

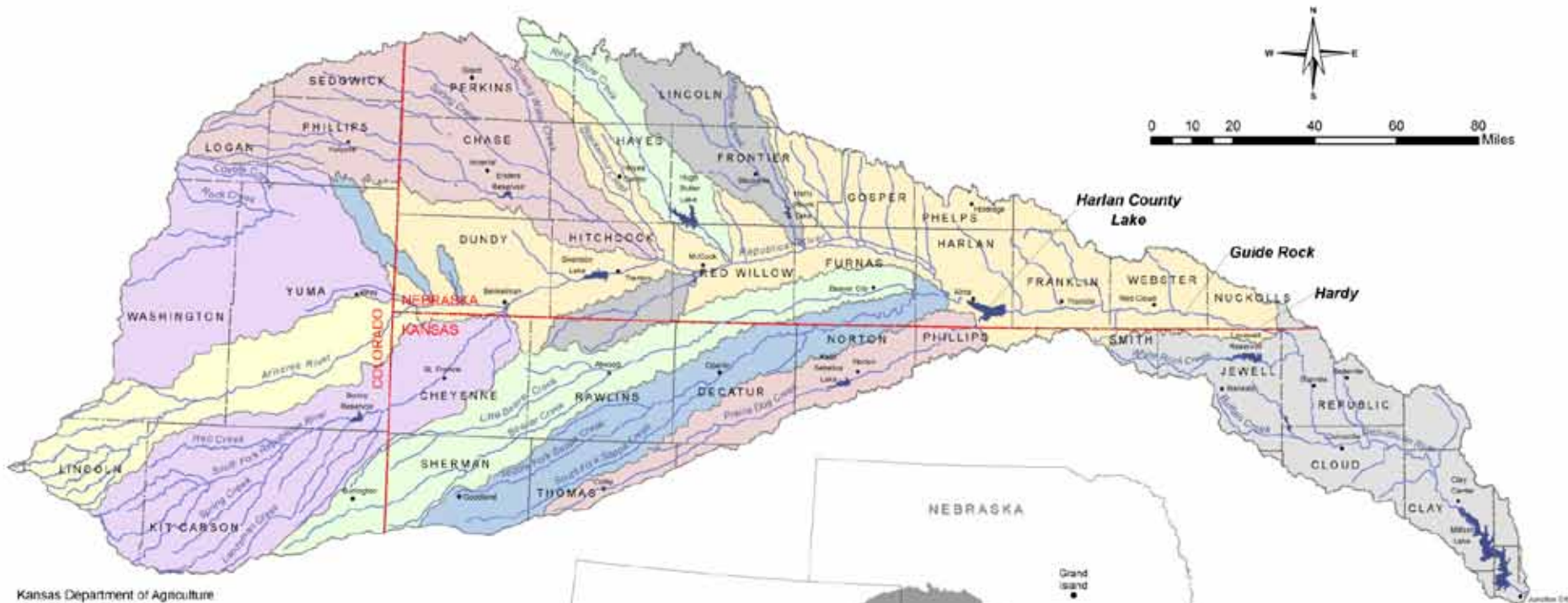
Kansas' view of the Republican River Compact

David Barfield, Chief Engineer
Kansas Department of Agriculture
Division of Water Resources

Nebraska State Irrigation Association
Nebraska Water Resources Association

November 22, 2010

Republican River Basin



Kansas Department of Agriculture
 Administrative Services, GIS
 April 15, 2010

Legend

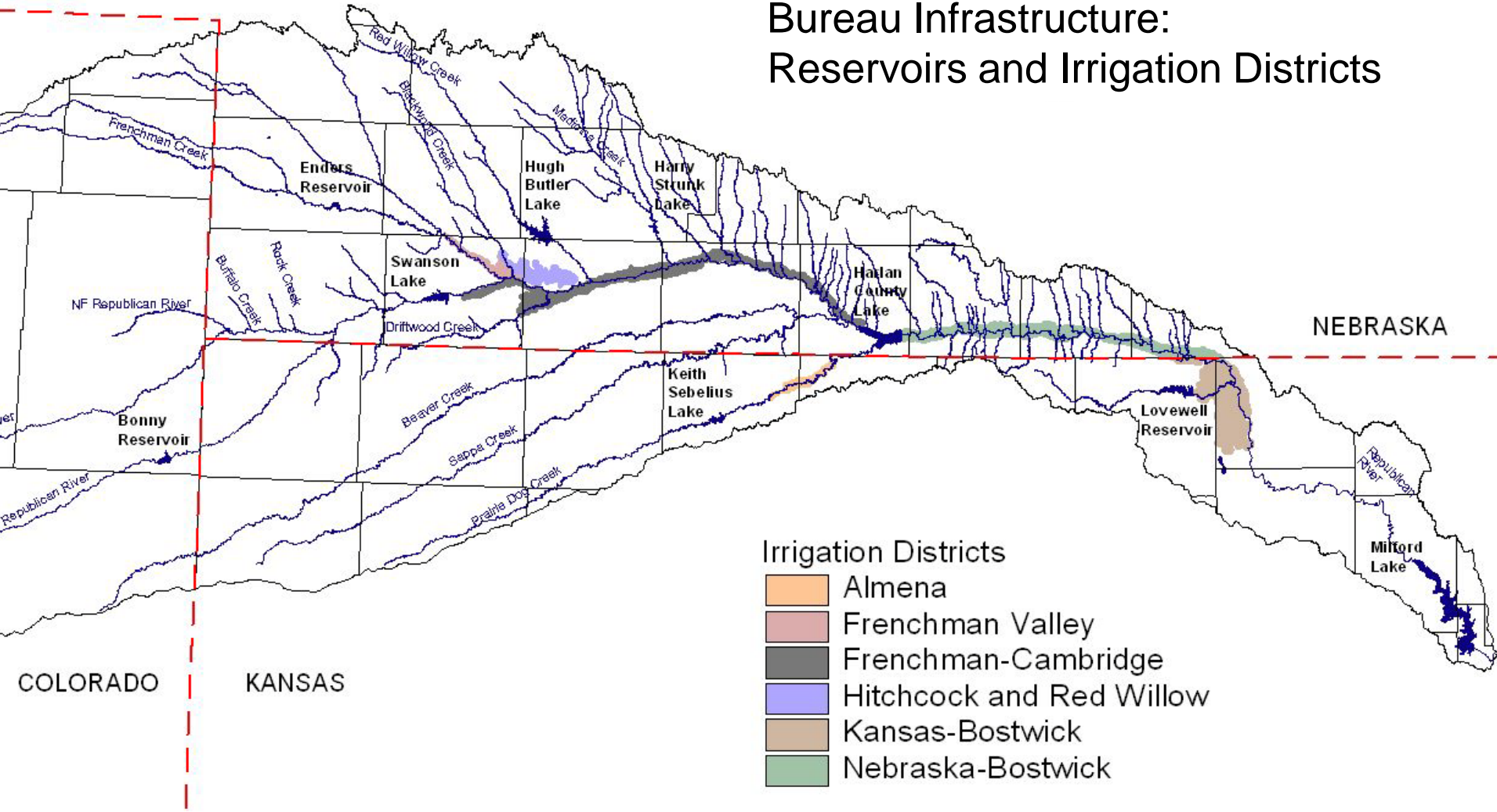
- County Seats
- Streams
- State Lines
- Lakes
- County Boundaries
- Basin Boundaries



Republican River Compact (1943)

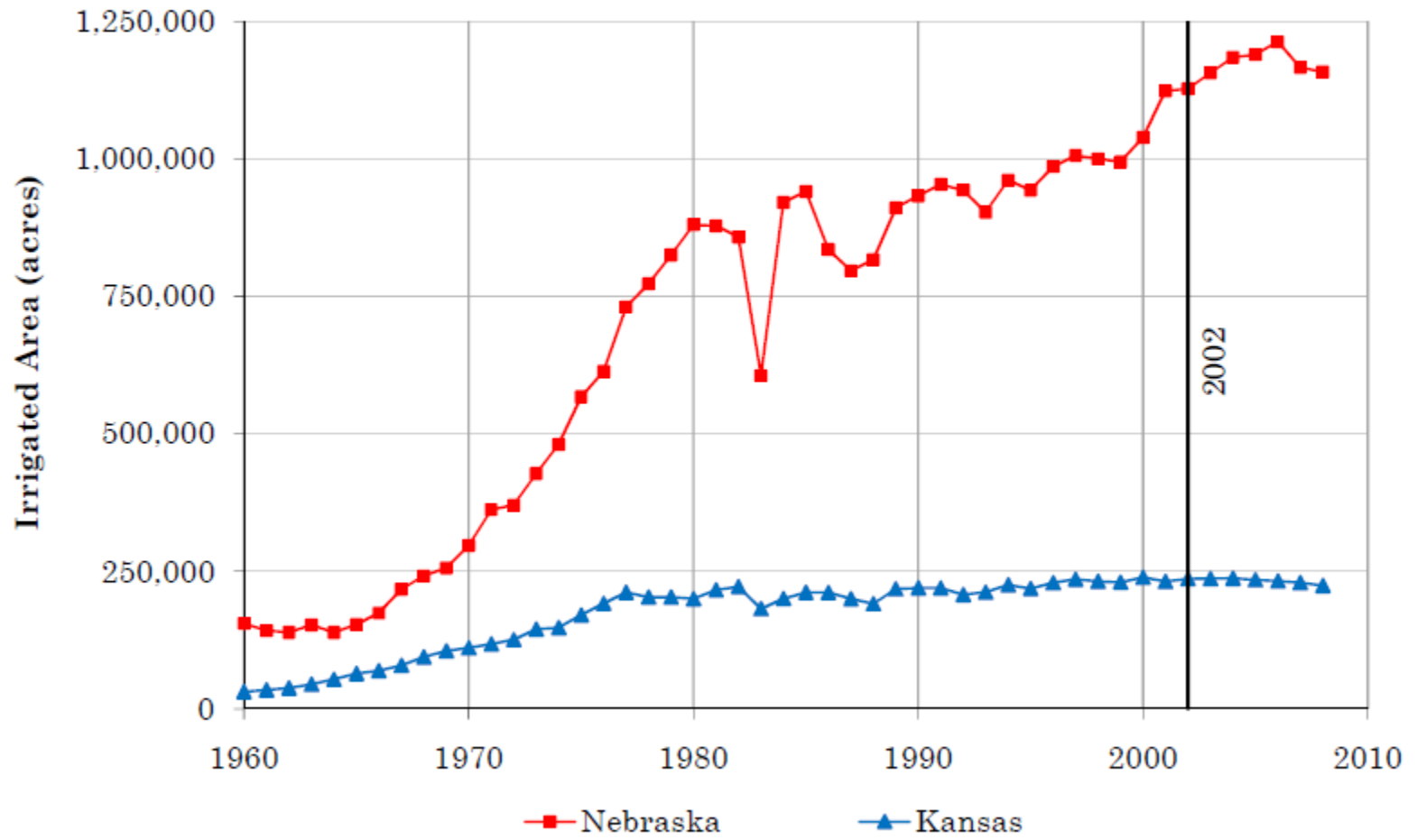
- Compact was formed as a prerequisite for federal flood control and irrigation projects
- Three States: Kansas, Colorado and Nebraska
- Approved by the States, Congress and the President
- Allocates 100 percent of the basin's water supply among the states.
- If one state uses too much, the downstream state is shorted

Bureau Infrastructure: Reservoirs and Irrigation Districts



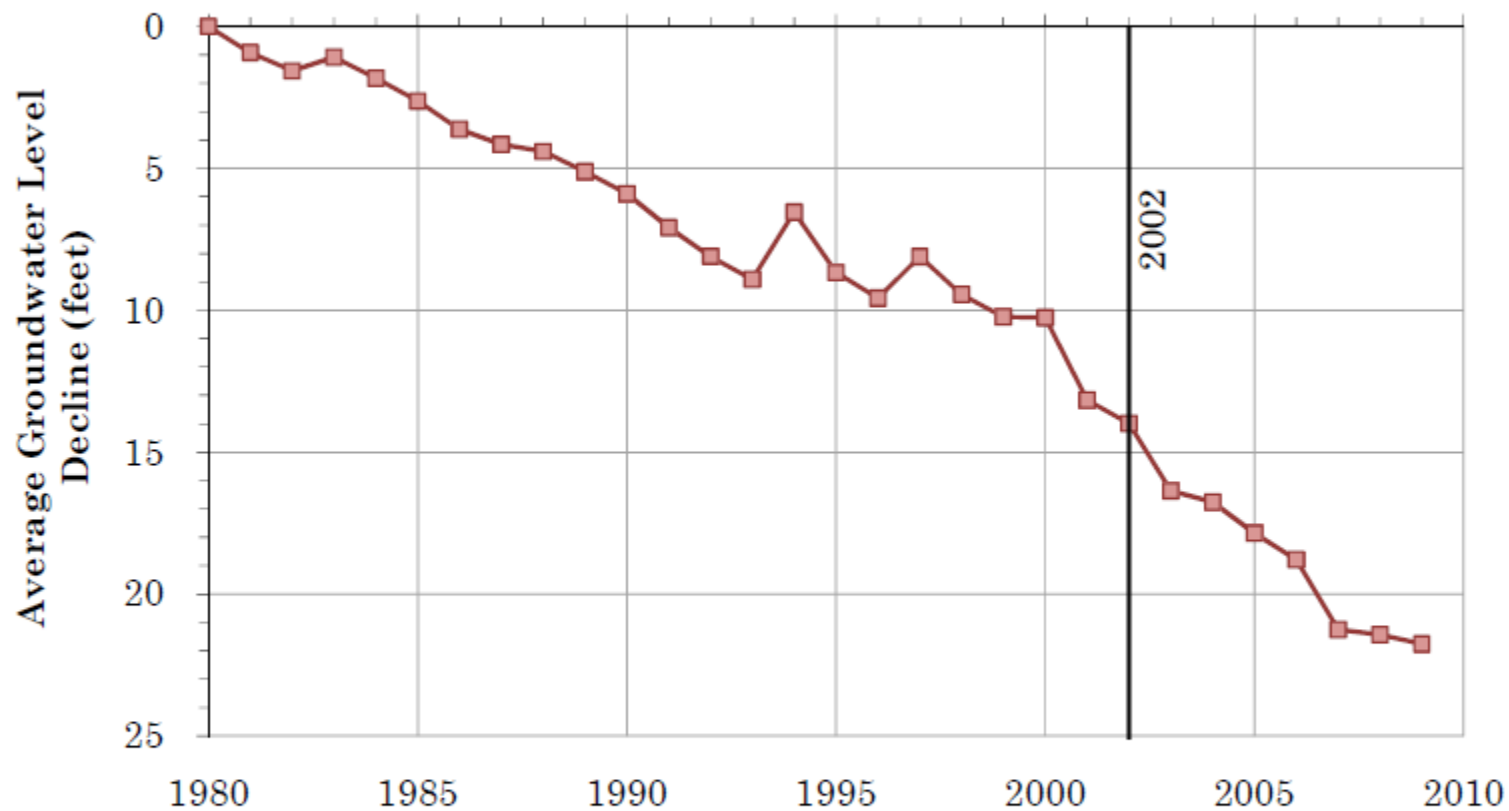
- Irrigation Districts**
- Almena
 - Frenchman Valley
 - Frenchman-Cambridge
 - Hitchcock and Red Willow
 - Kansas-Bostwick
 - Nebraska-Bostwick

Figure 5
Groundwater Irrigated Area
Republican River Basin, Nebraska and Kansas



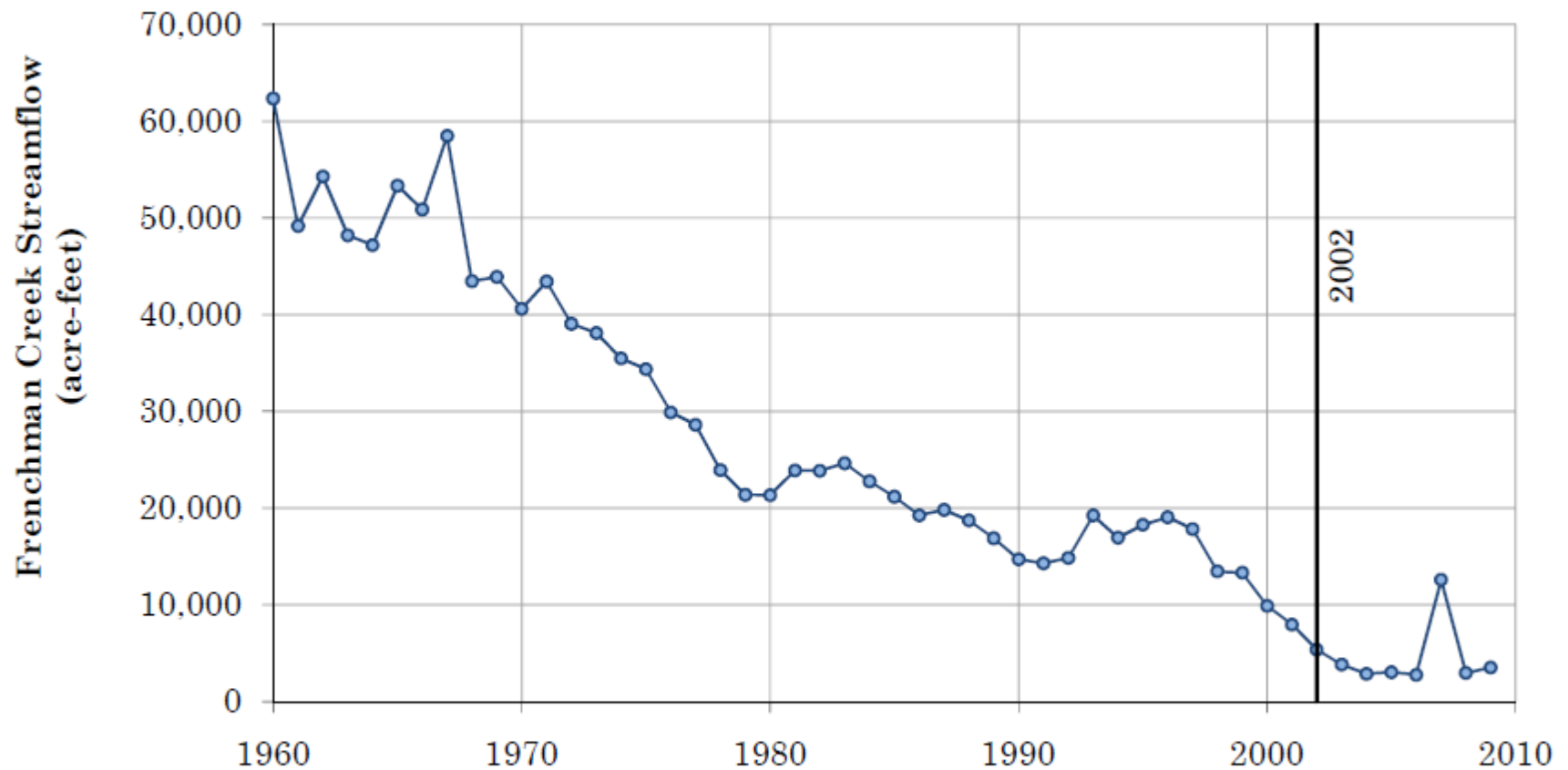
Source: Republican River Compact Administration Groundwater Model data.

Figure 2
Average Groundwater Level Decline
Upper Republican Natural Resources District, Nebraska



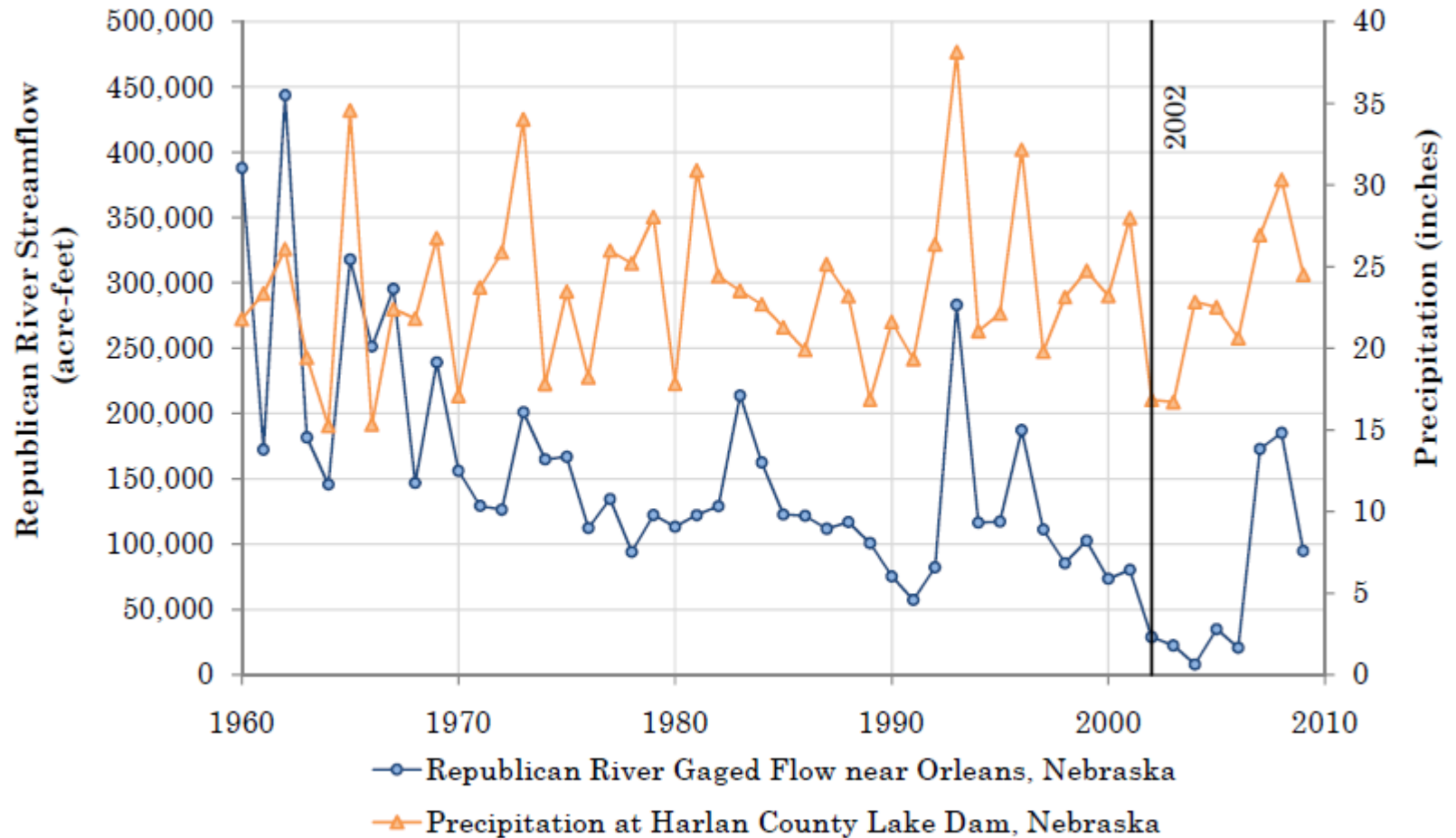
Source: United States Geological Survey National Water Information System
Note: Each data point represents the average for wells with data in 1980 and each corresponding year. Number of observations included in each average value varies from 190 to 238.

Figure 3
Frenchman Creek Annual Streamflow
Upper Republican Natural Resources District, Nebraska



Source: United States Geological Survey (1960 - September, 1994) and Nebraska Department of Natural Resources (October, 1994 - 2009), Gage 06831500 Frenchman Creek near Imperial, Nebraska

Figure 4
Annual Republican River Streamflow ⁽¹⁾ and Local Precipitation ⁽²⁾
Harlan County Lake, Nebraska



Source:

- (1) United States Geological Survey Gage 06844500 Republican River near Orleans, Nebraska
- (2) United States Bureau of Reclamation precipitation at Harlan County Lake Dam

Compact Enforcement History

Year	Issue
1980s - 1990s	Nebraska begins to overuse its share. Kansas seeks to address concerns via the Compact Administration
1998	Kansas files suit in U.S. Supreme Court. Nebraska asserts that the Compact does not include groundwater.
2000-2002	Court rules that groundwater pumping must be accounted for; States negotiate comprehensive settlement
2003	U.S. Supreme Court approves settlement
Settlement includes clear compact compliance requirements and jointly developed groundwater model/accounting methods	

The Final Settlement Stipulation (FSS)

- Kansas waives damages for pre-2003 violations of the Compact
- Provides methods for quantifying and allocating the water supplies of the Basin, using the RRCA groundwater model
- RRCA Groundwater model cooperatively developed
- Provides calendars of compliance:
 - Normal years: five-year test
 - Water-short years: two-year average test

Nebraska violated its first three compliance tests under the FSS:

Year	Nebraska's Overuse
2005	42,860 acre-feet
2006	36,100 acre-feet
Total	78,960 acre-feet

Nebraska Water Short Year Test for 2006

- Nebraska also failed its second water-short year test (2006-2007).
- Nebraska has failed its first five-year test as well (2003-2007) .
- Nebraska had four years to respond to the FSS, but took very limited action despite clear indications of overuse.

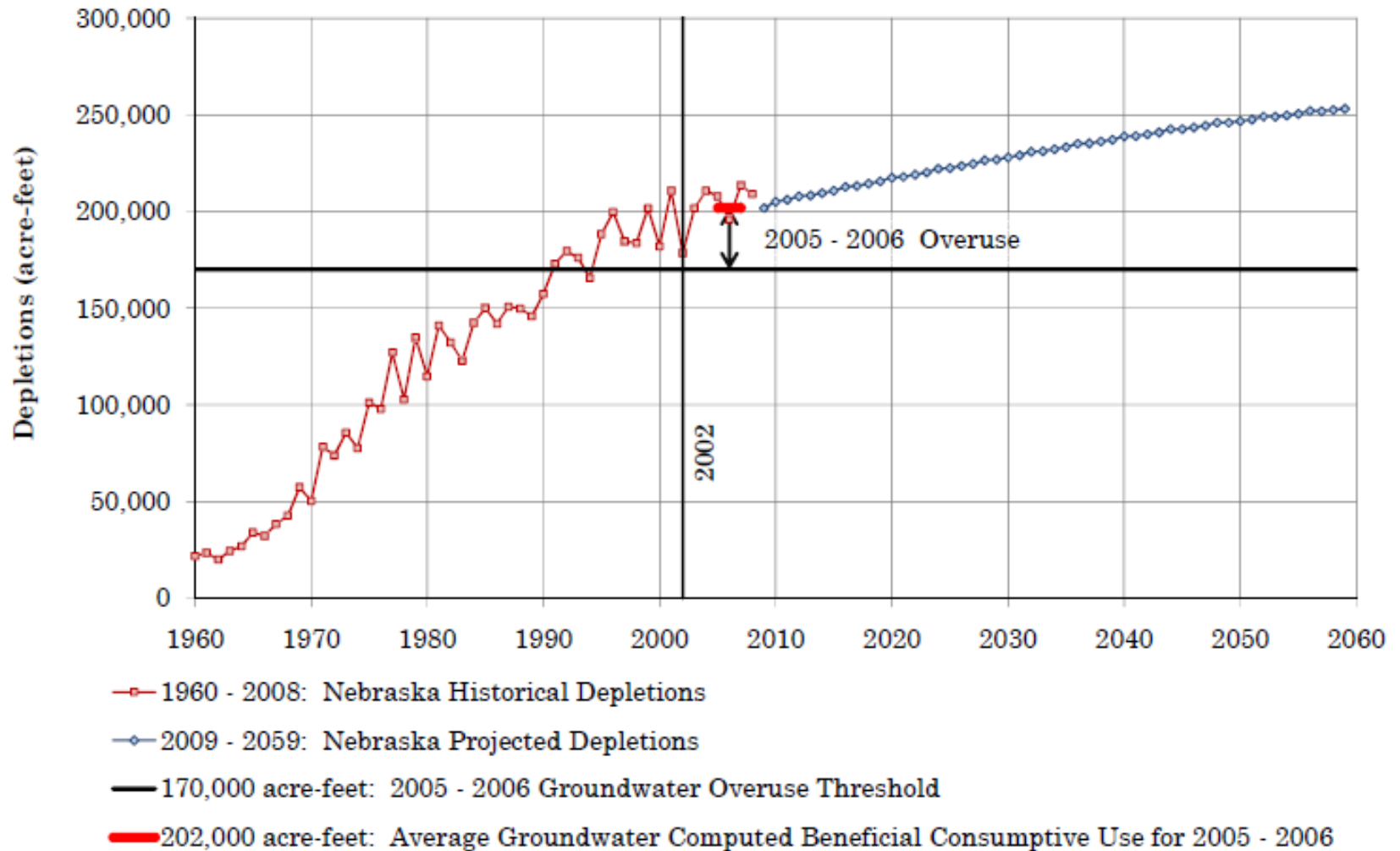
Kansas actions to enforce the Decree

- December 2007 - Kansas begins dispute resolution process before the Republican River Compact Administration (RRCA)
- July 2009 - Non-binding arbitration concluded
- Filing before the US Supreme Court, May 2010

What Kansas is seeking

- Significant reductions in groundwater pumping
- Damages
- River Master to superintend Nebraska's action
- Preset sanctions for further violations

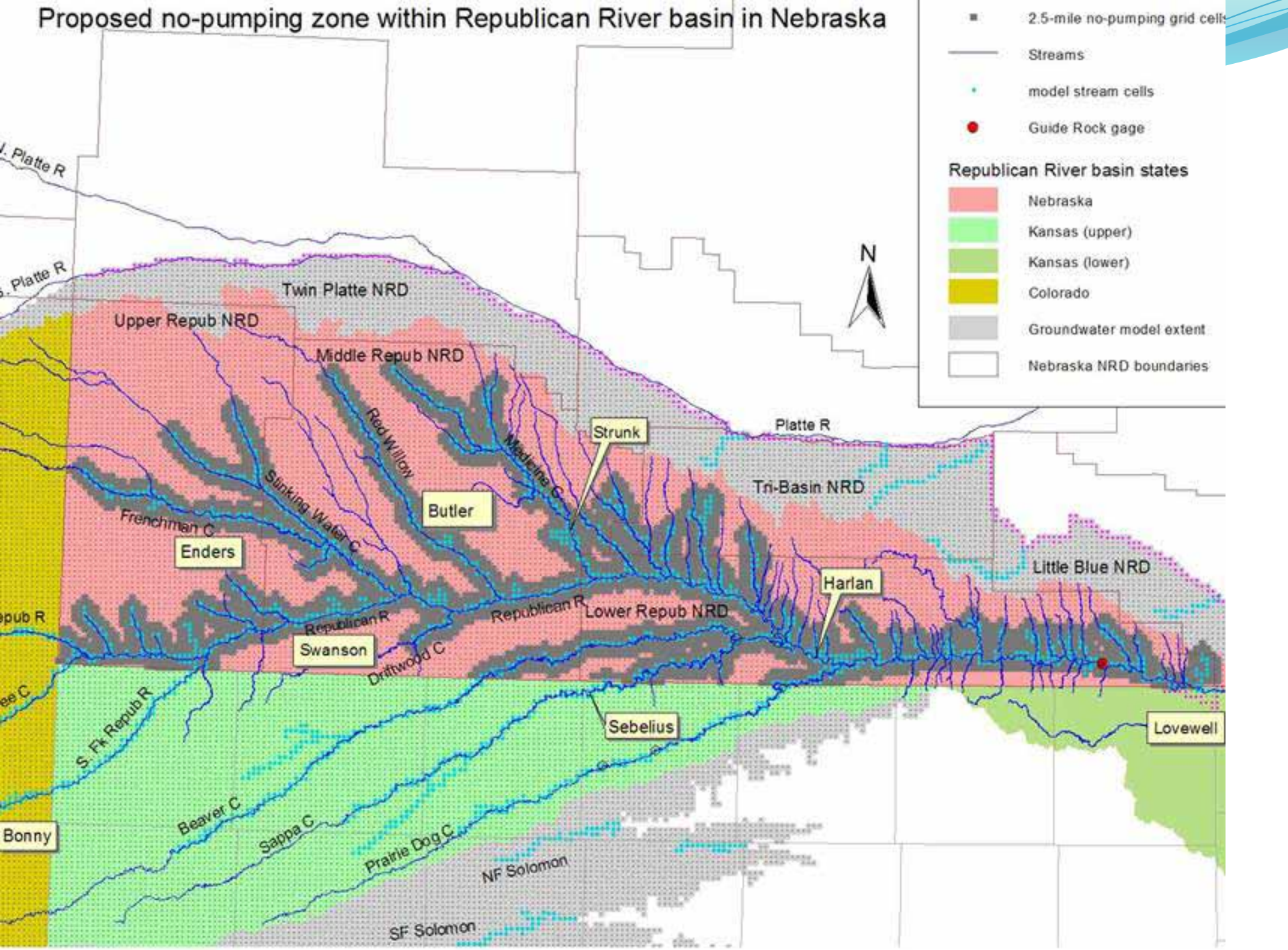
Figure 7
Depletions of Republican River Streamflow Above Guide Rock, Nebraska
By Nebraska Groundwater Pumping
Historical and Projected



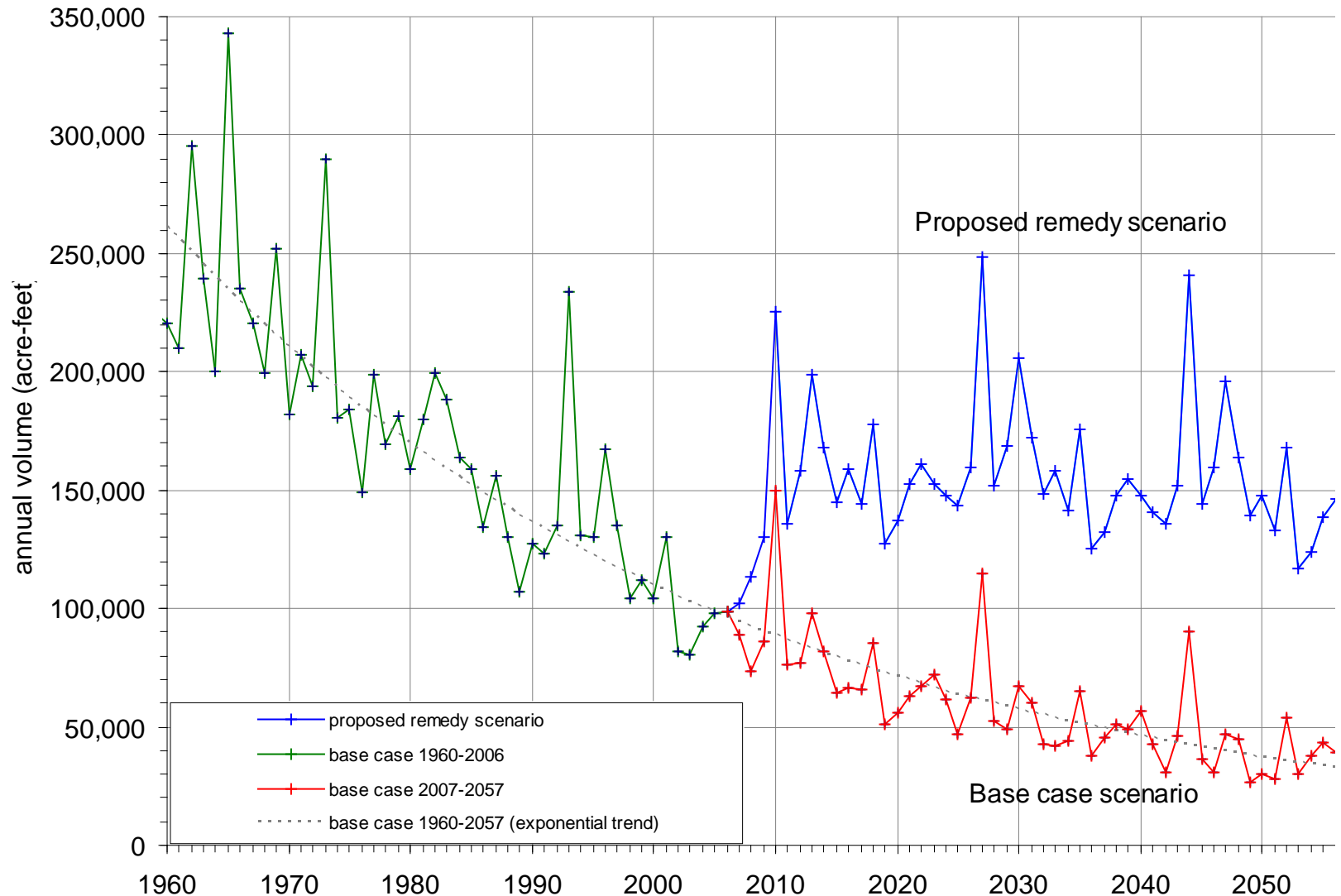
Source:

- (1) Historical Depletions - Republican River Compact Administration Groundwater Model results.
- (2) Projected Depletions - Republican River Compact Administration Groundwater Model results generally based on average conditions for years 1959 - 2008 and 2003 - 2008 average groundwater pumping per acre.

Proposed no-pumping zone within Republican River basin in Nebraska



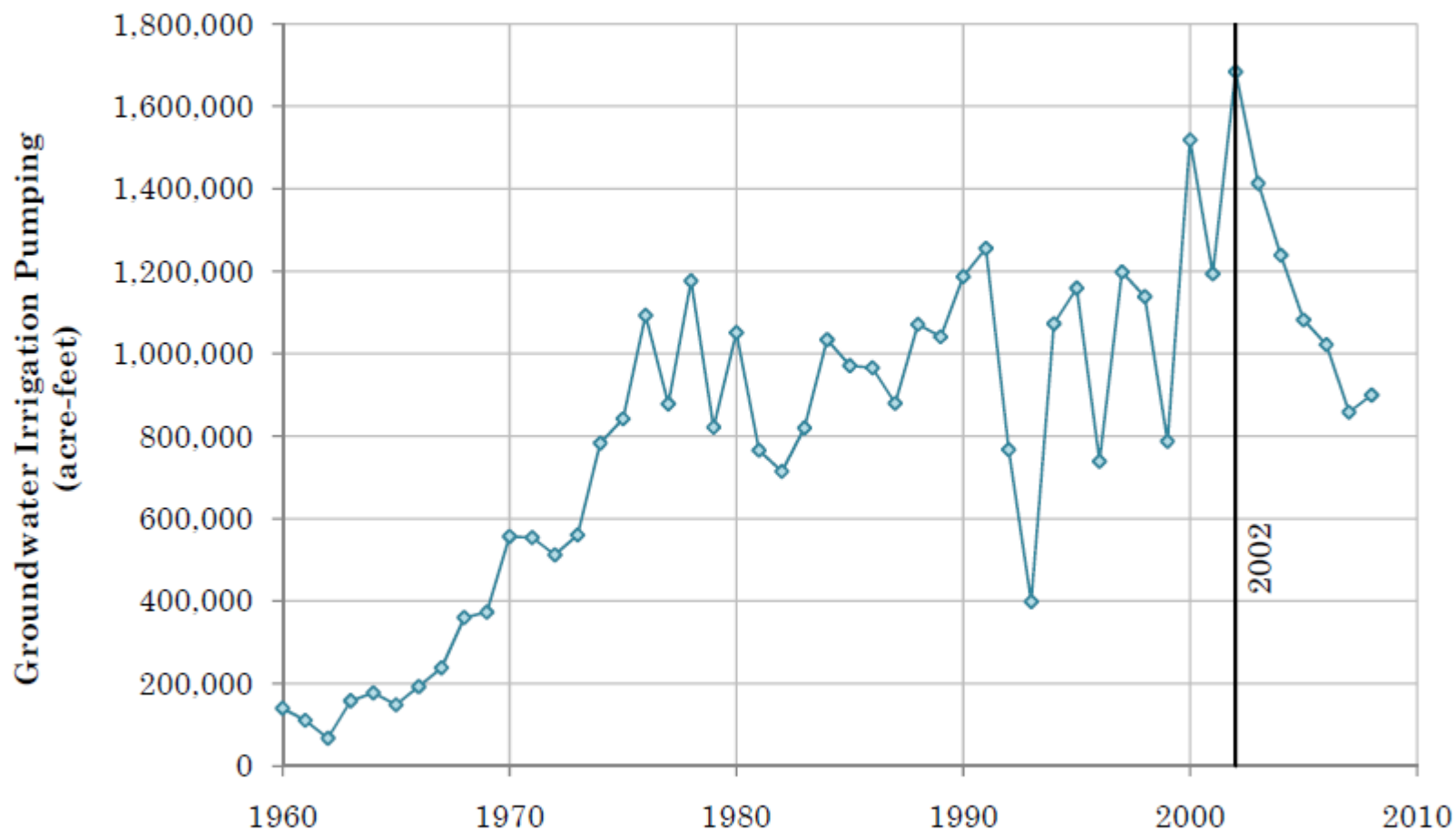
Baseflows - historic and future; with and without meaningful Nebraska action



Nebraska's current "compliance" is due principally to wet conditions

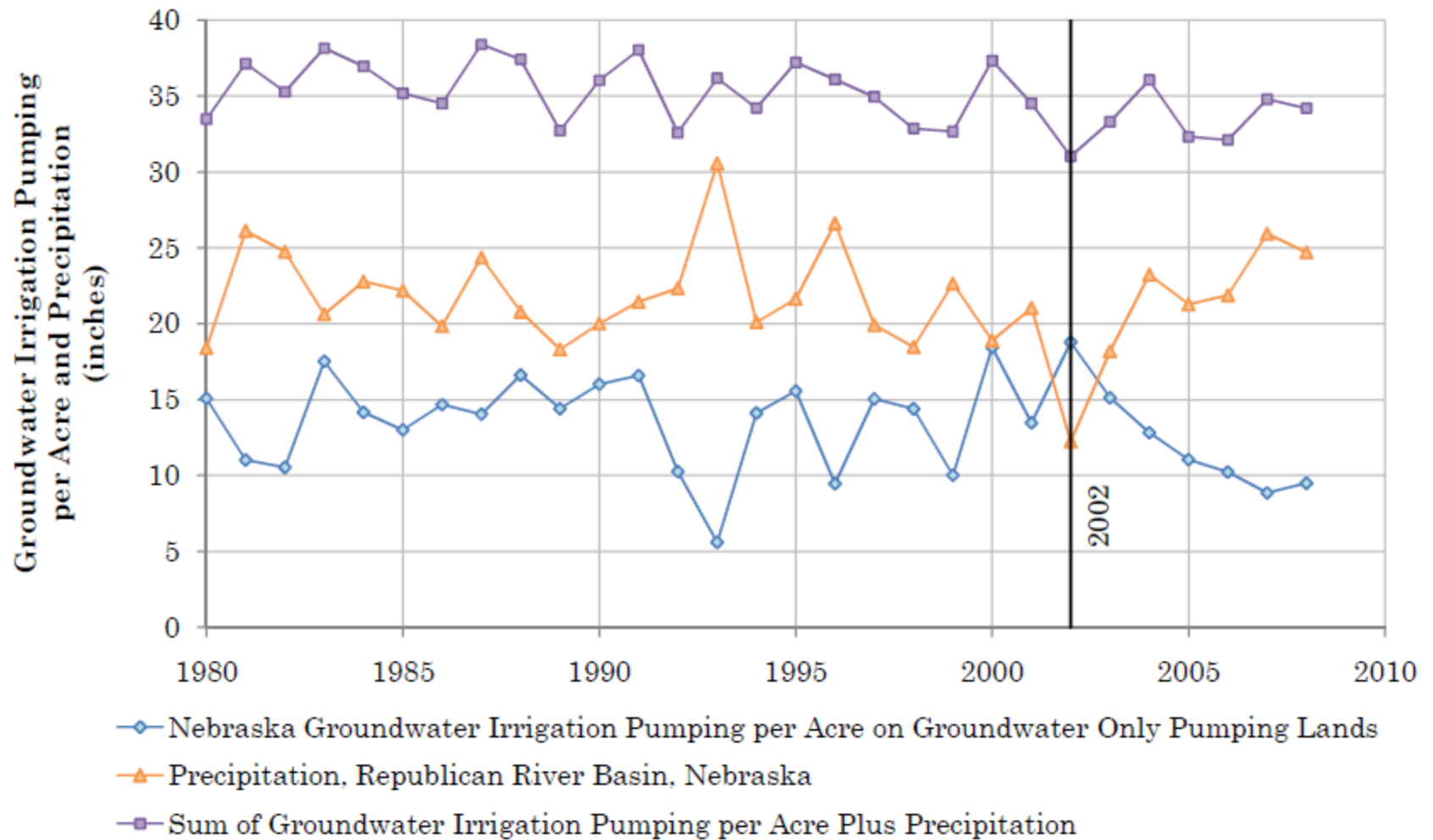
- Reductions in pumping since the peak of 2002 correspond with increased precipitation, which has reduced irrigation requirements.
- Water supply and allocation have increased since 2006
- Depletions to Basin water supply continue to grow.
- Consumptive use in Nebraska remains effectively unchecked.

Figure 6
Groundwater Irrigation Pumping by Nebraska
Republican River Basin, Nebraska



Source: Republican River Compact Administration Groundwater Model data.

Figure 8
 Nebraska Groundwater Irrigation and Precipitation
 Republican River Basin, Nebraska

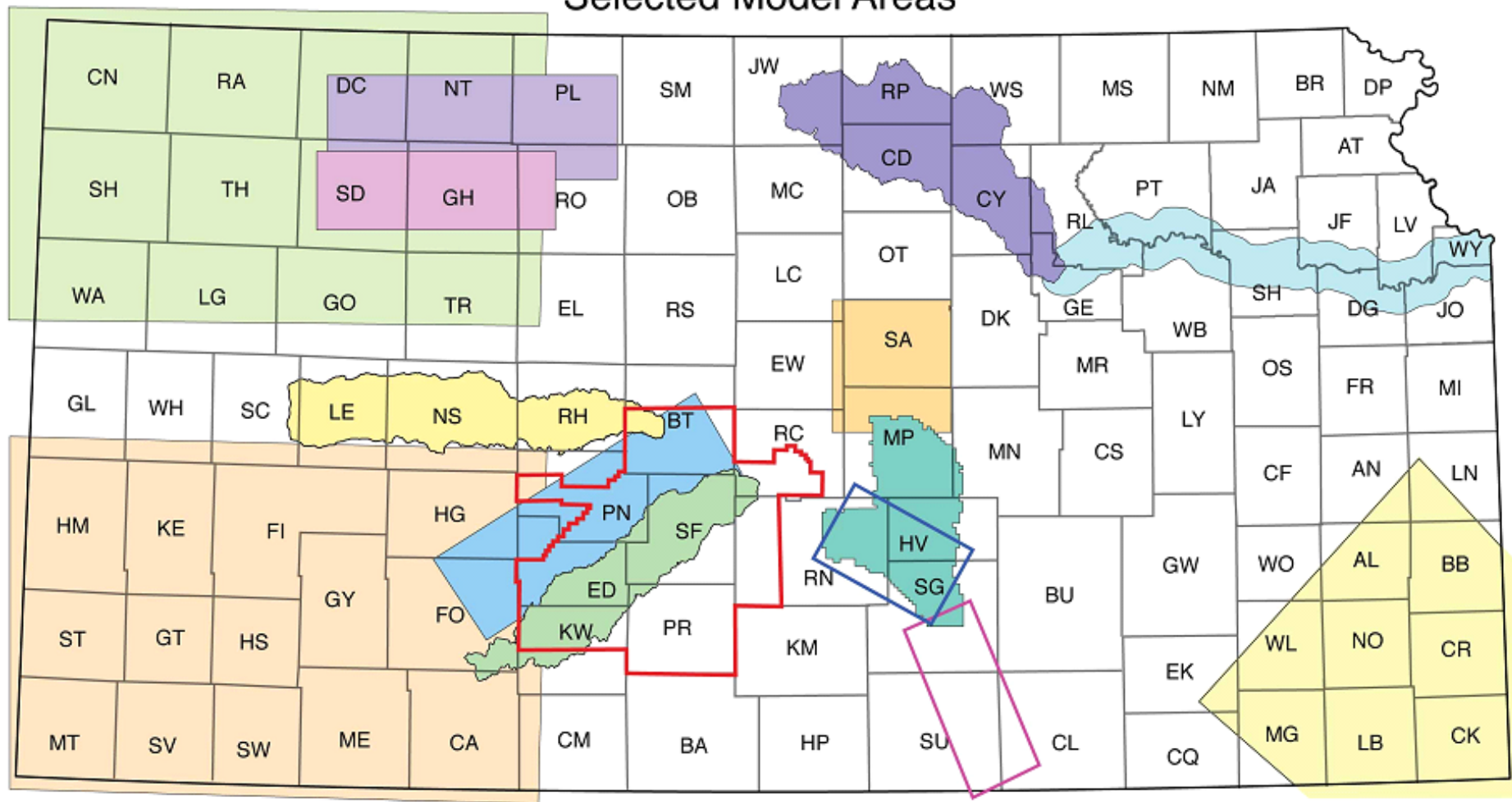














Source: Republican River Compact Administration Groundwater Model data.

Over-development of water resources not unique to Nebraska

- Nebraska not alone in allowing its water resources to be over-developed.
- Colorado over-developed its groundwater resources in the Arkansas River valley above Kansas. As a result of Kansas vs Colorado, less than half the groundwater irrigated acres continue.
- While Kansas fully in compliance with its obligations under the Republican River Compact, it too has areas which are over-developed.

Selected Model Areas



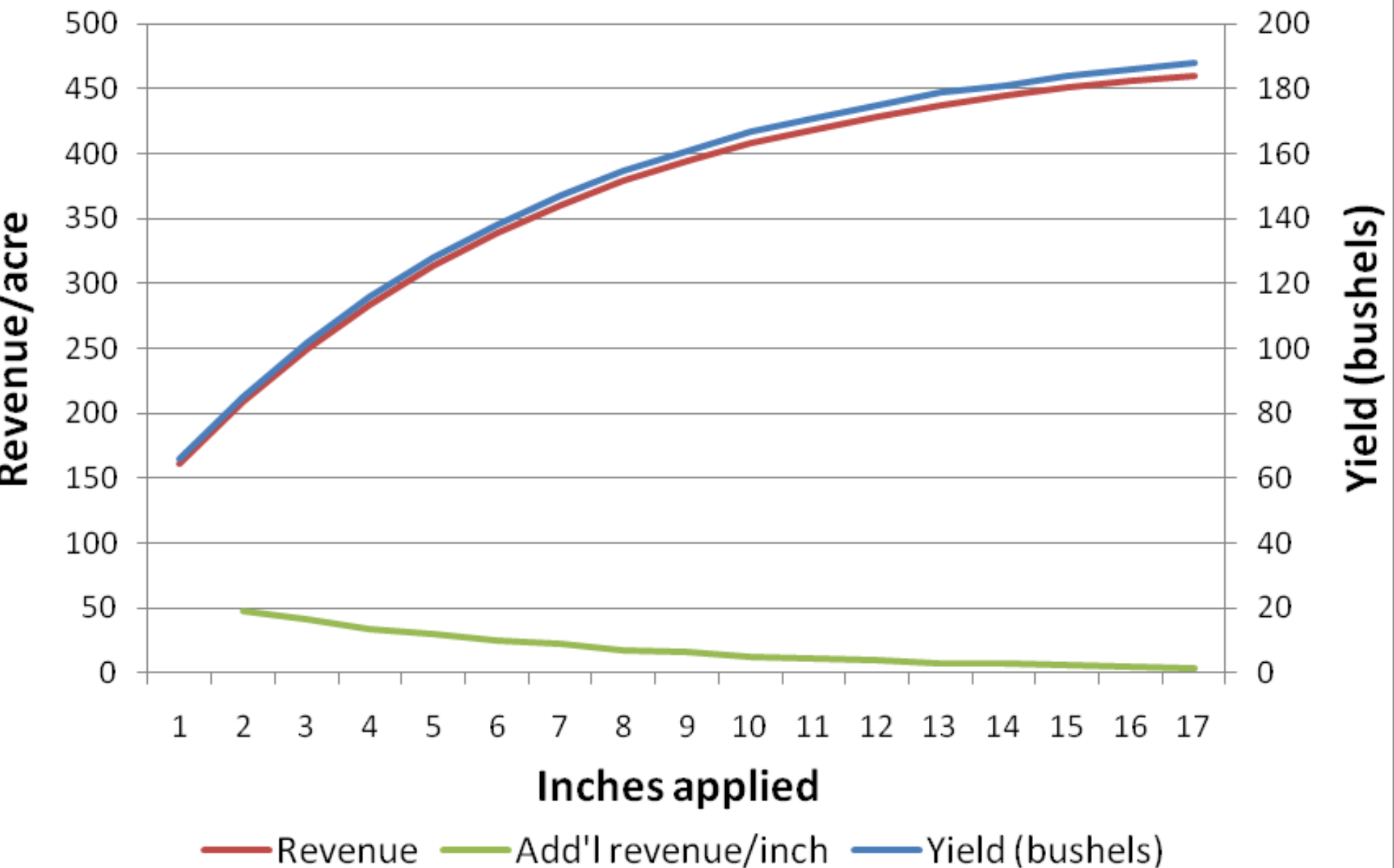
- | | | |
|---|---|---|
|  GMD 3 Models |  Equus Beds Model |  Middle Arkansas Model |
|  GMD 5 Model |  Smoky Hill Model |  Ozark Plateau Model |
|  Upper South Fork Solomon Model |  Rattlesnake Creek Model |  Wichita ASR Model |
|  Upper North Fork Solomon Model |  Wet Walnut Model |  Lower Arkansas Model |
|  Northwest Kansas Model |  Republican Model |  Kansas River Corridor |

Economic analysis/modeling

- Does irrigation scheduling save water?
 - No, it allows irrigators to maximize profits with a given resource.
- Do more efficient irrigation systems save water?
 - No, but it does typically leads to greater profits, less waste
- Diminishing incremental revenue with each additional inch applied (law of diminishing returns)

Yield and Revenue vs inches applied

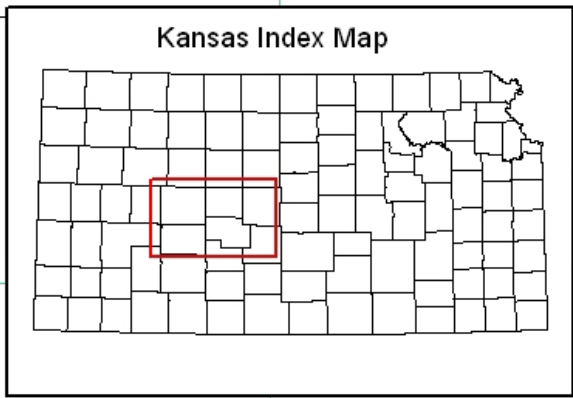
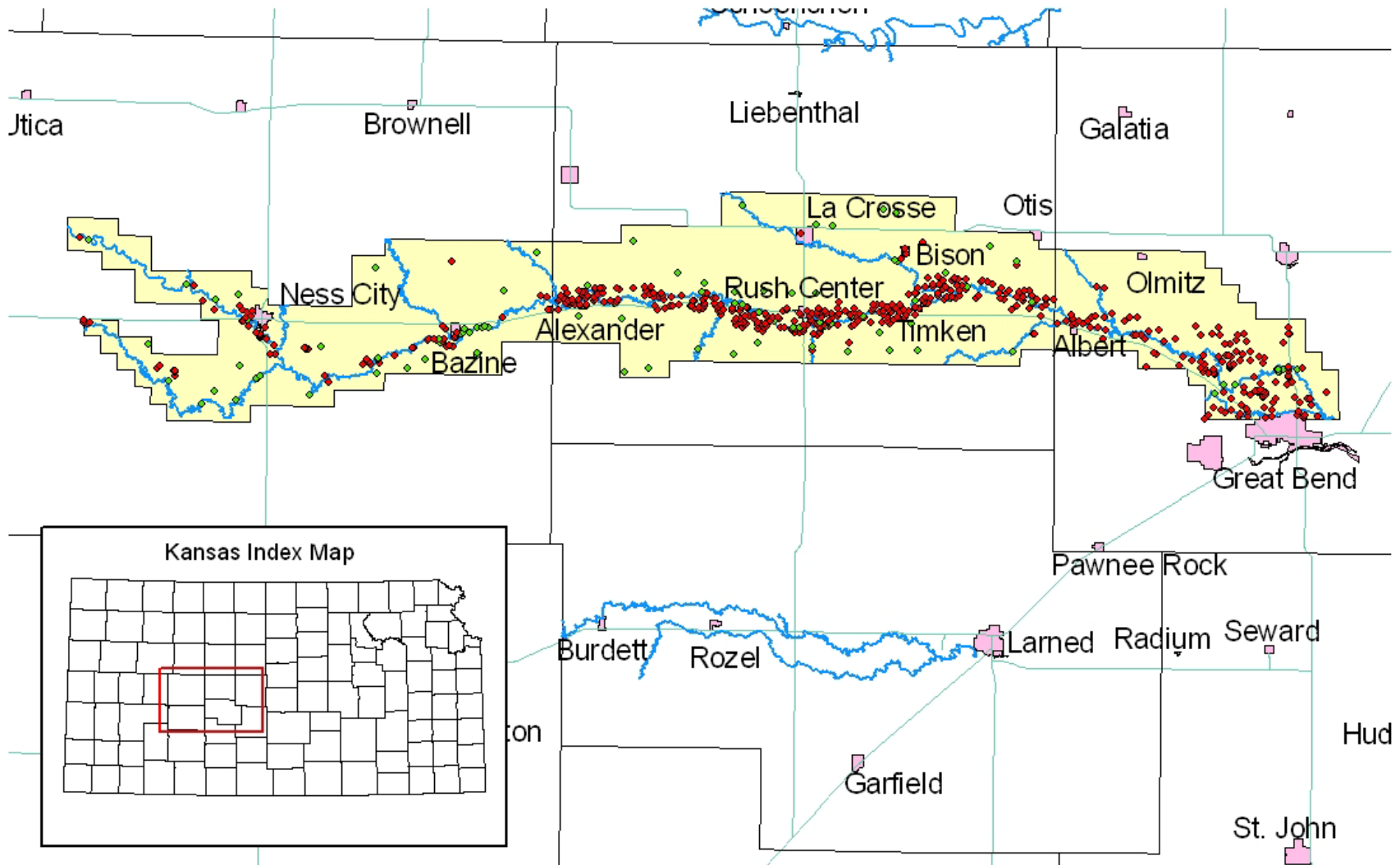
(From work of Bill Golden and others; Pawnee County)



Lessons learned from a Kansas Intensive Groundwater Use Control Areas (IGUCA)

- IGUCA's are a water management tool that works in conjunction with the Kansas Water Appropriation Act
- Provides alternatives to strict administration of water rights by priority
- Allows for flexible solutions
- Chief engineer can amend an IGUCA in the public interest

Walnut Creek IGUCA



Kansas Department of Agriculture
Division of Water Resources
October 18, 2007



0 3.75 7.5 15 Miles

Walnut Creek IGUCA Corrective Controls

- Long-term sustainable yield is 22,700 acre-feet/year
 - No reduction in vested rights
 - Senior rights: 12 inches to 14 inches
 - Junior rights (44 % of the allocations for senior rights, 5.25 to 6.25 inches)
- Five-year allocations
- Similar reductions in other uses (municipal/industrial)

Economic Impacts May Not Be Permanent ?

💧 Wet Walnut Creek IGUCA Study

Figure 5. Time Series Comparison of the Indexed Values of Irrigated Crop Revenue

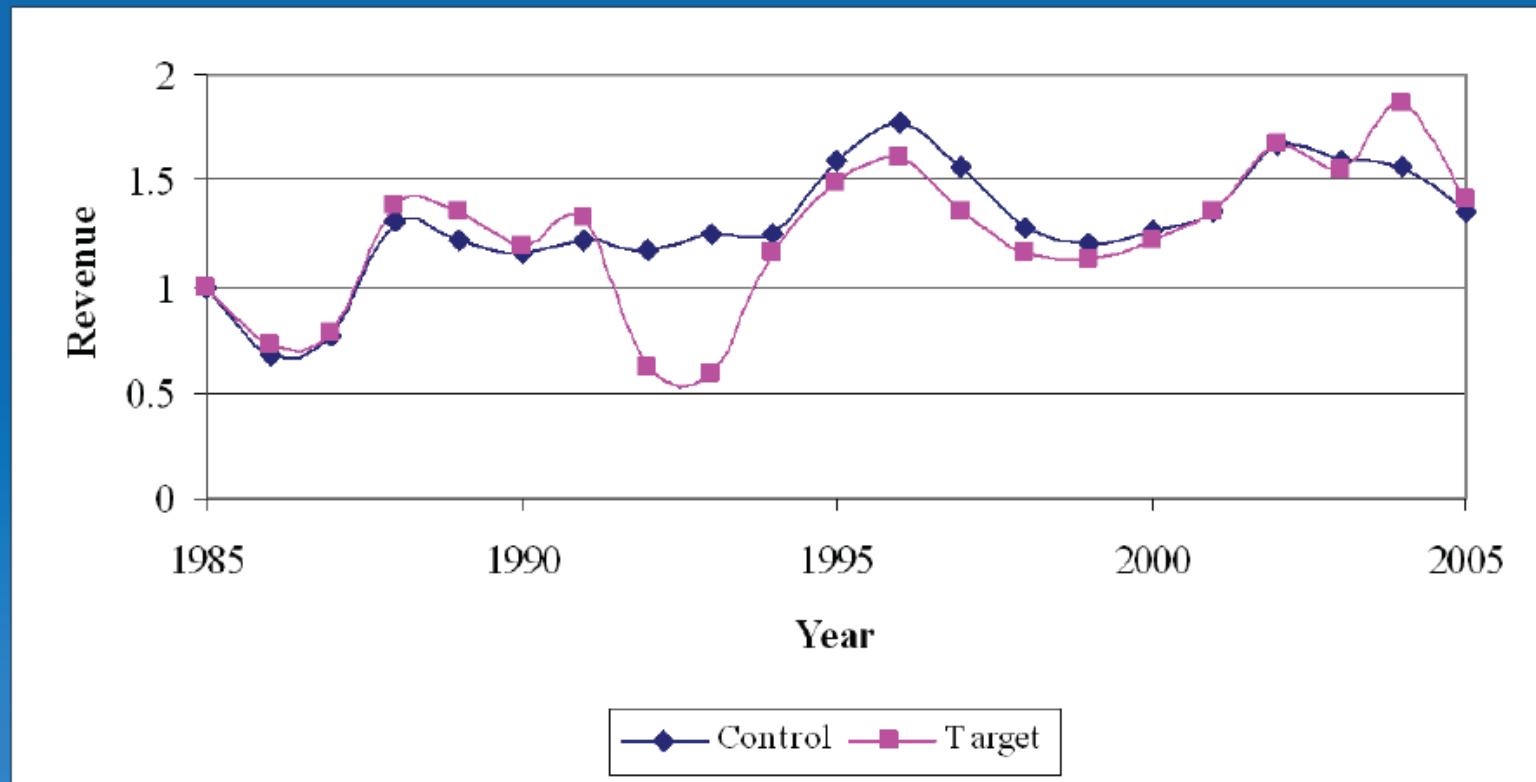
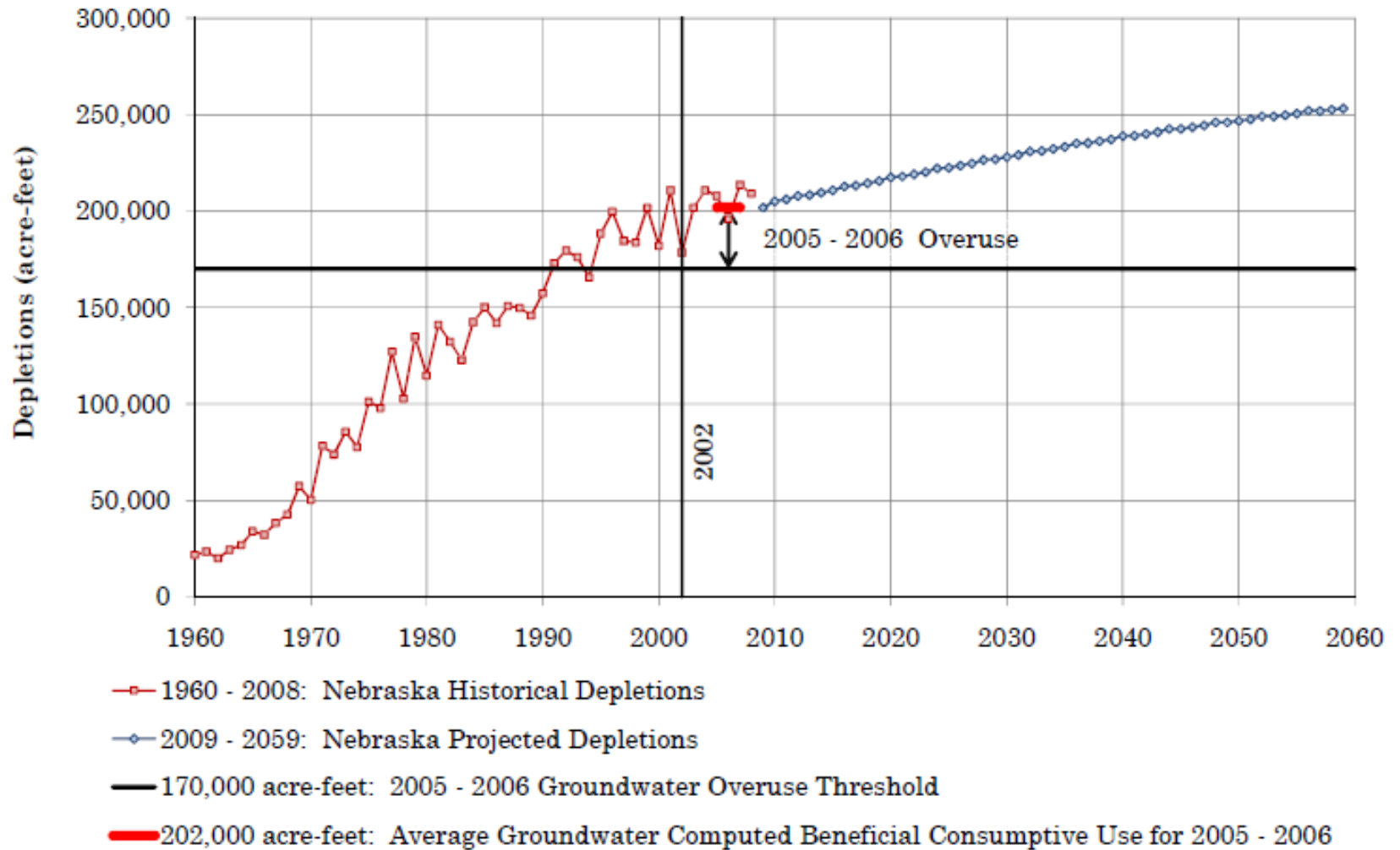


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Questions?