Potential Benefits from the
Purchase of Surface Water Rights
in the Republican River Basin

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In order to estimate the potential benefits of a surface water buyout in the Republican Basin, the DNR has developed some projections of the potential supply of water in the future. The purchase of surface water irrigation rights in the Republican Basin will bring Nebraska into compliance with the Republican River Compact Settlement. The purchase of surface water rights will continue to be a potentially valuable option for approximately five years. The purchase of surface water rights within the Republican Basin will allow ground water irrigation allocations to be 1 ½ to 2 inches more than they would be with the purchase of surface water rights.

RECENT WATER USE

During the years 2003-2006, the Nebraska total surface water (SW) Computed Beneficial Consumptive Use (CBCU) averaged approximately 43,400 acre-feet per year. Of this total, approximately 20,000 acre-feet per year was the result of evaporation from surface water impoundments (i.e. reservoirs) and the remainder was the result of surface water irrigation. This analysis will assume that the reservoirs will continue to exist, so that the maximum benefit from a surface water buyout will be the difference between the total projected SW CBCU and the projected evaporative losses. Therefore, for this analysis, the projected evaporative loss is assumed to be 20,000 acre-feet per year going forward.

From the numbers above for the 2003-2006 period, limiting surface water use to no more than reservoir evaporative losses would have reduced SW CBCU (and thus total Nebraska CBCU) by approximately 23,400 acre-feet per year. The average Nebraska shortfall in compact accounting for the period 2003 through 2006 was approximately 25,500 acre-feet per year. Therefore, limiting SW CBCU to 20,000 acre-feet per year (i.e. limited to evaporative losses only) for those years would have brought NE very close to being in compliance with the Compact.

POTENTIAL SURFACE WATER SUPPLY

There are two questions to be addressed:

- What is the potential supply of surface water that could be purchased for Compact compliance purposes?
- How will this compare to the projected shortfall for NE in the future?

Simulations using the Republican River Compact Model (RRCM) under a moderate drought scenario give us some information about potential water supply in the future.

The model results with Nebraska irrigation wells pumping (*pumping on*) and the Platte River-derived groundwater mound (*Mound*) turned on and off yield model projections of the following baseflows:

Tg = Total Baseflow

Vg = Virgin Baseflow

The difference between the two is:

Ig = Baseflow Due to Imported Water Supply Measured at Compact Accounting Gages (Mound Credit)

As Figure 1 shows, baseflows in the basin are currently much lower than historic levels, and under a moderate drought scenario, are expected to continue to decline.

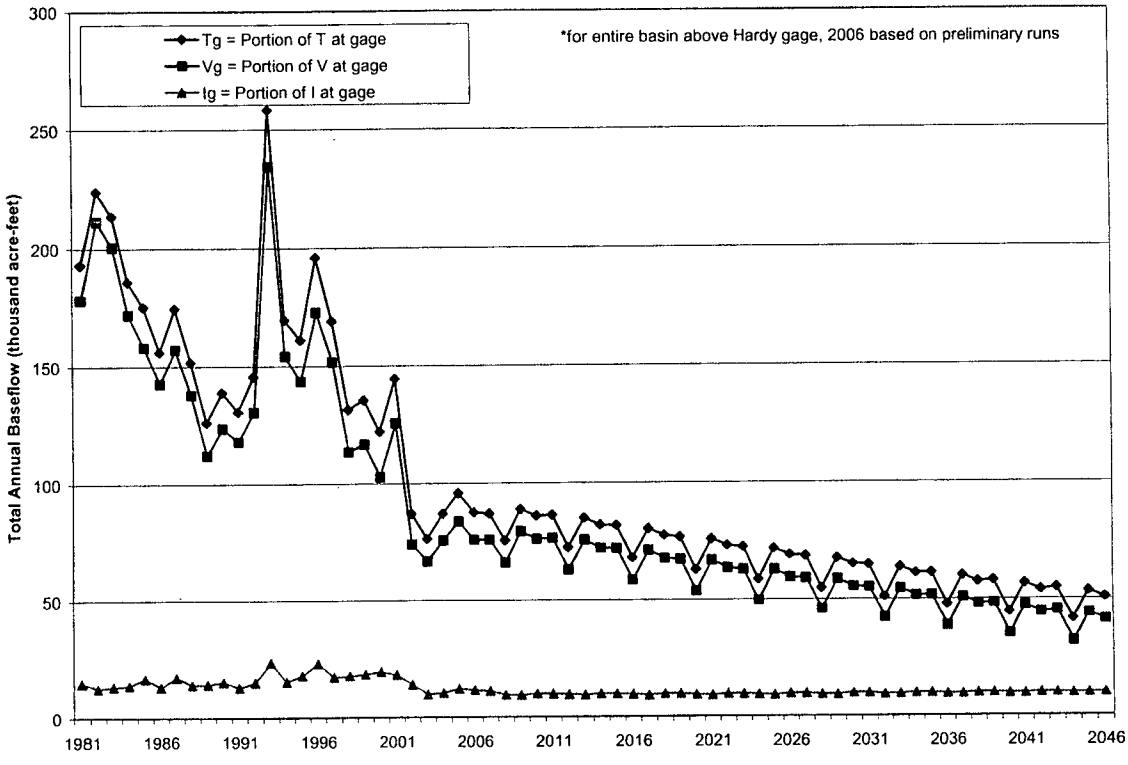

Figure 1. Components of gauged baseflow in the Republican Basin. All values obtained from the Republican River Compact Model. Values after 2006 are based on a moderate drought scenario.

The baseflows are one component of the available surface water within the basin. However, runoff must also be accounted for, and this is not a factor in the RRCM. In the past, runoff has accounted for a significant portion of the gauged flow in the basin. In the recent past, though, runoff has been significantly reduced due to drought. Average runoff in the basin during 2003-2006 has been about 30,000 acre-feet per year, with

significantly lower values occurring during 2005 and 2006. Furthermore, during 1991 (the last of the four years, 1988-1991, used to construct the moderate drought scenario) runoff was approximately 20,000 acre-feet per year. A regression analysis of runoff and the virgin baseflow in the basin (both of which are directly related to rainfall in the basin), shows that in the future under this moderate drought scenario, runoff can be expected to average approximately 20,000 acre-feet per year. Based on all of these factors, DNR feels that a projection of 20,000 acre-feet per year of runoff under the moderate drought scenario is appropriate. Adding this to the modeled baseflow for the basin yields the projected surface water supply for the basin.

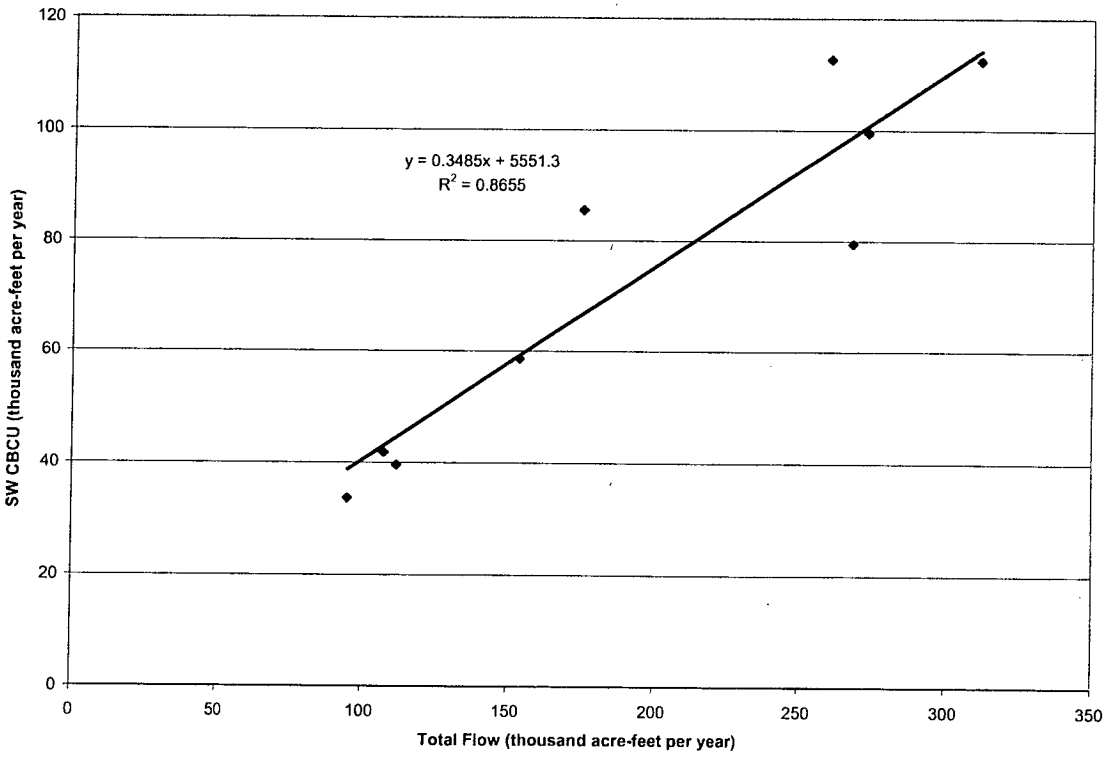

Figure 2. Relationship between SW CBCU and Total flow in the Republican Basin for 1998-2006.

The available surface water during a given year should directly relate to the potential SW CBCU. Figure 2 plots the SW CBCU against the total gauged flow in the basin for the years 1998 through 2006. As this figure shows, there is a significant linear relationship between the two.

This linear relationship was used to project the potential SW CBCU in the future under a moderate drought scenario. Projected SW CBCU in the future starts at a little over 40,000 acre-feet per year and gradually declines to around 30,000 acre-feet per year after 40 years (Figure 3). Assuming that evaporative loss in the Republican Basin will remain at around 20,000 acre-feet per year, a surface water buyout will decrease consumptive use around 23,000 acre-feet per year in the short term. This benefit will gradually

decrease over time under this moderate drought scenario, due to the expected decrease in streamflow.

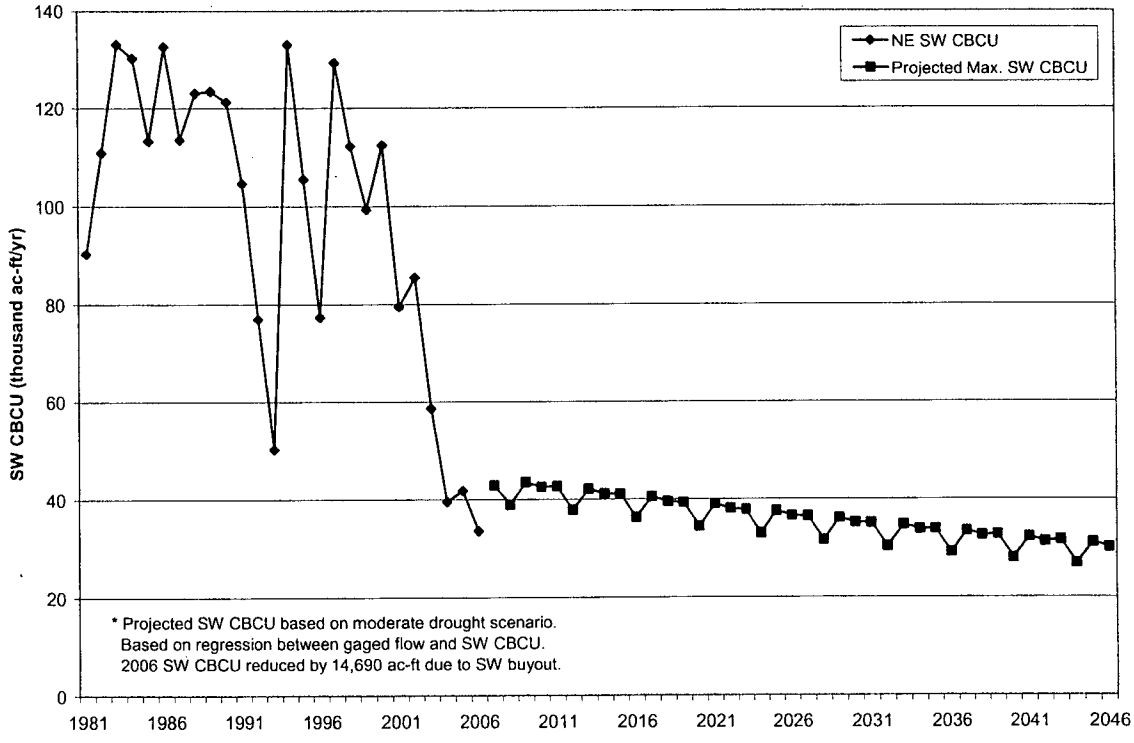

Figure 3. Historic and projected SW CBCU in the Republican Basin.

Figure 4 shows how a surface water buyout of the projected surface water supply would help NE with compact compliance. The total shortfall going forward under this moderate drought scenario has been projected by DNR. This bottom line takes into account future savings from current NRD allocations and CREP, the increased groundwater depletions due to the lag effect (due to historic pumping), and the decreased water supply due to continued overuse.

SUMMARY

Benefits. A surface water buyout significantly benefits NE in the short term. Capping the SW CBCU at 20,000 acre-feet per year (i.e. limiting the SW CBCU to only that caused by evaporation from reservoirs), would increase NE's average shortfall for the 2008-2012 period from approximately 33,600 acre-feet per year to approximately 12,500 acre-feet per year. This would allow significantly larger groundwater consumptive use allocations while still achieving compact compliance. (However, the projected benefit does decrease in the future, as indicated by the convergence of the two curves in Figure 4.)

Future Conditions. This paper is a summary of DNR's attempt to quantify the benefit of a permanent surface water buyout in the Republican Basin under a moderate drought scenario. Actual benefits could be significantly more or less than presented here,

depending on actual future conditions. This projection appears to be a reasonable assessment of the future benefit of surface water buyouts under the assumed climatic conditions.

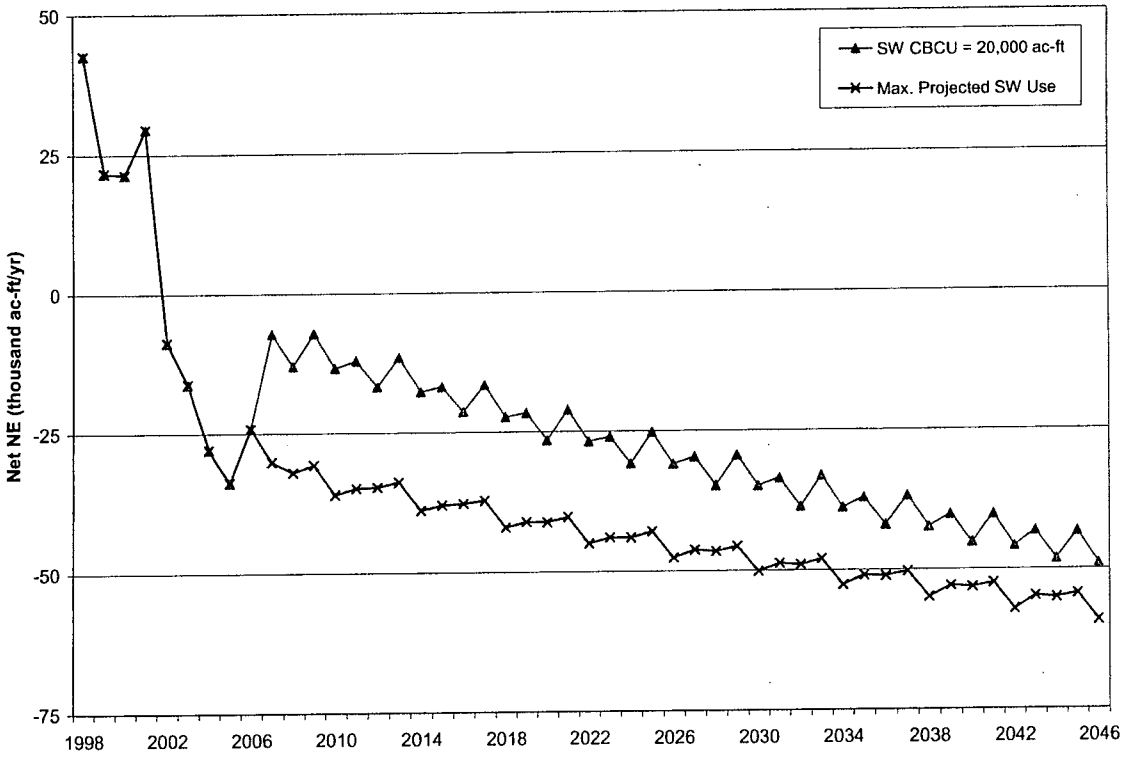

Figure 4. Comparison of projected Nebraska shortfall in the future with and without a surface water buyout in the Republican Basin.

Ground Water Allocation Reductions. The results indicate that a surface water buyout would significantly assist NE with compact compliance, particularly in the short term. However, unless water supplies are significantly greater than expected in the future, additional reductions in groundwater use will probably also be needed in the short term, and will definitely be needed to keep NE in compliance with the Compact in the long term.