

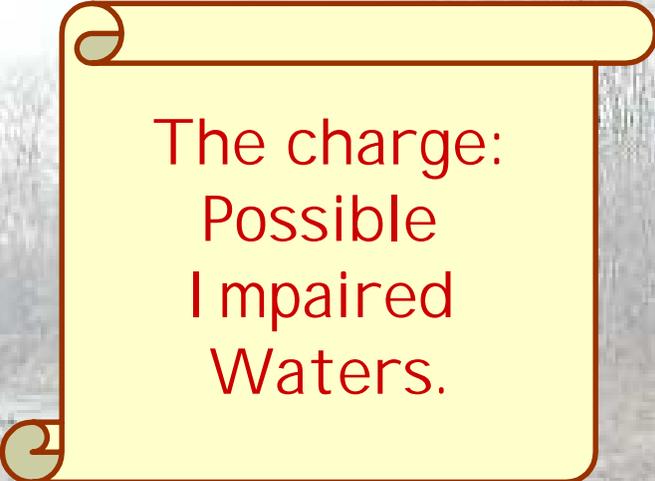
Sherlock Holmes & the Watershed

Or, How We
Discovered Our
Own Backyard

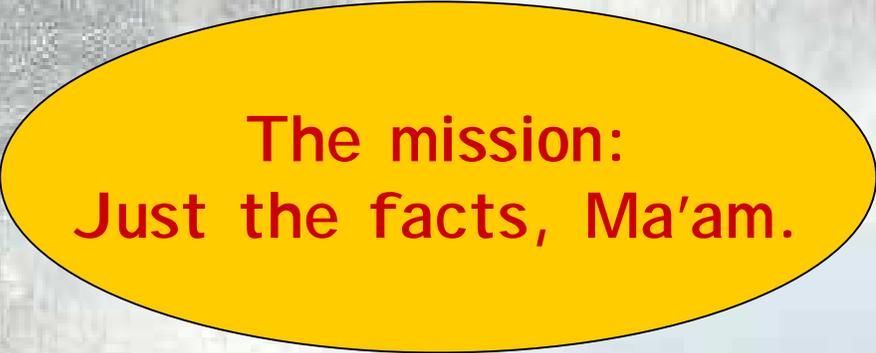




**The Case:
Find out what's
up in the
Orchard Creek
watershed.**



**The charge:
Possible
Impaired
Waters.**



**The mission:
Just the facts, Ma'am.**



Orchard Creek, Morgan County, IN

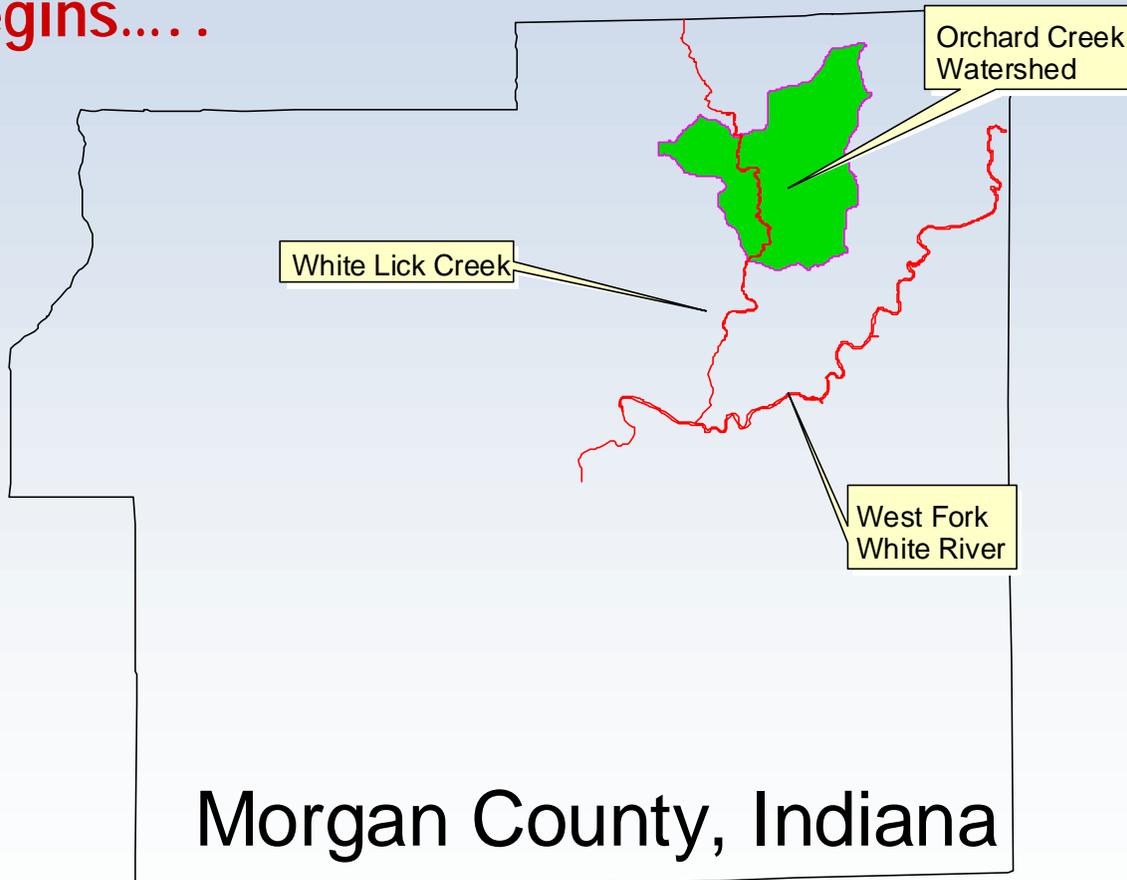
05120201-150-170

8548 Acres

13.36 square miles

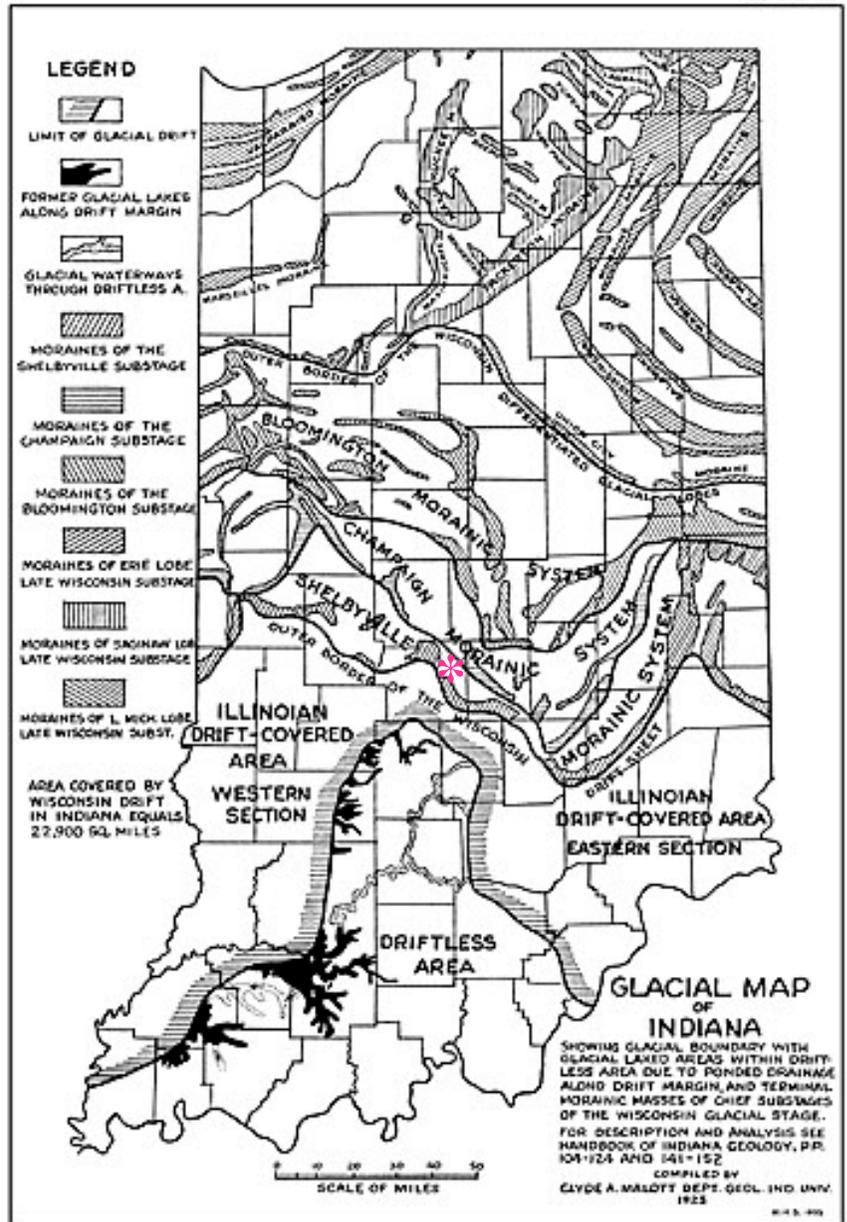
3.25% of the total county area

Where the sleuthing begins.....



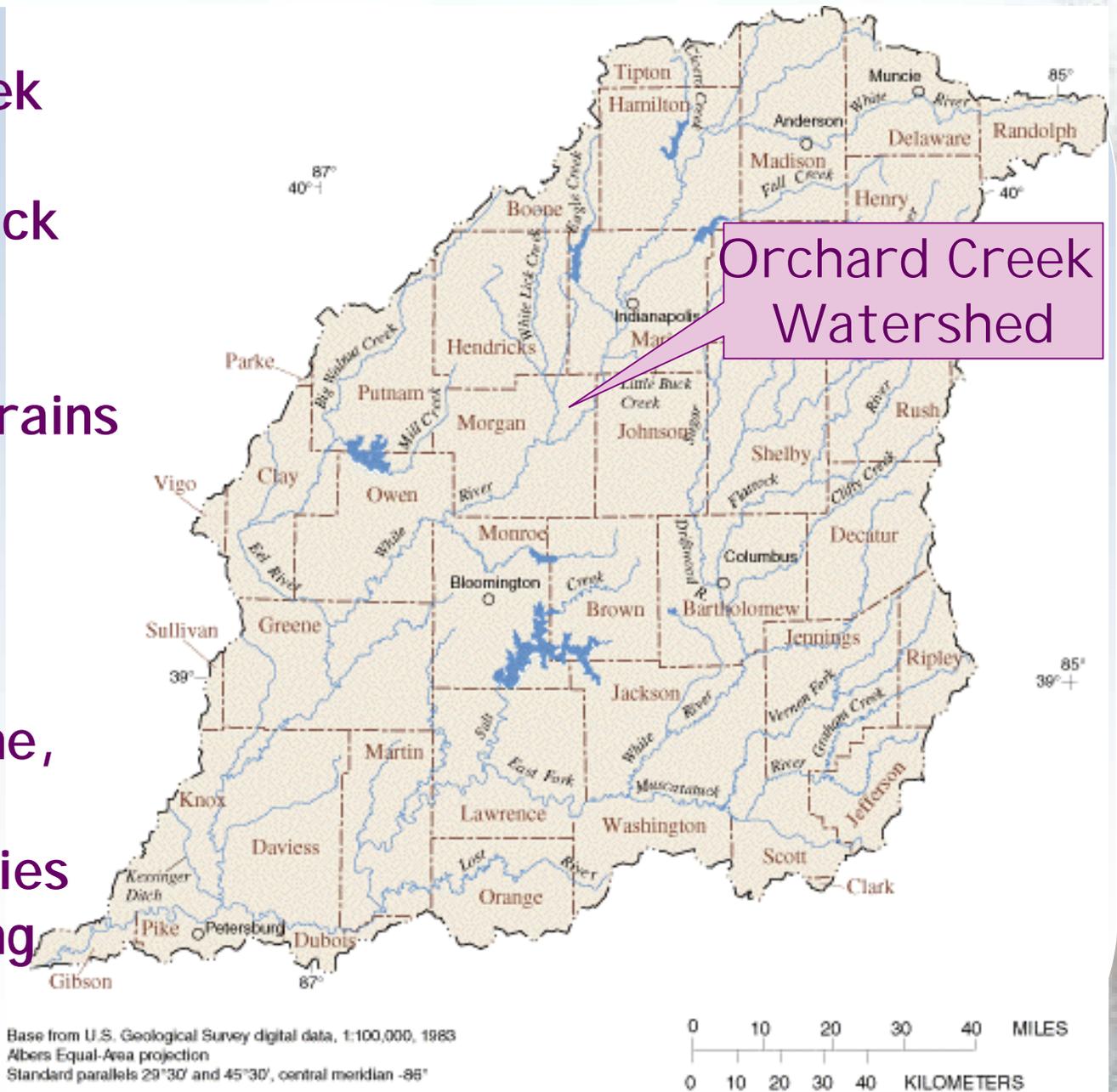
Terrain of our WS affected by Wisconsin glaciation (near edge of till plain & moraines) and by outwash from glacial melt waters.

My yard has the boulders to prove it!



Orchard Creek drains into White Lick Creek.

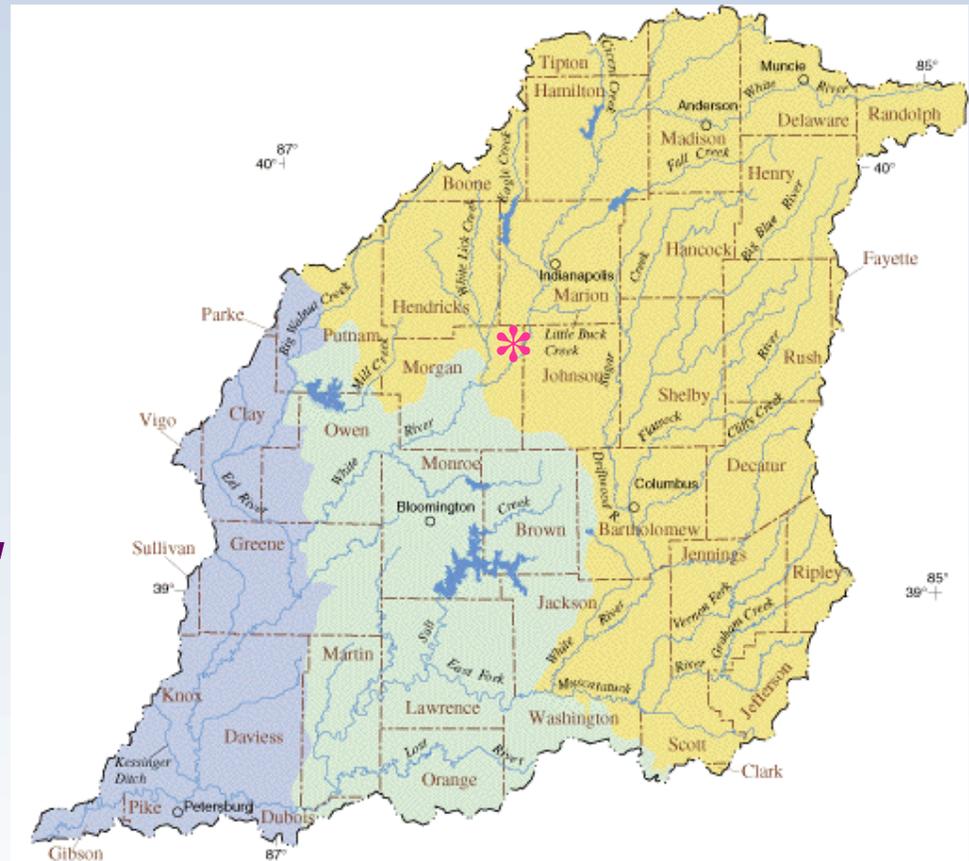
White Lick drains rapidly developing, densely residential areas in Boone, Hendricks, & Marion Counties before running through 'our' watershed.



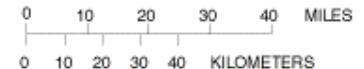
Base from U.S. Geological Survey digital data, 1:100,000, 1983
Albers Equal-Area projection
Standard parallels 29°30' and 45°30', central meridian -86°

EXPLANATION
--- White River Basin boundary

At the fringe of the Eastern Corn Belt Plains, our WS would have been forested with some open glades of tall grass prairie. After 1820, all of it was cleared for farming and grazing.



Base from U.S. Geological Survey digital data, 1:100,000, 1983
Albers Equal-Area projection
Standard parallels 29°30' and 45°30', central meridian -86°



EXPLANATION

- Eastern Corn Belt Plains
- Interior Plateau
- Interior River Lowland
- White River Basin boundary

Population

~2167 in 2000

(3.25% of 66,689)

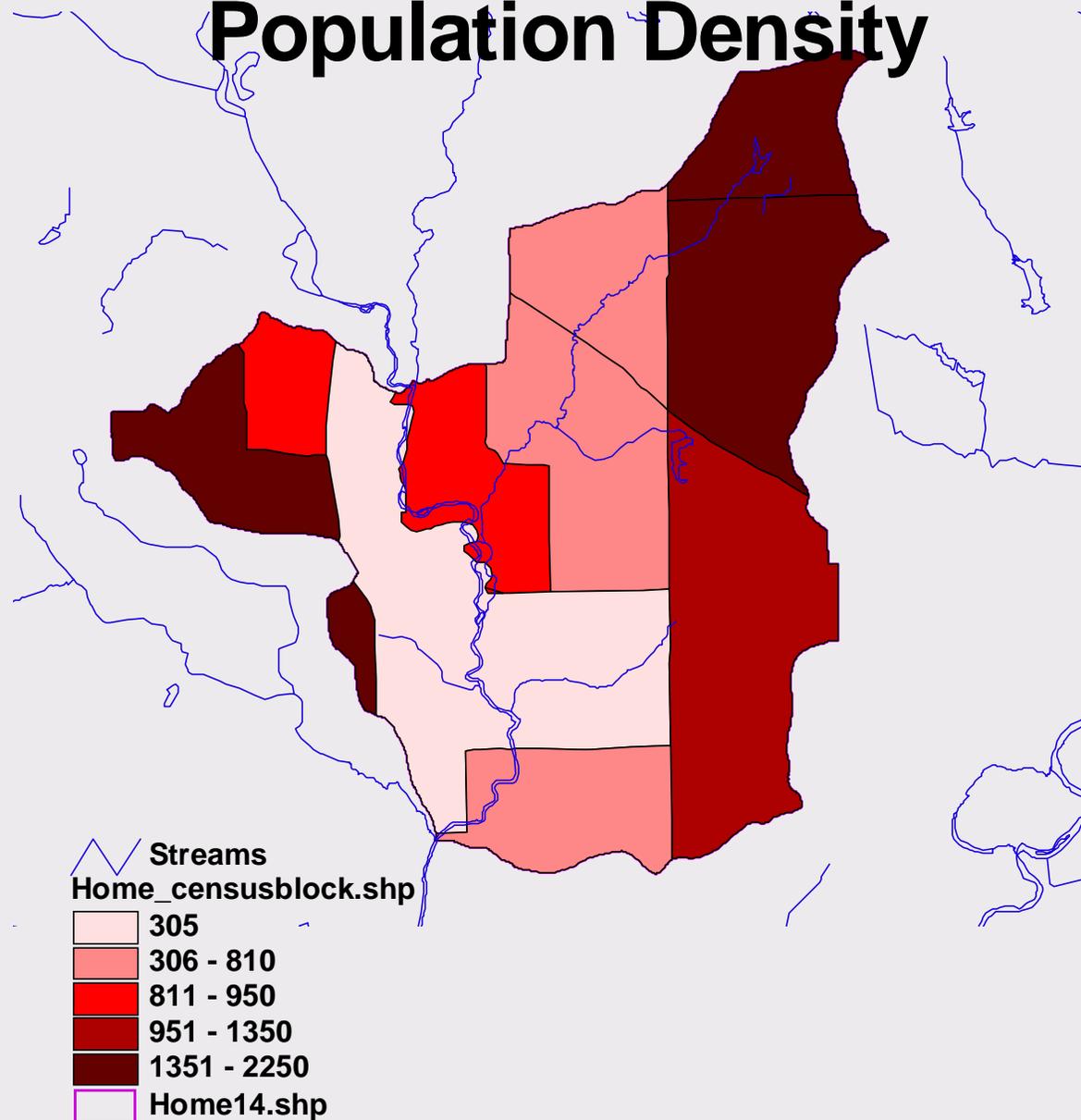
Projected 23% increase by 2020.

Pop. Has tripled since 1900.

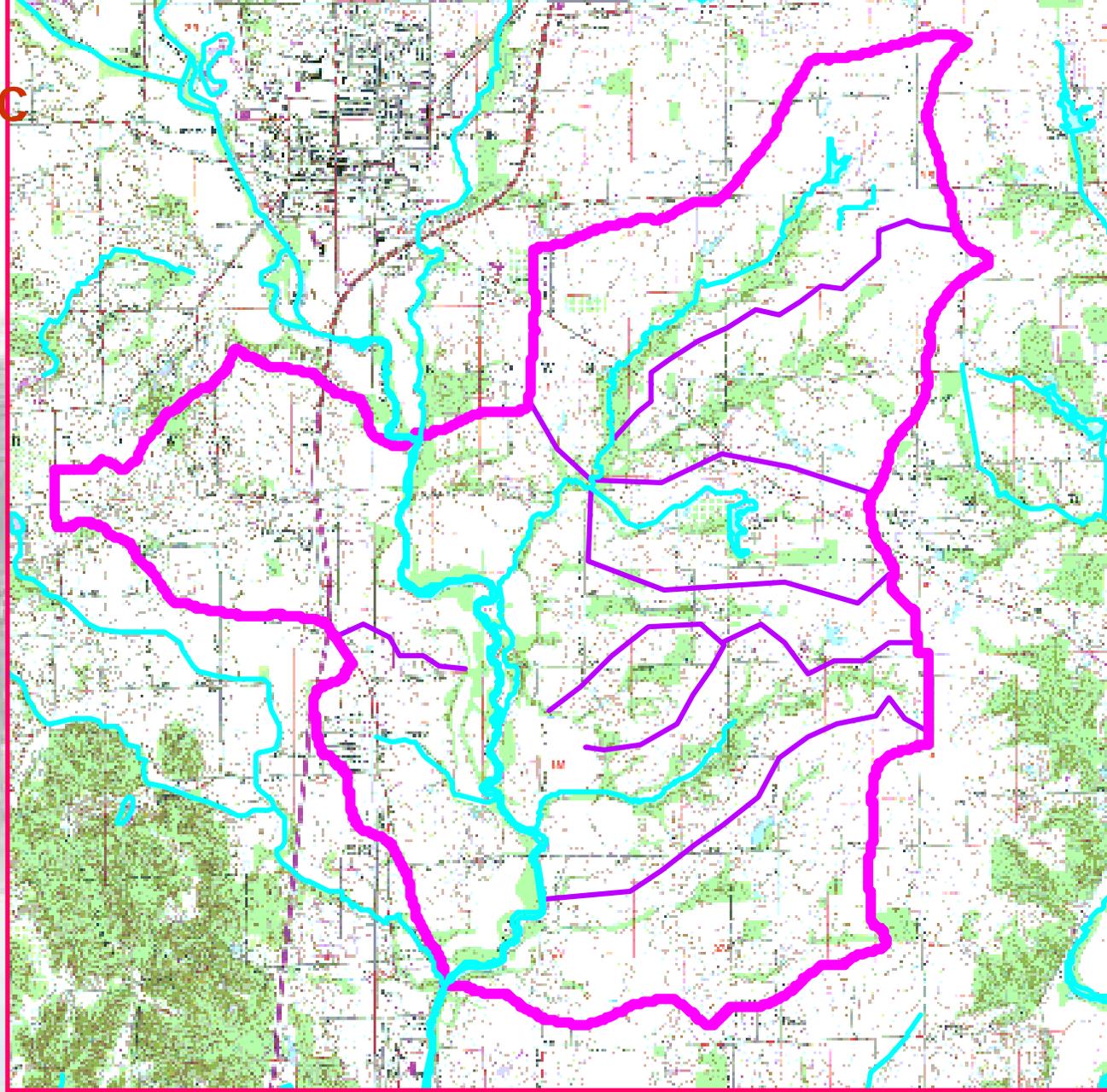
4th Largest in-migration in I N.

2/3 of population commutes to Indianapolis.

Population Density

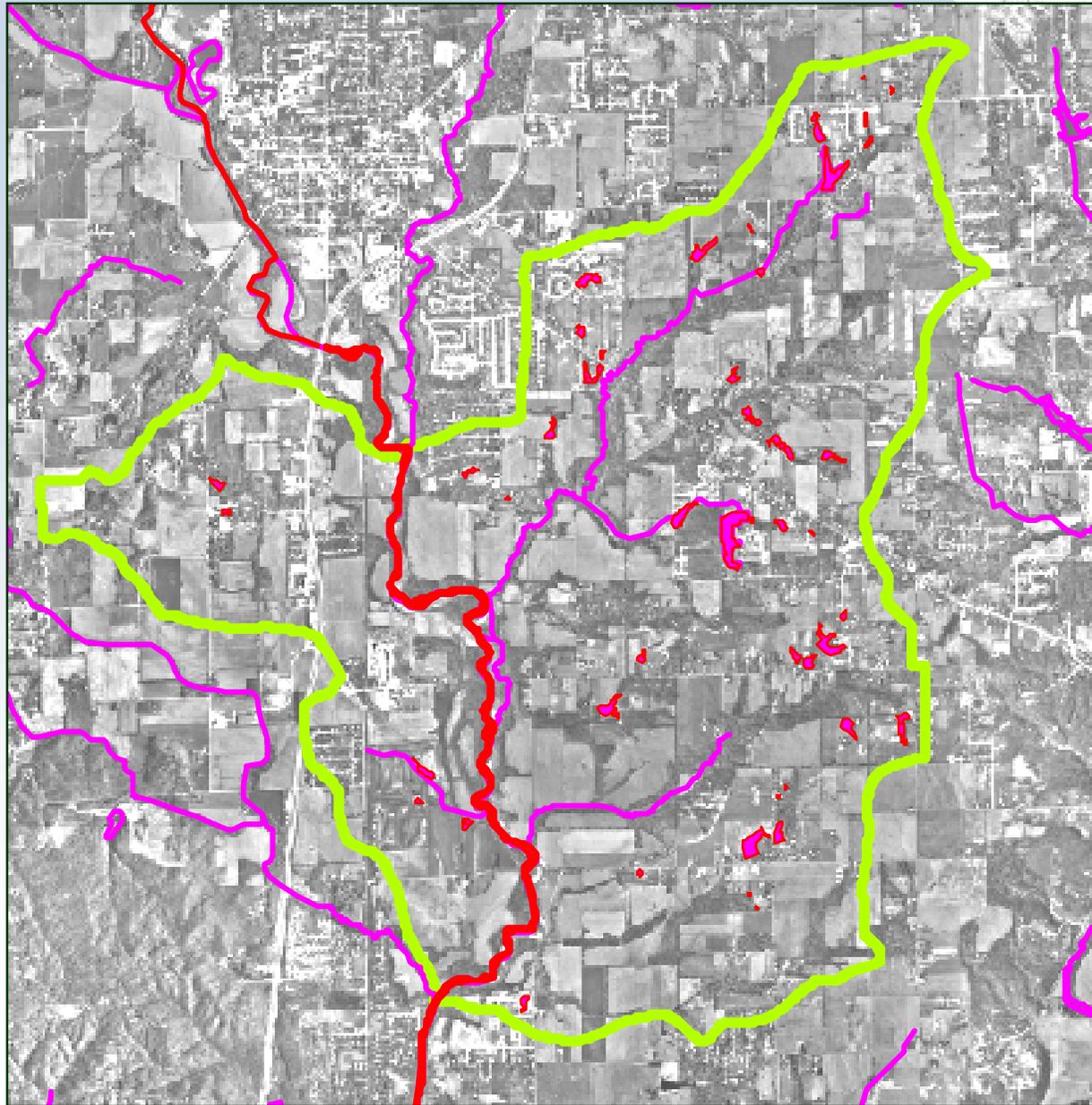


Use topographic maps for recording features and observations and to outline sub-watersheds.

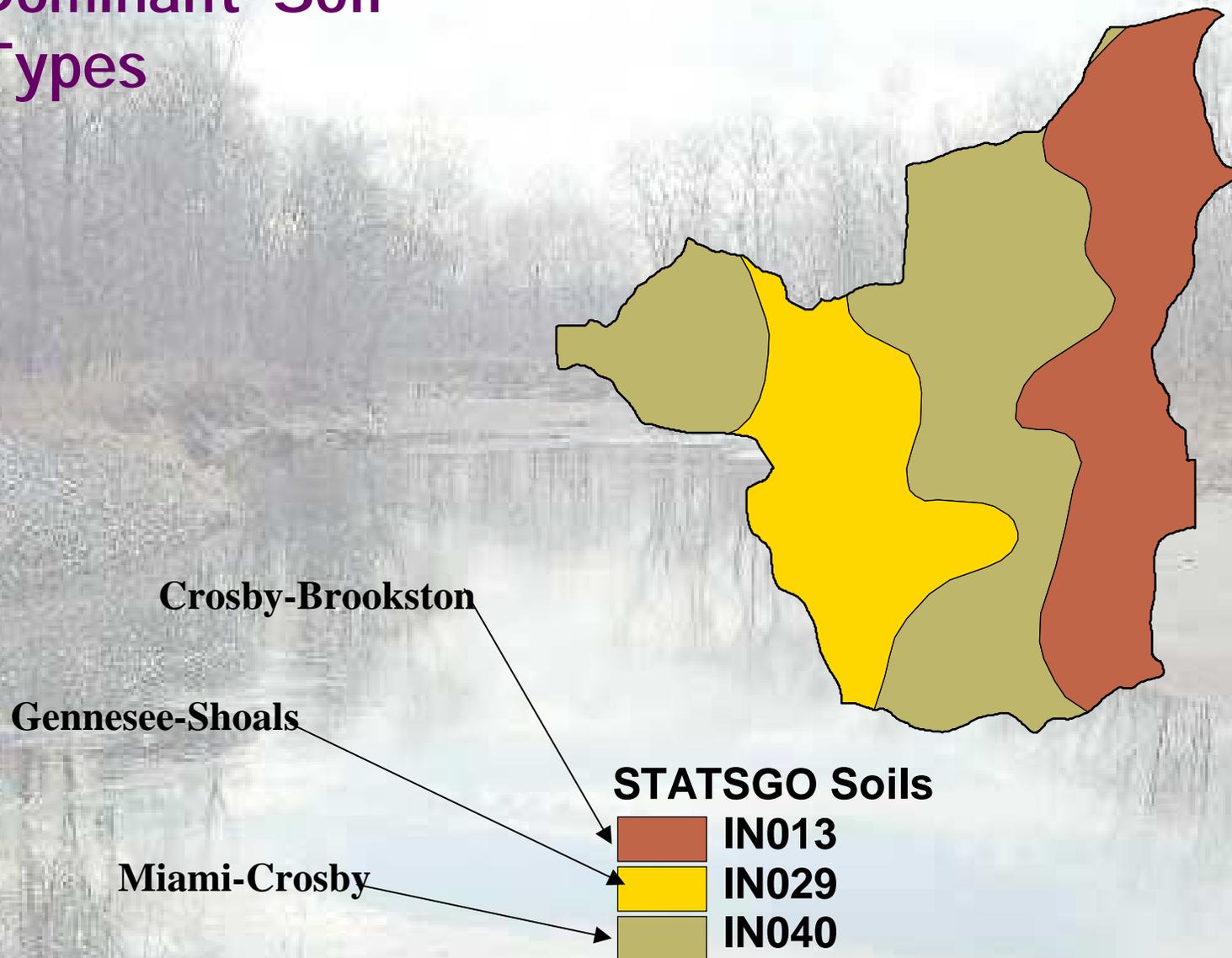


Major streams and
all 51 ponds.

White Lick Creek
[in red] is listed
as impaired for
Hg, PCBs [FCA].
Turbid appearance
and large sand and
silt deposits
indicate nutrient
and sediment
problems as well.



Dominant Soil Types

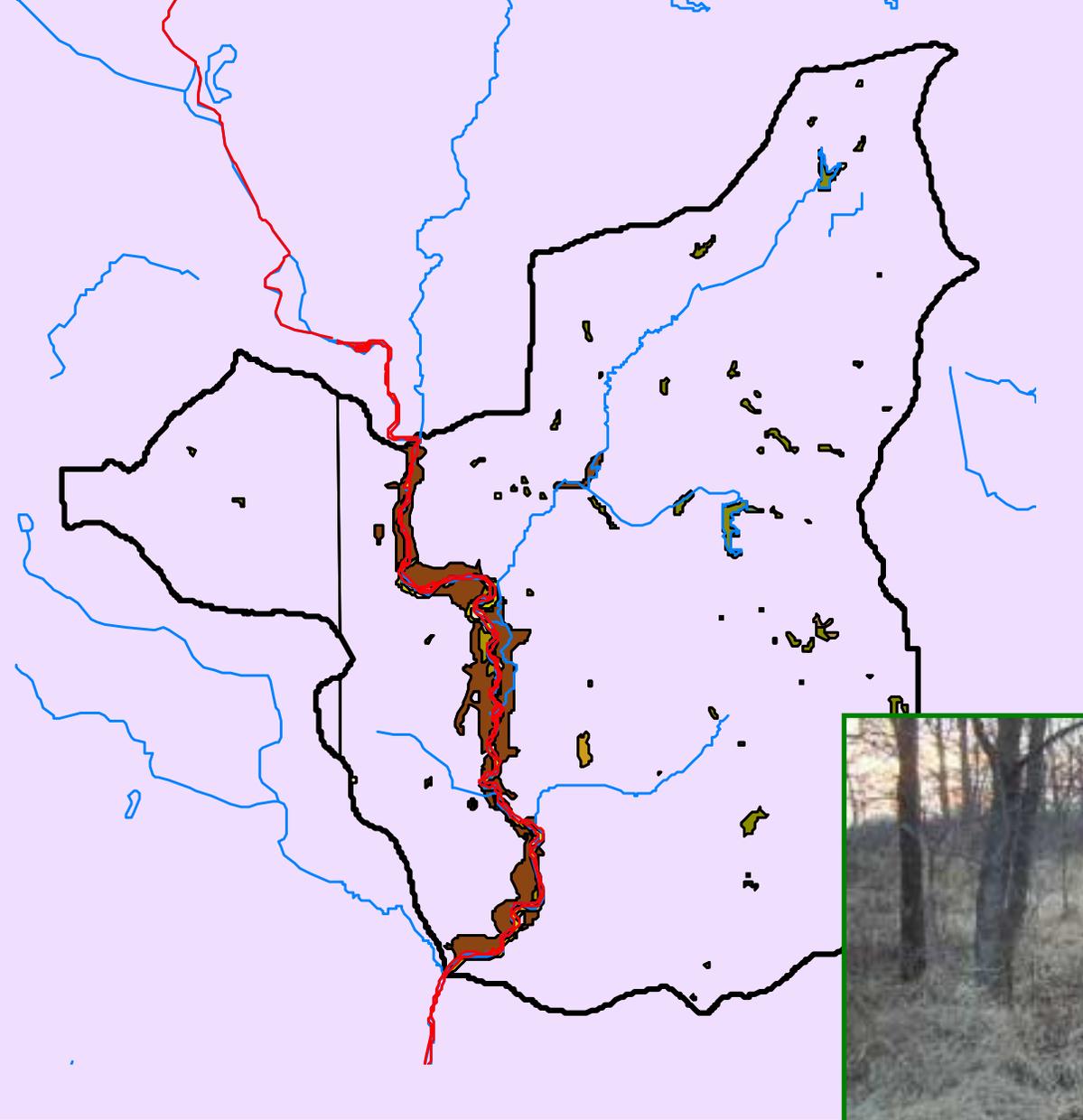


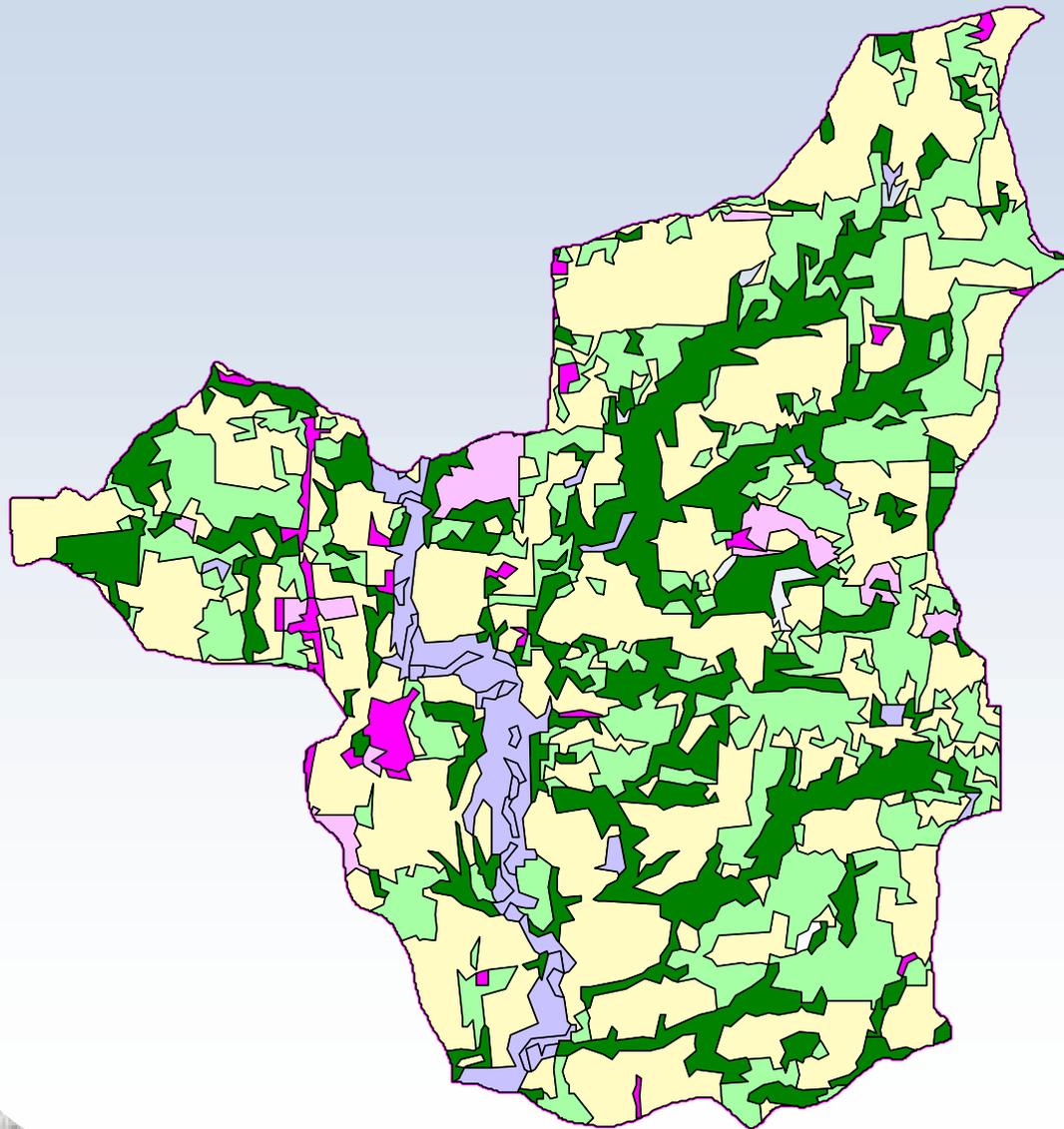
Wetland acres

Riparian- 25

Ponds- 65

Palustrine- 341





Orchard Creek Land Use GAP-1992

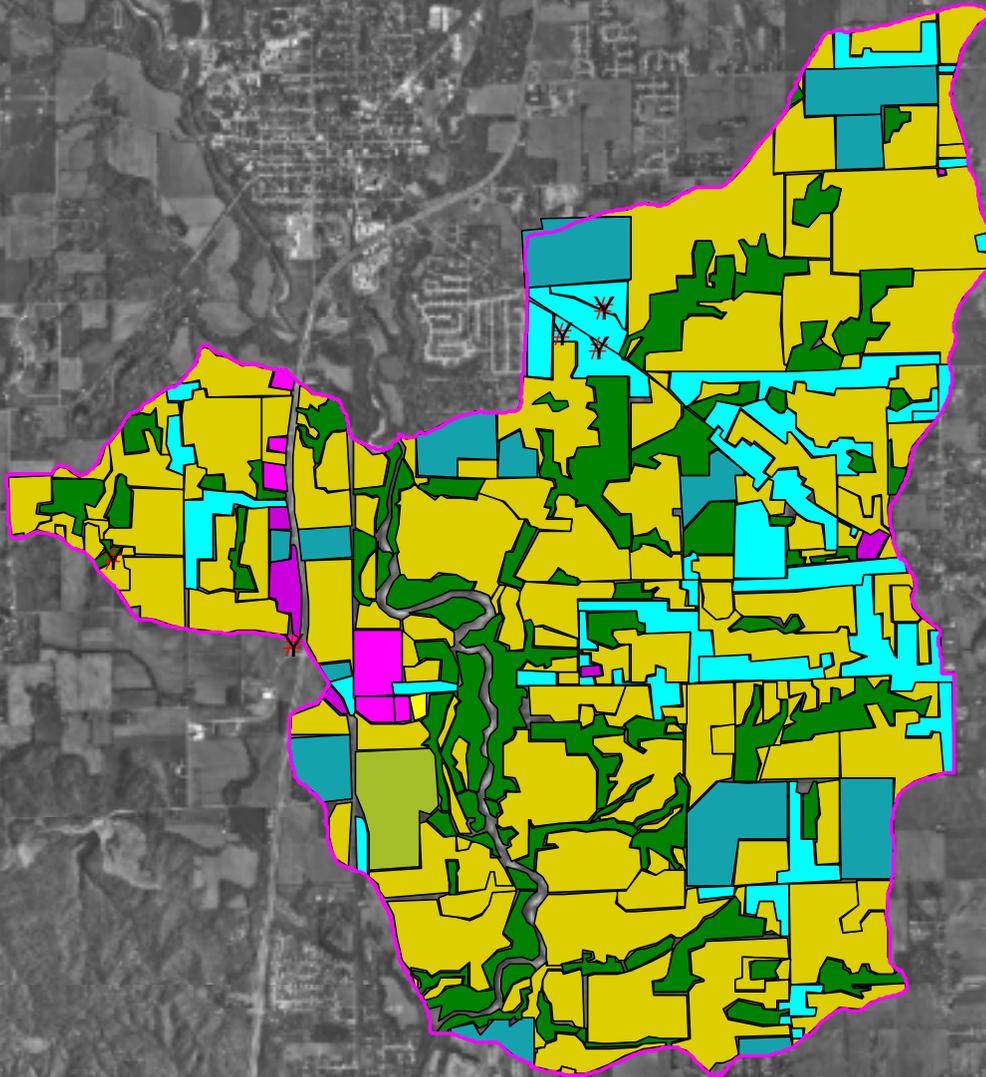
- Home wetpalustrine.shp
- Home forest.shp
- Home agpasture.shp
- Home agcrops.shp
- Home urblowdens.shp
- Home urbhidens.shp
- Home14.shp

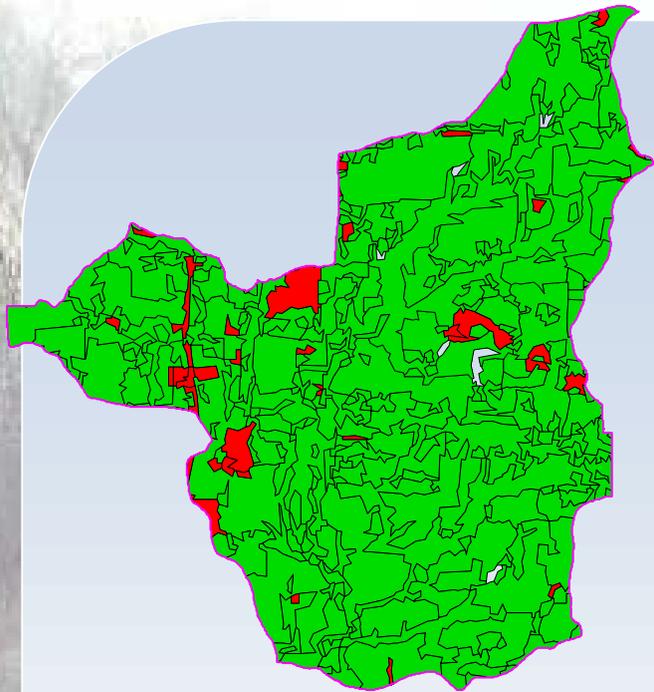
Land Use- 2001

8% Impervious
4.2% Wetlands
11.3% Open Water
55% Agricultural
14% Residential
13% Woodland
2% Industrial/Commercial

Land Use- Orchard Creek

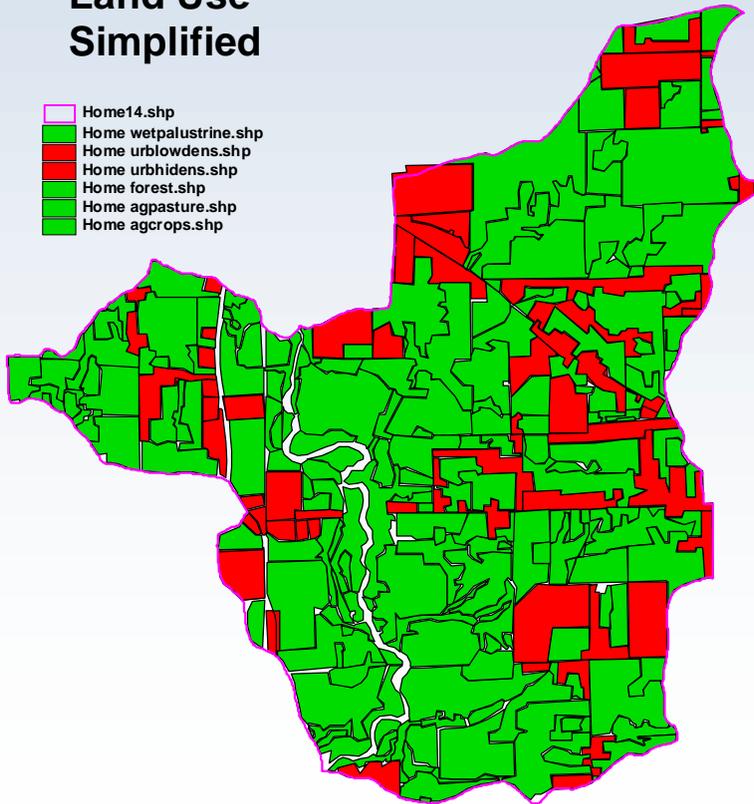
- ✂ Meeting Places
- Orchard Creek Watershed
- Recreational Sites
- Woodland
- Agricultural Land
- Commercial Property
- Industrial Property
- Residential Clusters
- Subdivisions





1992 GAP Land Use Simplified

- Home14.shp
- Home_wetpalustrine.shp
- Home_urbldens.shp
- Home_urbhidens.shp
- Home_forest.shp
- Home_agpasture.shp
- Home_agcrops.shp



2001 Land Use

- Home14.shp
- Home_workingag.shp
- Home_woods.shp
- Home_subdivision.shp
- Home_resclusters.shp
- Home_res_hi_dens.shp
- Home_recrea.shp
- Home_industry.shp
- Home_commercial.shp

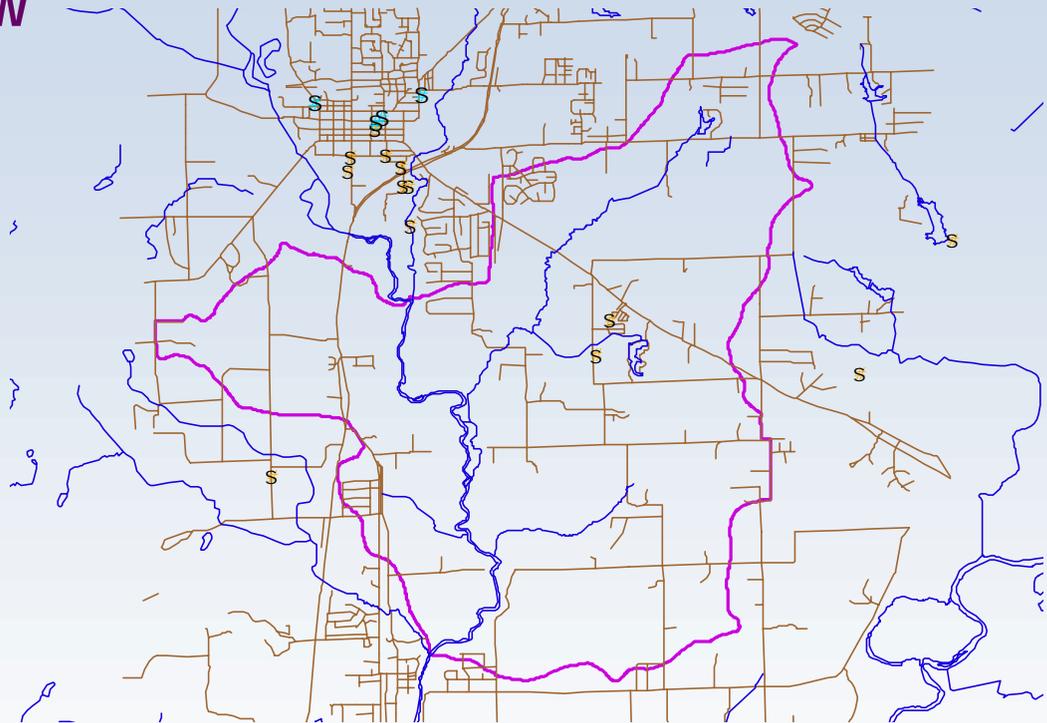
Land use trends in the watershed



Point Sources

There are only a few NPDES sites in the WS.

However, upstream sites could affect White Lick Creek.

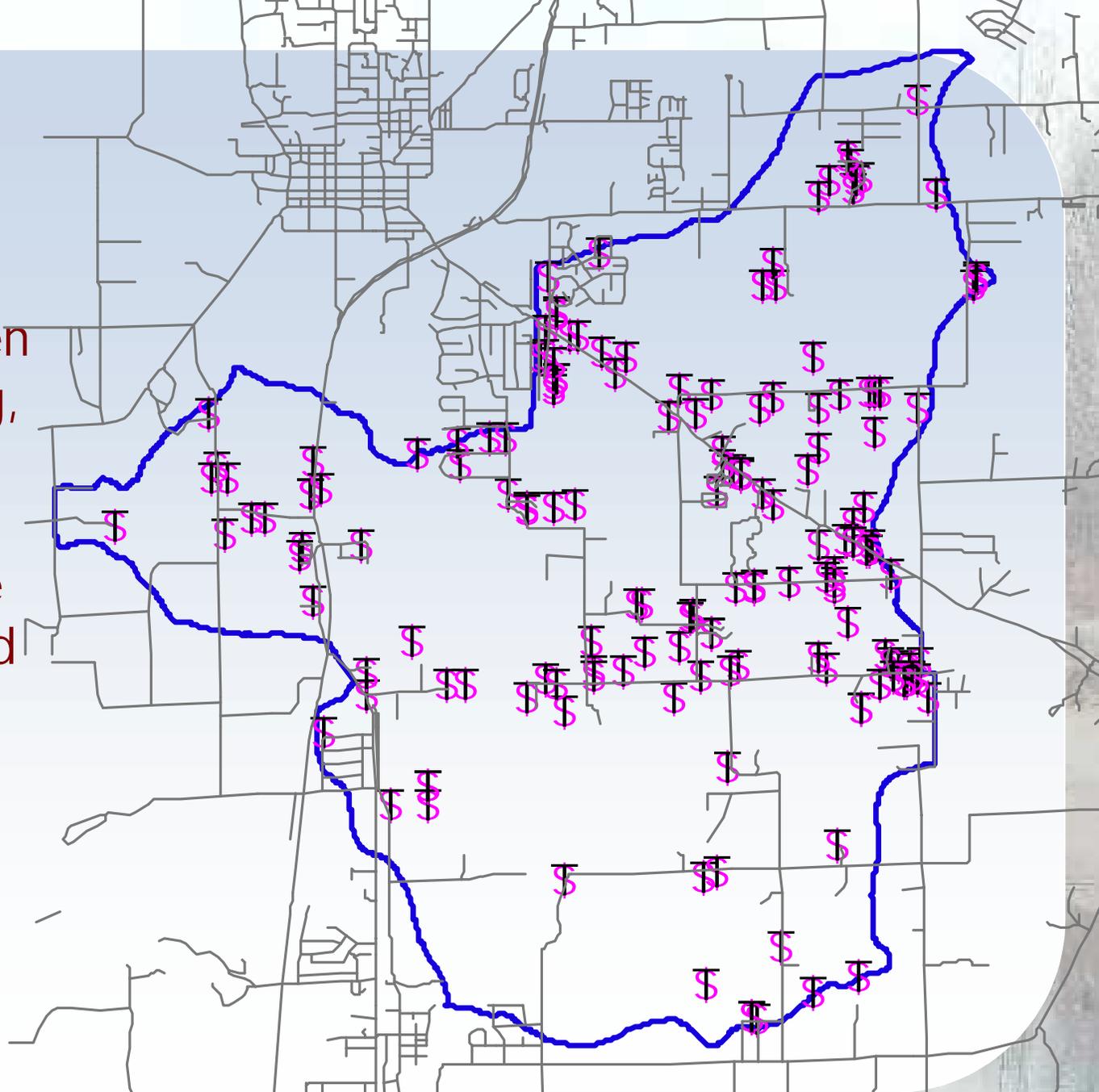


- S Air sources
- S NPDES facilities
- Streams
- Roads
- # Envirofacts.shp
- Home14.shp

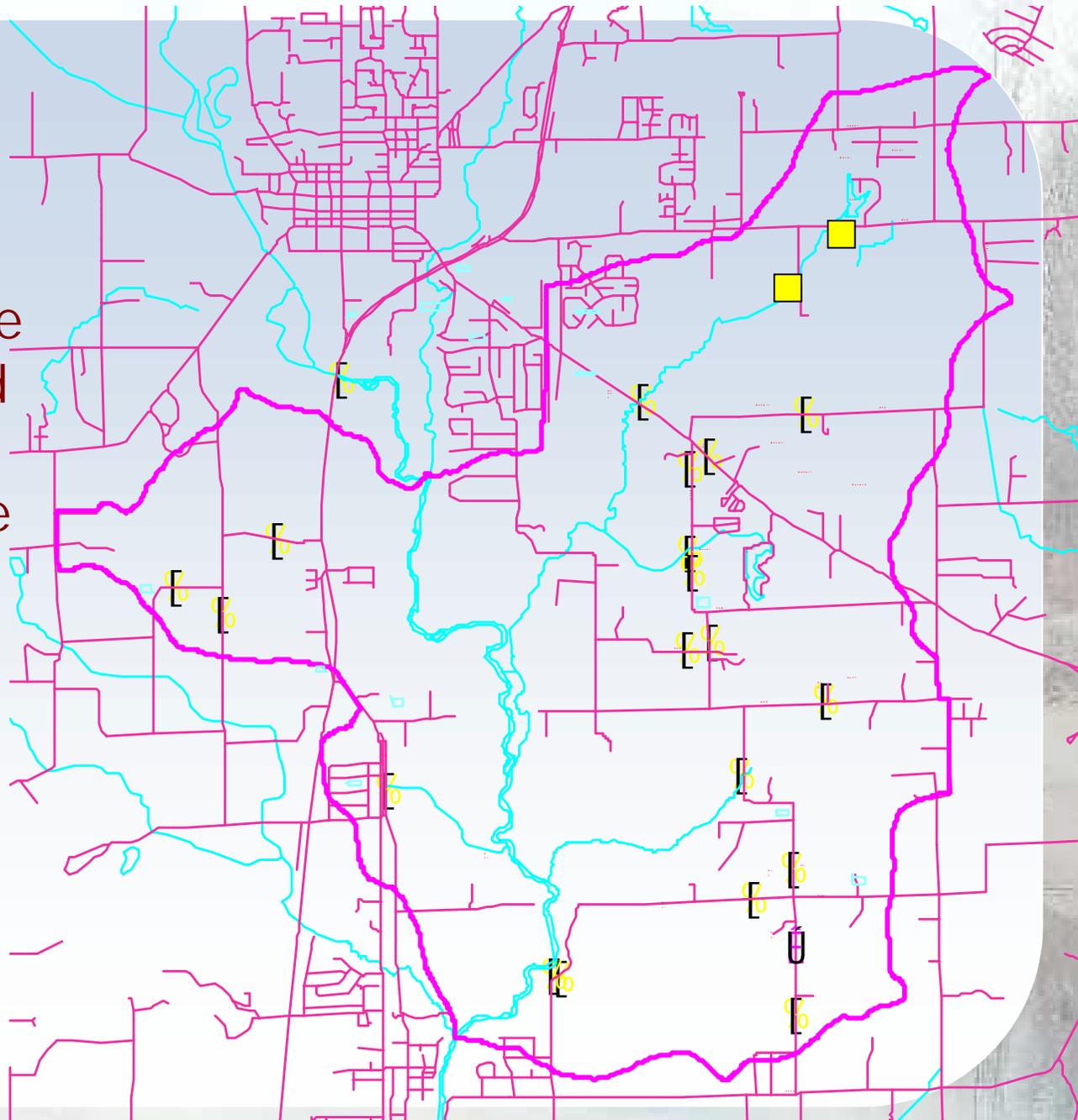
Permitted Facilities in the Orchard Creek Watershed

Hazardous Materials Handlers (RCRA)	Permit Compliance System (PCS)	Toxic Materials Releases (TRIS)	Other
Enterprise Collision Center 581 Kitchen Road	Ashbury Mobile Home Court Pennington Road	General Shale..... 19 reports (Cr compounds, HF, and Mn compounds)	Town of Mooresville will need a stormwater plan under MS4 requirements.
Environmental Coatings 2201 Hancel Parkway	Country View Estates Pennington Road		Signature Skylights also listed under air permits
Jake's Body Shop 3204 SR 144	Signature Skylights 101 Linel Drive off Bethel Lane		
Viking Air Tools 1400 Hancel			
Signature Skylights 101 Linel Drive off Bethel Lane			
Walker Machine 597 Old 67 N			

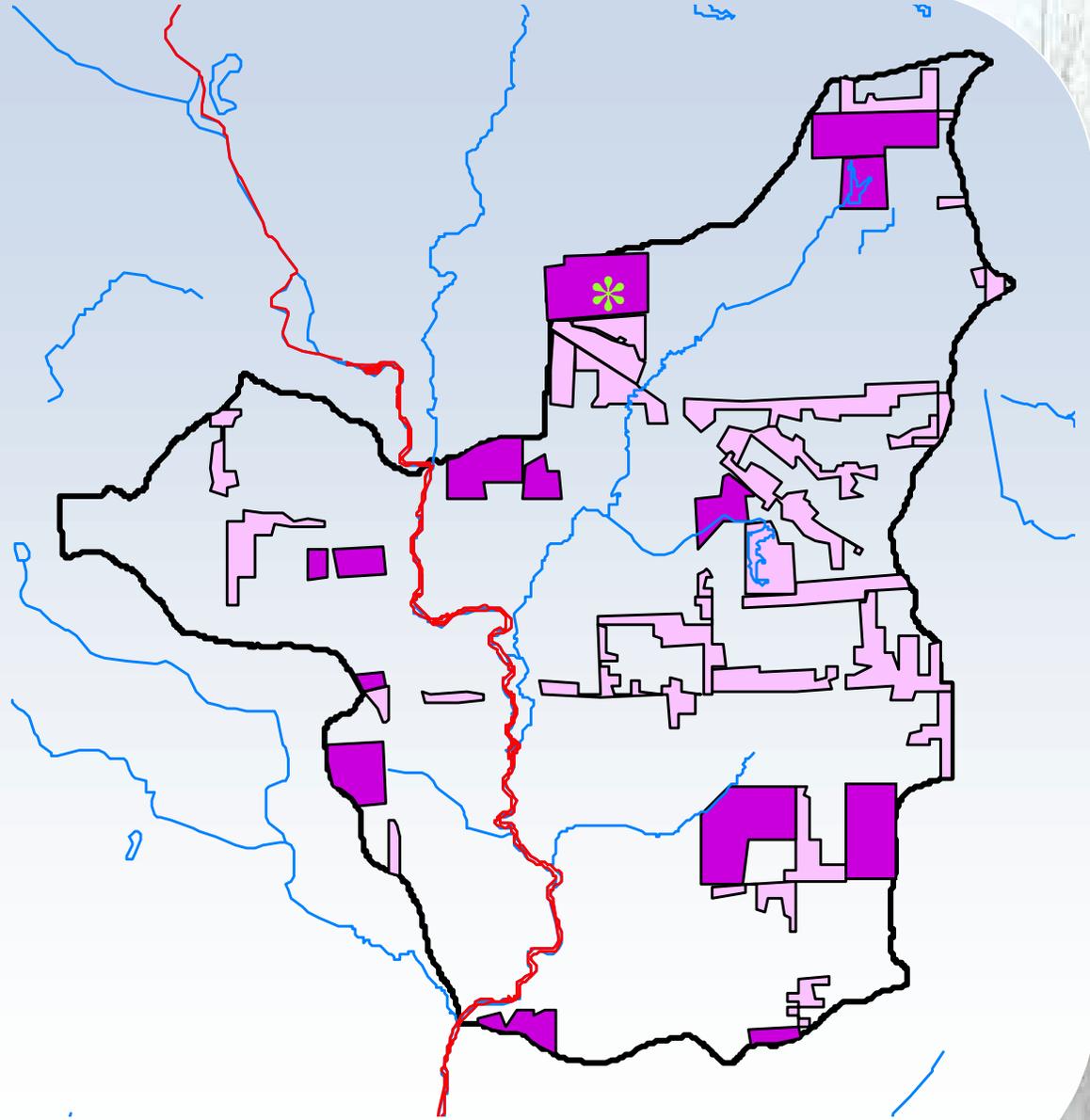
Don't forget groundwater!
Many rural residents, even in new housing, drink from private wells. These are the wells recorded in I DNR Division of Water database.



Stream observation sites..... Just about every place the road crossed a stream. These would NOT all be suitable water quality sampling sites. Note: the main stem was pretty inaccessible.

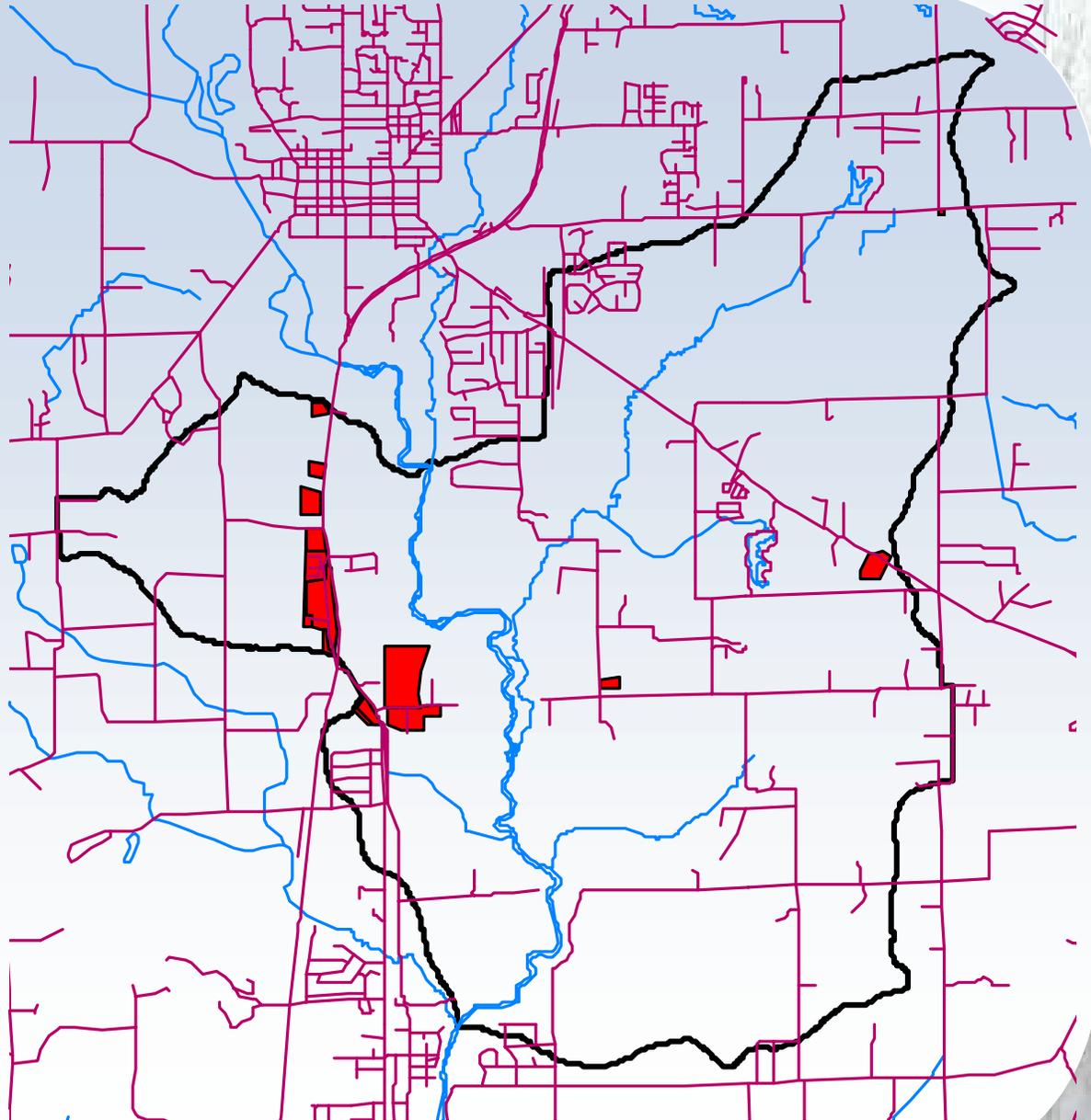


Most subdivisions in the WS have no storm water control. Control has not been required until very recently, and enforcement is uncertain. Impervious area = about 8% at present.



Is there a potential for industrial and commercial land use to expand?

New zoning maps are still in development.



Agriculture in Orchard Creek

- Corn-soybean rotation with some corn-bean-wheat;
- 75% of beans are no-tilled; 50% of corn conservation tilled.
- Beef and dairy pastures appear in good condition.
- Horse pasture 80% very poor condition; several locations just mud.
- Some hobby livestock (donkeys, emu, long-horn cows.)
- One dog kennel in the watershed.
- No confined feeding, swine, or poultry.



Livestock:

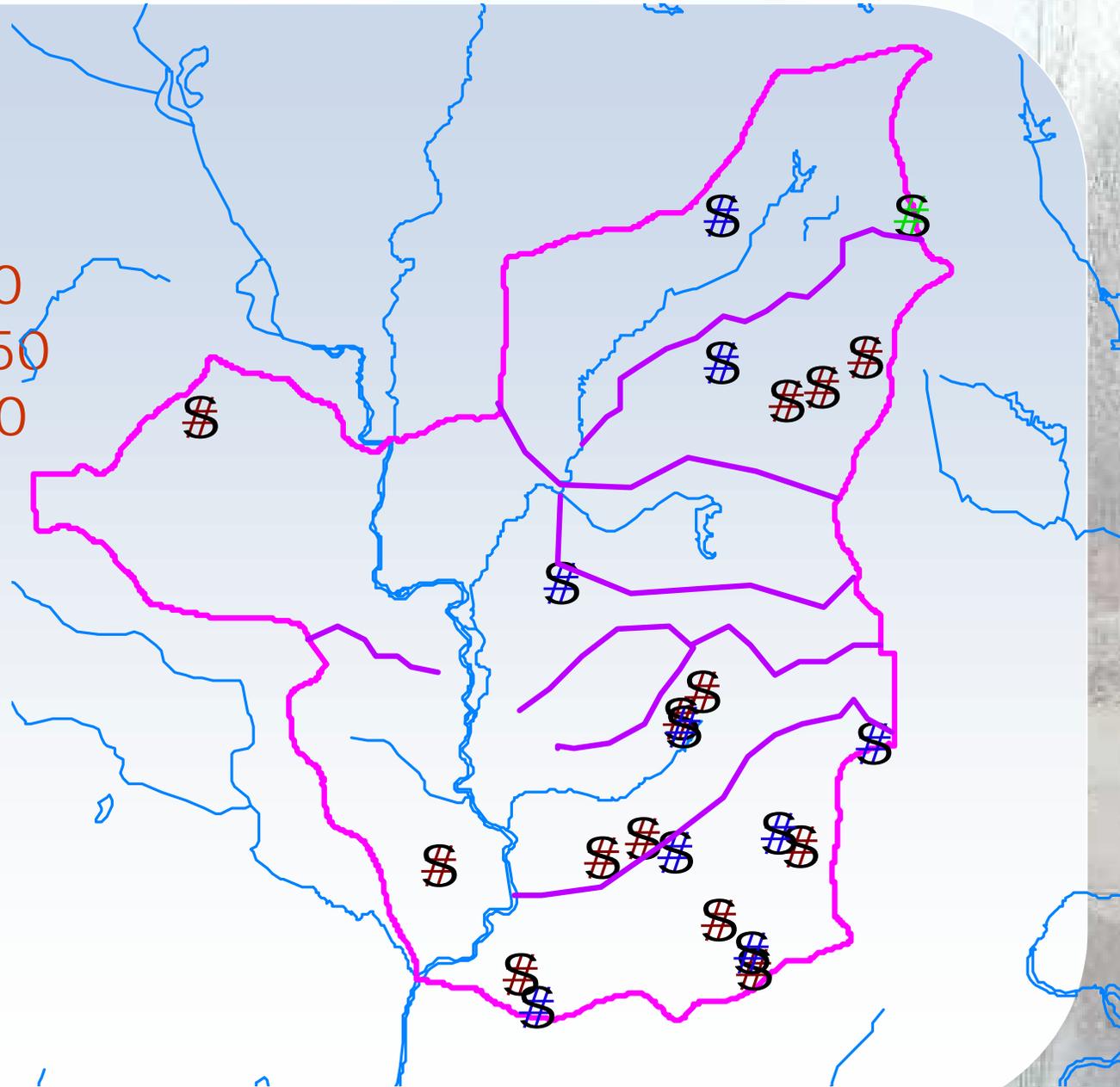
Dairy [green] ~60

Beef [brown] ~250

Horses [blue] ~60

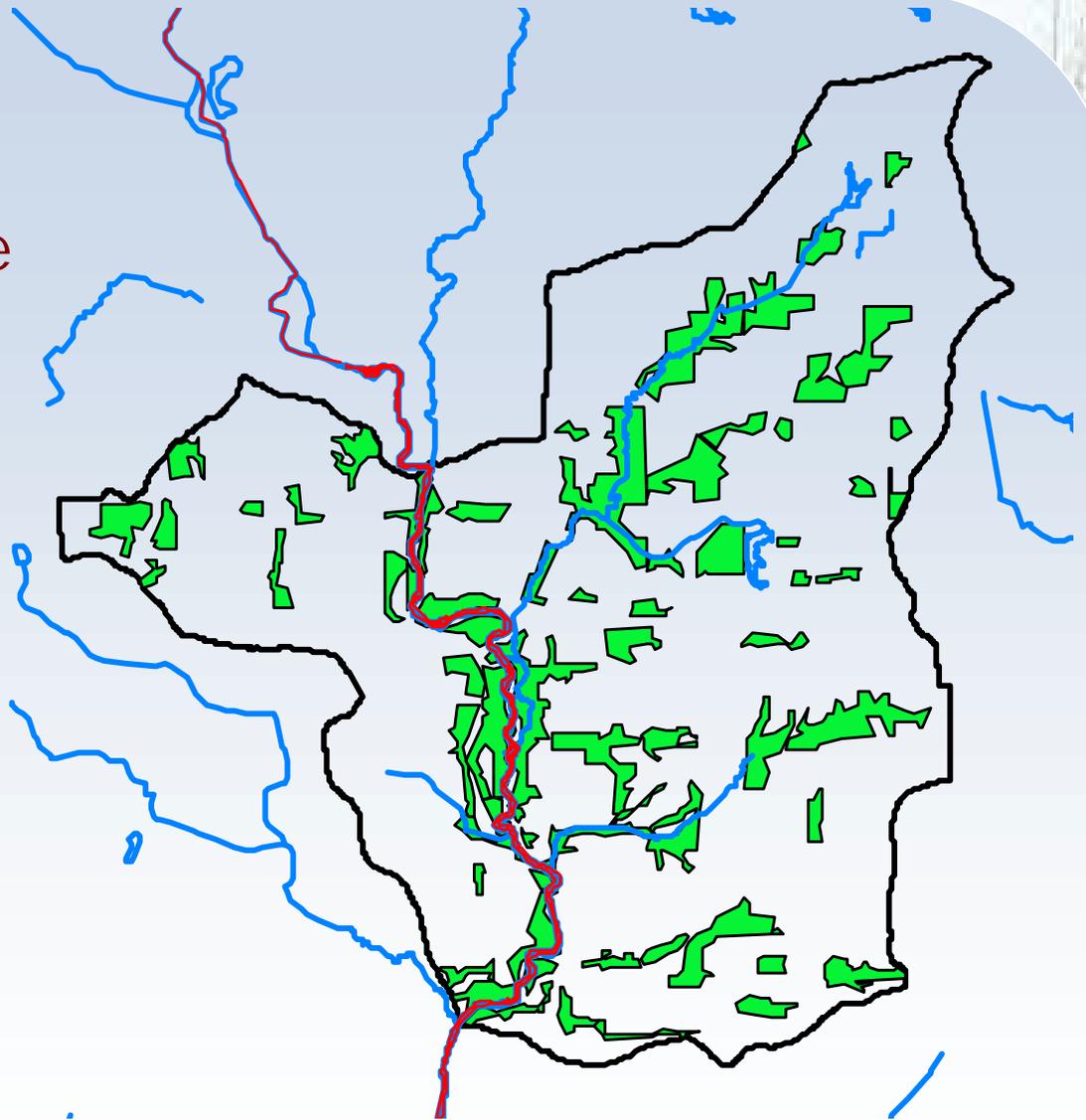
Dairy & beef
pasture in good
condition.

Horse pasture in
very poor or
'mud-pit'
condition.



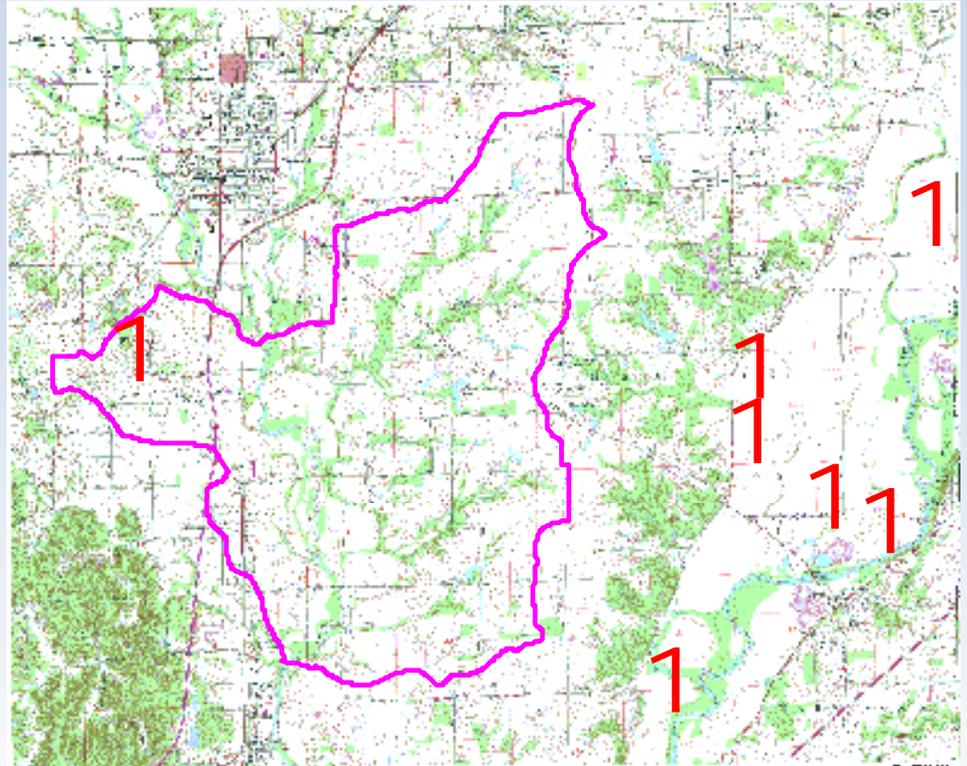
Woodlands

Many streams have riparian forest, although it needs to be widened in some areas. There are no easements (CRP, WRP, Classified Forest) in the watershed. This may be an alternative to explore.



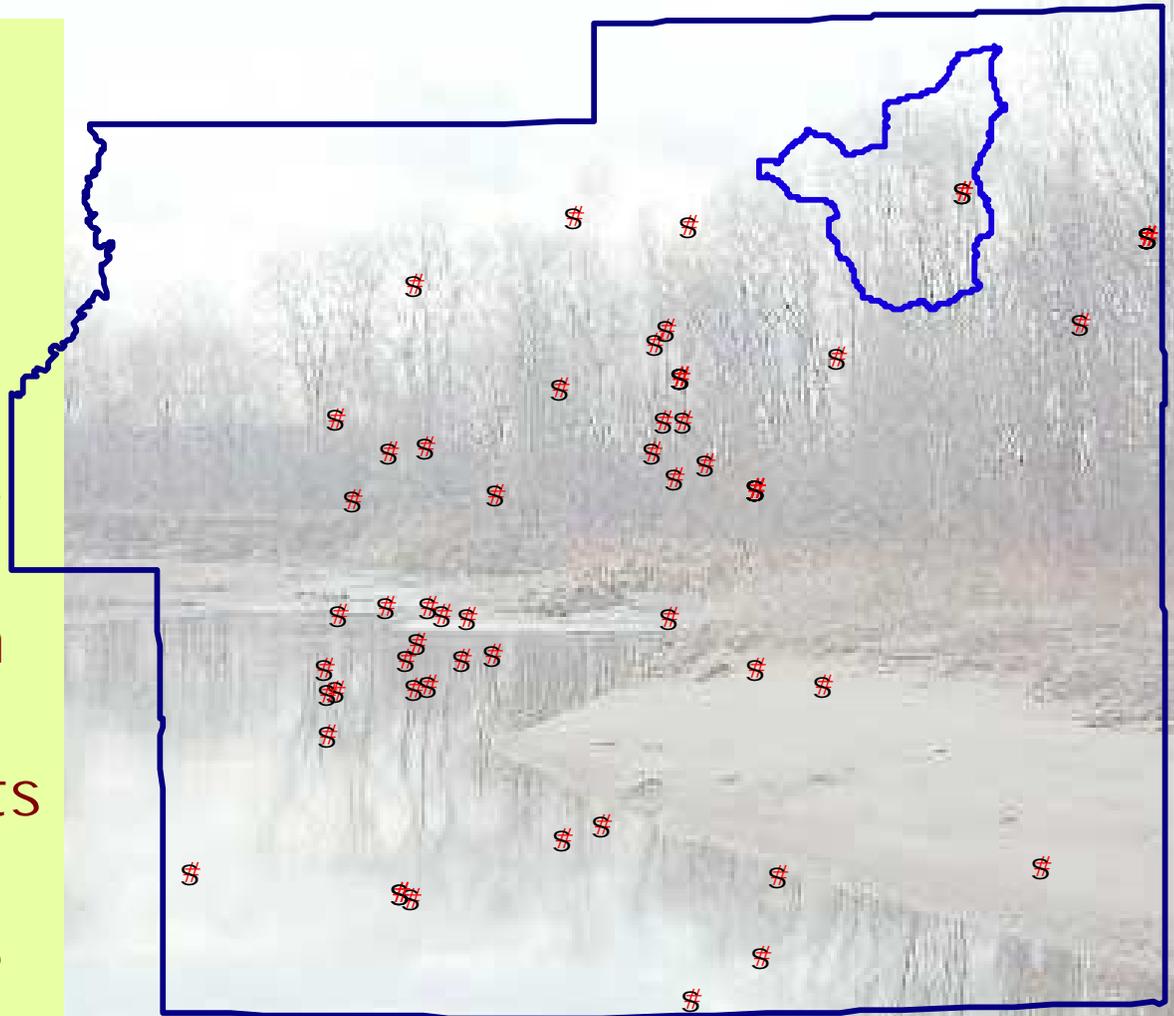
Mining

One old gravel pit in the WS. The sand & gravel operations shown in the White River floodplain are all fairly new, three in the past year. Since White Lick floodplain has same soils, potential exists for mining in the WS.



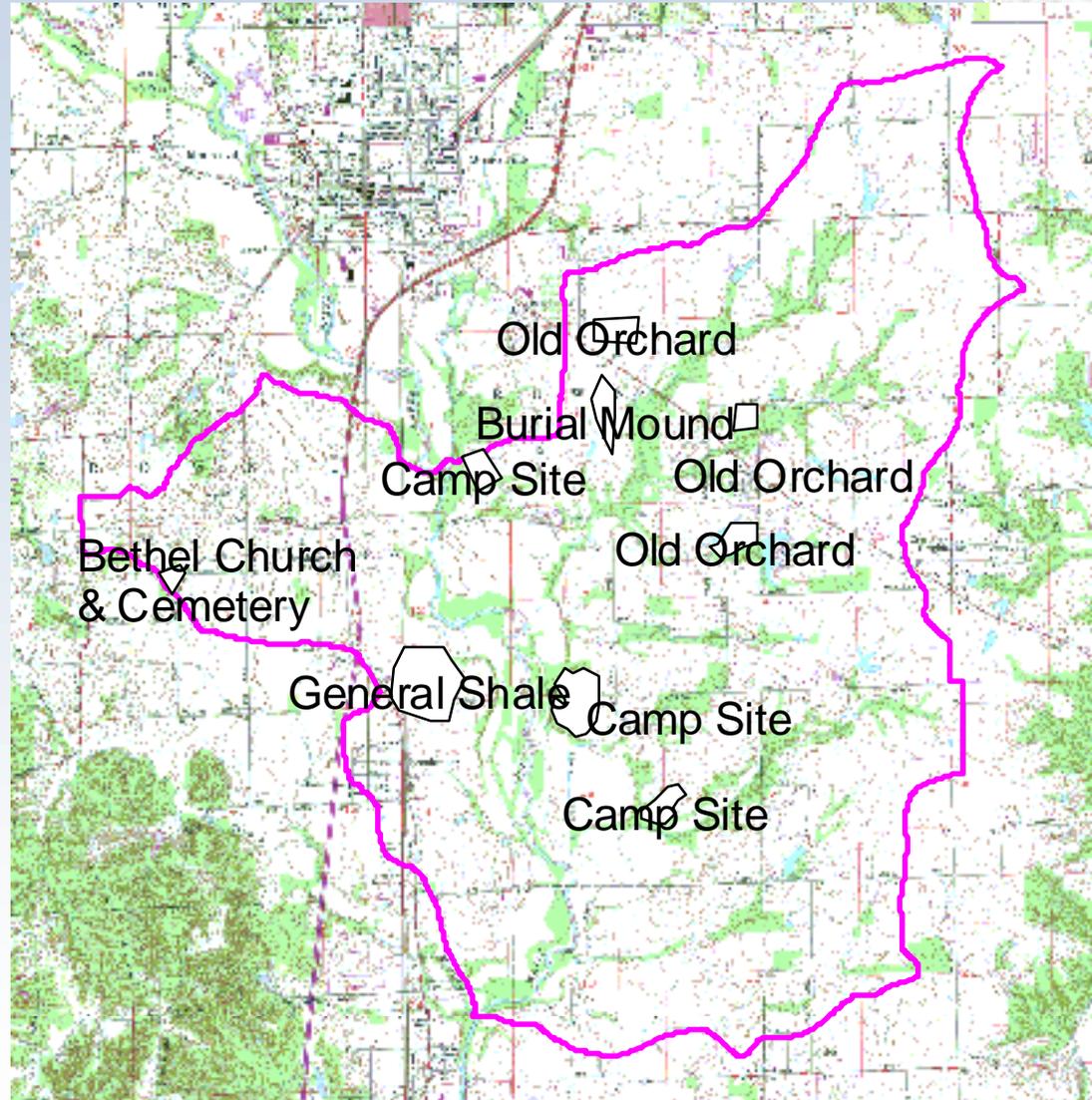
Biodiversity

Reports of endangered or threatened species. The report in our WS is for a mammal. Consultation with I DNR Fish & Wildlife Biologists would be recommended, as well as the Division of Nature Preserves.



Cultural Resources

Some modern & some pre-Euro. Area settled during 1820-1830; Mooresville & Waverly were among the earliest towns. Place-names (Rooker, Moore, Watson, Hadley) show up in 1830 census.



What are some special features
this watershed doesn't have?

Karst

Public lands

Parks & recreation (just one golf course)

Heavy industry

Shopping malls

Mining

Major transportation facilities

Confined feeding operations

Conservation easements

Superfund sites

landfills

.....etc, etc

Based on what you have seen,
what problems might exist in this watershed?

1. _____

2. _____

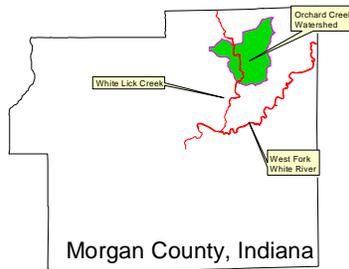
3. _____

A misty, overcast landscape with a body of water in the foreground and a dense forest of bare trees in the background. The water is calm, reflecting the sky and the surrounding trees. The overall atmosphere is quiet and somewhat somber.

And now for.. ..

The REST

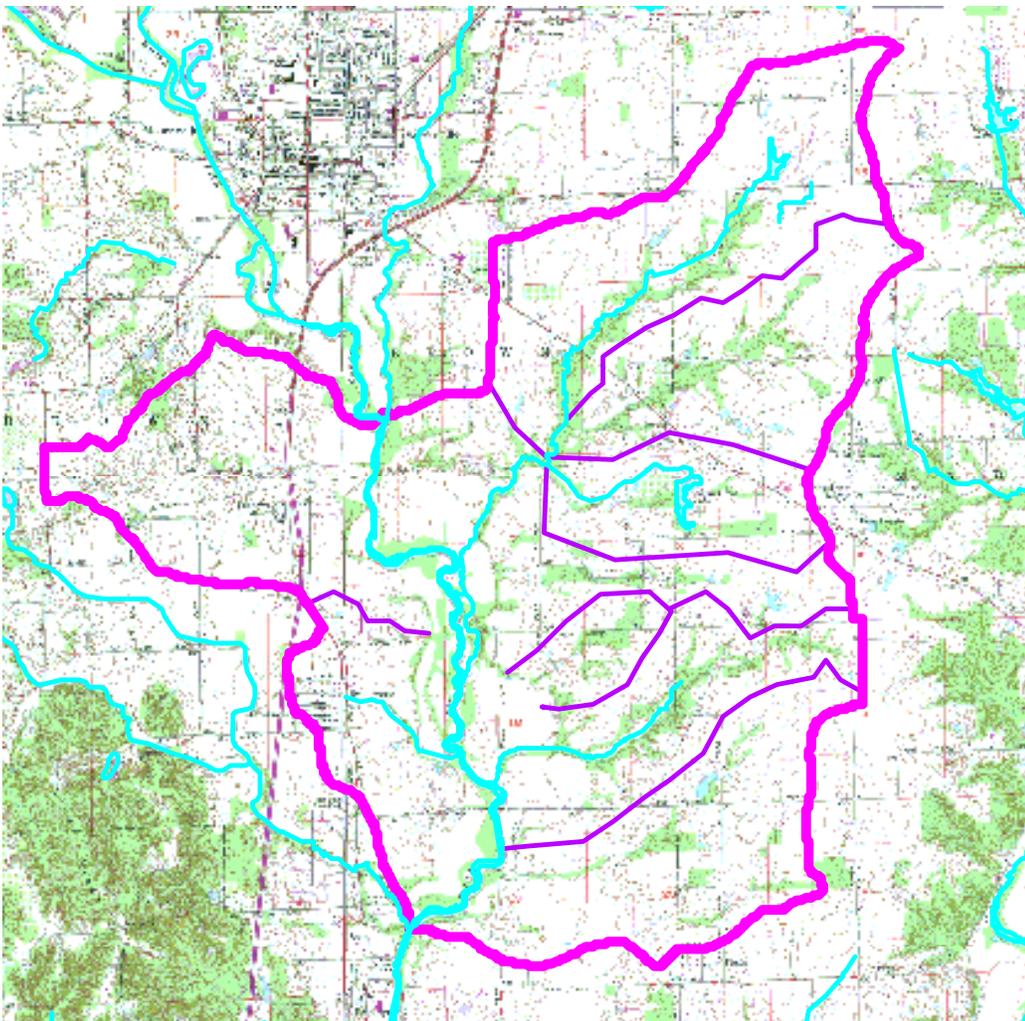
of the Story ...



Watershed Boundaries

Orchard Creek Watershed
Morgan County, Indiana
05120201-150-170
Upper White River

Area 8548 acres 13.36 mi. sq.
Percentage of Morgan County in the watershed: 3.25 %





Base from U.S. Geological Survey digital data, 1:100,000, 1983
 Albers Equal-Area projection
 Standard parallels 29°30' and 45°30', central meridian -86°

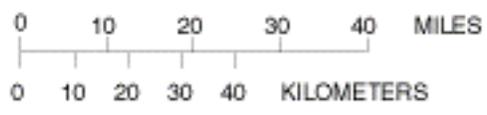


EXPLANATION

----- White River Basin boundary

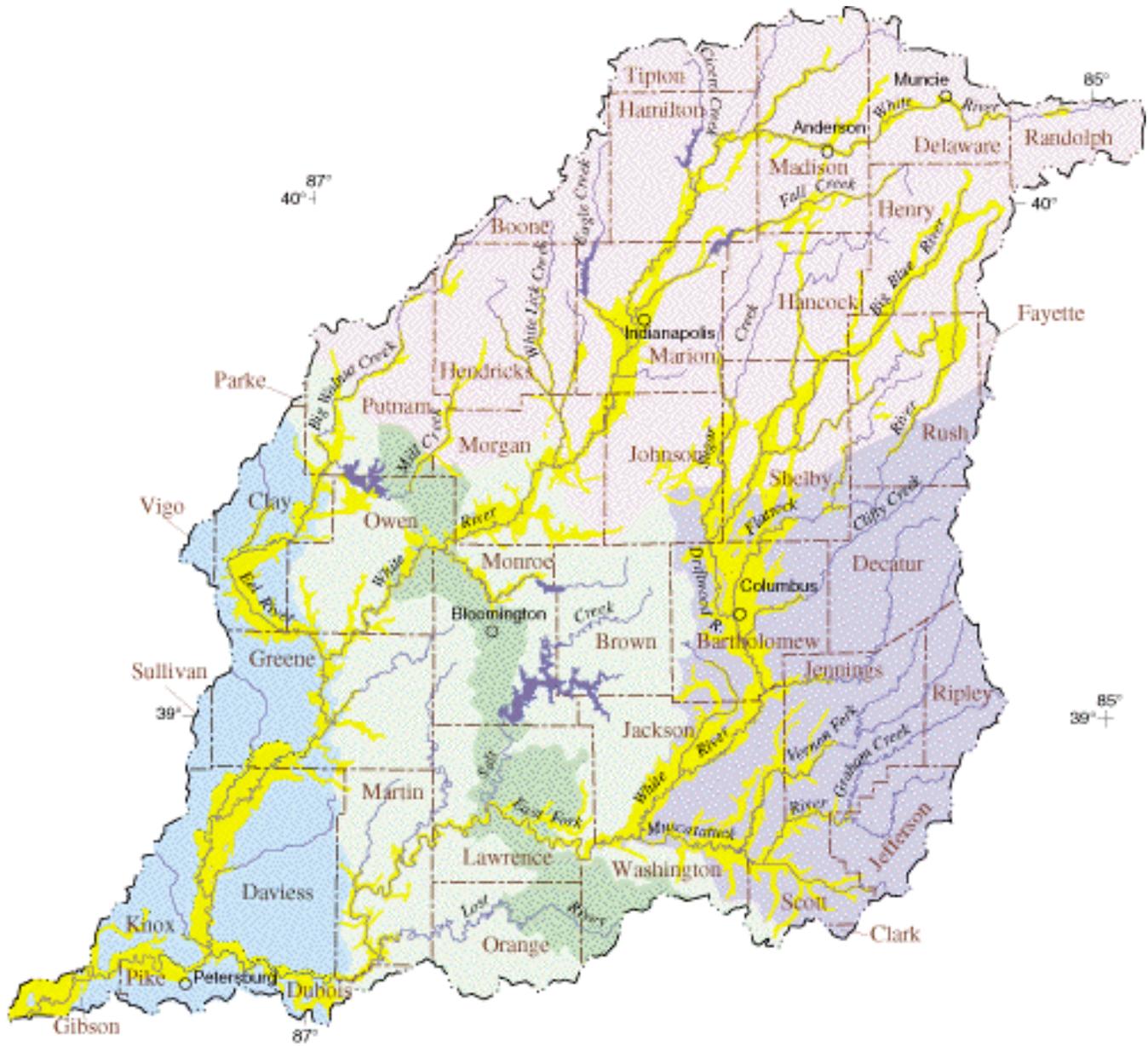


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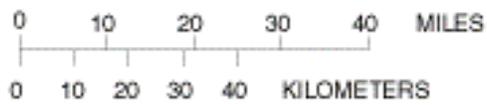


EXPLANATION

- Eastern Corn Belt Plains
- Interior Plateau
- Interior River Lowland
- White River Basin boundary



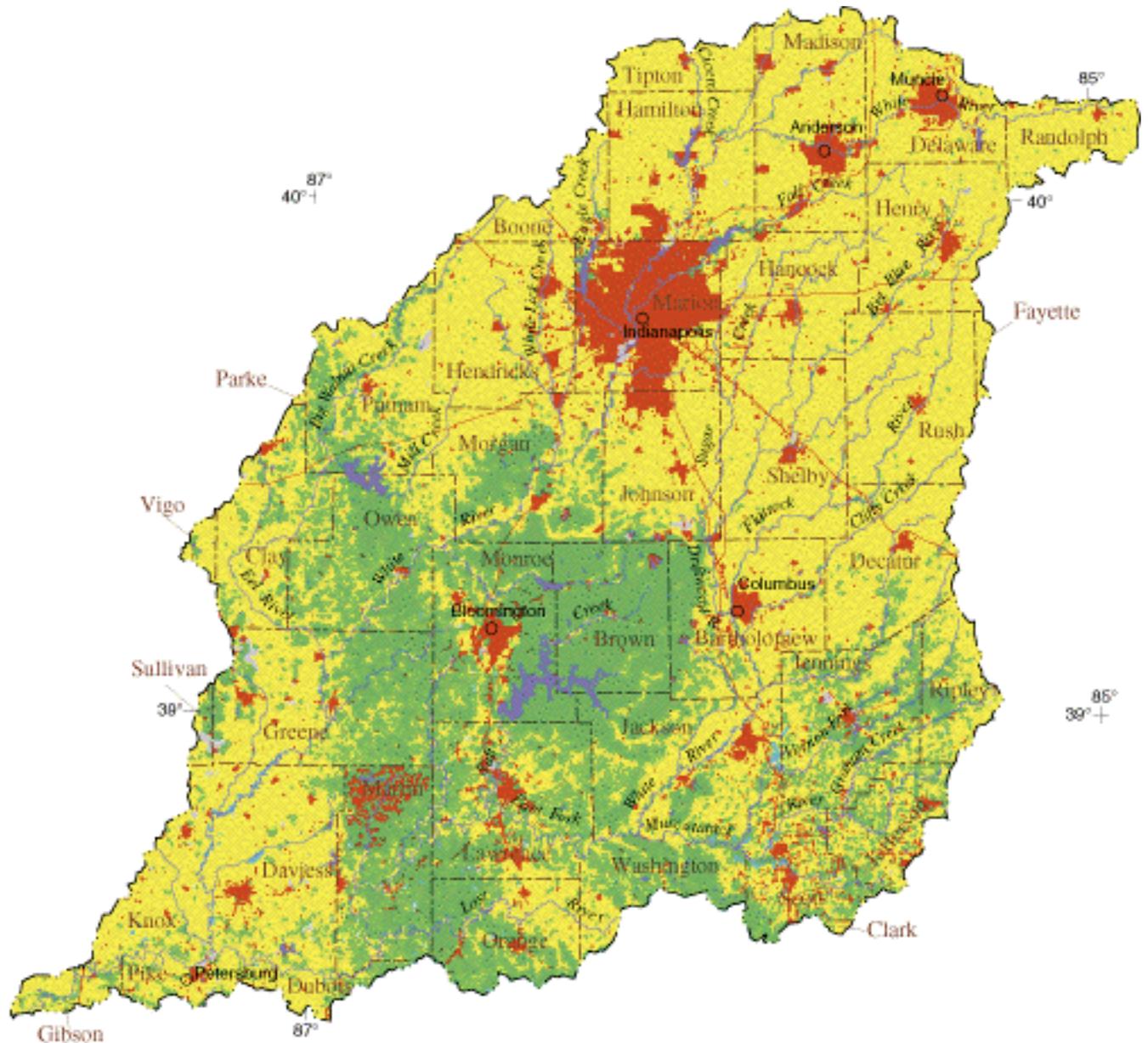
Base from U.S. Geological Survey digital data, 1:100,000, 1983
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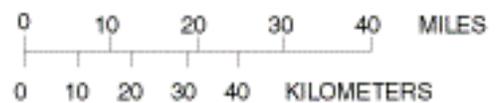
EXPLANATION

Hydrogeomorphic regions

- Till plain
- Bedrock uplands
- Glacial lowland
- Bedrock lowland and plain
- Karst plain
- Fluvial deposits
- White River Basin boundary



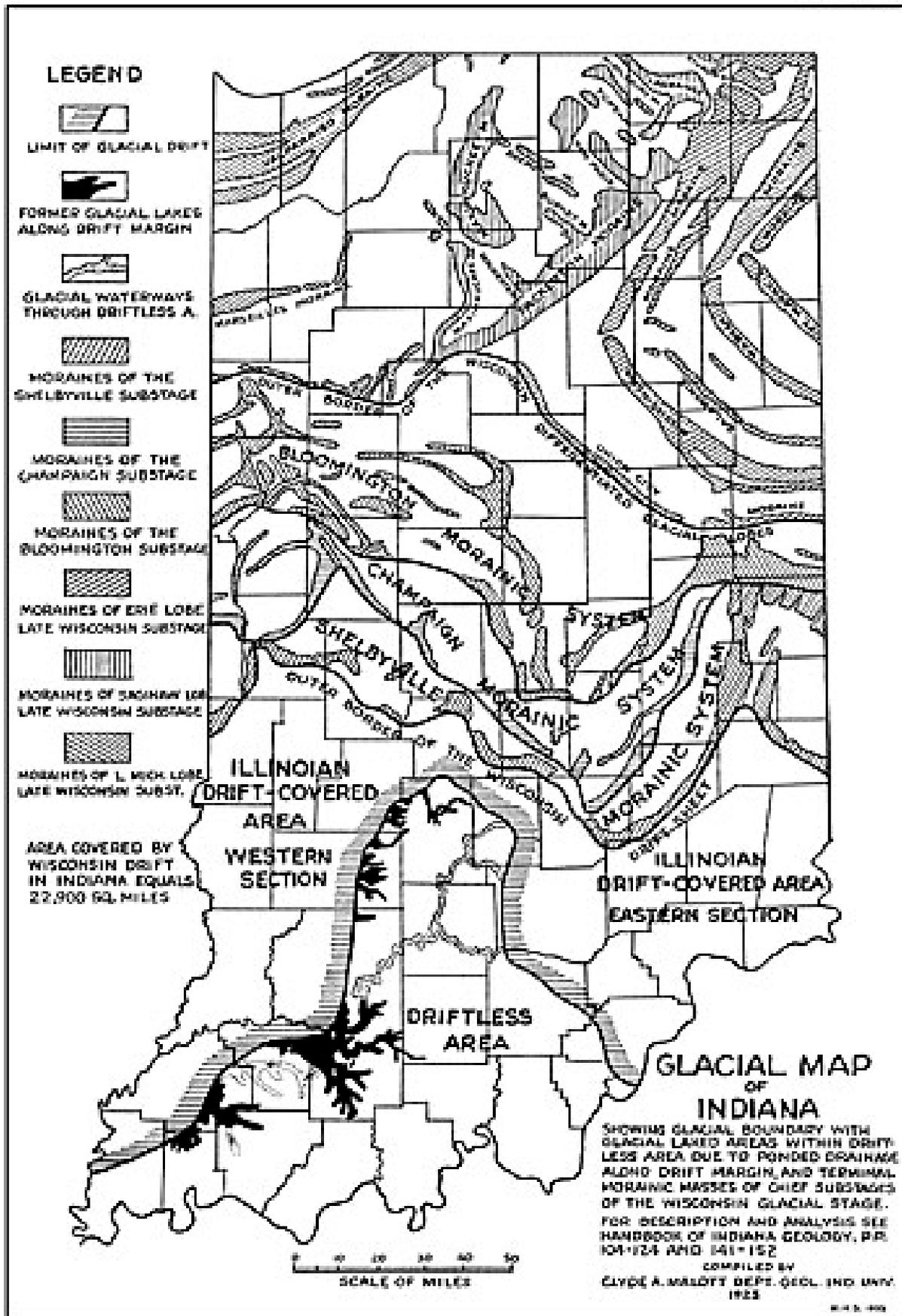
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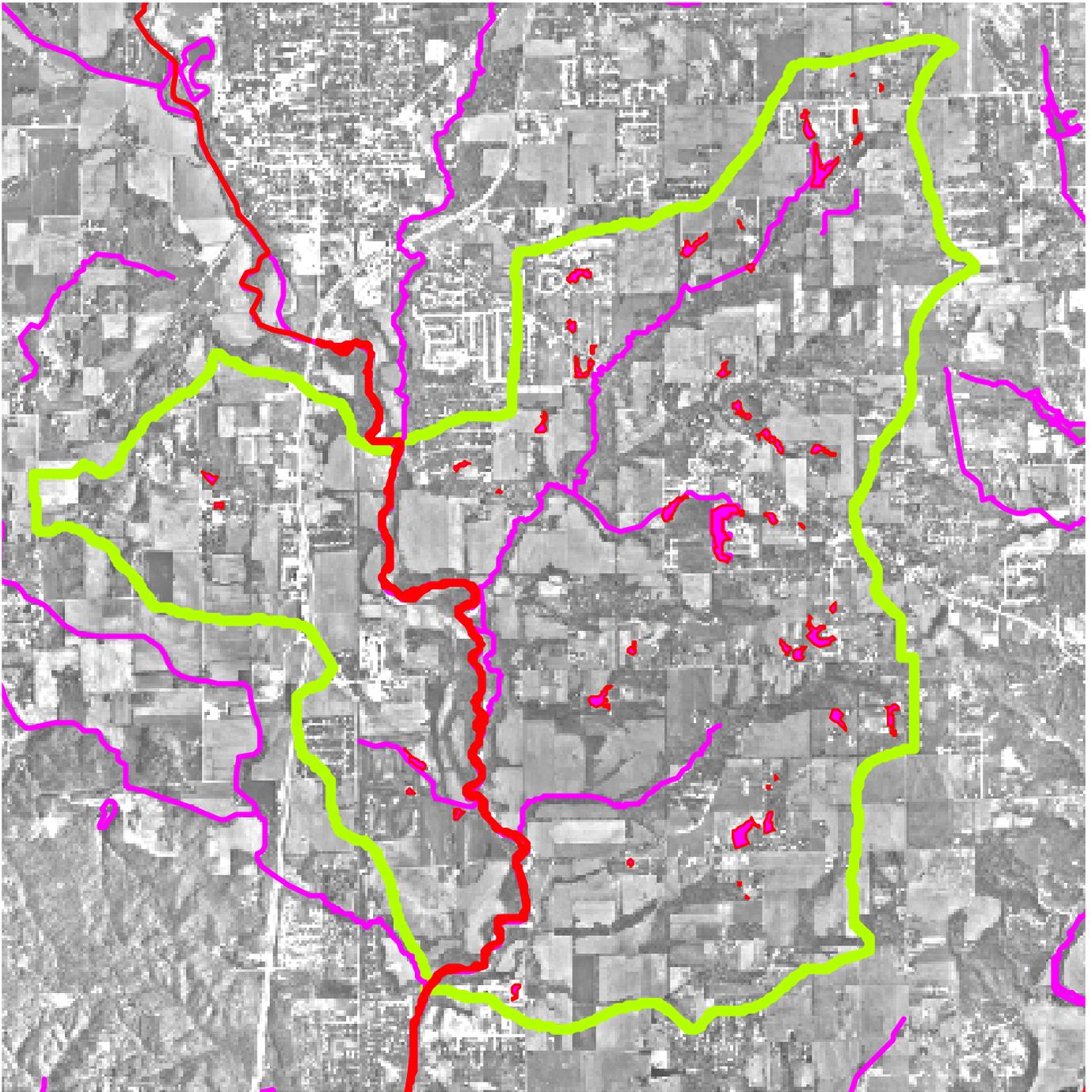


EXPLANATION

Land use and land cover

- Urban or built-up land
- Agricultural land
- Forest land
- Water
- Wetland
- Barren land
- White River Basin boundary





1998 ortho photo showing streams and ponds. The 303d-listed White Lick Creek is shown in red.

Streams & Lakes

Visual Observation - Streams								
Site ID #	Stream	Location	Date	Weather	Stream Depth	Stream Width	Riparian Condition [E = eroded banks. L = livestock access. W = wooded riparian zone.]	Site Comments
ST1	Hub's Cr	Watson, just after Horse & Hub come together, nr WL	7/20	Hot, overcast, no recent rain	Almost empty, but would normally be 10-12"	Normally 6-8 feet	Shrubs & trees. Riparian buffer more than 50 feet on both sides.. Banks show a little undercutting but no slumping. Banks not more than 2 feet high. W E	bottom silty, some gravel, looks like a lot of stuff gets washed down. Bridge is scoured on one side & they have put rip-rap & gabions in previously in a vain attempt to stop the erosion. Woods both sides.
ST2	Hub's Cr	Pennington, flow from new pond into Crouse Lk	7/13	Hot, sunny, recent rain	Just a few inches in a culvert pipe.	Pipe is about 24"	In this case "riparian" means a culvert, since the stream just runs under the road. There is erosion around the upstream pipe, and sediment deposition bars around the outlet pipe into the lower pond. E L	Water just runs from one side of road, from pond outlet, into other pond on other side of road. Residential. Hub turns his cows in here during July & August.
S2A	Hub's Cr	Watson below Crouse Lk	7/13	"	6-8"	3.5 ft before entering pipe.	Grass & forbs for more than 100' on both sides. No apparent erosion.	Pretty overgrown. There used to be cows in this field but they have been gone about 2 yrs.
S3	Donkey Cr	Pennington (redbuds)	7/13	"	8-10"	6-8'	Upstream: woods on both sides; banks are slightly scoured. Downstream: this is the area where the donkeys hang out. Banks bare and riparian vegetation poor pasture, overgrazed. Banks about 5' high here.. a few trees are hanging on. W E L	Woods on upstream side and pasture on the other.
S4	Donkey Cr	Dayhuff Rd	7/20	Hot, overcast, no recent rain	4-6"	3-4'	Riparian zone is mowed grass. No apparent erosion.	residential on both sides, mowed down to edge of creek in places.

Visual Observation - Streams								
Site ID #	Stream	Location	Date	Weather	Stream Depth	Stream Width	Riparian Condition [E = eroded banks. L = livestock access. W = wooded riparian zone.]	Site Comments
S5	Shady Cr	Pennington nr the fat cow	7/20	Hot, overcast, no recent rain	4-6"	1-3'	Riparian zone good-quality pasture and tall grass.. Banks about 2 to 3 feet here, and there has been some sloughing. E L	banks grazed but since it's only one cow, still in good shape. Residential.
S6	So Fk Orchard	Pennington, just below pond outlet nr trailer park	7/20	Hot, overcast, no recent rain	trickle		Upstream: pond outlet is surrounded by mowed grass. Downstream: shrubs & unmowed grass for more than 100' on both sides. Occasional use as beef pasture. Banks look eroded near the culvert but are stable further away. L	bank of pond pretty bare, some grass. This is just the overflow from the pond. trailer park on one side, pasture on the other.
S7	So Fk Orchard	just so of S6, trib that drains Poplar Grove lk	7/20	Hot, overcast, no recent rain	6-8"	4-6'	Riparian zone more than 100' woods upstream and more than 100' shrubs & unmowed grass downstream. Some bank erosion where they put in the package plant. This would be a good sample location. W E L	woods on one side of road and overgrown pasture on the other. Package plant for Country View is on the bank.
S8	Mid Fk Orchard	Pennington below 144	7/20	Hot, overcast, no recent rain	8-10"	6-8'	Zone wooded >100' both sides. Banks stable. W	this sometimes floods and the culvert gets blocked. Woods.
S9	Mid Fk	144 east of Pennington	7/20	Hot, overcast, no recent rain			Densely wooded, couldn't see the banks. W	Stream invisible in the bushes & no safe place to stop the car.
S10	Mid Fk	Neitzel Rd	7/20	Hot, overcast, no recent rain	6-8"	2-3'	Zone mowed grass with a narrow unmowed buffer <10'. No apparent erosion.	residential, not much to see.

Visual Observation - Streams								
Site ID #	Stream	Location	Date	Weather	Stream Depth	Stream Width	Riparian Condition [E = eroded banks. L = livestock access. W = wooded riparian zone.]	Site Comments
S11	Shady Cr	Rooker Rd just No of the kennel	7/20	Hot, overcast, no recent rain	6-8"	3-4'	Tree cover both sides, but the understory is mowed. Banks show signs of flashing, some slumping. Some driveway culverts which appear too small for the flow. E	residential, lawns
S12	Orchard Main Stem	Rooker Rd down on the flat	7/20	Hot, overcast, no recent rain	8-10"	4-8'	Zone wooded ~ 30' each side, then unmowed grass. Banks stable. W	residential & hobby farm...horses? Have never seen any livestock grazing down on the flat.
S13	No Fk Orchard	Hadley Rd just below Arens Lk	7/20	Hot, overcast, no recent rain	nearly dry	?	Upstream: mowed grass. Downstream: pasture with livestock access; however vegetation is thick and there is no apparent erosion. L	Not much to see, just a trickle at this point. Outfall from lake. Pasture with cows. Lake surrounded by houses, mowed to the very edge; lots of geese. houses probably on septic.
S14	No Fk Orchard	Hadley Rd, unnamed trib just east of lake	7/20	Hot, overcast, no recent rain	8"	2'	Both sides: pasture with livestock access; zone wooded <30' both sides. W L	cows in creek, pasture both sides, bushes & trees overhang the creek.
S15	No Fk Orchard	144 west of Pennington	7/20	Hot, overcast, no recent rain	~6-10"	4-6'	Zone tall grasses & weeds. No apparent erosion.	can't really see much, very overgrown & no safe place to stop. Swampy.
S16	Trailer Cr	old 67 at Brookmoor	7/24	Hot, rain 4 days ago	?	?	Tall grass & weeds. No apparent erosion.	Just a trickle at this point, hard to even see where it is.
S16A	Horse Cr	Pennington nr horse wasteland	7/20	Hot, overcast, no recent rain	0-7"	5-7'	Upstream: no vegetation, 1 acres "pasture" with 9 horses; owners burn manure near the creek. Downstream: woods >100' both sides, banks about 3 to 4 feet high, stable. W E L	Horse pasture on one side & woods on the other

Visual Observation - Streams								
Site ID #	Stream	Location	Date	Weather	Stream Depth	Stream Width	Riparian Condition [E = eroded banks. L = livestock access. W = wooded riparian zone.]	Site Comments
S17	Bethel Cr	Runs along road on Bethel Ch Rd east of church.	7/24	Hot, rain 4 days ago	8-10"	2-3'	Zone tall grass & shrubs except where it runs alongside the road. No evidence of erosion. 1/2 W	Heavily overgrown ditch with willows & shrubs
S18	Bethel Cr	Runs under Bethel Rd	7/24	Hot, rain 4 days ago	8-10"	3-4'	Zone wooded but narrow, <30' in places. W	Corn both sides of road; shrubs & willows along streambank.
S19	Bethel Cr	down behind apartments & under 67	7/24	Hot, rain 4 days ago	?	?	Zone probably mowed grass.	Can't see very well. Runs through residential area.
S20	White Lick	off Watson at the bend	7/20	Hot, overcast, no recent rain	3-4'	20-40'	Wooded on far side of creek, road on other. Outside bank very steep, sloughing, protected by riprap. 1/2 W E	small parking area right there for fishermen etc.
S21	Shady Cr	on Shady Lane	7/20	Hot, overcast, no recent rain	8-10"	2-4'	Banks mowed, overhanging trees, banks stable.	banks mostly mowed through here, residential area, but creek is shaded and banks are not eroding noticeably.
S22	White Lick Cr	main stem at 67 so of theatre	7/24	Hot, rain 4 days ago	12-24"	15-30'	Zone woods ~ 50' both sides, impervious area on north side, banks not stable. W E	Banks eroded, lots of sand bar & silt deposits. Woods both sides. New bridge built a few years ago. Commercial strip just north of creek appears to have no stormwater ponds.
19 observation points. Some were revisited in the winter.							Wooded riparian zone: 12 / 19=63% Streambank erosion: 9 / 19 = 47% Livestock access: 8 / 19 = 42%	Note: 2 worst sites were horse pasture.

Summary

Most 1st, 2nd, and 3rd order streams in this watershed run through a combination of agricultural and rural residential land; in general the banks are well vegetated and there is at least some buffer vegetation along most of the streams; where there is no buffer it is usually lawn. 63% of observation sites had wooded riparian zones. These streams are much affected by weather, and go dry in late summer unless it rains a lot. Some of

the streams are getting flashy although there is little concentrated impervious area. 47% of observation sites showed some streambank erosion, although it was not severe in most cases. If this watershed increases from ~8% impervious to 15%, it will cause accelerated streambank erosion and habitat degradation. There are over 50 ponds in the watershed, which has probably reduced the base flow through the summer. 42% of observation sites had livestock access to the stream; many of these sites are used only periodically. The two sites that were degraded by livestock trampling were both horse pasture.

The main stem of White Lick Creek bisects the watershed from North to South. The floodplain is in agricultural use (cropland planted to corn & beans). The stream is braided with sandbars and stream banks on outside curves are steep and unstable. Where observable, the riparian zone is wooded, from 30 feet to several hundred feet wide. The White Lick's hydrologic problems can't be solved here, since they stem from increased impervious area upstream. However, in order to avoid contributing further to flooding, impervious area management in this watershed is recommended. Maintaining a minimum 100' wooded riparian zone on both sides of White Lick should be encouraged with CRP and other programs. Conservation easements in the floodplain through WRP or other programs should also be encouraged.

Wetlands

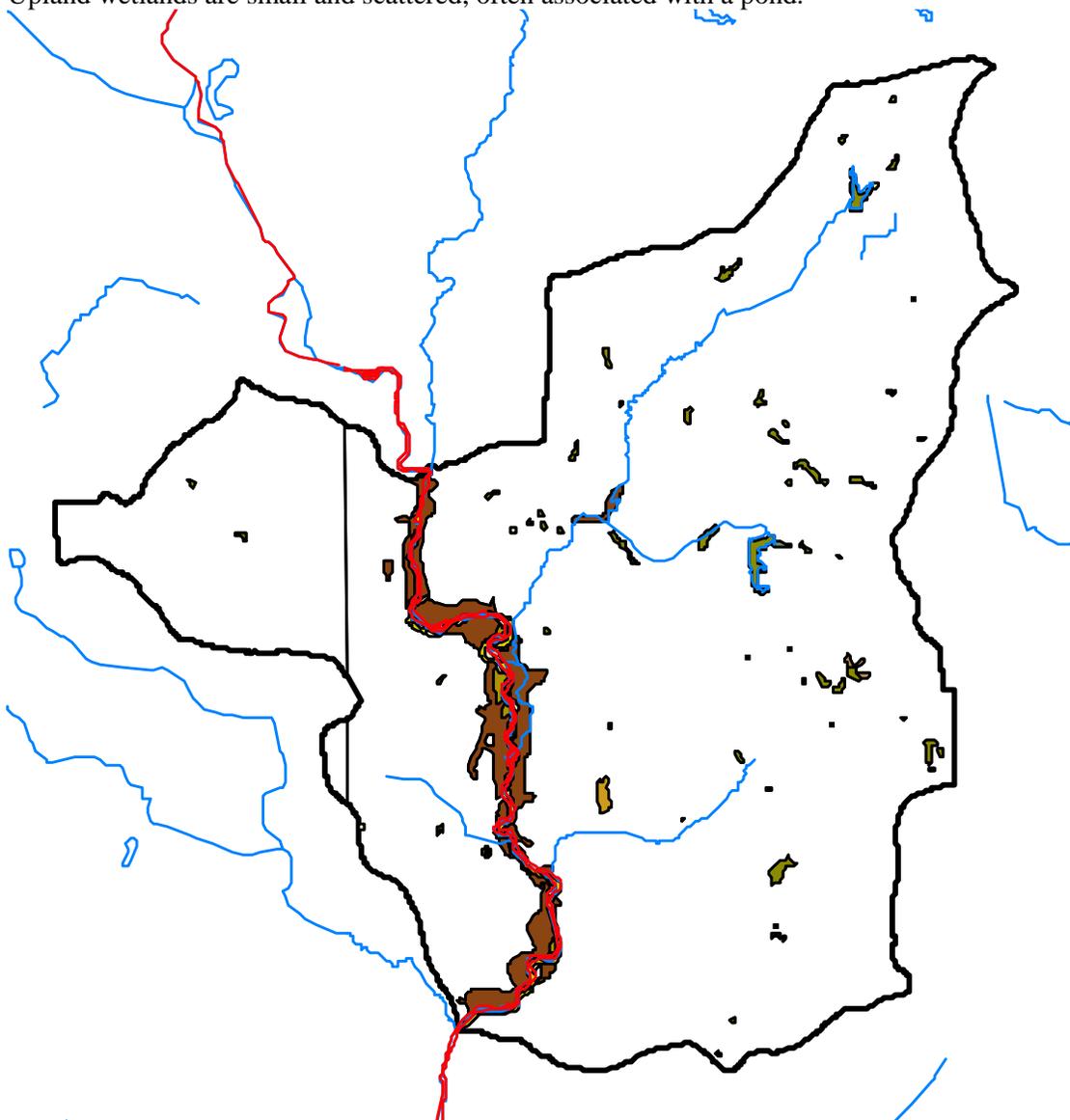
The USF&WS National Wetland Inventory digital maps identified 117 wetlands, including 52 ponds.

Riverine shores (mostly along White Lick Creek) 25 acres (riparian)
Rivers & large streams (again mostly the White Lick) 893 acres
Ponds 67 acres

Palustrine broad-leaf 12 acres.....from 5.5 ac to 1.3 ac
Palustrine deciduous forest 314 acres.....from 107 ac to < 1 ac, including 6 large tracts
Palustrine aquatic & emergent 15 acresfrom 6 ac to < 1 ac

The palustrine types are what we normally think of as wetlands; all told there were 35 of those sites encompassing 341 acres, or 4.2% of the watershed. Except for one 8-acre tract, all the palustrine forested wetlands are along the White Lick in the floodplain. Hopefully they couldn't be developed because of being in the floodway.

Upland wetlands are small and scattered, often associated with a pond.



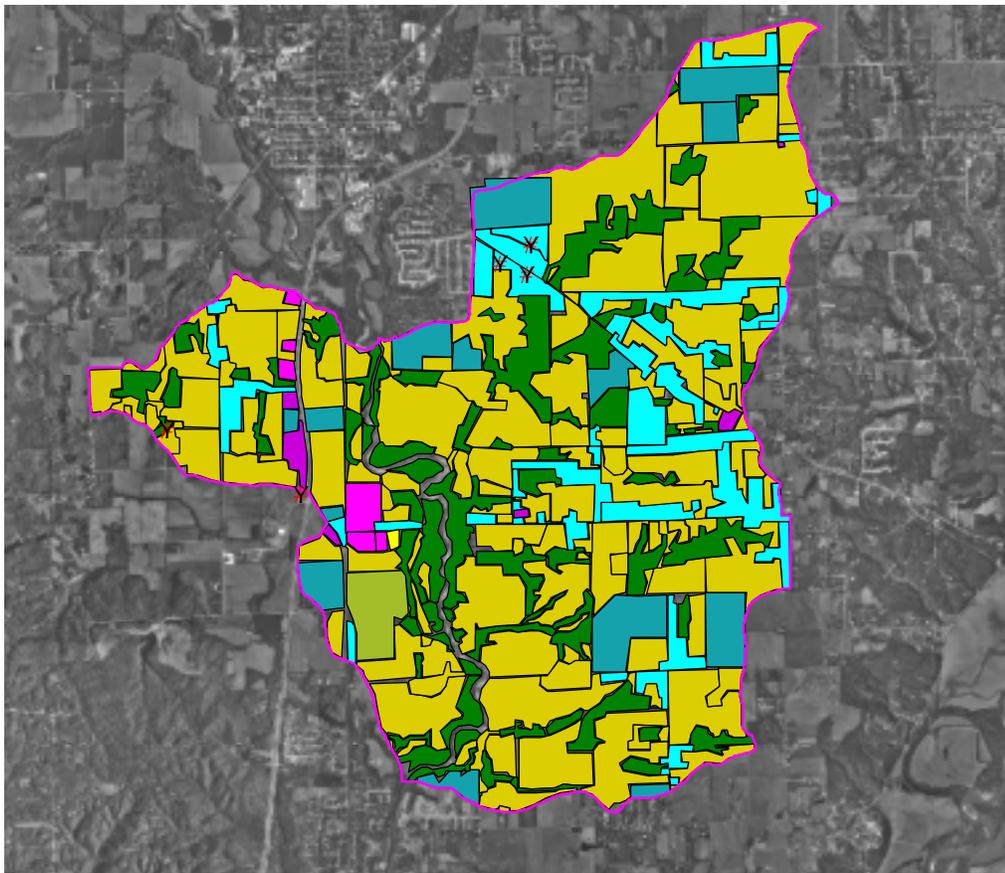
NWI wetlands

Land Use Overview

Note: impervious factor for forest & ag same at 0.01. Commercial 0.85, industrial 0.72, residential small lots 0.4 and large lots 0.2.

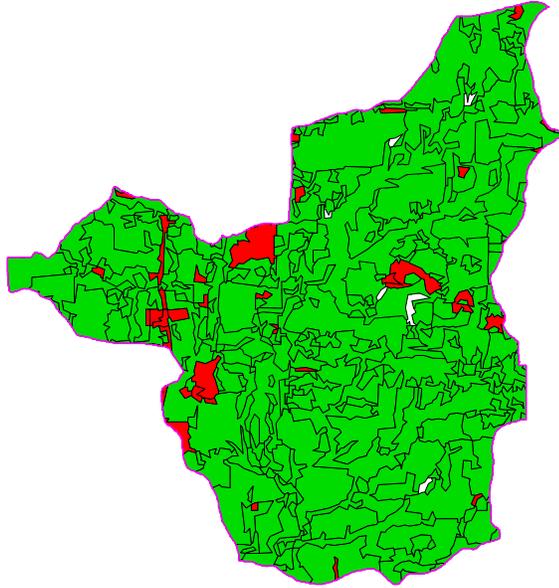
Ag 60%.....	51
Commercial/industrial 2%.....	145
Forest & wetlands 24%.....	20
residential 14%.....	478

Watershed is (leaning toward the pessimistic) about 8% impervious at present. If impervious surface is allowed to expand another 2 to 7 %, serious stream habitat degradation could occur. It's especially important for new development to have stormwater control and for construction sites to be properly managed. As little as 10% impervious area can degrade fish habitat, and 15% impervious area severely degrades habitat as well as streambank integrity.



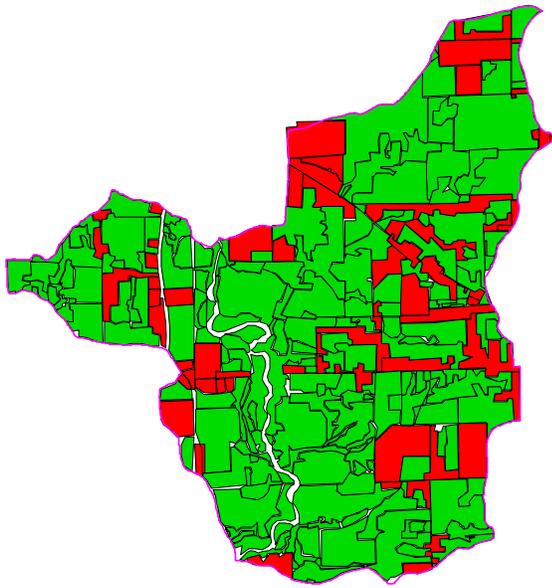
**Land Use-
Orchard Creek**

- ⚡ Meeting Places
- ▭ Orchard Creek Watershed
- ▭ Recreational Sites
- ▭ Woodland
- ▭ Agricultural Land
- ▭ Commercial Property
- ▭ Industrial Property
- ▭ Residential Clusters
- ▭ Subdivisions



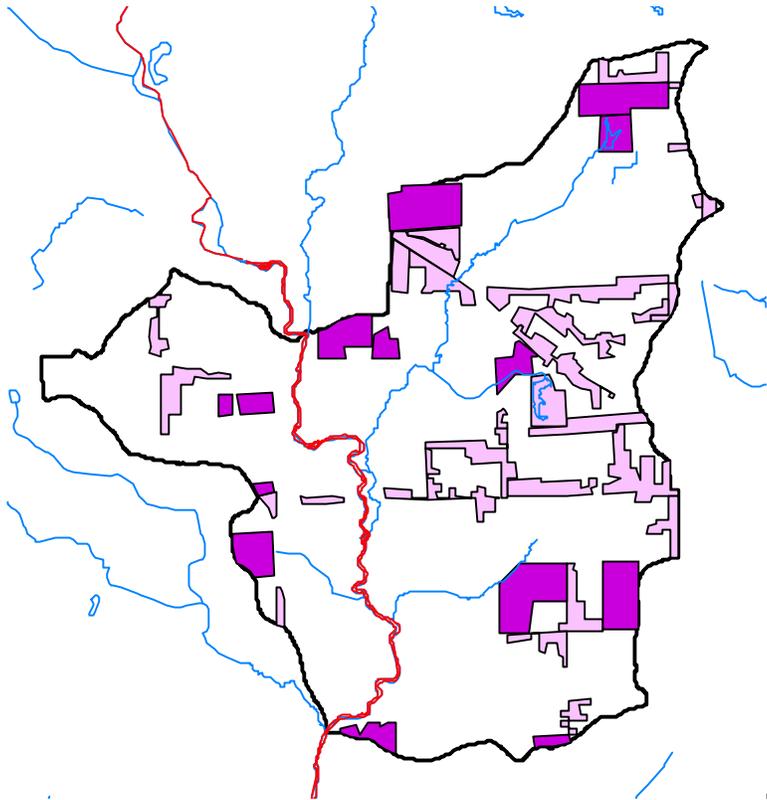
1992 GAP Land Use Simplified

- Home14.shp
- Home wetpalustrine.shp
- Home urblowdens.shp
- Home urbidens.shp
- Home forest.shp
- Home agpasture.shp
- Home agcrops.shp



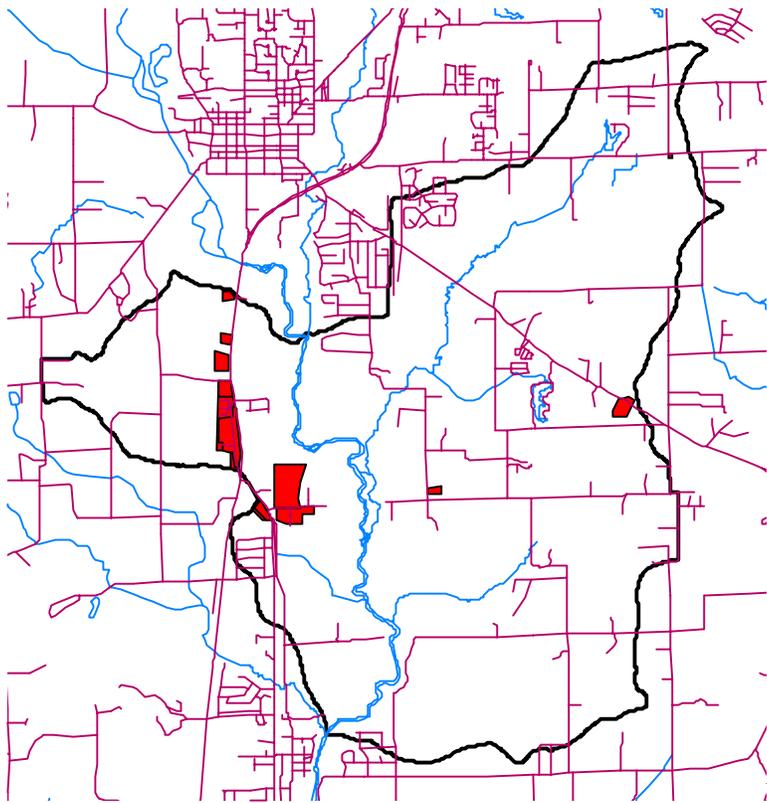
2001 Land Use

- Home14.shp
- Home_workingag.shp
- Home_woods.shp
- Home_subdivision.shp
- Home_resclusters.shp
- Home_res_hi_dens.shp
- Home_recrea.shp
- Home_industry.shp
- Home_commercial.shp



(lavendar) from the 1998 aerial photos.

Subdivisions (purple) and residential strips and clusters



photos.

Industrial/commercial sites in red. From the 1998 aerial

POPULATION

2000 census data for Morgan County (available from the US Census Bureau website, or the Indiana State library web site):

Population from 1900 to 2000

20,457-1900

21,182

20,010

19,424

19,801

23,726

33,875

44,176

51,999 – 1980

55,920 – 1990

66,689 – 2000

projected 2020 – 81,716

Growth from 1990 to 2000: 19.3%

Growth from 1980 to 2000: 28.3%

Projected growth from 2000 to 2020: 22.5%

In-migration about 1,032 per year; births (minus deaths) 387. 4th largest in-migration rate in the state.

School-age population (0-17) 27% & retired population (65+) 11%. Median age 36. Ethnic: 98.6% white. 890 people said they were other than white and 490 said they were Hispanic.

29.4% of households are married with children, 35.8% are married without kids, 7.6% are single parents and 18.4% live alone. Only 10% of adults currently have a college degree; however 52% of last year's graduating class went on to a 4-yr. college. 7.8% of families live below the poverty line, including 11.4% of the kids. In 1998, 927 people were born (12% to teenagers) and 494 people died.

The unemployment rate is 2.1% (May 2001).

In 1999, 96.2% of labor worked off the farm; 23.8% in services and 21.2% in retail.

Daily, about 2800 people commute into Morgan county to work, and about 20,000 commute out of the county to somewhere else, mostly Marion County.

Martinsville is the biggest town at 11,698 and Mooresville second at 9,273. Brooklyn/Bethany actually has 1639.

In 1999 601 residential building permits were filed.

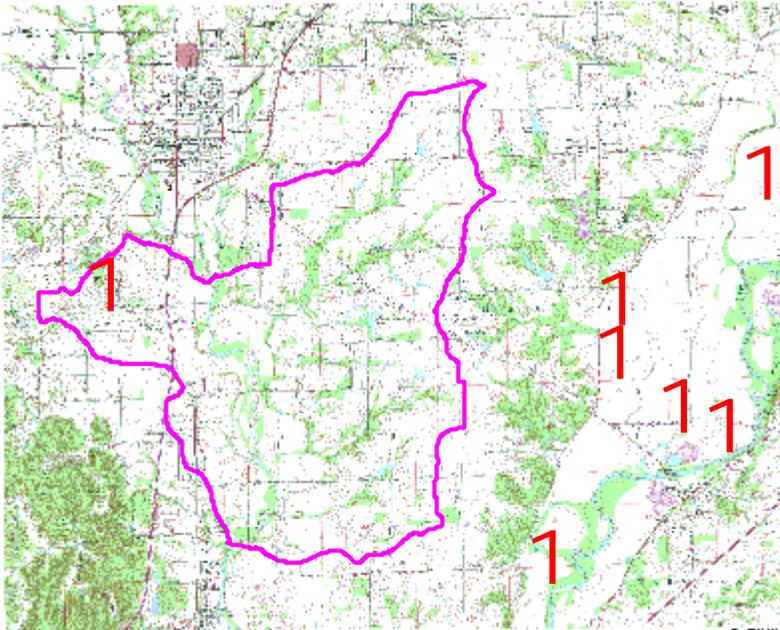
There are almost 26,000 housing units in the county.

There are 164 people per square mile.

In 1995, there were 91 people in the county employed in agriculture (less by 1999 but the number wasn't specified.)

Mining

One gravel pit is in the watershed and many new sand pits are spring up in the floodplain of the White River. It is possible that there are sand & gravel reserves in the floodplain of White Lick as well, since the soils are similar.



There are no other known mineral reserves in the watershed, and there was no indication of abandoned gas or oil wells.

Orchard Creek's History

A number of place names such as Rooker, Moore, Watson, and Hadley show up in the earliest Census counts (1830, 1840). Earliest recorded sale of land from the government in the area of the watershed was by William Ballard in Brown Township on Dec 4th, 1820. A number of Madison and Brown Township men fought in the Civil war and were eligible for pensions in 1890, including my neighbor's ancestor Elijah Trusty.

In an early mortality list for 1850, a number of persons in both townships died of typhoid, typhus, dysentery, and similar diseases that can be waterborne. Several also died of smallpox, and a common cause seemed to be "inflammation of the brain". During this time the nearest settlements would have been Mooresville and the small clusters of housing that became Waverly.

During the 30's, possibly earlier, to the 70's there were commercial orchards scattered through the watershed, some of which still show on the topo maps although they aren't actually there any more. I assume that's why it's called Orchard Creek.

During the 80's to the present, agricultural land use has been gradually, now rapidly, giving way to residential development as people move out of Indianapolis. Establishment of the United Air maintenance facility in the late 90's led to a burst of development; the Heartland Crossing subdivisions soaked up all the newcomers for a few years, but now the new "mom-&-pop" subdivisions are cropping up again in the watershed, in fact all over Morgan County. Viable farming is likely to remain in the wide floodplains of the White Lick and White river, but will probably be eliminated on the uplands within the next 2 decades.

Cultural resources: There are several possible pre-European cultural sites on bluffs overlooking White Lick. They are not likely to be of major significance.

The old orchard sites might be of interest if any of the streams test positive for arsenic, since they could be a source.

The Bethel Church & Cemetery is the oldest extant site in the watershed.

The General Shale (brick plant) site is the oldest industrial site. Some of the glazes that were used on the bricks in the past might have been toxic; these substances may or may not have ever been exposed to the environment.

Agriculture

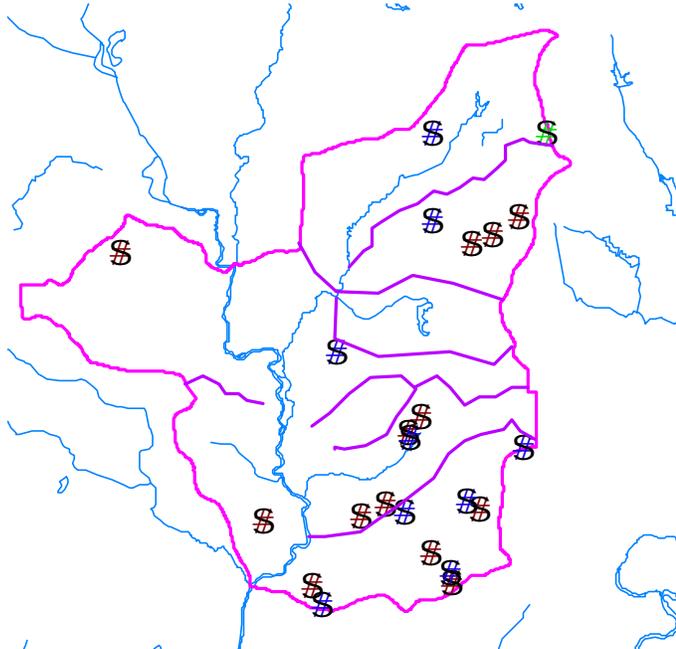
Livestock consist of small beef cow-calf operations, one small dairy farm milking about 60 Holsteins, a number of hobby farms with horses or oddball animals (long-horn cattle, donkeys, emu, goats) and one commercial dog kennel. There are no swine or poultry and no confined feeding operations.

Since most of the livestock are on pasture for all or much of the year, there is not a lot of manure land-applied. I could not find any manure storage lagoons or dry storage structures on the watershed, although the dairy probably has some form of dry storage.

Crops include corn, soybeans, wheat, and pasture. Most crop fields are in corn-bean rotations and some are corn-beans-wheat. Conservation tillage rates are slightly higher than the state average. Crop fields are usually tile-drained. There are no open ditch drains except on the floodplains. There is no active drain maintenance.

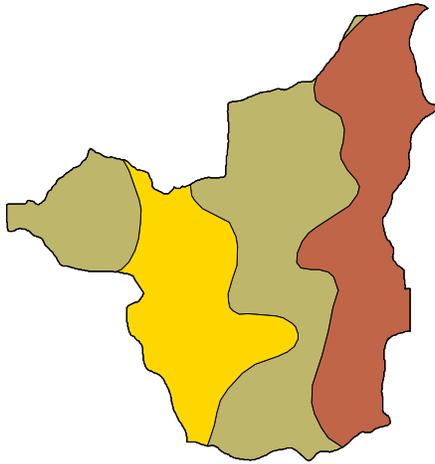
Three farms in the watershed went out of business within the last year and the land is being converted to housing. The map shows where livestock operations are located:

Green – dairy;
Brown – Beef;
Blue – horses or other stock





Location of crop or pasture fields.



STATSGO Soils

- IN013
- IN029
- IN040

Forestry

There is no evidence of active timber harvesting in the watershed, although neighbors have said that small logging operations occasionally occur. Few tracts of woodland would be big enough to interest a timber company. All the woodland is mixed hardwoods and none of it has been planted. (as with pines or walnut). Joining riparian forested areas along stream corridors would be beneficial to wildlife as well as providing better streambank stabilization.

