For example, attempts to divert upstream flows to waterfowl wetland habitats may harm downstream fish habitats and recreational uses. Allocations among these uses are made in tenuous fashion involving a combination of regulatory procedures and the politics of the relevant public agencies. Is there a constructive way to clarify this allocative process, utilizing some measure of market incentives?

2. Acquisitions and Public Rights to Water Resources

The two key concepts in addressing these issues are acquisition and liability. Acquisition is the securing of water rights, including rights to water quality, for public uses. In most states, there are no rights for public uses other than those imposed by regulatory or court proceedings through mechanisms such as instream flows and "public trust."⁵⁸ In several western states there is some legislative and administrative movement toward establishing rights to instream flows for nonconsumptive uses such as fisheries.⁵⁹ The establishment of instream flows is in essence the establishment of a water right for public (and sometimes private) uses, although it remains to be seen whether these newly formed instream flow standards will survive during dry years when there is direct competition with senior appropriative rights, most of which are for private uses.

Beyond this type of regulatory approach to protection of public uses, there is the larger question of what priority public uses are ultimately to have in the mix of private and public uses prevalent in most of the nation's water basins. It is consistent with the concept of water markets that public users ought to be able to acquire rights in much the same manner as any other purchaser within a basin or regional market. In attempting to preserve public uses, public acquisition from willing sellers has the added attraction of providing government water agencies with an alternative to the involuntary taking of existing water rights. Public purchase of water rights can be seen as a market analogue to the implementation of the public trust doctrine within the existing structure of appropriative rights.

Creating a market for water rights along with a willingness among the appropriate public agencies to acquire rights is probably an easier task than providing the financial capability for these agencies to make such acquisitions. The question is whether the

58. A succinct discussion of the public trust doctrine can be found in *Water Policy In the Balance: Water Development and Environmental Interests in the Era of the Public Trust Doctrine*, WATER STRATEGIST n.d. vol. 1 no. 1, at 1. Perhaps the most significant judicial finding with regard to public trust rights to water resources came in the California Supreme Court's 1983 decision that the public trust doctrine modifies the diversions by the Los Angeles Department of Water and Power from the Mono Lake Basin. *National Audubon Society v. Superior Court*, 33 Cal.3d 419, 658 P.2d 709, 189 Cal. Rptr. 346 (1983).

59. A summary is provided in WATER EFFICIENCY WORKING GROUP, WESTERN GOVERNORS' ASSOCIATION, WATER EFFICIENCY: OPPORTUNITIES FOR ACTION REPORT TO THE WESTERN GOVERNORS 82-93 (1987).

public users, represented by these agencies, have the ability to pay to secure water rights. Revenues from user fees can provide funds for public agencies which could enable them to purchase water rights.⁶⁰ These fees, however, are unlikely to be adequate because of the impracticality of charging all users. A significant additional source of revenues for public acquisitions may be the assessment of liability for damages to public rights.

3. Liability and Compensation

It is often the case that both the appropriation and consumptive use of freshwater and pollution discharge result in damages to other competing uses. There are several legal avenues of redress available to private users. They involve property, nuisance, and general tort law. Analogous experience exists in suits for compensation for damages to public rights.⁶¹ Fines for failure to comply with regulatory standards are sometimes sought as part of public enforcement actions. Litigation by public agencies seeking damage compensation does occur, and Department of Interior regulations provide rules for assessing damages for injury to, destruction of, or loss of natural resources from oil or hazardous substance releases.⁶² These kinds of efforts are a step in the right direction, but a general policy of vigorously securing damages for harm caused to public waters would complement the acquisition of public water rights.

A controlled policy by federal and state water agencies to identify pollution law violations and to seek compensation for damages to public water rights would help to maintain the integrity of those rights. In addition, the revenues generated by such compensation could be placed in trust funds dedicated solely to the acquisition of additional water rights for public uses—acquisitions made from willing sellers.

60. An example of this type of relationship between user fees and habitat maintenance is the use of duck stamp fees charged to hunters for wetland enhancement and maintenance in several states. Similar arrangements, instituted by state fish and game authorities, use fishing license fees to support hatchery breeding and other fisheries enhancement programs.

61. Perhaps the most frequent instance of such public action has been by state fish and game authorities seeking compensation from water polluters for damages to fish and bird populations.

62. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, § 301(c), 42 U.S.C. § 9613(c) (1982 & Supp. IV 1986), requires that natural resource damage assessment regulations be developed.

4. Liabilities of Public Agencies

It is important to note that the parties liable for damage would include not only private water users, but also public agencies. Examples abound. Damage payments could be sought from the U.S. Department of Agriculture as a result of its agricultural commodity support programs, from the U.S. Forest Service for its timber harvesting programs, from the U.S. Department of Interior for its reclamation irrigation projects, from the U.S. Army Corps of Engineers for its flood control projects, from the federal power authorities for the operation of their hydroelectric facilities, and even from the U.S. Department of Defense for the operation of the many military installations which result in damages to public water resources. This internal cost accounting among the federal agencies would not only provide a source of revenue for water rights acquisitions for public uses, but also would provide economic incentives for the agencies to reduce the damages to water resources which result from their programs and policies. At the very least, it would make explicit the hidden costs in many government programs.

IV. ASSESSMENT OF THE OPPOSITION TO POLICY REFORM POTENTIALS

Most, if not all, of the policy reforms advocated in this paper follow directly from the hypotheses set out in the beginning of the paper. Demand for public water uses (both in quantity and quality) is rising; supply is contracting. Existing federal regulatory and subsidy policies are increasingly coming under criticism. Alternatives which deliver improved environmental quality at a reasonable economic cost and which are consistent with American traditions favoring voluntarism and disfavoring government coercion seem to have a promising future. Political coalitions which span the spectrum from left to right, Democrat to Republican, are possible, as the reforms suggested here are delivered in a spirit of bi-partisan or non-partisan advocacy.

Political realism indicates, however, that the reforms advocated here will not come easily. Entrenched interests will contest these policy reforms for a variety of reasons.

A. *Mission-Oriented Agencies and Private Sector Beneficiaries*

The most obvious opposition will come from the mission-oriented agencies, such as the U.S. Bureau of Reclamation, whose time we believe has passed. Reforms which would make new government-backed and subsidized projects less likely and which would assess those agencies with liability for the resource damages they cause threaten bureaucrats whose careers are dependent on such projects. These agencies have allies in Congress and in the private sector who do not pay the full price for the benefits which the projects deliver.

These potential opponents in the private sector have been able to exploit public water resources at little or no cost to themselves and might, under the proposed reforms, find themselves liable for pollution they are causing or find their expectations of further government subsidies frustrated. Ultimately some private political opposition is inevitable, but a significant part of this potential opposition can be avoided by making the reallocation of water supplies voluntary and by encouraging least cost pollution control through incentive mechanisms.

Still other government agencies and bureaucrats who have powers over allocation of water (like their cousins who control shares of a private market) will behave like threatened competitors and will seek government and public support when policies are proffered that threaten to take away some of their control. Unlike private market shares, the perceived loss is not monetary, but it is real nevertheless. Defense of existing government-based allocations will be based not only on the "natural monopoly" rationale discussed above, but also on self-perceived beliefs that existing agencies have developed greater knowledge and perspective on the proper allocation of water than a more dispersed market could ever develop.

That this belief flies directly in the face of the dominant cultural commitment to the merits of free enterprise and market allocation will be either ignored or disguised by counter-attacks on incentive-based schemes as being only quasi-markets or inadequate second-best solutions. Yet, while most of the reforms postulated above would not create markets by an economist's pure definition (as government control remains a major element both in the allocation of water supply and in the regulation of its quality), they certainly approximate the market paradigm much better than the

current government control and regulatory schemes they would replace.

B. *Government Regulatory Bureaucracies*

More subtle opposition will come from other government agencies and bureaucrats whose interest is not government subsidy, but government control or power. Many regulators—including even regulators who frequently are loathe to apply strong regulatory pressure upon those whom they are legally supposed to control—will often jump to the defense of their prerogatives and will oppose alternative incentive-oriented schemes, even though they may accomplish the same goals at a lower financial and institutional cost.

Finally, another group of government agencies and bureaucrats whose missions have been pro-environment are also potential opponents of reform. This is partly because they fear change will threaten the few prerogatives they have and partly because they are not confident that the political support exists for them to take action on behalf of the resources they are required to protect.

C. *Command and Control Environmentalists*

The last general category of opponent is perhaps the most disturbing. A large cadre of professional advocates for environmental betterment has grown up around the command-and-control structure of the major pollution laws. In many cases, they know the intricacies of those laws as well or better than the regulators who administer them and the industries they regulate. These advocates naturally will be very slow to accept new ideas that may render much of their expertise obsolete, especially when they can rightfully claim that experience with many of the alternatives proposed in this paper is sparse indeed.

A related group of pro-environment advocates opposes market-oriented allocation schemes on similar grounds and suggests instead more aggressive advocacy for public rights on the part of government regulators and courts. This group favors the politicization of resource and pollution policy and attempts to rely on an aroused citizenry, sustained media attention and hoped for favorable electoral outcomes to offset the imbalance in financial resources among environmentalists, government, and industry. Protecting some environmental resources by anything less than a major confrontation is somehow thought deplorable; op-

ponents are viewed as enemies; and the world is divided into those who wear white and black hats. Such a perspective leaves little room for reliance on a profit motive to accomplish environmental goals.

D. The Challenge: A Difficult Reform Package to Deliver

This sketch of the array of potential opponents to the proposed reforms is not intended to imply that all opposition to or criticism of these proposals is self-serving and non-substantive. No doubt many fair criticisms are possible. This delineation of potential opponents, however, does demonstrate that reform will be elusive even if the hypotheses regarding the increasing demand for environmental quality and the general support for libertarian outcomes are correct. Even with the best strategy for public advocacy, coalition building, and alliance with potentially benefited private and public interests, reform will likely come slowly in the face of the obstacles identified above. This comports with our experience to date, but we continue to believe that history is on the side of the reform agenda, and that precedent-setting initiatives will ultimately lead to the implementation of such reforms.

V. SUMMARY

Several principles for the reform of federal water policy can be distilled from this discussion. First, federal agencies should no longer plan and develop new water resource supply, flood control, energy, or pollution control projects. Second, general federal taxpayer revenues should no longer support the allocation of water resources to any private and to many public uses. Third, for existing federal facilities, tradable shares in the project should form the basis for the allocation of the project's water resources, with the relevant federal agency operating the project accordingly. Fourth, federal water conveyance facilities should be managed as common carriers, with tradable rights to their use available to private and public users as part of water transfer opportunities.

Fifth, federal water quality policy is disjointed, and new comprehensive legislation is needed to formulate a meaningful and effective policy. Of utmost concern in such legislation are (1) the initiation of tradable discharge permit systems as the most effective means of controlling nonpoint sources of pollution, and

(2) the need to condition federal groundwater quality policy upon the willingness of state water authorities to establish clear priority rights systems for groundwater. Sixth, public water uses should be narrowly defined to include only those types of uses that are not amenable to market allocation. Such public uses should be secured by the acquisition of water rights, for quantity, quality, or both, from willing sellers.

Seventh, compensation for water resource damages should be sought from both private and public water users, and the resulting revenues should be dedicated to the acquisition of water rights for legitimate public uses. While there are existing legal and regulatory procedures for seeking such compensation for at least some types of damages, comprehensive federal water legislation should include specific procedures for seeking such compensation, and for subsequent acquisitions by relevant public water agencies.