THE PRIORITIZED PESTICIDE LISTS FOR SURFACE WATER MONITORING

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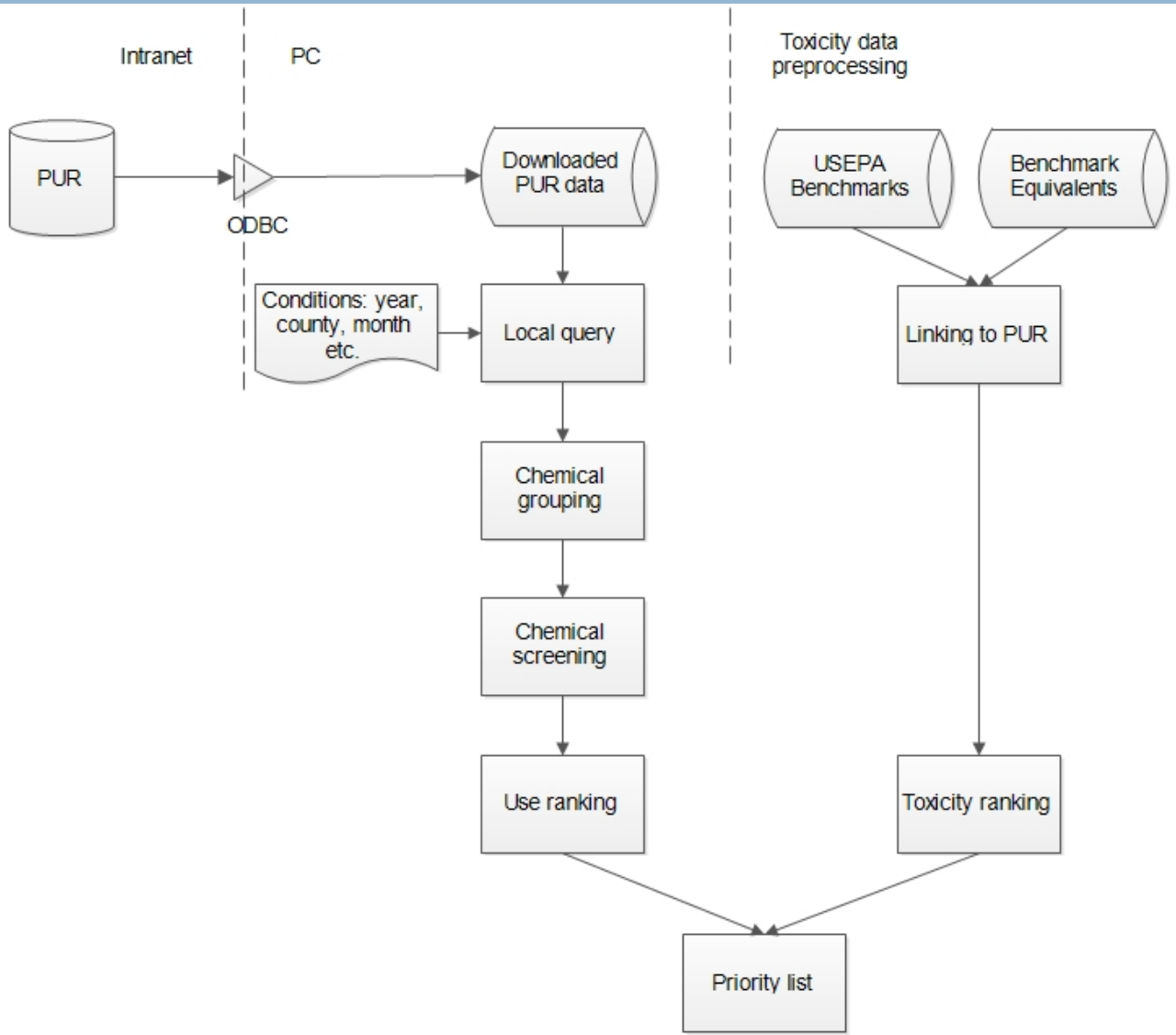
Objective

- Methodology and computer implementation to prioritize pesticides for surface water monitoring in agricultural and urban areas
- Development philosophy
  - Consistency
  - Automation
  - Extensibility

Overview


Intranet
PC
Toxicity data preprocessing
PUR
ODBC
Downloaded PUR data
USEPA Benchmarks
Benchmark Equivalents
Conditions: year, county, month etc.
Local query
Linking to PUR
Chemical grouping
Chemical screening
Use ranking
Toxicity ranking
Priority list

Input data

- PUR (Pesticide Use Reporting) database by CDPR
  - "…*the world's most extensive database on pesticide use*."
  - Spatial resolutions: section (1x1 mi^2) to county
  - Temporal resolutions: daily to monthly
- Aquatic life benchmarks
  - Benchmarks by USEPA OPP
  - Benchmarks equivalent by CDPR

Summary of the methodology

- Pesticide use ranking, with scores = 1 (lower use) to 5 (higher use)
  - Exclude/summarize certain pesticides
  - Prioritize based on regional/seasonal data
- Pesticide toxicity ranking, with scores = 1 (lower toxicity) to 8 (higher toxicity)
- [Final score] = [use score] * [toxicity score]

Scores for prioritization

chem_code	pesticide name	use (lb)	use score	toxicity (ppb)	toxicity score	final score
253	CHLORPYRIFOS	1297827	5	0.05	6	30
2008	PERMETHRIN	279992.4	4	0.01	7	28
1601	PARAQUAT DICHLORIDE	1882586	5	0.396	5	25
1973	OXYFLUORFEN	751463.7	5	0.29	5	25
2300	BIFENTHRIN	170210.3	4	0.075	6	24
2297	LAMBDA-CYHALOTHRIN	51826.9	3	0.0035	7	21
714	COPPER	5509287	5	2.05	4	20
1929	PENDIMETHALIN	1893593	5	5.2	4	20
677	CHLOROTHALONIL	903034.8	5	1.8	4	20
629	ZIRAM	741690	5	9.7	4	20
367	MALATHION	501806.9	4	0.3	5	20
231	DIURON	618561.1	4	2.4	4	16
597	TRIFLURALIN	497870.7	4	7.52	4	16
5133	S-METOLACHLOR	281022	4	8	4	16
383	METHOMYL	225722.9	4	2.5	4	16
503	PROPANIL	2128149	5	16	3	15
1868	ORYZALIN	657106.9	5	15.4	3	15
198	DIAZINON	117519.9	3	0.11	5	15
335	PHOSMET	115415.5	3	1	5	15
105	CARBARYL	104763.6	3	0.85	5	15
5802	FLUMIOXAZIN	84139.6	3	0.852	5	15
2171	CYPERMETHRIN	59217.8	3	0.195	5	15
229	DIQUAT DIBROMIDE	57168.4	3	0.75	5	15
3995	FIPRONIL	51350.5	3	0.11	5	15
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Toxicity ranking

Toxicity score	Benchmark value (ppb)
8 (very high)	<=0.001
7	(0.001, 0.01]
6	(0.01, 0.1]
5	(0.1, 1]
4	(1,10]
3	(10,100]
2	(100,1000]
1 (very low)	>1000

Starner (2007). Assessment of acute aquatic toxicity of current-use pesticides in California, with monitoring recommendations, CDPR.
Starner (2008). Review of the U.S. Environmental Protection Agency aquatic life benchmarks, with monitoring recommendations, CDPR.

Use ranking: probability based

Chemical name	Use (lb)
COPPER	5509287
GLYPHOSATE, ISOPROPYLAMINE SALT	4831091
POTASSIUM N-METHYLDITHIOCARBAMATE	4336684
GLYPHOSATE, POTASSIUM SALT	2616808
KAOLIN	2365038
PROPANIL	2128149
PENDIMETHALIN	1893593
PARAQUAT DICHLORIDE	1882586
CHLORPYRIFOS	1297827
CHLOROTHALONIL	903035
OXYFLUORFEN	751464
ZIRAM	741690
ORYZALIN	657107
GLUFOSINATE-AMMONIUM	651477
MANCOZEB	647981
DIURON	618561
GLYPHOSATE	548968
MALATHION	501807
TRIFLURALIN	497871
2,4-D	416636
SIMAZINE	413940
CAPTAN	383844

Percentage	Use score
2%	5 (very high)
4%	4
8%	3
16%	2
70%	1 (very low)

default values, and
can be changed by users

Chemical grouping and screening

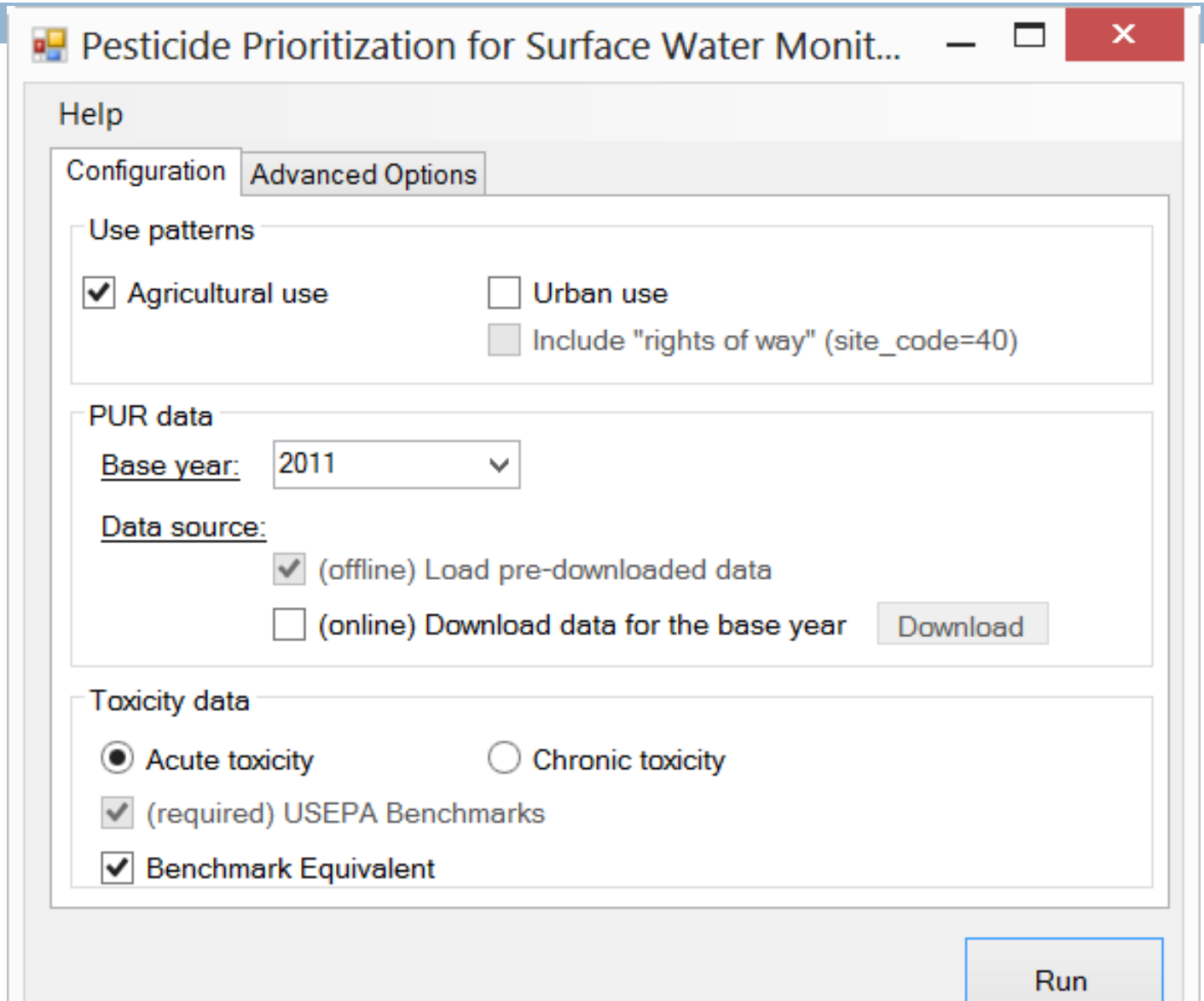
- Grouping: multiple chemicals → ONE form in surface water
  - Copper based pesticides; 2,4-D acids and salts, 2,4-D esters
- Screening: to exclude chemicals which are unlikely to be surface water quality problems, or not usually monitored by SWPP
  - Based on use type (e.g., fumigant)
  - Based on chemical group (e.g., inorganic)

Screening codes

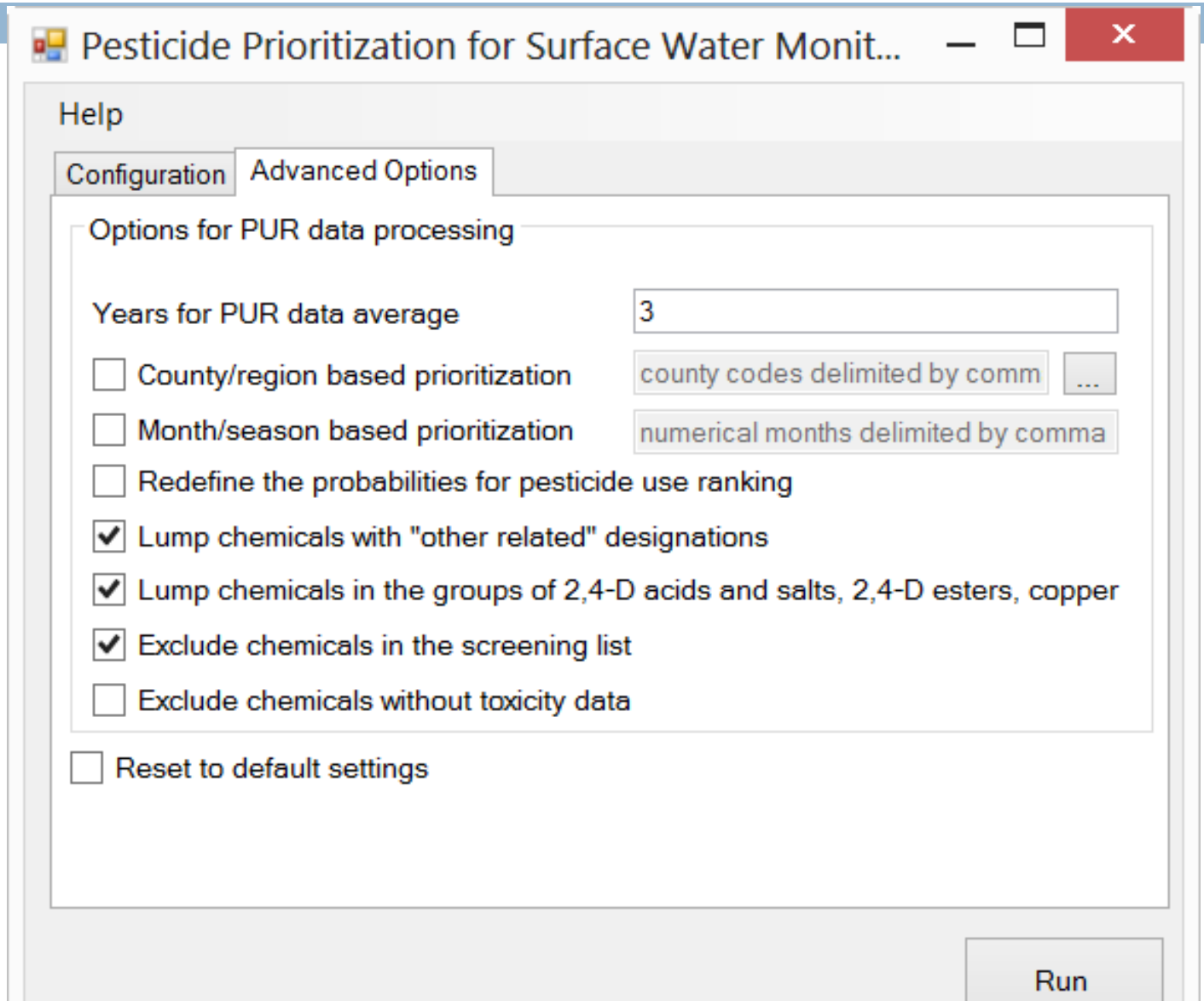
Screen "A" - categories of chemical use	Screen "B" - chemical groups
Adjuvants	Animal derived
Bait	Botanical
Breakdown Product	Fatty acid/ester
Dye	Heavy metal
Fragrance	Inorganic [not Copper]
Impurity	Inorganic compound
Fumigant	Microbial
Microbiocide	Micro-organism derived
Other product constituent	Oil – essential/vegetable
Pheromone	Petroleum derivative
Plant growth regulator	Plant derived
Repellent – Bird, Deer, Dog, Cat	Soap
Soap	
Solvent	
Sterilant	
Surfactant	
Synergist	
Unclassified	
Wood preservative	

Budd et al. (2013). Method for Prioritizing Urban Pesticides for Monitoring California's Urban Surface Waters. CDPR.

User Graphic Interface



User Graphic Interface, cont'd



Right click here to download the report.
Click here to download the priority list in Excel format.

Report summary:
Use Data: Agriculture
Year(s) of PUR data: 2009 ~ 2011
PUR data version: Year2011 (3/21/2013 1:47:46 PM); Year2010 (3/21/2013 1:05:46 PM); Year2009 (3/21/2013 1:06:20 PM);
Type of toxicity benchmarks: Acute toxicity data
Method for use ranking: Probabilistic method

- **use rate > 1.256E06 lb[AI]/year (or selected months), score=5, with 13 chemicals**
- **use rate > 2.836E05 lb[AI]/year (or selected months), score=4, with 24 chemicals**
- **use rate > 7.020E04 lb[AI]/year (or selected months), score=3, with 48 chemicals**
- **use rate > 1.137E04 lb[AI]/year (or selected months), score=2, with 97 chemicals**
- **use rate < 1.137E04 lb[AI]/year (or selected months), score=1, with 422 chemicals**

Counties of interest: Statewide
Months of interest: Annual

chem_code	CHEMNAME	use	usescore	benchmark	toxscore	finalscore	fv
253	CHLORPYRIFOS	1271377.5	5	0.05	6	30	
2008	PERMETHRIN	110277.6	3	0.01	7	21	
714	COPPER	4938598.8	5	2.05	4	20	
1929	PENDIMETHALIN	1802207.6	5	5.2	4	20	
1601	PARAQUAT DICHLORIDE	831544	4	0.396	5	20	
1973	OXYFLUORFEN	611999.4	4	0.29	5	20	
367	MALATHION	500470.3	4	0.3	5	20	
2300	BIFENTHRIN	85113.5	3	0.075	6	18	
677	CHLOROTHALONIL	844393.7	4	1.8	4	16	
629	ZIRAM	746473.6	4	9.7	4	16	
597	TRIFLURALIN	496793.4	4	7.52	4	16	

Future development

- Physio-chemical properties
- Pesticide degradates aquatox
- Human drinking water benchmark
- Hydrology

Contacts

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