AQUATIC LIFE WATER QUALITY CRITERIA DERIVATION PROCESS

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WHAT ARE AQUATIC LIFE CRITERIA?

What is a numeric aquatic life criterion?

The highest instream concentration of a toxicant to which organisms can be exposed for a period of time without causing an unacceptable adverse effect.

What is it intended to protect?

Aquatic animals (e.g., fish, invertebrates) and plants from acute and chronic exposure to a toxicant or condition. More to the point, it is protection of the ecosystem so that it retains its "fishable, swimmable" designated use(s).

KEY COMPONENTS OF THE GUIDELINES

- Defines Aquatic Life & Its Uses & Protection Goals – 95th centile of genera, most places, most of the time
- Defines Criteria Components – magnitude, duration and return frequency
- Defines Range of Taxa Seeking Data for: "Minimum Data Requirements" (MDRs) and surrogacy based on taxonomic relationships
- Defines Basic Toxicity Test Requirements and Study Quality Considerations
- Provides Consistent Approach for Deriving National Criteria
  - provides consistent approach for staff developing criteria and for co-regulators, regulated community, stakeholders, and the public

EFFECTS DATA: SOURCES AND ENDPOINTS

Data is collected and periodically updated from all sources and entered into the ECOlogical TOXicity database (ECOTOX, maintained by EPA/ORD)

- ECOTOX is a comprehensive, publicly-available knowledgebase providing single chemical toxicity data on aquatic life, terrestrial plants and wildlife (https://cfpub.epa.gov/ecotox/)
- ECOTOX screens out many studies of unacceptable data quality

Guidelines and OW's SOP provide additional study quality criteria to consider when selecting studies for criteria derivation

MINIMUM DATA REQUIREMENTS (MDRS) FRESHWATER

SALMONID

SECOND FISH FAMILY

CHORDATA

PLANKTONIC CRUSTACEAN

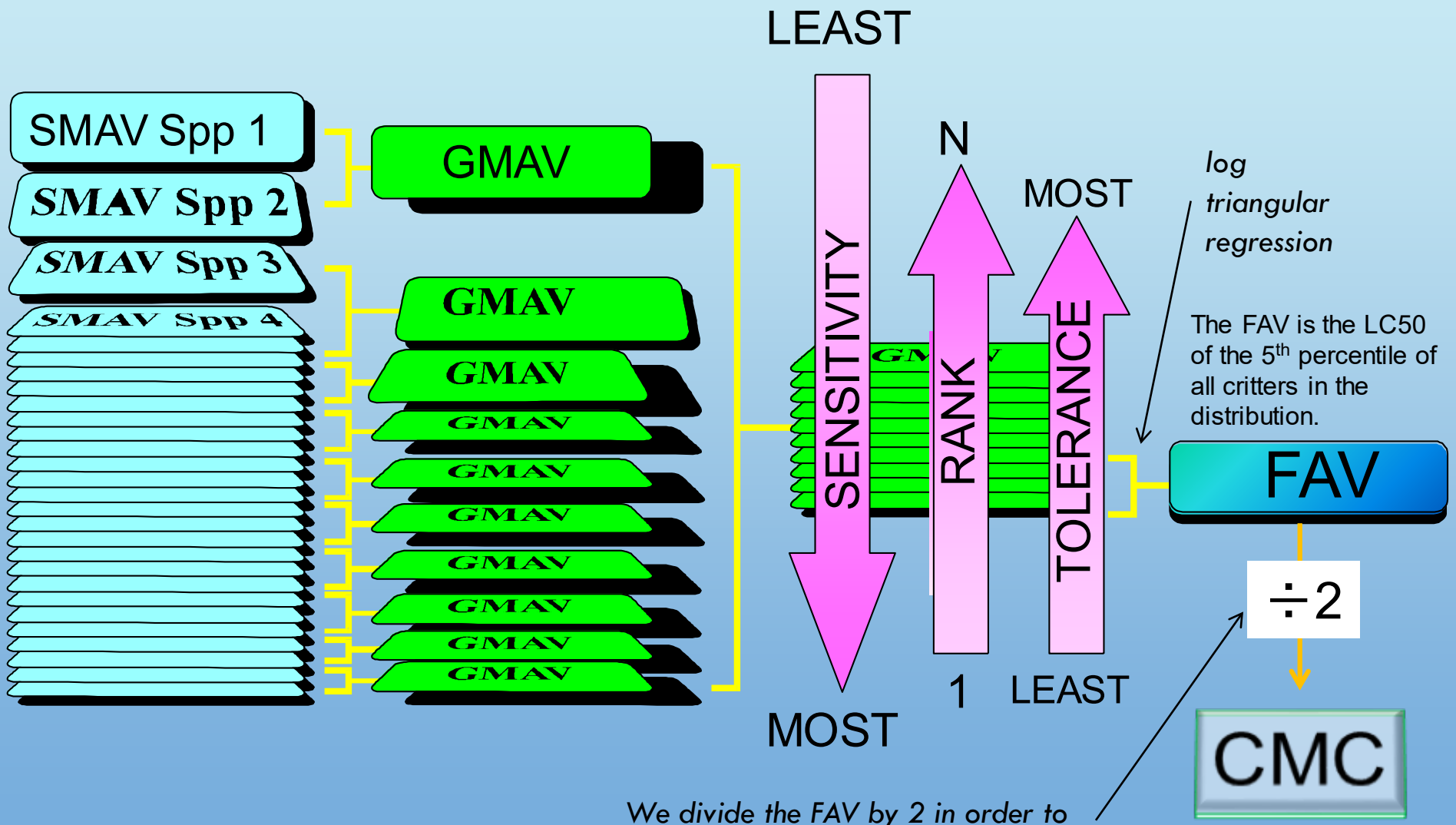
BENTHIC CRUSTACEAN

INSECT

ROTIFERA, ANNELIDA, MOLLUSCA

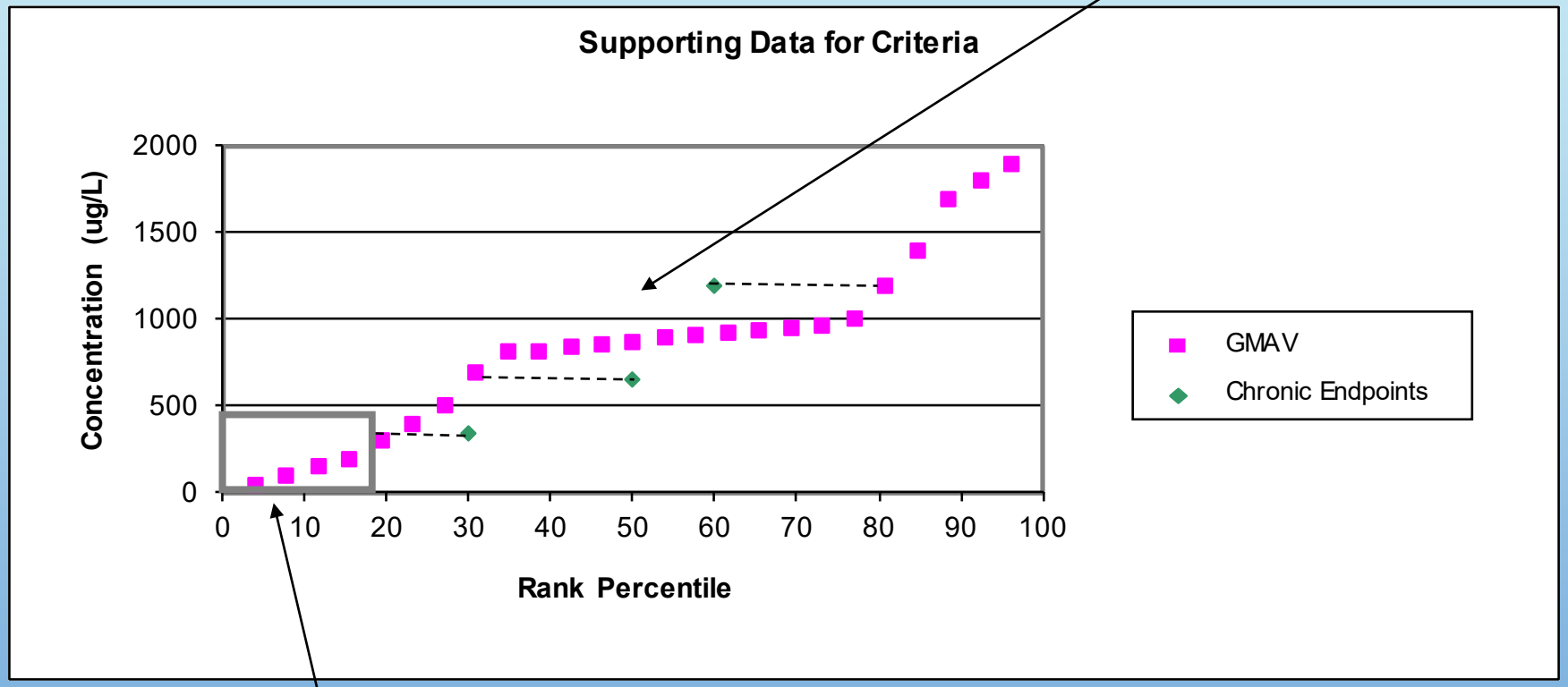
OTHER INSECT OR MOLLUSC

FAV CALCULATION OVERVIEW



FAV CALCULATION

GMAV and Calculate the Percentile of each rank (100 R/(N+1))



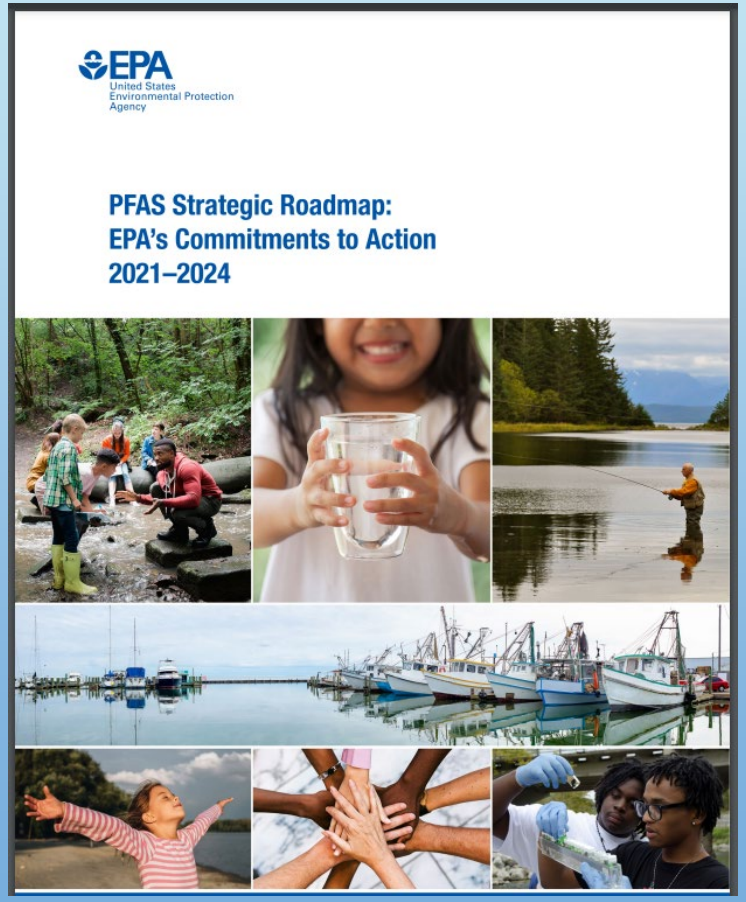
Using the 4 Most Sensitive Genera, Perform a Log Triangular Regression of the GMAV (log values) on the Percentile Ranks (square roots) to generate an HC_5 = FAV

CRITERIA REVIEW PROCESS

- Internal Review
  - EPA Peer Review
    - Data quality of studies used in criteria derivation and criteria document
    - Intra-agency workgroup
- Independent Expert External Review
  - External Peer Review (external experts – multiple views)
- Revise Criteria considering external peer review comments
- Publication of Draft Recommended 304(a) criteria via the Federal Register
  - Request for scientific views on draft from the public via Federal Register
- Revise criteria considering public comments
- Internal Review
    - Intra-agency workgroup
    - Management Review
- Publication of Final Recommended 304(a) criteria via Federal Register
  - Response to Public and Peer Review Comments Documents (Published with Final)

EPA UPDATE ON PFOA AND PFOS AQUATIC LIFE CRITERIA & SCOPING FOR OTHER PFAS VALUES

PRIORITIZING PFAS FOR AQUATIC LIFE CRITERIA (ALC) DEVELOPMENT



- EPA's PFAS Strategic Roadmap:
- https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

PFOA & PFOS DRAFT CRITERIA DEVELOPMENT PROCESS

- These two separate criteria documents were developed to protect aquatic life.
- EPA Aquatic Life Criteria for toxics undergo rigorous scientific development and review.
- Peer review
  - EPA internal scientific reviews (2020-2022).
  - Independent external peer review (Summer 2021).
- Public comment
  - Draft released to public for 30-day comment period with an additional 30-day extension to obtain scientific views (ended July 2, 2022).
- Anticipated publication of final criteria document, reflecting public comment (scheduled for late March 2023).

SUMMARY OF 2021 DRAFT PFOA AND PFOS ALC AND BENCHMARKS

- All of the recommended criteria (acute and chronic water column and tissue criteria) are intended to be protective of aquatic life.
  - We recommend states and tribes adopt all of the criteria.
  - The criteria are intended to be independently applicable; no one criterion takes primacy.
- The draft aquatic life benchmarks for PFOA and PFOS are recommendations for states and tribes to consider in their water quality protection programs, and are not regulations or part of a rulemaking.
- These draft criteria are being revised considering public comments and integrating additional toxicity data, including sensitive insect data.

Table 2. Draft Recommended Freshwater Perfluorooctanoic acid (PFOA) and Perfluorooctane Sulfonate (PFOS) Aquatic Life Ambient Water Quality Criteria and Benchmark Magnitudes.

Chemical	Freshwater					Saltwater
	Acute Water Column (CMC)[1]	Chronic Water Column (CCC)[2]	Invertebrate Whole-Body[3]	Fish Whole-Body[3]	Fish Muscle[3]	Acute Water Column Benchmark[1]
PFOA	49 mg/L	0.094 mg/L	1.11 mg/kg ww	6.10 mg/kg ww	0.125 mg/kg ww	7.0 mg/L
PFOS	3.0 mg/L	0.0084 mg/L	0.937 mg/kg ww	6.75 mg/kg ww	2.91 mg/kg ww	0.55 mg/L

[1] Duration =1-hour average and Frequency = Once in three years

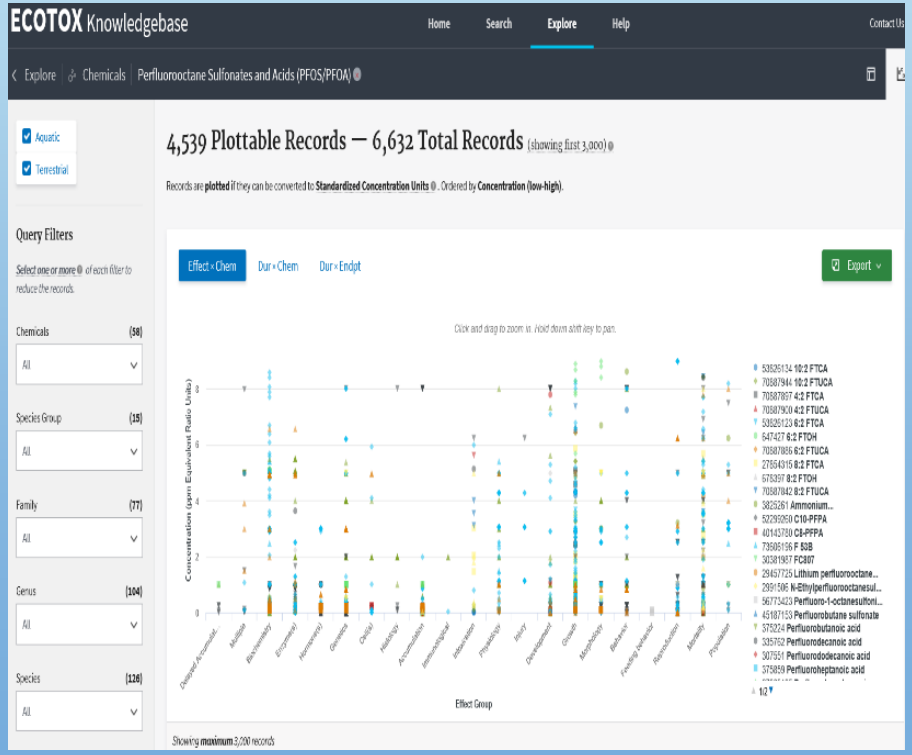
[2] Duration = 4-day average and Frequency = Once in three years

[3] Duration = Instantaneous and Frequency = Once in ten years

ww = wet weight

BEYOND PFOA AND PFOS: EVALUATING EXISTING PFAS DATA: ECOTOX KNOWLEDGEBASE

- Overview of available PFAS data
  - There are currently 96 individual CAS numbers for PFAS compounds identified by the ECOTOX Knowledgebase
  - PFOS and PFOA represent the most frequently tested; several other PFAS compounds have limited data
  - Common taxa tested: fish, aquatic and (some) terrestrial invertebrates
  - Some apical studies, but few "standardized" tests; gene expression/biomarkers commonly reported effects



AVAILABLE PFAS TOXICITY DATA
(FOR CHEMICALS OTHER THAN PFOA AND PFOS)

- Toxicity data are increasing, but are limited for most PFAS
- PFAS chemicals represent a large, structurally-complex universe of chemicals
    - More than 3,000 PFAS chemicals have been estimated to occur on the global market (Wang et al. 2017)
- Minimum Data Requirements (MDRs) for deriving Aquatic Life Criteria are not currently met for other PFAS compounds
- ERAB is currently considering deriving acute freshwater aquatic life benchmarks for 8 data-limited PFAS chemicals using ORDs Web ICE
    - PFBA, PFHxA, PFHxS, PFNA, PFDA, PFBS, Pentadecafluorodecanoic acid, and Hexadecafluoro-2-decenoic acid

QUESTIONS?