Aquatic Nuisance Species Workshop
US Army Engineer District, Portland
10 May 2007

Introduction

Background on the Workshop

A workshop on Aquatic Nuisance Species (ANS) was held in Portland, Oregon, on 10 May 2007. Attendees were from the Portland, Los Angeles, and Settle Districts, North West Division Office, USFWS, Portland State University, and Pacific States Marine Fisheries Commission. Ten presentations were given in three sessions: 1) Research, 2) USACE case studies, and 3) Regional activities. Although the purpose of the workshop was to deal with all ANS, concern over the introduction and spread of zebra (*Dreissena polymorpha*) and quagga mussels (*Dreissena bugensis*) was of primary importance—due to the finding of the latter species in the Colorado River earlier this year. A discussion session was held at the end of the meeting.

An agenda and presentations are on this website. Table 1 of the document contains attendees. Workshop findings will be presented at the 100th Meridian Meeting to be held in Portland, Oregon, June, 2007. The workshop was held at the request of Dr. Al Cofrancesco, Technical Director at the Environmental Laboratory (EL), U.S. Army Engineer Research and Development Center (ERDC).

Zebra Mussels

Zebra mussels were accidentally introduced into Lake St. Clair, Michigan, via ballast water in the mid 1980s. This species is currently the only freshwater invertebrate biofouler in North America. Like blue mussels and barnacles, in marine habitats this bivalve can quickly foul intake screens, trash racks, and water pipes and negatively affects pumping plants, cooling systems in vessels, hydropower and pumping plants that require freshwater. The species can be controlled with chlorine, coatings, biocides, elevated temperatures, and desiccation.

Workshop Findings

Presentations

Andrew Miller presented an introduction to the invasive species problem and described several methods for dealing with Aquatic Nuisance Species (ANS) issues that included networking, collaborative decision making, risk analysis and geospatial assessments. Dr. Payne provided an historical perspective on ANS research at the US Army Engineer Research and Development Center which included a discussion of the origin and

development of both the Aquatic Plant Control research Program and the Zebra Mussel Research Program.

In Session I of the workshop that dealt with research, Andrew Miller summarized ongoing work units at ERDC on ANS. These projects are: 1) Harmful algal blooms, 2) Asian carp, 3) Use of niche modeling to predict introduction and spread of ANS, 4) toxin production by algae, and 5) ANS information systems. Mark Systma, Portland State University, summarized ongoing aquatic plant studies and research needs that would facilitate management of ANS in the Pacific Northwest.

In Session II of the workshop that dealt with US Army Corps activities, Sheryl Carrubba, Portland District, discussed the development of best management practices for USACE dredges designed to limit the introduction and spread of ANS. Hiram Arden, Seattle District, discussed *Spartina* evaluation on Swinomish Navigation Channel. Goeff Dorsey, Portland District, described a project designed to reduce the negative impacts of European beech grass with sediments from a marine dredging project. A fact sheet that describes this project in more detail, prepared by Mr. Dorsey, appears as Appendix A to this document.

In Session III of the workshop Paul Heimowitz, USD Fish and Wildlife Service, discussed regional ANS issues. Major points of his presentation were:

- Although the 100th Meridian Initiative and associated *Dreissena*-focused projects represent a major source of regional partnerships in the Pacific Northwest, there are many other aquatic invasive species (AIS) issues that involve regional collaboration between the U.S. Fish and Wildlife Service and others.

- Strong state-level AIS programs form a foundation of regional collaboration in the Northwest. Oregon and Washington have federally-approved state AIS management plans and therefore receive partial funding through the USFWS. Idaho is in the final stages of completing their plan.

- The Aquatic Nuisance Species Task Force's Western Regional Panel (WRP) provides an important forum for regional collaboration.

- Prevention is a high priority for regional collaboration in the Northwest, and there are a number of pathways being addressed by joint projects. For example, the Western Regional Panel has recently started a workgroup to develop regional and national measures that could reduce the introduction of AIS by classroom educators, prompted by recent incidents involving this pathway in the Northwest.

- The simplified risk management process known as Hazard Analysis and Critical Control Point (HACCP) planning has also emerged as a priority effort in the Northwest. Training and plan development continues for fish hatcheries, environmental sampling crews, and other natural resource agency programs in the Northwest.

- AIS early detection and monitoring coverage remains incomplete in the Northwest, but efforts are underway to better integrate existing aquatic monitoring programs, such as the Pacific Northwest Aquatic Monitoring Partnership.

- Regional coordination also occurs in the form of species-specific projects, guided in some cases by national AIS management/control plans (e.g., Asian carp, New Zealand mudsnails, *Nutria*).

- Some key issues that need further regional attention (and national support) include:
    - How do we best remove ANS fouling large vessels/equipment?
    - What's the next invader to worry about (e.g., other *Dreissena* species)?
    - How do we enhance early detection (e.g., PCR methods)?
    - What is the eradication "threshold" for species "X" under situation "Y"?
    - What are direct impacts of AIS (e.g., New Zealand mudsnails) to ESA-listed species?
    - What are the implications of climate change on AIS populations/management in the Northwest?

Robyn Draheim, Portland State University, discussed a Columbia River Aquatic Nonindigenous Species Survey. This was primarily the result of the the National Invasive Species Act of 1996 which identified the need to conduct an ecological survey of aquatic nonindigenous species in the Columbia River and authorized funding for this purpose. The Lower Columbia River Aquatic Nonindigenous Species Survey (LCRANS) (2001-2004) was initiated to provide comprehensive information about the nonnative species present in the lower Columbia River. The objective of the LCRANS was to provide a comprehensive survey and analysis of all aquatic nonindigenous species present in the tidally influenced, 234-kilometer reach of the lower Columbia River from Bonneville Dam to the Pacific Ocean and the tidal portions of the major tributaries. As a follow up to LCRANS a similar survey of the middle Columbia River (MCRANS), from Bonnneville to Priest Rapids and along the lower Snake to Lower Granite Dam, began in 2005 and was completed spring 2007.

The literature review and field survey revealed that at least 82 organisms have been introduced into the lower Columbia River since the mid 1800s. The majority of these species were fish (28%), aquatic plants (23%) and crustacea (15 %). Results from the middle Columbia River survey show at least 51 nonnative species dominated by fish (54%), aquatic plants (14%) and crustaceans (12%). In total there are at least 96 nonnative species in the Columbia River Basin spanning the estuarine mouth to the free flowing Hanford Reach. Due to the limitations of these surveys, inadequate taxonomic resolution in prior studies, and the abundance of unresolved and cryptogenic taxa, our results are likely a conservative estimate of the number of Aquatic Nonindigenous Species in the lower and middle Columbia River.

In the final presentation of the day, Stephen Phillips, Pacific States Marine Fisheries Commission, described goals of the 100th Meridian Initiative: 1) Prevent the spread of zebra mussels and other aquatic nuisance species in the 100th meridian jurisdictions and west; 2) Monitor and control zebra mussels and other aquatic nuisance species if detected in these areas. Additional information can be found on their website (http://100thmeridian.org/) and in the presentation by Stephen Phillips.

Major Findings of the Workshop

A major point brought forth by Paul Heimowitz, was the need for all agencies with ANS interests, including USACE field and research elements, to have active and consistent participation in the regional ANS panels of the ANS Task Force. These panels (there are six that cover the US) are directly involved in implementing policy relating to slowing or preventing the introduction and spread, permitting, and management of ANS. Consistent participation by USACE personnel would support the ongoing national and regional ANS agenda. USACE staff would benefit by obtaining a more complete understanding of ANS concerns which would assist in dealing with applied issues.

Overall the workshop illustrated a need for coordinated multi-agency expenditure of limited research dollars to deal with ANS problems of the highest priority. Dr. Mark Systma described the need for applying research dollars at specific aquatic plant management issues, some of which have not been dealt with at all in the past as part of large-scale, comprehensive programs. Often researchers get involved with highly interesting problems that do not reflect priorities suggested by the National ANS Task Force and its subordinate regional panels. A better alignment of research with these efforts would improve R&D applications to solve practical ANS problems. For example, at the workshop Cheryl Carrubba described developing Best Management Practices (BMPs) designed to reduce the likelihood that USACE dredges (government and contract) would spread ANS. BMPs were prepared without assistance from research staff. The same could be said for other USACE presentations at the workshop.

The future of ANS research would benefit from development of a series of highly focused work projects that required EL staff to interact with USACE District and Division personnel and the regional ANS panels tasked with implementation of national policy. Such projects should be designed to solve ongoing applied problems related to permitting, risk assessment, and monitoring of ANS. In the case of developing BMPs (e.g., Sheryl Carrubba's presentation), there is no reason that an EL scientist could not have directly interacted with Ms. Carrubba's staff to produce the BMP document.

Table 1. Attendees at an Aquatic Nuisance Species Workshop, 10 May 2007, Portland, Oregon

Name	Oraganization	e-mail Address
Andrew Miller	Ecological Applications	ecol_appl@earthlink.net
Barry Payne	USACE ERDC-EL	barry.s.payne@erdc.usace.army.mil
Kathryn Barko	USACE-Portland District	kathryn.l.barko@nwp01.usace.army.mil
Jerry Gompers	USACE-Portland District	jerry.gompers@nwp01.usace.army.mil
Jim Reese	USACE-NW Division	jim.r.reese@usace.army.mil
Stephane Stirling	USACE-NW Division	stephanie.k.stirling@usace.army.mil
Robyn Draheim	Portland State University	draheim@pdx.edu
Mark Systma	Portland State University	systmam@pdx.edu
Geoff Dorsey	USACE-Portland District	geoffrey.l.dorsey@usace.army.mil
Carolyn Schneider	USACE-Portland District	carolyn.b.schneider@usace.army.mil
Paul Heimowitz	US Fish and Wildlife Service	paul_heimowitz@fws.gov
Hiram Arden	USACE-Seattle District	hiram.t.arden@usace.army.mil
Sheryl Carrubba	USACE-Portland District	sheryl.a.carrubba@usave.army.mil
Mo Chang	USACE-Los Angeles District	mohammed.n.chang@usace.army.mil
Jeffery W. Randall	USACE-The Dalles-John Day Project	jeffery.w.randall@usace.army.mil
Stephen Phillips	PSMFC	stephen_phillips@psmfc.org
Tim Darland	USACE-Bonneville Dam	timothy.j.darland@nwp01.usace.army.mil
Patricia Miller	USACE-Seattle District	patricia.r.miller@usace.army.mil

Appendix A
Coos Bay Western Snowy Plover Habitat Management, OR, Section 1135(b)

Name of Project: Coos Bay, Oregon Federal Navigation Project: The initial project was authorized by the River and Harbors Act of March 3, 1879

The proposed modification entailed the local control of European beachgrass on approximately 71 acres on Coos Bay North Spit. The project modification was intended to restore 26 acres of dredged material disposal area and 45 acres of adjacent lands for western snowy plover nesting habitat.

The proposed modification would address nesting habitat losses incurred at Coos Bay North Spit by the western snowy plover, a Federally listed threatened species. A substantial decline in the coastal (Oregon, Washington and California) population of western snowy plovers has occurred to date. Historically, plovers nested at 29 locations on the Oregon coast; only six locations remained in use as of 1990 (USFWS 1993). An estimated 55-61 western snowy plovers occurred on the Oregon Coast in 1993. Eight nesting locations were documented in 1994 on the Oregon coast (Hallett et al., 1994). Coos Bay North Spit, specifically the dredged material disposal site within the proposed project area, has been one of the three most important remnant breeding habitats for western snowy plovers on the Oregon coast.

The proposed modification would occur on USACE lands. Restoration efforts will primarily focus on the control of European beachgrass. European beachgrass is an exotic plant introduced for sand stabilization. Between 1900 and 1915, the Corps planted almost 1,000 acres of European beachgrass on Coos Bay North Spit for sand stabilization (Willingham 1983). These plantings were associated with maintenance of the Federal Navigation Channel. European beachgrass is presently the dominant vegetation on the foredune and interior of Coos Bay North Spit, as well as much of the Oregon Coast.

The change in coastal dune vegetation from native plants to European beachgrass, in addition to altering dune morphology, has had a profound detrimental effect on native sand dune plant communities and western snowy plovers. Plovers require a relatively barren, open habitat condition whereas European beachgrass results in a densely vegetated, hummocky environment. Native plants have been crowded out of their habitat and only remnant native plant communities and their associated dune formation remain (Wiedemann 1984, Tom Kaye, Oregon Department of Agriculture, 1994).

Dredged material disposal, to mimic the 1978 deposition on the North Spit, salt water irrigation, and hand pulling/tillage were methods considered for management of European beachgrass. Placement of dredged material would bury existing European beachgrass to a depth sufficient to kill the plant plus have the additive effect of placement of large volumes of salt water on the site. Channel maintenance near the entrance of Coos Bay is now done by hopper dredges with disposal offshore. Cost for a pipeline

dredge solely for habitat restoration purposes thus precluded this option. Hand pulling/tillage is inefficient as it does not remove roots/rhizomes of European beach efficiently. Research, specifically a PhD. Thesis by Dr. Peter R. Baye (1990) indicated that attainment of soil salt concentration above two percent during the active growing season for European beachgrass will kill the plants.

Thus, the application (irrigation) of salt water to attain a greater than two percent concentration in the soil at the root zone was the chosen means to control European beachgrass at the North Spit location. Application of salt water was accomplished using conventional agricultural irrigation equipment – a pump, supply lines and eight large sprinklers. The soil at the modification location was to be saturated three times with salt water to achieve a soil salt concentration in excess of two percent; seawater is approximately 3.2-3.4 percent salt.

Our application goal was to apply sea water at a rate of approximately 12 inches per 24 hour period over the 71 acres with three replications. This goal was basically met but not without problems.

Marine algae – clogs intake and shuts down system

Install revolving screen within a static screen was installed to counter marine algae

Electrolysis – don't have multiple metals in your salt water irrigation system; this process resulted in numerous pipe failures.

Pump chance – requires a deep, near shore location within a bay due to tidal range

Saltwater irrigation was completed in September 1996. BLM vegetation monitoring to determine survival of European beachgrass post saltwater irrigation was completed in November 1996.

Results:

We were unsuccessful.

Why:

Desiccated dune sand is hydrophobic. Dr. Baye had this epiphany during a followup conversation. Desiccated dune sand repels water, thus we did not get saltwater penetration to the moisture/root zone. We burned the surface vegetation off but did injure the roots or rhizomes. We observed that salt water penetrated between ¾ and approximately 1.5 inches even though we placed massive volumes of salt water on the site.

Short-term or annual remedy for beachgrass at this location:

We purchased a disk for use by BLM – two applications per year to limit vegetative density of European beachgrass on the site and maintain western snowy plover nesting habitat.

Long-term Remedy:

Given authority and associated funds, initiate salt water irrigation in combination with tillage operation to provide transmission corridors for salt water to enter the moisture/root zone.

The Oregon Department of Agriculture planted pink sandverbena in November 1996. This planting, and spring 1997 monitoring of pink sandverbena population establishment, was a secondary objective of the project. Monitoring indicated that pink sandverbena was very successful in germinating and growing on the project area following saltwater irrigation and tillage. The long term viability of this action is not known.

Western snowy plovers have enjoyed somewhat of a recovery on the Oregon Coast although their population status is still somewhat perilous. Lauten et al. (2006) reported an Oregon Coast population of 177-179 adults that generated 147 located nests and 15 broods from unknown nests. For Coos Bay North Spit, they reported 45 adults generating 32 located nest and 6 broods from nests that were not located. For comparison, they reported only 9 nests located at Coos Bay North Spit in 1993, three of which were on the South Beach.

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Institute for Natural Resources, Oregon State University 1322 SE Morrison Avenue
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