



# Water Quality Standards Human Health Criteria Update

## Alaska Forum on the Environment 2015

Alaska Department of Environmental Conservation  
Division of Water- Water Quality Standards  
Brock Tabor



# Division of Water

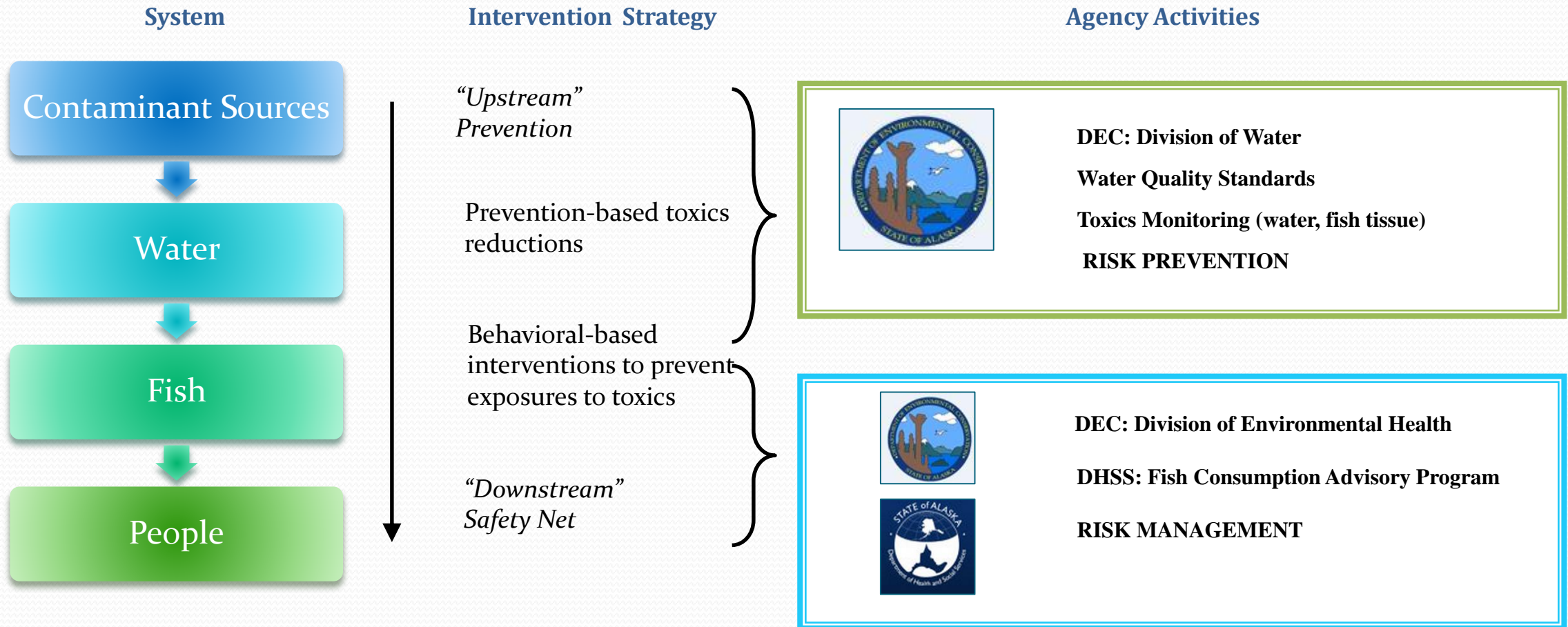
Mission Statement:

Improve and Protect Alaska's Water Quality

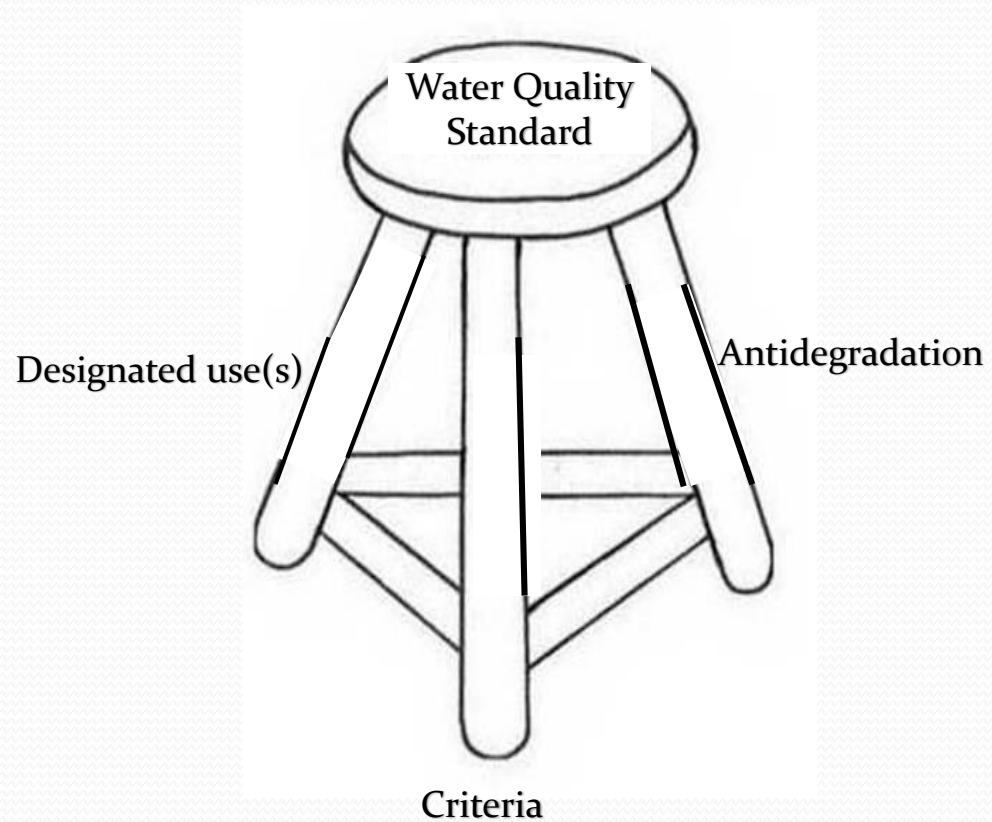
How?

- 💧 **Establishes standards for water cleanliness**
- 💧 Regulates discharges to waters and wetlands
- 💧 Provides financial assistance for water and wastewater facility construction and waterbody assessment and remediation
- 💧 Trains, certifies, and assists water and wastewater facility system operators
- 💧 Monitors and reports on water quality

# State Agency Programs That Address Water Quality Issues



# Foundation of a Water Quality Standard



## *-Defined-*

1. **Designated Uses** – how water is used (e.g. recreational, industrial, aquatic life)
2. **Criteria** - are numeric or narrative values. Consider how much and how long you may be exposed to a substance or condition
3. **Antidegradation** –process for protecting high quality waters



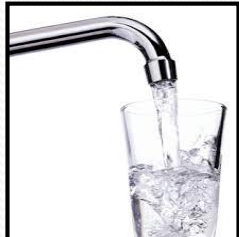
# Water Quality Standards

- 💧 The foundation of state/tribal water quality-based pollution control programs under the Clean Water Act (CWA)
- 💧 Are designed to protect public health or welfare (*designated use*)
- 💧 Provide maximum (generally) concentration of a particular pollutant in the water (*criteria*)
- 💧 Help identify polluted waters; clean-up polluted water, and make sure our waters don't get more polluted

# Human Health Criteria (HHC)



- 💧 designed to **minimize the risk** of adverse effects
- 💧 **chronic (lifetime) exposure** to contaminants
- 💧 **the ingestion of drinking water** from surface water sources
- 💧 **the consumption of fish** obtained from surface waters.



\*



## What are HHC (cont.)

- 💧 Human Health Criteria consider two different exposure scenarios
  - 💧 Consumption of fish
  - 💧 Consumption of fish & ingestion of surface water
- 💧 Several factors to consider...
  - 💧 Population of concern
  - 💧 Mode of effect of the contaminant (acute, chronic, carcinogenic, etc.)
  - 💧 Includes all fish and shellfish- not just what you catch in local waters
  - 💧 Body weight/water consumed/other sources of contaminants (e.g. air)

# HHC in the Inorganic Toxics Criteria Worksheet

Enter the appropriate **Hardness** value for the water you are interested in:  mg/L as CaCO<sub>3</sub> \*\*\*\*

### Calculation of Hardness

adapted from Standard Methods, Method 2340B

units in mg/L

input calcium and magnesium concentrations:

Calcium:

Magnesium:

Resulting Hardness=

color key: orange highlighting: the most stringent criterion

yellow highlighting: the criterion depends on the hardness

all units in micrograms per liter (ug/L)

all units in micrograms per liter (ug/L)

Parameter	Drinking Water	Stockwater	Irrigation Water	Aquatic Life-Fresh Water										Human Health Criteria for NonCarcinogens			
				Acute					Chronic					Water + Aquatic Organisms	Aquatic Organisms Only		
				the criterion is	as	using the conversion factor	the criterion is	as	the criterion is	as	using the conversion factor	the criterion is	as				
alkalinity											20,000 minimum						
aluminum			5,000	750	TR						87	TR					
antimony	6														14	4,300	
arsenic	10	50	100	340	TR	1	340	D	150	TR	1	150	D				
barium	2,000																
beryllium	4		100														
boron			750														
cadmium	5	10	10	0.63	TR	0.994	0.62	D	0.11	TR	0.959	0.11	D				
chloride				860,000								230,000					
chlorine (total residual)				19								11					
chromium (total)	100		100														
chromium III				672.62	TR	0.316	212.55	D	32.15	TR	0.86	27.65	D				
chromium VI		50		16	D				11	D							
cobalt			50														
copper			200	4.50	TR	0.960	4.32	D	3.33	TR	0.960	3.20	D	1,300			
cyanide (as free CN)	200 *			22 **								5.2 **		700	220,000		



# Why is Alaska interested?

- 💧 An accurate **Fish Consumption Rate** is important for the protection of human health and water resources
- 💧 DEC-Environmental Health actively monitors fish tissue
  - 💧 Most Alaskan fish have **low to no** detectable levels of contamination from pollutants
- 💧 Criteria must be scientifically defensible
- 💧 Alaska has tools available to increase/decrease water quality criteria and fish consumption rates using site- specific approach





# How do Fish Advisories and HHC criteria compare?

- 💧 *Fish consumption* in a **Fish Advisory** context
  - 💧 (# of meals per time period that is safe for a person to consume)
    - 💧 E.g,: two 8oz meals of halibut (of a certain size) per week over a lifetime
    - 💧 Data are used to provide consumer protection and consider **beneficial** uses in its risk analysis
- 💧 *Fish consumption* in **HHC** equates to g/day of fish a person consumes on average over a lifetime



# How do we derive criteria? Use the EPA HHC Formula!

- 💧 The formula determines the degree of risk
  - 💧 Risk = Toxicity\* Uncertainty \* Exposure
- 💧 Exposure =  $(BW/DI+(FI*BAF))$ 
  - 💧 BI= Body weight (70 kg)
  - 💧 DI= Drinking water intake (2 liters)
  - 💧 FI = Fish Consumption (varies per state)
  - 💧 BAF= Bioaccumulation Factor (varies per species)

## Input Variables

*BW* = Human Body Weight (adult = 70 kg = 154 lbs)

*DI* = Drinking water Intake (2.0 L/day)

*FI* = Fish Intake, aka consumption rate Value g/ day

*BAF* = Bioaccumulation Factor (L/Kg), chemical specific

*RfD* = Reference Dose, non-carcinogens (mg/Kg-day)

*RsD* = Risk specific Dose, for carcinogens (mg/Kg-day)

*RSC* = Relative Source Contribution

## Human Health Criteria Formulas

Noncancer Effects<sup>2</sup>

$$AWQC = RfD \cdot RSC \cdot \left( \frac{BW}{DI + \sum_{i=2}^4 (FI_i \cdot BAF_i)} \right)$$

Cancer Effects: Linear Low-Dose Extrapolation

$$AWQC = RSD \cdot \left( \frac{BW}{DI + \sum_{i=2}^4 (FI_i \cdot BAF_i)} \right)$$



# What is FCR and How is FCR Calculated?

- 💧 Frequency of consumption \* meal size
- 💧 Frequency can be culturally/regionally influenced
- 💧 Meal size is age and weight dependent
- 💧 Units? g/day or mg/Kg-day? (grams of fish per kg of a person's body weight)
  - 💧 Note that kids might eat less but their lower bodyweights influence their overall consumption rates

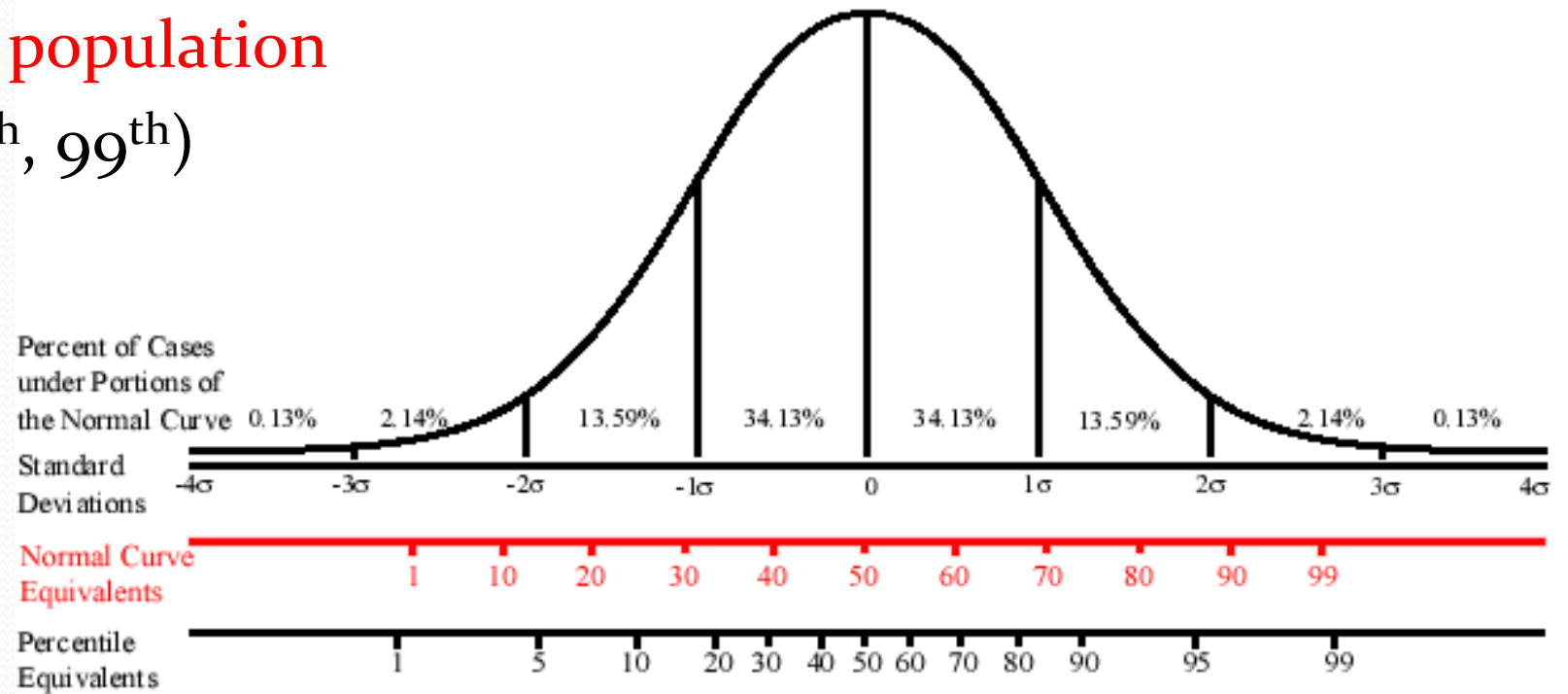


# How do you determine what a FCR may be?

- 💧 Use of a Dietary Survey or similar means
  - 💧 Provides the distribution of long-term estimates of consumption rates
  - 💧 Should account for seasonal variations
  - 💧 Characterize consumption of general population as well as special populations
  - 💧 Identifies different sources of fish and shellfish, by species

# Population of concern

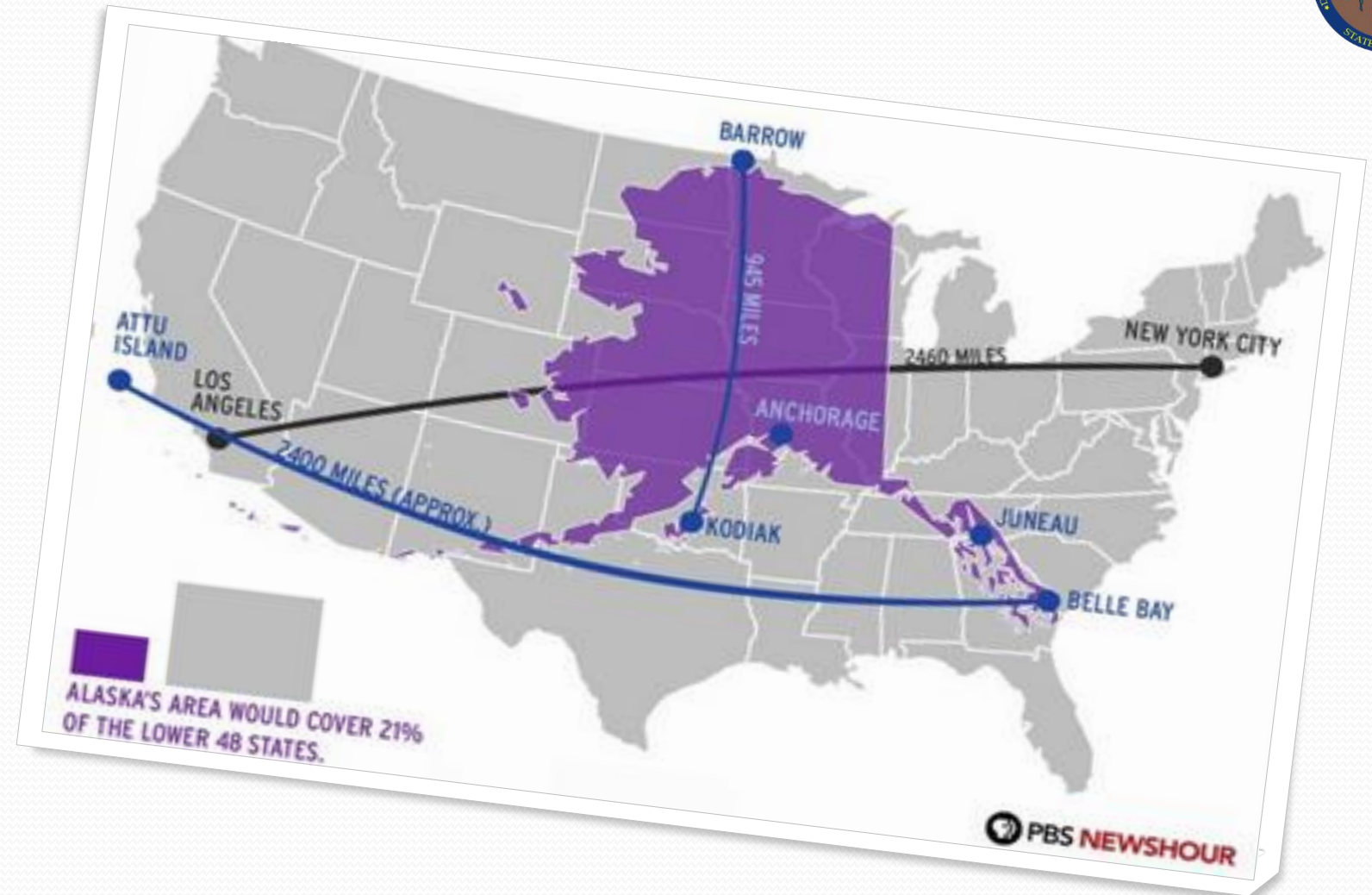
- 💧 The fish consumption rate (FCR) in the HHC should reflect the rate of consumption by the **population of concern** (90<sup>th</sup>, 95<sup>th</sup>, 99<sup>th</sup>)



## Alaska has regional differences

There may be obvious differences in the amount, species, and frequency of fish consumed depending on where you live (think Georgia v. North Dakota)

NOTE: This image doesn't capture the differences that may exist when comparing rural and urban locations.





# A Sample of General Questions to consider in the coming months...

- 💧 How will DEC determine the best **process** to address this issue?
- 💧 How will DEC ensure that it is being **inclusive and transparent** in its efforts?
- 💧 How will DEC consider **implementation** of new criteria; and
- 💧 Why this effort may take several years to complete?





## HHC in 2015

- Complete a peer review of *Literature Review of Fish Consumption Research in Alaska (2015)*
  - Available for public review following completion of peer review
- Monitor how Washington and Idaho complete their revision process- lessons learned?
- 2015 EPA Recommendations?
  - Adjust consumption of water from two to three liters per day
  - Adjust body weight from 70 to 80 kilos
  - Relative source contribution- contaminant sources besides water and fish?

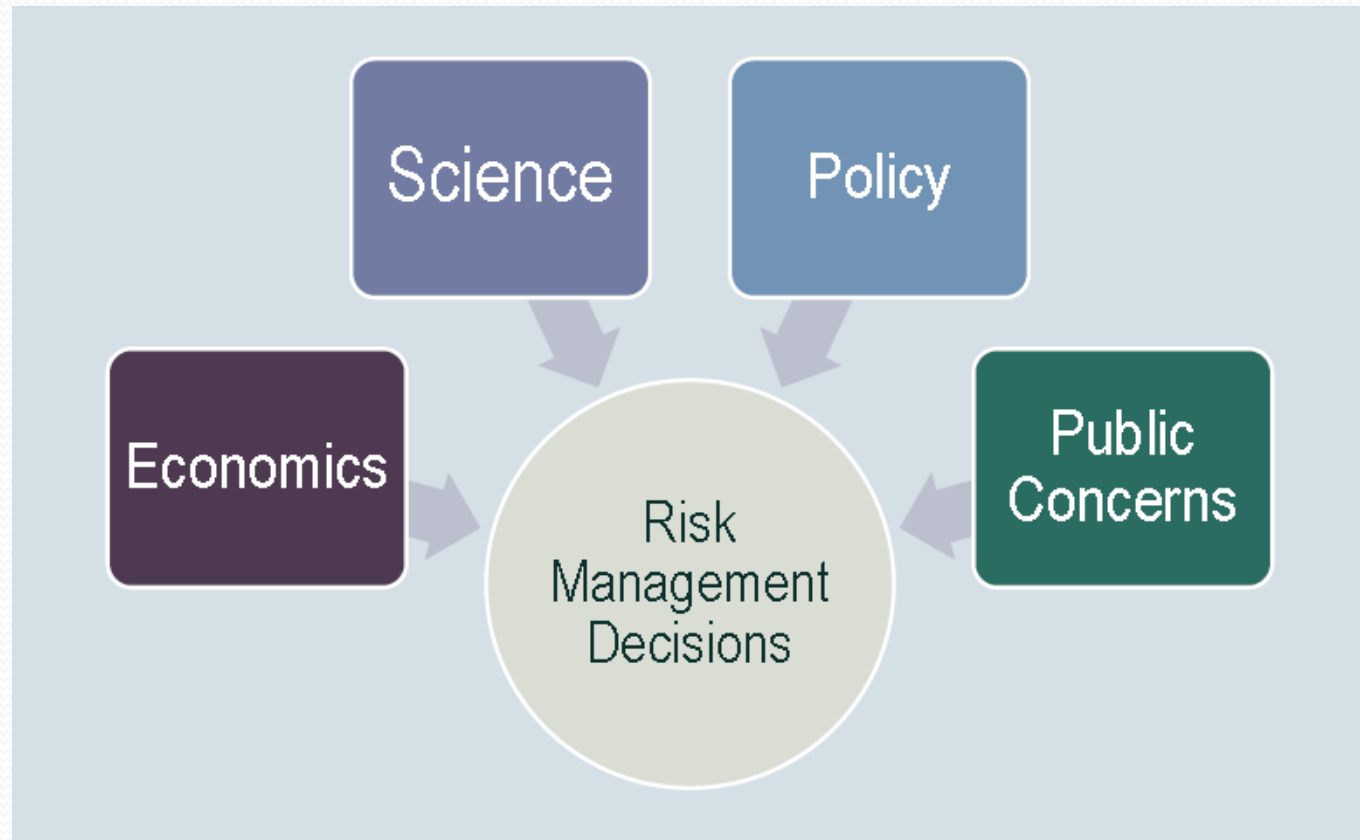


# HHC Workshop-work in progress

- 💧 When: Fall 2015
- 💧 Where: Anchorage
- 💧 Why: Inform stakeholders on the issues, challenges and process
- 💧 Who: Informed stakeholders

Additional details will be made available on DEC-Water website and DEC-Water-Standards listserv

# Decisions on HHC and various factors will account for multiple factors





# How can I stay involved?

## **DEC Standards listserv(s)**

- 💧 Issues and Communications on Water Quality Standards:  
[http://list.state.ak.us/soalists/DEC\\_WaterQualityStandard/jl.htm](http://list.state.ak.us/soalists/DEC_WaterQualityStandard/jl.htm)
- 💧 Stay connected and informed on the DEC fish consumption rate and human health criteria for water quality standards:  
<http://list.state.ak.us/soalists/DEC.Water.Quality.FishConsumption/jl.htm>



## DEC is now accepting comments on this issue through the **Triennial Review** process

- 💧 DEC issues a public notice requesting comments on water quality standards issues.
- 💧 Helps ensure that pollution limits are integrating the latest science, technology, and policy requirements.
- 💧 Engages all interested stakeholders when collecting and evaluating information to help increase the effectiveness of this process



## How to comment

- 💧 Public comment is always very important but especially when you don't like what's being proposed.
  
- 💧 **Your input can make the regulations better.**
  - 💧 Be brief
  - 💧 Be specific
  - 💧 Know your subject
  - 💧 Be honest and realistic
  - 💧 Be polite
  
- 💧 Comments are being accepted through February 27<sup>th</sup> at 4:30 pm.



Thank you for your time!

Thoughts? Suggestions?  
Questions?

We want to hear from you!





# Alaska Department of Environmental Conservation

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6.5 Grams works out to ~ one 8 oz serving per month  
54 grams is ~one to two meals per week  
157 grams is four or five meals per week  
1 lb = 454 g. 250 grams is ~ $\frac{1}{2}$  lb per day- essentially you eat fish  
at least once daily