

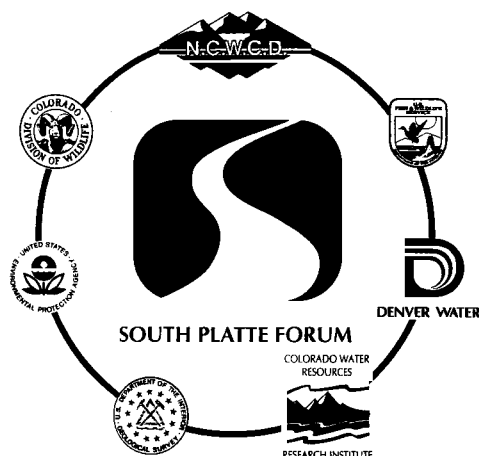
Endangered Species Management: Planning Our Future

*Proceedings of the 1995
South Platte Forum
October 25 - 26, 1995
Greeley, Colorado*

David Graf, Editor
David J. Williams, Assistant Editor

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Endangered Species Management: Planning Our Future

Proceedings of the 6th Annual South Platte River Basin Forum

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Colorado Division of Wildlife
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**October 25-26, 1995
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**Colorado Water Resources Research Institute
Colorado State University
Fort Collins, Colorado 80523
Robert C. Ward, Director**

Preface

The South Platte River Basin 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 between disciplines to increase awareness and understanding of South Platte River Basin issues and public values".

Past forums have successfully identified important issues to resource managers in the basin. Progress has been made toward building the foundation for comprehensive, basin-wide strategies by discussing the institutional arrangements which hinder or facilitate resource planning. Amorphous concepts such as "ecological integrity", "biological diversity", "sustainability" and "integrated watershed management" have been fodder for critics and defended by supporters: but most important, these ideas have been put on the table for public discussion in a public forum.

This year's theme, "Endangered Species Management: Planning Our Future" is no less contentious than themes of the past. As Congress debates the issue alongside ourselves, we must also ask "What do we want an Endangered Species Act to look like?". The answer is at the crux of this year's discussion, and reflects not only the value we place on species preservation, but also the faith and commitment we bring with us when seeking solutions. As we'll see, gridlock is prohibitively expensive, socially unpalatable, and species fail to recover. The answer lies somewhere between pure free market functions and unfundable federal mandates. Hopefully, you will all be able to seize upon some useful tools and ideas from the 6th Annual Forum, as we discuss and debate sensitive, threatened, and endangered species issues.

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Biographical Sketch
ROY ROMER
GOVERNOR OF COLORADO

Roy Romer, the 39th Governor of Colorado, is a veteran political and business leader in the state.

First elected in 1986 and re-elected in 1990 and 1994, Romer has been the state's chief executive since January 1987. He previously served from 1977-87 as Colorado state treasurer. He was a member of the Colorado House from 1958-62 and a member of the Colorado Senate from 1962-66.

Attempts to curb juvenile violence and promote "smart growth" in Colorado have topped Governor Romer's most recent agenda. At his urging, the Colorado Legislature passed a law prohibiting handgun possession by juveniles under the age of 18. A tough new Youth Offender System was created to punish and attempt to rehabilitate hardened juvenile offenders convicted of violent crimes.

The Governor also is working actively to encourage communities and their citizens to work block-by-block to take back their neighborhoods and to help children succeed and become responsible adults.

Other key concerns of the Governor are health care and welfare reform, establishing higher educational achievement standards for the state's public school students and balancing the protection of the state's environment with continuing economic strength and stability.

Romer is the past immediate chairman of the National Governor's Association and continues to serve on the NGA board of directors and as co-chair of the association's task force on health care reform. He also served as co-chair of the 1992 Democratic Platform Committee and is a past chairman of the Democratic Governors' Association. In 1990-91, he was the first chairman of the National Education Goals Panel and in that post was responsible for developing the first national education report card. He also served as co-chair of the National Council of Education Standards and Testing. He is the chairman-elect of the US Education Commission of the States.

The 65-year-old Romer, who grew up in the southeastern Colorado town of Holly, also has had an active business career.

He is an owner of a chain of construction equipment stores in Colorado, Virginia and Florida. He developed a portion of Colorado's Centennial Airport, ran a flying school and owned and operated a ski area.

Romer received a bachelor's degree in agricultural economics from Colorado State University, a law degree from the University of Colorado and studied ethics at Yale University.

He and his wife, Bea, live in Denver. They have seven children, ranging from 40 to 22 years of age. Romer was born in Garden City, Kansas, on Oct. 31, 1928. His family moved to Holly when he was six months old.

Management of Native Aquatic Species in Colorado Taking Time Out from the Urgent to Deal with the Important

David L. Harrison

Attorney at Law

At a public workshop last March, there was a broad discussion amongst water users, environmentalists and public officials of a possible far reaching initiative in the water resource arena dealing with the entire aquatic ecosystem in our native aquatic fish and other species list, and to do so in a “working landscape” that continues to serve human and economic water use needs. The expensive, awkward, and often times crippling efforts to recover species after federal listing has educated water people from all philosophical perspectives. Working in the crisis mode--with too little opportunity too late in the process of species decline--is not a viable course.

Water users need to take the lead. By making partnerships with environmentalists and agency resource managers, and by taking advance steps to intervene in the decline of aquatic species, many more water management options will be available. It starts with sound science identifying the patterns of aquatic species occurrences and identifying the ecological processes necessary to support them. It requires identifying the threats that are interrupting those patterns and processes. It involves carefully identifying the whole range of strategies available: land and water habitat acquisition and restructuring water quality management in key locations, exotic species control, native species management and many others. And it involves an adequate commitment of financial resources. So pay the man now, or pay him later. It's time to take a new look.

Setting Priorities for the Conservation of Natural Diversity in the South Platte Watershed Using Natural Heritage Methodology

Chris Pague, Katie Pague, Daryl Burkhard, Mary Klein, and Brooke Wallace

Colorado Natural Heritage Program

The majority of Colorado's human population dwell and work in the South Platte River watershed. This watershed also supports a significant agricultural and recreational economy and possesses numerous biological values. With so many opportunities attached to this large upper watershed, it is not a surprise that some conflicting proposals for watershed use have arisen. Therefore, any tool that can synthesize information for the purposes of proactively planning for conflict resolution will be an asset. The Colorado Natural Heritage Program and adjacent programs in Nebraska and Wyoming have assimilated the known information on rare and imperiled plants, animals, and natural communities for the entire watershed. We have included federal and state listed species as well as other species believed to be imperiled now or in the near future. For each occurrence of a rare or imperiled species or community meeting specific quality and locational precision criteria, we have estimated an area, based on known ecological factors, within which conservation attention would be needed. These potential conservation areas have various management requirements that are directly related to the ecological needs of the species or communities for which they were drawn. A priori identification of these sites will provide opportunities for planning and success through the identification of potential threats and resolutions for all watershed values.

Habitat Considerations in the South Platte River Basin

Janet S. Heiny

U.S. Geological Survey, WRD
South Platte River Basin NAWQA Study Unit

Habitat is defined as the environment in which the life needs of a plant or animal are supplied. River habitat features are not static; rather, they are dynamic, changing and evolving as human and natural factors influence fluvial processes. These processes can have profound effects on biological diversity and ecological integrity within a river basin. River-restoration efforts that have been driven by philosophical or political motivation frequently have focused on returning aquatic habitats to their natural condition. However, present or intended (future) beneficial uses of rivers may or may not be met by the original, natural habitat condition. For example, we know relatively little about historical instream and riparian habitat conditions (or biological diversity) in the South Platte River and how those conditions might support desired human uses (recreation, fishing, aesthetics) in the future. Without establishing a frame of reference for habitat and its ecological links, claims of deterioration of biological diversity and ecological integrity may be impossible to judge and difficult to predict. Although habitat considerations are recognized as important by many local, state, and federal agencies, quantitative procedures for assessing the quality and integrity of aquatic habitats have not been evaluated, and relations between qualitative habitat assessments and biological diversity are poorly understood.

Stream habitat is characterized in the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program as part of an integrated physical, chemical, and biological assessment of the Nation's water quality. The South Platte River Basin NAWQA Study Unit is assessing environmental settings and the relation of stream habitat to several factors that could be used to describe existing water-quality conditions. Evaluation of stream habitat is based on a spatially hierarchical framework that incorporated habitat data at basin, segment, reach, and microhabitat scales. This framework provides a basis for local and national consistency in collection techniques. Quantitative habitat evaluations were done yearly at 11 sites in the South Platte River basin during 1993-1995, and included measurements of more than 34 riparian and instream habitat characteristics. Detailed surveys of channel cross-sections at those sites were done in 1994 and 1995. Integration of quantitative habitat characteristics with current water-quality conditions and biological diversity could form an important basis for guiding river-restoration efforts in the South Platte River basin.

For more information regarding this presentation, please contact:

Janet S. Heiny
U.S. Geological Survey
Denver Federal Center
P.O. Box 25046, MS 415
Denver, CO 80225

Multiple Variables Important to Understanding Biological Diversity in the South Platte River Basin

Cathy M. Tate

U.S. Geological Survey, National Water-Quality Assessment Program,
South Platte River Basin

Water quality (chemistry), habitat structure, flow regime (water volume, timing of flow), energy (food) source, and biological interactions (competition, predation, disease) are all variables that affect the structure of the biological communities in a river. Therefore, alteration of any or all of these variables can result in a decline in the biological diversity and ecological integrity of a stream. Constructing a list of water-quality characteristics that incorporates these variables can identify which variables have been affected by human activity. Identifying the cumulative effects of human activity on these resource variables can be a valuable tool in determining the feasibility of managing a water resource for biological diversity.

Since 1992, the U.S. Geological Survey National Water-Quality Assessment (NAWQA) program has been using an integrated approach to examine water quality in the South Platte River Basin. Surveys of algae, invertebrate, and fish communities; physical (habitat, flow, temperature) and chemical variables; and contaminants in fish tissue and bed sediment have been used to assess water quality at sites located in different land uses in the basin. These data can be used to assess the biological diversity to be expected under different land-use and water-quality settings. A list of water-quality characteristics that integrates the results from these surveys has been developed for the different land-use settings and indicates that water quality is related to land use. Furthermore, the data studied have indicated that physical, chemical, and biological variables are interrelated and interdependent. For example, more invertebrate and fish species were present in the South Platte River at sites characterized by wide, braided channels and lower nitrogen and phosphorus concentrations than at sites characterized by a single channel and higher nitrogen and phosphorus concentrations. Measurement or collection of just one of these variables is insufficient to assess the status of the system; moreover, recognizing the holistic nature of the system (South Platte River Basin) is essential.

For more information regarding this presentation, please contact:

Cathy M. Tate
U.S. Geological Survey
Denver Federal Center
P.O. Box 25046, MS 415
Denver, CO 80225
Phone: (303) 236-4882 ext. 287
Fax: (303) 236-4912

Ecological History of Riparian Ecosystems in the Great Plains

Michael L. Scott, Gregor T. Auble, Jonathan M. Friedman, Peggy Anderson

National Biological Survey

Riparian corridors are important landscape features representing a transition between terrestrial and aquatic ecosystems. Riparian ecosystems are shaped by natural disturbances such as landslides, floods, fires, and channel migration processes. Throughout the western Great Plains, frequent natural disturbance and locally abundant moisture contribute to the native physical and biological diversity typically associated with riparian corridors. Much of the aesthetic and economic value attached to riparian ecosystems is associated with this natural diversity. However, because of their position in the landscape, riparian corridors are sensitive to many land and water use activities including streamflow management, agricultural practices, and urbanization.

The ecological history of the Platte River system is relatively well understood; in part because of this the South Platte has been used to characterize regional encroachment of woody vegetation in Great Plains riparian corridors. We present information indicating that dramatic increases in riparian cottonwood in the Platte River system is a transient part of a longer-term response and stands in contrast to widespread declines in native riparian species along other rivers and streams of the Great Plains. We also provide evidence for the role of large floods in long-term, natural cycles in the expansion and contraction of woody riparian corridors across the western Great Plains.

We attempt to provide perspective on evaluating longer-term effects of natural and human-caused changes along riparian corridors by 1) illustrating how incomplete historical information can produce misleading conclusions, 2) discussing time scales of changes in riparian ecosystems and 3) providing examples of long-term responses of riparian corridors to infrequent large floods and water management activities.

Important Issues in Understanding the Status of Fishes in the South Platte River Basin

Kevin R. Bestgen and Kurt D. Fausch

Larval Fish Laboratory and Department of Fishery and Wildlife Biology
Colorado State University

Recent interest in the status of fishes of the South Platte River basin points to a general lack of information about these species in Colorado. Only reductions in coldwater greenback cutthroat trout *Oncorhynchus clarki* have been reasonably well documented and understood. Reduced distribution of transition-zone stream species such as common shiner *Luxilus cornutus* and northern redbelly dace *Phoxinus eos* is evident but the extent and causes for reductions are poorly understood. Status of some plains stream species is unknown because historical records are unassembled or lacking and because population abundance levels may vary dramatically. The confused historical taxonomy of difficult to identify fishes in the genus *Hybognathus* frustrates efforts to simply define the species involved. Understanding the conservation status of fishes in the South Platte River basin requires incorporation of historical distribution data and further research on their ecology.

Reductions in South Platte River basin fish populations suggest historically increased human-caused habitat disturbances and significant loss of local ecological integrity. Even though reductions in relatively small Colorado populations may not necessarily indicate declining status of these species throughout their present larger geographic ranges, they may signal imminent future declines. Thus, appropriate geographic and temporal scales should be defined when attempting to evaluate and interpret status of fishes in the South Platte River basin.

Animal and Habitat Relationships in the South Platte Basin with Emphasis on Threatened and Endangered Species

James P. Fitzgerald

Department of Biological Sciences
University of Northern Colorado, Greeley

A minimum of 353 species of terrestrial vertebrates reside in or make important seasonal use of habitats in the South Platte River basin in Colorado. The list includes 252 birds, 69 mammals, 22 reptiles, and 10 amphibians. Surprisingly few, 15 (4%), show up on the current Colorado list of state/federal endangered or threatened species: wood frog, western toad, wolverine, river otter, lynx, black-footed ferret, piping plover, greater prairie chicken, plains sharp-tailed grouse, greater sandhill crane, American peregrine falcon, bald eagle, whooping crane, least tern, and Mexican spotted owl. Depending on the compiler, lists of candidate species or species of concern that might impact the Basin include: leopard frog, Woodhouse and plains toads, smooth green snake, spiny soft-shelled turtle, Plains black-headed snake, Abert's squirrel, dwarf shrew, pygmy shrew, fringed myotis, Townsend's big eared bat, meadow jumping mouse, Gunnison and black-tailed prairie dogs, ringtail, swift fox, marten, plains spotted skunk, spotted ground squirrel, several pocket mice, plains pocket gopher, bighorn sheep, American bittern, common loon, black tern, Franklin's gull, osprey, white-faced ibis, Baird's sparrow, dickcissel, grasshopper sparrow, Sprague's pipit, Cassin's sparrow, clay-colored sparrow, ferruginous hawk, northern harrier, northern goshawk, western burrowing owl, boreal owl, flammulated owl, lark bunting, mountain plover, snowy plover, upland sandpiper, long-billed curlew, loggerhead shrike, olive-sided flycatcher, southern willow flycatcher, three-toed woodpecker, and yellow-billed cuckoo. When species are tied to habitat requisites, the most critical habitats in priority of management needs/preservation are: 1. Grassland/Prairie; 2. Plains Riparian/Wetlands; 3. Middle to High Elevation Forests.

In a management context the two most critical habitat types present the most serious problems. Most of the eastern plains is in private ownership with few incentives available to landowners for protection/habitat management. Habitat is becoming fragmented with less than one-third still in prairie. Water allocation and use patterns as well as human population growth patterns are increasing pressures on remaining plains landscapes, especially at the foothills/plains interface in the basin. Agricultural patterns including increasing use of the Conservation Reserve Program will also likely effect distributional patterns of wildlife, perhaps to the detriment of some species.

Colorado Riparian Vegetation Classification: The South Platte River

Gwen Kittel and Renée Rondeau

Colorado Natural Heritage Program

While we know riparian areas are important to wildlife, soil conservation, flood-control, and biotic diversity, little is known about the diversity and condition of riparian plant communities in Colorado. Since 1990 The Nature Conservancy and the Colorado Natural Heritage Program, in cooperation with a Riparian Task Force (a group of 14 state and federal agencies), have studied over 1200 sites on the Western Slope. We use a systematic, basin-wide approach by which we stratify each major watershed by elevation and stream order, in order to sample the diversity of riparian habitats across the basin. This summer, the project has moved onto the East Slope, studying the South Platte and Arkansas River drainage. The goal of the project is to develop a statewide classification of riparian vegetation, determine the diversity and condition of riparian communities throughout the state, and to identify high-quality areas that may merit protection status or further research. Results of the South Platte River Riparian research will be presented.

Ecological Integrity and Western Water Management: A Colorado Perspective

**Alan P. Covich
John D. Stednick
Kurt D. Fausch
William H. Clements
Steven R. Abt
John Wilkins-Wells**

Colorado State University

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EXECUTIVE SUMMARY

The 1994 reauthorization of the Clean Water Act listed among its purposes: "To assure that water pollution control programs more comprehensively protect the ecological integrity of water bodies ... through enhanced protection of the physical and biological components of waterbodies." This paper reviews the concept of "ecological integrity" as related to water resources management. Our main goal is to provide physical, biological, and social science perspectives on the definition and measurement of ecological integrity.

For our purposes, we propose that: **ecological integrity** refers to an ecosystem where interconnected elements of physical habitat, and the surficial processes that create and maintain them, are capable of supporting and sustaining the full range of biota adapted for that region.

Both the physical processes and the biota are naturally variable in time and space. Settings with high ecological integrity are resilient, and self-correcting when subject to natural disturbance, and their inherent potential is realized without management support or intervention.

Measures of ecological integrity should be based on physical relevance, ecological relevance, societal relevance and have sensitivity to demonstrate changes above the background variability. The intention of this paper is to initiate a dialogue designed to develop an improved definition of sustainable water resources management. Our definition of ecological integrity is an attempt to broaden the scope of how to visualize the connection of water resources to the land. We can best achieve ecological integrity by:

- maintaining a range of variation in maximal and minimal flows of water, nutrients, and energy across different scales;

- maintaining watershed function (both physical and biological) by maintaining watershed structure;
- initially ignoring social-political boundaries and working at the landscape level on a watershed basis before considering other boundaries or jurisdictional constraints;
- subscribing to long term monitoring for physical and biological comparisons with relatively undisturbed settings that serve as baselines for interpreting trends and major changes in local and regional ecosystems;
- developing protocols to identify restoration needs, while recognizing and maintaining properly functioning systems;
- recognizing all stakeholders on a watershed basis and encouraging them to participate in decision making process; and
- recognizing the range of natural variability in physical and biological processes and maintaining flexibility in assessing "surprises" or major departures from steady-state ecosystem dynamics.



INTRODUCTION

The Federal Water Pollution Control Act (FWPCA) amendments of 1972 (PL92-500) directed states to identify both point-source and non-point source pollution of surface waters. Point sources are regulated under the National Point Discharge Elimination System administered by the Colorado Department of Health. Land-use practices were modified to minimize non-point source pollution and are referred to as Best Management Practices (BMPs).

The FWPCA amendments and subsequent legislative updates are collectively referred to as the Clean Water Act. The 1994 reauthorization of the Clean Water Act listed among its purposes: "To assure that water pollution control programs more comprehensively protect the ecological integrity of water bodies...through enhanced protection of the physical and biological components of waterbodies."

There is increased awareness of the essential and valuable nature of freshwater resources throughout the world. As various groups organize themselves to respond to diminishing availability of water resources and impoverishment of biotic diversity at the species and ecosystem levels, there will be an ever increasing need for ways to discuss differences in interpretations of alternative uses and economic values. The recent recognition of a "Freshwater Imperative" provides one example for setting national research priorities in dealing with these issues (Naiman et al. 1995).

As population pressures increase within the Rocky Mountain West there will also be a growing need for a regional perspective that emphasizes the unique conditions that characterize freshwaters in arid regions at high altitude. For example, agreement on national and regional standards for dissolved oxygen may need to consider the importance of oxygen saturation values (as determined by a wide range

of extreme temperatures and altitudinal effects of atmospheric pressure) rather than simply referring to concentrations of dissolved oxygen.

This paper reviews the concept of "ecological integrity" as related to water resources management. The main goal is to provide physical, biological, and social science perspectives on the definition and measurement of ecological integrity. We recognize that past or present "natural" ecosystems are not necessarily of higher ecological integrity than "managed" ecosystems. Our purpose is to establish a means for comparing one ecosystem to another while recognizing that each ecosystem is in some sense unique.

We also recognize that ecosystems can change dramatically over time in response to natural and cultural changes within any catchment. What criteria are best for characterizations of catchments in different ecosystems? We suggest that specific abiotic and biotic criteria are useful in describing ecosystem function. The economic costs of alternative management scenarios can be compared in a separate analysis once the abiotic and biotic variables are well understood at the ecosystem level.

Social Attributes of Ecological Integrity

John Wilkins-Wells

Department of Sociology
Colorado State University

This paper discusses three issues surrounding the development and use of a definition of ecological integrity. One issue has to do with what is often assumed to be the essence of the social dimension of ecological integrity; institutional constraints and competing values. A second issue has to do with the degree to which any definition can be reduced to a simple family of empirical measures; ones that may include the measurement of social attributes as well. A third issue has to do with the degree to which any future definition can be universal; that is, not bound to a particular cultural setting, time, or place. These three issues are often at the heart of disputes and distrust over the use of such definitions. The comments in this presentation represent reflections on these issues stemming from experience working in various community settings, both locally and internationally. The conclusion is that a working definition of ecological integrity will continue to require greater public involvement in its formation and use.

Changing Approaches to Endangered Species Act Implementation

Joan Friedlander

Endangered Species Program Leader

USDA Forest Service, Rocky Mountain Region

The first part of our discussion will relate to updating the audience with respect to the current status of Special Use Authorizations in the Platte River basin. A handout will be provided. The remaining discussion will focus on changing approaches to managing for sustainable ecosystems that are founded in learning from science and politics.

Tremendous media attention and public debate has centered on the contentious, divisive and litigious nature of endangered species issues in recent years. This focus has obscured substantial progress achieved with respect to new participatory government models emphasizing the coming together of interests to resolve these inherently complex natural resource issues. As important are new scientific models which incorporate principles and concepts of managing for sustainable ecosystems. These successful national models merit careful consideration and examination as they demonstrate effective alternatives to current gridlock.

Kai Lee, a social scientist from Williams College cites his involvement in the Northwest salmon debate in suggesting a suitable framework for combining the principles of science and politics that will allow us to come closer to sustainable management of the world's resources. In his book "Compass and Gyroscope: Integrating Science and Politics for the Environment" Professor Lee suggests that the "compass" of physical and social science can point us in the right direction by applying the rigor of analysis, verification, and correction to our public policies. The other navigational aid is the "gyroscope" of politics or democratic debate, which subjects the answers offered by science to the free market of interests and ideas, a competition that can keep policy from serious error.

Analagous to a gyroscope, our social and political process allows public opinion to shape how we manage the landscape. Inherent in this model is "informed" and "shared" decision-making. Without sharing of decision-making, stakeholders will leave the table and quietly sabotage the outcome through a variety of techniques that are currently available to any citizen.

It is instructive to examine factors that seem to separate endangered species success stories from failures. The successes seem to share the same ingredients: forums are consensus based, all stakeholders are invited to and share an equal partnership; natural resource and social sciences are a guiding principle which influences public policy; incentives rather than disincentives are used to change behavior and participation is often voluntary; the forum involves a variety of governments at different scales; adaptive management concepts are applied in areas where there is uncertainty but assurances of certainty and safe harbour are provided to individuals or entities that have less capacity for uncertainty such as private landowners.

In spite of tremendous obstacles, it is encouraging to note that the Platte River stakeholders are working,

albeit slowly, through a complex array of legal, scientific, political, and social issues. But the arrangement is tenuous at best with the most imminent risk being attempts to move the issue to the judicial or legislative arenas. Any attempts by stakeholders to walk away from this process or to subvert this process will certainly doom all of us to a long sentence of gridlock. Gridlock is the highly predictable outcome of polarized publics not working together in equal partnership and is the most important lesson from many endangered species train wrecks.

Rather than focusing on what we haven't accomplished, we should give credit to the States for their willingness to work through water issues that are politically punishing. The community of water providers and interests deserves credit for earnestly and honestly trying to resolve these issues and in return gain some needed certainty for their continued operations. The conservation community deserves credit for their diligence in insuring that proposed resolutions are scientifically credible and reasonably certain to achieve resource goals agreed upon by the American public embodied in the Endangered Species Act. Last, the federal agencies should be credited for being united and resolute in resolving these issues and creating a forum for a wide spectrum of stakeholder participation.

Three-State Memorandum of Agreement

J. Michael Jess

Director

Nebraska Department of Water Resources

At the heart of the three-state MOA effort is a commitment to develop an endangered species recovery plan. Precisely what the plan will be, what its components will include or when it will be fully implemented is yet to be determined. Water, land and money, however, are acknowledged, key elements. Who is or should be empowered to make decisions is also important.

Water

Of the four, implications relating to water have created the most discussion. Recognition that the Platte is over committed in all three states prompts Nebraskans to insist upon fairness in sharing the burdens of providing water to endangered species. New water use drawing upon native supplies are expected to increase competition among users and to diminish flow needed to preserve habitat with is labeled inadequate and diminishing.

Our view evolved for FERC relicensing efforts of two existing projects where additional consumption is not planned and from participation on Corps of Engineers' permitting activities where additional consumptive uses are intended. Integral to each are endangered species consultations with the Fish and Wildlife Service. When the final outcomes of the consultations are laid side by side, glaring inconsistencies are evident.

Within the FERC proceedings for example, the Service effectively instructed the licensees to make large-scale releases from Lake McConaughy as a means of assuring specified flows at downstream locations. Purchase and conversion of the sandbars and riparian properties to acceptable habitat was also required. The two districts were also required to support data collection and research activities intended to verify the success of their efforts.

For Denver or the State of Wyoming to secure a Section 404 permit from the Corps, however, the Service devised a much different arrangement. It's based upon what we termed a "land for water swap." Neither Denver or Wyoming was instructed to take aim at downstream flow targets with release of water from their upstream Two Forks or Deer Creek projects. Instead the Service agreed to additional consumption (and proportionate habitat reduction) if either entity agreed to purchase property adjacent to the river in Nebraska. No upper limits were specified. Purchase of particular tracts would follow Service approval. Clearing unwanted vegetation by the new owner would be required also. As for the loss of river flow, the Environmental Impact Statement for the Two Forks Project says off-setting volumes would be obtained from "local sources."

After deciphering that bit of cryptography, many began opposing Denver's project. At the same time they reflected upon the two schemes employed by the Service. The need for all three states to share in developing and participating in a comprehensive recovery plan became apparent.

How Much Water?

The water requirements for the Endangered Species established by the U.S. Fish and Wildlife Service are also questioned. Many challenge the science on which the requirements are based. Many feel the requirements are not practically attainable.

Land and Money

Among the three states, concerns relating to land are probably greatest in Nebraska. Because most all endangered species habitat in the Platte watershed is in Nebraska, local worries seem logical. County and school board officials, upon learning that some 29,000 acres might be set aside for wildlife habitat, are left to wonder about their agribusiness economies and whether to expect a decline in property tax revenues. Others question whether new zoning restrictions will be required. They ask whether construction of utilities, homes and commercial structures will be allowed. It is hoped a recovery plan will address these issues in an equitable manner.

Who's in Charge?

Across the western states frustration with the federal Endangered Species Act (ESA) is well documented. Even where recovery programs have been employed, it's said the possibility of a federal veto has discouraged meaningful input. On those occasions when the Service has exercised its veto power, feelings relate to wasted efforts and bitter memories. Polarity sets in as sides harden.

Through our involvement in the MOA effort, we've sought greater input and responsibilities for the states. We have urged change in the ESA which would result in the states and the Service having equal status.

* * * * *

Endangered Species Management in the Central Platte River Basin

Gordon W. "Jeff" Fassett

Wyoming State Engineer
Cheyenne, Wyoming

The Platte River system is one of the most varied and important river basins in the intermountain West and Great Plains. The Platte, South Platte and North Platte Rivers and their tributaries are important in diverse and often conflicting ways.

The South Platte River supplies the water that Denver drinks. Without the South Platte, neither Denver nor its Front Range neighbors could survive. As it flows down from the Rocky Mountains, it also provides some of Colorado's best recreation and fishing opportunities.

The North Platte River is equally as important to Wyoming. It and its tributaries supply water for municipalities, arid land irrigation, and the five Federal reservoirs provide much of the hydroelectric power production, along with the privately owned Dave Johnston Power Plant and Laramie River Station which have cooling water supplied by the river system, for Wyoming and Nebraska as well as other Plains States. Until the "energy bust", the North Platte River was to be a cornerstone of the planned mining and alternative fuels industry in Wyoming.

In Nebraska, the Central Platte has often been called the state's lifeline, providing most of the water for all beneficial uses. Nebraska dams on the Platte provide hydropower throughout that state.

It has been said that Wyoming's greatest asset is its people. I believe that our people's greatest assets are our natural resources. Over half of the land area of Wyoming is owned by the Government (47 percent Federal and 10 percent State). In view of the people's ownership of the water and wildlife resources of the State (per the State Constitution) and the large amount of public land in Wyoming, it is clear that the State cannot avoid playing a central role in arriving at decisions about society's wise use and conservation of natural resources in Wyoming. I am mindful of former Chief Solicitor and the Department of the Interior Tom Sansonetti's statement that Wyoming is more affected by Interior actions than any other state. I believe this statement and I wish to connect that point with our longstanding recognition that many natural resource decisions and issues transcend state boundaries.

On account of Wyoming's physiography as a headwaters state, most downstream water management issues can, and do, instantly "ricochet" upstream and affect resources management and use in this State. This is very clearly the case with the four Upper Colorado River Basin endangered fish species whose migration, sometimes hundreds of miles, over the course of their life cycles is done irrespective of state-lines and other political boundaries.

As in the Colorado River Basin, our experience has certainly been that downstream water management issues ricochet upstream in the Platte River Basin as well. While unarguably there are many differences between the Platte and Colorado River Basins, one factor looms very very large between the two basins in the context of competing water needs. In the case of the Colorado there are

undeveloped Compact-apportioned water supplies remaining available - present day "surplus" - and in the Platte Basin there are not. All agree that the Platte River system is water-short in all but the periodic and sporadic "wet" years like 1995. This is a key and fundamental difference that complicates, tremendously, the approach to resolving the conflict between continuing water development and endangered species conservation and management. It is also important to know that the species of concern - both the four endangered fish species in the Upper Colorado River Basin - as well as the piping plover, least tern, whooping crane and bald eagle in the Central Platte - are in the downstream neighboring states and not in Wyoming.

In order to set the stage for briefly discussing the Platte River MOA Process - the purpose of which is to develop a mutually acceptable Platte River Endangered Species Recovery Implementation Program - it seems appropriate to note that attempts to address Section 7 consultations for water projects in the Basin have been long-ongoing, substantial and quite frustrating processes. Following the Narrows Project's Section 7 biological opinion in 1983, which found that the proposed USBR project was likely to "jeopardize the continued existence of the endangered species and adversely modify or destroy critical habitat" the Bureau of Reclamation and the Fish and Wildlife Service formed the Platte River Management Joint Study (PRMJS). In March 1985, the two Federal agencies asked the States of Colorado, Nebraska, and Wyoming and representatives of the water user and environmental conservation communities in the three states to participate in the Study effort. The Joint Study participants attempted to identify habitat and flow needs of threatened and endangered species using the Platte River in central Nebraska, and come to terms on who, how and what would be involved in meeting those habitat and flow needs. A habitat plan was developed that included 29,000 acres in 10 different areas along an 89-mile reach of the Platte in central Nebraska.

Although the Interior agencies involved stated their commitment to the PRMJS process, its funding and the staff commitment to the effort was on an as-available basis. From 1985 into the 1990's many meetings were held, but unfortunately the process did not forge ahead. In 1992 and early 1993, attempts were made by the participants to develop a draft framework agreement and program document that included 29,000 acres of habitat, funding arrangements, institutional responsibilities and commitments to work on meeting unspecified water needs of the species. By mid-1993, no agreement had been reached on the framework approach and the negotiations collapsed.

In part this collapse occurred due to a lack of leadership and perhaps commitment on the part of the involved Interior agencies; the States had opposing, or at least dissimilar interests and expectation (and the State of Nebraska chose not to participate in the Joint Study for a considerable period of time); the Nebraska v. Wyoming lawsuit certainly impacted the tenor if not the substance of the Study's conduct; and further there were differing expectations with regard to the certainty that the Federal agencies were willing to provide to water users with regard to Section 7 consultations for new water development and existing water projects. Finally, at that time, some participants were willing to start an undefined Program and work out the final arrangement and details later - while others, like the State of Wyoming, leery from our ongoing experiences, were not willing to initiate a Program until there was a clear understanding of the extent of the commitments being sought and what our water users would receive in exchange for Wyoming's participation in a basin-wide Program in the Platte River Basin.

It is interesting to note that while the PRMJS process was ongoing, the USFWS was pursuing a separate course of dealing with Section 7 consultations in the South Platte Basin. In 1991, the Water Supply and Storage Company, Public Service Company of Colorado and the communities of Boulder,

Fort Collins, Loveland and Greeley found it necessary to begin renewing special use permits for their water projects located within the Arapaho and Roosevelt National Forests. The Forest Service and the Fish and Wildlife Service determined that the renewal of the permits for these long-existing water projects (for which no changes in operation were being proposed) "would affect" endangered species and critical habitat in the central and lower Platte River, over 450 river miles downstream. Two "reasonable and prudent alternatives" were offered to avoid this jeopardy finding: the first being to replace the water depleted in both amount (AF for AF) and timing at the Julesburg gaging station on the South Platte River; or to fund habitat restoration and maintenance for whooping cranes, terns and plovers, and wet meadow habitat; fund research on the pallid sturgeon for a total of \$75,000 over three years; and support the initiation of and participate in a Platte River habitat recovery program. If the Program was not implemented by the fifth year then the depletions would be replaced in amount and timing by the permittees.

The facility owners rejected the "reasonable and prudent alternatives" (RPA), objected to the scientific and legal bases for the draft biological opinions and argued that even if the depletions were replaced the water would be diverted by other downstream appropriators in the intervening 450 miles before it reached the Central Platte critical habitat. Ultimately, these entities spent many months negotiating with the two Services to develop temporary reasonable and prudent alternatives. The temporary RPA that they accepted is an annual fee of approximately \$3.00 per acre-foot of depletion by the existing projects and will continue until a Program is implemented, so long as that occurs within four years. If a Program has not been put into place by 1997, the USFWS will re-initiate consultation on these existing municipal water supply projects. The pressure that has been generated by these developments has certainly been intense in Colorado, and led to a recognition that even though the PRMJS had faded away, the problem certainly has not. Governor Romer and Colorado officials encouraged Nebraska and Wyoming to participate in the MOA process to take another crack at developing a basin-wide solution to resolve these endangered species versus water use and development conflicts.

In addition to the upcoming need to renew Forest Service special use permits in Wyoming, there are other ESA Section 7 consultation activities that give Wyoming motivation to participate in the current MOA Process. About four years ago, the Bureau of Reclamation began its "Evaluation of Existing Operation of the North Platte Reservoirs." This evaluation is informal Section 7 consultation on the operation of the North Platte Reservoirs. As you know, the Endangered Species Act's Section 7 (a) (1) has been interpreted as imposing a continuing obligation on Federal agencies to ensure that their activities do not cause jeopardy to the continued existence of listed species or cause adverse modification to or destruction of critical habitat. While the Bureau's evaluation of operations Section 7 consultation is not very far along at this point in time, we feel that it, like the McConaughy FERC relicensing and Colorado USFS special use permit renewals, indicates the direction the Department of Interior is headed.

Each of these activities have certainly led Wyoming, and I think it is fair to say Colorado and Nebraska also, to infer that the Department of the Interior is seeking water for endangered species through re-operation, taking some of the yield, of existing projects. It is no longer just a matter of getting new water development projects to provide some portion of their proposed yield for endangered species and habitat maintenance/enhancement purposes, but also that existing projects are going to be asked, or rather required, to cough up some of the existing yield. The United States is saying, in essence, that the status quo is not good enough, and that additional water is needed to atone for the "sins of the

past."

As an aside, I feel compelled to point out that these "jeopardy" opinions on any depletion, regardless of its size, needs to be considered in the context of other statements we hear. In a written statement presented on June 15, 1994 by Secretary Babbitt to the Senate Committee on Environment and Public Works at an Oversight Hearing on the Endangered Species Act, Mr. Babbitt told the Committee:

"The Endangered Species Act has been responsible for improving population of declining species throughout the United States and has been the focus of international conservation efforts ... The bald eagle, peregrine falcon, grizzly bear, eastern timber wolf, whooping crane, black-footed ferret, Columbian white-tailed deer, and greenback cutthroat trout have been recovered from the brink of extinction and are approaching full recovery and delisting."

So, in the face of this statement, one really has to wonder about the plight of the whooping crane. On the other hand, there is the potential that the proposed recovery program would not have to do a lot for the whooping crane if that species is approaching full recovery and delisting. Let me just add that over the course of the ten years we were participating in the PRMJS, and during the course of the MOA process so far, there has continued to be huge questions about the "science" and biological validity of the species needs that the USFWS claims there are. The Nebraska Game and Parks Commission has documented 23 confirmed whooping crane sightings on the Platte River from 1942 through 1993. These 23 sightings amounted to 97 nights spent on the river by this species of birds. One individual whooping crane accounts for 64 of these nights. Given the Secretary of the Interior's statements last year to the Senate Environment and Public Works Committee and these sorts of statistics about the whooping crane's use of the Platte River, we often find ourselves asking the fundamental question of whether this is all about endangered species or about power and the exercise of the unbridled authority of the current ESA statute.

Nonetheless, it is fairly apparent that the Federal Government is seeking both money and water from the States. Wyoming's initial question has been, and is, "how does our economy, state laws and water needs fit into the formula?" It is easily documented that many of our irrigators in Wyoming who rely on Federal storage, have existing water supply shortages. So the notion that Wyoming users, who don't presently have an adequate water supply, are going to have to get by with less in the future, is a difficult starting point to move discussions forward from. In addition, Wyoming has additional needs for municipal water supplies in the North Platte River Basin. So we in Wyoming are certainly interested in how these two facts can be factored into the proposed recovery program that the three States and the Federal Government are attempting to negotiate at this time.

The Federal Government's representatives in these negotiations have not been clear about what they, the Federal Government, is bringing to the table in terms of money and Federal permitting process clearances and assurances for future and pending contract renewals, special use permit renewals and many other potential Federal actions. Way too often, it seems that when the Federal Government starts talking about "partnership", that term can be translated to mean you (the States) bring state water and state money to the party and we (the Federal Government) will bring our Federal rules.

Some progress was made during the initial year-long efforts that were provided for in the initial Platte River Memorandum of Agreement. The MOA was recently extended until December 1st by

agreement of Governors Romer, Nelson and Geringer and Secretary Babbitt. We are continuing to press on with the efforts to develop a program that will provide certainty to our water users who will be facing future Section 7 consultation. Two subcommittees have been formed, one is working on developing a single, integrated proposal as to what water management and re-operation actions can be done in the three states, a second is addressing how the recovery program should be organized, how it should function and what are the options for funding such an effort. At the same time, we are working with our Congressional delegation and other entities to obtain some very necessary reforms to the Federal Endangered Species Act.

Many significant issues remain unresolved and are being addressed in our MOA discussions, including:

1. What success or failure of the MOA process to initiate a basin-wide recovery program will mean to the upcoming Section 7 consultation on the existing operation of the USBR's North Platte Project reservoirs on the North Platte River in Wyoming.
2. What success or failure of the MOA process to initiate a basin-wide recovery program will mean to the ongoing Section 7 consultation for the Federal Energy Regulatory Commission's relicensing of the Central Nebraska Public Power and Irrigation District and Nebraska Public Power Districts' power generation facilities, including the Lake McConaughy/Kingsley Dam Power Plant.
3. What amount of water, funding and other resources will become the responsibility of the involved participants, including the three States, in order for a recovery program to be implemented.
4. The current lack of legal authority and inability of Nebraska to regulate groundwater pumping depletions along the North Platte and Platte River systems.

If the Federal Government truly wishes the States to participate in watershed management plans and basin-wide endangered species recovery programs, the Endangered Species Act must be modified to allow truly effective state and federal partnerships. Without some authorities and shared decision-making in the recovery process, the States are, essentially, being asked to open their wallets and to turn over their water resources to the U.S. Fish and Wildlife Service. Wyoming is certainly not willing to allow itself to be put into that predicament. In many ways, the question becomes: Just how badly does the Department of the Interior want to recover these federally listed and nationally important species and have a program to make that happen. We clearly believe that the current ESA cannot, of and by itself, cause any endangered species recoveries to occur. The Act is entirely geared to maintaining the status quo with regard to endangered species and their habitats. The Upper Colorado River Endangered Fish Program, and the proposed Platte River Program, on the other hand, provide a means to actually recover species as they go far, far beyond offsetting specific project impacts.

Successful implementation of cooperative Federal/State recovery/management programs must provide certainty to the respective states and their water users that they will receive favorable (either non-jeopardy or jeopardy with reasonable and prudent alternative) Section 7 consultation biological opinions so long as the ongoing recovery/management programs are contributing towards species protection and recovery.

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**Colorado's Participation
in Efforts to Develop a Program
to Restore Habitat for Endangered Species
in the Central Platte River Basin**

James S. Lochhead

Executive Director
Colorado Department of Natural Resources

Colorado has been involved in efforts to address species and habitat needs in the central Platte River Basin for over a decade.¹ Beginning in 1983, when the Fish and Wildlife Service determined that construction and operation of the Narrows Dam near Fort Morgan would jeopardize endangered species downstream, the State of Colorado and Colorado water users have actively sought practical solutions to endangered species issues on the Platte consistent with the State's obligations under the South Platte River Compact.

Colorado's effort to find solutions received renewed emphasis eighteen months ago when Governor Romer sought to engage Secretary Babbitt and Governors Nelson (NE) and Sullivan (WY) in a reinvigorated dialogue to develop a habitat and water management program for the central Platte River Basin. Initially, the signatories produced a Memorandum of Agreement (MOA) in June, 1994 committing themselves to a year-long negotiation to develop such a program. As described in the MOA, the purposes of this program would be to:

- address the needs of species listed under the Endangered Species Act (ESA);
- prevent the need for listing additional species under the ESA;
- provide regulatory certainty for both existing and new water facilities in the Platte River Basin required to comply with section 7 of the ESA;

Despite months of good faith bargaining, the signatories could not agree on a program within the year covered by the MOA. Still, substantial progress has been made.

Representatives of the Secretary of the Interior clearly articulated in a March, 1995 document both short and long-term land and water management goals for the species and habitat in the central Platte. This "sideboards" document, as it has come to be known, specifically validated a previously identified goal for the protection and management of 29,000 acres of land in various configurations over the long-term. A short-term goal of 10,000 acres was also identified. The document also called for the provision of 130,000 to 150,000 acre-feet of additional flows on an average annual basis through the critical reach

¹ The central Platte River Basin is roughly defined as the reach of the mainstem of the Platte below the confluence of the North and South Platte Rivers and above the confluence with the Loup River. Within this basin, the reach extending from Lexington to Grand Island, NE, has received the most attention, since it roughly conforms to designated critical habitat for the whooping crane.

during the next ten years. The sideboards document also articulated how a program could provide regulatory certainty and how land and water management goals could be adjusted over time through an adaptive management process.

State representatives tentatively agreed with this approach, pending resolution of seventeen complex issues. Since all parties recognized these issues could not be resolved in the allotted time, the signatories agreed to extend the MOA until December, 1995.

The MOA signatories continue to work to resolve several difficult issues. For the purposes of this brief overview, these issues can be lumped into several broad categories, including (1) water management; (2) habitat management; (3) regulatory certainty; (i.e. the regulatory streamlining benefits to be derived from participation in the program); (4) program governance; (5) the basis for allocating responsibility to implement specific actions that would make up the program (i.e. how "fair share" is determined).

Embedded in each of these broad categories are many difficult questions that need to be answered to the satisfaction of the MOA signatories before a program can be successfully formulated. Some of these questions include the following:

Water Management: How can water management in the basin most efficiently produce desired flows through the critical habitat reach? How can assurance be provided that water made available to the program will make it to and through the habitat? Will water made available through re-regulation be "scored" towards the program's goals differently than water made available through re-allocation? What is the relationship between improved water management and other measures which could be undertaken on behalf of the central Platte River habitat, such as land protection and management?

Habitat Management: How can land and habitat be protected and managed expeditiously so as to avoid continued degradation and encroachment by development and other land conversion activities? What is the most appropriate sequencing of land and habitat protection and management relative to water management activities? How can land be protected at the least cost?

Regulatory Certainty: How can the program function as the reasonable and prudent alternative that avoids jeopardy for water facilities undergoing section 7 compliance under the ESA? Who or what determines whether the program is in fact functioning so as to provide this RPA? How can regulatory certainty be afforded to new facilities as well as existing ones? What is the length of the period during which water development interests can count on the program providing certainty? How can the important goal of certainty be meshed with the need to adjust possibly the program's elements as a result of ongoing monitoring and evaluation afforded by adaptive management?

Program Governance: What is the most appropriate structure to make decisions, set policies, allocate funds, etc.? Who should participate in these decisions and at what level?

Fair Share: How should program beneficiaries support the program (cash, in-kind, specific changes in existing activities, or initiation of new activities)? How should this responsibility be divided among program beneficiaries? What is the common "currency" that allows program beneficiaries to understand their obligations with respect to those others may want or have to undertake?

These are only some of the difficult questions being confronted as the MOA signatory parties, water

users, and conservationists continue their discussions. As these discussions move forward, Colorado participants will continue to seek the following:

- the program must provide a defensible, realistically attainable reasonable and prudent alternative that avoids the likelihood of jeopardy to listed species resulting from the issuance of federal permits to existing and new water facilities;
- the program should seek to maximize efficiencies by taking advantage of the different capabilities and resources which can be brought to bare on the solution by the MOAsignatories and various stakeholders. These differences arise from the varied physical, hydrological, socio-economic, legal and political geography of the Platte River Basin.
- the program must respect the obligations and rights of various parties to existing interstate compacts and decrees.

These discussions are scheduled to conclude on December 1.

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Implications of Agricultural Water Conservation for Endangered Species Management

Kathleen C. Klein

Department of Earth Resources
Colorado State University

The South Platte River Basin is home to over 5000 irrigators reliant on surface and groundwater resources to produce crops on approximately 700,000 acres of land. The South Platte Basin is also home to significant fish and wildlife concerns due to the downstream listing of threatened and endangered species on the Central Platte River, and the decline of native species in the South Platte. The role that improved agricultural water use efficiency could play in addressing fish and wildlife concerns on the South Platte system is the subject of this presentation. Various irrigation water conservation strategies and their implication will be discussed.

Irrigators divert about 80 percent of the available surface water in the Basin, and reuse that water approximately four times prior to discharge to the State of Nebraska. Typical irrigation practices such as flood and furrow irrigation enhance this reuse rate and result in high basin efficiencies as well as prolonged instream flows in the latter portion of the irrigation system. While flood and furrow irrigation methods are viewed as inefficient at the farm or field level, hydrologic benefits to the system as a whole include maintenance of groundwater levels, and delayed return flows to surface water systems that extend the instream seasonal flow. These two factors can be viewed as beneficial to fish and wildlife in terms of habitat maintenance and elimination of zero flow conditions in late summer. The diversion of water for irrigation purposes can, however, result in dewatered stream segments, reduced flows, and higher water temperatures in certain locations.

The use of water conservation measures by farmers can have several different impacts on the hydrologic regime and fish and wildlife conditions, depending on the type of measure adopted, existing flow conditions, and use of the conserved water. Water conservation measures in the South Platte system are being adopted to provide additional water for use on existing fields, improve crop production, and save on water costs and labor costs. Possible impacts from adopting water conservation measures include increased crop consumptive use, reduced return flows, decreased groundwater levels, and reduced late season instream flows in surface channels. All of these potential impacts could be detrimental to fish and wildlife. On the benefits side however, the use of agricultural water conservation measures could in some cases result in reduced diversion requirements with possible instream flow benefits (until the next water right holder in priority diverted the water), and reduced water quality degradation because of the reduced filtering of excess water through the soils.

The role of agricultural water conservation in management of the South Platte system should be considered in the context of the hydrologic and institutional realities present in this plains river system. Although potential for improving on-farm water use efficiency exists, changing the system might result in the improvement of one set of environmental values at the expense of another set of environmental values.

The South Platte River: the Other Part

Brian S. Kolstad, P.E. and Leo M. Eisel, Ph.D., P.E.

McLaughlin Water Engineers, Ltd.

The South Platte River is the link binding diverse ecological and social communities. Preservation and restoration of several ecological communities and redevelopment of social communities along the South Platte are now being combined with the flood control projects on the South Platte. The resulting multi-purpose projects are being planned, designed and constructed by the Urban Drainage and Flood Control District, the City and County of Denver, Adams County, in conjunction with the Denver Water Department, Public Service Company of Colorado, and the Colorado Division of Wildlife throughout the Denver metro reach of the South Platte River.

The effect of these projects will be to provide important flood damage reduction benefits to existing developed urban areas while providing redevelopment to communities adjacent to the river, increasing recreation access to the river and enhancing boating safety, and restoring and enhancing the stream and riparian habitat. These projects are providing the vehicle for establishing instream flows thereby demonstrating that water resources development projects can promote these other goals. Such water resource projects help demonstrate the value of the South Platte River to the citizens of Colorado.

The recently completed flood control project for the South Platte River reach at the confluence of Cherry Creek with the South Platte provides a demonstration of how these multipurpose flood control projects can meet broader environmental and community development objectives.

Greeley's Water Program: Protection, Conservation and Innovation

Nancy Koch¹ and Blaine N. Dwyer²

Greeley, like most water suppliers in the South Platte Basin is caught in the middle:

Upper Basin Management	⇐	Greeley	⇒	Downstream Demands
Historic Operations	⇐	Greeley	⇒	Federal Agency Policies
User Expectations	⇐	Greeley	⇒	Operational Realities
Drought and Floods	⇐	Greeley	⇒	Cost of Storage

How does a responsible water supplier react to these issues affecting endangered species management and the reliability of its system? In Greeley's case, it's been a 3-prong approach:

1. **Protection** - assertive legal protection of its current supplies.
2. **Conservation** - implementation of a 5-year plan that will reduce water demand and preserve the City's growth opportunities and vibrant green community
3. **Innovation** - going beyond the norm to identify ways of integrating a multiple source water supply with dramatic demand variations.

Protection

Greeley's activities in the legal arena, whether in water court or in processing extensions to existing federal permits is well documented in a variety of water conferences and court proceedings. The actions of the Greeley Water and Sewer Board have reflected strong resolve for state primacy in water law and a strong belief that federal resource management must be accomplished with deference to long-established water uses.

Conservation

The second approach, adoption of a balanced five-year water conservation plan, is a primary subject of this paper. The City of Greeley is currently growing at a rate of 3.7% per year. Being "caught in the middle", as portrayed above, means that a diverse and growing community must make the best possible use of its water supply. The principal elements of the plan recently adopted by the Board are summarized in the paper.

Innovation

The third prong of Greeley's approach—innovation—is a product of the City's multiple sources of water and the temporal distribution of its water demands. Innovative approaches being developed by the City focus on flexible management of: 1) high elevation reservoirs; 2) two treatment plants; and 3) a diverse water right portfolio. Innovative solutions include a comprehensive Joint Operations Plan, active participation in a rental market to preserve dry-year yield and assure beneficial use in wet years, and a Water Purchase Plan that includes all reasonable potential options. Other solutions may include a non-potable water supply utility which may also serve the University of Northern Colorado.

¹ Water Resource Manager, City of Greeley

² President, ECI, the water resource division of Frederic R. Harris, Inc.

Lower South Platte Riparian Zone

Dr. F. Robert McGregor, P.E.¹

E. Robert Weiner, P.E.²

Kenneth R. Wright, P.E.³

The riparian zone of the lower South Platte River in Colorado provides valuable habitat for a wide variety of water fowl and aquatic life. Efforts to preserve the habitat and adjacent sandhill aquifer zones have involved acquisition by public agencies and private parties of ranches with grazing lands and irrigated farmland.

A focus on the South Platte riparian zone by organizations such as Ducks Unlimited and the Wildlife Federation, coupled with public and individual property acquisitions for nature or hunting preserves has established a reason for reexamining the South Platte River water quality management strategies.

Preservation of riparian habitat for “game species” has a tangential beneficial effect on habitat preservation for endangered and threatened species. Water quality management options in the lower South Platte corridor, considering new uses of the riparian zone, will likely require a new look at stream classification, pollutant discharges, and general water quality control issues.

¹President, Waste Engineering, Inc., 2430 Alcott Street, Denver, CO 80211

²Senior Scientist, Waste Engineering, Inc., 2430 Alcott Street, Denver, CO 80211

³President, Wright Water Engineers, Inc., 2490 West 26th Avenue, Suite 100A, Denver, CO 80211

Economic Impacts of Critical Habitat Designation in the Colorado River Basin

David S. Brookshire¹, Michael McKee¹, Gary Watts²

The incremental economic impacts of critical habitat designation for four endangered Colorado River fishes- the razorback sucker, the bonytail, the humpback chub, and the Colorado squawfish - are discussed.

The study region encompasses Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming. Economic input-output (I-O) models were constructed for each State and for the seven-State region. A computable general equilibrium (CGE) model also was developed for the seven-State region. The models are aggregates to 20 representative sectors in the economy. The time frame chosen for the study, 1995 through 2020, is the period projected for recovery of the endangered fishes. Linkages between the biological requirements for recovering the endangered fishes and the economic activities in the region were assessed and these formed the basis for the economic analysis.

The effects of recovery efforts on the future water depletions in the basin were also taken into consideration. The impacts of these possible changes on current and prospective economic activities were then estimated for each State, the region, and the National economy.

Utilizing projected economic growth data, economic activity level were projected for the 20 economic sectors. This assumed that no actions were taken to recover the endangered fishes and formed the "without fish" scenario. Incorporating the changes in economic activity necessary to recover the fishes led to a second set of economic projections a "with fish" scenario. The differences between the "without fish" and "with fish" scenarios formed the net economic impacts of listing and critical habitat designation.

For the Basin as a whole, regional economic impacts are clearly positive. The stream impacts over the study period (discounted at 3 percent to yield a present value) yield a positive impact of \$129.40 million (1991 dollars). The impacts of a critical habitat designations are not distributed evenly over the individual States in the Basin. Impacts range from a positive \$335.02 million (California) to a negative \$245.46 million (New Mexico).

A general equilibrium analysis, which is capable of capturing the interactions across the various sectors that make up the economy, is used to evaluate national efficiency impacts. There would be a \$7.29 million dollar (1991 dollars) expansion in the national economy projected on the basis of the 1982 levels of economic activity. Similarly, there would be an increase in employment of 710 jobs and increases in earnings and government revenues.

¹ Department of Economics, University of New Mexico

² Watts and Associates, Laramie, Wyoming

Economic Values of Endangered Species: Indicators of Public Preferences

John B. Loomis and Douglas S. White

Department of Agricultural and Resource Economics
Colorado State University

Efforts to balance economic growth with endangered species protection require not only an estimate of the costs but also the benefits of preserving the endangered species habitat. While the economic value of preserving threatened and endangered (T&E) species is not well known, this knowledge (to the extent permitted under the Endangered Species Act) is useful to make informed decisions about management actions that affect the habitat of these species which includes adequate quantity and quality of water.

An economic value of an endangered species is defined as the direct on-site non-consumptive use value in addition to off-site values. While on-site visitors have much higher benefits per person than non-visiting members of the general public, the number of visitors to view a T&E species is often limited to a few thousand. Yet many members of the general public receive satisfaction from simply knowing an endangered species exists or that they have the option of viewing the animal or plant if they so choose. The off-site value for per household concerned about a species usually range from \$5 to \$40. These values becomes very significant when aggregated over the millions of households that care about the species. This paper will provide a summary of what is known about the economic benefits of preserving threatened and endangered species including birds, fish and mammals.

There have been significant studies conducted for the whooping crane, squawfish and other threatened and endangered species similar to those that inhabit the South Platte Basin. By using the contingent valuation methodology (CVM) in surveys of the general public, off-site values are found to be 2-10 times larger than the direct on-site recreation use values and thus important to the total valuation of a species. For example, the whooping crane CVM shows values per household of \$21 to \$29 thus translating into several hundred million dollars per year of benefits.

Endangered Species Preservation in Practice: The Denver Metropolitan Area

Mary L. Powell¹

MDG & Associates, Inc.

I. Introduction:

Who is MDG & Associates?
Environmental Consulting
Landscape Architects

Experience with threatened, endangered and sensitive species

II. Endangered and Sensitive Species in the Denver Metropolitan Area

Species of Concern:

Upland:

Bald eagle
Peregrine falcon
Burrowing owl
Etc.

Riparian/Wetland:

Butterfly weed
Ute ladies'-tresses orchid
Preble's meadow jumping mouse
Etc.

III. Specific Survey Efforts for Two Species

Current Formalized Survey Procedures
Ute ladies'-tresses orchid
Prebles' meadow jumping mouse

Cost Estimates
Ute ladies'-tresses orchid
Prebles' meadow jumping mouse

¹ Environmental Specialist, MDG & Associates, Inc.
1776 South Jackson Street, Suite 812
Denver, Colorado 80210

IV. Threats to Habitat

**Development - Housing/Recreation
Bank erosion/stabilization**

V. Conservation of Riparian/Wetland Sensitive Species

**Existing Conservation Efforts
Proposed or Possible Conservation Efforts**

The Future of Endangered Species Management in the Platte River Basin: Resolving Conflicts Between Water Development and Endangered Species Protection

Tom Pitts, P.E.

Water Users Perspective

Endangered species protection and water development/management have been locked in conflict in the Platte River Basin since 1978, when the Gray Rocks dam decision regarding impacts on endangered species habitat in central Nebraska was rendered in federal court. Various regulatory, administrative, and legal resolutions have been discussed and proposed. None of these have been satisfactory to all of the principal parties involved. The principal parties include the federal government, the states of Colorado, Wyoming, and Nebraska, water users, and environmental organizations. This conflict mirrors those taking place throughout the United States regarding development and management of natural resources and endangered species protection. As a result of these conflicts, bills have been introduced in both the House and the Senate of the U.S. Congress to amend the Endangered Species Act. This is the first time since the Act was passed in 1973 that serious proposals to significantly amend the Act have been made.

While the House and Senate bills amending the Act differ, both emphasize protection of private property, providing incentives in various forms for species conservation, balancing the federal agencies' responsibilities with respect to the Endangered Species Act and other laws, reducing application of the Act, strengthening the roles of states, requiring additional economic considerations in decisions regarding species conservation, streamlining Section 7 consultation, and increasing outside peer review. None of the proposed bills eliminate Section 7 of the Act, which applies the Act to water projects. Whether or not amendments to the Endangered Species Act will be made in this Congress is questionable.

With or without amendments to the Endangered Species Act, endangered species protection will continue to play a role in water resource development and management in the Platte River Basin. Conflict resolution must be consistent with the Endangered Species Act, the South Platte Compact allocating water between Colorado and Nebraska, the U.S. Supreme Court decree allocating water on the North Platte River, and state water law. Without resolution, court mandates are inevitable. Court imposed solutions will not resolve the underlying conflicts. A grass roots solution is needed, and will be needed even more in the future. The best solution will come from within the Platte River Basin, and from those parties who are currently involved in the process - federal agencies, the states, water development interests, and environmental groups. These groups need to reaffirm their commitment to resolving these conflicts.

Tom Pitts is principal of Hall, Pitts & Associates, Consulting Engineers, Loveland, Colorado.