

When the Anglo-Americans occupied New Mexico in 1846, they found a largely self-sufficient agrarian society that was concentrated in the riparian zones of the Rio Grande Valley. With the arrival of the railroads in the 1880s, came the end of the economic stability that New Mexican farmers had known for nearly two centuries. This circumstance was brought about by the introduction of the commercial economy of the United States into New Mexico. I will not comment here on the exploitation of the natural resources of the West in the 19th and 20th centuries as we are all familiar with these developments and their impacts on riparian and other ecosystems. Though more urbanized and subject to outside influences than other parts of New Mexico, the residents of the Middle Rio Grande Valley maintained traditional patterns of land use until the 1920s. Up to the 1920s, at least 90% of Middle Rio Grande Valley farmers were Hispanic or Pueblo Indian and approximately 90% of irrigated acreage was farmed by Hispanics and Pueblo Indians.

The breakdown of traditional land use patterns in the Middle Rio Grande Valley during the 1920s and 1930s was due to economic depressions and to changes in the patterns of relationships with irrigation agriculture on the part of the farmers themselves. The changes in relationships with irrigation agriculture were associated with the organization of the Middle Rio Grande Conservancy District (MRGCD) in 1925. The MRGCD emerged as the solution to Middle Rio Grande Valley problems related to water shortages, sedimentation, aggrading of the main channel of the Rio Grande, waterlogging, seepage and salinization of soils. Especially important in the impacts on farmers was the break in the link between the irrigation of the land and ditch maintenance. After the late 1920s, the MRGCD assumed the maintenance of the ditches from the water users who paid a fee for this service. The whole process was voluntary and with the consent of the irrigators. The new system replaced the previous system of community ditch maintenance and thus broke the individual farmers connection with community agricultural endeavors.

In historic times, riparian resources in the Middle Rio Grande Valley were utilized by three groups: American Indian, Hispanic and Anglo-American. Some studies of cultural values regard-

ing land and water uses do exist, but these studies tend to be simplistic. It is generally assumed that American Indians, Hispanics and Anglo-Americans have different world views and therefore, different cultural values regarding land and water resources. There has never been sufficiently detailed study to determine if there really are substantially different cultural views of land and water use among American Indians, Hispanics and Anglo-Americans in the Rio Grande Valley. Discussions on the allegedly different cultural views have been fueled by simplistic and romantic views within our present industrial society about subsistence farmers and their relationships with the land. American Indian and Hispanic cultural values in New Mexico are seen as tied to their earlier roles as subsistence farmers. The question that must necessarily be addressed is: Are the cultural values regarding land and water different among Pueblo Indians, Hispanics and Anglo-Americans? If so, how do they differ and do those presumptively different values play a significant role in how these three groups utilize land and water resources? Studies of cultural values that do not romanticize certain groups and demonize others are a fundamental foundation for any understanding of the relationship between humans and riparian ecosystems.

ENDANGERED SPECIES IN RIPARIAN SYSTEMS OF THE AMERICAN WEST

By David S. Brookshire⁴, Michael McKee, Christian Schmidt

INTRODUCTION

This paper examines the economic impact of critical habitat designation for three fish species endemic to the Virgin River: the woundfin, Virgin River chub, and Virgin spinedace.⁵ The woundfin and the Virgin River chub are listed as Endangered; the Virgin spinedace is proposed for listing as Threatened (the three fish are referred to collectively as the "listed fishes").

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⁵ *For a detailed discussion of the economic effects of critical habitat designation, please refer to Brookshire et al.*

The Virgin River crosses southwestern Utah, the northwestern corner of Arizona, and part of the southern tip of Nevada before flowing into an arm of Lake Mead. Preserving and restoring the listed fish species would require that Virgin River water for future uses be used for industrial, domestic, and agricultural purposes in conjunction with flows for the listed fishes.

The two counties that would be directly affected by actions taken on behalf of the listed fish are Washington County, Utah, and Clark County, Nevada. These are among the fastest-growing areas in the United States: Washington County's population grew by 52% in the period 1980-1990, while Clark County's grew by 62.5% in the same period. Continued growth is expected in these counties. The Virgin River also flows through a portion of Mohave County, Arizona, but this area has a very small population and modest economic activity. Iron County, Utah, another rapidly-growing area, lies to the north of Washington County and is closely linked with it economically. Although the Virgin River does not flow through Iron County, any economic impacts on Washington County would be felt in Iron County as well. The region covered in this study is shown in Figure 1. The region's economy resembles in many

ways that of the Rio Grande Basin. The arid climate and rapid urbanization are similar to the Rio Grande Basin as well.

METHODOLOGY

This analysis uses the input-output method of economic modeling to investigate the impacts of listing and critical habitat designation for the Virgin River fishes. Input-output models are a way of describing an economy by representing it as a series of "linkages" between the various production sectors. Once a model has been constructed for a particular economy, it can be used to investigate "what if" scenarios, such as the impact of exogenous shocks on that economy. A shock will have direct impacts: for example, production of a particular commodity will be curtailed because a basic input (such as water) has become scarce. Because of the linkages in the economy, a shock will also have indirect impacts: for example, lower production will affect employment and income in that sector, while the higher cost of a scarce commodity means that less disposable income can be spent on the products of other sectors of the economy. Ultimately, the shock is reflected in a change in final demand for products of the regional economy.

Input-output models are well suited to characterize the impacts of an exogenous shock on a small regional economy such as that of the Virgin River basin. The IMPLAN data sets, which permit construction of county- and regional-level models, were used as a basis for this study. These were augmented by local population growth projections produced by the Las Vegas Valley Water District (LVVWD, Clark County) and the Washington County Water Conservancy District (WCWCD, Washington and Iron counties).

The method followed in this study was to construct a baseline projection for the regional economy as a whole, plus separate baseline projections for Clark and Washington counties. Two alternative scenarios were then developed to reflect actions taken to protect the listed fish species: one scenario compares the projected effects of these actions against the baseline, while the second shows the effects compared to the baseline if water conservation policies are implemented in the affected region.

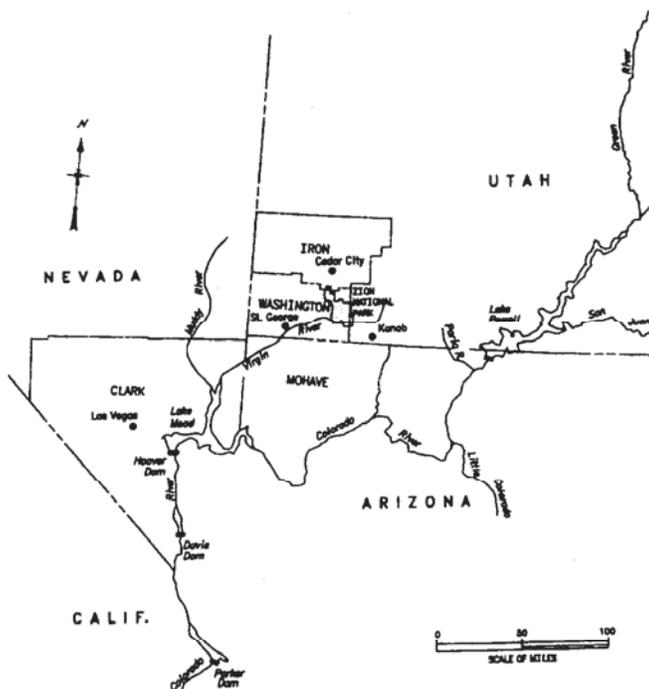


Figure 1. Generalized location of the Virgin River basin.

All three scenarios investigated in this study are based upon the assumption that population growth rates in the region will be sustained throughout the study period, although some decline is expected as desirable building areas become scarce. The water needs of the growing population will be met by constructing a series of structural projects to increase the region's supply of water for municipal and industrial uses, as well as to improve water quality in the Virgin River. In addition, retirement of agricultural land is anticipated as water and agricultural land are allocated for other uses.

SCENARIOS

The "without fish" baseline (WOFBA) was projected for the region as a whole, as well as for Washington County and for Clark County. This scenario is based upon the plans of the two regional water districts for meeting the area's water needs through structural projects and agricultural retirements. The "with fish" structural (WFST) scenario uses the same assumptions, but the region's available water supply is shared by the amount necessary to provide instream flows to protect habitat for the listed fish species. In both scenarios, per-capita water consumption is projected to remain the same as at present. The "with fish" conservation (WFCO) scenario begins with the same assumptions as the WFST scenario, but per-capita water consumption is reduced by implementing water conservation measures. These include installation of water-saving devices (appliances, plumbing, etc.) and use of xeriscape landscaping in new construction.

The WFST scenario has three direct impacts: earlier retirement of agricultural land as the water is diverted to other uses, hence a decline in agricultural production; increased cost of water because structural projects must be built earlier, reducing the amount of income that can be spent elsewhere; and loss of revenue to the WCWCD because diverting water to the river to preserve fish habitat will cause a decline in the production of two small hydroelectric power facilities operated by the water district. The WFCO scenario adds the cost of water conservation expenditures (e.g., for low-flow toilets and timed sprinklers). These costs will

chiefly impact the construction sector of the economy, but the water delivery projects are able to be delayed with the result that costs are reduced.

RESULTS

Under the WFST scenario,, the present value of output changes in the Washington County economy due to fish considerations is -\$47.5 million, which constitutes 0.0016% of the present value of the baseline stream of output (WOFBA). The annualized value equivalent is -\$1.95 million. Employment and earnings effects are presented in the report, and are of a magnitude similar to that of the output effects.

For Clark County, the output effects of the fish considerations are -\$10.63 million. The baseline economy of Clark County is much larger than that of Washington County, so the relative effects of the designation of critical habitat are correspondingly much smaller. **Thus the cumulative output effects represent only 0.00001%** of the baseline level of economic activity. Both the earnings and tax revenue effects are too small to be reliably reported as deviations from the baseline level of economic activity.

For the region as a whole, the output effect of designating critical habitat is -\$59.8 million (0.0001%). The other aggregate effects are of similar relative magnitudes.

Water use conservation is able to significantly mitigate the effects of listing and designating critical habitat. This is also true for the critical habitat effects alone. Under the WFCO scenario, the present value of the output changes in Washington County is -\$13.7 million, 0.00046% of the baseline level of activity. For the region as a whole, the output effects of designating critical habitat are -\$20.9 million, an amount too small to calculate as a percentage of the baseline. There are no conservation scenario impacts for Clark County.

CONCLUSIONS

The impact of critical habitat designation for the three listed fishes is very small when viewed in the context of the regional economy. Meeting increased water needs on behalf of the fishes will only accelerate the current trend of converting agricultural water uses to municipal and industrial uses.

CITATIONS

Brookshire, D.S., M. McKee, and C. Schmidt, August 1995. *Economic Analysis @Critical Habitat Designation in the Virgin River Basin for the Woundfin, Virgin River Chub, and the Virgin Spinedace*. Prepared for U.S. Department of the Interior, Fish and Wildlife Service, Salt Lake City, Utah. 232 pp.

CURRENT AND FUTURE RECREATIONAL ISSUES

By Tony Barron⁶

The management of riparian areas creates a unique challenge for the riparian resource manager. Due to many adverse historical use patterns, managers must utilize aggressive low impact management techniques. Some of these techniques are compatible recreational uses, fire management programs, restoration of burned or deteriorated areas, volunteer programs, educational and interpretive programs and a presence of law enforcement.

When various projects must be facilitated, buffer areas should be established and maintained along with vehicle access controls which will provide protection from urban encroachment. Limited recreational use can be provided in the riparian area, and sound management practices must be utilized to minimize the destruction of vegetation and creation of unwanted trails. We should wherever practical and feasible provide ADA handicap accessibility. Trails should be marked and signage should be provided.

Opportunities within the bosque provide a wide range of opportunities and recreational experiences. Various official access points must be established and these areas should provide information for hiking, jogging, nature walks, ADA accessibility, areas that are closed, and rules, regulations and ordinances. These management objectives when implemented will reduce drainage for these riparian areas. Many times this and other damage

can be reduced because a tremendous amount of damage can be caused by too many accessing or congregating in one location.

Expansion and diversification should be one of the major concerns of the riparian resource manager. Improved access and designation of official access points will provide increased recreational and educational opportunities.

The interfacing of volunteer programs such as "Trail Watch Volunteers" along with a strong law enforcement educational presence will enhance the experience of the user of these riparian areas.

Safety is a major issue for both managers and users of the bosque. Sensitive areas having cultural and historical values should be protected. The safety of our visitors to these areas will be one of the major priorities of the riparian resource manager. Passive recreation is recommended and will limit liability using education, access, and controls. Directing and encouraging park users to stay away from hazardous areas or situations and encouraging responsible use of our loved and valued riparian area is critical.

On-going monitoring programs must be established to insure effective management goals, objectives, and practices. Bold management decisions must be implemented whenever data from on-going monitoring efforts dictates the need for appropriate review up to and including the possibility of changes in current management practices.

CONCLUDING COMMENTS

By Carol Raish

As the panelists have emphasized, the future of the Rio Grande riparian ecosystem is affected by both present-day and historical factors. In order to be successful, future land management planning and development must take these factors into consideration. In his historical review of the valley, Frank Wozniak makes the important point that three different ethnic groups; the American Indian, the Hispanic-American, and the Anglo-American; reside in and use the riparian area. Differing cultural values concerning land and water use, stemming from presumed differences in world view, are often attributed to these groups. Wozniak calls for detailed, non-romanticized

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