

Research Update

S&T Program Project ID 2387
Bulletin 2017-01

Bottom Line

This research project developed a standard operating procedure for the sample preparation and analysis of samples by the FlowCam™ instrument, and compiled sample data in a developed database so RDLES researchers know which bodies of water have data and which samples need to be analyzed by the FlowCam™ instrument.

Better, Faster, Cheaper

The ability to catalogue the algae and zooplankton in a reservoir will allow managers to better understand the ecology in Reclamation reservoirs by revealing water quality and fishery concerns in their earliest stages with the potential to improve water management in a less costly way.

Principal Investigators

Jamie Carmon
Former Biological Services
Technician

Jacque Keele
Biologist
303-445-2187
jkeele@usbr.gov

Denise Hosler
Botanist
303-445-2195
dhosler@usbr.gov

RDLES/Hydraulic Investigations and
Laboratory Services Group
Technical Service Center

Detecting Environmental Impacts of Invasive Mussel Infestations

Developing an algae and zooplankton database using FlowCam™ technology

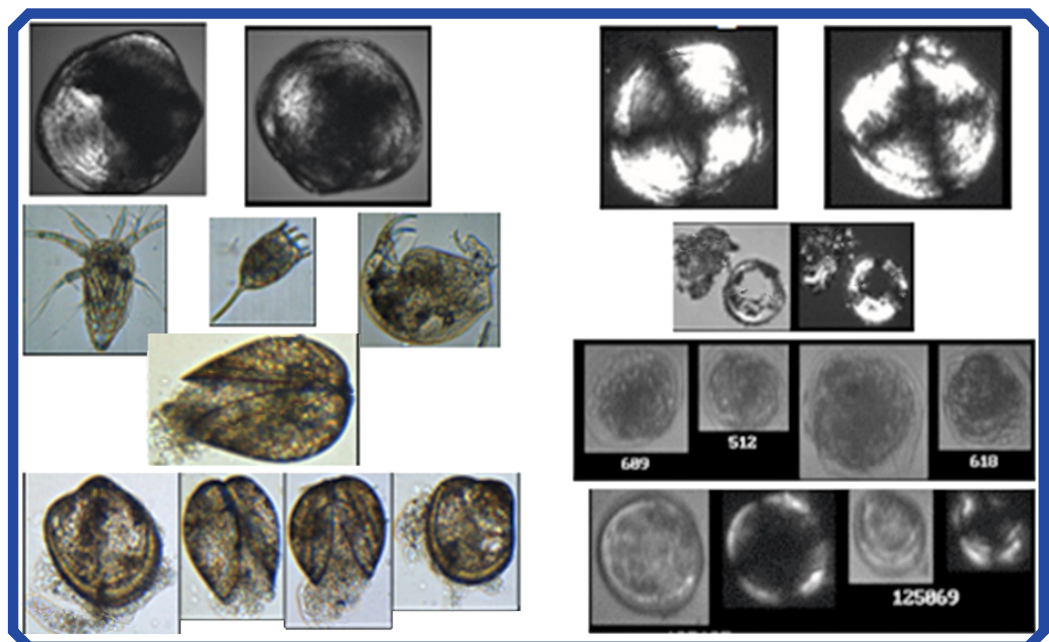
Problem

Dreissenid mussels in reservoirs rapidly filter nutrients out of the water, causing serious impacts to the ecosystem. FlowCam™ technology combines the benefits of digital imaging, flow cytometry, and microscopy into a single instrument to help researchers quickly and easily measure the size and shape of microscopic particles in a fluid medium. The FlowCam™ instrument and software can easily be used to create libraries of organisms that can be visually searched to determine what types of zooplankton are present in a sample. Zooplankton sampled with the FlowCam™ instrument can generally be identified to higher taxonomic levels. The ability to identify sampled zooplankton to the species level may be limited to the dependence on a single image; however, this level of identification may be unnecessary for the ecological questions at issue.

Reclamation has an obligation, and spends tax dollars managing reservoirs to improve populations of fish species of concern. Using this instrument can alert Reclamation staff to reservoir concerns at its earliest signs of distress, potentially reducing management costs.

Solution

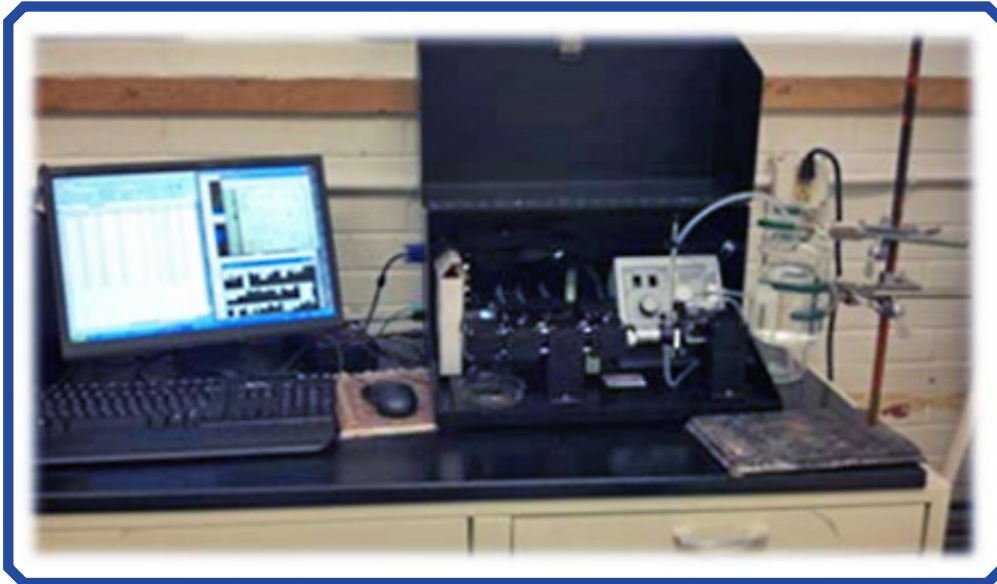
This Reclamation Science and Technology Program research project assembled a team of researchers from the Reclamation Detection Laboratory for Exotic Species (RDLES) in the Technical Service Center who collaborated with Fluid Imaging Technologies, Inc. to learn the most effective ways of operating the FlowCam™ instrument and software. In addition, RDLES researchers worked with the City of Westminster, Colorado, to improve the taxonomic identification of species for future photographic cataloging. Both high school and college interns were also taught how to use the FlowCam™ instrument so they can analyze samples and, in turn, provide a more efficient labor use for RDLES staff.



FlowCam™ instrument photographs of zooplankton and mussel veligers.

Application and Results

A standard operating procedure (SOP) for the sample preparation and analysis of samples by the FlowCam™ instrument was developed. During winter 2015, all the samples from 2010 to 2014 were compiled to determine how many times each site has been analyzed and to better understand the FlowCam™ data that have been collected. This developed and compiled database will also allow RDLES researchers to better pinpoint which bodies of waters need to be analyzed by the FlowCam™ instrument.



FlowCam™ instrument in use.

Future Plans

The tasks accomplished have taught RDLES researchers about the capabilities and limitations of the FlowCam™ instrument and software. RDLES will continue to analyze and build libraries of water samples from across the Western United States. RDLES researchers hope and envision that one day software will be developed that can easily analyze the data itself, thus understanding reservoir data even further.

“This technology has the potential for helping managers understand invasive mussel impacts on reservoirs.”

Denise Hosler
Botanist
Reclamation’s Technical Service
Center

Research Office Contact

John Whitler
Science and Technology
Program Manager
303-445-2241
jwhitler@usbr.gov

Collaborators

- Reclamation’s Great Plains, Lower Colorado, Upper Colorado, Mid-Pacific, and Pacific Northwest Regions
- Fluid Imaging Technologies, Inc.
- City of Westminster, Colorado

More Information

www.usbr.gov/research/projects/detail.cfm?id=2387

www.usbr.gov/research/projects/researcher.cfm?id=160