Illicit Discharge Detection and Elimination: Program Component Considerations

Presented At:
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Presented By:

CENTER FOR WATERSHED PROTECTION

Presentation Overview

Program Component Considerations

- Audit existing programs
- Establish responsibility & authority
- Make an initial assessment of illicit discharge potential
- Develop program goals & strategies
- Conduct field & lab work to identify illicit discharges
- Find & fix illicit discharges
- Prevent illicit discharges
- Revisit & update program goals

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Top 15 Management Tips to Develop an Effective IDDE Program

1. Go after continuous sewage discharges first
2. Put together an interdisciplinary and interagency IDDE development team
3. Educate everybody about illicit discharges
4. Understand your infrastructure
5. Walk all of your streams in the first permit cycle

Top 15 Management Tips to Develop an Effective IDDE Program

6. Use GPS to create your outfall map
7. Don't develop a monitoring plan until you understand your discharges
8. Utilize a simple outfall tracking system to organize your data
9. Outsource some functions to local watershed groups
10. Utilize a hotline as an education and detection tool

Top 15 Management Tips to Develop an Effective IDDE Program

11. Cross-train all local inspectors
12. Target your precious storm water education dollars
13. Stress public health and safety benefits of sewage-free streams
14. Calibrate your program resources to the magnitude of your problem
15. Think of discharge prevention as a tool of watershed restoration

Table 5: Comparison of IDDE Program Components					
IDDE Program Component	**When To Do**	**Startup Costs**	**Annual Cost**	**Expertise Level**	**Type of Expertise**
1. Audit	Immediately	$	-0-	??	Permitting
2. Authority	Year 1	$$	$	??	Legal
3. Desktop Analysis	Year 1	$$	-0-	???	GIS
4. Goals/Strategies	Year 1	$	-0-	??	Stakeholder Management
5 Field Search/Monitoring	Year 2 to 5	$$	$$$$	???	Monitoring
6 Isolate and Fix	Year 2 to 5	$	$$	???	Pipe and Site Investigations
7. Prevention	Year 2 to 5	$$	$$$	??	Education
8. Evaluation	Annually	-0-	$	?	Management

Key: $ = <$10,000
$$ = $10,000 - 25,000
$$$ = $25,000 - 50,000
$$$$ = > $50,000

? - Simple
?? - Moderately Difficult
??? - Complex

Auditing Existing Resources & Programs

- Purpose:
  - Determine most capable local agency to run program
  - Identify available staffing, resources and gaps
  - Understand local resources and expertise
- Elements:
  - Legal authority
  - Mapping data
  - Field staff
  - Lab/monitoring equipment and expertise
  - Education and outreach
  - Discharge removal
  - Program funding

Auditing Existing Resources & Programs

- Desired Product or Outcome(s):
  - Initial five year IDDE program development plan over the current permit cycle
- Budget and/or Staff Resources Required:
  - Less than one staff month for smaller communities
  - Up to three staff months for larger communities

Establish Responsibility & Authority

- Purpose:
  - Establish authority to regulate, respond & enforce
  - Identify & prohibit inappropriate connections through plumbing code updates
  - Develop reporting & tracking system

- Elements:
  - Identify responsible department/agency
  - Ensure adequate legal authority
  - Develop tracking system

Establish Responsibility & Authority

- Desired Product or Outcome(s):
  - Local ordinance
  - Internal & external reporting and tracking system
- Budget and/or Staff Resources Required:
  - Month of staff effort if no major surprises
  - Actual time-frame to adopt an ordinance often longer
  - Where existing hotlines exist significant staff & infrastructure savings should be realized

Initial Assessment of Illicit Discharge Potential

- Purpose:
  - Determine the potential severity for illicit discharges
  - Identify which subwatersheds or generating land use merit priority investigation

- Elements:
  - Define drainage areas (Step 1)
  - Compile data (Step 2)
  - Characterize drainage areas (Step 3)
  - Characterize illicit discharge potential (Step 4)

Step 2: Compile Data

Very Useful:

- Aerial photos or orthophotos
- Drainage area boundaries
- Hydrology including piped streams
- Land use or zoning
- NPDES storm water permittees
- Outfalls
- Sewer system, 1” = 200’ scale or better
- Standard Industrial Classification (SIC) codes for all industries
- Storm drain system, 1” = 200’ scale or better
- Street map or equivalent GIS layers
- Topography (5 foot contours or better)

Good Supplementary Data

- Age of development
- As-builts
- Condition of infrastructure
- Field inspection records
- Depth to water table & groundwater quality
- Historical industrial uses or landfills
- Known locations of illicit discharges (current & past)
- Outfall & stream monitoring data
- Parcel boundaries
- Pollution complaints
- Pre-development hydrology
- Sanitary sewer I/I surveys
- Septic tank locations or area served by septic systems
- Sewer system evaluation surveys (SSES)

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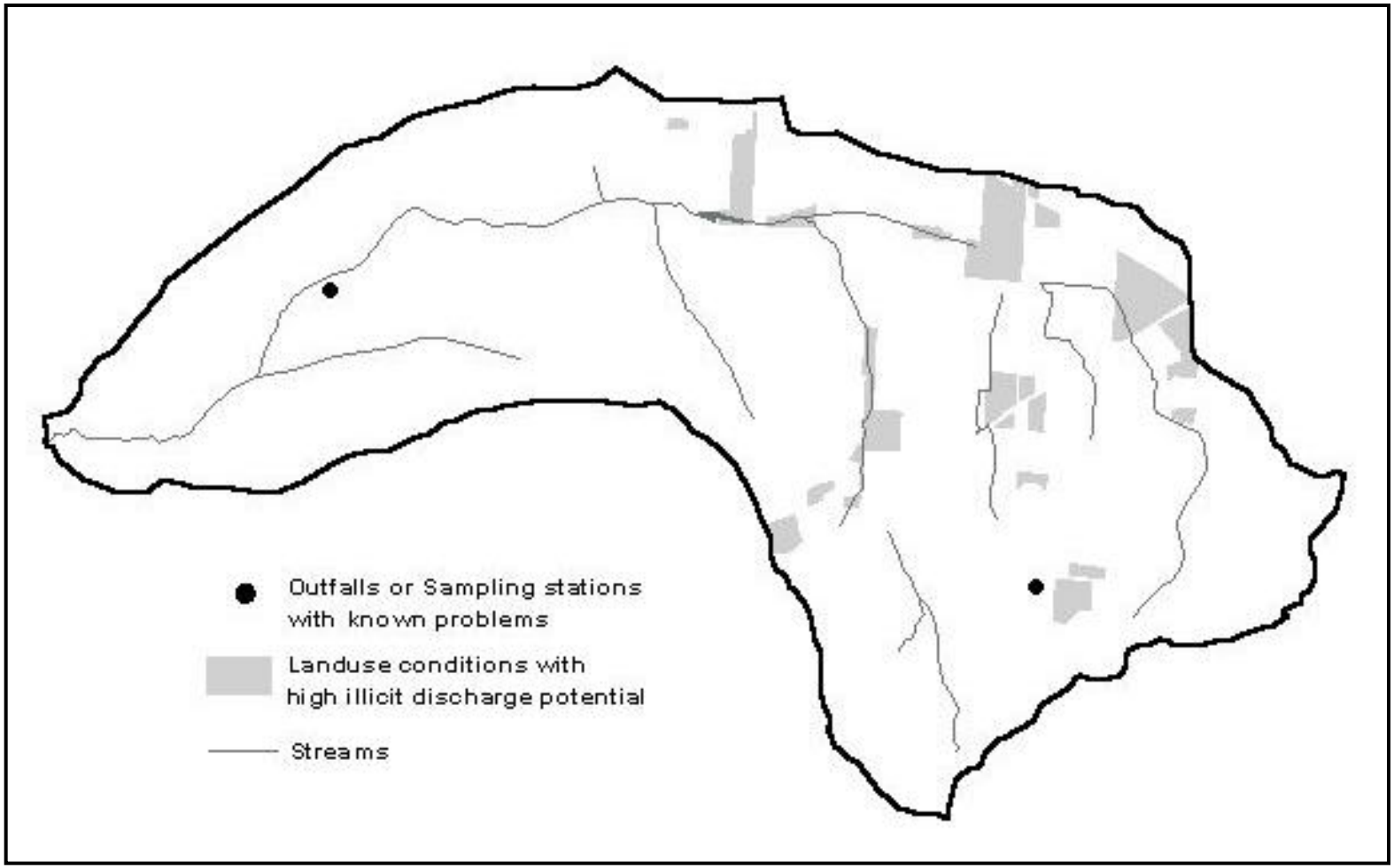
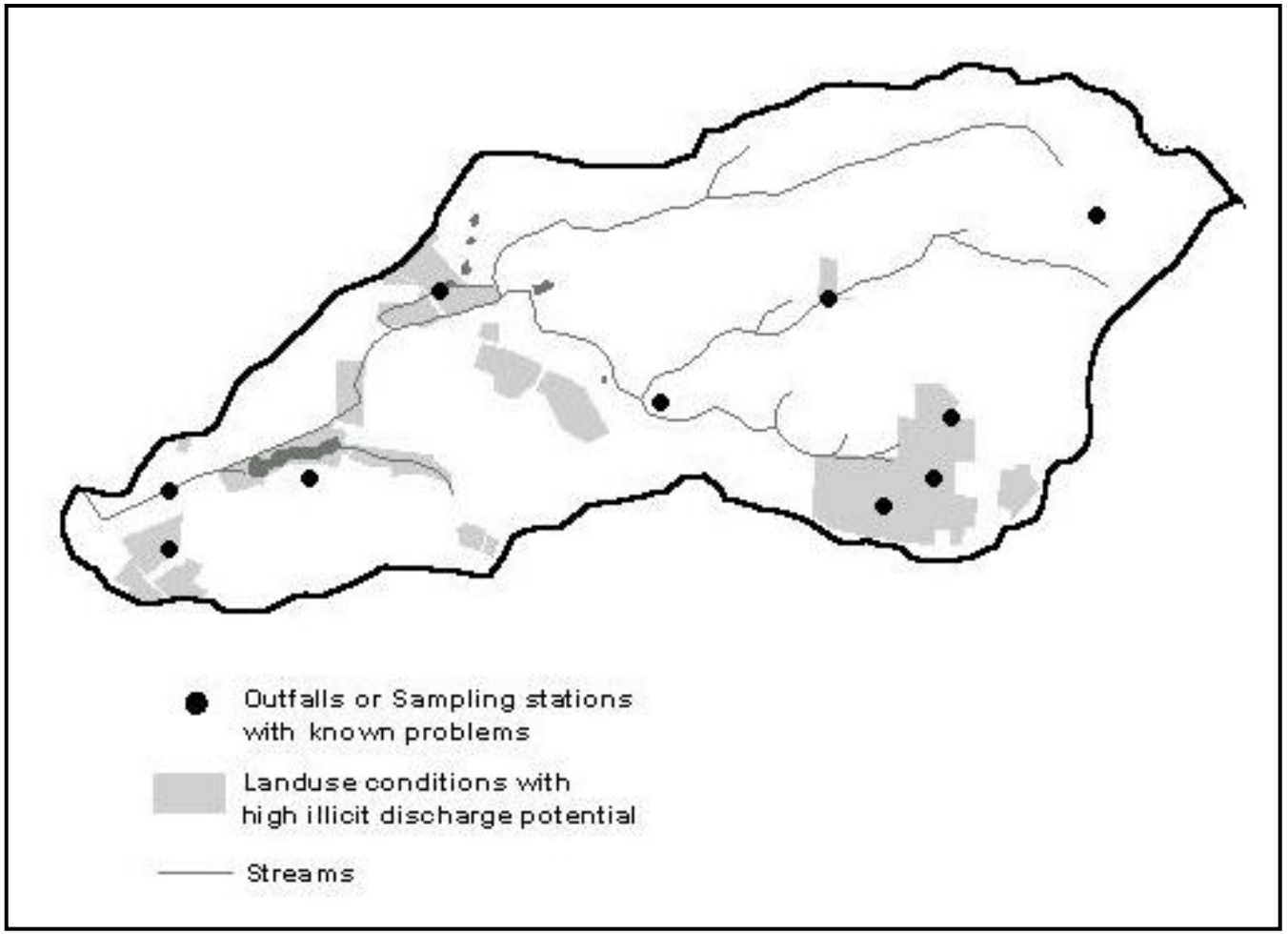
Characterizing Illicit Discharge Potential for Drainage Areas

Potential for Illicit Discharges	Indicators
Low	• Few historical complaints • Good dry weather water quality • Good biological data • Some of drainage area contains land use conditions & generating sites with high illicit discharge potential
Medium	• Some historical complaints • Fair dry weather water quality • Fair biological data • Substantial portions of drainage area contain land use conditions & generating sites with high illicit discharge potential
High	• Many historical complaints • Poor dry weather water quality • Poor biological data • Most of drainage area contains land use conditions & generating sites with high illicit discharge potential

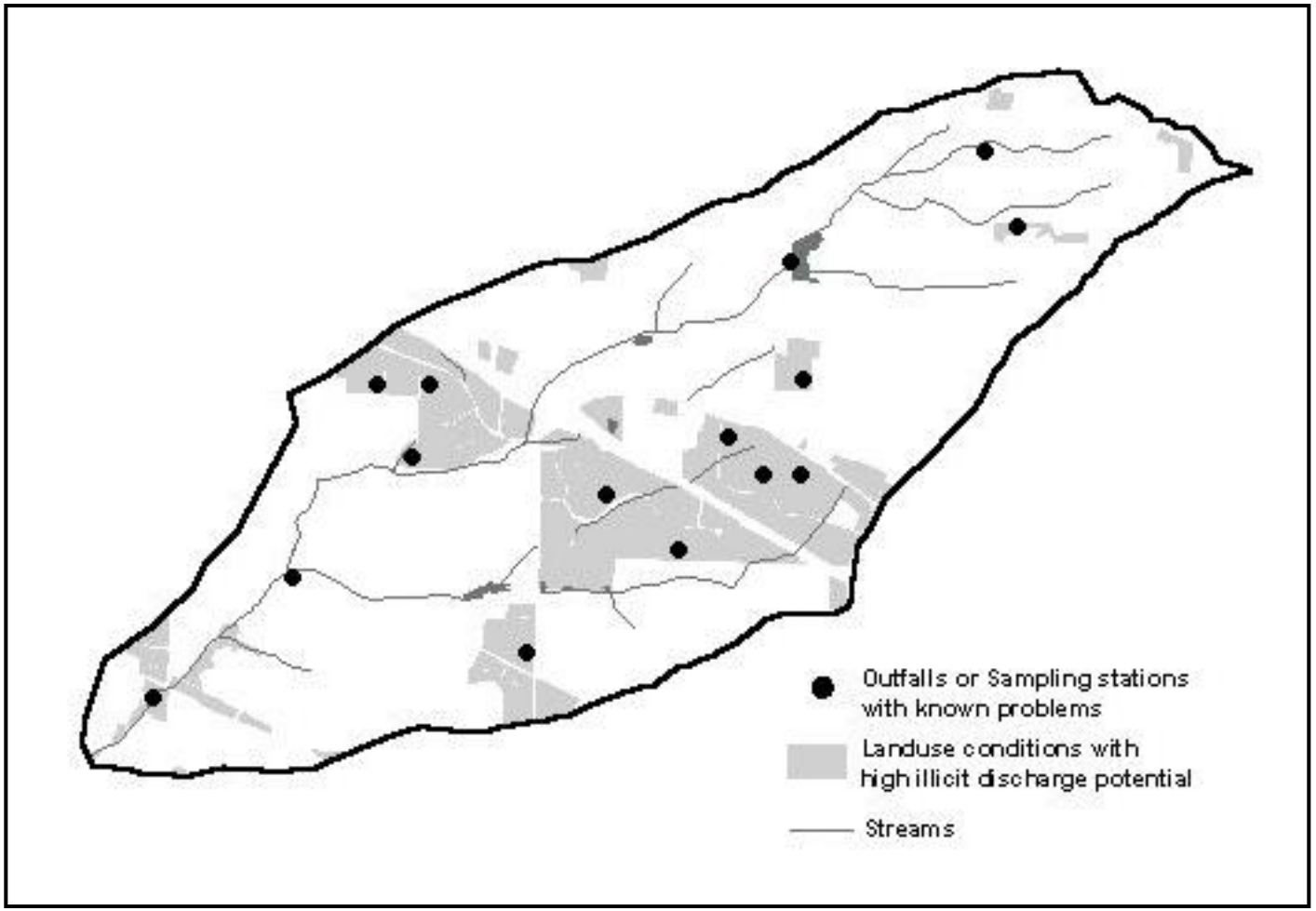
Drainage Area with Low Potential for Illicit Discharges



Drainage Area with Medium Potential for Illicit Discharges



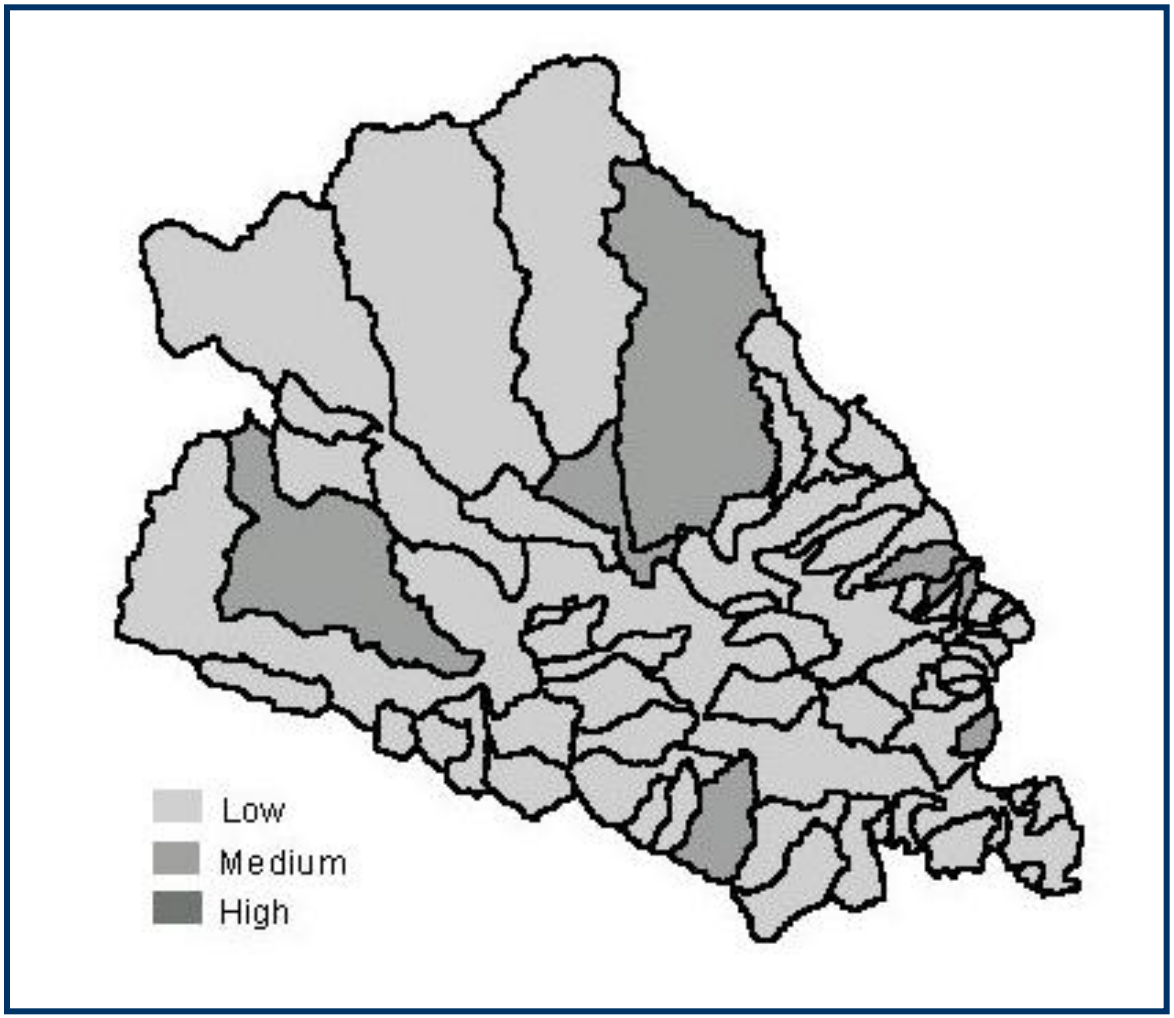
Drainage Area with High Potential for Illicit Discharges



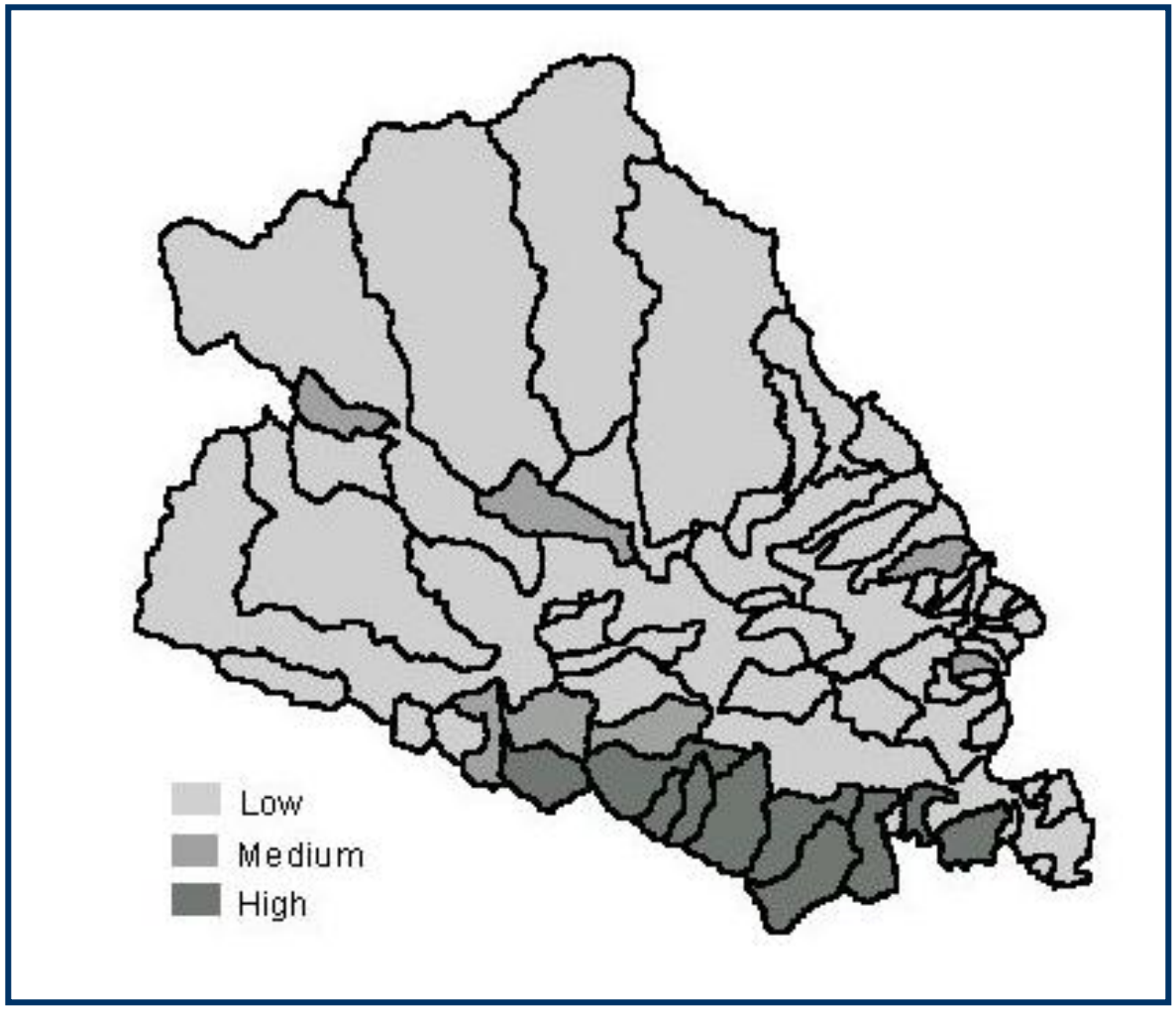
Step 4: Characterize Illicit Discharge Potential in the Community

Characterization	Indicators
Minimal (no known problems)	Majority of subwatersheds are rated as having low risk, with remainder rated Medium
Clustered (isolated problems)	More than 20% of subwatersheds rated as Medium or High risk
Severe (rampant problems)	More than 50% of subwatersheds ranked as Medium or High risk, or more than 20% of subwatersheds ranked as High Risk

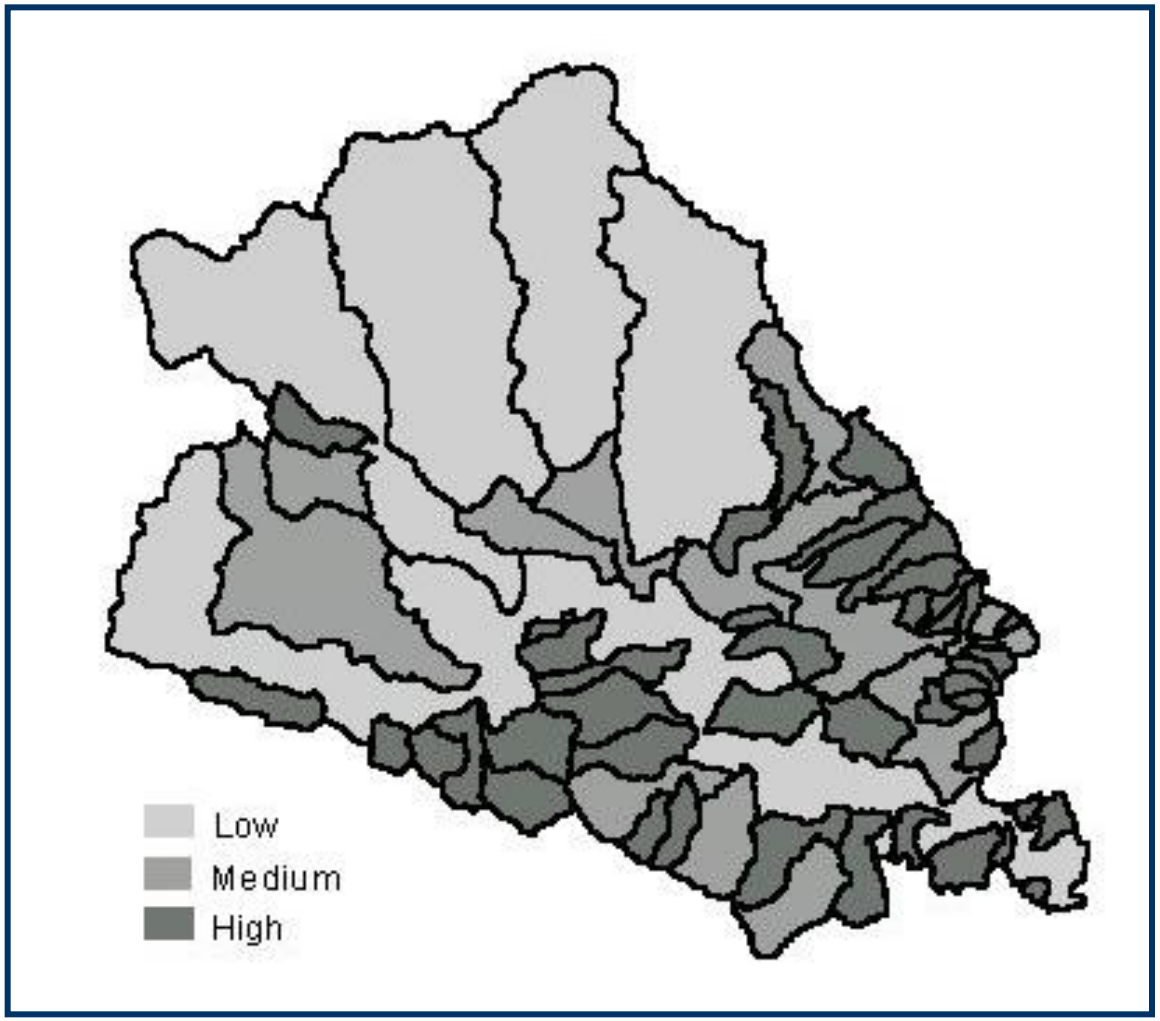
Community with Minimal Illicit Discharge Problems



Community with Clustered Illicit Discharge Problems



Community with Significant Illicit Discharge Problems



Initial Assessment of Illicit Discharge Potential

- Desired Product or Outcome(s):
  - Prioritization of problem catchments or subsheds
  - GIS or other database system to track outfalls
  - Generation of basic mapping for field work
- Budget and/or Staff Resources Required:
  - Effort to assess current conditions should be < 4 staff weeks
  - Quality & accuracy is a function of existing info

Developing Program Goals & Strategies

- Purpose:
  - Define milestones to measure progress in program during 1st permit cycle
  - Make sure scarce resources allocated to address real problems
  - Choose most appropriate and cost-effective methods to find illicit discharges

- Elements:
  - Program goals
  - Program strategies

Goals Related to Overall Program Administration

Example Measurable Goals	Timeframe	Priority
Audit existing capabilities & identify needs	Immediately	essential
Designate one program head & identify key support staff		essential
Develop a complete list of ongoing activities related to IDDE		optional
Coordinate & communicate with other affected agencies	At program start up Continuously & regularly after that	essential
Develop a projected 5-year budget		essential
Secure funding to match 5-year goals		essential
Draft & promulgate new or modified ordinance	Year 1	essential
Establish a tracking & reporting system		essential

Goals Related to Outfall Assessment

Example Measurable Goals	Timeframe	Priority
Define & characterize drainage areas or sewer sheds	Year 1	essential
Conduct stream walk of all stream miles	Begin Year 1, complete 1st screening end permit cycle Repeat once per permit cycle	essential
Develop digital map of all outfalls, land use, & other relevant infrastructure	Year 1 Continuously & regularly after that	essential
Secure analytical laboratory services	Initiate in conjunction with field screening	essential
Sample & trace source of % of flowing outfalls each year of permit cycle	Initiate during 1st permit cycle Expand & enhance where problems are observed	essential
Conduct regular in-stream monitoring of single parameter		optional
Conduct intermittent flow investigations at % of outfalls where in-stream water quality poor		optional
Integrate all collected stream data & citizen complaints into GIS system	Initiate during 1st year Expand & enhance with time	optional

Goals Related to Finding & Fixing Illicit Discharges

Example Measurable Goals	Timeframe	Priority
Develop spill response plan & coordinate emergency response with other agencies	Immediately	essential
Remove all obvious illicit discharges	Ongoing in conjunction with field screening & response to hotline reports	essential
Train staff on finding illicit discharge sources	Initiate during 1st year Expand & enhance with time	essential
Repair fraction of illicit discharges identified through field screening or citizen complaints	Initiate during 1st permit cycle Expand & enhance where problems observed	essential
Establish hotline for public to call in and report incidents	Initiate during 1st year Expand & enhance with time	optional
Inspect & dye-test all industrial facilities	Initiate during 1st permit cycle Expand & enhance where problems observed	optional
Develop system to track results of on-site inspections	Initiate during 1st year Expand & enhance with time	optional
Establish pre-approved list of plumbers & contractors to make corrections		optional
Establish Adopt-a-Stream program	Initiate during 1st permit cycle Expand & enhance where problems observed	optional

Goals Related to Preventing Illicit Discharges

Example Measurable Goals	Timeframe	Priority
Distribute educational materials to citizens and industries	Initiate during 1st year Expand & enhance with time	optional
Conduct storm drain stenciling	Initiate during 1st permit cycle Expand & enhance where problems are observed	optional
Hold hazardous waste collection days at least annually		optional
Conduct upland subwatershed site reconnaissance surveys to better characterize generating site potential		optional

What could you do if……

- There are minimal illicit discharge problems anticipated throughout the MS4.

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What could you do if…

- The anticipated problems are confined to a few subwatersheds or reaches, where history of suspect discharges exist or in-stream dry weather water quality is consistently poor.

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What could you do if……

- The community has chronic dumping areas.

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Developing Program Goals & Strategies

- Desired Product or Outcome(s):
  - Program goals & measurable indicators for:
    - overall program administration
    - outfall assessment
    - finding and fixing illicit discharges
    - prevention of illicit discharges
  - Detailed yet flexible field investigation strategy
- Budget and/or Staff Resources Required:
  - Approx 2 to 6 weeks to draft goals & strategies, conduct meetings, respond to comments & finalize (update continuously)

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Conduct Field & Lab Work to Identify Illicit Discharges

- Purpose:
  - Conduct rapid field screening to identify & track suspected outfalls & stream segments
  - Conduct investigatory sampling & analysis to establish flow types & likely sources

- Elements:
  - Field screening and data analysis
  - Chemical monitoring

Conduct Field & Lab Work to Identify Illicit Discharges

- Desired Product or Outcome(s):
  - Locations & characterizations of all outfalls
  - Strategy for future chemical analysis
  - Local “fingerprint” library

- Budget and/or Staff Resources Required:
  - Function of extent & number of outfalls and complexity of observed problems
  - Budget estimates based on a MS4 with 10 miles of stream & analyzing 80 samples per year range from $30,000 to $50,000

Find & Fix Illicit Discharges

- Purpose:
  - Use a variety of tools & techniques to narrow down the source of illicit discharges & correct the problem
  - Establish an appropriate & effective enforcement program to ensure repair
- Elements:
  - Using land use to isolate the source
  - Tracking the discharge through the storm drain
  - Fixing illicit discharges

Benefits & Challenges of a Complaint Hotline

Benefits

- Leads to early detection & correction
- Encourages active public stewardship
- Can “piggyback” on other call response needs
- Identifies suspected facilities for further investigation & education
- Increases facilities & municipalities sense of accountability
- Increases likelihood of discovering intermittent discharges

Challenges

- Time & money to provide 24/7 service
- Marketing the hotline number
- Establishing inter- & intra-departmental process

Quick Drainage Area Investigation

Source: R. Frymire

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Tracking Discharges through the Storm Drain

Strategy	Nature of Investigation	Drainage System	Advance Prep Required
Follow the discharge up	Narrow source of an individual discharge	• Small diameter outfall (<36”) • Simple drainage network	No
Split into segments	Narrow source of a discharge identified at outfall	• Large diameter outfall (>36”), complex drainage • Logistical or traffic issues make sampling difficult	Yes
Move down the storm drain	Multiple types of pollution, many suspected problems – possibly due to old plumbing practices or number of NPDES permits	• Very Large (> one square mile) drainage area	Yes

Techniques to Locate the Discharge


Source: www.darrscleaning.com


Source: NEIWPPC,2003


Source: www.darrscleaning.com


Source: www.darrscleaning.com


Source: www.darrscleaning.com

Fixing Illicit Discharges

- Who is responsible?
- What methods will be used to repair?
- How long will the repair take?
- How will removal be confirmed?

Find & Fix Illicit Discharges

- Desired Product or Outcome(s):
  - Finding & fixing illicit discharges is
  - Ancillary outcomes:
    - Improved water quality
    - Increased homeowner & business awareness
    - Tracking system to document problems & repairs

- Budget and/or Staff Resources Required:
  - Variable
  - Repair costs can be incurred fully by offending party or shared

Preventing Illicit Discharges

- Purpose:
  - Identify location & regulatory status of generating sites
  - Screen for bad actors
  - Target appropriate education & enforcement efforts
- Elements:
  - Residential
  - Non-Residential
  - Community Wide

Preventing Illicit Discharges

- Desired Product or Outcome(s):
  - Programs that target the most common intermittent and transitory discharges
  - Three sectors to target include: neighborhoods, generating sites, and municipal housekeeping

- Budget and/or Staff Resources Required:
  - Can be considerable and should be coordinated with other 6 minimum measures
  - Economies realized through cross-training, watershed org partnerships, and regional initiatives

Revisiting & Updating Program Goals & Strategies

- Purpose:
  - Revise the program to prevent or eliminate the most serious illicit discharges in the most cost-effective manner in response to monitoring and hotline information gathered in the first few years of the permit cycle.

- Elements:
  - Revisit goals and strategies
  - Update goals and strategies

Using Tracking Systems

- Updated mapping to reflect outfall locations, surveyed stream reaches, locations of confirmed illicit discharges, locations of suspicious discharges, dumping sites, etc.
- Water quality results associated with specific outfall and in-stream sampling
- Frequency of hotline use and associated number of “hits” or confirmed illicit discharges
- Program costs by major area (e.g., office, field, lab, education, enforcement, etc.)
- Number of corrections and cost associated with each correction

Revisiting & Updating Program Goals & Strategies

- Desired Product or Outcome(s):
  - Updated tracking database & annual report with summary of progress to date, findings, recommendations for program revisions, & work plan for upcoming year
- Budget and/or Staff Resources Required:
  - Ongoing responsibility of the program manager
  - Staff effort for an annual report about 3 to 4 weeks (1st annual report will require more effort than subsequent years)

Table 11: IDDE Program Costs					
IDDE Program Component		Start Up Cost		Annual Cost	
		Low	High	Low	High
Component 1:	a) Perform Audit	$3,000	$9,000	NA	NA
	b) Initial Program Plan	$1,000	$3,000	NA	NA
Component 2:	a) Adopt Ordinance	$1,000	$17,000	NA	NA
	b) Tracking System	$2,000	$15,000	$2,000	$2,000
Component 3:	a) Desktop Analysis	$1,000	$4,000	NA	NA
	b) Field Mapping	$500	$1,000	NA	NA
Component 4:	a) Develop Goals	$1,000	$3,000	NA	NA
	b) Field Monitoring Strategy	$1,000	$3,000	NA	NA
Component 5:	a) ORI	NA	NA	$5,700	$12,800
	b) Establish Hotline	$1,300	$7,700	$1,500	$11,400
	c) Sample Analysis	$500	$15,500	$9,000	$21,200
	d) Outfall Map	NA	NA	$500	$1,000
Component 6:	a) Isolate	NA	NA	$2,000	$5,200
	b) Fix	NA	NA	$10,000	$30,000
Component 7:	a) Education	$1,000	$8,100	$1,300	$13,900
	b) Enforcement	NA	NA	$1,000	$14,000
Component 8:	a) Program Administration	$10,000	$15,000	$10,000	$15,000
TOTAL		**$23,300**	**$101,300**	**$43,000**	**$126,500**

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Additional Resources

- *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments* (CWP & Pitt, 2004)
  - **www.cwp.org**
- *Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems: A User's Guide* (Pitt et al., 1993)
  - **www.epa.gov/npdes/pubs/investigating_inappropriate_pesds.pdf**
- *Illicit Discharge Detection And Elimination Manual* (NEIWPPC,2003)
  - **www.neiwpcc.org/iddmanual.pdf**
- *A Guidance Manual for Identifying and Eliminating Illicit Connections to Municipal Separate Storm Sewer Systems* (Galveston County Health District, 2002)
  - **www.gchd.org/pages/pollution/GuideManual.pdf**
- The Rouge River Project Illicit Discharge Elimination Program
  - **www.rougeriver.com/techtop/illicit/index.html**

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What could you do if……

- Anticipated problems are confined to areas with high densities of generating sites.

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What could you do if……

- Community used to be on combined sewer system or existing sanitary sewer infrastructure is old & has history of problems .

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What could you do if……

- Community has old development areas (i.e., > 20 years) with high density of septic systems.

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What could you do if……

- Significant illicit discharges are suspected throughout jurisdiction & across all land uses.

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