Water Quality Standards

Alaska Department of Environmental Conservation
Division of Water
Brock Tabor

Updates to Human Health Criteria

AFE 2014

WQS are composed of …

1. Beneficial uses – include aquatic life, recreation in and on the water, drinking water, etc…

2. Criteria – minimum levels of water quality that fully protect uses

Numeric

Narrative

3. Antidegradation Policy - ensures existing and designated beneficial uses are maintained and protected, and that waters of high quality are not degraded unless necessary and in the public interest

Also: Other policies affecting application and implementation, such as mixing zones, low flows, and variances.

What are Human Health Criteria (HHC)?

- HHC are numeric criteria in the water quality standards
- HHC are designed to minimize the risk of adverse effects occurring to humans
  - from chronic (lifetime) exposure
  - toxic and deleterious substances

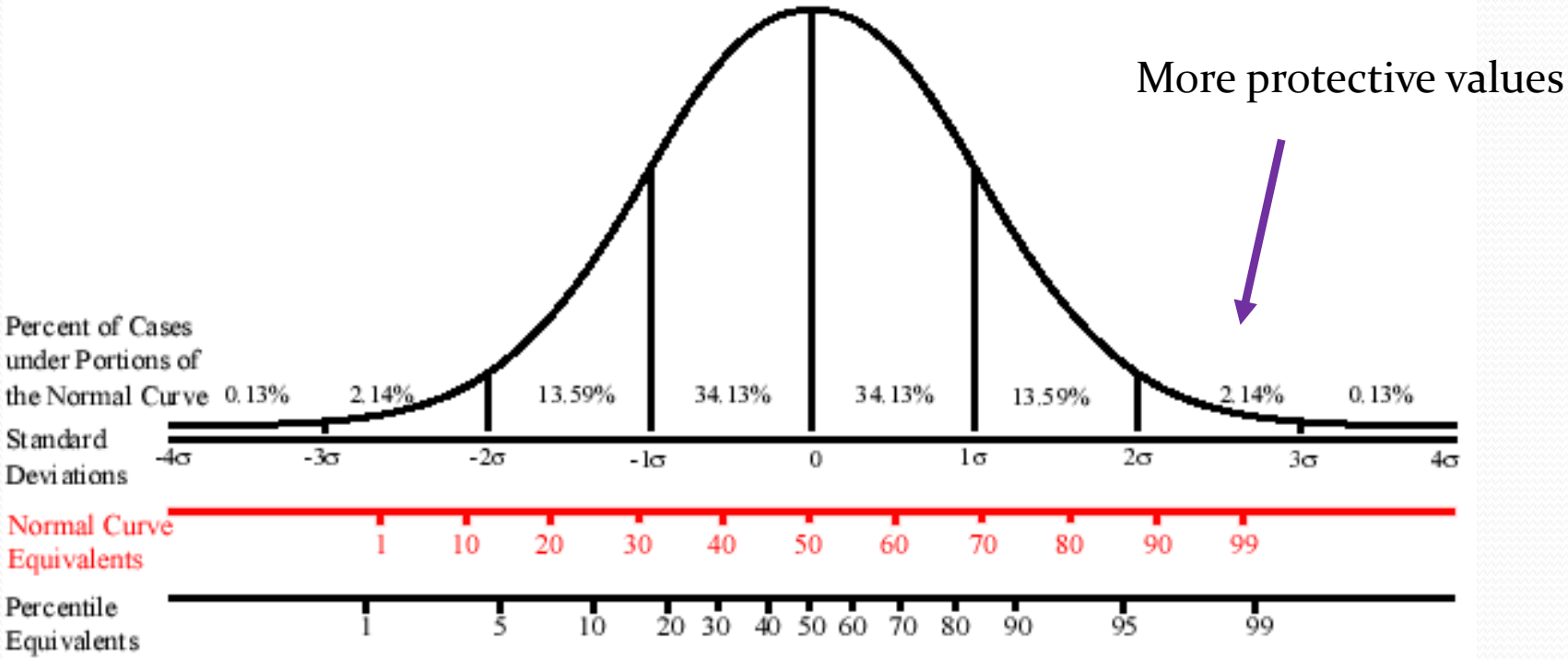
What are Human Health Criteria (HHC)?

- Human Health Criteria consider two different exposure scenarios Each with its own criteria
  - Consumption of fish
  - Consumption of fish & ingestion of water

- Additional factors to consider
  - Where the species consumed is in the food chain (trophic level)
  - Size of the fish
  - Mode of effect of the contaminant (acute, chronic, cancerous, etc.)
  - Contaminant contributions of other food sources

- Human Health Criteria (HHC) in the water quality standards are set at a level that is expected to protect human health
- One element used in establishing HHC is the Fish Consumption Rate
- Other elements include amount of drinking water consumed, and ingestion of pollutants from other sources

- The fish consumption rate (FCR) in the HHC should reflect the rate of consumption by the population of concern (90th, 95th, 99th)



- FCR may include all fish and shellfish from recreational, commercial, traditional, and aquaculture sources-not necessarily just fish caught from your local waters

- HHC levels and FCR can be adjusted up or down depending on site-specific needs

Source: http://water.epa.gov/scitech/swguidance/standards/criteria/health/methodology/upload/hhfaqs.pdf

Why is Alaska interested?

- Alaska wants its WQS to be protective of human health
- More recent studies have determined that the FCR used in the current HHC formula may not accurately reflect consumption rates in certain parts of Alaska
- Stakeholders have called for DEC to review and revise the HHC
- DEC wants any revisions to be scientifically defensible

Key Points to Consider

- **The consumption of fish and shellfish from Alaskan waters is a safe and healthy practice.** Alaska has very good information on potential points of concern and addresses them through Fish Advisories issued by DEC-Environmental Health (EH) and Dept. of Health and Social Services (DHSS)

- DEC recognizes that having accurate HHC is important for the protection of human health and water resources

Key Points cont.

- Addressing this issue is **not a crisis.** Alaska already has tools available to adjust HHC using existing regulations.

- Taking the time to collect information, evaluate that information, and determine what actions are most appropriate will lead to better results

How do Fish Advisories and HHC criteria compare?

- *Fish consumption* in a **Fish Advisory** context equates to (# of meals per time period that is safe for a person to continue 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 mg/kg of fish a person consumes over a lifetime

- Fish consumption rates and HHC are used to help determine amounts of pollutants that are allowable in Alaskan waters

State Agency Programs that address Toxics in Fish

System	Intervention Strategy	Agency Activities
Contaminant Sources → Water → Fish → People	*"Upstream" Prevention* Prevention-based toxics reductions	DEC: Division of Water Water Quality Standards Development and Implementation Toxics Monitoring (water, fish tissue) RISK PREVENTION
	Behavioral-based interventions to prevent exposures to toxics *"Downstream" Reactive*	DEC: Division of Environmental Health DHSS: Fish Consumption Advisory Program RISK MANAGEMENT

How do we derive criteria?

Use the EPA HHC Formula

- The formula determines the degree of risk you are willing to accept
  - 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[2]

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

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
- Note: sometimes there is consideration of how the meal is prepared
- 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

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 ~½ lb per day- essentially you eat fish at least once daily

A Sample of General Questions to consider in the coming months…

- What does it mean to be "**protected**" and who is the protection targeting?
- How will DEC determine the best **approach**(s) 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?

More Specific Questions About HHC…

- Consumers or consumer and non-consumer fish consumption rates? Makes a difference…
- What Alaska-specific data is currently available and reliable? Who will determine whether it is applicable to this process?
- Is Development of a Statewide v. Regional-specific criteria the best approach? Combination of the two?
- Where do salmon fit in? EPA guidance reads no but EPA Region 10 likes it…
- How **Relative Source Contribution** will be factored in (80/20)?

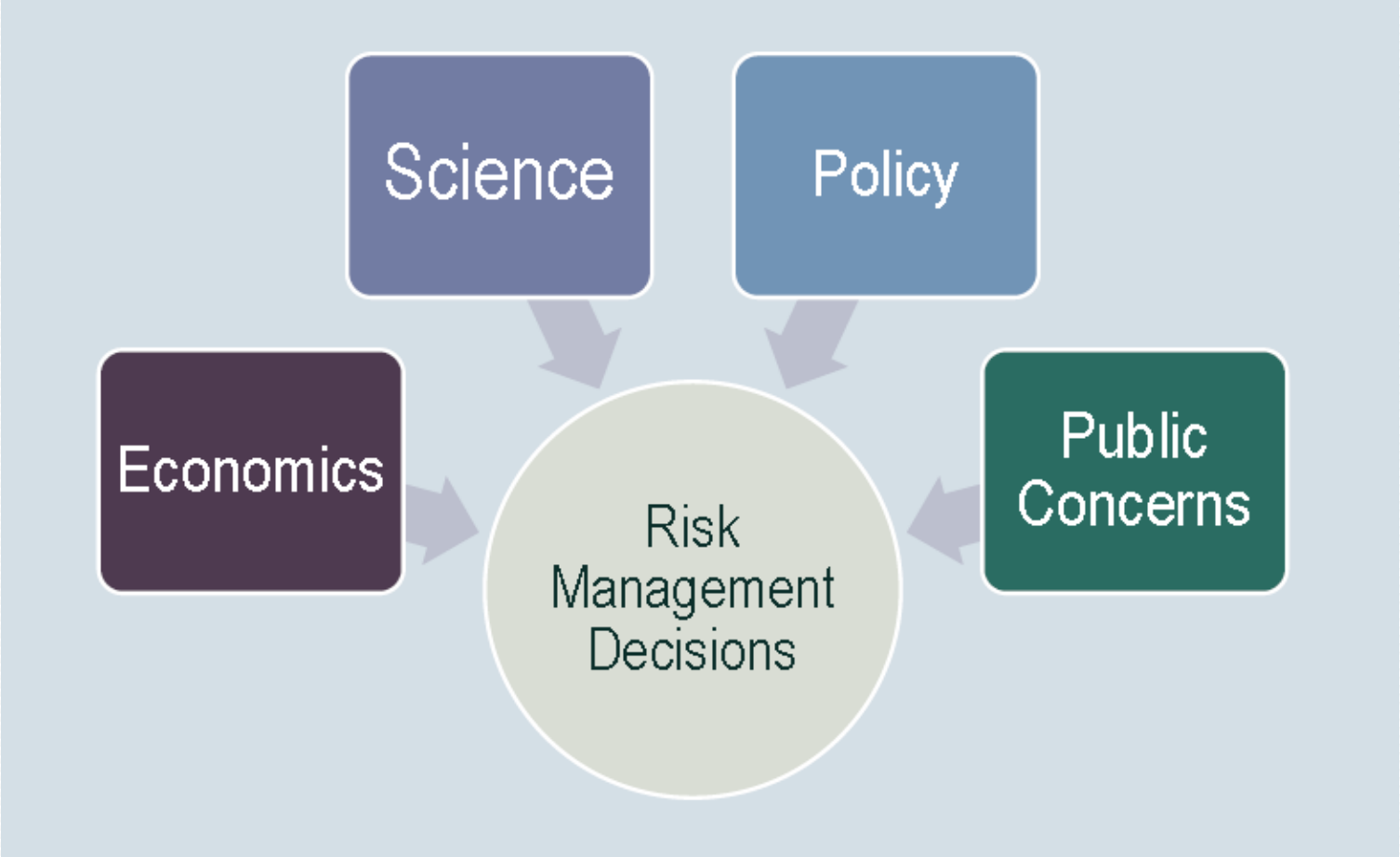
What does an ideal FC survey look like?

- Provides the distribution of long-term estimates of consumption rates (nod to the probabilistic model)
- Account for seasonal variations
- Characterize consumption of general population as well as special populations
- Identify all sources of fish, by species

Q: What model should Alaska consider using when trying to determine an HHC?

- EPA methodology references a deterministic model- gives you a single point to consider
- Certain states (Florida, Washington, Idaho) are considering a probabilistic model-gives you a range to consider
- Neither is perfect as deterministic may be “too conservative” but probabilistic may not provide enough certainty

Decisions on Fish Consumption Rates will take into account multiple factors



Taken from WA State FC Presentation 2012

What is DEC doing now?

- Set as the goal, updated standards that are protective of water quality and human health
- Defining the process, issues, and challenges
- Researching efforts of other coastal states

What is DEC doing now?

- Considering how it will conduct public outreach about this issue
- Recognizes the importance of fish consumption and the challenges of calculating local or statewide human health criteria
- Considering implementation early in the process
- Working carefully to establish an approach that is appropriate for Alaska

2014-2016 Actions

- Consider statewide adoption of updated human health criteria
  - more aligned with nationally recommended criteria
  - an initial basis

- Using existing regulations and permitting process,
  - develop implementation tools for addressing local or site specific conditions

Ongoing Actions

- Continue to monitor other states' methods
  - the successes or failures of those approaches
  - inform Alaska's long-term approach

- Continue to monitor national and local research on
  - human health criteria,
  - fish consumption rates and other factors
  - the relationship between those factors

Ongoing Actions

- Gather and assess information unique to Alaska
  - inform Alaska's human health criteria development

- Based upon ongoing research and monitoring,
  - assess current implementation tools
  - consider whether additional modifications to human health criteria are needed

Thank you for your time

Questions?
Comments?
Thoughts?

Please direct them to:

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Potential Data sources for fish consumption rates

- Subsistence fish harvest data is collected by Department of Fish & Game
- Environmental Health program at DEC runs a fish tissue monitoring program/Works with DHSS to issue fish advisories
- Contaminated Sites program at DEC considers fish consumption when setting remediation standards
- Several federal agencies touch on fish consumption