Aquatic Nuisance Species Committee Report to the 2006 Washington State Legislature

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Washington Department of Fish and Wildlife

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Photos on title page, clockwise from top:
Mussel cage covered with invasive colonial tunicate (*Didemnum sp*) photo taken by Gordon King, Taylor Shellfish, Okeover Inlet, B.C.
Invasive tunicate (*Ciona savignyi*) photo taken by Amy Eko, teacher at A.G.West Black Hills High School, Tumwater, WA.
Mussel lines covered with invasive tunicate (*Styela clava*) taken by the Prince Edward Island Department of Agriculture, Fisheries, Aquaculture and Forestry – Fisheries and Aquaculture Division in the Murray River Estuary.

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Implementation of all plans and programs developed by the ANS Committee are accomplished through the authority and cooperation of its member agencies and other cooperating organizations. Member agencies include:

Washington Department of Fish and Wildlife
Washington Department of Ecology
Washington Department of Agriculture
Washington Department of Health
Washington Department of Natural Resources
Puget Sound Action Team
Washington State Patrol
Washington State Noxious Weed Control Board
Washington Sea Grant Program

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Introduction

The 2000 Washington State Legislature created the Aquatic Nuisance Species (ANS) Committee (RCW 77.60.130) to coordinate the implementation of programs that minimize the impact of invasive aquatic species, such as spartina, green crab, and others. (See Appendix A for the list of Committee members.) The Committee organizes the management efforts of many state and federal agencies through the Washington State ANS Management Plan. More than one hundred representatives from various agencies, local governments, tribes, and industries are invited to participate in the semi-annual meetings. The full Committee meets twice per year and the executive Committee meets monthly to address issues that require immediate attention and to prepare items for review by the full Committee. The Committee is currently co-chaired by Joan Cabreza, U.S. Environmental Protection Agency, and Randall Marshall, Washington Department of Ecology.

Members of the Executive Committee also participate on the following groups to improve coordination: the State Noxious Weed Control Board, the State Ballast Water Work Group, the Western Regional Panel on Aquatic Nuisance Species, the National Aquatic Nuisance Species Task Force, the Puget Sound/Georgia Basin International Task Force, the Lower Columbia River Estuary Partnership, the Columbia River Basin 100th Meridian Group, and the ad hoc committee to form an Invasive Species Council in Washington.

The legislation that established the Committee requires a biennial report to the legislature with the third report due by December 1, 2005. The purpose of this report is to outline the Committee's accomplishments and make recommendations to the Legislature and other agencies to better fulfill the Committee's purpose.

Recommendations to the Legislature to Better Accomplish the Committee's Purpose

The ANS Committee would like to thank the 2005 Washington State Legislature and the Governor's Office for acting on a recommendation from our second report to establish a program to prevent the spread of aquatic invasive species (AIS) by recreational watercraft. This new program will serve the citizens of Washington by reducing the risk of economic and environmental damage from AIS spread by recreational watercraft.

The Committee believes the following recommendations will further reduce the impact of AIS to our state.

1. Ballast water management

The Washington Department of Fish and Wildlife (WDFW) ballast management program is operating on funds that end August, 2006. This program has been very successful in Puget Sound, but, due to inadequate funding, is not able to monitor ballast water compliance as effectively in the Columbia River. Without continued funding, WDFW efforts to educate vessel operators and to monitor and enforce compliance with the state laws may end. The Committee recommends that the Legislature provide funding to WDFW to continue implementing the ballast management program (See page 26 for further support of this recommendation).

The Committee supports the ballast water management efforts of WDFW and the Ballast Water Work Group to further reduce the risk of new invasive species introductions. The Ballast Water Work Group was created in section 1, chapter 282, laws of 2002, for the purpose of studying all issues relating to ballast water technology, and the services needed by the industry and state to protect the marine environment, as well as the costs of and possible funding methods for implementing the ballast water program. The Committee encourages the Washington Ballast Water Work Group to identify costs and funding for a comprehensive State ballast water program that fully coordinates with federal programs to avoid duplication. A comprehensive program should include, but not be limited to:

- Vessel inspections,
- Sampling and testing,
- Studies to evaluate the effectiveness of promising ballast water treatment technologies,
- Certification and approval of effective treatment technologies,
- Data management and compliance follow-up,
- Enforcement, and
- Education and outreach to port officials and to vessel owners, operators, agents.

The ANS Committee recommends that the Washington Ballast Water Work Group develop long-term dedicated funding mechanisms such as fees for service, barrel tax contributions, dedicated enforcement accounts, incentive programs to encourage compliance, state funding, and other options to support the state's efforts in ballast water management.

2. Invasive species screening and risk assessment

WDFW has limited capacity to screen aquatic animal species imported by pet and aquarium trade suppliers. A recent two-day inspection of 40 markets, restaurants, wholesale dealers, and 24 pet stores in the Seattle metropolitan area to verify compliance with state regulations found numerous violations. Five citations were issued for possessing prohibited species.

The Department of Agriculture has an efficient program to inspect outlets and manage the importation of plants. This program is funded by a fee on plant suppliers. We recommend that the Legislature establish a similar program for WDFW to manage the importation of aquatic animal species.

3. Early detection and rapid response

The ANS Committee has developed a draft Early Detection and Rapid Response Plan. The Director of WDFW is taking the lead to develop a memorandum of agreement (MOA) among relevant agencies to coordinate the implementation of the finalized plan. The process of developing the MOA and finalizing the plan will identify a list of needed authorities and funding required for implementation.

The Committee encourages the Legislature to assist agencies in building their capacity to protect our state waters from new invasive species introductions. A potential funding source for early detection and rapid response implementation is revenue from fines levied by WDFW on commercial vessels that have violated Washington's ballast water management law.

4. Invasive species monitoring, control, and eradication

The ANS Committee identified a critical need for the development of new monitoring, control, eradication, and restoration programs, as well as for enhancement to existing programs for *Spartina*, green crab, mud snails, mitten crab, and zebra mussels. Further rapid assessment surveys should be conducted as soon as possible to gather baseline data on the status of nonnative plant and animal populations in the Puget Sound /Georgia Basin and to evaluate their potential impacts on native species

The Committee recommends that WDFW develop and implement strategies to manage and eradicate existing invasive aquatic animal species posing economic and environmental threats to the state, including: invasive tunicates (*Didemnum* sp., *Styela clava*, and *Ciona savignyi*), nutria, New Zealand mud snail, European green crab, escaped Atlantic salmon, and others. The implementation of monitoring, control and eradication strategies will require a stable, long-term source of funding. The ANS Committee requests assistance from the Legislature to identify feasible sources of funding to fulfill this need, and to protect our state waters from the economic and environmental impact of these and other aquatic invasive species.

5. Invasive plant management

Funding from the Department of Ecology's (Ecology) Aquatic Weed Program to manage/eradicate freshwater plant infestations is limited to water bodies with public boat launching facilities. Sometimes an infestation of a noxious species in a private water body threatens downstream public waters. The Legislature should consider revising existing law to allow Ecology to fund control work in all water bodies where noxious weeds threaten downstream public waters.

Requests for funding from local governments for the control of freshwater noxious weeds exceed the amount available for grants each year. The current $3.00 portion of the boat trailer fee dedicated to the Aquatic Weed Program should be increased to $4.00. These additional funds should be designated solely for financial assistance to local governments to manage freshwater invasive plant species, like Eurasian watermilfoil.

Under state weed law, management of weeds is dependent upon land ownership. Most of Washington's lakebeds are owned by the "state," but no state agency has been assigned responsibility for the management of the plants growing on the lakebeds. Even if land ownership were determined, the funding needed to control all nonnative invasive aquatic species would exceed many millions of dollars per year. The ANS Committee requests assistance from the Legislature to identify possible methods to resolve lakebed ownership issues.

6. Invasive Species Council

The ANS Committee recommends that the Legislature create the Washington State Invasive Species Council. A Washington State Invasive Species Council would support and assist in coordinating existing efforts to manage both terrestrial and aquatic invasive plants and animals. Such coordination would maximize resources and programs for government agencies and other interested parties. The Council could also directly work with State Invasive Species Councils in Idaho and Oregon to achieve regional goals, and coordination in the Pacific Northwest.

Efforts to prevent and respond to invasive species would also benefit from a Statewide Invasive Species Management Plan. Addressing both terrestrial and aquatic species would provide agencies, industries, and stakeholders with a consistent, long-term vision for action. Forming a Council would be a major step toward closing jurisdictional and species coverage gaps, coordinating agencies, pursuing funding (particularly preventative, rapid detection, and early response funding), managing budgets, and working effectively to maximize resources. The ANS Committee has already created a major component of this Plan - the Washington State Aquatic Nuisance Species Management Plan – that can become part of a comprehensive document that covers all invasive species management strategies.

Recommendations For Partner Agencies to Better Accomplish the Committee's Purpose

The following recommendations should be considered for implementation by appropriate agencies to build capacity for the management of aquatic invasive species. The Committee recognizes the need for additional resources and recommends that agencies consider adding new funding requests to implement these important actions.

1. Enhance existing and create new monitoring and control programs

- Develop cooperative monitoring programs with Idaho and Oregon for invasive animals such as Chinese mitten crab, New Zealand mud snails, and zebra mussels in the Puget Sound Basin and the Columbia River.
- Improve coordination with British Columbia for ANS programs in the shared waters of Puget Sound/Georgia Basin and the Columbia River.
- Work with commercial and recreational divers, shellfish growers and others to identify, report, and map the presence/absence of the invasive colonial tunicate *Didemnum* sp. and the solitary tunicates *Styela clava* and *Ciona savignyi.*
- Establish a centralized reporting system for invasive species.
- Develop and implement a strategy to manage and/or eradicate existing invasive aquatic animals – New Zealand mud snail, nutria, tunicates (*Didemnum* sp., *Styela clava*, and *Ciona savignyi*), European green crab, and others.
- Develop research priorities for aquatic invasive species in the state and seek means to fund and implement these priorities.

2. Develop and implement an Early Detection and Rapid Response Plan

- Develop a Rapid Response Action Protocol for invasive plants and animals.
- Establish a Rapid Response Fund.
- Compile an "Unwanted Invader" list.
- Compile an "on – call" expert list for invasive species.
- Compile Eradication and Control libraries including web-based databases.
- Identify and, where possible, remove barriers and constraints to rapid response.
- Develop model response plans and conduct training for responders.

3. The ANS Committee supports the ballast water management efforts made by Washington State to further reduce the risk of new invasive species introductions. WDFW should continue efforts to reduce the risk of invasive species introductions by:

- Implementing and enforcing the state ballast water management laws.

- Coordinating efforts with the U.S. Coast Guard and Canadian authorities, where possible, to avoid duplication and to enhance effectiveness.
- Working with federal partners to develop and implement a regional ballast water research facility to identify efficient, cost-effective ballast water treatment technologies.
- Encouraging research to identify the role that hull and anchor fouling on commercial vessels plays in the spread of ANS.
- Working with the State of Oregon, to increase monitoring in the Columbia River.

4. Enhance and develop public education outreach programs

- Develop an ANS education strategy aimed at decision makers, environmental managers, and the public to raise the profile of ANS.
- Develop educational inserts about ANS to be distributed with boating guides, fisheries regulations, fishing license renewals, and boat tax statements.
- Develop articles for publication in outdoor recreational magazines, club newsletters, etc.
- Make ANS identification materials available to agency staff and citizens.
- Update existing ANS websites with current management and identification information.
- Develop display materials directed at restaurants, fish markets, and bait shops describing how to properly handle nonnative species to prevent unintentional introductions.
- Develop and distribute educational materials to nurseries, vendors, and landscapers to stop the sale and use of noxious weeds as ornamental plants.
- Develop and implement a strategy to prevent or control sales and distribution of invasive species via the Internet.

5. Resolve issues that may hamper management of invasive aquatic plants and animals by

- Expediting permitting for early invasions of aquatic organisms where rapid intervention is crucial to contain/eradicate the invasive species.
- Streamlining the administrative permitting requirements to control/eradicate invasive aquatic plants and animals.
- Requesting that federal agencies expedite the process of reviewing grants for compliance with the federal nexus between pesticide use and threatened and endangered species.

Accomplishments

The "Washington State ANS Management Plan" serves as a work plan and qualifies the state for National Invasive Species Act (NISA) funding through the U.S. Fish and Wildlife Service. WDFW received $72,023 in fiscal year 2004 and $70,303 in fiscal year 2005 to fund coordination and implementation of the state plan. However, as more state plans are approved, the potential funding available for each state may be reduced.

One of the primary goals of the ANS Committee is to encourage collaboration between federal, state, and local entities working on ANS issues. The following accomplishments are part of this comprehensive statewide coordination effort.

The ANS Committee

Early Detection and Rapid Response Plan

The ANS Committee has created a draft Early Detection and Rapid Response Plan for aquatic invasive species. The Plan identifies a lead agency to conduct specific actions, outlines procedures for notification of other agencies, and provides a decision tree for determining the response. The WDFW Director will circulate the draft Plan for review by the partner agencies for final approval. The Directors of all state agencies involved are urged to sign the Memorandum of Agreement clarifying their respective roles and responsibilities.

The Committee is adopting the National Management Plans that have been approved by the ANS Task Forces for European green crab, mitten crab, Caulerpa, giant Salvinia, purple loosestrife, and water chestnuts. Management Plans are under development by the Task Force for New Zealand mud snails and Asian carp species. Several members of the ANS Committee are participating in the Columbia River 100th Meridian Group's efforts to develop a regional rapid response plan for zebra mussels.

The Puget Sound Action Team

The Puget Sound Action Team (Action Team) continues to work with British Columbia to prepare and implement an action plan to evaluate non-indigenous species in shared waters for the Puget Sound/Georgia Basin International Task Force. The action plan includes a risk assessment, developing a rapid response plan for British Columbia, and identifying and taking action on non-ballast water pathways of introduction.
The Action Team contracted with the San Francisco Estuary Institute to develop methodology and estimate costs to monitor and detect new or previously unreported nonnative organisms in

Puget Sound, the lower Columbia River, and Tillamook Bay National Estuaries. The proposal includes developing baseline databases, sampling protocols, taxonomic information support, and producing a Nonnative Species Detection Program and cost estimates for implementation to detect new or previously unreported nonnative organisms in Puget Sound

In 2004, the Action Team assumed the responsibility to chair and staff the state "Ballast Water Work Group". The group continued to study all issues related to ballast water management, including exchange and treatment methods, associated costs, and the availability of feasible and proven ballast water treatment technologies. The work group will identify the costs and possible funding methods to implement the ballast water program, and will describe how the states of Washington, Oregon, and California and the province of British Columbia coordinate ballast water programs together with the U.S. Coast Guard. A report and recommendations are to be prepared for the Legislature by December 2006.

To fulfill a commitment to support the state's tunicate response committee the Action Team funded the development and printing of "Invasive Tunicate Identification Cards" to be used by Washington Sea Grant to train SCUBA divers to identify and report invasive tunicates, and developed a web-based GIS system to map the areas surveyed. The Action Team will provide this mapped information to WDFW at the end of 2005. This will conclude the Action Team's commitment to support the state's tunicate response committee. The committee requested that WDFW assess the distribution of the tunicate in Puget Sound in order to design a rational state response to the invasion.

The 2003-2005 Puget Sound Conservation and Recovery Plan included proviso funding to WDFW specifically tagged to support ongoing green crab monitoring in the Puget Sound basin. The 2005-2007 Puget Sound Conservation and Recovery Plan includes $170,000 in proviso funding to WDFW to implement elements of the state ballast water program and the aquatic nuisance species program, including green crab monitoring in Puget Sound. The expected results from this work include supporting efforts to prepare a report on how to improve the state ballast water management program, and to develop and implement an early detection and rapid response plan for new invasive species.

The Action Team hosts a bi-nation Puget Sound Georgia Basin Research Conference every two years. This conference is the region's largest and most visible effort to communicate research on the condition of Puget Sound/Georgia Basin, and the premier opportunity for participants to share successes and challenges in the restoration and protection of the Puget Sound/Georgia Basin region. The 2005 conference included two panels on research related to aquatic invasive species. There were 850 attendees at the conference.

The Action Team continued to work with local and regional entities such as county marine resources Committees, the Northwest Straits Commission and watershed groups to build stronger local commitments to manage invasive species. The Action Team provided financial support to various efforts to detect, control and eradicate invasive species such as nutria in Skagit County, *Spartina* in Whatcom County and in Boundary Bay, British Columbia and volunteer green crab monitoring in the Puget Sound basin.

Washington Department of Ecology Aquatic Weeds Program

Monitoring

Ecology surveys water bodies in the state for aquatic plants, assesses the aquatic plant communities, develops a species list for each water body, and documents the presence of nonnative freshwater plants. About 450 lakes, rivers, and ponds throughout the state have been surveyed providing plant identification, subjective plant density, and water quality data for each water body sampled. Efforts are concentrated on the aquatic plants listed as noxious weeds by the Washington State Noxious Weed Control Board. However, other species of concern are being monitored for expansion and invasive tendencies.

Research

Ecology is funding the University of Washington to conduct tests to determine herbicide exposure impacts to juvenile coho and chinook salmon. Tests were conducted using the herbicides 2,4-D, diquat, fluridone, and triclopyr at concentrations consistent with those seen in the environment after a typical herbicide treatment to control invasive plants. The University also evaluated whether salmon can detect and avoid these chemicals and salmon olfaction studies are being conducted in 2005 and 2006. Upon completion of these studies in 2006, a salmon risk assessment for herbicide use in Washington lakes and rivers will be prepared. All studies will be published in peer-review scientific journals.

Ecology is funding Washington State University to conduct research trials to determine the most effective methods to kill the invasive freshwater plants – parrotfeather, yellow flag iris, and hairy willow-herb.

In addition to the outside projects funded by Ecology's Aquatic Weed Grant Program, several projects have been undertaken within Ecology to research various control methods for aquatic weeds. More details about these projects can be seen at this website: http://www.ecy.wa.gov/programs/eap/lakes/aquaticplants/index.html

Education and Technical Assistance

Ecology has produced many educational materials dealing with freshwater nonnative species and/or the management of these species. Some publications are available from the department's publication office at (360) 407-7472 or email to jewi461@ecy.wa.gov, but most are available on-line. Ecology also provides a Plant Identification Service, conducts workshops, conferences, and presentations, and provides technical assistance to lake groups, nursery groups, pesticide applicators and the general public about nonnative species. Ecology partnered with Parks and Recreation and WDFW to continue to place educational signs at boat launches throughout the state.

Permitting

Ecology regulates the use of aquatic pesticides through a state general permitting program.

Financial Assistance

Ecology provides grants to state and local governments to help control nonnative aquatic weeds. Grant projects must address education, monitoring, or prevention and/or control of freshwater, invasive, nonnative aquatic plants. Grants are competitive and are awarded on an annual basis. Generally about $300,000 is available during each funding cycle. An additional $100,000 per year is available on a year–round basis for early infestation grants. The purpose of early infestation grants is to provide immediate financial assistance to local or state governments to eradicate or contain a pioneering invasion of a nonnative freshwater aquatic plant. In water bodies with well established populations of nonnative, freshwater invasive aquatic plants, the development of an integrated aquatic plant management plan is required before grants are awarded for implementation (control or eradication projects). Under the grant program a number of eradication/management projects for freshwater nonnative species have been funded.

Successes

Ecology has been funding a hydrilla eradication project in partnership with King County and the cities of Covington and Maple Valley since 1995 in Pipe and Lucerne Lakes. No hydrilla plants were found in Lucerne Lake and only 11 hydrilla plants were found in Pipe Lake in 2005. Eradication efforts (herbicide treatment and diver hand pulling) will continue until hydrilla is not detected for three years following the last treatment. This infestation is the only known infestation of hydrilla in the Pacific Northwest.

Eurasian watermilfoil has not been observed for at least five years following removal in eight Washington lakes, and has been reduced to the extent that the plant is not causing problems in another twenty-one Washington water bodies.

Washington State Noxious Weed Control Board

The Washington State Noxious Weed Control Board continues to serve as the state's coordination center for noxious weeds, including aquatic noxious weeds. Through its actions and policy decisions, it serves to coordinate and assist the activities of 49 county noxious weed control boards and weed districts in Washington. Together, the state and local programs leverage and direct the much-larger total aquatic weed control efforts funded by property owners.

In recent years, the Board has added several new invasive, nonnative aquatic plants to the noxious weed list. These include fragrant water lily, yellow flag iris and curly leaf pondweed. Two aquatic weeds, reed sweetgrass and floating water-primrose, will be added to the Class A noxious weed list beginning in 2006.

One highlight of the Board's activities in the past biennium has been to establish, along with county programs, a Washington State voice on the national weed control scene. One aspect of building that voice has been active participation in the annual National Invasive Weed Awareness Week in Washington, D.C. In addition to other benefits, that participation helped secure a $51,000 grant to control Brazilian elodea in the Chehalis River.

The 49 county noxious weed boards and weed districts act as the "early detection" system for invasive aquatic plants in the state. Most of the first notifications about such aquatic plant invasions in recent years have come from or through those local programs.

Even work to control terrestrial noxious weeds frequently benefits Washington's aquatic environment. Many of the terrestrial noxious weeds hold soil less well than the native plants they displace. This causes erosion, which leads directly to sedimentation in streams and rivers, including on salmon spawning beds. Some noxious weeds also displace native plants which shade and cool streams and play vital roles in the aquatic food chain. Control of such weeds, along with restoration, protects those aquatic resources and the biodiversity they support.

The 2006 report of the Washington State Noxious Weed Control Board can be obtained by contacting the Board at P.O. Box 42560, Olympia 98504 or (360) 902-2053 or smcgonigal@agr.wa.gov.

Gaps in Washington State Weed Law

Washington State's weed law is considered one of the best in the nation, and several states have recently amended their weed laws in ways that make them similar to Washington's. Under state weed law, control of noxious weeds is the responsibility of the property owner.

Washington's navigable lakebeds and riverbeds are owned by the state and managed by the Department of Natural Resources, but there is often no navigability determination for a lake or river. Navigability is a convoluted issue that requires legal adjudication on a case-by-case basis, and is costly. Therefore, unlike most terrestrial species where land ownership is readily determined and control can be mandated, in most cases the ownership of the aquatic beds remains a legal mystery. Even in areas where ownership is known, multiple jurisdictions – private, state, county, or city – can have ownership in a given waterbody. Some regions have been able to resolve this to some extent by forming cooperative agreements between local government, weed boards, and citizen groups to treat a section of a river basin or a lake. However, identifying ownership of lakebeds remains difficult, and there are not adequate funds in the Aquatic Weed Management account to cover treatment of these areas. Increasing funding earmarked for the control of aquatic weeds in lakes would assure treatment in areas where ownership cannot be determined.

Washington State Department of Agriculture (WSDA)

The Washington Department of Agriculture (WSDA) has listed 29 species of wetland and aquatic plants as being prohibited from sale in the state. Many of the prohibited plants are not known to occur in Washington, and some have limited populations. Others, such as the invasive knotweed species, purple loosestrife, and *Spartina* species, are the subject of extensive control and eradication programs. WSDA allocates the larger part of its appropriation from the Aquatic Lands Enhancement Account for the *Spartina* eradication project, with the remainder for purple loosestrife control. Starting in 2005, WSDA also receives an appropriation of $500,000 per year to conduct invasive knotweed species control, which is achieved through partnerships and contracts with county noxious weed boards and non-governmental organizations.

Purple loosestrife populations have been dramatically reduced in wasteways in the eastern part of the state and some areas of western Washington because of the successful introduction of a biological control, the Galerucella beetle. There are still some large populations of purple loosestrife in areas such as the Chehalis River Basin. Unfortunately, another invasive weed, a nonnative form of Phragmites, has colonized many areas from which purple loosestrife has been removed.

Knotweed species pose a threat to Washington state waterways. These plants will grow in most habitats (it is starting to show up along the highways in some areas) but the most common route of spread is along stream corridors. Knotweed species out compete most native species, including cottonwood and alder trees. It forms monocultures that obstruct wildlife access to riparian areas and reduce anadramous fish habitat. WSDA conducted a pilot control project in the southwest portion of the state in 2004 and plans to expand the project statewide.

The goal of the WSDA *Spartina* program is to eradicate four nonnative species of the estuarine grass now found in 11 counties in western Washington, spread over more than 30,000 acres of intertidal mudflats. If these infestations were one contiguous meadow it would total approximately 6,750 solid acres of *Spartina*. All but approximately 15 solid acres are located in Pacific, Snohomish, Island, and Skagit counties. In 2005, WSDA and state and federal partner agencies, local governments, tribal entities, and commercial and private landowners treated approximately 5,500 solid acres of *Spartina* statewide. If the level of funding and effort is maintained, *Spartina* may be completely eradicated in Washington by 2010.

In Willapa Bay, WSDA estimates the *Spartina* infestation totals 6,300 solid acres – a 25 percent reduction in the past two years. The 2005 season was the second season that the new herbicide imazapyr was used extensively. A majority of the applications (about 73%) were conducted aerially. All of the major meadows were treated in 2005, many for the second or third year in a row. Some of the areas of the largest infestations have been reduced substantially the past two years. The eradication effort will now move on to follow-up work being conducted with ground equipment.

In Puget Sound, the 2005 effort was able to continue to reduce *Spartina* infestations and bring several areas very close to eradication. Skagit County, Snohomish County, Island County, WDFW, Ecology, and WSDA cooperatively treated 520 solid acres of *Spartina*. South East Skagit Bay, the largest infestation in Puget Sound, was treated aerially with imazapyr. The Skagit Bay infestation now totals approximately 10 solid acres, reduced from a high of 100 solid acres eight years ago.

As a part of the eradication partnership, WDFW continues to treat and monitor several small infestations in Grays Harbor. During an aerial survey in September 2005 more *Spartina* was found, leading managers to believe that a more intense effort will be necessary to stop the spread of *Spartina* in that habitat.

Washington State Department of Natural Resources

The Washington Department of Natural Resources (DNR) is becoming more and more involved with and is funding ANS control work for a variety of noxious weeds on state lands, through the Aquatic Lands Enhancement Account, Resource Management Cost Account – Aquatics, and proviso dollars. The agency has been involved with Japanese knotweed control in the Chehalis River watershed and has funded milfoil control and other submerged noxious weed control work in Clark and Thurston Counties. DNR also began working with WDFW to treat invasive Phragmites along the Winchester Wasteway, and is one of several agencies and entities working together on the statewide effort to control/eradicate *Spartina*.

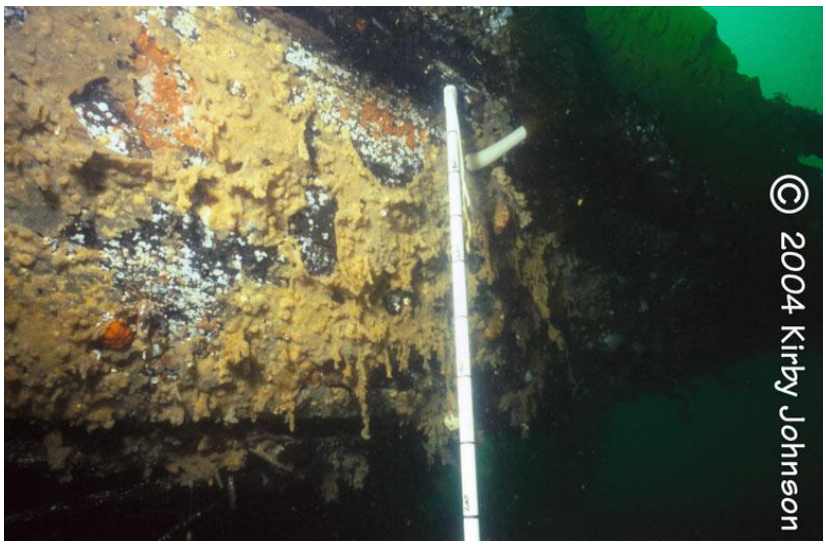
The agency is currently focusing *Spartina* control efforts on state owned aquatic lands in Willapa Bay, and will take another set of aerial infrared photographs of Willapa Bay and Grays Harbor in June of 2006, which will be used to monitor population change over a 12-year period and to create a GIS layer of the *Spartina* in Willapa Bay for use by DNR and other agencies for planning, modeling, and control purposes.

Washington Department of Fish and Wildlife (WDFW).

The WDFW Aquatic Invasive Species Management Program is funded in part by the 2005-2007 Puget Sound Conservation and Recovery Plan, which includes $170,000 in funding to WDFW. Of these funds, $12,000 is earmarked to fund the Puget Sound green crab monitoring and control program. The remaining funds cover a portion of the salary and benefits for the AIS Coordinator and Assistant AIS Coordinator. Five staff members are dependent upon funding from grants, contracts, and dwindling U.S. Fish and Wildlife Service funding for the implementation of the State ANS Management Plan.

Aquatic Nuisance Species Issues/Projects

Invasive Tunicates. In 2004, an invasive colonial tunicate *Didemnum* sp. was found at the Edmonds Underwater Park. *Didemnum* species have posed a threat to shellfish industries in New Zealand, Europe, Japan, British Columbia, and the East and West Coasts of the United States. This organism spreads very rapidly, by both sexual and asexual means. It produces noxious chemicals that discourage predation by most species. *Didemnum* species out-compete native marine invertebrate species and may alter the aquatic food web.



Didemnum on sunken boat at Edmonds Underwater Park, photo taken by Kirby Johnson

In response to this new invasion, WDFW worked with Ecology and WSDA to obtain an emergency water quality waiver to allow the use of chlorine to control the infestation. The local population of *Didemnum* sp. at the Edmonds Underwater Park has been controlled thanks to the dedicated efforts of many volunteer divers. WDFW contracted with the University of Washington Sea Grant Program and the Action Team to create a volunteer tunicate monitoring program for the purpose of locating populations that may have spread to other areas. Cards were created to educate divers how identify and report the discovery of new populations. A database and maps are being produced to identify the location of known populations. WDFW also contracted with an expert to assure the accurate identification of reported sightings. The tunicate has been found at Edmonds Marina beach and oil dock, the Des Moines marina, and in Totten Inlet, Dabob Bay, and Hood Canal on mussel lines and rafts.

Two invasive solitary tunicate species, *Styela clava* and *Ciona savigyni*, have been found in Hood Canal. *Styela clava*, was found in high densities at Pleasant Harbor Marina in Hood Canal, and at Neah Bay. This species has created serious problems for the aquaculture industry in the Northeast by fouling gear such as long-lines, buoys, and oyster bags. The larvae can attain a size of 25 millimeters (the size at which they can be sexually mature) in approximately one month after the larvae settle and attach.

In early November, 30 volunteer divers and ten support people attempted to eradicate them at Pleasant Harbor by removing the tunicates from boat slips by hand. The divers worked in teams of two, and most teams were only able to clear four to six square feet – less than one percent of the marina – in about two hours. A survey of the boats at the marina found that many of the boats had tunicates on them. When boating season begins and the water temperature rises, the risk of these tunicates spreading to other areas of Puget Sound is very high. WDFW will continue to work with volunteer divers, recreational watercraft owners, and representatives from the shellfish industry to develop new methods for eradication, control, or containment of this highly invasive species.

Styela clava growing under the docks at Pleasant Harbor Marina, photo by Charlie Waters

Ciona savigyni has been found by WDFW in high densities overgrowing a geoduck tract and a rockfish index site in lower Hood Canal. The infestation of this species is an indicator of dramatic ecological change in Hood Canal. WDFW does not know how extensive this infestation is, how quickly it will spread, or the full range of impacts to other species. Little information is available about the ecology of *Ciona* spp. in Washington or implications for resource management. However, a close relative, *Ciona intestinalis* has been a problem for mussel producers in areas of Nova Scotia, creating crop losses and even shutting down operations at some sites. The tunicate has also been found at Edmonds, Brownville, Eagle Harbor, and Des Moines. Continued monitoring and further research is needed to develop an appropriate response to this invasion.

DNR is preparing a Legislatively mandated report (RCW79.135.050) on a study of Hood Canal geoduck populations that addresses their observations of the ecological changes caused by a dense population of Ciona savignyi on geoduck tracts in south Hood Canal. At the Tahuya Tract near Union, the tunicate is attached to every available hard surface, some as small as a pebble

Ciona savigyni photo by Marla Davis Robinson, University of Washington

Nutria. Nutria have been present in Washington for many years and their populations are on the rise. In Clark County they are causing damage on the Federal Wildlife Reserve in Ridgefield, as well as in parks and golf courses in the Vancouver area. Nutria have also been observed in Olympia on Capitol Lake. Nutria are a tropical species, and a few days of below freezing weather during the winter reduces their numbers considerably. The past two unseasonably warm winters have likely contributed to their increase.

Nutria populations have recently been found in Clear, Mudd, and Beaver lakes in Skagit County and Johnson/DeBay's Slough Swan Reserve just east of Mount Vernon. Nutria have destroyed thousands of acres of marshland and farmland in the southeast U.S., and farmers in the Skagit area are concerned about potential impacts to their crops should nutria become established in northwestern Washington. Agriculture is predominant in Skagit County, with much of the agricultural land protected from flooding by various dike systems. Nutria dig burrows that can undermine dike and levee systems, which is a concern to the various diking district commissioners in the region. WDFW allocated money for a three-month study to determine population levels and the probability of eradication. During the three month trapping effort, a federal trapper caught 13 nutria representing four different age groups. Further funding is not available and trapping efforts have been discontinued. WDFW biologists in the region recently held a meeting with community representatives in the hope that the community will contract with federal trappers to continue eradication efforts. Some funding for the effort will be available from the Nature Conservancy provided matching funds are made available.

New Zealand Mud Snail. New Zealand mud snails were introduced into the Snake River in 1987 and rapidly spread to rivers in Yellowstone National Park and the Lower Columbia River. In Yellowstone Park, densities are as high as 750,000 per square meter. The snails are able to close their operculum to avoid desiccation and out-compete native snails and other invertebrates for food. The snails are tiny and are easily spread via stocking operations, recreational anglers, fish, birds, wildlife, and bait bucket dumping. The snail reproduces asexually, so it only takes one to start a new population. It is thought that they may have an impact on fisheries by reducing food availability. From the Columbia River they have been spread to other Oregon rivers, and are in the lakes and canals on the Long Beach Peninsula. Eradication may be possible in certain lakes; however it does not seem likely, with current technology, to eradicate them in rivers. WDFW includes New Zealand mud snail identification and instructions on how to avoid spreading them in all educational presentations.

European Green Crab. The green crab monitoring and control program, initiated in 1998 in Willapa Bay and Grays Harbor to control a newly established population, was changed to a volunteer monitoring program in 2003. Between 1998 and 2003, 1,100 crabs were removed from Willapa Bay and Grays Harbor. Of those, 320 were female crabs, representing a potential generation of 80-160 million eggs per season. However, recruitment in 2001 and 2002 was low, and the crabs introduced in 1996 were reaching the end of their projected life span. Dr. Sylvia Yamada of Oregon State University has been conducting research in Willapa Bay since 2003. She reports that 2003 was a good recruitment year, and there continues to be a population of green crab in Willapa Bay. Since 1998, volunteers under the direction of WDFW and in collaboration with Puget Sound Restoration and Nahkeeta Northwest, have continued to monitor over 100 sites in Puget Sound for the presence of green crab. To date none have been found.

European green crabs have been found in coastal waters around Vancouver Island. No information is currently available on the status of green crab populations in British Columbia.

Zebra Mussels. WDFW staff, using funds from the U.S. Fish and Wildlife Service, organize volunteers to conduct zebra mussel veligers (early free-floating life stage) monitoring in the Columbia River and selected high risk lakes. This includes distributing sampling supplies, collecting water samples and sending them to an outside laboratory for analyses, as well as maintaining a database of the volunteers and sites monitored. In addition, WDFW coordinates with Portland State University Center for Lakes and Reservoirs to implement a regional substrate-monitoring program at many lakes throughout Washington. During this biennium, Washington and Oregon are coordinating their efforts to increase veliger monitoring throughout the length of the Columbia River.

Funding provided by the 2004-2005 Legislature will enable WDFW and the State Patrol to work together to resume the zebra mussel inspection program at ports of entry weigh stations in 2006. The program had been curtailed due to increased security-related duties at the ports of entry following the attack on the World Trade Center. An education program will also be created for recreational watercraft users along with increased staff for enforcement.

WDFW continues to distribute educational signs, developed in partnership with Ecology and Washington State Parks and Recreation. The signs are posted at various county and municipal boat launch sites. The U.S. Forest Service recently obtained 35 signs for posting at National Park boat launches. WDFW has given informational presentations and dispersed educational materials on ANS to Boating Law Administrators, U.S. Coast Guard Auxiliary Officers, and Marine Enforcement Officers responsible for boater safety education classes.

Atlantic Salmon. Pacific States Marine Fisheries Commission contracted with WDFW to conduct surveys of streams and rivers in western Washington for the presence of Atlantic salmon. During the 2003 season, several hundred juvenile Atlantic salmon were found in Scatter Creek, near a hatchery that rears Atlantic salmon. Three Atlantic salmon fry were found in Cinnabar Creek near another Atlantic salmon hatchery. No adult Atlantic salmon have been found in Washington, other than adult Atlantic salmon escapees from net pens that were caught by fishermen. Staffing has been reduced to a single snorkel team to complete surveys in the 2005-2006 season.

Aquatic and Riparian Plants. The Habitat Division of WDFW, working with WSDA and other partners on *Spartina* and knotweed eradication projects, have been treating and monitoring several small *Spartina* infestations in Grays Harbor. Recently, more *Spartina* has been found and managers believe more intense effort will be necessary to stop the spread.

WDFW also participates in several Coordinated Weed Management Areas that were informally created and jointly managed by various state and local government and private entities throughout the state for knotweed species and other aquatic weeds. Coordinated weed management areas have helped groups such as the Nature Conservancy, tribes, or local governments to obtain funding, or have provided in-kind match for them to do knotweed control. WDFW and partner agencies are finishing up an aquatic weed management plan for parrotfeather, Brazilian elodea, purple loosestrife, and knotweed in the Chehalis River Basin, partially funded by Ecology's Aquatic Weeds Program, which should allow WDFW and other partners to seek funding to carry out control and eradication projects. This group is also working with Grays Harbor County on Phragmites control.

Ballast Water Management Program

WDFW implements the state's ballast management law, RCW 77.120 (created by SSB 2466, SB6538 and SB6329), by reviewing ballast water reporting data, evaluating ballast exchange compliance, and reviewing ballast water treatment technologies for possible approved use in Washington State waters. In 2004, the program was expanded to include a vessel inspector who boards vessels and educates the crew about ballast water issues and regulations. Checklists are used to audit the vessel's logs and compare them with the Ballast Water Reporting Form (RCW 77.120.040) to verify compliance with Washington Law. Vessel boarding's are coordinated with the U.S. Coast Guard and the Ecology Spills Program.

The vessel inspector also takes plankton samples from ballast water for analysis by the University of Washington. The samples are analyzed for the presence of coastal and oceanic planktonic species. Ballast that has a high percentage of oceanic species is considered to be properly exchanged and to pose a low risk of introducing invasive species. Ballast that has a high percentage of coastal species is considered to be improperly exchanged and to pose a relatively high risk of introducing invasive species into our waters. WDFW does not currently have the authority to set a standard based on plankton content for the discharge of exchanged ballast, but this research may assist in the development of a new standard.

Results are available for 92 ballast water samples from tanks that were discharged into state waters. Laboratory analyses of the samples indicate the presence of greater than 95 percent oceanic species in 52 percent of these tanks, indicating that the water discharged from these tanks posed a relatively low risk of introducing invasive species. The remaining 48 percent of sampled tanks posed various degrees of risk. Although these results cannot be used for enforcement action at this time, they have been used by WDFW to encourage vessel operators to improve exchange practices. The average percentage of high-risk coastal species found in ballast samples has decreased from 38 percent to 18 percent since 2001.

Vessel operators have improved their ballast exchange practices, but additional improvements are needed to adequately reduce the risk of new invasive species introductions. The U.S. Coast Guard is not currently implementing a program to verify the effectiveness of exchange practices, but is researching potential verification methods. The U. S. Coast Guard ballast management program also does not require ballast exchange for vessels engaged in coastal voyages. Over 50 percent of the ballast discharged into Washington waters originates from coastal voyages in high-risk areas, such as San Francisco Bay.

The WDFW ballast water risk-assessment program has fostered working relationships with other governmental agencies, including the U.S. Coast Guard, U.S. Geological Survey, U.S. Environmental Protection Agency, Smithsonian Environmental Research Center, Ecology Spills Program, and industry stakeholders. Interest in the program is high. Representatives from the National Geographic and National Public Radio as well as representatives from local environmental and governmental groups have accompanied the vessel inspector during on-board inspections. In the first year of this program, more than 204 vessels were boarded, many of which were vessels carrying high-risk coastal ballast.

In the past 18 months, reporting compliance for all vessels improved nearly 20 percent in Puget Sound ports, and ten percent in Columbia River ports. The improvement coincides with the implementation of a mandatory federal program and U.S. Coast Guard inspections of vessels not involved in coastal trade. WDFW recently sent warning letters to five vessels, fined three vessels for discharging un-exchanged ballast, and is in the process of fining another four vessels. The U.S. Coast Guard has, to date, not issued any fines to enforce their ballast management program in Washington State, but fines have been issued in other states.

The WDFW vessel boarding program is largely funded by grants, which will be depleted by August of 2006. Stable funding is necessary to continue the program in Puget Sound, and to expand it into the Columbia River.

Ballast Water Treatment Technology Development

Under Washington law, WDFW is required to identify effective ballast water treatment technologies that meet our ballast discharge standard and are practical. WDFW is working with Ecology to evaluate ballast water treatment technologies that use biocides to assure compliance with state and federal standards. An Environmental Soundness Workgroup has been formed to advise WDFW on the approval of ballast water treatment technologies that use biocides. Two ballast treatment systems have been approved. One treatment system uses filtration combined with UV light, and the other uses highly treated black and gray water for ballast. Neither system is practical for use on vessels that use high volumes of ballast. The U.S. Coast Guard has, to date, not approved any ballast treatment systems for evaluation on-board vessels.

Three additional ballast treatment vendors are preparing to submit applications for review. The "Bal Pure" system utilizes electro-chlorination. The vendor, Severn Trent, is currently trying to obtain funding from the National Sea-Grant program for full scale testing. A second system by Eco-Chlor that uses chlorine dioxide is in the process of applying for interim approval. The company has arranged for the system to be installed on a vessel, provided by Matson Navigation Company, for testing. The third system is a mobile system that utilizes filtration and UV light. The vendor, Marenco, has funding for shipboard testing, and the University of Washington is developing the research plan. Results from these on-board trials will determine if approval will be granted for additional installations. Ballast water treatment is widely considered to be the best solution to prevent new invasive species introductions. There are international, federal, and state efforts underway to facilitate treatment testing and development.

WDFW is currently developing a rule requiring vessel operators to submit an interim ballast water management report to the agency as required by RCW 77.120. This report will describe how vessel operators intend to comply with the upcoming changes in Washington law on July 1, 2007 that phase-out the discharge of high-risk un-exchanged ballast. A form for owners/operators to fill out and submit to WDFW has also been designed and presented to the State Ballast Water Work Group for review and comment.

The number of vessels discharging un-exchanged ballast into Washington waters has dramatically decreased over the past three years. During a recent six-month period only eight vessels out of more than 1,500 vessels arriving at Washington ports discharged un-exchanged ballast. Continuing with the state's plan to phase-out the discharge of high-risk un-exchanged ballast after July 1, 2007 will impact very few vessel operators, while encouraging them to improve their ballast management practices, and significantly reducing the risk of new invasive species introductions into our waters.

Federal Partners

U.S. Environmental Protection Agency

The Region 10 Office of the U.S. Environmental Protection Agency (EPA) developed an invasive species strategy in 2003. This resulted in the establishment of a half time Regional Invasive Species Coordinator position, and the formation of a cross-program invasive species team. Invasive species education and in-house coordination to develop contacts with other agencies and the community are ongoing, and many changes have been made in core programs such as wetlands and National Environmental Policy Act as a result of the educational efforts.

The region has obtained a grant from the EPA Head Quarters Office of Research and Development to determine invasion pathways of invasive species along the West coast, and is also developing a genetic screening tool that can be used for ballast water verification and other projects. This has been underway for a year, and may have implications for west coast ballast water management. Because the coordinator also works in and with the states of Oregon, Idaho, and Alaska, she is able to assist in information exchange that helps bring slower states up to speed and assures some uniformity of approaches.

The EPA lab in Newport, Oregon is also establishing a database of organisms along west coast estuaries in Washington, Oregon, and California and has information on over 500 estuaries and sub-estuaries, and over 2,600 species in the database at this point. The database contains invasive, native, cryptogenic and indeterminate organisms, as well as watershed and water quality, taxonomic and habitat data for the species. It also allows mapping.

In addition, the Region funds invasive species work under a variety of grant and contract programs. This past year the office funded work in Washington under Regional Geographic grants, wetland grants, and pesticide grants, and also funded two small contracts with the Pacific States Marine Fishery Commission for zebra mussel outreach and education. The EPA Invasive Species Coordinator is currently the co-chair of the ANS Committee.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (the Service) provided $70,303 to WDFW for the ANS Program in 2005. This is the eighth year funding has been granted for implementation of the Washington State ANS Management Plan. Invasive species managers for the Service's Pacific Region also make educational presentations at many events in Washington such as the Seattle Fish Exposition, the Pacific North West Sportsman Show, and the North West Youth Conservation and Fly Fishing Academy. They partner with state agencies and local governments in providing funding and technical assistance for management, monitoring, and control efforts for species such as zebra mussels, New Zealand mud snails, and invasive tunicates. The Service is working with state and local entities on the effort to control/eradicate *Spartina* in Willapa Bay, and the Willapa National Wildlife Refuge has received several federal appropriations for this purpose.

The Service continues to promote use of the Hazard Analysis and Critical Control Point process, completing several plans during 2005 for National Wildlife Refuges in Washington. They also are funding a new baseline survey of ANS located in the mid-Columbia and lower Snake Rivers. In addition to their participation in the ANS Committee Executive Committee they participate in the Ballast Water Work Group and the Columbia River Basin 100th Meridian Group. The Service has produced several educational materials and identification cards for invasive species, including a recently released identification card for European green crab.

Non-Governmental Partners

Washington Invasive Species Coalition

Invasive species are responsible for the listing of nearly half of all threatened and endangered species[1], consume over $130 billion a year in the U.S. alone[2], are expected to be the leading cause of extinctions in North American freshwater ecosystems[3], and according to the BLM, spread at a rate of at least 4,600 acres a day on federal lands in the western U.S. All in all, invasive species are one of the top two threats to global biodiversity[4].

In recognition of the tremendous economic and environmental threat that invasive species pose to Washington, an Invasive Species Forum was held in 2003. That forum brought together interests from Oregon, Idaho, and Washington—state and federal agencies, environmental organization leaders, foundations, scientific experts, and other stakeholders--to discuss what could be done to begin solving these problems.

Three priority program areas were determined by consensus process at the initial 2003 forum: Working to halt the spread of invasive species through ballast water; working with the nursery industry to voluntarily curtail the spread of invasive species through the sale of garden plants; and creating a statewide Washington Invasive Species Council to maximize the resources and effectiveness of multiple state and federal agencies, as well as stakeholder groups, as they work to prevent and eradicate invasive species in Washington. During the 2005 legislative session, a bill that would have created a Council received support from a broad range of interests, including the Washington Environmental Council and the Washington Farm Bureau. The bill establishing the Council didn't pass in 2005, but funding for the Council was allocated. Legislation to formalize the Council will be introduced in the 2006 state legislative session.

Another outcome from that initial forum was the creation of The Washington Invasive Species Coalition (Coalition), which works on the three priority programs, and includes: The Mountaineers, The Nature Conservancy, Conservation Northwest, People for Puget Sound, Seattle Audubon, University of Washington - Center for Urban Horticulture, University of Washington - Sea Grant, Washington Native Plant Society, Audubon Washington, Sierra Club – Cascade Chapter, Washington Conservation Voters, Washington Environmental Council, Washington Toxics Coalition, and The Wilderness Society.

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[1] Per the National Invasive Species Council

[2] Pimentel, D. et al. 2000. Environmental and economic costs of nonnative species in the United States. BioScience 50:53-65.

[3] Ricciardi, A. and J.B. Rasmussen. 1999. Extinction rates of North American freshwater fauna. Conserv. Biol. 13:1220-1222.

[4] Walker, B. and W. Steffen. 1997. An overview of the implications of global change for natural and managed terrestrial ecosystems. Conservation Ecology 1(2).

Recommendations from the Invasive Species Coalition

Ballast water from ships is one of the largest pathways for the introduction and spread of aquatic invasive species. The Coalition supports the ballast water management efforts made by WDFW. WDFW's grant-funded monitoring program and remarkable efforts by ship operators has resulted in far lower risk of invasion in Puget Sound. Unfortunately, due to lack of funding, the Columbia River remains largely unmonitored. The Coalition urges the Legislature to provide consistent funding to WDFW's successful Puget Sound monitoring program. A similar program should be implemented for the Columbia River. The Coalition is encouraged by the progress that treatment vendors are making and we believe the timeline is reasonable. The Coalition recommends a change in policy to also include the regulation of barges beginning in 2008.

Appendix A

List of ANS Committee Members

Last Name	First Name	Affiliation
Acheson	Don	APHETI
Aitkin *	Kevin	U.S. Fish & Wildlife Service
Anderson *	Kevin	Puget Sound Action Team
Barson	Len	The Nature Conservancy
Baxter	Rex	U.S. Army Corps of Engineers
Bohlman	Robert	Seattle Marine Exchange
Bowlby	Ed	NOAA
Bradley	Tom	Port of Vancouver
Brancado	Mary Sue	NOAA
Brown *	Wendy	Dept of Natural Resources
Brunskill	Roy	Metro King County
Buck	Jim	Washington Legislature
Cabreza *	Joan	U.S. E.P.A
Cain	Lon	Transmarine
Campbell *	Clinton	U.S.D.A. APHIS
Clubb	Bob	Douglas Co. PUD
Cool	Seth	Inasive Species Coalition
Cooper	Diane	Taylor Shellfish
Copping	Andrea	Washington Sea Grant
Cordell	Jeff	University of Washington
Curl	Herbert	Audubon Society
Custer	Cindy	Bonneville Power Assn.
Determan *	Tim	Department of Health
Dickison	Jeff	Squaxin Tribe
Doumit	Mark	Washington Legislature
Draheim	Robyn	Portland State University
Eissinger	Ann	Nahkeeta Northwest
Elder*	Nancy	U. S. Geological Service
Fagergren	Duane	Puget Sound Action Team
Feist	Blake	NOAA
Fogelsong	Clare	City of Bellingham
Fraidenberg	Mike	Independent Consultant
Gabrielson	John	U.S. E.P.A
Nichols*	John	Washington State Patrol

* Indicates that the individual is a member of the Executive Committee

Hayes	Mark	Department of Fish & Wildlife
Heimer	Dave	Department of Fish & Wildlife
Herwig	Russell	University of Washington
Hewes	Carol	U.S. Army Corps of Engineers
Hickey	Paul	Tacoma Public Utilities
Holmes	Frank	Western States Petroleum Assn.
Hooper	Thomas	NOAA
Hughes	Leslie	N. Pacific Fishing Vessel Owners Assn.
Hurley	William	Glosten Associates Marine Engineering
Irish	Ed	Tesoro Petroleum
Irish	Jim	Bonneville Power Assn.
Jacobsen	Ken	Washington Legislature
Joerger	Sue	Puget Soundkeepers Alliance
Johnson	Eric	WA Port Association
Joubert	Moya	City of Seattle
Kirby *	Grant	N.W. Indian Fisheries Council
Kounts	John	Washington PUD Association
Lantz	Lisa	Washington Parks
Lee	Craig	British Petroleum
Li	Kevin	Metro King County
Lyons	Betsy	The Nature Conservancy
Mahaffy	Mary	U.S. Fish & Wildlife Service
Marquardt	Raymond	US Shipping LLC
Marshall*	Randy	Department of Ecology
McGonigal *	Steve	Noxious Weed Control Board
Meacham *	Pamala	Department of Fish & Wildlife
Moon	Vic	Washington Legislature
Moore	Michael	Pacific Merchant Shipping Assn.
Mosness	Ann	Institute for AG and Trade Policy
Murphy *	Kyle	Department of Agriculture
Nalen	Charlie	Crowley Shipping
Oke	Bob	Washington Legislature
Olson	Steve	APHETI
Parker	Blaine	Columbia R. Indian Tribal Fisheries Council
Parsons	Jenifer	Department of Ecology
Peabody	Betsy	Puget Sound Restoration
Phelps	Kris	Nisqually Indian Tribe
Phillips	Stephen	Pacific States Marine Fisheries Council
Reeves	Blain	Department of Natural Resources
Regala	Debbie	Washington Legislature
Reichard	Sarah	University of Washington
Ressler	Peter	Port of Seattle

Riggs	Sharon	Padilla Bay National Estuary
Rogers	Russell	Department of Fish & Wildlife
Rohr	Dennis	Douglas Co. PUD
Ruesink	Jennifer	University of Washington
Secord	Dave	U.W. Tacoma
Sele	Brad	Department of Fish & Wildlife
Smith *	Scott	Department of Fish & Wildlife
Stenvall	Charles	Willapa Bay National Estuary
Striek	Keith	Department of Fish and Wildlife
Sump	Bob	Washington Legislature
Sytsma	Mark	Portland State University
Thorsteinson	Lyman	U.S.G.S.
Toohey	Mary	Department of Agriculture
Wainwright	Liz	Merchants Exchange of Portland
Walker	Julia	APHETI
Wamsley	Bill	Lewis Co. Weed Control Board
Warner	Danielle	U.S. Fish & Wildlife Service
Wecker	Miranda	University of Washington
Wessels *	Tom	Department of Agriculture
Wishart	Bruce	People for Puget Sound
Wolfe	Dona	Washington Parks
Wylie	Jack	Oregon DEQ