



— BUREAU OF —  
RECLAMATION

# Early Detection and Monitoring

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# Background

- Early detection and monitoring program started in 2007
  - ARRA funding in 2008
  - In 2012 Reclamation was awarded the Colorado Labs Governor's Award for High Impact Research
- Goal:
  - Detect invasive mussels at earliest stages of introduction
  - Trigger management response before populations increase
    - Containment: boat inspection and decontamination
    - Implementation of control measures at power plants or other at-risk facilities
    - Implementation of rapid response plans



# Background

- Reclamation labs analyzing mussel samples
  - TSC, Ecological Research Lab- Denver, CO
  - Columbia-Pacific Northwest Region, Water Quality Lab- Boise, ID
- Samples are collected at prioritized sites based on...
  - Habitat suitability- Ca and pH
  - Boat visitation numbers
  - Potential for significant impact to Reclamation mission critical activities
- Samples collected by Reclamation, States, and managing partners



# Ecological Research Lab

- Over 20,000 samples analyzed since 2007
  - 602 water bodies in 17 western states
- Approximately 1,500 samples analyzed per year
  - Received over 1400 samples this year despite pandemic





# Sample Collection

- Sampling for veligers
  - States require
  - Earlier warning than adults
    - Easier to detect
    - More prevalent
- Plankton tow net samples
  - Multiple sites
  - 5 tows per site
  - Field blanks
- Preserved with alcohol and buffered before shipped



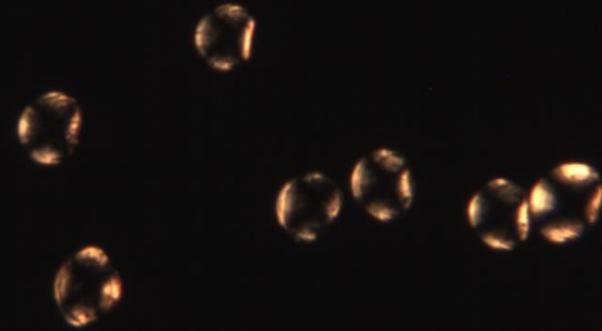
# Sample Analysis

- Samples logged into database
- Settled in modified Imhoff cones
  - Veligers fall to the bottom of the sample
  - Analyze bottom 15 mL of sample



# Sample Analysis

- Cross-polarized light microscopy
  - Light reflects off veliger shell
  - Distinct cross pattern
- When a veliger is detected
  - Higher magnification photos
  - Veliger and water sample are genetically analyzed
    - States need genetic species confirmation
  - Environmental DNA



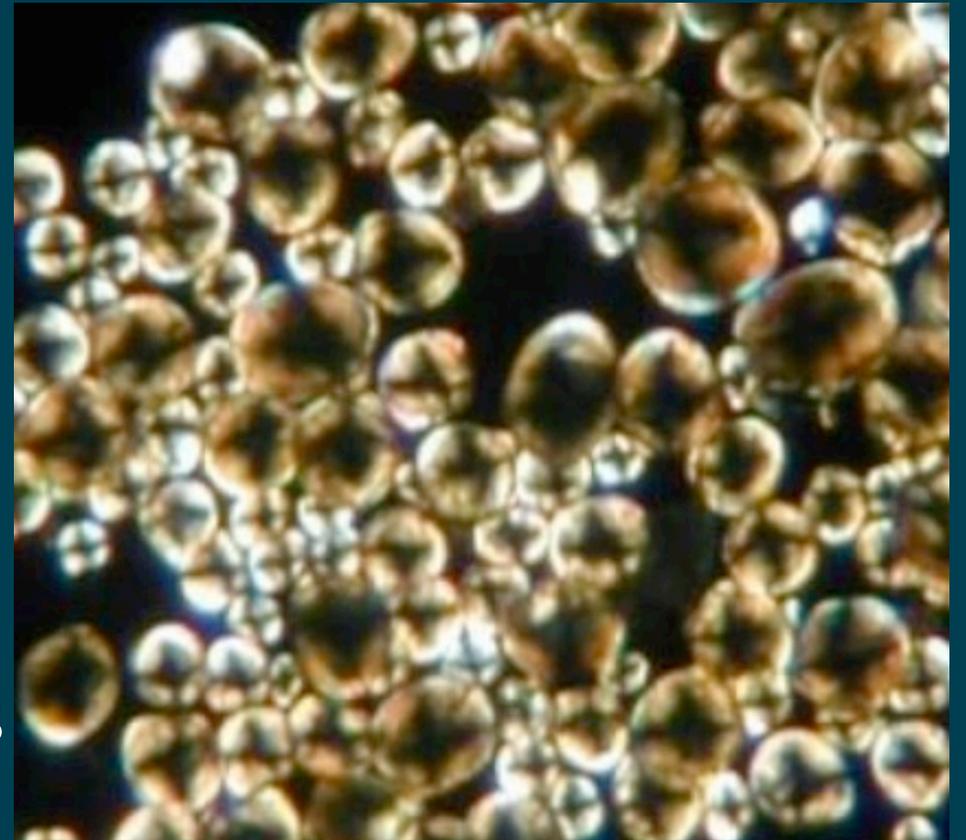
# Sample Results

- After veliger detection, the water body goes on a watch list
  - All future samples analyzed for veligers and eDNA
- eDNA: Environmental DNA
  - A sub-sample of the plankton tow water sample is analyzed for eDNA
  - DNA sequencing performed on positive findings to confirm



# Sample Results

- Notification protocol
  - Sample results are confidential
    - Only designated personnel are notified
    - State AIS Coordinator and managing partners
- Reclamation only provides sample results
  - Does not classify waters as positive or negative
  - States have unique and defined criteria for making designations
- Many cases where veligers detected but population never established



# Sampling Protocols

- Developed SOPs for sample collection and analysis
  - Posted on website
- Participate in government and outside working groups
  - Standardize sampling methods
  - Genetic testing methods and advancements
  - eDNA use for management decisions
- The Eco Lab also provides identification of other invasive and endangered species along with environmental monitoring, restoration and research.



# Outreach

- Train and mentor college and high school interns
- Lab tours for the public and partners
- Present to elementary and high school students
  - Water Festivals
  - STEM Conferences

