



**WYOMING**

## **Boysen Nutrient Initiative**

***Proactively Working to Reduce HCBs at a  
High-Priority Wyoming Reservoir***

**Jennifer Zygmunt, Nonpoint Source Program Coordinator**

**Great Plains and Midwest Harmful Algal Blooms Conference**

**February 4, 2020**

# The Wyoming DEQ Team

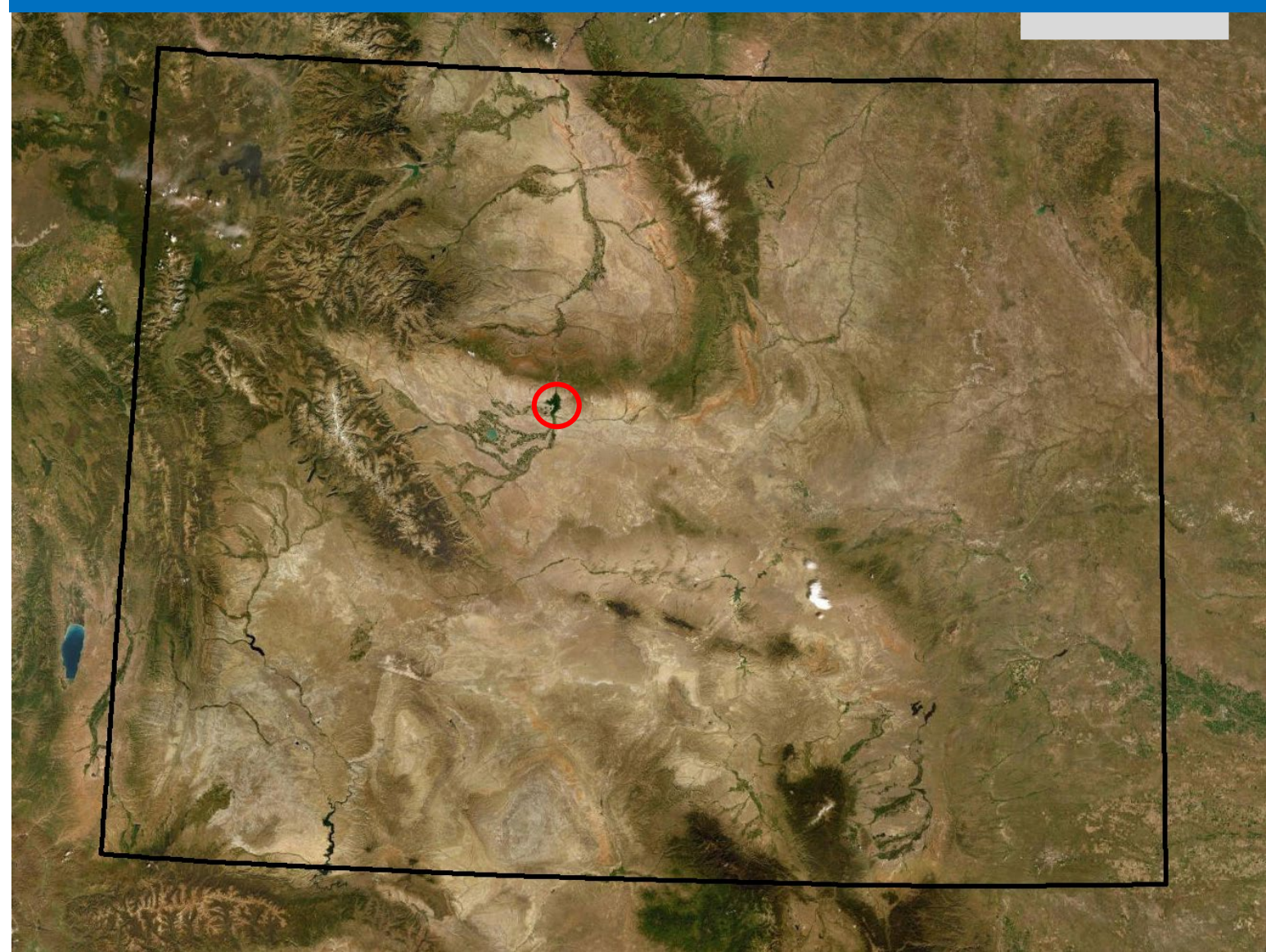
- Lindsay Patterson—Standards
- Michael Thomas—Standards
- Jeremy Zumberge—Monitoring
- Eric Hargett—Monitoring
- Ron Steg—TMDL/Assessment
- Jennifer Zygmunt—NPS
- Jason Thomas—WYPDES
- Rich Cripe—Water and Wastewater

# Wyoming Nutrient Strategy

- DEQ and the Wyoming Nutrient Work Group developed the Nutrient Strategy to identify priority items and key next steps to address nutrient pollution in Wyoming
- A prioritization system was developed by DEQ and the Nutrient Work Group to begin implementing the strategy
- Lakes and reservoirs were prioritized based on risk to public health:
  - use of water as public water supply
  - primary recreation or swimming
  - potential for harmful cyanobacterial blooms (HCBs)

# Prioritizing Boysen Reservoir

- Boysen Reservoir was prioritized based on:
  - elevated densities of cyanobacteria
  - use as a public water supply
  - high level of use for recreation



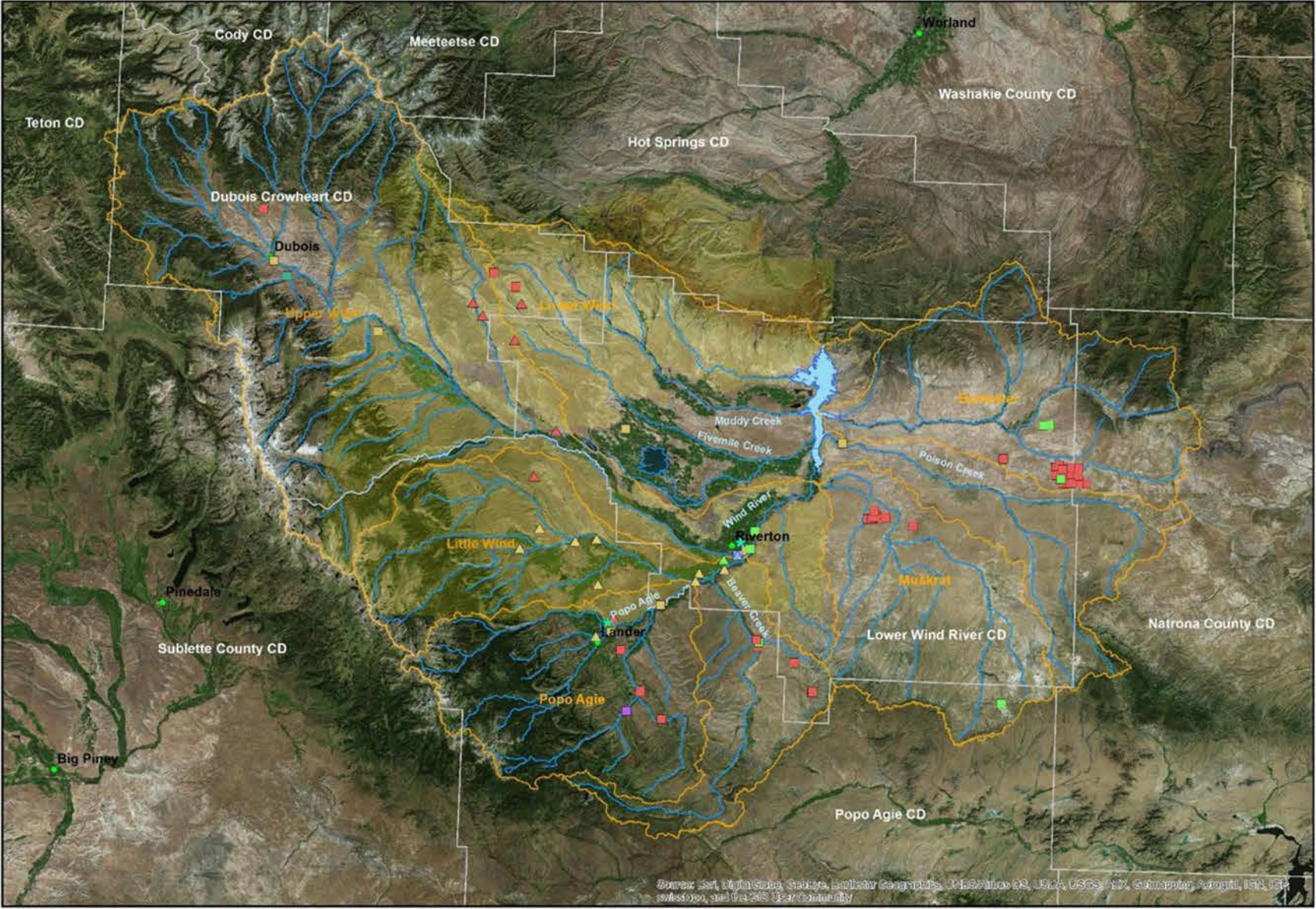


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**Boysen Reservoir Watershed**

- Boysen Reservoir
- NHD 500K Flowlines
- Boysen Watershed (HUC 8)
- Wind River Indian Reservation
- Conservation District Boundary
- County Boundary
- Major City

**EPA Point Sources**

- ▲ CAFO
- ▲ Industrial
- ▲ Oil Treaters
- ▲ Wastewater

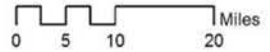
**WYPDES Outfalls**

- CAFO
- Industrial
- Oil Treaters
- Wastewater
- Coal Mine
- Fish Hatchery



WYOMING

Water Quality Division  
Watershed Protection Program  
April 2018



Source: USGS, DigitalGlobe, GeoEye, Earthstar Geographics, CNR/EOS/USDA, USDA, USGS, AeroGRID, IGN, EIA, Swirex, and the GIS User Community

\* Lander and Riverton Wastewater Facilities are Majors

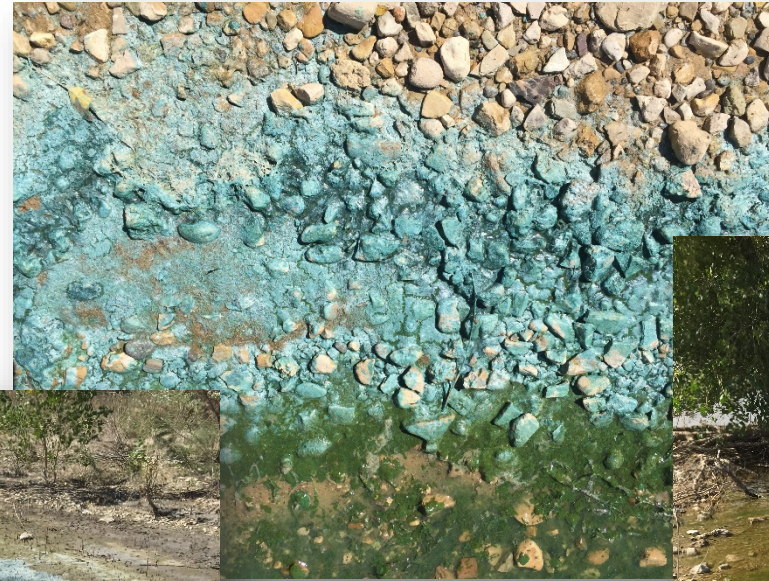


# HCB Photos at Boysen Reservoir

Brannon Boat Ramp



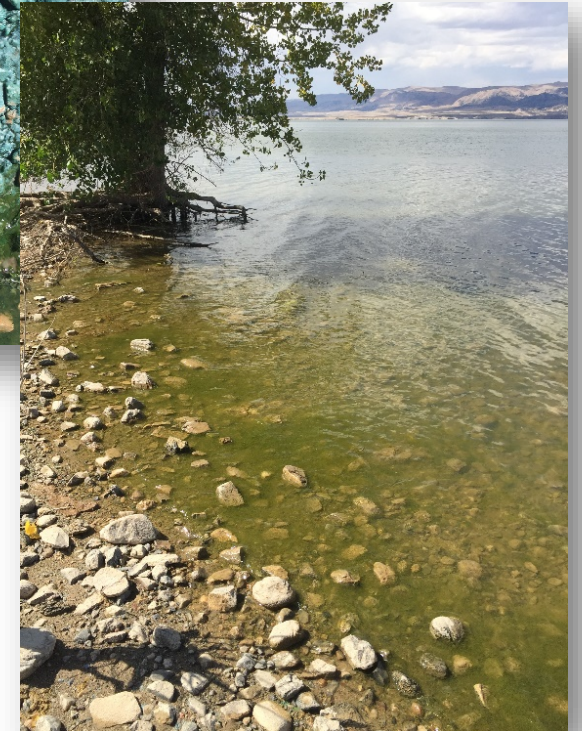
Swim Beach



Tamarask  
Campground



Tough Creek  
Campground



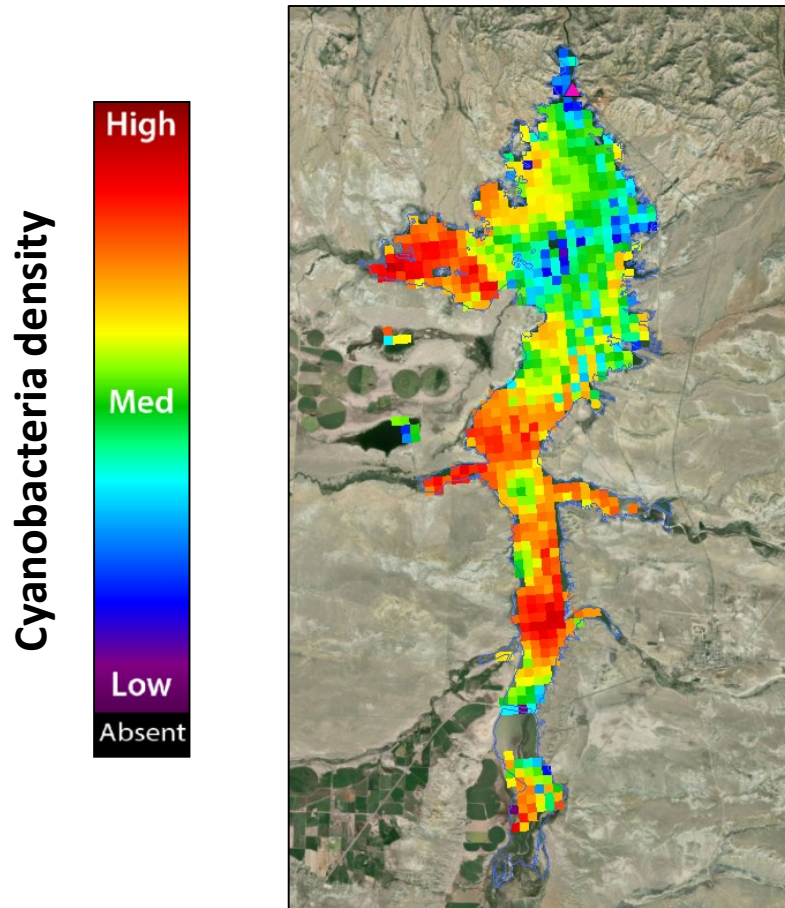
# HCB Advisories at Boysen Reservoir

Year	Date Advisory Issued – Lifted	Cyanobacteria Density (cells/mL)	Dominant Cyanobacteria	Total Microcystins (µg/L)
2017	August 25 – October 13	6,859,517	<i>Psuedanabaena</i>	111
2018	July 27 – October 18	6,079,314	<i>Microcystis</i>	443
2019	August 28 – November 20	11,289,192	<i>Aphanizomenon</i>	104

[wyohcbs.org](http://wyohcbs.org)



# Satellite Imagery at Boysen Reservoir



September 9 – September 15, 2018  
(based on max value)

- Cyanobacteria throughout reservoir
- Higher densities in southern and western portion of the reservoir

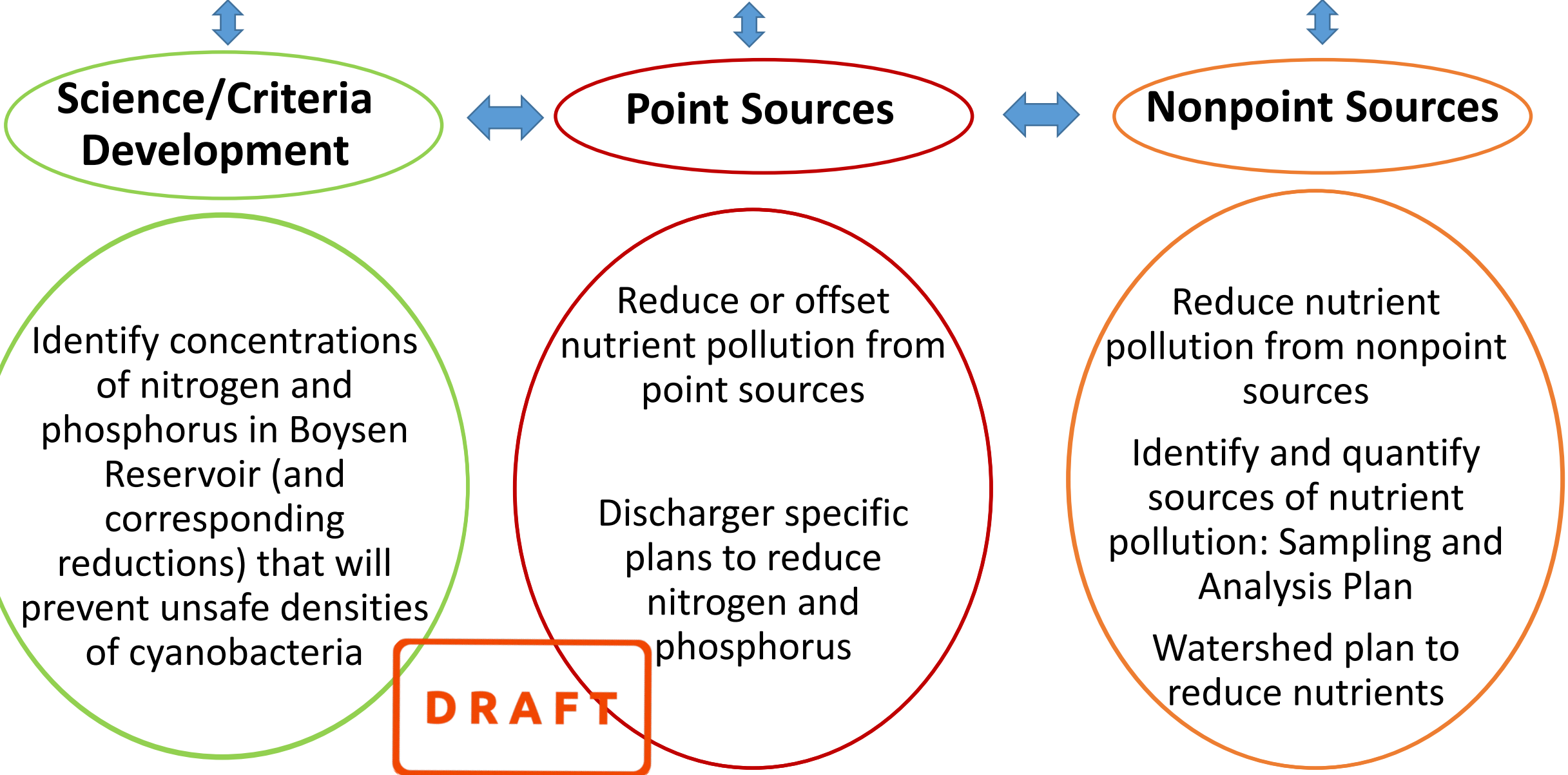
# Summary of Nutrient Loading Data

- More nutrients coming into Boysen Reservoir than are leaving (up to ~75% of incoming loads retained)
- Wind River contributes largest total load of nutrients
- Fivemile Creek contributes the largest total load of nutrients per acre of watershed
- Nutrient concentrations in the tributaries have a seasonal component – highest in April to July
- On average, nonpoint sources appear to be the largest contributor of current nutrient loading to the reservoir; however, we are working with point sources to collect additional data
- Reducing nutrient loading to address HCBs will be a **long-term** process that requires **stakeholder cooperation** and **technical and financial resources**

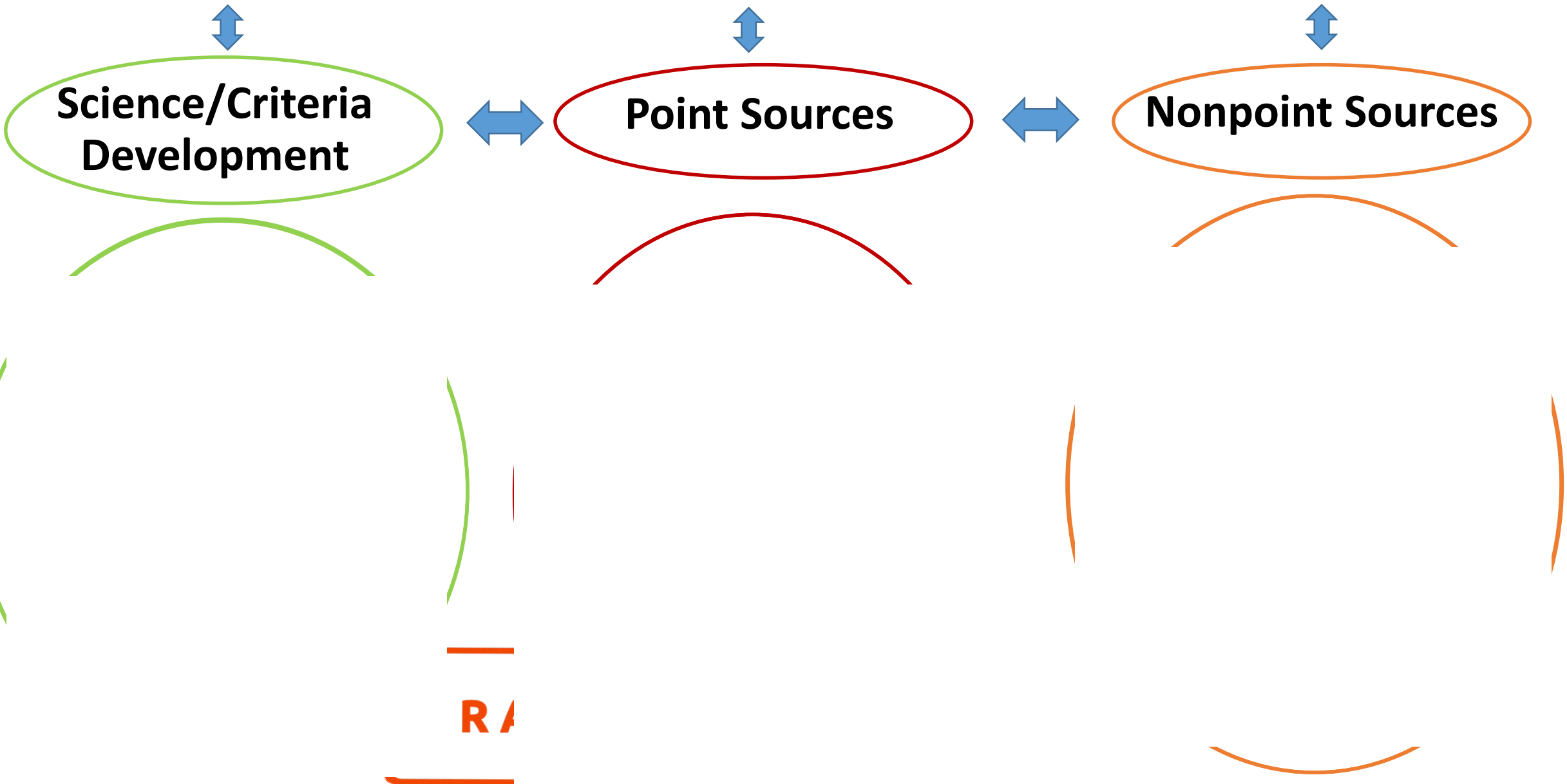


# Boysen Initiative

- Proactive, long-term, stakeholder-driven effort
- Protect public health and improve recreational experiences in Boysen Reservoir
- Decrease cyanobacterial blooms by reducing nutrient (i.e., nitrogen and phosphorus) contributions to the reservoir
- Proposes an Executive Committee and Work Group Structure
  - Each Work Group has goals, objectives, deliverables, and schedule







**Science/Criteria Development**

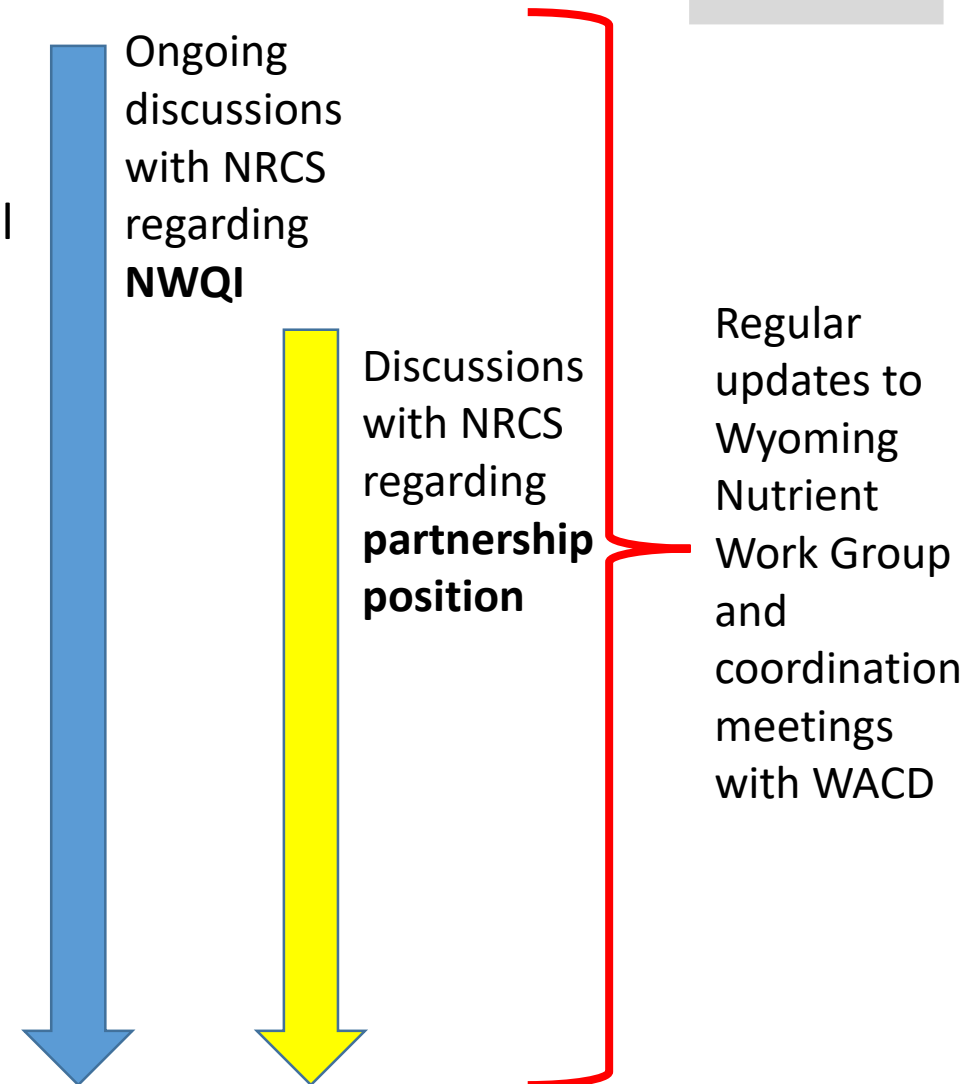
**Point Sources**

**Nonpoint Sources**

**RA**

# Launching the Initiative—Local Support

- **June 2017:** initial meeting with conservation districts
- **Sept. 2018:** presented compiled data for the reservoir and watershed; discussed preliminary initiative structure and potential for NRCS National Water Quality Initiative
- **Sept. 2018 – August 2019:** worked internally to develop initiative structure, including goals, objectives, deliverables, and schedules; discussed need for a coordinator position and potential to fund the position through partnership with Wyoming NRCS
- **August 2019:** discussed proposed initiative structure and coordinator position with conservation districts to get feedback
- **December 2019:** further discussions regarding initiative structure and coordinator position; preliminary thoughts on further monitoring; update on proposed UW study
- **January 2020:** discussion on monitoring activities for 2020 and beyond; further feedback on coordinator position





# Coordinator Position



- Proposed as a two-year partnership position with Wyoming NRCS
- Assist DEQ, NRCS, and conservation districts with Nonpoint Source activities, including
  - Education and outreach
  - Coordinating and facilitating work group meetings and public meetings
  - Developing Sampling and Analysis Plan
  - Watershed plan development
  - NRCS NWQI assessment requirements
  - Other activities to support implementation of Farm Bill conservation programs
  - Writing grant applications
- Assist with Point Source efforts by conducting outreach and compiling information to begin developing facility-specific plans
  - Encourage point source participant in Nonpoint Source Work Group

# Potential University of Wyoming Study

- *Identifying, predicting, and managing the occurrence of harmful cyanobacterial blooms in Wyoming reservoirs*
  - Sarah Collins (UW), William Fetzer (UW), Lindsay Patterson (DEQ), Matt Ross (CSU), Annika Walters (UW)
- Objectives (using Boysen as a pilot)
  - Verify the **effectiveness of remote sensing** for HCB identification with cyanobacterial count samples collected in the field
  - Use long-term records of HCBs from satellite imagery to **predict how climate and other environmental conditions lead to blooms**
  - Analyze and generate data from Boysen Reservoir and its tributaries to **determine nutrient thresholds for bloom formation**
  - Conduct preliminary analyses to determine whether further **research on taxonomic differences** among blooms is important for effective management
- Proposed for funding through the University of Wyoming Water Research Program (UW/USGS)



# Point Sources—Lagoon Optimization

- Lagoon optimization training planned for May 2020
- Wastewater treatment plants in watershed upstream of Boysen Reservoir
- Start conversations with point sources on ways to improve nutrient removal with existing infrastructure

# Next Steps

- Continue building local support and buy-in
- Assist with coordinating limited monitoring for 2020
- Continue pursuing coordinator position
- Work with DEQ Senior Management to establish Executive Committee
- Begin outreach to other stakeholders
- Continue responding to HCBs at Boysen



# Challenges and Lessons Learned

- Proactive approach
  - Messaging
  - Roles and responsibilities
  - Buy-in
  - Prioritization
- “New” water quality issue and “new” pollutants
  - Need for education
- Coordination between DEQ Point Source and Nonpoint Source programs
  - Dialogue about innovative solutions
- Initial participants
  - Bringing downstream conservation district to the table
- Developing a simple but structured approach
  - Meaningful work groups

# Challenges and Lessons Learned

- Scope
  - Large geographic area
  - Numerous partners
  - Long-term effort
- Limited resources
  - DEQ
  - NRCS
  - Conservation Districts
- National Water Quality Initiative
  - Coordination between partners; outreach to NRCS and STAC
  - Watershed selection
  - Assessment requirements

# Questions?

