# Belle Fourche River Watershed Tour
# September 22, 2016

BELLE FOURCHE RIVER WATERSHED PARTNERSHIP

BELLE FOURCHE IRRIGATION DISTRICT

SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

South Dakota Department of Environment & Natural Resources — Protecting South Dakota's tomorrow...today!

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U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

South Dakota State University SDSU

SOUTH DAKOTA Game, Fish & Parks

NRCS Natural Resources Conservation Service

BELLE FOURCHE RIVER
WATERSHED PARTNERSHIP

BELLE FOURCHE
IRRIGATION DISTRICT

Belle Fourche Watershed Tour Itinerary

Board of Water and Natural Resources

September 22, 2016

9:00 AM – 1:00 PM – Hills Area Tour

- 9:00 AM – Leave from Spearfish Holiday Inn
- 9:20 AM – Arrive at Spearfish Lodge – Tour Little Spearfish Falls or Roughlock Falls
- 10:30 AM – Leave Spearfish Lodge
- 10:50 AM – Arrive at City of Spearfish Hydro Plant
- 11:30 AM – Leave Hydro Plant
- 11:45 AM – 1:00 PM – Lunch at Spearfish City Park/DC Booth Fish Hatchery

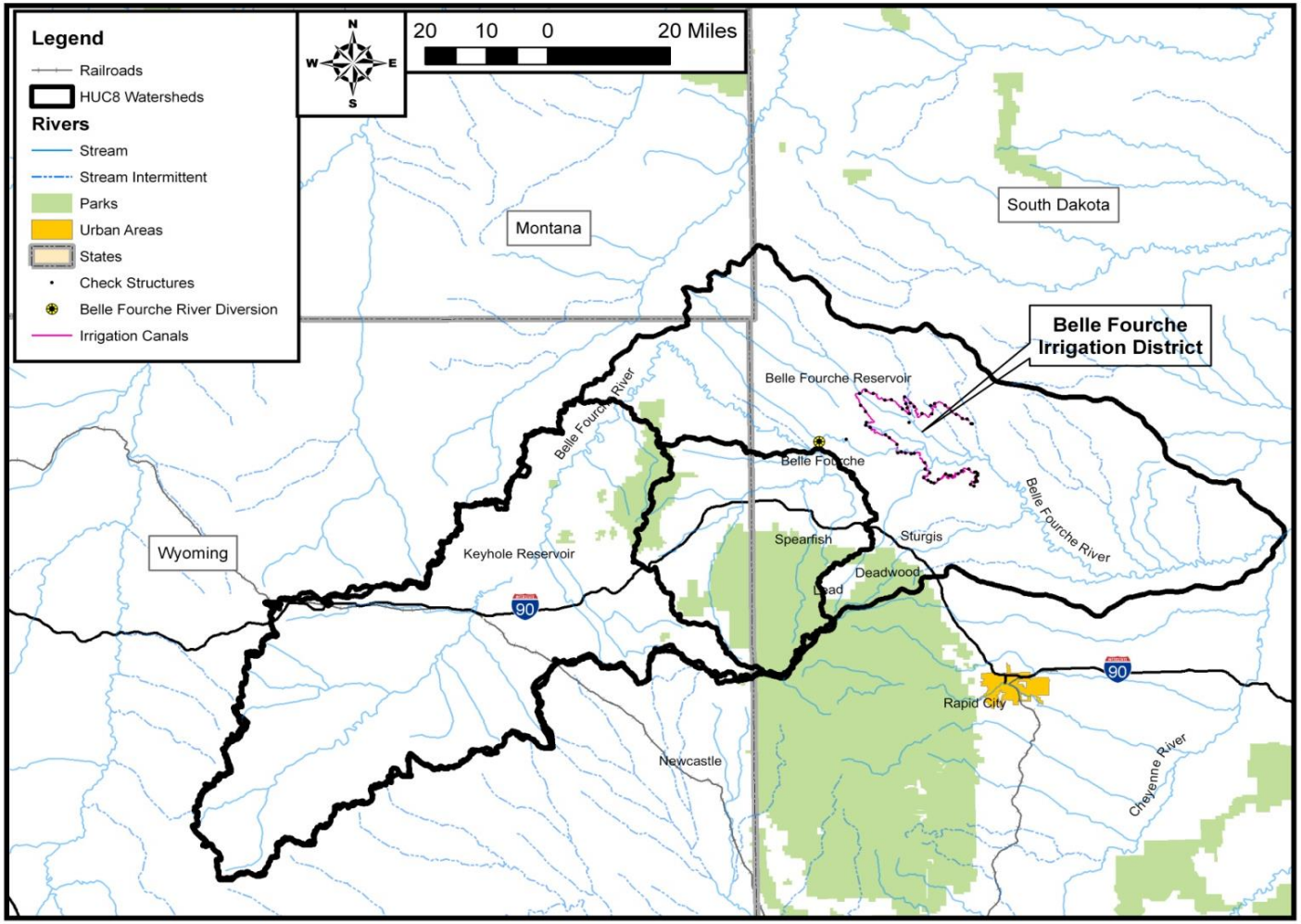
1:00 PM – 4:00 PM – Plains Area Tour

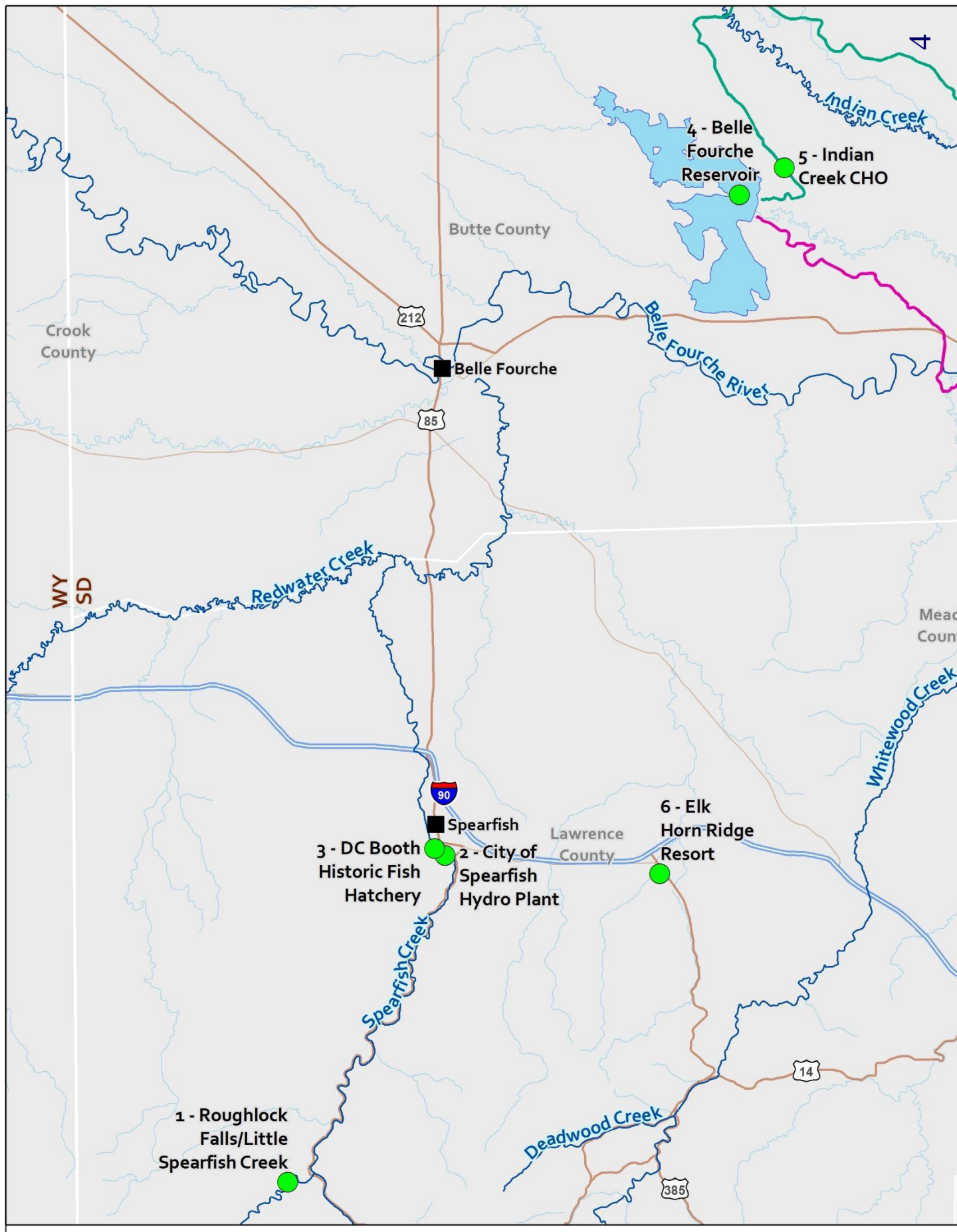
- 1:00 PM – Leave from Spearfish
- 1:30 PM – Arrive at Orman Dam – Tour of interpretive site, gatehouses, dredging
- 2:45PM – Leave Orman Dam
- 3:00 PM – Arrive at Belle Fourche Irrigation District Indian Creek Lateral Automation
- 3:20 PM – Leave Indian Creek Lateral Automation
- 4:00 PM – Arrive at Spearfish Holiday Inn

5:00 PM – 7:00 PM – Social/Supper

- 5:00 PM – Leave Spearfish Holiday Inn
- 5:15 PM – Arrive at Elk Horn Ridge for social and meal
- 6:45 PM – Leave Elk Horn Ridge
- 7:00 PM – Arrive back at Spearfish Holiday Inn

# Belle Fourche River Watershed






2016_BF Tour Stops 9/21/2016 Teresa.Whitney

# Belle Fourche Irrigation District System Upgrades

## Delivery Improvements

Upgraded Water Order/ Billing System

Canal Piping

Canal Lining

Canal Automation

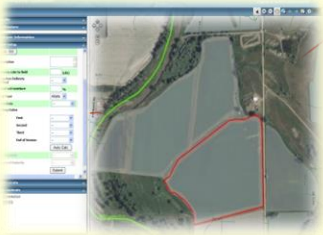
Reservoir Improvements

## On-Farm Improvements

Surface to Sprinkler Irrigation

Open Ditch to Pipe

Irrigation Scheduling



# Belle Fourche Irrigation District Overview

- **57,183 Acres**
- **Over 480 Individual Farmers**
- **Crops**
  - ***Alfalfa, corn, wheat, and barley***
- **Surface Irrigation Dominated**
- **Annual Water Availability**
  - ***~13" Precipitation***
  - ***~20" Allotted water***

Constructing Korwelt lateral
September 17, 1936 No. 29

# Gate House Replacement

- Installed in 1910
- Concerns over removal of injured workers in bottom of shaft
- Construction Completed in 2015/2016
- Design completed by FourFront and Albertson
- RCS Construction (Rapid City) Selected as Contractor

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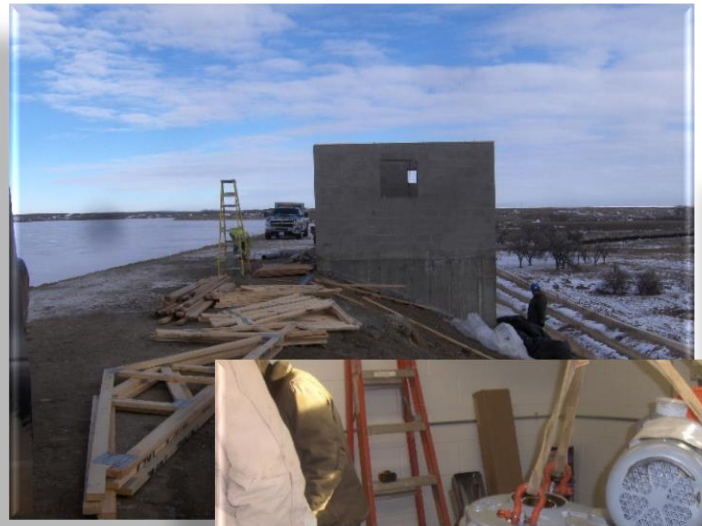
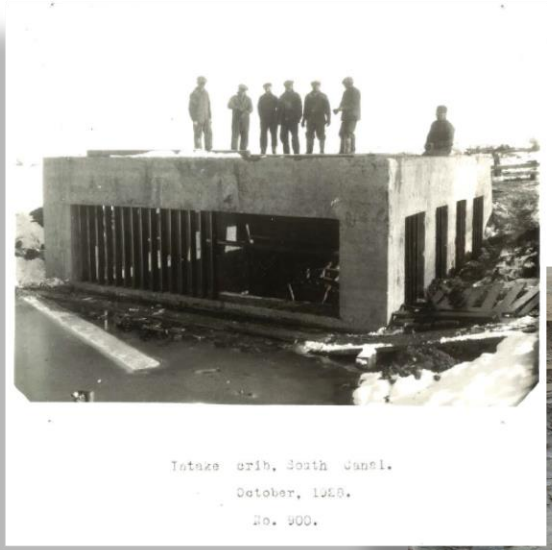
# Gatehouse Demo/Construction

# Gatehouse Construction



# Reservoir Dredging

- Funding through SD DENR SWRMS
- Sediment inhibiting access to active pool
- Scheduled to resume Fall 2016
- Veit (Rogers, MN) selected as contractor



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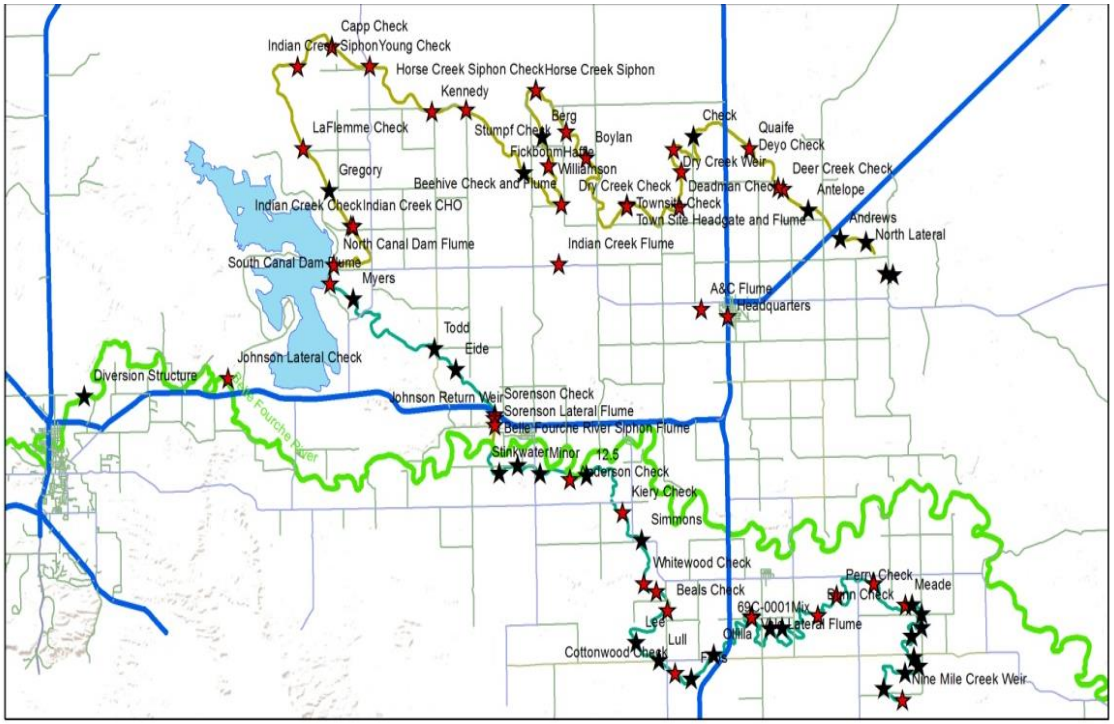
# Dredging Operations

# Belle Fourche Irrigation District Automated Structures

- Funding through SD DENR, BOR, BFID
- Control Canal Levels
- Monitor and Control Flows

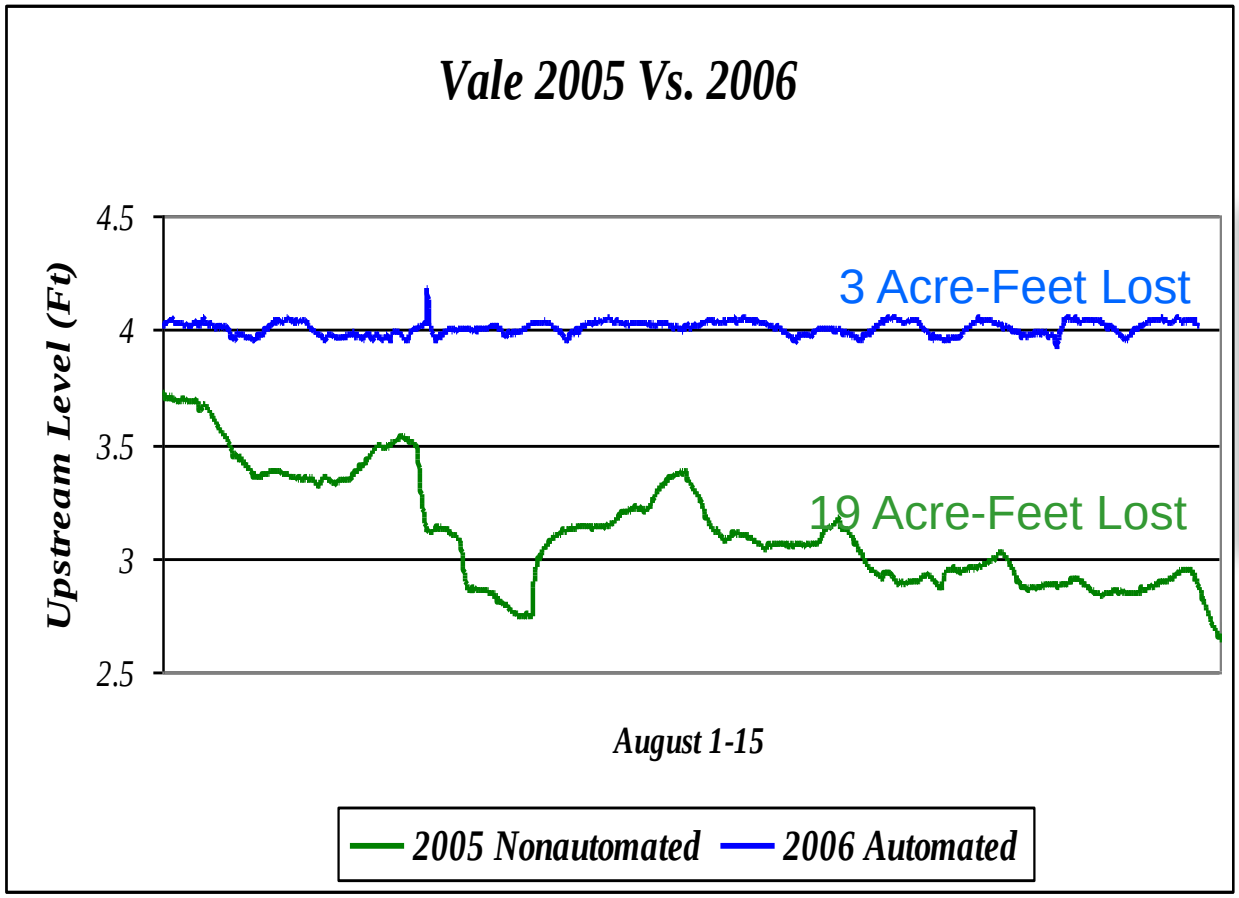


# Typical Belle Fourche Irrigation District Check Structures

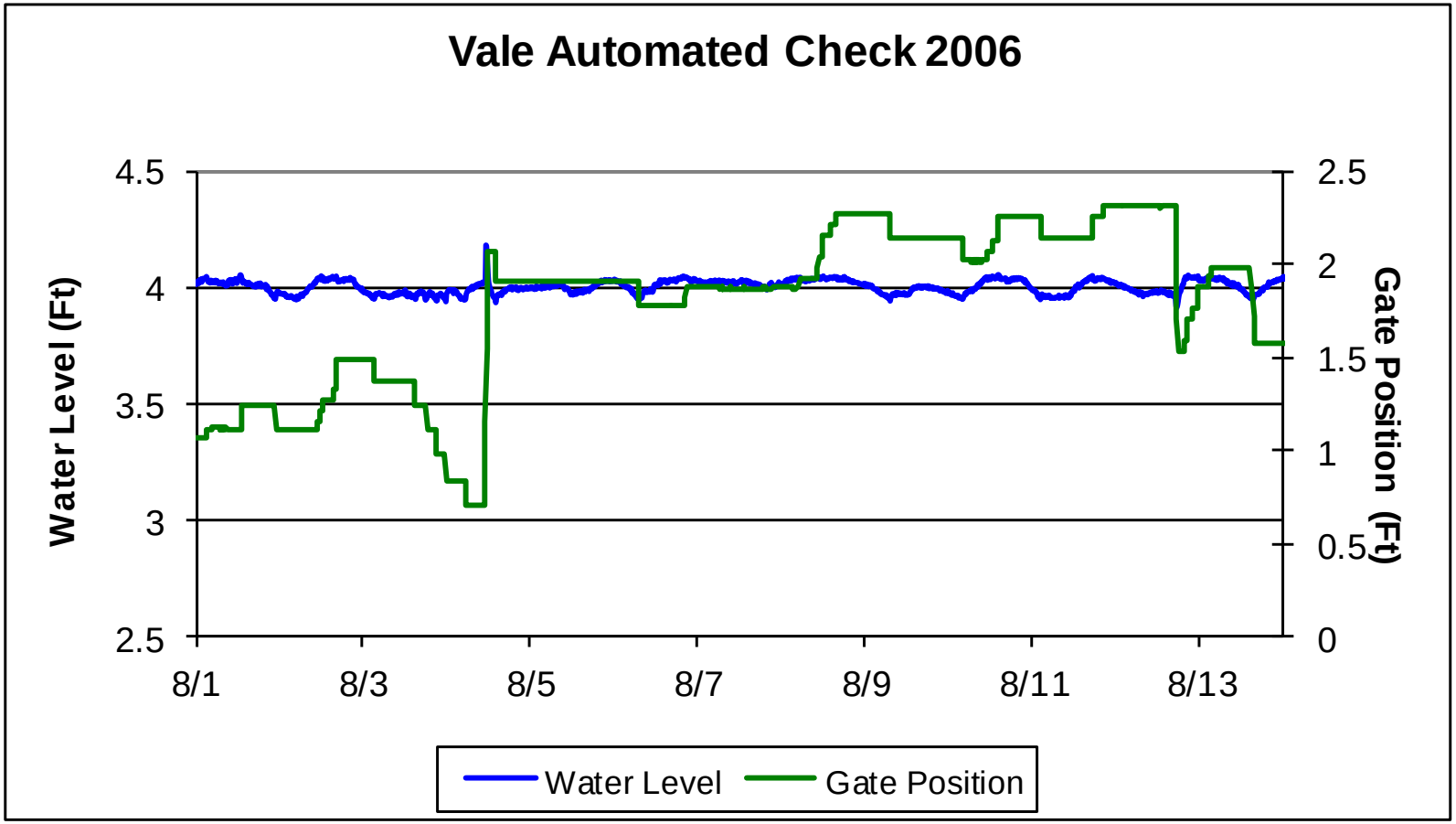
# Automated Check Gates

- **Components**
  - ***Pressure transducer (PT)***
  - ***Solar panel/battery***
  - ***Data logger/ controller***
  - ***Gate actuator***
  - ***Radio***

# Vale Lateral Analysis



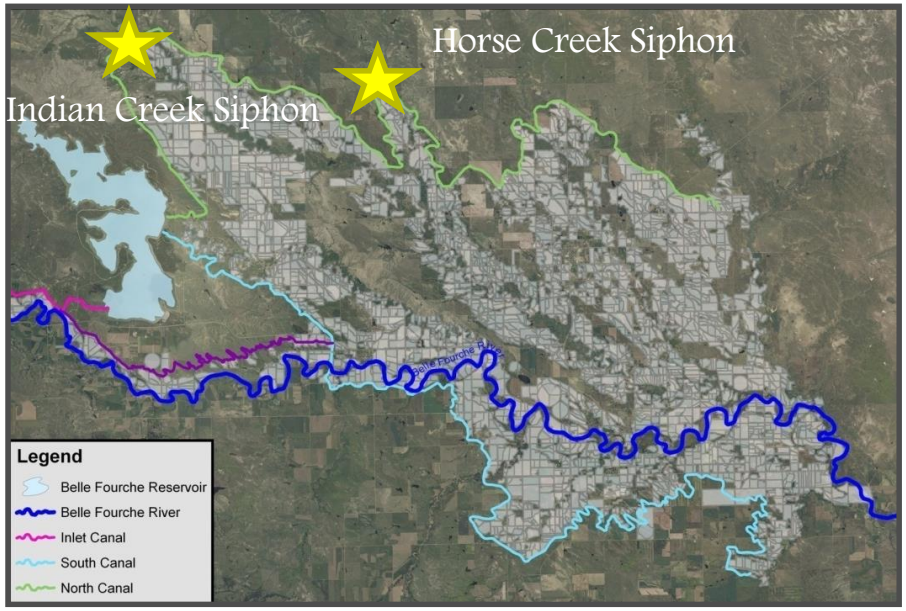
# Vale Gate Position




Gate Moved ~ 4times/day***

# Indian and Horse Creek Siphon Upgrades

- Funded through grant/loan from SD DENR SWRMS program
- Existing 96” above ground steel pipes installed in the late 1930s
- Below ground RCP installed by Heavy Constructors (Rapid City, SD)

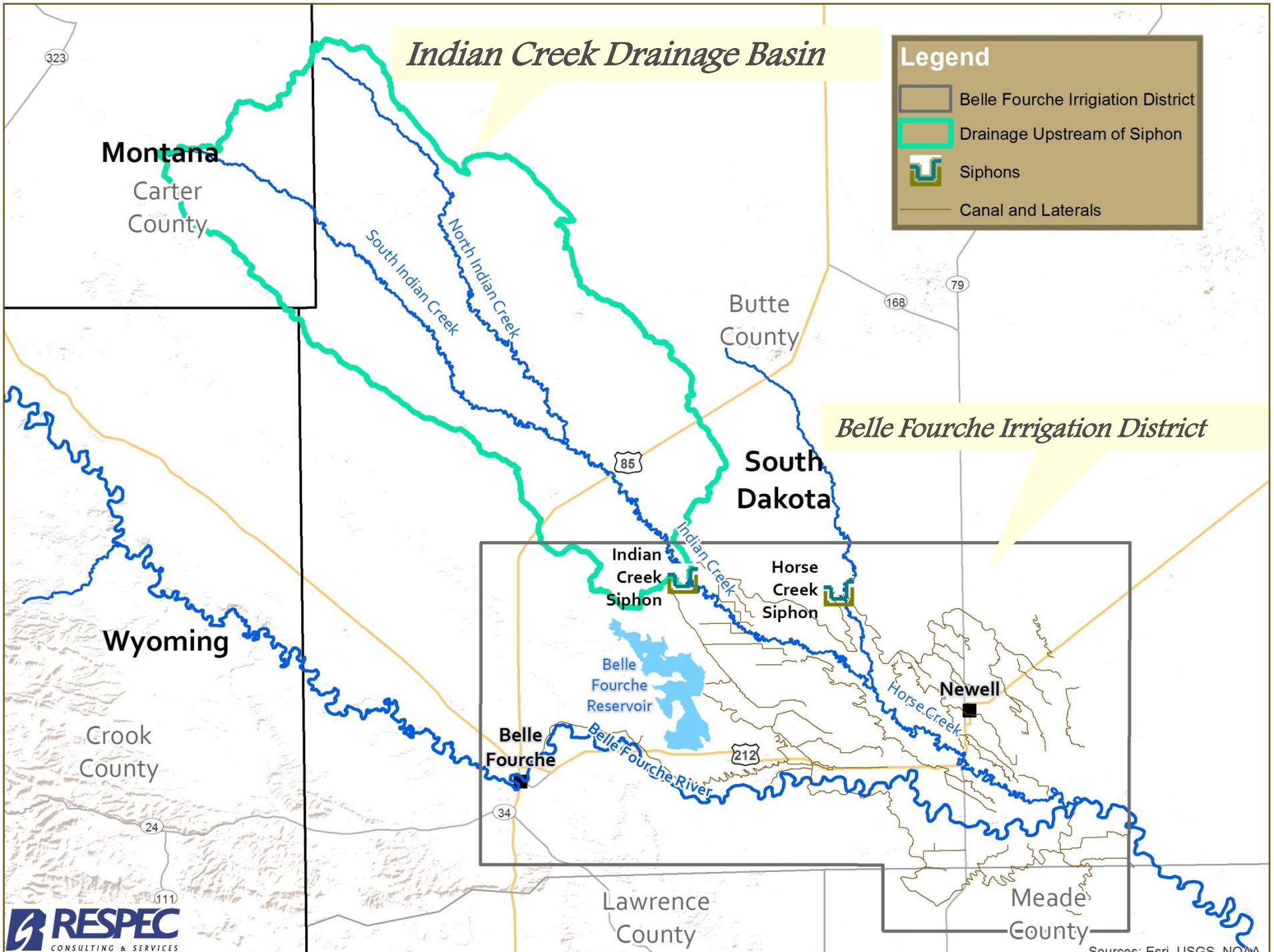


# Horse Creek and Indian Creek Siphon Upgrades

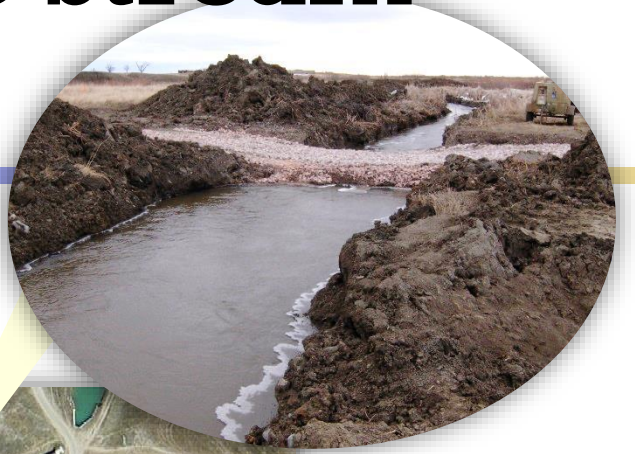
# Horse Creek and Indian Creek Siphon Upgrades

# Indian Creek Siphon Demo

CAT

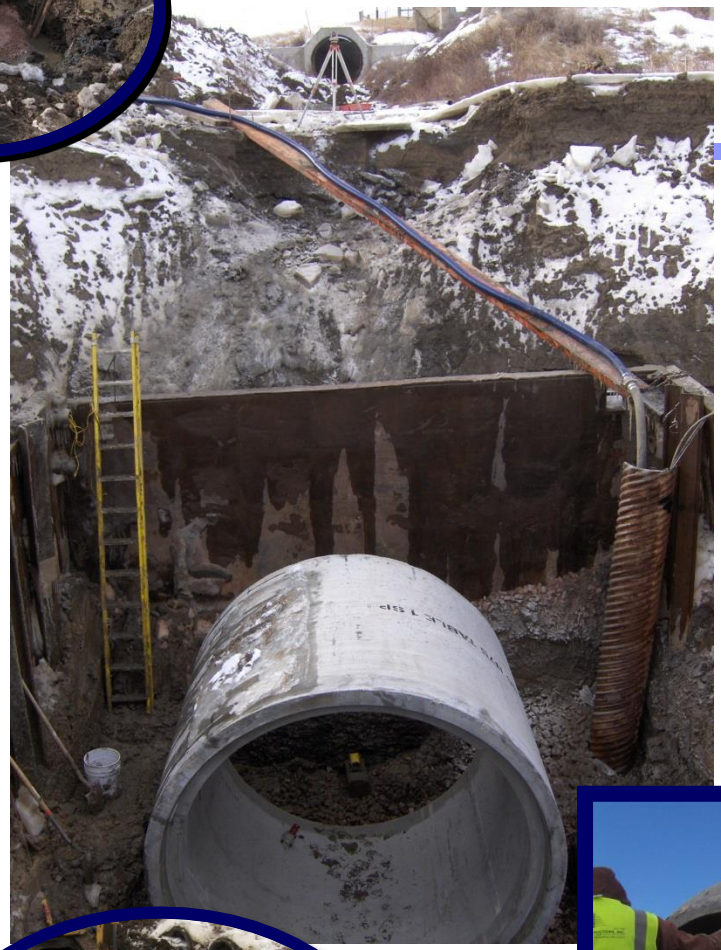

Indian Creek Drainage Basin
Legend
Belle Fourche Irrigiation District
Drainage Upstream of Siphon
Siphons
Canal and Laterals
Montana
Carter County
South Indian Creek
North Indian Creek
Butte County
Belle Fourche Irrigation District
South Dakota
Indian Creek
Indian Creek Siphon
Horse Creek Siphon
Wyoming
Belle Fourche Reservoir
Newell
Horse Creek
Crook County
Belle Fourche
Belle Fourche River
Lawrence County
Meade County
323
168
79
85
212
34
24
111
RESPEC
CONSULTING & SERVICES
Sources: Esri, USGS, NOAA

# Diversion of the Stream



# Runoff Event 1: January

# Pipe Laying Process



# Runoff Event 2: February

# Horse Creek and Indian Creek Siphon Upgrades

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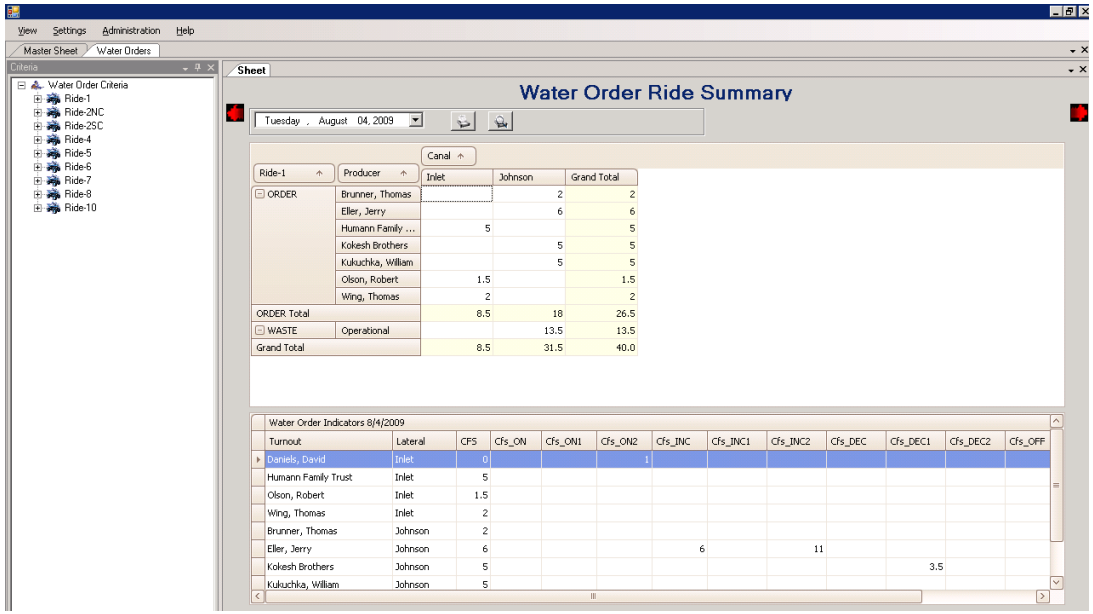
BUREAU OF RECLAMATION

# Water Order/Billing Software

- Funding through SD DENR
- Replaced hand calculations
- Includes dam release calculator

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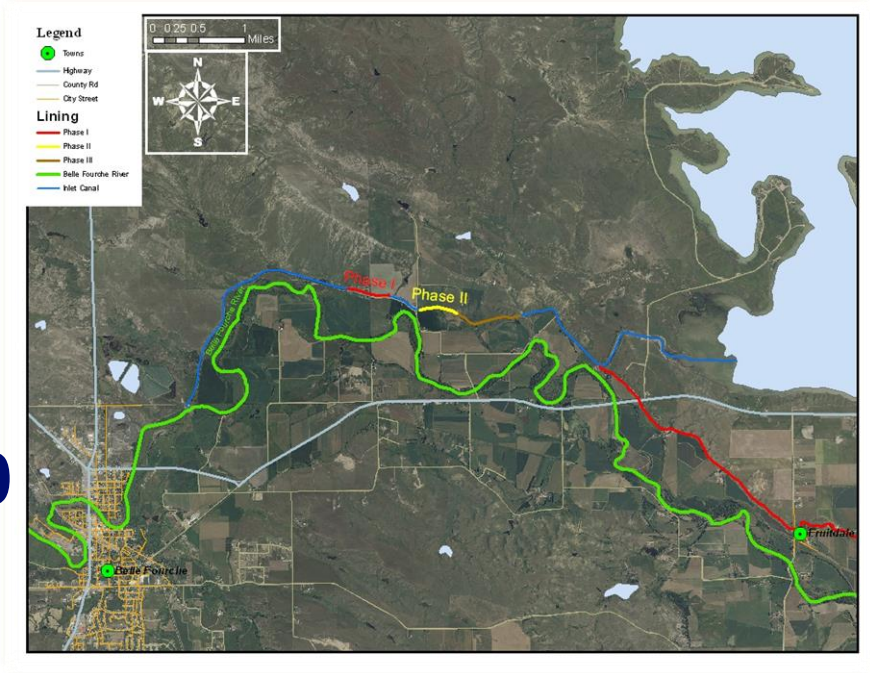
# Inlet Canal Lining

- Funding through the BOR
- Completed in three phases from 2007 - 2010
- Approximately 10,000 feet lined

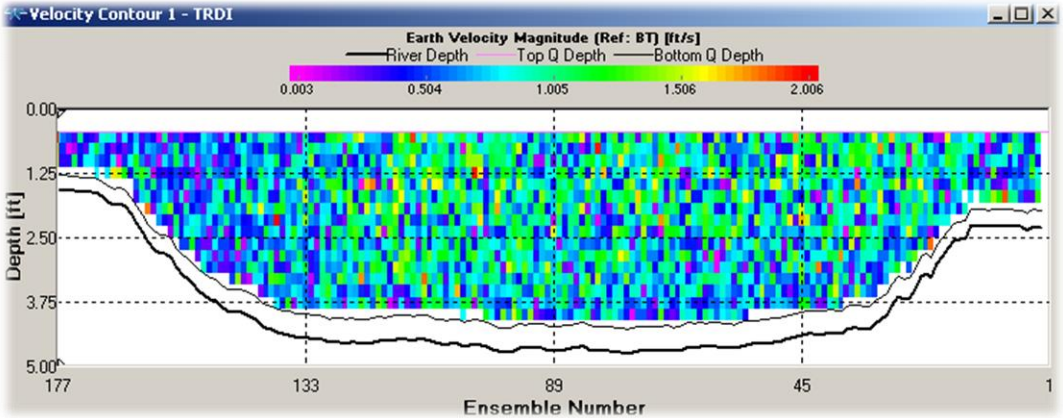


# Inlet Canal Lining

- 45 mil EPDM Firestone product
- Provided in rolls 50 ft x 200 ft

# Acoustic Doppler

5,000 Acre-Feet/Year Conserved!!!



# Before

# After

# Conservation Innovation Grant (CIG) Project Overview

- **3-Year Project Funded by NRCS**
- **Components**
  - ***Extensive weather network***
    - **Four weather stations**
    - **Nine rain gage sites**
  - ***Soil moisture stations***
  - ***Web-based irrigation scheduling consultant for producers (20 total producers)***
    - **Easy to set up**
    - **Accurate, reliable, and adaptable**

NRCS Natural Resources Conservation Service

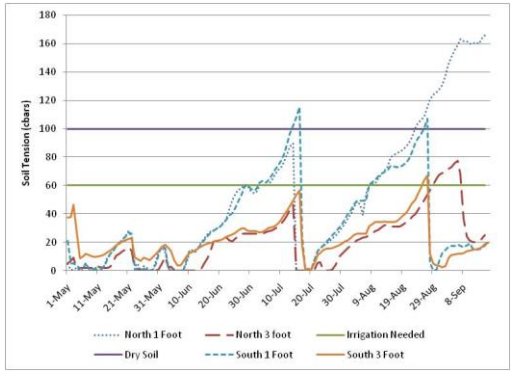
Web Mapping Application

RESPEC | POD | Help

Logged in as RSI\Jared.Oswald

Results

SoilMoisture



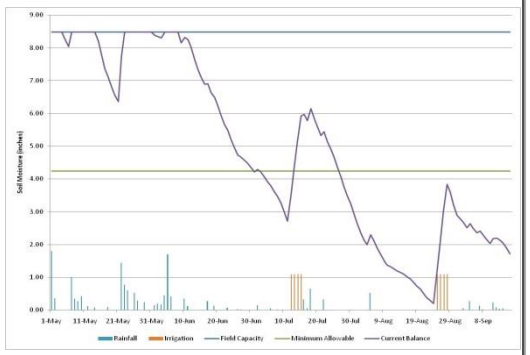

Current Readings:

Site 1 Shallow = 20 cbar

Site 1 Deep = 22 cbar

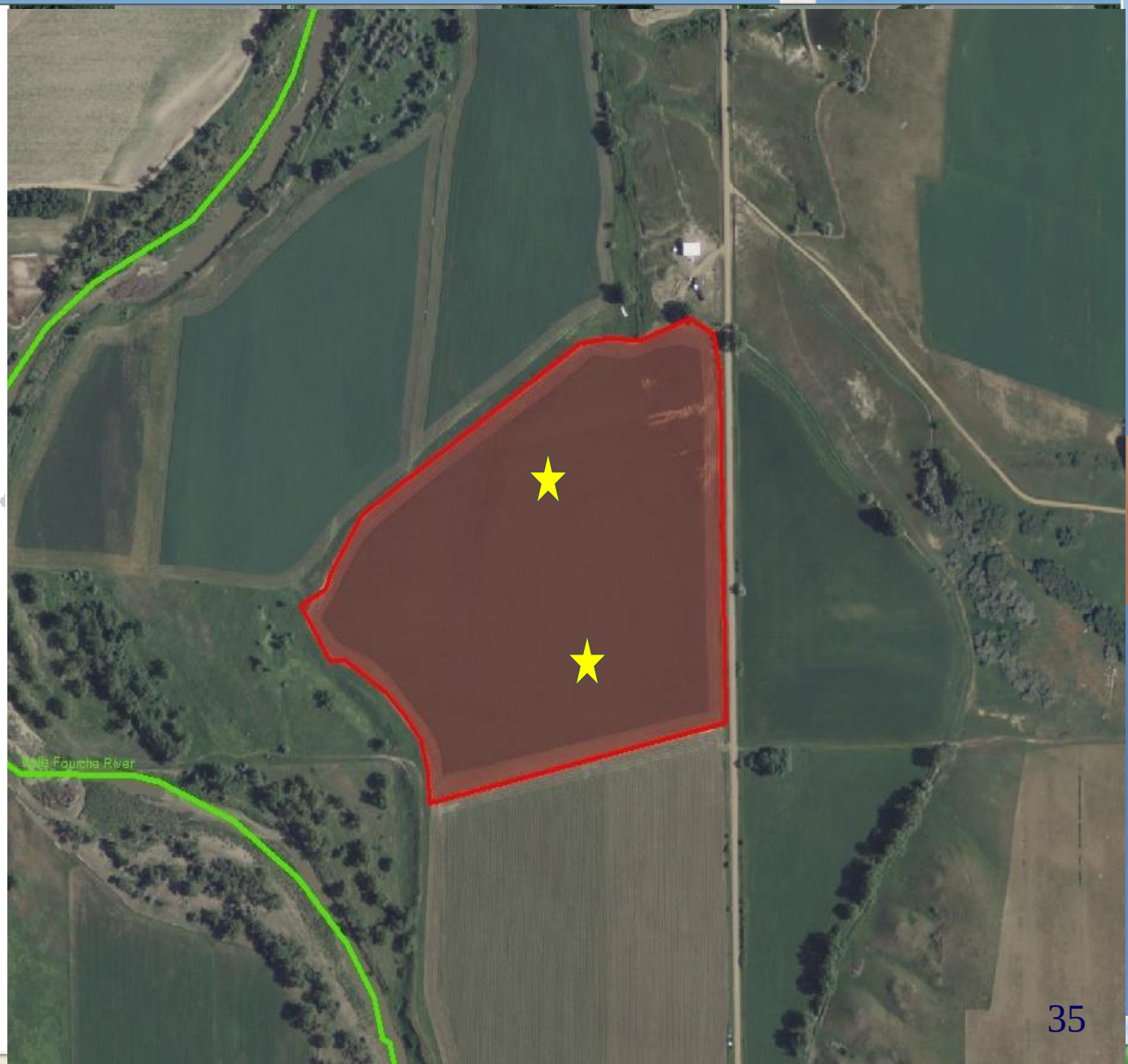
Site 2 Shallow = 175 cbar

Site 2 Deep = 22 cbar




Current Calculated Soil Moisture = 25%

Edit Soil Moisture



# On-Farm Improvements

- 105 Flood Irrigation to Sprinkler Irrigation Projects on 9,000 Acres
- 32 Open Ditch to Pipe Projects
- Irrigation Scheduling on Over 6,200 Acres

Flood Irrigation Tail Water Runoff

Conversion to Center Pivot

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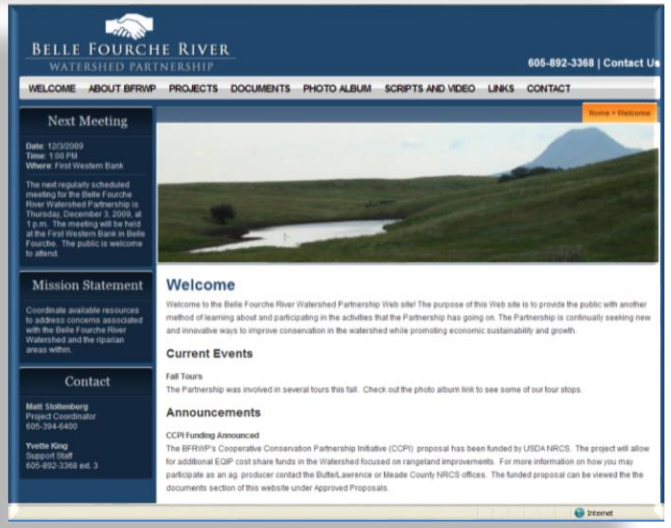
# Range/Riparian Improvements

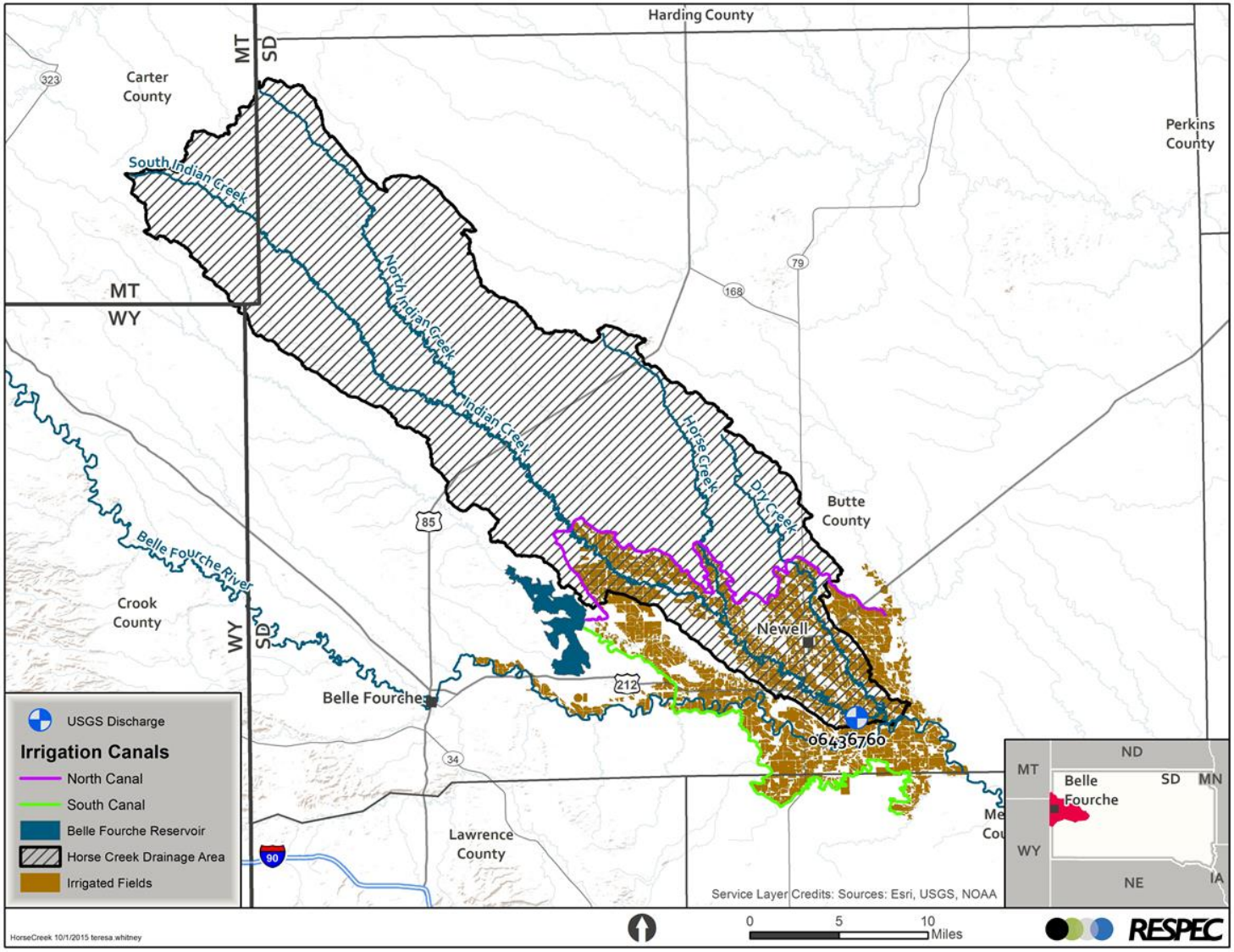
- 86 Range/Riparian Improvement Projects Affecting Over 475,000 Acres
- 525,000 Acres of Rangeland Conservation

# Public Outreach

- Soil-Quality Demonstration Trailer Targeting Audiences of all Ages
- 3-4 Annual Watershed Tours
- Range Riparian Workshops
- Informational Radio Sound Bytes Reaching Thousands of Listeners
- Numerous Informational Booths in the Watershed
- Informational Website (bellefourchewatershed.org)
- Statewide Newspaper Insert (SISMA Invader)



# Horse Creek Watershed



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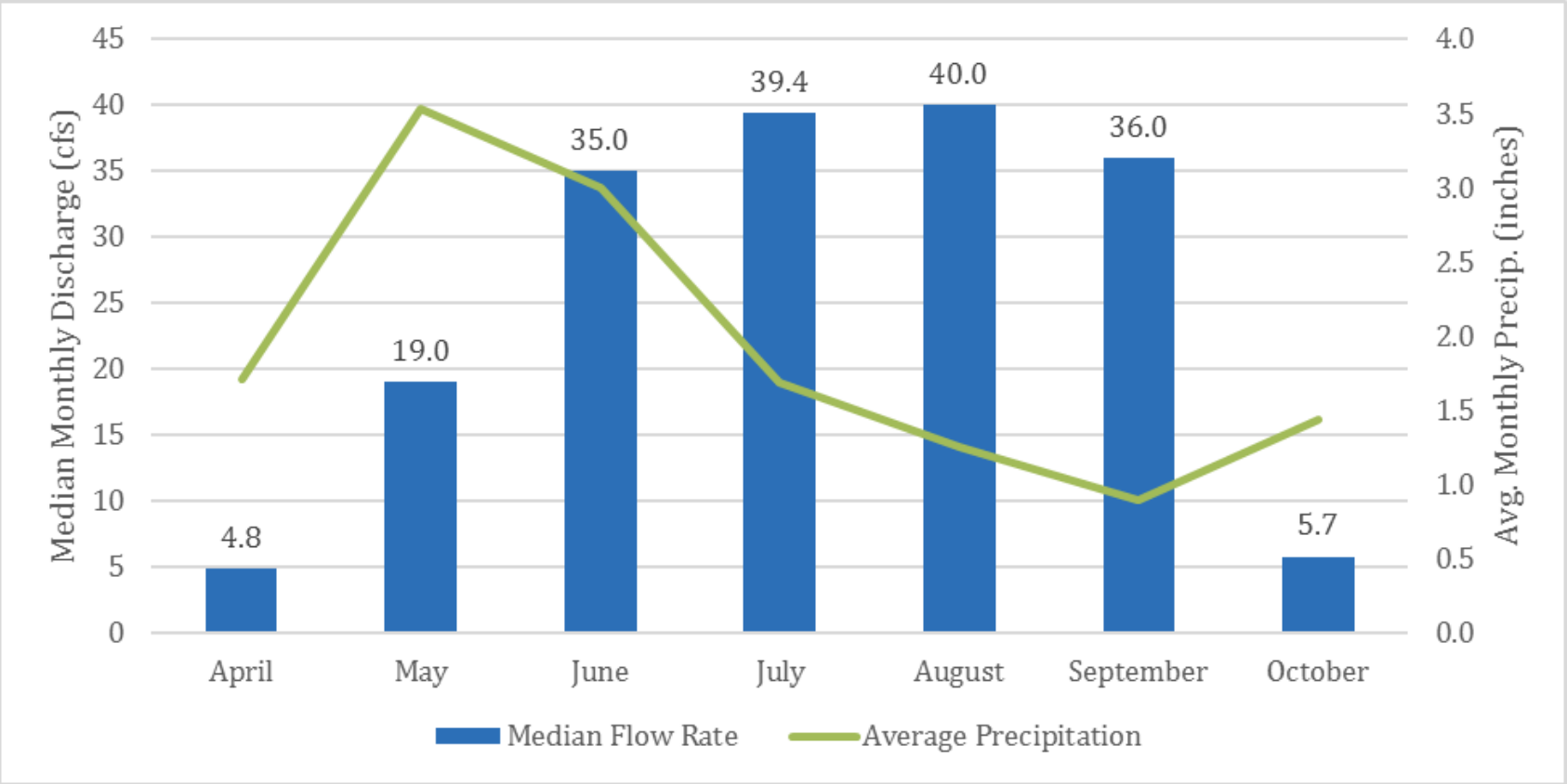
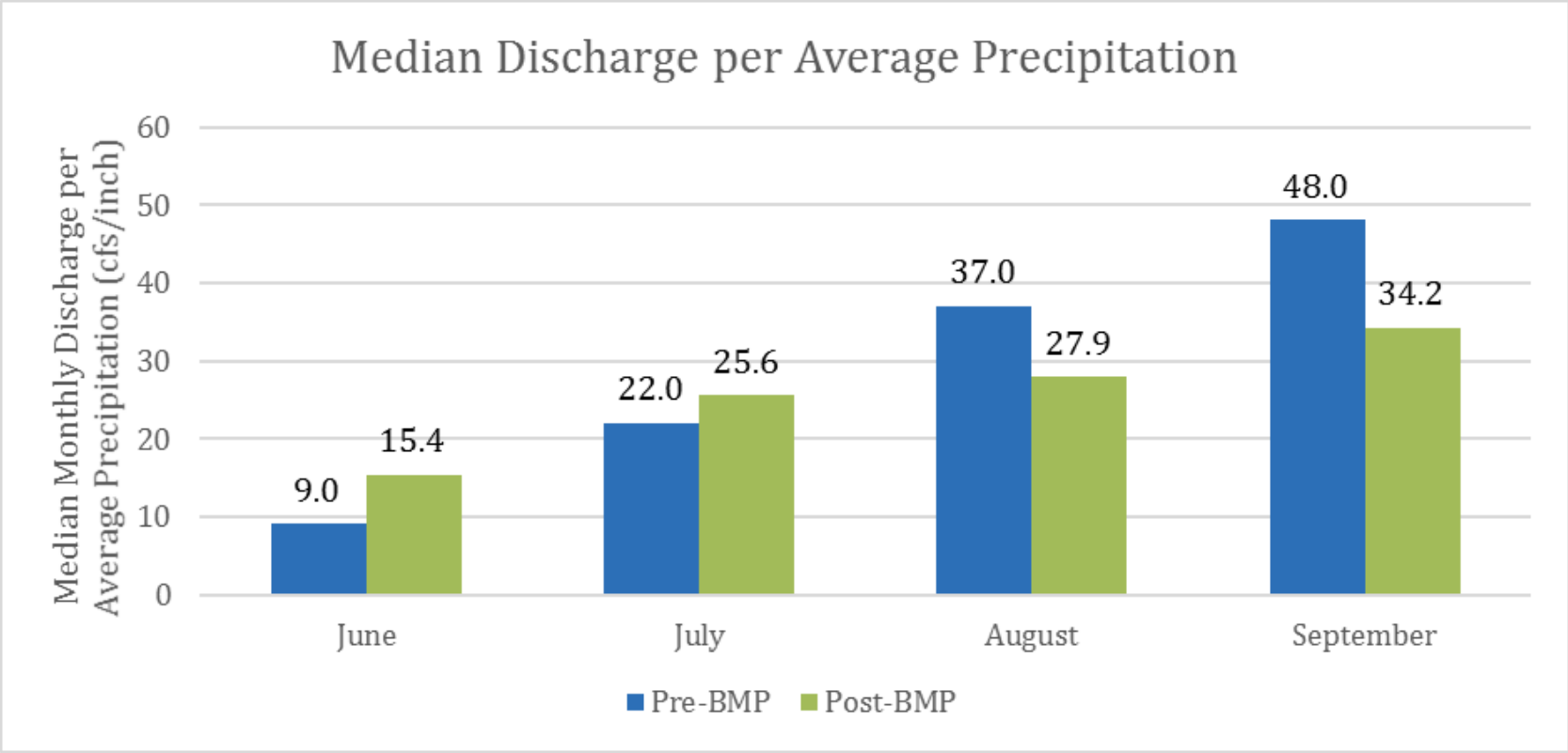
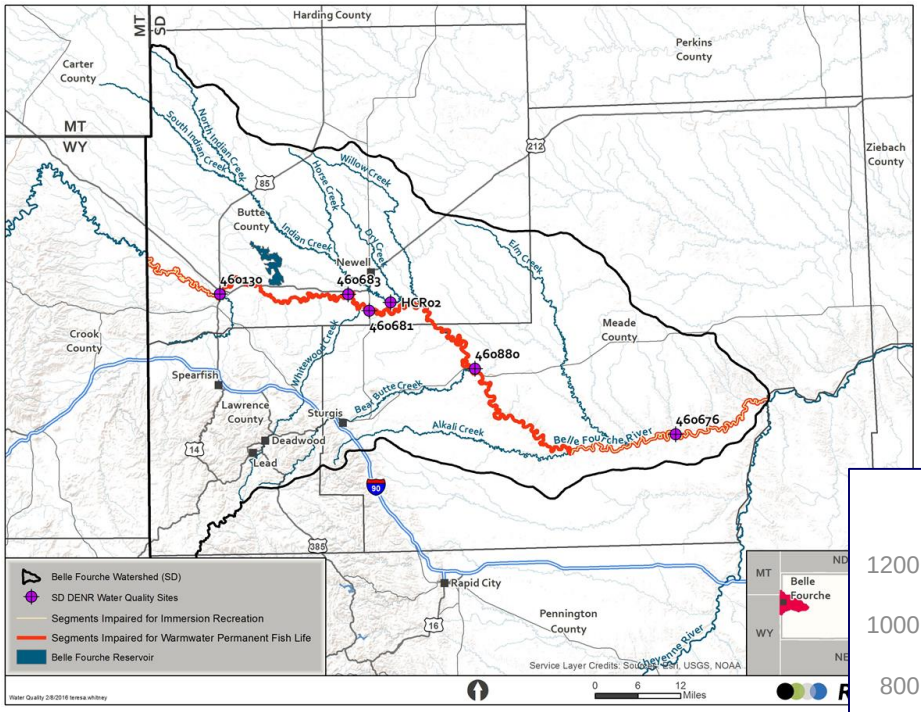
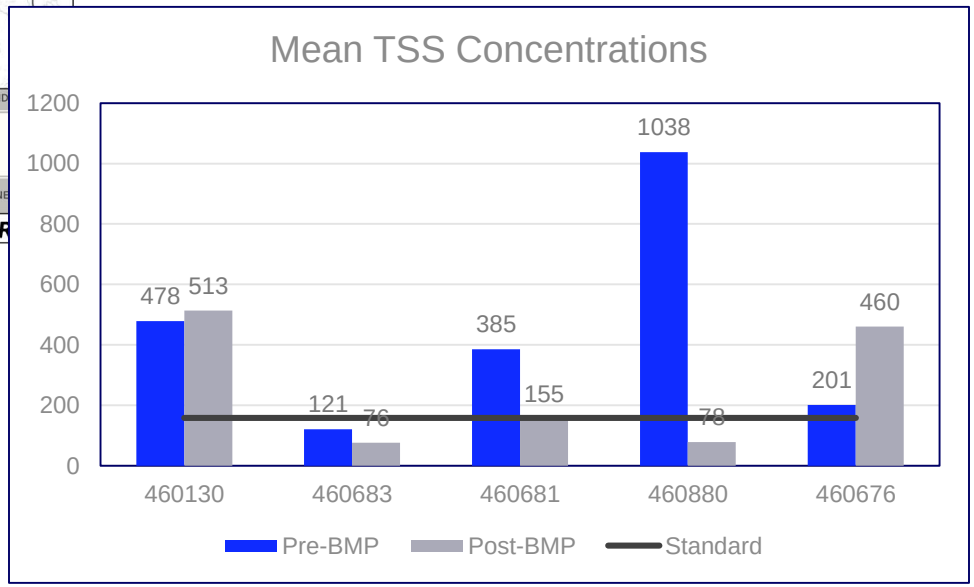


# Horse Creek Improvements



# TSS Water Quality Data



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**Jared Oswald, RESPEC**

**605.394.6400**

***Jared.Oswald@respec.com***

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