MARCH 2007

Ballast Water Management in Washington State

Recommendations for Improvement

PUGET SOUND ACTION TEAM

Office of the Governor, State of Washington

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Cargo ship on the Columbia River. / Pamala Meacham, WDFW

EXECUTIVE SUMMARY

The Ballast Water Management Act created the Ballast Water Work Group (work group) to study and recommend ways to improve Washington state's program for managing ballast water. In February 2006, the work group submitted an interim report to the Washington State Legislature (legislature) documenting the status and progress of the work group and ballast water management practices in Washington State. This report outlines the recommendations of the work group for improving the state management program. It also provides a snapshot of the risks, management practices and regulatory programs affecting Washington's program.

A separate report *Ballast Water Management in Washington State: A Report of the State Ballast Water Work Group to the 2007 Regular Session of the Washington State Legislature* provides details on each of these topics including majority and minority reports on specific recommendations.

RECOMMENDATIONS

A The legislature should provide stable and adequate funds to administer and enforce the state's program for managing ballast water.

The state program is currently funded by grants and diminishing support from federal sources. The work group supports the Department of Fish and Wildlife's (WDFW) request for $364,000 in new state general funds for the 2007-2009 biennium for staff to inspect vessels for compliance with ballast water laws and regulations.

WDFW should continue to seek grants, accept gifts and donations and use penalties and fees when appropriate to carry out additional work of the program. The work group recommends that the legislature create a ballast water management account in the state treasury to accommodate the use of these funds.

The work group also recognizes that the program will evolve over time and with experience. In the future, the group may recommend funding to support an environmental monitoring program to help evaluate the effectiveness of the state's program and to evaluate non-ballast water vectors such as hull fouling and sea chests as sources for introducing non-indigenous species.

B The states of Washington and Oregon should develop the capacity to effectively coordinate and manage ballast water on the Columbia River.

Portland State University supports the Oregon ballast water program through research. The Oregon Department of Environmental Quality (ODEQ) is Oregon's regulatory agency, but the state has not funded the department to administer the program.

The legislature should direct the work group to facilitate interstate cooperation to resolve and integrate Washington and Oregon ballast water programs, policies, regulations and activities by engaging staff from ODEQ, representatives from the Oregon Ballast Water Task Force and Portland State University when considering Columbia River issues. Representatives from Washington and Oregon should co-chair cooperation meetings.

C WDFW should align state law and regulations with regional, and national and international ballast water requirements.

Current state standards for approval of technology and those currently used to set performance of treatment technology do not align with current or proposed international and national standards. The work group agreed that there is considerable uncertainty about international and national policy related to treatment and discharge standards, and that stakeholders have divergent positions regarding standards.

The work group recommends that WDFW update agency rules to align state standards with current or proposed international and national standards. Table 1: *Proposed and Existing Ballast Water Performance Standards for the West Coast* shows current international, national and regional treatment standards against which the state standards should align where practical and possible.

In addition, the work group recommends that WDFW clarify treatment requirements for ballast water discharges in regulation. After July 2007, if a vessel operator cannot exchange ballast water, the operator must either treat it prior to discharge or retain ballast water onboard. If the operator claims an exemption from these requirements for safety reasons, the owner/operator should pay a fee or an enforcement penalty if the operator inappropriately used a safety exemption.

Table 1: Proposed and Existing Ballast Water Treatment Performance Standards for the West Coast

	IMO Regulation D-2	Transport Canada	Washington Administrative Code 222-170	California PRC 71200, 71271	National Invasive Species Act (US Coast Guard)
Management approach	Exchange moving towards treatment only	Exchange or treatment	Exchange or treatment	Exchange moving towards treatment only	Exchange moving towards treatment only
Standard:	Proposed	Adopted	Adopted Interim	Adopted	Adopted
	Discharge standard	Discharge standard	Technology standard	Discharge standard	Relies exclusively on exchange
1) Organisms greater than 50 microns in dimension	<10 viable organisms per cubic meter	<10 viable organisms per cubic meter	Kill or inactive 95% zooplankton	No detectable living organisms	USCG will propose numeric discharge treatment standards in 2006
2) Organisms 10-50 microns in minimum dimension	<10 viable organisms per ml	<10 viable organisms per ml	Kill or inactive 99% bacteria & phytoplankton	$<10^{-2}$ living organisms per ml	
3) Organisms less than 10 microns in dimension	No standards	No standards		$< 10^{3}$ cfu bacteria/100 ml	
4) Escherichia coli	<250 cfu[1]/100 ml	<250 cfu/100 ml		<126 cfu/100 ml	
5) Intestinal Enterococci	<100 cfu/100 ml	<100 cfu/100 ml		<33 cfu/100 ml	
6) Toxicogenic Vibrio cholerae (O1& O139)	<1 cfu/100 ml <1 cfu/gram of wet zooplankton samples	<1 cfu/100 ml <1 cfu/gram of wet zooplankton samples		<1 cfu/100 ml <1 cfu/gram of wet zoological samples $<10^{4}$ viruses/100 ml Final standards—no discharge of living organisms	

Implementation schedules proposed by International Maritime Organization and adopted by California and Canada:

Ballast capacity of vessel	Applies to vessels in this class if constructed in or after:	Applies to all other vessels in this class starting in:
<15,000 metric tons	2009	2016
1,500-5,000 m tons	2009	2014
>5,000 m tons	2012	2016

D The legislature should update the state's ballast water penalty and enforcement structure.

The state of California and U.S. Coast Guard (USCG) can assess penalties of up to $27,500 for violations of their ballast water requirements. The work group recommends that the legislature amend the Ballast Water Management Act to align the state's penalty structure with the national program. WDFW should adopt rules to implement a schedule for variable penalty amounts based on the severity of the violation and ensure that the schedule is consistent with those adopted by the USCG.

E WDFW should improve the ballast water reporting process and reporting compliance.

In addition to federal reporting requirements, Washington law requires ship operators to report ballast water practices to WDFW. WDFW reports that on average, about 55 percent of the ship operators submitted reports that were in full compliance with state law. Of the 45 percent of the operators not in compliance, about 16 percent did not submit reports, 24 percent provided inaccurate, but timely reports, and about 4 percent submitted accurate reports that were late.

The work group recommends that WDFW work with vessel operators to improve reporting practices and continue to do outreach to vessel operators and agents about ballast water reporting requirements and the reporting process.

Container ship, Port of Tacoma. / Kevin Anderson

F WDFW should improve the process for approving ballast water treatment technologies in Washington.

The state lacks protocols and procedures to approve ballast water treatment technology proposed for use in Washington State. WDFW should consult with the work group and coordinate with the USCG to develop standards and protocols for evaluating the efficacy of exchange and treatment technologies, and for evaluating the environmental impacts of discharged treated ballast water. WDFW should also update state regulations to create a science panel to review and evaluate technology for use in Washington.

G WDFW should demonstrate ballast water treatment as an environmentally friendly and cost-effective management approach.

For various reasons, the state has difficulty encouraging ship owners and operators to invest time and resources to install ballast water treatment technologies for further testing and eventual approval for long-term use. The work group identified the lack of: 1) funds to test systems; 2) definite deadlines for compliance; 3) uniform standards; and 4) liability protection as barriers that prevent owners and operators from further testing technologies.

WDFW should develop and implement incentives to encourage further testing of treatment technologies.

Ship docked at the Port of Everett. / Kevin Anderson

H WDFW should identify essential research and key research questions to inform and improve the state ballast water management program and policy.

WDFW, in consultation with the work group, should seek state funds, grants and other funds to support research; and should prioritize research to answer essential questions that informs and helps develop reasonable policy and improves the state's program for managing ballast water.

I The legislature should extend the work and role of the Ballast Water Work Group.

The work group will sunset on June 30, 2007. The legislature should extend the work group to advise and support WDFW as the department improves the state's ballast water program. The work group should also recommend steps to implement an environmental monitoring program for the purposes of evaluating the effectiveness of the ballast water program, as well as steps to address non-ballast water vectors (hull fouling, sea chests, etc.) as sources of non-indigenous species. The work group will report to the legislature on this work by July 1, 2009.

THE PROBLEM

The Ballast Water Management Act (Chapter 77.120 RCW) declares that introduced non-native marine plants and animals will damage the state's economy and environment, and current efforts to stop the introduction of non-indigenous species from ships are not adequate.

The law also recognizes the international ramifications and the rapidly changing dimensions of this issue, the lack of currently available treatment technologies, and the difficulty that any one state has in legally or practically managing this issue.

The Act declares its support for the International Maritime Organization (IMO) and USCG efforts, its intent to complement, to the extent its powers allow it, the USCG program for managing ballast water.

The preamble to S363, a congressional bill introduced in 2006, declares that ballast water from ships is one of the largest pathways for the introduction and spread of aquatic invasive species, and estimates that some 10,000 non-indigenous aquatic species travel around the globe each day in the ballast water of ships.

Styela clava. / Janna Nichols, Pacific Northwest Scuba.

Non-native Plants and Animals Change Ecosystems

Ballast water is only one of many possible sources for introduced species.

In 2005, the National Invasive Species Council prepared a *National Invasive Species Management Plan*. This plan includes a description of the invasion history in the San Francisco Bay/Delta Estuary to highlight how invasions can change an entire ecosystem.

More than 234 non-native plants and animals are established in the San Francisco Bay/Delta. Up to 97 percent of all organisms and 99 percent of all the biomass in the Bay are foreign species. They dominate many estuarine habitats, accounting for 40 to 100 percent of the common species at many sites in the estuary.

According Dr. Andy Cohen at the San Francisco Estuary Institute, a new species was established in the estuary every 14 weeks from 1961 to 1995—most probably introduced in discharged ballast water from large ships.

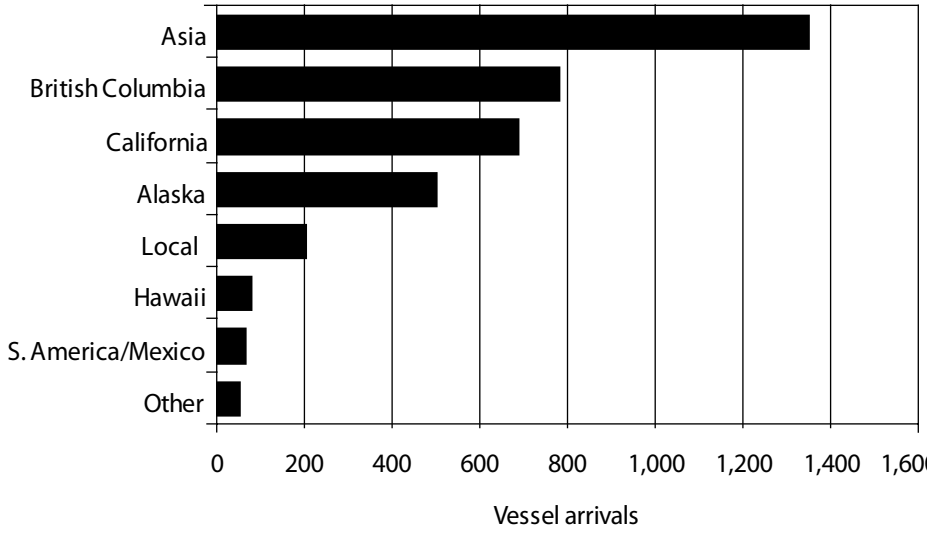
No one can estimate the environmental costs of these invasions. The small Asian clam *Potamocorbula amurensis*, for example, is the most abundant clam in the northern part of the San Francisco Bay, reaching densities of nearly 50,000 clams per square meter. The animal has displaced native species. It is also a highly efficient filter feeder. Researchers estimate that clams in the northern portion of the Bay can filter the entire water column at least once and possibly more than twice in a single day—virtually eliminating the annual phytoplankton blooms. Phytoplankton is at the base of the food chain in the bay.

Cargo ship. / Shutterstock.com, Natalia Bratslavsky

IMPORTANCE OF SHIPPING

Shipping is an important and vital economic engine in the state. Washington's trading partners include Pacific Rim countries and the states of California, Oregon and Alaska. The U.S. Maritime Administration (MARAD) reported that in 2005, more than 62 million metric tons of imported and exported goods passed through Washington ports compared to about 45 million metric tons in 2000.

FIGURE 1: Last Port of Call for Arrivals at Washington Ports in 2005 (n=3,728)



SOURCE: Department of Fish and Wildlife

In 2005, of the 3,728 vessel arrivals at Washington ports, the last ports of call for about 40 percent were from U.S. ports, more than 30 percent were from Asian countries and more than 20 percent were from British Columbia ports (Figure 1: *Last Port of Call For Arrivals at Washington Ports*).

Under federal law, vessels arriving from Asian countries are required to exchange ballast water prior to entering U.S. waters.

RISKS

Improperly or ineffectively exchanged ballast water increases the likelihood that non-native species will be introduced when ballast water is discharged to state waters. Vessels that discharge effectively exchanged or partially exchanged ballast water pose a moderate risk, and those that do not discharge ballast water are a minimal risk. Ballast water treated to meet approved state standards is a minimal risk.

HOW BIG IS THE PROBLEM?

Between 2003 and 2005, WDFW recorded an annual average of more than 3,025 vessel arrivals at Puget Sound ports and 625 arrivals at Washington ports on the Columbia River. Between these dates, port calls increased each year (Table 2: *Reported Vessel Arrivals*)

Table 2: Reported Vessel Arrivals

	2003	2004	2005
Puget Sound	**2,806**	**2,935**	**3,330**
Columbia River	**534**	**630**	**704**
TOTAL	**3,340**	**3,565**	**4,034**

Total volume discharged: WDFW's vessel reporting system shows that vessels discharged an annual average of about 9.5 million cubic meters (more than 2.5 billion gallons) of ballast water to state waters between 2003 and 2005—or about nine times the volume of the Tacoma Dome (Figure 2: *Total Volume of Ballast Water Discharged to State Waters*). The volume of the Tacoma Dome is about 0.6 million cubic meters. Vessels discharged about two thirds of this volume to Puget Sound ports and the rest to Washington ports on the Columbia River.

Vessel operators report that they exchanged or partially exchanged about 90 percent of total volume of ballast water discharged to Washington waters.

Captain Keith Strieck, a vessel inspector at WDFW, samples a ballast tank. / Pamala Meachum, WDFW

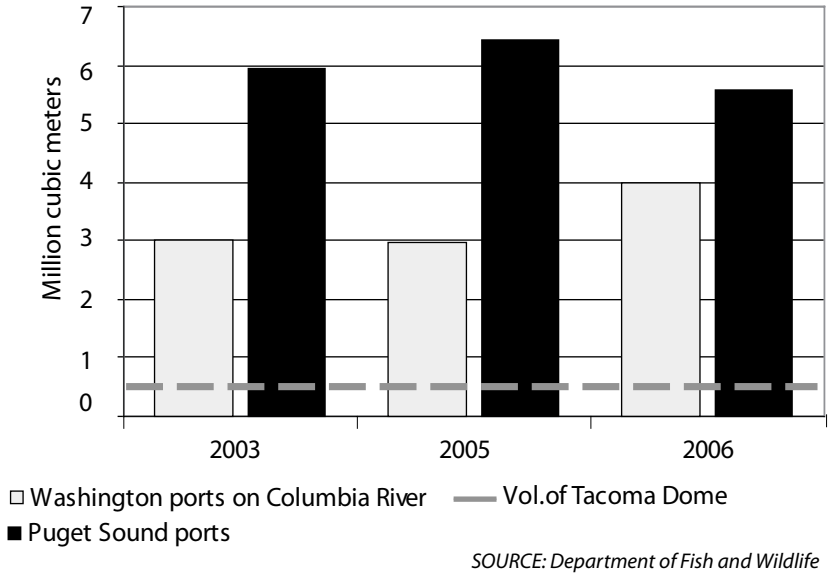
Total volume of high-risk ballast water discharged: WDFW reported that between 2003 and 2006, ships discharged an annual average of 44,000 cubic meters (12 million gallons) of unexchanged high-risk ballast water to Washington ports on the Columbia River (Figure 3: *Total Unexchanged Ballast Water Discharged to State Waters*).

The annual volume of high-risk ballast water discharged to Puget Sound ports dropped significantly between 2003 and 2006—from 230,000 cubic meters to about 30,000 cubic meters or about 8 million gallons (Figure 3: *Total Unexchanged Ballast Water Discharged to State Waters*).

Almost all of the high-risk unexchanged ballast water discharged to state waters is from vessels arriving from California ports. Water from California ports are some of the most invaded in the nation, if not the world. For example, up to 97 percent of all organisms and 99 percent of all the biomass in the San Francisco Bay and Delta region are non-indigenous species. They dominate many estuarine habitats, accounting for 40 to 100 percent of the common species at many sites in the estuary.

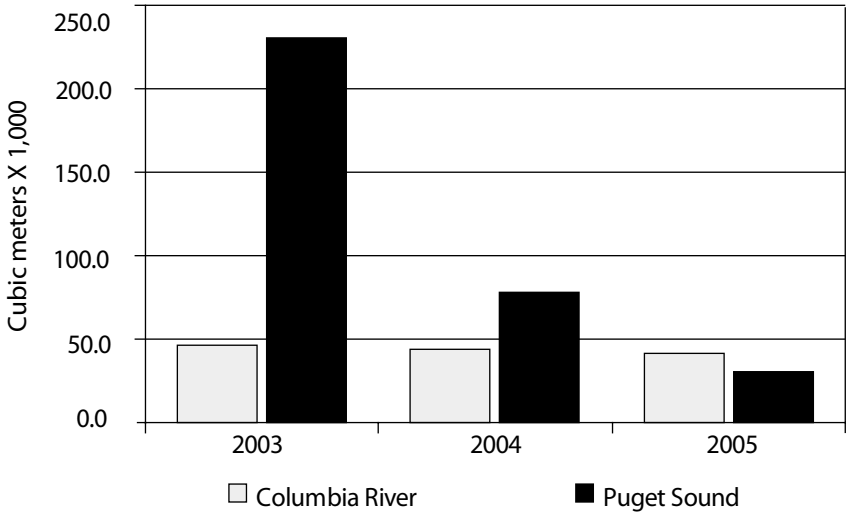
In addition, ship operators cannot always effectively exchange ballast during short duration voyages between California and Washington, which makes ballast discharged from these vessels a high risk for introducing non-indigenous species to Washington waters.

FIGURE 2: Total Volume of Ballast Water Discharged to State Waters



SOURCE: Department of Fish and Wildlife

FIGURE 3: Total Unexchanged Ballast Water Discharged to State Waters Reported by Operators

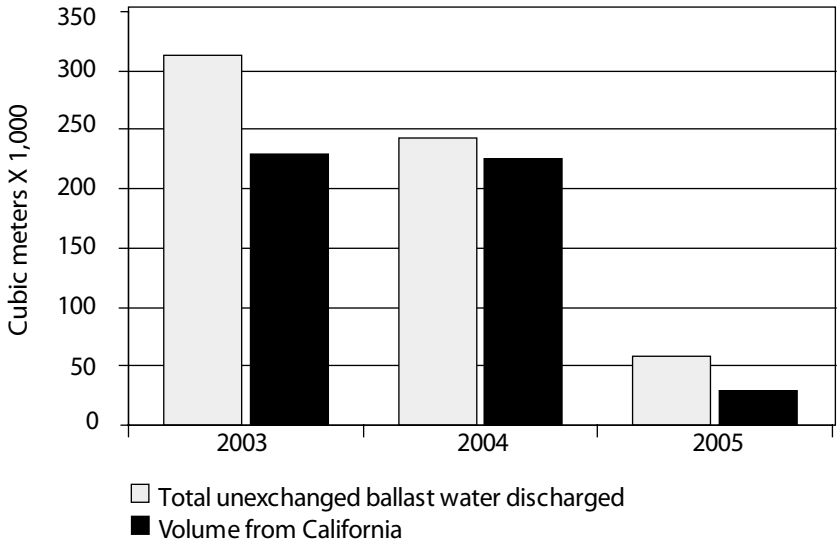


SOURCE: Department of Fish and Wildlife

SOURCE OF HIGH-RISK BALLAST WATER

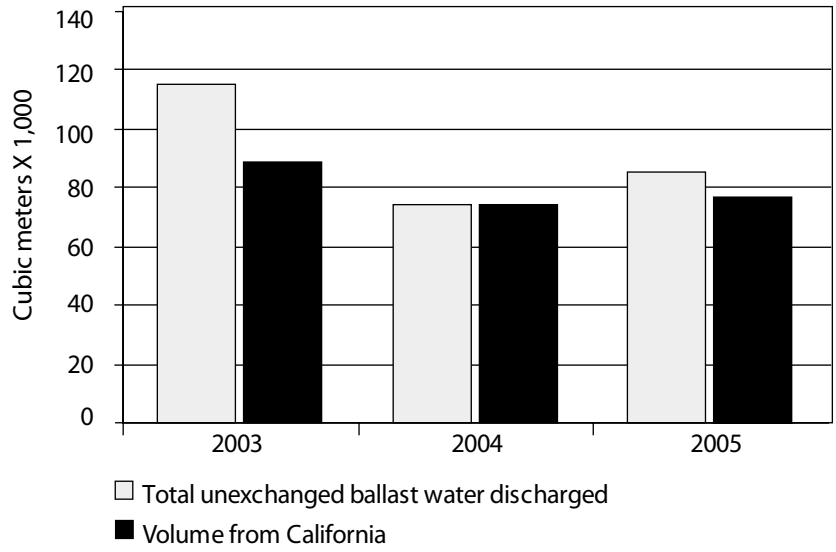
WDFW reports that almost all of the high-risk ballast water discharged to our ports originates from vessels arriving from California ports (Figure 4: *Source of High-risk Unexchanged Ballast Water Discharged to Puget Sound Ports* and Figure 5: *Source of High-risk Unexchanged Ballast Water Discharged to Washington Ports on the Columbia River*).

FIGURE 4: Source of High-risk Unexchanged Ballast Water Discharged to Puget Sound Ports



SOURCE: Department of Fish and Wildlife

FIGURE 5: Source of High-risk Unexchanged Ballast Water Discharged to Washington Ports on the Columbia River



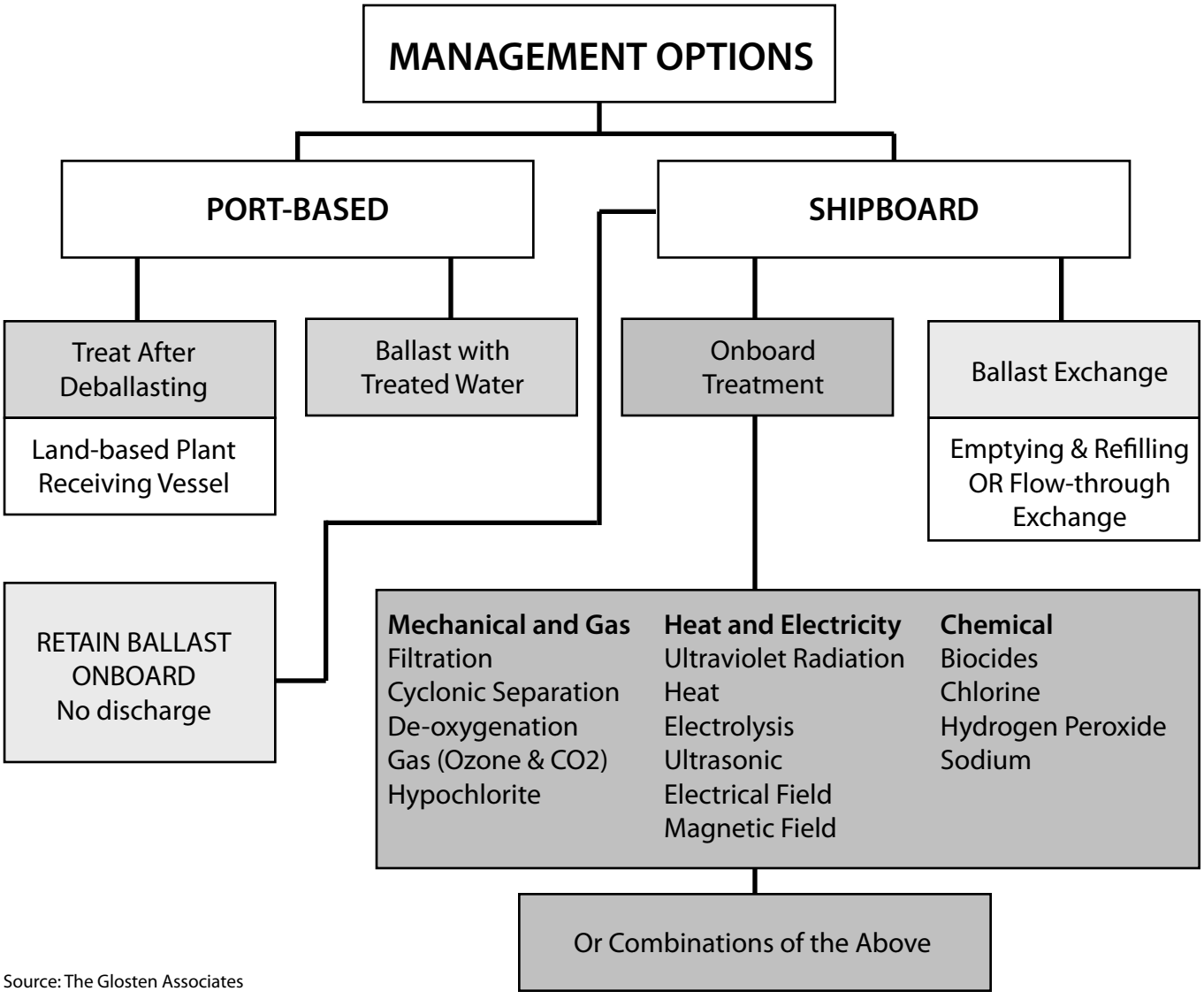
SOURCE: Department of Fish and Wildlife

PHOTOS TOP TO BOTTOM:
Ropes. / Kevin Anderson.
Ship docked at Port of Olympia. / Kevin Anderson.
Captain Keith Strieck, a vessel inspector at WDFW samples a ballast tank. / Kevin Anderson.

OPTIONS FOR MANAGING BALLAST WATER

Figure 6: *Options for Managing Ballast Water* shows some solutions for managing ballast water both onboard the vessel or on shore. Currently, there are very few options available for the pretreatment or disposal of ballast water on shore. The current national focus is on exchange or retaining ballast water onboard. The state of Oregon follows suit. At the international level, the IMO is focusing on treatment as a preferred management approach, as is the state of California. Washington's program allows either exchange or treatment. These options are briefly discussed below. Additional information about each option is available in a separate report *Ballast Water Management in Washington State: A Report of the State Ballast Water Work Group to the 2007 Regular Session of the Washington State Legislature.*

Figure 6: Options for Managing Ballast Water



Source: The Glosten Associates

Bulk carrier in port / Captain Keith Strieck, WDFW

Exchange: Exchange is a process of replacing water in ballast tanks onboard a ship with open ocean water to minimize the transport of non-native organisms that may become invasive when introduced to a new region. There are two methods of exchange:

- **The flow-through exchange method** flushes water in ballast tanks by pumping in mid-ocean water at the bottom of the tank and continuously overflowing the tank from the top until three full volumes of water in the tank have been changed to minimize the number of original organisms remaining in the tank.

- **The empty/refill exchange method** pumps water taken on in ports, estuarine or territorial waters, from tanks until they are empty. Empty tanks are refilled with mid-ocean water.

Research conducted by the University of Washington (UW) and WDFW from 2001 through 2005 has found that the effectiveness of ballast exchange to minimize non-native species in the discharge is highly variable. UW studied exchanged ballast water from almost 250 vessels of various types. They concluded that exchange as currently practiced probably has little effect in reducing the introduction of planktonic non-indigenous species to Puget Sound.

UW found that the density and percentage of non-indigenous species in samples of exchanged ballast water were consistently and significantly higher from domestic trips dominated by tank ships carrying ballast water from California, and lower in samples from transpacific ships from Pacific Rim countries. (This and other findings are in an article under review by the Canadian Journal of Fishery and Aquatic Sciences, by Jeffery Cordell, UW, and coauthors).

The effectiveness of ballast water exchange depends on a number of issues including how operators conduct exchanges, the design and construction of the ballast tanks on different classes of ships, the location where the exchange is conducted, and whether the vessel operator

has sufficient time to carry out a complete exchange to meet prescribed standards.

Treatment: Various water treatment technologies can either kill or remove organisms from ballast water before it is discharged. Technologies may be mechanical or use heat, electricity or chemicals to kill and/or remove organisms. Ship owners/operators must install equipment onboard to use this option.

Many regulatory institutions are moving away from exchange to treatment as the preferred method of managing ballast water.

Glosten Associates, Inc. summarized the status of several treatment systems based on the vendors' prominence in the field. Table 3: *Status of Prominent Ballast Water Technologies* summarizes the state of development of these technologies, a range of costs for equipment, installation, testing and protocols, training, operations, maintenance, support, the status of efficacy testing efforts and the mechanical interfaces (electrical power, pressure drop, footprint, capacity, etc.) of each technology.

In 2006, the Congressional Research Service (CRS) estimated the costs to install treatment technology. "Although estimates of the costs of ballast treatment may be imprecise and vary from vessel to vessel, there is some general agreement on average costs. For example, it may cost an estimated $400,000 per vessel for modification of container/bulk vessels to use onshore ballast water treatment facilities at California ports. More generally, the cost of retrofitting vessels to treat ballast water has been estimated at between $200,000 and $310,000 per vessel for mechanical treatment and around $300,000 for chemical treatment. Most of this expense will be borne by foreign shipping companies, as the U.S. flag fleet is a small percentage of the global fleet and by consumers of products imported by ship. The likelihood of compliance by the foreign flag fleet was increased by the February 2004 conclusion of an international agreement on ballast water management."

WDFW has aggressively pursued a program to review, evaluate and approve ballast water treatment systems for use in Washington. To date, the department has conditionally approved three technologies for further evaluation.

Retain onboard: Ballast water may be held onboard without discharging it to waters of the state.

Ship's crew sample ballast water. / Captain Keith Strieck, WDFW

Discharge to shore-based facilities: There are no shore-based facilities to accept discharged ballast water in this state or, for that matter, along the west coast. In addition, ships generally are not equipped to accommodate discharge to port facilities.

Ballast with treated water: This option requires pre-treatment of ballast water prior to loading it into tanks. Ships are not generally equipped to accommodate pretreated ballast water.

Table 3: Status of Prominent Ballast Water Treatment Technologies

Manufacturer, Name and type of system	State of development	Regulatory certification	Vessel type served	Seawater treated per hour and power usage	Cost: Initial equipment	Cost: Installation	Cost: Operating	Service availability	Required lead time
Severn Trent De Nora BalPure™ Electro-chlorination	Commercially available Pending full-scale trials Pending certification	• ETV (NRL) in progress • ABS Type approval pending	Ships requiring large flow rates	500 m^3/hour at 35 kW	Small capacity Cost not reported	$150,000 for retrofit $70,000 for new build	$0.03 / m^3	Worldwide	18-22 weeks
				1,000 m^3/hour at 52 kW	Medium capacity $400,000				
				3,000 m^3/hour at 165 kW	Large capacity Cost not reported				
Hyde Marine Ballast Water U/V plus Filtration	Commercially available Pending full-scale trials Pending certification	• STEP application pending • California state testing in process • Washington state approved	Any	250 m^3/hour at 24 kW	Small capacity $164,000	$15,000 for retrofit $5000 for new build	Replacement U/V bulbs, $400 each every 2 to 3 years Internal parts, $550 per lamp every 5 to 6 years	Worldwide	8 weeks
				500 m^3/hour at 48 kW	Medium capacity $249,000				
				1,000 m^3/hour at 96 kW	Large capacity $463,100				

Manufacturer, Name and type of system	State of development	Regulatory certification	Vessel type served	Seawater treated per hour and power usage	Cost: Initial equipment	Cost: Installation	Cost: Operating	Service availability	Required lead time
NEI Treatment Systems De-oxygenation via Venturi Oxygen Stripping	Commercially available Pending full-scale trials Pending certification	• STEP application pending	Large ships serving transoceanic routes	500 m^3/hour Power usage not reported 3,000 m^3/hour at 90 kW 10,000 m^3/hour at 220 kW	Small capacity $200,000 Medium capacity $350,000 Large capacity $1,000,000	$60,000 for retrofit Cost for new build not reported	Cost of diesel fuel	Worldwide	12 to 24 weeks
Techcross Inc. Electro-Clean Electrolysis	Have completed pilot testing Pending onboard testing	• Have received IMO basic approval • Awaiting IMO final approval, expected July 2007	Any vessel or water type	200 m^3/hour at 7 kW 500 m^3/hour at 26 kW	Under development	$50 per ton	Cost not reported	Under development	8 weeks
Nutech 03 Venturi Ozone	Commercially available by Sept. 2006 Pending full-scale trials Pending certification	• ABS installation approval	25,000 ton cargo ships to largest tankers	15,000 gpm Power usage not reported	$600,000 to $700,000 for large capacity system	Cost not reported	$16,000 to $80,000 service period Cost of diesel fuel	Under development	8 weeks
Degussa AG PERACLEAN® Ocean	Commercially available Pending shipboard and landbased testing	• Have received Basic Approval by IMO for application as Active Substance • Application for EPA registration submitted in May 2006	Any vessel type	250 m^3/h at 4 kW 1,500 m^3/h at 10 kW	Small capacity $50,000 High capacity $100,000	$5,000 to $10,000	0.20 to 0.30 dollars per cubic meter	Worldwide / under development	12 to 16 weeks

Container ship and ferry boats traveling on Puget Sound. / Shutterstock.com, Jo Ann Snover

REGULATORY PROGRAMS

Map 1: *International, National and Regional Ballast Water Jurisdictions* and Table 4: *Ballast Water Programs on the West Coast of North America, excluding Mexico* show the areas of jurisdiction for international, national and state programs on the west coast and compares the specific details of each program.

International Maritime Organization (IMO): IMO will play a major role in the ballast water management. In February 2004, IMO and member countries adopted the **International Convention for the Control and Management of Ships Ballast Water and Sediments**. This convention identifies standards for treatment and exchange effectiveness and defines a compliance schedule. It becomes effective when 30 countries that represent 35 percent to the world's shipping tonnage ratify the treaty. So far, only six countries have ratified the convention. These signatories represent less that one percent of the total world tonnage.

Canada Shipping Act: Transport Canada administers and enforces Canada's program for managing ballast water. This Act requires all vessel operators entering Canadian waters from outside the Canadian Economic Exclusion Zone (EEZ) to exchange ballast water at least 200 nautical miles offshore in waters 2,000 meters deep. Vessels entering Canadian waters from within the 200 mile EEZ must exchange ballast water at least 50 miles offshore in water 500 meters deep. Vessels taking on ballast water north of latitude 42° 50' are exempt from exchange requirements. Vessel masters may claim safety exemptions. The Act adopts ballast water discharge standards proposed by the IMO. With this exception, the Act is consistent with other west coast state programs.

U.S. Coast Guard (USCG): USCG regulates ballast water discharges at the national level. Under the national program, operators of vessels that arrive at American ports from outside the United States EEZ or 200 nautical miles offshore must report ballast water management practices to the National Ballast Water Information Clearinghouse (NBIC), and implement ship board plans for managing ballast water. Operators must also conduct mid-ocean ballast water exchanges in waters 2,000 feet deep before entering the EEZ. Vessel masters may claim safety exemptions. Operators may also retain ballast water on board, use approved alternate methods for managing ballast or discharge ballast to an approved reception facility.

State programs: The USGC does not regulate ballast water for vessels engaged in commerce inside the EEZ the same way as it does for vessels that arrive from outside the EEZ. The national regulations allow vessel operators to discharge only the amount of ballast water operationally necessary

Map 1: International, National and Regional Ballast Water Jurisdictions

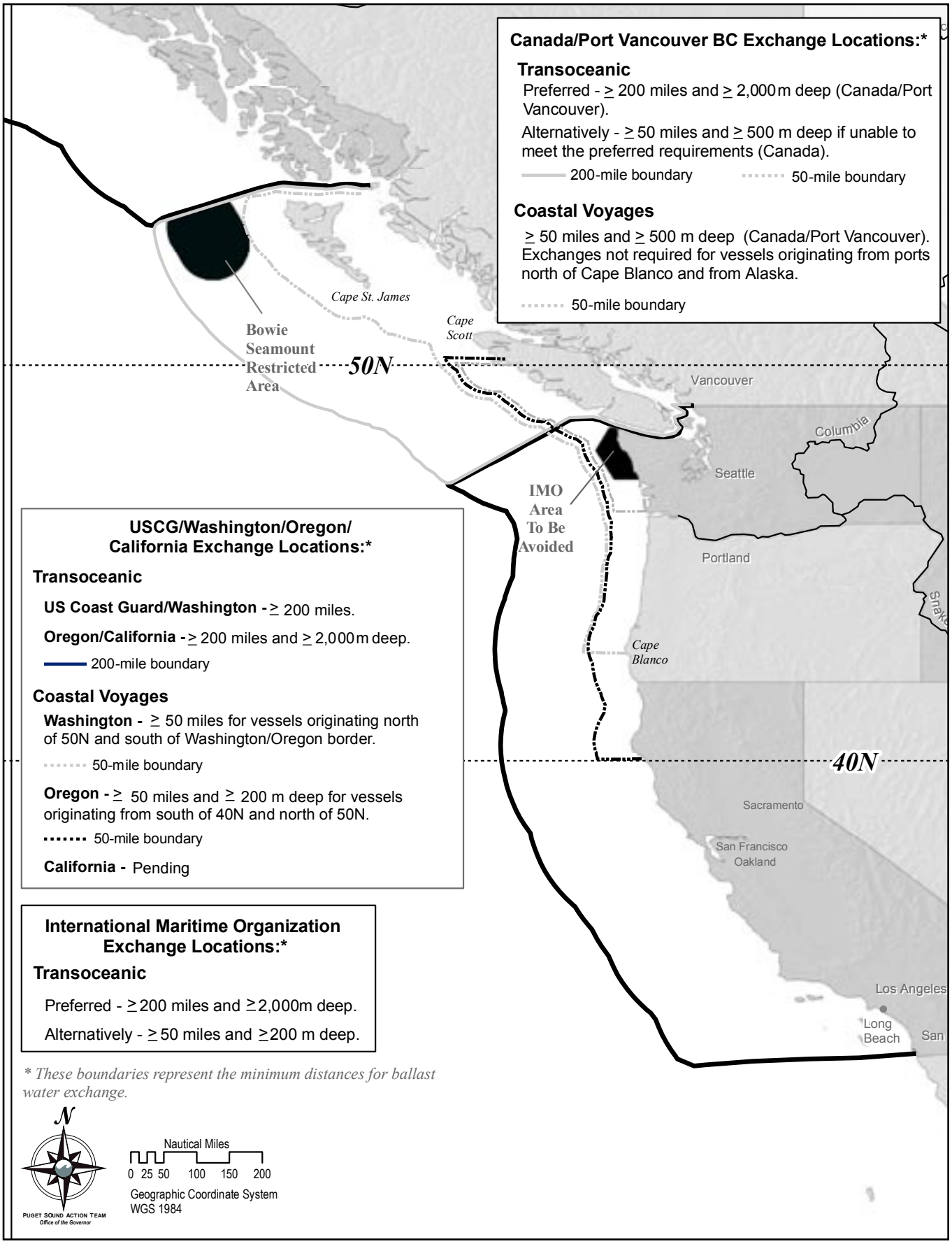


Table 4: Ballast Water Programs on the West Coast of North America, excluding Mexico.

Program Elements	U.S. Coast Guard	Washington[2]	Oregon[3]	California[4]	Alaska	Canada[5]
Enabling legislation	NISA 1990, 1996	RCW 77.120.030 WAC 220.77.090 and 095	ORS Chapter 783.620-.992	PRC71204, 71207, 71211, 71216, 71271, 72421, 72423, 72440	AS 46.03.750.	Canada Shipping Act 2006
Implementation—effective date of legislation	July 2004	2001—exchange July 1, 2007—treat if not exchanged	January 2002	1999, reauthorized 2003, 2006 rules for coastal traffic and treatment standards	Unknown	June 8, 2006
General application	All vessels entering US waters from outside EEZ	Vessels ≥300 tons entering WA water	Vessels ≥300 tons entering OR waters	Vessels ≥300 tons entering CA waters	All vessels	All vessels entering Canadian waters
Provides for safety exemptions	Yes	Yes	Yes	Yes	Yes	Yes
Preempts state or provincial programs	No	NA	NA	NA	NA	No
Requires consistency with IMO and USCG	NA	Yes	No	No	No	Yes
Requires that operators use best management practices[6]	Yes	No	No	Yes	No	Yes
Requires operators to develop and use vessel specific ballast management plans[7]	Yes	Yes	No	Yes	No	Yes
Requires that operators maintain logs and report ballast operations[8]	Yes—all vessels entering US ports.	Yes	Yes	Yes	No	Yes
Requires owner/operators to submit interim report that describes steps that they will take to meet treatment or exchange standards	No	Yes	No	No	No	No
Requires assessment of non-ballast water vectors and management recommendations	No	No	No	Yes	No	No
Requires an evaluation of the program's effectiveness	No	No	No	Yes	No	No
Jurisdiction's approach to managing ballast water	Exchange, retain on board or use approved treatment alternatives.	Exchange or treat.	Exchange.	Exchange, retain on board, treat or use shore side treatment	Prohibits discharge of ballast water from a cargo tank of a tank vessel only	Exchange, retain ballast on board, discharge to reception facilities or treat
Exchange standard	Flow-through = 3 times tank volume. 100% empty/refill	Flow-through = 3 times tank volume. 100% empty/refill	Flow-through = 3 times tank volume. 100% empty/refill	Flow-through = 3 times tank volume. 100% empty/refill	None	≥ 95% volumetric exchange and ≥30 parts per thousand salinity if exchanged ≥50 miles offshore Flow through = 3 X tank volume.
Exchange location	Transoceanic voyages: ≥200 nautical miles offshore	Transoceanic voyages: ≥200 miles offshore. Coastal voyages: ≥50 nautical miles offshore	Coastal voyages: For vessels originating from S of 40^0 and N of 50^0 on US west coast. ≥50 nautical miles offshore	Transoceanic voyages: ≥200 miles offshore in water ≥ 2000 m. > 50 nautical miles offshore in ≥ 200 m. deep	None	Transoceanic voyages: ≥200 miles offshore in water ≥ 2,000 m. deep. If unable to exchange as above, ≥ 50 miles offshore and in water ≥ 500 m. deep. Coastal voyages: >50 miles offshore in >500 m. depth

Program Elements	U.S. Coast Guard	Washington[2]	Oregon[3]	California[4]	Alaska	Canada[5]
Treatment standard	Three alternatives under consideration.	Technology standard: Inactivate/ remove 95% zooplankton and 99% bacteria & phytoplankton in ballast water.	Allows discharge of ballast water 'that has been treated to remove organisms in a manner that is approved by the USCG'	Interim—zero detectable standard for the largest organism size class (>50µm). Final—zero detectable for all organism size classes by 2020.	None	Same as IMO - Discharge $\leq$10 org/m^3 greater than 50 microns; $\leq$10 org/ ml between 10 to 50 microns, Human health standards.[9]
Exemption from ballast management requirements[10]		Ballast water or sediments that originate in WA waters, Columbia system, or internal waters of British Columbia south of 50^{0}N, including straits of Georgia and Juan de Fuca.	Exempts vessels originating from north of 40^{0}and south of 50^0	Vessels operating within "common water" zones are not required to manage ballast water but must when operating between zones. Zones include: 1) ports within San Francisco Bay and delta region. 2) LA/Long Beach port complex	None	Exchange not required for vessels originating from ports north of Cape Blanco (42^o 50'N)
Requires jurisdiction to approve treatment systems	Proposed	Yes	No	Yes—for systems that are environmentally safe and as effective as exchange. Also, CA approves systems approved by USCG HQ	No	Yes (flag state)
Allows use of approved experimental treatment systems	Yes[11]	Yes	No	Yes	No	Yes
Requires early compliance for new ships	Unknown	No	No	No	No	No
Requires operators to manage ballast tank sediments[12]	Proposed	No	No	Yes	No	Yes
Requires facilities that clean or repair ballast tanks to provide sediment disposal options	No	No—but facilities—defined as point source polluters—are subject to state clean water regulations.	No	No—but facilities—defined as point source polluters—are subject to state rules	No	Yes
Requires jurisdictions to designate no-ballast uptake areas	Yes	No	No	No—state has authority to designate areas to be avoided.	No	No
Requires jurisdictions compensate operators for delays	No	No	No	No	No	No
Allows jurisdictions to inspect logs and sample ballast water	Yes	Yes	Yes	Yes Sample/cause to inspect a minimum of 25% of arriving vessels	No	Yes
Penalties for non-compliance	Civil penalties up to $27,500/ day and criminal	$500 to $5,000 per violation	$500 to $5,000 per violation	Up to $27,500 per violation for civil penalties as defined. Each day constitutes a separate violation	None	Unknown—same as current enforcement and compliance in Canada Shipping Act
Allows jurisdictions to assess fees to support program	No	No	No	Currently, $400 at first CA port per visit.	No	No

(Endnotes)
[1] cfu = colony forming units
[2] Washington state law: Chapter 177.120 RCW and state regulations WAC 220.77.090
[3] Oregon state law ORS 783.625, 783.630, 783.635, 783.640 and 783.992 – amended in March 2005.
[4] California Coastal Ecosystem Protection Act 2006
[5] Ballast Water Control and Management Regulations established by SOR 2006-129 effective June 8, 2006.
[6] Avoid uptake or discharge in certain areas, clean ballast tanks, clear anchors and chains, clean hull fouling organisms, etc
[7] Plans detail actions to implement BW requirements, how sediment must be managed, designates an office in charge and defines reporting requirements
[8] Ballast record book can be electronic, integrated into other record systems, etc. It must be available for inspection anytime. Logs detail ballast practices undertaken.
[9] Discharge less than 250 colony-forming units per 100 ml of E. coli; less than 100 cfu per 100 ml of intestinal enterococci and less than 1 living organisms per 100 ml of cholera
[10] Exchange, treatment, retention or discharge to approved facilities.
[11] Shipboard Technology Evaluation Program (STEP) January 2004. Approved systems must be environmentally safe and as effective as exchange.
[12] Remove and dispose of sediments according to the ship's ballast water management plan

to maintain the safety of the vessels and to document the reasons for this necessity when operating within the EEZ.

As a result, states on the west coast have laws and regulations in place to manage ballast water for vessels engaged in commerce inside the EEZ. These programs fill a critical gap in the national program to protect state waters and minimize the introduction of non-indigenous species.

Washington: WDFW administers the state's program to manage ballast water. The state regulates vessels that arrive at Washington ports. Vessels originating from ports on the

Columbia River or from ports south of 50°N are exempt from these requirements.

Masters of vessels are required to exchange ballast water at least 50 nautical miles offshore or use treatment systems approved by the state before they discharge ballast water to state waters.

All vessel operators must report ballast management practices to WDFW and the NBIC.

Vessel masters or owners/operators may claim exemptions from these requirements if the safety of the ship, its crew or passengers is at risk. State inspectors can board vessels to collect samples and review logs and other documents to confirm reported ballast practices.

Oregon: The Oregon Department of Environmental Quality (ODEQ) administers and enforces the state program, although the agency has received no funding for this program.

Vessels operators engaged in coastal trade must exchange ballast water at least 50 nautical miles from shore. Vessels that discharge ballast water that originated solely from the waters located between the parallel 40°N and parallel 50°N on the westcoast of North America are exempt from these requirements.

Vessels originating from Canadian ports south of 50°N are also exempt. All other foreign and coastal vessel operators are required to exchange ballast water and report their management practices to both the NBIC and to the state.

Oregon also allows the discharge of ballast water "that has been treated to remove organisms in a manner that is approved by the USCG."

California: The California State Lands Commission administers and enforces the state's program for managing ballast water.

Operators must also report their ballast management practices to the Lands Commission and the NBIC. State inspectors can board vessels to collect samples and review logs and other documents to confirm reported ballast practices.

The Lands Commission must adopt regulations to implement interim and final standards for the quality of discharged ballast water by January 1, 2008. By law, these standards must be phased in on the same schedule of compliance as the IMO. The state must also review the efficacy, availability and environmental impacts of currently available technologies by January 1, 2008.

In addition, under this law the California Department of Fish and Game established and maintains an inventory of non-indigenous species in marine and estuarine areas and made the inventory available to the legislature and public in January 1, 2007.

California is the only state on the west coast to collect a vessel arrival fee to support the state's program.

Alaska: The state's environmental conservation statute prohibits the discharge of ballast water from a cargo tank of a tank vessel into the waters of the state. This statute allows a master of a tank vessel to discharge ballast water if necessary for the safety of the tank vessel and no alternative action is feasible to ensure the safety of the tank vessel.

WASHINGTON STATE PROGRAM COSTS

WDFW requested $364,000 for the 2007-2009 biennium for two vessel inspectors.

Staff to the work group estimates that the total cost of an effective program is about $1.4 million every two years.

Roughly half this amount is for salaries and personnel support. These costs cover 0.8 FTE to administer the program, one FTE to support the state's vessel report tracking system, two inspectors to board vessels to assure compliance with state requirements, contract costs for analyses samples taken during vessel inspections, and personnel costs associated with enforcement actions and the approval of technologies.

The remaining $700,000 would support: a) Department of Ecology to write permits to manage ballast water; b) the ballast water work group; c) contracts to develop a baseline of invasive species and carry out environmental monitoring in Puget Sound and the Columbia River ports; and d) an evaluation of the effectiveness of the state management program.

Some members of the workgroup question whether costs associated with the Department of Ecology to write a permit to regulate ballast water discharges are appropriate. In addition, some members want the work group to further evaluate the need for an environmental monitoring program.

Further details of these cost estimates are in:

Table 5: *Estimated Total Biennial Costs for Administering the State Ballast Water Program*,

Table 6: *Program Elements and Estimated Costs for Environmental Monitoring Program*,

Table 7: *Washington State Department of Fish and Wildlife 2007-2009 Budget Request for the State Ballast Water Management Program*

SUPPLEMENTAL FUNDING

The Fish and Wildlife Commission and WDFW can seek legislation and adopt rules to supplemental state funding of the program. Supplemental funding could come from a) fees to recover the cost of inspections, data analysis and ballast water report tracking; b) vessel arrival fees similar to those assessed by California; c) penalties and fines; and d) safety exemption fees.

Table 5: Estimated Total Biennial Costs for Administering the State Ballast Water Program

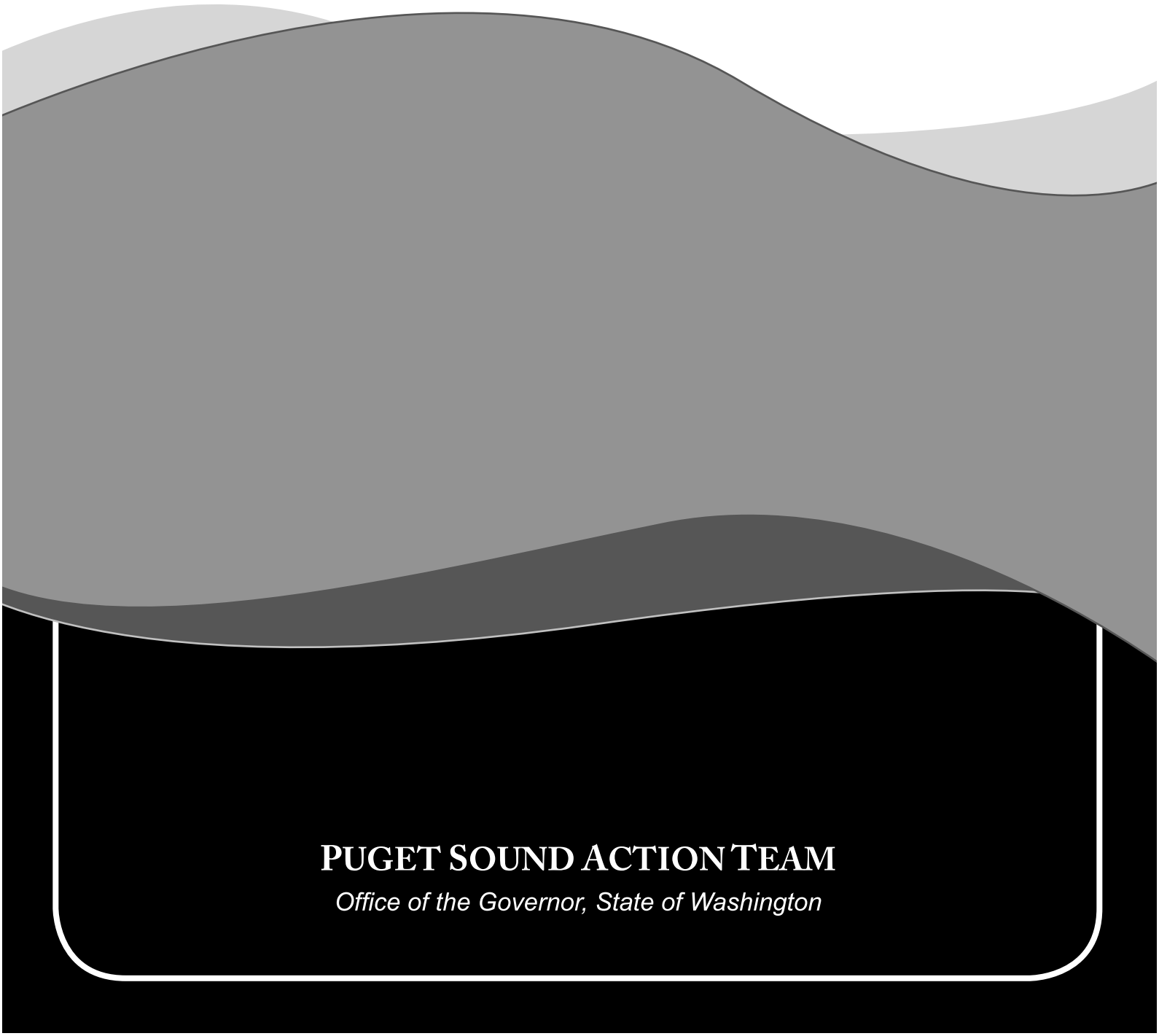
Activities	FY 2007 X $1,000	FY 2008 X $1,000	Biennium X $1,000
Department of Fish and Wildlife			
Program management—0.8 FTE @ $65,000	52	52	$104
Vessel inspectors—2.0 FTE @ $70,000 each	140	140	$280
Data entry and statistical analysis 1.0 FTE @ $35,000 data entry	35	35	$70
Travel (2 trips per year @ $1,000 each)	2	2	$4
Vehicles—2 leased @$210/vehicle/month	5	5	$10
Mileage—3,000 miles/month X 2 vehicles @ $0.26/mile	19	19	$38
Computers, phones and service providers	2.5	2.5	$5
Office supplies	1	1	$2
Sampling equipment (gear, coolers, preservative, gloves, etc)	2.5	2.5	$5
Contracts			
Harmonize database with the National Ballast Water Information Clearinghouse and neighbor states	75	75	$150
Ballast sample analyses (15 samples/month @$700/sample)	126	126	$252
Environmental and effectiveness monitoring	162	208	$370
Department of Ecology			
NPDES permit—0.4 FTE @ $65,000	26	26	$52
Technology residual toxicity assessments—0.4 FTE @ $65,000	26	26	$52
Puget Sound Action Team			
Support for the state Ballast Water Work Group, prepare reports and work to solve Columbia River conflicts.	13	12	$25
Total Program Cost	**$687**	**$732**	**$1,419**

Table 6: Program Elements and Estimated Costs for Environmental Monitoring Program

Objective	2007	2008	2009	2010	Total
1: Baseline database	$55,125				$55,125
2: Supplemental biological surveys	$107,150	$107,150			$214,300
3: Ongoing monitoring program		$100,000	$100,000	$100,000	$300,000
4: Evaluation of the effectiveness of ballast water program			$15,000		$15,000
Total	**$162,275**	**$207,150**	**$115,000**	**$100,000**	**$584,425**

Table 7: Washington State Department of Fish and Wildlife 2007-2009 Budget Request for the State Ballast Water Management Program

State Ballast Water Management Program	2007/2009
Salaries and benefits—2.0 FTE @ $69,725 per FTE per year	$278,900
Mileage 3,000 miles/month X 2 vehicles @ $0.34/mile	$48,960
Equipment: Computers, phone service and cell phones	$8,070
Per diem and lodging	$7,200
Office supplies and sampling equipment	$1,200
Contracts: Ballast water sample analyses	$19,910
GRAND TOTAL	**$364,240**



PUGET SOUND ACTION TEAM

Office of the Governor, State of Washington