



# Design and Initial Results from an Integrated, Probabilistic Stream Monitoring Survey in Portland, OR

Jason Law

City of Portland

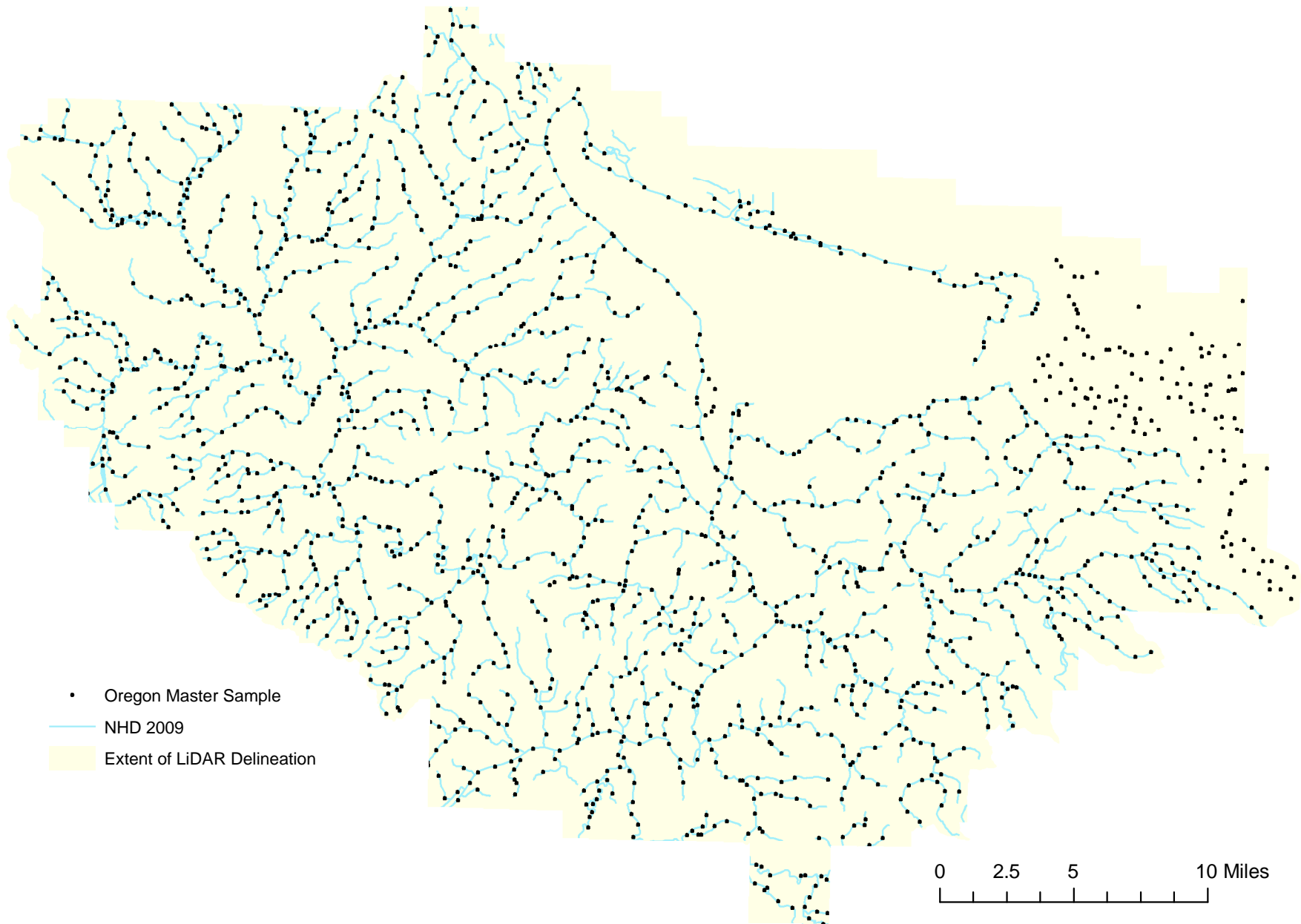
Bureau of Environmental Services

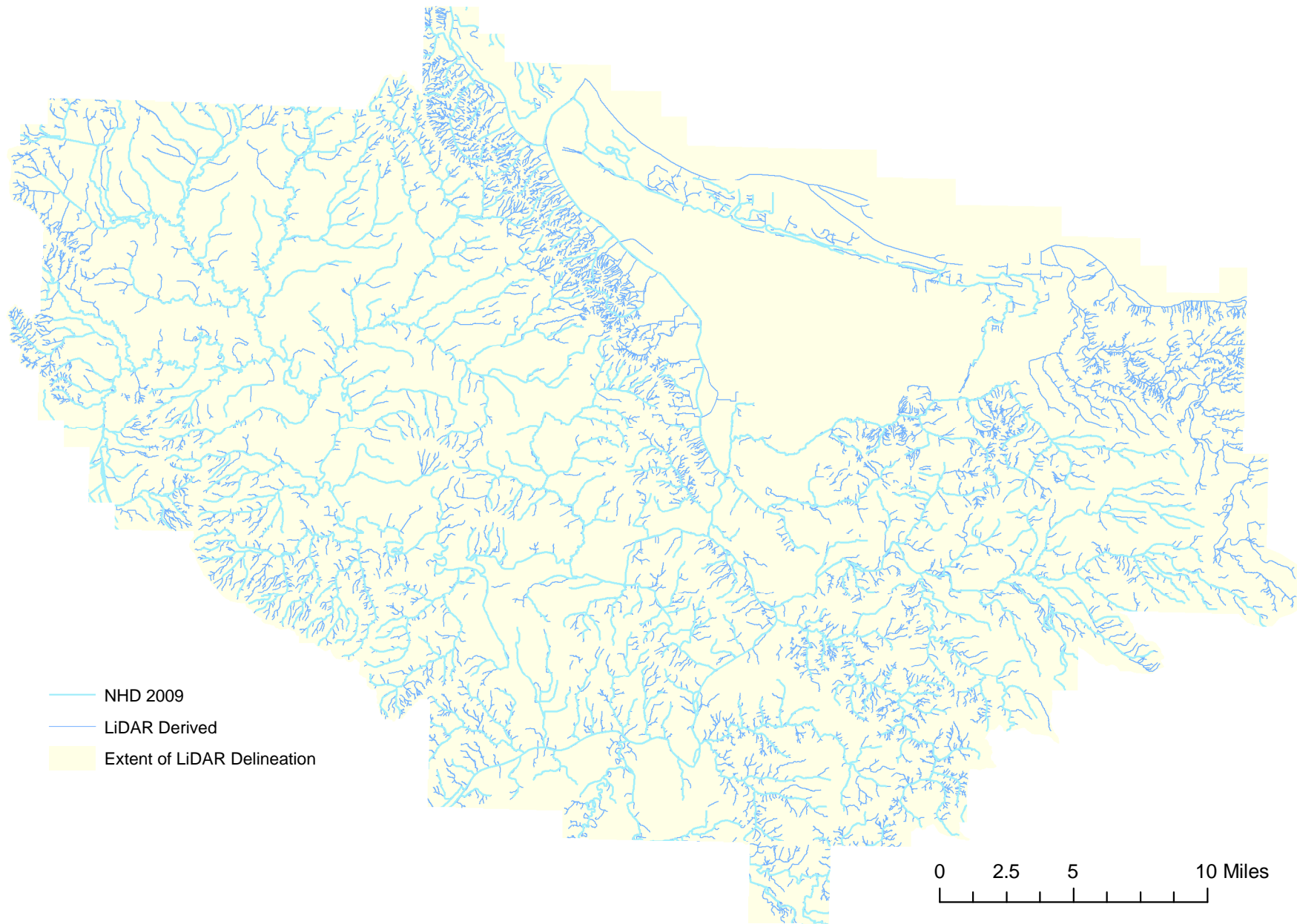
- Why a new monitoring program?
- Master sample creation
- Sample design
- Response design
- What we have found so far
- Issues and successes

“A healthy urban watershed has hydrologic, habitat, and water quality conditions suitable to protect human health, maintain viable ecological functions and processes, and support self-sustaining populations of native fish and wildlife species whose natural ranges include the Portland area.”

# Why a new program?

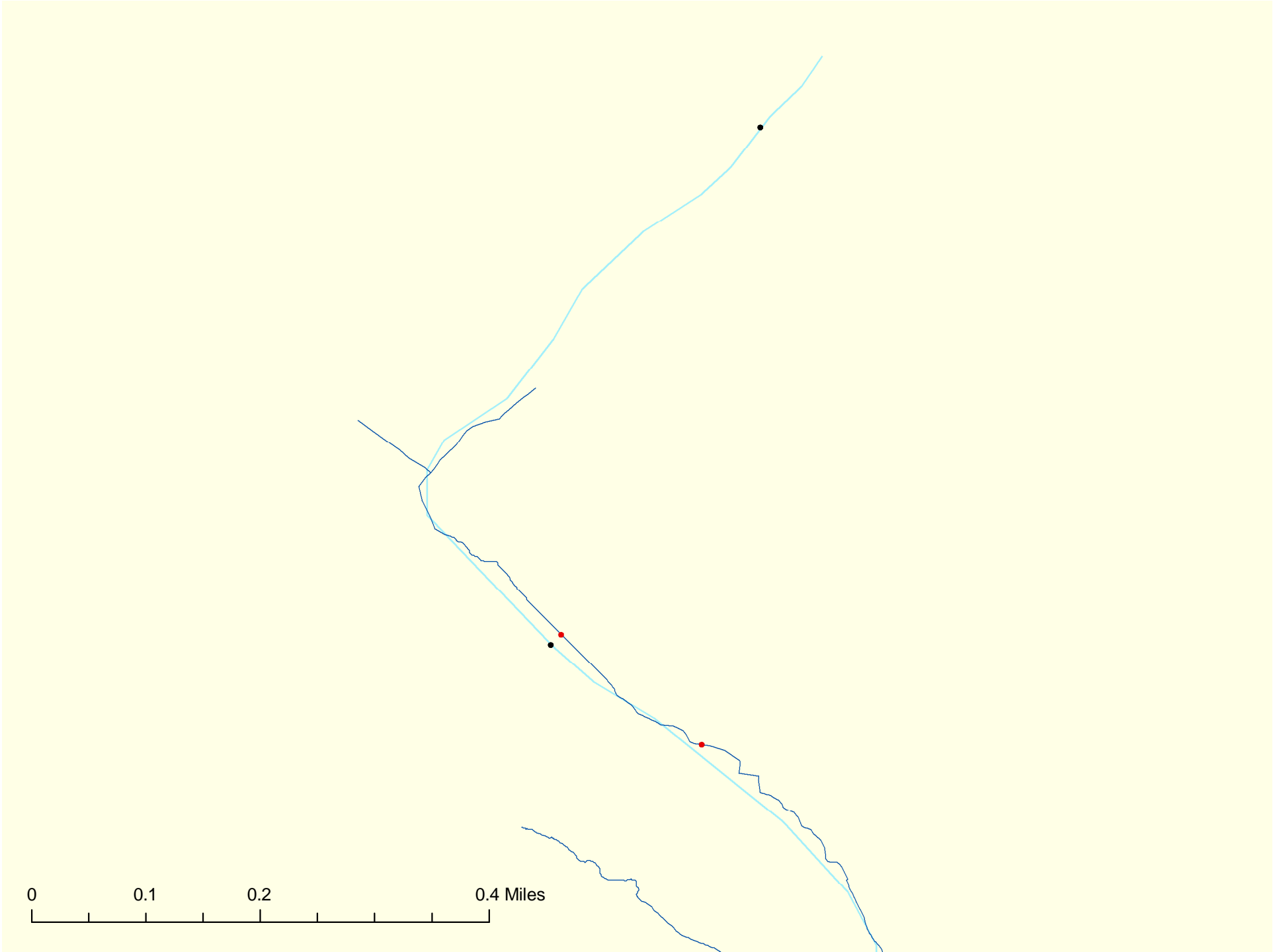
- Portland watersheds managed using a watershed approach
- Watershed managers had different monitoring objectives
- Difficult to get a sense of city wide status





# Incorporating frame updates

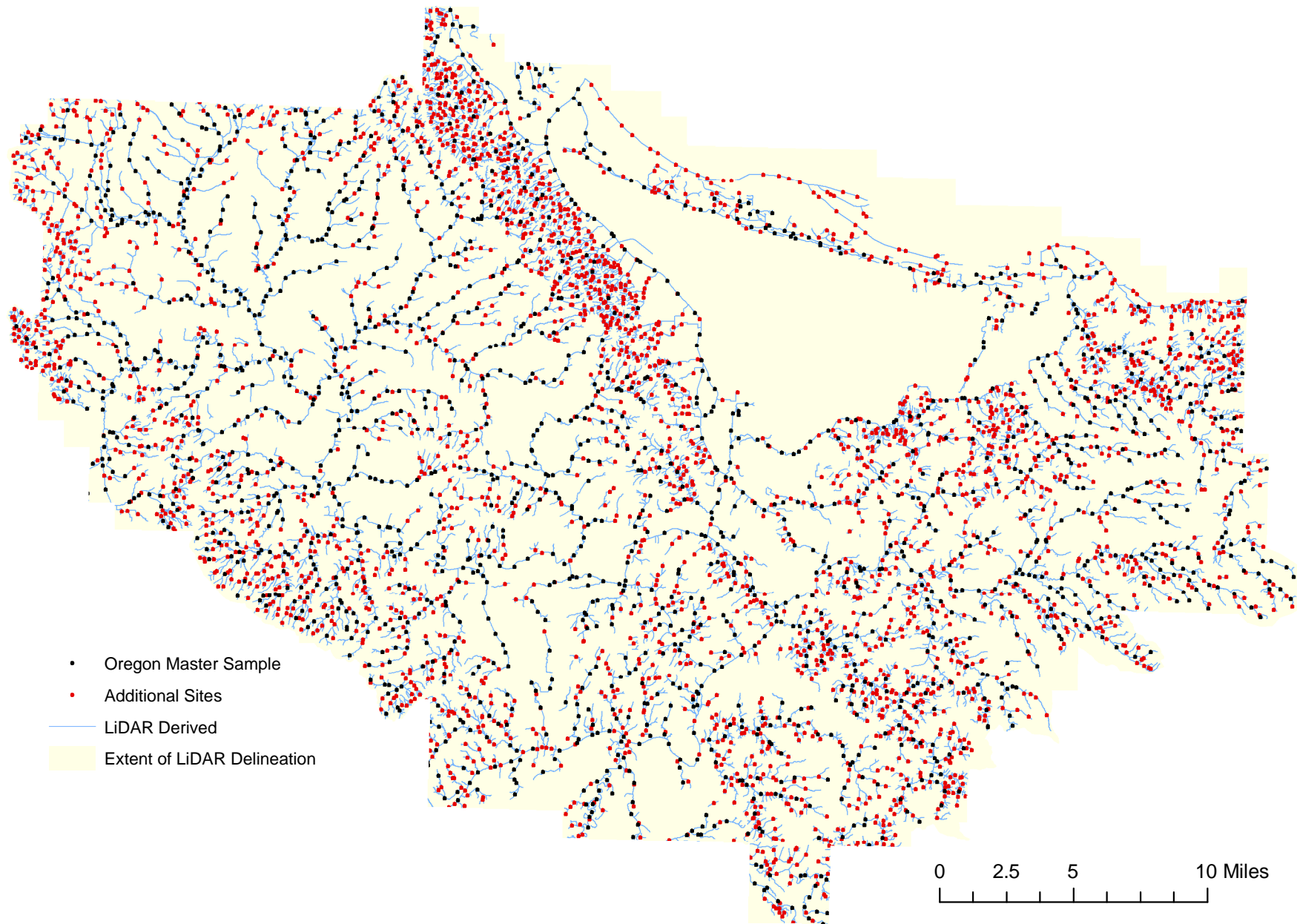
- Move master sample points to new frame
- Remove master sample points where stream trace does not exist on new frame
- Add sample points to the updated frame

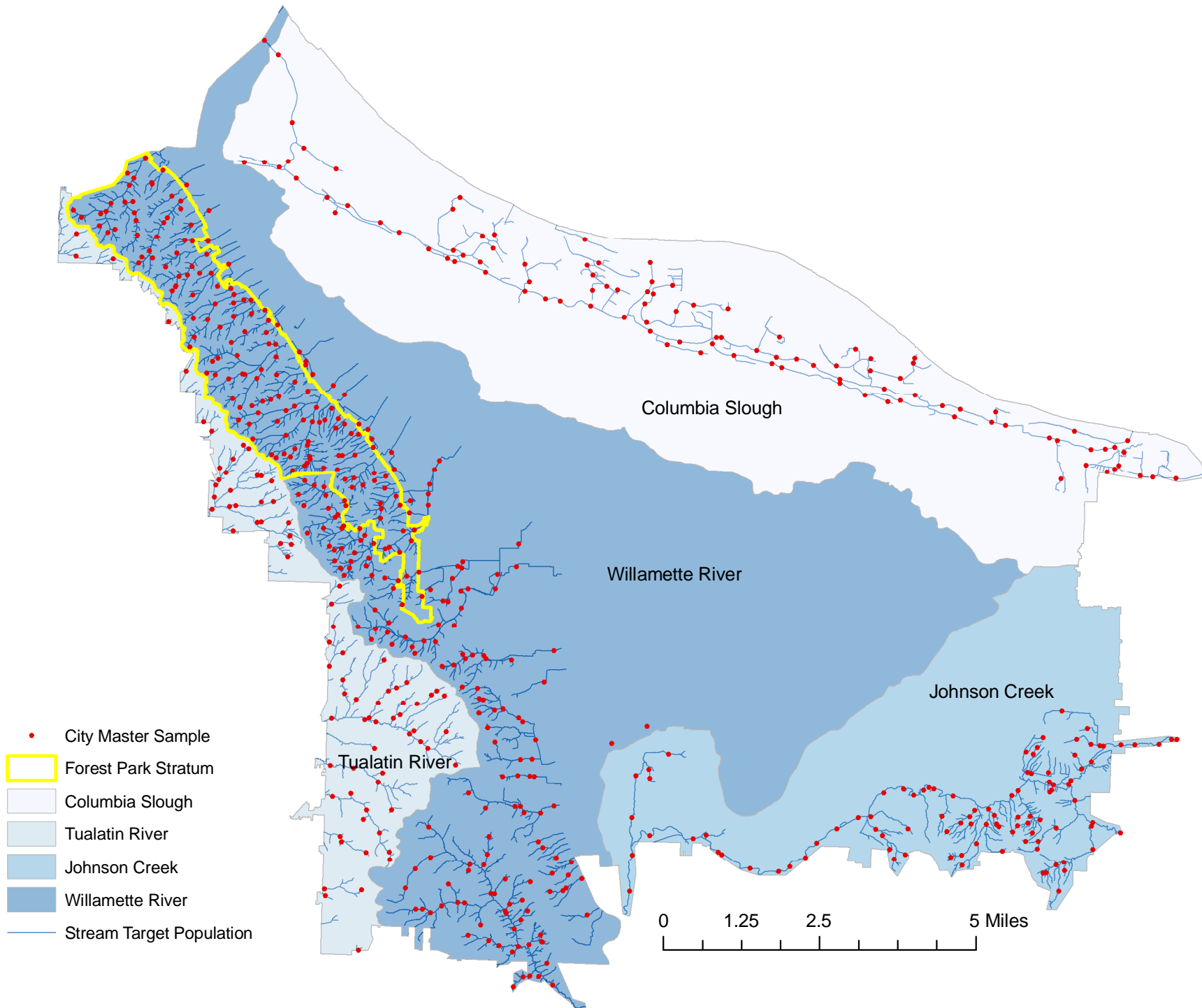








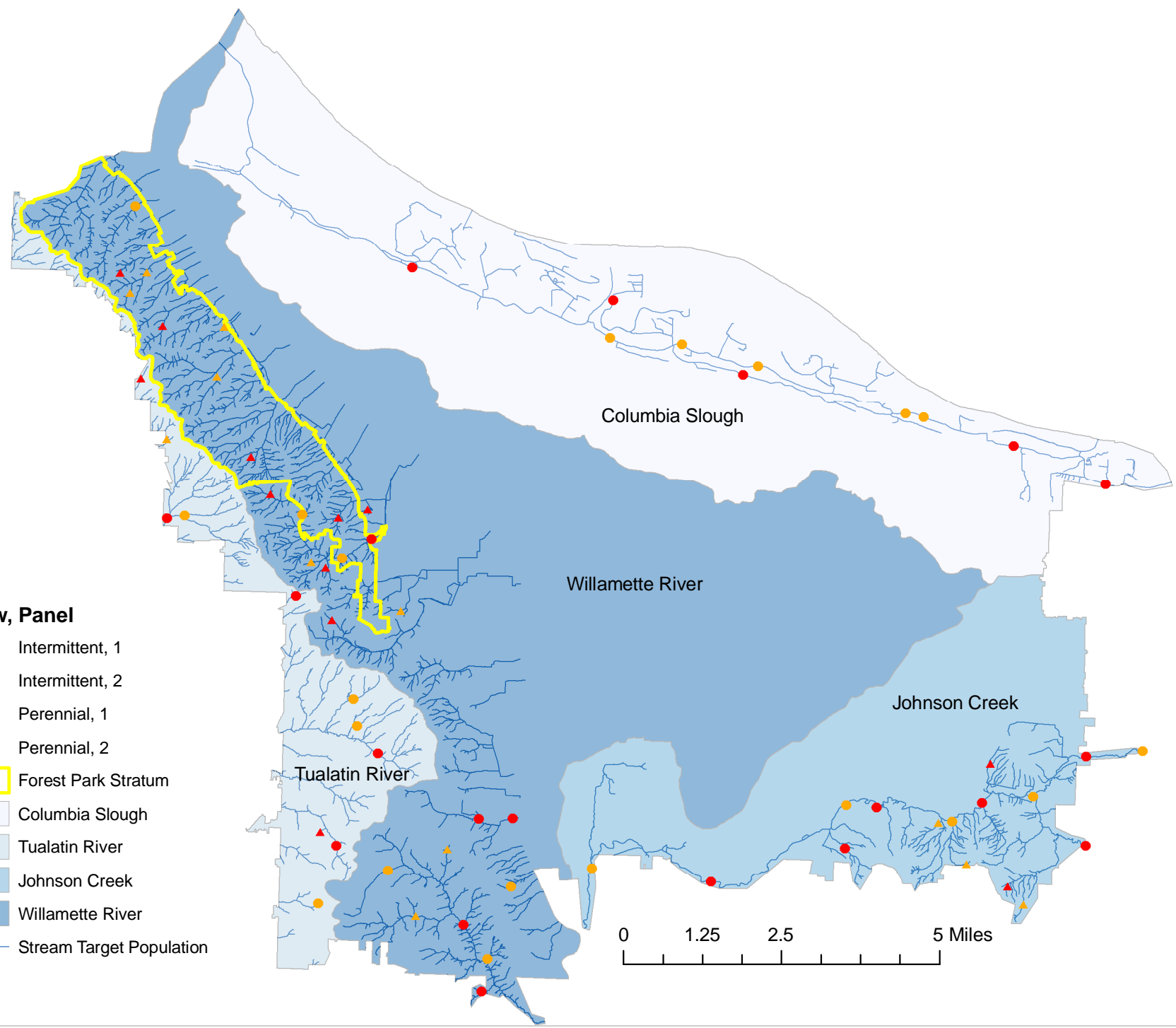




Panel	Stratum	Number of Sites				
		2010-2011	2011-2012	2012-2013	2013-2014	...
Panel 1	Perennial	20				
	Intermittent - Other	8				
	Intermittent - Forest Park	4				
Panel 2	Perennial		20			
	Intermittent - Other		8			
	Intermittent - Forest Park		4			...
Panel 3	Perennial			20		
	Intermittent - Other			8		
	Intermittent - Forest Park			4		
Panel 4	Perennial				20	
	Intermittent - Other				8	
	Intermittent - Forest Park				4	

**Flow, Panel**

- ▲ Intermittent, 1
- ▲ Intermittent, 2
- Perennial, 1
- Perennial, 2
- ▭ Forest Park Stratum
- ▭ Columbia Slough
- ▭ Tualatin River
- ▭ Johnson Creek
- ▭ Willamette River
- Stream Target Population



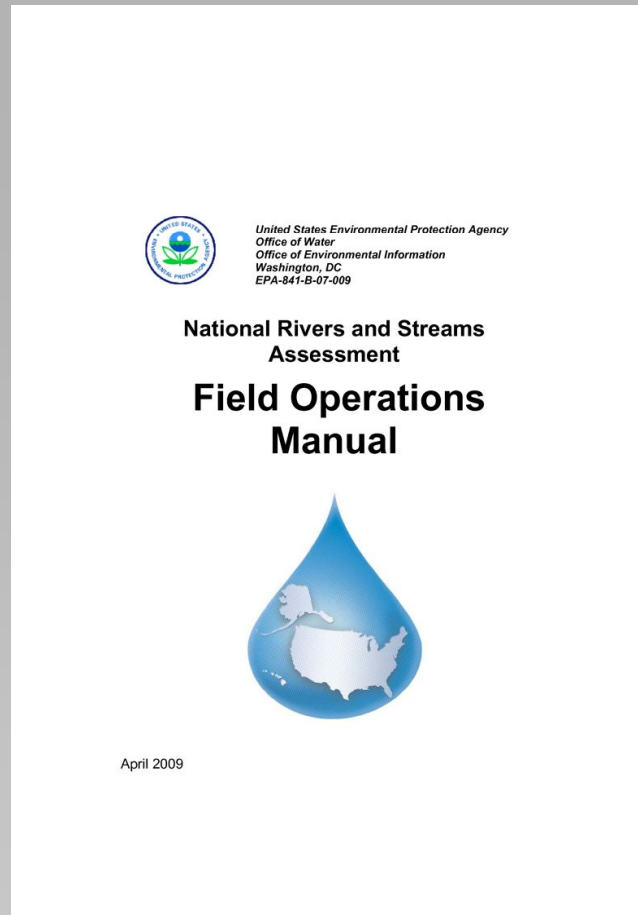
# Response Design

“A healthy urban watershed has hydrologic, habitat, and water quality conditions suitable to ... support self-sustaining populations of native fish and wildlife species ”

## Electrofishing



## Habitat



## Water quality



## Aquatic macroinvertebrate



Temperature monitoring



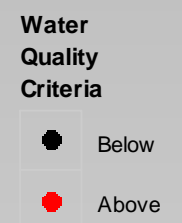
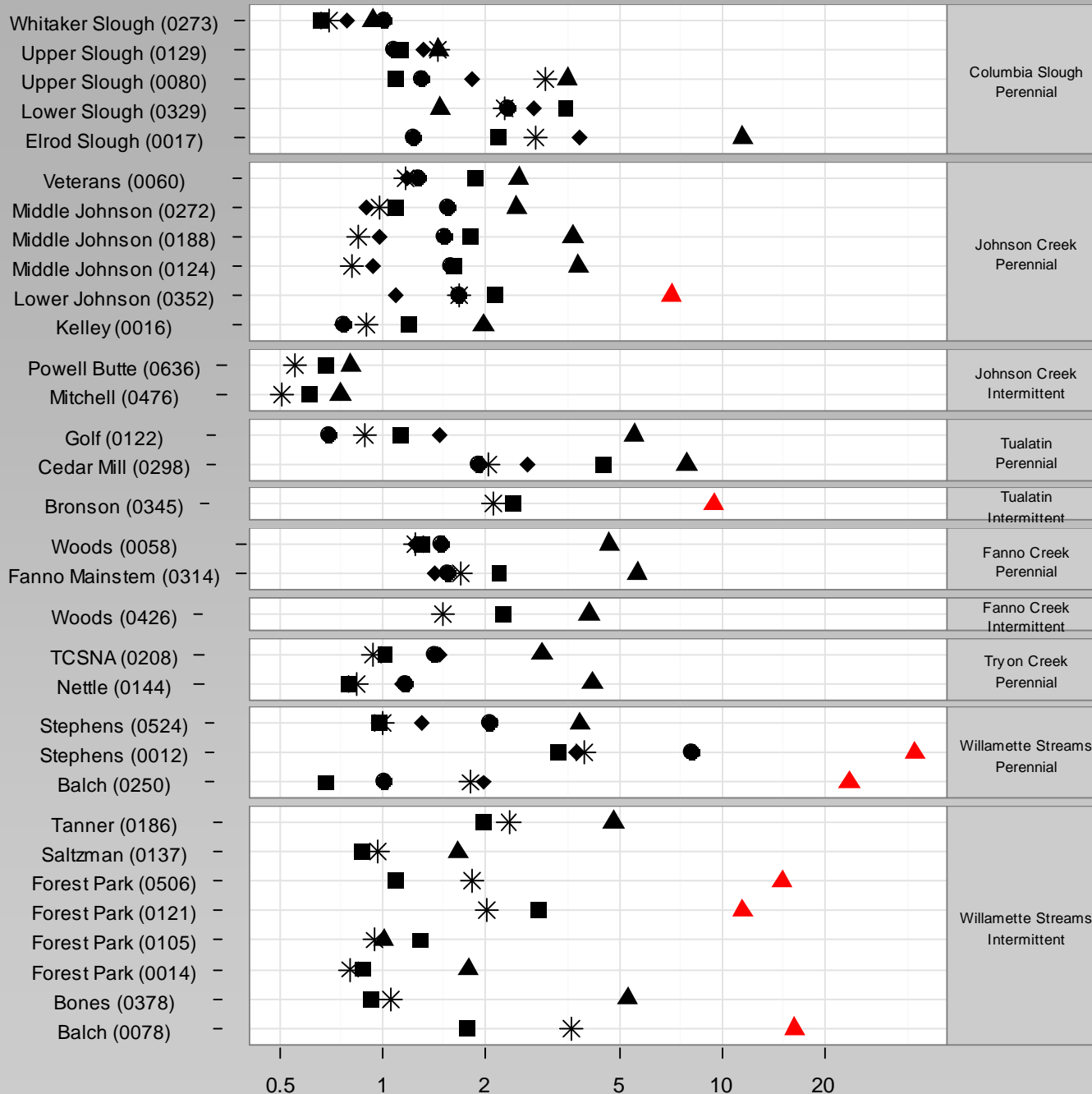
Avian point counts

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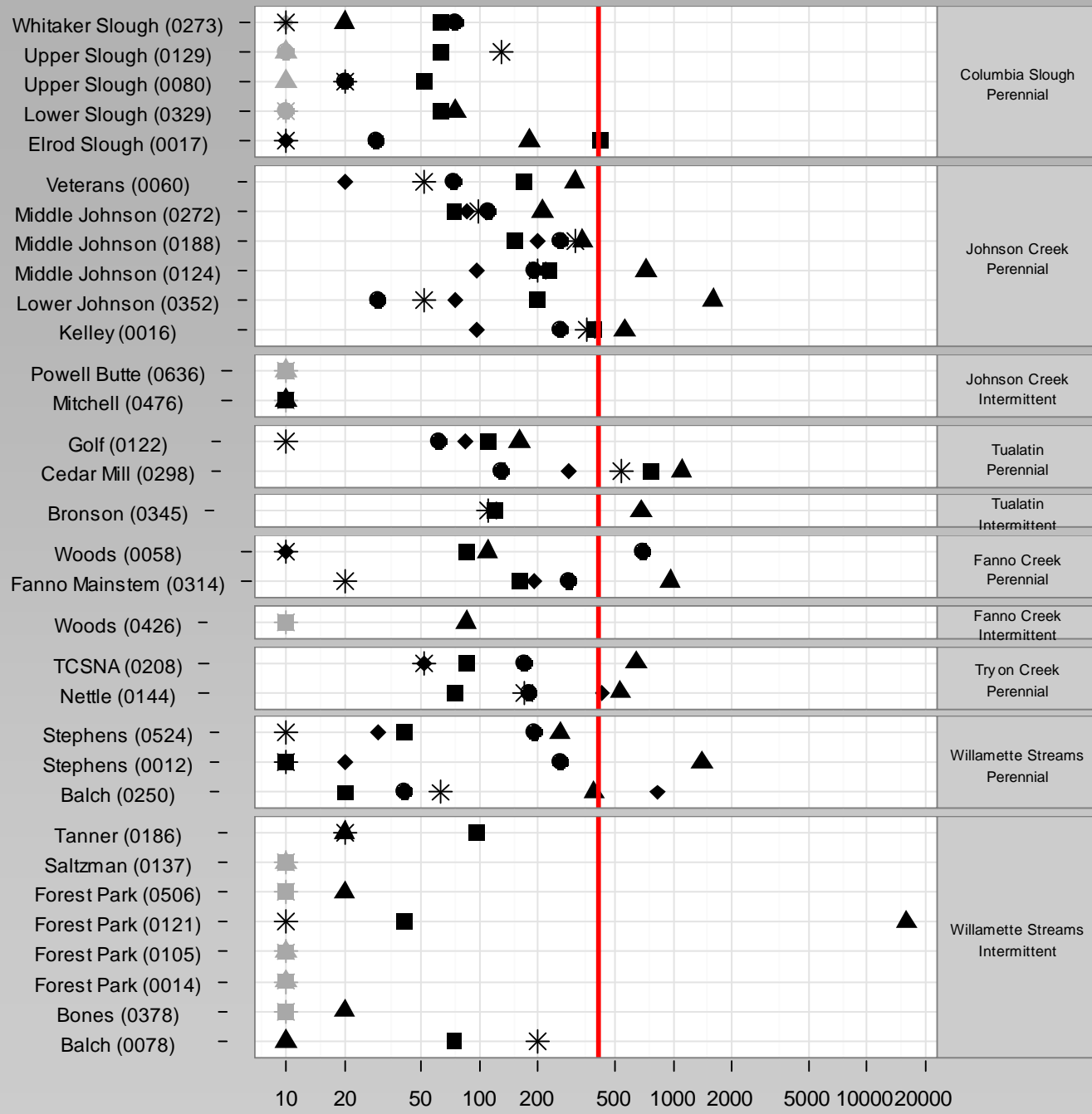
	Perennial	Intermittent
NRSA habitat protocol	Yes	Yes
Water quality	4 samples	2 samples
Wet weather water quality	1 sample	1 sample
Avian point count	Yes	Yes
Electrofishing	Yes	Yes
Macro-invertebrate	Yes	No
Temperature monitoring	Yes	No

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Copper (ug/L)

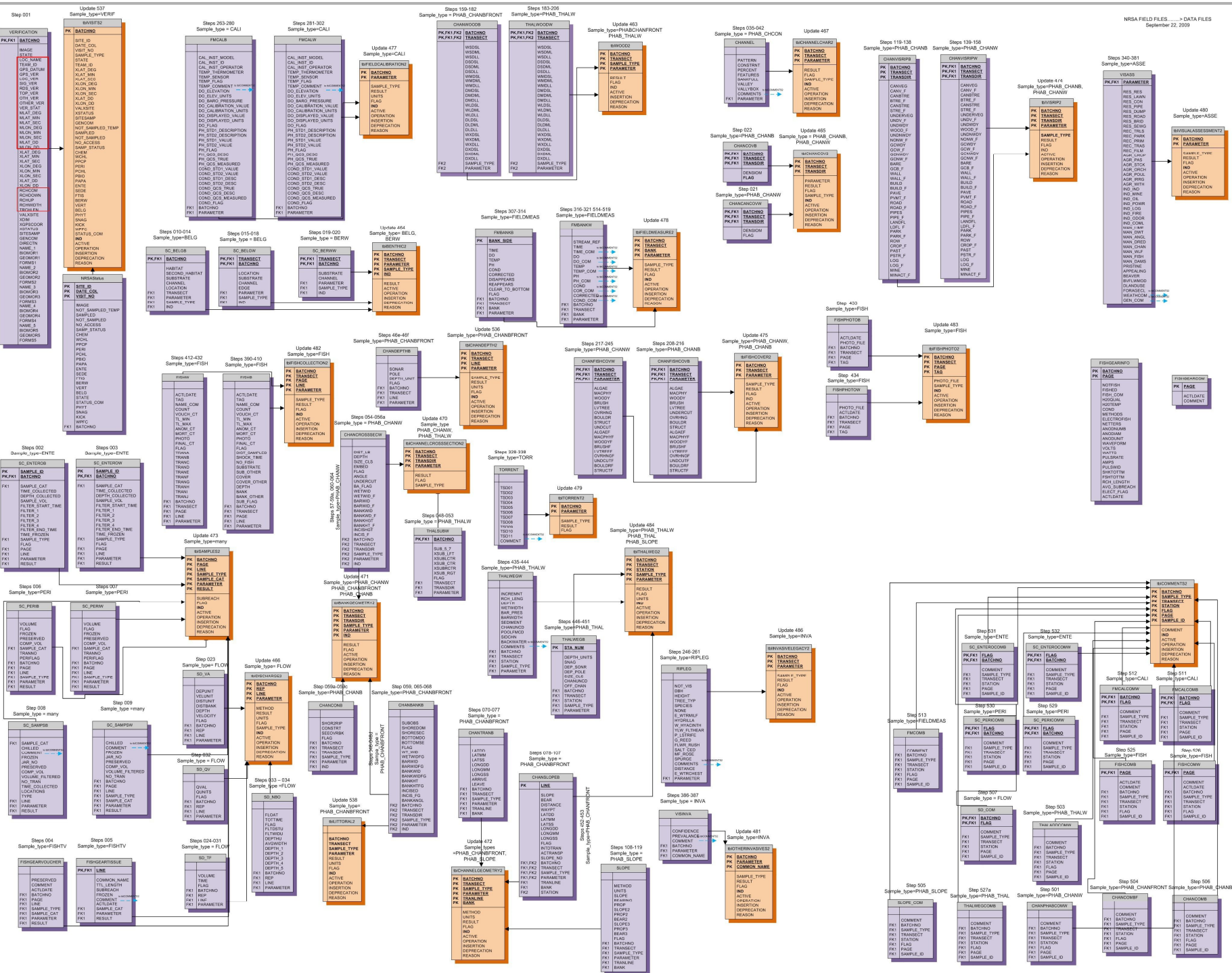


E. Coli (mpn/100 ml)









# Successes So Far

- Assessing watershed status consistently across city
- Collecting data for multiple uses: MS4, ESA
- Successfully incorporated frame improvement
- Increased comparability





