U.S. COAST GUARD AUXILIARY

Training Guide

for

U.S. Coast Guard's Aquatic Nuisance Species and Ballast Water Programs

Developed by the
Office of Environmental Standards
(G-MSO-4)
updated 2002

Table of Contents

Lesson 1
Aquatic Nuisance Species and Ballast Water

Section 1-1 Aquatic Nuisance Species

The term non-indigenous species (NIS) refers to any non-native organism that, through man's activity, has spread beyond its natural, historical geographic range. Once in a new environment, NIS often become ecologically dominant because the physical and biological factors that kept them in check in their native ecosystems are absent. NIS are also referred to as exotic, alien, introduced, or non-native species.

While the focus of this review is aquatic nuisance species, NIS whose introductions have resulted in negative economic or ecological impacts to aquatic ecosystems, it is important to realize that not all NIS are harmful. Many of our nationally produced crops are not native to the U.S. For example, corn, wheat and other grains, and numerous fruit trees are all introduced species that we cultivate for economic gain. Similarly, a number of introduced marine species form the basis for an important aquaculture industry. Perhaps the best example of this is the Japanese oyster on the Pacific Coast of North America.

Aquatic nuisance species (ANS), on the other hand, are those organisms whose introductions into waters of the U.S. have adversely impacted their new environments. For example, the infamous zebra mussel *(Dreissena polymorph*a) not only out-competes the native mussels in the Great Lakes for food and substrate, they have also resulted in millions of dollars of damage to the water intake pipes of power plants and municipal water supplies by encrusting in and around the pipes. It is an expensive and time-consuming process to remove or prevent the establishment of these newcomers.

Other examples of ANS are the ruffe (pronounced "rough") and Hydrilla. The ruffe *(Gymnocephalus cernuus*) is a fish believed to have been introduced through ballast water at Duluth Harbor in Lake Superior. Originally from Eurasia, this bottom feeding fish competes with native fish for food and habitat. It has quick growth and reproductive rates and sharp spines on its gill covers, dorsal, and anal fins protect it from possible predators such as the walleye and pike.

Hydrilla (*Hydrilla verticillat*a) is an ornamental aquatic plant introduced to the U.S. in the 1950s for aquarium use. Once discarded or planted in the canals of Florida, it quickly spread throughout the inland water system. Once introduced, Hydrilla invades the deeper waters of a system and aggressively spreads to shallower waters, forming thick mats that shade the native plants below the water's surface. In addition to displacing beneficial native plants, Hydrilla can also result in fish kills when the decomposition of the large accumulation of plants reduces the availability of dissolved oxygen. Transported from one body of water to another by fragments attached to boats, their motors, trailers, and live wells, Hydrilla is highly adaptive and resilient.

Once established, Hydrilla can restrict water flow and block the water supplies used for power generation and agricultural irrigation.

Section 1-2 Ballast Water

Ballast on board vessels serves an essential function. Whether the ballast is in the form of metal, stones, water or cargo, it is a source of weight used to manipulate the center of balance on a ship. Depending on a vessel's type and the operational circumstances, ballast helps maintain stability, structural integrity, efficient propulsion, and maneuverability.

During the 20th century, water became the primary form of ballast on board ships, with vessels filling their ballast tanks with thousands of tons of fresh, brackish, and open-ocean water. It also became a significant pathway for the transfer of organisms. While shipping has always been an important mechanism for the human mediated transfer of organisms around the globe, the explosive growth of international marine transportation since World War II has caused a similar increase in the rate of new introductions of NIS.

Vessels typically take on water at their last port of call and discharge the ballast upon arrival in a new port. In some instances, this water has traveled half way around the world. Organisms hitchhiking their way to a new environment find themselves released into an ecosystem with few, if any, natural predators.

Section 1-3 Impacts of ANS

Not just bacteria and small mussels are introduced via ballast water. Any organism small enough to fit through the ballast intake of a ship has the potential to be collected, carried to another environment, and discharged. The life stages of some animals can also facilitate transport by ballast water. Many clams, mussels, fish and other organisms have one or more small, planktonic larval stages during their early life, making them more likely to be taken into a ballast tank.

Once discharged into a new environment, ANS can cause impacts in one of three general categories: 1) ecological, 2) economic, and 3) public health. As discussed previously with the zebra mussel, many ANS are introduced into an ecosystem in which there are no known predators. Many ANS are opportunists, meaning they have the ability to take advantage of a new environment quickly because of a rapid growth rate, quick reproductive rate, and the ability to tolerate a variety of environmental conditions. As a result, ANS are often able to out-compete the native species for food and habitat and, in some cases, alter the environment. For example,
zebra mussels are such efficient filter-feeders that they alter the food chain in their new environment, making it impossible for native mussels, as well as plants and other fish to survive.

Tied to the ecological impacts of ANS, are the economic impacts. Alterations to the environment that adversely affect other organisms can be detrimental to biological resources such as crops or fisheries, while damage to structures can be expensive to repair and maintain. The public health impact also has the potential to be very significant. While microbial content of ballast water can often be attributed to poor drinking water and wastewater systems of developing countries, coastal waters of developed countries are not free of human pathogens. When taken on board as ballast, the microbial infested water is transported to other areas. This discharge may infect the local fish and shellfish populations, which are later harvested for human consumption.

Not only does ballast travel to the U.S. from all over the world, it travels in large volumes. The large ballast water capacity for some commercial vessels, upwards of 120,000 metric tons (32,000,000 gallons) each, results in a huge yearly release of foreign ballast water in ports throughout the U.S. Since ballast capacity varies by ship type, and some ports receive more of a certain type of ship, it is understandable that certain ports will receive more ballast water simply because of the type of vessels calling at their docks. This is one of many reasons why the U.S. Coast Guard, in cooperation with the Smithsonian Environmental Research Center, has initiated a survey program to assess the source and amount of ballast water being discharged into waters of the U.S.

Section 1-4 Review Questions

1. What are non-indigenous species?
2. Give an example of a beneficial non-indigenous species.
3. Give an example of aquatic nuisance species.
4. What is the function of ballast water on board a ship?
5. Historically, what types of materials have been used as ballast?
6. What are the three general types of impacts of ANS?
7. Give an example of each of the three types from question # 6.

Lesson 2
Legislation and Regulations

Section 2-1 Federal Legislation

The U.S. Coast Guard gets its authority to regulate ballast water and ANS from two laws: the Non-indigenous Aquatic Nuisance Species Prevention and Control Act of 1990 (NANPCA) and the National Invasive Species Act of 1996 (NISA). NANPCA directed the Coast Guard to issue regulations and guidelines to control the introduction and spread of ANS in the Great Lakes ecosystem[1]. It also required an assessment of ballast water management practices in all U.S. ports and the development of mariner education and assistance programs. By 1991, the Coast Guard developed voluntary guidelines for the Great Lakes which advised ships entering these waters from outside the Exclusive Economic Zone (EEZ)[2] to have either conducted mid-ocean ballast water exchange[3] or an acceptable alternative. These guidelines became mandatory in 1993.

In 1996, NISA was passed by Congress and directed the continuation of the mandatory regulations in the Great Lakes ecosystem, and tasked the Coast Guard with establishing a voluntary ballast water management (BWM) program for virtually all other U.S. ports.

The three main components of the Coast Guard's voluntary BWM program are:

(1) To promote BWM by operators of all vessels in waters of the U.S.

(2) To provide voluntary BWM guidelines for all vessels entering the U.S. waters from outside the EEZ.

(3) To request the reporting of BWM practices by all vessels entering U.S. waters from outside the EEZ.

While the only ballast water treatment currently approved by the Coast Guard is mid-ocean ballast water exchange it is the policy of the U.S. that ballast water management practices will not jeopardize the safety of a vessel, its crew, or its passengers. A ship's master has the final say in whether or not a mid-ocean exchange is possible given the operational conditions facing the vessel. For ships calling in the Great Lakes ecosystem, a more sheltered alternative exchange zone is provided for those ships that cannot conduct a mid-ocean exchange prior to arrival in the Great Lakes. There is also a safety exemption which gives a ship's captain absolute discretion for determining if performing open-ocean exchange would threaten the safety of the crew or the vessel.

---

[1] The Great Lakes ecosystem includes the Great Lakes and the area of the Hudson River north of the George Washington Bridge.

[2] The U.S. Exclusive Economic Zone (EEZ) generally includes those waters 200 miles from shore.

[3] Mid-ocean ballast exchange involves exchanging coastal ballast water with water taken from an area 200 miles from any shore and with a depth greater than 2000 meters.

The regulations "Ballast Water Management for Control of Non-Indigenous Species in the Great Lakes and Hudson River" and "Ballast Water Management for Control of Non-indigenous Species in Waters of the United States" are contained in 33 Code of Federal Regulations (CFR) Part 151, Subparts C and D, respectively. Subpart D applies to all waters of the U.S., including the Great Lakes, while Subpart C contains the additional provisions for the Great Lakes and the Hudson River north of the George Washington Bridge. The regulations can be retrieved on-line at:
http://www.access.gpo. gov/nara/cfr/cfr-retrieve.html#page1

Section 2-2 Voluntary Ballast Water Management Guidelines

The Coast Guard established the following guidelines in order to minimize the uptake and release of ANS by **all** vessels with ballast tanks operating in U.S. waters:

- Avoid ballast operations in or near marine sanctuaries, preserves, parks, or coral reefs.
- Avoid taking on ballast water:

  in areas known to contain harmful organisms and pathogens, such as toxic algal blooms;

  near sewage outfalls;

  near dredging operations;

  where tidal flushing is poor or when a tidal stream is known to be more turbid;

  in darkness when organisms may rise up in the water column; or

  in shallow water or where propellers may stir up the sediment.
- Clean ballast tanks regularly
- Discharge minimal amounts of ballast water in coastal and internal waters.
- Rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin.
- Remove fouling organisms from hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with local, State and Federal regulations.
- Maintain a vessel specific BWM plan.
- Train vessel personnel in ballast water and sediment management and treatment procedures.

Additionally, vessels operating outside of the EEZ are asked to do one of the following as a form of BWM. (Note: For vessels arriving in the Great Lakes ecosystem these actions are mandatory.)

- Exchange ballast water beyond the EEZ, from an area more than 200 miles from any shore, and in waters more than 2,000 meters in depth;
- Retain the ballast water on board the vessel;
- Use an alternative environmentally sound method of BWM that has been approved in advance by the Commandant of the U.S. Coast Guard;
- Discharge ballast water to an approved reception facility; or
- Exchange ballast water in other waters approved by the USCG Captain of the Port.

Section 2-3 Ballast Water Reporting

It is important to note that while the ballast water management guidelines are voluntary (except in the Great Lakes ecosystem), the reporting of ballast water management data is expected of all ships. NISA established a ballast water reporting requirement and directed the Coast Guard and the Smithsonian Environmental Research Center (SERC) to create and operate the National Ballast Information Clearinghouse (NBIC). The NBIC is responsible for the collection and analysis of information regarding compliance with ballast water reporting requirements, ballast water management practices, and surveys of ANS in waters of the U.S.

Ballast water data is collected through the National Ballast Survey (NABS). The goal of NABS is to gather data on ballast water management from ***all*** vessels entering U.S. ports from outside the EEZ. The survey collects information such as where ballast water was collected, whether or not ballast water was exchanged in mid-ocean, and where/how much foreign-acquired ballast is to be discharged within the U.S. NABS has three sources of data:.

1) Ballast Water Management Reporting Form: This form was designed by the Coast Guard and SERC and tested in a pilot project before being implemented. It requests basic information on ballast water and the vessels management practices. (See Appendix C). This form can be submitted to the NBIC via mail, fax, or the Internet.

2) U.S. Maritime Administration (MARAD) data: MARAD collects data on all vessels arriving into U.S. ports. The total number of arrivals recorded by MARAD is compared to the number of BWM forms collected by the NBIC in order to determine the rate of compliance.

The U.S. is not the only country working to prevent and control the spread of ANS. The International Maritime Organization (an agency of the United Nations) recognizes the critical role the maritime industry plays in the spread of ANS. Its Marine

Environmental Protection Committee (MEPC) is addressing this issue on a global level. The Coast Guard leads the U.S. participation in the MEPC where efforts are underway to develop a global treaty on ballast water management.

Section 2-4 Authorities and Responsibilities of the Coast Guard

The information received and analyzed by the NBIC will be used to report to Congress on the effectiveness of the voluntary BWM program. If the Coast Guard finds that the voluntary program is not effective, the Secretary of Transportation is required to make the voluntary guidelines mandatory and enforce civil and criminal penalties. The data from the program's first year shows a relatively low reporting rate of approximately 25%. The final report to Congress is due no later than January 2002.

In addition to its data collection efforts, the Coast Guard participates in other aspects of the ANS/ballast water issue, including the development ballast water treatment technologies and standards by which to evaluate proposed technologies.

The Coast Guard also plays an active role on the Aquatic Nuisance Species Task Force (ANSTF). Formed under NANPCA to provide an intergovernmental organization whose mission is to prevent and control the spread of ANS, the ANSTF has 7 federal agency and 13 ex-officio members. It is co-chaired by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration. The ANSTF coordinates government interests with those of the private sector through regional panels and issue specific committees. See the following site for more information on the ANSTF and its activities: http://www.anstaskforce.gov/

In addition to its participation on the ANSTF, the Coast Guard chairs the ANSTF's Ballast Water and Shipping Committee. One of the primary goals of the committee is to recommend a national research agenda that will lead to the development of ballast water treatment technologies.

Section 2-5 Review Questions

1. What legislation gave the Coast Guard the authority to regulate ballast water and ANS in the Great Lakes in 1990?
2. What are the two main components of the Coast Guard's BWM program?
3. What are 3 of the recommended BWM practices in the Coast Guard's BWM program?
4. What organization helps collect and analyze ballast water information for the Coast Guard?
5. What organization was established by NANPCA to provide an intergovernmental body whose mission is to prevent and control the spread of ANS through NISA and NANPCA?

Lesson 3
Recreational Activities Guidelines

Section 3-1 Voluntary Guidelines

Another requirement of NISA was direction to the ANSTF to develop guidelines for recreational activities to prevent and control the spread of zebra mussels and other ANS and for the Coast Guard to promulgate these guidelines. Recreational activities may account for much of the spread of ANS on the domestic waters of the United States. For example, the introduction of zebra mussels is most commonly attributed to ballast water. However, once introduced into the Great Lakes systems, zebra mussels quickly spread through the water bodies of the Great Lakes region by hitchhiking on boats, trailers, SCUBA equipment, personal watercraft, and seaplanes. The Recreational Activities Committee of the ANSTF developed guidelines detailing how the public can assist in reducing the movement of ANS. Once drafted, the Coast Guard was responsible for publishing the notice and collecting the comments during the review period. The final product, Voluntary Guidelines on Recreational Activities to Control the Spread of Zebra Mussels and Other Aquatic Nuisance Species, was published in the Federal Register on 28 December 2000 (Vol 65, No 250). See Appendix D to read the guidelines or view them on-line at http://152.119.239.10/docimages/p56/119638.pdf

Section 3-2 Education and Outreach

The recreational activities guidelines (RAG) are an important part of the Coast Guard's ANS education and outreach campaign. These guidelines are meant for the general public and recommend simple steps they can take to help protect aquatic ecosystems from the threat of ANS. For example, the guidelines suggest boats and boat trailers be physically examined for animals and plant materials that could be clinging to the surface or caught in the various intake and exhaust pipes. All parts of a boat should be dried for at least 5 days before placing the boat into another body of water, or the boat can be cleaned with hot water or high-pressured water to remove any organisms.

For anglers and waterfowl hunters, the RAG recommends inspecting equipment for "hitchhiking" organisms, never releasing live bait into a body of water, and properly caring for boats and trailers as described above. Seaplane pilots are advised to inspect aircraft for plant and animal material, pump the floats to remove infested water, thoroughly clean their aircraft if it is moored in infested waters, raise and lower water rudders several times during takeoff to free fragments of aquatic plants, as well as other recommendations for takeoff, landings, and storage of planes. Personal watercraft should be treated like boats and trailers with regards to visual inspection and cleaning of the craft. In addition, the engine should be run for 5 to 10 seconds after removing the watercraft from the water in order to blow out any excess water and vegetation.

It is important that the public be made aware of these guidelines and encouraged to incorporate these actions into their normal routines. To many people it may seem unlikely that actions such as running watercraft engines to flush out retained organisms would be of much use in preventing introductions of ANS. However, very little is known about how many individuals need to be introduced to a new habitat in order to establish a new population. Several careful studies have indicated that it may take only a few individuals to establish a population capable of overwhelming the ecosystem. The recommendations in the RAG were developed to be easy to perform, yet, if followed properly, provide a high degree of control against a variety of ANS. The next step for the Coast Guard is to inform the public of these guidelines and promote a behavioral change that will benefit the aquatic environment by controlling the spread of ANS.

The Coast Guard Auxiliary plays a vital role in this outreach campaign. Through its boating safety courses, courtesy marine exams, boat show exhibits, and advisory circulars, the Auxiliary reaches millions of members of the general water recreation public. With its understanding of aquatic nuisance species and the roles ballast water and recreational activities play in the introduction and spread of ANS makes the Auxiliary a vital element in national efforts to control these organisms and preserve our aquatic environments.

As a member of the ANS Task Force's Communication, Education, and Outreach Committee, the Coast Guard is working with a variety of federal and state and non-governmental organizations to develop an outreach campaign to educate the water recreation public about the simple measures they can take to control the spread of ANS. For more information on ANS in your area, try contacting your county's extension office, your state's department of natural resources, or a local or regional SeaGrant office. For more information on the USCG ballast water management program, copies of this training guide visit the Office of Environmental Standards web site at http://www.uscg.mil/hq/g-m/mso/mso4/ans.html or call 202-267-2079.

Section 3-3 Review Questions

1. Who developed the Recreational Activities Guidelines?
2. What are three recommendations made by the RAG for all aquatic recreational equipment?
3. What does the RAG recommend anglers do with live bait?
4. What does the RAG recommend personal watercraft owners should do for 5-10 seconds after removing the craft from the water?
5. Seaplane pilots should raise and lower the _____ to free fragments of aquatic plants.
6. What recreational activities are discussed in the RAG?
7. Cite three other agencies that could provide information on ANS.

Appendix A
List of Acronyms

ANS	Aquatic Nuisance Species
ANSTF	Aquatic Nuisance Species Task Force
BWM	Ballast Water Management
EEZ	Exclusive Economic Zone
IMO	International Maritime Organization
MARAD	U.S. Maritime Administration
MEPC	Marine Environmental Protection Committee
NABS	National Ballast Survey
NANPCA	Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990
NBIC	National Ballast Information Clearinghouse
NISA	National Invasive Species Act of 1996
NIS	Non-Indigenous Species
RAG	Recreational Activities Guidelines (Voluntary Guidelines for Recreational Activities to Control the Spread of Zebra Mussels and Other Aquatic Nuisance Species)
SERC	Smithsonian Environmental Research Center

Appendix B
Answers to Review Questions

Section 1-4

1. Non-indigenous species (NIS) are non-native organisms that, through human activity, have spread beyond their natural, historical geographic range.
2. Examples of beneficial NIS are corn, wheat and other grains, fruit trees, Japanese oysters
3. Examples of ANS are zebra mussels, Hydrilla, ruffe, cholera
4. Source of weight to manipulate the center of balance on a ship, used to aid stability, structural integrity, propulsion, and maneuverability
5. Examples of forms of ballast are cargo, water, stones, gravel
6. The three types of ANS impacts are ecological, economic, and public health
7. a) Ecological impacts – zebra mussels out-competing native mussels for food and substrate, Hydrilla mats shading native plants and resulting in fish kills, ruffe out-competing native fish and not being susceptible to native predators

   b) Economic impacts – expense to clean pipes and outfalls clogged by zebra mussels and Hydrilla, reduction in biological resources, damage to structures

   c) Public health impacts – human pathogens carried in ballast water

Section 2-5

1. Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA)
2. (1)To promote BWM for operators of all vessels in waters of the U.S.
   (2) To provide voluntary BWM guidelines for all vessels entering the U.S. waters from outside the EEZ.
   (3) To require the reporting of BWM data by all vessels entering U.S. waters from outside the EEZ.
3. Avoid ballast operations in or near marine sanctuaries, marine preserves, marine parks, or coral reefs.

   Avoid taking on ballast water:

   - with harmful organisms and pathogens, such as toxic algal blooms
   - near sewage outfalls.
   - near dredging operations.
   - where tidal flushing is poor or when a tidal stream is known to be more turbid.
   - in darkness when organisms may rise up in the water column.
   - in shallow water or where propellers may stir up the sediment.

   Clean ballast tanks regularly

   Discharge minimal amounts of ballast water in coastal and internal waters.

Rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin.

Remove fouling organisms from hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with local, State and Federal regulations.

Maintain a vessel specific BWM plan.

Train vessel personnel in ballast water and sediment management and treatment procedures.

4. National Ballast Information Clearinghouse (NBIC)
5. Aquatic Nuisance Species Task Force

Section 3-3

1. Recreational Activities Committee of the ANS Task Force
2. Physically examine equipment for animals and plant materials that could be clinging to the surface or caught in the various intake and exhaust pipes, dry equipment for at least 5 days before placing the boat into another body of water or the equipment can be cleaned with hot water or high pressured water to remove any organisms.
3. Never release live bait into a body of water
4. Run engine to blow out excess water and vegetation
5. Rudders
6. SCUBA diving, water fowl hunting, recreational harvest of live bait, angling, recreational boating, personal watercraft, seaplanes
7. County extension offices, state departments of natural resources, NOAA Sea Grant offices and the USCG Office of Environmental Standards

BALLAST WATER REPORTING FORM

IS THIS AN AMENDED BALLAST REPORTING FORM? YES ☐ NO ☐

1. VESSEL INFORMATION	2. VOYAGE INFORMATION		3. BALLAST WATER USAGE AND CAPACITY
Vessel Name:	Arrival Port:		***Specify Units Below (m³, MT, LT, ST)***
IMO Number:	Arrival Date:		Total Ballast Water on Board:
Owner:	Agent:		Volume / Units / No. of Tanks in Ballast
Type:	Last Port:	Country of Last Port:	
GT:			Total Ballast Water Capacity:
Call Sign:	Next Port:	Country of Next Port:	Volume / Units / Total No. of Tanks on Ship
Flag:			

4. BALLAST WATER MANAGEMENT Total No. Ballast Water Tanks to be discharged: ☐

Of tanks to be discharged, how many: Underwent Exchange: ☐ Underwent Alternative Management: ☐

Please specify alternative method(s) used, if any: _____

If no ballast treatment conducted, state reason why not: _____

Ballast management plan on board? YES ☐ NO ☐ Management plan implemented? YES ☐ NO ☐

IMO ballast water guidelines on board [res. A.868(20)]? YES ☐ NO ☐

5. BALLAST WATER HISTORY: Record all tanks to be deballasted in port state of arrival; IF NONE, GO TO #6 ***(Use additional sheets as needed)***

Tanks/ Holds (List multiple sources/tanks separately)	BW SOURCES				BW MANAGEMENT PRACTICES						BW DISCHARGES			
	DATE DD/MM/YY	PORT or LAT. LONG.	VOLUME (units)	TEMP (units)	DATE DD/MM/YY	ENDPOINT LAT. LONG.	VOLUME (units)	% Exch	METHOD (ER/FT/ ALT)	SEA HT. (m)	DATE DD/MM/YY	PORT or LAT. LONG.	VOLUME (units)	SALINITY (units)

Ballast Water Tank Codes: Forepeak = FP, Aftpeak = AP, Double Bottom = DB, Wing = WT, Topside = TS, Cargo Hold = CH, Other = O

6. RESPONSIBLE OFFICER'S NAME AND TITLE, PRINTED AND SIGNATURE: _____