Illicit Discharge Detection and Elimination:
Outfall Reconnaissance Inventory

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Presentation Overview

- Using Existing Data
- Review of ORI
- Customization and caveats of ORI
- Post-processing
- Collecting samples

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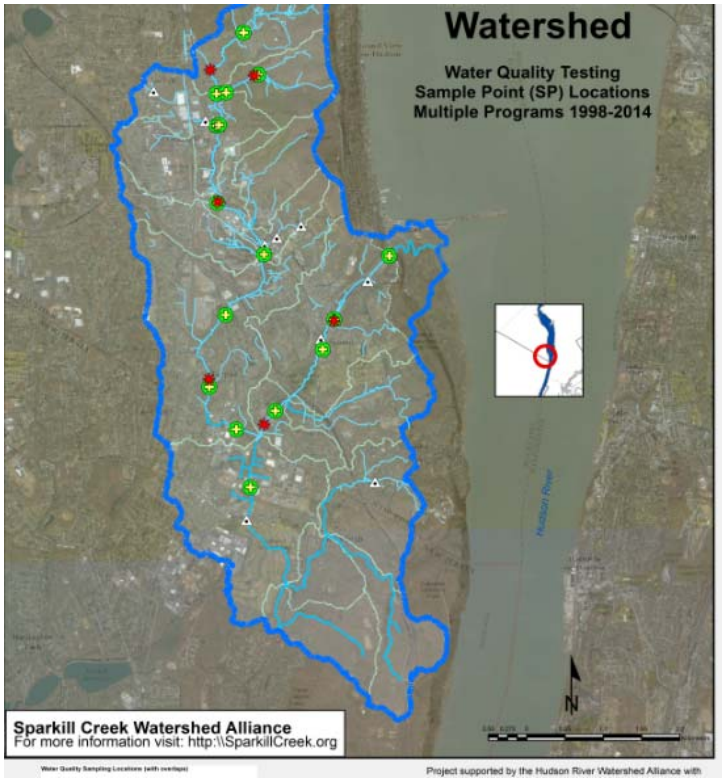
Quick “Desktop Assessment”



- Existing Water Quality Monitoring is a Great Start

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Some Screening Factors for Illicit Discharge Potential (IDP)

- Past Discharge Complaints
- Poor Dry Weather Water Quality
- Aging Sewers
- Any others?

Select the factors that apply most to your community

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Initial Desktop Screening Helps to:

- Identify best areas to focus on for Outfall investigations.
- Determine if IDDE should be a primary focus in a particular watershed.
- Develop field maps:
  - Outfalls
  - Storm Drain System (if available)
  - Land use/land cover
  - Other?

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Field Assessments
The Basics

- Time of year considerations
- Supplies
- Staffing requirements
- Safety considerations

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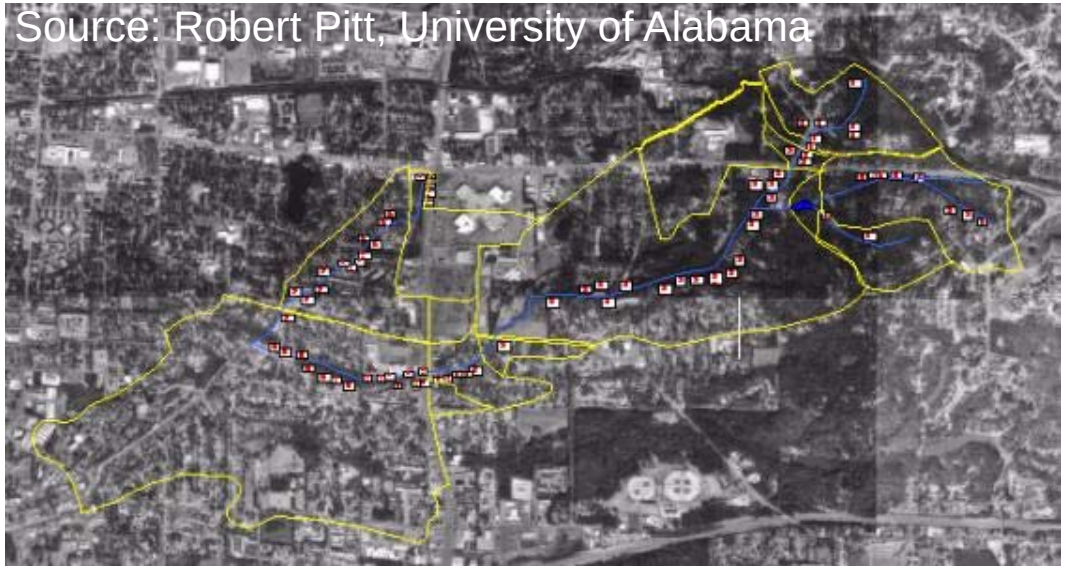
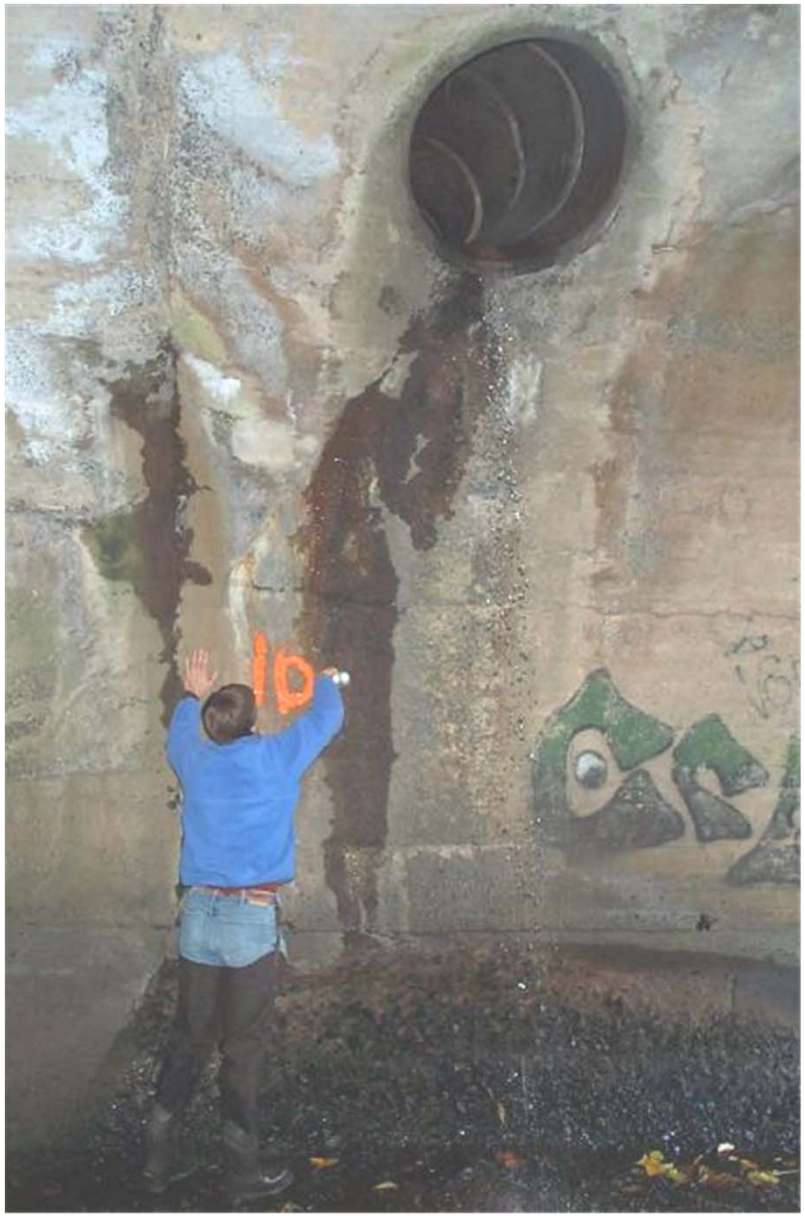
Outfall Reconnaissance Inventory (ORI)
Map, Mark & Photograph Outfalls

- Assign unique ID to each outfall
- Physically mark each outfall
- Use a GPS unit to record outfall locations
- Take a photograph





May need to work back up floodplain to find outfall

ection 1: Background Data

Today's date:	Time (Military):	Subwatershed:	Outfall ID:
Investigators:	Form completed by:	Temperature (°F):	
Camera:	Photo #s:	Rainfall (in.): Last 24 hours:	Last 48 hours:
Latitude:	Longitude:	GPS Unit:	GPS LMK #:

Land Use in Drainage Area (Check all that apply):

☐ Industrial ☐ Ultra-Urban Residential ☐ Commercial ☐ Open Space ☐ Suburban Residential ☐ Institutional

Other: _____ Known Industries: _____

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Outfall Reconnaissance Inventory (ORI)
Record Basic Characteristics

- Dimensions
- Material
- Whether or not outfall is flowing

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Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE	DIMENSIONS (IN.)	SUBMERGED
☐ Closed Pipe	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Single ☐ Elliptical ☐ Double ☐ Box ☐ Triple ☐ Other: _____ ☐ Other: _____	Diameter, circular: _____ Box: h - _____ w - _____ Elliptical: h - _____ w - _____	In Water: ☐ No ☐ Partially* ☐ Fully* With Sediment: ☐ No ☐ Partially ☐ Fully
☐ Manhole				
☐ Open drainage	☐ Concrete ☐ rip-rap ☐ Earthen ☐ Other: _____	☐ Trapezoid ☐ Other: _____ ☐ Parabolic	Depth: _____ Top Width: _____	Bottom Width: _____
☐ In-Stream	Complete Stream Discharge form			

Flow Present? ☐ Yes ☐ No *If No, Skip to Section 5* **Flow Description** ☐ Trickle ☐ Moderate ☐ Substantial

Section 3: Quantitative Characterization

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Outfall Reconnaissance Inventory (ORI)
Simple Monitoring at Flowing Outfalls

- Flow
- pH
- Temperature
- Ammonia

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Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		**RESULT**	**UNIT**	**EQUIPMENT**
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	Stopwatch
☐Flow #2	Flow width	_____' _____"	Ft, In	Tape measure
	Flow depth	1._____2. _____3._____	In	Tape measure
	Time of travel (thalweg)	1. 2. 3.	Sec	Stop watch
	Measured length	_____' _____"	Ft, In	Tape measure
☐**Flow #3** **(only for free-flowing outfalls)**	Flow depth		In	Tape measure
	Wetted width		ft	Tape measure
Ammonia			mg/L	Colorimeter
Temperature			°F	--
pH				--
Potassium			Ppm	Ion probe
Detergents			Ppm	Chemets kits
Fluoride			Mg/L	Photometer
Conductivity			µS	Conductivity probe

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Outfall Reconnaissance Inventory (ORI)
Physical Indicators for Flowing Outfalls

- Odor
- Color
- Turbidity
- Floatables

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Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

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Outfall Reconnaissance Inventory (ORI)
What to do when obvious illicit discharge encountered?

- STOP the ORI
- Track the source
- Contact appropriate water pollution agency
- Photo document, estimate flow, and collect a sample – if safe

Photo Source: R. Frymire

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Outfall Reconnaissance Inventory (ORI)
Physical Indicators for Flowing and Non-Flowing Outfalls

- Outfall Damage
- Deposits/Stains
- Abnormal Vegetation
- Poor Pool Quality
- Pipe Benthic Growth

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Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

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Outfall Reconnaissance Inventory (ORI)
Section 6-8

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection

1.	External lab sample (50 ml, plastic)?	☐ Yes	☐ No	2.	Internal lab sample (~50 ml, whirlpack)?	☐ Yes	☐ No
3.	Sterile sample for bacteria analysis (100 ml, whirlpack)?	☐ Yes	☐ No				

4. Sample(s) collected from: ☐ Flow ☐ Pool 5. Duplicate collected? ☐ Yes ☐ No *If yes, check appropriate:* ☐ External lab ☐ Internal lab ☐ Sterile

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs) or other Notes?

- **Illicit Discharge Severity?**
- **Sample taken at outfall?**
- **Note unusual conditions near the outfall**

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Quick and Dirty ORI Exercise

(Pardon the pun!)

10. 18

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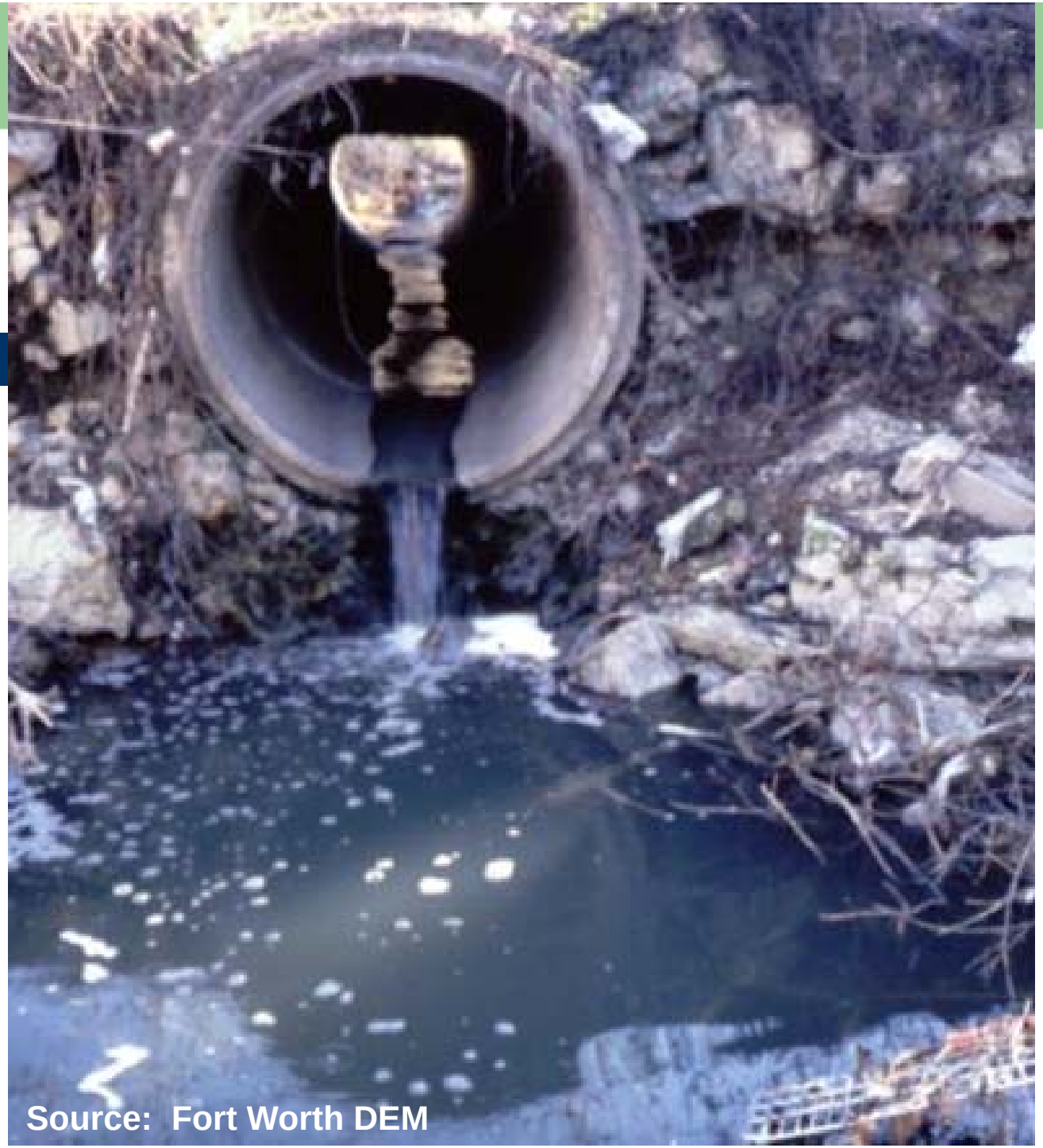
IL-15

Source: R. Frymire



Source: Fort Worth DEM

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11. 20. 2002

Customizing the ORI

- Open channels
- Submerged or tidally influenced outfalls
- Cold climate/ ice
- Other local indicators (e.g., biological)

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The ORI Cannot:

- Find all discharges (can sometimes lead to a “false positive” as well)
- Detect intermittent flows that leave no trace
- Quantify impacts definitively (no direct measure of relative problem)
- Define sources (except for some obvious indicators)

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Post-Screening Prioritization

ORI, combined with other existing data, can help determine:

- Extent of the problem
- If problems are “clustered”
- Indicators of intermittent discharges
- Relative ranking of problem outfalls

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Subwatershed and Survey Reach Screening: Metrics to Consider

- Fraction flowing (from ORI)
- Number with physical indicators, and severity
- Indicators at dry outfalls
- Other existing monitoring data
- In-stream goals
- History of complaints

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Characterizing the IDDE Problem at the Watershed Level:

Using Stream and ORI Data to Categorize IDDE Problems	
Extent	**ORI Support Data**
Minimal	• Less than 10% of total outfalls are flowing • Less than 20% of total outfalls with obvious, suspect or potential designation
Clustered	• Two thirds of the flowing outfalls are located within one third of the subwatersheds • More than 20% of the communities subwatersheds have greater than 20% of outfalls with obvious, suspect or potential designation
Severe	• More than 10% of total outfalls are flowing • More than 30% of total outfalls with obvious, suspect or potential designation • More than 20% of total outfalls with obvious or suspect designation

Summary

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