Watershed Strategies that Cost-Effectively Reduce Drinking Water Risks

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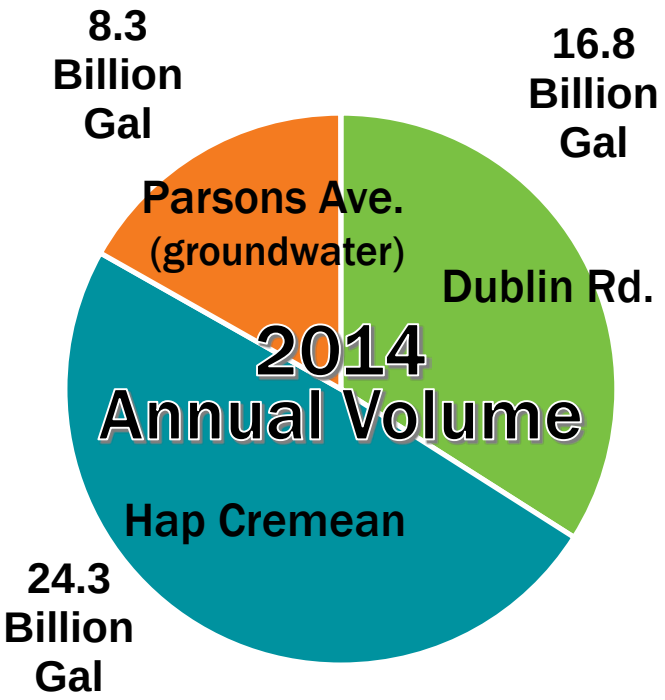
THE CITY OF COLUMBUS
MICHAEL B. COLEMAN, MAYOR

DEPARTMENT OF PUBLIC UTILITIES

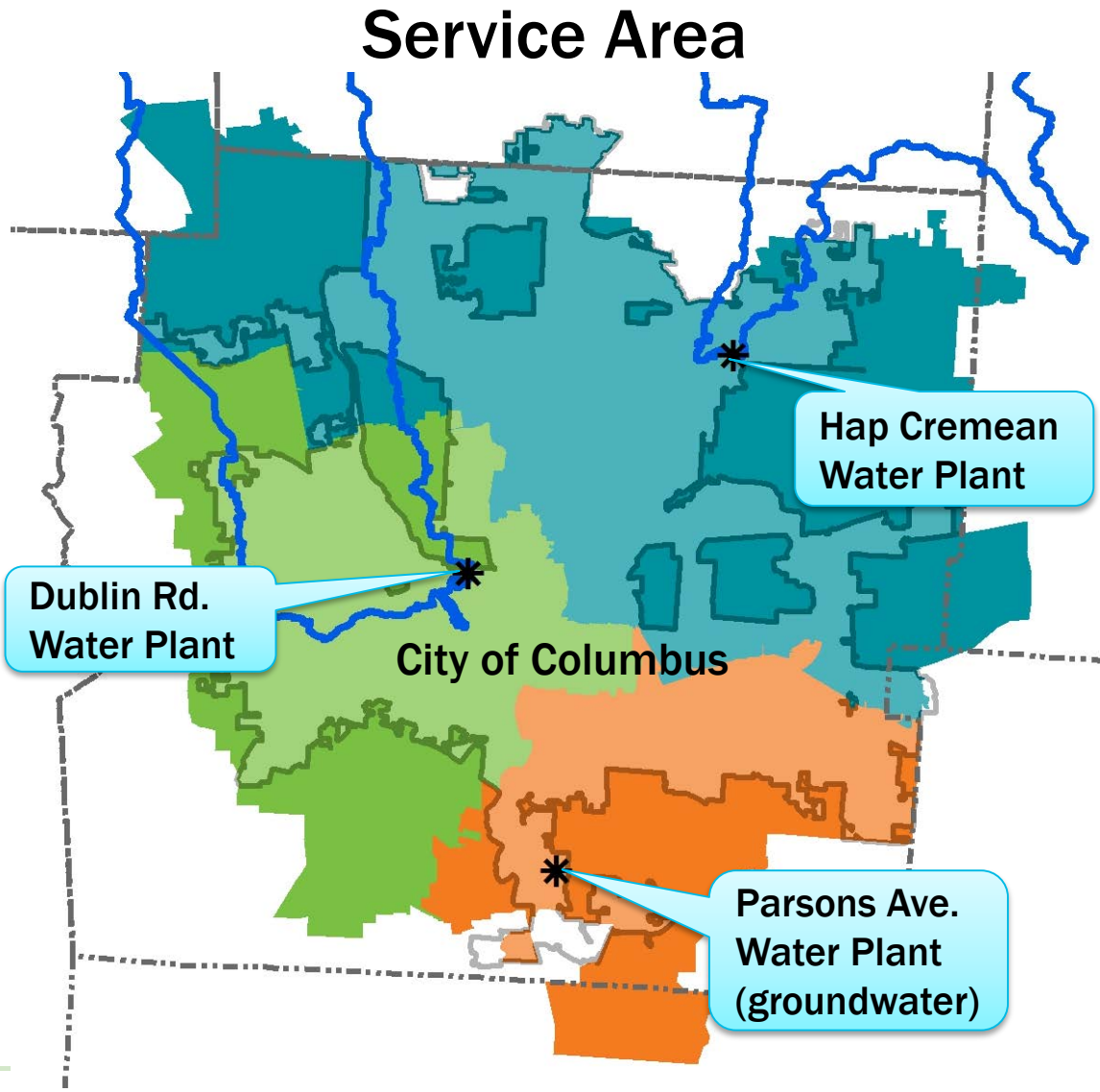
Presentation Outline

- Introduction
  - City of Columbus Division of Water
- Project Approach
  - Risk identification and strategy framework
  - Watershed characterization
  - Water quality modeling
  - Watershed protection strategies
  - Implementation plan

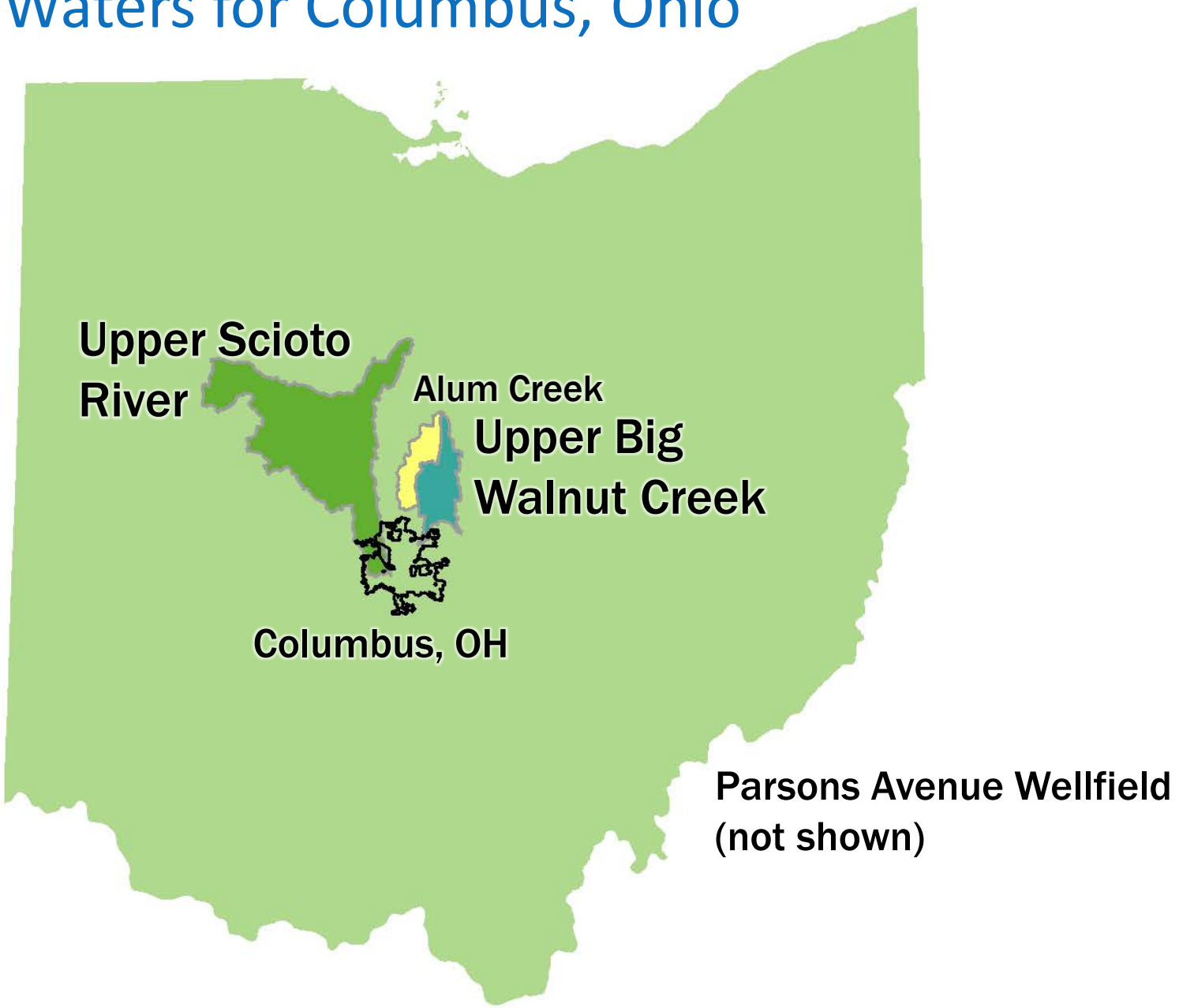
City of Columbus Division of Water



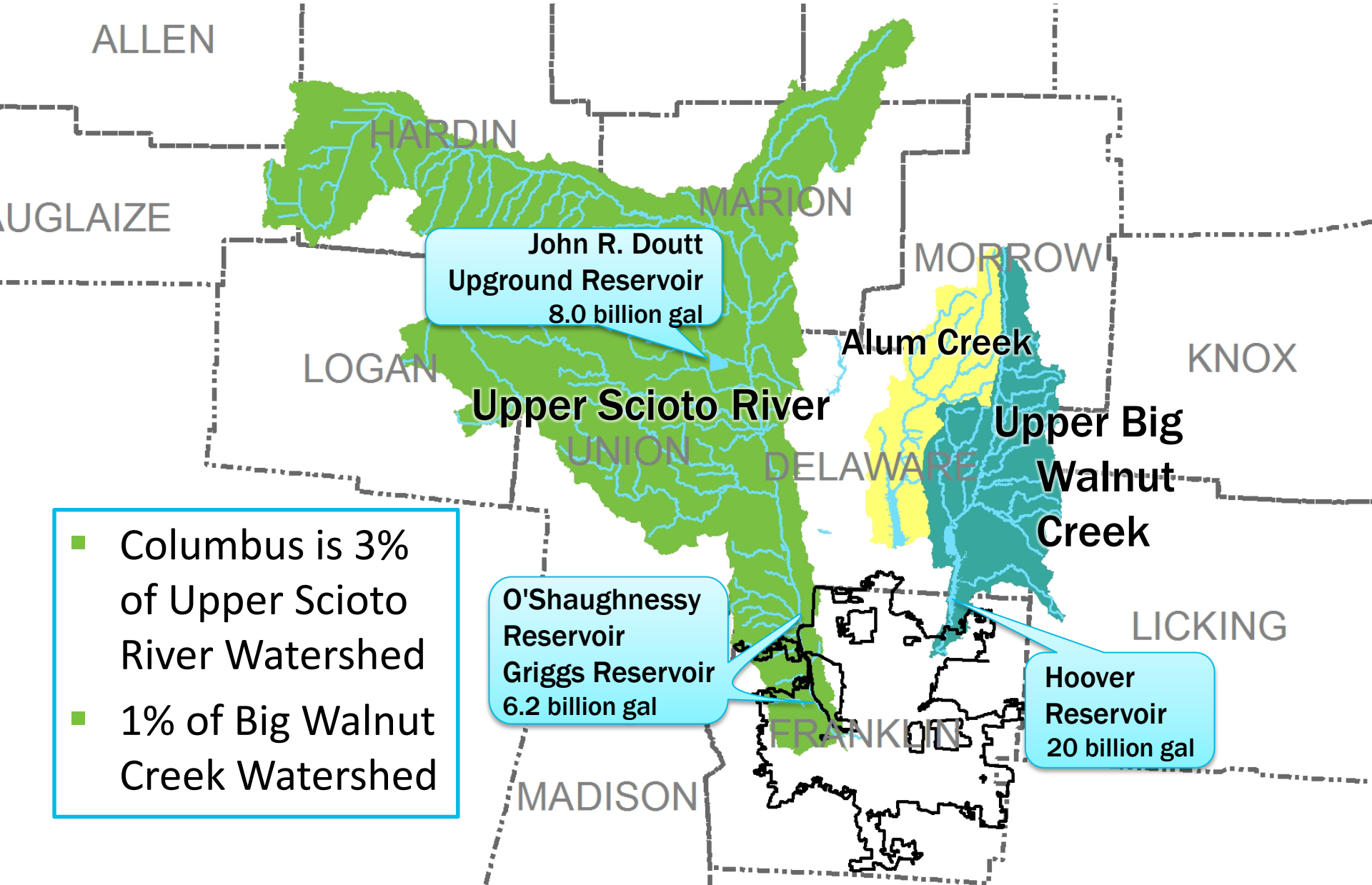
- 49.4 billion gallons in 2014
- 83% **surface** water
- Service population 1.16 million



Source Waters for Columbus, Ohio



Watershed Management Section est. 1994



- Columbus is 3% of Upper Scioto River Watershed
- 1% of Big Walnut Creek Watershed

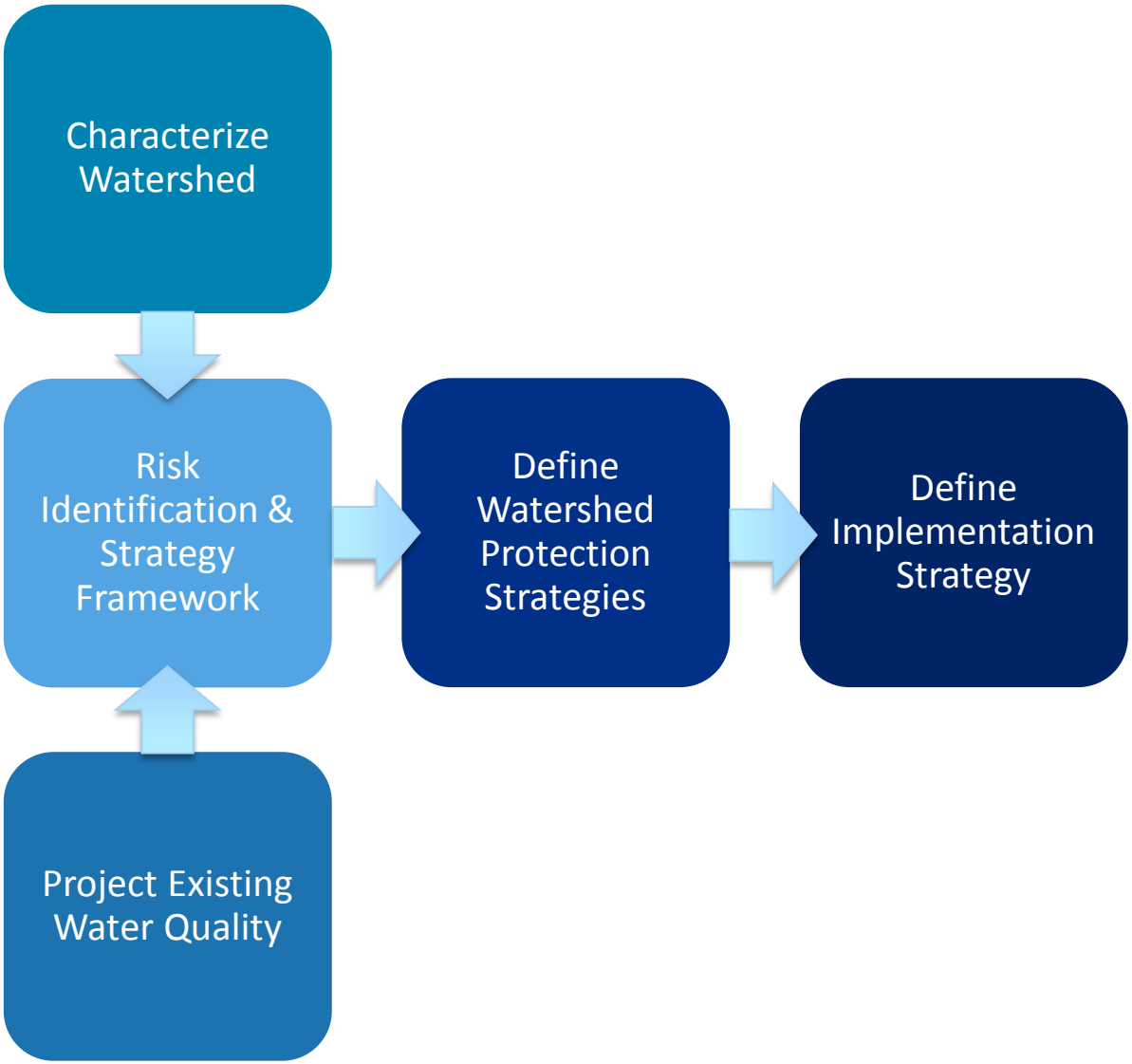
Recent Source Water Concerns

- Nitrogen/Phosphorus → 2-week nitrate advisory issued in June
  - Excess algae growth
    - taste & odor complaints
    - microcystin detected in raw water
- Atrazine (herbicide) → High cost to feed carbon at water plant
- Sediment/Erosion → Reduced reservoir volume

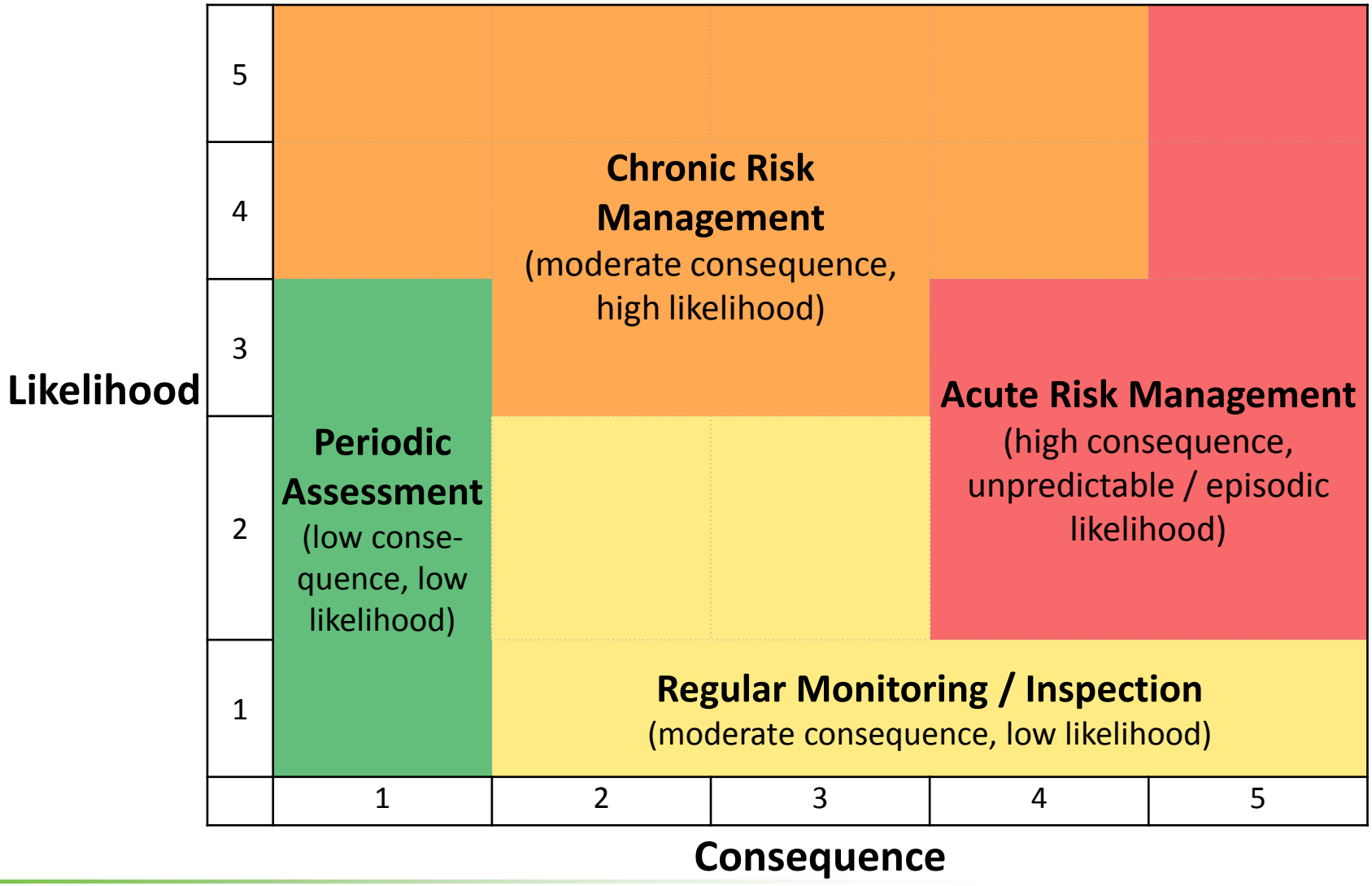
Watershed Master Plan Goals

- Prioritized and phased plan to:
  - Cost-effectively reduce risks
  - Minimize operational costs
  - Focus efforts of Watershed Management Section
  - Update Source Water Assessment and Protection (SWAP) Plan

Watershed Master Plan Approach



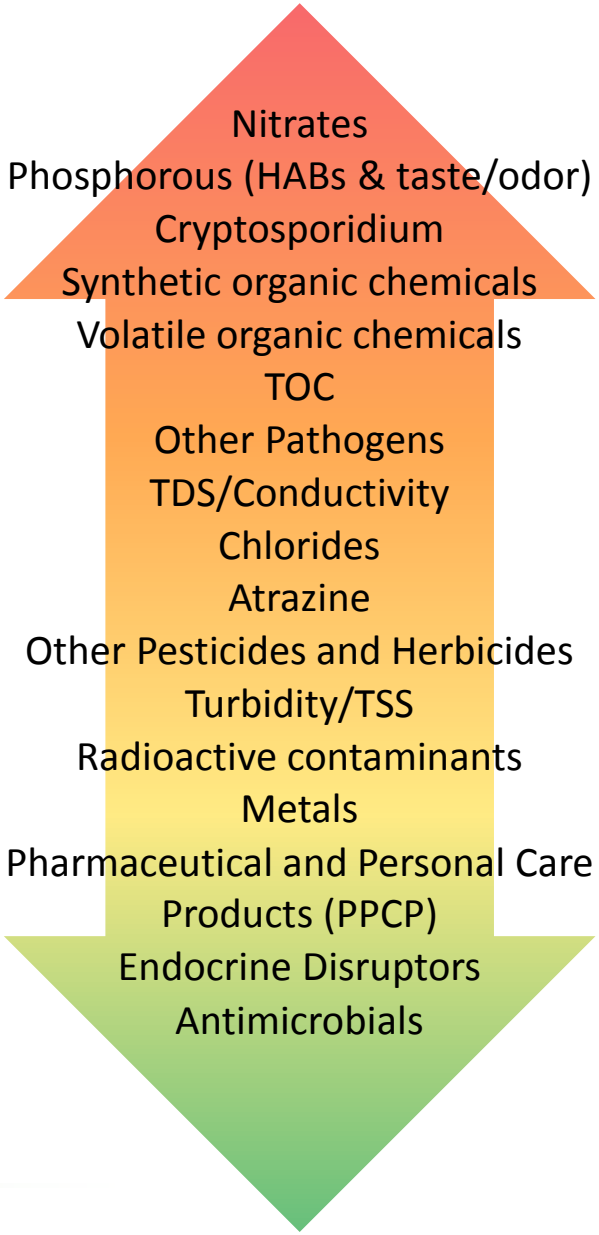
Risk Action Levels



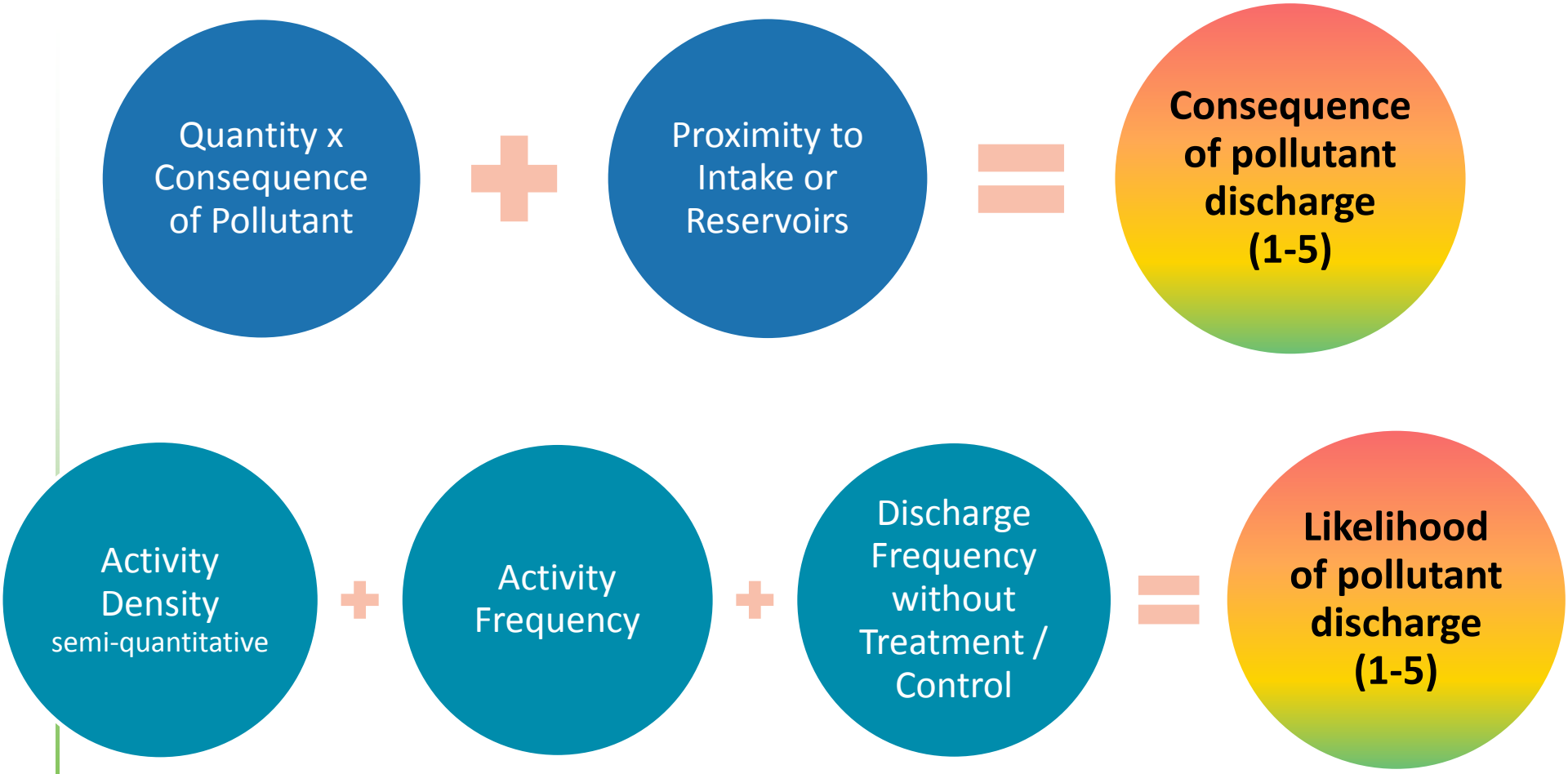
Pollutants of Concern

Human Health Risk + Existing Ability to Treat = **Consequence to Source Water**

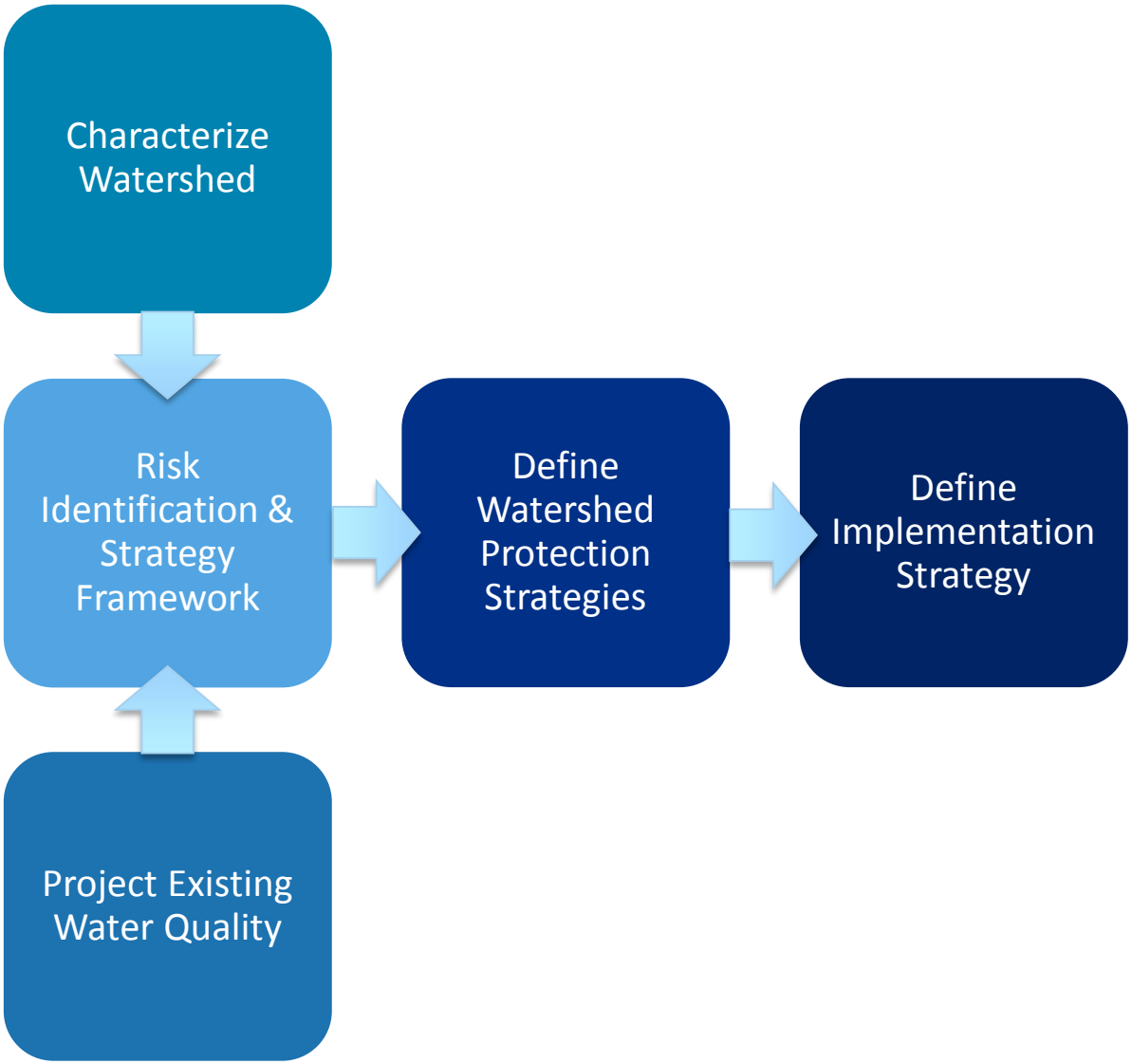
Operational Impacts (HABs, capacity) + Recreational Use & Aquatic Life = **Consequence to Reservoirs**



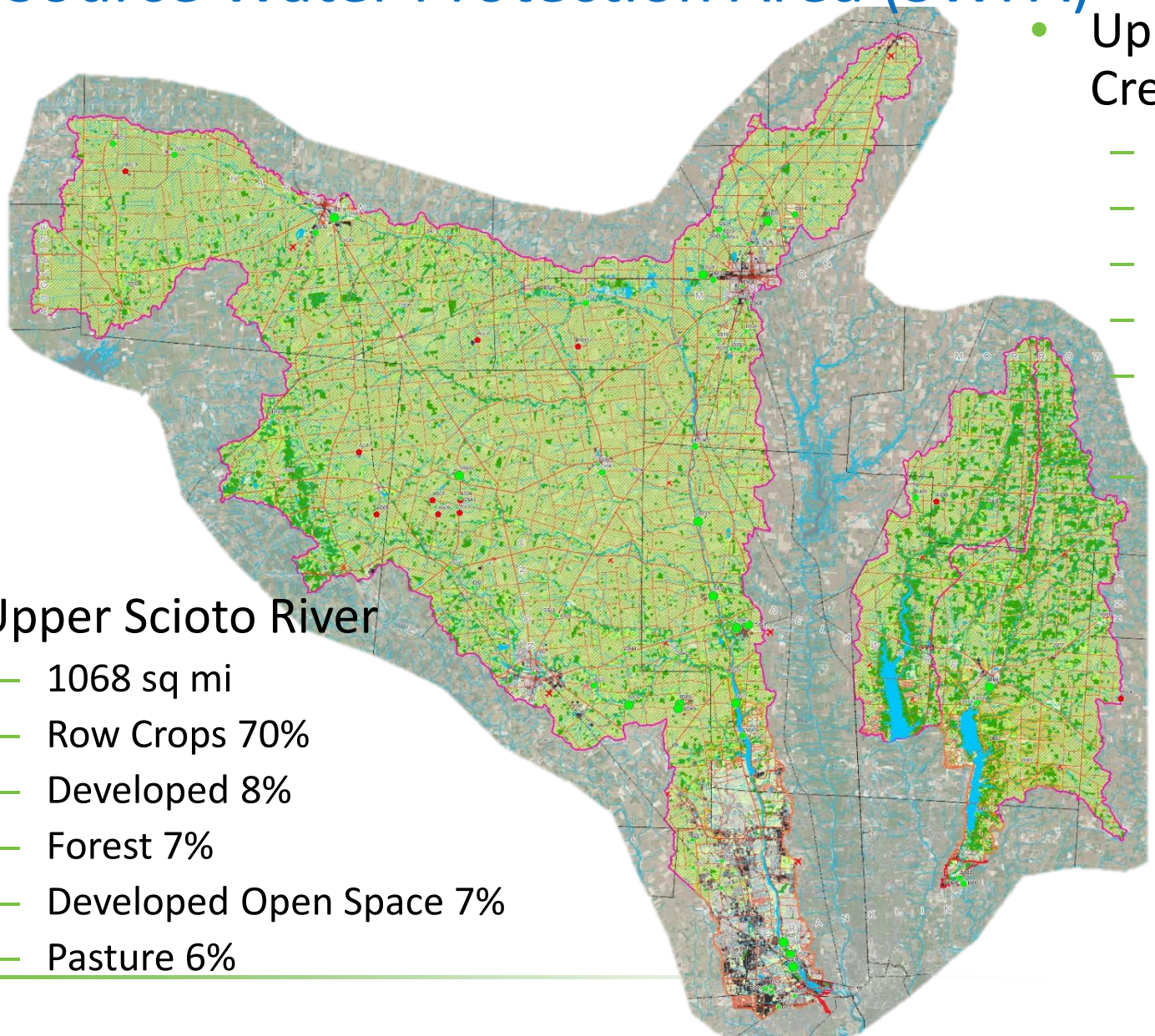
Activities of Concern



Watershed Master Plan Approach

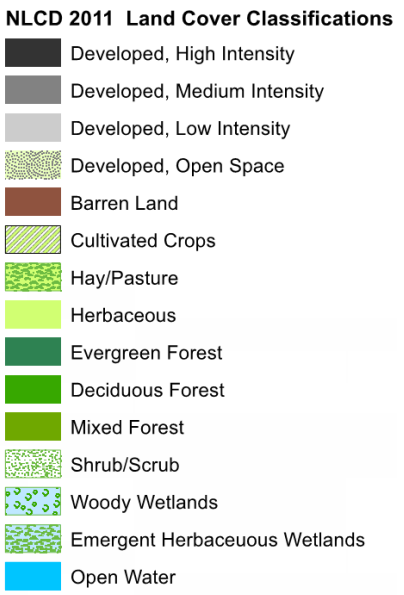


Characterize chronic / long-term sources in Source Water Protection Area (SWPA)

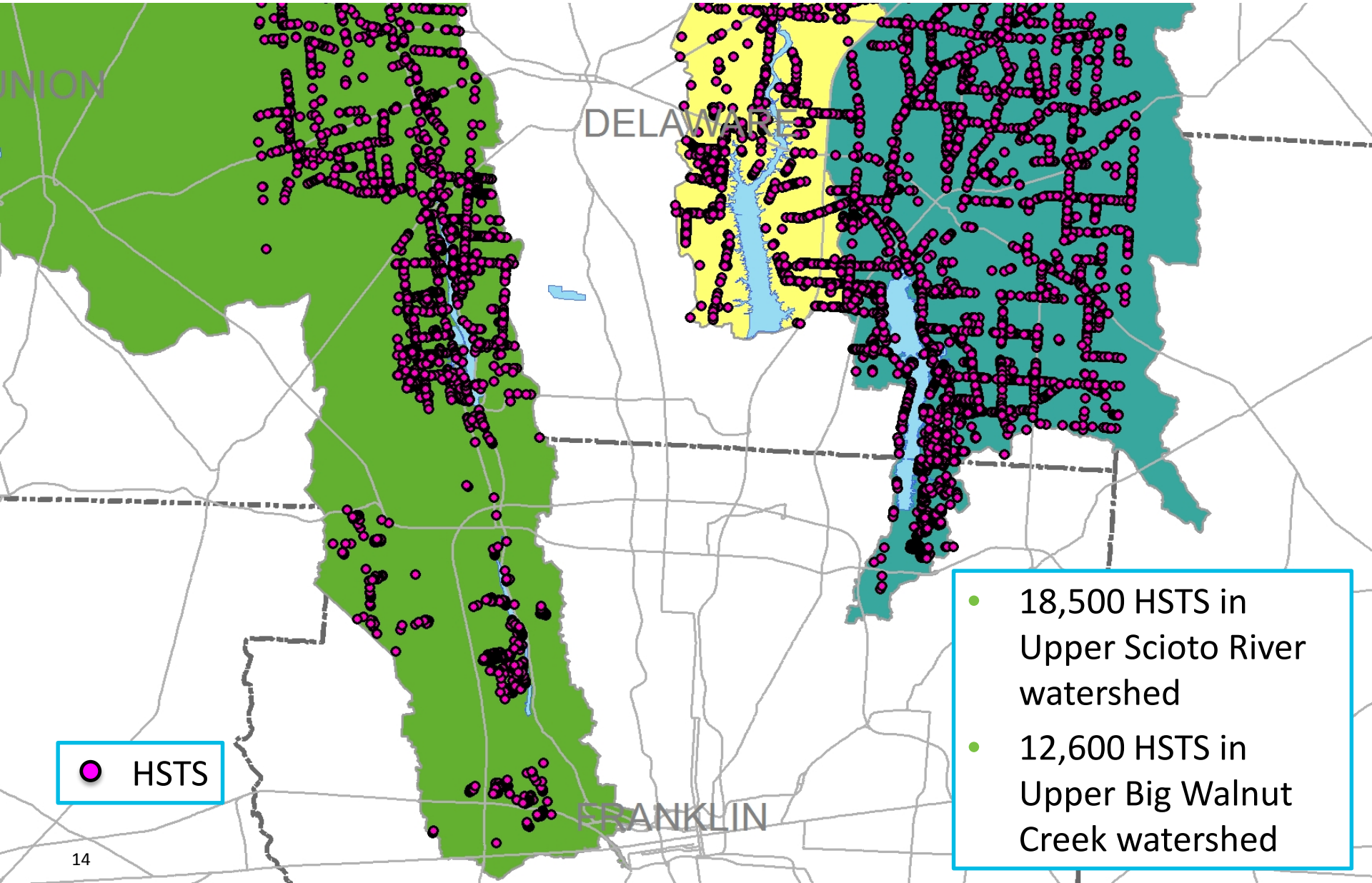


- Upper Big Walnut Creek
  - 195 sq mi
  - Row Crops 47%
  - Forest 25%
  - Hay/Pasture 13%
  - Developed Open Space 8%
  - Developed 3%

- Upper Scioto River
  - 1068 sq mi
  - Row Crops 70%
  - Developed 8%
  - Forest 7%
  - Developed Open Space 7%
  - Pasture 6%



Home Sewage Treatment Systems (HSTS)



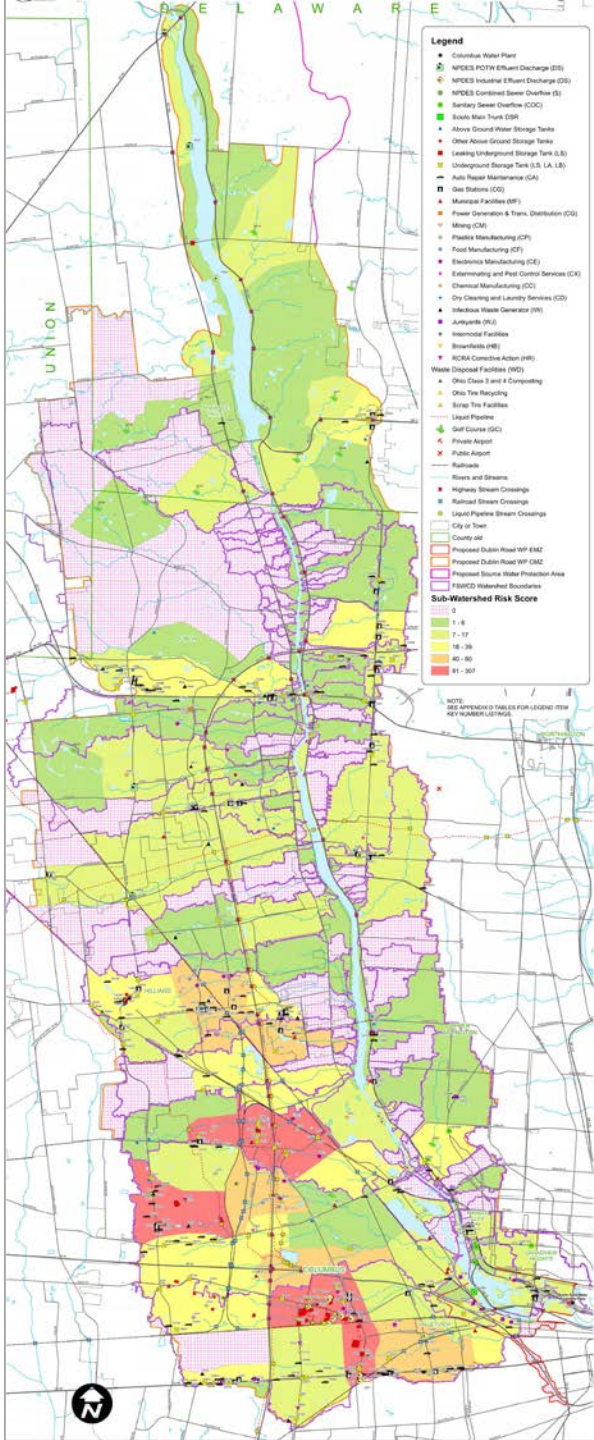
- 18,500 HSTS in Upper Scioto River watershed
- 12,600 HSTS in Upper Big Walnut Creek watershed

Characterize acute / spill threats in Corridor Management Zone (CMZ)

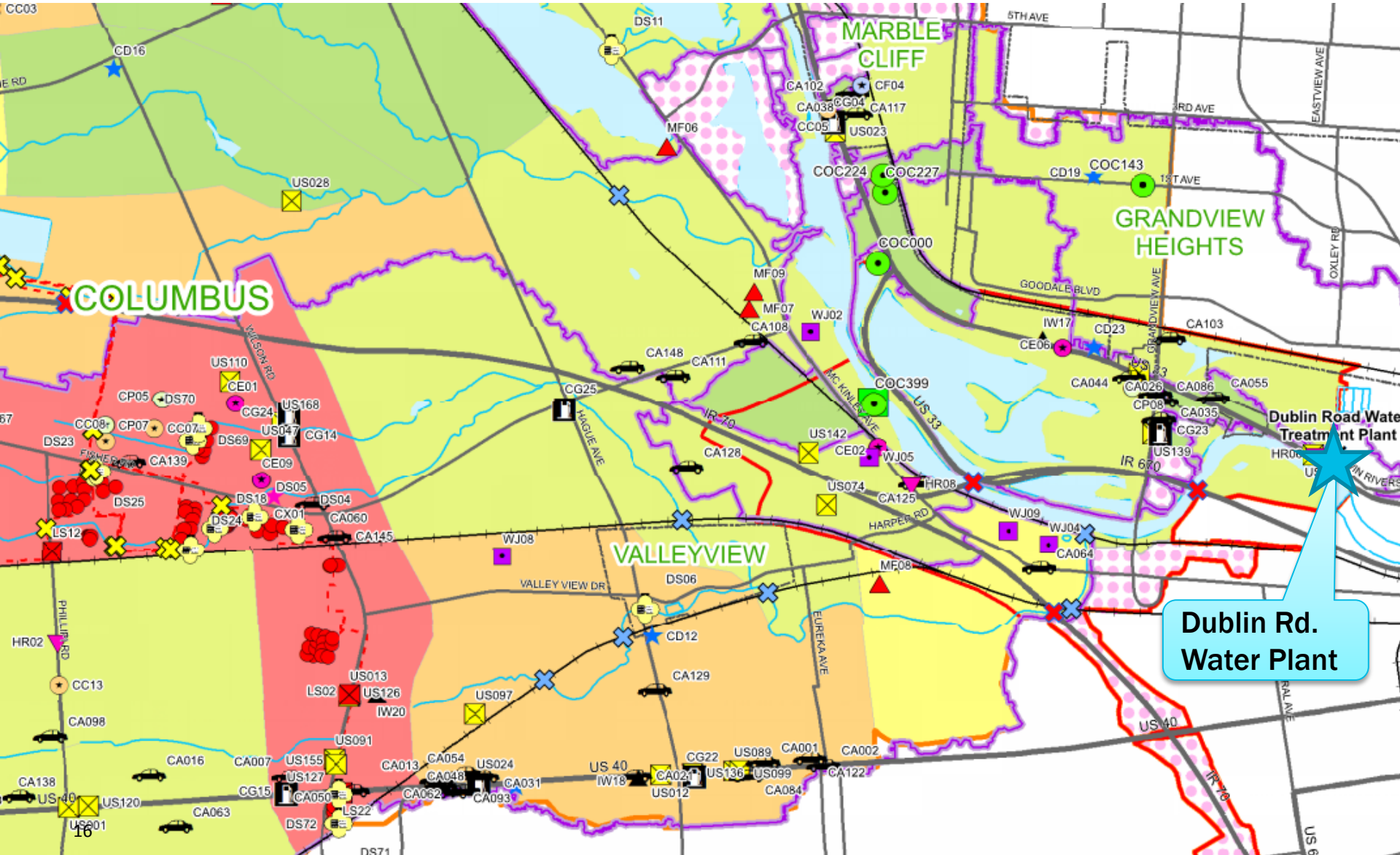
- **Corridor Management Zone (CMZ):** area that warrants detailed inventory because spills or discharges can be quickly introduced to source water
- **Emergency Management Zone (EMZ)**: area immediately upstream of intake where there is little to no time to react

Subwatershed Acute Risk Score

- 0
- 1 - 6
- 7 - 17
- 18 - 39
- 40 - 80
- 81 - 307

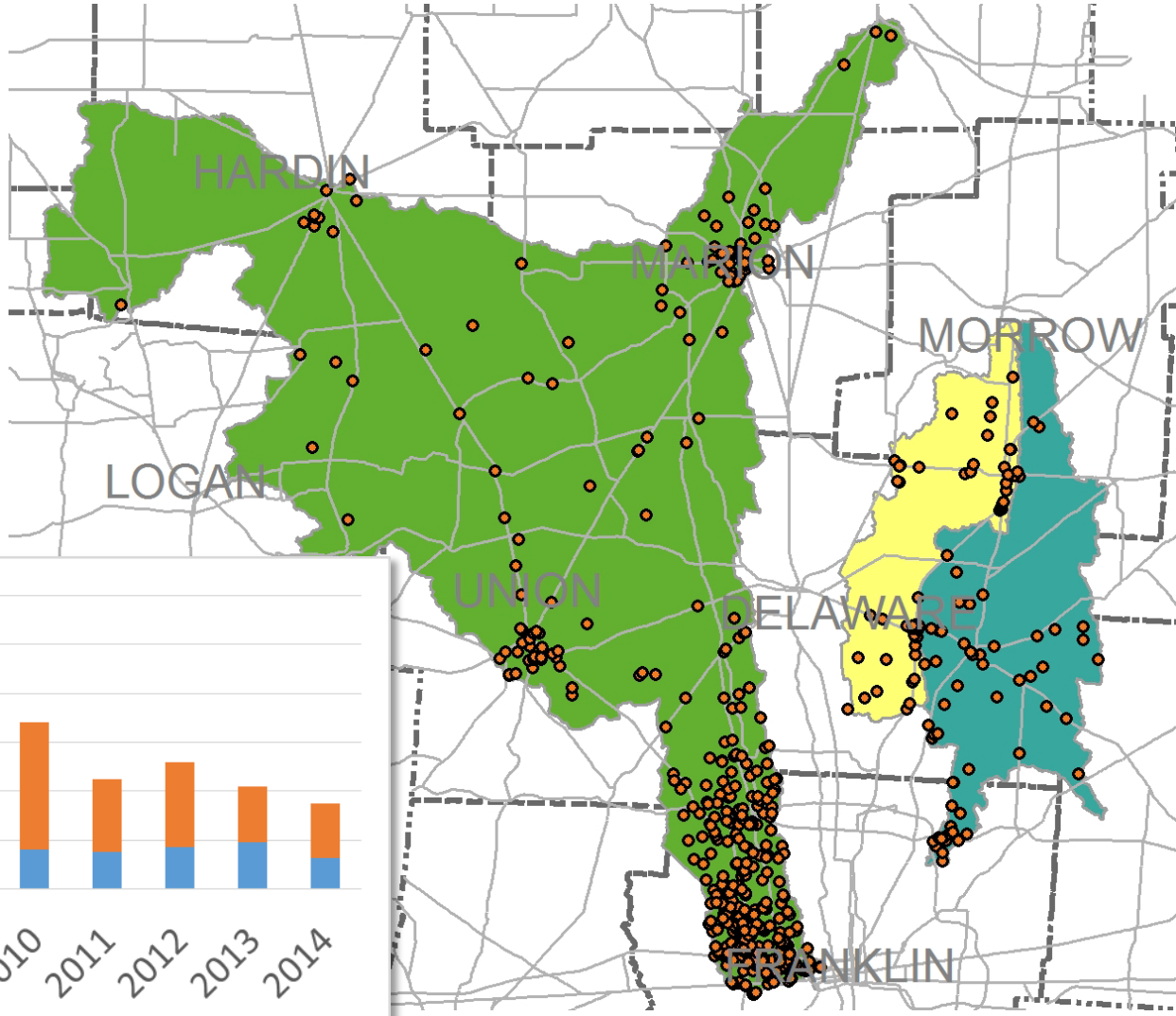


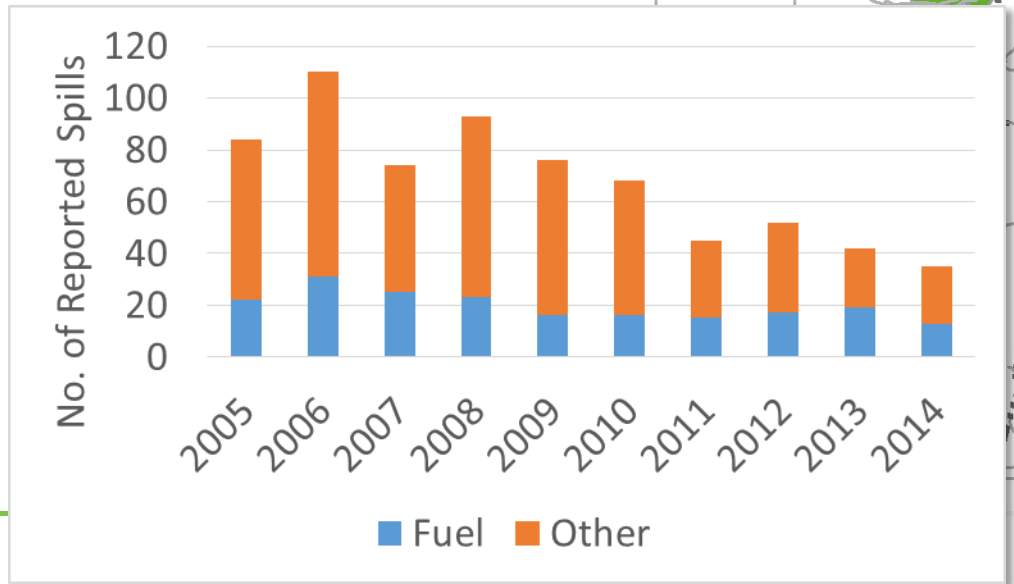
Characterize acute / spill threats in Corridor Management Zone (CMZ)



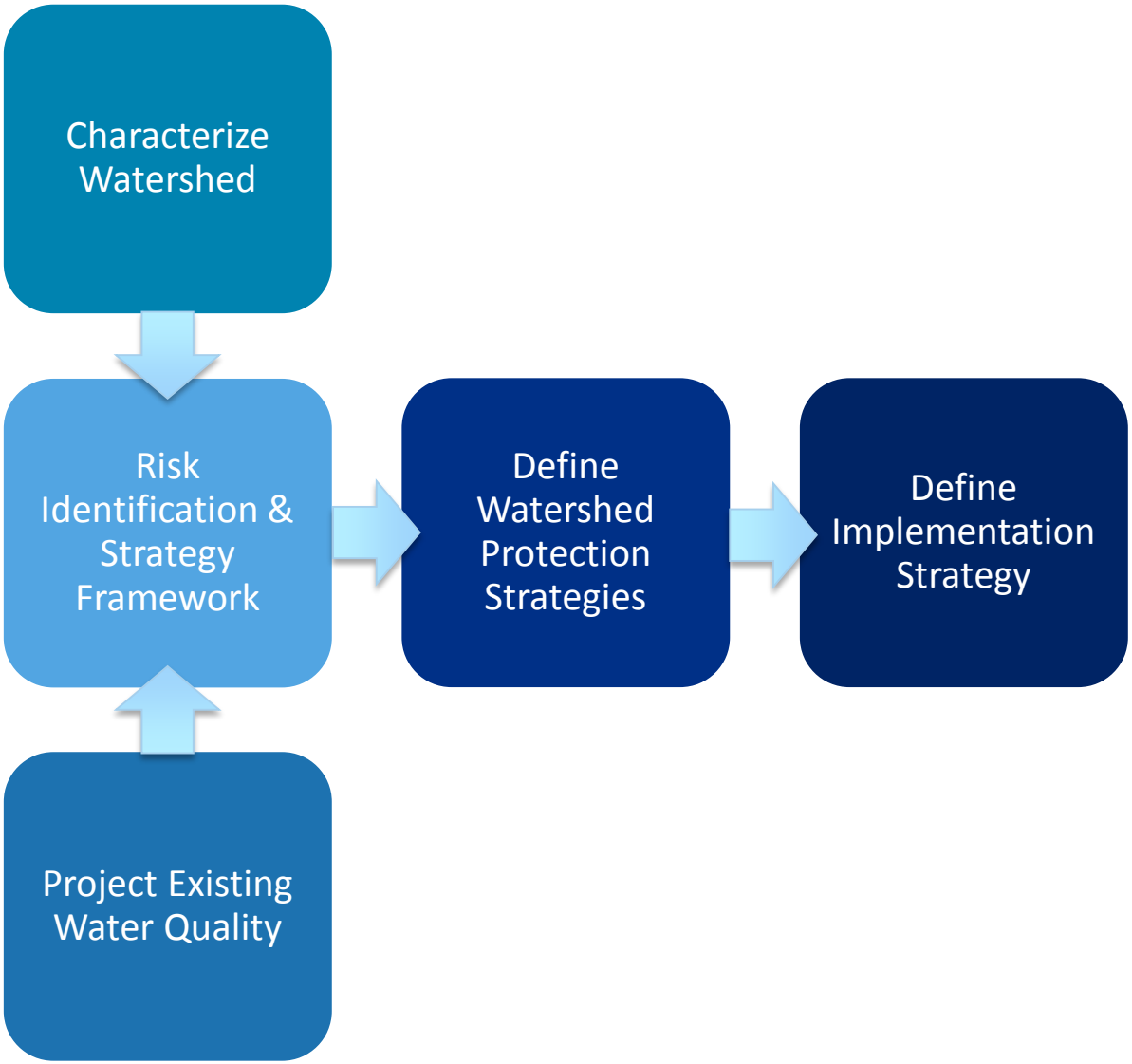
Spill Report History (2005-2015)

- Geocoded from Ohio EPA Emergency Response data
- 686 reported spills
- 65% Franklin Co.
- 11% reported by owner



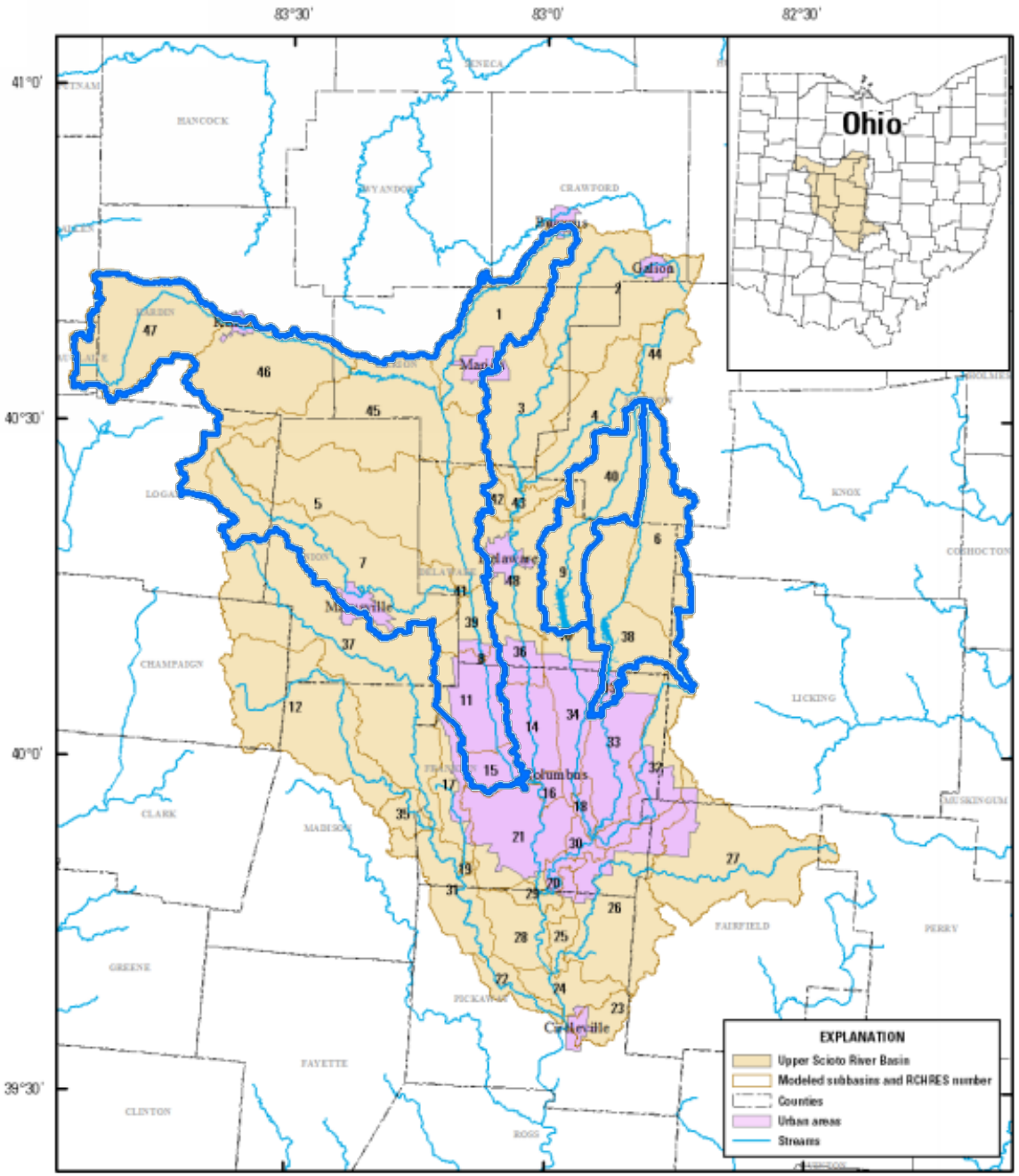


Watershed Master Plan Approach



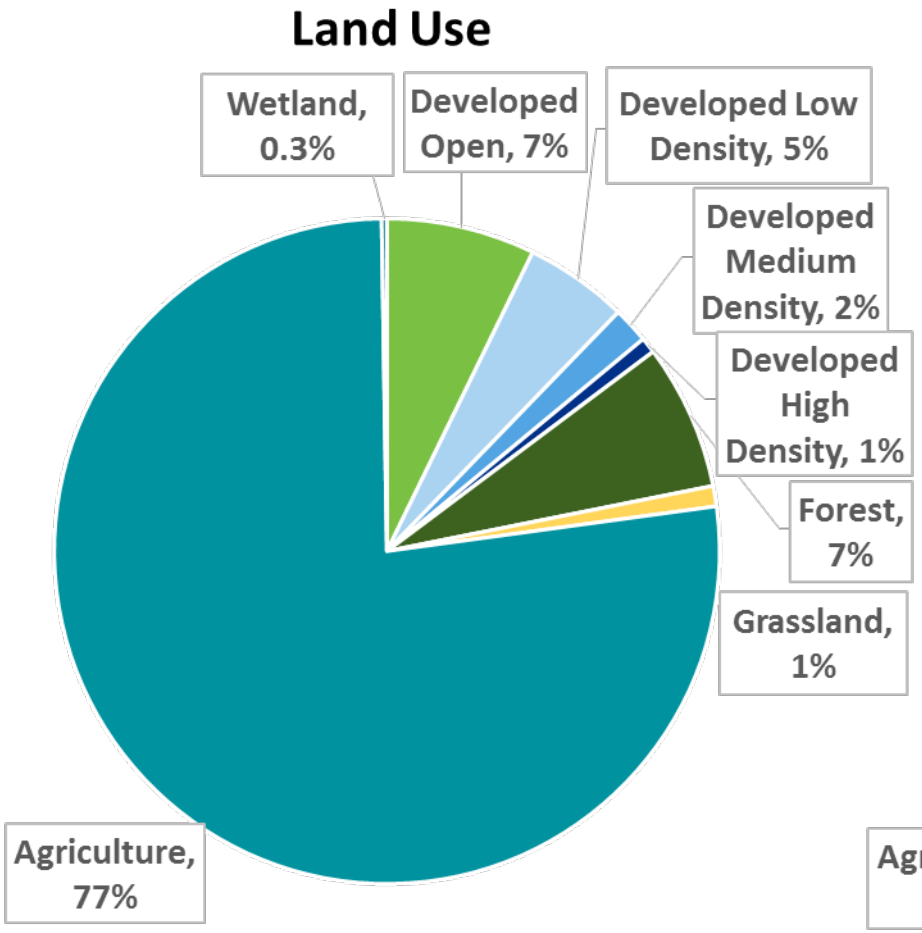
Water Quality Modeling

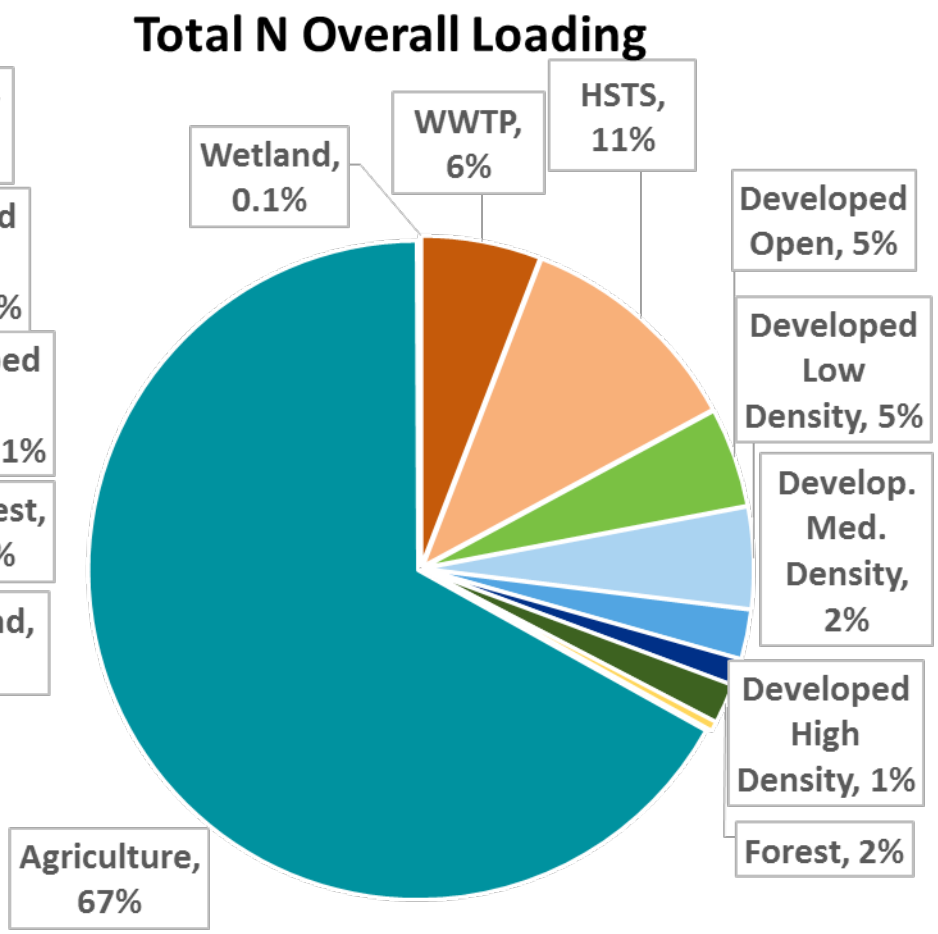
- HSPF (Hydrological Simulation Program-Fortran)
- Constituent loadings
  - Land-based
  - Major WWTPs
  - Home sewage treatment systems (HSTS)
- 2006-2010
- Validated using existing sampling data



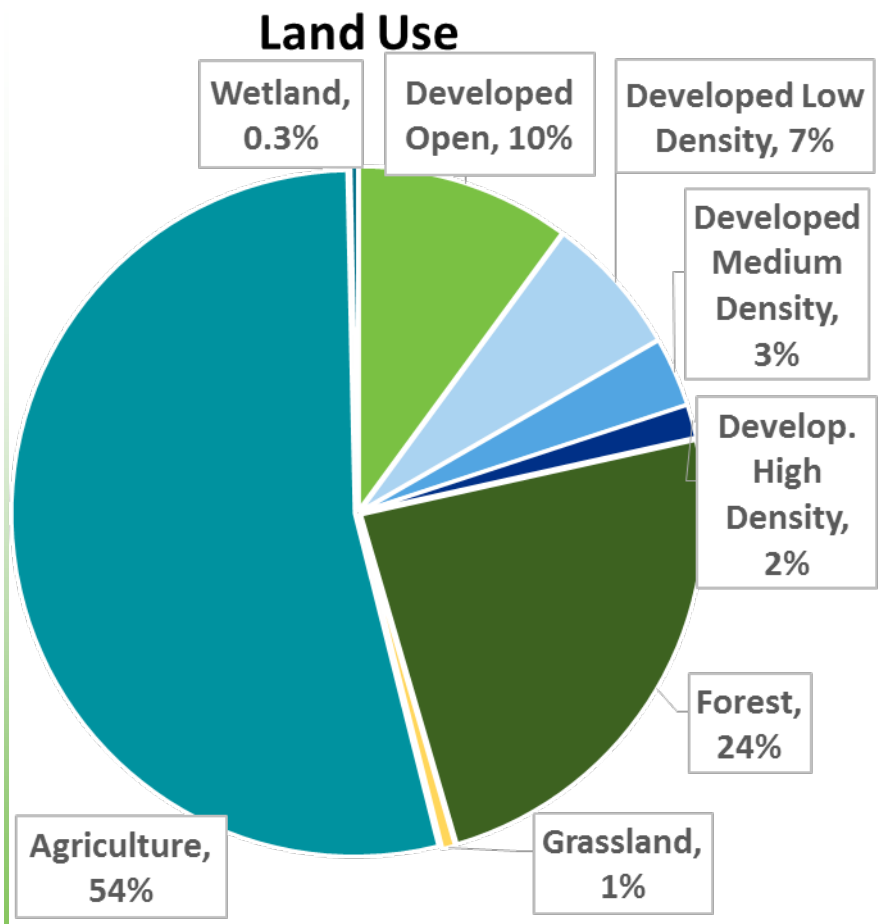
USGS, Map showing sub-basins and corresponding reach-reservoirs used in the HSPF model of the Upper Scioto River Basin, Ohio

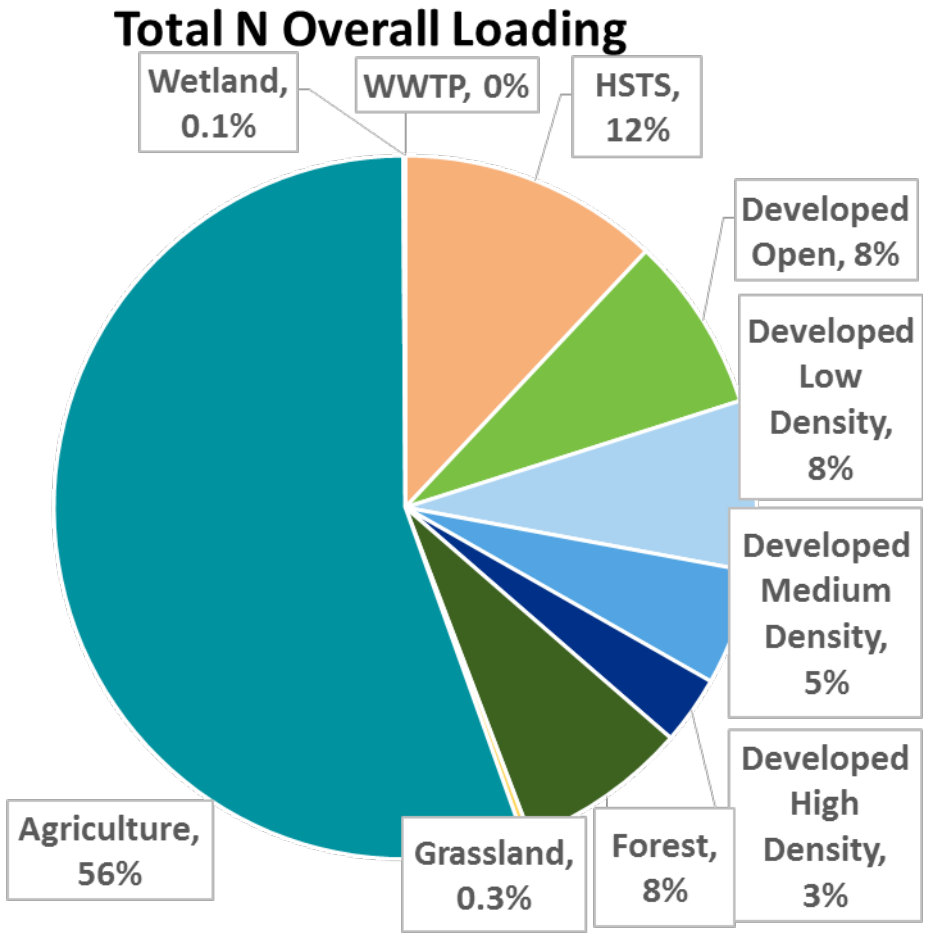
Model Characterization: Scioto



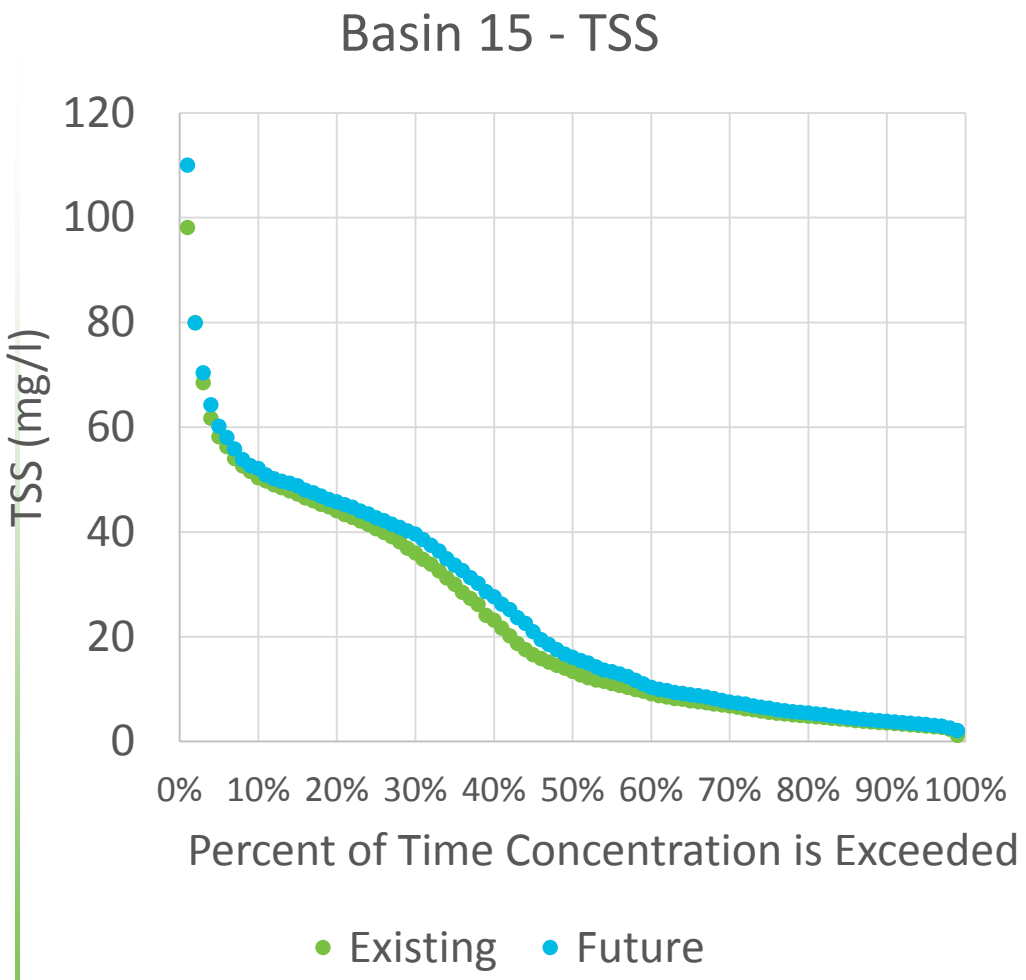


Model Characterization: Big Walnut



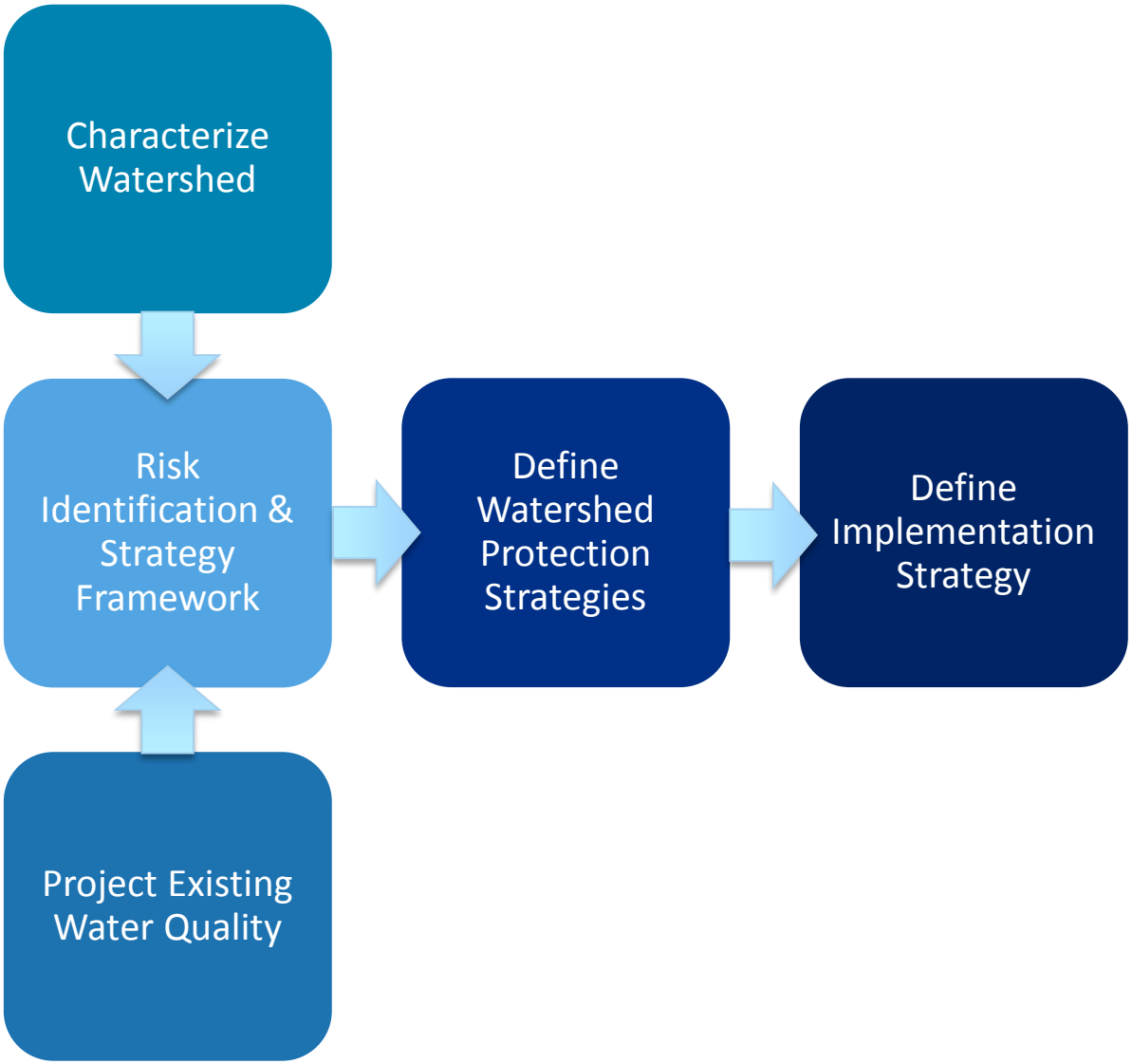


Model Characterization: Future Water Quality

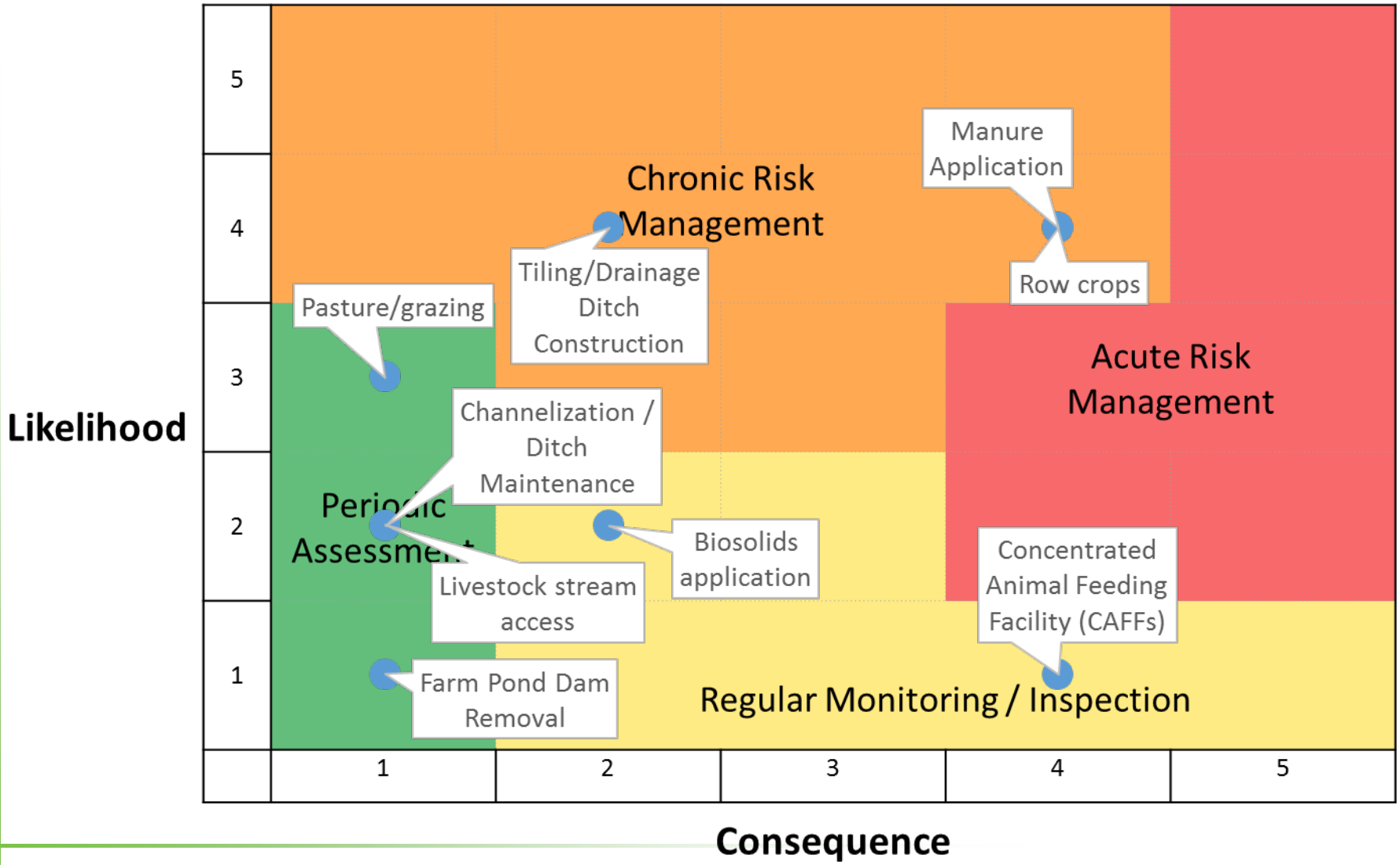


- Year 2035
  - 14% of agricultural land converts to developed
  - Impervious cover increases from 5% to 14%
- 26% increase in solids
- 16% increase in Total P
- 10% increase in total N

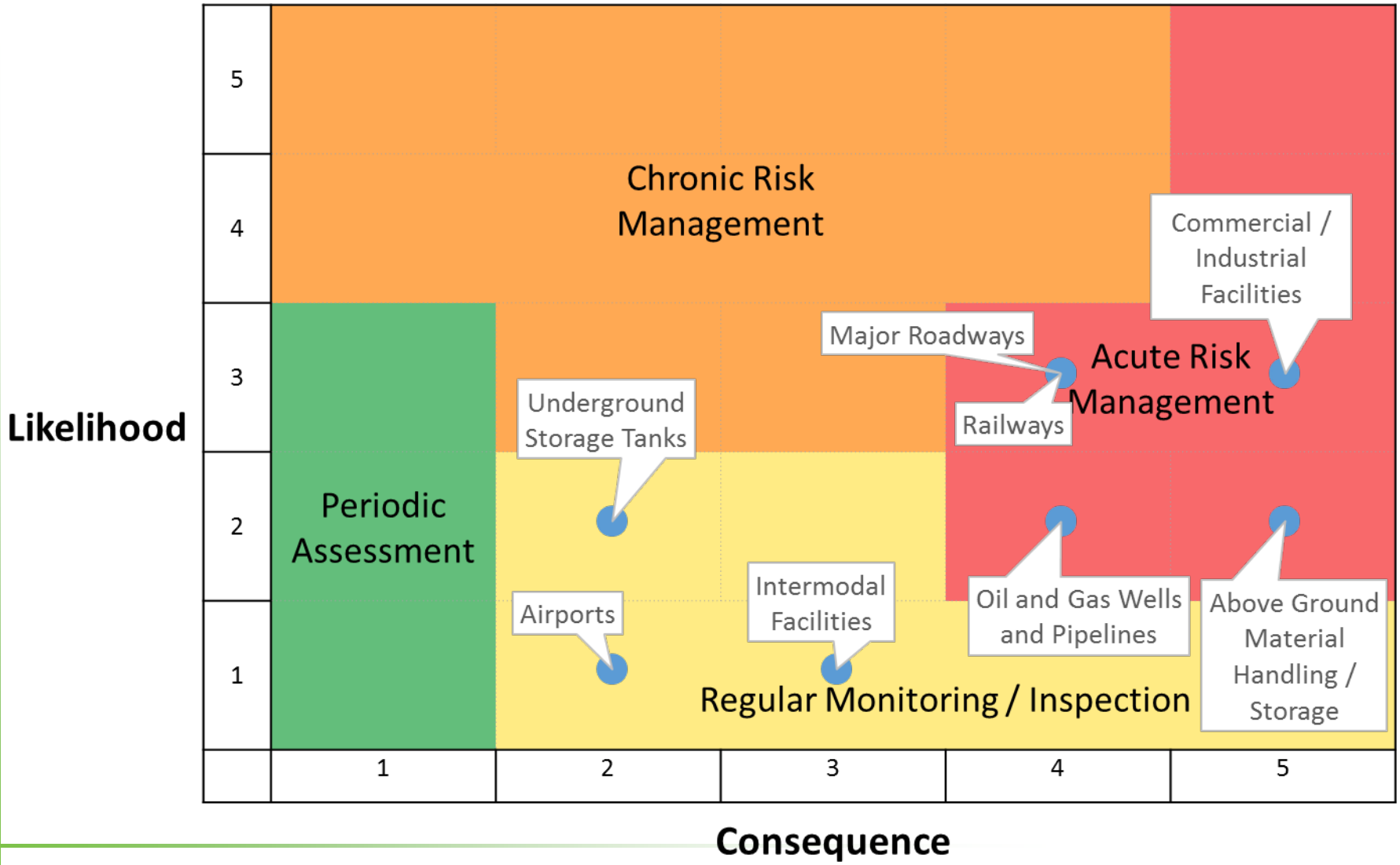
Watershed Master Plan Approach



Dublin Road Water Plant: Agricultural Risks to Source Water



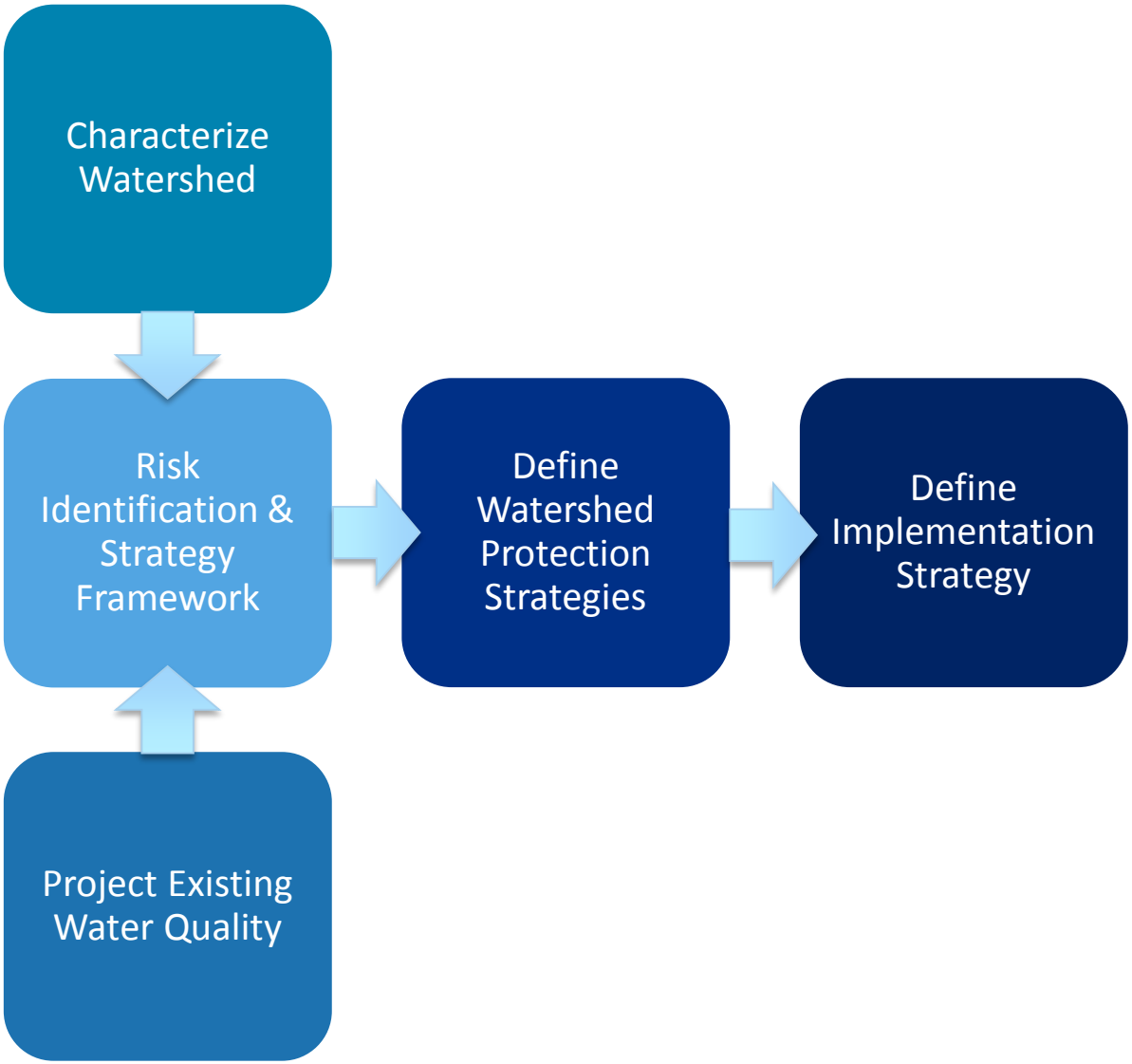
Dublin Road Water Plant:
Material Storage/Transport Risks to Source Water



Priorities for Watershed Management

Category	Activities of Concern	Dublin Road Water Plant		Hap Cremean Water Plant	
		Source Water	Reservoirs	Source Water	Reservoirs
Agriculture	Row crops	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Manure Application	Chronic Risk	Chronic Risk	Chronic Risk	Acute Risk
	Tiling/Drainage Ditch Construction	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Pasture/grazing	Periodic Assessment	Chronic Risk	Chronic Risk	Chronic Risk
	Livestock stream access	Periodic Assessment	Chronic Risk	Monitor / Inspect	Chronic Risk
Urban Development	Yard / Landscape	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Untreated Impervious Cover	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Street / Pavement Mgt. & Deicing	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Construction	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Golf Courses	Monitor / Inspect	Chronic Risk	Monitor / Inspect	Chronic Risk
Waste Management	Failing Leach Field / Mound Systems	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Failing Discharging / Aerator Systems	Acute Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Solid waste (collection)	Chronic Risk	Chronic Risk	Chronic Risk	Monitor / Inspect
	Pet waste	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	POTWs	Acute Risk	Acute Risk	Acute Risk	Acute Risk
	CSO/SSO	Acute Risk	Monitor / Inspect	Monitor / Inspect	Monitor / Inspect
	Solid waste facilities (scrap yards)	Acute Risk	Monitor / Inspect	Monitor / Inspect	Monitor / Inspect
Material Storage / Transport	Commercial/Industrial Facilities	Acute Risk	Monitor / Inspect	Acute Risk	Monitor / Inspect
	Major Roadways	Acute Risk	Monitor / Inspect	Acute Risk	Monitor / Inspect
	Railways	Acute Risk	Monitor / Inspect	Monitor / Inspect	Monitor / Inspect
	Above Ground Storage	Acute Risk	Monitor / Inspect	Monitor / Inspect	Monitor / Inspect
	Oil and Gas Wells and Pipelines	Acute Risk	Periodic Assessment	Acute Risk	Monitor / Inspect
Degraded Natural Resources	Habitat Loss	Acute Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Streambank Erosion & Entrenchment	Chronic Risk	Chronic Risk	Chronic Risk	Chronic Risk
	Limited Stewardship	Chronic Risk	Periodic Assessment	Chronic Risk	Chronic Risk
	Wildlife wastes (e.g., geese)	Periodic Assessment	Periodic Assessment	Chronic Risk	Chronic Risk
	Marinas & Other Leased Activities	Monitor / Inspect	Periodic Assessment	Monitor / Inspect	Chronic Risk

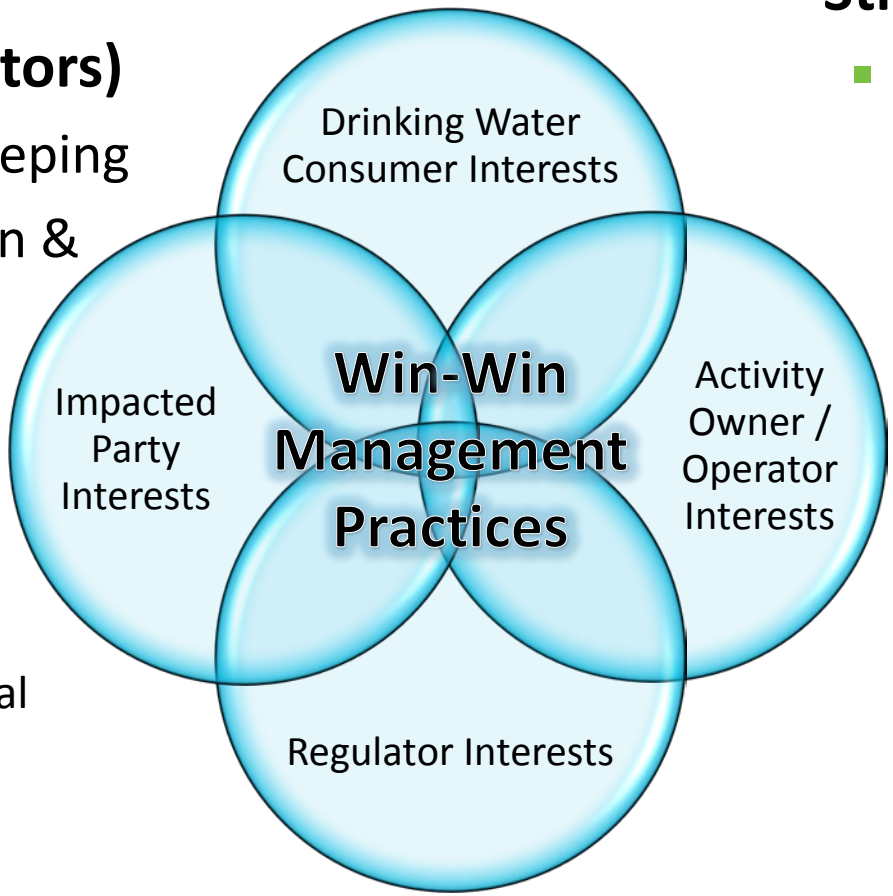
Watershed Master Plan Approach



Watershed Protection Tools

Practices (Owners/Operators)

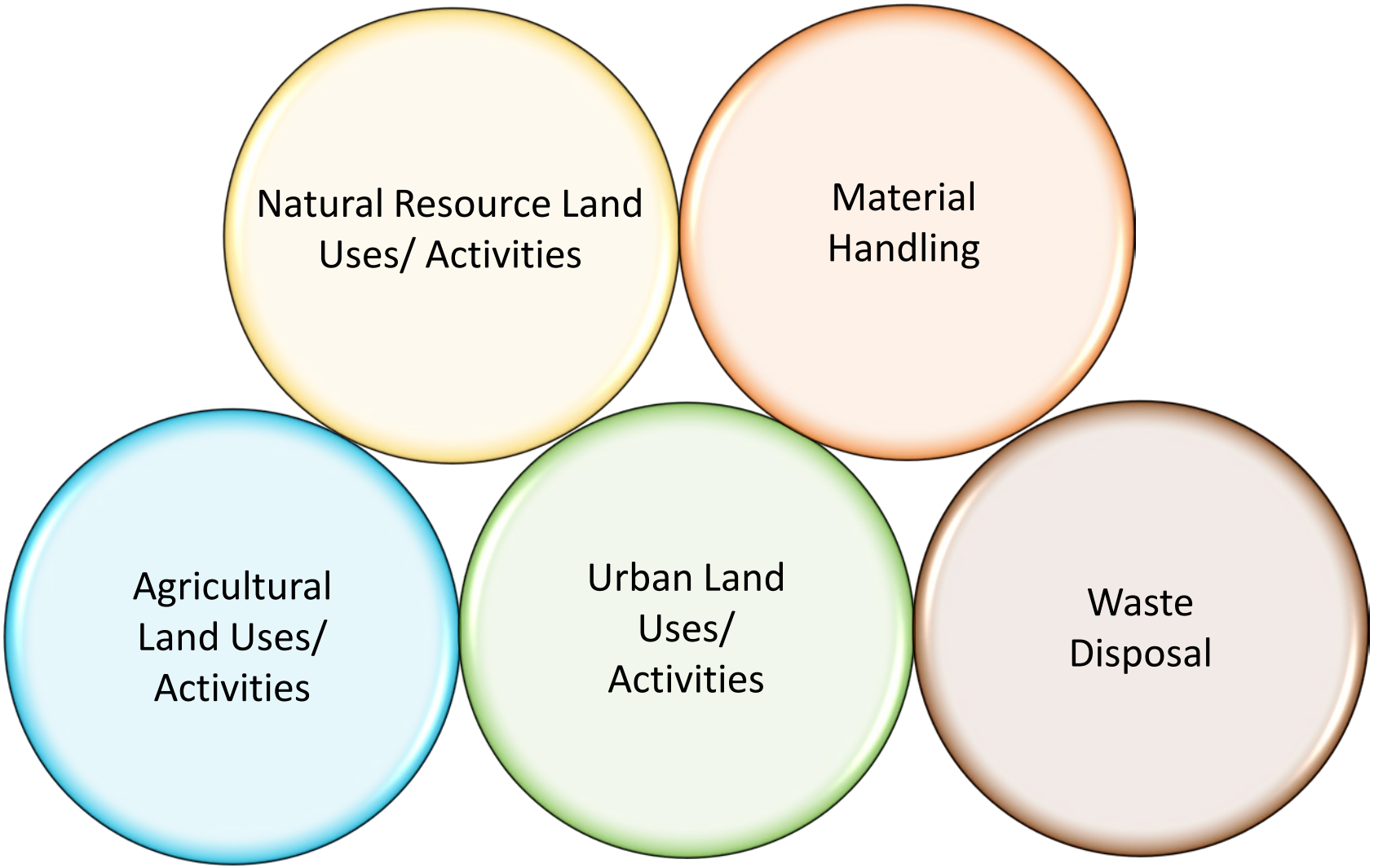
- Good housekeeping
- Spill prevention & response
- Conservation
- Water quality controls
  - Structural
  - Non-Structural



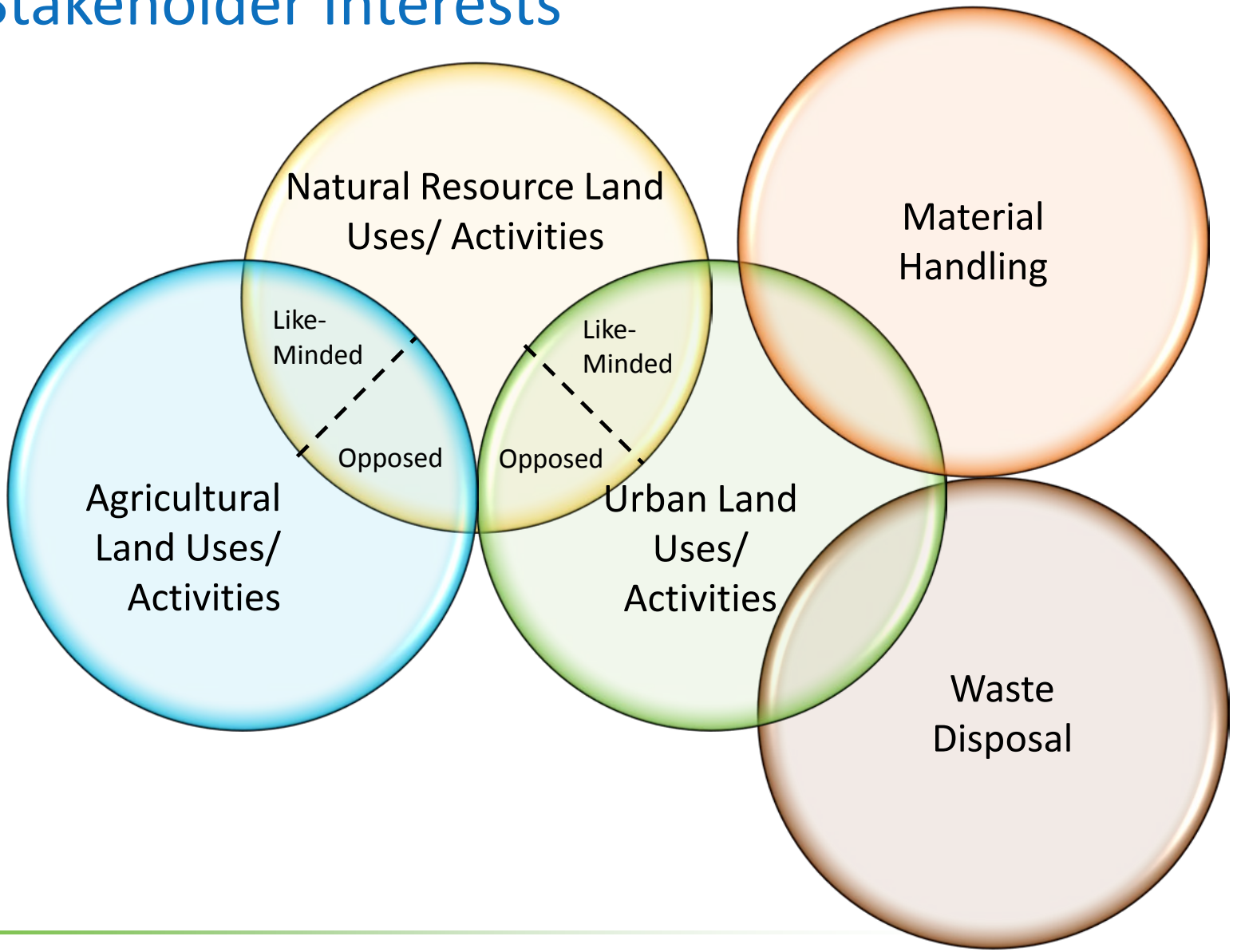
Strategies (City)

- Collaboration
- Education
- Regulation
- Incentives
- Capital Improvements

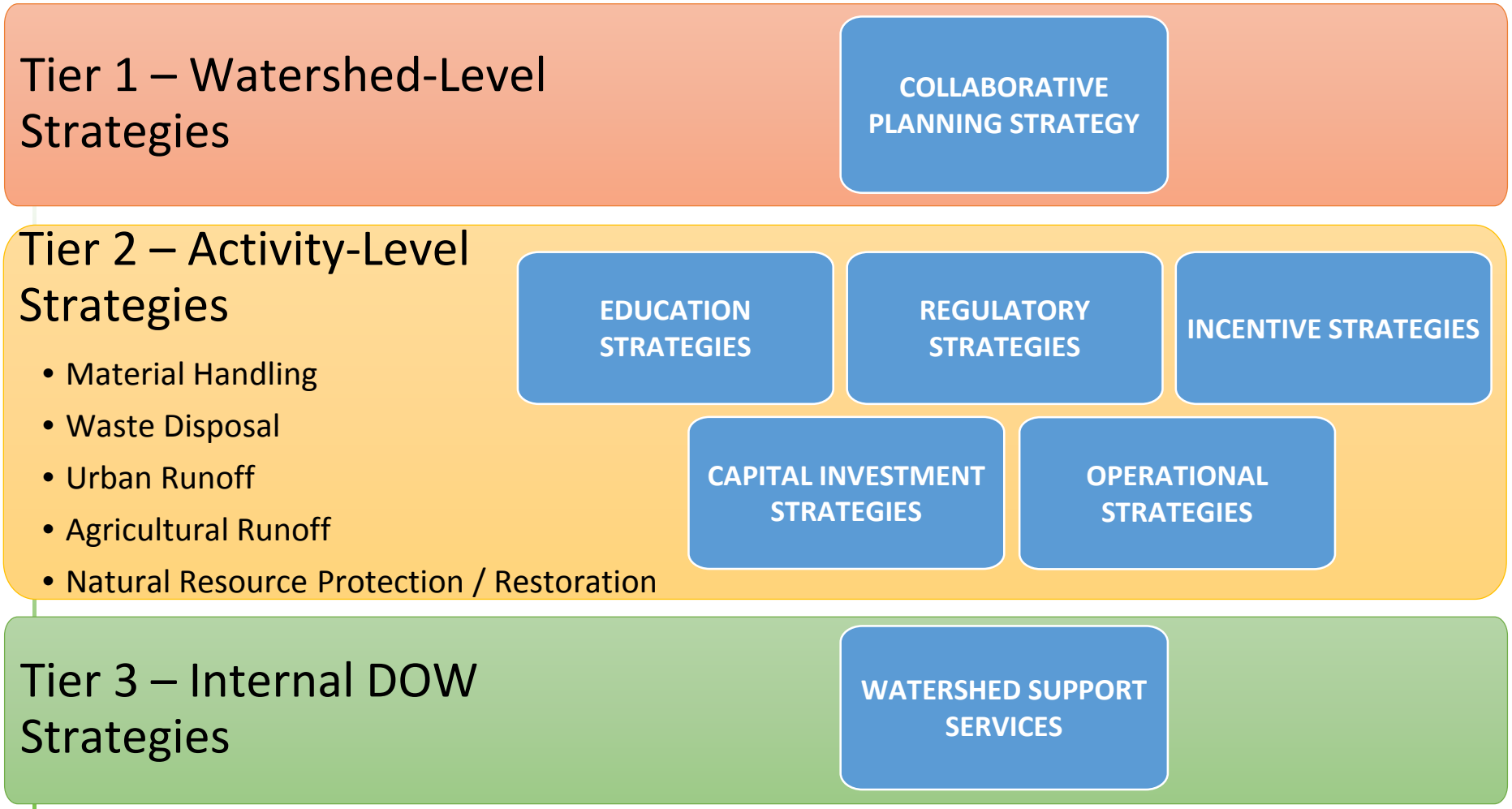
Strategies Targeted to Five Groups of High-Risk Watershed Activities



Strategies Build on Interrelationships between Stakeholder Interests



Watershed Master Plan Organization



Recommended Collaborative Planning Strategy

- Establish Watershed Collaborative
- Identify baseline conditions, programs
- Confirm, prioritize AOCs, objectives
- Select early-action sub-watershed
- Guide BMP selection, implementation
- Educate for watershed awareness

Watershed Master Plan Status

- Watershed Master Plan completion: Early 2016
- Interviewing stakeholders and potential partners
- Evaluating target pollutant reduction levels and costs/benefit of watershed protection

Questions?

columbus.gov/watershed