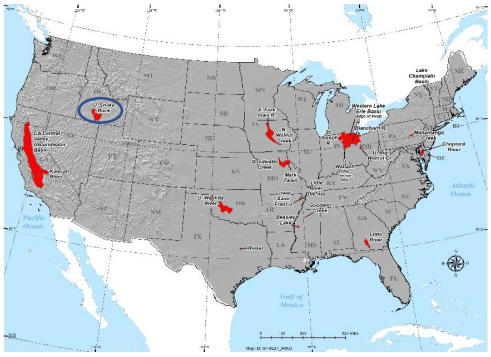
Upper Snake/Rock Watershed

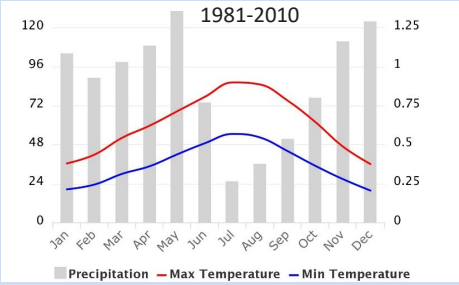


A Conservation Effects Assessment Project (CEAP) Watershed Assessment Study: A collaboration between the Agricultural Research Service and the Natural Resources Conservation Service

Location

This assessment has focused on the Twin Falls irrigation tract within the Upper Snake/Rock Watershed in southern Idaho. The Twin Falls Canal Company (TFCC) diverts irrigation water from the Snake River, which flows to 205,000 acres of farmland.

Temperature and Precipitation



Major land uses

Cropland: Alfalfa, Corn, Dry Bean, Barley, Wheat, Sugar Beet, Potato.
Livestock: Dairy.

Data collection

Water quality analysis has focused on sediment, nutrients, and soluble salts. The first data set was collected in 1968-1971. In 1990, TFCC partnered with the University of Idaho and U.S. Bureau of Reclamation to sample the main irrigation return flow streams. From 2005-2008, ARS began measuring flow rate and water quality at 24 return flow and 2 inflow sites for an NRCS Special Emphasis CEAP-Watershed project. ARS continues to collect water samples at the inflow and eight return flow sites while Idaho Department of Water Resources measures flow rate.

Concerns

The Twin Falls irrigation project started in 1906. The watershed is bounded by the main irrigation canal on the east, highline irrigation canal on the south, Salmon Falls Creek canyon on the west, and Snake River canyon on the north. This is a highly managed watershed. Rock Creek is the only natural stream in the Twin Falls irrigation tract, and it generally does not flow during the summer. Water flowing in streams is irrigation water, furrow irrigation runoff, or subsurface drainage. Annual irrigation application on fields is two to three times greater than average annual precipitation.

Soils are silt loams with low organic matter and high erodibility. All crop land was initially furrow irrigated, causing chronic erosion problems and high sediment loads in irrigation return flow to the Snake River.

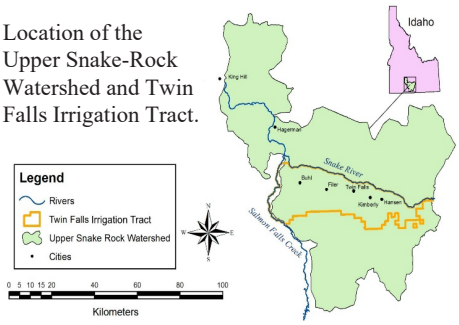
In the 1990s, farmers began converting from furrow irrigation to sprinkler irrigation with assistance from state and federal programs. During the same time, the dairy industry grew rapidly in Idaho, increasing the amount of corn grown and manure applied, which changed irrigation demand and nutrient management.

Main conservation practices used

Conversion from furrow irrigation to sprinkler irrigation has been the main practice. About 2,500 acres of crop land are converted to sprinkler irrigation each year. Many furrow-irrigated fields have sediment basins to trap sediment before tailwater flows from the field. Most farmers who furrow irrigate mix water soluble polyacrylamide (PAM) with irrigation water, which can reduce soil erosion 50-80%.

TFCC worked with state and local organizations to install more than 20 water quality ponds that capture sediment and nutrients before water flows back to the Snake River. These ponds are similar to constructed wetlands, but water continuously flows through them so retention time is less than 12 hours.

Location of the Upper Snake-Rock Watershed and Twin Falls Irrigation Tract.



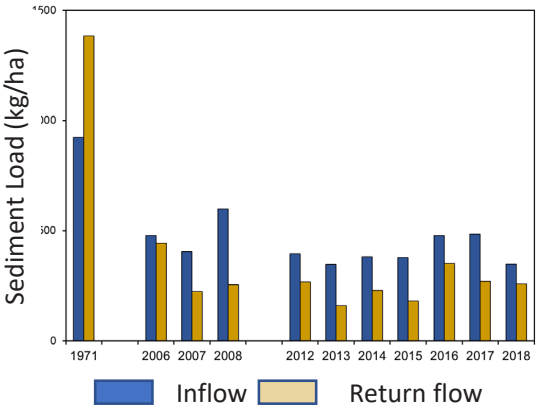
Upper Snake/Rock Watershed

Outcomes/Findings

Watershed scale

- The amount of irrigation water annually diverted into the watershed was 45 to 50 inches from 2006-2016, which was 3 to 9 times greater than annual precipitation.
- Irrigation return flow includes runoff from furrow-irrigated fields, unused irrigation water, and subsurface drainage. Return flow during the irrigation season is approximately 30% of the diverted irrigation water.
- Furrow irrigation has been steadily converted to sprinkler irrigation (45% of the crop land was sprinkler irrigated in 2006 vs. 60% in 2016). Irrigation project efficiency (evapotranspiration/diverted irrigation water) did not increase as more land was sprinkler irrigated. TFCC is a supply-based irrigation project that uniformly distributes available water to farms. Irrigation project efficiency in July, when crop water use is maximum, increased from 2006-2016.
- Annual sediment discharged to the Snake River has decreased from 1200 lbs./acre in 1971 to 230 lbs./acre in 2018. More sediment enters the watershed with irrigation water than is discharged to the Snake River with return flow, removing 15,000 tons of sediment from the river annually.
- Water quality ponds reduced sediment concentrations 36 to 75% (57% on average), total phosphorus 13 to 42% (27% on average) and dissolved phosphorus 7 to 16% (7% on average).
- Nitrate-nitrogen concentrations in shallow groundwater and return flow have increased from 3 mg/L in the late 1960s to 5 mg/L in the early 2000s.

Clockwise from left: Water quality pond, muddy irrigation return flow in the 1980s, sediment basin on a furrow-irrigated field, and untreated (left) and PAM-treated furrows.



Field scale

- Soil quality parameters were lower on the eroded, inflow ends of furrow-irrigated fields compared to the bottom end of the fields. Within three years of converting to sprinkler irrigation, soil quality parameters were no longer different between the top and bottom ends of the fields.
- Furrow-irrigated fields are often moldboard plowed. Increasing sprinkler irrigation has increased conservation tillage and a few farmers have started direct seeding.

Collaborators and Stakeholders

Twin Falls Magic Valley Canal Co.

IDWR

University of Idaho

More Information

CEAP Site Lead: Dave Bjorneberg, dave.bjorneberg@usda.gov
ARS website: ars.usda.gov NRCS website: nrcs.usda.gov
CEAP website: nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap/