



# NONPOINT SOURCE SUCCESS STORY

# Wyoming

## Irrigation Practices Restore Water Quality in the North Platte River

### Waterbody Improved

Irrigation of cropland overlying cretaceous shale formations contributes to high selenium concentrations in the North Platte River near the city of Casper. In 1998, the Wyoming Department of Environmental Quality (WDEQ) added a 36.8-mile segment of the river to the Clean Water Act (CWA) section 303(d) list due to aquatic life, coldwater fisheries, and wildlife designated uses being impaired by selenium. Voluntary restoration efforts led by Natrona County Conservation District (NCCD) in cooperation with many partners have reduced selenium loading to the river from irrigated cropland activities. The segment of the North Platte River now meets the selenium water quality criterion, and WDEQ has removed it from the impaired waters list in the 2016/2018 305(b)/303(d) Integrated Report.

### Problem

The North Platte River through the city of Casper is an important waterbody protected for drinking water, fisheries, aquatic life, and other designated uses (Figure 1). Studies in the 1990s in the irrigated cropland area west of Casper found high concentrations of selenium in plants, soils, water, sediment, and biota, which was thought to have impaired reproduction and caused embryonic deformities in migratory aquatic birds. Although natural background loading of selenium to surface waters has occurred from soils and bedrock composed of marine shales, studies indicated that naturally occurring selenium dissolves from soil during irrigation and is returned to surface waters through excessive drainage water. As a result of high selenium concentrations, WDEQ added a 36.8-mile segment of the river to the 1998 CWA section 303(d) list of impaired waterbodies due to aquatic life, cold water fisheries, and wildlife designated uses not being supported.

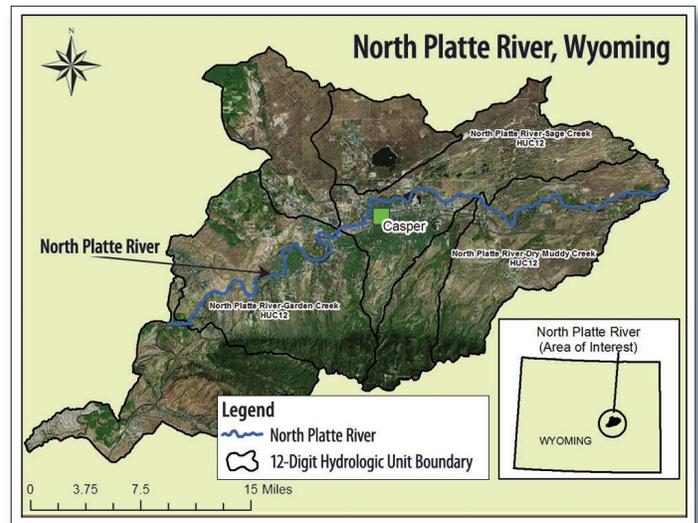


Figure 1. Map of the North Platte River watershed project area.

### Want to Dive into Details?

The [North Platte River's In-Depth Success Story](#) page explains the keys to success, including:

- Dedicated local leaders who educated and encouraged others
- Enterprising and enthusiastic farmers who were early-adopters
- Economic benefits realized through water and labor cost-savings



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### Story Highlights

Locally led restoration activities and monitoring began in the mid-1990s and continue today. CWA section 319 funding initially contributed to these restoration activities through four projects between 2001 and 2011. The total maximum daily load (TMDL) development process, initiated by the WDEQ in 2009, resulted in a watershed-based plan. NCCD received additional section 319 funds in 2012 to continue restoration activities, following recommended action items in the plan.

Due to NCCD's leadership as well as key partnerships developed with other entities (e.g., Natural Resources



Figure 2. Landowners installed practices such as pivot sprinkler irrigation.

Conservation Service, city of Casper, Natrona County, Casper Alcova Irrigation District [CAID], and numerous landowners), this project implemented an impressive number of best management practices (BMPs) between 2012 and 2016. During this four-year period, voluntary cost-share assistance projects resulted in a total of 726 acres converted from flood to sprinkler irrigation and 29,569 feet of underground pipeline installed to replace 35,519 feet of open ditch (Figure 2). In addition, 12 livestock/wildlife watering projects were completed using other funding sources.

This project also included education and outreach efforts, including annual meetings with the city of Casper, Natrona County, and elected officials; meetings with landowners and CAID; and the publication of educational booklets about land management activities and selenium. NCCD received additional section 319 funds in 2015 which, along with other funding sources, has allowed landowners to convert an additional 495 acres from flood to sprinkler irrigation and 29,854 feet of dirt ditch to 21,661 feet of pipeline.

## Results

NCCD collected monthly data along the North Platte River and tributaries within the Kendrick Irrigation Project Area (Kendrick Project). Monitoring objectives included determining whether the impaired river segment was meeting the chronic water quality criterion for selenium (5 micrograms per liter [ $\mu\text{g}/\text{L}$ ]). Monthly data collected between January 2010 and December 2013 at two sampling sites—the upper (site NPR1) and lower (site NPR2) extents of the impaired segment—revealed that selenium concentrations were at or below 5  $\mu\text{g}/\text{L}$ . However, due to the importance

of the river as a cold-water fishery and a highly visible resource within the Casper community, coupled with limited information on total selenium concentrations within the 25 river miles separating NPR1 and NPR2, WDEQ recommended that additional sites be monitored.

Per WDEQ's recommendation, NCCD began monthly sampling at three additional sites (NPRRR, NPRPP, and NPRCR22) in 2014 while continuing monthly sampling at NPR1 and NPR2. Data at all sites have indicated no exceedances of the 5  $\mu\text{g}/\text{L}$  criterion for at least two consecutive years. Furthermore, mean total selenium concentrations at all sites for data available between July 2014 and August 2017 were less than or equal to 2.7  $\mu\text{g}/\text{L}$ . Finally, data from 2010–2017 in combination with historic 2003–2009 data collected by NCCD at sites within the Kendrick Project showed a statistically significant reduction in project-wide average selenium concentrations. Therefore, the WDEQ has removed the 36.8-mile impaired segment of the North Platte River from the 303(d) list with the 2016/2018 305(b)/303(d) Integrated Report.

## Partners and Funding

Local voluntary efforts helped to address nonpoint source pollution. NCCD's leadership, a strong partnership with the Natural Resources Conservation Service (NRCS), and landowner participation were instrumental to the project's success. A total of \$1,129,292 in CWA section 319 funding has been contributed to these projects to date, and the NCCD is looking at additional projects to address high selenium concentrations in tributaries to the North Platte River. State, local and private funds have contributed \$1,303,150 towards the projects; notably, partnerships and outreach under these projects prompted the city of Casper and Natrona County to both contribute funding to assist with BMP implementation. NRCS funding has contributed \$640,908 in cost-share assistance to the projects to date. Project partners included the city of Casper, Casper Public Utilities Board, Natrona County Commissioners, Natrona County Weed and Pest, Wyoming Association of Conservation Districts, University of Wyoming Extension Service, NRCS, CAID, U.S. Department of Agriculture Farm Service Agency, Wyoming Department of Agriculture, WDEQ, Wyoming Water Development, and Wyoming Game and Fish Department.



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