

# Fukushima and Alaska Fish



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**Alaska Tribal Conference on Environmental Management**

**October 2014**

# Sources of Environmental Contaminants

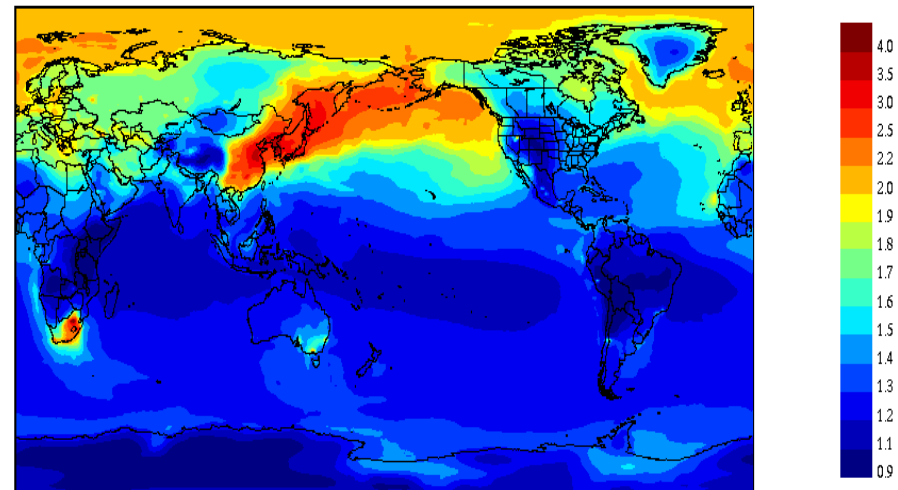
## ● Local

- 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





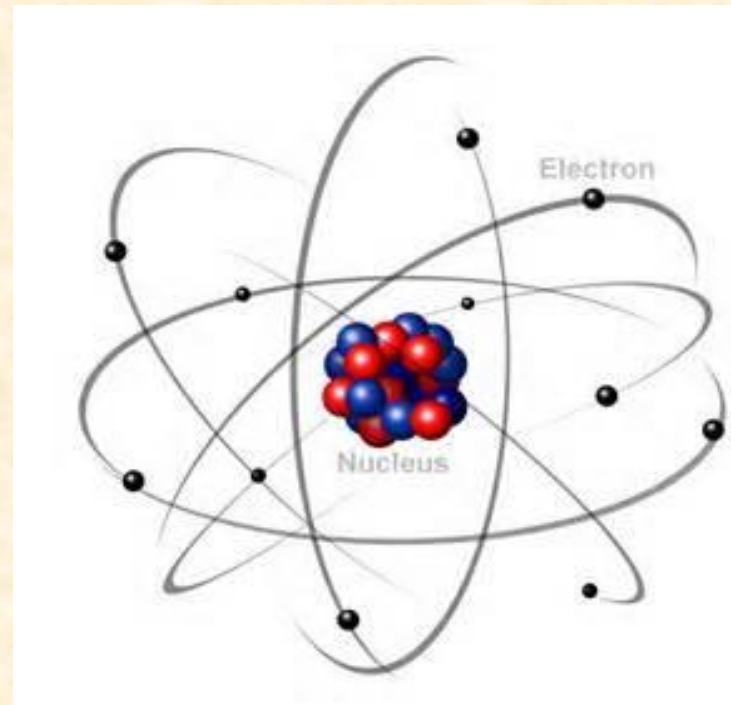
# Evaluate Alaskan fish and invertebrates:

- 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

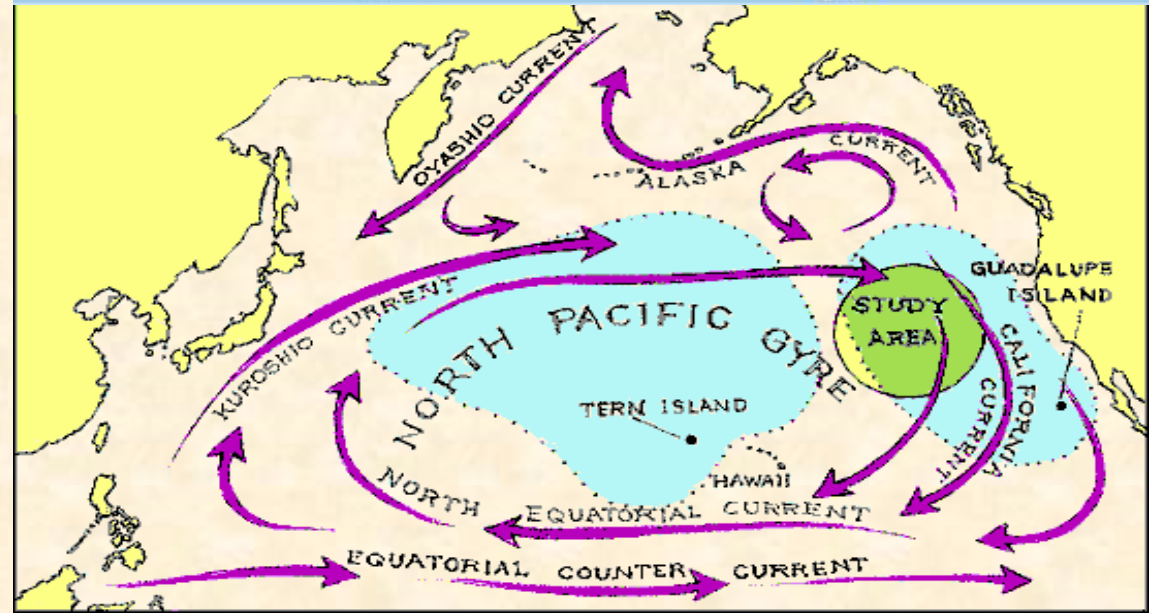
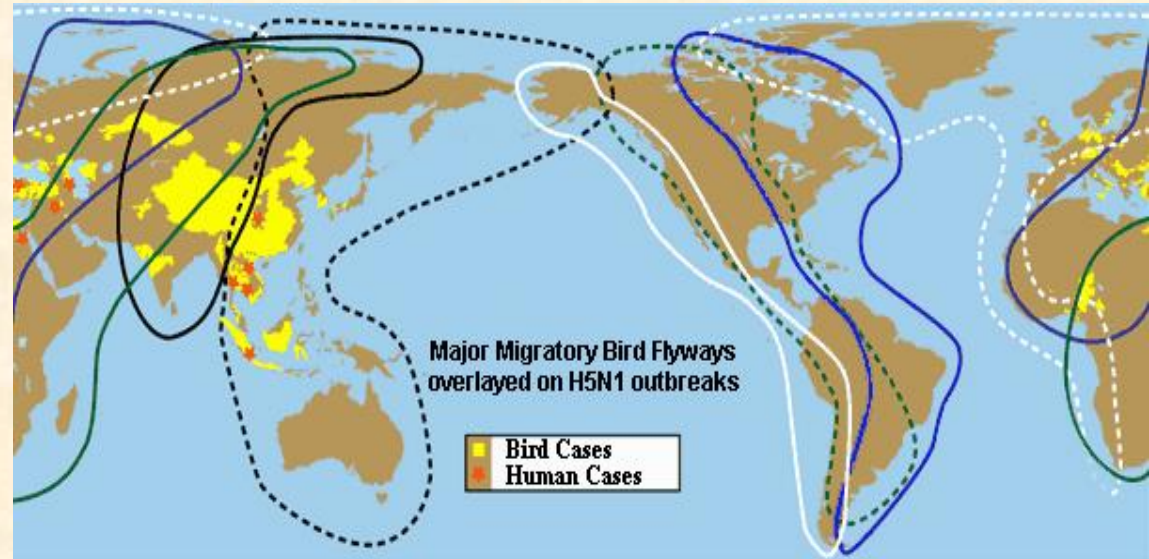
I-131

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

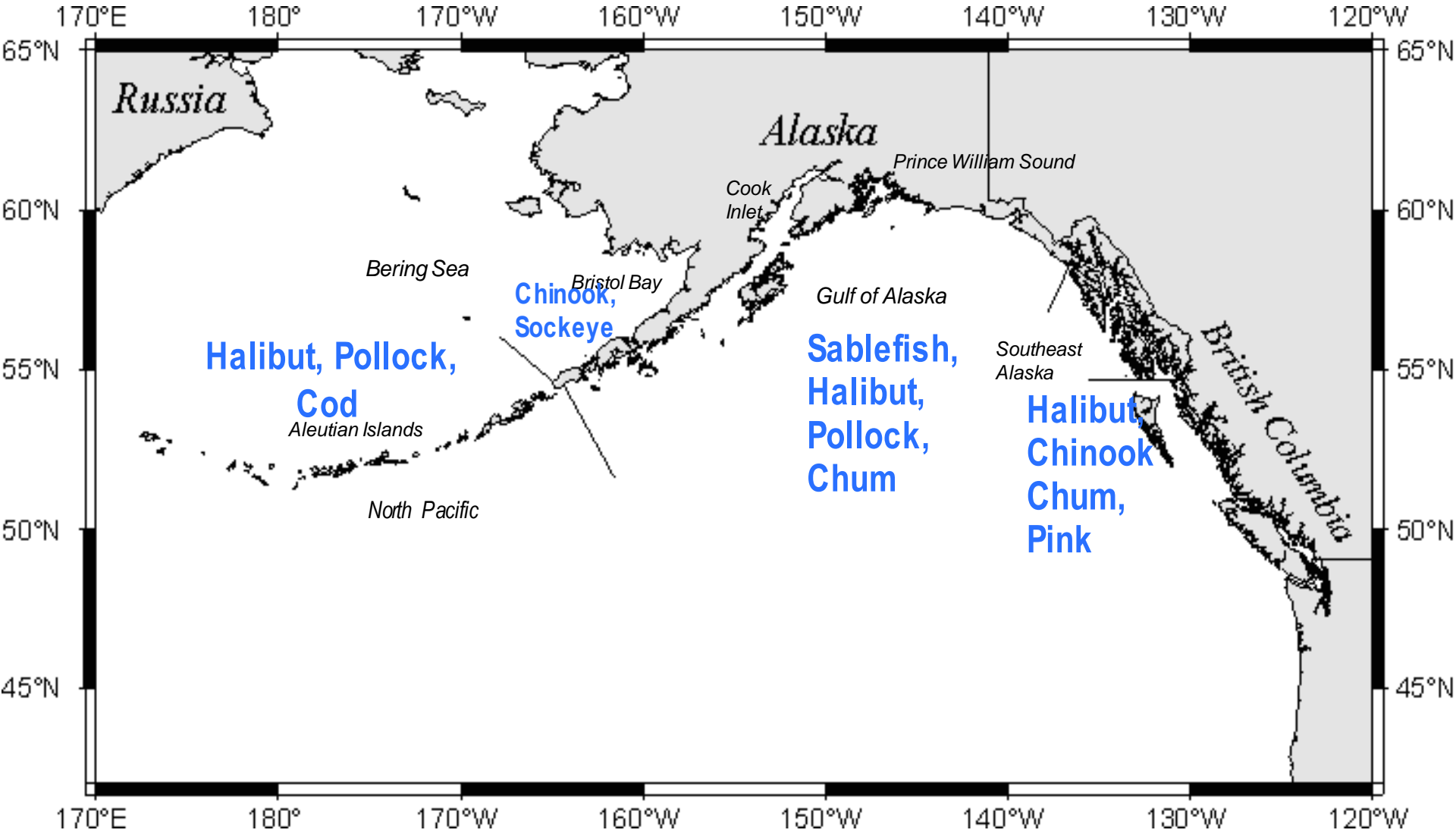
- 20 Samples from Alaska
- Fish collected using FDA statistical protocols by ADEC Staff from commercial processors
- Composites samples (4 – 10 fish per sample) of 4 pounds
- FDA Winchester Laboratory – specialized lab
  - Testing of commercial foods- domestic, imports
  - FDA Standard analytical techniques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

1400

1200

**Derived Intervention Level (FDA Level of Concern) 1,200**

1000

800

600

400

200

**Not Detected. Average Minimum Detection Concentration 1.9 Bq/kg**

0



# What are the risks?

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

- We assumed
  - 273 pounds (124 Kg) 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

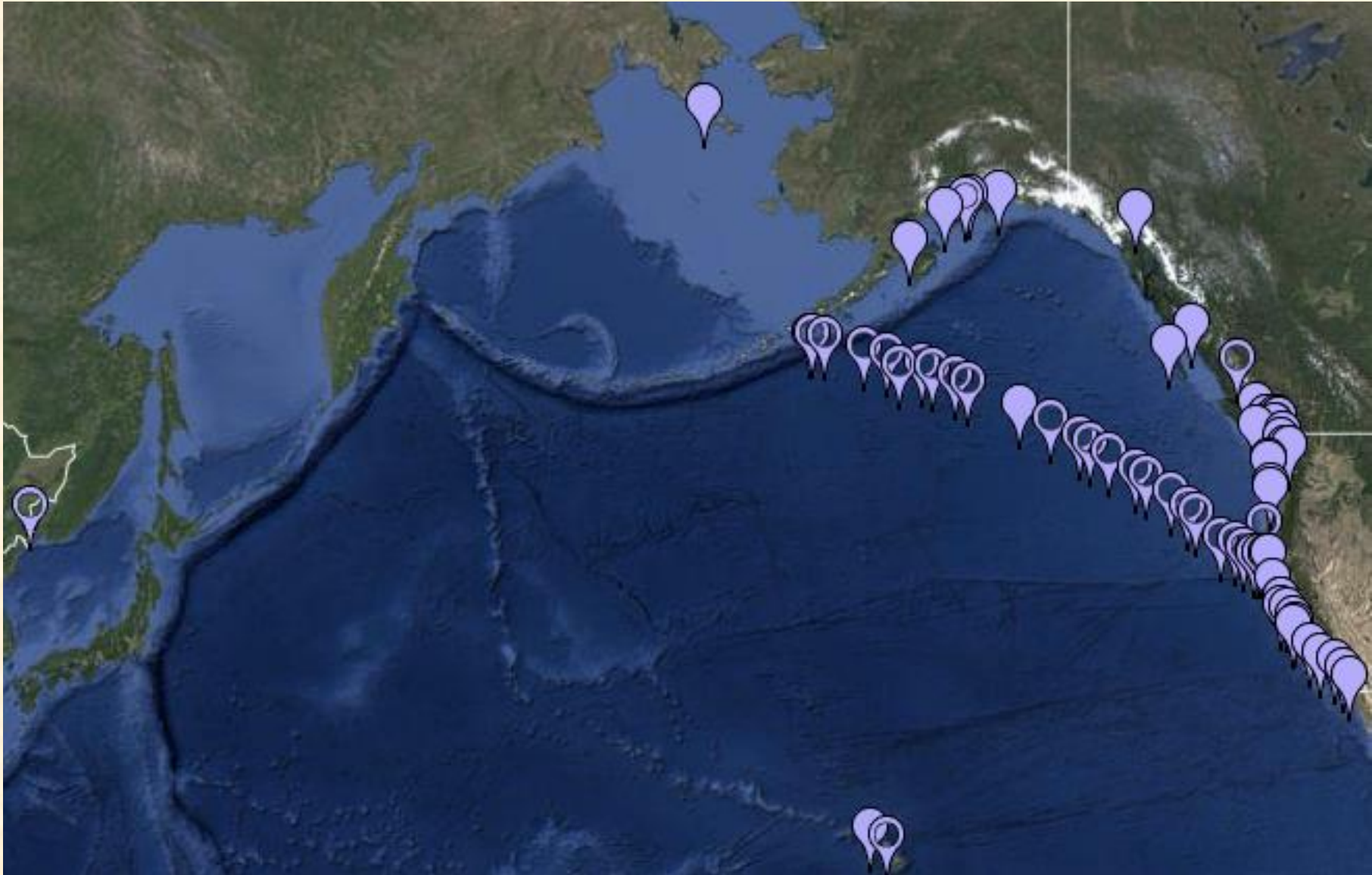
<u>Analysis Result</u>		<u>Bq/Kg dry weight</u>	
<u>Sample</u>	<u>Location</u>	<u>Cs-134</u>	<u>Cs-137</u>
Ringed Seal	North Slope, AK	<MDA	1.07
Bearded Seal	Little Diomedede, AK	<MDA	0.99
Ringed Seal	Point Lay, AK	<MDA	0.85
Ringed Seal	Hooper Bay, AK	<MDA	0.55
Ringed Seal	Shishmaref, AK	<MDA	1.34
Historical 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

# 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/m<sup>3</sup> for <sup>137</sup>Cs
  - 0.2 Bq/m<sup>3</sup> for <sup>134</sup>Cs
  - EPA maximum acceptable level in drinking water = 7,400 Bq/m<sup>3</sup>

# Woods Hole 2014 Water Samples



# Water Results

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



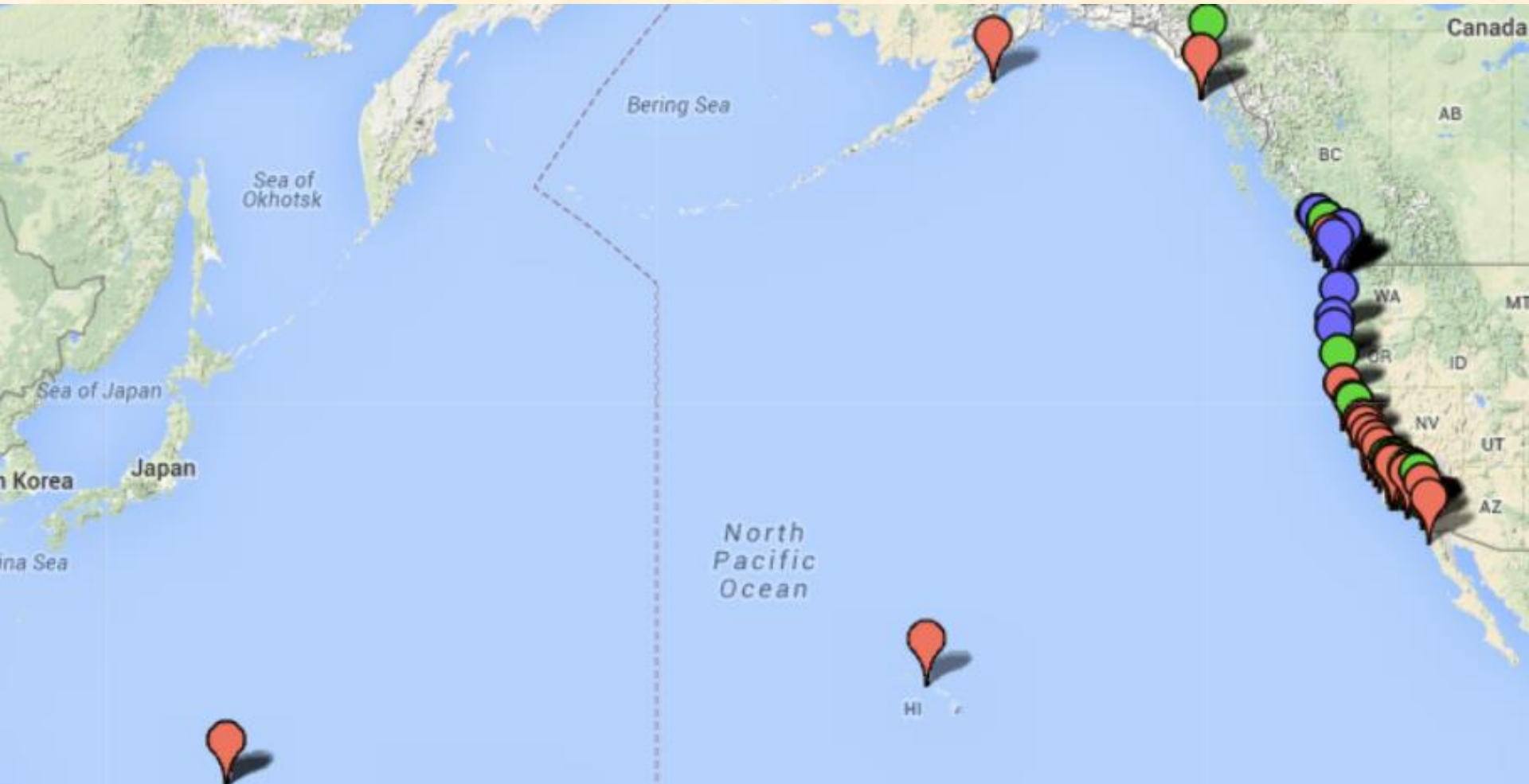


# KelpWatch



- 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



# 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

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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