

# Missouri River Water Quality Monitoring in Relation to Combine Sewer Overflow Systems near Omaha, Nebraska, 2012-present

City of Omaha &  
the USGS Cooperative Water  
program

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# Project Goal

- To document how improvements being made to the Combine Sewer Overflow (CSO) system affect long term change in Missouri River water quality.



# Outline

- Challenges faced in designing the project
- Sample methods
  - Discrete and continuous sampling
- Data

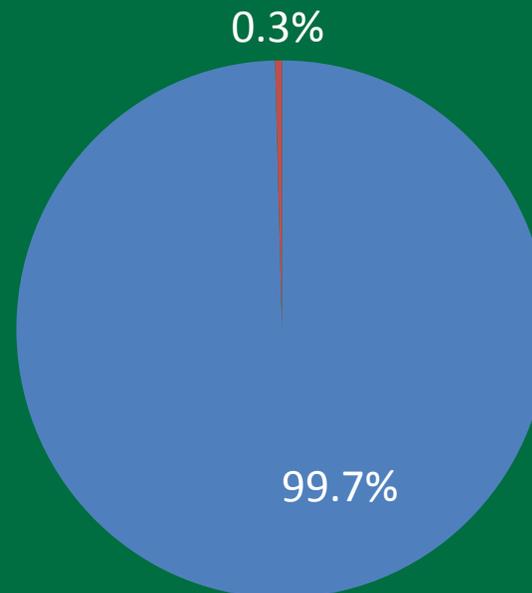


# Challenges

- Small storm water and waste discharge in relation to the discharge of the Missouri River

## Mean Annual Flow Comparison

- Missouri River (1953-2014)
- Big Papillion Creek at Fort Crook (2008-2014)



# Challenges

- Variability of hydrograph complicates trend analysis.
  - from year to year
  - within year

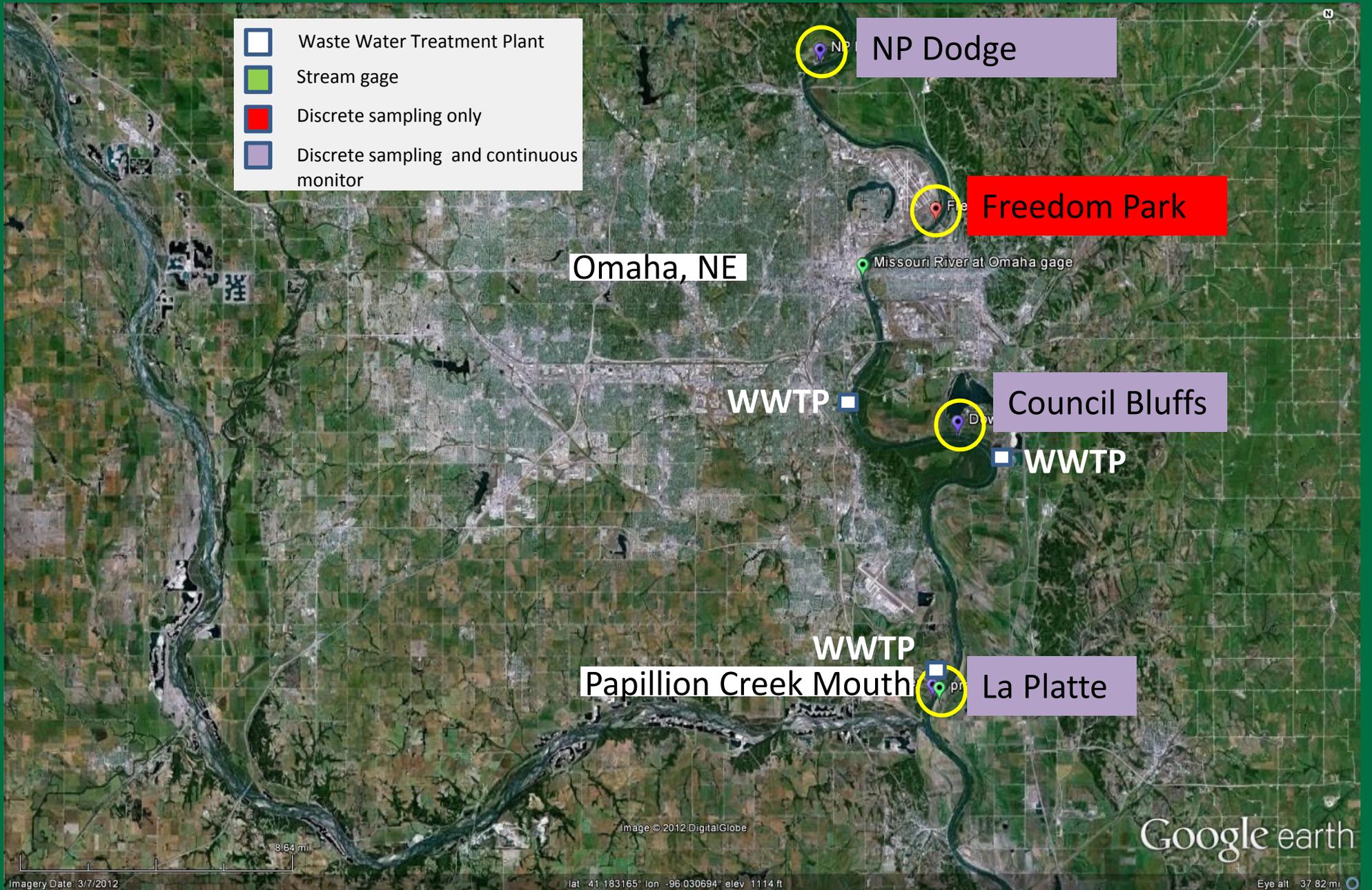


# Challenges

- Many upstream point sources and non-point sources on the Missouri River (drainage area: 322,800 square miles)
- Poor stream mixing

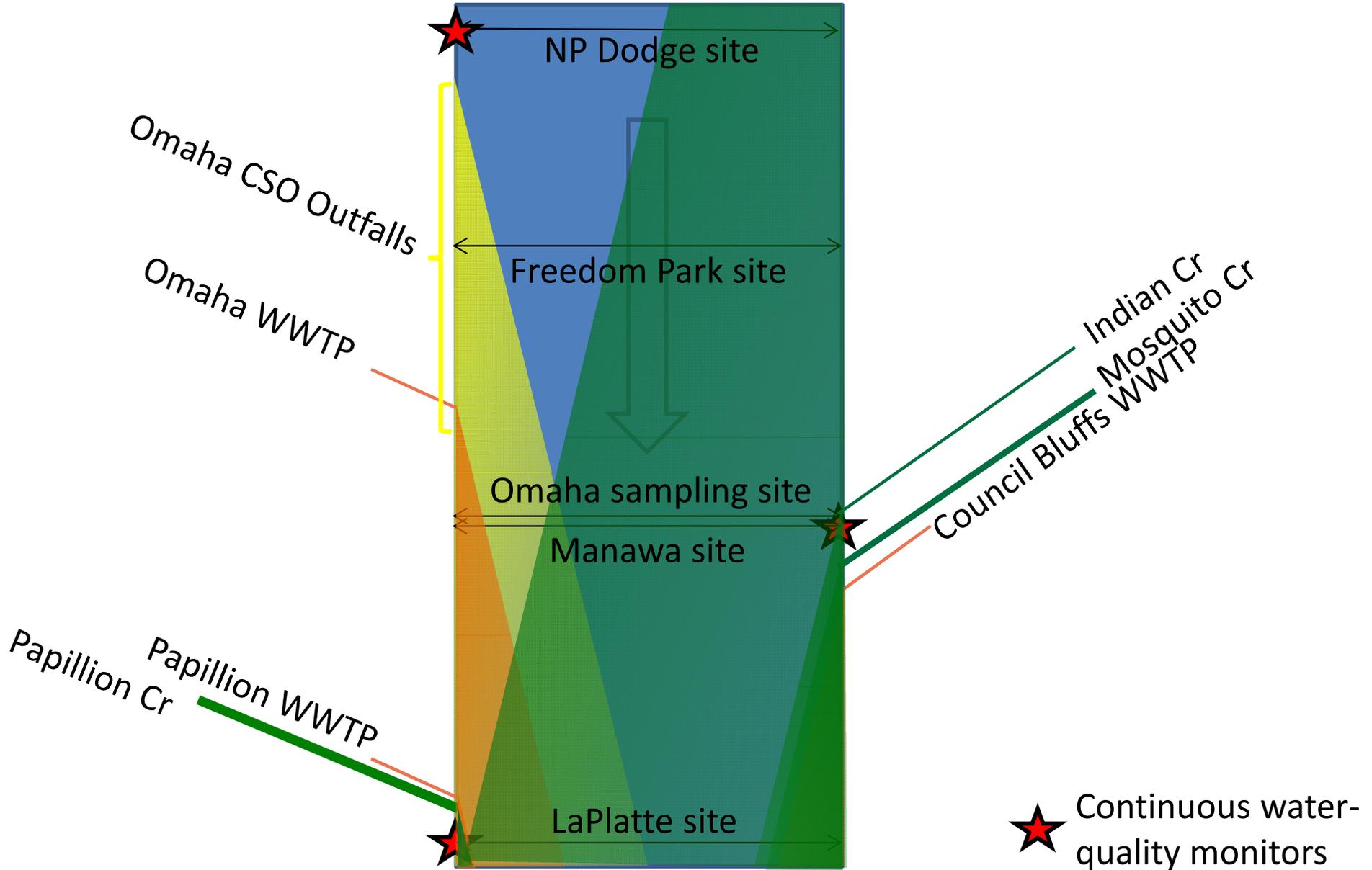


# Sites



Boyer River (9 miles US)

# Missouri River Flow Diagram



# Discrete Water Quality (QW) Sampling Methods

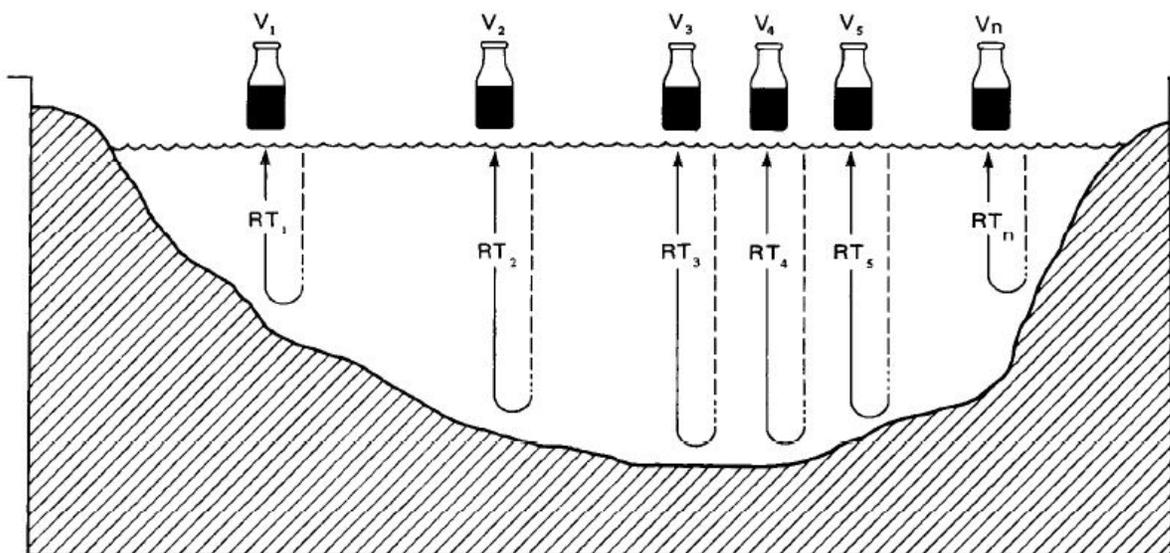
- Flow weighted boat sample (equal-discharge-increment method)
- Quality Control: blanks and replicates (about 10%)
- Mid-channel and bank **grab** samples for *E. coli* and coliforms



**Equal-discharge-increment method** for collection of water samples. All bottles are composited into one representative sample for laboratory analyses (from Edwards and Glysson, 1999).

**EXPLANATION**

- RT Transit rate at each centroid (not equal)
- V Volume collected at each centroid (equal)
- Centroid in each increment (samples collected)





# Discrete QW Sampling Parameters

- Parameters:
  - Solids, Total Suspended
  - Biochemical Oxygen Demand 5-day
  - Total Phosphorus
  - Nitrogen-Total Kjeldahl (TKN)
  - Nitrogen, Nitrate
  - Nitrogen-Ammonia (liquid)
  - Chloride
  - E. coli and Total Coliforms (Quantitray)
  - Field Parameters (pH, temperature, specific conductance, turbidity, floating debris)
- Note local wet weather and river stage
- Monthly field samples and 2 recreation season wet weather samples



# Continuous WQ monitoring

- Deployed at:
  - NP Dodge (Nebraska bank)
  - Lake Manawa (Iowa bank)
  - La Platte (Nebraska side)
- Continuously monitored parameters
  - pH
  - Temperature
  - Dissolved Oxygen
  - Specific Conductance
  - Turbidity





Stealth Cam 06/24/2014 13:24:19



# Data Collected to Date

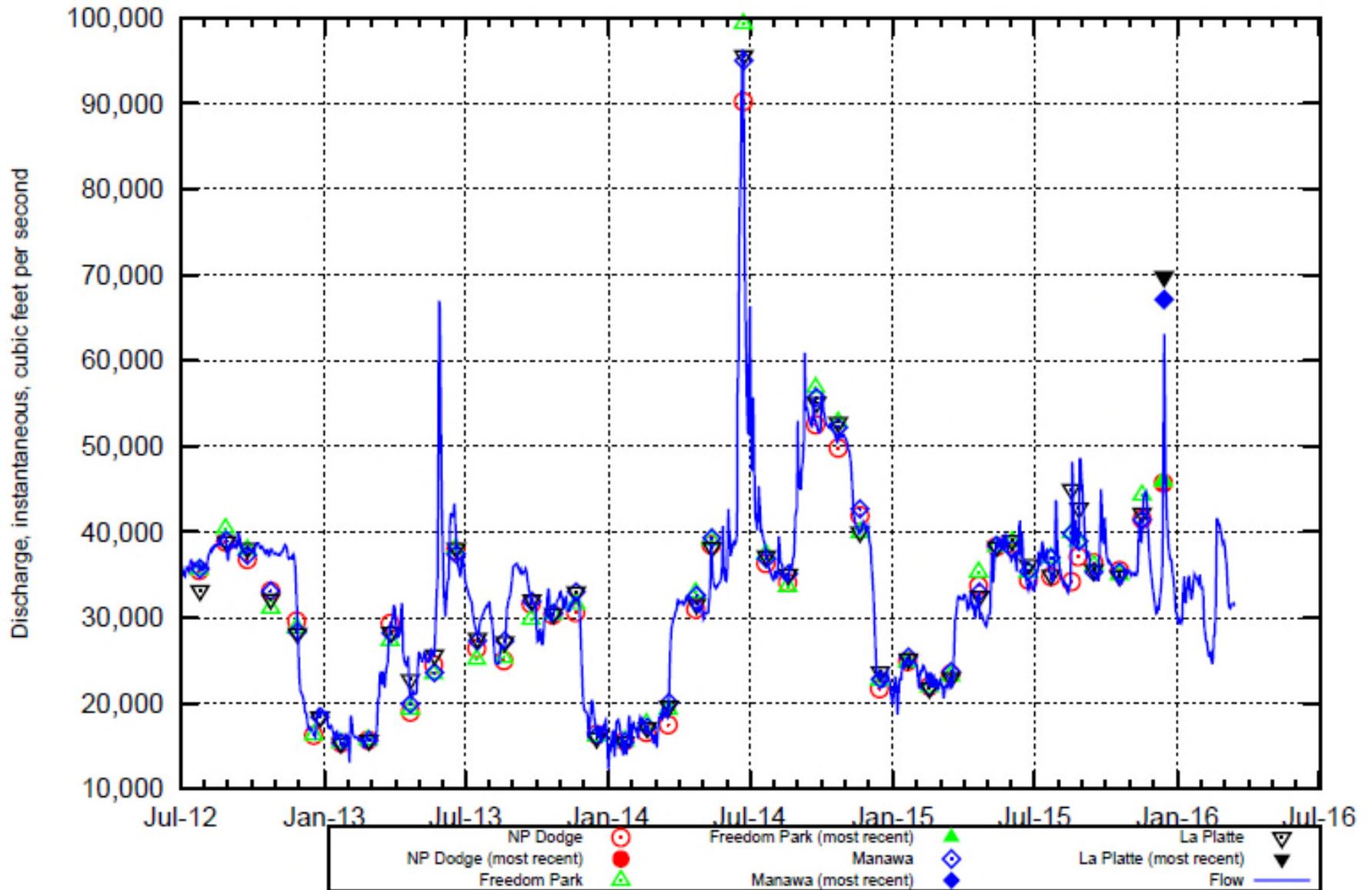
- Monthly sampling started July 2012
- Continuous monitoring started in July 2012
- Wet weather sampling started in 2015
- 44 sample sets collected



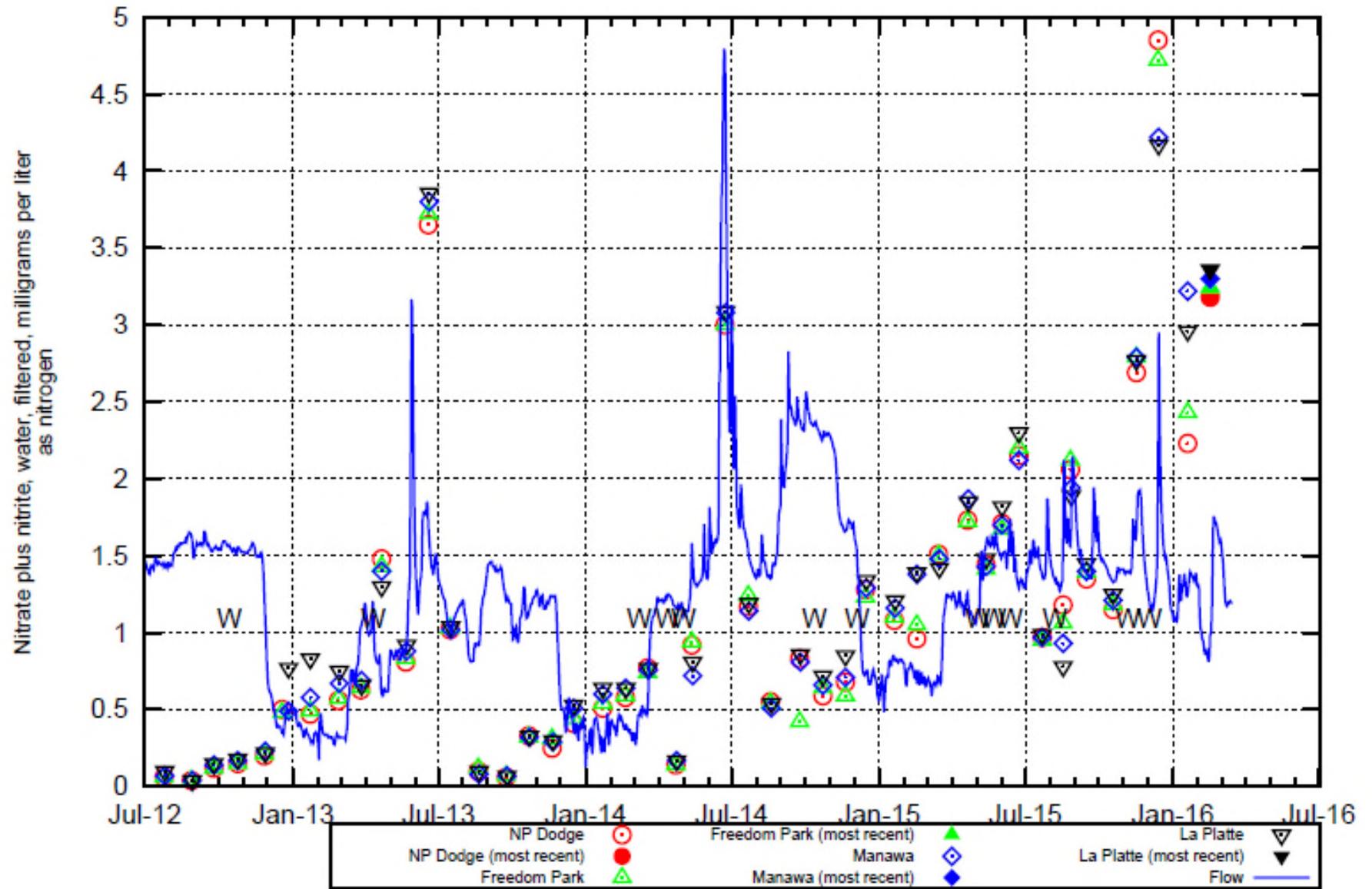
	No Urban Runoff	Urban Runoff
Normal Missouri R. flow	26	9
Above Normal Missouri R. flow	5.5	3.5



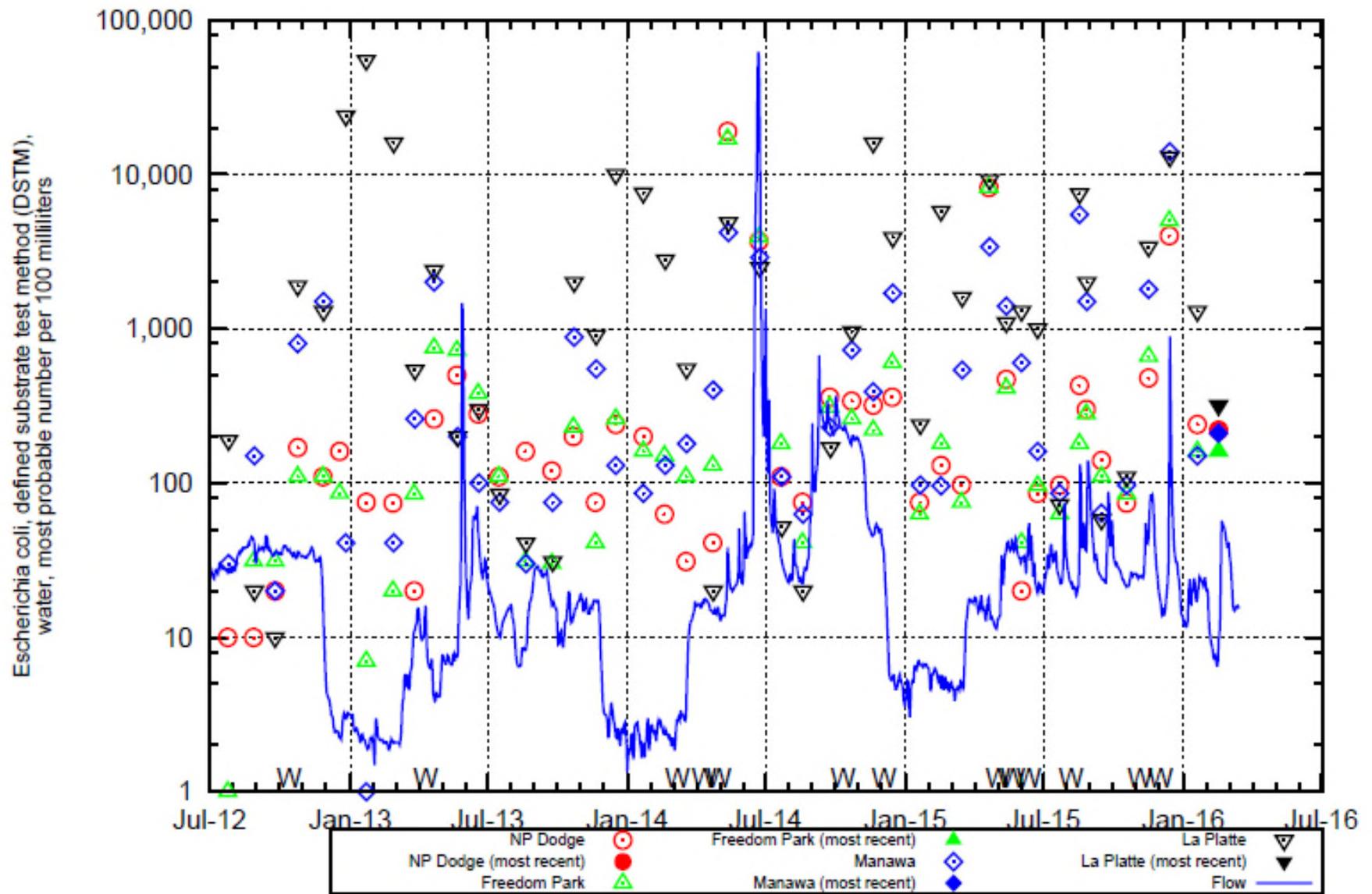
# Discharge



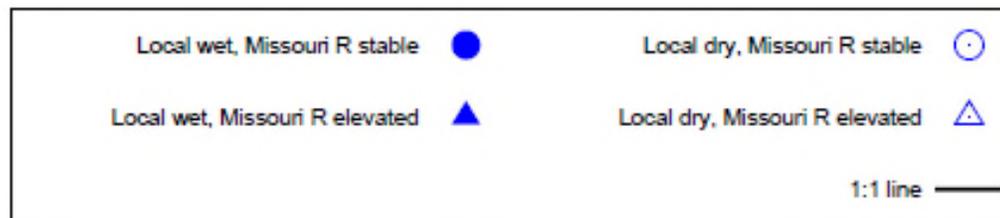
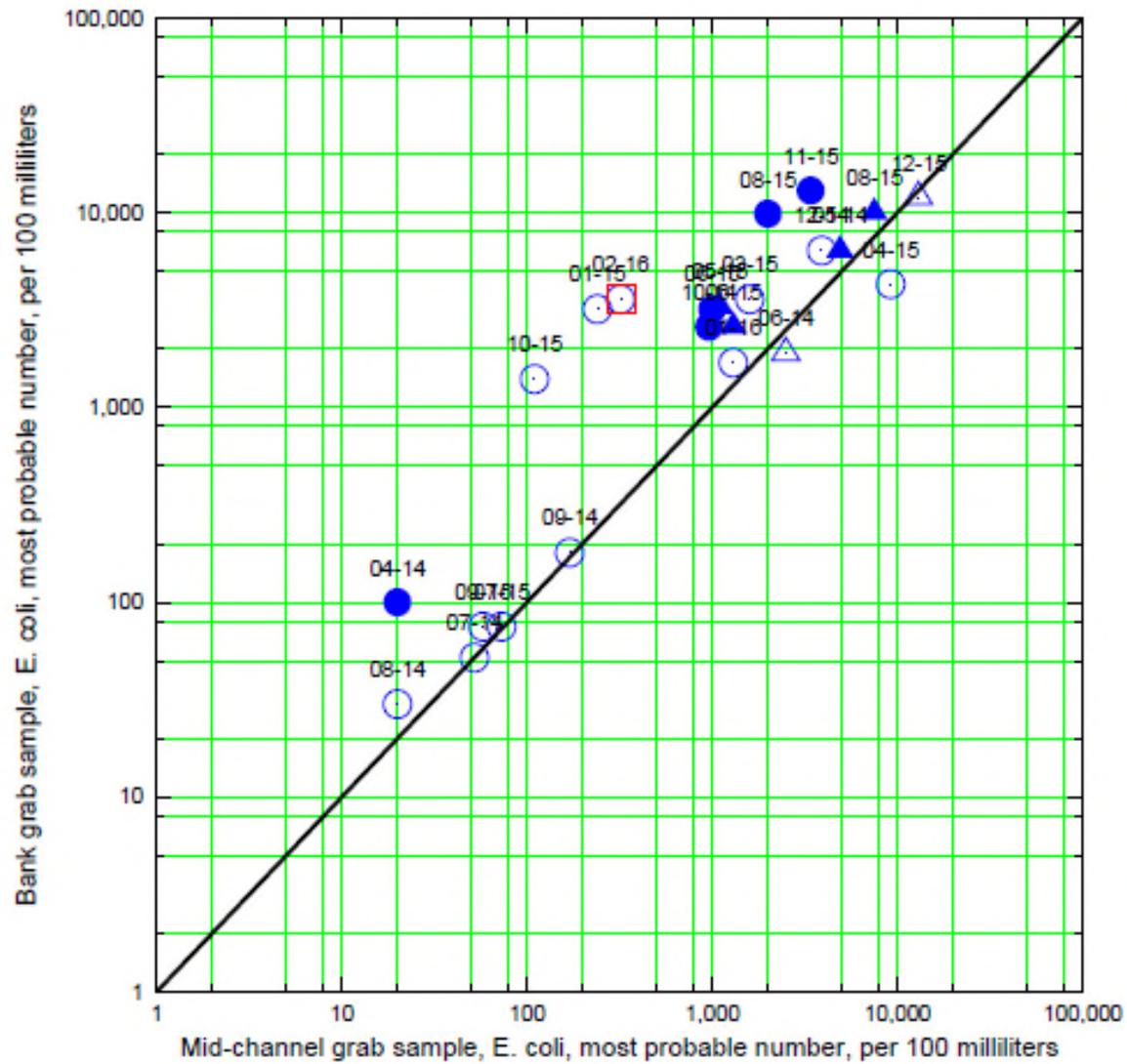
# Nitrate plus nitrite



# Escherichia coli



# La Platte



# Future

- Continue monthly and event sampling-possibly through 2019
- Possibly begin development of load models for future analysis of trends.



# CONTACT INFORMATION

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