

Analyzing
Watersheds to
Determine Sources of
Bacteria at Two of
Iowa's Beaches

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Research Geologist

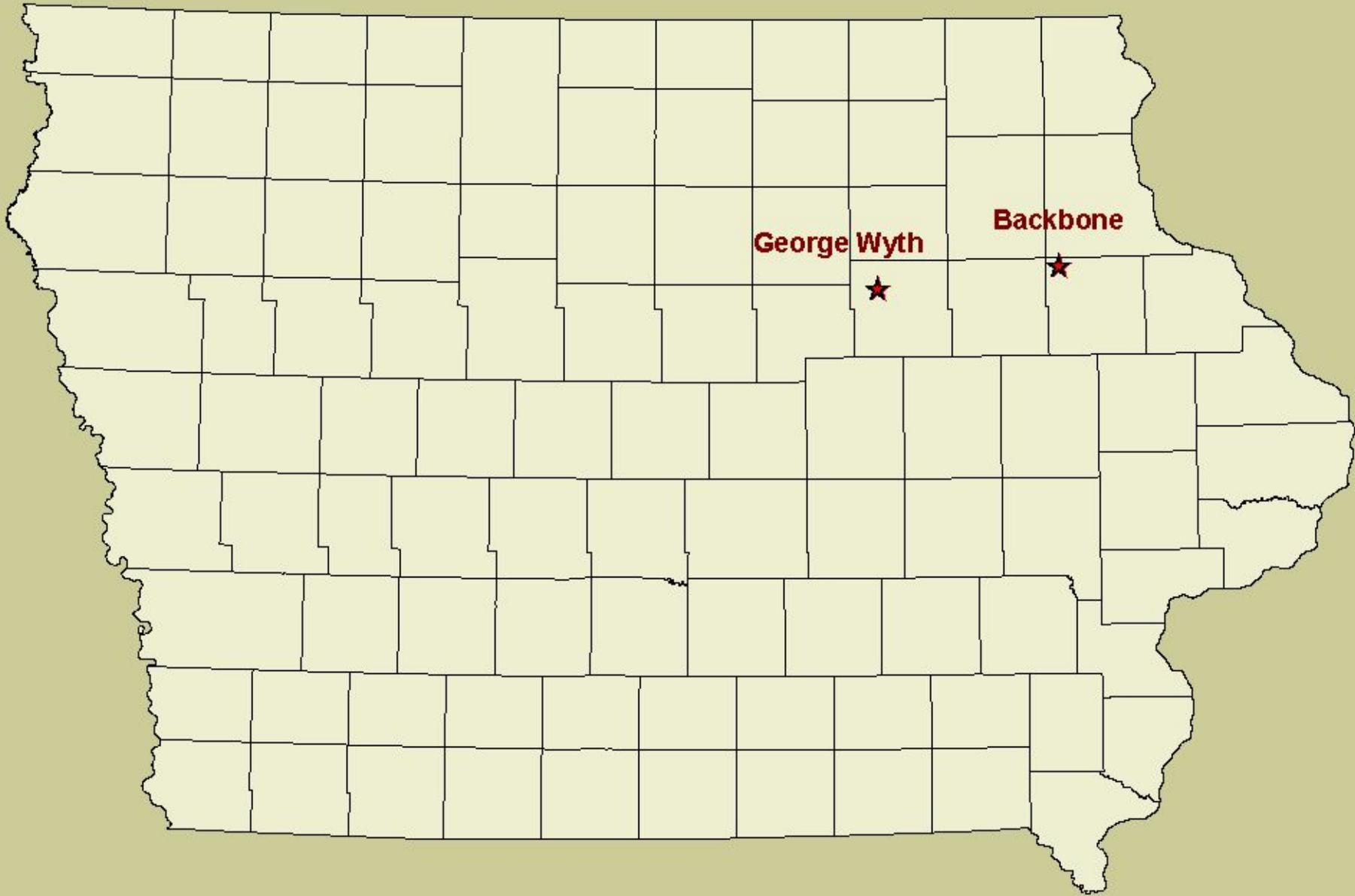
IDNR-Iowa Geological Survey

Photo by Ray Anderson



Indicator Bacteria

- Indicator bacteria are used to suggest the presence of pathogens (disease-causing organisms) in water
- Pathogens can come from the feces of any warm blooded animal
- Indicator bacteria are easy to collect and analyze, relatively safe to handle and usually present when pathogens are present
- These indicator bacteria are harmless
 - Fecal coliform, *E. coli*, enterococci
- Intensive watershed investigations help to identify the sources of indicator bacteria



George Wyth

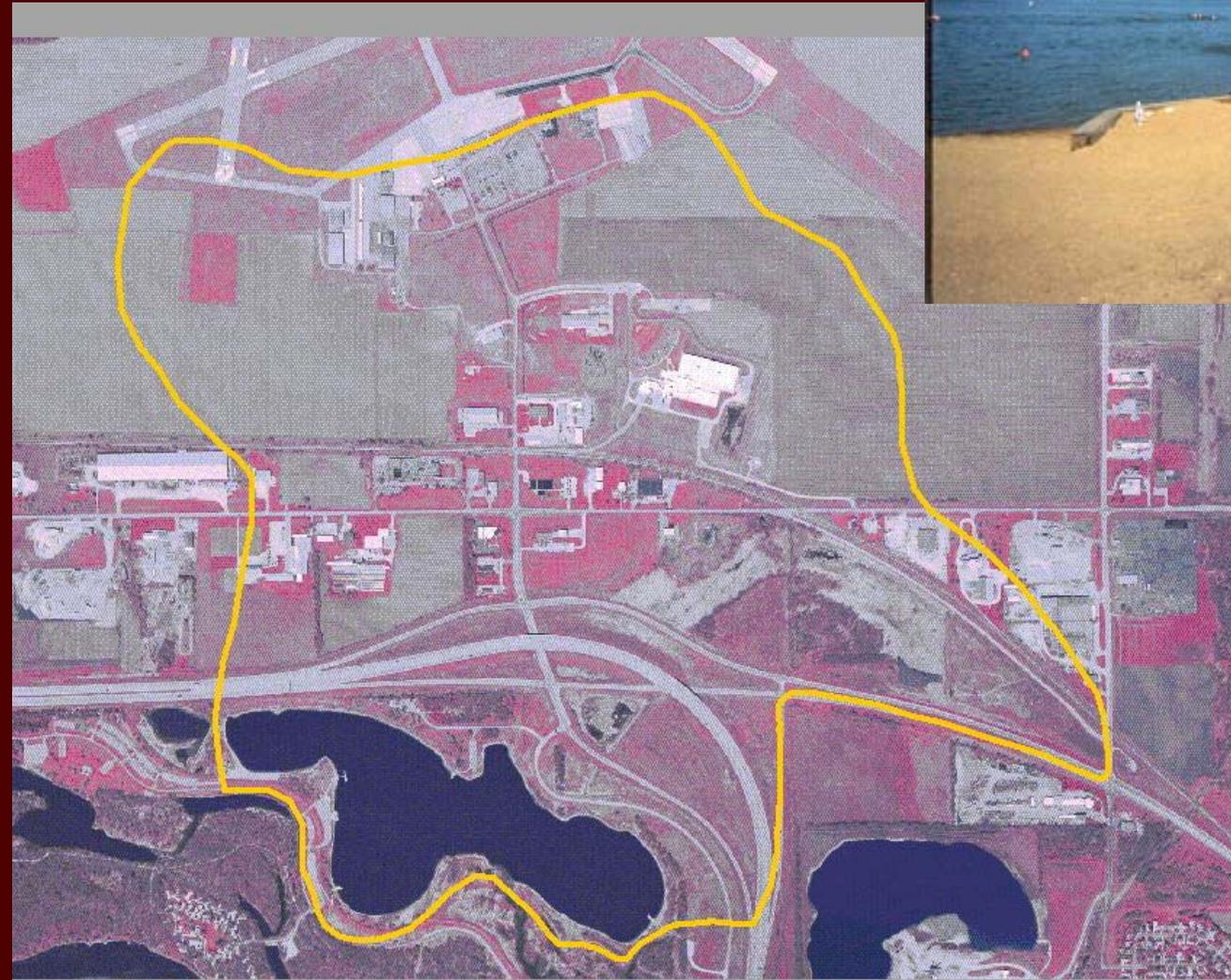
Backbone



Intensive Watershed Analysis

- Watershed:lake ratio
- Land use
- Type of water body
- Possible sources
- Response to rainfall
- Pattern of high bacteria levels

Photo by Clay Smith

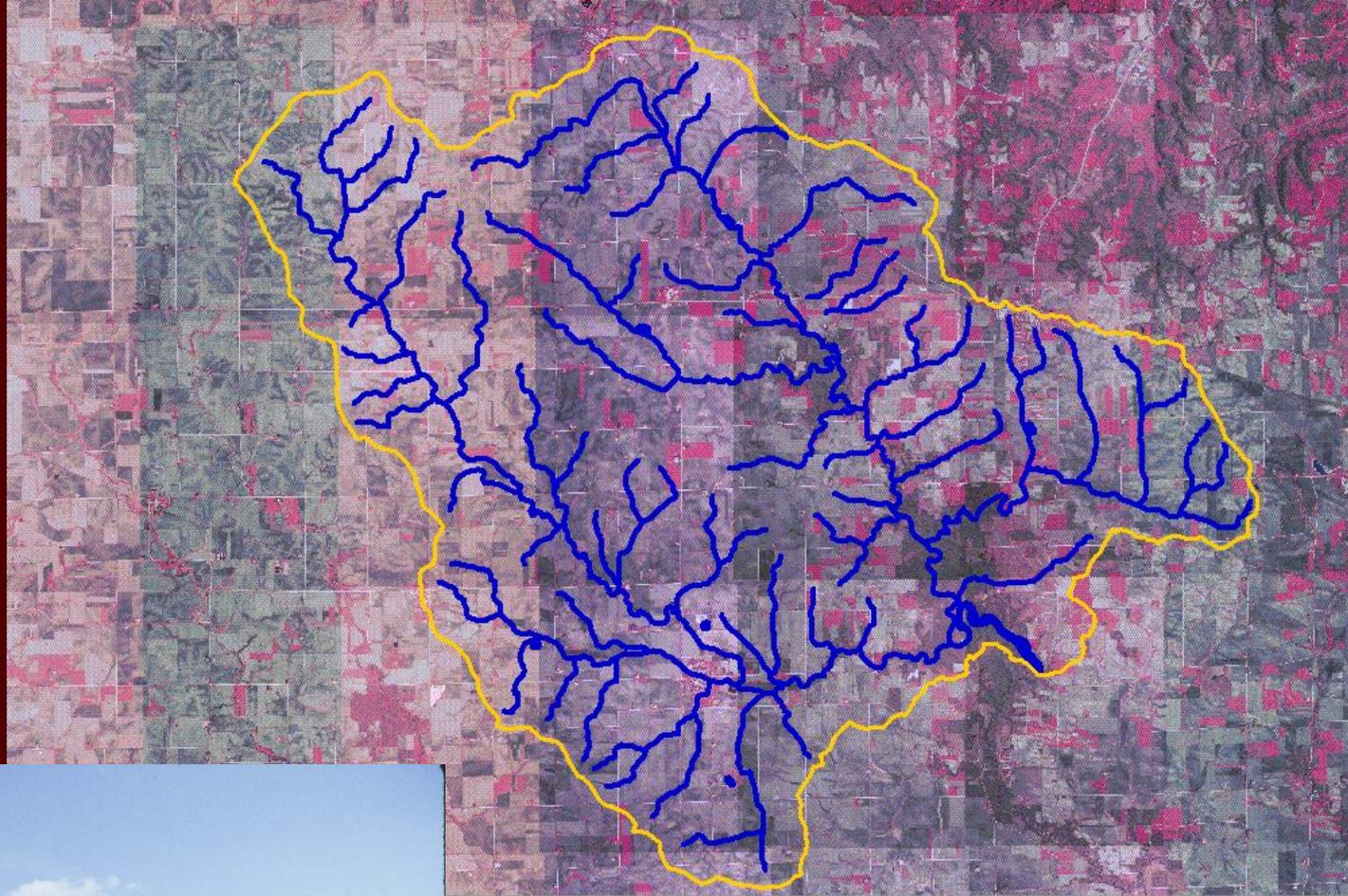


Watershed: Lake
89:1

0 0.6 1.2 Miles



Watershed: Lake
919:1



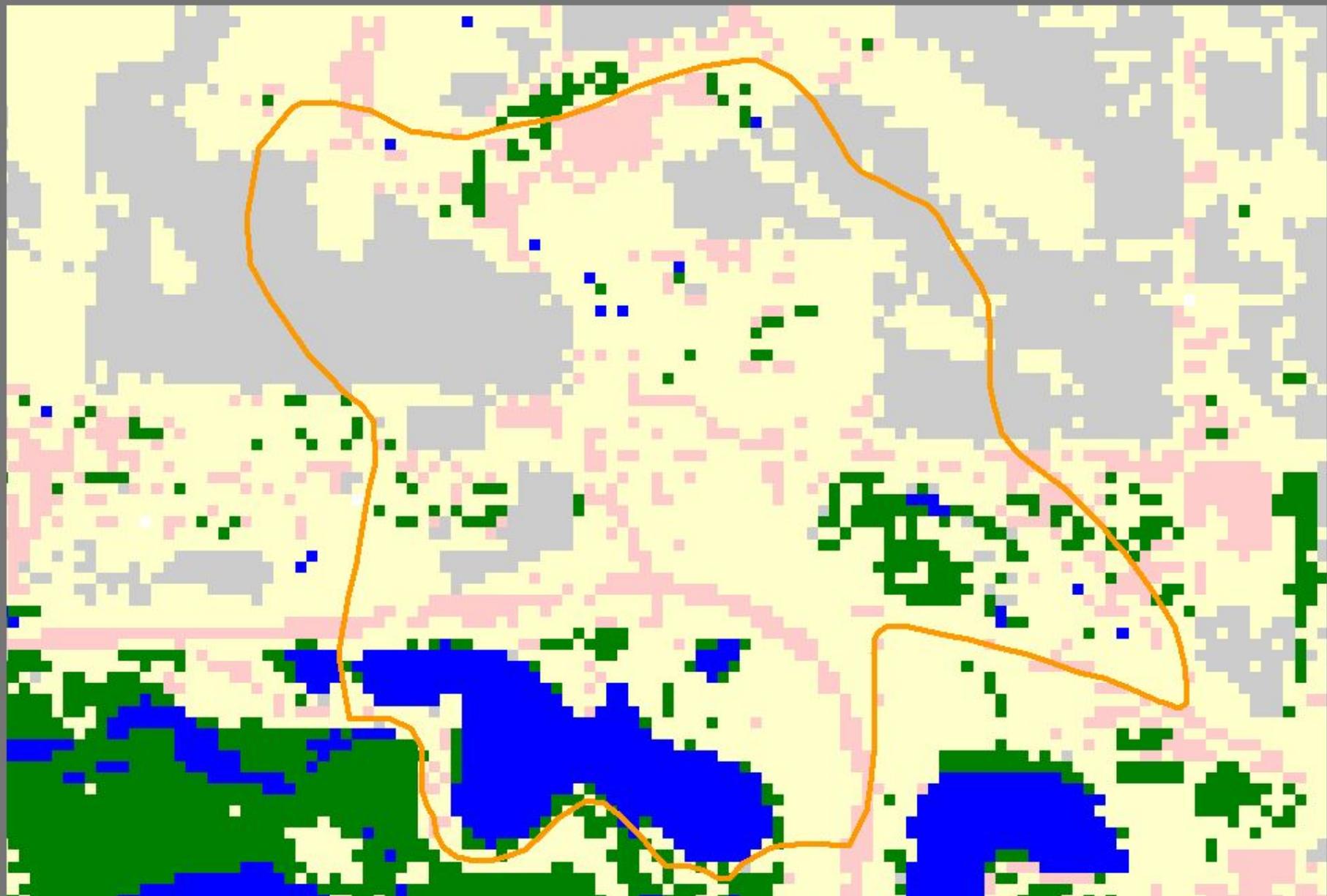
0 1 2 Miles



Photo by Ray Anderson

Intensive Watershed Analysis

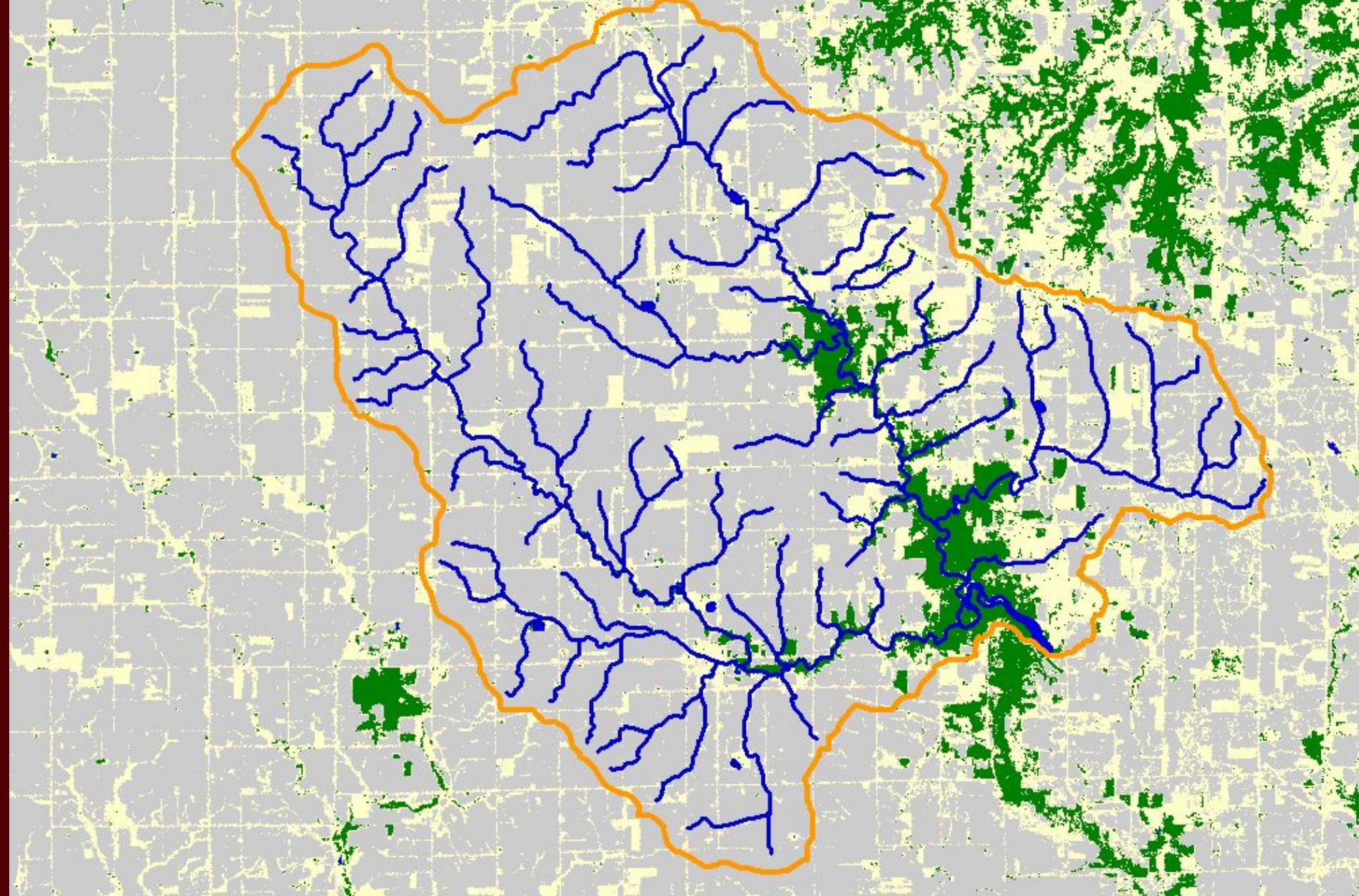
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Land Cover

- | | |
|---|---|
|  Water |  Row Crop |
|  Forest |  Urban/Artificial |
|  Grass/Hay |  Barren/Sparse Veg |





Land Cover

- | | | | |
|---|-----------|---|-------------------|
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Type of Water Body

George Wyth

Borrow Pit for
Highway 380

- Little flow
- Little dilution
- Fewer sources

Backbone

Lake Created by
Damming River

- All water flows past
beach towards dam
- Dilution of sources
- More sources

Intensive Watershed Analysis

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Possible Sources

George Wyth

- Geese
- Human (sewage pipes ruled out, but not effects from bather density)

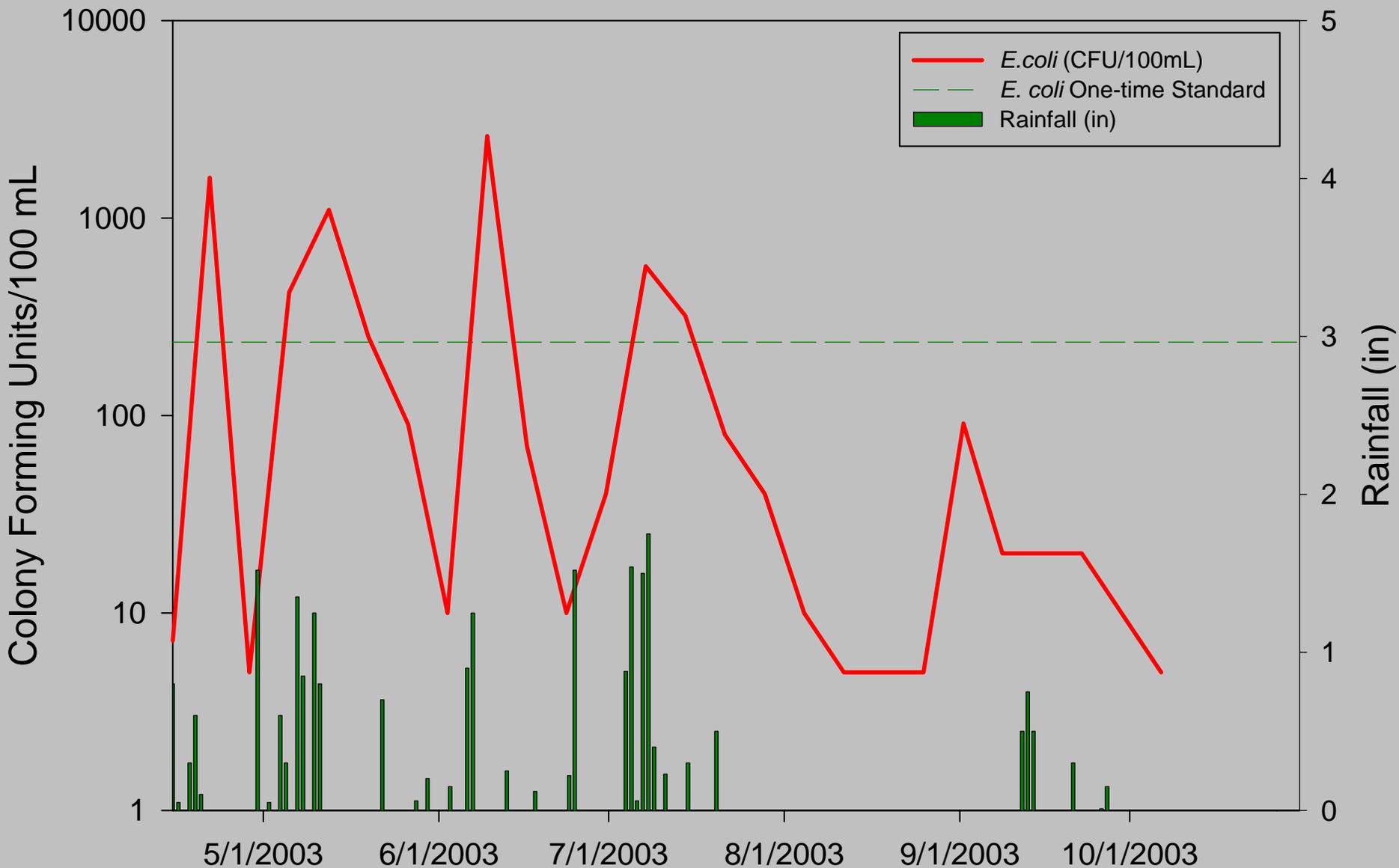
Backbone

- Geese
- Domestic animals
- Wild animals
- Manure spread on farm fields
- Septic systems
- Sewage lagoons
- Human (bather density)

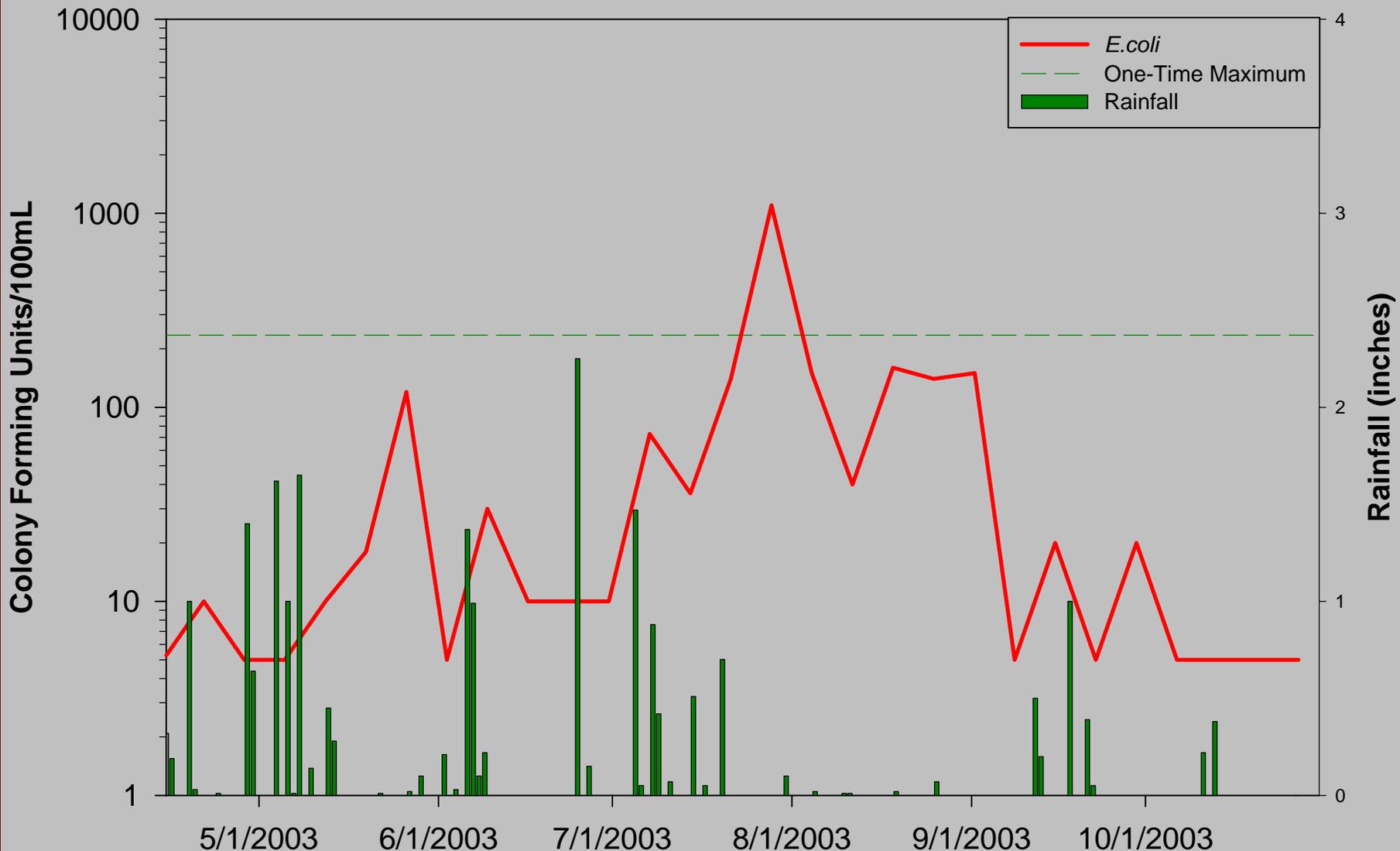
Intensive Watershed Analysis

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- **Response to rainfall**
- Pattern of high bacteria levels

Backbone 2003 Beach Monitoring



George Wyth 2003 Beach Monitoring



Intensive Watershed Analysis

- Watershed:lake ratio
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- Type of water body
- Possible sources
- Response to rainfall
- Pattern of high bacteria levels



0 0.02 0.04 Miles



* Sampling Points

Pattern of High Bacteria Levels

George Wyth

- High Ankle Zone
- Decreased levels in knee and chest zone

Backbone

- High everywhere at beach, especially in chest zone

Summary

- Analyzing many characteristics of a watershed help to determine the sources of bacteria
- Intensive watershed investigation is one tool used to identify the source of bacteria
- Other experimental source tracking tools are being used at Iowa's beaches (DNA ribotyping, Antibiotic resistance analysis)

Acknowledgements

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Extra Slides

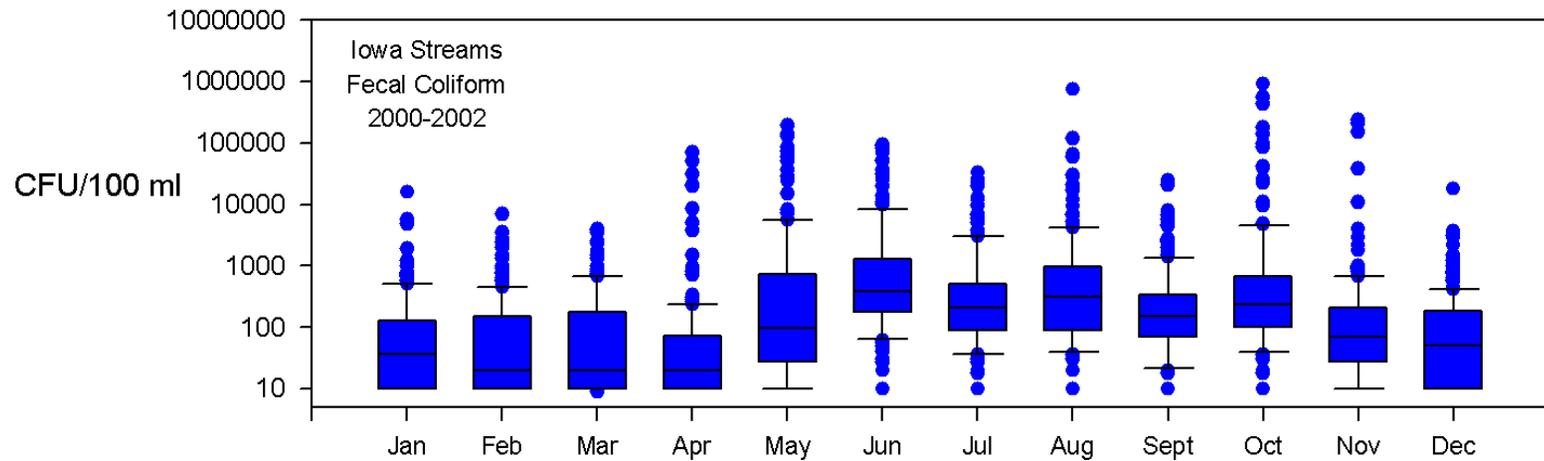
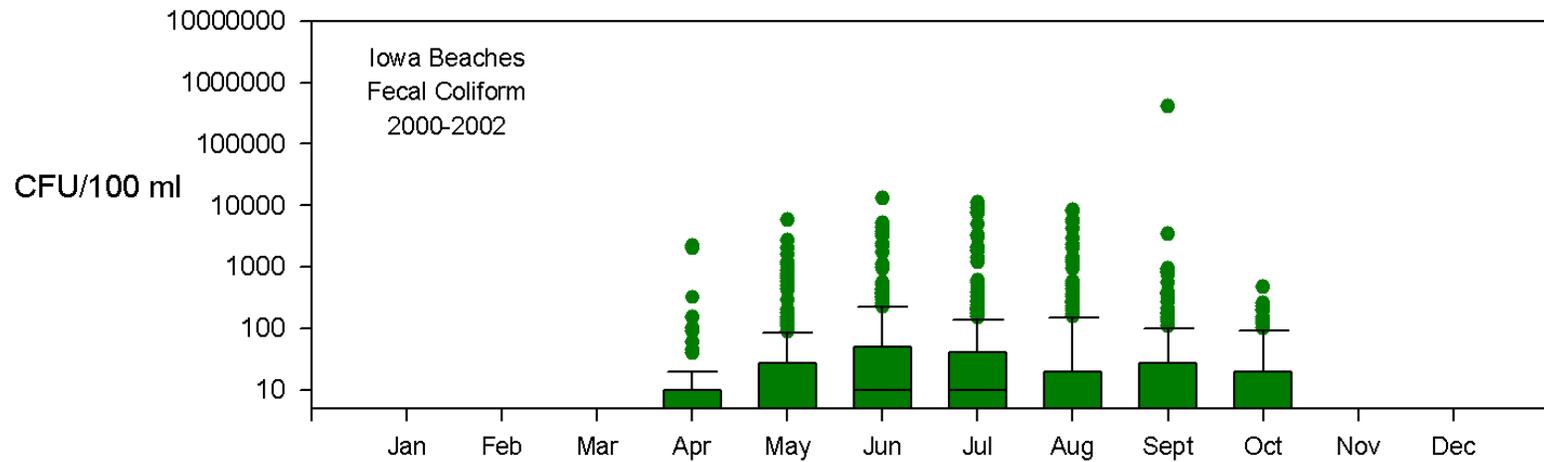
How to prevent pathogens from entering water

- Use toilet facilities whenever possible
- Keep clean diapers on children
- Do not swim if you have diarrhea
- If you have a septic system, make sure it is working properly
- Install buffers and fences to keep livestock out of creeks

To minimize your risk of becoming ill while swimming

- Avoid swimming after heavy rainfalls
- Avoid swallowing the water
- Shower/wash hands after swimming

Iowa Data



Status of State-Owned Beaches

