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Appendix A:
Geographic Information Systems (GIS) Metadata

The following geographic information systems (GIS) data sources were used to create one or more of the maps in the Watershed Management Plan:

IDEM, 2013. BROWNFIELDS_IDEM_IN: Defined as a parcel of real estate that is abandoned or inactive, or may not be operated at its appropriate use, and on which expansion, redevelopment, or reuse is complicated because of the presence or potential presence of a hazardous substance, a contaminant, petroleum, or a petroleum product that poses a risk to human health and the environment. IDEM, Office of Land Quality, Brownfields Section. (unknown scale) Point shapefile.

IDEM, 2013. CONFINED_FEEDING_OPERATIONS_IDEM_IN: Confined Feeding Operation Facilities in Indiana, IDEM, Office of Land Quality, Compliance and Response Branch, Solid Waste Compliance Section. (no scale) Point Shapefile.

IDNR, 2013. FLOODPLAINS_FIRM_IDNR_IN: Floodplains and Flood Hazard Zones in Indiana, 20130326. Indiana Department of Natural Resources, 1:12,000, Polygon Shapefile.

IDEM, 2013. UST_IDEM_IN: Underground Storage Tanks in Indiana, IDEM, Office of Land Quality, Remediation Service Branch, Underground Storage Tank Section. (no scale) Point Shapefile.

IDEM, 2013. WASTE_INDUSTRIAL_IDEM_IN: Industrial Waste Sites in Indiana, IDEM, Office of Land Quality, Compliance and Response Branch, Industrial Waste Section. (no scale) Point Shapefile.

IDEM, 2012. IMPAIRED_STREAMS_IDEM_IN: Impaired Streams in Indiana on the 303(d) List of 2012. Indiana Department of Environmental Management, Office of Water Quality. Line Shapefile.

IDEM, 2010. OPEN_DUMPS_IDEM_IN: IDEM, Office of Land Quality, Solid Waste Compliance Section, Compliance and Response Branch. (unknown scale) Point shapefile.

IDEM, 2009. RECREATIONAL_FACILITIES_IDNR_IN: Outdoor recreational facilities in Indiana. IDNR, Department of Outdoor Recreation (1:24,000) Point shapefile.

IDEM, 2002. NPDES_FACILITY_IDEM_IN: Facilities in the National Pollutant Discharge Elimination System with assigned UTM Coordinates in Indiana. IDEM, Office of Water Quality, Data Management Section. (no scale) Point Shapefile.

IDNR, 2013. IN_ETR_SPECIES: IDNR, Division of Nature Preserves, Indiana Natural Heritage Database. (unknown scale) Polygon shapefile.

IDNR, 2009. RECREATIONAL_FACILITIES_IDNR_IN: Outdoor recreation facilities, including facilities managed by federal, state, and local governments, as well as non-government organizations, private and commercial entities, and schools. It does not include sites that are private and not open to the public. (1:24,000) Point shapefile.

IGS, 2004. CENSUS_MCD_POPCHANGE_IN: Population Densities and Changes of Densities of Minor Civil Divisions in Indiana from 1890 to 2000. Derived from United States Census Bureau. (1:500,000) Polygon Shapefile, digital representation by Denver Harper, 2004.

IGS, 2003. ECOREGIONS_USGS_IN: Ecoregions, Levels III and IV, Indiana. Derived from U.S. Geological Survey. (1:250,000) Polygon Shapefile.

INDOT, 2004. HIGHWAYS_INDOTMODEL_IN: Highways in Indiana, INDOT, Graphics and Engineering. (1:24,000) Line Shapefile.

INDOT, 2001. INCORPORATED_AREAS_INDOT_IN: Incorporated Boundaries in Indiana, INDOT, Graphics and Engineering. (no scale) Polygon Shapefile.

NRC, 1997. RIVERS_OUTSTANDING_NRC_IN: Outstanding Rivers in Indiana, as listed by the Natural Resource Commission which identifies rivers and streams which have particular environmental or aesthetic interest. (1:100,000) Linear shapefile.

NRCS, 2009. WBDHU_12_L_IN: 12-digit and 10-digit hydrologic accounting units. (1:24,000) Polygon shapefile.

USCB, 2000. URBAN_AREAS_TIGER00_IN: major urban areas identified by the U.S. Bureau of the Census. Derived from U.S. Department of Commerce, U.S. Census Bureau, Census 2000 Tiger Line Files. (1:100,000) Polygon Shapefile.

USCB, 2005. ROADS_2005_INDOT_IN: Indiana Roads from INDOT and TIGER Files, 2005. (1:100,000) Line Shapefile.

USDA, 2013. CROPS_2013_USDA_IN: Crops in Indiana for 2013, Derived from National Agricultural Statistics Service, U.S. Department of Agriculture, 1:100,000, 30-Meter TIFF Image.

USDA, 2012a. SOILMU_A_IN007: Soil Survey Geographic (SSURGO) database for Benton County, Indiana. (1:24,000) Polygon shapefile.

USDA, 2012b. SOILMU_A_IN157: Soil Survey Geographic (SSURGO) database for Tippecanoe County, Indiana. (1:24,000) Polygon shapefile.

USDA, 2012c. SOILMU_A_IN171: Soil Survey Geographic (SSURGO) database for Warren County, Indiana. (1:24,000) Polygon shapefile.

USDA, 2012d. SOILMU_A_IN181: Soil Survey Geographic (SSURGO) database for White County, Indiana. (1:24,000) Polygon shapefile.

USDA, 2004. CULTIVATED_AREAS_USDA_IN: Cultivated Areas in Indiana in 2004. U.S. Department of Agriculture, 1:100,000, Polygon Shapefile.

USDA, 1994. SOILS_STATSGO_IN: Soil Associations in Indiana. U. S. Department of Agriculture, Natural Resources Conservation Service. (1:250,000) Polygon Shapefile.

USEPA, 2009. Facilities Regulated by EPA (NPDES data from Envirofacts). Point Shapefile.

USFWS, 2011. IN_NWI_CURRENT_DRAFT_07062011: Updated National Wetland Inventory dataset which was originally developed in 1979. Latest version updates 1979 dataset through the use of aerial photographs. (1:24,000) Polygon shapefile.

USGS, 2008a. HYDROGRAPHY_HIGHRES_FLOWLINE_NHD_USGS: Streams, Rivers, Canals, Ditches, Artificial Paths, Coastlines, Connectors, and Pipelines. Derived from National Hydrography Dataset which was originally developed at 1:100,000 scale to be developed at 1:24,000-1:12,000 scale. (1:24,000) Linear shapefile.

USGS, 2008b. HYDROGRAPHY_HIGHRES_WATERBODYLINEAR_NHD_USGS: Rivers, Inundation Areas, Canals, Submerged Streams, and Other Linear Waterbodies. Derived from National Hydrography Dataset which was originally developed at 1:100,000 scale to be developed at 1:24,000-1:12,000 scale. (1:24,000) Linear shapefile.

USGS, 2006a. IMPERVIOUS_SURFACE_2006_USGS_IN: Estimated Percentage of Impervious Surface in Indiana in 2006, Derived from the 2006 National Land Cover Database (United States Geological Survey, 30-Meter TIFF Image).

USGS, 2006b. LAND_COVER_CHANGE_2001_2006_USGS_IN: Land Cover Change in Indiana, Derived from the 2001 and 2006 National Land Cover Database (United States Geological Survey, 30-Meter TIFF Image).

USGS, 2001. LC2001USGS_IN: 2001 Land Cover in Indiana, Derived from the National Land Cover Database (NLCD 2001, United States Geological Survey, 30-Meter Grid), digital representation by Chris Dintaman, 2007.

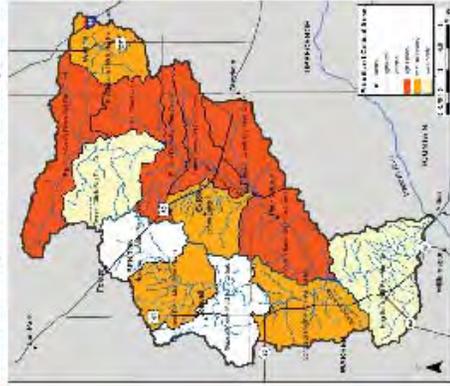
USGS, 1998. LANDSURVEY_COUNTY_POLY_IN: County boundaries in polygon format. Derived from the U.S. Geological Survey's 1:24,000 digital raster graphic (DRG) series. (no scale) Polygon shapefile.

USGS, 1996. PLACES_POINTS_USGS_IN: Shows the locations of populated places, extracted from the Geographic Names Information System (GNIS) developed by the U.S. Geological Survey. Elevations (feet above sea level) are also provided. (1:24,000) Point shapefile.

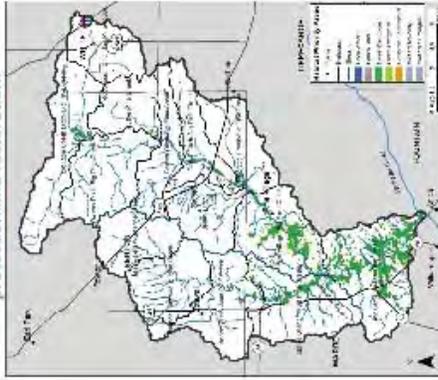
USGS, 1991. WATERSHEDS_HUC08_CATALOG_UNITS_USGS_IN: 8-digit hydrologic accounting units. Derived from the 14-digit hydrologic units in Indiana created by U.S. Geological Survey and National Resources Conservation Service. (1:24,000) Polygon shapefile.

Appendix B:
Big Pine Watershed Brochure

Critical areas where BMPs will be focused to reduce nutrient, sediment and E. coli pollution:



Priority areas for habitat protection and restoration:



Big Pine & Mud Pine Creek Watershed

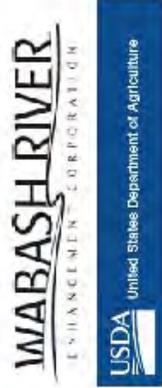
The Mission:
 Voluntarily conserve and improve the natural environment while balancing interests of stakeholders in the Big Pine Creek watershed.



The Vision:
 Big Pine Creek Watershed is an anchor and an asset to the community.

Outstanding Rivers
 Three streams in the Big Pine Creek watershed are designated by DNR as outstanding rivers: portions of the main stem of Big Pine and Mud Pine Creeks, as well as a portion of Fall Creek, a small tributary to Big Pine. Known for their scenic beauty, these streams are popular recreation and kayaking spots.

Get Involved!
 Meetings are typically held on the last Wednesday of each month from 4:00 to 6:00 PM. The public is welcome and encouraged to attend. To learn more or find out meeting dates and locations please call your local Soil and Water Conservation District:
 Benton County: 765-884-1090 x107 (Jon Charlesworth)
 Warren County: 765-762-2443 x3 (Deb Lane)
 White County: 574-583-5962 x3 (Sharon Watson)



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Big Pine Creek in Warren County

Historical accounts tell us that the Big Pine was a full and slow moving stream, with clear water, surrounded by wetlands and tall grass prairie that allowed little storm water runoff. Although some of this is still found today, many stresses on the environment have now placed the watershed in a battle. This battle ensues as we seek to balance the demand on agriculture lands to provide the food we need, healthy water to drink and recreate in, and habitat for wildlife. The Big Pine Watershed Group, made up of many partners and individuals, wants to work with you to make the watershed a better place to live, farm, and raise a family.

Goals of the project:

- Reduce Nutrient Loading
- Reduce Sediment Loading
- Reduce E. coli Loading
- Protect & Improve Habitat
- Increase Public Awareness & Participation

Cost-share Available for Best Management Practices (BMPs):

Conservation buffers, conservation tillage/no-till, cover crops, nutrient and pest management, bioreactors, drainage water management, two-stage ditch, septic upgrades, streambank stabilization, livestock management, grassed waterways, saturated buffers, forest/wetland/prairie restoration, and many others

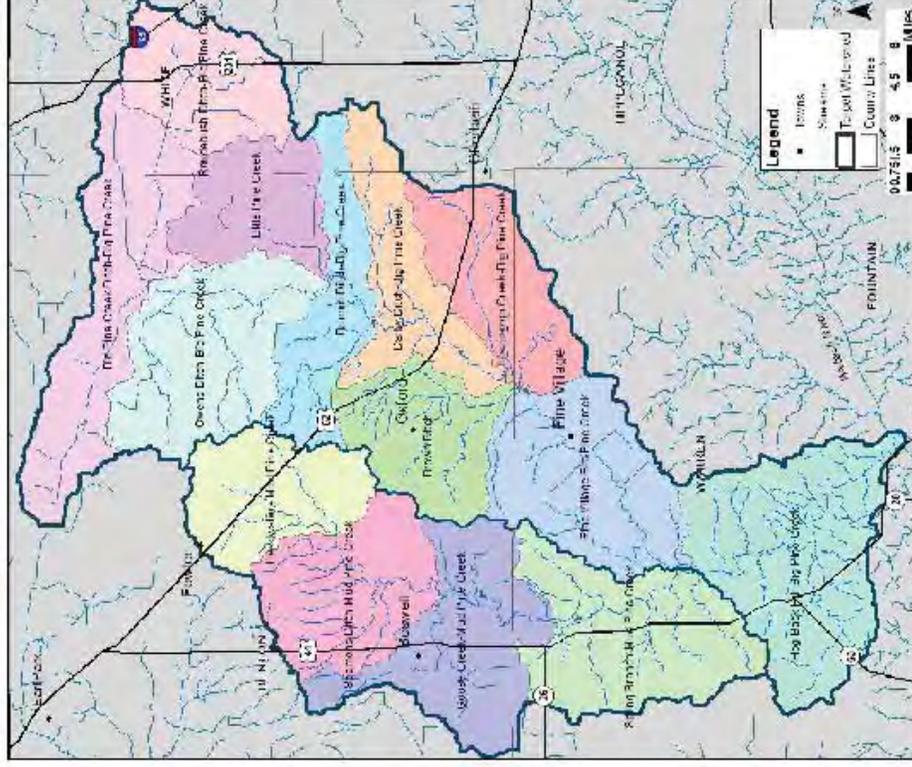
What is A Watershed?

A watershed describes an area of land that contains all the streams and rivers that drain into a single larger body of water, such as a river, lake or ocean. A watershed can cover a small or large land area. Small watersheds are usually part of larger watersheds.

Not only does water run into the streams from the surface, but water also filters through the soil, and some of this water eventually drains into the same streams.

The Big Pine and Mud Pine watersheds cover 209,709 acres in Benton, Warren and White counties.

Subwatersheds in the Big Pine and Mud Pine Watershed.



Appendix C:
Endangered, Threatened, and Rare Species List

Special species and high quality natural areas observed in the Big Pine Creek watershed.

Common Name	Scientific Name	State Rank	Last Observed
Bird			
Barn Owl	<i>Tyto alba</i>	SE	1958-06-30
Henslow's Sparrow	<i>Ammodramus henslowii</i>	SE	2002-05
Least Bittern	<i>Ixobrychus exilis</i>	SE	2001-07-25
Red-shouldered Hawk	<i>Buteo lineatus</i>	SSC	2001-05-12
Sedge Wren	<i>Cistothorus platensis</i>	SE	2001-07-25
Short-eared Owl	<i>Asio flammeus</i>	SE	1988-05-03
Upland Sandpiper	<i>Bartramia longicauda</i>	SE	1997-06-10
Western Meadowlark	<i>Sturnella neglecta</i>	SSC	1997-06-10
Crustacean			
Prairie Crayfish	<i>Procambarus gracilis</i>	ST	2004-08-05
Fish			
Channel Darter	<i>Percina copelandi</i>	SE	1945
Variagate Darter	<i>Etheostoma variatum</i>	SE	1962-07-16
Insect			
An Olethreutine Moth	<i>Hystriophora loricana</i>	SE	2009-08-01
Mammal			
American Badger	<i>Taxidea taxus</i>	SSC	1990-08-15
Eastern Red Bat	<i>Lasiurus borealis</i>	SSC	2003-07-24
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	SE	2001
Hoary Bat	<i>Lasiurus cinereus</i>	SSC	2003-07-23
Indiana Bat	<i>Myotis sodalis</i>	SE	2005-07-01
Least Weasel	<i>Mustela nivalis</i>	SSC	1988-05-07
Northern Myotis	<i>Myotis septentrionalis</i>	SSC	2005-06-22
Plains Pocket Gopher	<i>Geomys bursarius</i>	SSC	1988-10-10
Mollusk			
Clubshell	<i>Pleurobema clava</i>	SE	2005-08-23
Kidneyshell	<i>Ptychobranthus fasciolaris</i>	SSC	2005-08-24
Little Spectaclecase	<i>Villosa lienosa</i>	SSC	2004-04-12
Purple Lilliput	<i>Toxolasma lividus</i>	SSC	2005-08-24
Round Hickorynut	<i>Obovaria subrotunda</i>	SSC	2006-07-10
Salamander Mussel	<i>Simpsonaias ambigua</i>	SSC	2005-08-24
Wavyrayed Lampmussel	<i>Lampsilis fasciola</i>	SSC	2006-07-18
Reptile			
Smooth Green Snake	<i>Liochlorophis vernalis</i>	SE	1988-07-07
Vascular Plant			
Aromatic Aster	<i>Aster oblongifolius</i>	SR	2007-10-10

Cattail Gay-feather	<i>Liatris pycnostachya</i>	ST	1981-09
Downy Gentian	<i>Gentiana puberulenta</i>	ST	NO DATE
Earleaf Foxglove	<i>Agalinis auriculata</i>	ST	1930-09-12
Eastern Featherbells	<i>Stenanthium gramineum</i>	ST	1911-08-16
Eastern White Pine	<i>Pinus strobus</i>	SR	1988-10-09
Ebony Sedge	<i>Carex eburnea</i>	SR	1983-05-12
Forbes Saxifrage	<i>Saxifraga forbesii</i>	SE	1983-05
Forked Aster	<i>Aster furcatus</i>	SR	2010-08-31
Heavy Sedge	<i>Carex gravida</i>	SE	NO DATE
Ledge Spike-moss	<i>Selaginella rupestris</i>	ST	1998-10-01
Leiberg's Witchgrass	<i>Panicum leibergii</i>	ST	2004-06-15
Pitcher's Stitchwort	<i>Arenaria patula</i>	SE	1919-05-10
Rough Rattlesnake-root	<i>Prenanthes aspera</i>	SR	1928-09-20
Scarlet Hawthorn	<i>Crataegus pedicellata</i>	ST	1919-08-22
Shaggy False-gromwell	<i>Onosmodium hispidissimum</i>	SE	2010-07-12
Western Silvery Aster	<i>Aster sericeus</i>	SR	1998-10-01
Wild Hyacinth	<i>Camassia angusta</i>	SE	1992-06-09
Wolf Bluegrass	<i>Poa wolfii</i>	SR	1985-05-13
Geologic Feature			
Water Fall and Cascade	Geomorphic - Nonglacial Erosional Feature	--	2009-02-17
Other			
Migratory Bird Concentration Site	Migratory Bird Concentration Area	SG	1998-05-17
High Quality Natural Community			
Dry-mesic Prairie	Prairie - dry-mesic	SG	1981
Mesic Prairie	Prairie - mesic	SG	1988-05-12
Sandstone Cliff	Primary - cliff sandstone	SG	2002

Indiana County Endangered, Threatened and Rare Species List

County: Benton

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
<i>Toxolasma lividus</i>	Purple Lilliput		SSC	G3	S2
<i>Venustaconcha ellipsiformis</i>	Ellipse		SSC	G4	S2
<i>Villosa lienosa</i>	Little Spectaclecase		SSC	G5	S3
Insect: Lepidoptera (Butterflies & Moths)					
<i>Macrochilo hypocritalis</i>	A Noctuid Moth		SR	G4	S2
<i>Papaipema beeriana</i>	Beer's Blazing Star Borer Moth		ST	G2G3	S1S3
Fish					
<i>Etheostoma variatum</i>	Variagate Darter		SE	G5	S1
Reptile					
<i>Emydoidea blandingii</i>	Blanding's Turtle		SE	G4	S2
<i>Liochlorophis vernalis</i>	Smooth Green Snake		SE	G5	S2
Bird					
<i>Asio flammeus</i>	Short-eared Owl		SE	G5	S2
<i>Bartramia longicauda</i>	Upland Sandpiper		SE	G5	S3B
<i>Circus cyaneus</i>	Northern Harrier		SE	G5	S2
<i>Cistothorus platensis</i>	Sedge Wren		SE	G5	S3B
<i>Ixobrychus exilis</i>	Least Bittern		SE	G5	S3B
<i>Rallus elegans</i>	King Rail		SE	G4	S1B
<i>Sturnella neglecta</i>	Western Meadowlark		SSC	G5	S2B
<i>Tyto alba</i>	Barn Owl		SE	G5	S2
Mammal					
<i>Geomys bursarius</i>	Plains Pocket Gopher		SSC	G5	S2
<i>Lasiurus borealis</i>	Eastern Red Bat		SSC	G5	S4
<i>Lasiurus cinereus</i>	Hoary Bat	No Status	SSC	G5	S4
<i>Mustela nivalis</i>	Least Weasel		SSC	G5	S2?
<i>Myotis septentrionalis</i>	Northern Myotis		SSC	G4	S3
<i>Nycticeius humeralis</i>	Evening Bat		SE	G5	S1
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse			G5	S2
<i>Spermophilus franklinii</i>	Franklin's Ground Squirrel		SE	G5	S2
<i>Taxidea taxus</i>	American Badger		SSC	G5	S2
Vascular Plant					
<i>Agalinis auriculata</i>	Earleaf Foxglove		ST	G3	S1
<i>Aster sericeus</i>	Western Silvery Aster		SR	G5	S2
<i>Camassia angusta</i>	Wild Hyacinth		SE	G5?Q	S1
<i>Carex gravida</i>	Heavy Sedge		SE	G5	S1
<i>Cirsium hillii</i>	Hill's Thistle		SE	G3	S1
<i>Gentiana puberulenta</i>	Downy Gentian		ST	G4G5	S2
<i>Liatris pycnostachya</i>	Cattail Gay-feather		ST	G5	S2

Indiana Natural Heritage Data Center
Division of Nature Preserves
Indiana Department of Natural Resources
This data is not the result of comprehensive county surveys.

Fed: LE = Endangered; LT = Threatened; C = candidate; PDL = proposed for delisting
State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant; WL = watch list
GRANK: Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concern; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank
SRANK: State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

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04/16/2013

Indiana County Endangered, Threatened and Rare Species List
County: Benton

Species Name	Common Name	FED	STATE	GRANK	SRANK
<i>Panicum leibergii</i>	Leiberg's Witchgrass		ST	G5	S2
<i>Prenanthes aspera</i>	Rough Rattlesnake-root		SR	G4?	S2
<i>Viola pedatifida</i>	Prairie Violet		ST	G5	S2
High Quality Natural Community Prairie - mesic	Mesic Prairie		SG	G2	S2
Other Migratory Bird Concentration Area	Migratory Bird Concentration Site		SG	G3	SNR

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Indiana County Endangered, Threatened and Rare Species List

County: Tippecanoe

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
<i>Cyprogenia stegaria</i>	Eastern Fanshell Pearlymussel	LE	SE	G1Q	S1
<i>Epioblasma torulosa rangiana</i>	Northern Riffleshell	LE	SE	G2T2	SX
<i>Epioblasma torulosa torulosa</i>	Tubercled Blossom	LE	SE	G2TX	SX
<i>Epioblasma triquetra</i>	Snuffbox	LE	SE	G3	S1
<i>Fusconaia subrotunda</i>	Longsolid		SE	G3	SX
<i>Lampsilis fasciola</i>	Wavyrayed Lampmussel		SSC	G5	S3
<i>Lampsilis ovata</i>	Pocketbook			G5	S2
<i>Leptodea leptodon</i>	Scaleshell	LE	SX	G1G2	SX
<i>Ligumia recta</i>	Black Sandshell			G5	S2
<i>Obovaria retusa</i>	Ring Pink	LE	SX	G1	SX
<i>Obovaria subrotunda</i>	Round Hickorynut		SSC	G4	S1
<i>Plethobasus cicatricosus</i>	White Wartyback	LE	SE	G1	SX
<i>Plethobasus cyphus</i>	Sheepnose	LE	SE	G3	S1
<i>Pleurobema clava</i>	Clubsshell	LE	SE	G2	S1
<i>Pleurobema cordatum</i>	Ohio Pigtoe		SSC	G4	S2
<i>Pleurobema plenum</i>	Rough Pigtoe	LE	SE	G1	S1
<i>Pleurobema rubrum</i>	Pyramid Pigtoe		SE	G2G3	SX
<i>Potamilus capax</i>	Fat Pocketbook	LE	SE	G1G2	S1
<i>Ptychobranchius fasciolaris</i>	Kidneyshell		SSC	G4G5	S2
<i>Quadrula cylindrica cylindrica</i>	Rabbitsfoot	C	SE	G3G4T3	S1
<i>Simpsonia ambigua</i>	Salamander Mussel		SSC	G3	S2
<i>Toxolasma lividus</i>	Purple Lilliput		SSC	G3	S2
<i>Villosa fabalis</i>	Rayed Bean	LE	SSC	G2	S1
Insect: Coleoptera (Beetles)					
<i>Lissobiops serpentinus</i>	A Rove Beetle		SE	GNR	S1
Insect: Ephemeroptera (Mayflies)					
<i>Paracloeodes minutus</i>	A Small Minnow Mayfly		SR	G5	S2
Insect: Lepidoptera (Butterflies & Moths)					
<i>Speyeria idalia</i>	Regal Fritillary		SE	G3	S1
Insect: Mecoptera					
<i>Merope tuber</i>	Earwig Scorpionfly		SE	G3G5	S1
Insect: Odonata (Dragonflies & Damselflies)					
<i>Erpetogomphus designatus</i>	Eastern Ringtail		ST	G5	S2
<i>Somatochlora tenebrosa</i>	Clamp-tipped Emerald		SR	G5	S2S3
Fish					
<i>Etheostoma tippecanoe</i>	Tippecanoe Darter		SSC	G3G4	S3
Amphibian					
<i>Hemidactylum scutatum</i>	Four-toed Salamander		SSC	G5	S2

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Indiana County Endangered, Threatened and Rare Species List

County: Tippecanoe

Species Name	Common Name	FED	STATE	GRANK	SRANK
Reptile					
<i>Clemmys guttata</i>	Spotted Turtle		SE	G5	S2
<i>Emydoidea blandingii</i>	Blanding's Turtle		SE	G4	S2
<i>Liochlorophis vernalis</i>	Smooth Green Snake		SE	G5	S2
<i>Terrapene carolina carolina</i>	Eastern Box Turtle		SSC	G5T5	S3
<i>Terrapene ornata ornata</i>	Ornate Box Turtle		SE	G5T5	S1
Bird					
<i>Aimophila aestivalis</i>	Bachman's Sparrow			G3	SXB
<i>Ammodramus henslowii</i>	Henslow's Sparrow		SE	G4	S3B
<i>Ardea herodias</i>	Great Blue Heron			G5	S4B
<i>Asio flammeus</i>	Short-eared Owl		SE	G5	S2
<i>Asio otus</i>	Long-eared Owl			G5	S2
<i>Aythya collaris</i>	Ring-necked Duck			G5	SHB
<i>Bartramia longicauda</i>	Upland Sandpiper		SE	G5	S3B
<i>Botaurus lentiginosus</i>	American Bittern		SE	G4	S2B
<i>Buteo platypterus</i>	Broad-winged Hawk	No Status	SSC	G5	S3B
<i>Carduelis pinus</i>	Pine Siskin			G5	S3N
<i>Cistothorus platensis</i>	Sedge Wren		SE	G5	S3B
<i>Dendroica cerulea</i>	Cerulean Warbler		SE	G4	S3B
<i>Falco peregrinus</i>	Peregrine Falcon	No Status	SE	G4	S2B
<i>Grus canadensis</i>	Sandhill Crane	No Status	SSC	G5	S2B,S1N
<i>Haliaeetus leucocephalus</i>	Bald Eagle	L.T.,PDL	SSC	G5	S2
<i>Ixobrychus exilis</i>	Least Bittern		SE	G5	S3B
<i>Lanius ludovicianus</i>	Loggerhead Shrike	No Status	SE	G4	S3B
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron		SE	G5	S1B
<i>Rallus elegans</i>	King Rail		SE	G4	S1B
<i>Sturnella neglecta</i>	Western Meadowlark		SSC	G5	S2B
<i>Tyto alba</i>	Barn Owl		SE	G5	S2
Mammal					
<i>Corynorhinus rafinesquii</i>	Rafinesque's Big-eared Bat		SSC	G3G4	SH
<i>Geomys bursarius</i>	Plains Pocket Gopher		SSC	G5	S2
<i>Lasiurus borealis</i>	Eastern Red Bat		SSC	G5	S4
<i>Mustela nivalis</i>	Least Weasel		SSC	G5	S2?
<i>Myotis septentrionalis</i>	Northern Myotis		SSC	G4	S3
<i>Myotis sodalis</i>	Indiana Bat or Social Myotis	LE	SE	G2	S1
<i>Nycticeius humeralis</i>	Evening Bat		SE	G5	S1
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse			G5	S2
<i>Spermophilus franklinii</i>	Franklin's Ground Squirrel		SE	G5	S2
<i>Taxidea taxus</i>	American Badger		SSC	G5	S2

Vascular Plant

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Indiana County Endangered, Threatened and Rare Species List

County: Tippecanoe

Species Name	Common Name	FED	STATE	GRANK	SRANK
<i>Androsace occidentalis</i>	Western Rockjasmine		ST	G5	S2
<i>Arenaria patula</i>	Pitcher's Stitchwort		SE	G4	S1
<i>Aster oblongifolius</i>	Aromatic Aster		SR	G5	S2
<i>Astragalus tennesseensis</i>	Tennessee Milk-vetch		SRE	G3	SX
<i>Bacopa rotundifolia</i>	Roundleaf Water-hyssop		ST	G5	S1
<i>Besseyia bullii</i>	Kitten Tails		SE	G3	S1
<i>Botrychium matricariifolium</i>	Chamomile Grape-fern		SR	G5	S2
<i>Botrychium simplex</i>	Least Grape-fern		SE	G5	S1
<i>Camassia angusta</i>	Wild Hyacinth		SE	G5?Q	S1
<i>Carex flava</i>	Yellow Sedge		ST	G5	S2
<i>Carex gravida</i>	Heavy Sedge		SE	G5	S1
<i>Chelone obliqua</i> var. <i>speciosa</i>	Rose Turtlehead		WL	G4T3	S3
<i>Chrysopsis villosa</i>	Hairy Golden-aster		ST	G5	S2
<i>Circaea alpina</i>	Small Enchanter's Nightshade		SX	G5	SX
<i>Cirsium hillii</i>	Hill's Thistle		SE	G3	S1
<i>Coeloglossum viride</i> var. <i>virescens</i>	Long-braet Green Orchis		ST	G5T5	S2
<i>Crataegus pedicellata</i>	Scarlet Hawthorn		ST	G5	S2
<i>Cypripedium candidum</i>	Small White Lady's-slipper		WL	G4	S2
<i>Eriophorum angustifolium</i>	Narrow-leaved Cotton-grass		SR	G5	S2
<i>Erysimum capitatum</i>	Prairie-rocket Wallflower		ST	G5	S2
<i>Euphorbia obtusata</i>	Bluntleaf Spurge		SE	G5	S1
<i>Gentiana alba</i>	Yellow Gentian		SR	G4	S2
<i>Houstonia nigricans</i>	Narrowleaf Summer Bluets		SR	G5	S2
<i>Linum sulcatum</i>	Grooved Yellow Flax		SR	G5	S2
<i>Lithospermum incisum</i>	Narrow-leaved Puccoon		SE	G5	S1
<i>Melampyrum lineare</i>	American Cow-wheat		SR	G5	S2
<i>Muhlenbergia cuspidata</i>	Plains Muhlenbergia		SE	G4	S1
<i>Napaea dioica</i>	Glade Mallow		SR	G4	S2
<i>Onosmodium hispidissimum</i>	Shaggy False-gromwell		SE	G4	S1
<i>Orobanche riparia</i>	Bottomland Broomrape		SE	G5	S2
<i>Oryzopsis racemosa</i>	Black-fruit Mountain-ricegrass		SR	G5	S2
<i>Panicum rigidulum</i> var. <i>pubescens</i>	Long-leaved Panic-grass		SX	G5T5?	SX
<i>Plantago cordata</i>	Heart-leaved Plantain		SE	G4	S1
<i>Poa paludigena</i>	Bog Bluegrass		WL	G3	S3
<i>Psoralea tenuiflora</i>	Few-flowered Scurf-pea		SX	G5	SX
<i>Sanguisorba canadensis</i>	Canada Burnet		SE	G5	S1
<i>Selaginella apoda</i>	Meadow Spike-moss		WL	G5	S1
<i>Silene regia</i>	Royal Catchfly		ST	G3	S2
<i>Trichostema dichotomum</i>	Forked Bluecurl		SR	G5	S2
<i>Viola pedatifida</i>	Prairie Violet		ST	G5	S2

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Indiana County Endangered, Threatened and Rare Species List

County: Tippecanoe

Species Name	Common Name	FED	STATE	GRANK	SRANK
High Quality Natural Community					
Barrens - gravel	Gravel Slope Barrens		SG	G3	S1
Barrens - sand	Sand Barrens		SG	G3	S2
Forest - upland dry-mesic	Dry-mesic Upland Forest		SG	G4	S4
Forest - upland mesic	Mesic Upland Forest		SG	G3?	S3
Lake - lake	Lake		SG	GNR	S2
Prairie - dry-mesic	Dry-mesic Prairie		SG	G3	S2
Wetland - fen	Fen		SG	G3	S3
Wetland - marsh	Marsh		SG	GU	S4
Wetland - seep circumneutral	Circumneutral Seep		SG	GU	S1
Other Significant Feature					
Geomorphic - Nonglacial Erosional Feature - Water Fall and Cascade	Water Fall and Cascade			GNR	SNR

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Indiana County Endangered, Threatened and Rare Species List

County: Warren

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
Cyprogenia stegaria	Eastern Fanshell Pearlymussel	LE	SE	G1Q	S1
Epioblasma flexuosa	Leafshell		SX	GX	SX
Epioblasma obliquata perobliqua	White Cat's Paw Pearlymussel	LE	SE	G1L	SX
Epioblasma propinqua	Tennessee Riffleshell		SX	GX	SX
Epioblasma sampsonii	Wabash Riffleshell		SX	GX	SX
Epioblasma torulosa torulosa	Tubercled Blossom	LE	SE	G2TX	SX
Epioblasma triquetra	Snuffbox	LE	SE	G3	S1
Fusconaia subrotunda	Longsolid		SE	G3	SX
Lampsilis fasciola	Wavyrayed Lampmussel		SSC	G5	S3
Obovaria retusa	Ring Pink	LE	SX	G1	SX
Obovaria subrotunda	Round Hickorynut		SSC	G4	S1
Plethobasus cicatricosus	White Wartyback	LE	SE	G1	SX
Plethobasus cyphus	Sheepnose	LE	SE	G3	S1
Pleurobema clava	Clushell	LE	SE	G2	S1
Pleurobema cordatum	Ohio Pigtoe		SSC	G4	S2
Pleurobema plenum	Rough Pigtoe	LE	SE	G1	S1
Ptychobranhus fasciolaris	Kidneyshell		SSC	G4G5	S2
Quadrula cylindrica cylindrica	Rabbittfoot	C	SE	G3G4T3	S1
Simpsonia ambigua	Salamander Mussel		SSC	G3	S2
Toxolasma lividus	Purple Lilliput		SSC	G3	S2
Villosa lenosa	Little Spectaclecase		SSC	G5	S3
Insect: Lepidoptera (Butterflies & Moths)					
Hystrichophora loricana	An Oletreutine Moth		SE	G2G4	S1
Fish					
Percina copelandi	Channel Darter		SE	G4	S2
Bird					
Ammodramus henslowii	Henslow's Sparrow		SE	G4	S3B
Ardea herodias	Great Blue Heron			G5	S4B
Asio otus	Long-eared Owl			G5	S2
Bartramia longicauda	Upland Sandpiper		SE	G5	S3B
Buteo lineatus	Red-shouldered Hawk		SSC	G5	S3
Haliaeetus leucocephalus	Bald Eagle	LT,PDL	SSC	G5	S2
Ixobrychus exilis	Least Bittern		SE	G5	S3B
Tyto alba	Barn Owl		SE	G5	S2
Mammal					
Geomys bursarius	Plains Pocket Gopher		SSC	G5	S2
Lasionycteris noctivagans	Silver-haired Bat		SSC	G5	SNRN
Lasiurus borealis	Eastern Red Bat		SSC	G5	S4
Myotis lucifugus	Little Brown Bat		SSC	G5	S4

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Indiana County Endangered, Threatened and Rare Species List

County: Warren

Species Name	Common Name	FED	STATE	GRANK	SRANK
<i>Myotis septentrionalis</i>	Northern Myotis		SSC	G4	S3
<i>Myotis sodalis</i>	Indiana Bat or Social Myotis	LE	SE	G2	S1
<i>Nycticeius humeralis</i>	Evening Bat		SE	G5	S1
<i>Spermophilus franklinii</i>	Franklin's Ground Squirrel		SE	G5	S2
<i>Taxidea taxus</i>	American Badger		SSC	G5	S2
Vascular Plant					
<i>Arenaria patula</i>	Pitcher's Stitchwort		SE	G4	S1
<i>Aster furcatus</i>	Forked Aster		SR	G3	S2
<i>Aster oblongifolius</i>	Aromatic Aster		SR	G5	S2
<i>Aster sericeus</i>	Western Silvery Aster		SR	G5	S2
<i>Azolla caroliniana</i>	Carolina Mosquito-fern		ST	G5	S2
<i>Carex eburnea</i>	Ebony Sedge		SR	G5	S2
<i>Carex pseudocyperus</i>	Cyperus-like Sedge		SE	G5	S1
<i>Crataegus pedicellata</i>	Scarlet Hawthorn		ST	G5	S2
<i>Juglans cinerea</i>	Butternut		WL	G4	S3
<i>Napaea dioica</i>	Glade Mallow		SR	G4	S2
<i>Onosmodium hispidissimum</i>	Shaggy False-gromwell		SE	G4	S1
<i>Panicum leibergii</i>	Leiberg's Witchgrass		ST	G5	S2
<i>Pinus strobus</i>	Eastern White Pine		SR	G5	S2
<i>Poa wolfii</i>	Wolf Bluegrass		SR	G4	S2
<i>Rudbeckia fulgida</i> var. <i>fulgida</i>	Orange Coneflower		WL	G5T 4?	S2
<i>Saxifraga forbesii</i>	Forbes Saxifrage		SE	G4Q	S1
<i>Selaginella rupestris</i>	Ledge Spike-moss		ST	G5	S2
<i>Silene regia</i>	Royal Catchfly		ST	G3	S2
<i>Stenanthium gramineum</i>	Eastern Featherbells		ST	G4G5	S1
<i>Wolffiella gladiata</i>	Sword Bogmat		SE	G5	S1
High Quality Natural Community					
Barrens - bedrock siltstone	Siltstone Glade		SG	G2	S2
Forest - upland dry	Dry Upland Forest		SG	G4	S4
Lake - lake	Lake		SG	GNR	S2
Prairie - dry-mesic	Dry-mesic Prairie		SG	G3	S2
Prairie - mesic	Mesic Prairie		SG	G2	S2
Primary - cliff sandstone	Sandstone Cliff		SG	GU	S3
Other Significant Feature					
Geomorphic - Nonglacial Erosional Feature - Water Fall and Cascade	Water Fall and Cascade			GNR	SNR

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Indiana County Endangered, Threatened and Rare Species List

County: White

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
<i>Cyprogenia stegaria</i>	Eastern Fanshell Pearlymussel	LE	SE	G1Q	S1
<i>Epioblasma torulosa rangiana</i>	Northern Riffleshell	LE	SE	G2T2	SX
<i>Epioblasma triquetra</i>	Snuffbox	LE	SE	G3	S1
<i>Fusconaia subrotunda</i>	Longsolid		SE	G3	SX
<i>Lampsilis fasciola</i>	Wavyrayed Lampmussel		SSC	G5	S3
<i>Obovata subrotunda</i>	Round Hickorynut		SSC	G4	S1
<i>Plethobasus cyphus</i>	Shaeptosa	LE	SE	G3	S1
<i>Pleurobema clava</i>	Clubshell	LE	SE	G2	S1
<i>Pleurobema cordatum</i>	Ohio Pigtoe		SSC	G4	S2
<i>Pleurobema rubrum</i>	Pyramid Pigtoe		SE	G2G3	SX
<i>Ptychobranthus fasciolaris</i>	Kidneysthell		SSC	G4G5	S2
<i>Quadrula cylindrica cylindrica</i>	Rabbitsfoot	C	SE	G3G4T3	S1
<i>Simpsonia ambigua</i>	Salamander Mussel		SSC	G3	S2
<i>Toxolasma lividus</i>	Purple Lilliput		SSC	G3	S2
<i>Villosa fabalis</i>	Rayed Bean	LE	SSC	G2	S1
Insect: Lepidoptera (Butterflies & Moths)					
<i>Boloria selene nebraskensis</i>	The Nebraska Silver Bordered Fritillary		SE	G5T3T4	S1
<i>Euphyes bimacula</i>	Two-spotted Skipper		ST	G4	S2
<i>Satyrodes eurydice fumosa</i>	Smoky-eyed Brown		ST	G5T3T4	S1S2
Insect: Odonata (Dragonflies & Damselflies)					
<i>Enallagma divagans</i>	Turquoise Bluet		SR	G5	S3
Fish					
<i>Etheostoma tippecanoe</i>	Tippecanoe Darter		SSC	G3G4	S3
Amphibian					
<i>Rana pipiens</i>	Northern Leopard Frog		SSC	G5	S2
Reptile					
<i>Clemmys guttata</i>	Spotted Turtle		SE	G5	S2
<i>Emydoidea blandingii</i>	Blanding's Turtle		SE	G4	S2
<i>Kinosternon subrubrum subrubrum</i>	Eastern Mud Turtle		SE	G5T5	S2
<i>Ophisaurus attenuatus attenuatus</i>	Western Slender Glass Lizard			G5T5	S2
<i>Terrapene ornata ornata</i>	Ornate Box Turtle		SE	G5T5	S1
Bird					
<i>Ammodramus henslowii</i>	Henslow's Sparrow		SE	G4	S3B
<i>Ardea herodias</i>	Great Blue Heron			G5	S4B
<i>Bartramia longicauda</i>	Upland Sandpiper		SE	G5	S3B
<i>Chlidonias niger</i>	Black Tern		SE	G4	S1B
<i>Circus cyaneus</i>	Northern Harrier		SE	G5	S2
<i>Cistothorus palustris</i>	Marsh Wren		SE	G5	S3B

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Indiana County Endangered, Threatened and Rare Species List

County: White

Species Name	Common Name	FED	STATE	GRANK	SRANK
<i>Cistothorus platensis</i>	Sedge Wren		SE	G5	S3B
<i>Haliaeetus leucocephalus</i>	Bald Eagle	LT, PDL	SSC	G5	S2
<i>Lanius ludovicianus</i>	Loggerhead Shrike	No Status	SE	G4	S3B
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron		SE	G5	S1B
Mammal					
<i>Geomys bursarius</i>	Plains Pocket Gopher		SSC	G5	S2
<i>Spermophilus franklinii</i>	Franklin's Ground Squirrel		SE	G5	S2
<i>Taxidea taxus</i>	American Badger		SSC	G5	S2
Vascular Plant					
<i>Aster furcatus</i>	Forked Aster		SR	G3	S2
<i>Berberis canadensis</i>	American Barberry		SE	G3	S1
<i>Besseyia bullii</i>	Kitten Tails		SE	G3	S1
<i>Camassia angusta</i>	Wild Hyacinth		SE	G5?Q	S1
<i>Carex conoidea</i>	Prairie Gray Sedge		ST	G5	S1
<i>Carex straminea</i>	Straw Sedge		ST	G5	S2
<i>Cirsium hillii</i>	Hill's Thistle		SE	G3	S1
<i>Crataegus pedicellata</i>	Scarlet Hawthorn		ST	G5	S2
<i>Eleocharis wolfii</i>	Wolf Spikerush		SR	G3G4	S2
<i>Gentiana puberulenta</i>	Downy Gentian		ST	G4G5	S2
<i>Melampyrum lineare</i>	American Cow-wheat		SR	G5	S2
<i>Melanthium virginicum</i>	Virginia Bunchflower		SE	G5	S1
<i>Oenothera perennis</i>	Small Sundrops		SR	G5	S2
<i>Panicum leibergii</i>	Leiberg's Witchgrass		ST	G5	S2
<i>Platanthera leucophaea</i>	Prairie White-fringed Orchid	LT	SE	G2G3	S1
<i>Prenanthes aspera</i>	Rough Rattlesnake-root		SR	G4?	S2
<i>Scutellaria parvula</i> var. <i>australis</i>	Southern Skullcap		WL	G4T4?	S2
<i>Viola pedatifida</i>	Prairie Violet		ST	G5	S2
High Quality Natural Community					
Prairie - dry-mesic	Dry-mesic Prairie		SG	G3	S2
Prairie - mesic	Mesic Prairie		SG	G2	S2
Prairie - sand mesic	Mesic Sand Prairie		SG	GNR	SNR
Prairie - sand wet	Wet Sand Prairie		SG	G3	S3
Prairie - sand wet-mesic	Wet-mesic Sand Prairie		SG	G1?	S2
Savanna - sand dry	Dry Sand Savanna		SG	G2?	S2

Indiana Natural Heritage Data Center
Division of Nature Preserves
Indiana Department of Natural Resources
This data is not the result of comprehensive county surveys.

Fed: LE = Endangered; LT = Threatened; C = candidate; PDL = proposed for delisting
State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant; WL = watch list
GRANK: Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concern; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank
SRANK: State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Appendix D: Land Cover Definitions

Land Cover Class Definitions (NLCD 2001)

Open Water - All areas of open water, generally with less than 25% cover of vegetation or soil.

Developed, Open Space - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Developed, Low Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49% of total cover. These areas most commonly include single-family housing units.

Developed, Medium Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79% of the total cover. These areas most commonly include single-family housing units.

Developed, High Intensity - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial. Impervious surfaces account for 80 to 100% of the total cover.

Barren Land (Rock/Sand/Clay) - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

Deciduous Forest - Areas dominated by trees generally greater than 16 feet (5 meters) tall and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.

Evergreen Forest - Areas dominated by trees generally greater 16 feet (5 meters) and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.

Grassland/Herbaceous - Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

Cultivated Crops - Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.

Woody Wetlands - Areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Emergent Herbaceous Wetlands - Areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Appendix E:
Water Quality Parameter Descriptions

Water Quality Parameter Descriptions (WREC 2011)

Temperature Temperature can determine the form, solubility, and toxicity of a broad range of aqueous compounds. Likewise, water temperature regulates the species composition and activity of life associated with the aquatic environment. Since essentially all aquatic organisms are cold-blooded, the temperature of the water regulates their metabolism and ability to survive and reproduce effectively (USEPA, 1976). The Indiana Administrative Code (327 IAC 2-16) sets maximum temperature limits to protect aquatic life for Indiana streams. For example, temperatures during the months of June and July should not exceed 90°F by more than 3°F. The code also states that the “maximum temperature rise at any time or place... shall not exceed 5°F in streams...”

Dissolved Oxygen (DO) DO is the dissolved gaseous form of oxygen. It is essential for respiration of fish and other aquatic organisms. Fish need water to possess a DO concentration of at least 3-5 mg/L of DO. Coldwater fish such as trout generally require higher concentrations of DO than warmwater fish such as bass or bluegill. The IAC sets minimum DO concentrations at 5 mg/L for warmwater fish. DO enters water by diffusion from the atmosphere and as a byproduct of photosynthesis by algae and plants. Excessive algae growth can over-saturate (greater than 100% saturation) the water with DO. Waterbodies with large populations of algae and plants (macrophytes) often exhibit supersaturation due to the high levels of photosynthesis. Dissolved oxygen is consumed by respiration of aquatic organisms, such as fish, and during bacterial decomposition of plant and animal matter.

Conductivity Conductivity is a measure of the ability of an aqueous solution to carry an electric current. This ability depends on the presence of ions: on their total concentration, mobility, and valence (APHA, 1998). During low flows, conductivity is higher than it is following a storm water runoff because the water moves more slowly across or through ion containing soils and substrates during base flow conditions. Carbonates and other charged particles (ions) dissolve into the slow moving water, thereby increasing conductivity levels.

pH The pH of stream water describes the concentration of acidic ions (specifically H⁺) present in the water. The pH also determines the form, solubility, and toxicity of a wide range of other aqueous compounds. The IAC establishes a range of 6-9 pH units for the protection of aquatic life.

Alkalinity Alkalinity is a measure of the acid-neutralizing (or buffering) capacity of water. Certain substances in water, like carbonates, bicarbonates, and sulfates can cause the water to resist changes in pH. A lower alkalinity indicates a lower buffering capacity or a decreased ability to resist changes in pH. During base flow conditions, alkalinity is usually high because the water picks up carbonates from the bedrock. Alkalinity measurements are usually lower during storm flow conditions because buffering compounds are diluted by rainwater and the runoff water moves across carbonate-containing bedrock materials so quickly that little carbonate is dissolved to add additional buffering capacity.

Turbidity Turbidity (measured in Nephelometric Turbidity Units or NTUs) is a measure of water coloration and particles suspended in the water itself. It is generally related to suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms. According to the Hoosier Riverwatch, the average turbidity of an Indiana stream is 11 NTU with a typical range of 4.5-17.5 NTU. Turbidity measurements >20 NTU have been found to cause undesirable changes in aquatic life (Walker, 1978). The U.S. Environmental Protection Agency developed recommended water quality criteria as part work to establish numeric criteria for nutrients on an ecoregion

basis. Recommended turbidity concentrations for this ecoregion are 9.89 NTUs (USEPA, 2000).

Nitrogen Nitrogen is an essential plant nutrient found in fertilizers, human and animal wastes, yard waste, and the air. About 80% of the air we breathe is nitrogen gas. Nitrogen gas diffuses into water where it can be “fixed”, or converted, by blue-green algae to ammonia for their use. Nitrogen can also enter lakes and streams as inorganic nitrogen and ammonia. Because of this, there is an abundant supply of available nitrogen to aquatic systems. The three common forms of nitrogen are:

- **Nitrate-nitrogen (NO_3-N)** Nitrate is an oxidized form of dissolved nitrogen that is converted to ammonia by algae. It is found in streams and runoff when dissolved oxygen is present, usually in the surface waters. Ammonia applied to farmland is rapidly oxidized or converted to nitrate and usually enters surface and groundwater as nitrate. The Ohio EPA (1999) found that the median nitrate-nitrogen concentration in wadeable streams classified as warmwater habitat (WWH) was 1.0 mg/l. Warmwater habitat refers to those streams which possess minor modifications and little human influence. These streams typically support communities with healthy, diverse warmwater fauna. The Ohio EPA (1999) found that the median nitrate-nitrogen concentration in wadeable streams classified as modified warmwater habitat (MWH) was 1.6 mg/l. Modified warmwater habitat was defined as: the aquatic life use assigned to streams that have irretrievable, extensive, man-induced modification that precludes attainment of the warmwater habitat use designation; such streams are characterized by species that are tolerant of poor chemical quality (fluctuating dissolved oxygen) and habitat conditions (siltation, habitat amplification) that often occur in modified streams (Ohio EPA, 1999). The U.S. Environmental Protection Agency developed recommended nitrate-nitrogen criterion as part of work to establish numeric criteria for nutrients on an ecoregion basis. The recommended nitrate-nitrogen concentration for the ecoregion is 0.63 mg/l (USEPA, 2000). Nitrate-nitrogen concentrations exceeding 10 mg/l in drinking water are considered hazardous to human health (Indiana Administrative Code IAC 2-1-6).
- **Ammonia-nitrogen (NH_3-N)** Ammonia-nitrogen is a form of dissolved nitrogen that is the preferred form for algae use. Bacteria produce ammonia as they decompose dead plant and animal matter. Ammonia is the reduced form of nitrogen and is found in water where dissolved oxygen is lacking. Important sources of ammonia include fertilizers and animal manure. Both temperature and pH govern the toxicity of ammonia for aquatic life. According to the IAC, maximum ionized ammonia concentrations for the study streams should not exceed approximately 1.94 to 7.12 mg/L, depending on the water's pH and temperature.
- **Organic Nitrogen** Organic nitrogen includes nitrogen found in plant and animal materials. It may be in dissolved or particulate form. The most commonly measured form used to calculate organic nitrogen is total Kjeldahl nitrogen (TKN). Organic nitrogen is TKN minus ammonia. The U.S. Environmental Protection Agency developed TKN criterion as part of work to establish numeric criteria for nutrients on an ecoregion basis. The recommended total Kjeldahl nitrogen concentration for this ecoregion is 0.591 mg/l (USEPA, 2000).

Phosphorus Phosphorus is an essential plant nutrient and the one that most often controls aquatic plant (algae and macrophyte) growth. It is found in fertilizers, human and animal wastes, and in yard waste. There are few natural sources of phosphorus to streams other than that which is attached to soil particles; there is no atmospheric (vapor) form of phosphorus. For this reason, phosphorus is often a **limiting nutrient** in aquatic systems. This means that the relative scarcity of phosphorus may limit the ultimate growth and production of algae and rooted aquatic plants. Management efforts often focus on reducing

phosphorus inputs to receiving waterways because: (a) it can be managed and (b) reducing phosphorus can reduce algae production. Two common forms of phosphorus are:

- **Soluble reactive phosphorus (SRP)** SRP or orthophosphorus is dissolved phosphorus readily usable by algae. SRP is often found in very low concentrations in phosphorus-limited systems where the phosphorus is tied up in the algae themselves. Because phosphorus is cycled so rapidly through biota, SRP concentrations as low as 0.005 mg/l are enough to maintain eutrophic or highly productive conditions in lake systems (Correll, 1998). Sources of SRP include fertilizers, animal wastes, and septic systems.
- **Total phosphorus (TP)** TP includes dissolved and particulate phosphorus. TP concentrations greater than 0.03 mg/l (or 30µg/L) can cause algal blooms in lake systems. In stream systems, Dodd et al., 1998 suggests that streams with a total phosphorus concentration greater than 0.075 mg/L are typically characterized as productive or eutrophic. TP is often a problem in agricultural watersheds because TP concentrations required for eutrophication control are as much as an order of magnitude lower than those typically measured in soils used to grow crops (0.2-0.3 mg/L). The Ohio EPA (1999) found that the median TP concentration in wadeable streams that support WWM for fish was 0.10 mg/L, while wadeable streams that support MWH for fish was 0.28 mg/L. The U.S. Environmental Protection Agency recommended TP criterion for this ecoregion is 0.076 mg/L (USEPA, 2000).

Total Suspended Solids (TSS) A TSS measurement quantifies all particles suspended in stream water. Closely related to turbidity, this parameter quantifies sediment particles and other solid compounds typically found in stream water. In general, the concentration of suspended solids is greater during high flow events due to increased overland flow. The increased overland flow erodes and carries more soil and other particulates to the stream. The State of Indiana does not have a TSS standard. In general, TSS concentrations greater than 80 mg/L have been found to be deleterious to aquatic life; concentrations of 15 mg/L are often targeted as levels necessary for quality fishery production (Waters, 1995).

***E. coli* and Fecal Coliform Bacteria** *E. coli* is one member of a group of bacteria that comprise the fecal coliform bacteria and is used as an indicator organism to identify the potential presence of pathogenic organisms in a water sample. Pathogenic organisms can present a threat to human health by causing a variety of serious diseases, including infectious hepatitis, typhoid, gastroenteritis, and other gastrointestinal illnesses. *E. coli* can come from the feces of any warm-blooded animal. Wildlife, livestock, and/or domestic animal defecation, manure fertilizers, previously contaminated sediments, and failing or improperly sited septic systems are common sources of the bacteria. The IAC sets the maximum standard at 235 colonies/100 ml in any one sample within a 30-day period.

Index of Biotic Integrity (IBI) As part of their assessment of water quality in Indiana, IDEM uses fish communities as an indicator of stream biological integrity or health. Biological integrity is defined as "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the best natural habitats within a region" (Karr and Dudley, 1981). To provide a method of determining the biological integrity of an aquatic ecosystem Karr (1981) developed the Index of Biotic Integrity (IBI). Simon (1991) further modified the IBI for evaluation of warmwater stream communities located in the ecoregions of Indiana. The IBI is composed of 12 metrics which are each individually scored based on types and numbers of fish collected in each sample. These attributes fall into such categories as species richness and composition, trophic composition, and fish abundance and condition. After data from sampling sites have been collected, values for the twelve metrics are compared with their corresponding expected values

(Simon and Dufour, 1997) and a rating of 1, 3, or 5 is assigned to each metric based on whether it deviates strongly from, somewhat from, or closely approximates the expected values.. These metrics are used to assess the attributes of fish communities in streams. These individual scores for each of the 12 metrics are then summed to yield an IBI score. An IBI score of 12-22 would indicate very poor biological integrity while the maximum score of 60 would indicate excellent biological integrity.

Macroinvertebrate Index of Biotic Integrity (mIBI) Macroinvertebrate results were analyzed using a IDEM's macroinvertebrate Index of Biotic Integrity (mIBI). IDEM's mIBI is a multi-metric (10 metrics) index designed to provide a complete assessment of a stream's biological integrity. Karr and Dudley (1981) define biological integrity as "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization compared to the best natural habitats within the region". It is likely that this definition of biological integrity is what IDEM means by biological integrity as well. IDEM developed the mIBI using five years of wadeable data collected in Indiana. The data were lognormally distributed for each of the ten metrics. Each metric's lognormal distribution was then pentasected with scoring based on five categories using 1.5 times the interquartile range around the geometric mean. The following table lists the eight scoring metrics used to calculate the mIBI and the value or range of values associated with the classification scores. The mean of the eight classification scores for each metric is the mIBI score.

Classification score are 0, 2, 4, 6, and 8. mIBI scores of 0-2 indicate the sampling site is severely impaired; scores of 2-4 indicate the site is moderately impaired; scores of 4-6 indicate the site is slightly impaired; and scores of 6-8 indicate that the site is non-impaired.

Macroinvertebrate data were also used to calculate the family-level Hilsenhoff Biotic Index (HBI). The HBI uses the macroinvertebrate community to assess the level of organic pollution in a stream. The HBI is based on the premise that different families of aquatic insects possess different tolerance levels to organic pollution. Hilsenhoff assigned each aquatic insect family a tolerance value from 1 to 9; those families with lower tolerances to organic pollution were assigned lower values, while those families that were more tolerant of organic pollution were assigned higher values. Calculation of the HBI involves applying assigned macroinvertebrate family tolerance values to all taxa that have an assigned HBI tolerance value, multiplying the number of organisms present by their family tolerance value, summing the products, and dividing by the total number of organisms present (Hilsenhoff, 1988). Benthic communities dominated by organisms that are tolerant of organic pollution will exhibit higher HBI scores compared to benthic communities dominated by intolerant organisms.

Qualitative Habitat Evaluation Index (QHEI) Physical habitat was evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995). Various attributes of the stream and riparian zone habitat are scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrates; amount and quality of instream cover; channel morphology; extent and quality of riparian vegetation; pool, run, and riffle development and quality; and gradient are some of the metrics used to determine the QHEI score. The QHEI score ranges from 20 to 100.

Substrate type(s) and quality are important factors of habitat quality and the QHEI score is partially based on these characteristics. Sites that have greater substrate diversity receive higher scores as they can provide greater habitat diversity for benthic organisms. The quality of substrate refers to the embeddedness of the benthic zone. Small particles of soil

and organic matter will settle into small pores and crevices in the stream bottom. Many organisms can colonize these microhabitats, but high levels of silt in a streambed can result in the loss of habitat within the substrate. Thus, sites with heavy embeddedness and siltation receive lower QHEI scores for the substrate metric.

Instream cover, another metric of the QHEI, represents the type(s) and quantity of habitat provided within the stream itself. Examples of instream cover include woody logs and debris, aquatic and overhanging vegetation and root wads extending from the stream banks. The channel morphology metric evaluates the stream's physical development with respect to habitat diversity. Pool and riffle development within the stream reach, the channel sinuosity and other factors that represent the stability and direct modification of the site are evaluated to comprise this metric score.

A wooded riparian buffer is a vital functional component of riverine ecosystems. It is instrumental in the detention, removal, and assimilation of nutrients. According to the Ohio EPA (1999), riparian zones govern the quality of goods and services provided by riverine ecosystems. Riparian zone and bank erosion were examined at each site to evaluate the quality of the buffer zone of a stream, the land use within the floodplain that affects inputs to the waterway, and the extent of bank erosion, which can reflect insufficient vegetative stabilization of the stream banks. For the purposes of the QHEI, a riparian buffer is a zone that is forest, shrub, swamp, or woody old field vegetation. Typically, weedy, herbaceous vegetation does not offer as much infiltration potential as woody components and does not represent an acceptable riparian zone type for the QHEI (Ohio EPA, 1989).

The fifth QHEI metric evaluates the quality of pool/glide and riffle/run habitats in the stream. These zones in a stream, when present, provide diverse habitat and in turn can increase habitat quality and availability. The depth of pools within a reach and the stability of riffle substrate are some factors that affect the QHEI score in this metric.

The final QHEI metric evaluates the topographic gradient in a stream reach. This is calculated using topographic data. The score for this metric is based on the premise that both very low and very high gradients will have negative effects on habitat quality and the biota in the stream. Moderate gradients receive the highest score, 10, for this metric.

The QHEI is used to evaluate the characteristics of a stream segment, as opposed to the characteristics of a single sampling site. As such, individual sites may have poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of stream segments in Ohio have indicated that values greater than 60 are *generally* conducive to the existence of warmwater faunas. Scores greater than 75 typify habitat conditions that have the ability to support exceptional warmwater faunas (Ohio EPA, 1999). IDEM indicates that QHEI scores above 51 support a stream's aquatic life use designation, while scores less than 51 are deemed non-supporting the stream's aquatic life use designation (IDEM, 2000).

Appendix F: Subwatershed Critical Area Calculations

Watershed (Count/%) miles/sq. miles	Roubidoux Ditch-Big Pine Creek (051201080401)	Big Pine Creek Ditch-Big Pine Creek (051201080402)	Little Pine Creek (051201080403)	Owens Ditch-Big Pine Creek (051201080404)	Brumm Ditch-Big Pine Creek (051201080405)	Darby Ditch-Big Pine Creek (051201080406)	Brown Ditch (051201080407)	Harrington Creek-Big Pine Creek (051201080408)	Pine Village-Big Pine Creek (051201080409)	Hog Back Hill-Big Pine Creek (051201080410)	Headwaters Mud Pine Creek (051201080301)	Seamons Ditch-Mud Pine Creek (051201080302)	Goose Creek-Mud Pine Creek (051201080303)
Acres)	11,273	19,725	10,058	17,921	11,030	11,756	11,850	12,873	17,652	23,671	12,019	14,432	16,867
/Drain Length (miles)	34.8	40.7	17.9	53.4	30.6	32.6	38.2	26.4	46.8	96.7	23.0	41.1	40.0
ed Drain & Tile (miles)	34.8	31.5	17.9	45.9	27.5	26.0	37.7	21.4	11.1	0.6	18.8	34.1	28.9
Soils													
Erodible Soils	62.9%	41.7%	51.9%	36.6%	39.4%	47.5%	39.6%	39.6%	22.8%	14.5%	42.2%	38.1%	34.9%
Highly Erodible Soils	0.0%	1.2%	0.1%	1.4%	1.3%	0.0%	3.0%	0.3%	8.1%	15.5%	0.4%	0.5%	3.7%
Highly Erodible Soils	9.3%	27.8%	20.0%	29.1%	21.2%	13.1%	31.3%	11.5%	44.4%	43.2%	24.8%	26.6%	29.5%
Not Limited for Septic Use (acres)	99.9%	99.4%	100.0%	100.0%	99.9%	99.8%	99.8%	100.0%	100.0%	98.9%	99.9%	99.9%	99.9%
Not Limited for Septic Use	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Septic Use Limitation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Not Limited for Septic Use	0.1%	0.6%	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%	0.0%	1.1%	0.1%	0.1%	0.1%
Water													
Water	0.1%	0.5%	0.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.1%	0.1%	0.0%
Wooded	6.4%	4.0%	4.3%	4.0%	4.3%	4.1%	8.2%	4.4%	5.4%	6.1%	8.5%	5.0%	6.2%
Scrub	0.3%	2.7%	1.5%	2.2%	2.1%	5.0%	1.8%	2.1%	18.0%	27.9%	0.2%	0.9%	2.8%
Land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pasture	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.5%	0.1%	0.1%	0.1%
Woods	0.0%	2.4%	1.4%	1.9%	2.5%	2.1%	3.5%	1.0%	13.3%	8.2%	0.7%	3.4%	5.4%
Woods	93.2%	90.5%	92.8%	91.9%	91.1%	88.8%	86.3%	92.6%	63.2%	56.8%	90.4%	90.4%	85.6%
Woods	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%
Woods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
Woods NWI	0.5%	1.4%	0.8%	1.1%	1.3%	2.6%	0.9%	1.3%	2.9%	4.5%	0.4%	0.6%	1.1%
Soil Loss (Hydric Soils-Wetlands)	99.3%	96.7%	98.5%	96.9%	96.8%	94.6%	97.7%	96.8%	87.1%	69.0%	99.0%	98.5%	97.0%

Watershed (Count/%) miles/sq. miles	Roubush Ditch-Big Pine Creek (051201080401)	Big Pine Creek Ditch-Big Pine Creek (051201080402)	Little Pine Creek (051201080403)	Owens Ditch-Big Pine Creek (051201080404)	Brumm Ditch-Big Pine Creek (051201080405)	Darby Ditch-Big Pine Creek (051201080406)	Brown Ditch (051201080407)	Harrington Creek-Big Pine Creek (051201080408)	Pine Village-Big Pine Creek (051201080409)	Hog Back Hill-Big Pine Creek (051201080410)	Headwaters Mud Pine Creek (051201080301)	Seamons Ditch-Mud Pine Creek (051201080302)	Goose Creek-Mud Pine Creek (051201080303)
Soils (acres)	7,086	8,232	5,224	6,551	4,344	5,582	4,689	5,092	4,019	3,424	5,072	5,505	5,893
Erodible Soils (acres)	-	244	12	258	148	3	354	45	1,433	3,657	43	65	628
Highly Erodible Soils	1,051	5,477	2,013	5,219	2,340	1,545	3,711	1,480	7,837	10,234	2,978	3,836	4,973
Not Limited for Septic Use (acres)	11,256	19,606	10,058	17,914	11,024	11,738	11,823	12,873	17,644	23,403	12,008	14,422	16,853
Not Limited for Septic Use	0	0	0	0	7	9	0	0	0	0	0	0	0
Septic Use Limitation (acres)	0	0	0	0	0	0	0	0	0	0	0	0	0
Not Limited for Septic Use (acres)	17	119	0	7	0	9	27	0	9	268	11	11	14
Water (acres)	15	106	5	3	0	0	19	0	3	71	13	18	4
Wooded (acres)	720	783	428	720	474	483	976	562	954	1,454	1,026	726	1,042
Scrub (acres)	33	526	151	398	227	590	208	271	3,173	6,611	20	136	468
Land (acres)	6	8	3	9	3	7	9	7	15	120	9	21	21
Pasture (acres)	3	467	140	332	279	243	413	125	2,343	1,952	83	490	910
Croplands (acres)	10,501	17,847	9,336	16,473	10,049	10,435	10,230	11,916	11,152	13,437	10,869	13,047	14,430
Woods (acres)	0	4	2	1	7	6	3	0	25	43	0	0	0
Open Land (acres)	4	1	0	0	0	2	1	1	1	1	9	6	4
Wetlands NWI (acres)	52	271	76	206	139	302	109	162	518	1,063	51	81	179

Watershed (Count/%) miles/sq. miles	Roubidoux Ditch-Big Pine Creek (051201080401)	Big Pine Creek Ditch-Big Pine Creek (051201080402)	Little Pine Creek (051201080403)	Owens Ditch-Big Pine Creek (051201080404)	Brumm Ditch-Big Pine Creek (051201080405)	Darby Ditch-Big Pine Creek (051201080406)	Brown Ditch (051201080407)	Harrington Creek-Big Pine Creek (051201080408)	Pine Village-Big Pine Creek (051201080409)	Hog Back Hill-Big Pine Creek (051201080410)	Headwaters Mud Pine Creek (051201080301)	Seamons Ditch-Mud Pine Creek (051201080302)	Goose Creek-Mud Pine Creek (051201080303)
Land Feeding Operations (acres)	0	6,369	0	0	0	3,991	0	8,021	0	0	0	0	0
Land Feeding Operations (operations)	0	3	0	0	0	0.5	0	0.5	0	0	0	0	0
Land Application Areas (acres)	0	868	0	0	0	286	0	585	0	0	0	0	0
Feed spread (lb./year)	0	38,311,374	0	0	0	11,493,481	0	23,099,277	0	0	0	0	0
Land Application Operations	2	4	4	3	6	5	2	4	8	9	1	0	0
Land Application Areas	402	501	111	63	435	1085	37	135	0	0	464	23	128
Water Treatment Plants	0	0	0	0	1	0	1	0	1	0	1	0	1
Insewered Areas (acres)	0	0	0	0	0	43	16	0	342	175	0	0	0
Bank Access (miles of surface affected)	0.0	0.3	0.4	0.2	0.5	1.6	1.7	0.8	2.6	0.8	0.0	0.0	0.0
Bank Access (%)	0.0%	0.8%	2.1%	0.4%	1.6%	5.0%	4.5%	2.9%	5.7%	0.8%	0.0%	0.0%	0.0%
Bank Access (miles)	2.88	7.16	2.02	3.39	3.47	5.42	3.56	6.88	7.45	2.33	3.69	2.98	2.80
Bank Access (%)	8.3%	17.6%	11.3%	6.4%	11.3%	16.6%	9.3%	26.1%	15.9%	2.4%	16.0%	7.3%	7.0%
Bank Access (acres)	196.0	327.1	354.3	362.6	40.2	531.6	549.1	0	1189.9	12.6	396.8	1242.6	506.3
Bank Access (%)	1.7%	1.7%	3.5%	2.0%	0.4%	4.5%	4.6%	0.0%	6.7%	0.1%	3.3%	8.6%	3.0%
Bank and Bed Erosion (miles)	0.0	0.5	0.7	2.00	0.81	2.0	2.6	7.9	2.9	0.4	0.59	2.03	1.55
Bank and Bed Erosion (%)	0.0%	1.3%	3.9%	3.7%	2.6%	6.1%	6.8%	29.7%	6.1%	0.4%	2.5%	5.0%	3.9%
Bank and Bed Erosion (miles)	13.75	14.69	9.30	13.96	3.96	8.91	5.50	0.01	11.34	23.71	0.00	0.00	0.06
Bank and Bed Erosion (%)	6	10	5	10	4	6	2	1	2*	4	2	4	3
Bank and Bed Erosion (miles)	20%	9%	0%	9%	0%	0%	0%	0%	2%	0%	0%	0%	0%
Bank and Bed Erosion (%)	6	10	5	10	4	6	2	1	2*	6	2	5	4
Bank and Bed Erosion (miles)	40%	20%	36%	13%	0%	25%	63%	29%	9%	76%	50%	50%	50%
Bank and Bed Erosion (%)	6	10	4	9	4	6	1	0	2*	6	2	5	4
Bank and Bed Erosion (miles)	20%	20%	0%	22%	25%	25%	0%	N/A	22%	8%	0%	0%	36%

Watershed (Count/% miles/sq. miles)	Roubush Ditch-Big Pine Creek (051201080401)	Big Pine Creek Ditch-Big Pine Creek (051201080402)	Little Pine Creek (051201080403)	Owens Ditch-Big Pine Creek (051201080404)	Brumm Ditch-Big Pine Creek (051201080405)	Darby Ditch-Big Pine Creek (051201080406)	Brown Ditch (051201080407)	Harrington Creek-Big Pine Creek (051201080408)	Pine Village-Big Pine Creek (051201080409)	Hog Back Hill-Big Pine Creek (051201080410)	Headwaters Mud Pine Creek (051201080301)	Seamons Ditch-Mud Pine Creek (051201080302)	Goose Creek-Mud Pine Creek (051201080303)
Sample Sites	1	0	1	0	0	0	1	0	3*	4	2	5	3
None E exceeded target (235 DO ml)	0%	N/A	40%	N/A	N/A	N/A	20%	N/A	47%	23%	25%	78%	67%
Sample Sites (MHAB)	0	0	0	0	0	0	1	0	1	1	0	0	0
Score < 36 (non-supporting of life use, MHAB samples)	N/A	N/A	N/A	N/A	N/A	N/A	0%	N/A	0%	50%	N/A	N/A	N/A
Score > 45 (good or excellent)	N/A	N/A	N/A	N/A	N/A	N/A	0%	N/A	0%	50%	N/A	N/A	N/A
Sample Sites (KICK)	0	0	0	0	0	0	0	0	0	3	0	0	0
Score < 2.2 (non-supporting of life use, KICK samples)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0%	N/A	N/A	N/A
Score > 5 (KICK)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	83%	N/A	N/A	N/A
Sample Sites (macro sampling)	0	0	0	0	0	0	1	0	1	3	0	0	1
Score < 51 (poor habitat, macro g)	N/A	N/A	N/A	N/A	N/A	N/A	100%	N/A	100%	0%	N/A	N/A	100%
Score > 75 (macro sampling)	N/A	N/A	N/A	N/A	N/A	N/A	0%	N/A	0%	57%	N/A	N/A	0%
Sample Sites	5	7	4	7	2	2	1	0	1	2	0	0	1
Score < 35 (non-supporting of life use)	100%	43%	0%	14%	50%	50%	0%	N/A	0%	0%	N/A	N/A	0%
Score > 45 (good or it)	0%	0%	40%	29%	0%	0%	100%	N/A	0%	100%	N/A	N/A	0%
Sample Sites (fish sampling)	5	7	4	7	2	2	1	0	1	2	0	0	1
Score < 51 (poor habitat) (fish g)	100%	71%	60%	14%	100%	100%	0%	N/A	0%	0%	N/A	N/A	100%
Score > 75 (good habitat) (fish g)	0%	0%	20%	0%	0%	0%	0%	N/A	0%	50%	N/A	N/A	0%
Score < 60	N/A	20%	33%	40%	N/A	N/A	80%	50%	N/A	N/A	N/A	50%	N/A
Score > 60 (generally conducive to life of warmwater fauna)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100%	N/A	N/A	50%	N/A

N/A: No data available

*IDEM Fixed Station in HUC -409

