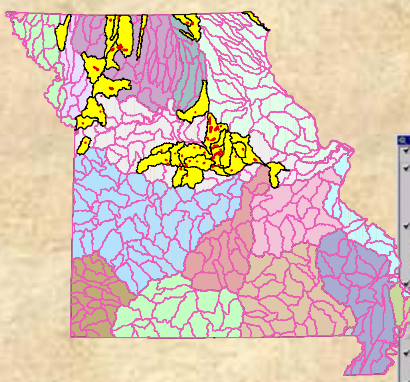
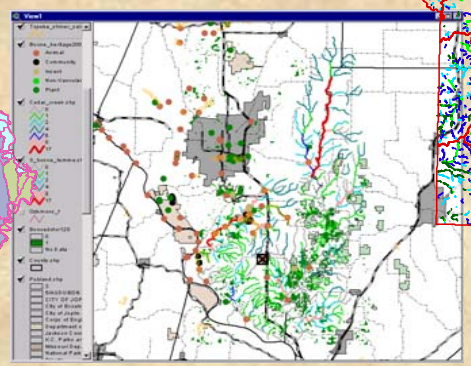
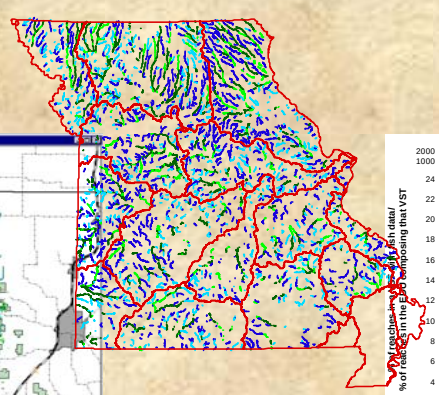
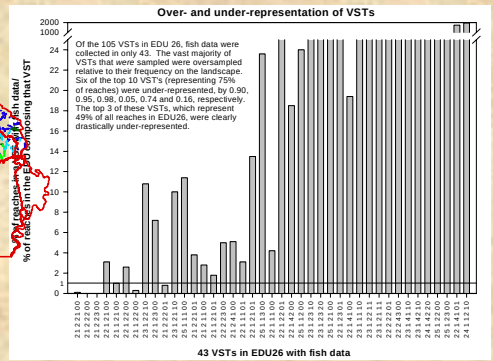
Some Real-World Examples Showcasing the Diverse Utility of Aquatic GAP Data









Scott P. Sowa, Gust Annis, Michael E. Morey, and David D. Diamond

Missouri Resource Assessment Partnership

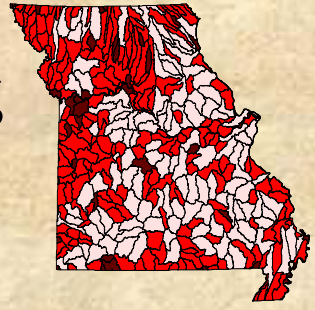
4200 New Haven Road

Columbia, Missouri 65201

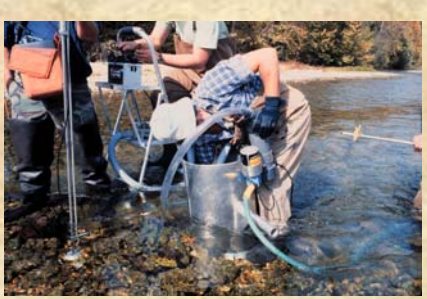
http://www.cerc.usgs.gov/morap

Examples Covered

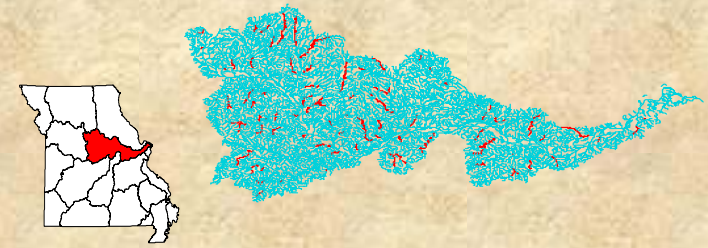
- Identifying data gaps and assessing biases in statewide survey data



- Developing a statewide sampling design for long-term biomonitoring



- Prioritizing stream segments for locating undocumented populations of endangered species



- Identifying potential outflows for a newly proposed wastewater treatment facility

Assessing Gaps in Statewide Survey Data To Prioritize Future Sampling Efforts

Problem/Need:

Biases of existing survey data are limiting our understanding of the biophysical character of many stream ecosystems in Missouri

Objective:

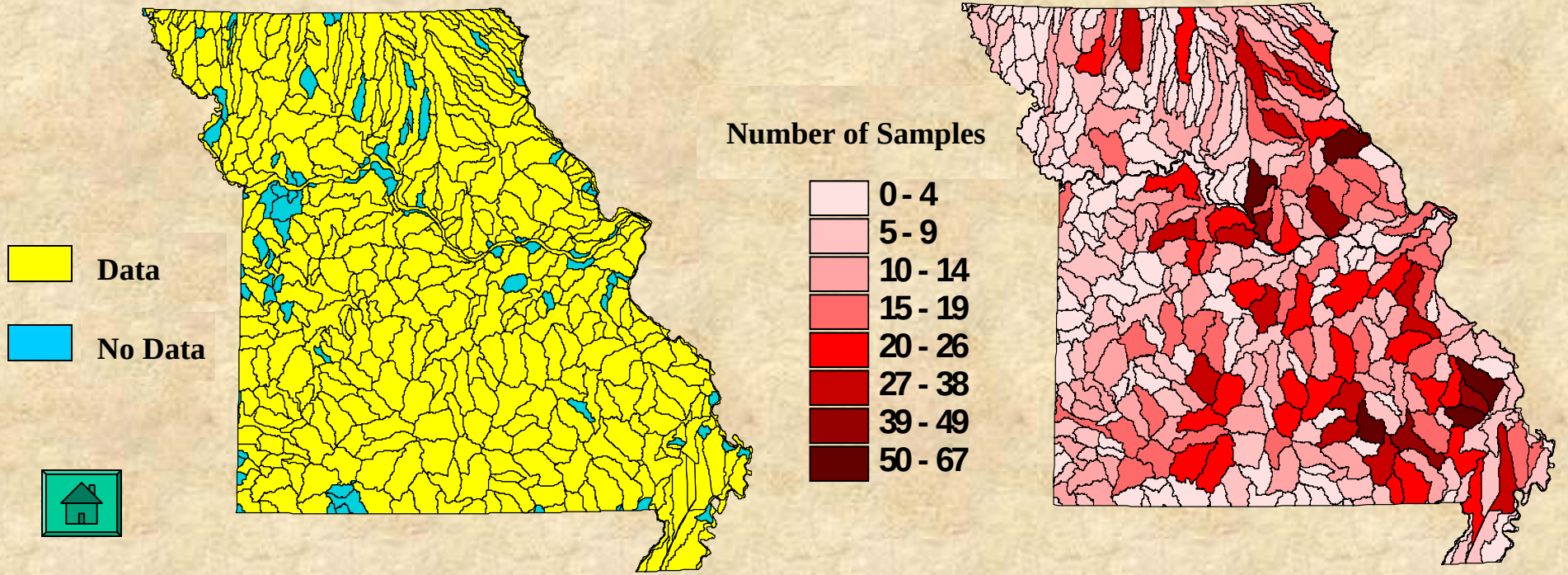
Quantify sampling biases to identify watersheds and valley segment types lacking sufficient biological data and prioritize future biological surveys

Stream Reaches with Community Fish Data

MoRAP

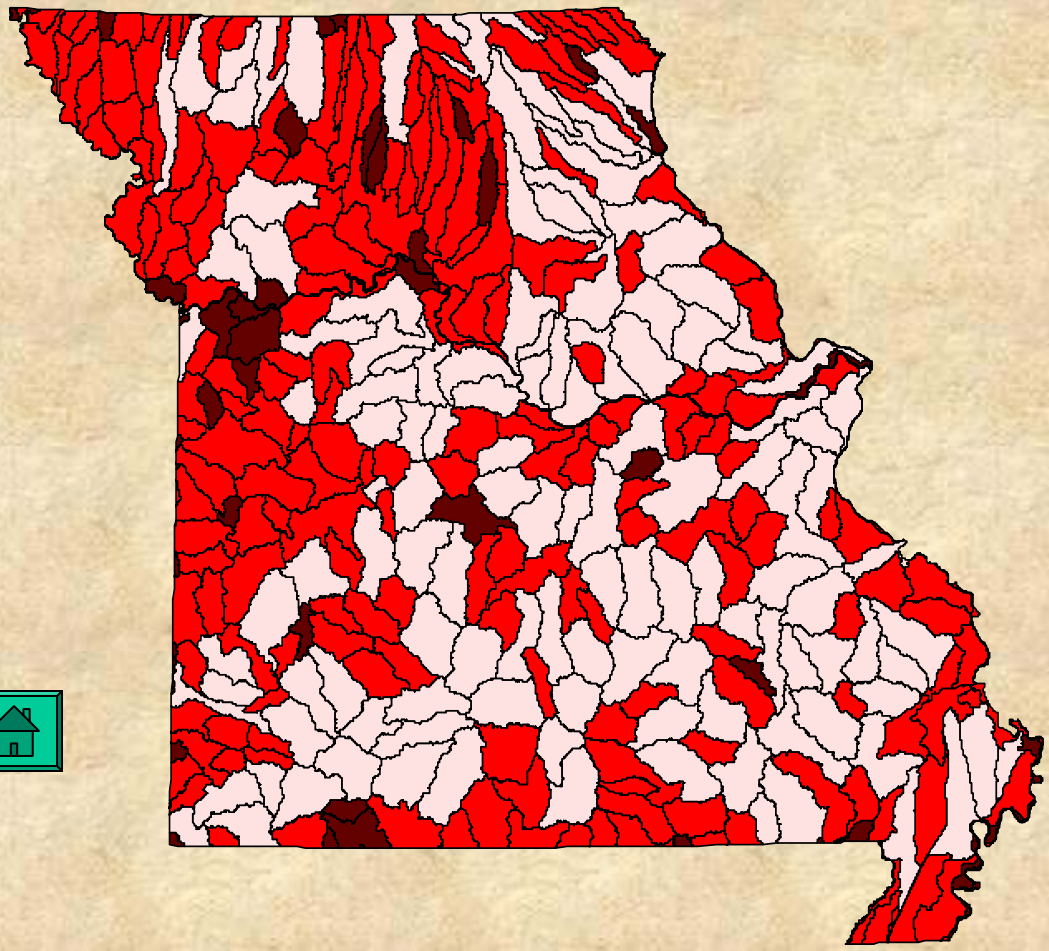
GAP
National Gap Analysis Program

Steps 1&2: Identify Data Gaps and Assess Sampling Biases By Watershed



Community Fish Sampling Data

Priority Watersheds
For Future Fish Survey Efforts



Number of Samples

- **0**
- **1 - 10**
- **11 - 67**

Community Fish Sampling Data

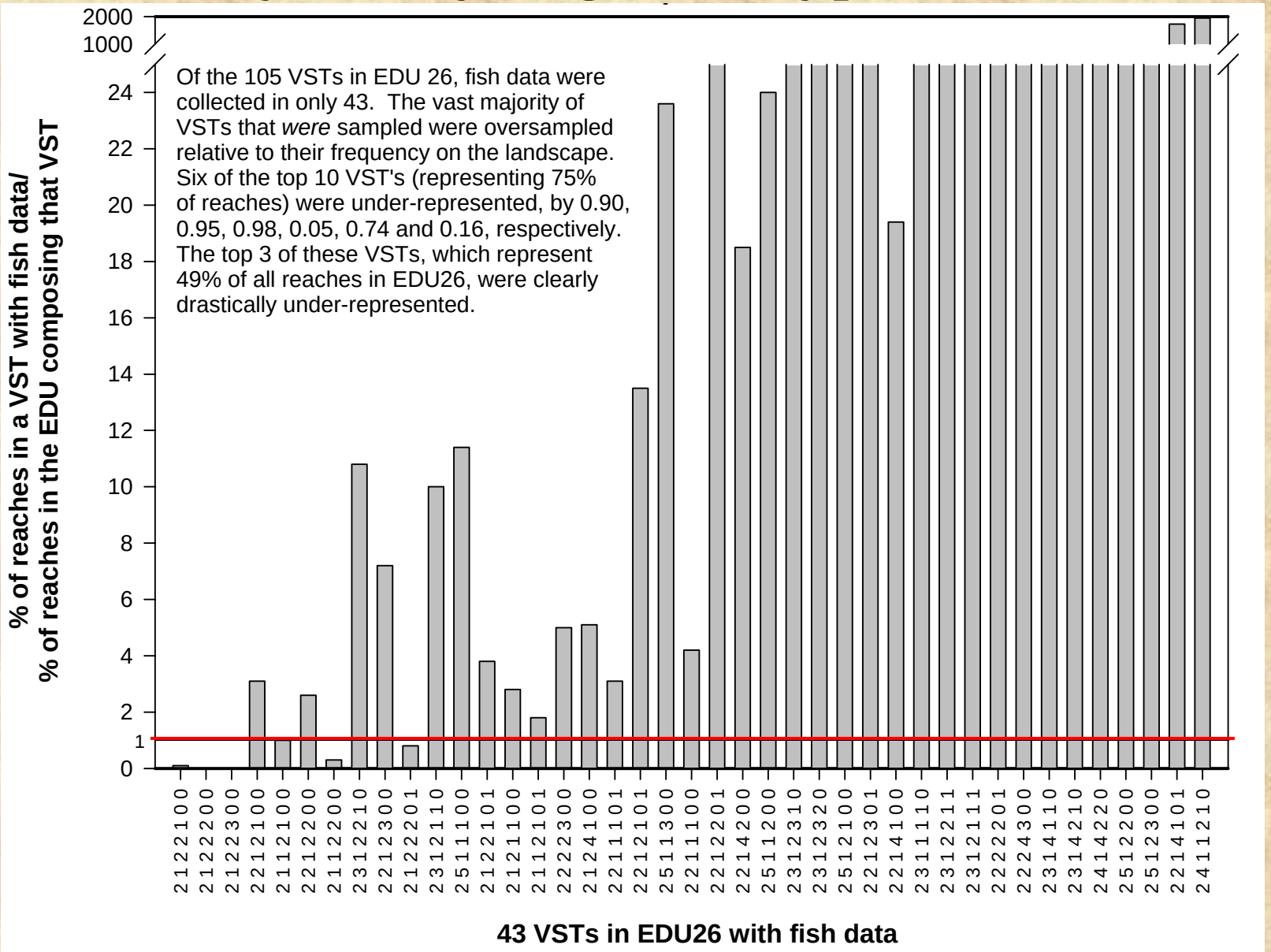
Step 3: Identify Data Gaps By Valley Segment Type

105 Total
Valley Segment Types

403 Total Collections
From 43 Different VST's

Community Fish Sampling Data

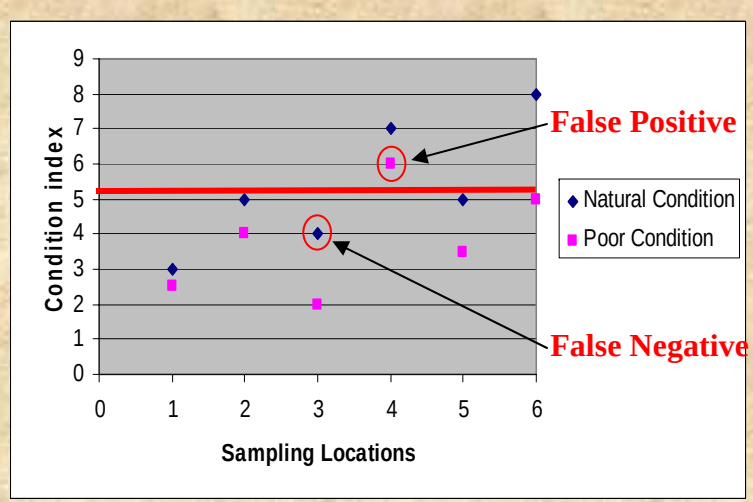
Step 4: Asses Sampling Biases By Valley Segment Type



Developing a Statewide Sampling Design For Long-term Biomonitoring

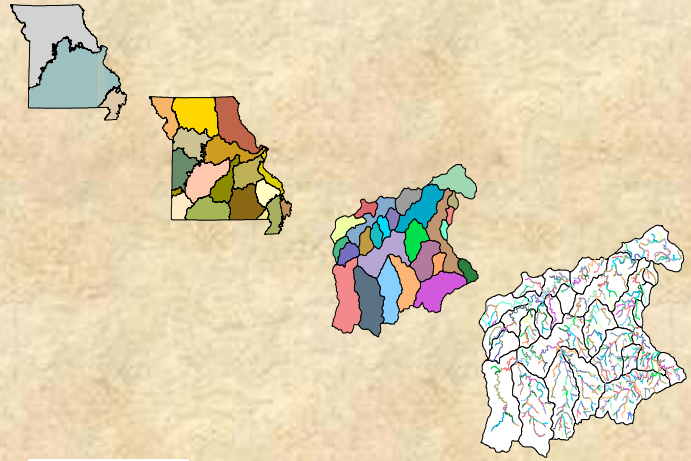
Problem/Need:

A major obstacle to effective biomonitoring is failure to account for natural variation among sampling locations



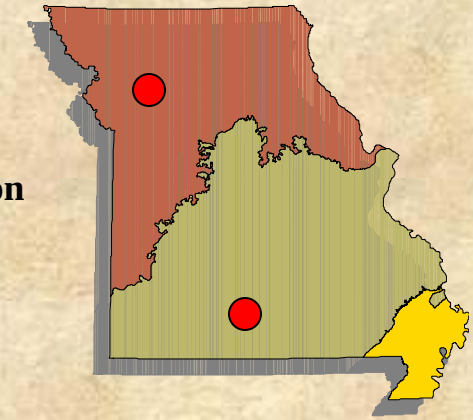
Objective:

Use MoRAP Stream Classification System to account for natural variation among monitoring sites and develop a stratified sampling population of stream segments

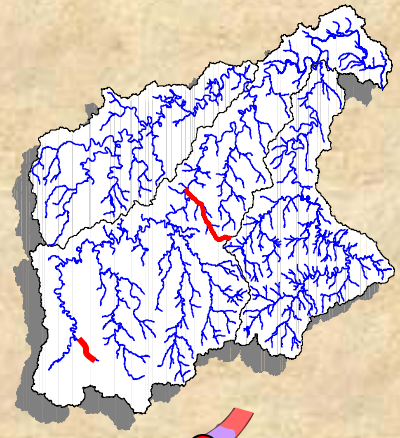


Typical Levels of Stratification

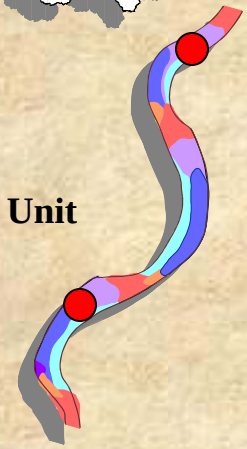
Region

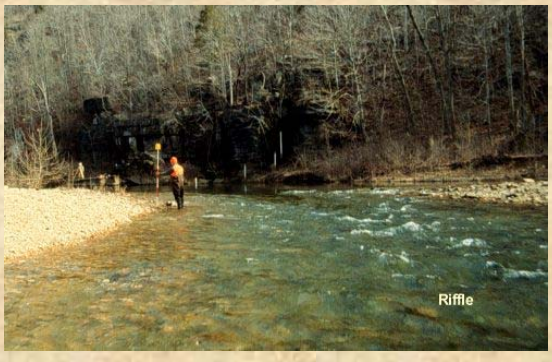


Stream Size



Habitat Unit

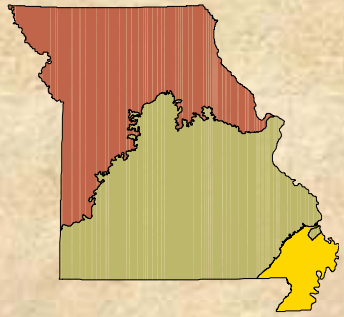




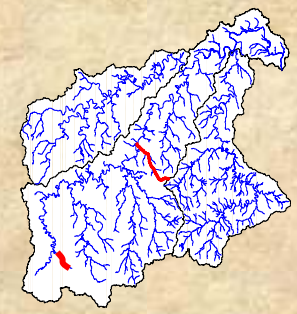
Improving Biomonitoring
By Accounting For More Natural Variation

Existing Strata

Bailey's Physiographic Provinces



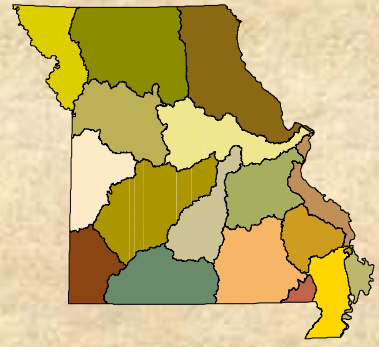
Wadeable Streams



Habitat Unit

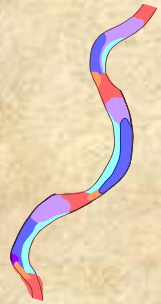
Proposed Strata

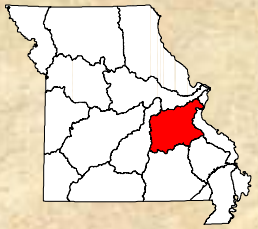
Ecological Drainage Units



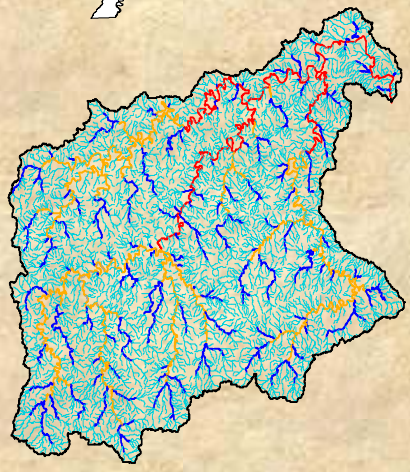
Most Common Creek and Small River VST's by EDU

Habitat Unit

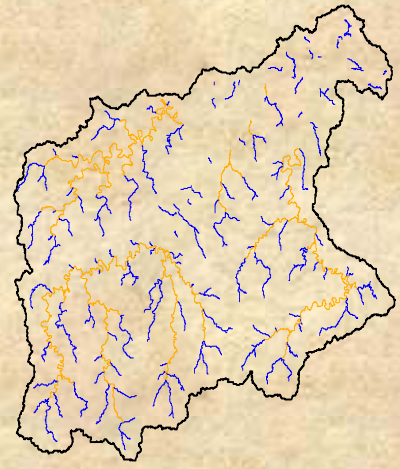




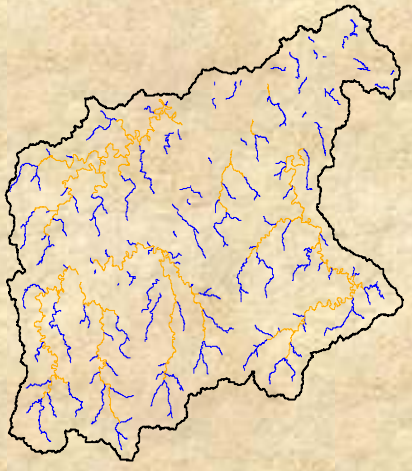
Step 1: Eliminate Valley Segment Types That Will Not Be Monitored



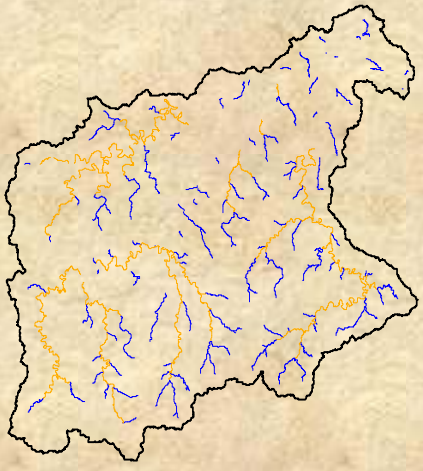
Full Network



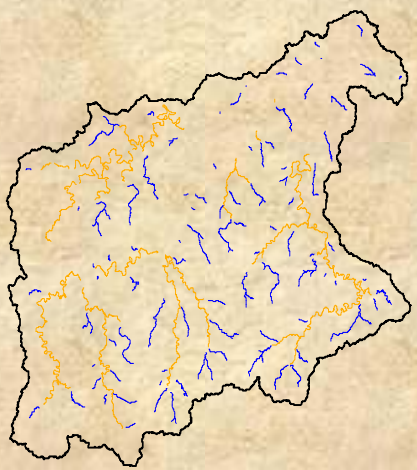
Headwater or Large River VST's Removed



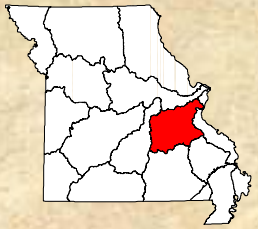
Coldwater VST's Removed



Intermittent VST's Removed



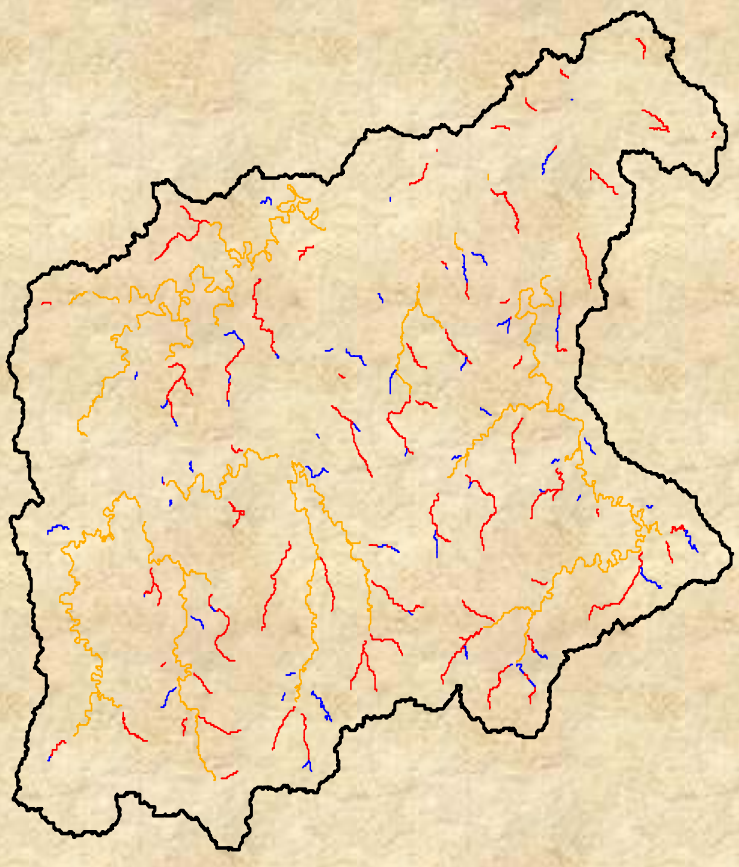
VST's with Size Discrepancy Removed



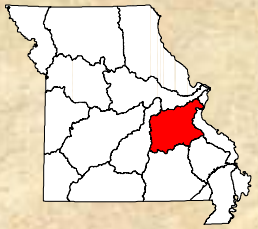
Step 2: Identify Most "Characteristic" Valley Segment Types By EDU

sum8.dbf

Max_vs_typ	Count
22121002	244
22122002	225
22123002	76
22141002	41
22142002	19
22221002	3
22132002	3
22143002	2
22221001	1
22222002	1
22241002	1
22123001	1

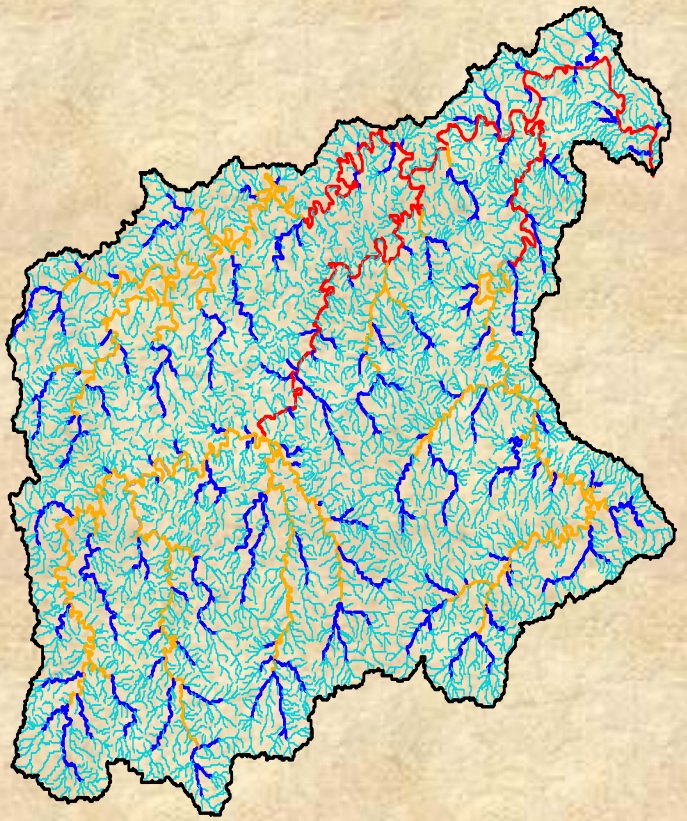


Most Common Creek VST's within Ozark/Meramec EDU



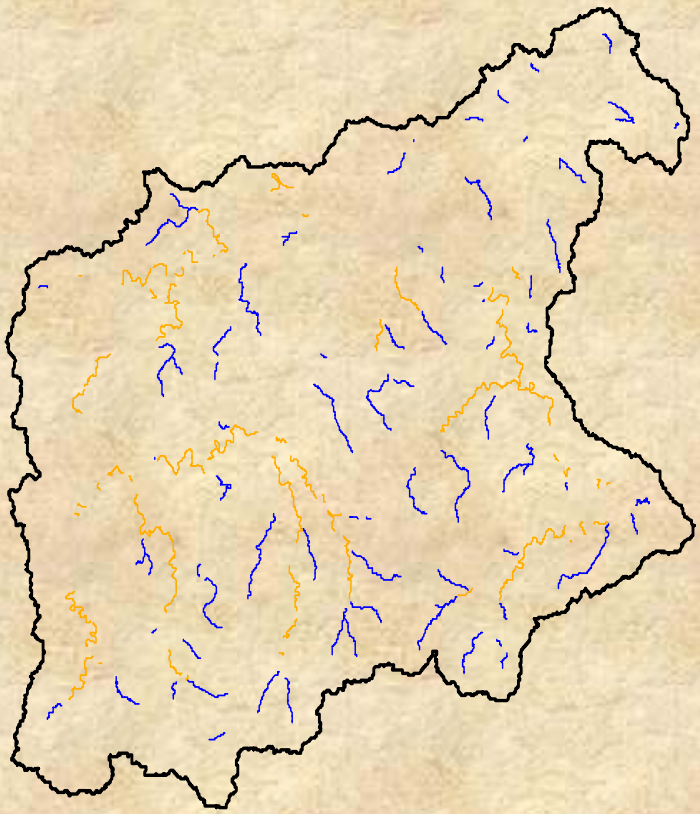
Step 3: Develop Spatially Explicit Map of Potential Monitoring Sites

Full Network



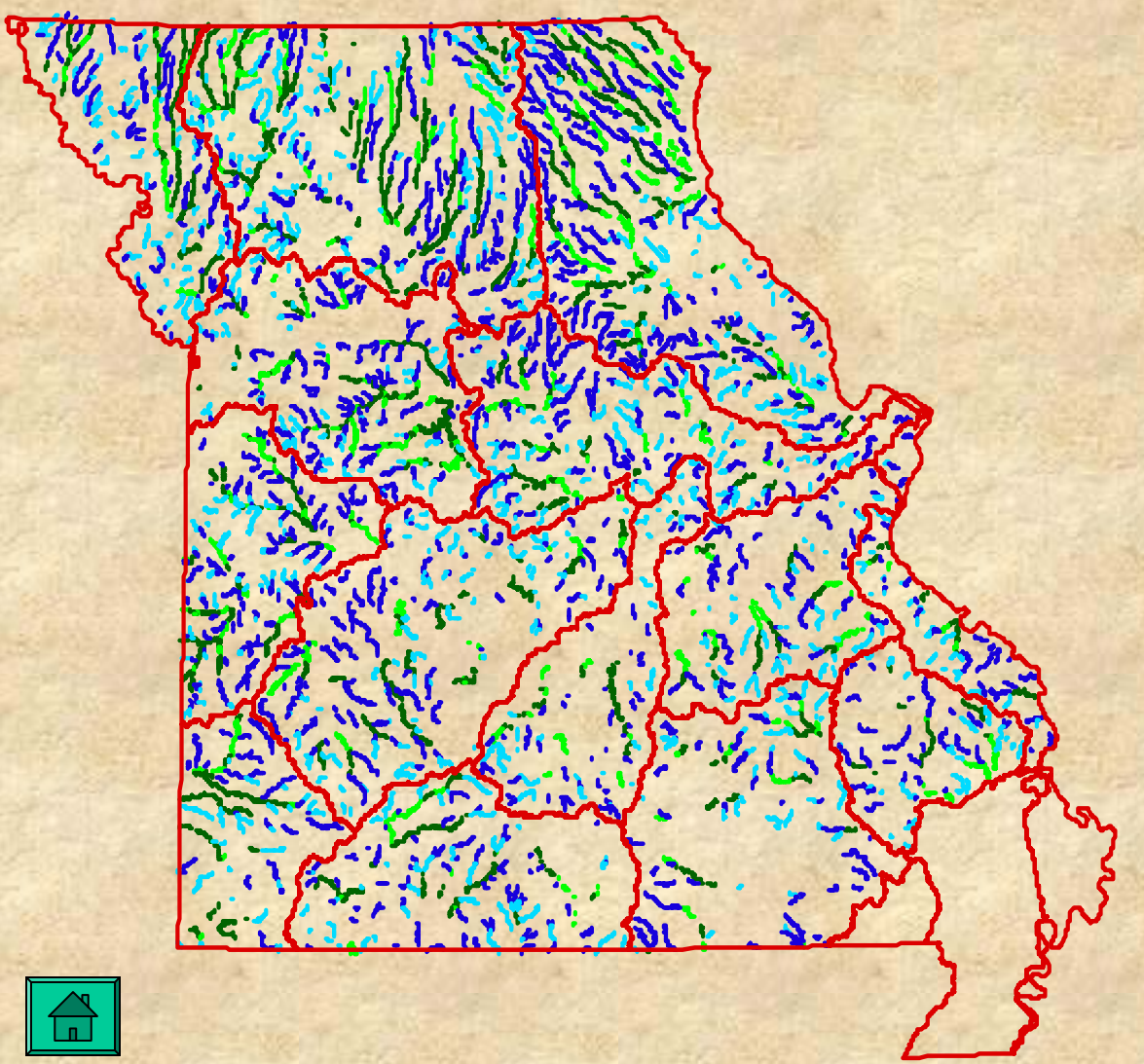
6,637 miles

Potential Monitoring Sites



550 miles

End Result: Statewide Population of Stream Segments Used For Random Site Selection



Creek

- Most common
- Second most common

Small River

- Most common
- Second most common

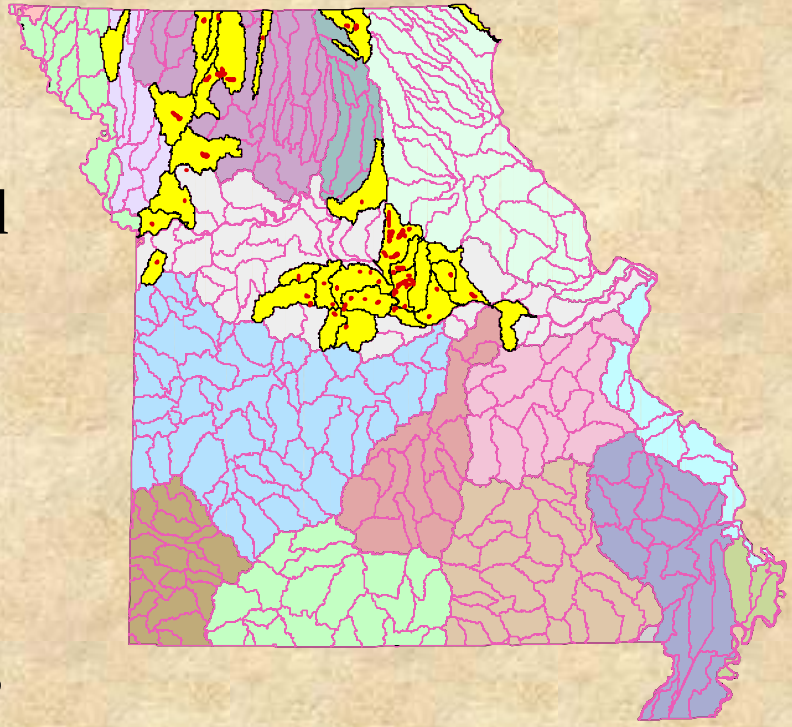
Prioritizing Stream Segments for Locating Undocumented Populations of Topeka Shiners

Problem/Need:

Randomly sampling streams has proved to be inefficient and ineffective

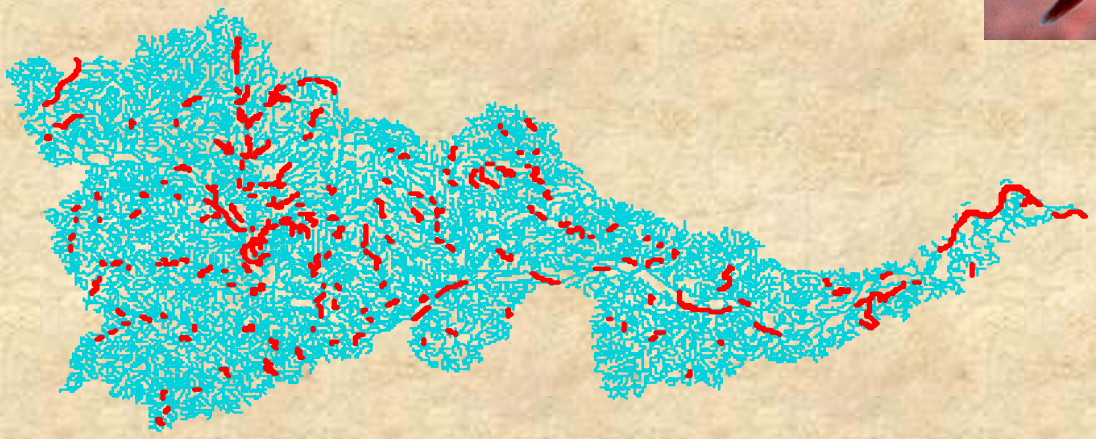
Objective:

Identify watersheds and valley segments where management biologists should focus sampling efforts

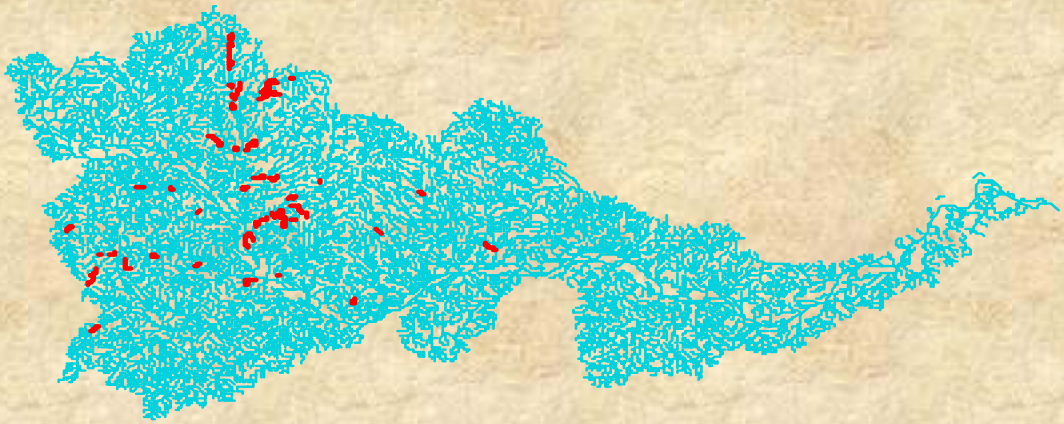


Watersheds harboring Topeka shiners

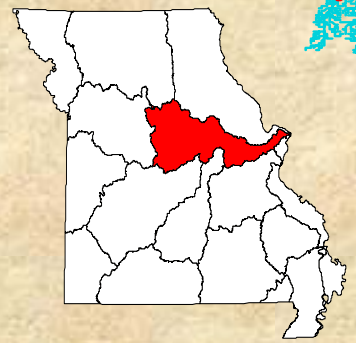
Step 1: Isolating Samples With Topeka Shiners



403 Total
Fish Collections



52 Collections with
Topeka shiners



Step 2: Isolating Specific Valley Segment Types Where Topeka shiners Have Been Collected

105 Total Valley Segment Types

Topeka shiners found in 17

Microsoft Excel - topeka_sum.dbf

File Edit View Insert Format Tools Data Window Help

Arial 10

C21 =

	A	B
1	MAX_VS_TYP	COUNT
2	22121002	17
3	22123002	8
4	22122002	6
5	21221002	4
6	21221012	2
7	21222012	2
8	21223012	2
9	23121202	2
10	21121002	1
11	21121012	1
12	21211012	1
13	21221001	1
14	21222021	1
15	21223002	1
16	22121042	1
17	22122042	1
18	23123302	1
19		

topeka_sum

NUM

Step 3: Using GIS To Map Stream Segments Likely to Harbor Topeka Shiner Populations

Microsoft Excel - topeka_sum.dbf

File Edit View Insert Format Tools Data Window Help

Arial 10

C21 =

	A	B
1	MAX_VS_TYP	COUNT
2	22121002	17
3	22123002	8
4	22122002	6
5	21221002	4
6	21221012	2
7	21222012	2
8	21223012	2
9	23121202	2
10	21121002	1
11	21121012	1
12	21211012	1
13	21221001	1
14	21222021	1
15	21223002	1
16	22121042	1
17	22122042	1
18	23123302	1
19		

topeka_sum

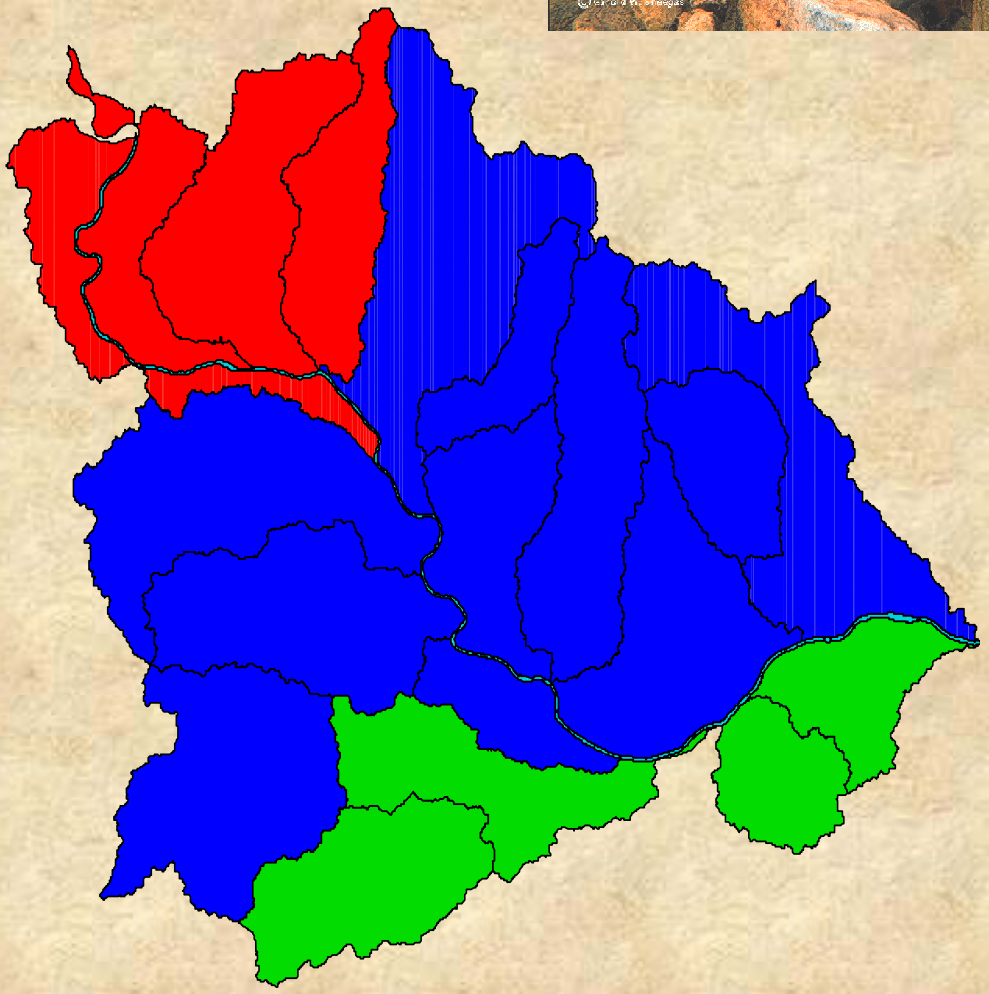
NUM

Step 4: Prioritizing Watersheds

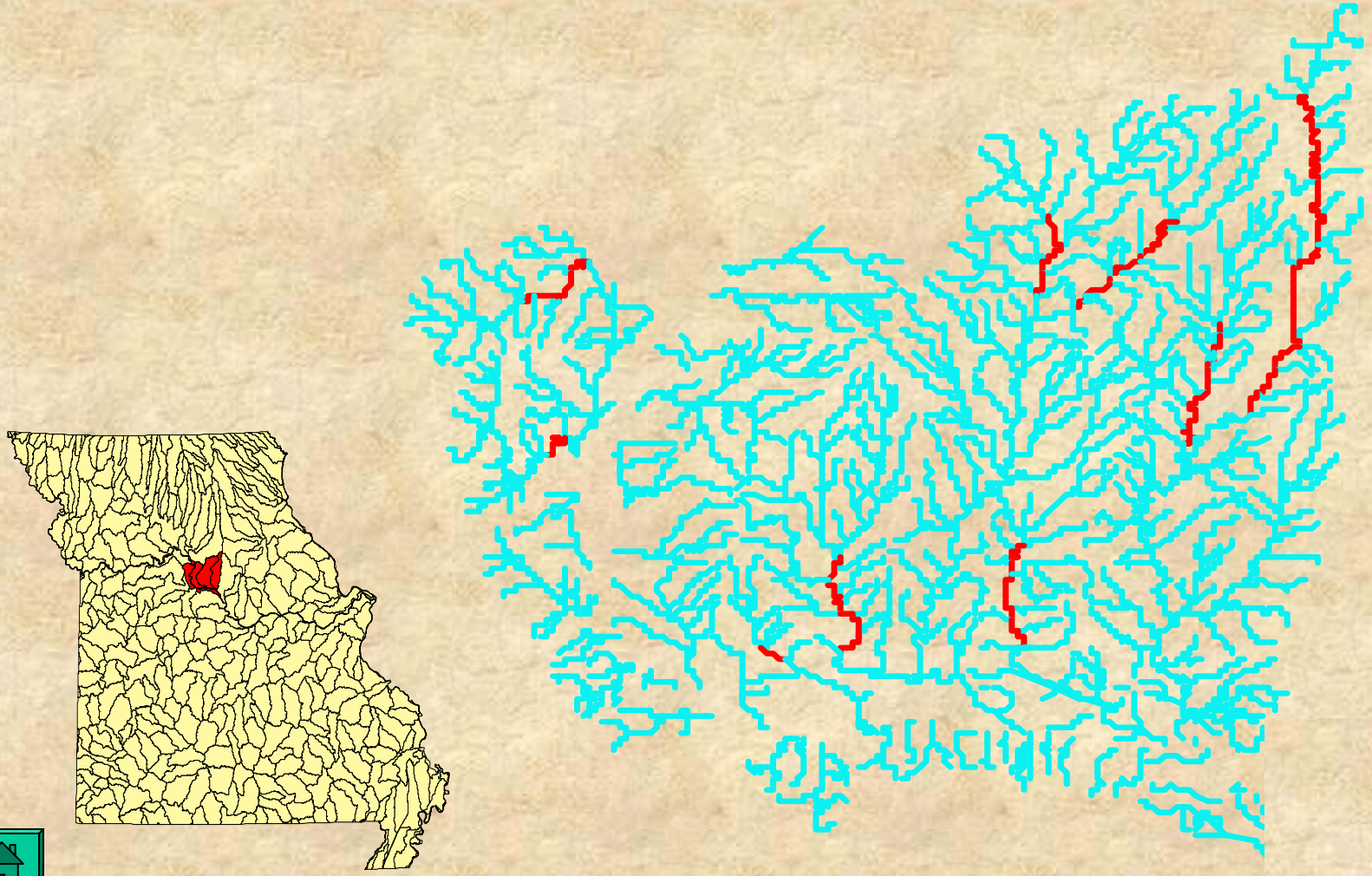
Suitable habitat sampled: Yes
Known populations: Yes

Suitable habitat sampled: Yes
Known populations: No

Suitable habitat sampled: No
Known populations: No



End Result: Priority Stream Segments Within Priority Watersheds



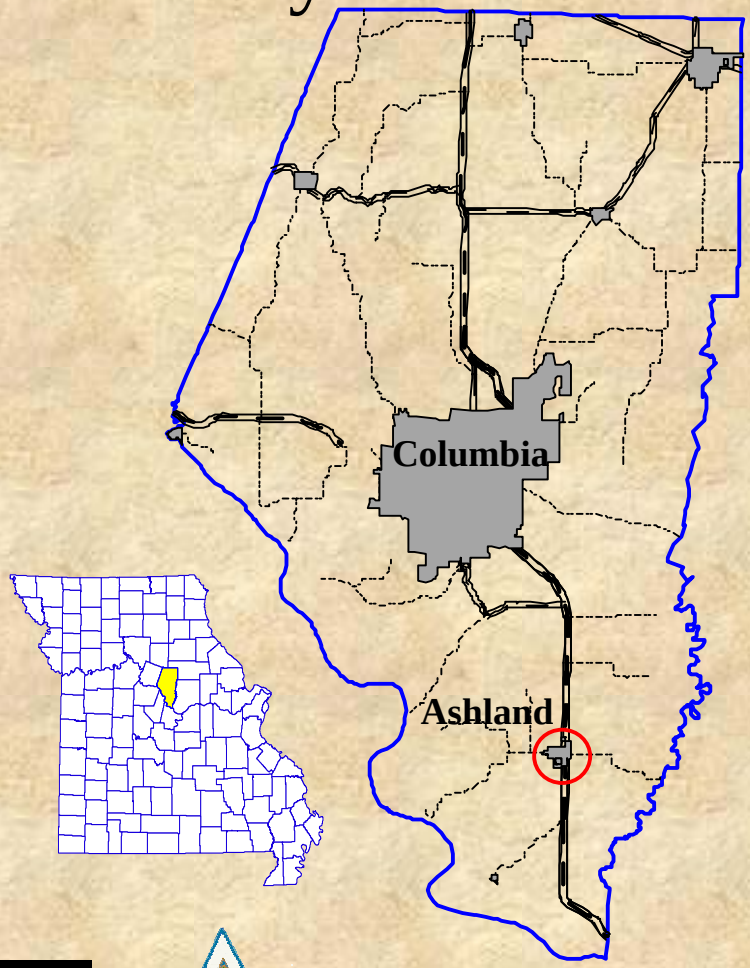
A Decision Support System To Identify Potential Outflows for a Municipal Wastewater Treatment Facility

Problem/Need:

City of Ashland must increase capacity of existing wastewater treatment facility

Objective:

Identify potential outflows for a new treatment facility that meet mandatory criteria and preferred conditions



Mandatory Criteria and Preferred Conditions

Mandatory Criteria

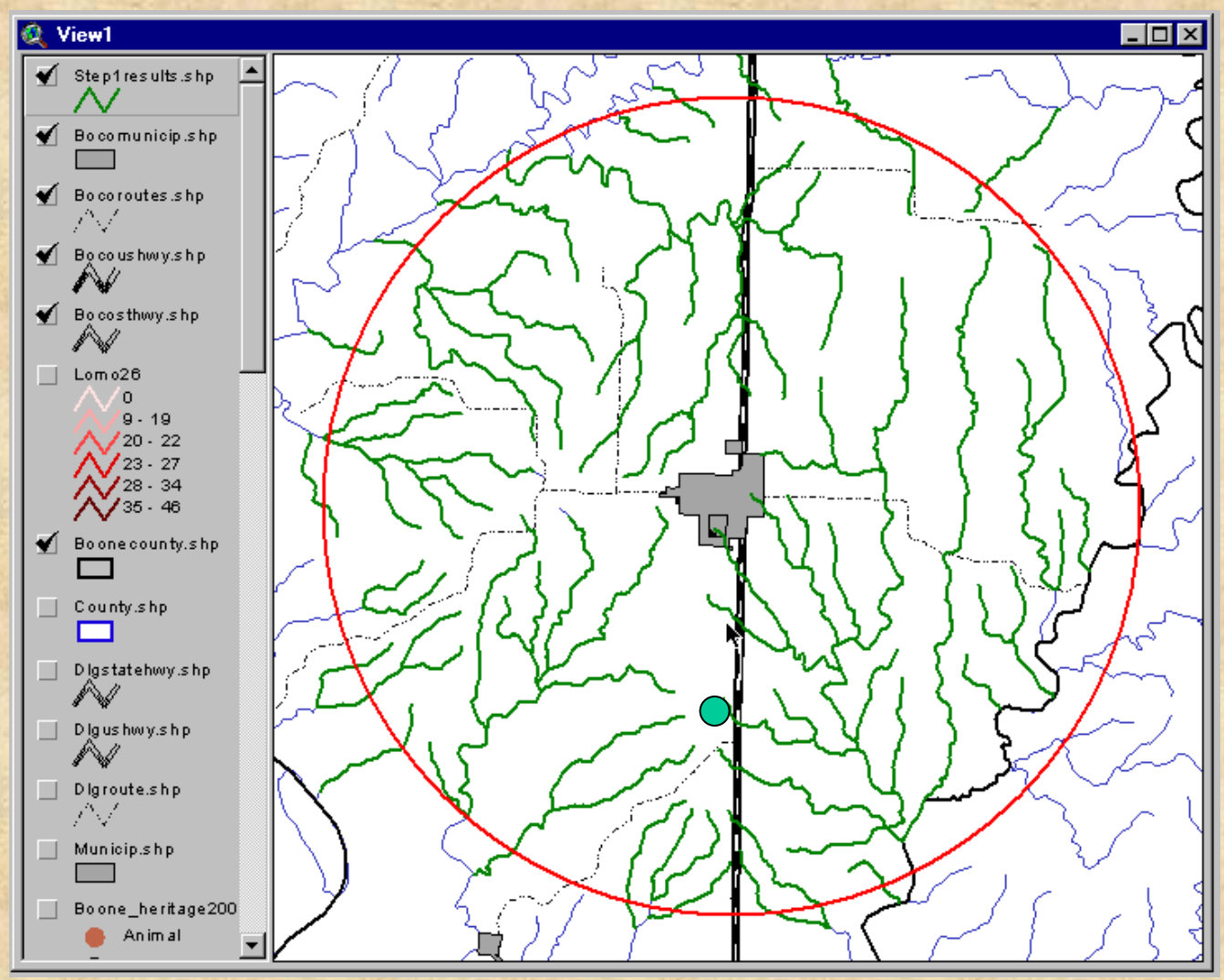
- Located within 5 miles of Ashland
- Located within Boone County
- Located on relatively flat terrain
- Located on private land
- Cannot be located on land harboring endangered species
- Cannot discharge into stream harboring endangered species
- Cannot discharge into Bonne Femme watershed
- Cannot discharge into a losing stream

Preferred Conditions

- Construction would not disturb core forest habitat
- Would not discharge into stream flowing through public land
- Would not discharge into stream likely to harbor endangered species
- Would not discharge into stream with relatively high biodiversity
- Discharge should reach Missouri River in shortest distance possible
- Existing road access to construction site

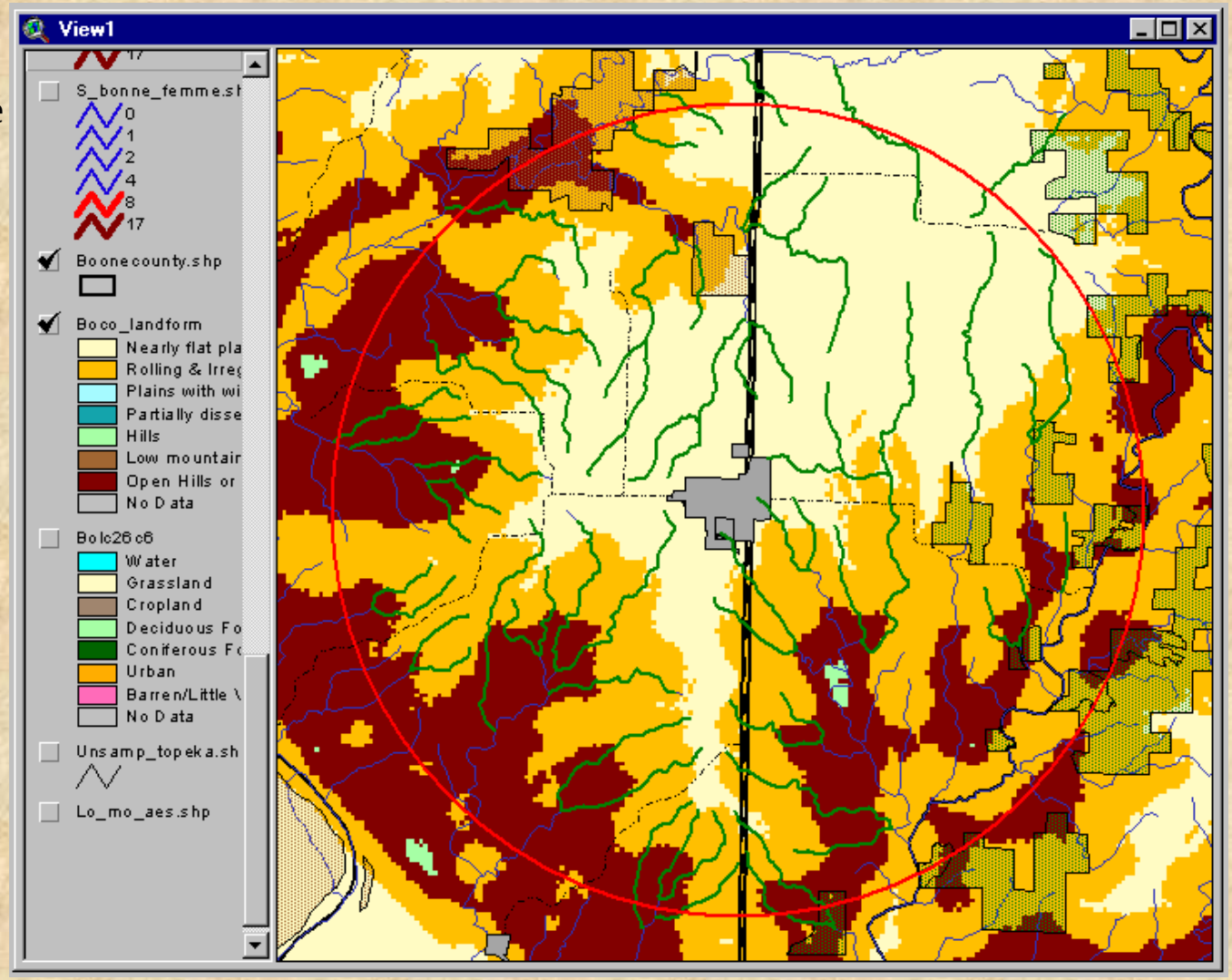
Mandatory Criteria
Step 1

- **Located within 5 miles of Ashland**
- **Located within Boone County**
- **Located on relatively flat terrain**
- **Located on private land**
- **Cannot be located on land harboring endangered species**
- **Cannot discharge into stream harboring endangered species**
- **Cannot discharge into Bonne Femme basin**
- **Cannot discharge into a losing stream**



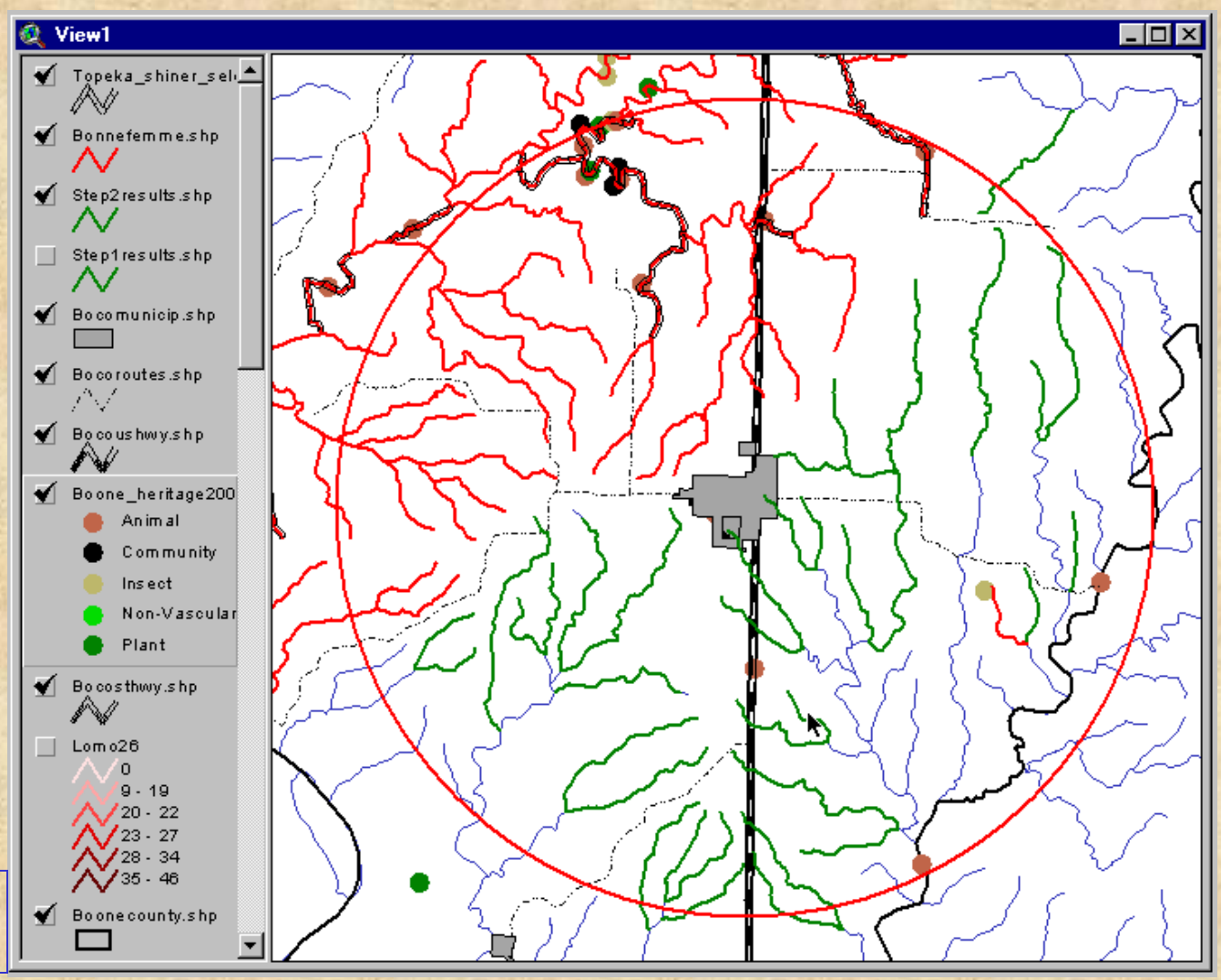
Mandatory Criteria
Step 2

- **Located within 5 miles of Ashland**
- **Located within Boone County**
- **Located on relatively flat terrain**
- **Located on private land**
- **Cannot be located on land harboring endangered species**
- **Cannot discharge into stream harboring endangered species**
- **Cannot discharge into Bonne Femme basin**
- **Cannot discharge into a losing stream**



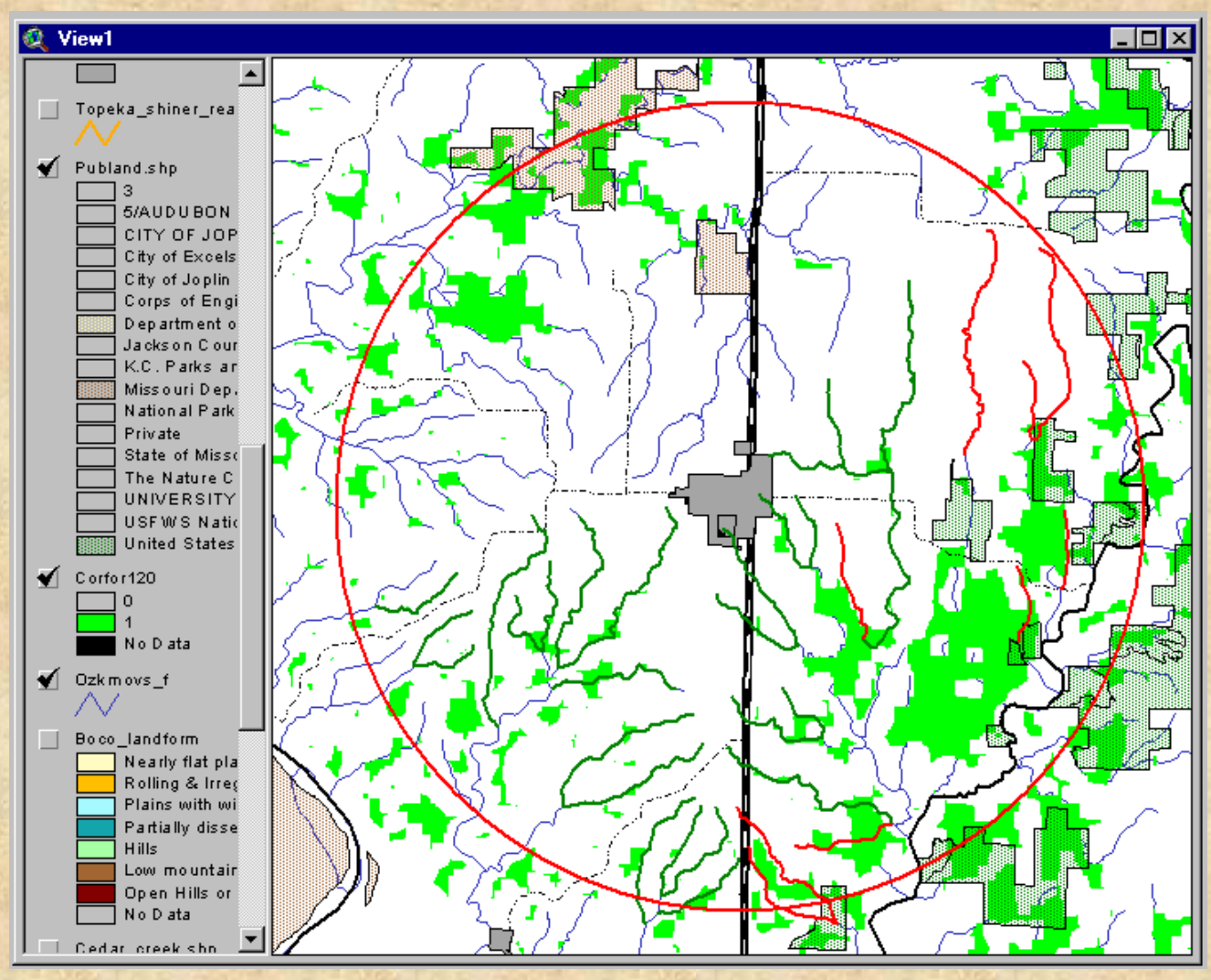
Mandatory Criteria
Step 3

- **Located within 5 miles of Ashland**
- **Located within Boone County**
- **Located on relatively flat terrain**
- **Located on private land**
- **Cannot be located on land harboring endangered species**
- **Cannot discharge into stream harboring endangered species**
- **Cannot discharge into Bonne Femme basin**
- **Cannot discharge into a losing stream**



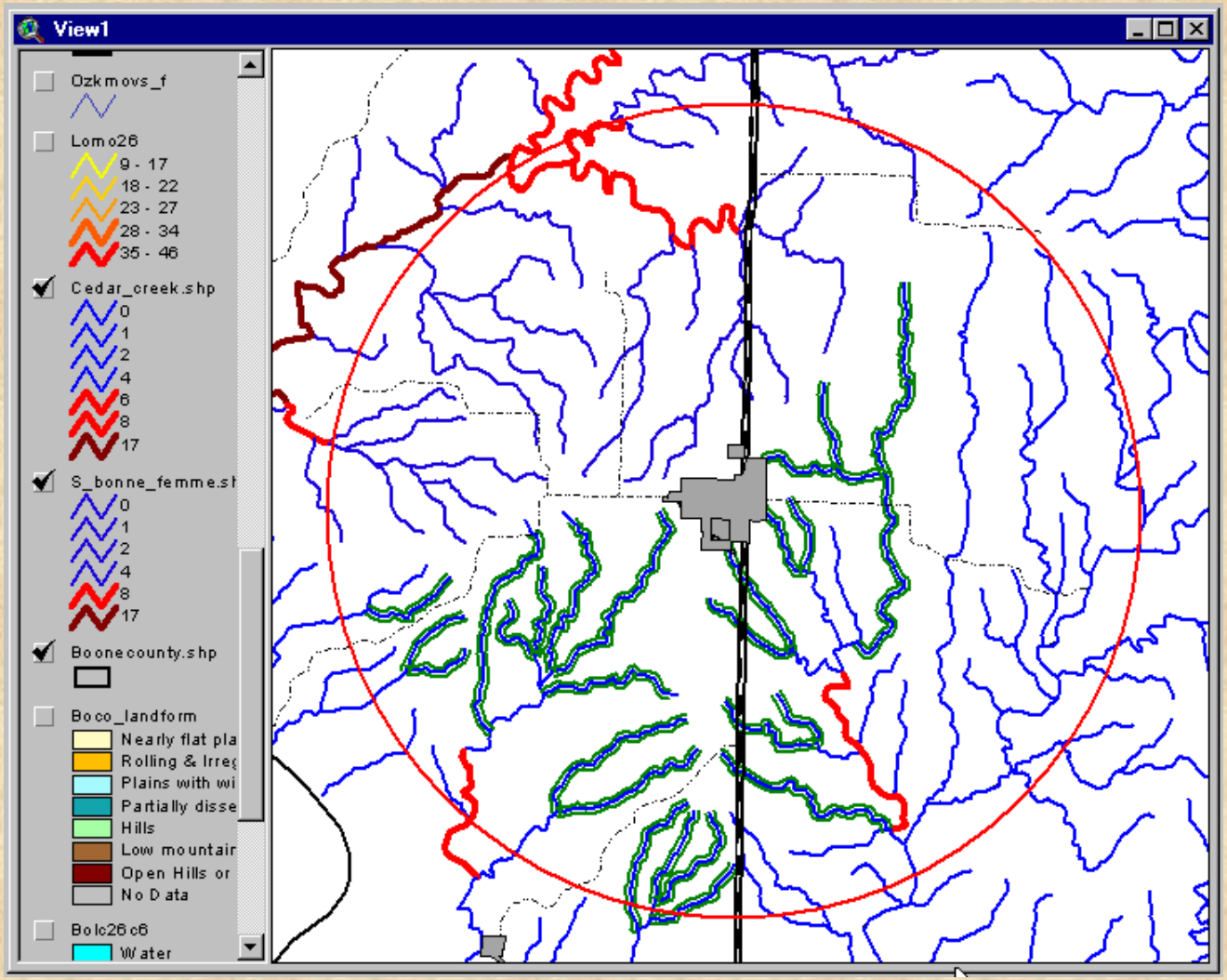
Preferred Conditions
Step 4

- **Construction would not disturb core forest**
- **Avoid discharging into stream flowing into public land**
- **Avoid discharging into stream likely to harbor endangered species**
- **Avoid discharging into stream with relatively high biodiversity**
- **Discharge reach MO River in relatively short distance**
- **Existing Access to construction site**



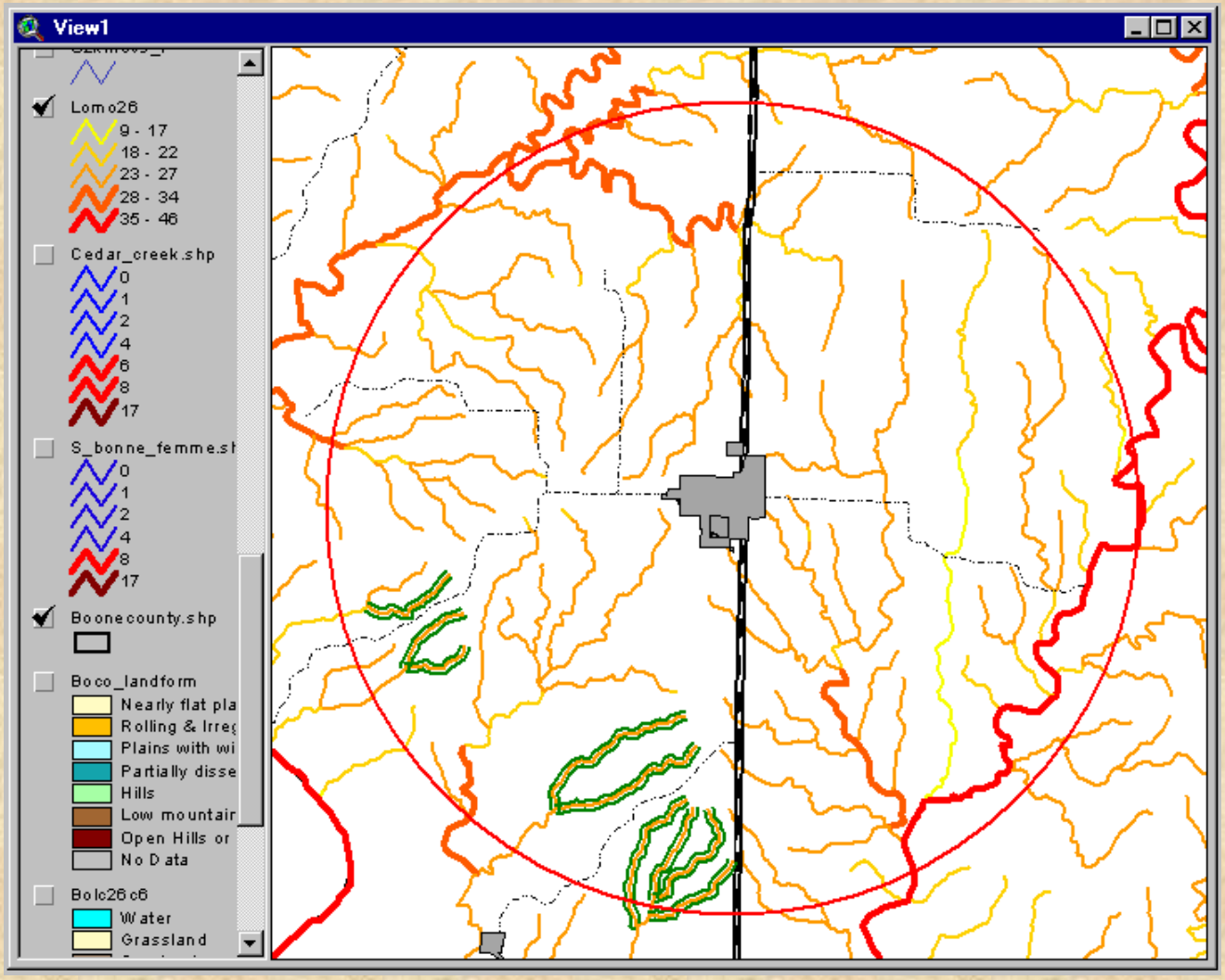
Preferred Conditions
Step 5

- **Construction would not disturb core forest**
- **Avoid discharging into stream flowing into public land**
- **Avoid discharging into stream likely to harbor endangered species**
- **Avoid discharging into stream with relatively high biodiversity**
- **Discharge reach MO River in relatively short distance**
- **Existing Access to construction site**



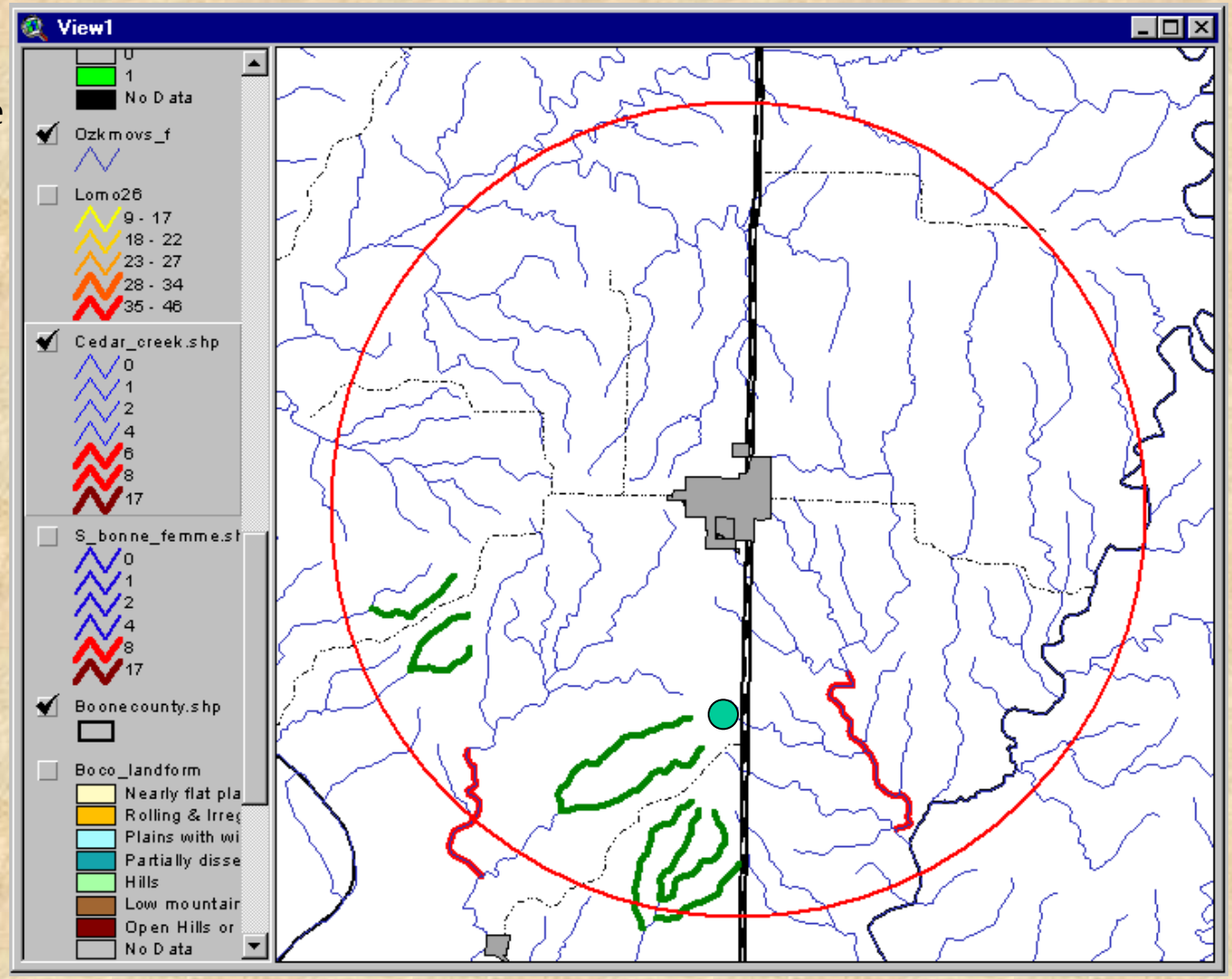
Preferred Conditions
Step 6

- **Construction would not disturb core forest**
- **Avoid discharging into stream flowing into public land**
- **Avoid discharging into stream likely to harbor endangered species**
- **Avoid discharging into stream with relatively high biodiversity**
- **Discharge reach MO River in relatively short distance**
- **Existing Access to construction site**



Mandatory Criteria
Final Step

- **Located within 5 miles of Ashland**
- **Located within Boone County**
- **Located on relatively flat terrain**
- **Located on private land**
- **Cannot be located on land harboring endangered species**
- **Cannot discharge into stream harboring endangered species**
- **Cannot discharge into Bonne Femme basin**
- **Cannot discharge into a losing stream**



Conclusions

- Geospatial data generated by an Aquatic GAP Project have wide application outside the original intent for which the data were generated

- Identifying and publicizing these “alternate” uses is invaluable for obtaining support

- Using Aquatic GAP Datalayers for identifying data gaps and improving future sampling efforts will enhance future conservation assessments and ultimately efforts to conserve aquatic biodiversity

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