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Draft Final Report

The Economic Impact of Reduced Irrigation in the Republican River Basin

Prepared for the Lower, Middle, and Upper Republican
and Tri-Basin Natural Resource Districts

① Still need 5 scenario

② will change if crop price dec

③ Nonetheless - points to need
for help in transition.

Based on 15%/40% U/QR

loss in 3.5% - 7.5%
total econ

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This study provides a current economic impact estimate. The study also examines several impacts that were not emphasized in the previous studies. First, we estimate the magnitude of economic impacts due to forward linkages in economy. These are estimates of the losses in selected business that handle grain. There will be less local production of grain so there may be less need for these processing services. Second, we estimate the economic impact from lost tax revenue for local government due to declines in agricultural property value.

Finally, for at least two reasons, the local economic impact estimates produced in this report should provide valuable information to citizens, businesses, and policy-makers considering proposed regulation of irrigation in the Republic River Basin. First, even if some action is required due to the Republican River Compact and the subsequent court order, an understanding of local economic impacts may influence how the state of Nebraska chooses to pursue regulation of consumptive water use. Second, information about local economic impacts may be critical in making decisions about mitigating the impacts of regulation. Mitigation at the state or federal level can reduce the local economic impacts and also allow the costs of the regulation to be shared more evenly among regions of the state or nation, rather than concentrated in particular local and county economies.

The latter point is important when understanding the influence of regulation on local economies. Regulation of a key local industry can have sustained, long-term effects on local economies and communities. While there is always "churning" in a market economy – where jobs and income lost in one set of businesses and industries are replaced by growth in other businesses and industries – this is not an appropriate way to view the impact of government regulation on the economy. Government regulatory action introduced into a local economic system, unless it generates substantial local economic benefits as well as costs, will lead to a long-term loss in local economic activity. There will be a smaller economy then would have existed without the regulation, with less employment and population. To be sure, the economy may eventually recover from any economic dislocation that occurs as the key industry reacts to regulation, such as an initial spike in unemployment. And, there is reason to be optimistic about the potential for private sector job growth in non-metropolitan Nebraska (Goss et. al., 2007). But, the

economy will be smaller than it would have been over the long-run with fewer people and less employment. This could be a source for concern in a growing area, since there are many advantages to having a larger economy and population (Thompson, 2005). But, the concern might be greater in an area, such as the Republican River Basin, which is losing population. Contraction of a key local industry would likely lead to further population loss.

In the next section of the report, we estimate the reduction in farm yields, sales, and income from the proposed regulation, and estimate the overall economic impact in the Upper, Middle, and Lower Republican Natural Resource Districts. In the third section, we discuss the implications of our findings for economic development in the region.

II. Economic Impact

Previous studies such as Supolla and Nedved (2004) utilized a profit-maximizing model to examine the relationship between limits on consumptive use of irrigation water and agricultural production in the Republican River Basin. Their model was used to predict how producers would react to lower allocations either through reduced irrigation of existing crops, a change in the mix of crops grown, or a switch to dry-land agriculture. The authors' also developed specific information about which wells in each area of the Republican River Basin would be effected by lower allocations, and which wells were already pumping less groundwater than would be allowed under the irrigation limits.

We utilize the estimates of Supalla and Nedved (2004) on the number of certified irrigated acres and the average allocation in the Upper, Middle, and Lower Republican Natural Resource districts.[1] That study also provides a good summary of the potential uncertainties regarding estimates of the number of irrigated acres and of historic data regarding pumping of water for irrigation. Either source of uncertainty could affect

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[1] The Upper Republican NRD is comprised of Chase, Dundy, and Perkins County. The Middle Republican NRD is comprised of Hayes, Hitchcock, Red Willow, most of Frontier, and portion of Lincoln County. The Lower Republican NRD is comprised of Furnas, Harlan, Franklin, and portions of Nuckolls and Webster Counties.

economic impact estimates. Finally, following that study, we focus on five crops: corn, wheat, soybeans, grain sorghum, and alfalfa.

Given the timeframe for the current study, we did not conduct a complete analysis of profit-maximizing response to limits on irrigation in the Republican River Basin. Our baseline estimate assumed reduced irrigation of existing crops (based on 2006 production data from the National Agricultural Statistical Service) rather than crop switching or a switch to dry-land production. We did utilize the Water Optimizer software developed by faculty in the UNL Department of Agricultural Economics (Martin, Supalla, and Nedved, 2005) to estimate how much production would fall in response to reduced irrigation. This also was our source for data on the costs of irrigation, and the additional costs associated with handling each additional bushel of yield.

Our regulatory scenario was a 15% reduction in the average allocation in upland acres, and a 40% reduction in quick response acres in each of the three natural resource districts. Our price assumptions were based on current prices and forecasts for the next few years from the Univeristy of Missouri and Iowa State Univeristy.[2] Estimates of lost farm sales, and economic impact would fall, by about 20%-25%, if prices do not remain at current (and forecast) levels, and fall back to prices that prevailed throughout most of 2005 and 2006.

Lost production and sales of corn and other crops are what drive the estimate of lost local economic activity as a result of the proposed (further) limits on irrigation. The impact of lost sales is manifest in two ways. First, reduced irrigation and lost production are accompanied by lower irrigation costs, less use of nitrogen, and lower costs for handling and transporting crops. Lower spending on irrigation, transportation, and nitrogen imply lost activity on the farm but also less activity at local businesses or individuals that provide these products and services. Second, lost sales imply lower farm proprietor income. Less proprietor income implies less spending in the community.

As described above, lost farm production leads to less farm income, but also to less demand for the services of local businesses. This relationship between lower crop yields and less employment, income, and output throughout the community is captured

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[2] The model utilized a corn price of $3.17 a bushel, a wheat price of $4.28 a bushel, a grain sorghum price of $3.09, soybeans of $6.10 a bushel, and alfalfa at $66 a ton.

through "economic multipliers." The IMPLAN software developed by the Minnesota Implan Group, Inc. was used to estimate relevant economic multipliers for corn, wheat, grain sorghum, soybeans, and alfalfa in the Upper, Middle, and Lower Republican Natural Resource Districts. This was possible because the IMPLAN model can be used to examine the economic impact of lost activity in over 500 industry sectors in every county, or combination of counties, in the United States. Economic multipliers from IMPLAN are applied to estimates of lost crop sales due to the irrigation restrictions to estimate the total loss in economic activity.

Results are presented in Table 1 in terms of lost output, value-added, income, and jobs. Value-added is a more inclusive measure than income, because it includes labor income but also property income and indirect business taxes. The first column of Table 1 shows our estimate of lost crop sales from farms in each of the three districts. Remaining columns of the table show the economic impact from lost crop production due to limits on irrigation. The largest loss in crop sales is expected in the Upper Republican NRD but the total impact is similar or higher, depending on the measure, in the Middle Republican NRD. The larger, more diversified economy in the Middle Republican NRD has higher economic multipliers. The economic impact in the Lower Republican NRD is also substantial, from between 60% to 80% as large as in the other two districts.

Table 1
Total Economic Impact from Lost Crop Sales
with 15%/40% Regulation of Irrigation

Natural Resource Districts	Loss in Crop Sales	Total Economic Impact			
		Output	Value Added	Labor Income	Jobs
Lower Republican	-$15.6M	-$19.9M	-$13.7M	-$11.0M	-97
Middle Republican	-$18.6M	-$26.1M	-$18.0M	-$14.9M	-135
Upper Republican	-$23.4M	-$26.9M	-$17.8M	-$15.0M	-104
Overall Total	-$57.6M	-$72.9M	-$49.5M	-$40.9M	-336

Source: BBR calculations

Forward Linkages

Economic impact analysis of the kind reported in Table 1 accounts for the purchases of agricultural producers. These purchases represent the "backward" linkages in agricultural production. The model, however, does not calculate any "forward" linkages. In particular, there is a substantial supply of grain in the Republican River Basin which is the basis of a number of grain processing businesses such as grain elevators and wholesalers. These businesses also would be affected if there is a reduction in the local supply of grain, and these impacts are not captured in the multiplier analysis of Table 1. Cattle feed lots and ethanol plants are other examples of forward linked businesses.

It is more difficult to develop an estimate of the magnitude of any job losses in such forward linked industries. For illustration, we do estimate the potential lost employment among grain elevators and wholesalers due to a reduced local supply of grain. Reductions in irrigation would lead to a 10% decline in grain production in the natural resource districts. We assume a proportional decline in employment in the grain wholesaling and elevator business. This would mean a decline of 8 to 16 jobs in each of the natural resource districts in this forward linked industry. These grain industry impacts are included in the impact estimates in Table 2

Lost Property Value

When regulation causes a long-term reduction in farm incomes this loss is
eventually manifest as a reduction (relative to an unregulated scenario) in property
values. This long-run impact on property values is estimated based on annual losses in
farm income. Lost farm proprietor income, assuming it is not compensated by reduced
hours worked by farm proprietors, should ultimately lead to reduced cash rents for
farmland. To estimate lost property value, 90% of lost farm income was multiplied by the
2006 ratio of land values to cash rents in Southwest Nebraska. Table 2 reports estimates
of lost agricultural property value using this approach. There is $82.1 million less in

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property value in the Lower Republican Natural Resource District, $93.1 million less in the Middle Republican District, and $102.3M in the Upper Republican.[3]

This relative loss in agricultural property values has important implications for local economies. One implication is lost tax revenue for local governments and school districts. This lost revenue is not available for funding government jobs and government services. Losses in government employment and activity results[4], and there is also a multiplier effect from the lost local government activity.[5] The IMPLAN model, despite all of its advantages, does not directly estimate tax revenue impacts. As a result, losses due to reduced property values were not represented in Table 1, and must estimated separately.[6] In Table 2 below we estimate the economic impact of lost property values in each of the natural resource districts. For simplicity, we focus on county property taxes and school district taxes, and ignore the impact of other types of taxes. Note that the impact figures in Table 2 also reflect the lost employment for grain wholesalers due to forward linkages.

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[3] Proprietor income and property values estimates are heavily influenced by crop prices. The estimates in Table 2 would fall by 40% to 45%, depending on the district, if prices fail to remain at current levels and fall to average 2005 and 2006 prices.

[4] If it is assumed that tax rates would be higher to compensate for lost property value, then this also would cause a negative economic impact due to lower after-tax incomes.

[5] To see this, note that agricultural property values are based on income earned from exporting agricultural products around the nation and the world. The ultimate source for government employment supported by agricultural property is from outside of the local region.

[6] This was confirmed in an email with IMPLAN staff.

Table 2
Total Economic Impact from Lost Property Tax Revenue and Forward Linkages with 15%/40% Regulation of Irrigation

Natural Resource Districts	Lost Property Value	Annual[1] Loss of Tax Revenue	Output	Total Economic Impact Value Added	Labor Income	Jobs
Lower Republican	-$82.1M	-$1.1M	-$2.9M	-$2.3M	-$1.6M	-57
Middle Republican	-$93.1M	-$1.2M	-$3.2M	-$2.5M	-$1.8M	-53
Upper Republican	-$102.3M	-$1.3M	-$2.5M	-$2.1M	-$1.6M	-57
Overall Total	-$277.5M	-$3.6M	-$8.6M	-$6.9M	-$5.0M	-167

Source: BBR calculations
[1] Lost tax revenue based on county and school district taxes only.

III. Summary and Discussion

The overall economic impact is the sum of the two economic impact estimates in Tables 1 and 2. These overall impacts are summarized in Table 3 below for each of the effected natural resource districts. The total annual economic impact (output) is $29.4 million in the Upper Republican Natural Resource District, $29.3 million in the Middle Republican Natural Resource District, and $22.9 million in the Lower Republican natural resource district. The overall impact across all 3 districts in the Republican Basin is $81.6 million, including $45.8 million in labor income (proprietor and worker) and 503 full or part-time jobs.

The overall economic impact is approximately equal in the Upper Republican and the Middle Republican Natural Resource Districts. The impact in the Lower Republic Natural Resource District is about 75% to 80% as large as in the other two.

These impact estimates in Table 3 are interesting by themselves, but it is always helpful to consider impacts in the context of the overall economy. What share of the local

economy would be lost if the regulation is implemented? What would be the implication for other factors, such as demographic change?

Table 3
Overall Economic Impact with 15%/40% Regulation of Irrigation

Natural Resource Districts	Output	Overall Economic Impact Value Added	Labor Income	Jobs
Lower Republican	-$22.9M	-$16.0M	-$12.6M	-154
Middle Republican	-$29.3M	-$20.5M	-$16.6M	-188
Upper Republican	-$29.4M	-$19.9M	-$16.6M	-161
Overall Total	-$81.6M	-$56.4M	-$45.8M	-503

Source: BBR calculations

The natural approach to answer these questions is to look at the impacts in Table 3 relative to the overall economy of a district to examine what share of employment, output, and income is lost due to the proposed limits on irrigation. Results for the Upper Republic Natural Resource District provide the starkest example, and are presented in Table 4.[7] The expected economic losses would account for between 3.5% and 7.5% of 2004 regional output, value-added, and income.[8] There would be a 2.5% loss in employment. There is a smaller percentage loss in employment since our estimates assume there is a reduction in the number of hours worked by farm proprietors and their employees rather than a reduction in the number of jobs in response to limits on irrigation. There is a larger percentage for labor income since much of the loss in crop sales is reflected in lower farm income. Only a modest portion is reflected in lost farm

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[7] In the Middle Republican Natural Resource District, the expected economic losses would account for 0.9% of district output, 1.2% of value-added, 1.6% of labor income, and 0.6% of employment. In the Lower Republican Natural Resource District, the expected economic losses would account for 2.1% of district output, 3.1% of value-added, 4.4% of labor income, and 1.4% of employment.
[8] 2004 is the most current year that output and value-added figures are available from IMPLAN.

expenditure. The only costs that fall with reduced irrigation are irrigation costs and costs related to yield such as nitrogen use and costs for transporting the harvested crop.

There also is a demographic component associated with these income losses. Research by Bartik (1991) in the context of manufacturing employment, shows that when new factories enter a community, approximately 80% of new jobs in the community are filled by new residents and only the remaining 20% are filled by existing residents as they enter the labor force, or by formerly unemployed workers. This is a different context than we are considering in current study but if the same principal applies, there would be a significant population loss in response to the limits on irrigation, roughly of the same magnitude as the job loss. And, as is typically the case, losses would likely be concentrated among younger workers.

Table 4
Percentage Loss in the Upper Republican NRD Economy with 15%/40% Regulation and a Hypothetical Example from the Omaha Economy

Economic Measure	Percent Loss in Upper Republican Economy with 15%/40% Regulation	Percent Loss in Douglas County Economy 50% Loss in Insurance Carriers
Output	3.5%	5.5%
Value-Added	4.8%	4.8%
Labor Income	7.4%	4.6%
Employment	2.5%	4.3%

Source: BBR Calculations

For further context we present an analogous set of the results in Table 4 for a scenario involving the insurance carrier industry in Omaha. The insurance carrier industry is an important part of both the Lincoln and Omaha economies. Insurance carriers, like agricultural producers, primarily generate products (services in the case of insurance carriers) for export around the nation or world. Therefore, the example of the insurance carrier industry presents an urban analogy to the impacts on the farm sector which have been the subject of this report.

We develop a scenario where a change in state regulation of the insurance carrier industry has a negative impact on industry activity in the Omaha area. The eventual loss

is 50% of activity among insurance carriers. Table 4 shows this loss relative to the Douglas County economy using our 4 economic measures. The percentage loss is higher or lower in some cases but on average is roughly the same percentage loss as was estimated for the Upper Republican Natural Resource District.

There is another point worth making about this analogy. It has been pointed out in this study that it may be possible for the Upper Republican Natural Resource District, and the other resource districts, to absorb the blow to their economy from the proposed limits on irrigation. The economies and the population of the districts will be smaller due to the regulation than each would have been without it, but the innovative and hardworking residents of Southwest Nebraska would likely find a way to bounce back, so that aggregate economic measures of economic well-being such as per capita income and unemployment recover. However, a major new regulation on a region's key industry is costly because transitions are difficult and there are many advantages to having a larger economy, particularly in areas that have been losing population. One would have to wonder how residents and business leaders of Douglas County would react to a hypothetical regulation on the insurance carrier industry like we have simulated in Table 4.

Finally the impact estimates in Tables 1 through 4 do not consider efforts to compensate agricultural producers for their lost income. Compensation is under consideration, and could mitigate some of the economic impacts discussed above. In particular, annual compensation payments would tend to support property values which would mitigate the impacts from lost government revenue included in Table 2, as well as mitigate some of the impacts of reduced crop production in Table 1. Results in Table 1, however, reflect more than just the impact from a decline in farm proprietor income. They also represent the reduction in operating costs that occur as farm operators reduce irrigation and have smaller yields. Compensation would represent a way to mitigate negative local economics impacts. However, some negative economic impacts would remain.

The surest way to reduce the local economic impact, if this is a priority, is to implement fewer limits on irrigation in the Republican River Basin. In particular, it would be critical to ensure that the proposed limits on irrigation are the minimum that are

required to help Nebraska meet its obligations with neighboring states. It is beyond the scope of this report, however, to evaluate whether this has been done.

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