Monitoring Strategies for Chemicals of Emerging Concern in California's Aquatic Ecosystems:

Results on Russian River Watershed Pilot Study

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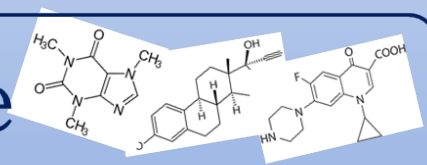
CALIFORNIA
Water Boards

State and Regional Water Board Roles

- Identify and improve the knowledge base
- Work with Expert Panel to develop and implement monitoring strategies for recycled water and other types of discharges
- Track and help evaluate effectiveness of regulatory interventions
- Direct pilot monitoring programs recommended by expert panel

CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

CEC Initiative



Pathways to the Environment

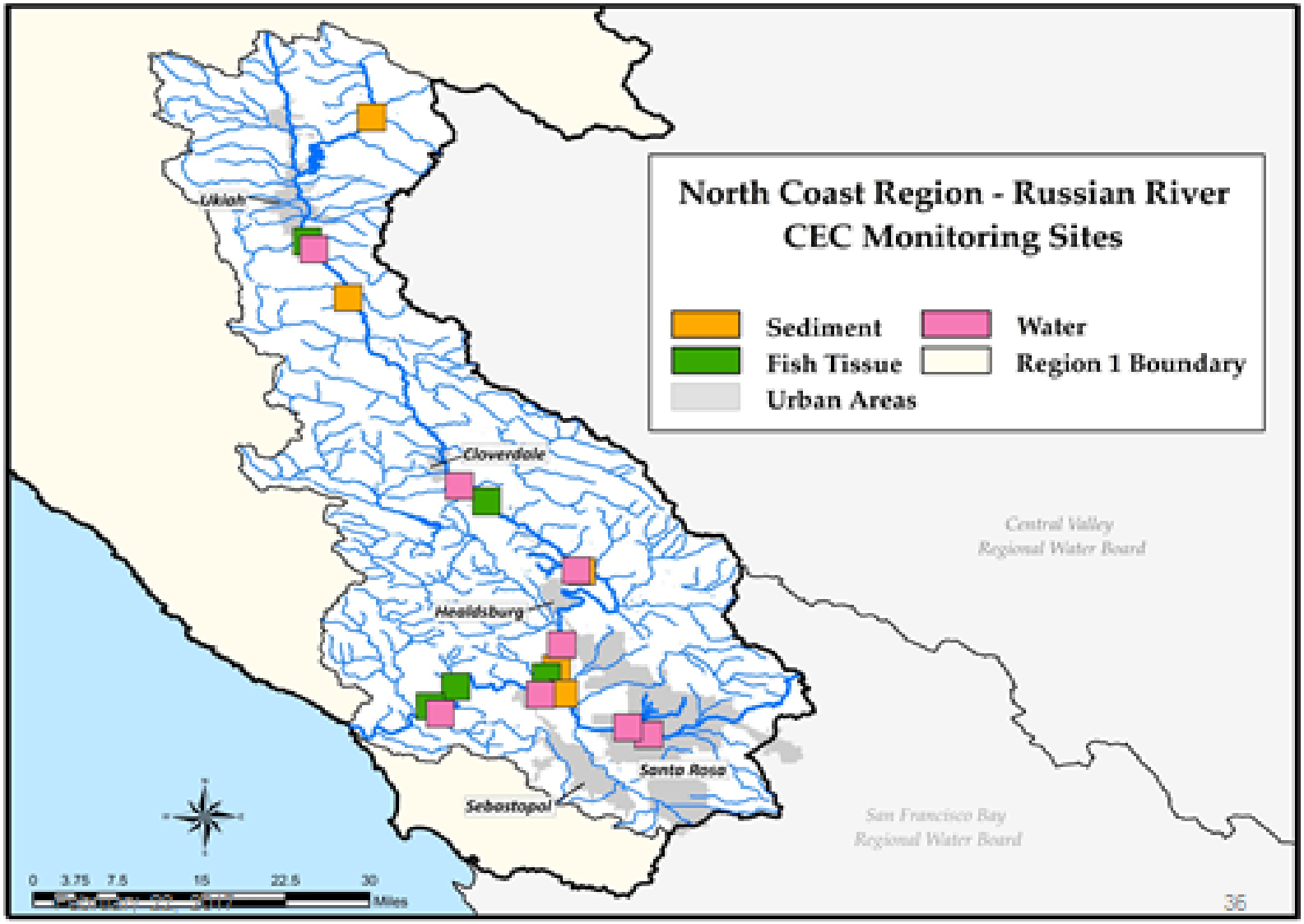
Treated Wastewater
Industrial Discharges

Septic Tanks
Landfills
Biosolids

Recycled Water

Urban Storm Water Runoff
Agricultural Runoff

Russian River CEC Pilot Study



Russian River CEC Pilot Study

- Are CECs in WWTP effluent and storm water runoff present?
- What is the relative contribution of treated wastewater effluent and storm water runoff to CEC loading into the watershed?
- Do bioanalytical tools effectively screen for the occurrence of CECs?
- What is the extent and magnitude of CECs in the water column, sediments and fish tissue?
- Which pesticides applied in the Russian River watershed are of highest priority for monitoring?

Tools for Russian River CEC Study

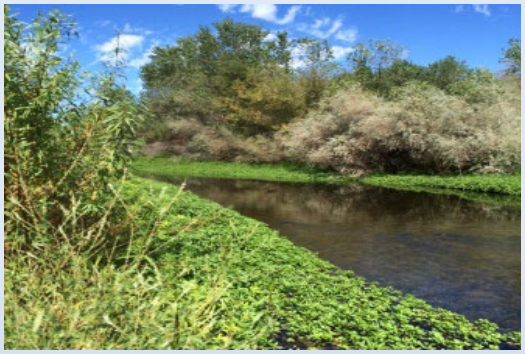
Targeted Chemistry

Bioanalytical

BioAssessment

Bioanalytical Tools

What is the extent and magnitude of **endocrine active CECs** in water and sediment in the Russian River Watershed?



- Water, sediment and effluent samples collected
- Sample analyses:
  - *Cell assay bioscreening (estrogen and glucocorticoid receptor)*
  - *Targeted analyses of known CECs*

Estrogenic Screen of Water Samples

	Effluent #1	Effluent #2	Mirabel	Piner Creek	Santa Rosa Crk	El Roble
ER Bioscreen (ng E2 equiv/L)	<0.5	**1.9**	<0.5	<0.5	<0.5	<0.5
			Targeted chemical analyses (ng/L)			
17b-estradiol (E2)	<0.5	**0.6**	<0.5	<0.5	<0.5	<0.5
estrone	<0.5	**11.0**	0.5	0.6	<0.5	<0.5
bisphenol A	<10	12.0	<10	55.0	16	<10
4-nonylphenol	60.8	247	25.4	53.3	62	63
Chem. equiv. (ng/L)	<0.5	**1.6**	<0.5	<0.5	<0.5	<0.5

Conclusions

- Fish studies have shown that exposure to 2 – 4 ng E2/L had no effect on growth and survival
  - *Effluent BEQ of 1.9 ng E2/L (without dilution) = low concern*
  - *River water BEQ < 0.5 ng E2/L = no concern*

- CECs present low to moderate concern in the Russian river
  - Water concentrations of pharmaceuticals below MTLs
  - *Some pesticide concentrations in sediment were > MTLs*

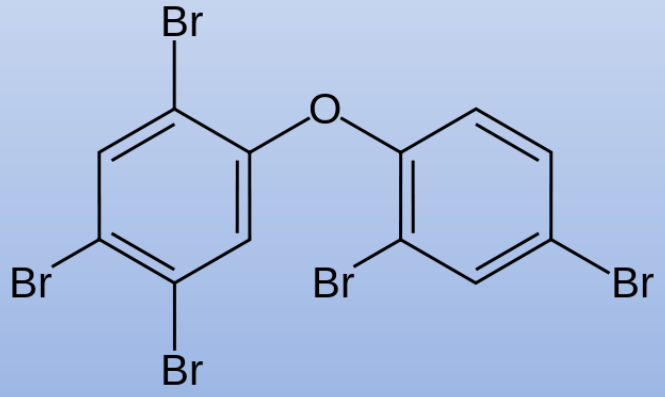
- Cell assays provided a reliable and integrated measure of estrogenic chemicals

- Routine application of cell assays could provide a cost-effective strategy to prioritize sites requiring more chemical and toxicity testing

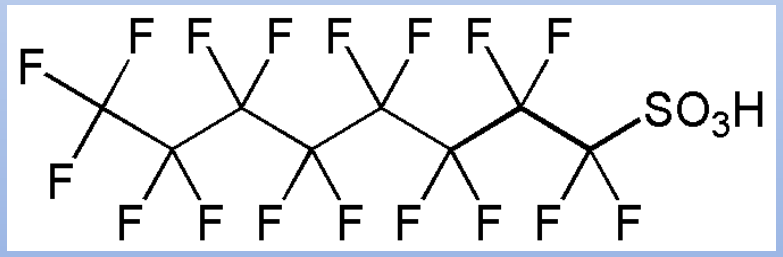
Bioassessment

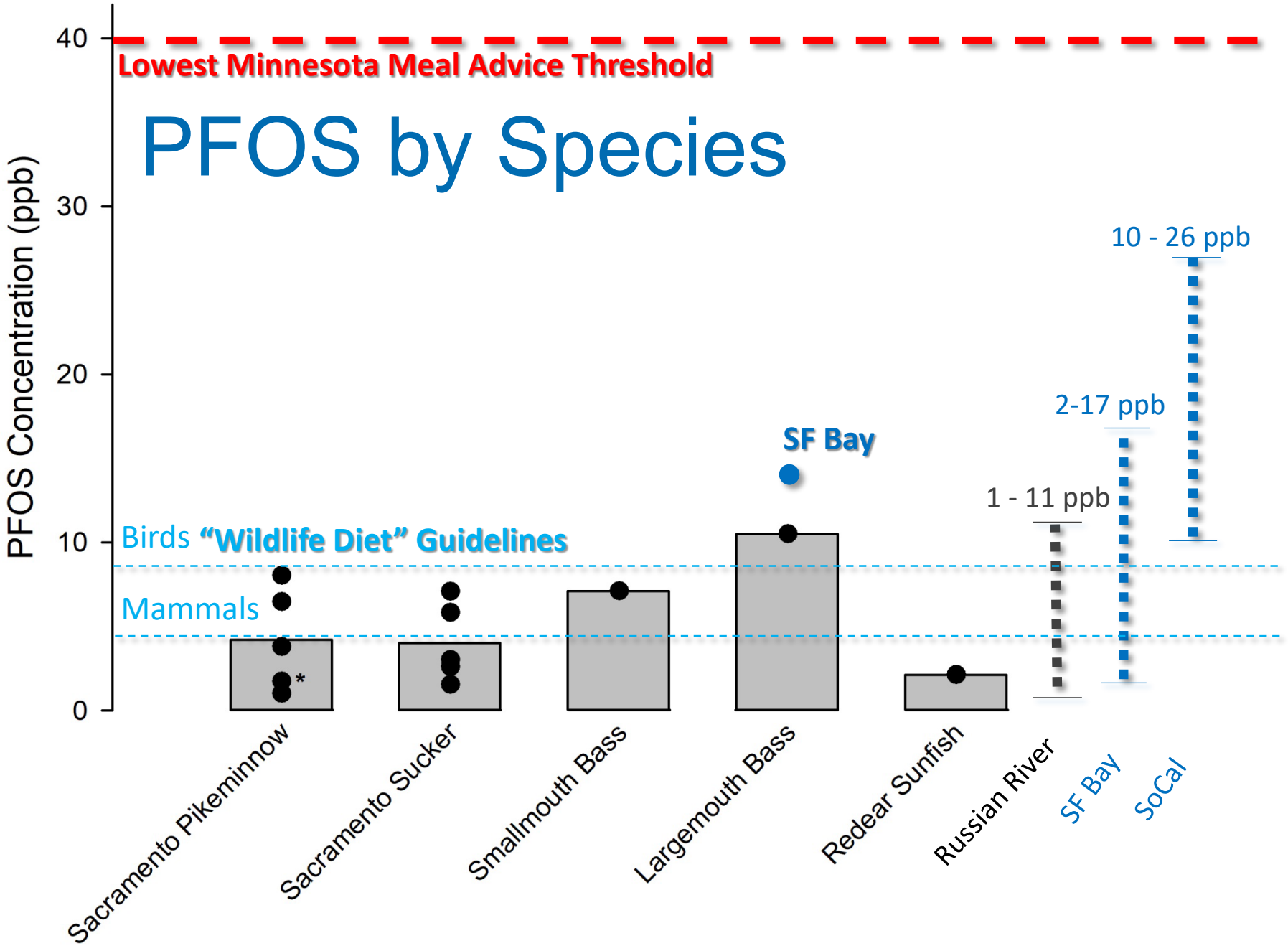
What is the extent and magnitude of **PBDE** and **PFOS** contamination in fish tissue in the Russian River Watershed?

Polybrominated diphenyl ethers (PBDEs)



Perfluorooctane Sulfonate (PFOS)




Lowest Minnesota Meal Advice Threshold
PFOS by Species
PFOS Concentration (ppb)
40
30
20
10
0
Birds "Wildlife Diet" Guidelines
Mammals
SF Bay
10 - 26 ppb
2-17 ppb
1 - 11 ppb
*
Sacramento Pikeminnow
Sacramento Sucker
Smallmouth Bass
Largemouth Bass
Redear Sunfish
Russian River
SF Bay
SoCal

Bioassessment Conclusions

- Fish tissue findings suggest minimal concern
  - Levels of PBDEs and PFOS generally below available consumption thresholds
  - For PFOS, potential for impacts further up the food chain

- Periodic monitoring (e.g., every 5-10 years) is recommended

Pesticide Study Objectives

Which pesticides applied in the Russian River watershed are of highest priority for monitoring?

What is the extent and magnitude of pesticide contamination in Russian River water and sediment?

Pesticide Monitoring Conclusions

- Pesticides from agricultural runoff are not likely a major concern during the fall, based on this study
  - Pesticide use varies seasonally – this study did not characterize risks from **spring runoff**
  - Pesticide concentrations may be higher nearer to sources
- Some **urban insecticides** currently exceed or are approaching levels of concern
  - **Imidacloprid** exceeded a USEPA chronic invertebrate benchmark
  - **Fipronil degradates** are approaching or exceed chronic invertebrate threshold
  - **Bifenthrin** is approaching a USGS sediment benchmark

Recommended for monitoring in receiving waters by California Statewide CEC Expert Panel

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Lessons Learned

- ✓ BioAnalytical tools show promise; public and board member interest
- ✓ Initial results for water and fish tissue suggest minimal concern for impacts; however, keep an eye on PFOS
- ✓ Specific pesticides warrant a closer look
- ✓ Confirm agricultural runoff sample results

Future Management Needs

- Recommendations to include specific CECs and BioAnalytical tools in permits and ambient monitoring programs
  - Surface Water and Groundwater

- Recommendations on PFOS follow up
  - Biosolids and WWTP Land Disposal (Groundwater/Surface Water Interactions)
  - Within food-chain (Agriculture, Subsistence Fishing, and Native American Cultural Resources Beneficial Uses)

Next Steps

- ✓ Continue coordination and implementing improved monitoring strategies
- ✓ Russian River Watershed Association (RRWA)
- ✓ Include target list of CECs in Wastewater, Storm Water and Agricultural Permits
- ✓ Russian River Regional Monitoring Program (R3MP)

Thank You

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