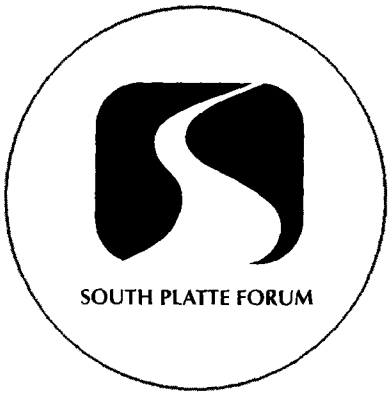
Not in My Watershed!
Changes in Land and Water Use in the South Platte Basin

Proceedings of the 9th Annual
South Platte Forum
October 28-29, 1998
Longmont, Colorado



Laurie Schmidt, Editor

October 1998

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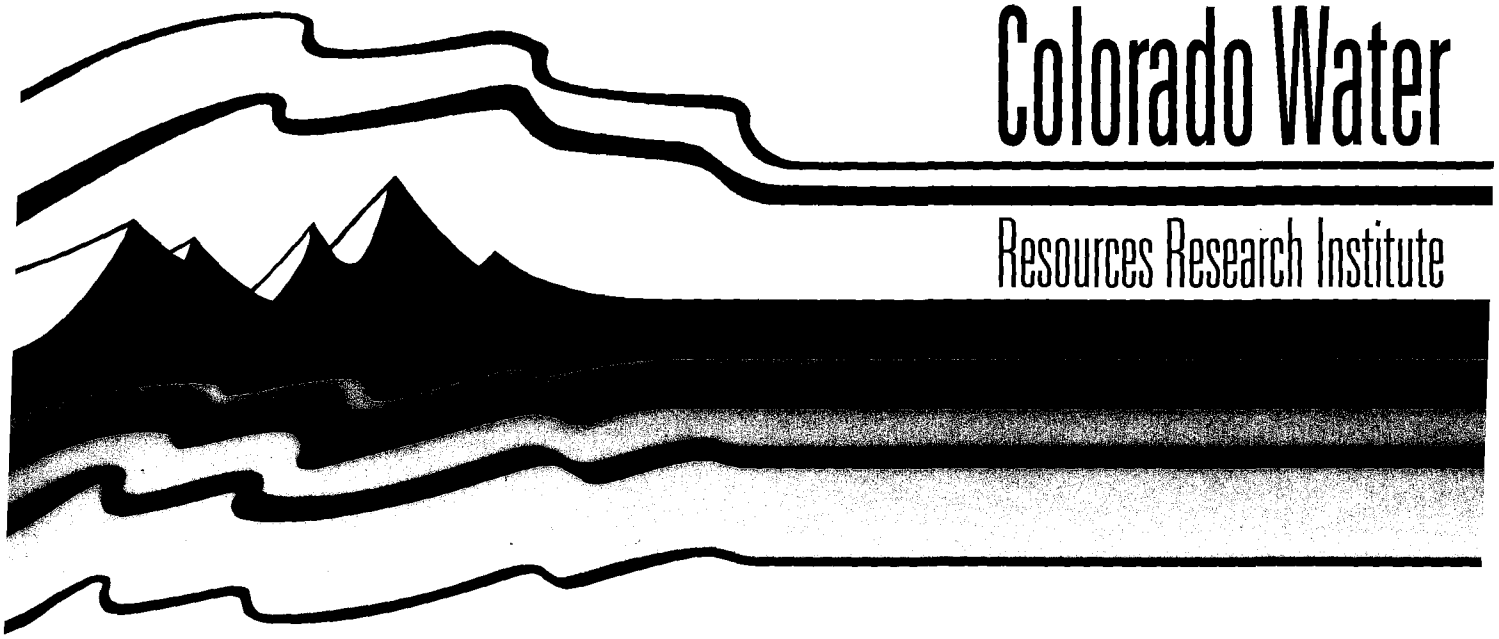

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Robert Ward & Laurie Schmidt, CWRRI

October 28 - 29, 1998
Raintree Plaza Conference Center
Longmont, Colorado

The research on which this report is based was financed in part by the U.S. Department of the Interior, Geologic Survey, through the Colorado Water Resources Research Institute. The contents of this publication do not necessarily reflect the views and policies of the U.S. Department of the Interior, nor does mention of trade names or commercial products constitute their endorsement by the U.S. Government.

Colorado Water Resources Research Institute
Colorado State University
Fort Collins, Colorado 80523-2018
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Preface

The South Platte Forum was initiated in 1989 to provide an avenue for the multi-disciplinary exchange of information and ideas important to resource management in the South Platte River Basin. Its stated mandates are:

- to enhance the effective management of natural resources in the South Platte River Basin by promoting coordination between state, federal, and local resource managers and private enterprise, and

- to promote the interchange of ideas among disciplines to increase awareness and understanding of South Platte River Basin issues and public values

The South Platte River is the principal water source for Colorado's ever-growing Front Range. The management of growth issues in the South Platte Basin is moving traditional water and land uses beyond historical patterns. Interstate litigation, the Endangered Species Act, and federal permitting requirements are limiting water use. Can these changes in traditional water and land uses be integrated in a way that satisfies the competing demands of various interest groups?

Colorado's position as an upstream state places us in a unique situation. We are faced with challenges from downstream states, new federal and state legal requirements, and rapidly-changing perspectives. Instream flow requirements, groundwater quality, endangered and threatened species, and the use of new technologies in watershed management are all issues that need to be addressed. The 1998 South Platte Forum examines many of these issues.

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The West's New Backyard: How Development is Changing the Face of the Rockies

William E. Riebsame[1]

A set of strong driving and enabling forces are changing the geography of the West, allowing people and firms to express their locational desires and turning the old economic link between jobs and population growth around, as people vote with their feet first and then bring or develop jobs. A few social guiding and limiting forces are arrayed in the face of the geographical juggernaut, including land and water use planning. However, if development forces are the "strong" forces of the land use universe, then planning is the "weak" force and promises to have very little overall effect on how our backyard looks in future decades. A series of maps and landscape scenes are used to explore the new geographies in our backyard: the metroplex, the exurbs, the commons, and the resort zone.

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[1]Professor, Department of Geography, University of Colorado, Campus Box 260, Boulder, CO 80309, 303-492-6312

Colorado's Water Future

Justice Gregory J. Hobbs, Jr.[1]

As the history of Colorado demonstrates, beneficial use and preservation are the two chambers of our western hearts -- the two lobes of our brains. Our state and federal public land, land use, water, and environmental laws mirror these fundamental principles. We coexist in the land of little rain with other living creatures. We must respect these creatures and help them to survive.

Coloradans will proceed into the twenty-first century with values that will be reflected in water decisions at every level. Local citizens will react to proposed diversions that threaten their economic livelihood and love for their home place. Conservation of animals, birds, and plants must be addressed. It is not possible to build a new water project without extensive public consultation and a study of alternatives, including not building the project.

As Colorado is forced to live within its interstate apportioned water share, management will become even more necessary. Efficient means of diversion and storage, beneficial use without waste, and recognition of all purposes that Coloradans value have always been fundamental precepts of Colorado water law. The era of their fuller implementation is upon us.

Land use decisions made in accordance with law will be instrumental in determining the look and feel of Colorado. Water supply planners will be required to examine all options, including conservation, exchange, groundwater recharge, joint use projects, conjunctive use of groundwater and surface water, out-of-priority diversions through decreed augmentation plans, and the sale and purchase of water rights for use within the state. Use of local water resources for local purposes will be the primary focus. Yet, Coloradans know that the state must share its water and financial resources as a whole.

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[1]Colorado State Supreme Court, Colorado State Judicial Building, 2 East 14th Avenue, Denver, CO 80203, 303-861-1111

Western Water as a Religion

Ed Quillen[1]

In his luncheon keynote talk, *Denver Post* columnist Ed Quillen will discuss "Western Water as a Religion" – a system of faith in invisible things like CFS (cubic feet per second), a theology that offers "reclamation" and "redemption," and a charismatic and mystic founder, John Wesley Powell.

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[1]P.O. Box 548, Salida, CO 81201, 719-539-5345

Colorado's Instream Flow Law: A History of Legislation

Fred Anderson[1]

I. Colorado Water Law
   A. Doctrine of Prior Appropriation
   B. Question of depletion
   C. All needs not answered

II. Introduction of Instream Flow Legislation
   A. Senate Bill 97, 1973
      1. Recognized instream flows and lake levels
      2. Diversion requirements
      3. Colorado Water Conservation Board Authority

III. Legislative Intent
   A. Protect environment
   B. Rights reserved to CWCD
   C. Functions within existing Colorado water law

IV. Clarifying Legislation
   A. 1981, Senate Bill 414
   B. 1986, Senate Bill 91
   C. 1987, Senate Bill 212

V. Interpretations by Colorado Water Conservation Board
   A. Inundation
   B. Conditional water rights
   C. Legislative response

VI. Current and Future Considerations
   A. Federal mandates
      1. Endangered Species Act
      2. bypass flows
   B. Snowmass court decision
   C. Possible legislative action
      1. modifiable instream flow
      2. Snowmass legislative interpretation
      3. no legislative response

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[1]Former Colorado State Senator, 2397 W. 29th Street, Loveland, CO 80538

Colorado's Instream Flow Program: A Future Perspective

Melinda Kassen[1]

Given the 25-year history of Colorado's instream flow program, what is likely for the future in the drainage?

1. For those below coldwater fisheries and transition zones, the State's program has never meant anything in the past and is unlikely to affect these areas in the future.

2. An examination of the downward trend in new filings indicates that those in the coldwater zone can also expect little from the Colorado Water Conservation Board (CWCB) program in the future. A change could occur, however, if the methodology changes and if the CWCB revisits existing filings.

3. Where the Board holds existing rights, increased attention to enforcement can be expected. To date, the program is a "paper program." Perhaps in the future there will be more stream gages and more field personnel making calls. Trout Unlimited's GOCO grant is designed to establish a role in enforcement for non-CWCB employees.

4. Non-CWCB program activities may also put water in the streams. There are conservation easements, bypass flow requirements, flows for endangered species, and diversionary instream flows, such as the City of Ft. Collins' right. All of these can put water in the river for the fish.

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[1]Colorado Director, Trout Unlimited, 1900 13th Street, Suite 101, Boulder, CO 80302, 303-440-2937

Issues in Implementation of the Instream Flow Program

Patricia Wells[1]

Under Colorado law, the Colorado Water Conservation Board (CWCB) has the exclusive authority to hold water rights for instream flow purposes. The CWCB currently holds water rights on over 8,000 miles of stream, primarily in streams that host coldwater fisheries. To extend instream flows to warm water environments, methodologies for determining the desired flow rates will need to be developed. If other values, such as recreation and aesthetics, are to be protected through instream flows, some method of determining flows must also be developed.

While the number of miles covered by instream flows has grown steadily, the CWCB staff for the instream flow program has remained constant. It is difficult to appropriate new instream flows when legal filings to protect existing instream flow rights require ever-increasing efforts. The burden of on-the-ground monitoring and enforcement of flows is also increasing and will require new techniques and, possibly, new partnerships.

In appropriating instream flows, the CWCB must fulfill its dual, and sometimes conflicting, mission of protecting the natural environment to a reasonable degree and facilitating the full development of Colorado's compact entitlements.

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[1]Denver Board of Water Commissioners, Denver Water, 1600 W. 12th Avenue, Denver, CO 80254, 303-628-6460

The "Real" Cost of the Endangered Species Act

Senator Don Ament[1]

Because of the affluence this society enjoys, it is easy to call for the recovery of endangered species. There is, however, a cost -- a cost most people are unaware of because they don't pay it.

I. Who influences the public policy decisions regarding the Endangered Species Act?
   A. Twelve hundred environmental organizations, with an annual budget of $2.5 billion. Do they pay the bill for recovery efforts? Are they willing to pay the bill?
   B. Government agencies
      1. Environmental Protection Agency
      2. U.S. Fish and Wildlife Service
      3. U.S. Forest Service
   C. Industry
   D. General public

II. What are the negative impacts on our environment?
   A. Air quality
   B. Water quality
   C. Loss of agricultural lands and habitat to urban development

III. Is the high standard of living that we take for granted responsible for the negative impacts on our environment?

IV. What effect do more rules and regulations have on:
   A. Cost factors associated with agriculture, mining, oil and gas, and timbering
   B. Property rights

V. Solutions
   A. Colorado House Bill 98-1006
   B. Incentives
      1. Private/public partnerships
      2. Leases and easements
   C. Conservation purchases
   D. Lifestyle changes
   E. Good management of our natural resources

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[1]Route 1, Box 142, Iliff, CO 80736, 970-522-8205

Managing Native Fish for the Future

Jay Stafford[1]

The Tamarack Plan is an extensive water recharge project along the South Platte River in northeastern Colorado. The project is designed to re-regulate river flows as a portion of Colorado's contribution to the three-state cooperative agreement. Cooperating agencies in the project include Northern Colorado Water Conservancy District, Colorado Division of Wildlife, Colorado Water Conservation Board, South Platte Lower River Group, Go Colorado, and Ducks Unlimited. The initial demonstration project will offer many benefits to aquatic wildlife. A series of three ponds are being constructed to provide refugia ponds for fish and an alternative water source for a live stream. The 1/3-mile long stream will provide a unique opportunity to propagate some of Colorado's threatened and endangered minnow species, including Suckermouth Minnow (P. mirabilis) and Plains Minnow (H. placitus), in a natural, protected habitat. Work on the project is currently underway, with completion of the demonstration phase scheduled for early in 1999. The Tamarack Plan is a pro-active approach to managing Colorado's native fish species. It represents a partnership of several organizations, all of which are concerned about water and wildlife issues in Colorado and its neighboring states.

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[1]Aquatic Biologist, Colorado Division of Wildlife, 15630 Harris Street, Sterling, CO 80751, 970-522-4759

Platte River Endangered Species Partnership

Dale Strickland[1]

The states of Nebraska, Wyoming, and Colorado and the U.S. Department of the Interior (Interior) entered into a partnership to address endangered species issues affecting the Platte River Basin. A Cooperative Agreement, signed by the three states and Interior in July of 1997, guides the effort for a minimum of three years. A Governance Committee with members from the three states, water users, environmental groups, and two federal agencies has been established to implement the Cooperative Agreement. Governance Committee activities are guided by "Milestones" contained in the Cooperative Agreement. As Executive Director for the Governance Committee, I will describe the process and briefly report on its status.

The initiative has two main purposes:

1. To develop and implement a "recovery implementation program" (Program) to improve and conserve habitat for four threatened and endangered species that use the Platte River in Nebraska: the whooping crane, piping plover, least tern, and pallid sturgeon.

2. To enable existing and new water uses in the Platte River Basin to proceed without additional actions required (beyond the Program) for the four species under the Endangered Species Act (ESA).

The Governance Committee has successfully completed Year 1 of the Cooperative Agreement. The Committee has met approximately monthly since its first meeting on September 12, 1997. Land, Water, Technical, and Outreach Committees were formed and also have met approximately monthly during the year. Finally, Interior is required to analyze the potential impacts of the proposed Program and a range of alternatives under the National Environmental Policy Act. Interior has developed an interdisciplinary team and has initiated preparation of a Programmatic Environmental Impact Statement (EIS).

The Milestones relate to water, habitat, and monitoring and research issues that must be addressed to satisfy the objectives of the program. The Governance Committee and its subcommittee have made significant progress toward the completion of the sixteen Year 1 Milestones. Substantial work has also begun on most of the multi-year Milestones. The Governance Committee continues to work with the Interior as it prepares the EIS.

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[1]Vice President and Senior Ecologist, Western EcoSystems Technology, Inc., 2003 Central Avenue, Cheyenne, WY 82001, 307-634-1756

South Platte Mapping and Analysis Program (SPMAP)

Luis A. Garcia[1]

Water managers in the South Platte River Basin need an easy and efficient process for accurately computing augmentation requirements for existing wells. The South Platte Mapping and Analysis Program (SPMAP) is a joint effort between the Integrated Decision Support Group (IDS) and several water organizations in the South Platte. The goal of the project is to improve the quantity and quality of spatial data available to water users in the South Platte River Basin for modeling and analysis. These data can be used by water managers to determine the amount of water currently being used in the South Platte, the source of the water (surface water or groundwater), and the impacts of the water use on the river.

The development of the system has been funded by seven water organizations from the South Platte and the Colorado Water Resources Research Institute. The project has been developed in close coordination with an advisory committee that includes representatives from the Northern Colorado Water Conservancy District, the South Platte Lower River Group, Inc., the Colorado State Engineer's Office, the Central Colorado Water Conservancy District, Groundwater Appropriators of the South Platte, and the City of Greeley. This advisory committee has met regularly since mid-1995 to evaluate available data, data development needs, and water resource modeling strategies for the South Platte River Basin. The committee has promoted "modular development" and a data-centered approach. This means that data should be generic and developed in such a way that all modeling efforts can use the same data.

For the first year and a half, project efforts focused on data collection and evaluation. To use and view these data, a model called South Platte Mapping and Analysis Program (SPMAP) was developed. SPMAP, an extension to Arc View 3.0a, contains themes for well locations, stream depletion factors, hydrography, and other relevant spatial data. Since mid-1997, development efforts have focused on developing a Consumptive Use (CU) model in the South Platte. To develop this model, LANDSAT images of crops in the South Platte have been purchased. Northern Colorado Water Conservancy District is classifying these images to obtain crop location, area, and type. The CU model will allow water managers to estimate the consumptive use from farms and link each farm to wells on that farm. Based on surface water supplies and consumptive use estimates, users will be able to estimate well pumping. A Stream Depletion Factor (SDF) is being linked into the system to allow water managers to determine the effect of the pumping on the river. This information will be used to determine the amount of out-of-priority pumping occurring and the amount of water required to augment the depletions.

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[1]Integrated Decision Support Group, Colorado State University, University Services Center, Fort Collins, CO 80523, 970-491-5144

Using GIS in Environmental Science and Assessment

Tony Selle[1]

This presentation will focus on the use of GIS and remote sensing technologies at U.S. Environmental Protection Agency (EPA), Region 8. The presentation will include a discussion of how GIS is becoming institutionalized into various EPA programs, including examples of higher levels of technology use for ecological and human health risk assessment using risk modeling within the GIS, and site characterization and assessment using airborne photography and sensors. The role of GIS in watershed and ecosystem assessments and development at EPA will also be addressed. Finally, there will be a discussion of the increasingly important role of managing data to maximize access and utility for internal and external customers and interested parties, and how EPA is attempting to fill that need nationally through web products such as *Maps On Demand* and *Envirofacts*.

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[1]U.S. Environmental Protection Agency, Region 8, Mail Code 8EPR-PS, 999 18th Street, Denver, CO 80202-2466, 303-312-6774

Wildlife Resource Information: Taking it To the Web with NDIS

Donald L. Schrupp[1]

The Colorado Division of Wildlife (CDOW) has been using geographic information systems (GIS) technology and tabular databases on wildlife and its habitats to assist in natural resource planning efforts since 1973. These technologies have been applied to county land use planning, master management planning on State Wildlife Areas, environmental impact and permit reviews, input to federal land management planning processes, biodiversity assessments, and strategic plan efforts. Efforts are underway to make wildlife maps and tabular information available to the public via an internet-based web site for Colorado's Natural Diversity Information Source (NDIS).

The "Source" serves up the Division's habitat/distribution maps (Wildlife Resource Information System), life history information, and photos; as well as Colorado Natural Heritage Program (CNHP) Element Occurrence and Conservation Site information using integrated Hyper Text Mark-up Language (HTML) documents, Java program scripts, and ESRI's Internet Map Server (IMS) technology. Current analytical capabilities draw from the CDOW's early System for Conservation Planning (ScoP) efforts to identify "concerns if developed" issues for three focal counties, while providing similar methods for use where only statewide (landscape level) base data is available (i.e., from Colorado's Gap Analysis Project efforts). Future efforts will see development of NDIS's FTP site, where metadata and "export" copies of GIS coverages and documents will be made available for those data sets where data sensitivity is not an issue. As higher resolution data becomes available for habitat classifications derived from satellite imagery and riparian mapping derived from photo-interpretation of aerial photography, they can be posted to the FTP site.

The Colorado Division of Wildlife gratefully acknowledges partner support and/or matching funds from Great Outdoors Colorado (GOCO), the Denver Museum of Natural History, and the Rocky Mountain Elk Foundation, which has have augmented Division funding, in our efforts to move this work forward in a timely manner.

The URL for the NDIS is: http://blueberry.nrel.colostate.edu/ndis

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[1]Wildlife Inventory Coordinator, Habitat Resources Section, Colorado Division of Wildlife, 6060 North Broadway, Denver, CO 80216, 303-291-7277

The Future of the Livestock Business in Colorado: Myth, Perceptions, and Reality

Tom Haren[1]

Livestock producers in Colorado are experiencing rapid change within their industry. Cattlemen, beef and sheep feedlot operators, dairymen, and pork producers are presented with urban sprawl, "city" neighbors, new taxes, food quality and environmental regulations along with a decreased labor pool and increased costs for fuel, equipment, and land. Many producers have "had enough" and are moving or finding other occupations. The ones who remain must implement aggressive management strategies to survive. Large operations must address community issues and create a lean operational structure. Small operators must be unique, creative, and perceptive in order to absorb production costs while still maintaining market share.

Environmental issues along the South Platte River will be a determining factor for both large and small operators in the 21st century. Nuisance issues, water quality, waste management, and community involvement will dictate the results.

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[1]Director of Natural Resources, Colorado Livestock Association; Vice President, EnviroStock, Inc.; 11990 Grant Street, Suite 402, Northglenn, CO 80233, 303-457-4322

Confined Animal Feeding Operations Control Regulation in Colorado

Derald Lang[1]

This presentation will focus on the current status of Confined Animal Feeding Operations Control Regulation in Colorado, including the history of the control regulation from its inception with the 1972 Clean Water Act to the present day. The no-discharge requirements of the regulation and the provisions to provide both surface water and groundwater protection will be discussed. The presentation will also include an overview of the two ballot initiatives relative to the control regulation and of the pending federal EPA animal feeding operation strategy.

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[1]Water Quality Control Division, Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, CO 80246-1530, 303-692-2000

The Hog Industry in Colorado

Dave Luer[1]

Dave Luer will discuss confined animal feeding operations in Colorado from the perspective of the hog industry.

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[1]Owner, D & D Farms, Holyoke, CO, 605-224-6336

The Total Maximum Daily Load Process

Sarah Johnson[1]

The Total Maximum Daily Load (TMDL) process is designed by the Federal Water Pollution Control Act ("Clean Water Act") to ensure that all sources of pollutant loading are accounted for when devising strategies to meet water quality standards.

The TMDL itself is an estimate of the greatest amount of a specific pollutant that a water body or stream segment can receive without violating water quality standards. This amount includes a margin of safety, waste load allocation (for point sources), and a load allocation (for non-point sources and natural background). The TMDL Process is a method of analyzing pollution sources and allocating responsibility among those sources.

Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with technology-based controls alone. This identification of water quality-limited waters is presented in a document called the 303(d) List, updated biennially.

The State is required to prioritize these listed waters, analyze the causes of the water quality problem, and allocate the responsibility for controlling the pollution. This analysis and allocation is called the TMDL Process and results in the determination of (1) the amount of a specific pollutant that a water body or stream segment can receive without violating water quality standards, and (2) the apportionment to the different contributing sources of the pollutant loading. An important part of the TMDL Process is involvement of local stakeholders, not only to identify sources of loading, but also to allocate that loading and implement solutions.

Identification of Water Quality Limited Waters

State water quality standards are the "yardstick" by which the State assesses the status of the water body or stream segment. The State compares recent information regarding the physical, chemical, and biological condition of a stream segment with the associated water quality standards for that stream segment. Where technology-based effluent limits in discharge permits alone are not stringent enough to assure that water quality standards are met, these stream segments are designated "Water Quality Limited" and added to the 303(d) List. This list is produced every two years.

The 303(d) List includes the identification of the specific component (such as nitrate, copper, sediment, or habitat) that further identifies the specific water quality problem for that segment. TMDLs are required for all components listed for each stream segment on the 303(d) List.

Priority Ranking and Targeting

Once the total list is developed, the State prioritizes the list of stream segments using a ranking process. The ranking considers such issues as the risk to human health and aquatic life, degree of public interest and support, vulnerability or fragility of a particular water body as an aquatic habitat, and immediate need for waste load allocation for permits or other programmatic needs.

TMDL Development

For a Water Quality Limited stream segment that requires a TMDL, the State must quantify the pollutant sources and allocate allowable loads to the contributing sources, both point and non-point, so that the water quality standards can be attained for that segment. TMDL development is a rational method for weighing the competing pollution interests and developing an integrated pollution reduction strategy for point and non-point sources. TMDL development includes the following five basic steps:

1. Select the pollutant to consider
2. Estimate the water body assimilative capacity
3. Identify the contribution of that pollutant from all significant sources
4. Analyze information to determine the total allowable pollutant load.
5. Allocate (with a margin of safety) the allowable pollution among the sources so that water quality standards can be achieved

The complexity of the TMDL development is determined by the water body, the sources, and the pollutant being considered. While not all segments and TMDLs require complex computer modeling, some do.

Implementation of Controls

Implementation of the TMDL is the final step. It requires participation by all the stakeholders, as TMDLs are not self-implementing. The Waste Load Allocation portion of the TMDL can be implemented through effluent limits in discharge permits. In the case of non-point sources, voluntary controls or locally enacted controls are necessary to implement the load allocations. The State must rely on authority already granted by the Clean Water Act to implement TMDLs.

If you would like more information regarding TMDLs, Colorado's 303 (d) List, or Colorado water quality in general, please call the Assessment Unit of the Water Quality Control Division at (303) 692-3500.

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[1]Assessment Unit Manager, Water Quality Control Division, Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, CO 80246-1530, 303-692-3500.

Agriculture and TMDLs

Ray Christiansen[1]

For farmers and ranchers to continue to produce an abundant, safe, and inexpensive food supply, they must have clean water. The Colorado Farm Bureau supports keeping the state's water clean through programs that emphasize voluntary, incentive-based approaches. The Clean Water Act (CWA) establishes a clear distinction between point and non-point sources, and it provides for programs and control measures that are very different. Efforts to apply programs designed for point sources to non-point sources are not supported by the law and will almost certainly set up farmers, ranchers, and other stakeholders for failure.

The Water Quality Control Division (WQCD) has assured the Colorado Farm Bureau that Total Maximum Daily Loads (TMDLs) will not become a regulatory tool. Although the Farm Bureau believes that the WQCD's intentions to use voluntary, incentive-based approaches on impaired streams are sincere, the Environmental Protection Agency (EPA) may usurp state control.

The EPA has a long history of forcing states to implement regulatory approaches by threatening delegated status, fines, and lawsuits. Farm Bureau believes that Congress did not intend for TMDLs to be used for non-point sources. Section 319 of the CWA provides a program for the identification and control of non-point sources. The fact that Congress addressed non-point sources with similar language, but in a separate section with radically different control measures, demonstrates that it never intended Section 303(d) to apply to non-point sources. Indeed, on numerous occasions during the 1987 debate regarding Section 319, Congress stated that "for the first time" it was addressing non-point source pollution. Moreover, if daily load allocations had been contemplated for agriculture, Congress, in Section 303(d), would have designated load allocations for both dry and wet weather. It is only logical that a statute designed to allocate daily loads would have accounted for the fact that non-point source pollution occurs in wet weather and then only after a storm event. Because Section 303(d) was written with point sources in mind, no such provisions were provided.

TMDLs pose the following problems for farmers and ranchers:

- TMDLs pose operational problems for farmers and ranchers. Fertilizer and pesticides must be applied at certain times of the year. If farmers cannot apply chemicals due to TMDL regulations, crops may perish at the hands of pests or disease. A similar dilemma arises in livestock production. If ranchers are not allowed to graze on their lease because of TMDLs, their profits will quickly disappear.

- There are concerns related to loss of property values when watersheds and segments are assessed. A nonagricultural polluter can cause any entire watershed or segment of a watershed to qualify as an "impaired segment." The farmer's property may lose value through no fault of his/her own.

- TMDLs may encourage more nuisance lawsuits on small producers. If a segment is listed as impaired, neighbors will look to the operation that has the least amount of resources available to fight a lawsuit. In many cases, this could be the small rancher or farmer.

Colorado Farm Bureau realizes the importance of a clean water supply to farmers and ranchers. Farm Bureau does not, however, support regulatory approaches being forced on the state by the Environmental Protection Agency. Locally administered programs that are voluntary and incentive-based are better and more preferred than are "command and control regulations" to achieve the goals of the Clean Water Act.

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[1]President, Colorado Farm Bureau, P.O. Box 5647, Denver, CO 80217, 303-455-4553

TMDLs from the Conservation Perspective: Getting from Point A to Non-Point B

Robert Wiygul[1]

Although they have been part of the Clean Water Act for decades, only in recent years have Total Maximum Daily Loads (TMDLs) been a serious tool for cleaning up degraded watersheds. Until the late 1980s, the sections of the Clean Water Act requiring TMDLs were essentially ignored by both the federal Environmental Protection Agency (EPA) and the states. In the 1990s, several critical court decisions forced the EPA and the states to begin an earnest process of determining which water bodies required TMDLs. With a few exceptions, the actual preparation of TMDLs has largely been sidestepped up to the present. Settlements in TMDL lawsuits and the more aggressive enforcement by EPA have brought about lawsuits that will drive the preparation of literally thousands of TMDLs over the next 10 to 15 years.

There is little disagreement about the basic elements of a TMDL: (1) it should have a load allocation that takes into account pollutants from background and non-point sources; (2) it should have a waste load allocation that takes into account pollutants from point sources; and (3) it should be allocated to provide a margin of safety to ensure that water quality standards are met. Beyond those simple propositions, however, lie a host of philosophical and practical complexities. These include matters as basic as whether TMDLs should be prepared for waters affected by non-point source pollution alone, whether control measures relied upon in TMDLs will be enforceable, and what sort of assumptions should be used in the absence of hard data. The resolution of these questions will ultimately determine whether the TMDL programs that are now being implemented will live up to their potential, which is nothing less than accomplishing the Clean Water Act's goal of restoring the chemical and biological integrity of the waters of the United States.

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[1]EarthJustice Legal Defense Fund (Formerly Sierra Club Legal Defense Fund), 1631 Glenarm Place, Suite 300, Denver, CO 80202

Cooperative Efforts for Ecosystem Management

Alan Covich[1]

Ecosystem management requires a comprehensive approach to involve individuals and organizations in an integrated effort to set priorities for managing entire catchments. New ways are being used to stimulate discussion and to solicit input. Community organizations are recognizing the importance of their coordinated actions to improved stewardship of river ecosystems across Colorado. For example, some 500 high schools are participating in the Riverwatch Program, organized through the Colorado Division of Wildlife to encourage students and teachers to monitor their rivers. They have developed home pages to share their results regarding water quality and biotic communities with their neighbors. The U.S. Environmental Protection Agency has recently developed a Community Based Environmental Protection Program that encourages local groups to participate in formulating new goals and projects. The groups develop coalitions to achieve their goals and to inform the public about alternatives in managing watersheds. One group has focused on the South Platte River. These and other examples demonstrate that the fundamental ecological principles needed for ecosystem management are being broadly discussed and defined in new ways. Colorado State University is serving as a source of information for these activities through its new Water Center and will continue to provide expertise in evaluating unique, local solutions to environmental problems.

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[1]Department Head, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO 80523, 970-491-1410

An Agricultural Perspective

Rob Sakata[1]

Rob Sakata will discuss the concerns of the agricultural community with respect to the land and water use changes occurring in the South Platte Basin.

[1]Sakata Farms, P.O. Box 508, Brighton, CO 80601, 303-659-1559

The Legacy of Two-Forks: Partnership or Pestilence

Hubert Farbes[1]

Hubert Farbes will discuss the outcome of the Two-Forks project as an example of the need to better integrate various dimensions of water/land management in the South Platte Basin.

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[1]Brownstein, Hyatt, Farber, and Strickland, 410 17th Street, #2200, Denver, CO 80202, 303-534-6335

Economic Values of Restoring Ecosystem Functions to the Platte River

Paula Kent[1], John Loomis[1], Kurt Fausch[2], Liz Strange[2], and Alan Covich[2]

Fish and wildlife dependent upon the South Platte River for their habitat face increasing odds against their survival, due to current water management practices. Currently, the South Platte River retains only 17 percent of its water for instream flows vital to the fish and wildlife that live in this river ecosystem. Further, these inadequate instream flows are polluted by the environmental abuses of agricultural users, municipalities, and industries. As a result, there is an expected reduction in bird species to one-third their current number. In addition, only six of 28 native fish species remain, and these six are being considered for Colorado's endangered species list.

A proposed solution would protect and renew habitat along a 45-mile stretch of the South Platte River between Kersey and Fort Morgan. To implement this solution, the value of fish and wildlife to people living in the South Platte River Basin must be determined. The Contingent Valuation Method, a methodology used by resource economists to ascertain preservation values, establishes this value. The word *contingent* is a key part of the valuation method, in that respondents are asked to quantify their willingness to pay, *contingent* on water quality improvements in the South Platte River. Collectively, their responses measure the existence value, or preservation value, of the fish and wildlife of the South Platte River ecosystem.

As a social science, economics is increasingly utilized as the intermediary between the monetary values of market transactions (costs of the project) and the intrinsic values of environmental science (benefits of the project), to determine a common unit of value so that all relevant entities can be valued and compared equitably. To achieve this goal, we developed a survey based on the Contingent Valuation Method and interviewed a sample of 100 individuals in the following cities/towns: Denver, Fort Collins, Fort Morgan, Greeley, Longmont, and Platteville. Statistical analysis of data shows (1) characteristics of the sample, and (2) how much the surveyed respondents in the South Platte River Basin are willing to pay, in terms of a higher water bill, to improve the South Platte River ecosystem.

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Determining Stream Depletions in Colorado Using MODFLOW

Dennis McGrane[1]
Heather Bollacker[1]

Depletions occur when pumping wells cause drawdown, which intercepts groundwater flow that would normally discharge to a surface water feature (i.e., stream, lake, canal, etc.), or when it induces flow (leakage) from a surface water feature into an aquifer. In Colorado, when applying for a well permit or a change in water right, depletions must be quantified to mitigate injury to surface water rights. Injury is defined in terms of the timing, location, and magnitude of the depletion.

This poster briefly presents the use of traditional analytical methods for quantifying depletions (Glover, 1974 and Jenkins, 1968) and ways to use MODFLOW. The choice of method is determined by the complexity of the problem, the amount of available data, and the legal and regulatory environment. An example is given of a stream depletion model that combines the superposition concepts of traditional analytical techniques with the sophistication and flexibility of MODFLOW.

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[1]Leonard Rice Consulting Water Engineers, Inc., 2401 15th Street, Denver, CO 80202

Are Ten Years of Data Adequate for Monitoring Streams in the Rocky Mountain Front Range of Colorado?

Robert T. Milhous[1]

A common 'rule-of-thumb' among hydrologists is that ten years of daily streamflow data is adequate for most purposes. In the mountains of the South Platte Basin, the rule of thumb is probably true if the goal is to have a good estimate of the annual discharge of a stream or to be able to determine the flood discharges. A record of ten years is probably not adequate for understanding the channel formation process. The reasons for this conclusion are examined using data for North Saint Vrain Creek in the Front Range of Colorado. The watershed is mountainous with the elevation at the gage being 8,280 feet and the maximum elevation of the watershed slightly over 13,000 feet. The period of record includes water years 1926-1930 and 1987-1997 for a total of 15 years. The median of the annual flows is 56.6 cfs. Three other gages could be used to develop a longer record of annual flows; these are shown below with the correlation coefficient of each.

	St.Vrain @ Lyons	Big Thompson @Estes Park	Middle Boulder @Nederland
correlation coefficient	0.82	0.97	0.88
r square	0.68	0.94	0.77

The annual flows generated using the annual flows of the Big Thompson for the 1951-1997 period has a median value of 54.1 cfs. The maximum annual discharges for the same gages can be used with the North Saint Vrain data to develop a reasonably good flood frequency function for the gage location. An index (Channel Formation Capacity Index - CFCI) to the ability of the streams to modify or maintain their channels has been developed. There is little to no relation between the index on North Saint Vrain Creek and the Big Thompson River. A Monte Carlo type analysis using data for the Saint Vrain Creek at Lyons was made to demonstrated the range in ten year averages of the CFCI, maximum annual discharge, and the average annual discharge possible for Front Range streams. The ratio of the maximum and minimum to the median of 100 ten year periods is given below.

	CFCI	Maximum	Annual
maximum/median	2.51	2.85	2.70
minimum/median	0.003	0.97	1.55

The range in the CFCI is much more than the range in the maximum and average annual discharges and demonstrates the adequacy of using 10 years of record for determining the maximum and average annual discharges and the inadequacy of 10 years for the understanding of channel processes. If the object is understand the channel formation process more data is needed or a good watershed model developed.

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[1]Midcontinent Ecological Science Center, U.S. Geological Survey, 4512 McMurry Avenue, Fort Collins, CO 80525

Resolving Conflict: Compromise or Consensus?

Bill Thompson[1]

In today's disputatious climate surrounding water issues, and with an emphasis on collaboration and collaborative decision-making, what process leads to the best and lasting resolution of conflict? Compromise will sometimes move the decision process forward in the short term, but often leaves key issues unresolved. This "residue" can create blockages later on in the implementation of decisions. Incomplete consensus often leads to breakdowns later on as well. True consensus will take longer and require more up-front work, but these efforts will pay off in smoother implementation and quicker action. Bob Chadwick has developed a process that can lead a group effectively to true consensus. Key features of this process will be highlighted in this poster.

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