Case Study: FWS-Kansas Quivira National Wildlife Refuge

Brian Caruso, PhD, PE
Chief, Water Resources Division
U.S. Fish and Wildlife Service, Region 6

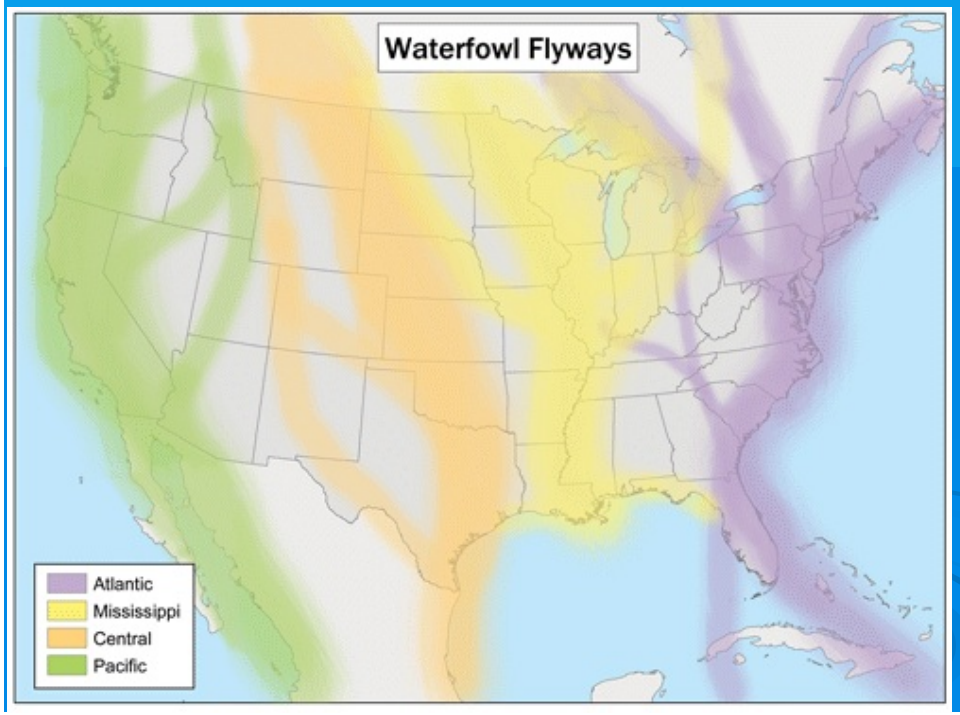
WSWC-WestFAST Non-Tribal Federal Water Rights Workgroup
State-Federal Relationships through the Implementation Phase
of Decreed and Adjudicated Water Rights
Albuquerque, NM, October 18, 2017

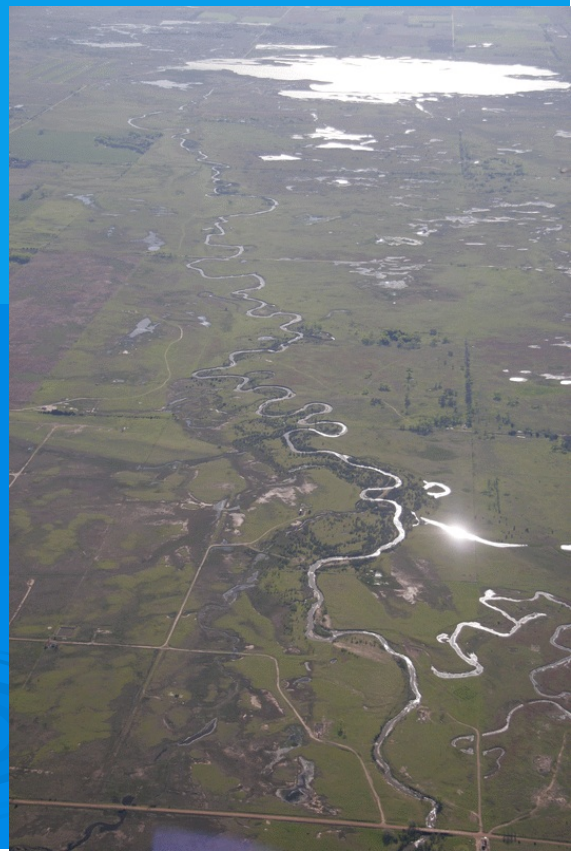
Outline

- Background and System Description
- Water rights
- Water issues
- Partnership steps
- Management alternatives
- Outcome
- Current Status

Located in south-central Kansas and is dependent on groundwater and surface water to maintain 34 marsh units

Refuge was established in 1955 to protect migratory waterfowl. It's 7,000 acres of wetlands attract hundreds of thousands of ducks and geese annually. Its location in the middle of the Central Flyway places it in the primary pathway for many species of migrating shorebirds.





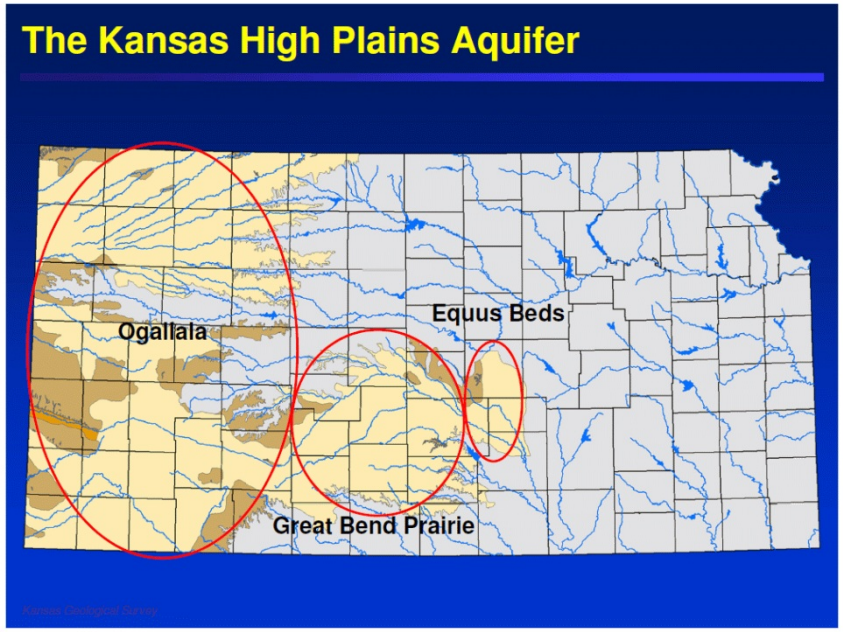
Designated as a:

Wetland of International Importance by the Ramsar Convention on Wetlands
Globally Important Bird Area by the National Audubon Society and American Bird Conservancy
Western Hemisphere Shorebird Reserve Network site, used by more than 30 shorebird species
Critical habitat for the endangered Whooping crane; and State Critical Habitat for interior least terns, snowy plovers, and Arkansas darters

Attracts an estimated 65,000 visitors annually

System Description

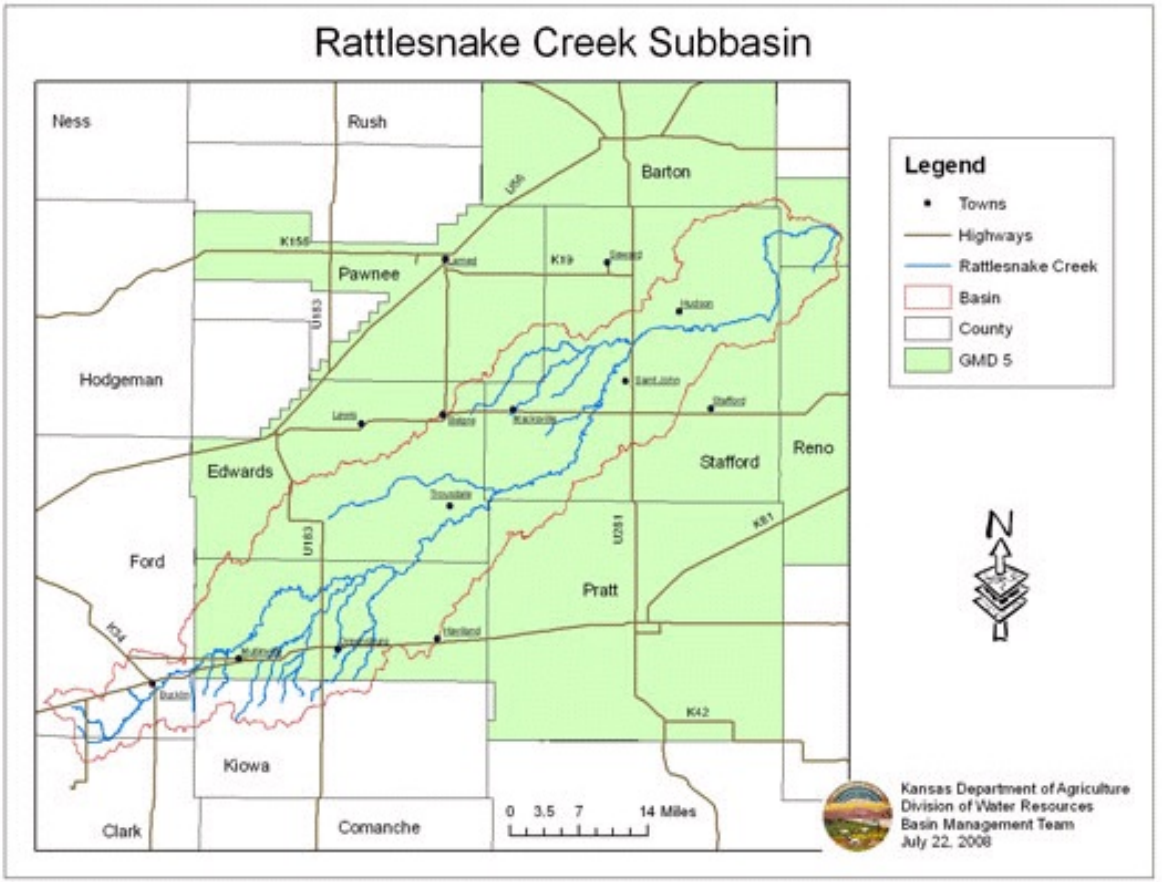
- Located in the High Plains/Great Bend Prairie aquifer
- Natural groundwater upwelling at the Refuge
- Groundwater is salty because it is in contact with saline Permian bedrock
- Salt marshes existed prior to European settlement and were enhanced by hunting clubs and later by the Service



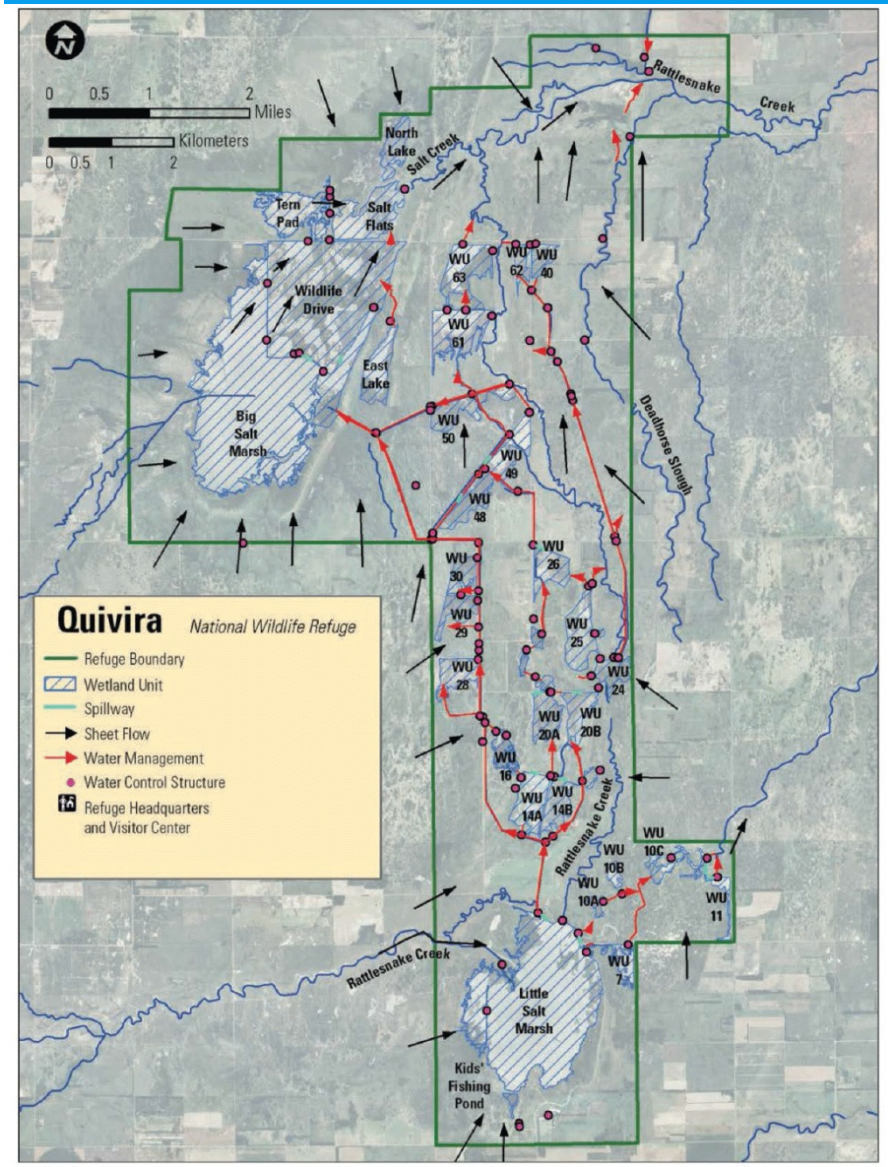
Big Salt Marsh/Quivira NWR

- Rattlesnake Creek provides fresh water
- 21 miles of canals and numerous water control structures divert water to over 34 wetlands ranging in size from 10 to 1,500 acres and totaling over 6,000 acres of marshlands.

At the Zenith gage on Rattlesnake Creek:
Mean Annual Discharge:
42.1 cfs (30,500 ac-ft)
Median Annual Discharge:
29.2 cfs (21,100 ac-ft)



Water Rights

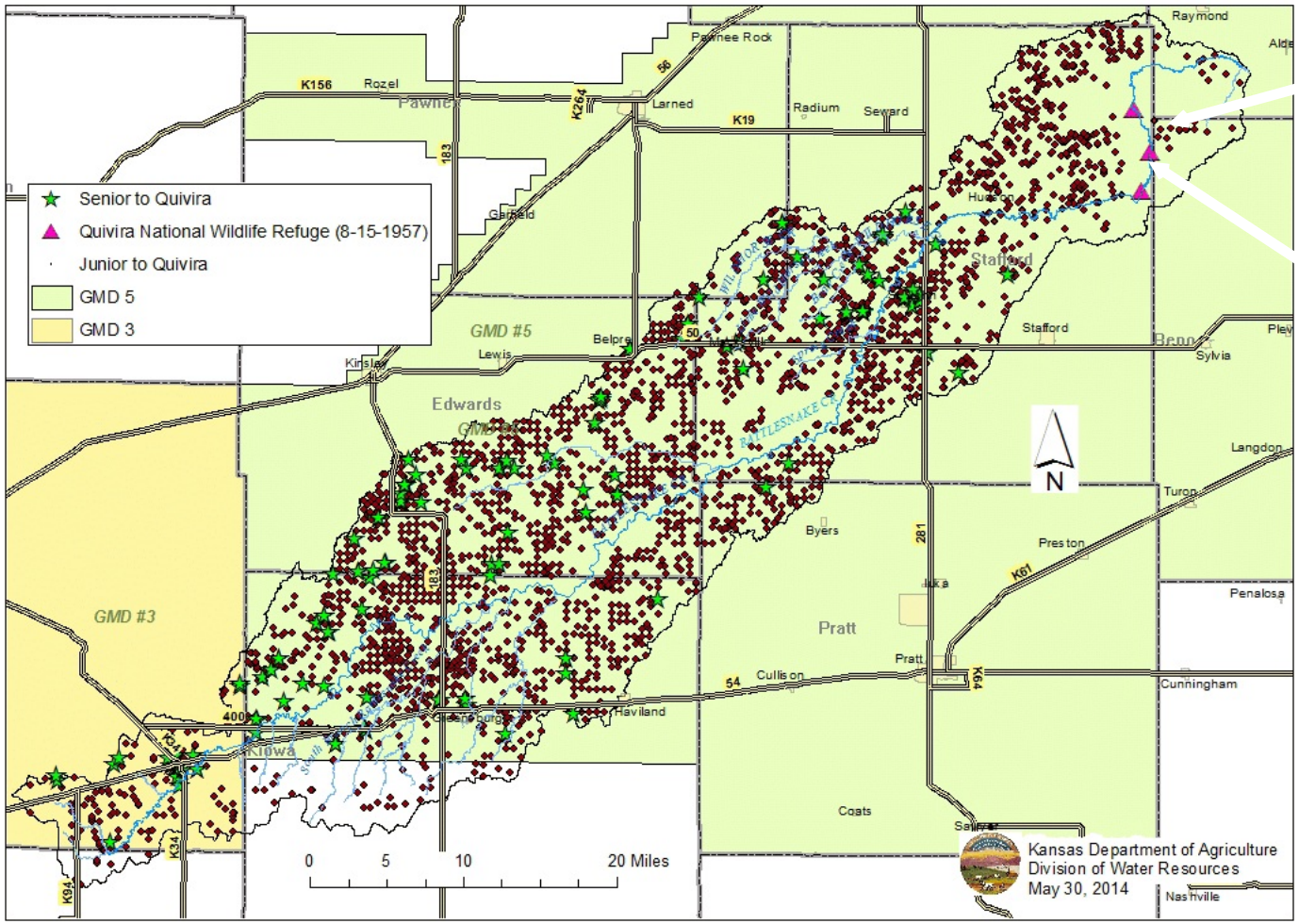


- State-based
- One surface water right with a priority date of 1957 for 14,632 a-f at a rate not to exceed 300 cfs
- 3 points of diversion – 1 on Rattlesnake Ck to Little Salt Marsh, and 2 on refuge

Water Issues

- Large scale Center Pivot Irrigation increased exponentially in the 1970's
- Depletion in stream flow first identified in mid 1980's
- Groundwater pumping was depleting streamflow in Rattlesnake Creek
- Saltwater intrusion identified as a growing problem
- Could not show impact was from any particular well or wells – Needed better science
- Minimum desirable streamflow
- Local water users got concerned

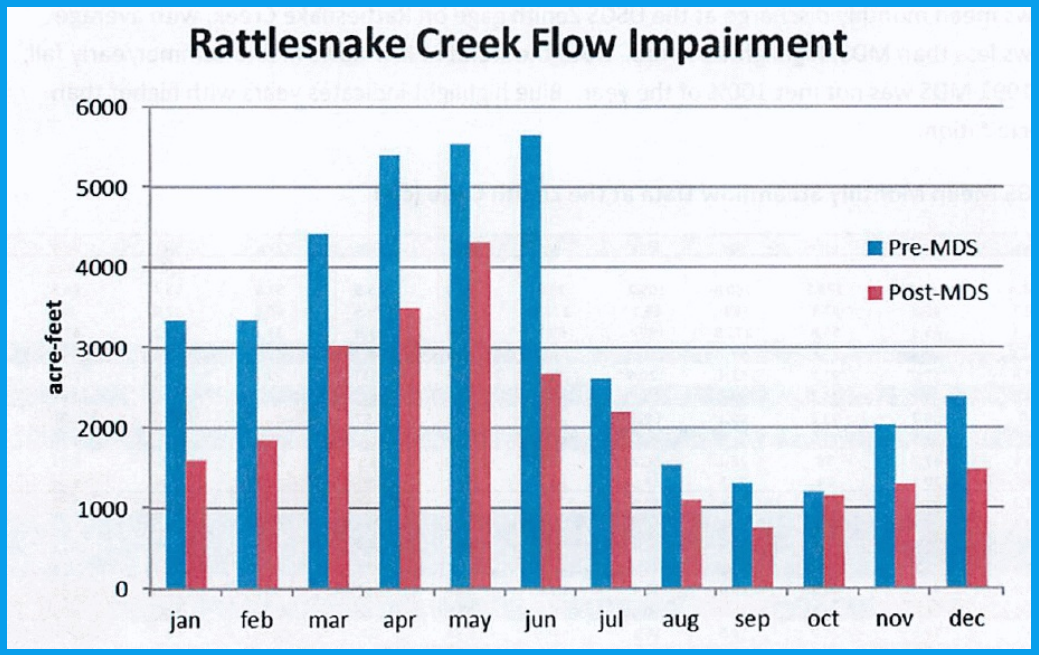
Points of Diversion within the Rattlesnake Creek Basin

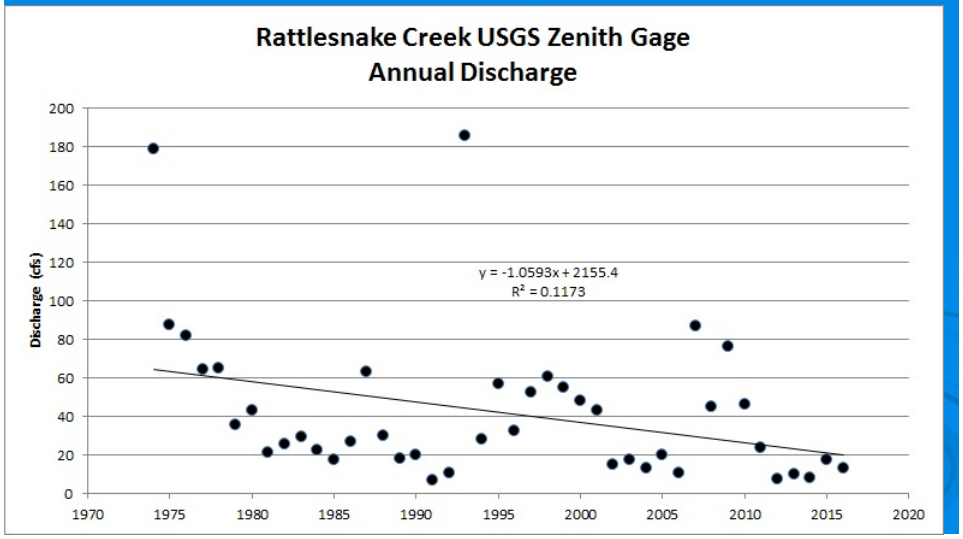


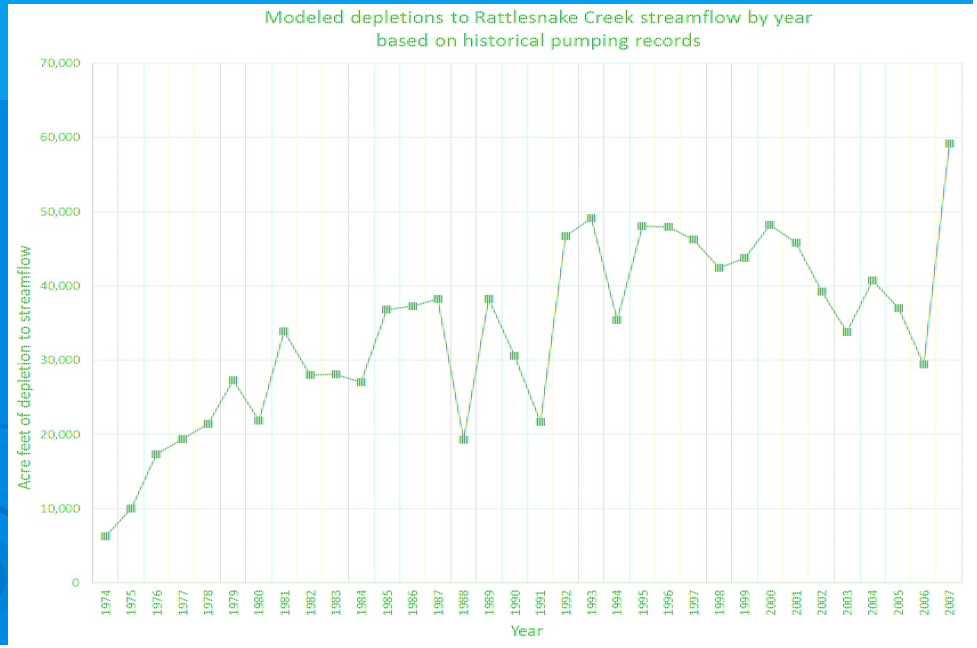
Quivira NWR

Rattlesnake Creek

Salt Creek Marsh


Rattlesnake Creek Flow Impairment
acre-feet
6000
5000
4000
3000
2000
1000
0
jan
feb
mar
apr
may
jun
jul
aug
sep
oct
nov
dec
Pre-MDS
Post-MDS


Rattlesnake Creek USGS Zenith Gage
Annual Discharge
Discharge (cfs)
y = -1.0593x + 2155.4
R² = 0.1173
200
180
160
140
120
100
80
60
40
20
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020


Modeled depletions to Rattlesnake Creek streamflow by year
based on historical pumping records
Acre feet of depletion to streamflow
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year

- **Quivira Partnership** was formed in 1994
- Largely in reaction to nearby State Wildlife Area Cheyenne Bottoms, which had similar issues and for which the first IGUCA (Intensive Groundwater Use Control Area) in Kansas was established by Sate Engineer
- WaterPACK, GMD#5, Kansas DWR, and the Service were members of the Partnership
- Goal to protect the Service's water right and reduce irrigation water use, while minimizing impacts to the agricultural economy/maintaining economic stability of the area
- Tried to develop an incentive-based plan for groundwater use reductions

Partnership Steps

- DWR formed subbasin management team – problem of over-appropriation of groundwater was across mid- and western Kansas
- Partners met for 7 years
- Kansas DWR paid for development of a groundwater model as basis for determining water use reductions
- WaterPACK lobbied successfully for money for Service to do a water resources study
- Study showed there weren't many viable alternatives
- Refuge used remaining money to fill borrow areas and remove trees

Steps (cont.)

-
- Delineation, prioritization, and establishment of 7 management areas
- Reached agreement on reduction goals for each area using an array of programs in 2000 – signed by Chief Engineer
- Total reduction in groundwater pumping to be achieved over 12-year period was 27,346 acre-feet
- 4-year reviews took place every year with state taking the lead

Management Alternatives

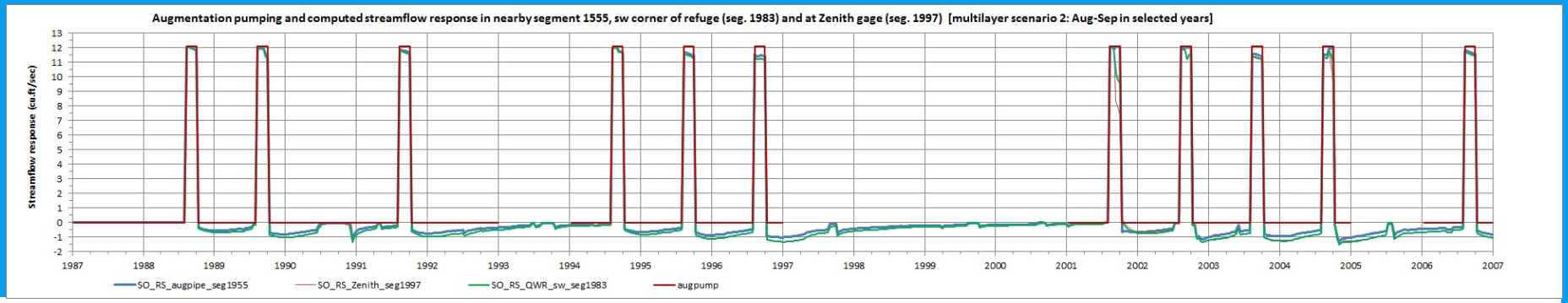
- Water rights buy-back
- Water banking
- Water transfers
- Conservation practices
- End-gun removal – more evap and losses from end-guns
- 5-Year Rolling Water Right – flexibility to use more water in drought and less in wet years
- Increased compliance and enforcement – well metering/monitoring and reporting requirements

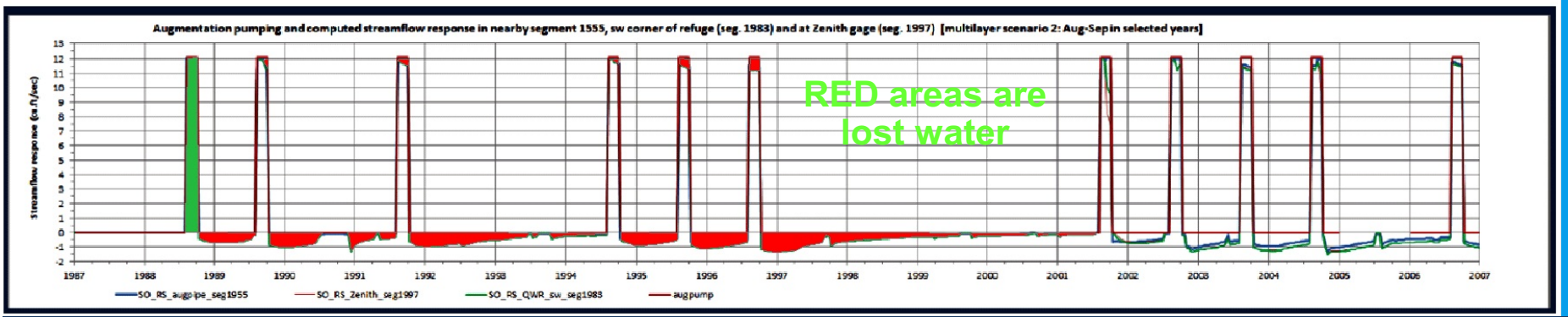
Outcome

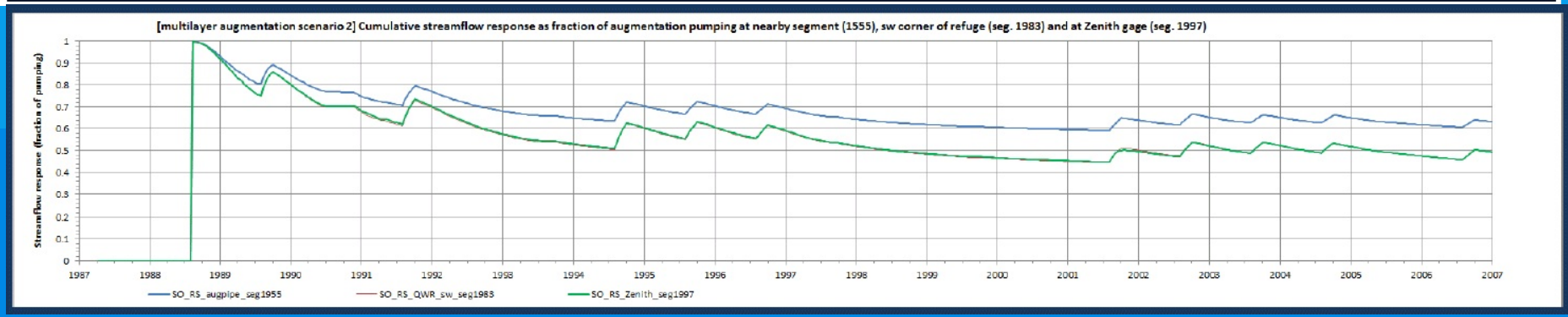
- Little progress over the years
- Groundwater levels continue to decline even with several years of above-average precipitation
- 25-cfs - January goal at Zenith USGS gage has not been met
- Groundwater use has increased
- Rattlesnake Creek goes dry at times during some summers
- State Engineer produced Impairment Report in 2015 showing:
- Over the 34 years reviewed, shortages were greater than 3,000 acre-feet in 18 years, particularly during periods of limited water supply. Groundwater reductions and/or augmentation will be needed to increase available streamflow at the Refuge by 3,000 to 5,000 acre-feet on a regular basis.

Current Status

- Preliminary augmentations plans developed by GMD#5 but rejected by FWS
- FWS submitted a Form to Secure Water in January 2017
- State Engineer is working with GMD#5 and others to develop a plan that includes augmentation and groundwater pumping reductions
- GW model being used to evaluate alternatives to meet goals
- Plan expected by the end of 2017







Augmentation Pumping and Streamflow

Gaining	10866
Losing	6130
Percent Gain	43.6
Percent Loss	56.4

Summary

- Partnership formed more than 20 years ago, so FWS and Kansas have been working together on this a long time
- Unfortunately FWS needed to submit a form to secure water
- Still a state-based process – hopefully will have better results in the future