Lower Columbia River and Snake River ANS Monitoring 2005

Annual Report

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Introduction

Invasions by exotic species typically include a lag phase characterized by slow population growth, followed by a period of exponential increase in coverage. In Willapa Bay, for example, the invasive cordgrass *Spartina alterniflora* remained at relatively low levels for close to a century after its initial introduction. It is in the early stages of infestation, when population sizes are relatively small, that control efforts can be most cost effective. Periodic monitoring within the Columbia and Snake Rivers can be done using conventional methods such as seining, grab samples, plankton tows, dredge sampling, and plant rakes.

Zebra mussels (*Dreissena polymorpha*) have been detected recently in other regions of the U.S. by analysis of plankton tow samples for the presence of veligers, the larval stage of the zebra mussel. After adult zebra mussels reproduce, their offspring live as free-swimming planktonic organisms for three to five weeks. The veligers are capable of drifting, especially during storms or temperature inversions. After that, they develop small bivalve shells, settle onto solid substrates, and begin to develop into adult zebra mussels.

Veliger sampling allows for the discovery of very young zebra mussels in bodies of water as much as two years before they may be seen with the unaided eye. Though monitoring does not guarantee a discovery, the efforts can provide an effective 'early warning system' for zebra mussel infestations.

Methods

Washington Department of Fish and Wildlife currently collects veliger samples at sites along the mid and upper Columbia River. We conducted similar sampling at four U.S. Army Corps of Engineers (USACE) hydroelectric dams along the Lower Columbia and Lower Snake Rivers (Table 1). Portland State University Center for Lakes and Reservoirs (CLR) personnel visited each of the four dams and did plankton tows once per month from April through October. Three plankton tows were made at each of the dams on each visit. Tows were made with a 64 µm mesh plankton net and the contents combined into a single sample per site. Samples were preserved in ethyl alcohol and analyzed by CLR personnel at Portland State University laboratory facilities for presence/absence of zebra mussel veligers.

Table 1. USACE dams on the Columbia and Snake Rivers included in 2005 sampling

Project name	River	Rivermile	State
Bonneville	Columbia	146	OR
John Day	Columbia	216	OR
Ice Harbor	Lower Snake	10	WA
Lower Granite	Lower Snake	110	WA

Plankton tow sample analysis was conducted using the polarized light technique developed by Johnson (1995). Samples were allowed to settle for a minimum of one week after which a Pasteur pipette was used to obtain three subsamples per sample bottle from the settled contents. Subsamples were combined in the well of a Sedgewick –Rafter® counting chamber and viewed at 45X magnification using polarized light.

Concurrent sampling for other invasive, aquatic nuisance species was also done. The USACE hydroelectric project dams have trash racks installed on their water intakes. These racks capture debris carried downstream by river currents, thus acting as giant water column samplers. USACE maintenance personnel regularly clean trash racks and find aquatic plants, large and small woody debris, and animals such as fish. We took advantage of these built-in river "samplers" as devices for monitoring and detecting invasive species in the Columbia and Snake Rivers.

Trash racks were subsampled on each of the monthly visits described above with an additional sampling visit in September when aquatic weed biomass is typically at its peak due to plant senescence. Trash rack subsampling consisted of removing three approximately gallon size volumes from the wrack pile, sampling the freshest material whenever possible. Plant identification was done on site when possible. The Washington Department of Ecology's (2001) Aquatic Plant Identification Manual was used to aid in identification of plant samples.

Results and recommendations

All plankton tow samples were negative for the presence of zebra mussel veligers. Sample dates, locations, and results are contained in Table 2 below. Results of analyses of samples taken from picketed leads are contained in Table 3. No new non-native plant species were detected i.e., both *Myriophyllum spicatum* and *Potamogeton crispus* have been well documented in the Columbia and Snake Rivers in the past.

Continued monitoring for both adult and veliger stages of zebra mussels is recommended for the Columbia River Basin which has been identified as a river system at high risk for zebra mussel invasion (Drake and Bossenbroek 2005). Phillips et al (2005) estimate potential mitigation costs at hydropower facilities in the Columbia River Basin to be approximately $23 million. US Army Corps of Engineers dam personnel have been monitoring for adults using sampling substrates provided by Portland State University as well as during regular maintenance operations on dam infrastructures. Zebra mussels have been detected in other river systems east of the 100th meridian at both adult and veliger stages thus, it would be prudent to continue both forms of monitoring.

Table 2. Plankton tow sampling dates and analyses results
(0 indicates negative for zebra mussel veligers)

	5/12/05	5/13/05	6/16/05	6/17/05	7/21/05	7/22/05	8/25/05	8/26/05	9/15/05	9/16/05	10/27/05	10/28/05
Bonneville Dam	0		0			0		0		0		0
John Day Dam	0			0		0	0		0			0
Ice Harbor Dam		0		0	0		0		0		0	
Lower Granite Dam		0	0		0			0		0	0	

Table 3. Presence/ Absence of macrophytes collected from picketed leads at USACE projects in 2005
(B = Bonneville, JD = John Day, IH = Ice Harbor, LG = Lower Granite)

Scientific name	Common name	native/ non-native	5/12/05 5/13/05	6/16/05 6/17/05	7/21/05 7/22/05	8/25/05 8/26/05	9/15/05 9/16/05	9/29/05 9/30/05	10/27/05 10/28/05	11/30/05
Myriophyllum spicatum	Eurasian watermilfoil	non-native	B, JD, IH	B, JD	B, JD, IH	B, JD, IH	B	B	B, IH	B
Myriophyllum sibiricum	Northern watermilfoil	native	B							
Potamogeton crispus	Curlyleaf pondweed	non-native	B, JD	B, JD	B, JD	B	B	B	B	B
Potamogeton pusillus	Small pondweed	native		B	B, JD	B	B	B		B
Potamogeton zosteriformis	Flatstem pondweed	native				B				B
Ceratophyllum demersum	Coontail	native	B	B	B	B, JD	B, JD, IH	B, JD	B	B

Elodea canadensis	Common elodea	native	B, IH	B	B	B	B	B	B, IH	B
Cladophora or Rhizoclonium	filamentous algae*	native	JD, IH		B, IH	JD, IH	B, JD, IH, LG	IH, LG	JD, IH	

*Filamentous algae included in sampling along with macrophytes

Literature cited

Drake, John and Jonathan Bossenbroek. (2004), "The Potential Distribution of Zebra Mussels in the United States," BioScience Vol. 54: 931-941.

Johnson, L.E. (1995), "Enhanced early detection and enumeration of zebra mussel (*Dreissena* spp.)veligers using cross-polarized light microscopy," Hydrobiologia 312:139-146.

Phillips, Stephen, Tim Darland, and Mark Sytsma (2005), "Potential Economic Impacts of Zebra Mussels on the Hydropower Facilities in the Columbia River Basin," Report to the Bonneville Power Administration.

Washington Department of Ecology (2001), An Aquatic Plant Identification Manual for Washington's Freshwater Plants, Washington State Department of Ecology.