

Stormwater Management and Infrastructure Improvement

an Asset Management approach

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**Environmental
Finance
Center**

Syracuse University

Brief Overview

- Thinking about stormwater consequences
- Green Infrastructure
- 3 tenets of stormwater management
- Watershed Management: Who's responsible
- Roadways and stormwater
- What you can do
- Stormwater asset management planning

This is Stormwater Management



This is not!





What's the cost
of not?

What's the impact?



Who Pays?



Hurricane Irene: \$16.6 billion

How many lives are affected?











Is the municipality prepared to react?



2 out of every 3 businesses
flooded never re-open



How long will clean-up take?



How is the Community Affected?



Is the municipality prepared to react?





\$50 million in 30 minutes for one city!



What is
Green Infrastructure?

Re-forestation/ Re-vegetation



Vegetated Swales



For Residential Use.
Keep the water from
running down the
driveway to the road

Rain Gardens



Rain Barrels



Cistern



Porous/Permeable Pavement Materials





**Where does the
water go?**

**Parking lot with rain
gardens, curb inlets,
trees. YES!**







3 Tenets of Stormwater Management

Slow it Down
Spread it Out
Soak it In

Who Cares?

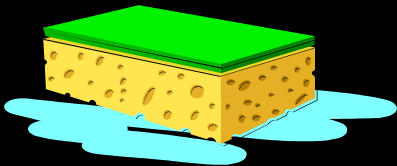


Why You Might Care

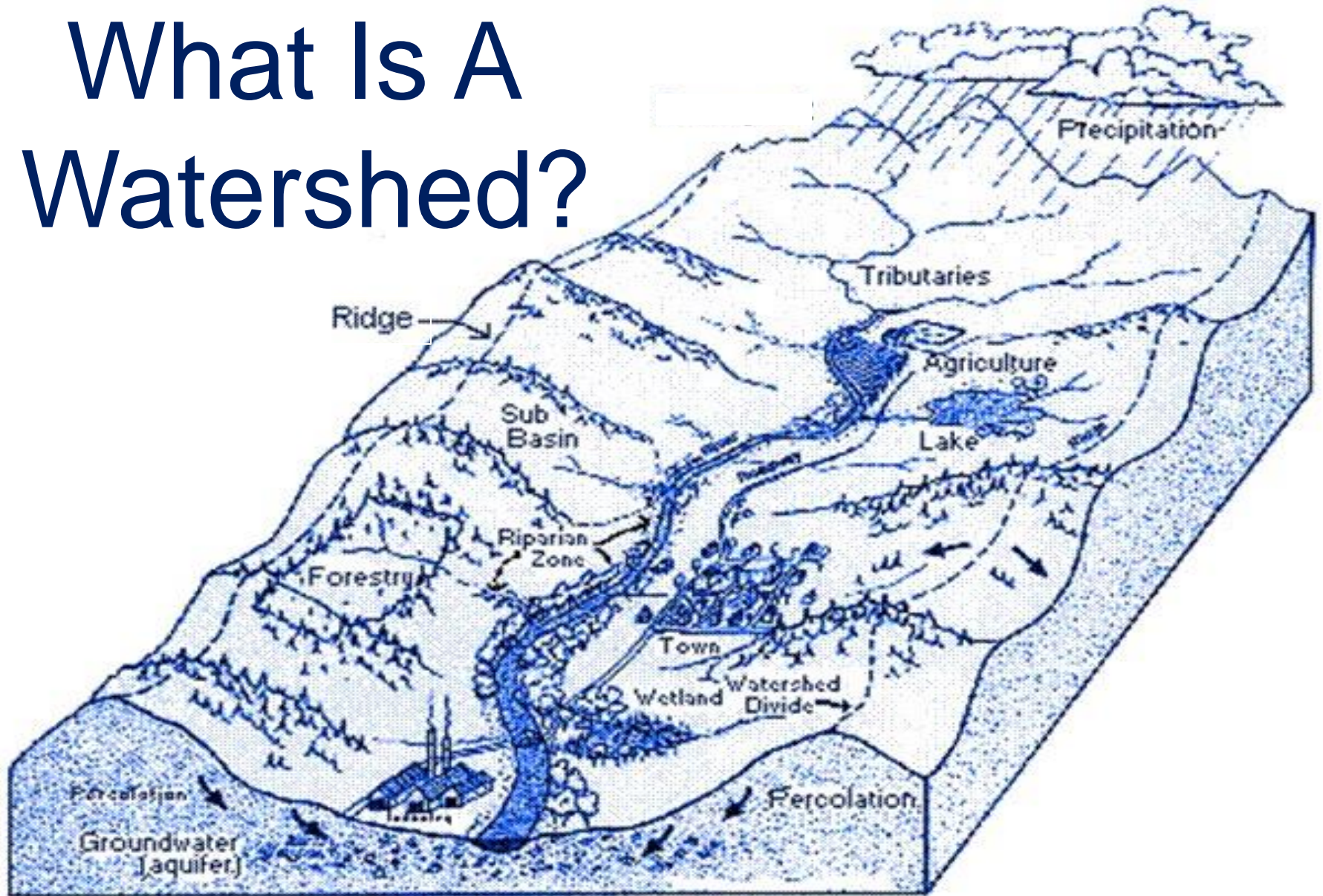
- *Flood damage – homes, property, cropland, etc.*
- *Landowner complaints*
- *Groundwater quality & quantity*
- *Jobs & Quality-of-life issues for growing area*
- **MUNICIPAL COSTS**



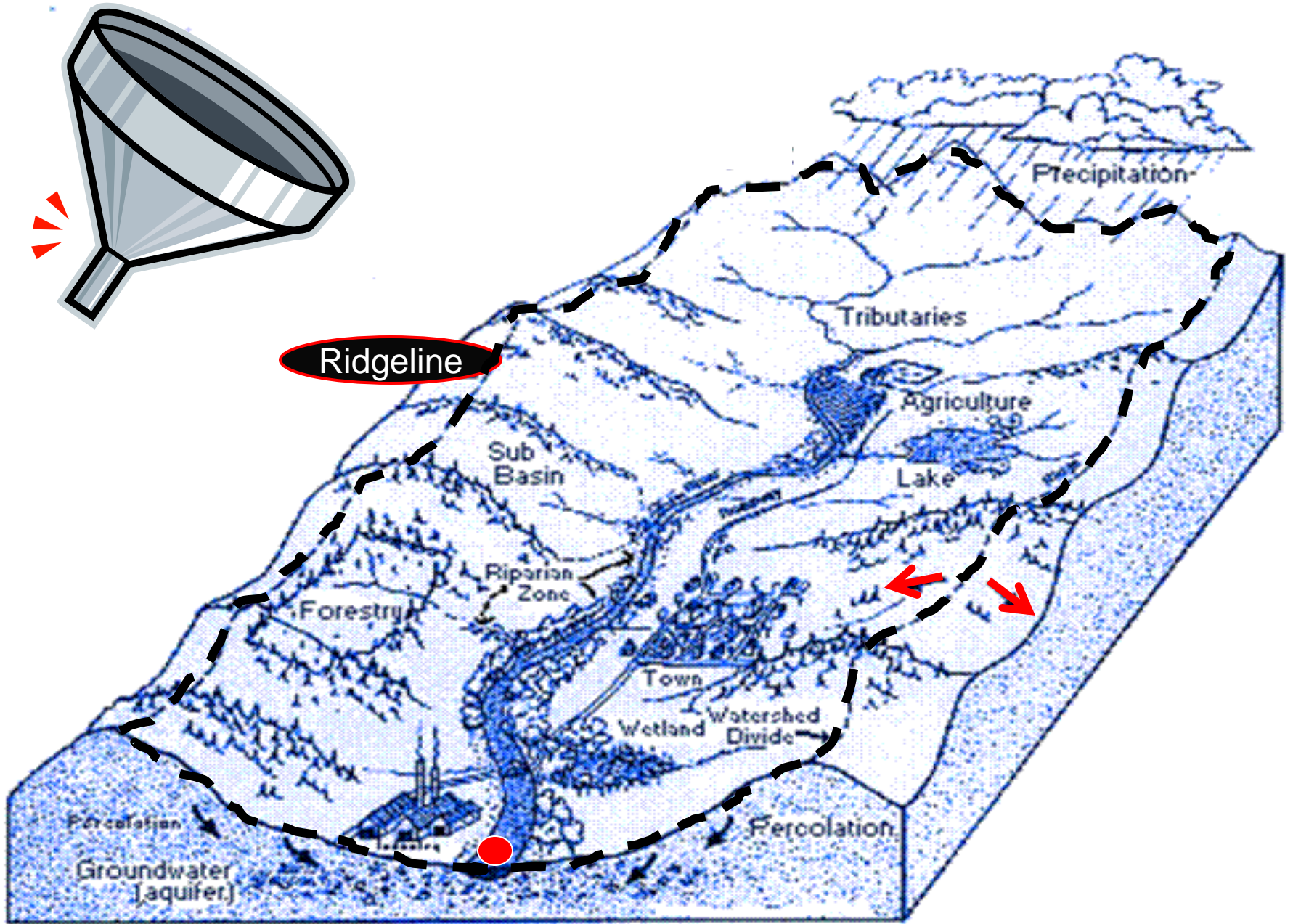
WATERSHEDS—THE FUNNEL, THE SPONGE, AND THE SLIDE



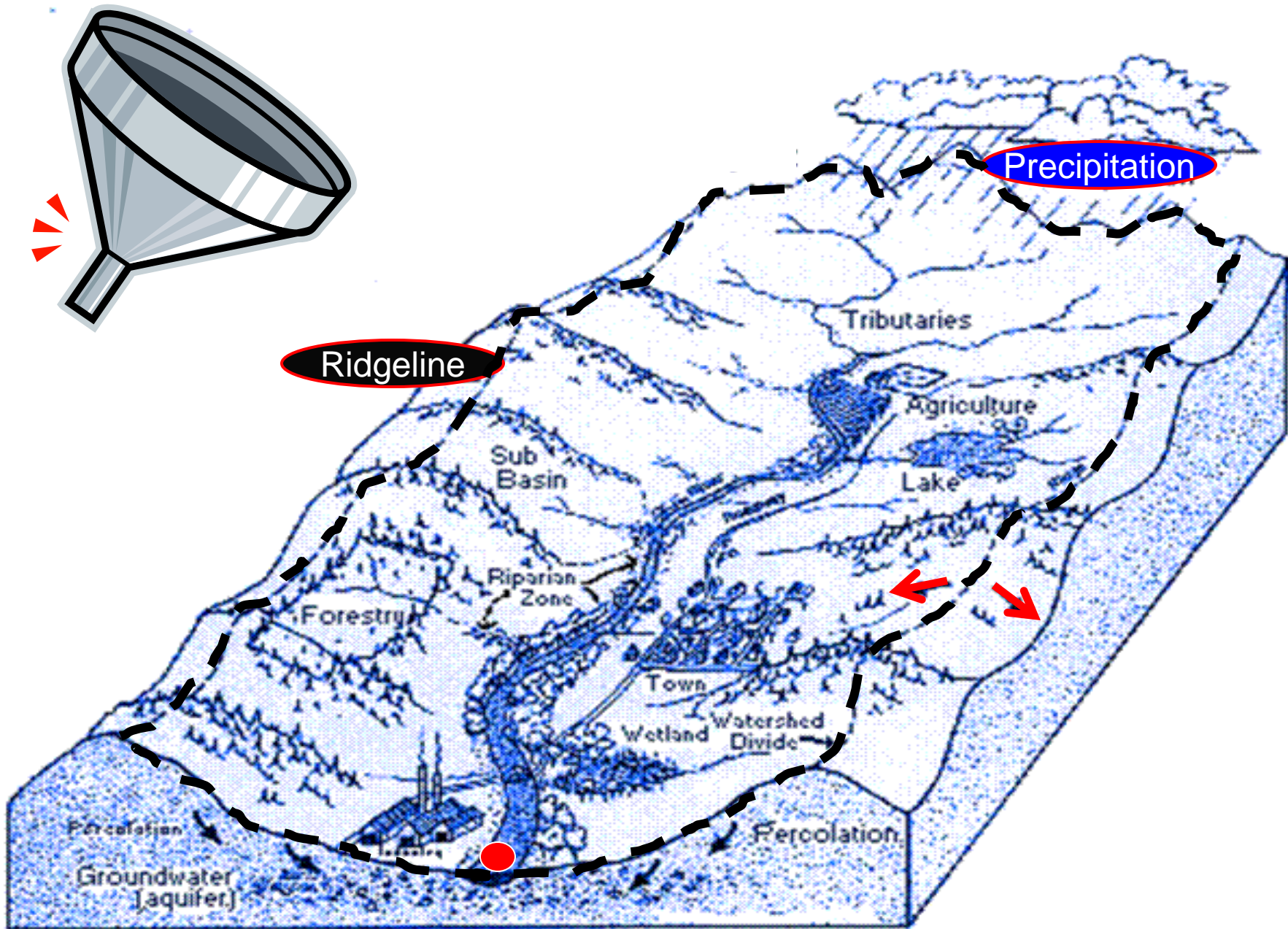
What Is A Watershed?



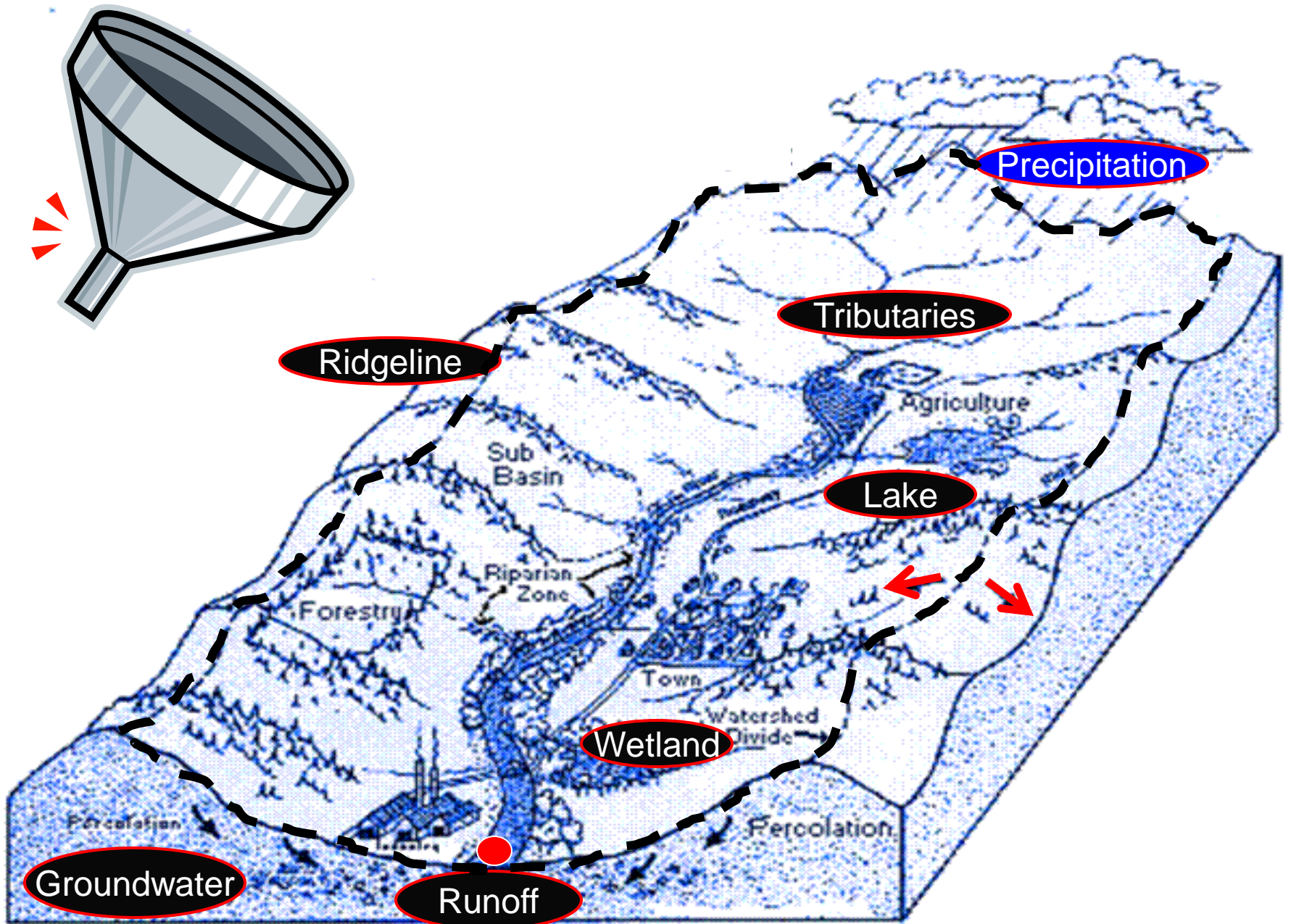
Produced by Lane Council of Governments



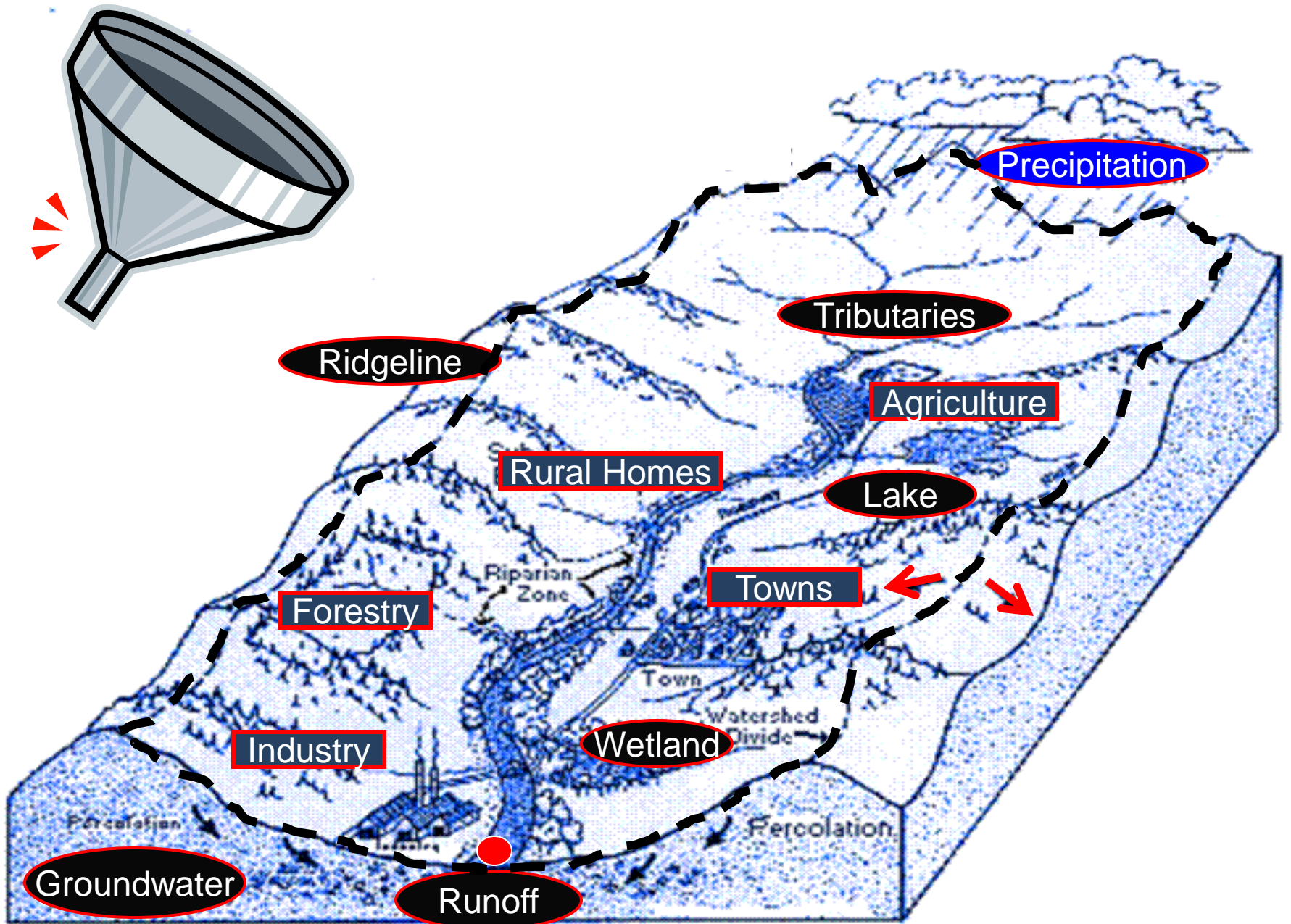
Produced by Lane Council of Governments



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Who's 'in-charge' -- of watershed management?

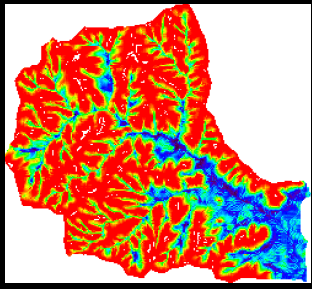


Photo: Rick Constantino

Who's 'in-charge' -- of watershed management?

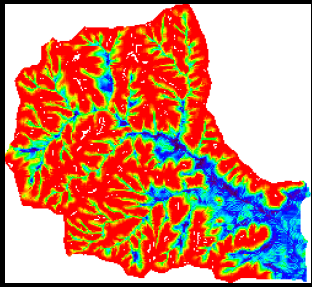
- No One
- Mayors / Supervisors
- Business Owners
- Conservation Groups
- Planning / Zoning
- Highway Departments
- NYS DEC
- Private Landowners
- All Of The Above





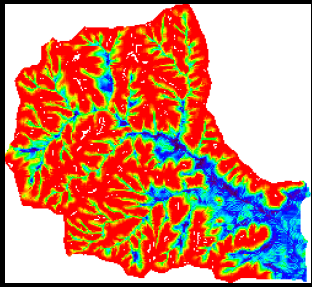
Soils, Vegetation & Land Use





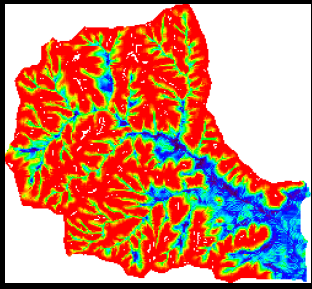
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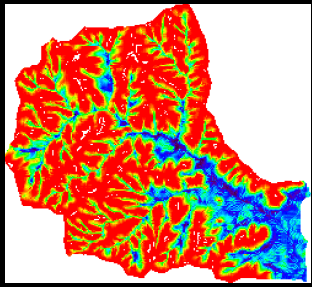
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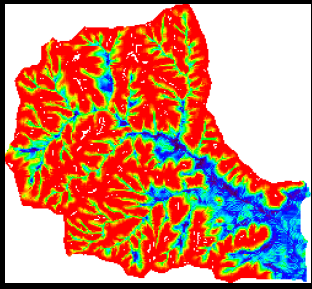
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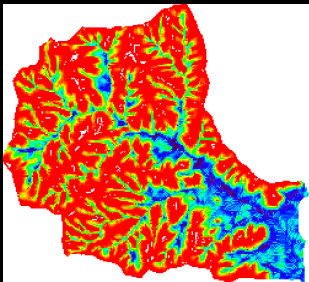
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Soils, Vegetation & Land Use



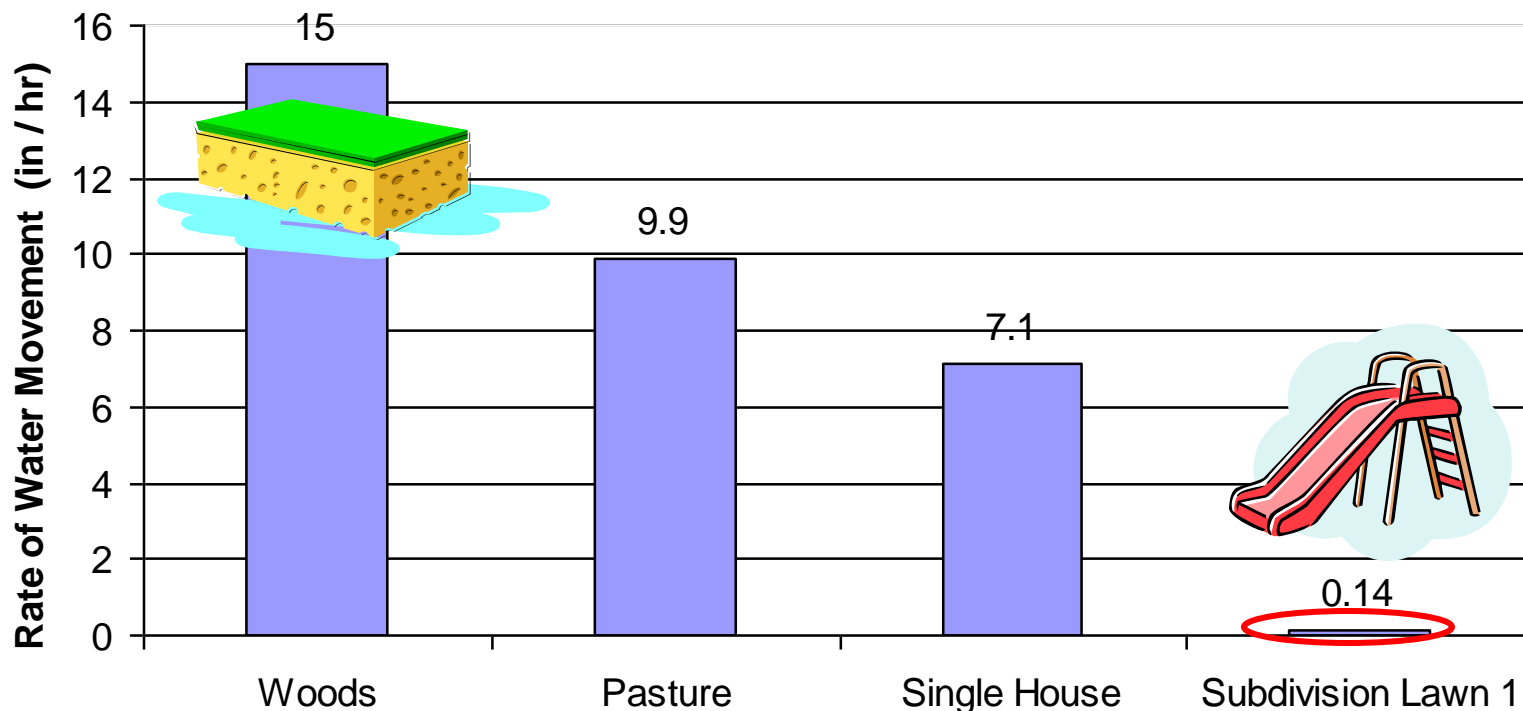


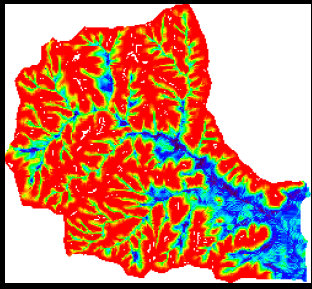
Compaction Effects

Water Movement Into Soils in Various Settings

Ocean County, NJ

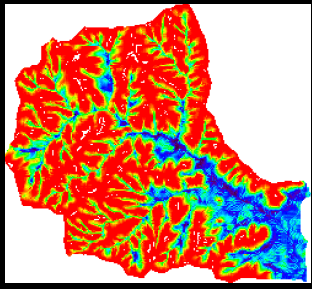
Avg. Annual Precipitation = ~ 50 inches





Impervious Cover





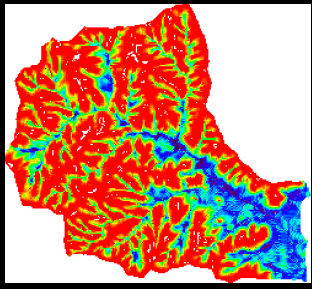
Groundwater

Storage



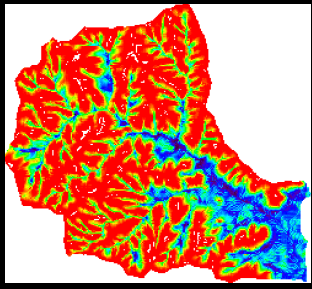
Loss





Watershed Plumbing





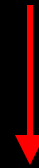
Watershed Plumbing



Municipal Costs



Rebuilt 5 times
In 3 years: \$15,000

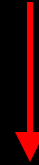


Stabilized in 2005:
\$3,500

Municipal ~~Costs~~ Benefits



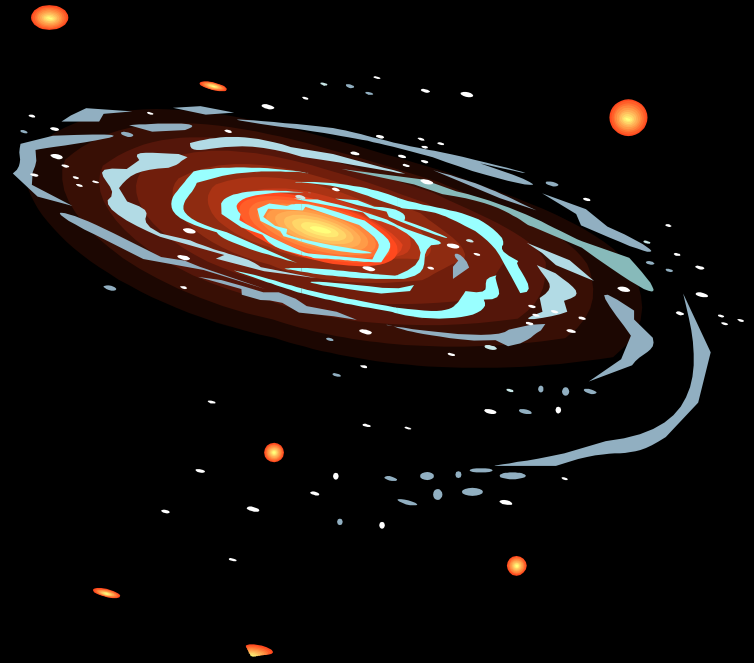
Rebuilt 5 times
In 3 years: \$15,000



Stabilized in 2005:
\$3,500

Until 2009:
\$0

Changes in Time & Space



A local example...

Cumulative Effects

SCENARIO A:

Development Proposal:

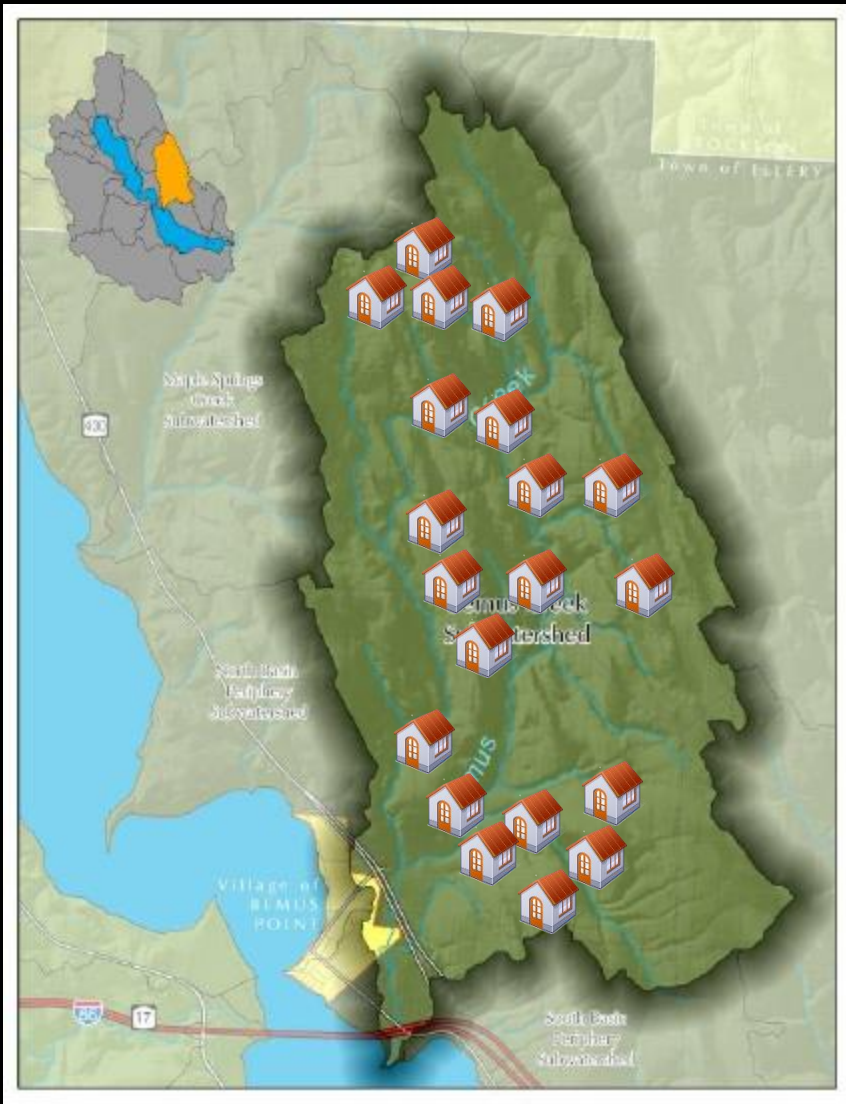
- 20 New Homes - 20 acres
- All within the same watershed
- Constructed in 2015

Triggers:

- SEQR
- NYS DEC SWPPP

Municipal Discussions?

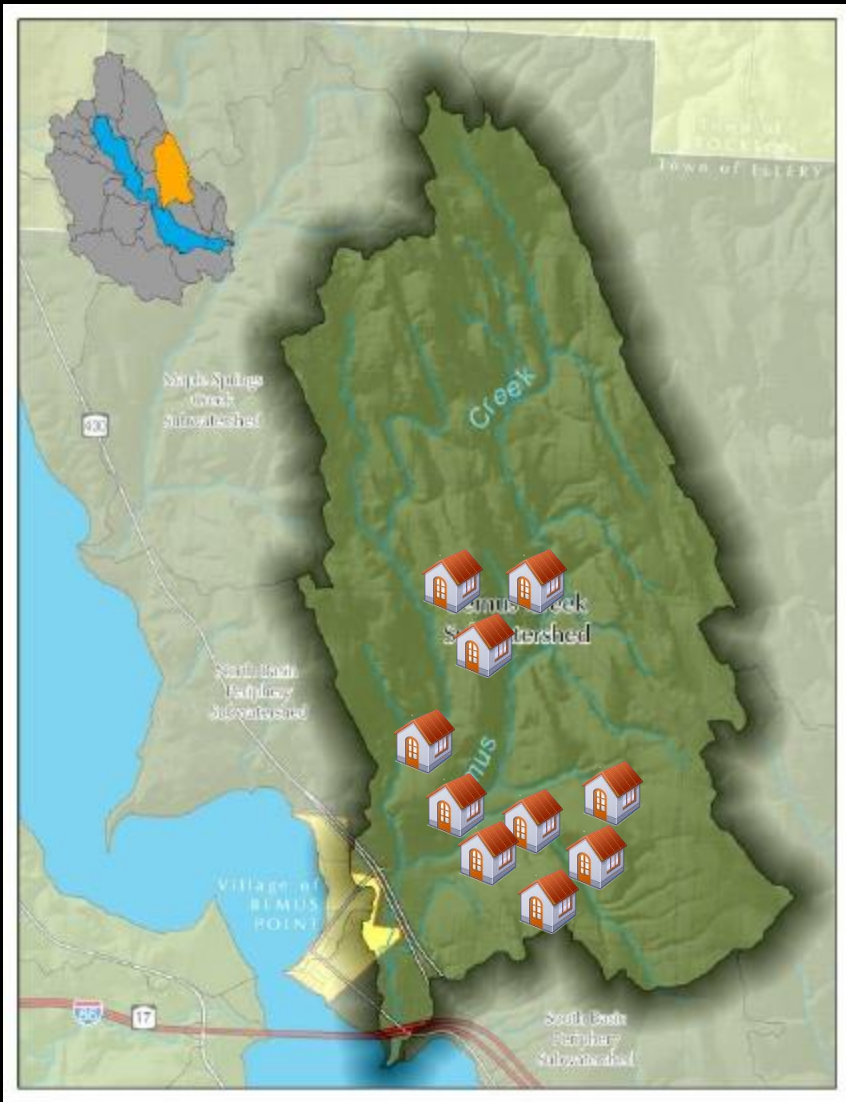
- Wastewater Management
- Emergency Services, etc.



Cumulative Effects

SCENARIO B-1 (2015):

- 10 Existing Homes – 10 acres



Cumulative Effects

SCENARIO B-2 (2017):

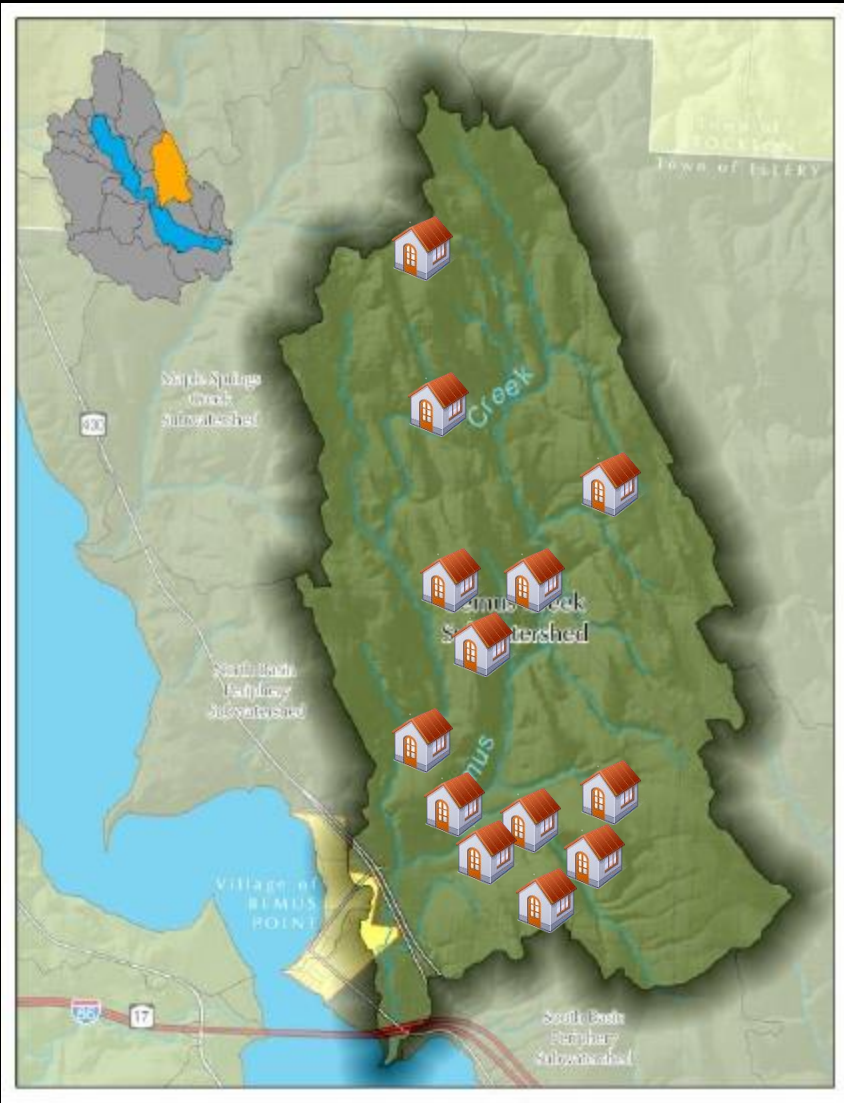
- 10 Existing Homes – 10 acres

No Proposal:

- 3 Additional Homes - 3 acres
- All within the same watershed

Triggers:

Municipal Discussions?



Cumulative Effects

SCENARIO B-3 (2020):

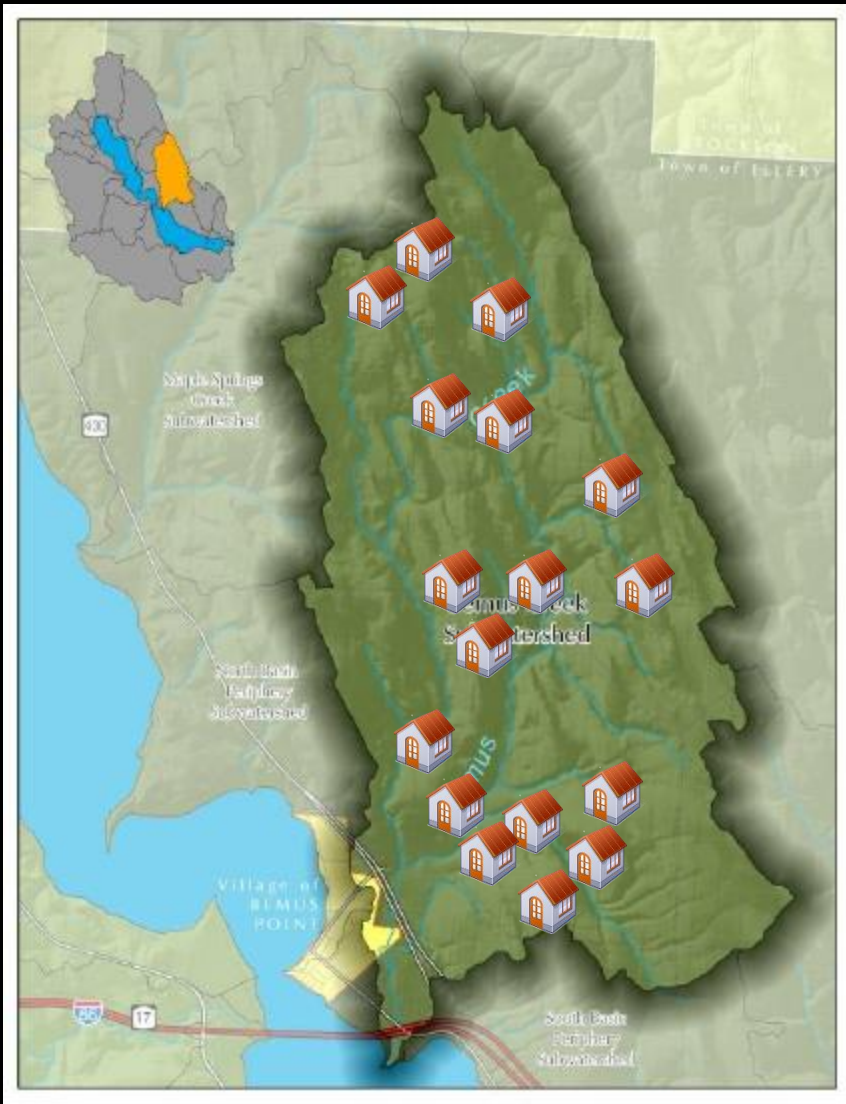
- 10 Existing Homes – 10 acres

No Proposal:

- 4 Additional Homes - 4 acres
- All within the same watershed

Triggers:

Municipal Discussions?



Cumulative Effects

SCENARIO B-4 (2023):

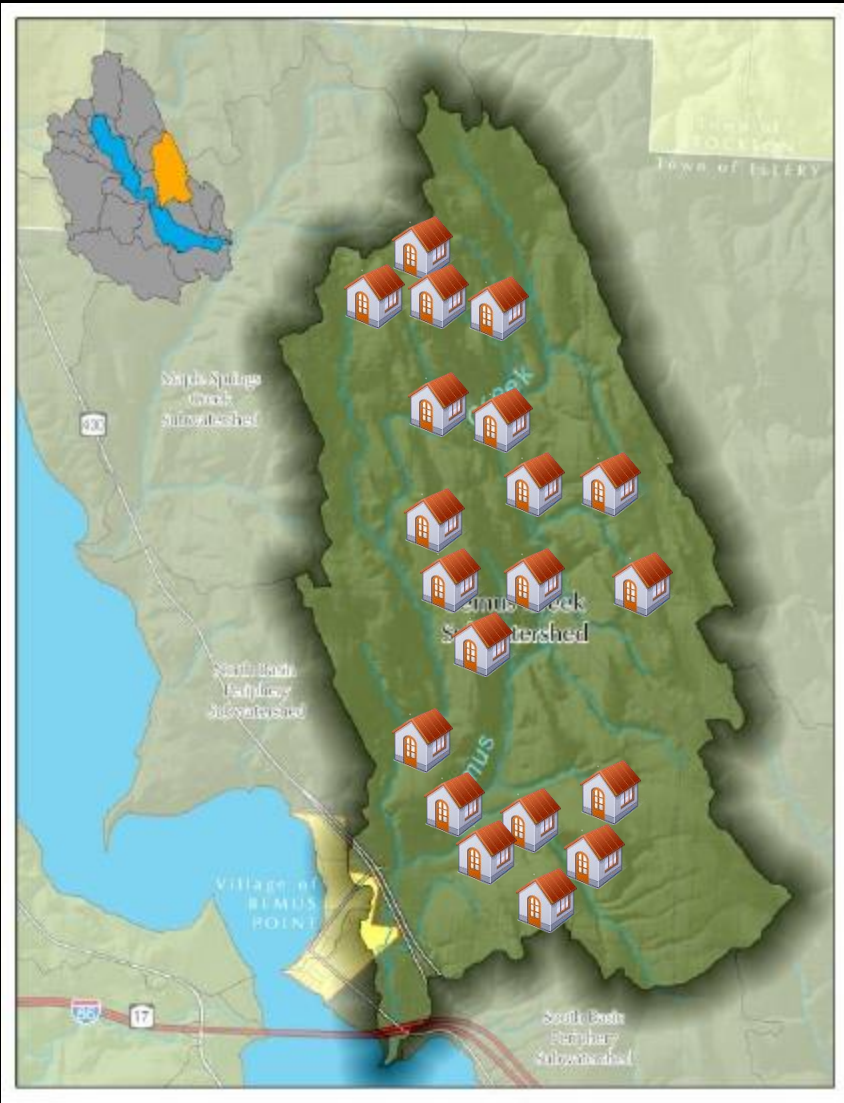
- 10 Existing Homes – 10 acres

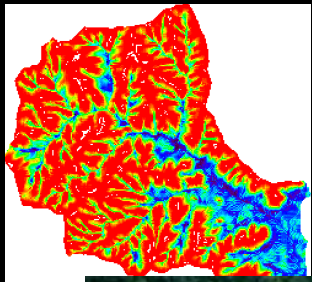
No Proposal:

- 3 Additional Homes - 3 acres
- All within the same watershed

Triggers:

Municipal Discussions?





Cumulative Effects



Individually minor, but cumulatively significant effects

Who's 'in-charge' -- of watershed management?

- Mayors / Supervisors
- Business Owners
- Conservation Groups
- Planning / Zoning
- Highway Departments
- NYS DEC
- Private Landowners
- All Of The Above



Photo: Rick Constantino

The Eight Tools of Watershed “Investment”



8. Watershed Stewardship



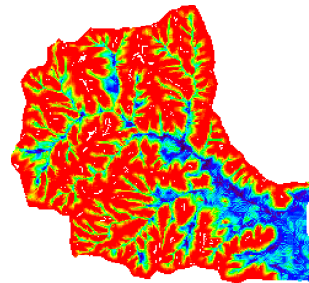
1. Watershed Planning



2. Land Conservation



7. Non-Stormwater Discharges



3. Aquatic Buffers



6. Stormwater Management



5. Erosion & Sediment Control



4. Better Site Design

Managing Stormwater for Roadway Resiliency



Drainage



Highway Drainage Problems

Excess Flow

High Velocity

Sedimentation

Perpendicular Flow

Poor Culvert Condition



Excess Flow



Over Topping



High Velocity



Sedimentation



Perpendicular Flows



POOR CULVERT CONDITION



What can Be Done?

Inspections

Reduce Volume

Reduce Velocity

Stabilize



Inspect



- Reduce Volume



diversion :



Storage:

Retention/Detention Ponds/Wetlands

- *Reduce Volume*



Reduce Velocity

- Slow the Flow Down!



Vertical Drops

Reduce Velocity





CHECK DAMS:



Check Dams:

Reduce Velocity



Rip Rap



Splash Pool



Stabilize & Protect



Stabilize



STABILIZE



How do you Improve Resiliency in Managing Stormwater?

- Reduce the Volume
- Reduce the Velocity
- Stabilize
- Inspect
- Maintain!



What is your role and
what can you do?

What do you 'do'?

- Most of us are landowners
 - manage your own stormwater
- Planning and Zoning
 - Site plan review: manage stormwater onsite
- Highway & DPW
 - Inspect, repair, replace, develop a capital plan specific to stormwater
- Elected officials
 - Develop policy with stormwater in mind

Stormwater Management Plan

1. Inventory ditches, culverts, bridges, drainage, pipes and outlets
2. What condition (probability) are they in?
3. How critical (impact) are they?
4. Rank & Prioritize
5. Capital Improvement Plan
6. Asset Advisory Committee
7. Educate-Educate-Educate

Good condition?

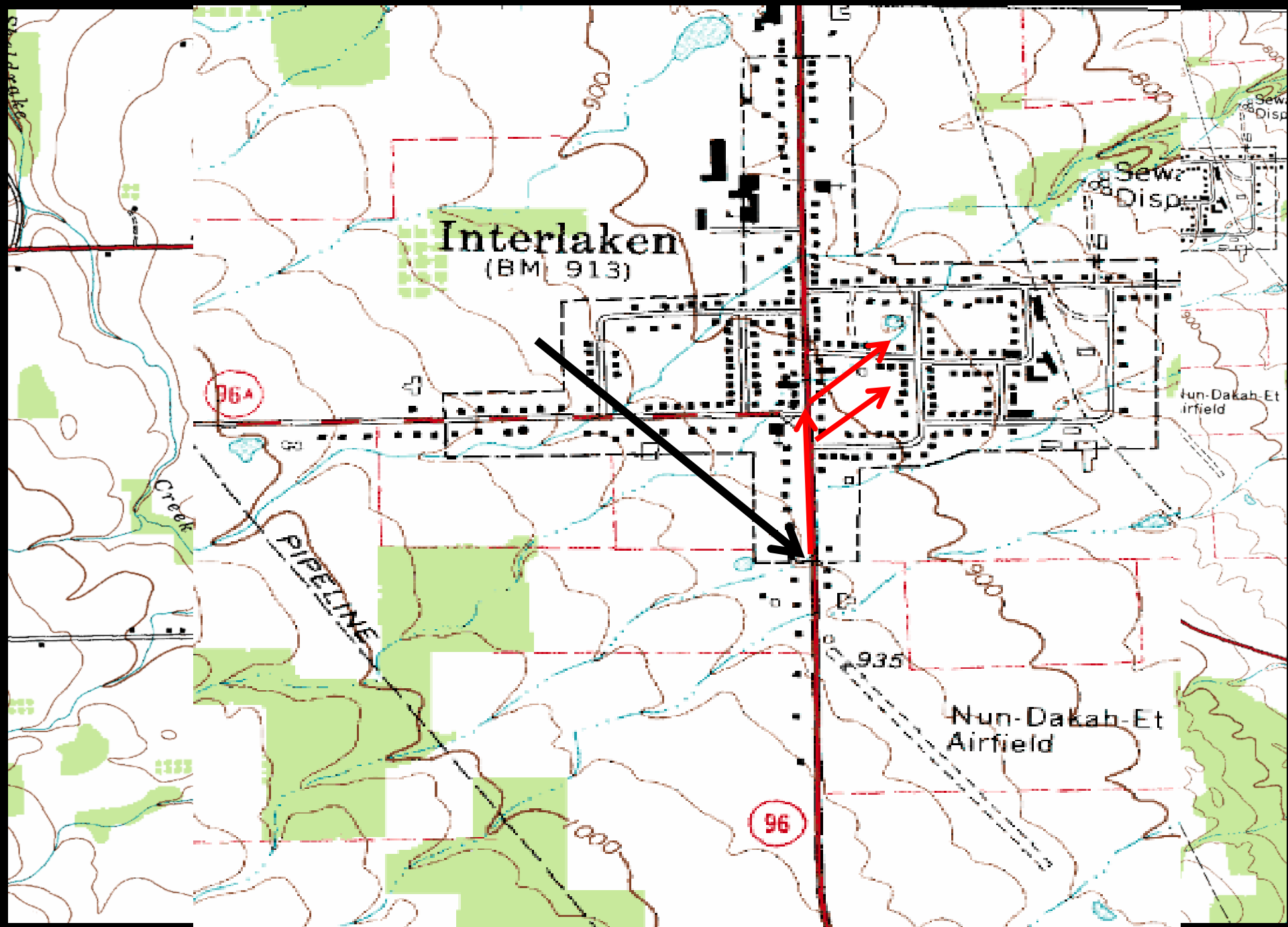


What's the Impact?





| | | Impact | | | | |
|--------------------|--------------------|----------------|--------------|-----------------|--------------|----------------|
| | | Trivial | Minor | Moderate | Major | Extreme |
| Probability | Rare | Low | Low | Low | Medium | Medium |
| | Unlikely | Low | Low | Medium | Medium | Medium |
| | Moderate | Low | Medium | Medium | Medium | High |
| | Likely | Medium | Medium | Medium | High | High |
| | Very likely | Medium | Medium | High | High | High |



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(BM) 913

96A

96

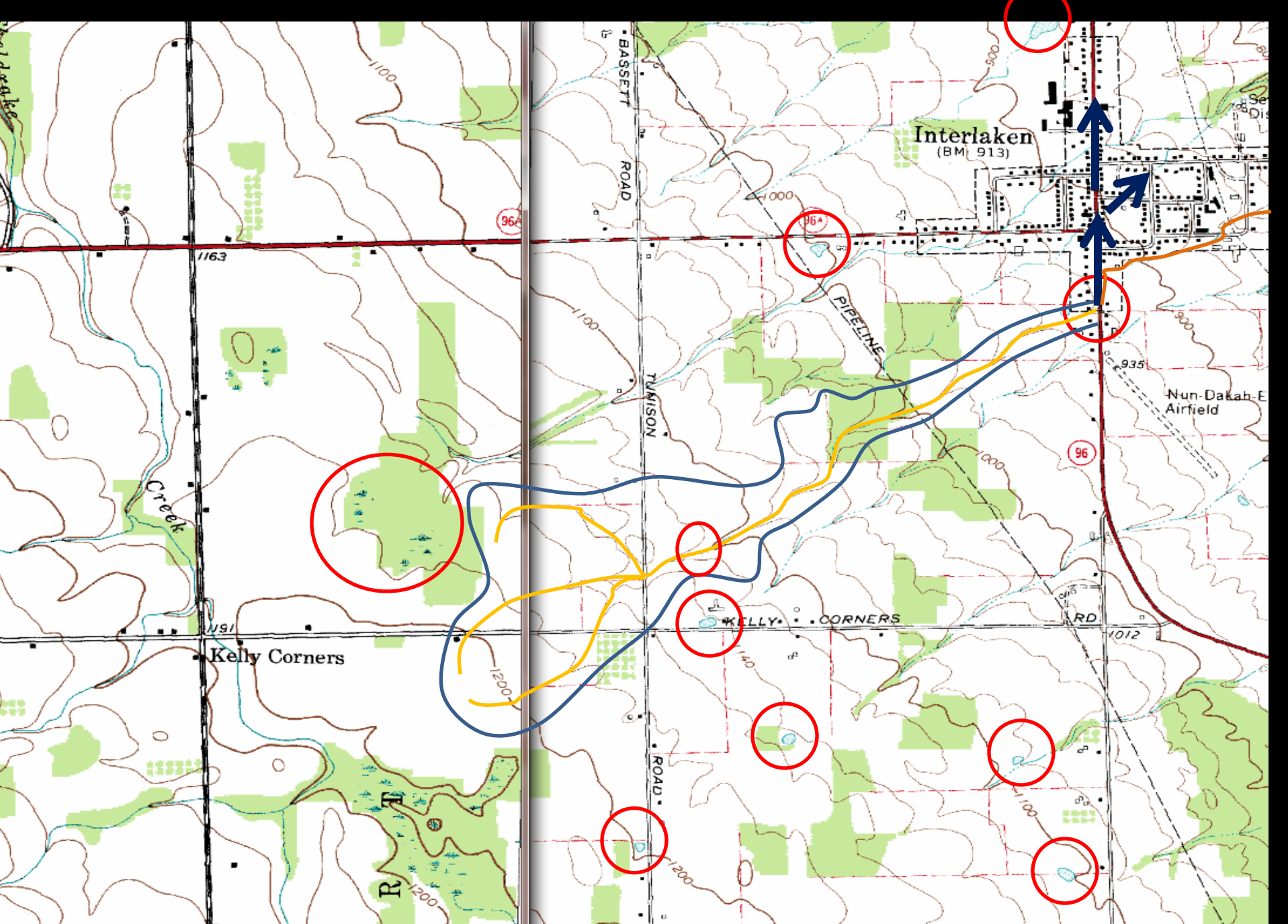
PIPELINE

Nun-Dakah-Et
Airfield

Sewer
Disposal

Nun-Dakah-Et
Airfield

Creek







Thanks for your time!



Call Me!

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