10 Cities Project Water Quality Results

SURFACE WATER & SEDIMENT TESTING CONDUCTED IN 2019 FOR 10 CITIES IN MAINE

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Pesticides Toxicologist
Maine Board of Pesticides Control

Who am I? Where do I come from?

- Pesticides Toxicologist at Board of Pesticides Control at the Department of Agriculture, Conservation, & Forestry
- Public policy Board of Pesticides Control - Governor appointed/ Legislature confirmed

10 Cities project history

- March 2019 proposed 10 Cities Water Quality Project to the BPC public policy board

The objectives of this study are to:

- Assess the occurrence of pesticides in surface water and sediment in urban waters along a population gradient of the 10 largest Maine cities.
- Establish the feasibility of implementing passive sampling techniques for future BPC water quality sampling by comparing passive sampling results to our traditional grab samples.
- Establish a baseline for future trend studies of pesticide contamination in urban waters of Maine's ten largest cities.

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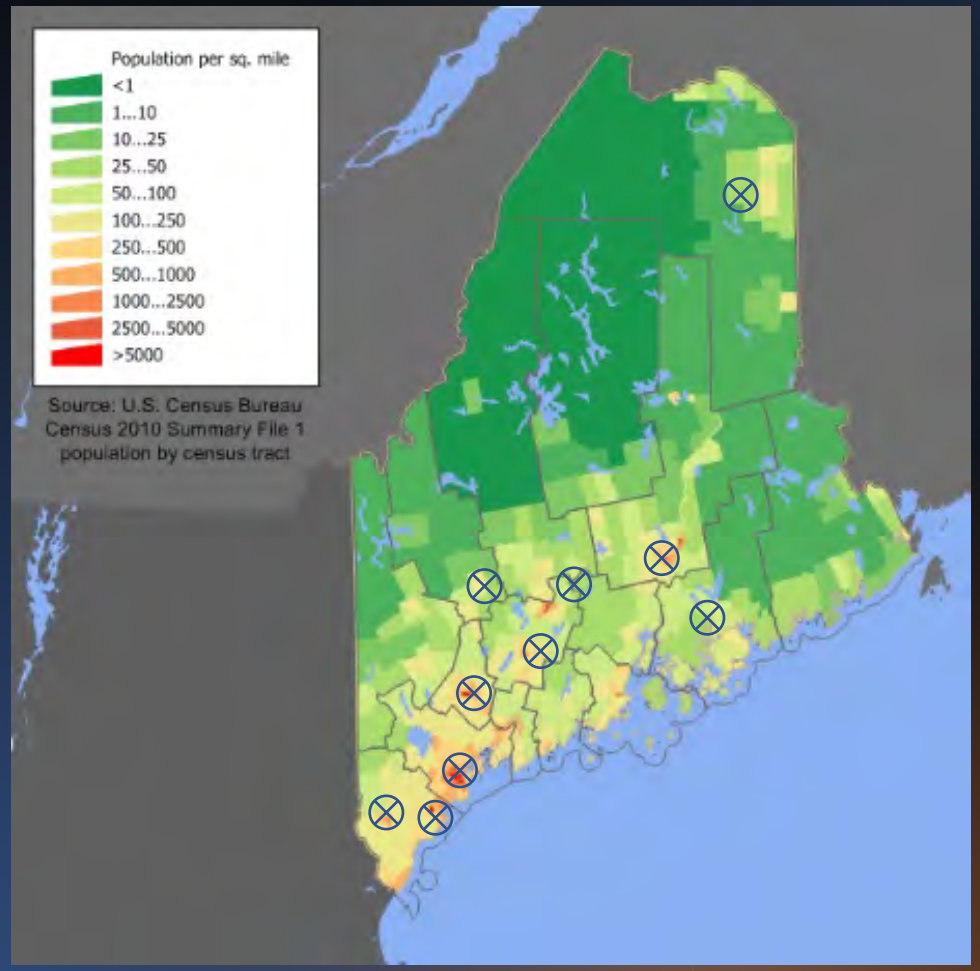
Sampling activities Summer 2019



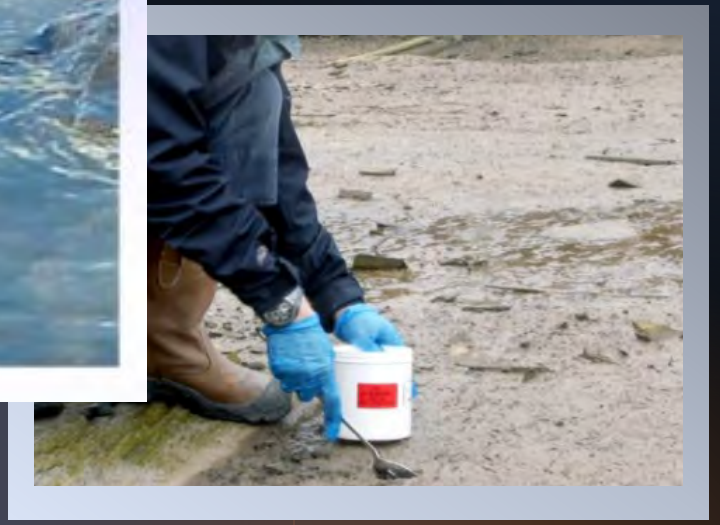
Selected cities are marked with an 'X' in a circle on the map above.

Population Centers*	Waterbody	Population†
Portland / South Portland	Fore River	91,196
Lewiston-Auburn (Durham)	Androscoggin River	59,647
Bangor / Brewer / Orono (Hampden)	Penobscot River	42,521
Biddeford / Saco	Saco River	39,759
Sanford	Mousam River	20,798
Augusta	Kennebec River	19,136
Waterville (Sidney)	Kennebec River	15,722
Presque Isle	Aroostook River	9,692
Ellsworth	Union River	7,760
Farmington	Sandy River	7,741

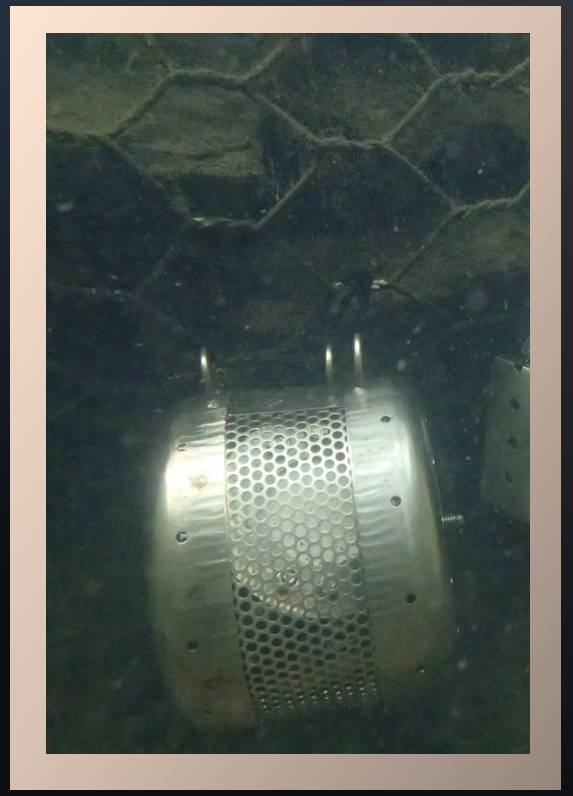
***Locations in parentheses indicate actual sampling location.**
†Population data from 2010 US Census

At each city:

- Grab samples



- Passive sampler

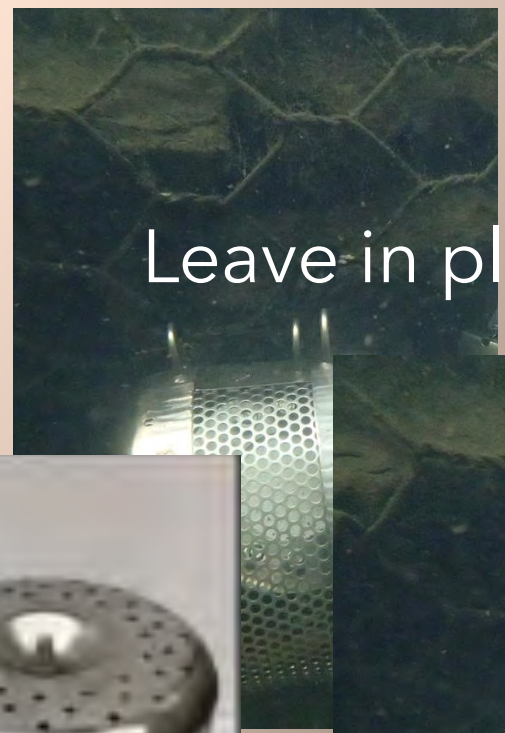


A quick detour:

What is a passive sampler?

Fancy plastic

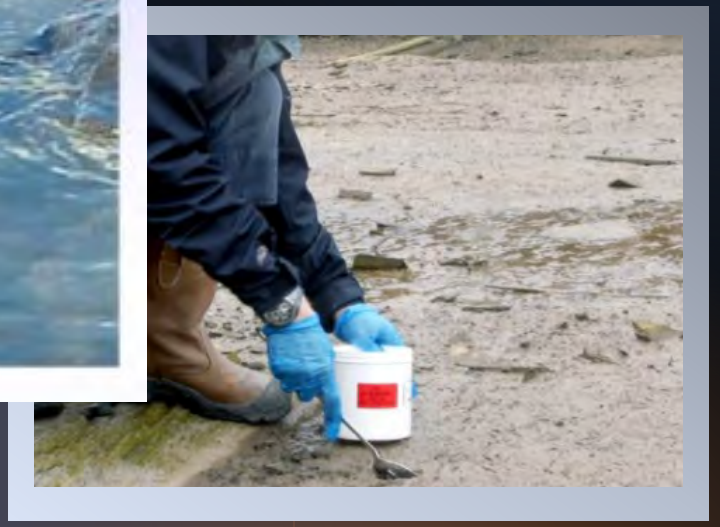
In an expensive metal housing



Leave in place for 3 - 4 weeks

At each city:

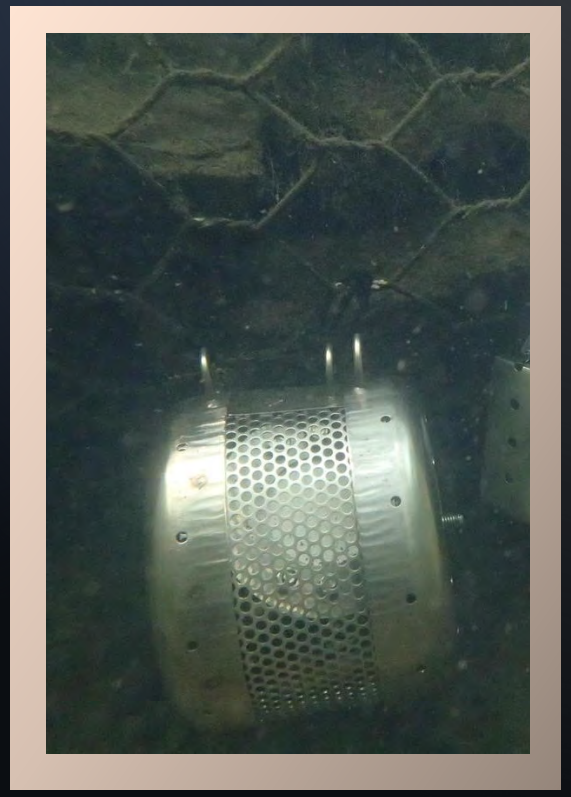
- Grab samples



Pros:

provides concentrations

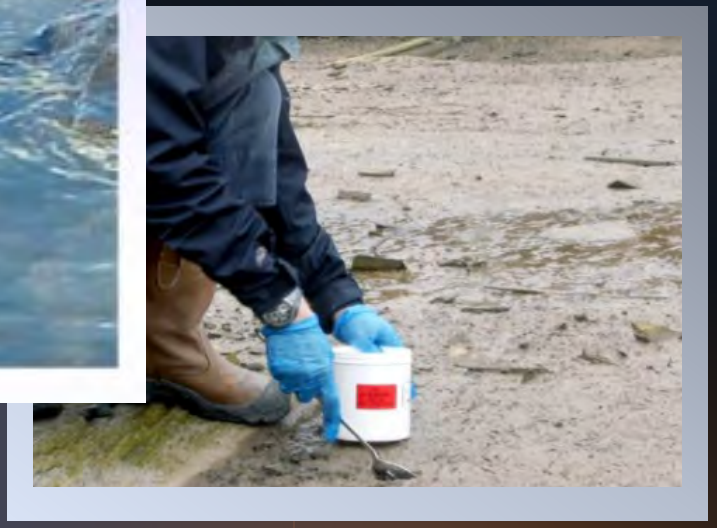
- Passive sampler



captures daily changes

At each city:

- Grab samples



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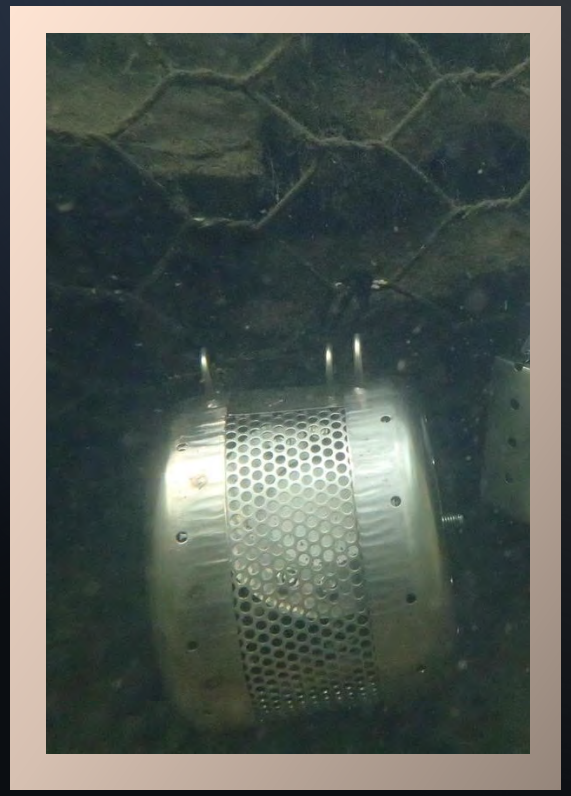


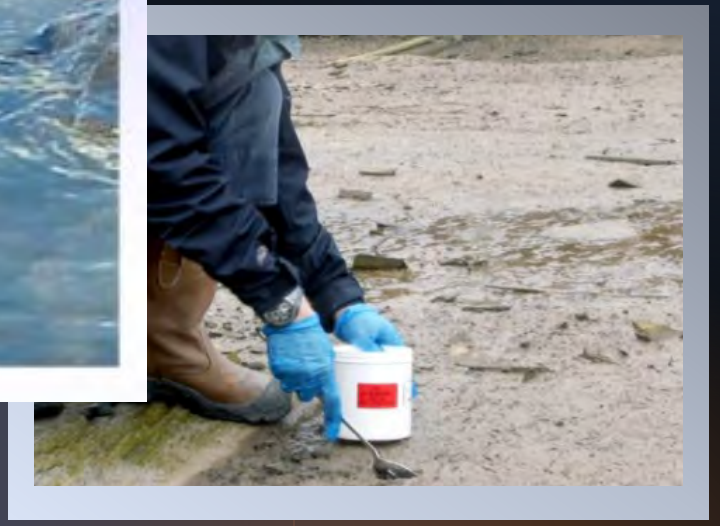
Cons:

only captures snapshot in time

doesn’t give concentrations*

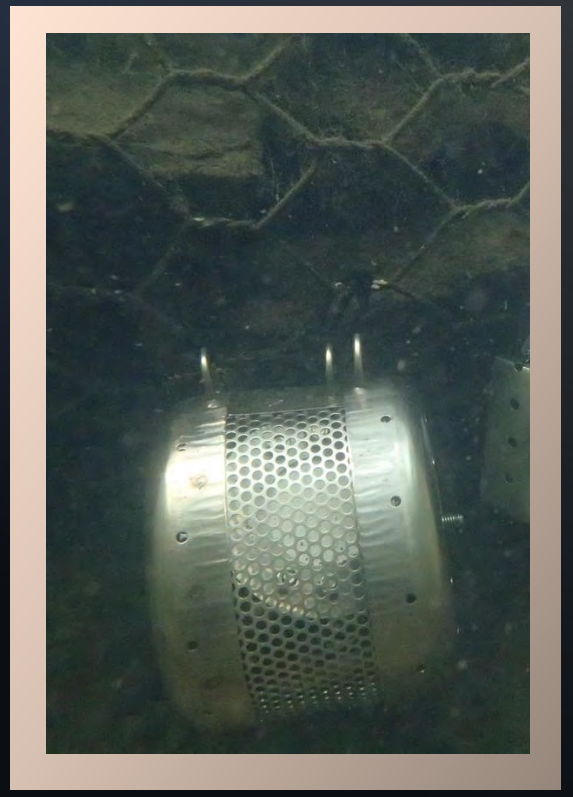
At each city:

- Grab samples



5- water grab samples
1- sediment sample

- Passive sampler



1- POCIS sampler

Grab sample results

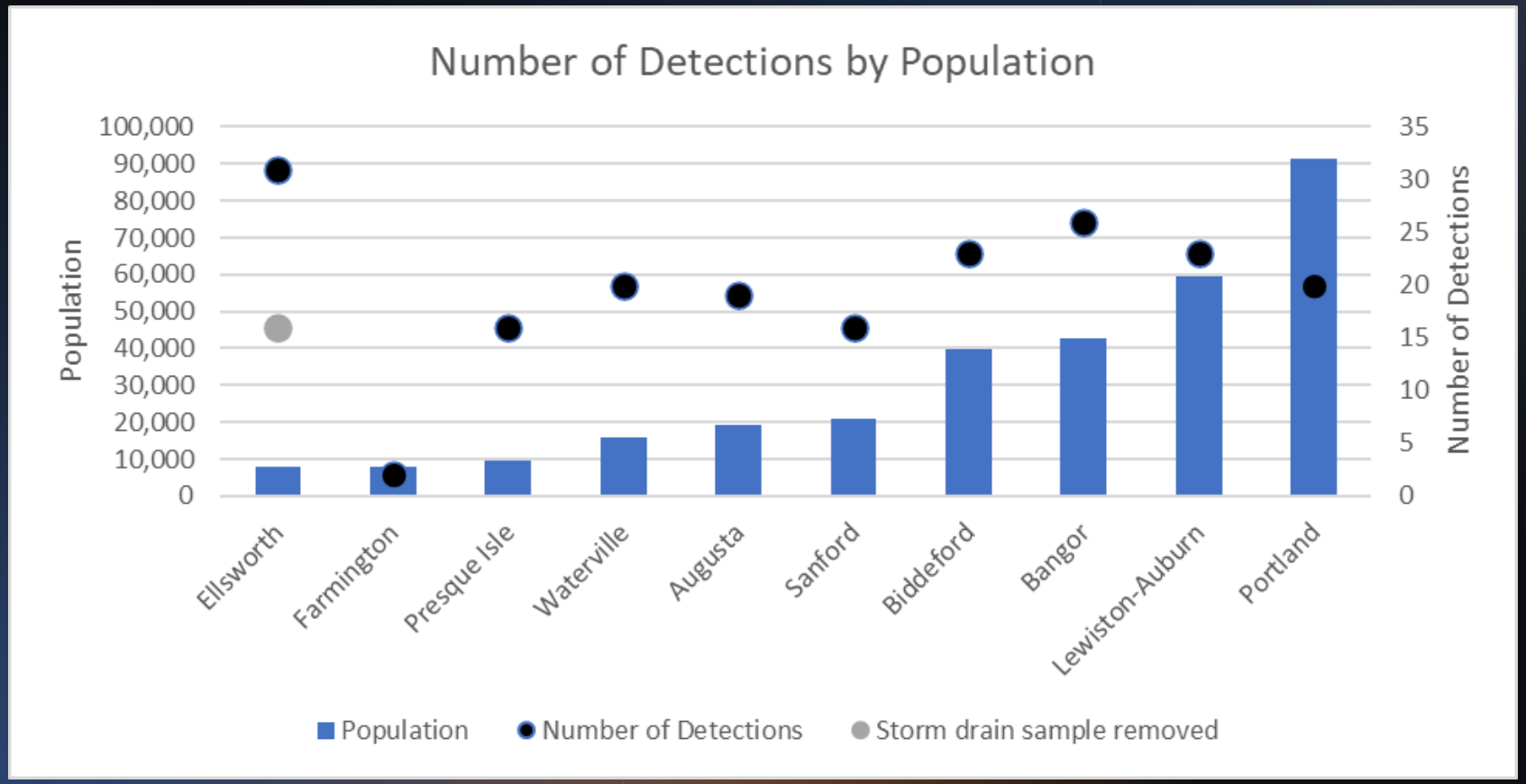
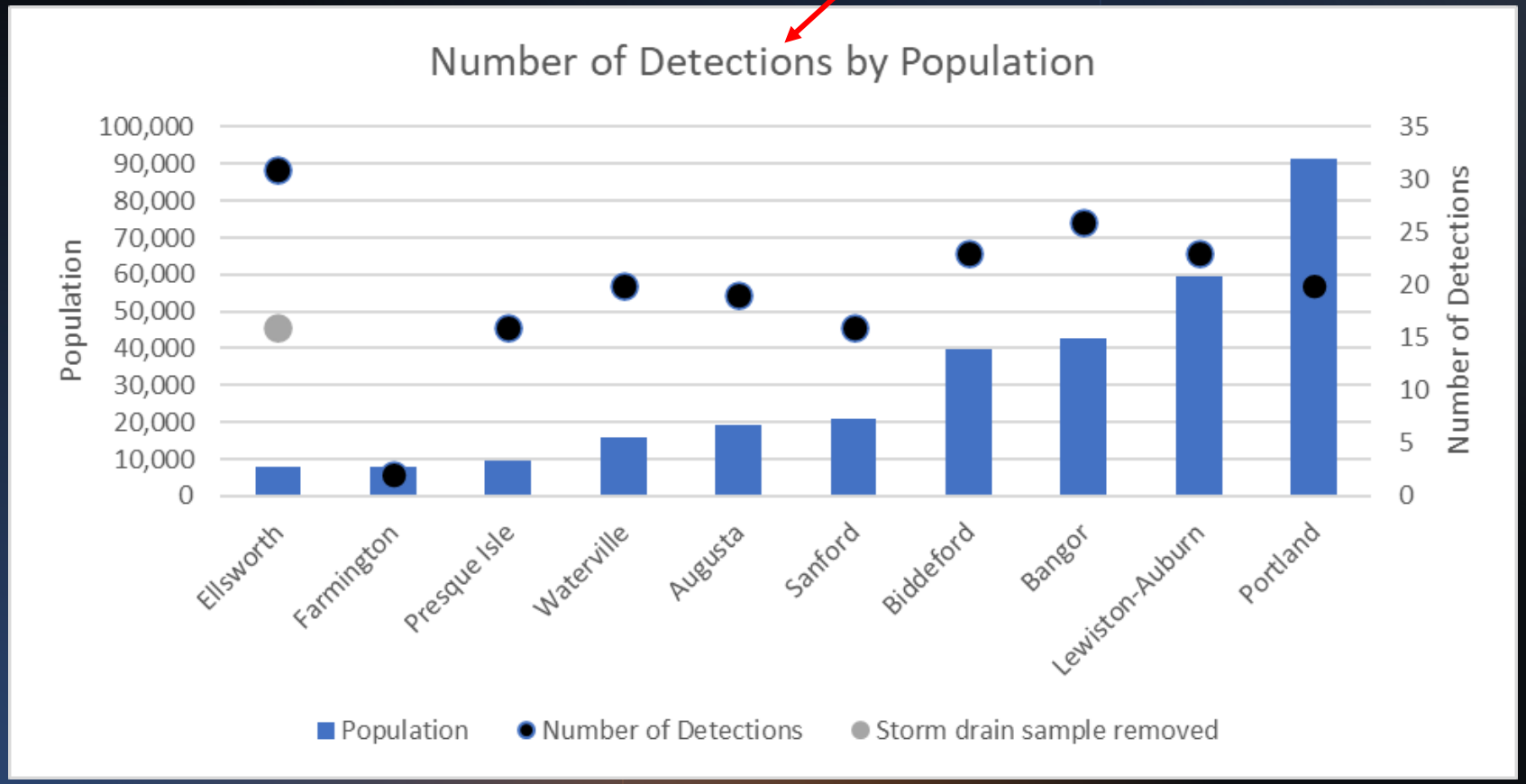


Figure 2. Number of analyte detections in surface water grab samples across the range of population centers. Bars represent the number of residents. Circles represent the number of times all of the samples from a city detected a pesticide. Five samples were taken at each city location. The gray circle represents the Ellsworth totals with a grab sample removed, see text for discussion.

Grab sample results

Detections = Number of times a pesticide is detected added up overall the samples



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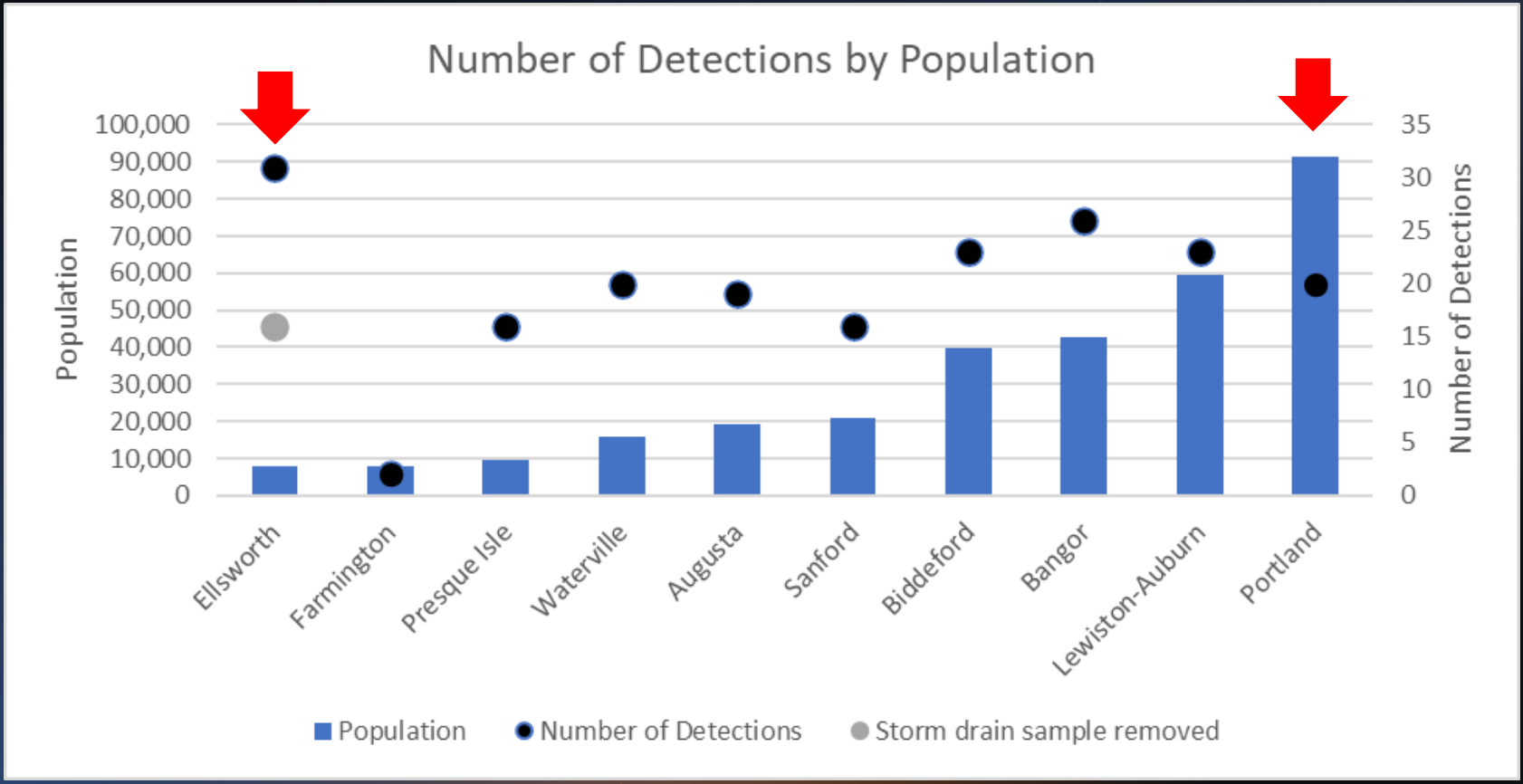

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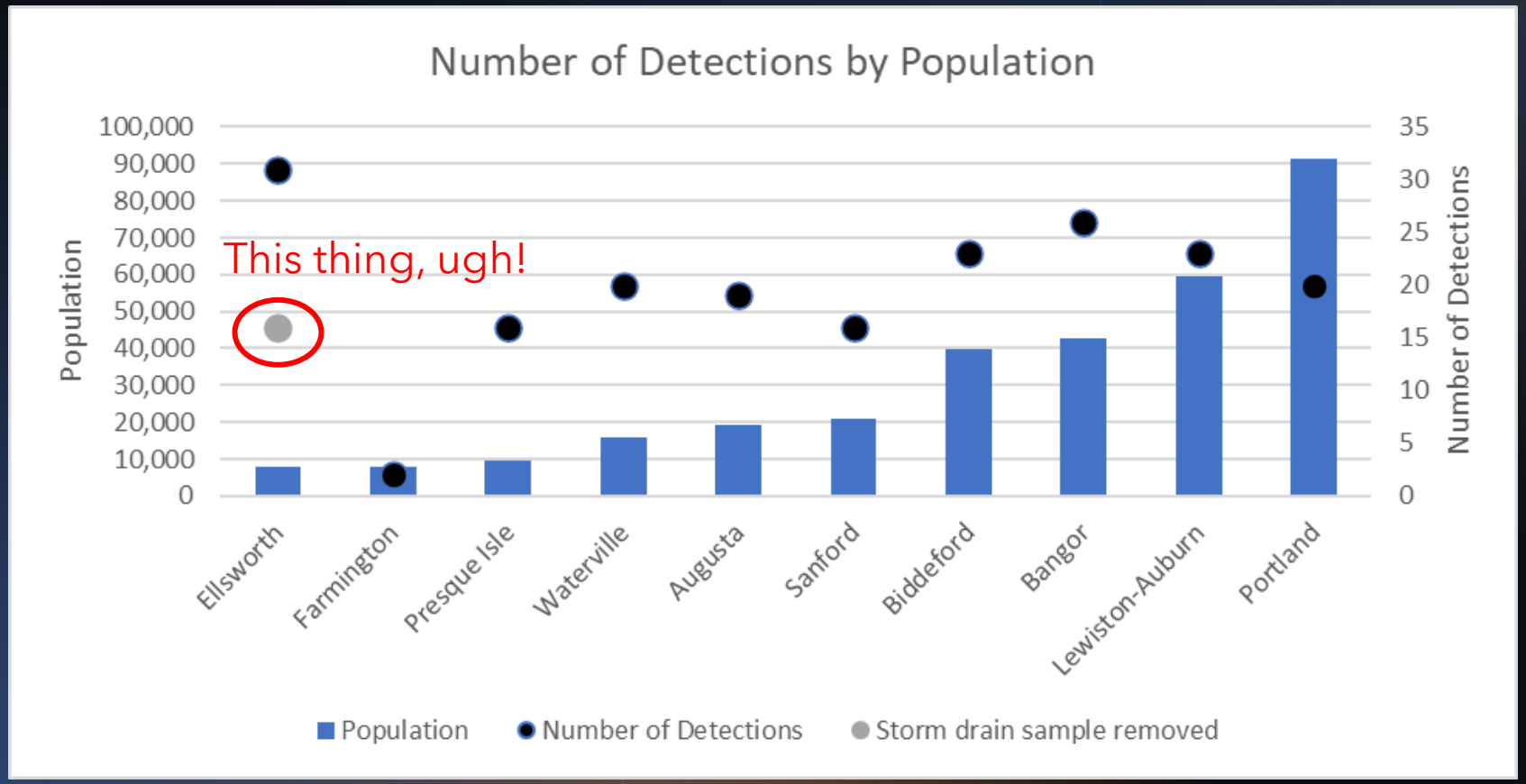

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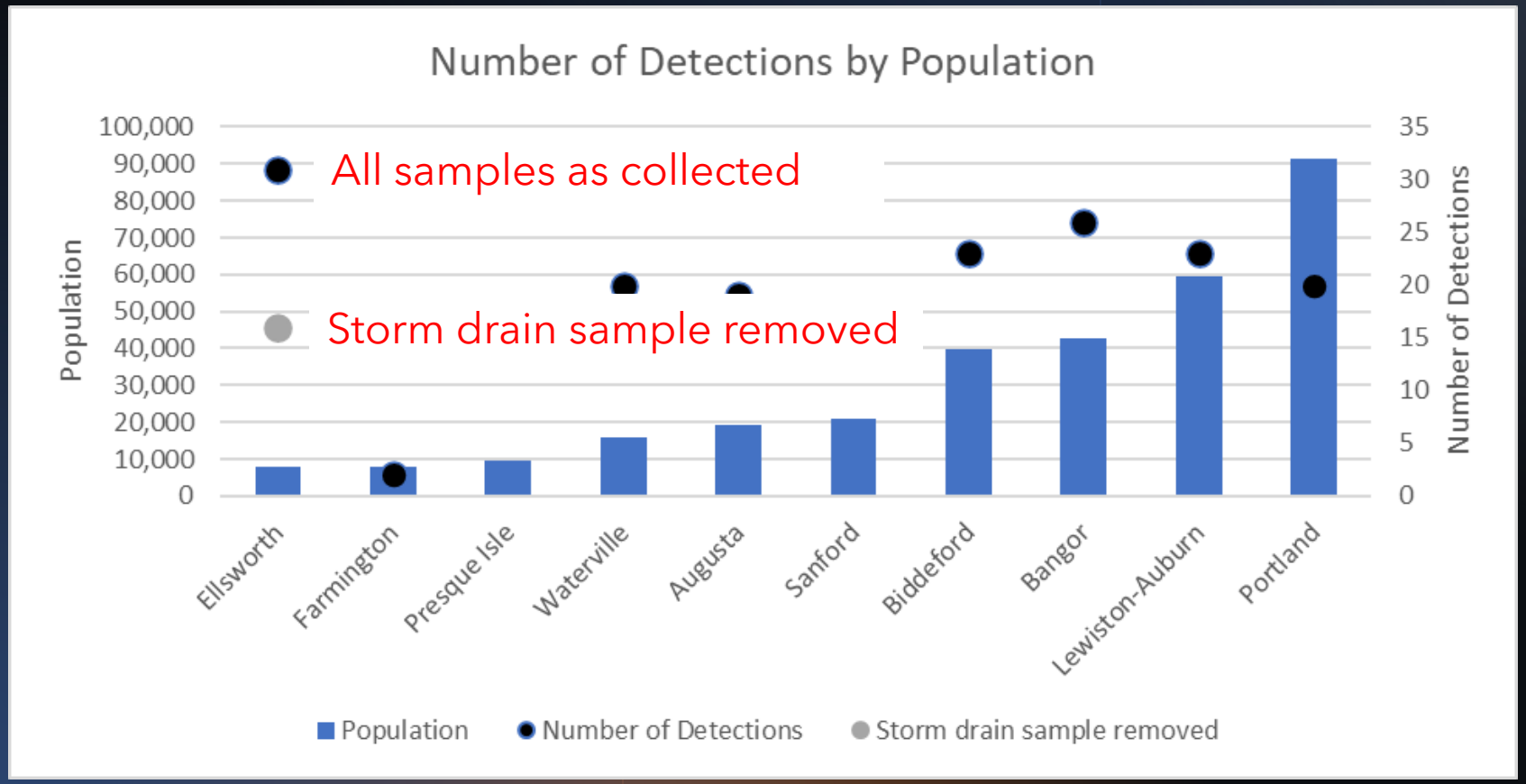

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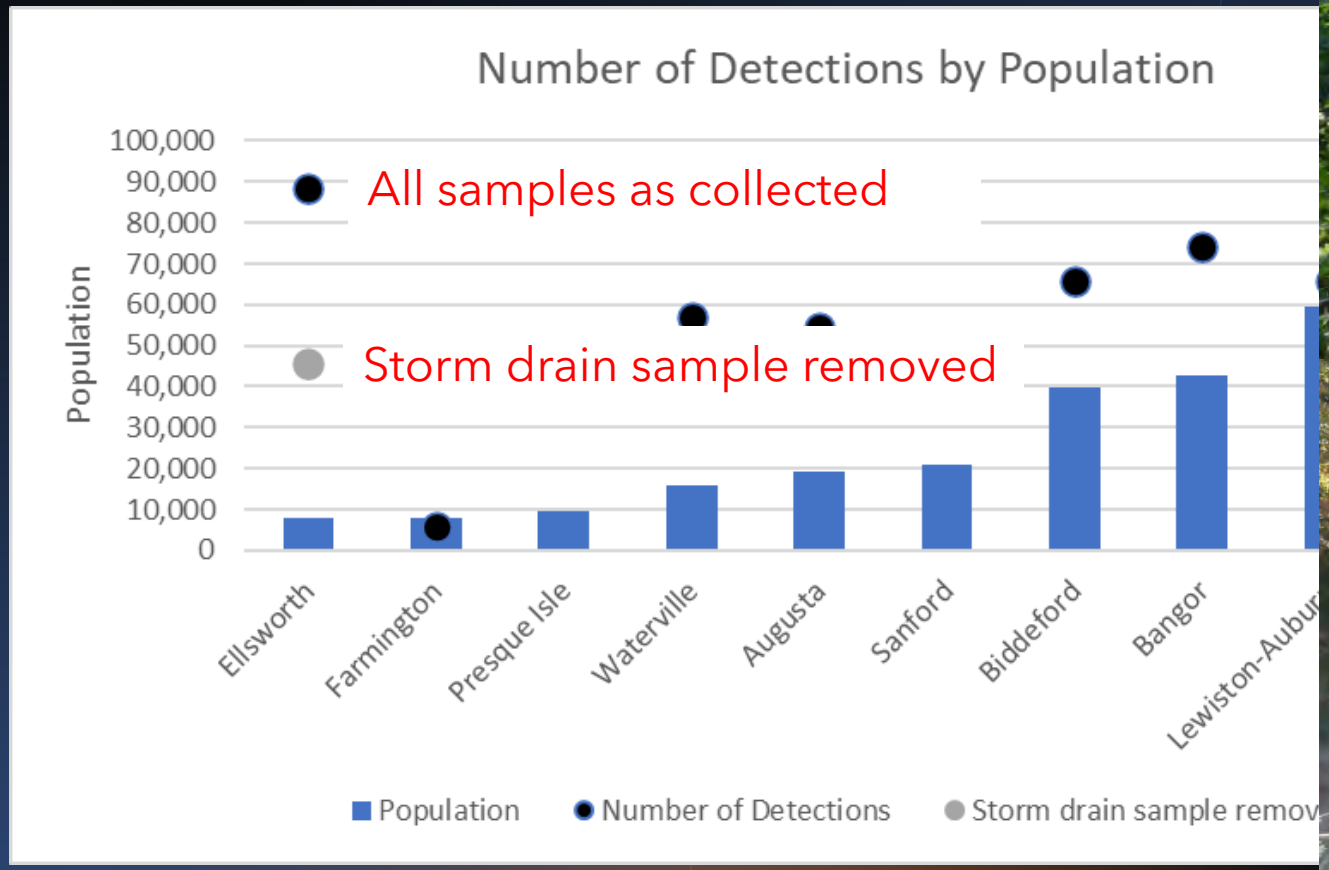

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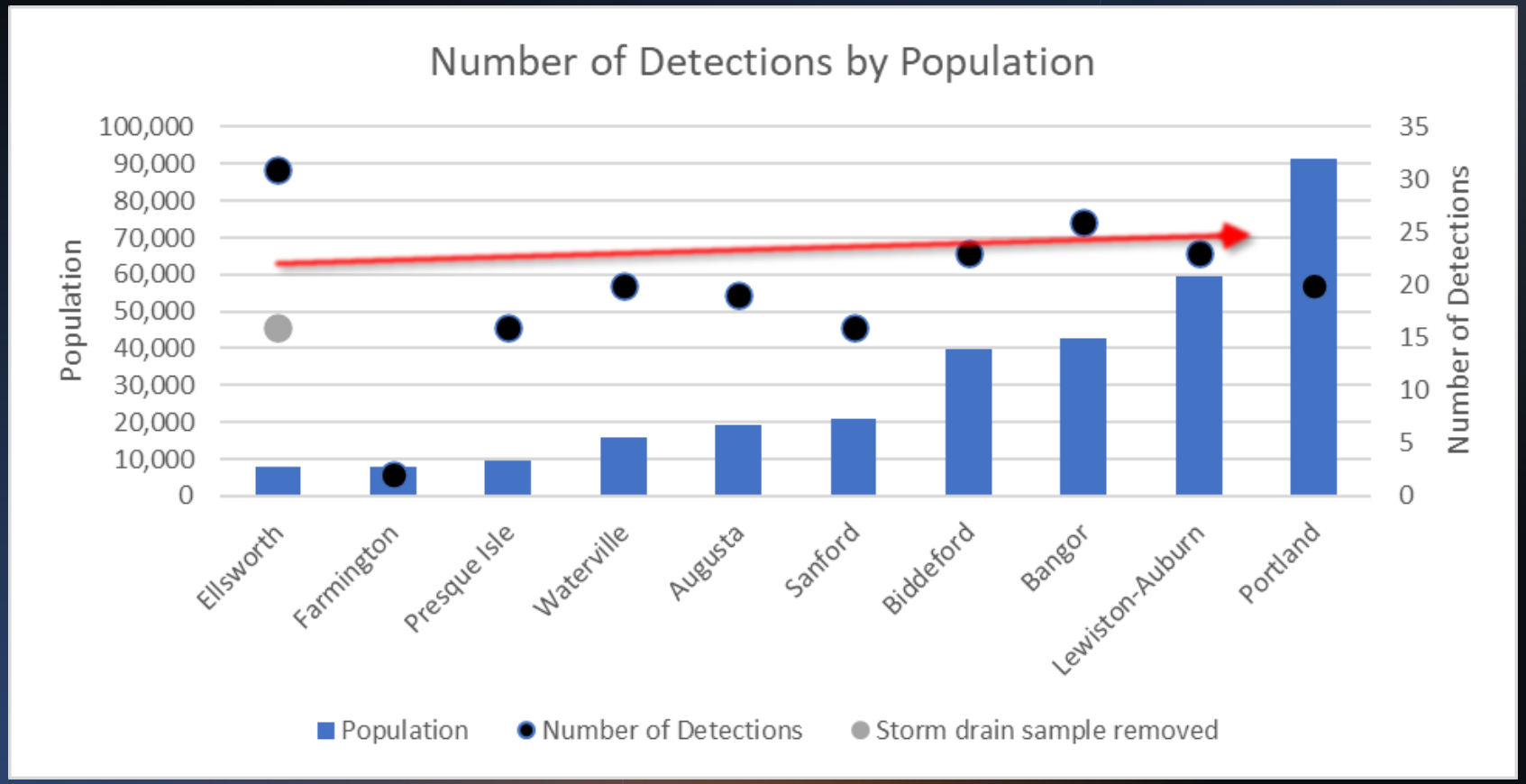

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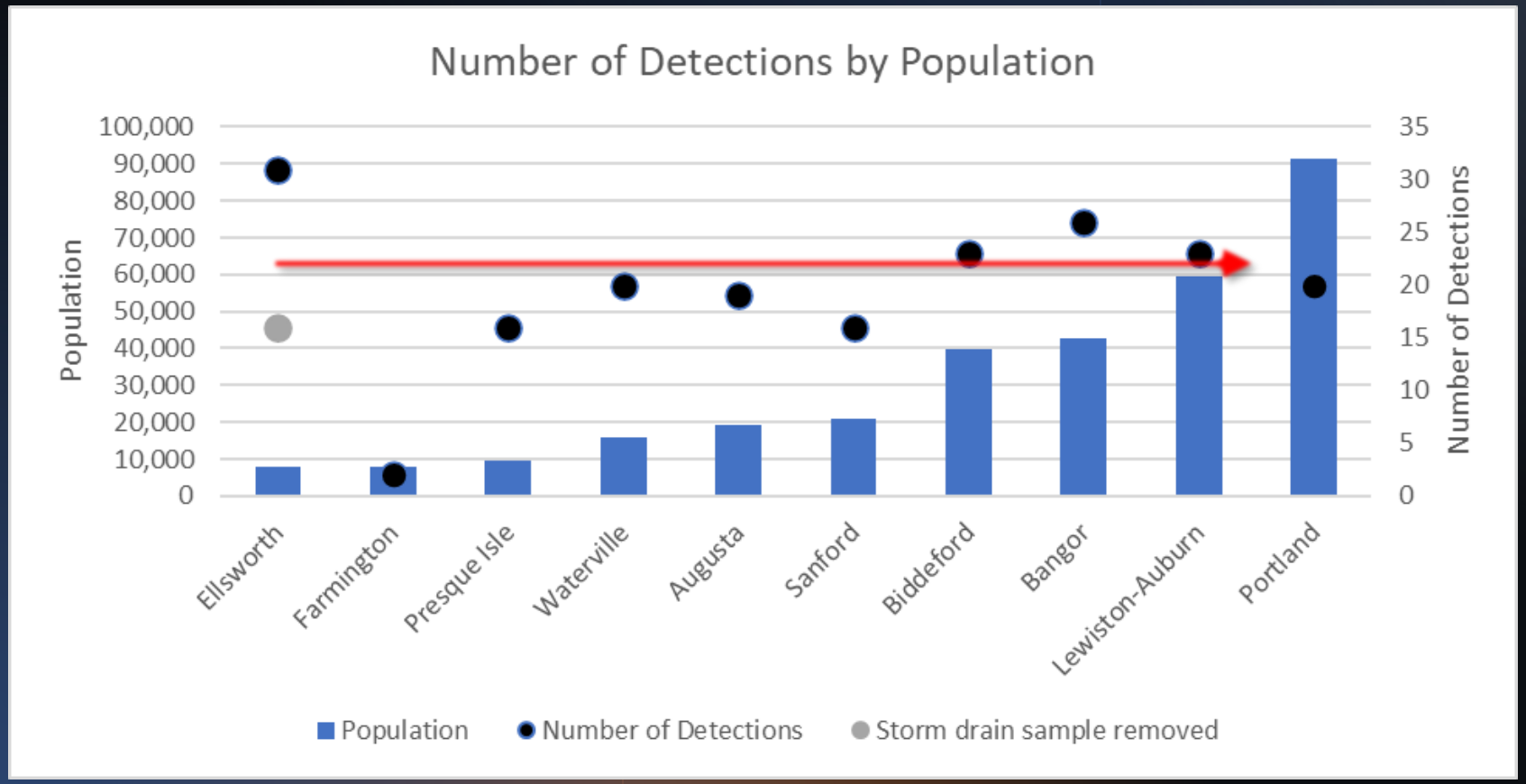

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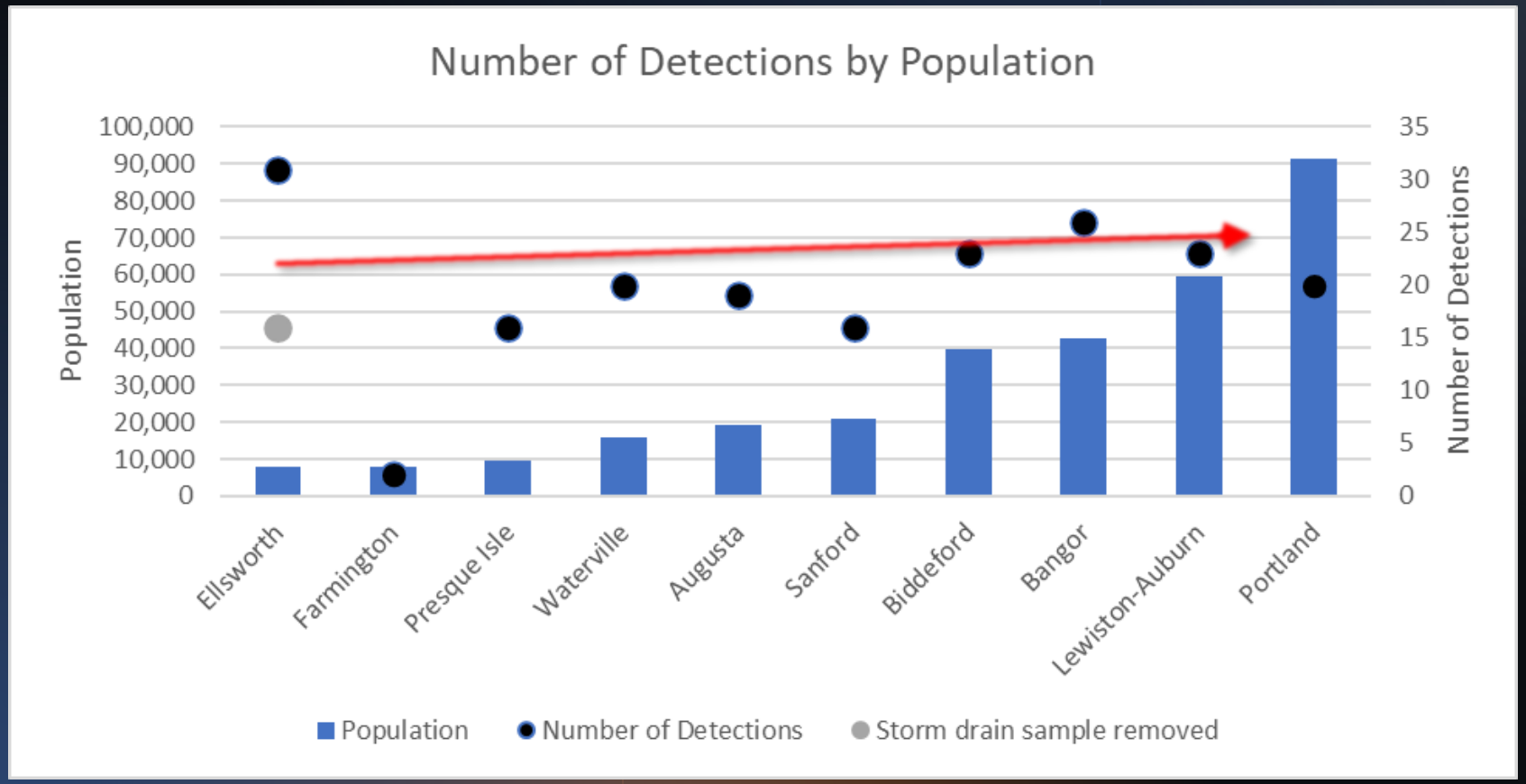

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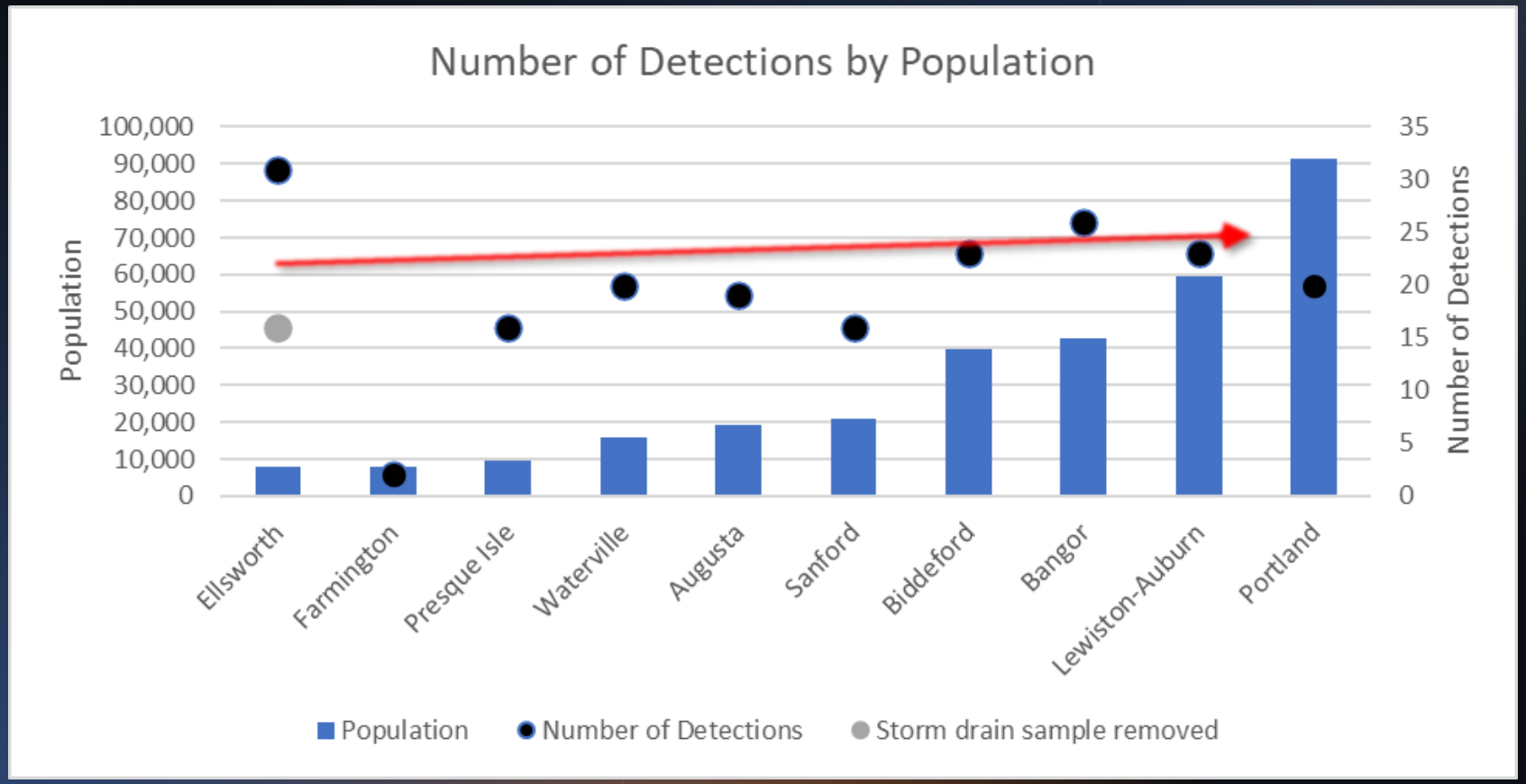

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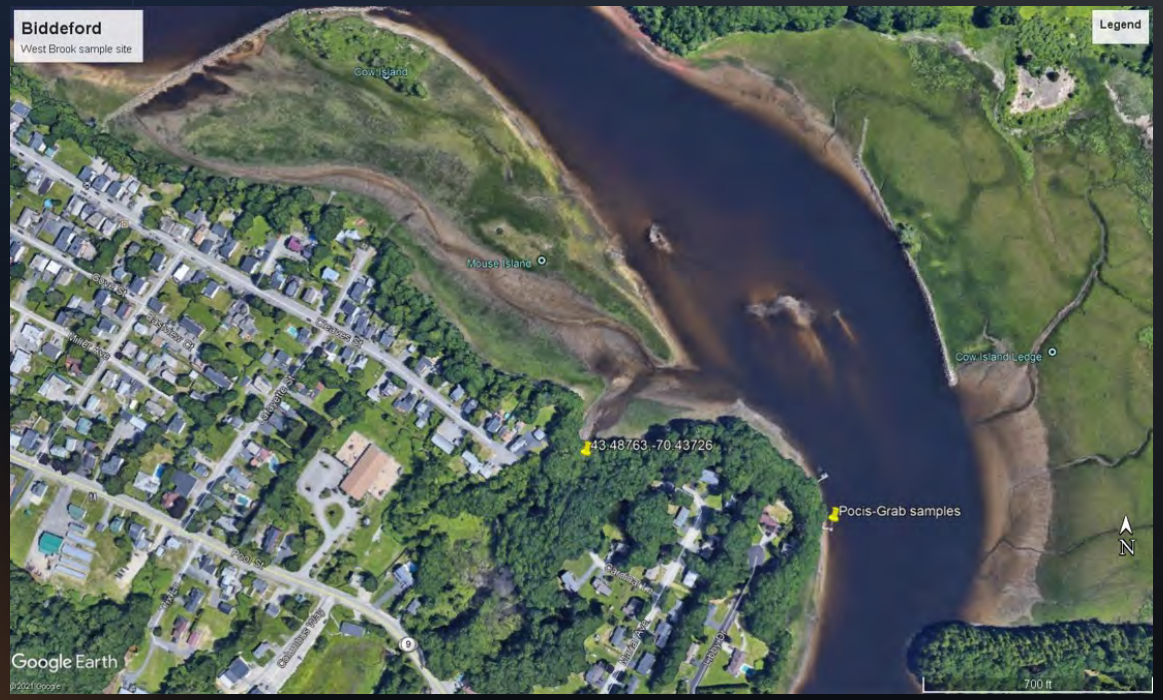
Larger population ≠ More detections

Grab sample results

One sample high concentration of concern:

Imidacloprid found in eight out of ten locations

- Biddeford 0.11 ppb
- EPA Aquatic Life Benchmark 0.01 ppb



Passive sampling (POCIS) results

Passive sampling

Number of unique pesticides = answers the question, "how many types of pesticide active ingredients in the sample?"

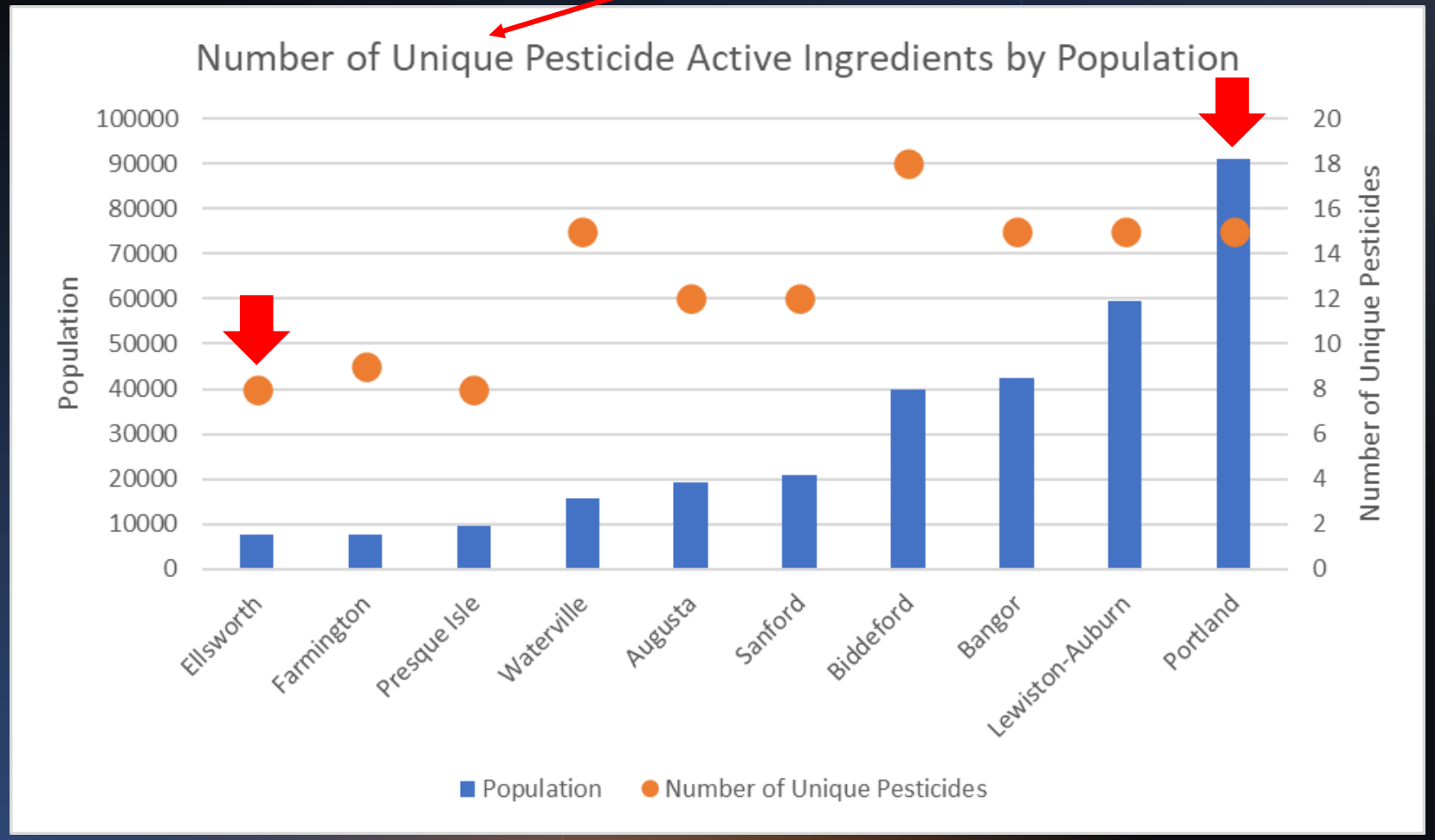
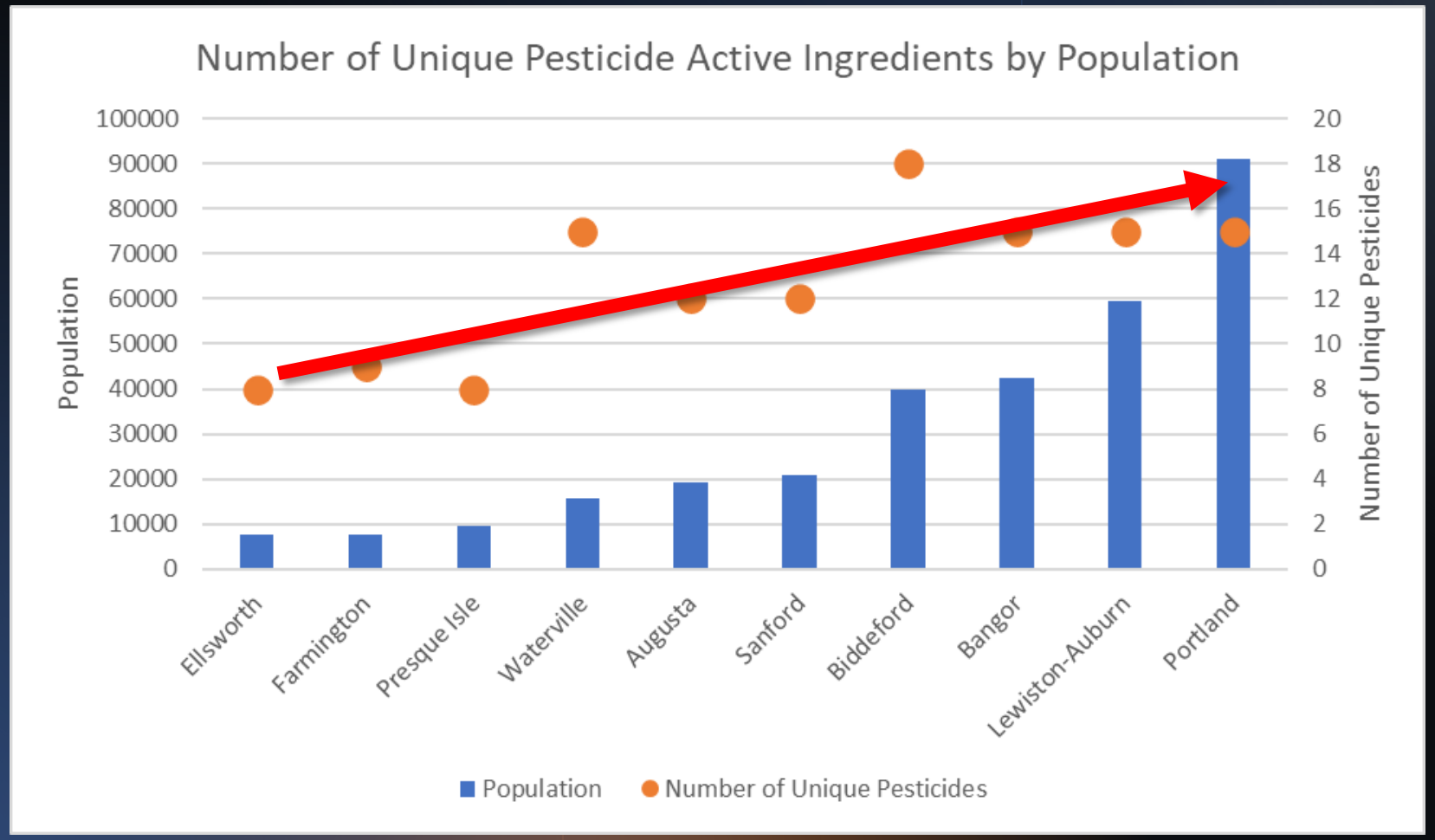


Figure 3. Number of unique pesticide products identified in surface water by passive sampling across the range of population centers. Bars represent the number of residents. Orange circles represent the number of different types of pesticides present. One POCIS sampler was used in each city, where it was deployed for one month.

Passive sampling (POCIS) results



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Sediment results

	Reporting Limit (ng/g)	Augusta	Bangor	Biddeford	Ellsworth	Farmington	Lewiston-Auburn	Portland	Presque Isle	Sanford	Waterville
Percent TOC		0.73	3.58	0.31	3.93	0.25	0.09	1	0.85	5.23	0.53
Allethrin	0.20										
Bifenthrin	0.045	1.3	0.91	0.46	0.67		0.058	0.23	0.059		0.084
Bifenthrin ng/g-OC		178.1	25.4	148.4	17.0		64.4	23.0	6.9		15.8
Cyfluthrin	0.20										
Fenpropathrin	0.20										
Fenvalerate	0.13										
cis-Permethrin	0.20										
trans-Permthrin	0.20										
Phenothrin	2.0										
Piperonyl butoxide	2.0										
Prallethrin	0.20										
Resmethrin	2.0										
Tetramethrin	0.14										

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Threshold Effects Benchmark at 170 ng/g-oc

Likely Effects Benchmark at 600 ng/g-oc

S nt results

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Bifenthrin	0.045
Bifenthrin ng/g-OC	
Cyfluthrin	0.20
Cyhalothrin	0.27
Cypermethrin	0.20
Deltamethrin	0.40
Fenpropathrin	0.20
Fenvalerate	0.13
cis-Permethrin	0.20
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Phenothrin	2.0
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Results summary

- No glyphosate
- Both methods helpful & work well together
- Sediments contained only bifenthrin*
- All locations contained pesticides (range 8 to 18)

  (out of 77 pesticides + 25 degradates)
- Variety of pesticides increases with population
- Out of 6,300 tests, two samples present over threshold values (bifenthrin & imidacloprid)

Thank you for your attention!

Pam Bryer

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