# Fukushima and Alaska Fish

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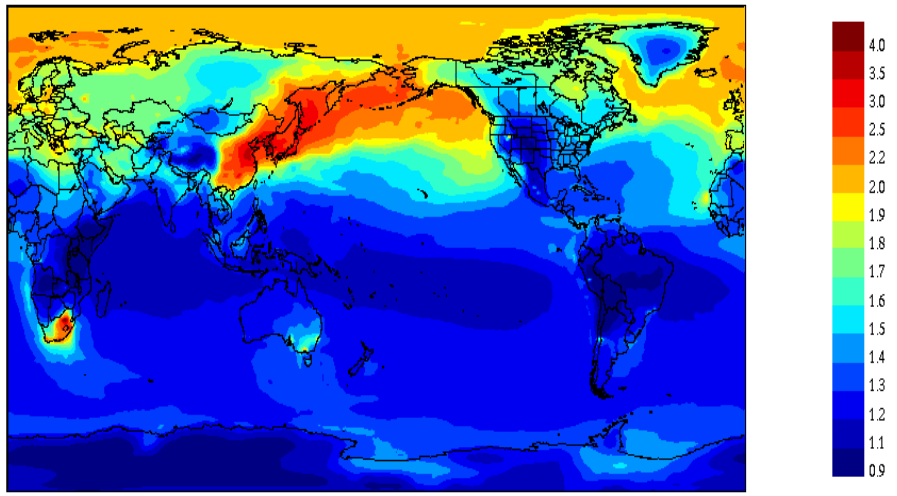
# Sources of Environmental Contaminants

- Local
  - Natural Geologic sources, forest fires
  - Cities and Industrial production
  - Military Sites
  - Resource Extraction- mines, oil exploration

- Long Range Transport
  - Atmospheric
  - Ocean Currents
  - Animal migration
  - Commercial transport



# Fish Monitoring Program:

- **General Survey of Alaskan Fishes:**
  - Commercial , Subsistence, Recreational species
  - Collaborative Effort for sample collection
    - Federal and State agencies, commercial, recreational and subsistence fish harvest

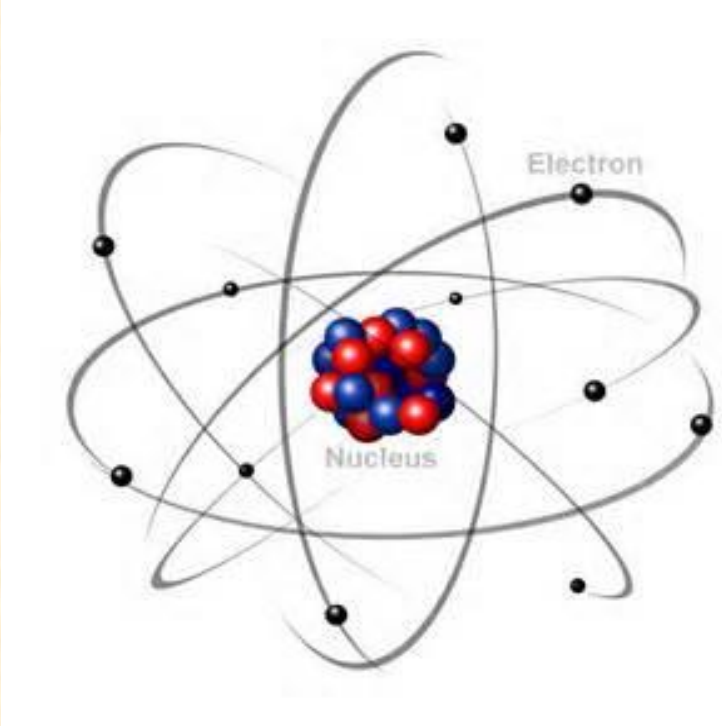
- **Selected coastal sites:**
  - Remote communities and villages
  - Adjacent to anthropogenic activities
    - cities, discharges/runoff
  - Historic mining sites

# Evaluate Alaskan fish and invertebrates:

- Measure contaminant levels in skinless fillet and whole fish from freshwater, estuaries and marine environments

- Data is used to:
  - Determine if there are any areas, species, or contaminants that warrant more in-depth sampling and evaluation.
  - Provide Alaskan residents with information to make an informed dietary decision based on Risks and Benefits of eating Alaskan Fish
- **2014** Updated Fish Consumption Advice for Alaskans

# 2014 FDA Testing of Alaskan Fish for Fukushima Radiation



# 2011 Initial Response

- Japan and International Agencies Monitor local discharges from the site:
  - Air, Water, Agricultural and Marine Products
- **Primary concern:**
  - Long Range transport by Atmospheric Transport
- Monitor Atmospheric Deposition
  - Collections Sites:
    - Across West Coast of the US,
    - Canada,
    - Alaska

Cs-134

# Emergency Steps – Fukushima

- In 2011 state and federal agencies in Alaska issued joint press release indicating safety of wild foods
- Concerns remained of fish contaminated with Fukushima-related radiation
- State websites discussed radiation monitoring, exposure, and health risk
  - communicated safety of fish, air, water, etc. media

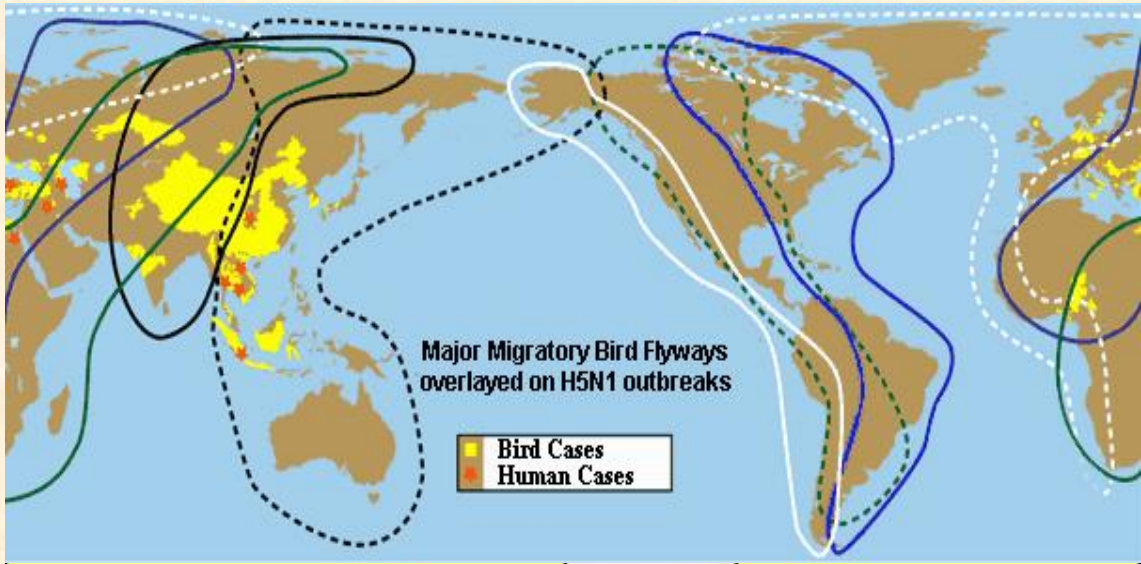
Sr-90

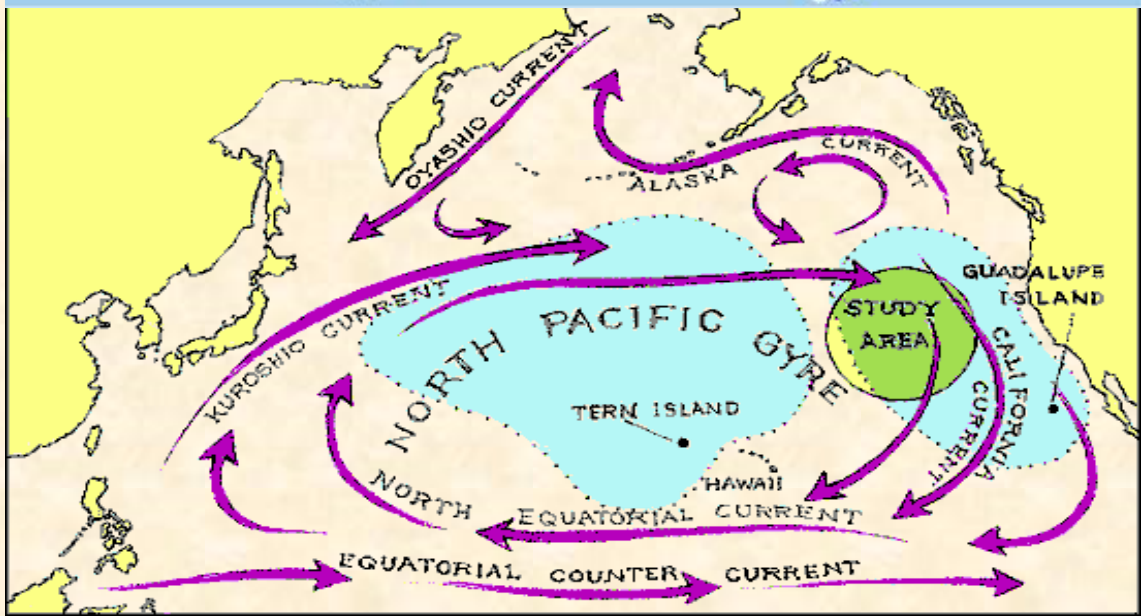
I-131

Cs-137

# Other Long Range Transport Concerns

- Migrating wildlife:
  - Birds
  - Fish
  - Marine mammal
- Ocean Currents :
  - Fish
  - Water
  - Marine Debris



# Fukushima

- Initiated an interagency call with all Pacific states, Canada, federal agencies, tribal agencies, and academics
  - Compile public concerns
  - Compare biota and other media for radionuclides
- Worked with the FDA to test Alaska fish for radionuclides
- Communicated information via press releases, tribal calls, and citizen calls
- Continue to communicate information at conferences and conference calls

# Fish Species

- FDA evaluation of species:
  - Important commercial species – consumption rate
  - Volume of harvest - economical
    - Two species of Tuna (Pacific Albacore, Pacific Bluefin)
    - North Pacific Salmon – from the Pacific Northwest

- Alaskan Species (> half of US catch from the North Pacific)
  - Commercial importance: consumption and harvest
    - Pollock 2 million metric tons
    - Pacific cod 65,000 metric ton
    - Sablefish 30,000-40,000 metric tons
    - Halibut 24.5 million pounds of
    - Salmon > 146 million fish

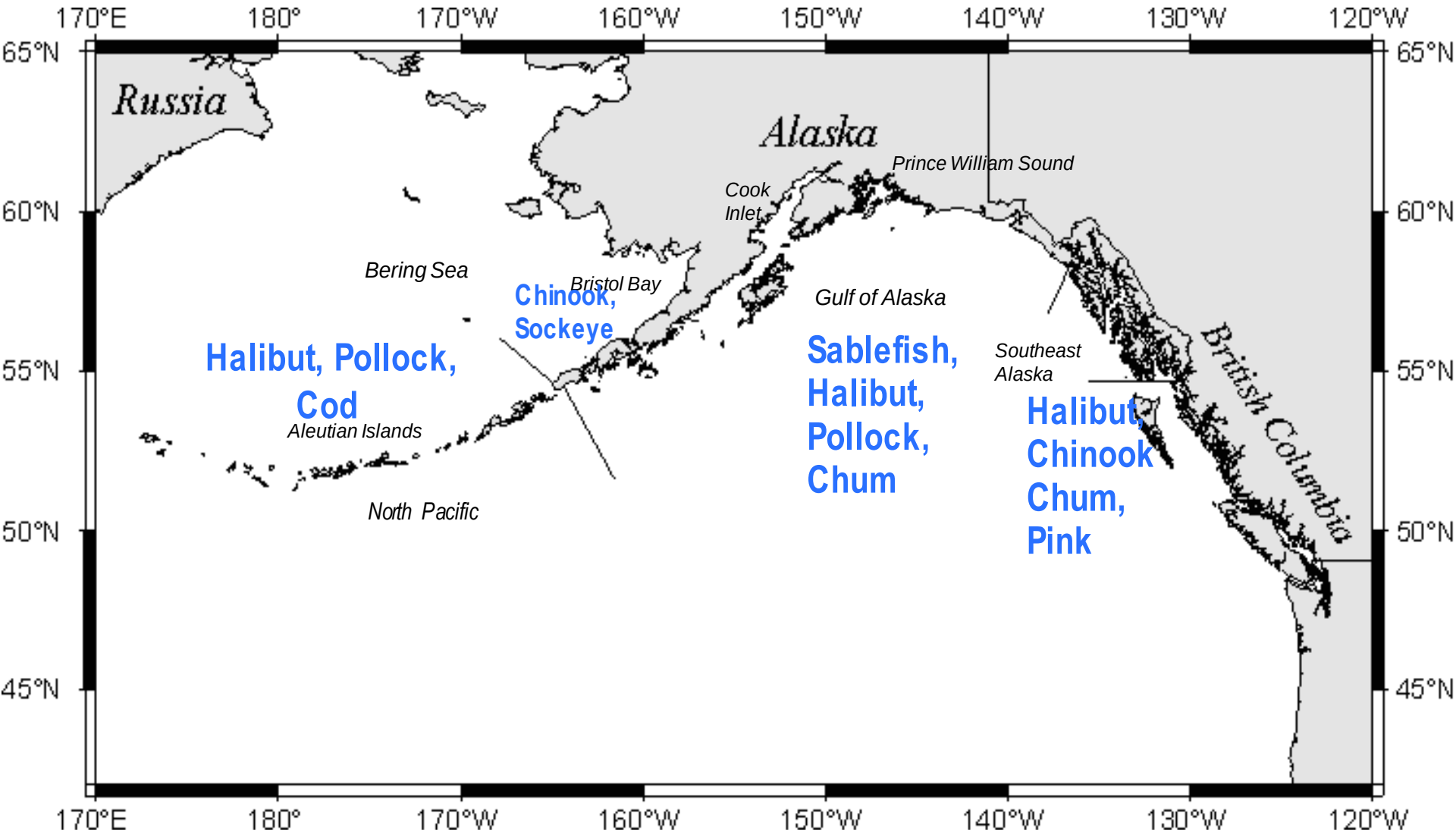
# Fish: collection & analysis

- 20 Samples from Alaska
- Fish collected using FDA statistical protocols by ADEC Staff from commercial processors
- Composites samples (4 – 10 fish per sample) of 4 pounds
- FDA Winchester Laboratory – specialized lab
  - Testing of commercial foods- domestic, imports
  - FDA Standard analytical techniques
    - High resolution gamma spectrometry

# Alaskan Radionuclide Monitoring

- Selection of 8 Species of fish:
  - Pollock, Cod, Halibut, Sablefish
  - Salmon: Chinook, Chum, Sockeye, Pink
- 4 regions covering Alaska Coastal Waters
  - Aleutian Islands/Bering Sea
  - Bristol Bay
  - Gulf of Alaska
  - Southeast
- Collection at start and at the end of 2014 fishing season

# Where were samples collected?



# What was measured?

- Cs-134 (Cesium) (2-year half life – usually indicates fresh release)
- Cs-137 (Cesium) (30-year half life – can indicate old or fresh release)
- I-131 (Iodine)
- K-40 (Potassium)

# Results

- No detections of Fukushima-related radionuclides (I-131, Cs-134, Cs-137)
- Detections of only naturally occurring radionuclide Potassium-40 (K-40)

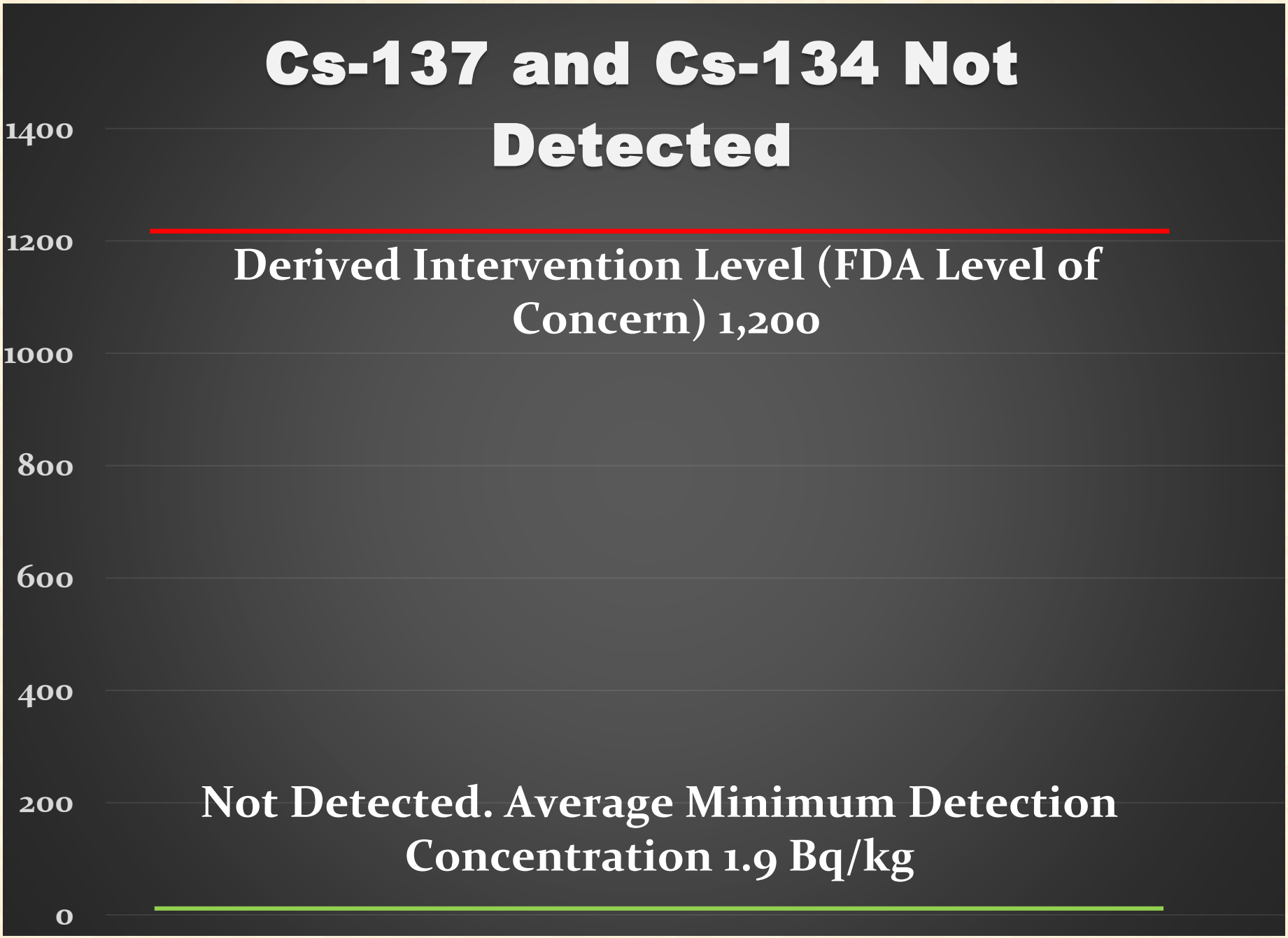
| Area | Species | I-131 | MDC* | Cs-134 | MDC* | Cs-137 | MDC* |
|---|---|---|---|---|---|---|---|
| Aleutian / Bering Sea | Pollock | ND | 3.55 | ND | 2.12 | ND | 2.06 |
| | Halibut | ND | 3.00 | ND | 1.93 | ND | 1.82 |
| | Pollock | ND | 3.86 | ND | 2.56 | ND | 1.97 |
| | Pollock | ND | 6.13 | ND | 2.00 | ND | 2.01 |
| | Cod | ND | 3.71 | ND | 2.42 | ND | 1.98 |
| | | | | | | | |
| Bristol Bay | Chinook | ND | 3.71 | ND | 2.08 | ND | 1.88 |
| | Sockeye | ND | 3.39 | ND | 1.92 | ND | 1.64 |

***Minimum Detectable Concentrations** = analytical detection limits

# Results

| Area | Species | I-131 | MDC* | Cs-134 | MDC* | Cs-137 | MDC* |
|---|---|---|---|---|---|---|---|
| Gulf of Alaska | Sablefish | ND | 2.11 | ND | 1.96 | ND | 1.68 |
| | Sablefish | ND | 2.72 | ND | 2.31 | ND | 1.86 |
| | Halibut | ND | 2.67 | ND | 2.13 | ND | 1.94 |
| | Halibut | ND | 2.34 | ND | 1.75 | ND | 1.51 |
| | Pollock | ND | 3.41 | ND | 1.88 | ND | 1.77 |
| | Pollock | ND | 5.92 | ND | 2.07 | ND | 1.74 |
| | Chum | ND | 5.97 | ND | 2.23 | ND | 1.76 |
| | Chum | ND | 5.29 | ND | 1.88 | ND | 1.72 |
| | | | | | | | |
| Southeast | Halibut | ND | 3.31 | ND | 1.81 | ND | 1.67 |
| | Halibut | ND | 6.07 | ND | 1.94 | ND | 1.91 |
| | Chinook | ND | 5.05 | ND | 1.8 | ND | 1.79 |
| | Chum | ND | 9.99 | ND | 1.8 | ND | 1.4 |
| | Pink | ND | 10.61 | ND | 2.08 | ND | 2.05 |

# Cs-137 and Cs-134 Not Detected



# What are the risks?

Is the FDA DIL protective of subsistence or upper end fish consumers?

- We assumed
  - 273 pounds (124 Kg) per year consumption of a variety of fish over a 70-year period
  - Radionuclide level was at the limit of detection of FDA analytical method
- We found
  - Excess cancer risk = 1 - 10 cancers in every 10,000,000 persons exposed (*i.e.*, very low)

**There is no appreciable risk to Alaskans' health from Fukushima-related radionuclides in Alaska Fish**

# Marine Mammal Testing

| Analysis Result | | Bq/Kg dry weight | |
|---|---|---|---|
| **Sample** | **Location** | **Cs-134** | **Cs-137** |
| Ringed Seal | North Slope, AK | <MDA | 1.07 |
| Bearded Seal | Little Diomede, AK | <MDA | 0.99 |
| Ringed Seal | Point Lay, AK | <MDA | 0.85 |
| Ringed Seal | Hooper Bay, AK | <MDA | 0.55 |
| Ringed Seal | Shishmaref, AK | <MDA | 1.34 |
| Historical data (1996-97) (Cooper et al., 2000) | | | |
| Bearded Seal | North Slope+Canada | Not analyzed | 0.8 |
| Ringed Seal | North Slope+Canada | Not analyzed | 0.6 |
| Spotted Seal | North Slope, AK | Not analyzed | 1.23 |

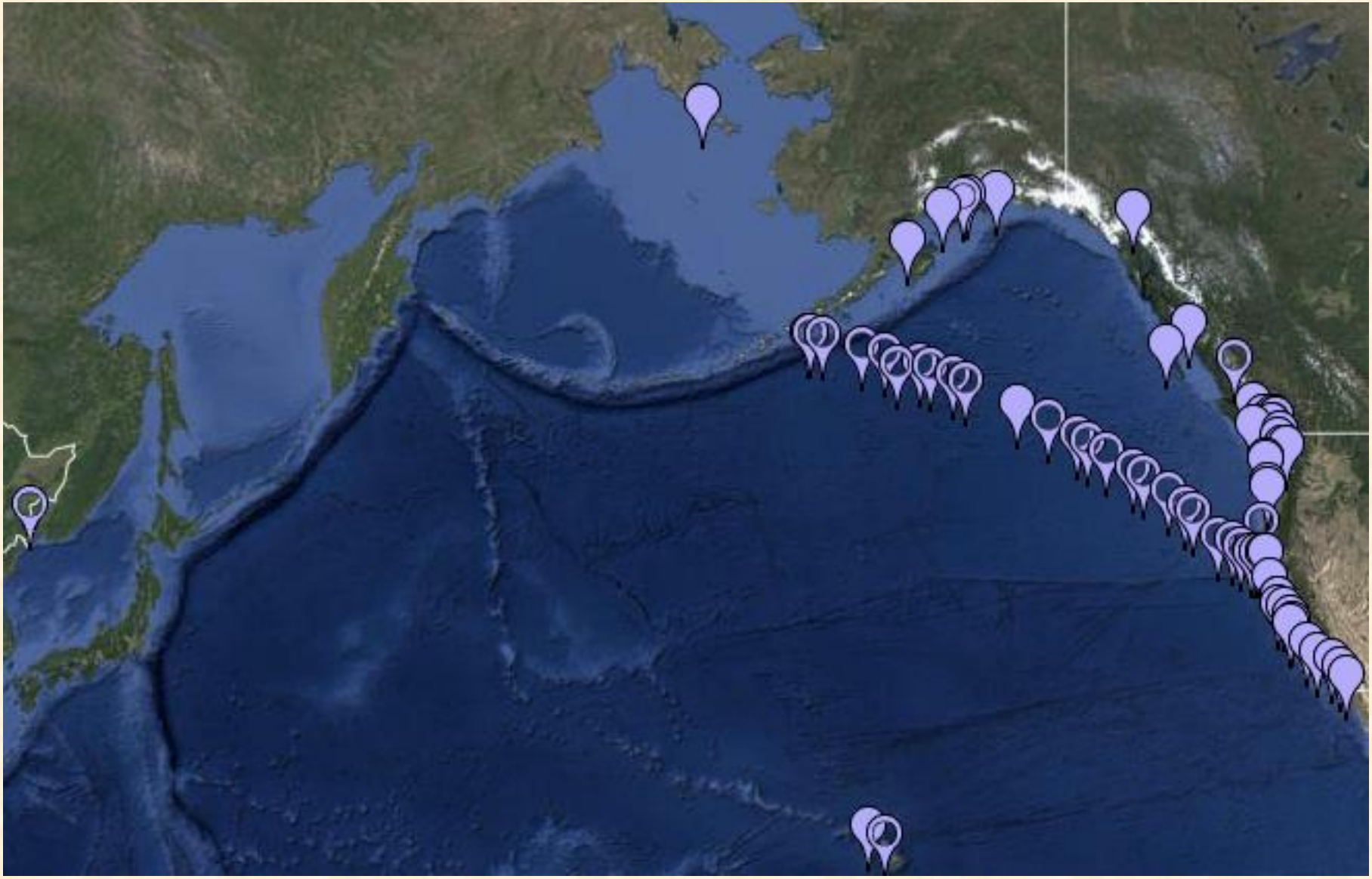
**Dasher et al., 2011**

# What about Water?

**Wood's Hole Crowd Sourcing efforts**

- Collect a container of water, ship to California, get radiation test result for water
  - 5 Alaskan locations
    (St Lawrence Is., Kodiak Is., Cook Inlet, Seward, Prince William Sound)
  - Dozens of other locations, mostly from Pacific Coast
- Detection Limits
  - 0.1 Bq/m3 for 137Cs
  - 0.2 Bq/m3 for 134Cs
  - EPA maximum acceptable level in drinking water = 7,400 Bq/m3

# Woods Hole 2014 Water Samples



www.ourradioactiveocean.org

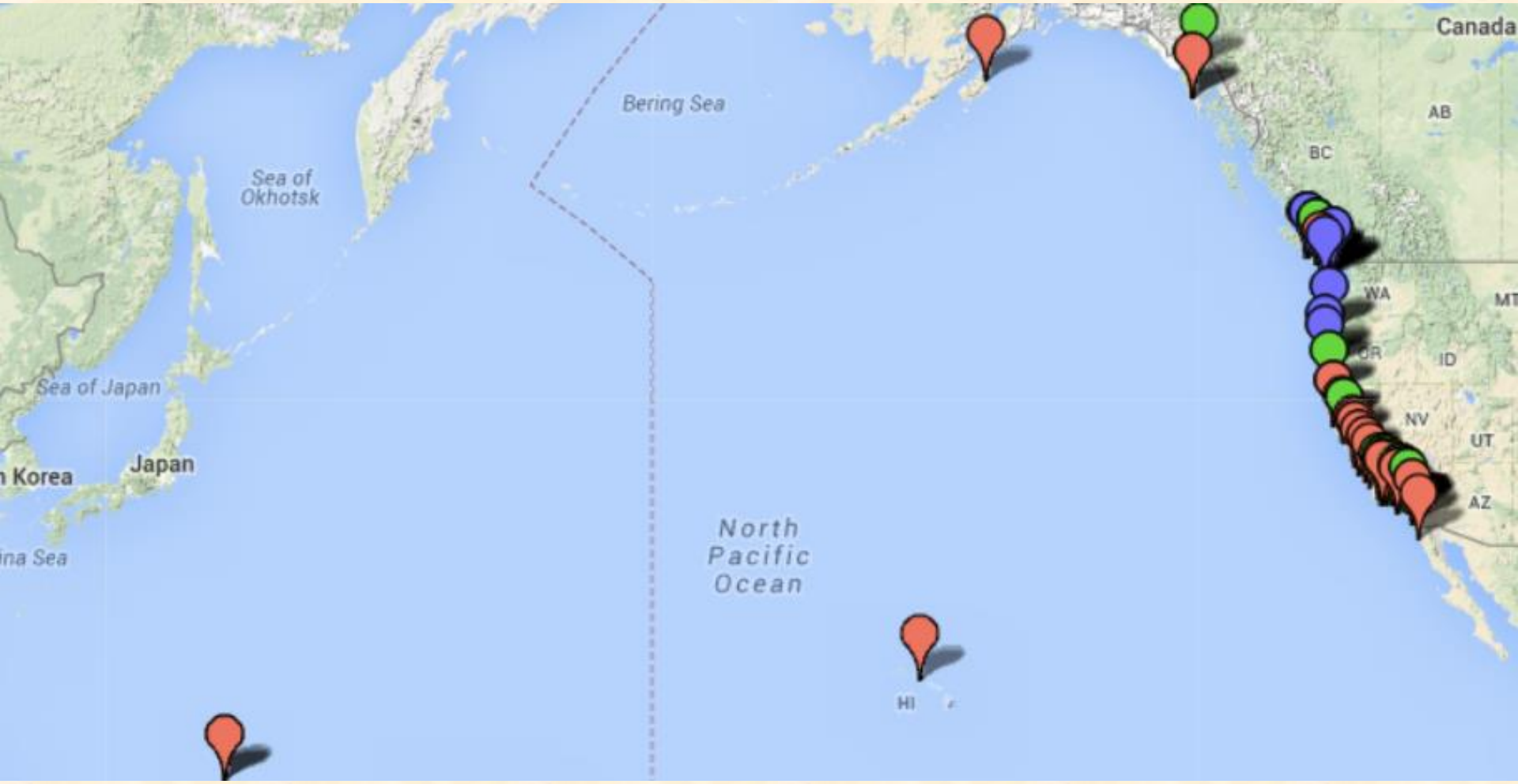
# Water Results

- Nondetect for Cs-134
- Background levels for Cs-137

# KelpWatch

- California researchers test kelp samples for radiation
  - Mostly samples from the Pacific Coast states, including Alaska
- Marine brown seaweeds are known to concentrate Cesium (Cs) and Iodine (I) into their tissues among many other elements.
  - *Macrocystis* tissue Cs levels are 20x that of its concentration in seawater
- If you send them a kelp sample, they will analyze it for free

# KelpWatch


Canada
AB
BC
Bering Sea
Sea of Okhotsk
WA
MT
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Sea of Japan
Japan
North Korea
North Pacific Ocean
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# Results

- 80 samples with no detection for Cs-134 (sign of fresh release like Fukushima).
- Very Low detection of Cs-137 (old and new releases) – background
- Some samples had detectable I-131 – possibly from medical waste in California

# Going Forward…

- No additional testing is planned at this time
- DHSS and ADEC continue to do public outreach & education
- Continued assessment of the situation
  - Federal agencies - NRC, NOAA, EPA, & FDA
  - Alaska state agencies - ASMI, DHSS, DF&G, NSB, DEC
  - Pacific States
  - Academic and Private Institutions

# Contacts

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# Fish Consumption

## Risks

- Contaminants
  - Mercury
  - Persistent Organic Pollutants
  - Other metals

## Benefits

- Omegas-3 fatty acids
- Protein
- Selenium
- Numerous other nutrients
- Sport
- Culture
- Subsistence