National Park Service Marine Debris Response and Concerns about Invasive Species
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Marine debris is a pervasive problem on Alaskan shorelines. With over 55,000 miles of coastline, the challenges of responding to the threat are immense. Although marine debris is not a new problem, the monstrous Japan tsunami in 2011, and the 5 million tons of debris it pulled into the ocean, gave the issue new life and new concerns for the environmental consequences of marine debris on our shorelines. Among those concerns is the possibility of marine organisms native to Japanese shores hitching a ride on Japanese tsunami marine debris (JTMD) bound for Alaska. The National Park Service is responding to marine debris washing ashore in Alaska’s nine national parks. Challenges include finding marine debris on remote beaches, prioritizing beaches to clean, getting to the beaches to clean them, and getting the trash off the beaches in remote locations. In this presentation I will summarize the National Park Service marine debris response in Alaska, and how it compliments other agencies. I will also highlight the evidence we have for marine invasive species entering the state on marine debris.
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Marine Debris Comes from a lot of Places

- Commercial and Recreational Fishing e.g. Ghost Nets
- Oil & Gas Platforms
- Cargo & Cruise Ships
- Rivers and Streams
- Storm Water Discharges
- Extreme Events (e.g. Hurricanes)

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Modeled Movement of the Marine Debris Generated by the March 2011 Japan Tsunami

On March 11, 2011, an estimated 5 million tons of debris washed out by the tsunami

Estimated 30% floated away and dispersed

Estimated 70% sank near Japan

Japan Ministry of the Environment estimates that 5 million tons of debris washed into the ocean.

They further estimated that 70% of that debris sank near the coast of Japan soon after the event.

What is Windage?
Winds have a greater effect on the movement of debris with a larger sail area.

Model Results: High windage items may have reached the Pacific Northwest coast as early as winter 2011-2012.

Majority of modeled particles are still dispersed north and east of the Hawaiian Archipelago.

NOAA expects widely scattered debris may show up intermittently along shorelines for a long period of time, over the next year, or longer.

Expected Distribution of Computer Simulated Particles Through Monday, 09/23/13 0700 PDT

NOAA used a computer model to simulate the movement of tsunami debris from March 11, 2011, to the present day. This GNOME model (General NOAA Operational Modeling Environment) simulation is based on ocean surface currents from the US Navy (the Hybrid Coordinate Ocean Model) and winds from NOAA (the NOAA blended wind product). The computer model simultaneously released 1,000 simulated particles from each of 8 locations on the Japan coastline where tsunami wave heights were 3.5 meters or greater. Particles were randomly assigned windage values from 1-5%, meaning that they were moved not only by ocean currents, but were also moved by 1-5% of wind speed in the downwind direction. The dotted black line contains 95% of all simulated particles. The cross-hatched area indicates the region of the highest concentration of simulated debris with 1% windage at the end of the simulation. For more details on this model, please visit marinedebris.noaa.gov. Have you seen tsunami debris? Report it to: DisasterDebris@noaa.gov
Marine Debris Sightings as of September 5, 2013

Sightings
Japan Tsunami Debris
(updated 09/05/13)

Potential
Confirmed

Note: According to NOAA, as possible tsunami debris. Potential sightings (red triangle) indicate objects that may be linked to the tsunami, based on current data sources.
What it looks like . . .

- JTMD tends to be more industrial in nature:
  - Building and Fishing Materials
  - Shipping Materials
  - Cargo Container Contents
  - Foam
  - Drums and Other Containers
  - Docks, Boats & Harbor Debris
  - i.e. more likely to host invasives
Misawa Docks - The Worst Vectors

• Huge structure – 66 feet long – lots of surface area
• Well built, could easily survive crossing the Pacific
• Already in the water before the earthquake
• In harbors or estuaries with lots of boat traffic
• Dozens of non-native species and many known to be invasive elsewhere
• Over $500,000 to dismantle and burn the biota.

Photo by Thomas Boyd
Misawa Docks - The Worst Vectors

- This dock came ashore in Olympic National Park
- 30-50 non-native species
- 4 mile hike one way from a remote unmaintained road
- $728,000 to dismantle
What’s going on in Alaska . . . Dept. Environmental Conservation aerial survey, August 2012 for baseline data
Montague Island, August 2012

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Figure 3. Example of a shoreline section (100m) with yellow circles indicating marked GPS coordinates. Width determines location of GPS coordinates.
What’s going on in Alaska . . . aerial survey, August 2012 for baseline data

Lake Clark NP

Katmai NP

Kenai Fjords NP

Aniakchak NP

Wrangell-St. Elias NP

Glacier Bay NP

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Still, JTMD and invasive species are a huge problem

- Vectors spread out over a huge area – unlike most marine vectors
- NPS has 3600 miles of coastline alone
- Once you get there, if you get there, how do you get the debris off?
- Limited time, limited staff, limited resources
- Prioritization and monitoring are the strategy

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Good News

We haven’t found as much marine debris as we feared . . . So far
Bad News

We have found one confirmed invasive species from Japan, *Megabalanus rosa*.
Good News*

• All dead
• Known thermal range 3°F above warmest water temp in the area
• Only JTMD invasive found in Alaska so far
• *Life find a way
Bad News

• There are two more docks still out there somewhere.
• One was last seen off Hawaii in Sept. 2012.
• Could come ashore in Alaska and remain undetected for a long time.
• Successful invasion could also go undetected for a long time.
Good News

• Not all Japanese Tsunami debris is likely to have invasive species - Much of it will not have been in the water long enough.
• 2013 saw a change in composition from harbor-type debris to house and construction-type debris.
• 2013 debris less than 2012, but still more than 2011.
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