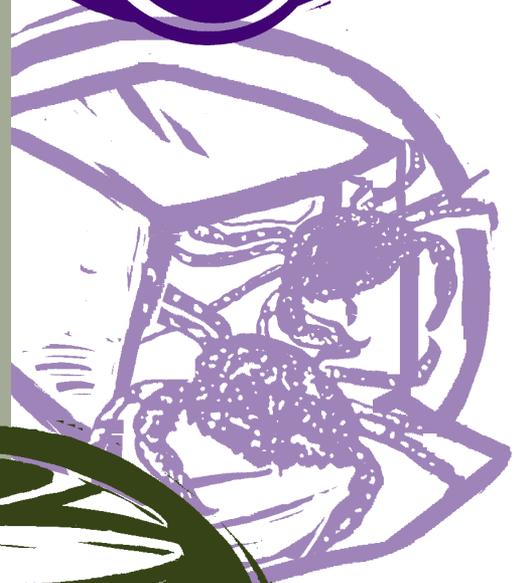


HANDLING  
AND  
DISPOSAL  
OF  
NON-NATIVE  
AQUATIC  
SPECIES AND  
THEIR  
PACKAGING



## WHO SHOULD USE THIS BOOKLET?

If you work in an educational, research or testing facility that receives and handles shipments of live, fresh, frozen or air-dried aquatic specimens, you could be introducing non-native species into your local environment. Shipments from international or out-of-state suppliers, or from infested areas within the state, often harbor unwanted organisms that can be inadvertently released into local waters. Invasions by nonindigenous species (NIS) are among the most severe threats facing the waters of the Pacific Northwest.

This booklet can help you prevent unintentional introductions by:

- identifying potential risks to your local ecosystems from working with non-native aquatic species;
- describing how to assess whether your facility or operations might provide a pathway for introduction of non-native aquatic species;
- suggesting standard protocols for handling and disposal of non-native aquatic species and their packaging; and
- listing additional sources for information.

## WHAT ARE NON-NATIVE AQUATIC SPECIES?

A “native” species lives within its natural or historical range and zone of natural dispersal. Non-native aquatic species are initially introduced by human activities into freshwater, brackish or marine ecosystems where they could not go naturally (by swimming or floating on winds, tides or currents).

Non-native species include those introduced from one part of a region or country into another, and those originating in other countries or continents. A species native to the Atlantic seaboard of the U.S., such as the smooth cordgrass *Spartina alterniflora*, is an introduced species to the Pacific coast.

Non-native aquatic species may pose serious economic and ecological threats to marine and freshwater ecosystems in our region and throughout the world [see sidebar]. Prevention — through proper disposal and handling procedures — is the most effective and least costly approach to controlling invasions.

## WHY ARE NON-NATIVE AQUATIC SPECIES A PROBLEM?

Non-native species — called exotics, nonindigenous species or alien species — can alter or degrade native habitat. They may prey on native species or outperform them in the quest for food, space and other resources, sometimes even causing the extinction of native species. Once established, exotics rarely can be eradicated.

Several established and emerging non-indigenous species threaten critical habitat and important commercial species in our region, and could lead to drastic changes in the ecology of marine, estuarine and freshwater systems. Estuaries in Washington and Oregon are home to Dungeness crab and many marine fish species, as well as salmonids. These estuaries are particularly susceptible to NIS introductions.

Historically, the Pacific Northwest’s aquaculture industry has thrived because of the deliberate introduction of certain species of mussels and oysters, and even the unplanned introduction of Manila clams. However, unintentional or poorly managed introductions can harm the economic success of the industry as well as the structure of the region’s marine ecosystems. Improper disposal of live aquatic specimens or their packaging always has the potential to establish a new invasion.

## HOW ARE NON-NATIVE AQUATIC SPECIES INTRODUCED?

The shipment of aquatic specimens to research, testing and educational facilities may introduce non-native species in two ways.

1. The scientific specimens (target species), which are often non-native, may escape or be released into the environment. Intentional release is illegal without the proper permit.
2. Hitchhikers (non-target species), including spores, parasites or other “hidden” species, may accompany a shipment of scientific specimens in the packaging. Improper handling or disposal of packaging may allow hitchhikers to escape into the local aquatic environment.

Improper handling and disposal of scientific specimens and their packaging are significant pathways for non-native species introductions.

**ANY LIVE OR FRESH SPECIMENS AND THEIR PACKAGING MAY CONTAIN NON-NATIVE SPECIES.**

## A SCIENTIFIC SPECIMEN AND ITS PACKAGING

Because packaging is designed to keep specimens alive, it also keeps unwanted organisms alive. Some aquatic species are hardy, withstanding high or low temperatures and long periods outside of their ideal environment, or lying dormant until more favorable conditions arise.

Non-native species can hitchhike on almost anything, surviving on or in the tissues of the scientific specimen, on solid surfaces of packaging, or on sampling equipment. Holding water, sediments and live or dried plant material in the packaging are of special concern. They can potentially carry large numbers of inconspicuous or microscopic live organisms.

Non-native species can hitchhike at various life stages from eggs to larvae to adults. Many of these life stages are microscopic (such as plankton, pathogens, microbes or other disease organisms). Because they are invisible to the naked eye, you may not even realize non-native species are present within the shipment.

## ASSESSING YOUR FACILITIES AND OPERATIONS

Take preventive measures to contain or confine non-native aquatic species and to reduce the risk of accidentally introducing them into the environment near your workplace. If you routinely use non-native aquatic species in research or testing, use lab protocols such as those developed by the U.S. National Aquatic Nuisance Species Task Force. Copies of the General Evaluation Protocol for Research Proposals Concerning Nonindigenous Aquatic Species can be ordered or downloaded from:

<http://www.anstaskforce.gov/resprot.htm#>

The following questions can help you determine whether preventive measures are needed in your workplace.

Do you:

1. Hold organisms on a dock, pier, beach or other facility?
2. Wash specimens and/or their shipping containers or sampling equipment?
3. Dispose of unused live specimens, their packaging or shipping containers?
4. Use sampling equipment to collect aquatic species and transport it among sites?

If you or others at your facility engage in *any* of these activities, initiate preventive measures to make sure non-native aquatic species aren't introduced into the local water bodies. You don't need to follow these procedures if you are working with a species that originated locally.



## SOME EXAMPLES OF ACCIDENTAL INTRODUCTIONS

### ESCAPES

The Mediterranean has been invaded by the tropical green alga, *Caulerpa taxifolia*, which had been on display as part of an exhibit. It likely escaped through a flow-through holding tank system which allowed algal fragments to be discharged directly to the waterfront. *Caulerpa taxifolia* has since spread along the coasts of France, Italy and Spain.

### DISCARDED SPECIMENS

- The Atlantic red alga *Mastocarpus stellatus* is invading the coast of Germany. A visiting scientist introduced the alga in the 1970s, unaware of the possible effects of improper handling and release of the alga during his research.
- Another red alga, *Bonnemaisonia hamifera*, may have been introduced into Germany through improperly discarded scientific samples from Norway.
- In eastern Washington, the common goldfish has become a pest in freshwater lakes and ponds. Home and classroom pets are often released into the wild without consideration for the impacts on native species.

### PACKAGING

- *Sargassum muticum*, a brown seaweed, was introduced into the Pacific Northwest, most probably through improper disposal of packaging included with oyster spat from Japan. The seaweed has since invaded much of North America's west coast. An introduction into France has spread to the western Mediterranean and European Atlantic coasts.
- East Coast snails and crabs narrowly avoided introduction in Washington state when brown seaweed was used as packing material. A researcher found hundreds of littorina snails and a small green crab living among the seaweed, and killed all of the organisms prior to disposal.

## WHAT ARE EFFECTIVE PREVENTIVE MEASURES?

### PROPER HANDLING OF NON-NATIVE AQUATIC SPECIES

Handling may include holding the organisms on a dock, pier, beach or facility in bags, tanks or other containers, as well as washing target species and/or the containers in which they are shipped or held, or any sampling equipment used in collection.

Proper handling is essential if you work with non-native target species or if non-native organisms are possibly present in the packaging material. Proper handling includes:

- containing the specimen, its packaging, and the sampling equipment;
- containing any water used for washing or holding the specimens, their packaging or sampling equipment;
- containing any liquids used in the sampling process, and
- disinfecting packaging, sampling or collection equipment (see page 9).

### PROPER DISPOSAL OF NON-NATIVE SPECIES AND ALL OF THEIR PACKAGING

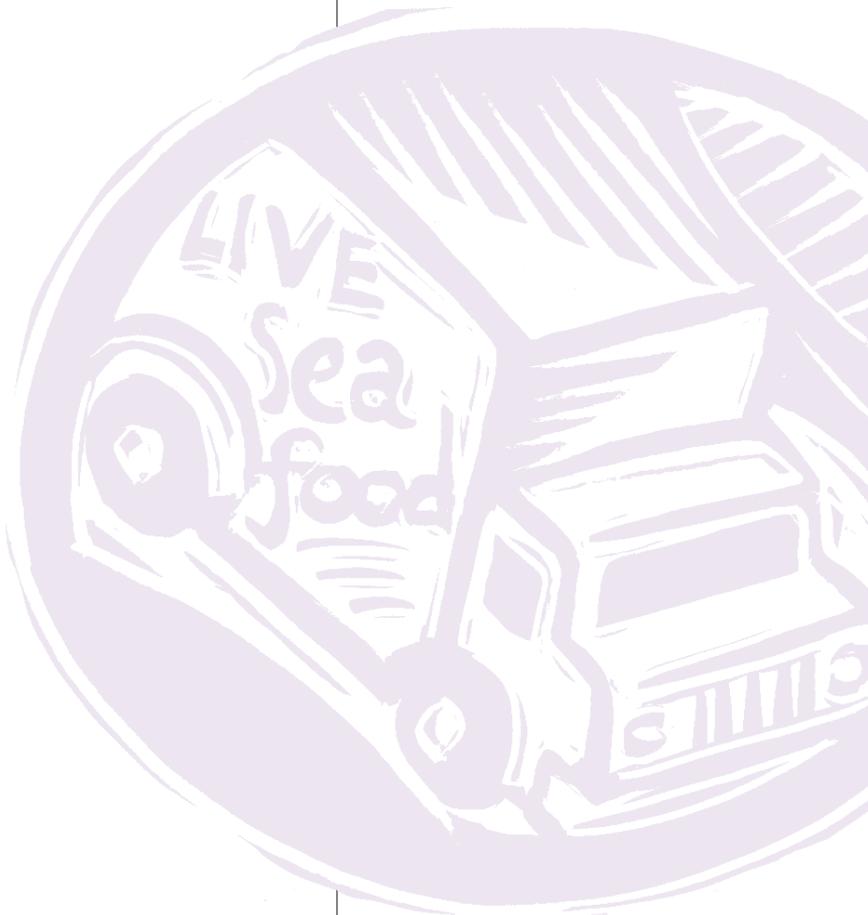
For the purpose of this booklet, “disposal” refers to the preparation of waste destined for a landfill or sewage treatment plant. Once you no longer need the packaging or target species, disinfect them (see page 9) to kill any non-native species before disposal.

#### GENERAL DISPOSAL PROTOCOLS:

- Keep any packaging or wastewater away from any freshwater or marine habitat of any kind, even if treated and disinfected to kill all possible organisms. A permit is required for any discharge into state waters.
- Dispose of non-native specimens by first euthanizing, and then placing them in a receptacle bound for a landfill or into the sanitary sewage system in accordance with local permits and regulations.
- Dispose of packaging (including sediments) or sampling equipment that may contain non-native species by first disinfecting, then dumping into a receptacle bound for a landfill.
- Dispose of water from the packaging or sampling process by disinfecting and dumping into a sanitary sewage system.

## OTHER WAYS YOU CAN HELP

- Inform your colleagues of proper handling and disposal protocols.
- Learn about other pathways for non-indigenous species introductions (see page 10).
- Inform others about the risks of non-native species and ways to prevent their introduction. Everyone can help prevent non-native aquatic species invasions and protect the Pacific Northwest environment.



**METHODS OF DISINFECTION:**

Even if live target specimens are not transported from the collection site, avoid transporting hitchhikers among sites by disinfecting potentially contaminated sampling and storage equipment (such as nets, traps, buckets, sieves, etc.). There are a number of methods for disinfecting. Choose the method effective for the target species and appropriate for the equipment or packaging materials.

<i>Target species or materials</i>	<i>Preferred methods of disinfecting</i>
invertebrates, fish or aquatic plants	ethanize in freezer, dispose according to rules of your facility
water	treat with bleach, ozonation, or sterilize with UV, dispose in sanitary sewer
sampling and storage equipment	sterilize with bleach or autoclaving, dispose according to rules of your facility
packaging	incinerate or sterilize with autoclaving, dispose according to rules of your facility
sediment	treat with bleach or incinerate, dispose according to rules of your facility

Further information: <http://www.anstaskforce.gov/reprot.htm#>

## OTHER PATHWAYS FOR NON-NATIVE AQUATIC SPECIES INTRODUCTIONS:

aquaculture  
public aquaria  
biological control  
boats and ships  
channels, canals and locks

live bait  
nursery industry  
fisheries enhancement  
restaurants, seafood retail and processing  
aquarium trade

**Private aquaria:** Releasing live aquarium plants and pets into marine waters, lakes or streams near you threatens their survival and can hurt native animals and the environment. Don't dump live pets or plants into the wild.

**Recreational boating:** Boats and floatplanes transport nuisance species in bait buckets or boatwells. Vessel hulls or boat anchors encrusted with organisms also transfer species. Whole aquatic plants or fragments get tangled on boat propellers and sportfishing gear. Clean off boats or fishing gear before entering a new water body.

**Fisheries enhancement:** In the past, government agencies imported game fish to enhance recreational fishing — sometimes resulting in the unplanned spread of certain species. Private citizens sometimes transport and release their favorite fish or shellfish species into a body of water. Never release a preferred species into a different water body.

**Live bait:** Both the bait species and its packing material can result in introductions through intentional or accidental release. Don't dump bait buckets overboard.

**Live seafood:** Packing materials for live seafood, such as seaweed and seawater, contain living organisms. If the unused product, packing materials and shipping containers are disposed of improperly, non-native species can be introduced. Dispose of live seafood and its packaging away from waterways.

**Ballast water:** Marine vessels that carry ballast water to maintain balance at sea take on and discharge millions of tons of ballast water daily in ports and harbors around the world. Ballast water can contain aquatic plants, animals and pathogens.



## USE THIS BOOKLET IF YOU:

- Receive samples of seaweeds or invertebrates from all over the world for study.
- Receive shipments of mussels to test for chemical or biological toxicity.
- Set up aquaria in classrooms for display or class projects.
- Use live or fresh specimens in your labs.

## FURTHER INFORMATION

To learn more, visit the National Sea Grant College Program's Nonindigenous Species Site (*SGNIS*): <http://www.ansc.purdue.edu/sgnis/>

Additional contacts:

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*Knowledge for Use in the Marine Environment*

