

Surface Water Monitoring Prioritization (SWMP) model and applications in the Central Coast

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SWMP

- Surface Water Monitoring Prioritization model
- A computer program to prioritize pesticides of interest (POIs) and areas of interest (AOIs) for surface water monitoring
- Surface Water Models website
 - http://www.cdpr.ca.gov/docs/emon/surfwtr/sw_models.htm
 - The latest version: SWMP4
 - Sent to Region 3 on 12/4/2017

Graphic User Interface

Pesticide Prioritization for Surface Water Monitoring, Ver. 4

Tools Help

Configuration Advanced Options Watershed

Use patterns

Agricultural use Urban use "Rights of way" (site_code=40)

Or, user-specified site_code(s)=

PUR data

Based on PUR data from to

Toxicity data

Acute Chronic Both

USEPA Aquatic Life Benchmarks

Supplemented by Benchmark Equivalent (based on FOOTPRINT PPDB)

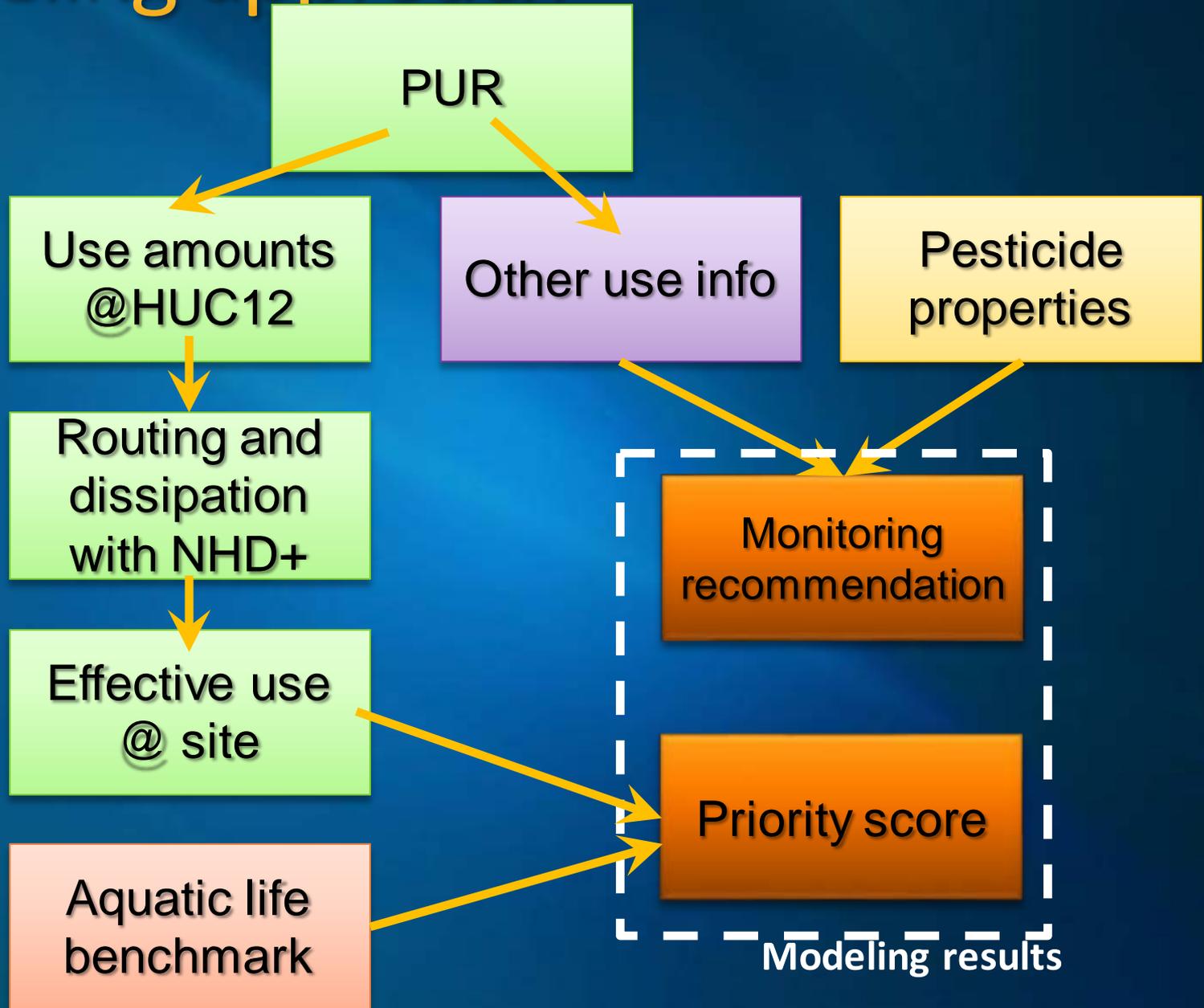
USEPA Drinking Water Standard

USEPA Human Health Benchmark

Note: if multiple toxicity databases are selected, the lowest toxicity value for each pesticide will be used for prioritization

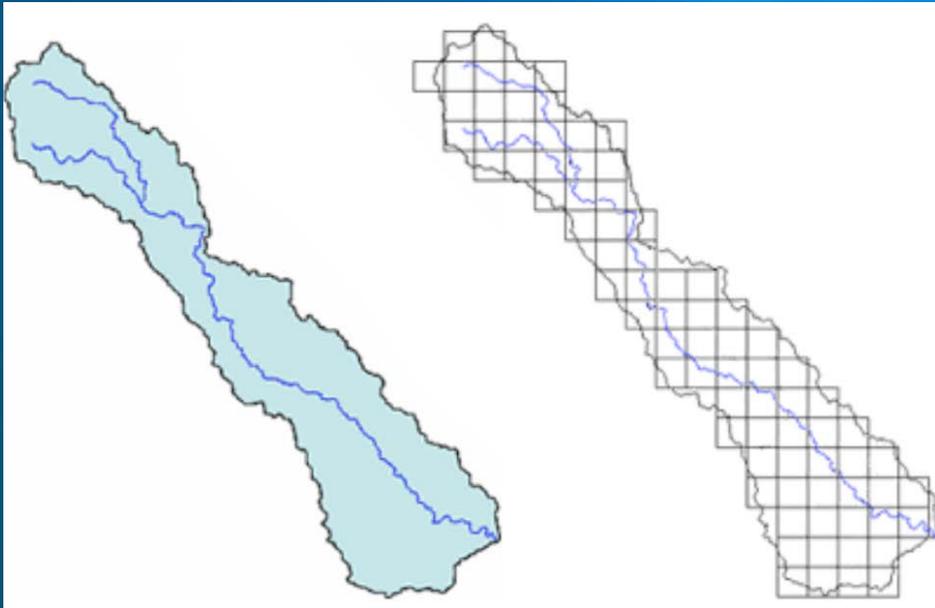
(beta) catchment

Modeling approach



PUR @ watershed scale

- [1] Agricultural uses: to aggregate PUR data from section (1x1mi²) to HUC12



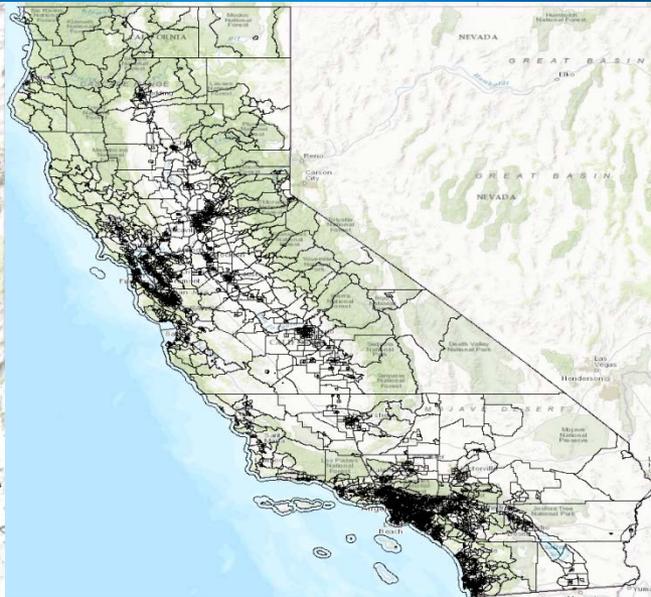
4,415 HUC12s in California

PUR @ watershed scale

- [2] Urban uses: downscaling from county to watershed by population density
 - “Structure pest control”
 - “Landscape maintenance”



County (58) →



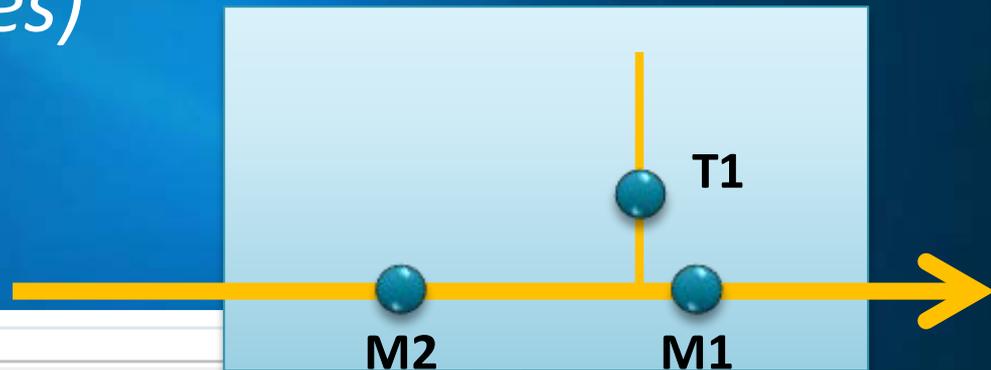
ACS census tract (8057) →



HUC12 (4,415)

Tributary vs. mainstream

- The minimum spatial resolution: HUC12
- Not able to differentiate M1 and M2
- *But can separate M's (mainstem sites) vs. T's (tributary sites)*



Select a site: Salinas River at Del Monte Rd

Or, manually define a site:

Monitoring site description

Base watershed by HUC12 = 180600051509

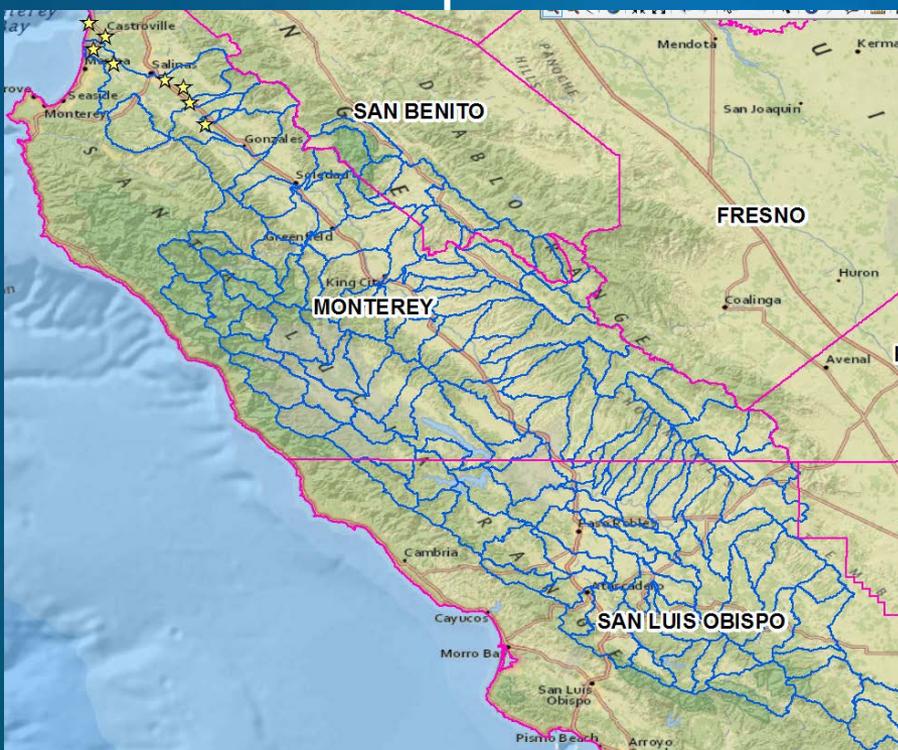
Located on a mainstream which receives water from upstream HUC

Two modeling functions

- [1] Site-specific prioritization
 - For a given monitoring site (AOI), to prioritize pesticide candidates (POIs) for monitoring

Model application, example 1

- DPR monitoring study for agricultural uses
- Example: Salinas River @ Del Monte Rd,



Pesticide	Use score	Tox score	Final score	Monitoring inclusion
Permethrin	3	6	18	Yes
Methomyl	4	4	16	Yes
Malathion	3	5	15	Yes
Paraquat dichloride	3	5	15	No ¹
λ-cyhalothrin	2	7	14	Yes
Chlorpyrifos	2	6	12	Yes
Bensulide	5	2	10	Yes
Oxyfluorfen	2	5	10	Yes
Imidacloprid	3	3	9	Yes
Cyprodinil	3	3	9	Yes
Fenamidone	3	3	9	No ²
Pyraclostrobin	2	4	8	Yes
Prometryn	2	4	8	Yes
S-metolachlor	2	4	8	Yes
Chlorantraniliprole	2	4	8	Yes
Diazinon	1	5	5	Yes

DPR Study #304 Protocol (Deng, 2017), Table 4

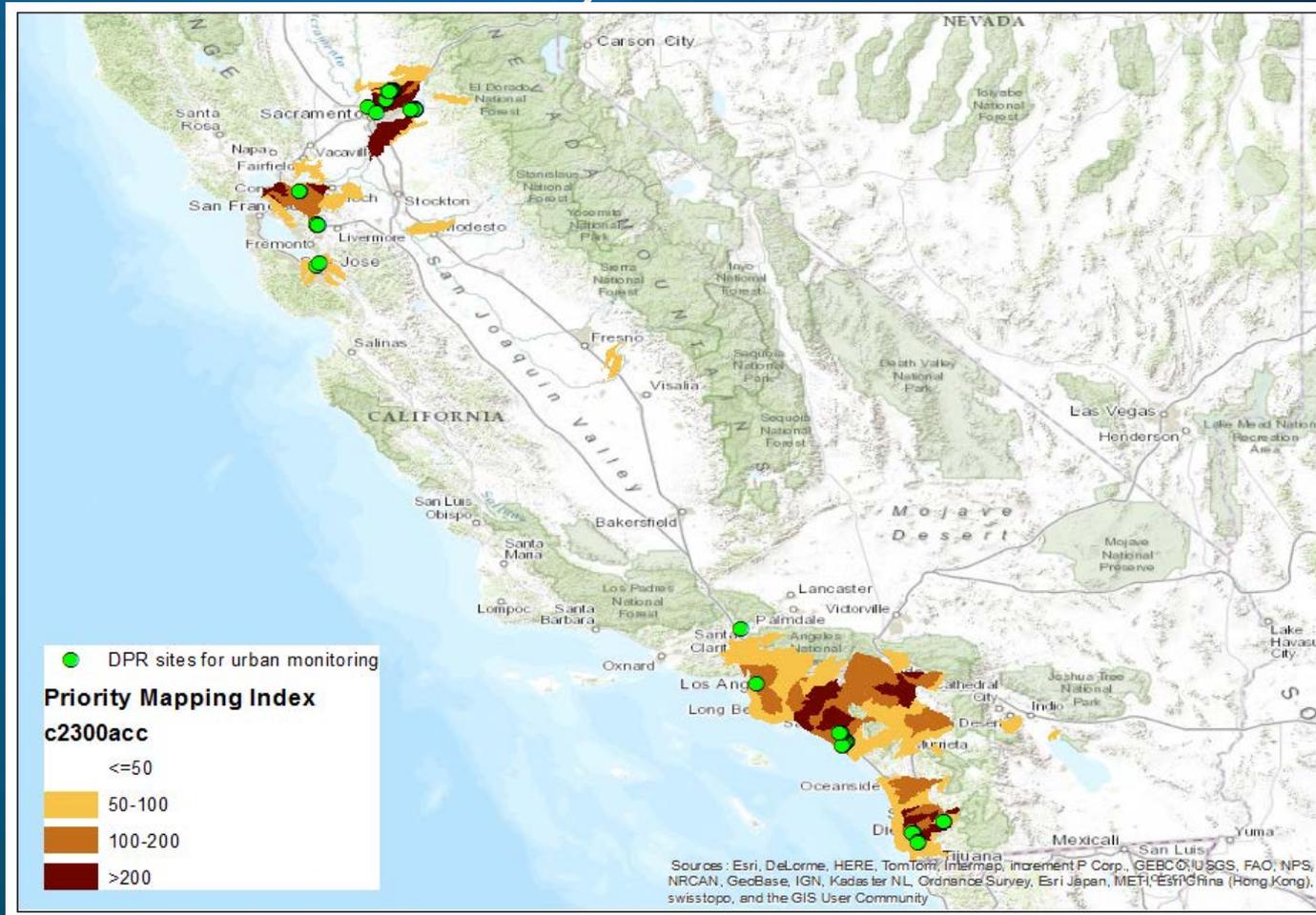
<http://cdpr.ca.gov/docs/emon/pubs/protocol.htm>

Two modeling functions

- [1] Site-specific prioritization
 - For a given monitoring site (AOI), to prioritize POIs
 - When and what to sample?
- [2] Spatially continuous mapping
 - For a given chemical or a group of chemicals (POIs), to prioritize AOIs
 - Where to sample?

Model application, example 2

- Spatially continuous mapping for non-agricultural use of *bifenthrin*

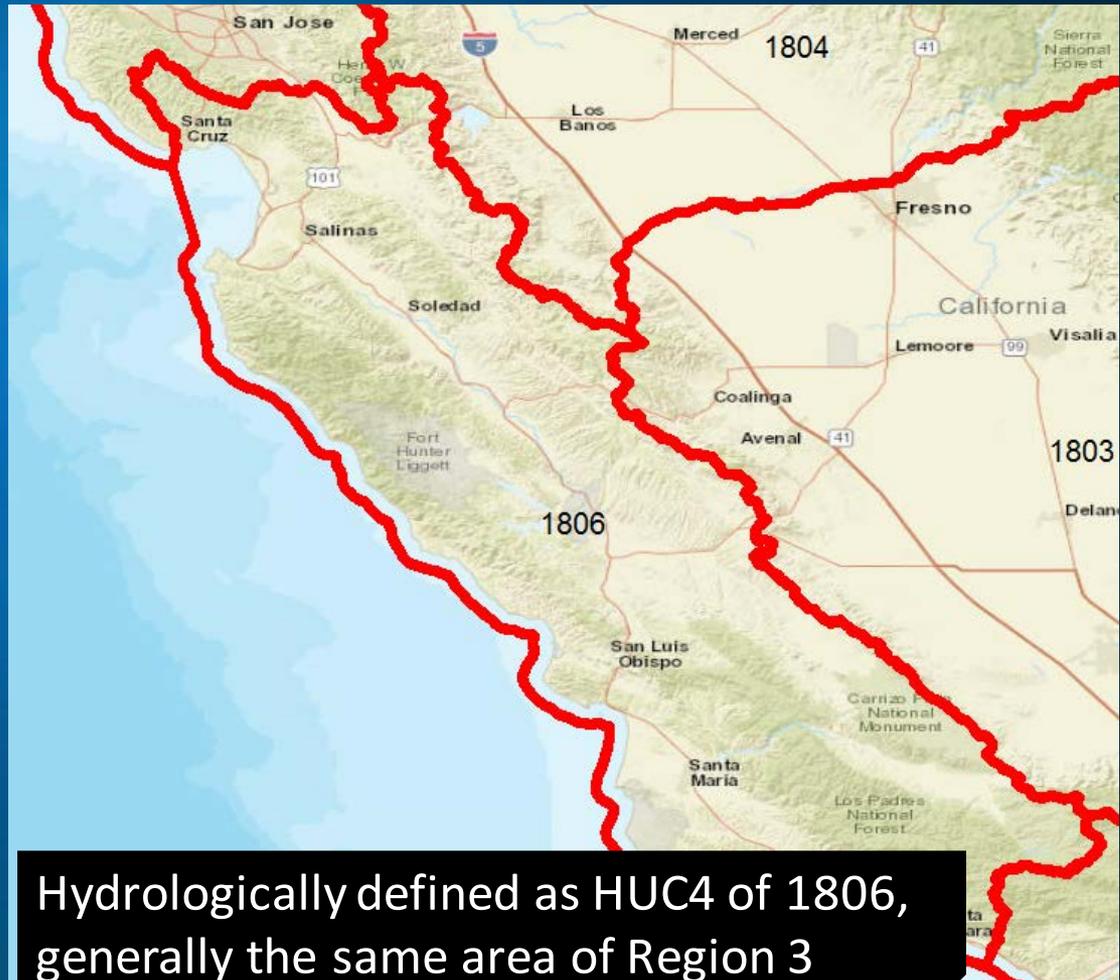


AOI/POI determination

- A recently developed model application based on the two basic functions
- Approach: run the model iteratively, and determine AOIs and POIs at the same time
- Potential applications
 - Develop new monitoring projects (e.g., DPR#310)
 - Evaluate and improve existing studies

Model application, example 3

- AOI/POI determination for Ag. monitoring in the Central Coast



Demonstration

Pesticide Prioritization for Surface Water Monitoring, Ver. 4

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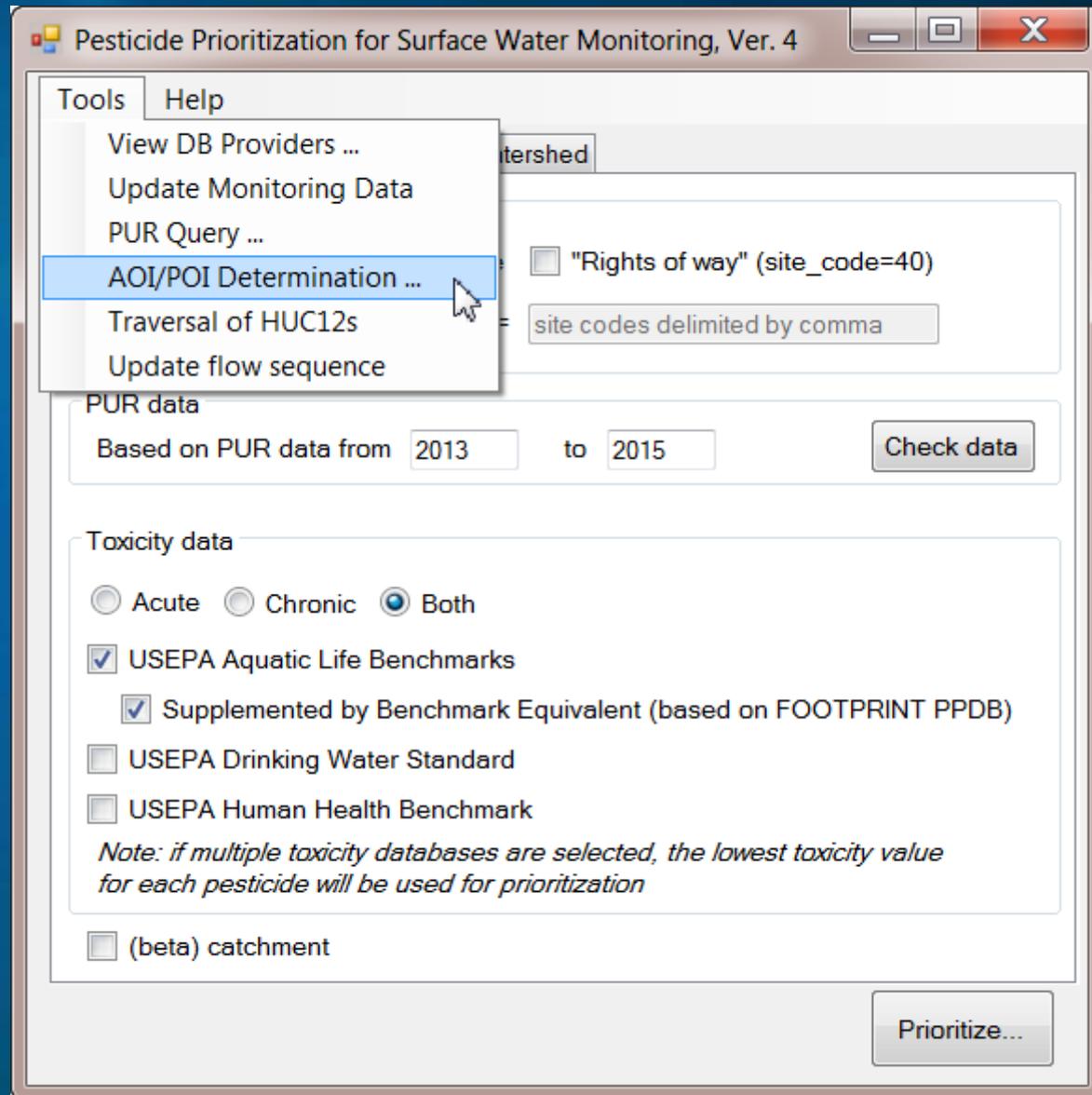
USEPA Drinking Water Standard

USEPA Human Health Benchmark

Note: if multiple toxicity databases are selected, the lowest toxicity value for each pesticide will be used for prioritization

(beta) catchment

Demonstration



Demonstration

AOI/POI Determination Wizard (page 1 of 4)



Study Domain

Specify study domain

- Statewide
 by HUC4

- 1801 Klamath-Northern California Coastal
- 1802 Sacramento
- 1803 Tulare-Buena Vista Lakes
- 1804 San Joaquin
- 1805 San Francisco Bay
- 1806 Central California Coastal
- 1807 Southern California Coastal
- 1808 North Lahontan
- 1809 Northern Mojave-Mono Lake
- 1810 Southern Mojave-Salton Sea



Next >

Ag top-20, currently sampled by DPR

AOI/POI Determination Wizard (page 2 of 4)

POI Selection

Part 1: Select POIs from model-prioritized pesticides:

POI?	ChemCode	ChemName	UseScore	ToxScore	FinalScore
<input checked="" type="checkbox"/>	367	MALATHION	5	6	30
<input checked="" type="checkbox"/>	3849	IMIDACLOPRID	4	7	28
<input checked="" type="checkbox"/>	2008	PERMETHRIN	4	7	28
<input checked="" type="checkbox"/>	383	METHOMYL	4	5	20
<input checked="" type="checkbox"/>	1973	OXYFLUORFEN	4	5	20
<input checked="" type="checkbox"/>	253	CHLORPYRIFOS	3	6	18
<input type="checkbox"/>	361	LINURON	3	6	18
<input checked="" type="checkbox"/>	1992	DIFLUBENZURON	2	8	16
<input type="checkbox"/>	1601	PARAQUAT DICHLORIDE	3	5	15
<input type="checkbox"/>	5946	SPINETORAM	3	5	15
<input checked="" type="checkbox"/>	2300	BIFENTHRIN	2	7	14
<input checked="" type="checkbox"/>	2297	LAMBDA-CYHALOTHRIN	2	7	14
<input type="checkbox"/>	179	CHLORTHAL-DIMETHYL	4	3	12
<input type="checkbox"/>	1929	DENDIMETHALIN	2	4	12

Part 2: Additional POIs specified by a user (comma-delimited chem_code)

Select All
Select None
Invert Selection

Next >

Note

- Two more chemicals were added upon the request on 1/10/2018
 - Methoxyfenozide
 - Azoxystrobin

Ag. top-3 HUC8's

AOI/POI Determination Wizard (page 3 of 4)

HUC8 Analysis

Part 1: Select HUC8s from model-prioritized pesticides:

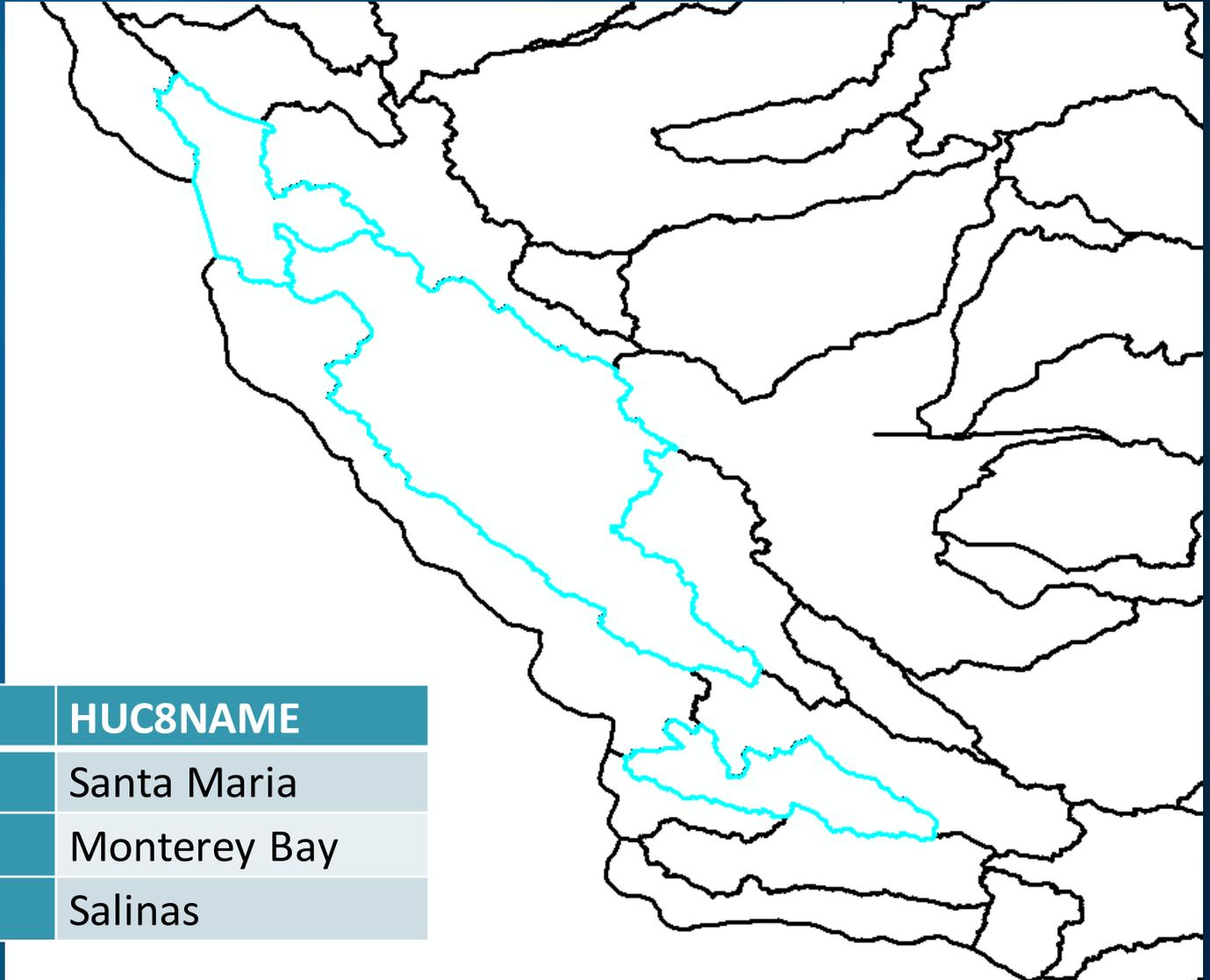
AOI?	HUC8	HUC8Name
<input checked="" type="checkbox"/>	18060015	Monterey Bay
<input checked="" type="checkbox"/>	18060005	Salinas
<input checked="" type="checkbox"/>	18060008	Santa Maria
<input type="checkbox"/>	18060002	Pajaro
<input type="checkbox"/>	18060009	San Antonio
<input type="checkbox"/>	18060006	Central Coastal
<input type="checkbox"/>	18060010	Santa Ynez
<input type="checkbox"/>	18060007	Cuyama
<input type="checkbox"/>	18060013	Santa Barbara Coastal
<input type="checkbox"/>	18060004	Estrella
<input type="checkbox"/>	18060003	Carrizo Plain
<input type="checkbox"/>	18060014	Santa Barbara Channel Islands

Part 2: Additional HUC8s specified by a user (comma-delimited chem_code)

Next >

Select All
Select None
Invert Selection

Ag. top-3 HUC8's



HUC8	HUC8NAME
18060008	Santa Maria
18060015	Monterey Bay
18060005	Salinas

Modeling results

AOI/POI Determination Wizard (page 4 of 4)

HUC12 Analysis

Options

of HUC12s per selected HUC8:

(Mainstem only) threshold (by use amount) for relevant POIs, %:

Threshold (by coverage) for relevant landuse, %:

Model-prioritized HUC12 and stream type Update Export

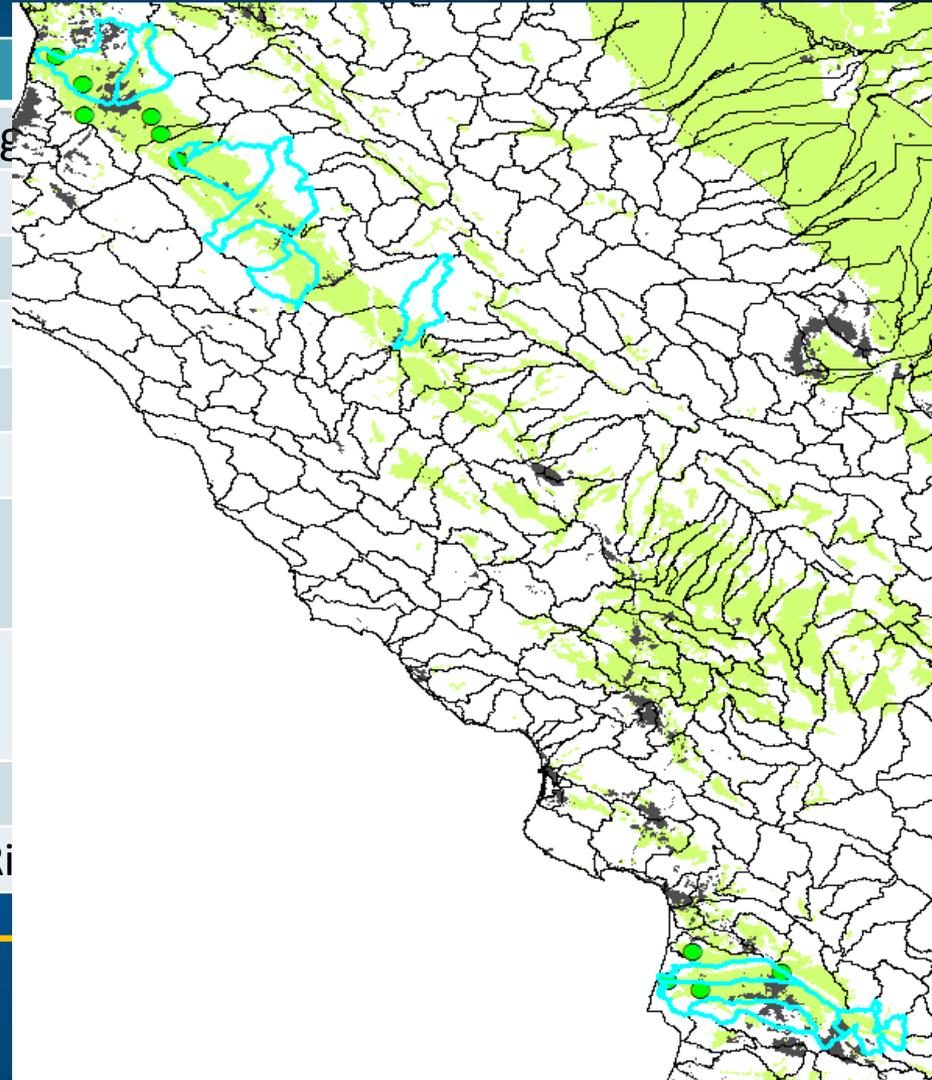
	HUC12	HUC12Name	Type	Irrelevant POI(s)
▶	180600150103	Alisal Slough-Tembladero Slough	Mainstem	2171,1868,
	180600150102	Nativdad Creek-Gabilan Creek	Mainstem	1973,2171,1868,
	180600150103	Alisal Slough-Tembladero Slough	Tributary	
	180600150102	Nativdad Creek-Gabilan Creek	Tributary	
	180600051505	Johnson Creek	Mainstem	
	180600051311	Paraiso Springs-Arroyo Seco	Mainstem	
	180600051004	Lower San Lorenzo Creek	Mainstem	
	180600051501	Lasher Canyon-Salinas River	Tributary	
	180600051509	Alisal Creek-Salinas River	Tributary	
	180600051505	Johnson Creek	Tributary	
	180600080503	Corralitos Canyon	Mainstem	2171,105,
	180600080502	Lower Orcutt Creek	Mainstem	2008,2171,1868,
	180600080404	Santa Maria Canyon-Sisquoc Ri	Mainstem	2300

Close

Summary of results

HUC12	HUC12NAME
180600150103	Alisal Slough-Tembladero Slough
180600080603	Lower Santa Maria River
180600080503	Corralitos Canyon
180600051004	Lower San Lorenzo Creek
180600051502	McCoy Creek-Salinas River
180600051505	Johnson Creek
180600080502	Lower Orcutt Creek
180600150102	Nativdad Creek-Gabilan Creek
180600051311	Paraiso Springs-Arroyo Seco
180600080404	Santa Maria Canyon-Sisquoc Ri

Modeling results



Notes

- The demonstration only shows results for top-3 HUC12s in each of the top-3 HUC8s
 - But you can select all HUC12s in all HUC8s
 - Full modeling results (for 339 HUC12s in the Central Coast) were sent on 2/2/2018
- The model only ranks HUC12s within a HUC8, not between different HUC8s
 - Regional ranking (e.g., among all 339 HUC12s) can be done manually with full modeling results

More considerations

- Modeling results narrow down the candidates of POI and AOI for monitoring
- To finalize the AOI/POI determination, additional factors should be considered
 - e.g., safety, site accessibility, perennial waters, other monitoring agency representation, ecological importance of receiving waters, and budgetary constraints.

Thanks

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