Gold Creek Return Flow Pilot Study

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

Goal: Identify and quantify potential benefits of early season, aggressive irrigation on soil moisture, agricultural production, and local hydrology

Background

The widespread conversion of irrigation method, from gravity-based flood irrigation to pressurized sprinkler systems, has created a paradox of irrigation efficiency. Flood irrigation is relatively inefficient because plants can only take up a small proportion of the applied water; however, the remaining water can enter the shallow aquifer and may percolate back to the stream later in the season (i.e., augments late-season return flows). Conversely, the precise application of water by sprinklers can lead to higher production, but this efficiency means that less water is available to contribute to late-season return flows.

This paradox has left a lot of conservation-minded irrigators wondering if sprinkler systems can be used in a way that also benefits local hydrology:

> Can pivot irrigation operation be optimized to irrigate heavily during early season run-off, boosting soil moisture storage and production, followed by running efficiently for the remainder of the season? Are there ancillary effects on aquifer storage, water quality, and/or streamflows with this practice?

Project Objectives

- Quantify effects of early season irrigation on:
  - Soil moisture bank
  - Agricultural production
  - Aquifer levels and streamflows
- Quantify water infiltration past the rooting zone
- Evaluate the feasibility of this approach for an agricultural operation, including challenges and benefits.

Taking water quality samples (upper) and measuring streamflow (lower). Pivot operating as usual (below).

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Experimental treatment

- Run east side pivots as <u>early as possible</u>
- Maintain <u>aggressive</u> irrigation schedule during spring run-off
- <u>Reduce</u> irrigation once streamflows drop
- <u>Do not alter</u> west side pivot irrigation

Timeline

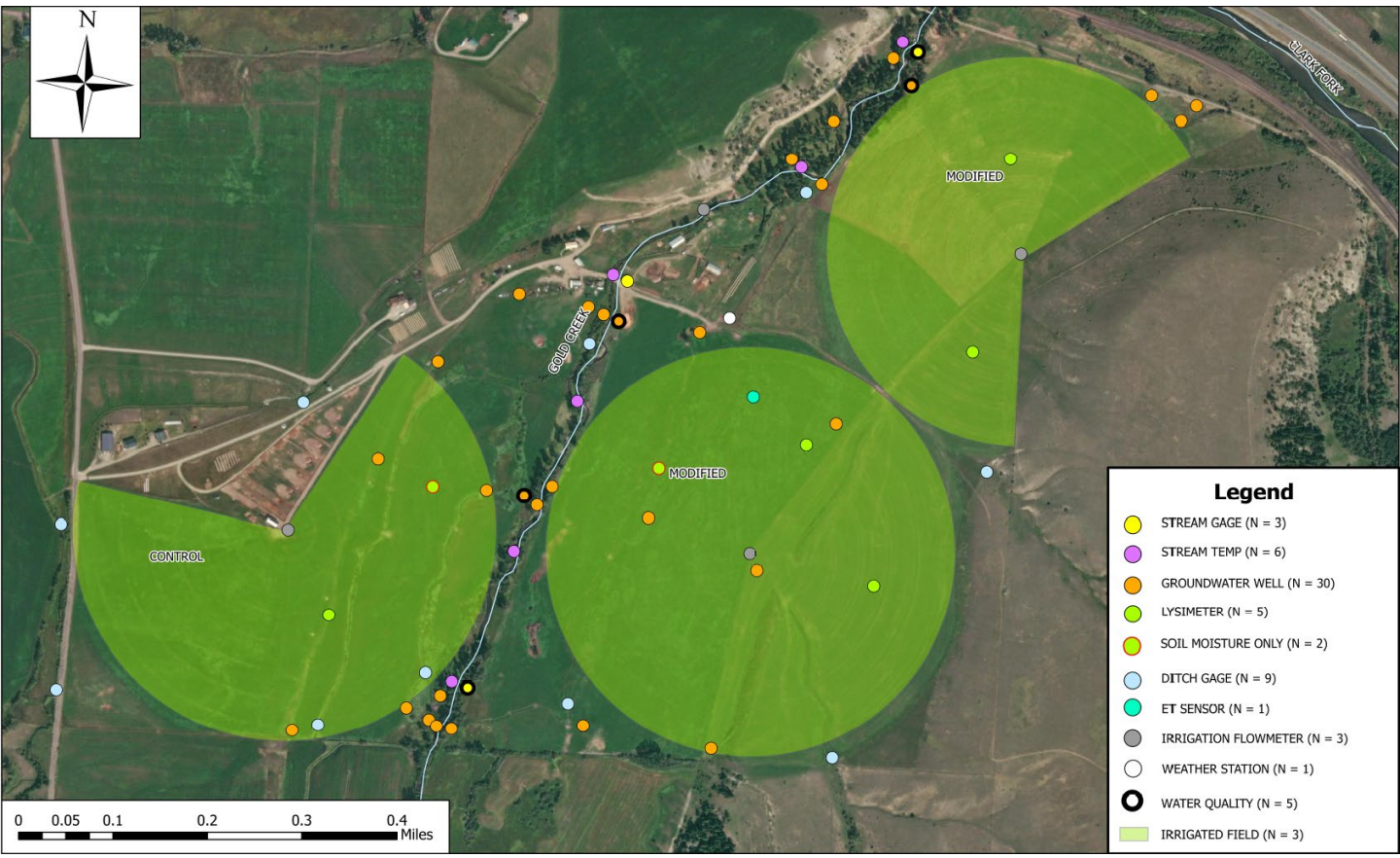
- <u>2023-2024</u> – outreach and planning
- <u>2024</u> – run pivots as usual to establish baseline
- **<u>2025</u> – run east pivots experimentally**
- <u>2026</u> – adapt as necessary and continue experimentally

Monitoring

- Stream flows
- Groundwater
- Irrigation use & ditch seepage
- Water quality
- Agricultural productivity
- Evapotranspiration
- Vegetation
- Weather station
- Soil variables:
  - Passive flux lysimeters
  - Soil moisture
  - Soil water potential
  - Infiltration

Key Personnel

- Bruce, Richard, and Shirley Thomas, Thomas Herefords
- Hannah Hogan, John Lunzer, Madeline McKeefry, Raeya Gordon, Todd Blythe, Troy Lechman, and Valerie Kurth, DNRC



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