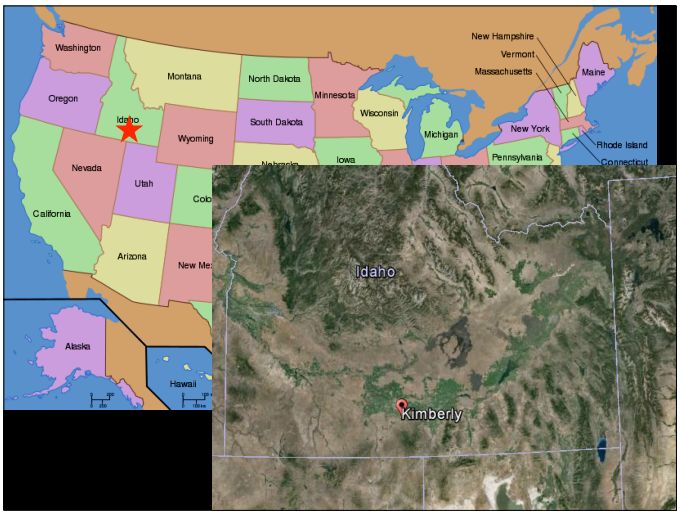
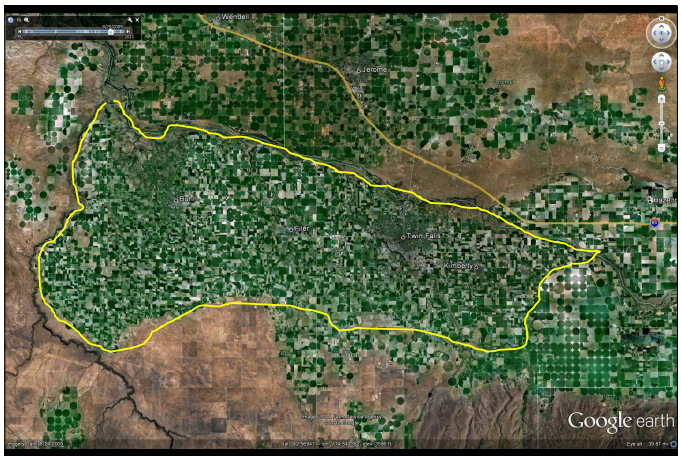
Water quality trends in irrigation return flow from a southern Idaho watershed

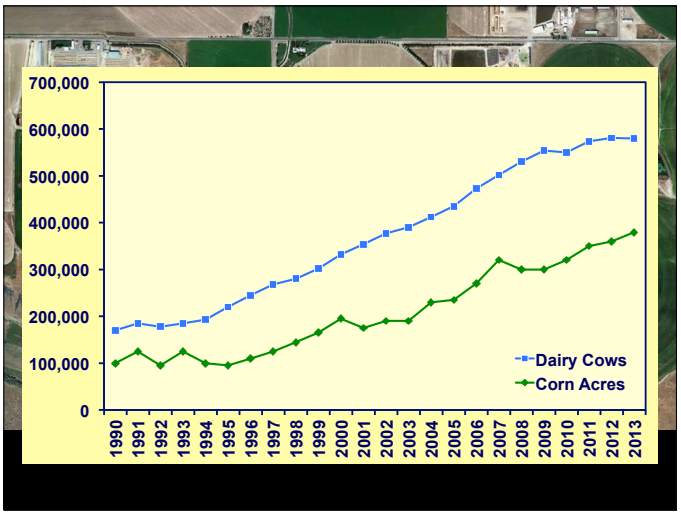
Dave Bjorneberg, Anita Koehn, Jim Ippolito
Northwest Irrigation and Soils Research Lab
Kimberly, ID

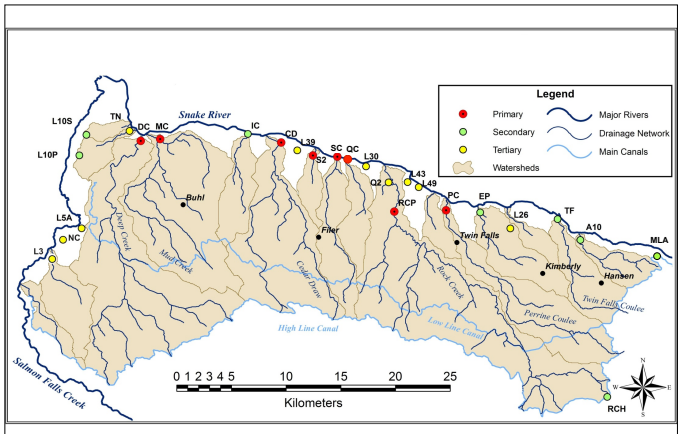
USDA Agricultural Research Service





Upper Snake Rock Watershed
August 2009

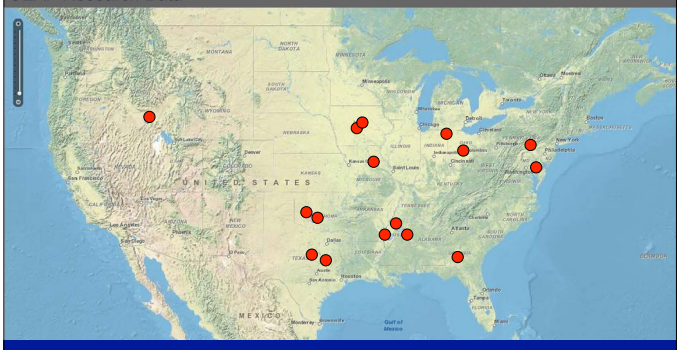




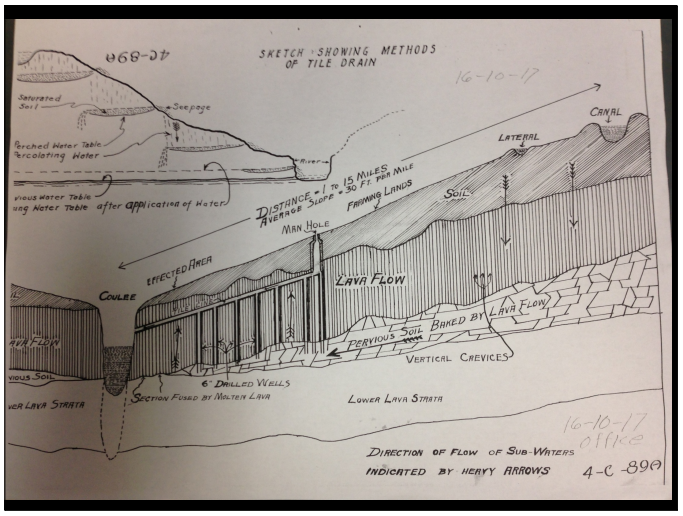
- 2 inflow and 24 return flow sites monitored from 2005-2008 for the Conservation Effects Assessment Project (CEAP).
- 8 return flow sites from 2012 to present.

USDA/ARS STEWARDS

CEAP Research Data



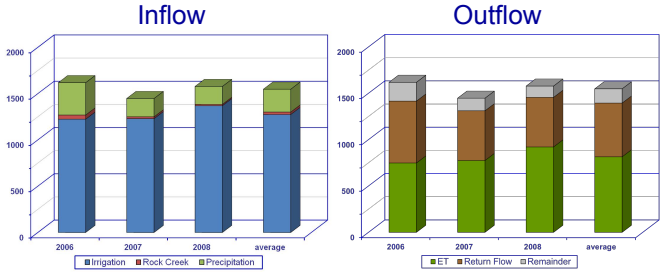
CEAP – Determine the role of agricultural conservation practices and programs in achieving clean air and water, healthy soils, and functioning habitat for wildlife.



Upper Snake Rock Watershed – Idaho

1. **82,000 ha (85% cropland).**
   - 180 km of main canal (>1000 cfs, 30 m^3/s)
   - 1500+ km of laterals (10 to 50 cfs, 0.3 to 1.4 m^3/s)
3. **Irrigation water diverted from Snake River by Twin Falls Canal Company since 1905.**
4. **95% of crop land was furrow irrigated before 1990, about 60% furrow and 40% sprinkler in 2008.**
5. **250 mm annual precipitation, 90 mm May to Sept.**
6. **Daily rainfall >20 mm only six times from 2005-2008, five times in 2005.**

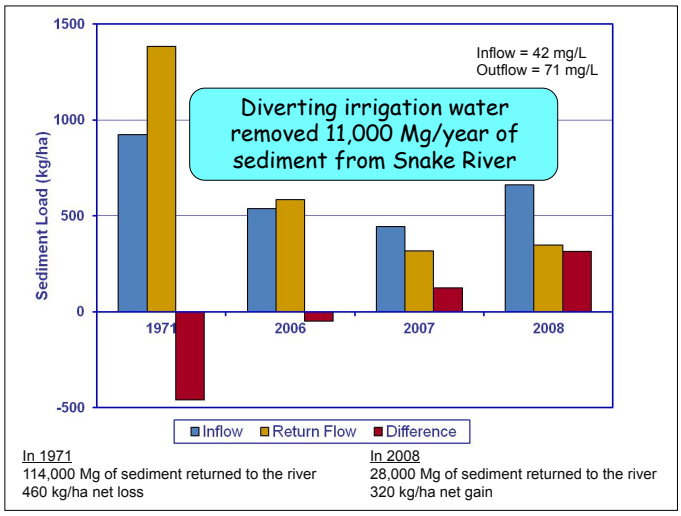
Water Balance (mm)



Irrigation = 80% of the total
(1300 mm)

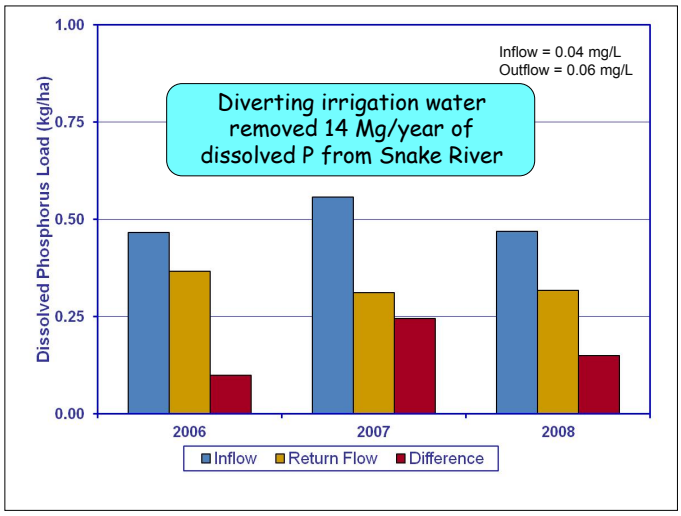
Precipitation = 15% of total
(250 mm)

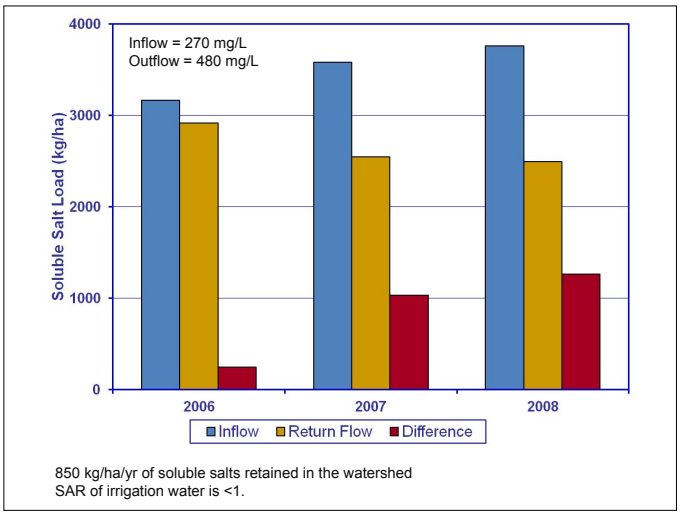
ET = 53% of the total
Return Flow = 37% of total
Remainder = 10%
(125 million m^3 or 100,000 acre-ft)



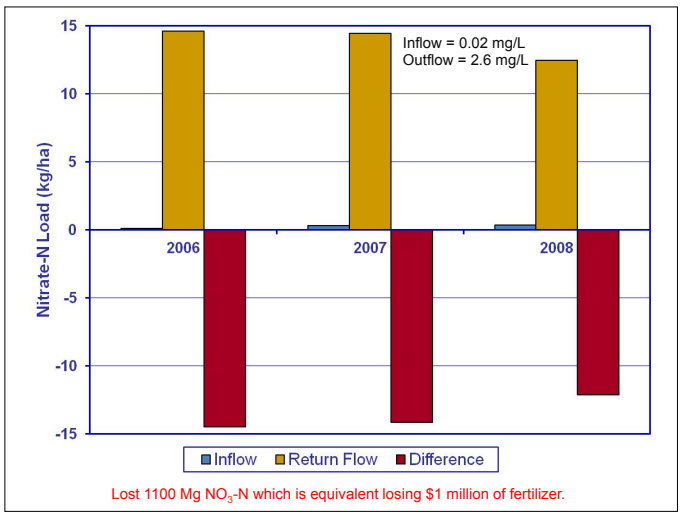
In 1971
114,000 Mg of sediment returned to the river
460 kg/ha net loss

In 2008
28,000 Mg of sediment returned to the river
320 kg/ha net gain

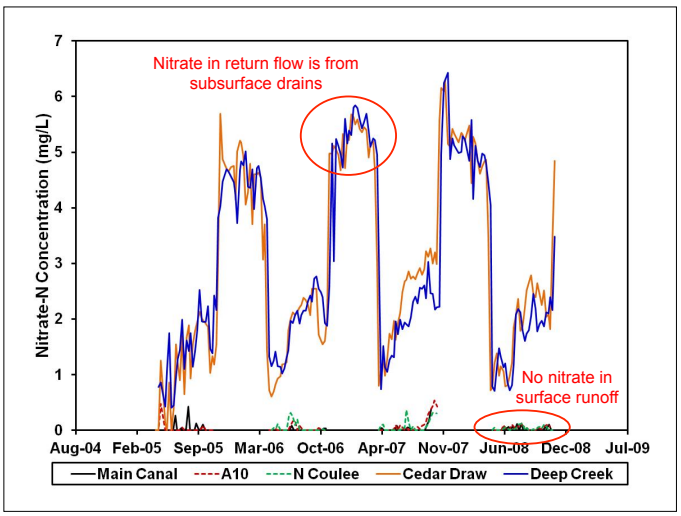


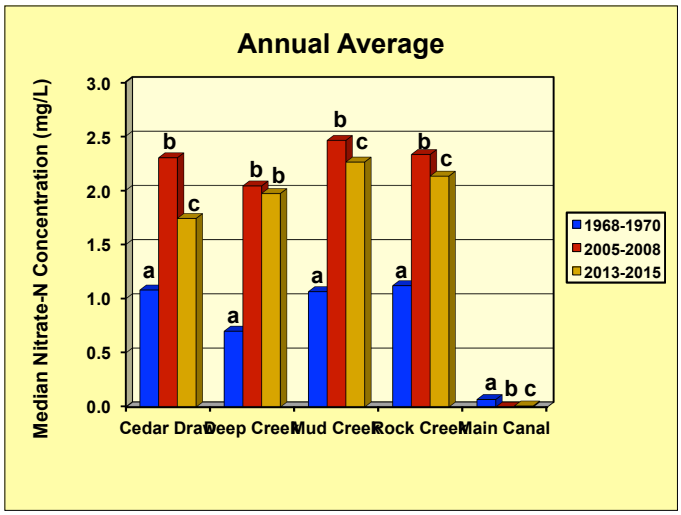


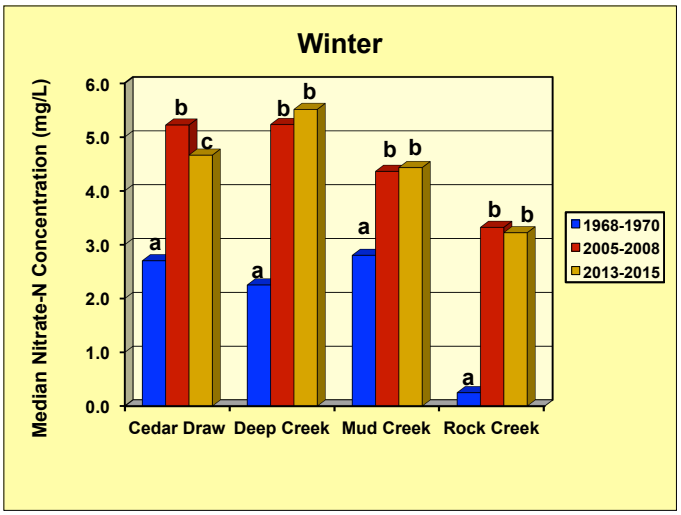
850 kg/ha/yr of soluble salts retained in the watershed
SAR of irrigation water is <1.

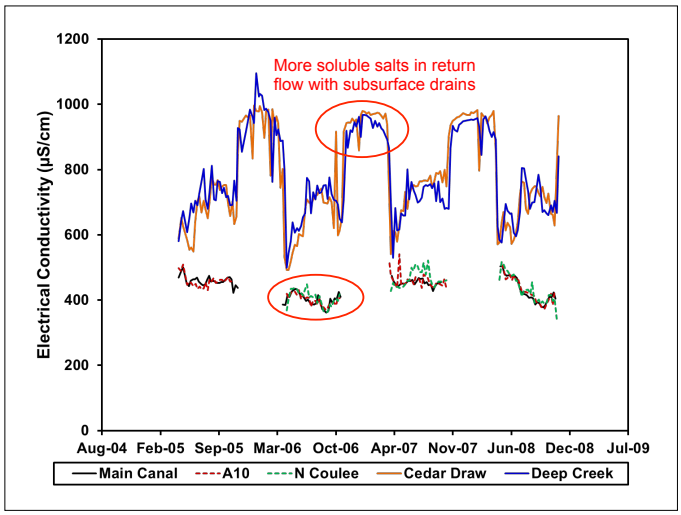


Lost 1100 Mg NO_3-N which is equivalent losing $1 million of fertilizer.









Percent Subsurface Flow in Summer

Year	Cedar Draw	Deep Creek	Mud Creek	Rock Creek
1968	56	55	93	76
1969	36	22	77	63
1970	27	12	81	55
average 68-70	40	30	84	65
2005	52	56	84	77
2006	52	60	84	83
2007	60	59	81	78
2008	52	55	81	75
2012	53	46	83	82
2013	58	48	80	86
2014	38	47	74	74
average 05-14	52	53	81	79

Summary

- Diverting water from the Snake River annually removed
  - 11,000 Mg of sediment
  - 14 Mg of dissolved P
  - 600 million m^3 (480,000 acre-ft) of water
- USR watershed contributed 1100 Mg of nitrate-N each year to the Snake River.
- Current trend indicates decreasing nitrate concentration?