

## Progress Report on Inquiry Into Biological Issues in Water Transfers

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The project has so far included review of about 250 articles and chapters, looking for information on the ecology of ditches and the land they water. Presentations in 2006 to the Society for Conservation Biology and various scientists, and the Environment and Water Resources Institute of the American Society of Civil Engineers resulted in informal confirmation that there is **little knowledge** on this subject, and **many potential surprises**, but no known research agenda on the biological impacts of water transfers. The fear motivating this inquiry is that development of better forms of agricultural water management might be defeated by problems of cumulative impacts in an already highly-modified set of conditions. Irreversible changes are likely to be much more risky than impact-spreading and reversible changes. A short non-technical article written with collaborators appeared in the May 2008 issue of Water Resources Impact, to accompany presentation to the American Water Resources Association riparian issues meeting (posted at <[www.Colorado.edu/ibs/eb/wiener/](http://www.Colorado.edu/ibs/eb/wiener/)>). Pro-active riparian and wetland conservation may help avoid problems that could include cumulative impacts and limits or thresholds.

**The Regional Picture is Missing.** The Eastern Plains of Colorado have been dramatically changed already. We cannot easily foresee consequences of changes in water management, agricultural policy, or climate variation. Extreme losses of wetlands, drastic declines in plains fishes and birds, loss of native grasslands, and a great deal of research at scales of better value to science than management leave us in a difficult position. There are continental-scale estimates, and micro-scale research, but regionally, little in the way of a "big picture" helpful for identifying thresholds, avoiding problems, or anticipating consequences. Agriculture accounts for well over 80 percent of consumptive use of water, but there is almost nothing on ditches and canals as part of the environment, or as partial substitute for converted and drained riparian and wet lands of all sorts. It is also known that created habitats have supported increases in bird species richness and numbers in some areas, including those which are partly urbanized.

**Management is Not in Government Control.** There is little governmental interference in management of the various kinds of wetland and riparian areas affected by agricultural water distribution, until some drastic situation such as an Endangered Species problem appears, with usually very **inequitable distribution of costs** on the state and people trying to act, rather than those who have already acted. These messes can cost a great deal.

**Minimum Intact Wetlands and Riparian Areas** of all kinds are irreplaceable for restoration and least-cost maintenance of habitats, and the full set of kinds of wetted lands are wanted, with adequate connectivity so that native vegetation can compete successfully with invasives. The value of many kinds of wetlands may have been underestimated in the past.

**The agricultural landscape** is not "natural" – in some ways it is much more biologically productive, and in some ways it is less desirable, but regardless of preference it is both "the only game in town" and not self-managing. This is a "hybrid ecology" with changes in all aspects, and it will not "go back" to some pre-development state if water is withdrawn. Soils irrigated for more than a century are profoundly changed, in physical and chemical qualities, and will not likely offer competitive advantage to native vegetation without long active amendment and management activity.

**Cottonwoods, Willows, and Russian Olive and Tamarisks** interact in complex ways which are affected by flow regimes and timing of flows, the speed of changes in water levels, and the availability of conditions which foster each species more than others. The ecological succession along the mainstems has changed and invasives will be a problem requiring management attention and effort under any foreseeable future. Suspending irrigation and "drying out" a ditch may be an opportunity for state, federal, and local interests to cooperate in eradication, or it may be an opportunity for invasives to take advantage of drought-like conditions for existing vegetation. Active and attentive management is needed until we know which outcome will appear or can be made to result.

**Land Use Changes** will interact with water transfers in important but usually **unexamined** ways. One important change is the rapid loss of middle-sized profitable farming, with consolidation of some land into huge operations and splintering of some land into non-commercial "life-style" ranchettes and such. These small parcels are a challenge for all kinds of management, from weeds to water uses and coordination or not with neighbors. In the 1997 Agricultural Census, 73% of Colorado farms made only 5% of sales, but from 43% of farm land, which may include the most biologically valuable lands, with the highest habitat value. In one study found on this problem, 18 to 20% of the riparian vegetation in a foothills area was along ditches – it may be a much larger proportion out away from tributaries to the major streams. And even in the foothill area, only 1% of standing water was not human-made. After the **fires** in Crowley County as well as in the mountains, new erosion issues arise.

Foresight and problem avoidance are not going to be cheap, but may be less expensive than the opposite. After a century or more of irrigation, any "natural versus unnatural" distinction blurs, and the question is, "What happens with sudden changes to what exists now?" It may be desirable to invest in problem-avoidance to prevent surprises and unfair distribution of costs imposed on those affected, while earlier actors are not involved in limitations, expenses, or remediation.