Response Protocols for Biofouled Debris and Invasive Species Generated by the 2011 Japan Tsunami

Outcome of the
Regional Preparedness and Response Workshop to Address Biofouling and Aquatic Invasive Species on Japan Tsunami Marine Debris

Portland State University
Portland, Oregon
July 31 – August 1, 2012

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Preface

On June 5, 2012, a 188 net ton (170.5 metric ton) floating dock, confirmed to have been lost from Misawa on Honshu Island during the 2011 Japanese Tōhoku, washed ashore on Agate Beach in Newport, Oregon. About 2.1 tons of marine organisms were removed and destroyed from the accessible surfaces of the dock. Scientists have confirmed that a number of the marine organisms attached to the dock were not native to the Northwest Pacific coasts of North America. Species identified from the dock included the Asian brown seaweed (*Undaria pinnatifida*—on Oregon's 100 Worst List of Invasive Species), the North Pacific seastar (*Asteria amurensis* – on the Global List of 100 Worst Invasive Species), and the Asian shore crab (*Hemigrapsus sanguineus*—a well-known aggressive invader on the East Coast of North America). On June 15, a 21-foot (6.4 meter) vessel from the Tōhoku tsunami event washed ashore at Cape Disappointment in Washington State. Local agencies promptly cleaned the vessel to remove potential aquatic invasive species (AIS).

These recent incidents have raised awareness of the potential introduction of non-native, and possible invasive species, to the West Coast of the United States, Hawaii, and Canada from Japan Tsunami Marine Debris (JTMD). Accordingly, a Regional Preparedness and Response Workshop to Address Biofouling and Aquatic Invasive Species on Japan Tsunami Marine Debris was held July 31 – Aug 1, 2012 at Portland State University, Portland, Oregon. Sponsors of the event included Portland State University, National Sea Grant, Oregon Sea Grant, Oregon State University, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and the National Oceanic & Atmospheric Administration (NOAA). The workshop addressed the need for entities along the West Coast, Hawaii and Canada to convene marine debris and invasive species experts, managers, and communicators to create a coherent framework for risk assessments, management, outreach and engagement, policy, and research related to the introduction of invasive species by JTMD.

The overarching goal of the workshop was to reduce the risk the introduction of AIS from the biofouling community associated with JTMD through a regional coordinated response. Objectives toward achieving this goal included: (1) clarification of agency jurisdiction roles and responsibilities; (2) enhanced communication and coordination (3) enlisting technical support for taxonomic identifications; and (4) identification of critically important research questions relevant to the risk of AIS transported by JTMD. Group discussions and interaction during the workshop were used to develop the following document. The Response Protocols for Biofouled Debris and Invasive Species Generated by the 2011 Japan Tsunami includes guidelines for the communication of risk (Level 1), a framework for incident reporting (Level 2), science-based protocols for risk assessment (Level 3), and management options to effectively and consistently respond to potential AIS associated with JTMD on shore and at sea (Level 4).

Information provided in this document is intended to serve as guidance for jurisdictions impacted by JTMD. The protocols are designed to be voluntary, adaptive, and to work within or be superseded by the construct of any potential federal and state and provincial mandates.

Introduction

On March 11, 2011 (JST), a magnitude 9.0 (Mw) earthquake struck off the coast of the Oshika Peninsula (Honshu, Japan), creating a devastating tsunami that reached heights of up to 133 feet (40.5 meters) and inundated 217 square miles (572 square kilometers). The tsunami sent millions of tons of Japan Tsunami Marine Debris (JTMD) into the ocean, originating both from terrestrial and coastal environments. **Terrestrial-origin debris (TOD)** may include lumber (from buildings and other sources), trees, insulated building materials, Styrofoam, plastic bottles, industrial fluid containers, appliances, clothing, toys, and many other items that originated on land and were washed into the sea by the tsunami. It is likely that these TOD items will be colonized at sea by marine organisms that occur naturally in the open ocean, such as several species of the pelagic goose barnacle (*Lepas* spp.) shown below[1]. These native and cosmopolitan species routinely utilize floating debris and should not be considered invasive.

Native pelagic goose barnacle (*Lepas*)

In contrast, of great concern is **marine-origin debris (MOD)** such as docks, piers, buoys, vessels, aquaculture floats, and other buoyant materials that were immersed in seawater at the time of the tsunami. There is a high likelihood that these MOD items may be **colonized by biofouling organisms.** Biofouling refers to the attached and associated free-living organisms found on marine structures. Those marine organisms associated with JTMD originating directly from Japanese harbors, ports, and estuaries are of particular concern. Some of these animals and plants may have the potential to become invasive species on the North American or Hawai'ian coasts.

Invasive species include organisms that have been moved far beyond their natural ranges and whose introduction can cause economic and/or environmental harm or threaten human health. Aquatic species can be transported between bioregions by various vectors including marine debris. Once introduced into a new environment, AIS may be dispersed further by natural currents and/or by human activities. AIS have been shown to cause local extinction of native species, spread parasites, alter community composition or food webs, change physical habitat structure, and alter energy or material flux through whole ecosystems. Once AIS become widespread and abundant they are extremely difficult, if not impossible, to eradicate. However, if they are detected soon after initial establishment, removal efforts can be successful. Successful management depends on early detection and rapid response to new invasions – or, in the present case, recognition of newly arrived propagules on floating or beached Japanese MOD.

Debris from the March 2011 Tōhoku tsunami started to come ashore on the Pacific coast of North America in early 2012. Much of the debris is classified as TOD and will likely be colonized by pelagic goose barnacles as it floats towards North America. In contrast, of great concern are the **docks, piers, buoys, vessels, and other marine-origin debris (MOD)** that are likely **colonized by living Asian species that are not native to North America or the Pacific Islands**.

Marine organisms attached to a dock from Japan washed up on Agate Beach near Newport, Oregon

[1] Photo courtesy of & ©Andrew Grygus Linking and non-commercial use permitted http://www.clovegarden.com/ingred/sf_bngoopz.html

In June 2012, for example, a large commercial fisheries dock (shown on the cover and at above[2]) - 66 feet (20.1 meters) long, 19 feet (5.8 meters) wide, and 7 feet (2.1 meters) tall, and weighing approximately 188 net tons (170.5 metric tons) – originating from the Port of Misawa, northern Honshu, Japan, washed ashore on Agate Beach, north of Newport, Oregon. The dock grounded on a sandy beach about 14.5 months after it was torn away from its moorings by the tsunami on March 11, 2011. Three identical docks were also set adrift by the tsunami surges. One dock was recovered in Japan, and two docks remain unaccounted for as of August 2012. A remarkable living assemblage of marine organisms were found on the dock including more than **90 Japanese species** of marine protists, algae, seaweeds, and invertebrates (i.e., sponges, hydroids, sea anemones, polychaete worms, snails, clams and mussels, chitons, barnacles, crabs, and other crustaceans, sea stars, sea urchins, sea cucumbers, sea squirts). In addition, several pelagic species became attached to the dock during its transoceanic crossing, including the goose barnacle *Lepas anatifera*. Samples of the biofouling community are still being analyzed as of August 2012. Updates of the full species list can be found at http://blogs.oregonstate.edu/floatingdock/. Remarkable is that several species of animals and plants on the dock are already known as **high-profile invasive species**, indicating the striking potential for JTMD to transport potentially serious AIS to North America. Examples are as follows:

Table 1: Examples of Aquatic Invasive Species Collected from the Misawa Dock that Washed Ashore on Agate Beach, Oregon

Species	**Invaded Regions** (*Examples Only*)
Tube worm, *Hydroides ezoensis*	Europe; Australia
Barnacle, *Megabalanus rosa*	Australia
Skeleton shrimp, *Caprella mutica*	Europe; east and west coasts of North America
Shore crab, *Hemigrapsus sanguineus*	Europe; east coast of North America
Sea star, *Asterias amurensis*	Australia
Kelp, *Undaria pinnatifida*	Europe; Australia and New Zealand; Argentina; California; Mexico

Transport of marine organisms across the North Pacific Ocean via JTMD is an ocean-scale and continent-scale environmental phenomenon potentially impacting Hawaii, Alaska, Washington, Oregon, and California, British Columbia and Mexico. The JTMD vector crosses multiple political boundaries and innumerable jurisdictions, at local, county, tribal, state, provincial, and federal levels.

This document is a product of the Regional Preparedness and Response Workshop to Address Biofouling and Aquatic Invasive Species on Japan Tsunami Marine Debris (Portland State University, Portland, Oregon; July 31 – August 1, 2012; Appendix F) and is intended to assist the development of an integrated regional protocol to enable rapid, effective monitoring and response to MOD biofouling organisms. The protocol provides guidance based on the best available information for the following:

- Level 1: A regional science-based approach for **Communication** with the public, media partner agencies, and organizations about potentially invasive species on JTMD.
- Level 2: A **Reporting** system that ensures information regarding JTMD is shared throughout the region and that incidents are responded to in a consistent manner.
- Level 3: A **Science Response and Risk Assessment** system is used for decision-making and to determine the appropriate level of response.
- Level 4: A **Management Response** structure that clarifies agency jurisdictional roles and responsibilities for JTMD that arrives on shore and at sea.

[2] Photo courtesy of Oregon Department of Fish and Wildlife

Level 1

COMMUNICATION

(Proactive Response)

Communication of accurate information regarding JTMD, the biofouling community, and potential AIS presents many challenges. The underlying challenge affecting communications is the uncertainty regarding the geographic scope, timing, and potential ecological, economic, or human health impacts related to this phenomenon. Specific challenges may include forecasting the JTMD distribution and impacted areas, explaining the potential risks of AIS, and recommending effective measures to prevent harmful species from becoming established.

The Communications Framework described in Level 1 is intended to facilitate the planning and development of a regional communication network to improve communication relevant to JTMD and the risk of AIS. The goal of such efforts is to minimize the risk of AIS introductions from JTMD with the support from multiple agencies that coordinate effectively and assistance by a knowledgeable public. Given the extended time-frame of JTMD arrival (projected by NOAA into 2014), it is recommended that the communication network adopt a long-term approach and be led by entities that have good working relationships with potentially impacted communities or stakeholders.

A list of key JTMD and AIS professionals is provided in Appendix A and represents a critical audience. For reports of suspicious (and potentially invasive) organisms or other relevant events associated with JTMD, it is recommended that all pertinent information be forwarded directly to the appropriate Federal, State, and tribal contacts on this list. These individuals have agreed to coordinate with other involved parties and respond in an appropriate and timely manner.

Identifying Critical Audiences

Direct messaging with the general public, internal communication among agencies, and consultation with other organizations may be needed to effectively reduce the risk of AIS introductions from JTMD. It is advisable that communication strategies for the general public focus on rapid dissemination of information and messages to target audiences before and during a JTMD incident and/or sighting. Such efforts may enable and empower the public to adopt behaviors that will minimize the risk and spread of AIS. Strong internal communication is recommended to create a timely exchange of information among stakeholders, including scientists, managers, JTMD responders, decision makers, and NGOs. Internal communications may need to consider interstate personnel, especially when JTMD incidents occur near state or international borders. These measures will aid in maintaining a coordinated response and keeping decision-makers informed of the situation, enabling them to make informed choices on possible next steps and policy changes.

Many people and groups may come into direct contact with JTMD in near-shore waters and along coastal shorelines. These individuals may inadvertently become secondary vectors, spreading potential AIS associated with JTMD into new habitats. Additional (human-mediated) vectors may include:

- Intentional movement of biofouled JTMD or organisms;
- Dislodgement (by scraping, washing, or other means) of organisms off JTMD;
- Destruction of debris leading to creation of biofouled fragments; and/or
- Accidental movement by footwear, disposal or sampling equipment, or other means.

It may be necessary to convey the risk of additional actions or behaviors that may contribute to the spread of potential AIS introduced by JTMD. Communication may also need to be targeted to maximize the efficacy and reduce the risk of AIS spread. Two broad categories of audiences to consider are:

- Individuals who may indirectly spread AIS associated with JTMD into new habitats.
  Examples: Beach-goers, boaters, park managers, scientists; and
- Individuals who may influence the actions of those who come into contact with JTMD.
  Examples: Media, volunteer coordinators, natural resource managers.

Considerations for Successful Risk Communication

Understanding the beliefs and concerns of target audiences is critically important as some audiences may not be as aware of the potential invasive species risks associated with JTMD or perceive other JTMD issues to be more serious. Examples of other JTMD issues causing significant concerns include pollution, personal safety, and hazards to navigation. Human remains and radiation are other concerns, but are very unlikely to occur. Therefore, it may be beneficial to integrate messages regarding the risk of AIS with other significant JTMD concerns to heighten awareness and ensure consistent messages are received.

In addition, the issue of AIS risk associated with JTMD involves multiple disciplines and consideration may be needed to address common jargon used in JTMD communications. For example, “biofouling” and “invasive” are potentially confusing terms. Language that avoids obscurity, inflated vocabulary, and matches the reading skill of the audience is strongly advised.

Further, the time of communications release may need to be considered. For example, the risk of JTMD washing up on shore may be increased during winter storms; accordingly, messages to convey reporting or disposal recommendations may be most effective if released just prior to these events.

Evaluation of Communication Tools

The understanding of JTMD, perception of JTMD risks, and value of communications will continue to increase through management responses and scientific research. As our knowledge of this phenomenon expands, additional vectors of non-native species associated with JTMD may be identified and audience beliefs and values may change. It is recommended that all communication strategies associated with JTMD be adaptable to accommodate for such changes.

In addition, channels of communications are rapidly evolving. While conventional methods such as posters and websites are highly effective, other means of communications should be explored. Examples include social media outlets, online videos, and smartphone applications.

Key Messages

Effective communication will result from a rigorous understanding of integration between JTMD, AIS, and communication science. The following are key components for messaging identified at the Workshop to address biofouling on JTMD. These messages may assist in developing a vital element from which AIS, JTMD, and communications professionals can work together to further advance effective communications strategies.

Safety

- Be safe: Use common sense. If the debris is large or potentially hazardous, do not touch or attempt to move the item.
- It is highly unlikely that any JTMD is radioactive or will contain human remains (no evidence of either as of August 2012, 17 months after the tsunami).

Risk of Aquatic Invasive species:

- JTMD may introduce AIS to the West Coast of North America and Hawaiian Islands.
- AIS pose a serious threat to native species and the environment by competing with our native fish and wildlife for food and habitat. While not all non-native species are destructive, most often, they exist at the expense of native species and can impact the nation's economy.
- Individuals who come into contact with JTMD have the potential to spread potential invasive, species into new habitats, intentionally or unintentionally.

Disposal

- Remove the debris from the water. If safe and practical, properly dispose of the item, recycling as much as possible.
- For biofouled debris, remove the item and attached organisms from the water and place on dry land above the high tide level.
- Never move debris with attached organisms to other bodies of water or tow into harbors.
- Stripping the beach of its natural driftwood depletes needed coastal habitat; do not dispose of untreated wood, plant materials, or shells as these are an important part of beach ecosystems. If potentially invasive organisms are attached to these materials, contact the appropriate authorities.

Marine Debris

- Marine debris has been an ongoing issue for decades and is a significant threat to marine wildlife, ocean habitat, mariners, and coastal communities.
- Most marine debris that washes ashore is not from the Japanese tsunami (but between 2012 and 2015, there may be localized beach landfalls of JTMD).

Existing Resources

Identification of existing JTMD and AIS communications resources is strongly recommended to facilitate the development of a regional communication network. This information may be useful to integrate AIS concerns into existing JTMD response and management plans. It is advised for each state and province impacted by JTMD to develop an inventory of all likely public communication partners, stakeholders, and focal points. This effort may be augmented by identifying possible communication gaps at the state, province, and regional levels and making recommendations for future development of outreach materials and a coordinated communication network[3].

Many states in the western region have begun to develop JTMD response plans and outreach materials. Examples of such efforts are listed in the Tables 2 - 4.

[3] A recommendation for next steps from the Regional Preparedness and Response Workshop to Address Biofouling and Aquatic Invasive Species was to develop consistent messaging to be inserted into JTMD outreach materials. Once available, this language will be inserted into the appendix of this document.

Table 2: State JTMD Response and Management Plans

State	Coordinating Agency	JTMD Response and Management Plans
Alaska	*TBA*	
California	California Emergency Management Agency (Cal EMA)	Japan Tsunami Marine Debris Concept of Operations (*In Process*)
Hawaii	HI Department of Land and Natural Resources	*Draft Plan Under Development*
Oregon	Oregon Parks and Recreation, Department of Environmental Quality	Tsunami Debris Response Plan
Washington	Washington Military Department Emergency Management Division	*Draft Plan in Review*
British Columbia	BC Ministry of Environment and Environment Canada	BC Tsunami Debris Management Plan – Phase 1 (http://www.env.gov.bc.ca/epd/tsunami-debris/pdf/BCTsunamiDebrisManagementPlan-Phase1_August2012.pdf) *Phase 2 in progress* (Framework:http://www.env.gov.bc.ca/epd/tsunami-debris/pdf/BCTsunamiDebrisManagementPlan-Phase2_Sept2012.pdf)

Table 3: State and Regional Aquatic Invasive Species Response Plans

State / Region	Author	Aquatic Invasive Species Rapid Response Plans
Alaska	*TBA*	
California	California Natural Resource Agency	California Aquatic Invasive Management Plan
Hawaii	Hawaii Department of Land and Natural Resources and NOAA	AIS response plans for both North West Hawaiian Islands and Main Hawaiian Islands (*Draft*)
Oregon	Oregon Invasive Species Council	Oregon Invasive Species Council Action Plan 2012-2016
Washington	Washington State Aquatic Nuisance Species Committee	Early Detection and Rapid Response Plan for Aquatic Invasive Species in Washington State (Draft)
Maryland *	Mid-Atlantic Panel on Aquatic Invasive Species	Rapid Response Planning for Aquatic Invasive Species: A Maryland Example
Great Lakes *	Great Lakes Commission	Model Rapid Response Plan for Great Lakes Aquatic Invasions
Gulf of Mexico *	Gulf of Mexico Regional Panel of Aquatic Nuisance Species	Rapid Response Plan for the Gulf of Mexico Region
Western	Western Regional Aquatic Nuisance Species Panel	Western Regional Panel Model Rapid Response Plan for Aquatic Nuisance Species

* Although this state or region will not be impacted by JTMD, the plan may provide valuable information in developing an effective response to the risk of JTMD - AIS.

Table 4: Existing State, Federal, and Tribal Outreach Materials

State	Agency / Organization	Outreach Material
Alaska	Alaska Department of Fish and Game, Alaska Sea Grant, NOAA National Marine Fisheries Service, and Smithsonian Environmental Research Center	Standard Protocol for Collection and Preservation of Non-native Species from Marine Debris
California	California Department of Fish and Game	*TBD - In process*
Hawaii	HI Department of Land and Natural Resources	*Under development*
Oregon	Oregon Parks and Recreation	Oregon Parks and Recreation Wallet Card
Oregon	Oregon Parks and Recreation	Oregon Department of Fish and Wildlife JTMD Factsheet
Oregon	Oregon Parks and Recreation	Beach Debris Frequently Asked Questions (http://www.oregon.gov/OPRD/PARKS/tsunami_debris.shtml)
Washington	Washington Department of Ecology	Tsunami Debris on Washington Beaches (http://www.ecy.wa.gov/news/2012/itn01_debris.html)
Washington	Washington Department of Fish and Wildlife	Tsunami Debris (http://www.wdfw.wa.gov/tsunami/)
British Columbia	Numerous	Tsunami Debris website – includes Information on what to do if you find debris linked to the tsunami (http://www.env.gov.bc.ca/epd/tsunami-debris/index.htm)
Tribal	Northwest Indian Fisheries Commission	Coastal tribes and communities preparing for arrival of tsunami debris (http://nwifc.org/2012/03/coastal-tribes-and-communities-preparing-for-arrival-of-tsunami-debris/)
Federal	Numerous	Japan Tsunami Marine Debris Joint Information Center (http://disasterdebris.wordpress.com)
	Aquatic Nuisance Species Task Force	Japanese Tsunami Debris: The Threat of Invasive Species (http://www.anstaskforce.gov/Tsunami.html)
	Environmental Protection Agency	Japan Tsunami Debris Information (http://www.epa.gov/region9/marine-debris/bulletin/may2012.html)
	NOAA	Japan Tsunami Marine Debris (http://marinedebris.noaa.gov/tsunamidebris)

Level 2

REPORTING

Experts predict that a portion of JTMD will reach U.S. and Canadian shores over the next several years. As JTMD arrives, it is critical that reports of biofouled debris bearing potential invasive species are shared among the region and responded to in a consistent manner. Level 2 (Reporting) of this document provides recommendations and best practices for:

- Instructions for the public to report biofouled JTMD;
- Taxonomic expertise related to the identification of organisms arriving on JTMD; and
- Informing state point of contacts to ensure potentially invasive species are responded to in a timely, consistent manner.

The following box contains information regarding biofouled marine debris that has washed ashore. This information is intended to be included in relevant Federal, State/Provincial, regional, and tribal outreach materials (webpages, brochures, posters, etc.) as well as technical memos distributed to existing monitoring and citizen science programs.

WHAT YOU SHOULD DO IF YOU FIND MARINE DEBRIS WASHED ASHORE

Your help is needed to spread the word about the best practice guidelines for safely handling marine debris. It is especially important to report hazardous substances, vessels or other large debris, and items contaminated with non-native - potentially invasive - organisms.

Suspicious or potentially invasive organisms attached to debris:

Take clear photographs. If possible, include photos displaying the entire piece of debris, close-up photos of the attached organisms, and any identifying marks (e.g., writing) on the debris

Contact {Insert Appropriate Contact Information} or submit a report and photos to **[Insert Appropriate Website and/or email Information]**

Remove the item from the water and place on dry land (well above the high tide line) so that any organisms living on it will die and not be returned to the ocean during high tide or storm events. In your report, note the current location of the item as authorities may need to retrieve specimens.

Potential hazardous materials (HAZMAT): *Examples: Oil or chemical drums, gas cans, propane tanks*
If you find debris that may pose a life-threatening risk, **call 911** immediately. Do not touch or move the item.

Litter and other typical marine debris items: *Examples: Plastic bottles, aluminum cans, buoys, Styrofoam*
If safe and practical, we encourage you to remove the debris and recycle as much of it as possible.

Derelict vessel or other large debris item: *Examples: Adrift fishing boat, shipping containers, docks*
Do not attempt to move or remove item. Contact your local authorities **[Insert Contact Information]**

If the debris item is a **hazard to navigation**, immediately notify the US Coast Guard Pacific Area Command at **510-437-3701** or radio your nearest U.S. Coast Guard Sector Command Center via **VHF-FM Ch. 16** or **2182 MHz**.

For Canada, contact **Transport Canada at 604-775-8867** or by email to **pacnwp-penpac@tc.gc.ca**.

Personal effects or possessions from the Japanese tsunami:
Items that appear to be personal belongings should be reported to **DisasterDebris@noaa.gov** with as much detail as possible. The NOAA Marine Debris Program will work with local Japanese consulates to determine if they can help identify the owner.

For other marine debris concerns: Contact **DisasterDebris@noaa.gov**

Biofouled debris *still afloat on the sea surface* may be encountered by fishermen, recreational boaters, commercial or research vessels, and others. The following information is recommended to be included in relevant outreach materials and technical memos targeted at these audiences.

WHAT YOU SHOULD DO IF YOU ENCOUNTER MARINE DEBRIS AT SEA

Your help is needed to report debris at sea, before it reaches land.
It is especially important to report hazardous substances, vessels, docks, or other large debris, and items contaminated with suspicious - potentially invasive – organisms.

AT-SEA DEBRIS REPORT
Key Information to be sent to:
[Insert Appropriate Contact Information]

Who:	Your name and contact information (cell number, email)
What:	Nature of debris; amount; extent of debris field; photographs
Where:	GPS & location (direction and distance from nearest point of land)
When:	Date and time

Litter and small debris that can be taken aboard: *Examples: Plastic bottles, aluminum cans, Styrofoam*
If safe and deck space permits, retrieve the debris. Dispose of the debris on land, recycling as much of it as possible.

Extensive Debris Fields *Examples: Hundreds of objects in an area less than ¼ mile*
If you encounter large, dense debris fields at sea in a relatively small area please submit information indicated in the **AT-SEA DEBRIS REPORT box (above) to the contact provided**

Potential hazardous materials (HAZMAT): *Examples: Oil or chemical drums, gas cans, propane tanks*
If you find debris that may pose a life-threatening risk, **call 911** immediately. Do not touch or move the item.

Derelict vessel or other large debris item: *Examples: Adrift fishing boat, shipping containers, docks*
Do not attempt to touch or move the item. Contact your local authorities **[Insert Contact Information]**

If the debris item is a **hazard to navigation**, immediately notify the US Coast Guard Pacific Area Command at **510-437-3701** or radio your nearest U.S. Coast Guard Sector Command Center via **VHF-FM Ch. 16** or **2182 MHz**.

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Suspicious or potentially invasive organisms attached to debris:
If safe, we encourage you to **retrieve** the debris. Please send the information indicated in the **AT–SEA DEBRIS REPORT** box (above) to the appropriate contact and indicate ***when and where you will be landing.***

- **If you are NOT further notified**, please dispose of the debris on land so that it cannot be returned to the water. Take care to not dislodge organisms attached on the debris.
- **If you are contacted**, you may be notified with specific disposal or drop-off instructions. Alternatively, someone may meet you at the dock when you arrive for debris examination and possible retrieval.

Do not attempt to move or tow large debris items. Large debris may be heavily contaminated with animals or plant material. Movement may increase the risk of dislodging and transporting potentially invasive species.

To evaluate this risk, send the information indicated in the **AT-SEA DEBRIS REPORT** (above) to the contact provided ***after*** notifying the U.S. Coast Guard Pacific Area Command (510-437-3701) or Transport Canada (**604-775-8867**).

For other marine debris concerns: Contact **DisasterDebris@noaa.gov**

State Reporting Numbers

It is recommended that each state and province that may be impacted by JTMD establish a "coastal disaster" telephone number for directing all marine incidents to the appropriate authorities. It is important that these numbers are communicated to the general public as well as other states and organizations that may receive JTMD reports. Some West Coast states have already established toll-free phone lines for reporting all categories of marine debris, including potentially hazardous debris, as shown in the table below.

Table 5: State and Province Marine Incident Hotlines

State / Province	Reporting Number
Alaska	1-877-INVASIV
California	*TBA*
Hawaii	*TBA*
Oregon	211
Washington	1-855-WACOAST
British Columbia	*TBA*

State Reporting Websites and Email Addresses

For reports regarding potential invasive species associated with JTMD it is recommended to develop a website or email address where the incident can be documented. This reporting system should request the following information:

- Date and time of detection.
- Location where the item was found.
- Contact information of person reporting (e.g., name, phone number, address, email address).
- Action taken (e.g., current location of the item, moved or not).
- General description of the item (including approximate size, material).
- General description of any organisms attached (size, color, alive or dead).
- Photos taken, to include entire view of the object, close-up photos of the organisms, and any identifying marks (e.g., Japanese markings).

Some states and provinces have already established a reporting system to capture details of potentially AIS associated with biofouled JTMD, as shown in Table 6.

Table 6: State and Province Electronic Reporting Methods

State / Province	Reporting Number
Alaska	Email: dfg.dsf.InvasiveSpecies@alaska.gov Website: *TBA*
California	Email: invasives@dfg.ca.gov Website: *TBA*
Hawaii	Email: *TBA* Website: *TBA*
Oregon	Email: beach.debris@state.or.us Website: *TBA*
Washington	Email: *TBA* Website: *http://www.wdfw.wa.gov/ais/reporting/*
British Columbia, Canada	Email: *TBA* Website: *TBA*

It is advised that the group or individual taking the report or retrieving information from an electronic reporting system also include their contact information. This is necessary to create a timeline of the response chain. Further, it is recommended that all reports of biofouled marine debris, even if action is not pursued, be archived into a regional database to provide a record of such encounters. The archived information may include the original report and photos, the person(s) to whom the report was forwarded, the reply to the sender, decision of whether further action was necessary, and a description of any response measures taken.

Taxonomic Expertise

To assist with the assessment of biofouled JTMD reports, the Japan Tsunami Marine Debris Taxonomic Assessment Team (J-TAT) has been assembled. J-TAT consists of experts who are specifically familiar with the marine animals and plants of the North Pacific Ocean and have indicated a willingness to examine photographs within a rapid response time framework. When a report of biofouled debris is received with pictures of marine organisms that appear to be something other than, or in addition to, pelagic goose barnacles (*Lepas* spp.), it is recommended that the photo(s) be sent immediately to J-TAT using the documentation provided in Appendix B. Once the photo(s) are analyzed, J-TAT scientists will respond to the designated J-TAT lead. The J-TAT lead will forward all significant responses to the State lead and other appropriate Federal, State, and tribal authorities.

Table 7: Japan Tsunami Marine Debris Taxonomic Assessment Team members

Japan Tsunami Marine Debris Taxonomic Assessment Team (J-TAT)		
Name	**Affiliation**	**Email**
James T. Carlton (J-TAT lead contact)	**Williams College**	**james.t.carlton@williams.edu**
Chris Brown	California State Lands Commission	Chris.Brown@slc.ca.gov
Don Cadien	County of Los Angeles	dcadien@lacsd.org
John W. Chapman	Oregon State University	john.chapman@oregonstate.edu
Eugene V. Coan	California Academy of Sciences	genecoan@gmail.com
Douglas Eernisse	California State University, Fullerton	deernisse@Exchange.fullerton.edu
Richard Emlet	Oregon Institute of Marine Biology	remlet@uoregon.edu
Daphne G. Fautin	University of Kansas	fautin@ku.edu
Jonathan Geller	Moss Landing Marine Laboratories	geller@mlml.calstate.edu
Scott Godwin	Papahanaumokuakea Marine National Monument	scott.godwin@noaa.gov
Michael Hadfield	University of Hawaii	hadfield@hawaii.edu
Gayle Hansen	Oregon State University	Hansen.Gayle@epamail.epa.gov
Leslie Harris	Natural History Museum, Los Angeles County	exogone@hotmail.com
Gordon Hendler	Natural History Museum, Los Angeles County	hendler@nhm.org
Gretchen Lambert	University of Washington	gretchen.lambert00@gmail.com
Jody Martin	Natural History Museum, Los Angeles County	jmartin.nhm@gmail.com
Linda McCann	Smithsonian Institution	mccannl@si.edu
Richard Mooi	California Academy of Sciences	RMooi@calacademy.org
John Pearse	University of California, Santa Cruz	pearsester@gmail.com
Vicki Pearse	University of California, Santa Cruz	pearsester@gmail.com
Bruno Pernet	California State University, Long Beach	bruno.pernet@csulb.edu

JTMD Report Assessment

If J-TAT confirms that the species reported are *not* harmful or potentially invasive a **No Action Required (NAR)** response is suggested. In this circumstance, the information path may end with a reply to those who provided initial report that conveys appreciation for their involvement and instructions for disposal of the debris.

If J-TAT confirms that the species reported is a suspicious (and potentially invasive) organism an **Action Required (AR)** response may be initiated, routing the information to Level 3 (Science Response and Risk Assessment) described in Level 3.

Level 3

SCIENCE RESPONSE AND RISK ASSESSMENT

If J-TAT confirms that the species reported is suspicious (and potentially invasive), it is recommended that all relevant information be forwarded to the State lead as well as the appropriate Federal, State, and tribal contacts listed in Appendix A. These individuals have agreed to coordinate with other involved parties and respond to the report in an appropriate and timely manner.

Decision Support and Assessment

Decision support and assessment is critical to determine if the reported JTMD merits further response. A decision support system provides a conceptual framework for how to address potential invasions and a means for disparate parties to proceed based on consensus of those parties. It is advisable for the decision support system to contain a set of threshold criteria that drive decisions for response to ensure consistency at the regional level. This will ensure JTMD of the same type (e.g., size, level of fouling, species composition) will be managed in the same way in different situations (e.g., dates, locations). For example, a similar action will occur based on the predetermined degree of economic or ecological loss that is reliably predicted (e.g., arrival of a large JTMD item or extensive debris field) or if biofouled debris is found in a protected or high quality habitat. If the threshold is exceeded, it is recommended that a decision support system be utilized to evaluate the risks and benefits of implementing any response.

The decision support system may take scientific assessment into account in addition to consideration for social, economic, and political factors that emerge during the event. Factors that may need to be examined carefully include the response period, predicted effectiveness, public health and safety issues, environmental soundness, and cost effectiveness. The geographical constraints posed by the location of the debris also may need to be taken into consideration. As the decision making process can be complex and require analysis of several factors in a short period of time, a common database may be needed to maintain all data collected, including success or failure of any management intervention.

Scientific Assessment Panel

Scientific Assessment is a sub-process underlying the decision support system for determining if a response is warranted and technically feasible based on the characteristics of the potential invaders and the nature of the debris (e.g., size, amount, location). If the organisms of concern are attached to a large JTMD object, or represent biofouling on a substantial debris field, the ability of a few authorities to respond in a timely manner may be vastly exceeded. For these situations, it is recommended to convene a ***pre-established*** Scientific Assessment Panel (SAP) to evaluate the seriousness of the threat (level of risk) and provide recommendations for potential management actions. The SAP may consist of members from academia, Federal, State, and tribal agencies, and local stakeholders. More complex issues may also require sub-panels to evaluate jurisdiction and policy, management logistics, sample collection and analysis and other significant concerns.

The box below contains a series of questions (adapted from the Western Regional Panel Model Rapid Response Plan for Aquatic Nuisance Species[4]) that may be useful for determining the appropriate level of response. It is acknowledged that the original intent of these questions was to determine the response necessary for a newly established population of a known invasive species; however, these questions may also be applicable to decision support systems for JTMD incidents.

SUGGESTED QUESTIONS TO BE INCORPORATED INTO A DECISION SUPPORT SYSTEM:

A. Is the risk of re-introduction low enough to justify eradication?

1. Is the JTMD unique or does it represent the potential for continued delivery?

B. Can controls be initiated rapidly?

1. Was there early detection?
2. Was there accurate and rapid identification?
3. Is there information on species biology and management?
4. Are treatment methods available?
5. Will environmental issues or regulatory hurdles delay action or increase cost?
6. If permits needed, are they available quickly?

C. Is there a will to act?

1. Do decision-making authorities have power to determine whether a response should proceed, how, and who should fund?
2. Are technical, field, administrative, funding and legal resources available for a response effort?
3. Is there acceptance of the need to proceed on best information available?
4. Is there acceptance of short term local impacts as trade-off for long term wide area benefits?
5. Is there acceptance that a "do nothing" response has serious impacts and is a poor option?
6. Do most agencies and their staff feel they have a clear responsibility to act, or that one agency has a clear mandate and authority to act?
7. Is there acceptance that the response effort may be long-term?

D. Is organization adequate?

1. Is there the ability to quarantine or control the infested area?
2. Is there capacity to determine whether the species of concern is restricted to the controlled area?
3. Is funding adequate and for a sufficient duration?
4. Is there effective collaboration between parties?
5. Is there good regional collaboration if the species cross jurisdictions?
6. Are there provisions to support decisions to modify, expand or end the response effort?

E. Other

1. Is there support by affected parties, including the public?
2. Is there effective education for the public, and government decision makers?
3. Have public safety concerns been considered?

[4] Western Regional Aquatic Nuisance Species Panel. 2003. Model rapid response plan for aquatic nuisance species. Prepared for the Western Regional Panel on Aquatic Nuisance Species by California Department of Food and Agriculture.

Field Scientific Analysis and Assessment

Dependent upon resources, time, timing, location, and availability, ***scientists may be deployed to a site for sample collection and analysis***. This recommendation may be part of, or in addition to, the decision support system process. Sample collection and analysis may be critical at this stage for the following three reasons:

(1) **Correct identification** of potentially invading species is fundamental to providing the data needed to proceed with **risk management and assessment.**

(2) **Genetic ground-truthing** of actual arriving populations of species from Japan will be critical to determining if any newly established invasive species on the Pacific coast of North America or Hawaii are linked directly to the JTMD.

(3) **Unique research opportunities** may result from the massive flotilla of JTMD arriving in the Central and Eastern Pacific Ocean with non-native species. These opportunities could lead to **significant advances in our ability to predict** what processes mediate successful invasions and what types of species may be successful future invaders.

All of these scientific opportunities require a well-linked and coordinated response of science and management efforts, to be balanced with potential rapid response efforts. In some situations, the sender of a report may already have collected samples or be contacted by the State lead to collect samples. For these circumstances, the following Specimen Collection Protocol is recommended.

SPECIMEN COLLECTION PROTOCOL

1. **Temporary live collection to transport to authorities:** Place the organism in a small plastic bag with a label and place in a cooler of ice. For short-term storage, organisms can be placed in the refrigerator for up to 24 hours and in the freezer for longer periods of time. Frozen specimens can be transferred in a cooler of ice if the drop-off time is <1 hour. (If transfer time is greater than this, or the specimens are to be mailed, see **Preservation**, below).

2. **Preservation:** Place **animals** in well-sealed plastic jars in 70-95% ethanol (or gin or vodka if ethanol is not available). Place **seaweeds** in between two damp paper towels and place in a plastic bag.

3. **Labels (please see below):** It is critical to place a label *inside* the container and affix a label on the outside as well. Details are provided below for **external** and **internal** label procedures.

   - ✓ A clear **EXTERNAL** label should be placed on the outside of any collecting container. The label should be written in pencil or permanent marker and include your contact information, date collected, name of collector (if different), preservative used, and exact location of collection (GPS coordinates, if known).
   - ✓ A clear **INTERNAL** label is critically important as external labels can fall off, and it is difficult to determine what specimens are and where they came from after the fact. This label should be written in pencil on paper (preferably waterproof paper, if available) and include your contact information, date collected, name of collector (if different), preservative used, and exact location of collection (including GPS coordinates if known).

4. **Mailing:** Mail the specimen to **[insert receiving location].** Be sure to follow your mailer's rules and guidelines for transporting chemicals (some carriers will not mail items in standing alcohol, in which case animals should be wrapped in amongst paper towels damp with alcohol). Notify the intended recipient that you have mailed the specimen.

Scientific Assessment Recommendations

Based upon the information received, the designated authorities or the SAP may make the following recommendations for action going forward:

Return to a No Action Required (NAR) in which case the information path may end with a reply to those who provided initial report that conveys appreciation for their involvement and instructions for disposal of the debris. It is advisable for this information to be logged into a database with links to the initial report.

OR

Continue with an Action Required (AR) condition in which case authorities charged with debris disposal and invasive species containment are advised to proceed to Level 4 (Management Response), described below. It should be noted that only Level 4 authorities may be able to determine the extent to which actions can be undertaken based upon local resources available, size of debris, amount (volume or number) of debris, site accessibility, level of risk, and so forth.

Level 4

MANAGEMENT RESPONSE

If the continuation of an Action Required (AR) response is recommended, Level 4 (Management Response) is designed to implement the actions necessary to effectively minimize the risk of potential AIS associated with JTMD. Response strategies, discussed below, may include a spectrum of eradication, containment, control, and/or impact mitigation measures. Management options selected for implementation should be determined by the specific location and size of the debris as well as the life history characteristics of the biofouling organisms, if known.

Clearly defined responsibility and action paths are critical to a timely response to biofouled JTMD. It is advisable that an organizational structure be established for each state and province, as well as regionally. This structure will aid in ensuring the exchange of necessary information between appropriate agencies and stakeholders as well as to identify and establish the appropriate roles and leadership needed to initiate an effective response. To support organizational efforts, it is critical that the organizational structure of this plan identify state and regional leads empowered to act. The agency responsible for implementing laws that support the goals of the response may be the appropriate entity to lead the rapid response team. A Memorandum of Understanding (MOU) also may be needed to overcome multijurisdictional challenges regarding communication and organizational responsibilities.

It is advisable that any organizational structure established to respond to JTMD include an outreach component for all activities associated with the response. This will help to avoid duplication, conflicting messages, and jurisdictional disputes. To maximize effectiveness of the response it is important to identify those who generate and receive information, how information is exchanged, and the level of urgency for information transfer. Of critical importance is the need for effective and transparent communication to be integrated throughout all activities during the response effort. It is recommended that an entity be designated to:

- Raise awareness and understanding on why a response is necessary (including clarification of benefits vs. risks).
- Ensure accurate flow of information between responders and stakeholders impacted by the event.
- Apprise local, state, and federal agencies and stakeholders of the progress and results of specific activities.
- Deliver timely and consistent messages to the media and general public.

The flow of activity for responding to biofouled JTMD, as recommended in this document, is illustrated in Figure 1. Additional guidance pertaining to the management response and available control measures are suggested in the sections below.

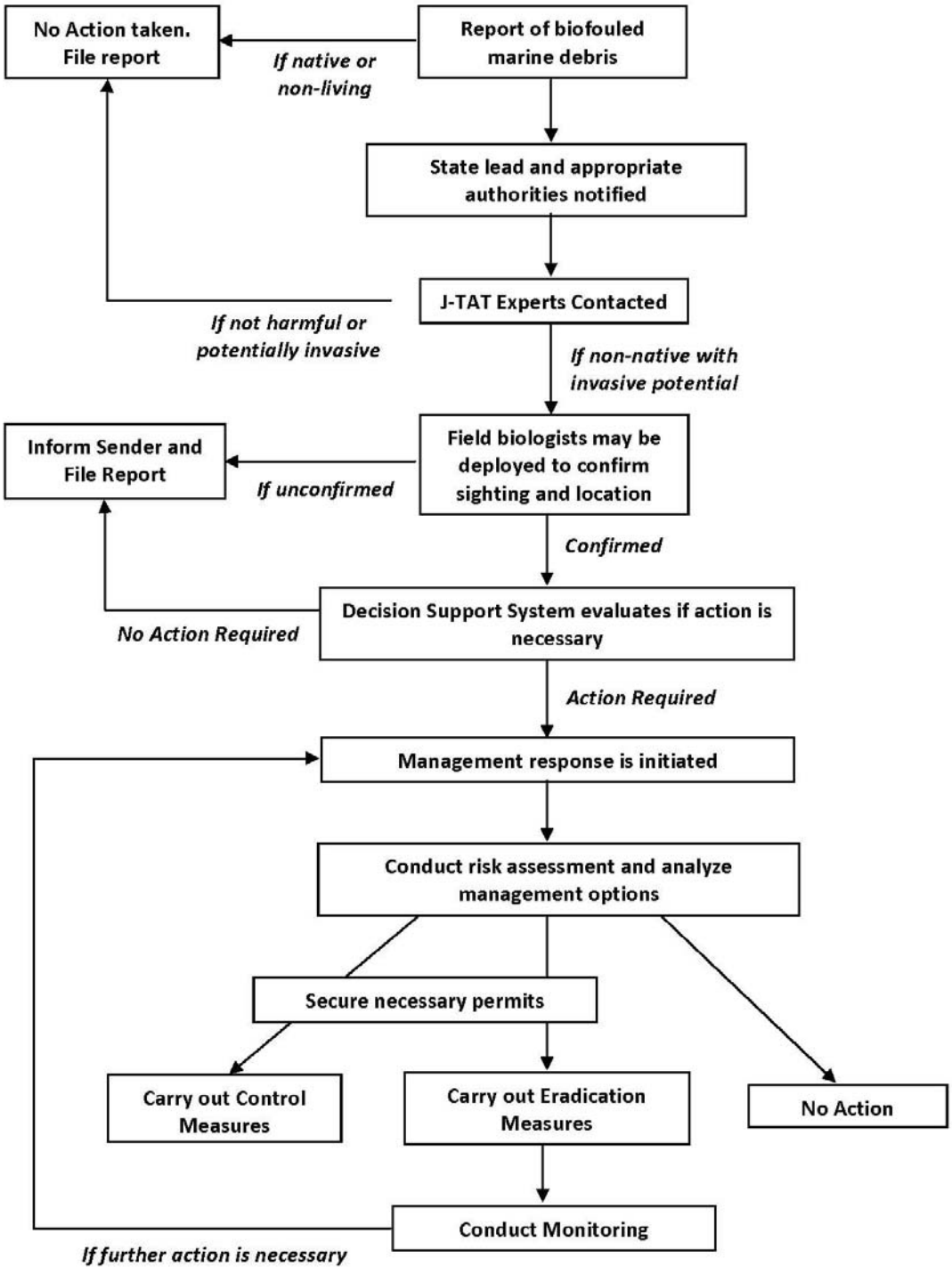

Figure 1: Recommended Response to Biofouled JTMD Incidents

Incident Command System

Incident Command System (ICS) has earned a reputation as an "all risk, all hazard" response tool. Originally developed by the U.S. Forest Service, and now recommended by the Aquatic Nuisance Species Task Force, agencies such as the National Oceanic and Atmospheric Administration (NOAA), United States Coast Guard (USGC), Environmental Protection Agency (EPA), and the Department of Homeland Security (DHS) use ICS to improve response to incidents from natural disasters to oil spills. The system is also employed currently in the Oregon Parks and Recreation Department's Tsunami Debris Response Plan.[5] In addition, Oregon, Washington, and British Columbia are signatories to the Columbia River Basin Interagency Invasive Species Response Plan[6] which also uses ICS as a foundation for response efforts. The continued use of ICS is recommended to respond to the risk of invasive species associated with JTMD.

Maryland Sea Grant has completed a Rapid Response Plan for Aquatic Invasive Species[7] that was requested and funded by the National Sea Grant Office from all Regional Panels of the congressionally-supported Aquatic Nuisance Species Task Force. The Plan uses ICS as its foundation, providing guidelines for responding to an AIS incident quickly and effectively. Additionally, this plan serves as a tool for states to use in developing their own Rapid Response Plans. A template version (Appendix D) allows agencies to tailor the plan and is recommended to employ the ICS structure to address JTMD needs.

Marine Debris Legislation and Policy

Federal legislation and policies have been developed and implemented to mitigate the impacts of marine debris, prevent its introduction, and reduce the amount of debris that is already in the marine environment. Efforts to regulate marine debris are also addressed with U.S. territories and commonwealths and at the state, local, and tribal level. The following table was adopted from the Interagency Report on Marine Debris Sources, Impacts, Strategies, and Recommendations[8] to identify existing federal authorities that explicitly state marine debris in the authority, address sources and items that may become marine debris, or address entities that may be impacted by marine debris (Table 8). Please refer directly to the report for a detailed description of authorities as related to marine debris.

[5] Oregon Parks and Recreation Department. 2012. Tsunami Debris Response Plan. Version 1.0. Prepared by Oregon Parks and Recreation Department Staff: John Allen, Chris Havel, Robert Smith, and David Solomon.

[6] Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other *Dreissenid* Species. 2008. Prepared for the 100th Meridian Initiative Columbia River Basin Team by: Paul Heimowitz and Steven Phillips.

[7] Mid-Atlantic Panel on Aquatic Invasive Species. 2009. Rapid Response Planning for Aquatic Invasive Species: Maryland Sea Grant Publication Number UM-SG-TS-2009-01.

[8] National Oceanic and Atmospheric Administration. 2008. Interagency Report on Marine Debris Sources, Impacts, Strategies, and Recommendations. Silver Spring, MD. 62 pp.

Table 8: Federal authorities by agency that: (1) specifically mention marine debris in the authority, (2) address sources and items that could become marine debris, and (3) address entities that may be impacted by marine debris.

Authority	Explicitly states marine debris in the authority	Authorities that address sources and items that may become marine debris	Authorities that address entities that may be impacted by marine debris
Marine Debris Research, Prevention and Reduction Act, 33 U.S.C. 1951 et seq.	NOAA, USCG		
Coral Reef Conservation Act of 2000, 16 U.S.C. 6401 et seq.	NOAA		
Coastal Zone Management Act of 1972 (P.L. 92-583; 16 U.S.C. 1451 et seq.), as amended. (Specifically the Reauthorization Amendments of 1990, 16 U.S.C. 1455b)	NOAA	NOAA, EPA	
Marine Plastic Pollution Research and Control Act 33 U.S.C. 1914 - 1915	NOAA, EPA	EPA, NOAA, USCG	
Driftnet Act Amendments of 1990, 16 U.S.C. 1826		NOAA, FWS, DOS	
Marine Protection, Research, and Sanctuaries Act, 33 U.S.C. 1401-1445		EPA	
Shore Protection Act, 33 U.S.C. 2603		EPA, USCG	
Clean Water Act, 33 U.S.C. 1251-1385, including 33 U.S.C 1346(f) as amended by Beaches Environmental Assessment and Coastal Health Act of 2000, Pub. L. No. 106-284, (114 Stat. 876)		EPA, USACE	
Resource Conservation and Recovery Act, 42 U.S.C. 6901-6992k		EPA	
Pollution Prevention Act of 1990, 42 U.S.C. 13101-13109		EPA	
Act to Prevent Pollution from Ships (APPS), 33 U.S.C 1901 et seq. as amended by the Marine Plastic Pollution Research and Control Act		USCG	
Rivers and Harbors Act of 1899, 33 U.S.C. 401 et. seq.		USACE, USCG	
Amended Section 2 of the Flood Control Act of 1954, Sec. 208		USACE	
Outer Continental Shelf Lands Act, 43 U.S.C. 1331 et. seq. and Amendments 43 U.S.C. 1801 et. seq.		MMS	

Energy Policy Act of 2005, 42 U.S.C. 15801 et. seq.		MMS	
Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C 1801 et. seq.		NOAA	NOAA
National Marine Sanctuaries Act, 16 U.S.C. 1431 et. seq.		NOAA	NOAA
National Wildlife Refuge System Administration Act of 1966 and National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd			FWS
Anadromous Fish Conservation Act, 16 U.S.C. 757a et. seq.			FWS
Endangered Species Act of 1873, 16 U.S.C. 1531 et. seq.			NOAA, FWS
Marine Mammal Protection Act, 16 U.S.C. 1402			NOAA, MMC, FWS

EPA – United States Environmental Protection Agency
FWS – United States Fish and Wildlife Service
MMC – Marine Mammal Commission
MMS – Minerals Management Service
NOAA – National Oceanic and Atmospheric Administration
USACE – United States Army Corps of Engineers
USCG - United States Coast Guard

Treatment Options for Biofouling on JTMD on Shore and at Sea

It is advisable for a response structure to be in place that allows for pre-approval and permitting of treatment strategies and tools (e.g., mechanical, chemical, or other measures) for removal of organisms. The pre-approved sets of tools should be accessible to facilitate timely application. Expertise regarding the approval process is critical, particularly in meeting the requirements of the National Environmental Policy Act (NEPA) and other possible environmental regulations.

Safety issues are paramount. Objects that wash ashore may be heavy, precariously balanced, susceptible to movement by waves, have exposed, jagged surfaces, or contain known (fuel or labeled chemicals) or unknown liquids. Objects encountered at sea, whether still floating or secured (e.g., to a vessel), raise numerous safety and insurance issues, including required training for divers and other necessities relative for work in a potentially dangerous environment.

Examples of treatment strategies are noted below. Additional treatments, such as *chemical applications*, may have additional requirements relative to legal approval, unanticipated environmental hazards, and attention to safety. If use of a registered biocidal pesticide is considered, application must be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulations and posted label.

Beach and Coastal Encounters: Debris that has Washed Ashore

Management and science teams are urged to work closely together to insure that treatment and disposal actions do not increase the potential for invasive species dispersal by dislodgement or loss, as such actions would be counter to management goals. Removal of the biofouled object from the shore is referenced throughout these protocols. Caveats and considerations include secondary dispersal issues

(e.g., dislodgement or moving an object to another location), safety considerations, and the availability and monitoring of land-based disposal sites.

The Misawa dock that washed ashore in June 2012 in Oregon was treated by scraping and heating (burning) of organisms. JTMD too large to lift by hand or forklift may benefit from protocols developed in the treatment of the dock. Modified for more general purposes, these protocols are as follows:

a) Shovels, lawn edgers, and other tools are used to **scrape** all exposed surfaces clean, with scraped material **captured** on large, secured tarps under, around, and below the object;
b) All biomaterials are placed into tubs, garbage bags, or other receptacles and removed from further contact with water;
c) All scraped material is removed for **land disposal** (by burial or other means), and
d) All exposed surfaces on the object are **burned** with propane torches.

Caveats and considerations include the inability to treat living organisms in inaccessible areas of the object. As soon as feasible and practicable, arrangements should be made to move the object to dry land, above the high tide line, as was done with the Misawa dock in Oregon.

Encounters at Sea: Biofouled Debris Still Afloat on the Sea Surface

Designated authorities may have to respond to JTMD encountered while still afloat at sea to reduce the risk of potential AIS reaching near-shore waters. Further, sampling biofouling on marine debris at sea could provide valuable data on the origin of the debris, the nature of potentially invasive species, and the survival potential of coastal species at sea. However, a thorough risk-benefit evaluation is recommended to avoid causing additional dispersal of organisms at sea. Management and science teams are urged to work closely together to ensure that treatment and disposal actions do not increase the potential for invasive species dispersal by dislodgement or loss, as such actions would be counter to management goals.

Treatment of biofouling on floating objects found at sea is a largely unexplored field and relies heavily on the ability to locate and secure the object. Logistics, time, funding, and, above all, safety considerations may frame the suite of possible management responses. Measures for treatment of biofouled JTMD discovered at sea may include:

- **Removal of the biofouled object from the water** by hand, net, crane, and/or floatation mechanism placed under the object, or other device. The object may be placed on board a vessel or barge. Dislodgement of living organisms may easily occur by mechanical handling.
- **Scraping and removal of organisms** would require access to multiple exposed and submerged surfaces, many of which are likely to be inaccessible without divers in the water (which may raise safety concerns, as noted above).The ability to thoroughly capture dislodged fouling would likely present significant challenges.
- **Wrapping a large structure** for invasive species containment has been previously employed with vessels, barges, floats, and pier pilings. However, in these circumstances, the objects were often stationery and not floating at sea. Wrapping the object may result in smothering, oxygen and light deprivation, and other biocidal processes for the biofouling organisms. Adding chemicals (e.g., fresh water, acetic acid, chlorine) inside the sealed impoundment structure may increase effectiveness of the treatment.

- **Towing an object** to a secure location for treatment such as a dry-dock or on-shore treatment facility. Location selection would require close coordination with scientific and management authorities to ensure that the towing itself would not result in displaced organisms en route. It is also recommended for the target location to provide a site that is more amenable to treatment and further from habitat that may be vulnerable to invasion.
- **Disposal at sea** may include sinking the object in its present location or towing it to deep water. Sinking an object in the ocean may remove the threat of invasive species but should be considered as a last resort. The depth of water and existing habitat in which the object is sunk is a critical biological consideration but there are many legal issues to be considered as well.

Sinking the object in place or transporting it for the purposes of sinking, can involve a number of federal agencies. EPA must authorize any transporting of debris for the purposes of dumping. If the debris is not transported but instead sunk in-place, the U.S. Coast Guard, U.S. Army Corps of Engineers, NOAA, and state jurisdictions may all be involved.

If transportation of marine debris for disposal at-sea is being contemplated, the Marine Protection, Research, and Sanctuaries Act (MPRSA) regulations may apply. Other federal authorities would apply if debris may contain hazardous substances.[9] If disposal of marine debris at sea is under serious consideration, it is recommended that decision-makers contact staff[10] within the Environmental Protection Agency's (EPA) Ocean Dumping Program as soon as possible and examine the MPRSA implementing regulations (40 CFR Parts 220 - 229). The ocean dumping criteria under MPRSA require consideration of land-based alternatives prior to authorization of ocean dumping.

The MPRSA regulates the transportation and dumping of any material into ocean waters[11] and prevents or strictly limits dumping into ocean waters any material that would adversely affect human health, welfare, amenities, the marine environment, ecological systems, or economic potentialities. The MPRSA implements the requirements of the international treaty governing ocean dumping, the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (also known as the London Convention). Unless authorized by permit or by regulation (or excluded from regulation by the MPRSA itself), the MPRSA prohibits the transportation of any material for the purpose of dumping. Information pertaining to the EPA and MPRSA ocean dumping regulations and permit processing is located in Appendix E.

If JTMD is sunk at sea, it is advisable that the location be marked exactly. If possible, a marine GPS tracking device may be permanently secured to the object to enable its relocation on the sea bed. Post-sinking monitoring is also advised, if possible, to determine the extent of any surviving organisms or biofouling on the object resting on the sea floor.

[9] Additional authorities may apply to the removal of marine debris. Authority to remove debris, including but not limited to Tsunami debris from open water and from shorelines, is given to the U.S. Army Corps of Engineers, pursuant to Section 19 of the Rivers & Harbors Act (33 U.S.C. § 414) where navigable waters would be obstructed or endangered by such debris. The U.S. EPA and the U.S. Coast Guard are also vested with authority where such debris is characterized as containing hazardous substances (Section 104 of CERCLA), and/or oil or pollutants or contaminants (Section 311(c)(1 & 2) of the CWA, also known as the Oil Pollution Act (OPA)). The USCG and EPA implement these authorities through the National Contingency Plan for Oil and Hazardous Substances, 40 CFR Part 300.

[10] See Appendix A for Ocean Dumping Program contacts for EPA Regions 9 and 10, listed by state.

[11] Ocean waters are defined as, "those waters of the open seas lying seaward of the baseline from which the territorial sea is measured. This definition includes the territorial sea, the contiguous zone and any portion of the high seas beyond the contiguous zone. Ocean waters do not include internal waters, also known as inland waters, which are inside or landward of the baseline of the territorial sea. The baseline of the territorial sea is generally the low water line (i.e., Mean Lower Low Water) along the coast, except where the United States has drawn specific closing lines, such as bay closing lines, river closing lines and harbor closing lines. Such bay, river and harbor closing lines also form part of the baseline of the territorial sea, and the waters enclosed thereby are internal waters."

Level 5

COMMUNICATION

(Post-Action Response)

Retrospective Communication:

Following a JTMD incident, it is recommended that all actions conducted in response to the incident and the results of such efforts be communicated effectively to the public as well as internally among agencies and organizations using the suggestions for risk communication and key messages from Level 1 (Proactive response). Retrospective communication will convey successful efforts and challenges associated with a JTMD response and may help reduce the risk of AIS introductions from JTMD incidents.

Components of Key Messages

Effective post-action communication is recommended to create a record of the event including actions taken and roles of participants. Evaluation of this information is advised to identify lessons learned and areas that can be improved upon to advance future response strategies. Retrospective communication with the public is also critical to ensure that accurate information reaches target audiences regarding response efforts, potential impacts, and information gained from the event. The key components stated below are recommended for post-action messaging.

- Description of JTMD incident.
- Location and dates of JTMD incident.
- Actions taken in response to JTMD incident, and reasons for actions
- Impact of incident.
- Results and next steps (by public, agencies, NGOs etc.) for all actions taken.
- List of agencies and other stakeholders involved in response.
- Scientific or management information gained from the event.
- Overall steps to be taken by the agencies, NGOs and public etc to return to normal
- Mitigation measures taken it JTMD is located in sensitive habitat
- Contact information for further information.

APPENDIX A: Federal, State, and Tribal Contacts for Reports and Incidents involving Biofouled JTMD (Last updated - August 2012)

For reports of suspicious (and potentially invasive) organisms associated with JTMD, it is recommended that all relevant information be forwarded to the appropriate Federal, State, and tribal contacts listed below. These individuals have agreed to coordinate with other involved parties and respond to the report in an appropriate and timely manner. (* Denotes the designated state (or province) coordinator for AIS incidents associated with JTMD).

ALASKA			
Tammy Davis *	**Alaska Department of Fish and Game**	**tammy.davis@alaska.gov**	**907 465-6183**
Cecil Rich	U.S. Fish and Wildlife Service	Cecil_rich@fws.gov	907 786-3510
Linda Shaw	NOAA Fisheries	Linda.Shaw@noaa.gov	907 586-7510
Stephanie Carman	Bureau of Land Management	SCarman@blm.gov	202 912 7404
TBA	U.S. Forest Service		
Chris Meade	U.S. Environmental Protection Agency, Ocean Dumping Program	Meade.chris@epa.gov	907 586-7622
Tahzay Jones	National Park Service	Tahzay_Jones@nps.gov	907 644-3442
Keith Hatch	Bureau of Indian Affairs	Keith.Hatch@bia.gov	503 872-2876

CALIFORNIA			
Martha Volkoff *	**California Department of Fish and Game**	**MVOLKOFF@dfg.ca.gov**	**916 651-8658**
Ronald Smith	U.S. Fish and Wildlife Service	Ronald_Smith@fws.gov	209 334-2968 x 321
Sarah Allen	National Park Service, Pacific West Region	sarah_allen@nps.gov	415 623-2202
Diane Ikeda	U.S. Forest Service	dikeda@fs.fed.us	707 562-8938
Steve Lonhart	NOAA Office of National Marine Sanctuaries	steve.lonhart@noaa.gov	831 420-3661
Sherry Lippiatt	NOAA Marine Debris Program	Sherry.lippiatt@noaa.gov	510 437-3466
Stephanie Carman	Bureau of Land Management	SCarman@blm.gov	202 912 7404
Chris Scianni	California State Lands Commission	Chris.scianni@slc.ca.gov	916 574-0209
Allan Ota	U.S. Environmental Protection Agency, Ocean Dumping Program	ota.allan@epa.gov	415 972-3476
Keith Hatch	Bureau of Indian Affairs	Keith.Hatch@bia.gov	503 872-2876

HAWAII and PACIFIC ISLANDS			
Sonia Gorgula *	**Hawai'i State Department of Lands and Natural Resources**	**sonia.gorgula@hawaii.gov**	**808 392 9629**
Scott Godwin	NOAA Office of National Marine Sanctuaries	Scott.Godwin@noaa.gov	808-694-3945
Carey Morishige	NOAA Marine Debris Program	Carey.morishige@noaa.gov	808 532-3207
Joshua Fisher	U.S. Fish and Wildlife Service	Joshua_Fisher@fws.gov	808 792-9452
Ty Benally	U.S. Fish and Wildlife Service - Papahanaumokuakea Marine National Monument	ty_benally@fws.gov	808 792-9554
John Klavitter	U.S. Fish and Wildlife Service – Midway Atoll National Wildlife Refuge	John_Klavitter@fws.gov	808 674-8237
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APPENDIX B: Documentation for the Japan Tsunami Marine Debris Taxonomic Assessment Team

The Maritime Studies Program of Williams College and Mystic Seaport

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JAPAN TSUNAMI MARINE DEBRIS (JTMD): TAXONOMIC ASSESSMENT TEAM

(J-TAT 1.0, as of *September 10, 2012*)

The following taxonomic experts have agreed to examine and advise on **photographs** of biofouling on JTMD-Marine-Origin Debris (MOD). If actual **specimens** are collected or acquired from JTMD, some of these experts may be willing to receive and examine the material for identification. This effort will be facilitated initially by the J-TAT lead contact Jim Carlton to ensure overall coordination. The J-TAT is part of a broader federal and state regional response effort to monitor the biofouling community associated with JTMD and avoid the potential introduction of invasive species. For more details visit: http://www.anstaskforce.gov/

J-TAT PROCEDURE:

- When reports of JTMD-MOD are submitted to your office with pictures of aquatic organisms that appear to be ***something other than, or in addition to,*** pelagic goose barnacles (*Lepas*), the **photo can be sent immediately to the entire J-TAT e-bundle (below).**
- The J-TAT group has been instructed ***to reply to Jim Carlton*** (lead contact), who will assemble the responses (in order to avoid loading your inbox with "Sorry, I don't recognize this," or "Bob's idea is close, but I think it might be …."). Jim will sort, filter, and assemble the J-TAT comments, and respond to your office, with a **target of real-time (same day) response**. *Note that some members of J-TAT may overlook this step on occasion, and respond to you directly, in which case please forward the response to Jim Carlton.*

PASTE-IN E-BUNDLE:

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APPENDIX C: Checklist of Steps in Developing a Response of Biofouled Debris

(Adapted from Locke and Hanson, 2009)[12]

[Note: The original intent this checklist was for detection, monitoring, and containment of reproducing populations of non-native species already established in the wild; however items in this checklist may also be applicable to JTMD incidents]

Prior to Invasion:

Organizational Structure

- Understand all relevant laws, regulations, policies and guidelines that may affect the ability to undertake a response.
- Identify who is responsible overall, and for each step in the response.
- Identify a primary point of contact at each local, provincial, and federal agency involved, and at major stakeholder organizations as appropriate.
- Identify potential sources of funding.
- Develop a communication structure.

Monitoring

- Develop monitoring protocols and identify monitoring networks.
- Develop of reporting system for both the public and agencies/stakeholders.
- Identify taxonomic experts and likely composition of a scientific assessment panel.
- List stakeholders and agencies that should be notified in the event of detection.

Risk Assessment and Decision Support

- Identify who will conduct the risk assessment.
- Identify the information needs for risk assessment, develop the required protocols, ensure appropriate equipment and personnel will be available.
- Formalize the decision support system for risk assessment

Containment

- Develop criteria for determining the need for containment or restriction of use of an infested water body.
- Evaluate legal authority that will allow containment or restriction of use of the water body.
- Identify who is responsible for the enforcement of restrictions of specific systems and what enforcement resources may be required.
- Communications: Identify the communications needs associated with containment or restriction of use.

Implementation phase

- Identify who is responsible for implementation of the response.
- Develop protocols for the control methods that may be used.
- Provide training to rapid response group members with simulations and field trials.
- Communications: Identify the communications needs associated with implementation.

Follow-up and Evaluation

- Identify who is responsible for post-treatment monitoring.
- Identify protocols for post-treatment monitoring to assess the effectiveness of the response.
- Identify protocols to evaluate the effectiveness of communication.

[12] Locke A. and Hanson J.M. 2009. Rapid response to non-indigenous species. 3. A proposed framework. Aquatic Invasions Volume 4 (1): 259-273.

After Potential Invader is detected:

Monitoring

- Receive report of the biofouled debris.
- Confirm the identity of the specimen.
- Deposit voucher specimens at the appropriate permanent archive.
- Update the database and webpages.
- Mobilize the communications officer and scientific advisory panel.

Risk Assessment and Decision Support

- Assemble data on the affected area, characteristics and distribution of the invader, and other relevant data needed for risk assessment
- Convene scientific assessment panel and review preliminary data.
- Review the control options.
- Identify risks and benefits associated with various controls, including no control.
- Consult stakeholders. Institutional, mandated responsibilities may override the wishes of local stakeholders, for example when endangered / threatened species or protected habitat is involved.
- Select the preferred control option.
- Set schedule for implementation. Different species and invasion scenarios will require differing schedules of response, depending on the likelihood of establishment, the rate of spread, life cycles, climate, weather, and other factors.

Containment

- Scientific advisory panel evaluates need for containment or restriction
- Commence containment or restriction of use of the infested area, if necessary.
- Monitor the infestation.

Implementation phase

- Begin management effort.

Follow-up and Evaluation

- Monitor to determine the response was effective and complete.
- Evaluate the effectiveness of communication.
- Debrief the process.

APPENDIX D: Rapid Response Planning for Aquatic Invasive Species: A Template[13]

This template plan serves as a tool for states to use in developing their own Rapid Response Plans. Throughout the plan, **red text** indicates information that should be customized. States may find it necessary to add, eliminate, or change additional text as well to address their specific needs for JTMD incidents. For an example of Maryland's use of the template visit www.mdsg.umd.edu/rapidresponse.

SECTION 1: INTRODUCTION

Incident Command System

Incident Command System (ICS) has earned a reputation as an "all risk, all hazard" response tool. Originally developed by the U.S. Forest Service, and now recommended by the Aquatic Nuisance Species Task Force, agencies such the National Oceanic and Atmospheric (NOAA), Environmental Protection Agency (EPA), and the Department of Homeland Security (DHS) use ICS to improve response to incidents from natural disasters to oil spills. The use of unified command and common terminology allows communication and coordination across agencies and jurisdictions. This common planning process and objective-driven management scheme shifts an incident from an initial reactive response to a proactive response[14].

Incident vs. Issue

This Rapid Response Plan addresses an invasive species "incident," rather than an invasive species "issue." An incident is an isolated introduction of a species that has yet to become established in the ecosystem, whereas an issue is an ongoing challenge with an established species.

Definition of Rapid Response

Preventing introductions of AIS is crucial to avoid their establishment and spread. Prevention measures, however, are not foolproof and government officials and natural resource managers must be prepared to take action in the event of an AIS introduction. The National Invasive Species Council defines rapid response as a systematic effort to eradicate, or contain invasive species while infestations are still localized[15]. To be most effective, a response to an introduction should occur quickly. Organizing an appropriate response requires significant coordination and analysis.

Rapid Response Procedure Overview

The following guidance is intended to direct rapid response efforts for a potential AIS associated with JTMD in STATE. An ICS Response to Biofouled JTMD Incidents flowchart (Figure D-1) details the general plan of operations for responding to a possible AIS incident associated with JTMD. The chart provides a holistic understanding of what needs to be accomplished to response in these situations.

In STATE, the GROUP is the first point of contact. If the report is deemed credible and worthy of a response, this point of contact will contact experts to identify the specimen. If the specimen is indeed non-native, biologists will be sent to the field to confirm sighting and location. If confirmed, the designated authorities or SAP will be convened to determine whether to take action. The team will then brief the HEAD OF RESPONSIBLE AGENCY **and** THE HEAD OF THAT AGENCY'S COMMUNICATIONS DEPARTMENT on the incident and recommendation whether or not a response is warranted.

[13] Adapted with permission from - Mid-Atlantic Panel on Aquatic Invasive Species. 2009. Rapid Response Planning for Aquatic Invasive Species: . Maryland Sea Grant Publication Number UM-SG-TS-2009-01

[14] Deal, Tim, Michael de Bettencourt, Vickie Huyck, Gary Merrick, and Chuck Mills. 2006. Beyond Initial Response: Using the National Incident Management System's Incident Command System. Author House, Bloomington, Indiana.

[15] National Invasive Species Council. 2008. 2008-2012 National Invasive Species Management Plan.

Once notified, the HEAD OF RESPONSIBLE AGENCY becomes the Incident Commander. If multiple agencies share equal responsibility, a Unified Command may result (defined Section 2). The Incident Commander (IC) or Unified Command (UC) will appoint a General Staff to oversee operations, logistics, planning, and finance and administration for the rapid response effort. The IC/UC will also appoint a legal advisor, science advisor, liaison officer, and public information officer (Command Staff). The roles and responsibilities of each of these positions are described in Section 2.

The newly appointed Incident Management Team will then conduct a risk assessment and analyze management options. To facilitate this process, they will refer to the Operational Planning "P" Process, discussed in Section 3.

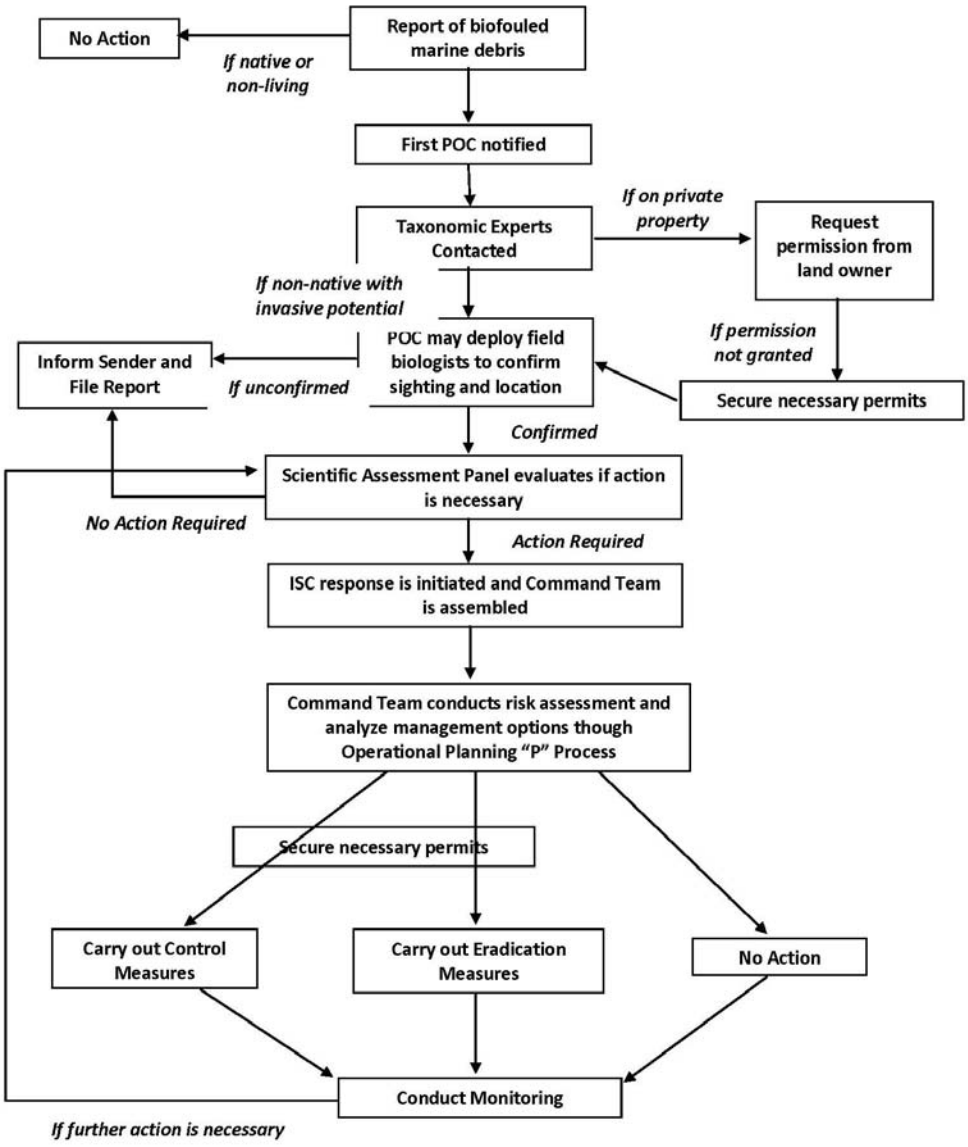


Figure D- 1: ICS Response to Biofouled JTMD Incidents

SECTION 2: INCIDENT COMMAND JOB DESCRIPTION

Incident Command System (ICS) position titles enable responders to speak a common language and avoid the confusion that may come when different agencies with differences in terminology. ICS seeks to eliminate uncertainty by using titles that are not dependent on the title of a person's daily job (e.g., a Natural Resource Planner for one agency may be a Field Biologist for another). In this way, positions are filled by the people most qualified to do the job, independent of their previous ranks or job titles.

The figure below illustrates the upper level of personnel organization for the Incident Command System. The Incident Commander oversees the entire response effort. Until the Incident Commander delegates a management function (Operations, Planning, Logistics or Finance/Administration) to another person, he/she must perform the required functions for each position. Once the Incident Commander delegates these management functions, the chiefs of each section comprise the General Staff. The General Staff reports directly to the Incident Commander.

Command Staff help the Incident Commander and General Staff manage incident safety, communicate with the public and personnel, conduct outreach to other agencies, and advise on legal and scientific issues. Although the Command Staff positions are shown above the General Staff, they are not actually in the chain of command.

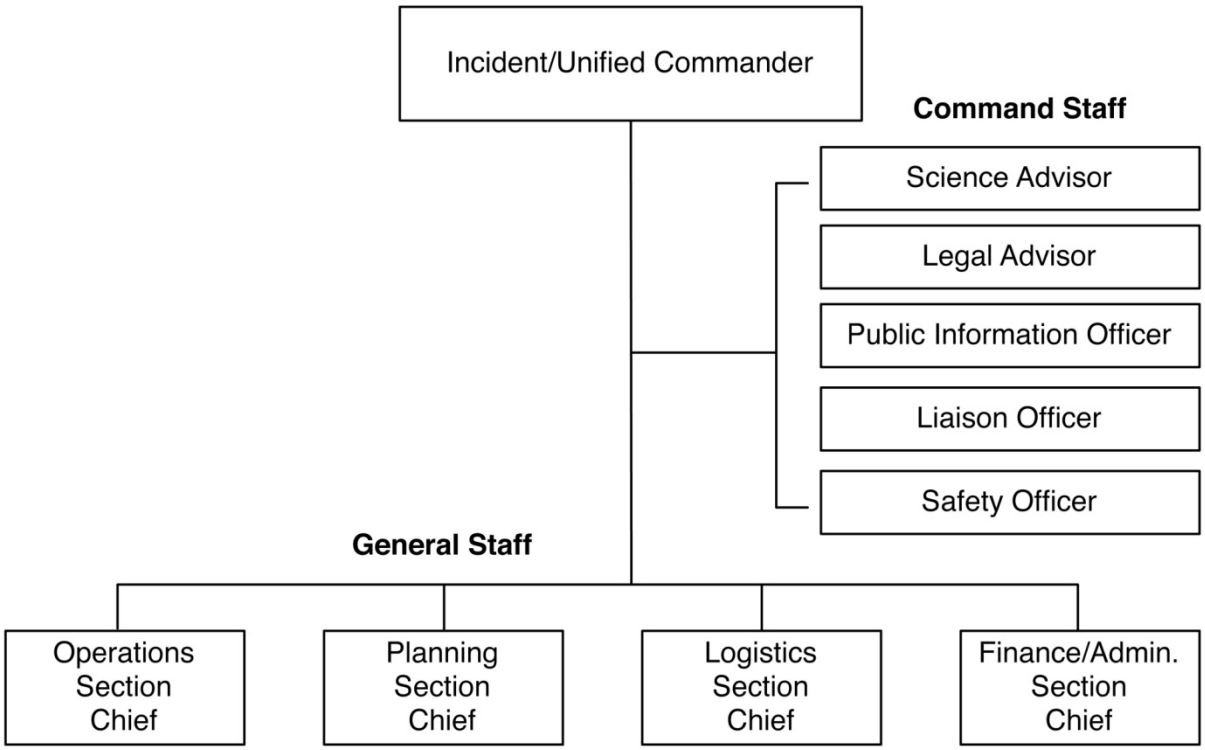


Figure D- 2: Incident Command Structure and Chain of Command

Incident and Unified Commander Descriptions:

Incident Commander

Desired Attributes: Proven leader, experienced in risk management, strong communicator.
Primary Responsibilities:

- Determine incident priorities.
- Establish incident objectives.
- Manage tactical operations.
- Assure safety of responders and public.
- Identify and order the necessary resources to accomplish objectives.
- Keep organization briefed.
- Evaluating contingencies.

Unified Command

Unified Command is the shared responsibility of command among several Incident Commanders. Attributes and responsibilities of a Unified Command are identical to an Incident Commander. Indicators that the response should be managed by a Unified Command include when an incident:

- Crosses geographic boundaries (e.g., two states).
- Involves various governmental levels (e.g., federal, state, local).
- Impacts different functional responsibilities.
- Includes different statutory responsibilities.
- Has some combination of the above.

If you can answer "yes" to all four questions for the particular type of incident that you are responding to, then your organization belongs in the Unified Command:

- Does my organization have jurisdictional authority or functional responsibility under a law or ordinance for this type of incident?
- Is my organization specifically charged with commanding, coordinating, or managing a major aspect of the response?
- Does my organization have the resources to support participation in the response or organization?
- Does the incident or response operation impact my organization's area of responsibility?

General Staff Descriptions:

Operations Section Chief

Desired Attributes: Leader, gives clear direction, conscientious.
Primary Responsibilities:

- Manage tactical operations.
- Ensure tactical operations are conducted safely.
- Maintain close communications with the Incident Commander/Unified Command.
- Identify required tactical resources to accomplish response objectives.

Planning Section Chief

Desired Attributes: Strong facilitator and communicator.
Primary Responsibilities:

- Keep everyone working together.
- Provide current, accurate situation status and concise briefings in support of the ICS process meeting schedule.
- Accurately track all resources
- Facilitate the planning process by conducting timely meetings and working closely with the Operation Section Chief, Logistics Section Chief, and Command Staff.
- Ensure thorough documentation of all key decisions.
- Establish and maintain a complete list of things that must be accomplished, ensuring that each item on the list is assigned to the appropriate ICS element.
- Ensure that a complete and thorough Incident Action Plan is delivered in support of the operations.

Logistics Section Chief

Desired Attributes: Experienced in logistical support, detail-oriented, propensity for customer service and teamwork.

Primary Responsibilities:

- Anticipate incident's potential for growth and plan resource and personnel requirements
- Develop and implement a resource ordering and tracking process.
- Ensure an effective communication network is in place to support incident operations.
- Support development of the Incident Action Plan.
- Ensure that Command and General Staff are aware of excessive costs.
- Ensure appropriate demobilization (e.g., account for property and services, properly dispose of hazardous materials).

Finance/Administration Section Chief

Desired Attributes: Experienced in finance/administration, detail-oriented, organized.

Primary Responsibilities:

- Ensure the proper completion of response cost-accounting documentation.
- Coordinate and manage response budgets and cost estimates.
- Provide financial support for contracting services, purchases, and payments.
- Project the "burn rate" of funding and advise the IC/UC when a ceiling must be increased.
- Maintain a daily inventory of all purchases.
- Forward all invoices to the appropriate agency processing center for payment.

Command Staff Descriptions:

Science Advisor

Desired Attributes: High scientific acumen, particularly in regard to AIS in the North Pacific; knowledge of environmental implications of all eradication and/or control options; ability to communicate with scientists and non-scientists alike; network of colleagues on whom to call if needed.

Primary Responsibilities:

- Consult with other scientific experts to inform decisions and assemble scientific advisory panel if necessary.
- Provide any necessary technical guidance to those preparing Incident Action Plan.
- Participate in planning process.
- Ensure rigorous oversight of response's scientific and environmental objectives.

- Provide expert input to Incident Commander and Command Staff on scientific and environmental decisions.
- Ensure Liaison and Public Information Officers are able to accurately relay scientific information to media, stakeholders, and others.

Legal Advisor

Desired Attributes: High legal acumen, particularly in regard to environment laws and permitting; network of colleagues on whom to call if needed.

Primary Responsibilities:

- Participate in planning process.
- Provide expert input to Incident Commander and Command Staff on laws that govern AIS response.
- Provide guidance on permits required for response actions.
- Oversee execution of all legal documents and contracts.
- Consult with other legal experts

Liaison Officer

Desired Attributes: Interpersonal skills, highly organized, knowledge of local stakeholders, communications skills via phone, in person, and by electronic means.

Primary Responsibilities:

- Provide agencies and organizations with a schedule for incident updates and determining their information needs.
- Keep the IC/UC informed on issues dealing with assisting agencies, cooperating agencies, stakeholders.
- Coordinate with the Public Information Officer.
- Coordinate VIP visits.
- Coordinate outreach efforts (e.g., community meetings).
- Oversee external messages to stakeholders.
- Serve as contact point for stakeholders, politicians and their staff, government agencies, nongovernmental agencies, industry partners.
- Identify public and private concerns related to the incident.
- Maintain master list of contact numbers.

Public Information Officer

Desired Attributes: Experienced in public affairs, communications-savvy.

Primary Responsibilities:

- Support the public communications needs of the Incident Commander/Unified Command.
- Gather and disseminate incident information (e.g., number of responders).
- Work closely with the Liaison Officer to inform public and stakeholders.
- Assist in establishing and implementing communications requirements such as holding press conferences, disseminating press releases, answering media queries.
- Attend command meetings to exchange information with the Incident Commander/Unified Command and to get approval of information to be released.
- Ensure that the response organization is kept informed on the overall response efforts.
- Coordinate media activities with the Command and General Staff
- Determine need to develop an Outreach Plan.

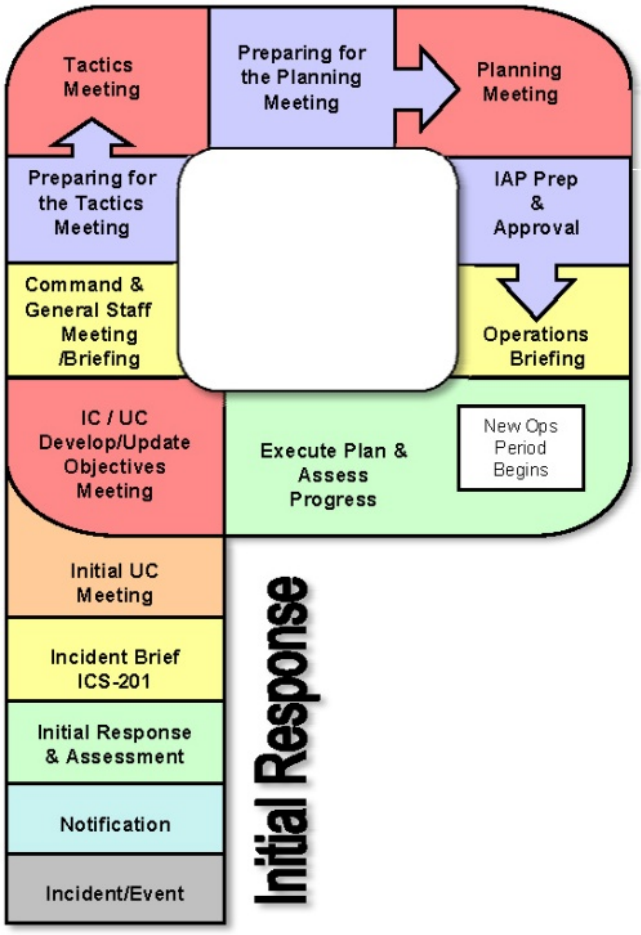
Safety Officer

Desired Attributes: Understands regulations, risk management skills, technical expertise.
Primary responsibilities:

- Work with the Operations Section Chief to identify and mitigate safety hazards associated with planned strategies and tactics.
- Participate in the planning process.
- Identify hazardous situations associated with the incident.
- Participate in the development of the Incident Action Plan.
- Exercise authority to stop or prevent unsafe tactics.
- Investigate accidents and injuries that have occurred in the incident areas.
- Develop appropriate safety plans for the response.
- Monitor compliance with safety requirements.

SECTION 3: OPERATIONAL PLANNING "P" PROCESS

The crux of the Rapid Response Plan is the Operational Planning "P" process. Developed for the U.S. Coast Guard, the Operational Planning "P" is a visual representation of the ICS planning process. The "P" serves as a step-by-step guide to response from the onset of an incident to assessment and monitoring. The following discussion outlines how to use the Planning P to organize a rapid response to an AIS incident associated with JTMD. Please refer to Section 2 for an ICS organizational chart and description of job titles.



Step 1: Incident

The discovery of a possible AIS on marine debris in STATE initiates the Operational Planning "P" process.

Step 2: Notification

Who: Anyone who sights a potential AIS on marine debris in STATE
What: Contacts local authorities, state or federal agencies to report sighting.
How: Submit report to HOTLINE, WEBSITE, OR EMAIL. Upon receiving the report, GROUP will be notified. If other state and federal entities are the first to receive notification, they should notify APPROPRIATE FEDERAL, STATE AND TRIBAL CONTACTS

Step 3: Initial Response and Assessment

Response
Who: GROUP
What: Receives report of potential AIS in STATE and contacts appropriate expert(s) to positively identify the AIS specimen.
How: Forward report and other available information or specimens to the Japan Tsunami Marine Debris Taxonomic Assessment Team (J-TAT).

Assessment
Who: GROUP or SAP
What: Confirm AIS sighting, location, extent of occurrence, and assess whether action is warranted.
How:

- Interview person who reported debris.
- Visit site. (Approach landowner for permission if AIS will require action on private property. If landowner is noncompliant, work with LEAD AGENCY to secure necessary access permits.)
- Conduct sampling.
- Complete visual and taxonomic identification.
- Identify life cycle stage.
- Estimate extent of occurrence.
- Record information
- Assess whether action is warranted

Step 4: Incident Brief

Who: GROUP
What: LEAD AGENCY's DIRECTOR, COMMUNICATIONS DIRECTOR, and LEGAL DIRECTOR of presence of AIS associated with JTMD and likely next steps.
How: Through written Incident Brief (found at http://www.fema.gov/forms/job-aids-tools-templates). Brief will include information such as

- Incident name
- Current situation
- Initial response objectives
- Current actions
- Planned actions (Recommendation of "Action," "No Action," or "Further Evaluation of Potential Action")
- Names of involved personnel
- Resources in use
- Resources needed

Step 5: Initial Unified Command Meeting

Who: Incident Commander/ Unified Command This initial meeting will likely include the LEAD AGENCY DIRECTOR as Incident Commander or his/her designee and key scientific and legal support staff or advisors whom the LEAD AGENCY DIRECTOR identifies.)
What: Begin to establish course of action.
How:

- Identify who (if anyone) should be in Unified Command
- Determine priorities for the incident. Priorities may include: Avoid ecological harm, protect human health, maintain economic value, reduce risk of spread
- Determine the incident response objectives. Objectives should be achievable, measurable, and adaptable.

Objectives may include:

- Determine the extent of JTMD incident (i.e., possible fragmentation, secondary vectors).
- Determine risk to environment, human health, economy, etc.
- Determine control and/or eradication methods to minimize potential environmental, health, and commercial impacts.
- Determine appropriate use and costs of control/eradication methods.
- Contain or eradicate potential invasive species at arrival site of JTMD.
- Dispense timely information and a coordinated message to stakeholders, colleagues, local, state and federal agencies affected by infestation.
- Conduct monitoring.
- Agree on best-qualified and acceptable individuals to fill General Staff positions (i.e., Operations Section Chief, Planning Section Chief, Logistics Section Chief, Finance/Administration Section Chief).
- Agree on who fills Command Staff positions (i.e., Legal Advisor, Science Advisor, Public Information Officer, Liaison Officer, Safety Officer)
- Identify funding mechanisms and agree on action to secure funding.
- Agree on resource-ordering procedures.

Step 6: Objectives Meeting

Who: Incident / Unified Command
What: Evaluates the current incident status, what needs to occur next, and how it will be achieved. Refines the objectives (outlined in previous step) that will drive the incident response for the next phase of the effort.
How:

- Determine time frame. Take into account pace of the operations, rate of change in incident situation, weather or other criteria (e.g., tides), safety and wellbeing of responders.
- Establish an incident organization that is capable of meeting initial and long-term challenges to mitigate the incident
- Identify and select incident support facilities for control and/or eradication efforts (i.e., Incident Command Post, Base, Staging Areas).
- Ensure scene integrity and evidence preservation.

- Identify constraints and limitations, which may include:
  - Inaccessible sampling environment
  - Protected or high-quality habitat
  - Jurisdictional issues
  - Legislative authority
  - Funding to pay for all aspects of rapid response
  - Availability of invasion control options
  - Securing permits (time and authority)
  - Training personnel
  - Access to private property (land ownership)
  - Gaps in knowledge of species biology
  - Ecological uncertainties

Step 7: Command and General Staff Meeting

Who: Members of the IC / UC, Command and General Staff.
What: Ensure Command and General staff are apprised of situation and next steps.
How: IC/UC will brief Command and General Staff on their decisions, objectives for the next operational period, priorities, limitations/constraints, and expectations.

- Review situation status.
- Determine message for Liaison Officer and Public Information Officer to dispense to local, state, and federal agencies, stakeholders, and the media

Step 8: Preparing for the Tactics Meeting

Who: Operations Section Chief, Planning Section Chief, Legal Advisor, Science Advisor.
What: Prepare for the upcoming Tactics Meeting.
How:

- Develop draft strategies on how to accomplish each objective.
- Detail the equipment and personnel required to implement the strategies.
- Confirm who has authority to procure resources.
- Identify any objectives that will require legal approval.

Step 9: Tactics Meeting

Who: Planning Section Chief, Operations Section Chief, Logistics Section Chief, Legal Advisor, Science Advisor, Safety Officer.
What: Organize how the operation will be conducted.
How:

- Review the priorities and objectives with the Planning Section Chief and consider the incident's limitations and constraints.
- Determine control or eradication measures to be performed (could include mechanical, chemical, or biocontrol treatment)
- Divide the Operations Section's work into manageable units (Divisions, Groups, etc.).
- Assign work tasks for each identified unit.
- List the resources required to accomplish the work assignment.

Step 10: Preparing for the Planning Meeting

Who: IC/UC, Command and General Staff, technical specialists as required.
What: Prepare for the Planning Meeting.
How:

- Gather current incident information (including potential options for control/eradication).
- Confirm availability of resources (e.g., boats, chemicals, etc.).
- Verify that information to be presented at Planning Meeting is accurate.

Step 11: Planning Meeting

Who: Members of IC/UC, Command and General Staff, technical specialists as required.
What: Bring primary players together to agree on proposed plan of action.
How: Present Tactical Plan and produce a coordinated and sustainable Incident Action Plan that everyone agrees they can support.

Step 12: Incident Action Plan Preparation and Approval

Who: Planning Section Chief, Operations Section Chief.
What: Assemble Incident Action Plan for final approval by the Incident Commander/Unified Command.
How:
Complete the following forms:
Forms can be found at: http://training.fema.gov/EMIWeb/IS/ICSResource/ICSResCntr_Forms.htm

- ICS-202, Incident Objectives: The Planning Section Chief prepares the ICS-202, but does not establish the objectives, which are the responsibility of the IC/UC.
- ICS-203, Organization Assignment List: The Operations Section Chief prepares the ICS-203, which lists the names and positions of the management team.
- ICS-204, Assignment List: The ICS-204 contains information on the operations and the work to be accomplished — that information comes directly from the Operations Section Chief.

Step 13: Operations Briefing

Who: IC, Command Staff, General Staff, Branch Directors, Division/Group Supervisors, Staging Area Managers, Task Force/Strike Team Leaders, and Unit Leaders.
What: Acknowledge that not everyone has been present at previous meetings; brief those who will carry out the plan to ensure that everyone understands his/her role.
How: Cover the following areas:

- Current situation
- Overall strategy and priorities
- Short and long range predictions
- Safety and security issues
- Accident/injuries reporting
- Expected outputs and accomplishments
- Resource ordering and re-supply
- Resource status changes
- Assigned tasks and resources
- Chain of command
- Internal and external communication

- Transportation issues
- Reporting time and location
- Performance expectations
- Sensitive/critical information reporting
- Updating work accomplishments
- Reporting any changes in tactics
- Technical specialists assigned to Operations
- Debriefing instructions

Step 14: Execute Plan and Assess Progress

Who: Entire ICS team.
What: Carries out the Incident Action Plan and monitors results.
How:

- Follow steps outlined in prepared Incident Action Plan.
- Adjust objectives and actions as needed.
- Monitor successes and failures of prepared objectives.

Follow-up Actions

The timeline for AIS control and eradication efforts associated with JTMD will vary widely according to a number of factors including: species involved, extent of infestation, location, weather conditions, etc. At the end of each operational period, the GROUP should assess progress and determine if further action is needed (refer to Figure 1) . If additional action is needed, the ICS planning process should begin again. At the conclusion of the rapid response, a final report and press release detailing actions and outcomes should be prepared and delivered.

SECTION 4: PLANNING FOR RAPID RESPONSE

The following tasks are suggested for the successful preparation and implementation of a Rapid Response Plan. They are adapted with permission from the California Aquatic Invasive Species Management Plan (California Department of Fish and Game 2007).

Task 1: Collaborate to complete plan.

Representatives from state agencies and other organizations that are currently involved in rapid response work, or are likely to be involved in the foreseeable future, should collaborate to finalize the Rapid Response Plan. The plan should become the basis for interagency agreements.

Task 2: Enter into cooperative agreements.

LEAD AGENCY staff will work with cooperating agencies and organizations to produce a list of entities that should be invited to sign Memoranda of Understanding, Implementation Agreements or similar instruments to facilitate cooperation on rapid response to AIS in STATE.

Task 3: Finalize the Rapid Response Plan.

Work that needs to be done to finalize the Rapid Response Plan includes:

- Implementation Criteria: Develop the process and criteria for the State to use in determining the course of action for any new AIS introduction associated with JTMD. Circulate for peer review.

- Likely Species and Scenarios: Identify likely scenarios for potential invasive species associated with JTMD. Run these scenarios through the criteria developed.
- Agency Preparation: Develop information needed to help cooperating agencies designate and train, in advance, potential responders to AIS introductions.
- Alternate Staff: Develop a procedure to designate and prepare potential alternate staff. This could avoid gaps in work progress and minimize managerial time spent searching for substitutes during a response.
- Resource Directory: Develop and maintain a directory of equipment, operations centers, supply sources, and associated contact people so that resources can be mobilized as quickly as possible during a response.
- Notification List: Develop a list of personnel who will need to be notified when rapid response procedures are being planned and implemented.

Task 4: Streamline permit processes for rapid response.

LEAD AGENCY staff will coordinate with staff from relevant agencies to investigate and pursue possibilities for streamlining the regulatory permit processes that might be required for rapid response measures. General measures or best management practices necessary to comply with streamlined permitting can be incorporated into the Rapid Response Plan.

Task 5: Revise Rapid Response Plan.

- Incorporate New Information: Periodically revise the Plan and incorporate things learned by evaluating the Plan's effectiveness and consulting current scientific research and related technological developments. Revisions may also be necessary due to changes in agency restructuring or environmental regulations. The interagency agreements to cooperate on rapid response should include a procedure for making revisions to the Plan.

- Notification of Plan Changes: LEAD AGENCY should ensure that adopted changes to the Plan are circulated to people listed in the Rapid Response Personnel Directory and other appropriate staff among the cooperating agencies and organizations. Changes should be addressed in training activities.

- Update Directories: GROUP staff, with assistance and input from cooperating agencies and organizations, will be responsible for the periodic update and circulation of the Rapid Response Resource Directory.

Task 6: Train employees, participants, and team members.

Agencies that agree to cooperate on AIS rapid response should participate in the development of a training program and train the employees likely to be involved in rapid response activities. Potential rapid response participants need to be familiar with the Rapid Response Plan, Incident Command System, and may need specialized training related to their likely duties during a response. ICS training is available on-line at: http://training/fema.gov/IS/.

Training should also include JTMD rapid response drills using a variety of scenarios and locations around the state. This will also assist in fine-tuning the Rapid Response Plan.

Task 7: Conduct education and outreach.

Outreach specialists from participating agencies and organizations should develop a plan of potential methods and protocols for conducting outreach to local communities, interest groups, and the media during rapid response procedures.

Task 8: Conduct research for improved rapid response.

Academic institutions, government agencies, and other organizations that agree to cooperate on rapid response should work together through various AIS working groups, professional, and environmental organizations and commercial interests to promote research that can specifically improve or promote rapid response efforts.

Task 9: Develop interim rapid response protocols.

Steps that can be taken to prepare to implement a rapid response effort while a formal plan is going through the review and approval processes:

- Memorandum of Understanding (MOU): The Directors of the appropriate agencies could sign an interim MOU directing their staff to participate in rapid response planning and implementation if a new AIS introduction occurs prior to the approval of the final plan.

- Interim Strategy: Management level staff from cooperating agencies could informally agree upon an interim strategy regarding roles and responsibilities should an AIS introduction associated with JTMD occur.

- Permitting: Management level staff from cooperating agencies could discuss how, in the absence of a formal streamlined permitting process, their staff could work within the existing regulatory permit programs to facilitate a rapid response operation and direct staff to follow through on these interim measures.

Employee Assignment: Management level staff could assign employees to an interim core rapid response team or working group. This team could participate in advance preparation and planning. In the event of a rapid response, this team would need to be augmented by additional staff based on the location of the response and the necessary areas of expertise.

APPENDIX E: Ocean Dumping Regulation and Permit Processing

The Marine Protection, Research, and Sanctuaries Act (MPRSA) (33 USC 1412 and 1414b) and implementing regulations (40 CFR 227.5 and 227.6) prohibit the following materials from ocean dumping:

- High-level radioactive waste
- Medical waste
- Sewage sludge
- Industrial waste
- Radiological, chemical, and biological warfare agents
- Materials insufficiently described in terms of composition and properties
- Persistent inert synthetic or natural materials which may float or remain in suspension in the ocean in such a manner that the interfere materially with fishing, navigation, or other legitimate use of the ocean
- Constituents prohibited as other than trace contaminants as defined at 40 CFR 227.6.

Material, as defined under this law, means matter of any kind or description. Thus, if debris, found either onshore or at sea, is to be transported for the purpose of disposal anywhere in ocean waters, the MPRSA regulations apply and a permit for at-sea disposal is required.

The EPA can issue four types of permits for ocean dumping: 1) general permits; 2) special permits; 3) research permits; and 4) emergency permits. In general, the permit processes are complex, requiring sufficient information and controls to ensure that the objectives of the MPRSA are met.

- **General permits** may be issued for the dumping of certain materials which will have a minimal adverse environmental impact and are generally disposed of in small quantities, or for special classes of material that must be disposed of in emergency situations. The EPA has issued general permits under the MPRSA, including a general permit (published at 40 CFR 229.3) for the transportation and disposal of vessels into the ocean, which includes conditions that vary depending on emergency situations. General permits include geographical areas or regions where materials may be dumped. There is no general permit for marine debris.
- **Special permits** may be issued for disposal of material in the ocean that meets the ocean dumping criteria. Areas where ocean dumping is permitted subject to specific conditions of individual special permits are designated through rulemaking. Site designations are based on environmental studies at each site and regions adjacent to the site, and on historical knowledge of the impact of waste disposal on areas similar to such sites in physical, chemical, and biological characteristics. Since 2000, the EPA has issued special permits for fish waste disposal in American Samoa.
- **Research permits** may be issued for the dumping of materials into the ocean as part of a research project when it is determined that the scientific merit of the proposed project outweighs the potential environmental or other damage that may result from dumping. The designation of disposal sites is included in these permits.
- **Emergency permits** may only be used in situations where the material to be disposed poses "an unacceptable risk relating to human health and admits of no other feasible solution." "Emergency" refers to situations requiring action with a marked sense of urgency, but is not limited to circumstances requiring immediate action. Dumping sites for materials disposed of under an emergency permit are specified as a permit condition based on an individual appraisal of the characteristics of the waste and the safest means for its disposal. If certain prohibited

constituents (listed in the regulations at 40 CFR 227.6) are present in other than trace amounts, an emergency permit may be issued after consultation with Department of State with respect to the need to consult parties to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (also known as the London Convention) that may be affected by the dumping. The designation of disposal sites is included in these permits. Since 2000, EPA has issued six emergency permits.

Transportation of materials for the purpose of dumping requires an MPRSA permit (Table E-1), but sinking debris that is adrift at sea without transportation does not require a permit. If in doubt as to whether a particular debris sinking activity does or does not involve transportation, please contact staff within the Environmental Protection Agency's (EPA) Ocean Dumping Program. See Appendix A for EPA Region 9 and 10 ocean dumping contacts listed by state

Table E-1: Permit processing scenarios for Japanese Tsunami Marine Debris (JTMD)

	JTMD Type: Vessel	**JTMD Type: Non-Vessel**
Action: Transporting JTMD for the purpose of ocean dumping	***Ocean dumping permit required***: See general permit for transportation and disposal of vessels at 40 CFR 229.3.	***Ocean dumping permit required***: See 40 CFR Parts 220, 221, 222, 223, 224, 227 and 228.

Specific to the issue of invasive species, the ocean dumping criteria used to evaluate permit applications for ocean dumping address non-native species in 40 CFR 227.7(c) & (e), titled "Limits for specific wastes or waste constituents." Permits for ocean dumping of such materials must meet the following limitations to be acceptable for ocean dumping:

(c) Wastes containing living organisms may not be dumped if the organisms present would endanger human health or that of domestic animals, fish, shellfish and wildlife by:

1) Extending the range of biological pests, viruses, pathogenic microorganisms or other agents capable of infesting, infecting or extensively and permanently altering the normal populations of organisms;
2) Degrading uninfected areas; or
3) Introducing viable species not indigenous to an area.

(e) Wastes containing biodegradable constituents, or constituents which consume oxygen in any fashion, may be dumped in the ocean only under conditions in which the dissolved oxygen after allowance for initial mixing, as defined in §227.29, will not be depressed by more than 25 percent below the normally anticipated ambient conditions in the disposal area at the time of dump

Invasive species are also addressed in the regulations for designating disposal sites under 40 CFR 228.6(a)(10), titled "Specific criteria for site selection." One of the factors that must be considered in the selection of a disposal site is:

10) Potentiality for the development or recruitment of nuisance species in the disposal site.

APPENDIX F: Workshop Agenda and Invited Participant List

Regional Preparedness and Response Workshop to Address Biofouling and Marine Invasive Species on Japan Tsunami Marine Debris (JTMD)

July 31 – Aug 1, 2012
Hoffmann Hall, Portland State University Conference Center, Portland, OR

Workshop Purpose: Prevent the introduction of marine invasive species from the biofouling* community associated with the Japan tsunami marine debris (JTMD) through a regional coordinated response.

*For the purpose of the workshop *biofouling* refers to attached and free living animals and plants found on vessel hulls, docks, buoys and other marine structures

Participants: Representatives from Federal agencies (US & CA), Tribes, States (HI, AK, OR, WA & CA), NGOs, and the research community that are involved in addressing AIS prevention/control.

Workshop Objectives:

- Improve coordination and collaboration amongst resource managers, community members, scientists and decision-makers involved in the response to organisms present on Tsunami debris.
- Develop a communications framework and consistent regional messaging for the public, media and decision-makers.
- Develop survey and monitoring tools to be integrated with the communications framework.
- Develop science-based protocols for assessment and management response.

Workshop Product

The workshop product will be a **Tsunami Biofouling Response Framework** which may include:

- A regional science-based approach to communicating with the public, media partner agencies and organizations on potentially invasive species on JTMD.
- Addition of a biofouling and marine invasive species component to the existing NOAA Marine Debris Program Shoreline Survey Field Guide and marine debris reporting system.
- A Decision Support and Scientific Assessment System used to determine the appropriate level of response.
- An organizational structure that clarifies jurisdictional roles and responsibilities.

The **Tsunami Biofouling Response Framework** will be:

- Voluntary.
- Adaptive & practicable.
- Based on sound science.
- Applicable to the coastal and off shore JTMD impact zone.
- Designed to work within or be superseded by any potential federal and state mandates.
- Developed based on existing state protocols and practices as a starting point.

Special thanks to the workshop planning team:

Margaret M. (Peg) Brady, NOAA
Steve Brandt, Oregon Sea Grant
James T. Carlton, Williams-Mystic Marine Studies Program
Sam Chan, Oregon Sea Grant
Lisa DeBruyckere, Oregon Invasive Species Council
Robyn Draheim, Portland State University & U.S. Fish and Wildlife Service
Melissa Errend, Oregon Sea Grant
Stephanie Kavanaugh, NOAA
Wan-Jean (Jean) Lee, NOAA
Susan Pasko, NOAA
Mark Systma, Portland State University
Nancy Wallace, NOAA

Suggested Group Norms:

- Cell phones off or on vibrate
- Listen to understand (one person speaks at a time)
- All ideas have value
- All input is of equal value, be concise when giving your input

Day 1 (9:00am-5:00pm)

9:00 am	**Welcome to Portland State University & Workshop Overview – Mark Systma, Portland State University & Stephen Brandt, Oregon Sea Grant**
9:15 am	**Participant Introductions & Agenda Review – Peg Brady, ANSTF Acting Co-Chair & Stephanie Kavanaugh, NOAA Facilitator**
9:30am	**NOAA's Marine Debris Program Response to the Japan Tsunami Marine Debris – Nancy Wallace, Director NOAA Marine Debris Program** *Objective: Increase understanding of NOAA's Marine Debris Program and efforts to date on the Japan Tsunami debris response.*
10:15am	**Risk of Marine Invasive Species Associated with JTMD – James T. Carlton, Director, Williams-Mystic Marine Studies Program** *Objective: Increase understanding of the invasive species associated with the tsunami marine debris and the potential implications.*
11:00 am	**BREAK**

11:15am	**State JTMD Response Panel: Update on State Response and Actions** **-Tammy Davis, Alaska Department of Fish and Game** **-Tom Therriault, Canada Department of Fisheries and Oceans** **-Allen Pleus, Washington Department of Fish and Wildlife** **-Caren Braby, Oregon Department of Fish and Wildlife** **-Susan Ellis, California Department of Fish and Game** **-Sonia Gorgula, Hawaii Department of Land and Natural Resources** *Objective: Panelists will provide an update regarding their jurisdiction's efforts to address biofouling and AIS as a result of the JTMD. Increase understanding of the opportunities, risks, and limitations for multiple jurisdictional programs & strategies.*
12:30pm	**LUNCH** (on your own for workshop participants) (Note: PSU will be providing lunch for workshop volunteers, i.e. break out group facilitators & recorders)
2:00pm	**Regional Tsunami Debris/Biofouling Protocol Team – Susan Pasko, Team Leader** *Objective: Present response & research protocols and answer participant questions. Team members will be noted.*
2:30pm	**Regional Communication & Coordination Team – Wan-Jean Lee, Team Leader** *Objective: Present draft communications framework and answer participant questions. Team members will be noted.*
3:00 pm	**BREAK**
3:15pm	**Breakout Sessions – Facilitators** *Objective: Gather input on the draft risk communications framework and response & research protocols.* *Participants should have reviewed the straw document prepared by the work groups.*
4:45pm	**Wrap-Up – Peg Brady**
5:00pm	**ADJOURN**

Day 2 (8:30 am-2:30pm)

8:30am	**Welcome and Day 2 Overview – Peg Brady & Stephanie Kavanaugh**
8:45am	**Day 1 Report-Outs & Feedback – Breakout Group Members** *Objective: Share recommendations from Day 1 breakout groups*
10:00am	**BREAK**
10:15am	**Scenario Exercise Breakout Groups** *Objective: Validate the communications framework and response/research protocol*
11:45am	**LUNCH** (on your own for workshop participants) (Note: PSU will be providing lunch for workshop volunteers, i.e. break out group facilitators & recorders)
1:15pm	**Report-Outs – Scenario Exercise Breakout Group Members**
2:15pm	**Next Steps – Peg Brady & Stephanie Kavanaugh**
2:30pm	**ADJOURN**

Invited Participant List

Name	Agency/Organization
Adams, Jeff	Washington Sea Grant, Marine Water Quality Specialist
Allain, Ryan	U.S. Coast Guard
Allen, Sarah	National Park Service
Allison, Steve	Hoh Tribe, Washington
Anderson, Kevin	Puget Sound Partnership
Antrim, Liam	National Marine Sanctuary Olympic Coast
Arvai, Joe	University of Calgary
Barber, Anthony	Environmental Protection Agency
Barnea, Nir	NOAA Marine Debris Program
Barth, Jack	Oregon State University Earth and Ocean Sciences
Bautista, Shawna	National Forest Service
Beard, Rita	National Park Service
Blodgett, Jono	Hawaii Department of Land and Natural Resources
Boatner, Rick	Oregon Department of Fish and Wildlife
Boehlert, George	Oregon State University, Hatfield Marine Sciences Center
Bostrom, Ann	University of Washington
Braby, Caren	Oregon Department of Fish and Wildlife
Brady, Margaret (Peg)	NOAA Fisheries, ANSTF & NISC
Brandt, Stephen	Oregon Sea Grant
Brown, Chris	California State Lands Commission
Brown, Wendy	Washington Invasive Species Council
Bruine, Wandi	Carnegie Mellon University
Butler, Tim	Oregon Department of Agriculture
Buttrick, Steve	The Nature Conservancy
Caldwell, Mike	Oregon Office of Emergency Management
Capurso, James	National Forest Service
Carlisle, Ladonna	Bureau of Indian Affairs
Carlson, Dorn	NOAA National Sea Grant Office
Carlton, James	Williams College
Carmen, Stephanie	Bureau of Land Management
Chan, Sam	Oregon Sea Grant
Chapman, John	Oregon State University, Hatfield Marine Sciences Center
Christie, David	Alaska Sea Grant
Cohen, Andrew	San Francisco Estuary Institute
Cone, Joe	Oregon Sea Grant
Cullen, Alison	University of Washington
Culver, Carolynn	California Sea Grant
Dalton, Penelope D.	Washington Sea Grant

Davidson, Ian	Portland State University
Davis, Tammy	Alaska Department of Fish & Game
DeBruyckere, Lisa	Oregon Invasive Species Council
Deschu, Nancy	Department of Interior, Bureau of Ocean Energy Management
Doelker, Albert	Bureau of Land Management
Dolliver, Jane	Coastal Observation and Seabird Survey Team
Dolphin, Glenn	Oregon Marine Board
Donohue, Mary	Hawaii Sea Grant
Doyle, Jamie	Oregon Sea Grant
Draheim, Robyn	Portland State University, U.S, Fish and Wildlife Service
Duguay, Linda	University of Southern California Sea Grant
Eckman, James	California Sea Grant
Ellis, Susan	California Department of Fish and Game
Errend, Melissa	Oregon Sea Grant
Everett, Richard	U.S. Coast Guard
Fisher, Joshua	U.S. Fish and Wildlife Service
Floyd, Mark	Oregon State University
Foss, Steve	California Department of Fish and Game
Freitag, Gary	Alaska Sea Grant
Gaffney, Kaitilin	Ocean Conservancy
Geller, Jonathan	Moss Landing Marine Laboratories
Gerwein, Joel	California Coastal Conservancy
Gilmartin, Bill	Hawaii Wildlife Fund
Godwin, Scott	NOAA Marine Debris Program
Gorgula, Sonia	Hawaii Department of Land and Natural Resources
Graham, Fritz	Representative for Senator Wyden
Grau, Gordon	Hawaii Sea Grant
Hagen, Jennifer	Quileute Nation, Washington
Hansen, Dave	Oregon Sea Grant
Hansen, Gayle	Oregon State University
Hanshumaker, Bill	Oregon State University, Hatfield Marine Sciences Center
Hatch, Keith	Department Of Interior, Bureau of Indian Affairs
Herborg, Leif-Matthias	British Columbia Ministry of Environment
Hirsch, Christine	National Forest Service
Hooff, Rian	Department of Environmental Quality
Ielmini, Mike	National Forest Service
Ikeda, Diane	National Forest Service
Illes, Nancy	Fisheries & Oceans Canada
Imai, Randy	California Department of Fish and Game
Johnson, Phillip	Coast Watch
Kaulukukui, Guy	Hawaii Department of Land and Natural Resources

Kenagy, Meg	Oregon Department of Fish and Wildlife
Kramer-Wilt, Errin	California Ocean Science Trust
Kurapov, Alexander	Oregon State University
Lee, Wan-Jean	NOAA National Sea Grant Office
Lippiatt, Sherry	NOAA Marine Debris Program
Lohrman, Bridgette	Environmental Protection Agency
Lonhart, Steve	National Marine Sanctuary, Monterey Bay
Mangin, Susan	Aquatic Nuisance Species Task Force
Mann, Ryan	Representative for Congresswoman Bonamici
Manyak, Anna	NOAA Marine Debris Program
Martin, Craig	U.S. Fish and Wildlife Service
Martin, Stacia	Representative for Congressman Schrader
MCCann, Linda	Smithsonian Environmental Research Center
McCreedy, Cliff	National Park Service
McMartin, Louanne	U.S. Fish and Wildlife Service
Miller, Ian	Washington Sea Grant
Miller, Jessica	Oregon State University
Miller, Whitman	Smithsonian Environmental Research Center
Mingo, Peter	U.S. Coast Guard
Mooney, Jamie	Washington Sea Grant
Owen, Wayne	National Forest Service
Parker, Blaine	Columbia River Intertribal Fish Commission
Parker, Heather	U.S. Coast Guard
Parrish, Julia	Coastal Observation and Seabird Survey Team
Pasko, Susan	NOAA Fisheries
Phillips, Stephen	Pacific States Marine Fisheries Commission
Pleus, Allen	Washington Department of Fish and Wildlife
Recht, Fran	Pacific States Marine Fisheries Commission
Rice, Jeep	NOAA Alaska Fisheries Science Center
Rich, Cecil	U.S. Fish and Wildlife Service
Rolfe, Jason	NOAA Marine Debris Program
Ruiz, Greg	Smithsonian Environmental Research Center
Rumrill, Steve	Oregon Department of Fish and Wildlife
Sanderson, Beth	NOAA Northwest Fisheries Science Center
Sarf, Dana	Makah Nation, Washington
Schaefer, John	Confederated Tribes of Coos
Scianni, Chris	California State Lands Commission
Senner, Stan	Ocean Conservancy
Shaw, Linda	NOAA Fisheries
Sherman, Ben	NOAA Public Affairs
Shiba, Sharon	California Department of Fish and Game

Siegel, Marc	Representative for Senator Merkley
Sims, Gary	NOAA Fisheries
Smith, Ron	U.S. Fish and Wildlife Service
Snow, Patty	Oregon Department of Land Conservation and Development
Stein, John	NOAA Northwest Fisheries Science Center
Stensvold, Mary	National Forest Service
Steves, Brian	Smithsonian Environmental Research Center
Stewart, Dale	Bureau of Land Management
Systma, Mark	Portland State University
Teucher, Andy	British Columbia Ministry of Environment
Therriault, Thomas	Fisheries & Oceans Canada
Thom, Barry	NOAA Fisheries
Thompson, Jonathan	U.S. Fish and Wildlife Service
Thorkilson, Kelly	U.S. Coast Guard
Umezawa, Miho	NOAA National Sea Grant Office
Underwood, Jeff	U.S. Fish and Wildlife Service
Unthank, Amy	National Forest Service
Varghis, Jacob	U.S. Coast Guard
Volkoff, Martha	California Department of Fish and Game
Wallace, Nancy	NOAA Marine Debris Program
Weimer, Mike	U.S. Fish and Wildlife Service
Williams, Lori	National Invasive Species Council
Woodruff, Patricia	British Columbia Ministry of Environment
Woollven, Katie	Hawaii Wildlife Fund
Yender, Ruth	NOAA Marine Debris Program
Zabin, Chela	Smithsonian Environmental Research Center
Zhuikov, Marie	University of Minnesota