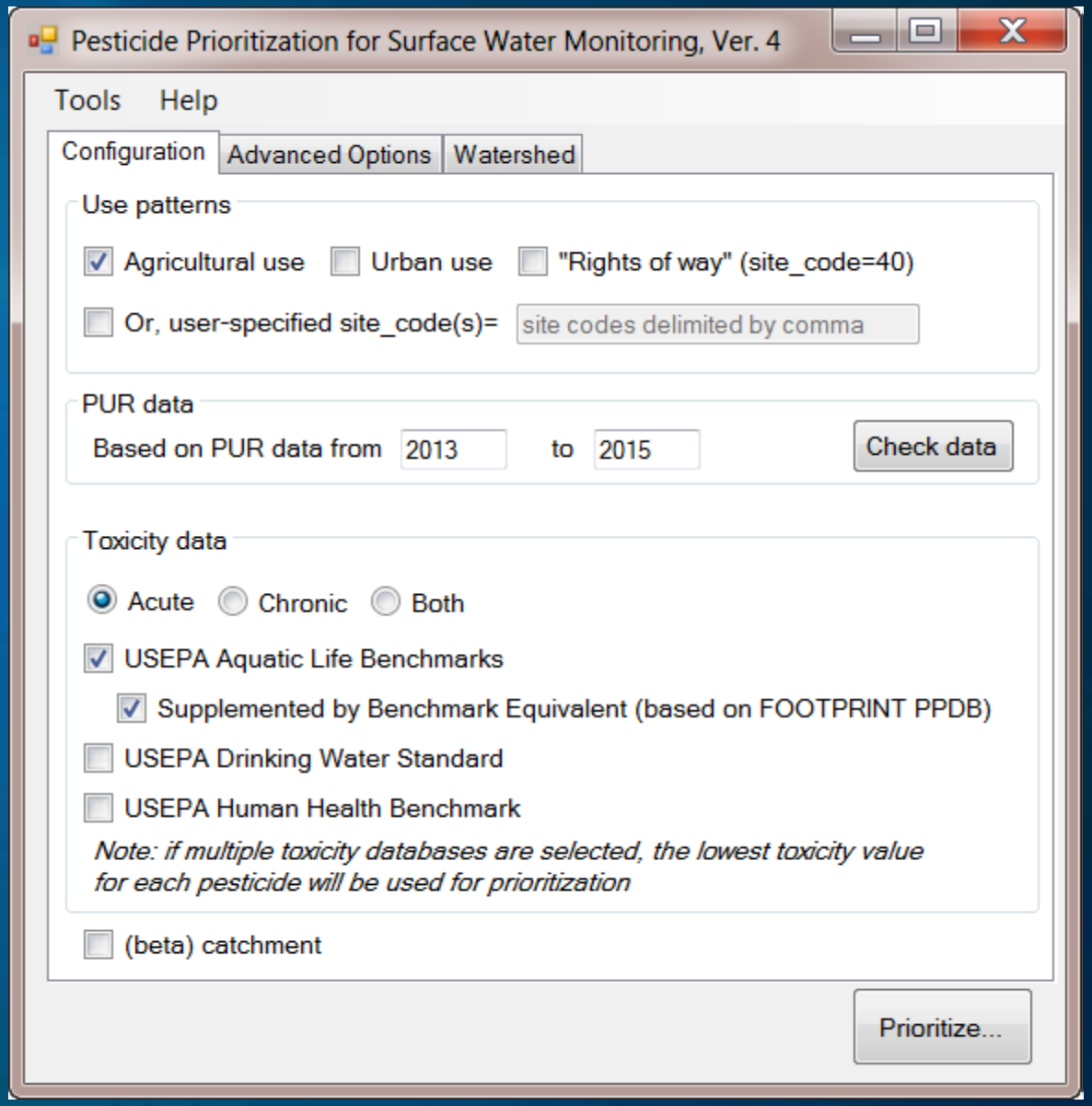
Surface Water Monitoring Prioritization (SWMP) model and applications in the Central Coast

Yuzhou Luo, PhD
Research Scientist IV
Surface Water Protection Program, CDPR
03/22/2018

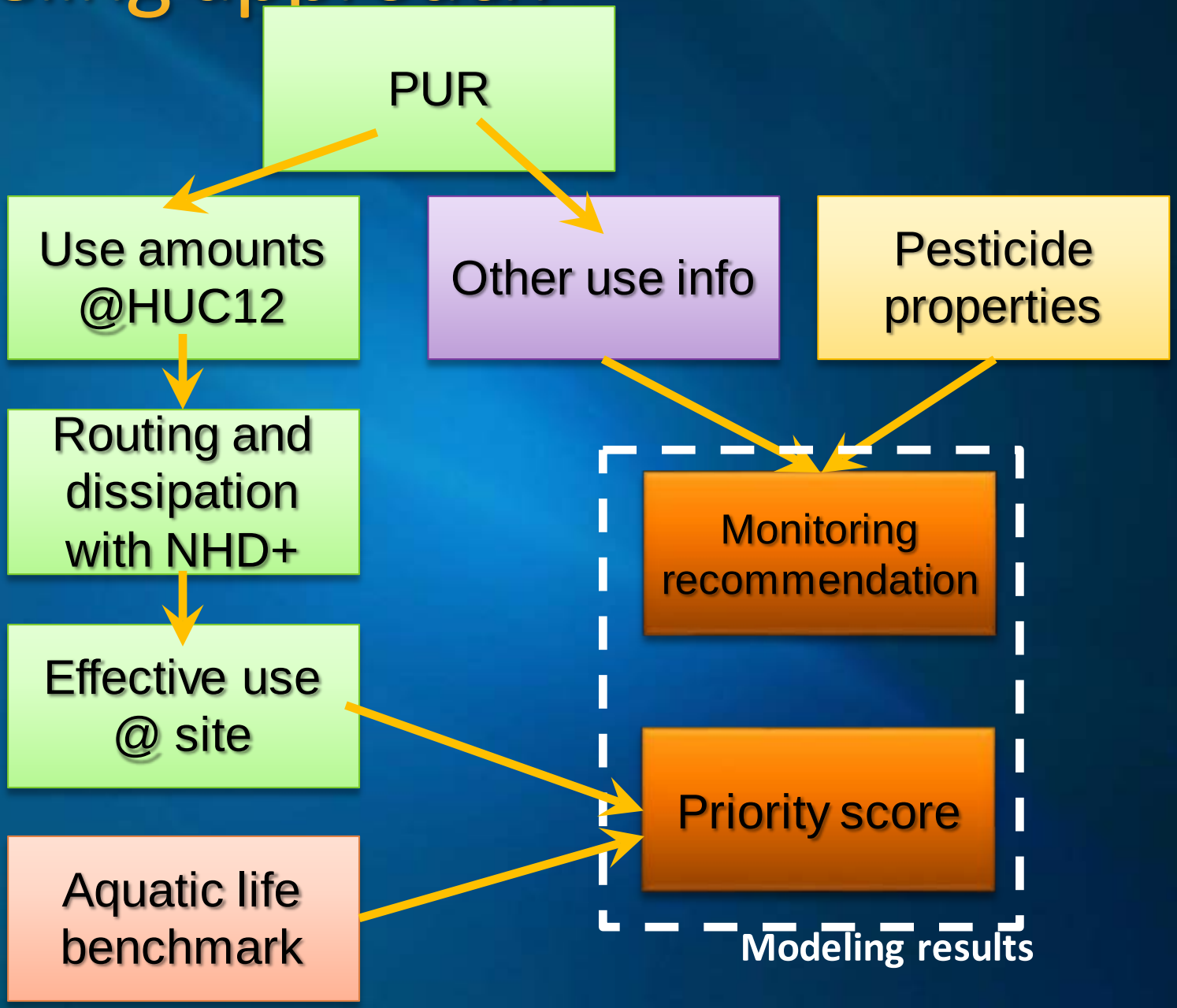
SWMP

- 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

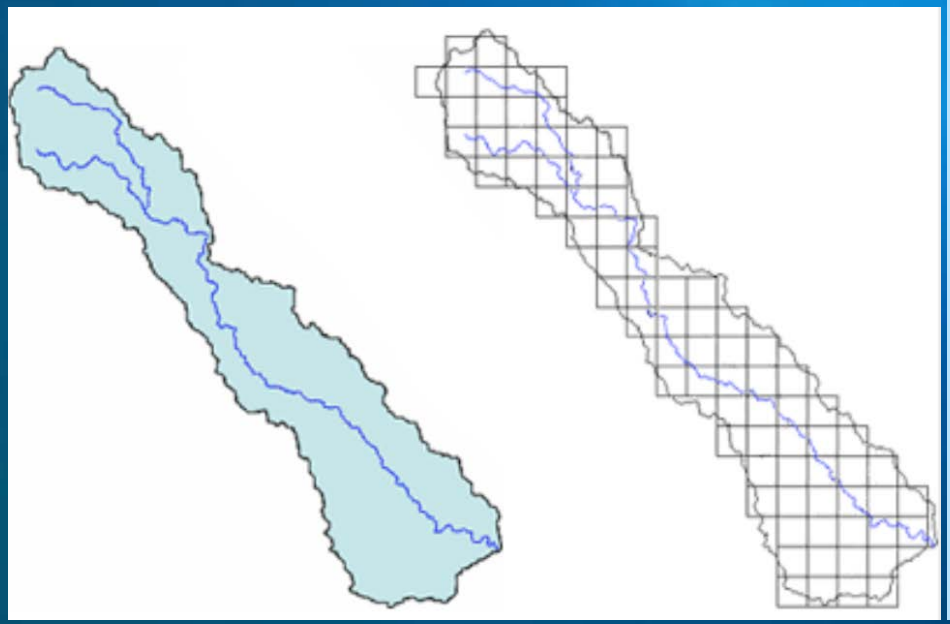


Modeling approach



PUR @ watershed scale

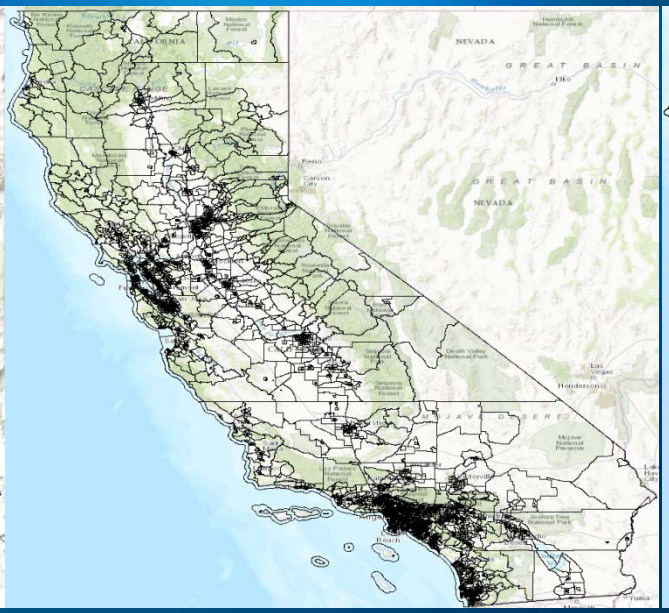
- [1] Agricultural uses: to aggregate PUR data from section (1x1mi^2) to HUC12



4,415 HUC12s in California

PUR @ watershed scale

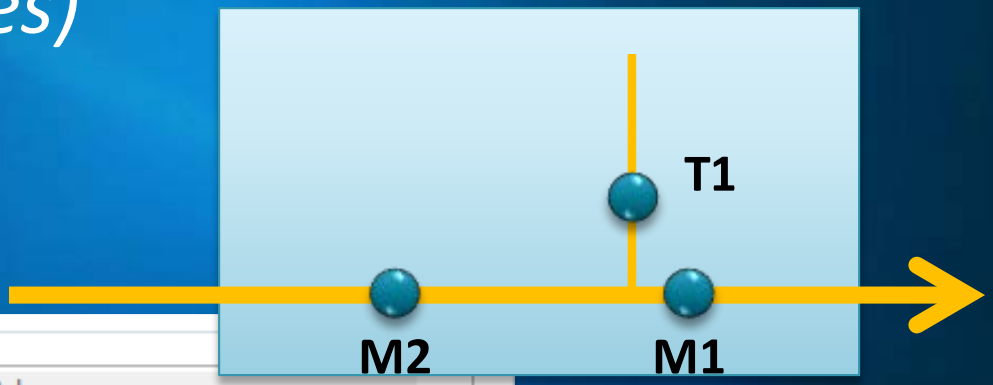
- [2] Urban uses: downscaling from county to watershed by population density
  - “Structure pest control”
  - “Landscape maintenance”

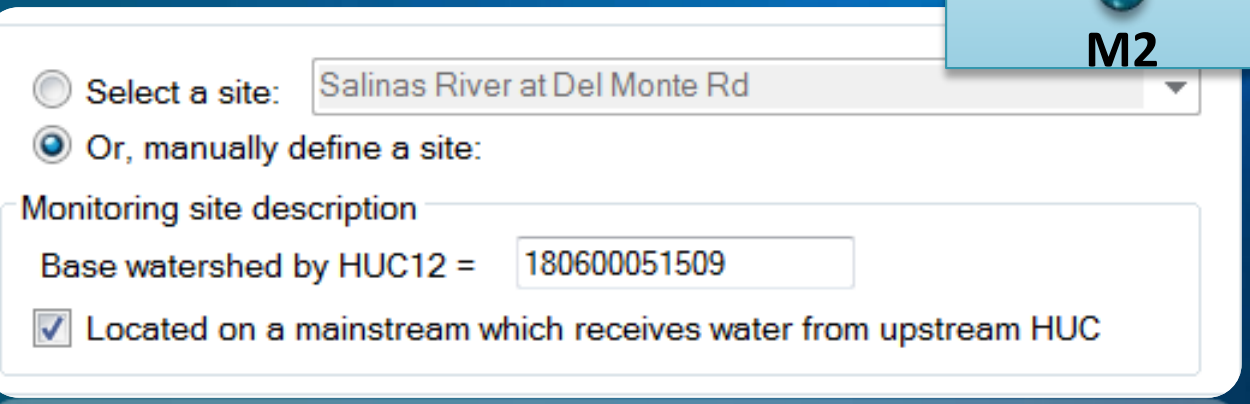


County (58) → ACS census tract (8057) → HUC12 (4,415)

Tributary vs. mainstem

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





Model – [Watershed] – HUC12-based prioritization

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,

Salinas River, Drainage Area = 11082 km^2

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

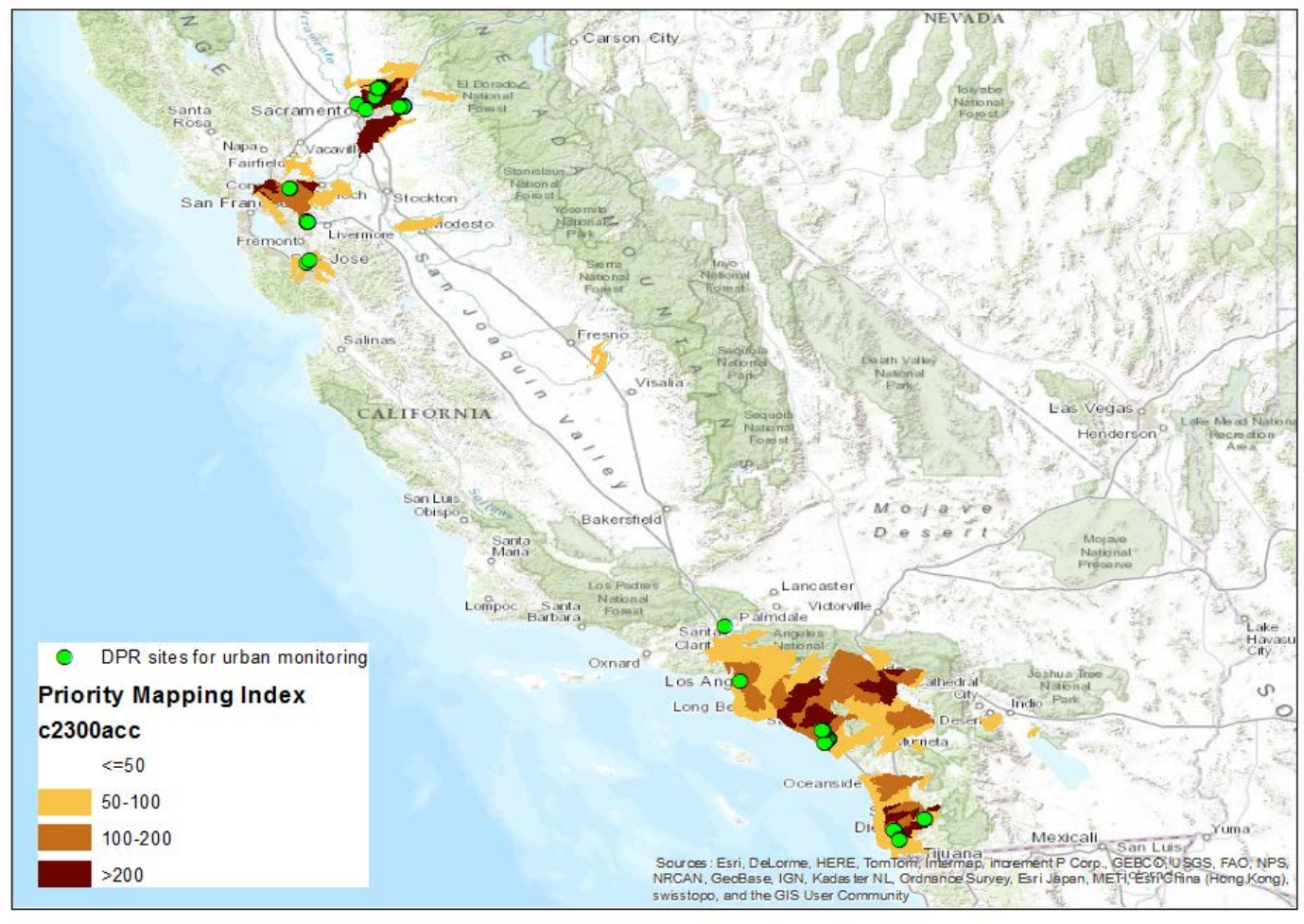
Two modeling functions

- [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*



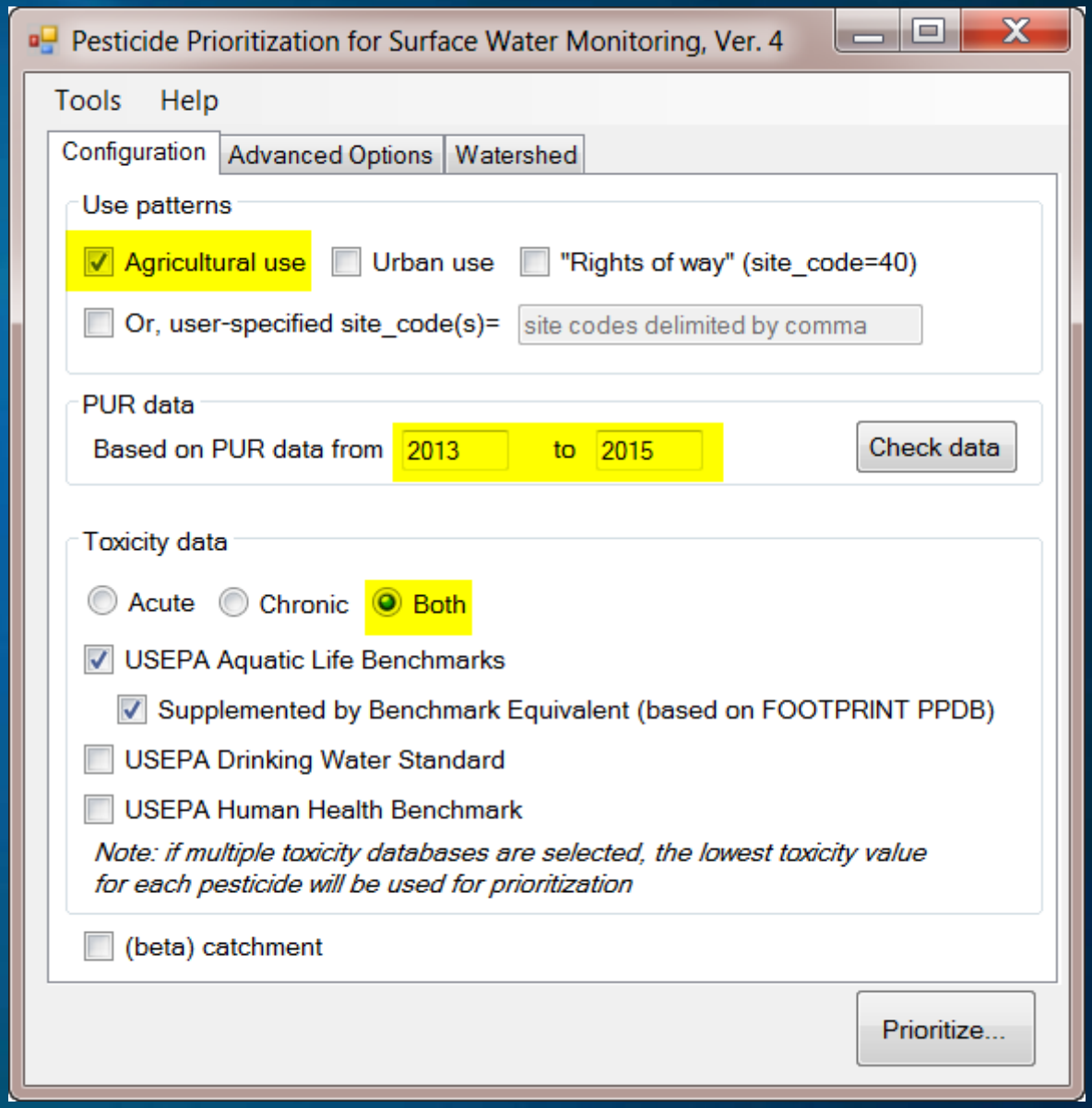
AOI/POI determination

- 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

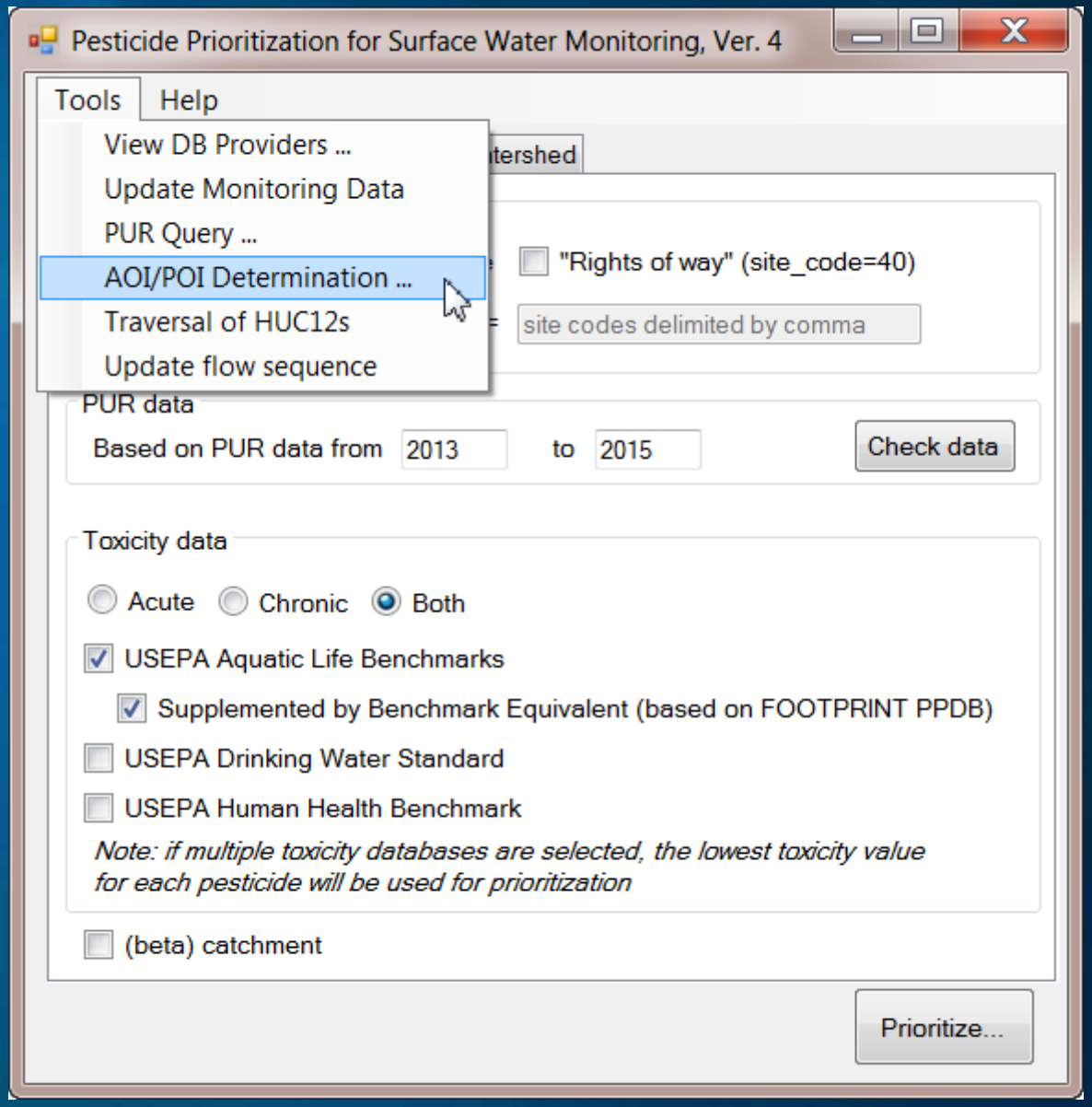
Model application, example 3

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

Demonstration



Demonstration



Demonstration

AOI/POI Determination Wizard (page 1 of 4)

Study Domain

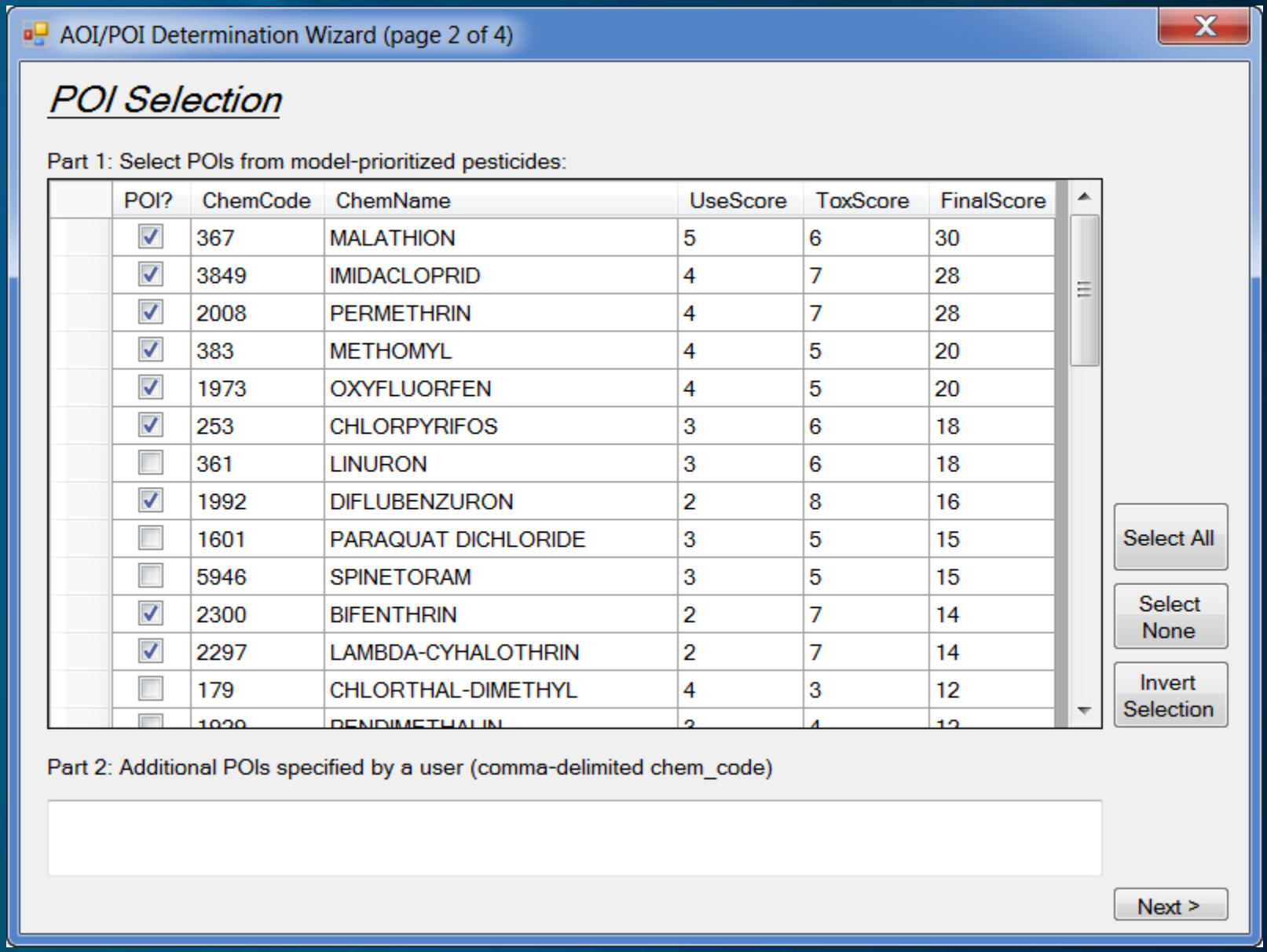
Specifiy study domain

- 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 >

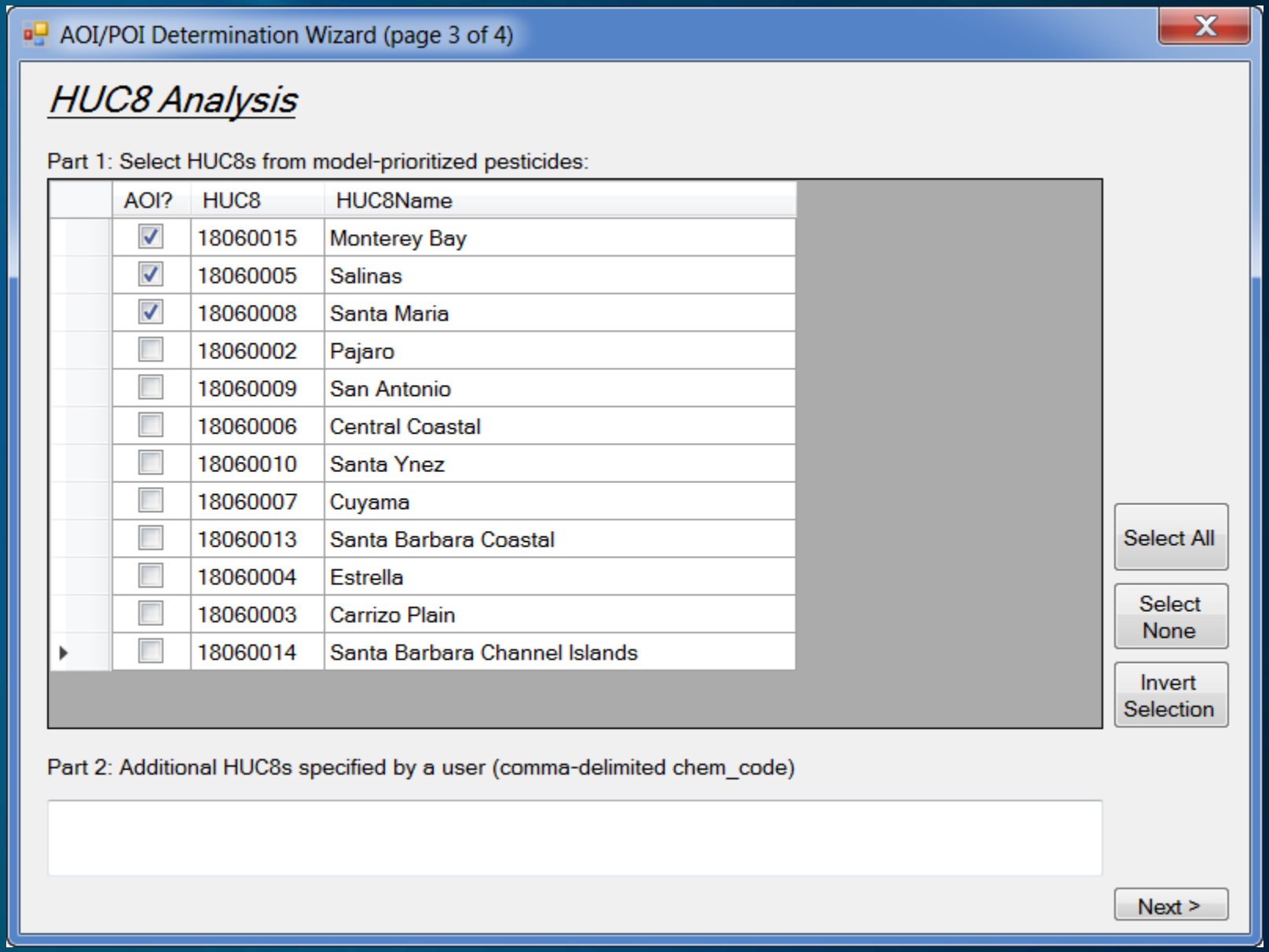
Ag top-20, currently sampled by DPR



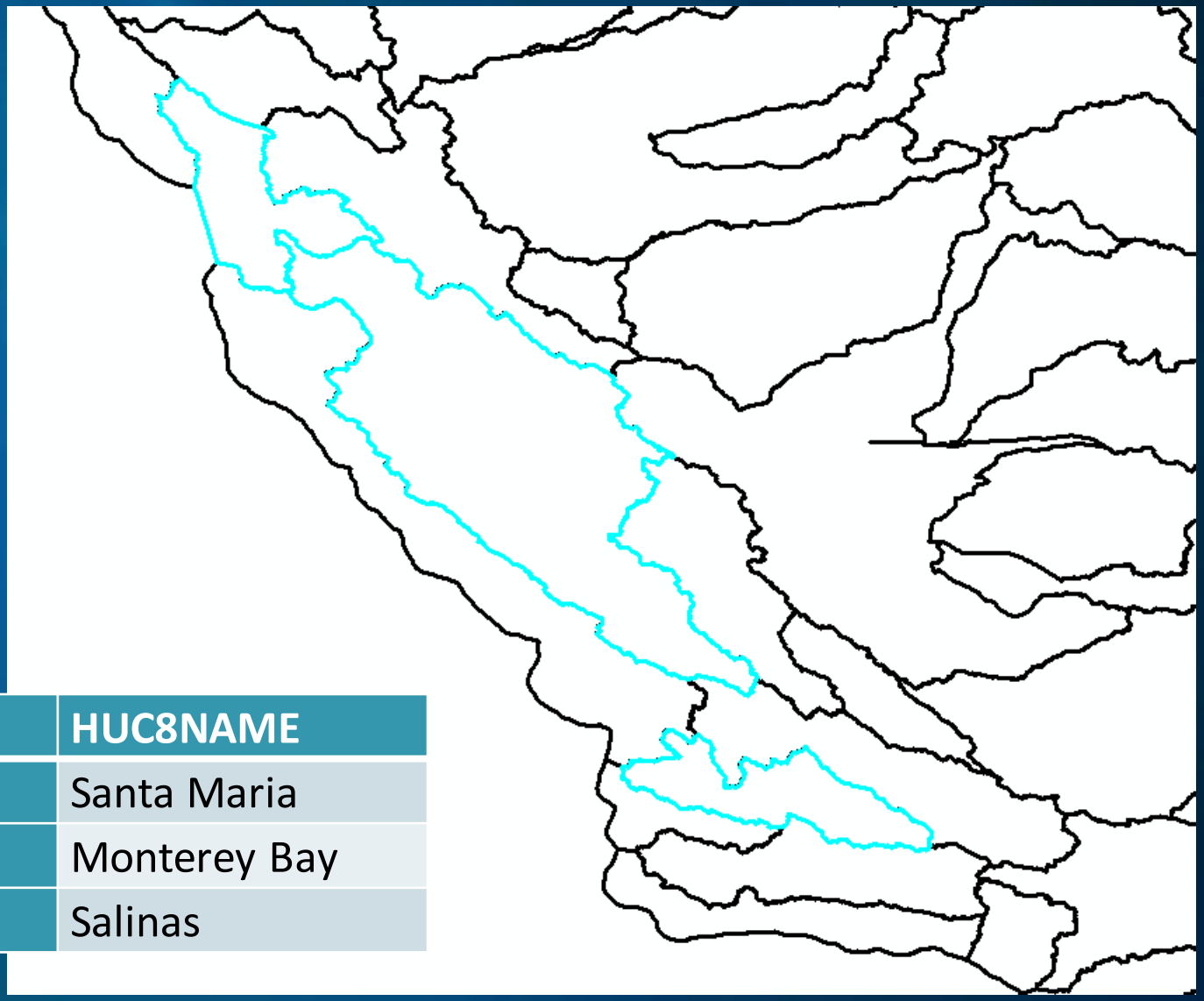
Note

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

Ag. top-3 HUC8's

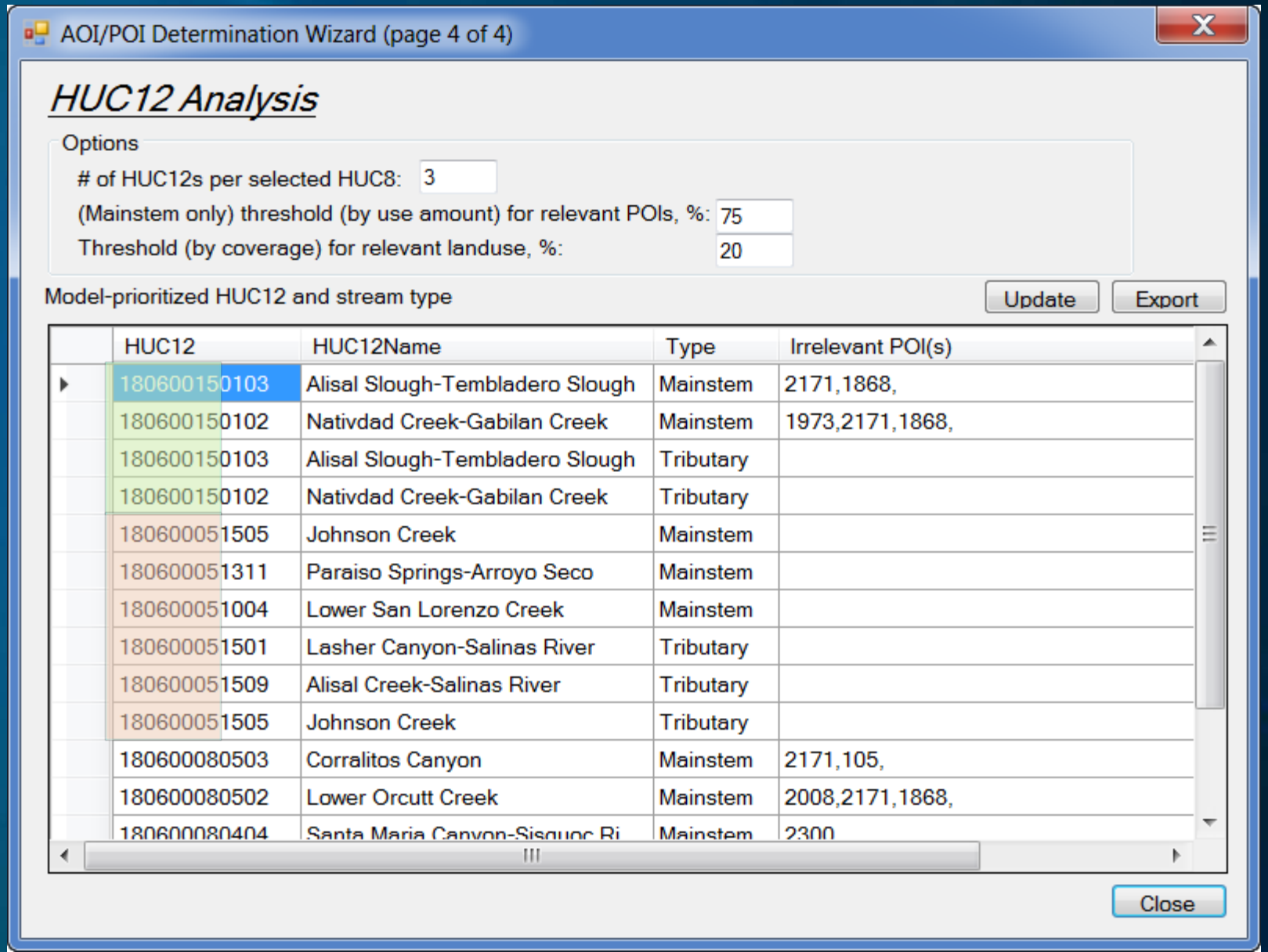


Ag. top-3 HUC8's



HUC8	HUC8NAME
18060008	Santa Maria
18060015	Monterey Bay
18060005	Salinas

Modeling results

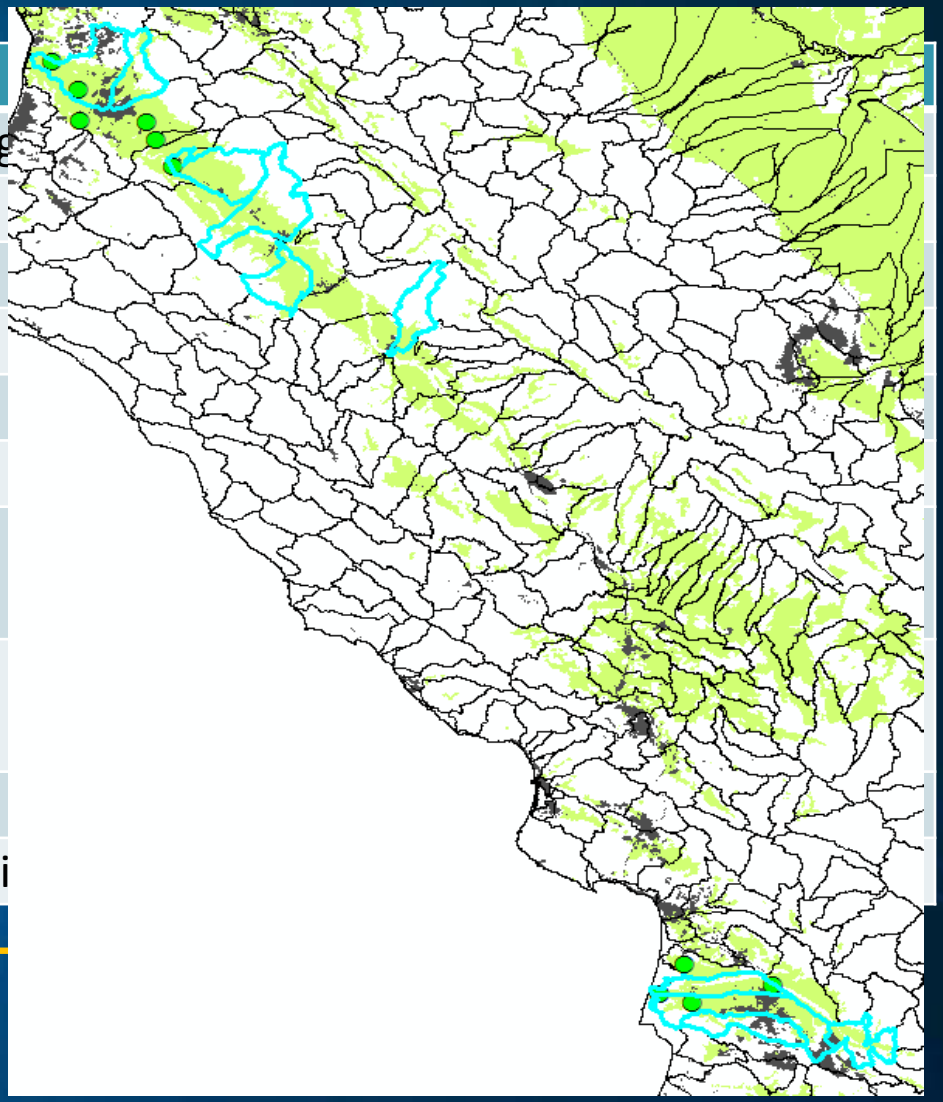


HUC12	HUC12Name	Type	Irrelevant POI(s)
180600150103	Alisal Slough-Tembladero Slough	Mainstem	2171,1868,
180600150102	Nativdad Creek-Gabilan Creek	Mainstem	1973,2171,1868,
180600150103	Alisal Slough-Tembladero Slough	Tributary	
180600150102	Nativdad Creek-Gabilan Creek	Tributary	
180600051505	Johnson 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

Summary of results

HUC12	HUC12NAME
180600150103	Alisal Slough-Tembladero Sloug
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

Yuzhou.Luo@cdpr.ca.gov
916-445-2090