# HABITAT CONDITIONS

#### **Stream Habitat Assessment**

The purpose of this section is to give a general, qualitative description of stream morphology and streamside forest conditions in the Pomme de Terre River watershed. The Upper Pomme de Terre HUC is given the most emphasis because of the presence of Niangua darters, a federally threatened species, and federally designated Niangua darter critical habitat.

Two different methods were used to qualitatively describe selected instream habitat parameters. One method was identical to that used by Sue Bruenderman (Fisheries Research Biologist, Missouri Department of Conservation) and the other was MDC's Stream Habitat Annotation Device (SHAD). Sites used for characterizations are shown in <a href="Figure HC01">Figure HC01</a>. Habitat descriptions are site specific and do not necessarily represent habitat conditions outside of the evaluation site.

# Pomme de Terre River watershed

Generally, stream bank stability in the watershed is good with the exception of localized erosion (Figure HC02). Streambank stability was listed as good at 56.1% of the sites surveyed followed by, poor (22.0%), fair (17.1%), and excellent (4.9%).

Algae concentrations were also recorded at 35 locations throughout the watershed (Figure HC03). The portion of the watershed above Pomme de Terre Lake had more records of heavy and moderate algae concentrations than sites below Pomme de Terre Dam. Forty percent of the sites above Pomme de Terre Dam had light or no algae concentrations, followed by 36% with heavy algae concentrations, and 24% with moderate concentrations. Sample sites below Pomme de Terre Dam had light or no algae concentrations recorded at 90% of the sites and moderate algae concentrations at 10% of the sites.

Algae concentration differences between the two portions of the watershed can probably be attributed to several factors. One, grassland land use/cover and grazing is more prevalent in the watershed above Pomme de Terre Lake. Land use/cover above Pomme de Terre Dam consists of grassland (57.4%), forest (33.2%), bare soil (7.4%), and urban (2.0%). Land use/cover below the dam consists of forest (57.2%), grassland (36.8%), bare soil (4.9%), and urban (1.1%) (MoRAP 1997). Grazing in riparian corridors was noted at most habitat evaluation sites above Pomme de Terre Dam. These conditions present more nutrient sources (manure) and allow for direct nutrient runoff into streams. There is more public land along streams below the Dam, a factor limiting the number of cattle with stream access. Another factor limiting algae growth below the dam may be that Pomme de Terre Lake functions as a nutrient sink. Nutrient inputs above the dam are stored in the lake bottom and water leaving the reservoir may be nutrient deficient. This nutrient sink effect may be robbing the Pomme de Terre River of nutrients in the stretch between Pomme de Terre Dam and Truman Lake. Reduced water clarity in Pomme de Terre Lake, from increased plankton production, has been observed in recent years, though no studies have been conducted to document the source or the extent of these changes (Meade, R., MDC, pers. comm.)

Riparian corridors were evaluated using digital Phase I land use/cover data (MoRAP 1997). Four-hundred foot corridors (200 ft. on both sides of the stream midline) were determined for second order and larger streams, and the land use/cover (forest, grassland, bare soil, and urban) percentage was determined (Table HC01). This data is good to the point that it considered all streams to be the same

Figure HC01. MDC 1996-97 fish, habitat, and water quality sample sites in the Pomme de Terre River watershed.

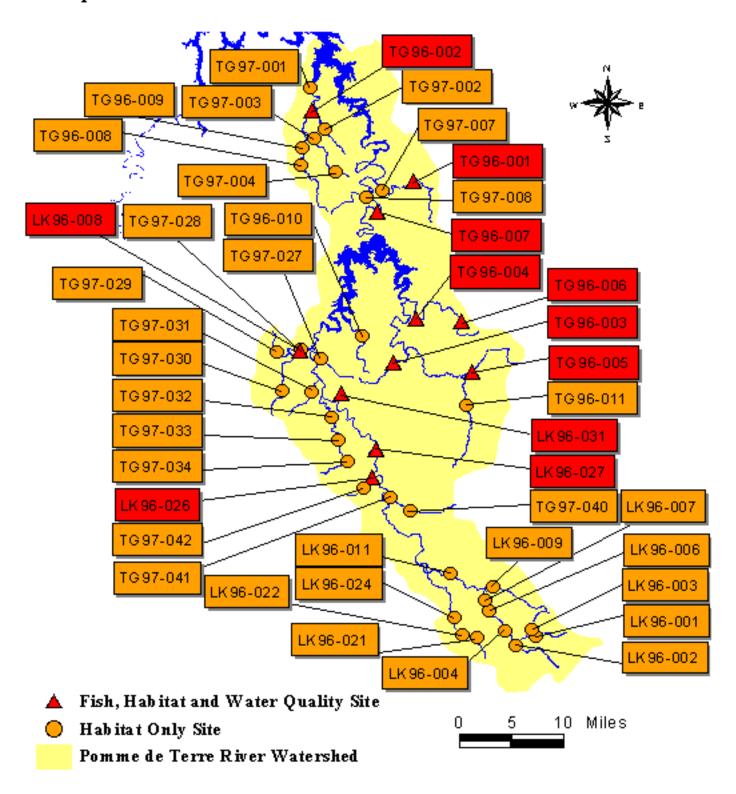


Figure HC02. Streambank stability rankings at habitat evaluation and fish sample sites, 1996-97, in the Pomme de Terre River watershed.

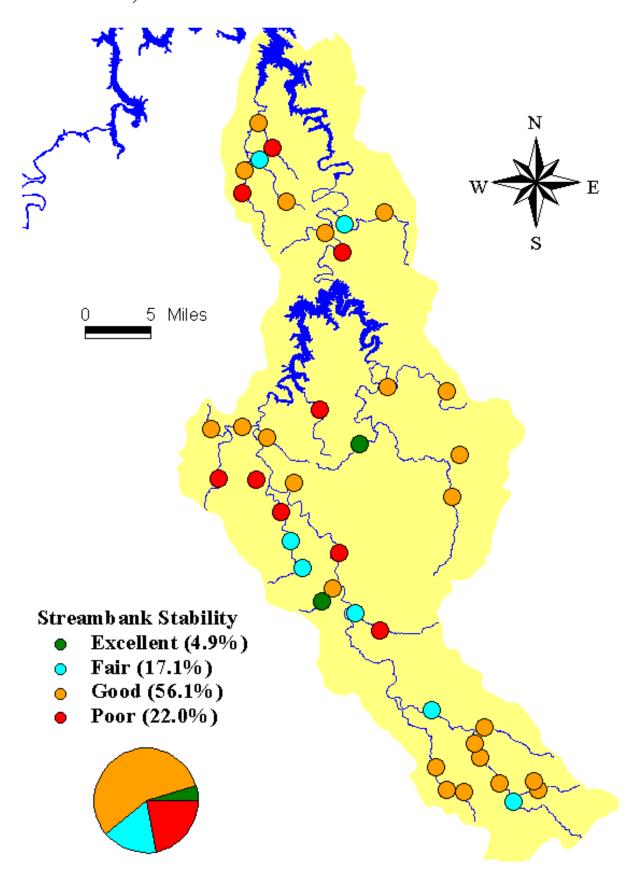


Figure HC03. Qualitative evaluation of algae concentration recorded at1996-1997 habitat sample sites in the Pomme de Terre River watershed.

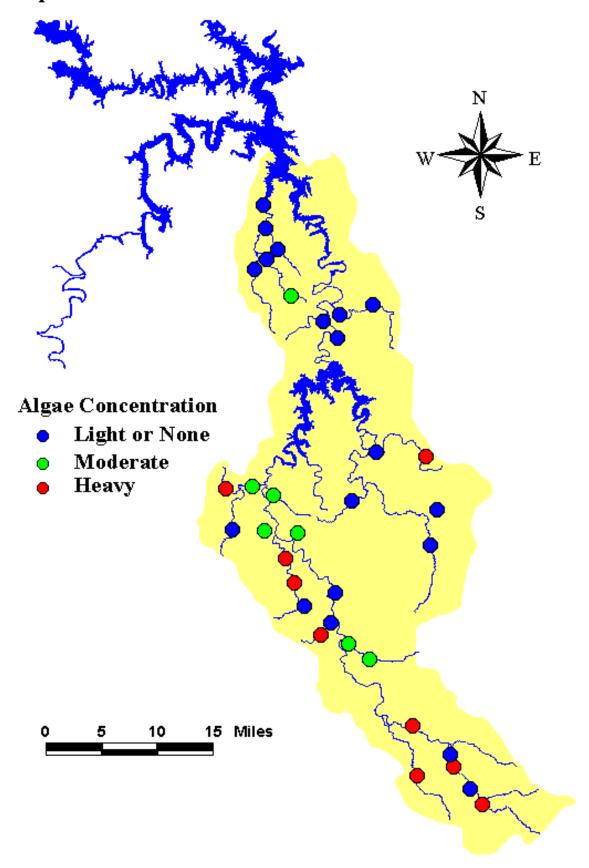


Table HC01. Land use/cover associated with riparian corridor\* within 200 ft. of stream mid-line, on both banks, for streams in the Pomme de Terre River watershed and HUCs (MoRAP 1997).

Riparian Land Use/Cover	Percent of Riparian			
Pomme de Terre River watershed				
Forest	46.6			
Grassland	47.4			
Urban	1.4			
Bare Soil	4.6			
Upper Pomme de Terre H	UC (10290107010)			
Forest	48.3			
Grassland	45.7			
Urban	1.9			
Bare Soil	4.1			
Middle Pomme de Terre HUC (1020107020)				
Forest	44.8			
Grassland	47.7			
Urban	2.9			
Bare Soil	4.6			
Lindley Creek HUC (	10290107030)			
Forest	42.6			
Grassland	52.2			
Urban	0.2			
Bare Soil	5.0			
Little Pomme de Terre North	HUC (10290107040)			
Forest	53.0			
Grassland	41.2			

Urban	0.7
Bare Soil	5.1
Lower Pomme de Terre HUC (10290107050)	
Forest	55.8
Grassland	38.7
Urban	1.4
Bare Soil	4.1

<sup>\*</sup> Riparian corridors were calculated for full length second order and larger streams. No corridors were included for the two major reservoirs. The Lower Pomme de Terre HUC includes second order and above streams from below Pomme de Terre Dam to the normal pool of Truman Lake.

width. The selected corridor for larger streams is narrower than for more smaller streams. This is because the wider the stream, the larger the area the stream itself occupies of the 400 feet, leaving less for the selected corridor. Forest and grassland were the dominant corridor land use/cover. Riparian corridors were dominated by grassland (47.4%) and forest (46.6%). Generally, streams in the lower portion of the watershed have corridors primarily dominated by forests. In the upper portions of the watershed riparian corridors are dominated by grassland.

Forest is the dominant corridor land use/cover type in three HUCs; Lower Pomme de Terre (55.8%), Little Pomme de Terre North (53.0%), and Upper Pomme de Terre (48.3%). Grassland is the dominant land use/cover in two HUCs, Lindley Creek (52.2%) and Middle Pomme de Terre (47.7%).

Substrate composition for sample sites on the Pomme de Terre River included gravel, or a gravel combination, as the dominant type at eight of nine sites surveyed. Cobble or a cobble combination ranked second as substrate types at five of seven sites. Substrate composition for sample sites on the Pomme de Terre River is presented in Table HC02.

### **Upper Pomme de Terre HUC**

Streambank stability was generally good at these sites, even though riparian corridor (streamside forest) widths were less than 33 feet wide on at least one streambank at 10 of the 11 sites. Four of the sites had at least one streambank with no riparian corridor, including two sites (LK96-022 and LK96-009) without a riparian corridor.

Riparian corridor land use/cover for perennial streams in the Upper Pomme de Terre HUC consisted of: forest (48.3%), grassland (45.7%), urban (1.9%), and bare soil (4.1%) (MoRAP 1997).

Stream corridors are heavily grazed in the Upper PDT HUC and this is probably impacting streams. None of the 11 sites had undisturbed forested corridors on both sides of the stream and only 4 had undisturbed forested corridors on one side of the stream. The corridor of at least one side of the stream was used as pasture in 10 of the 11 sites, including five sites where the stream corridor was used as pasture on both sides of the stream. The only site that did not have pasture land in it (LK96-004) had a road running within 30 feet of the stream.

Five of the 11 sites in this HUC were dry including LK96-001, LK96-003, LK96-009, LK96-021 and LK96-022. Of the remaining six sites (five on Pomme de Terre River and one on Little Pomme de Terre River) that had water, four were reported to have heavy instream algae concentrations. Two of the four sites were located on streams immediately west and east of Fair Grove. Several NPDES sites, CAFOs, and tributaries running through Fair Grove are all present in a small area encompassing Fair Grove (area measurement) and are likely causing stream problems. Only sites LK96-004 and LK96-007 did not have algae problems.

Substrate composition for sample sites in the Upper Pomme de Terre River HUC included gravel, or a gravel combination, as the dominant type at six of eleven sites surveyed. Cobble or a cobble combination ranked second as substrate types at five of eight sites. Substrate composition for sample sites in the Upper Pomme de Terre HUC is presented in <u>Table HC03</u>.

# **Riparian Corridor Conditions**

Aerial photographs (dated 1990) were used to qualitatively evaluate riparian corridors along streams in

Table HC02. Substrate composition of 1996-97 habitat sampling locations on the PDT River.

		Substrate Particle Composition Rank		
<u>Name</u>	<u>ID</u>	<b>Dominant</b>	Second	<u>Third</u>
PDT River	LK96-002	gravel	cobble	silt
PDT River	LK96-004	gravel	cobble	silt
PDT River	LK96-006	gravel/silt		sand
PDT River	LK96-007	boulder	cobble	bedrock
PDT River	LK96-011	gravel/cobble	boulder	
PDT River	LK96-026	gravel	cobble/boulder	
PDT River	LK96-027	sand/gravel		cobble/boulder
PDT River	LK96-031	gravel	silt/boulder/bedrock	
PDT River	TG96-007	gravel	sand/cobble	

Table HC03. Substrate composition of 1996-97 habitat sampling locations in the Upper Pomme de Terre HUC.

		Substrate Particle Composition Rank		
<u>Name</u>	<u>ID</u>	<u>Dominant</u>	<u>Second</u>	<u>Third</u>
Unnamed	LK96-003	cobble boulder		gravel
LPDT River	LK96-021	gravel/silt		sand
LPDT River	LK96-022	bedrock	boulder/cobble	
LPDT River	LK96-024	gravel/cobble/bedrock		
<b>Mutton Hollow</b>	LK96-009	bedrock	boulder/cobble	
Norlin Fork	LK96-001	cobble gravel		silt
<b>PDT River</b>	LK96-002	gravel cobble		silt
PDT River	LK96-004	gravel cobble		silt
PDT River	LK96-006	gravel/silt		sand
PDT River	LK96-007	boulder	cobble	bedrock
PDT River	LK96-011	gravel/cobble	boulder	

the Upper Pomme de Terre HUC. This area was targeted because of the presence of Federally designated Niangua darter critical habitat. A general interpretation of these photos is given below, with emphasis placed on the width of the riparian corridors. It was not possible to determine from the photos whether grazing was actually occurring along the streams. However, the amount and orientation of pasture land in the area, as well as the results of the surveys conducted, suggest that cattle have free access to streams in most areas and grazing along streams is common. Due to budget limitations photo coverage of streams was incomplete.

**North Fork**: The lower one-half (approx.) of this stream was reviewed. There was an apparent area without a riparian corridor at the confluence with the Pomme de Terre River, and vertical cutbanks and active erosion were evident. Most of this stream segment had a narrow riparian corridor on one side or the other. The land draining into the North Fork had fairly good forest coverage and most smaller tributaries had fairly good riparian corridors.

**South Fork**: The lower one-half (approx.) of this stream was analyzed. There was an area near the confluence with the Pomme de Terre River that was actively eroding resulting in vertical cutbanks. Approximately one-half of this lower portion (lower 1/4 of the stream) appeared to have an adequate riparian corridor. Upstream of this were areas with no riparian corridor on either side of the stream and active erosion was occurring. Land in the South Fork watershed lacked forest cover. Ten to 15% of the land was tree covered. Many of the smaller first and second order tributaries had either no or narrow riparian corridors, on one or both sides.

Pomme de Terre River between Highway DD crossing, southwest of Caddo, in Webster County and the confluence with the South Fork: Some short areas with no riparian corridor and active erosion were evident, especially where stream sinuosity was high. Although narrow riparian corridors predominated, erosion was minimal.

*Pomme de Terre River between Mutton Hollow and the South Fork*: This segment includes the Niangua Darter Critical Habitat. The riparian corridor of the Pomme de Terre River has been cleared and most of the tributaries lacked a riparian corridor. Extensive erosion was apparent in this segment.

The watershed immediately southeast of Fair Grove was lightly forested with the majority of the open land used for agriculture. These conditions create the potential for increased runoff which may increase erosion and sedimentation. This stream segment is an area of concern. Several CAFOs and other large agricultural operations were evident from aerial photographs. Excessive nutrification from these operations is a concern.

*Mutton Hollow*: Mutton Hollow had an adequate riparian corridor on both sides of the stream in the small portion of the stream reviewed.

Unnamed 23 (tributary to Mutton Hollow): Riparian corridors in the small area reviewed were lacking or nonexistent.

**Pomme de Terre River between Mutton Hollow and Unnamed #22**: About one-half of the segment evaluated had very narrow or no riparian corridor. Selected areas had actively eroding vertical banks. Riparian corridors were in fair condition along tributary streams near their confluences with the Pomme de Terre River. Little or no riparian corridor on either streambank was present in most upstream portions.

Unnamed #22: Approximately two-thirds of the stream was reviewed. Banks had either a very narrow or

no riparian corridor. The watershed draining into Unnamed #22 was devoid of trees, and the tributaries also have little or no riparian corridor.

Pomme de Terre River between Unnamed #22 and Little Pomme de Terre River South: Approximately one-third of the streambank had little or no riparian corridor. Small areas, especially at river bends, appeared to have vertical cutbanks and active erosion. About one-half of the land draining into this segment was forested. Many of the small tributary streams had narrow or no riparian corridor.

*Little Pomme de Terre River South*: Only a small portion of this stream was evaluated. The streambanks appeared to be fairly stable at the confluence with the PDT River. Riparian corridors were generally narrow. Tributaries were in good condition with only a few narrow riparian corridors. Most streams had adequate riparian corridor to provide streambank protection. The dominant land use in the watershed was grazing and haying, with about 15% forested.

**Pomme de Terre River between confluence of Little Pomme de Terre River South and Little Wilson Creek**: Most of this segment was protected by a healthy riparian corridor. Approximately 25% of this segment of the Pomme de Terre River had a narrow or no riparian corridor. Little active erosion was evident. Agricultural runoff is the primary concern in this segment of the Pomme de Terre River. One tributary stream has five CAFOs concentrated in a small area within its watershed, and the land surrounding these operations, including streams, was devoid of trees.

*Little Wilson Creek*: One-half of the stream length of Little Wilson Creek was reviewed. Approximately 35% of this segment had little or no riparian corridor and the remainder had fairly good riparian corridor protection. Some active erosion and channel braiding was evident and there appeared to be a heavy gravel bedload in this stream. Prater Branch, a tributary to Little Wilson Creek, had a very narrow or no riparian corridor along its entire length. The riparian corridor along smaller streams in Little Wilson Creek watershed appeared to offer moderate protection.

Pomme de Terre River between the mouth of Little Wilson Creek and the mouth of Unnamed #21: Slightly less than one-half of the streambanks reviewed had a narrow riparian corridor, and the remainder had adequate protection. One small area of active erosion was evident but, this segment appeared to be in relatively good condition. Tributaries to this segment appeared to be well protected by the riparian corridor.

*Unnamed #21*: The downstream one-half of Unnamed #21 was reviewed. Of this, approximately 80% had an adequate corridor. The area around the stream mouth appeared to be stable. The riparian corridor narrowed in the upper end.

*Sycamore Creek*: The entire length of Sycamore Creek and its tributaries were reviewed. The area near the mouth of Sycamore Creek appeared to have a wide, protective riparian corridor, however, most of the streambanks in this watershed (including tributary Unnamed #25) had very narrow or no riparian corridor. There appeared to be a considerable amount of active erosion in this watershed.

*Unnamed #25 (tributary to Sycamore Creek)*: Most of the length of Unnamed #25 had only a narrow riparian corridor and some active erosion was evident. A large eroded area was evident at the streams confluence with Sycamore Creek. More than half of the tributary streams to Unnamed #25 had no riparian corridor and the remainder had a very narrow riparian corridor.

Pomme de Terre River between Unnamed Tributary #21 and Upper Pomme de Terre HUC border:

Most of this segment had very narrow or no riparian corridors. Considerable active erosion was evident on many outside bends, just below the confluence with Sycamore Creek. Most of the tributaries to this segment, including Sycamore Creek, had narrow or no riparian corridors, including two relatively long tributaries that had virtually no riparian corridor. This segment of the watershed appeared to have a potential for sedimentation problems, including Sycamore Creek.

# **Niangua Darter Range and Critical Habitat**

Riparian corridor land use/cover was also determined for Niangua darter range and critical habitat using digital land use/cover data (MoRAP 1997). Corridors 400 ft. wide (200 ft. on each side of the stream midline) were determined and the land use/cover percentage were calculated for each (Table HC04). Forest was the dominant riparian corridor land use/cover in both stretches, Niangua darter range (64.2%) and critical habitat (63.7%). This varied considerably from the riparian corridor land use/cover for the Upper Pomme de Terre HUC, forest (48.1%) and grassland (45.5%). Critical habitat for the Niangua darter may also be impacted by CAFOs (Figure HC04).

### Middle Pomme de Terre HUC

All 14 evaluation sites located in this hydrologic unit had some flow. Streams were experiencing nutrient enrichment, likely through the combination of urban development and agricultural practices. Ten of the 14 sites were reported to have moderate or heavy algae concentrations (Figure HC03). There is a large number of NPDES sites and CAFOs located in this HUC as compared to the rest of the Watershed (Figure LU02). Bolivar, the largest city in the Watershed, is growing rapidly and the associated impacts from this expansion are likewise growing. The Missouri Office of Administration (1998) has estimated that the human population residing in Polk County will increase 30.3% between the years of 1990 and 2020; far exceeding the statewide projection of 9.0%. The potential threat to streams associated with urban expansion in this HUC is obvious and is a high priority for stream management.

Streambank stability varied from site to site (Figure HC02). Streambank stability was reported to be good at 6 of the 14 sites, fair at 3 sites, and poor at 5 sites. Likewise, riparian corridor widths also varied. Riparian corridor widths were found to be less than 33 feet on at least one side of the stream at 8 of the 14 sample sites including 3 sites with riparian corridor widths less than 33 feet on both sides. Eight sites had at least one side of the stream with a riparian corridor width greater than 82 feet including three sites where riparian corridor on both sides were greater than 82 feet. None of the sites were devoid of a riparian corridor on both banks.

Grassland (47.7%) was the dominant riparian land use/cover on perennial streams in this HUC followed by: forest (44.8%), bare soil (4.6%), and urban (2.9%) (MoRAP 1997).

Substrate composition for sample sites in the Middle Pomme de Terre HUC included gravel, or a gravel combination, as the dominant type at eleven of fourteen sites surveyed. Cobble or a cobble combination ranked second as substrate types at three of nine sites. Substrate composition at sample sites in the Middle Pomme de Terre HUC is presented in <u>Table HC05</u>.

# **Lindley Creek HUC**

Four of the five sites in this hydrologic unit had instream flow and one was intermittent. Four of the five sites had light or no algae concentration and one on Lindley Creek (TG96-006) had a heavy algae

Table HC04. Land use/cover associated with riparian corridor within 200 ft. of stream midline on both banks, found within Niangua darter range and critical habitat

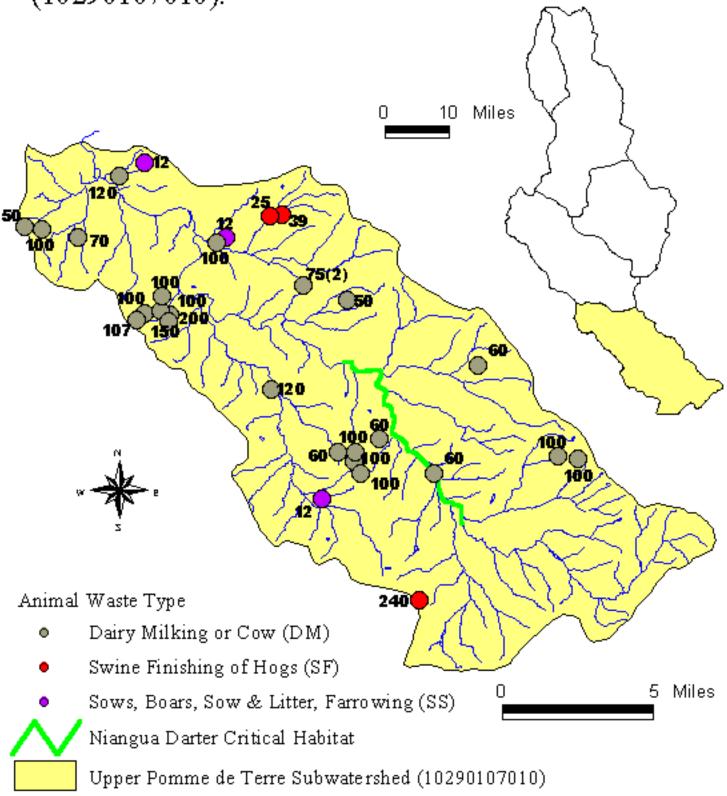
Riparian Land Use/Cover	Percent of Riparian		
Niangua darte	er Range		
Forest	64.2		
Grass	33.0		
Bare Soil	2.8		
Niangua darter Critical Habitat			
Forest	63.7		
Grassland	33.3		
Bare Soil	3.0		

(MoRAP 1997).

Table HC05. Substrate composition of 1996-97 habitat sampling locations in the Middle Pomme de Terre HUC.

		Substrate Particle Composition Rank		
<u>Name</u>	<u>ID</u>	<u>Dominant</u>	<b>Second</b>	<u>Third</u>
PDT River	LK96-026	gravel	cobble/boulder	
PDT River	LK96-027	sand/gravel		cobble/boulder
PDT River	LK96-031	gravel	silt/boulder/bedrock	
Davis Creek	TG97-027	gravel/cobble/bedrock		
Dry Fork	TG97-028	gravel	sand	cobble
Ashlock Creek	TG97-029	bedrock	gravel	cobble
<b>Dry Fork</b>	TG97-030	bedrock	cobble	gravel
<b>Abels Creek</b>	TG97-031	gravel	cobble	bedrock
Piper Creek	TG97-032	gravel sand		cobble
Piper Creek	TG97-033	gravel/silt		cobble
Piper Creek	TG97-034	no data	no data	no data
Schultz Creek	TG97-040	gravel/cobble		
Schultz Creek	TG97-041	gravel	silt	cobble
McKinney Creek	TG97-042	gravel	bedrock	cobble

Figure HC04. CAFOs near Niangua darter critical habitat in the Upper Pomme de Terre HUC (10290107010).



Note: Numbers represent animal units.

concentration.

Streambank stability was good at all five sites. Riparian corridors were less than 33 feet on at least one side of the stream at 3 of the 5 sites including one site (TG96-011) where the riparian corridor was less than 33 feet on both sides of the stream. Two of the five sites had a riparian corridor greater than 80 feet wide on one side and between 33 and 80 feet wide on the opposite side. None of the streambanks at these sites were devoid of trees.

Riparian corridor land use/cover of perennial streams was dominated by grassland (52.2%), followed by forest (42.6%), bare soil (5.0%), and urban (0.2%) (MoRAP).

Substrate composition for sample sites in the Lindley Creek HUC included gravel, or a gravel combination, as the dominant type at four of five sites surveyed. Cobble and silt ranked second as substrate types at two of five sites each. Substrate composition at sample sites in the Lindley Creek HUC is presented in <u>Table HC06</u>.

### Little Pomme de Terre North HUC

Site TG97-001 will be omitted from the following discussion because it was located within the normal pool level of Harry S. Truman Lake. Of the 6 sites in this HUC, one was dry (TG96-008) and one had intermittent stream flow (TG96-009). Algae was light at all sites except TG97-004 in the upstream portion of Montgomery Hollow where the algae concentration was moderate.

Streambank stability was good at three sites, fair at one site, and poor at two sites. All six sites had at least one side of the stream with a riparian corridor width less than 33 feet wide. Three sites had both sides less than 33 feet and one had no riparian corridor on either side. All six sites had grazing within the riparian corridor, including three sites that were 100% grazed, two that were 50% grazed and one that was 25% grazed.

Riparian corridor land use/cover of perennial streams was dominated by forest (53.0%), followed by grassland (40.7%), bare soil (5.0%), open water (1.3%), and urban (0.7%) (MoRAP 1997).

Substrate composition for sample sites in the Little Pomme de Terre North HUC included gravel, as the dominant type at all six sites surveyed. Cobble or cobble combinations ranked second as substrate types at five of six sites. Substrate composition at sample sites in the Little Pomme de Terre north HUC is presented in Table HC07.

# Lower Pomme de Terre HUC

Light or no algae concentrations were observed at all four sample sites in the Lower Pomme de Terre HUC.

Streambank stability was listed as good at two sites, fair at one site, and poor at one site. The site recorded with poor streambank stability was located on the mainstem Pomme de Terre River eight miles below Pomme de Terre Dam. Streambank instability in this section of the Pomme de Terre River is closely tied to Pomme de Terre Dam operation. These problems are dealt with in more detail in the Hydrology section.

Riparian land use/cover in the Lower Pomme de Terre HUC was dominated by forest (55.8%), the highest percentage of the five HUCs, followed by grassland (38.7%), bare soil (4.1%), and urban (1.4%)

Table HC06. Substrate composition of 1996-97 habitat sampling locations in the Lindley Creek HUC.

		Substrate Particle Composition Rank		
<u>Name</u>	<u>ID</u>	<u>Dominant</u>	Second	<u>Third</u>
Panther Creek	TG96-003	gravel/bedrock	silt	
<b>Ingals Creek</b>	TG96-004	bedrock	gravel	cobble
Unnamed#5	TG96-005	gravel	cobble	sand
<b>Lindley Creek</b>	TG96-006	gravel	silt	cobble
<b>Lindley Creek</b>	TG96-011	gravel	cobble	silt/sand

Table HC07. Substrate composition of 1996-97 habitat sampling locations in the Little Pomme de Terre North HUC.

		Substrate Particle Composition Rank		
<u>Name</u>	<u>ID</u>	<b>Dominant</b>	Second	<u>Third</u>
LPDT River	TG96-002	gravel	cobble	silt/sand
LPDT River	TG96-008	gravel	bedrock	cobble
LPDT River	TG96-009	gravel	silt/cobble	
LPDT River	TG97-001	no data	no data	no data
<b>Trinity Hollow</b>	TG97-002	gravel	cobble	
<b>Montgomery Hollow</b>	TG97-003	gravel	cobble	boulder
<b>Montgomery Hollow</b>	TG97-004	gravel	cobble	

(MoRAP 1997).

Substrate composition for sample sites in the Lower Pomme de Terre HUC included gravel as the dominant type at all sites surveyed. Bedrock ranked second as substrate type at three of five sites. Substrate composition at sample sites in the Upper Pomme de Terre HUC is presented in <u>Table HC08</u>.

#### **Channel Alterations**

No major channelization projects have taken place in the Watershed. Channelization is usually confined to short stretches associated with bridge and road construction. The rerouting and widening of state highways 65 (Benton, Hickory, and Dallas counties) and 13 (Polk County) may have localized effects at stream crossings, mainly in headwater areas.

# **Aquatic Community Classification**

The Watershed is located in the Ozark Faunal Region. This region includes all of the state south of the Missouri River, between the Lowland Faunal Region to the south and east and the Prairie Faunal Region to the north and west. The region is characterized by older bedrock, higher elevations, and greater local relief than surrounding areas. The majority of the bedrock is Mississippian in age or older, consisting mainly of limestone and dolomite. Uplands of the region are commonly above 1,000 feet msl, with local relief along major streams often exceeding 300 feet. Most stream channels in the region consist of a series of well defined riffles and pools. Generally substrates consist of coarse gravel, rubble, boulders, and bedrock (Pflieger 1989).

The Ozark Faunal Region is further broken down into six smaller divisions, with the Watershed located in the Missouri-Ozark Division (Pflieger 1989). The majority of the Missouri-Ozark Division is located in the Springfield Plateau, including the Watershed. Topographically the division, within the watershed, is level and undissected to the south and west and more deeply dissected and hilly to the north and east. Streams in the Springfield Plateau portion of the division are slightly more turbid and have a less extensive exposure of chert in their channels than streams in the Salem Plateau portion (Pflieger 1989).

The Missouri-Ozark Division is the largest division of the Ozark Faunal Region, but has few species that are restricted to it. The Niangua darter is endemic to the division. Blacknose shiners are only found in Missouri in the Missouri-Ozark division. The Missouri saddled darter only occurs in Missouri in the Missouri-Ozark and Mississipp-Ozark divisions. Ozark populations of redfin shiner and plains topminnow are restricted to the Missouri-Ozark and Ozark-Neosho divisions (Pflieger 1989).

# **Unique Habitats**

The MDC's Natural Heritage Program (MDC 1998a) has identified several unique natural communities in the Pomme de Terre River watershed (<u>Table HC09</u>). The section of the Pomme de Terre River that includes federally designated Niangua darter critical habitat (Figure BC02) has been identified as a unique aquatic natural community, as has most of Little Pomme de Terre River (North).

Natural Areas (NA) have been identified statewide by the Missouri Natural Areas Committee made up of representatives from MDNR, United States Forest Service, National Park Service, and MDC. La Petite Gemme NA, located southwest of Bolivar, is the only Natural Area located in the Watershed. The 37-acre upland prairie is owned by the Missouri Prairie Foundation and managed by MDC (Kramer, K., R. Thom, G. Iffrig, K. McCarty, and D. Moore, 1996).

Table HC08. Substrate composition of 1996-97 habitat sampling locations in the Lower Pomme de Terre HUC.

		Substrate Particle Composition Rank		
<u>Name</u>	<u>ID</u>	<b>Dominant</b>	Second	<u>Third</u>
Mill Creek	TG96-001	gravel	bedrock	cobble
PDT River	TG96-007	gravel	sand/cobble	
<b>Stinking Creek</b>	TG96-010	gravel	bedrock	silt/cobble
Mill Creek	TG97-007	gravel	cobble	
Jordan Branch	TG97-008	gravel	bedrock	sand/cobble/boulder

Table HC09. Unique natural communities identified in the Pomme de Terre River watershed (MDC Natural Heritage database).

Habitat Type	Date Last Observed	Number of Locations
Creeks and small rivers (Ozark)	AQUATIC COMMUNITIES 04/17/1984	2 reaches in 5 counties
	OTHER COMMUNITIES	
Caves	no data	4 caves in Hickory County
TE	RRESTRIAL COMMUNITIE	$\underline{\mathbf{S}}$
Dry chert forest	03/29/1989	1 Hickory County
Dry limestone/dolomite prairie	07/07/1989	1 Hickory County
Dry-mesic chert prairie	09/05/1989 and 09/27/1989	2 Polk County
Dry-mesic limestone/dolomite prairie	06/22/1989	1 Polk County
Dry-mesic sandstone/shale prairie	06/23/1994	1 Hickory County
Limestone glade	09/25/1989	1 Hickory County
Pond shrub swamp	07/21/1989	1 Dallas County

### **Improvement Projects**

The Crane Creek SALT project is the only watershed project in the Watershed. More details concerning this project are outlined in the Land Use section.

Only one MDC stream project has been reported in the Pomme de Terre River watershed. This was a logjam removal from the Pomme de Terre River approximately 2 river miles downstream of Pomme de Terre Dam (T37N, R22W, Sec. 10). The logjam consisted of approximately 20 trees lodged in the stream channel and an additional 5-10 standing live and dead trees catching debris. Streambank erosion measuring 60 feet long by 8 feet high was present in the project area. The logjam and standing trees were removed on September 10, 1990. The project slowed bank erosion and, as of 1992, the area had slowly begun to backslope and revegetate. No additional work is planned at this time.