

# Stormwater 101

Krista Reininga, PE



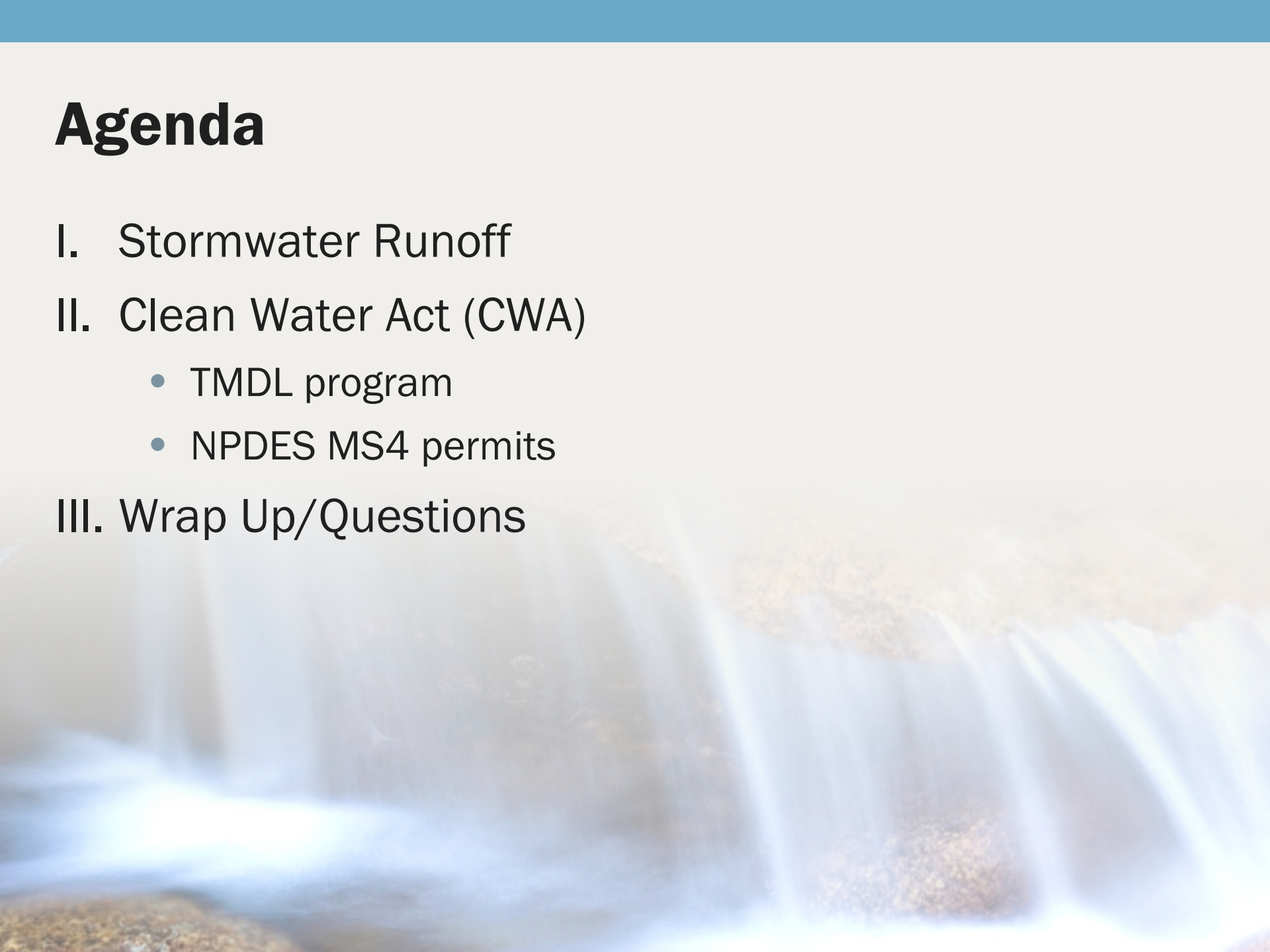
# Agenda

I. Stormwater Runoff

II. Clean Water Act (CWA)

- TMDL program
- NPDES MS4 permits

III. Wrap Up/Questions



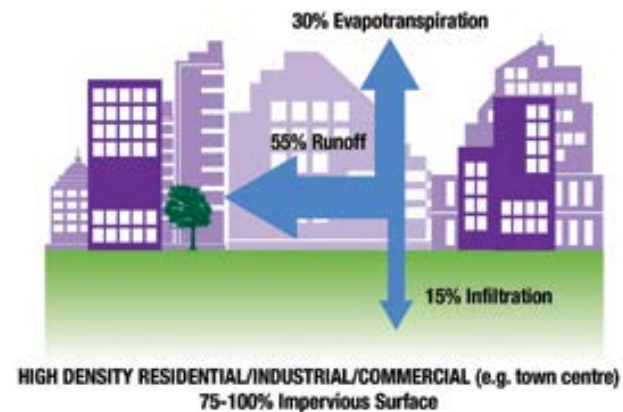
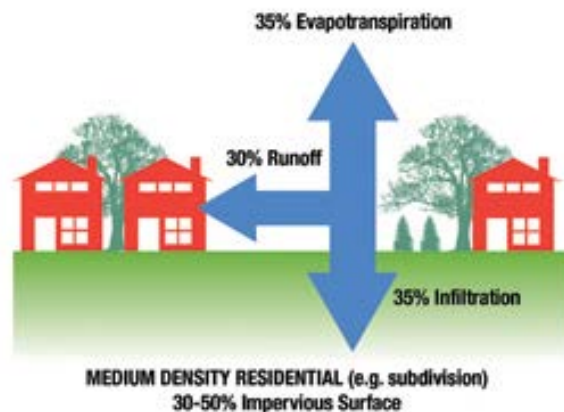
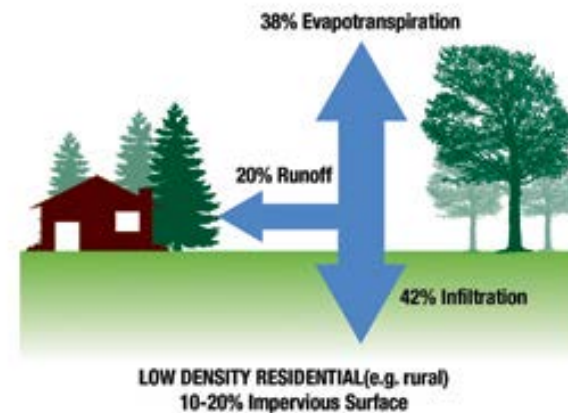
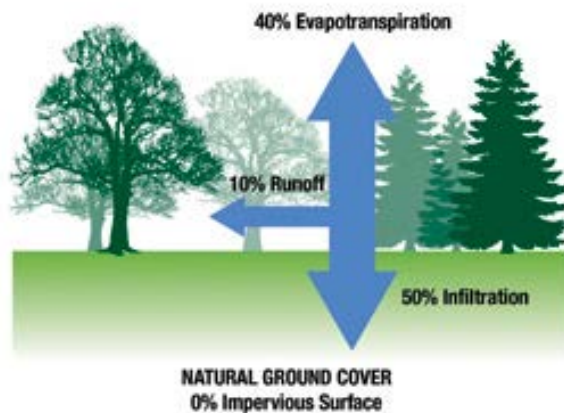
Section I

# Stormwater Runoff

# What is stormwater runoff?

Impervious surfaces such as roofs, roads, parking lots, and sidewalks prevent rainfall from soaking into the ground or being taken up by vegetation.

## EFFECTS OF IMPERVIOUSNESS ON RUNOFF AND INFILTRATION



# Where does stormwater go?



- Surface water or underground.
  - Gutters, catchbasins, pipes, outfalls
  - Ditches, open channels
  - Streams and rivers
- Pollutants on ground surfaces are conveyed via stormwater and enter streams.
- No end of pipe treatment system (treatment plant).

# Water quality problems with stormwater

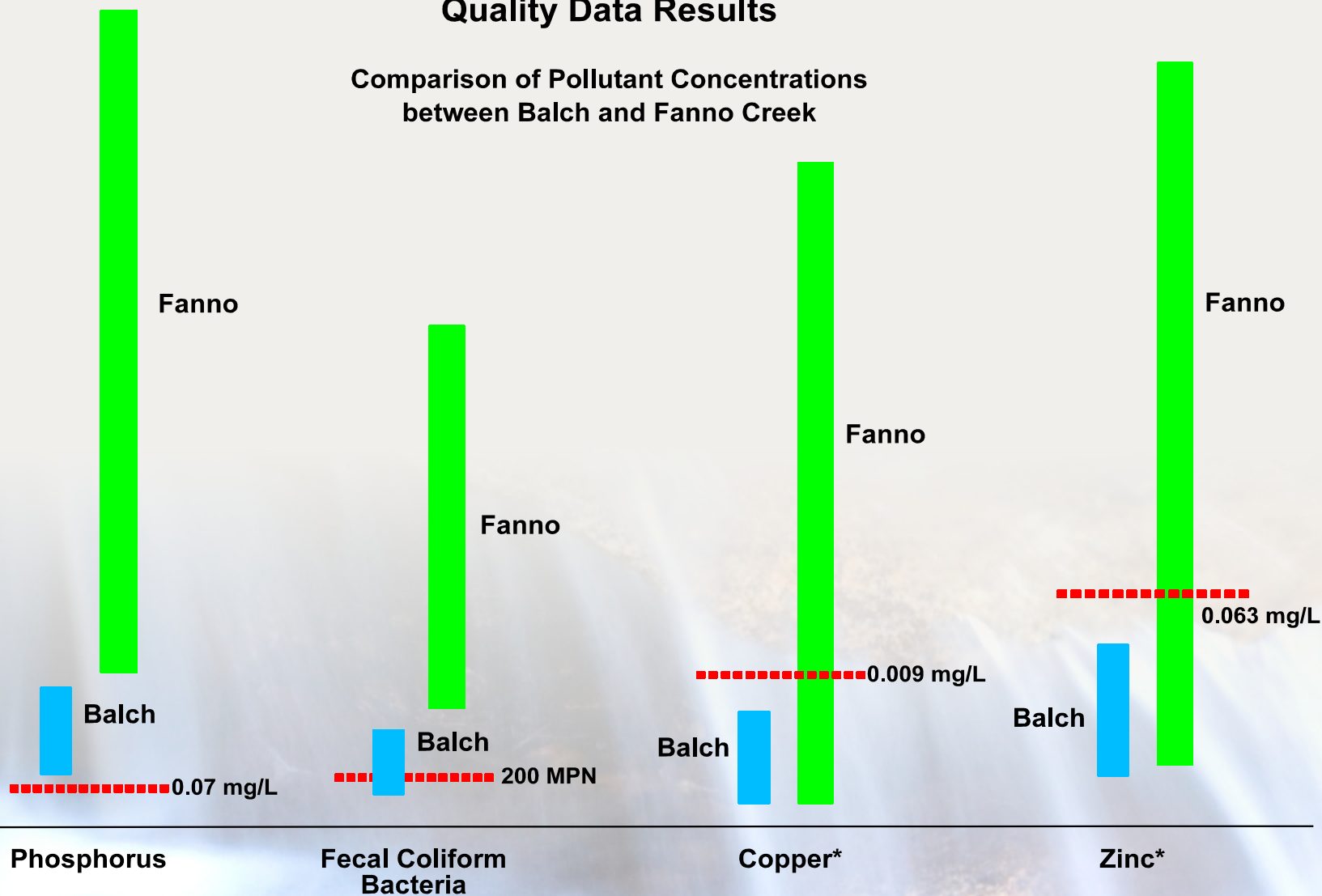
- Pollutants captured and carried by runoff include:
  - Sediment
  - Nutrients
  - Pesticides
  - Oil & grease
  - Metals
  - Bacteria
  - Toxins
  - Litter



# Example Graphic Presentation of Water Quality Data Results

## Comparison of Pollutant Concentrations between Balch and Fanno Creek

Range of Concentrations Observed



" - - - - " Water Quality Standard

\*Dissolved copper and zinc criteria based on a hardness of 50 mg/l.

# Increased runoff volumes and rates are a problem too

- Higher flows and volumes can lead to flooding (due to pipe capacity issues).
- Accelerated erosion of streambanks impacts property, habitat, and water quality.
- Increased frequency of small storms is also an issue (hydromodification).





Section II

# Clean Water Act

# I. Clean Water Act

- CWA was an amendment to the 1948 Federal Water Pollution Control Act (Truman).
- CWA included expansion and reorganization of the Pollution Control Act in 1972.
- Designed to achieve the goal of restoring and maintaining the “chemical, physical and biological integrity of the nations waters”.



Ohio River on fire, 1969



Fish kill resulting from municipal sewage and industrial discharges into the Cuyahoga River, 1969

# I. Clean Water Act (Amendments)

- 1972: EPA was directed to administer programs:
  - Implement water quality standards
  - Regulate the discharge of pollutants (issue point source permits)
  - Fund construction of treatment plants
- 1987: Included nonpoint source permitting (industries, municipalities, and construction sites).



# Water quality standards

- Implemented by the EPA and/or individual states.
- In Oregon, state standards exist for instream water quality.
- Standards include the following elements:
  - Designated beneficial uses
  - Water quality criteria
  - Anti-degradation policy

Oregon Department of Environmental Quality Table 30 Aquatic Life Water Quality Criteria for Toxic Pollutants 340-041-8033							
Pollutant	CAS Number	Human Health Criterion	Freshwater (µg/L)		Saltwater (µg/L)		
			Acute Criterion (CMC)	Chronic Criterion (CCC)	Acute Criterion (CMC)	Chronic Criterion (CCC)	
<sup>C</sup> Criterion is expressed in terms of "dissolved" concentrations in the water column.							
<sup>F</sup> The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.							
12	Chromium VI	18540299	n	16 <sup>C</sup>	11 <sup>C</sup>	1100 <sup>C</sup>	50 <sup>C</sup>
<sup>C</sup> Criterion is expressed in terms of "dissolved" concentrations in the water column.							
13	Copper	7440508	y	See E	See E	4.8 <sup>C</sup>	3.1 <sup>C</sup>
<sup>C</sup> Criterion is expressed in terms of "dissolved" concentrations in the water column.							
<sup>E</sup> The freshwater criterion for this metal is expressed as "total recoverable" and is a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote E at bottom of Table 30.							
14	Cyanide	57125			0.2 <sup>J</sup>	1 <sup>J</sup>	1 <sup>J</sup>

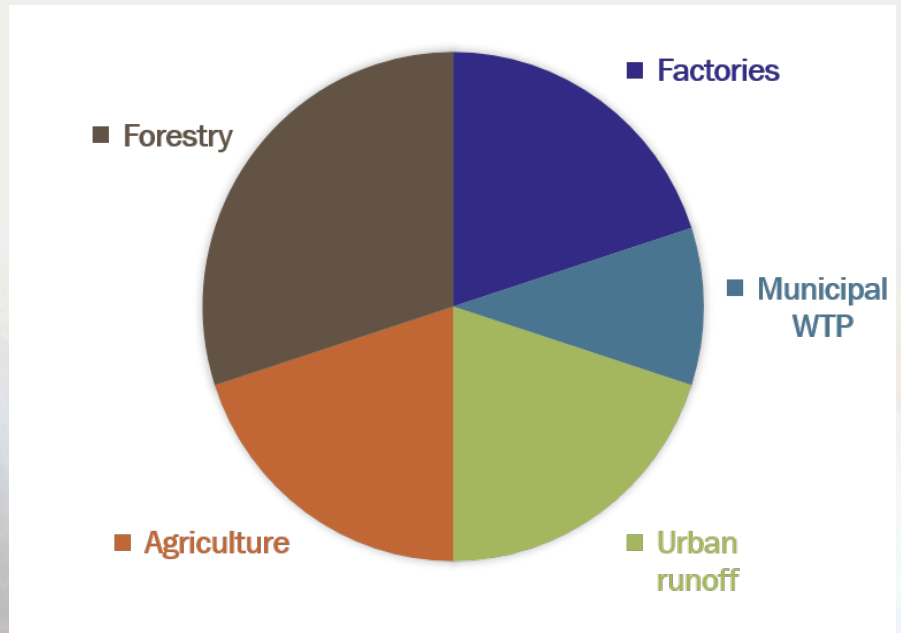
# Water quality standards

- DEQ requires that Integrated Reports (305(b)) be prepared every 2 years to summarize data.
- If instream data indicate standards are exceeded, the water body is placed on the 303(d) list.
- A Total Maximum Daily Loads (TMDL) program must be developed for water bodies on the 303(d) list.

Basin Name Subbasin 4th Field HUC Record ID	Water Body LLID River Miles Segment Miles Beach Name Beach ID	Pollutant	Season	Criteria	Beneficial Uses	Status	2010 Assessment Action	[Data Source] Supporting Data
Lower Columbia; Willamette  Lower Columbia- Clatskanie; Lower Willamette 17080003; 17090012  78	Columbia River 1240483462464 35.2 to 98 62.8	Arsenic	Year Around	Table 20 Toxic Substances	Resident fish and aquatic life; Anadromous fish passage; Drinking water	303(d)	No 2010 action	Previous Data: USGS data from 4 sites (Warrendale, Hayden Island, Columbia and Beaver): 14 of 16 samples exceeded Water Quality Standard for Arsenic, Table 20. Values where 1ug/l. Previous Status: 303(d) Previous Action: Added to database Previous Assessment Year: 1998
Lower Columbia; Willamette  Lower Columbia- Clatskanie; Lower Willamette 17080003; 17090012  20001	Columbia River 1240483462464 35.2 to 98 62.8	Arsenic	Year Around	Table 20 Toxic Substances	Aquatic life; Human health	Cat 5: Water quality limited, 303(d) list, TMDL needed	No 2010 action	Previous Data: [DEQ] LASAR 12981 River Mile 64.8: From 8/25/1997 to 8/25/1997, 0 out of 1 samples > applicable Table 20 criterion. [DEQ] LASAR 12979 River Mile 64.7: From 8/25/1997 to 8/25/1997, 0 out of 1 samples > applicable Table 20 criterion. [DEQ] LASAR 12980 River Mile 64.6: From 8/25/1997 to 8/25/1997, 0 out of 1 samples > applicable Table 20 criterion. Previous Status: Cat 5: Water quality limited, 303(d) list, TMDL needed Previous Action: Added to database Previous Assessment Year: 2004

# TMDL programs

- TMDL programs establish the allowable pollutant load a water body can receive without exceeding standards.
- The allowable load is distributed/allocated among the various dischargers/jurisdictions.

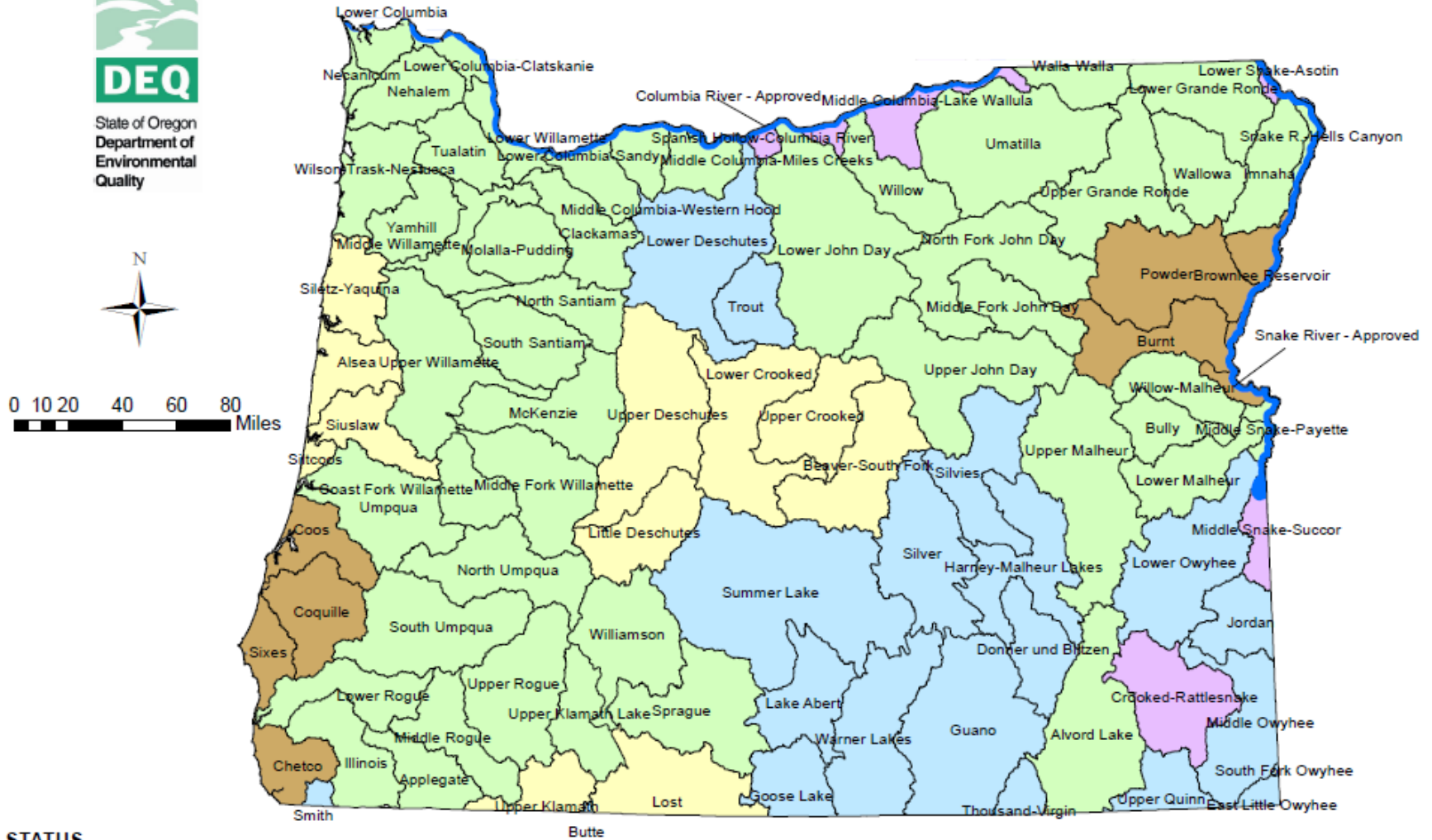


A TMDL is the pie, load allocations are a piece of the pie.



State of Oregon  
Department of  
Environmental  
Quality

# TMDL Development Status for 303(d) Listed Waters



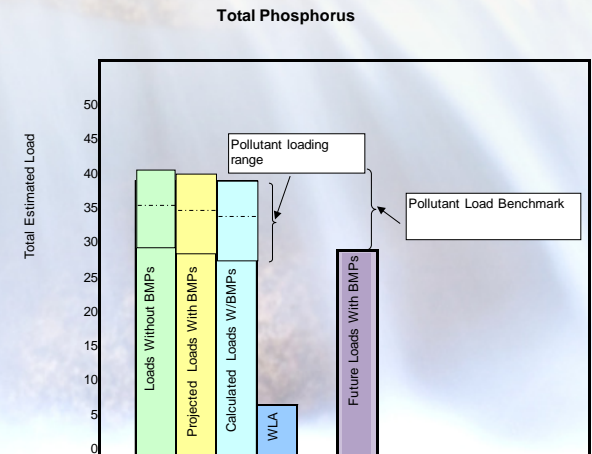
## STATUS

- EPA Approved\*
- TMDL Report In-Progress (Data analysis & report writing phase)
- TMDL Initiated (Initial scoping & data collection phase)
- TMDL Not Started (Minimal or no activity)
- No TMDL Necessary (No 303(d) listings)

\*See TMDL supporting documentation for parameters addressed at <http://www.deq.state.or.us/wq/tmdls/tmdls.htm>. Additional 303(d) listings may exist for parameters not addressed in approved TMDLs.

# TMDL programs

- 31 basins have TMDLs covering 1,206 stream segments.
- The Willamette Basin TMDL addresses:
  - temperature
  - bacteria
  - mercury
  - dissolved oxygen
  - dieldrin/ DDT
  - turbidity
- The Tualatin Basin TMDL addresses:
  - temperature
  - bacteria
  - chloropyll a
  - pH
  - dissolved oxygen





# NPDES permitting program

- 1987 Water Quality Act:
  - Added selected nonpoint sources to the NPDES permitting program
    - Municipal separate storm sewer systems (MS4s)
    - Industrial runoff
    - Construction site runoff (focused on erosion control)



# MS4 NPDES permitting program

## Phase I permits

- Early 1990s–Municipalities with >100,000 in population were required to get Phase I NPDES permits for runoff from their MS4s.
- Applied to six permit areas representing approximately 33 jurisdictions in Oregon.
  - Gresham
  - Eugene
  - Salem
  - Portland
  - Clackamas County
  - Clean Water Services



# Clackamas County Co-permittees

- Clackamas County Service District #1 (CCSD #1)
- Surface Water Management Agency of Clackamas County (SWMACC)
- Clackamas County DTD
- Gladstone
- Happy Valley
- Johnson City
- Lake Oswego
- Milwaukie
- Oak Lodge Water Services District
- Oregon City
- River Grove
- West Linn
- Wilsonville

Expiration Date: March 1, 2017  
Permit Number: 101348  
File Number: 108016

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) DISCHARGE PERMIT**

Oregon Department of Environmental Quality  
811 SW Sixth Ave., Portland OR 97204-1390  
Telephone: 503-239-5630

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Issued pursuant to Oregon Revised Statute 468B.050 and the Federal Clean Water Act

<b>ISSUED TO:</b> Clackamas County City of Gladstone City of Happy Valley City of Johnson City City of Lake Oswego City of Milwaukie City of Oregon City City of Rivergrove City of West Linn City of Wilsonville Oak Lodge Sanitary District Clackamas County Service District No. 1 Surface Water Management Agency of Clackamas County	<b>SOURCES COVERED BY THIS PERMIT:</b> This permit covers all existing and new discharges of stormwater from the Municipal Separate Storm Sewer System (MS4) within the service boundaries of the incorporated cities and within the service areas of Clackamas County Service District No. 1, Oak Lodge Sanitary District, and the portion of Surface Water Management Agency of Clackamas County in the UGB. <b>COUNTY:</b> Clackamas <b>RECEIVING WATERBODIES:</b> Basin(s): Willamette River Sub-basin(s): Lower Willamette River, Clackamas River, Tualatin River Waterbody(ies): Carlil Creek, Clackamas River, Cow Creek, Deer Creek, Johnson Creek, Kellogg Creek, Mt. Scott Creek, Phillips Creek, Richardson Creek, Rock Creek, Sieben Creek, Springbrook Creek, Willamette River, Tryon Creek, Fanno Creek, Tualatin River, and Oswego Lake <b>WASTE LOAD ALLOCATIONS:</b> A Total Maximum Daily Load (TMDL) that includes wasteload allocations for urban stormwater has been established for the Willamette River Basin, including the Lower Willamette River, Clackamas River and Tualatin River subbasins, Springbrook Creek, and Oswego Lake. Waste load allocations are addressed in Schedule D of this permit.
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**EPA REFERENCE NO.:** ORS108016

This permit is issued in response to Application Number 972510 received on August 29, 2008.

*Dennis Ades*  
Dennis Ades, Surface Water Management Section Manager

3/16/2012  
Date

# MS4 NPDES permitting program

## Phase I permit

- A two-part permit application:
  - 1991 Part 1: Storm system information gathering
  - 1993 Part 2: Stormwater Management Plan (SWMP) development
- The central element of the applications was the development of a SWMP.
- Permits subject to MEP std.



# MS4 NPDES permitting program

## Phase I permit

- 1995 – 2000: 1<sup>st</sup> permit term
- 2004 - 2009: 2<sup>nd</sup> permit term
- 2012 - 2017: 3<sup>rd</sup> permit term
- Next permit?

Note: Phase II permits for smaller communities were first issued in 2007.



# Current NPDES MS4 Permit Requirements

- Implement a SWMP that addresses the following program areas:
  - Illicit Discharge Detection & Elimination
  - Industrial and Commercial Facility Inspections
  - Construction Site Runoff Control
  - Education and Outreach
  - Public Involvement and Participation
  - Pollution Prevention for Municipal Operations
  - Water Quality Facility Maintenance
  - Post-Construction Site Runoff
- Annual reporting.
- Monitoring (analyzing stormwater samples).



# Illicit Discharge Detection & Elimination

- Develop, implement, and enforce an IDDE program.
  - System maps
  - Ordinance
  - Dry weather screening program
  - Inform the public
  - Respond to complaints
  - Identify sources
  - Eliminate discharges, as discovered
  - Respond to spills



# Industrial and Commercial Facility Inspections

- Screen existing and new facilities.
- Track industries required to obtain 1200Z permits.
- Consider whether commercial facilities should be added to the program.
- Establish priorities and procedures for inspection.





# Construction Site Runoff Control

- Develop, implement, and enforce a program to reduce pollutants from construction activities.
  - Applies to sites that are 1,000 square feet or larger
- Provide education to construction site operators.
- Provide an erosion control manual.
- Conduct site plan reviews.
- Conduct inspections.



# Public Involvement and Participation

- Implement a public education program and distribute public education materials.
  - Staff training on pest management and spill response
  - Brochures
  - Events
  - Catch basin stenciling
  - Watershed groups
  - Website
  - Pet waste pick up
- Implement a public participation process.



# Pollution Prevention for Municipal Operations

- Develop and implement an O&M program to reduce pollutants from municipal operations.
- Employee training.
- Erosion control for street repairs.
- Street sweeping.
- Pest management program.
- Manage runoff from municipal facilities.
- Eliminate cross connections.
- Consider water quality in CIP projects.



# Water Quality Facility Maintenance

- Inventory and map water quality facilities.
- Develop inspection and maintenance schedule.
- Develop criteria and priorities for inspections and maintenance.
- Develop tracking mechanisms.
- Ensure inspectors are trained.



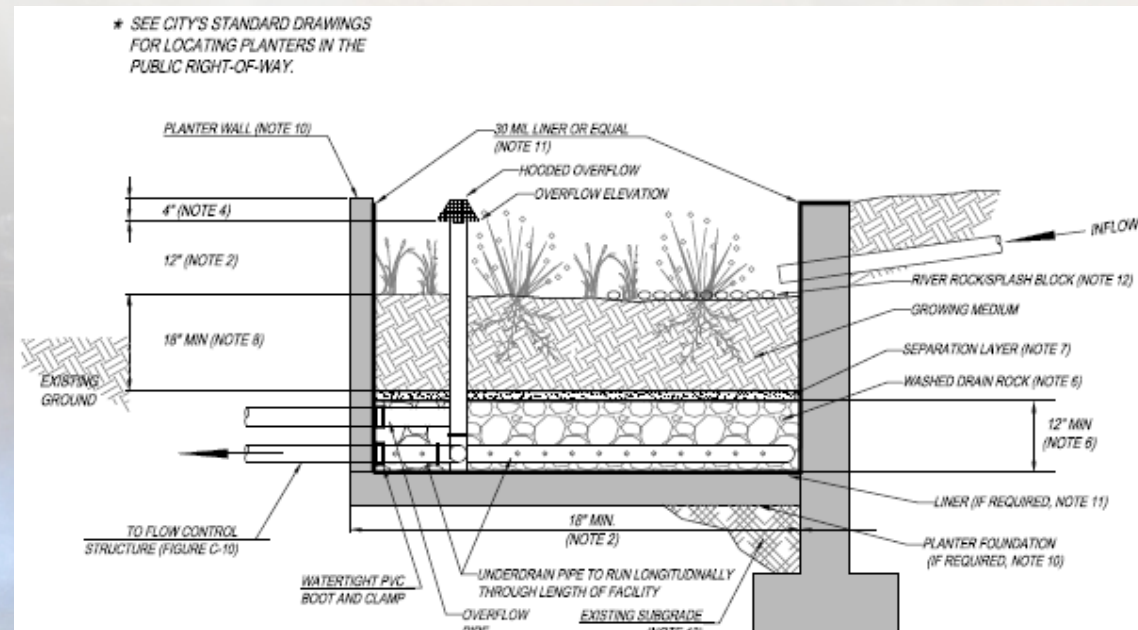
# New Development and Redevelopment

- Develop, implement, and enforce a program to address pollutants from new and re-development with impervious surface areas of 1,000 SF or greater.
- Target natural surface or pre-development hydrologic functions.
- Optimize on-site retention.
- Reduce runoff volume, duration, and rates.
- Prioritize and include implementation of LID, green infrastructure or equivalent approaches.
- Capture and treat 80% of average annual runoff.



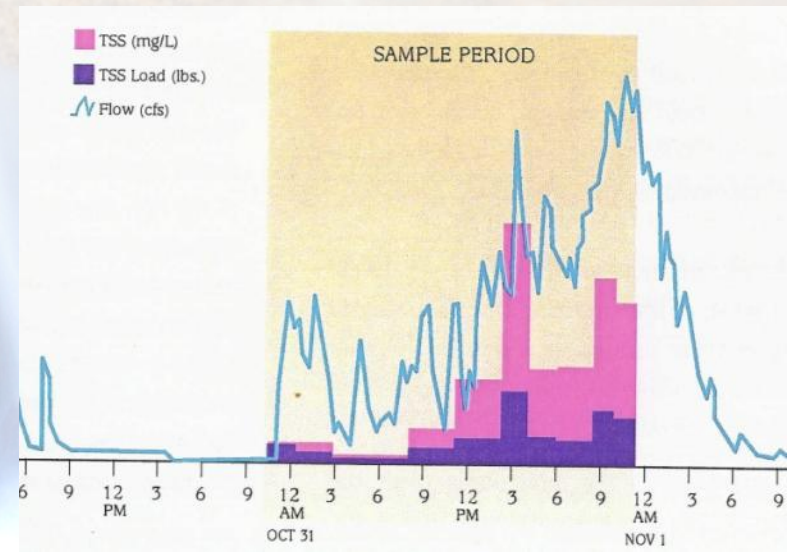
# New Development and Redevelopment

- Eliminate barriers to Low Impact Development (LID).
- Develop or reference an enforceable manual.
- Require equivalent measures when the project site is characterized by factors limiting use of on-site methods.
- Develop inspection and enforcement response procedures.



# Monitoring

- Analyze stormwater and biological samples from outfalls and streams:
  - To identify or track trends
  - To evaluate the effectiveness of the program
  - To compare to water quality standards
  - To identify sources
  - To estimate loadings



# Additional Phase I permit requirements

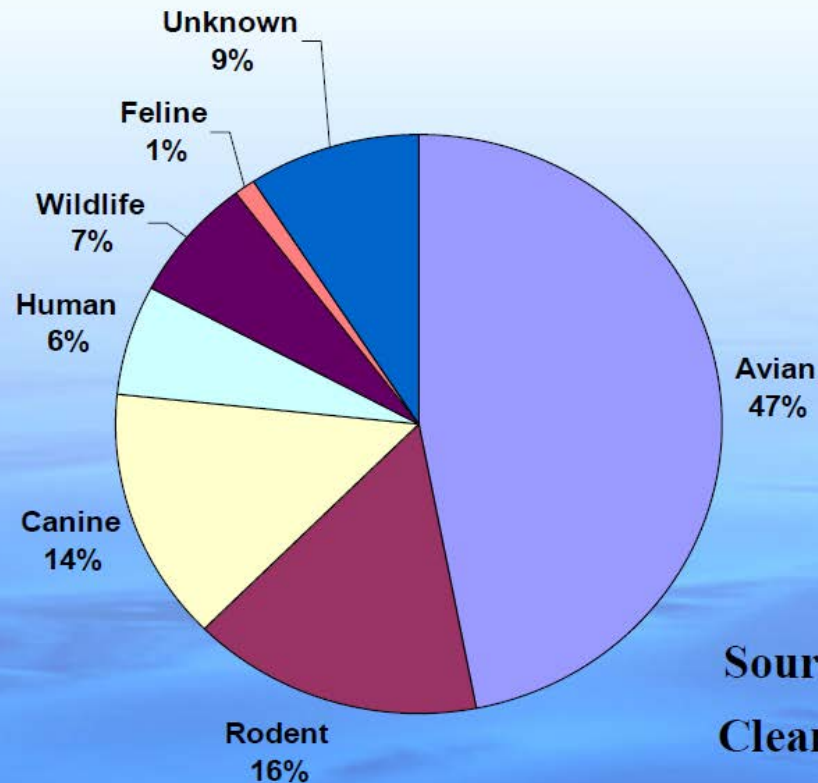
- TMDL benchmarks (completed 2017).
- Hydromodification assessment (completed 2015).
- Retrofit strategy (completed 2015).
- Construction of a retrofit (completed 2016/17).
- Waste Load Allocation (WLA) attainment assessment (completed 2015).





# Bacteria Sources - Instream

## DNA Source Tracking Study - Stream Bacteria Sources – All Sites

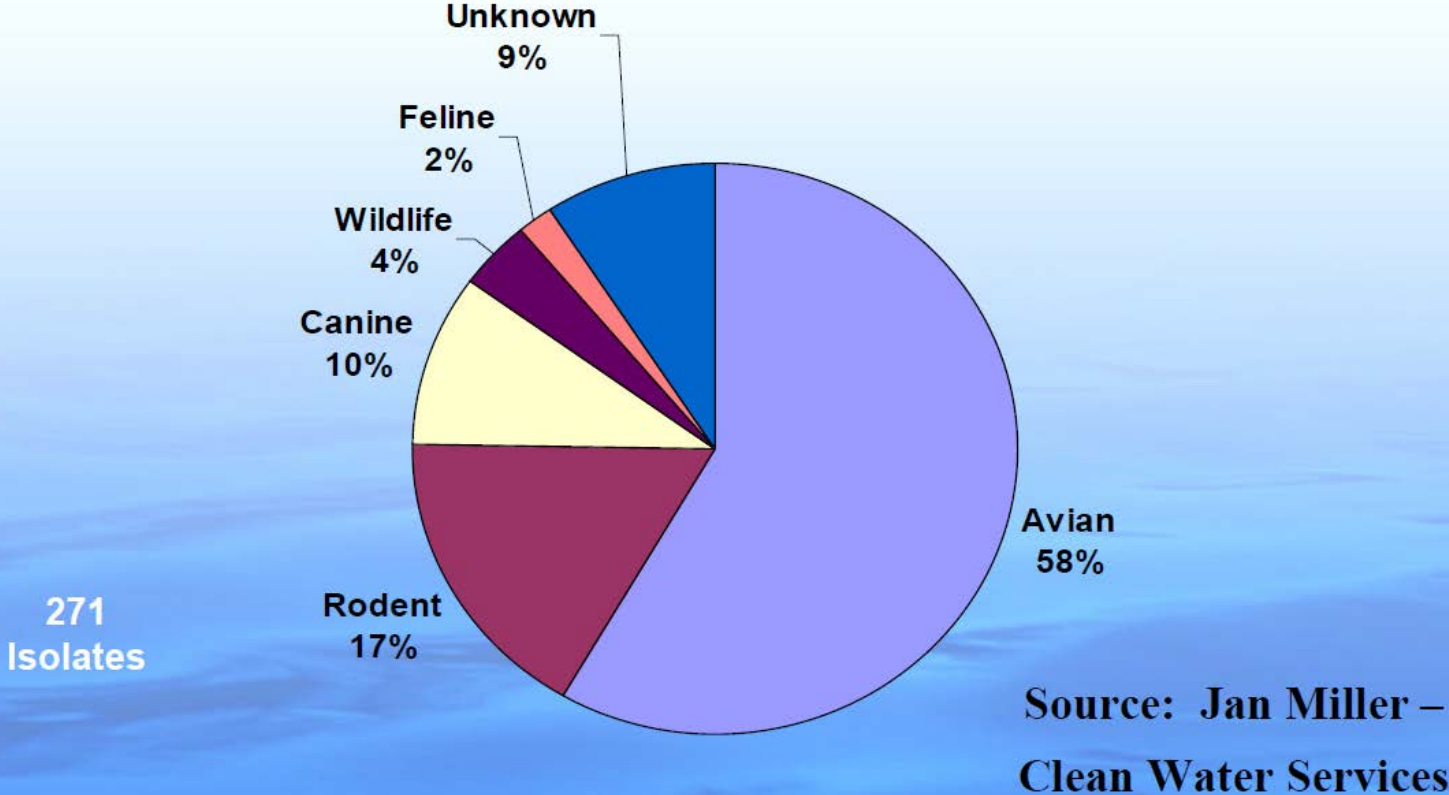


653  
Isolates

Source: Jan Miller –  
Clean Water Services

# Bacteria Sources - Stormwater

## DNA Source Tracking Study - Stormwater Bacteria Sources – All Sites



Section III

# Wrap Up/Questions