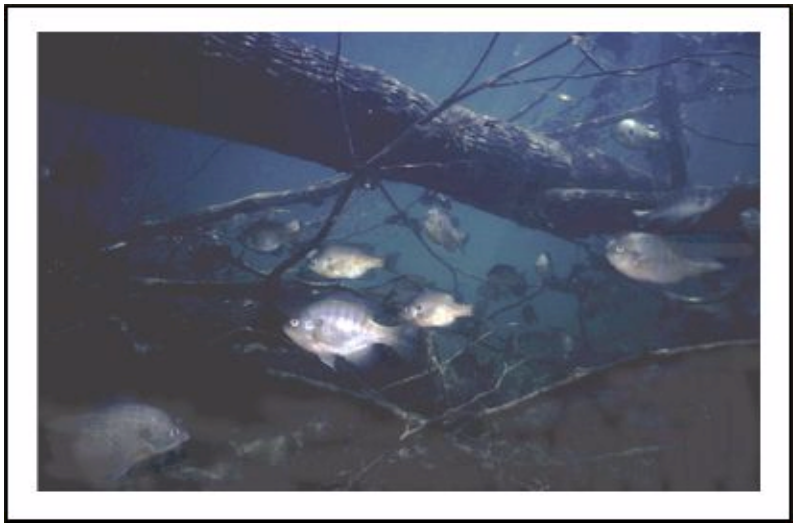
HABITAT CONDITIONS



AQUATIC COMMUNITY CLASSIFICATION

The portion of the White River covered in this document is part of the Ozark-White Division community, a portion of the larger Ozark Aquatic Faunal Region (Pflieger 1989). Streams in this classification are found in narrow, steep-sided valleys with high bluffs and are characterized by high gradient and relief (usually between 300 and 600 feet). Streams are clear with a substrate of mostly gravel and rubble with some bedrock. Channels have clear, well-defined riffles and pools. There are numerous springs in the area due to the karst topography. This makes some streams of the region ideal for coldwater fisheries (Pflieger 1989). The watershed is located entirely within the White River Natural Division in Missouri (Figure HC01).

CHANNEL ALTERATIONS

Stream channelization has not been a common practice in the watershed. Channelization is localized and usually associated with bridge or road construction, urban growth, gravel removal, and individual landowner's efforts to control streambank erosion. The USCOE is responsible for granting permits on many of these activities, and the MDC comments on most permits, typically making suggestions as to the most environmentally friendly approach for the specific project.

UNIQUE TERRESTRIAL HABITATS

The state's terrestrial resources have been classified into six major categories---Forest, Savanna,

Prairie, Primary, Wetland, and Cave communities. These communities have been divided based on characteristic features such as topography, size, distribution, and characteristic plant species (Nelson 1987). MDC's Natural Heritage Program has identified unique natural communities in the White River watershed in all six of the major categories (Table HC01). The Forest community is a xeric limestone/dolomite forest. The Savanna community is a chert savanna. The Prairie community is a dry limestone/dolomite prairie. The Wetland community is a pond marsh. The Cave community is represented by a wet pit cave and an effluent cave. The Primary community is the most prevalent of the listed communities and contains representatives from glade (dolomite glades and limestone glades), cliff (dry limestone/dolomite cliffs), and talus (limestone/dolomite talus) subdivisions.

In addition to unique terrestrial communities, the watershed supports seven natural areas designated by the Missouri Natural Areas Committee (Table HC02, Figure LU04) (Kramer, Thom, Iffrig, McCarty, and Moore 1996). The Committee defines a natural area as:

'. . . biological communities or geological sites that preserve and are managed to perpetuate the natural character, diversity, and ecological processes of Missouri's native landscapes. They are permanently protected and managed for the purpose of preserving their natural qualities.'

STREAM HABITAT ASSESSMENT

Several aspects of habitat were assessed, based on visual observations at fish sample locations, during 1997 samples. Observations were recorded for 20 of the 21 sites sampled (Table HC03). Most sites were accessible locations (i.e. county road crossings) and assessments of these should not be misinterpreted as representing watershed-wide habitat conditions, but rather as site specific examples. Observations included the entire reach of the sample site. The fisheries biologist recorded the bank stability as either excellent, good, fair, or poor. Bank stability ranked excellent at 4 sites, good at 14 sites, fair at 1 site, and poor at 0 sites. The percent of bank vegetation was recorded as the percent of trees, shrubs, herbaceous plants, and none. Overall, herbaceous made up the largest percent (35) followed by trees (20), shrubs (15), and none (16). Riparian corridor width was estimated in categories of: 1-10 feet, 11-25 feet, >25 feet, >50 feet, >75 feet, and >100 feet. These were recorded for both banks of the sampled reach. Corridor widths >100 feet were the most common, occurring 60% of the time, followed by >50 feet (22.5%), >75 feet and 1-10 feet (7.5%), and >25 feet (2.5%). Observations were also made concerning land use beyond the riparian corridor. Pasture land use was the most common, followed by forest and residential.

Overall, streambank stability at sample locations ranked good. There are few areas where vegetation along the bank is absent or insufficient to prevent flood scour. Herbaceous vegetation and shrubs are the most common forms of streambank protection, but trees are also present to help prevent flood scour. The majority of areas sampled had riparian corridors wider than 100 feet.

These descriptions represent a summary of habitat conditions at sample site locations (1997) and are not intended to represent watershed-wide habitat conditions, but rather to present site specific examples.

Barber's Creek:

The reach sampled along Barber's Creek (T25N-R19W-S21) was characterized as having good streambank stability. The protection provided to the streambanks consisted of 20% trees and 30% each of shrubs and herbaceous vegetation. Twenty percent of the bank in the reach sampled had no vegetation for protection. The width of the wooded riparian corridor was between 25 feet and 50 feet on the right bank and between 50 and 75 feet on the left bank. The land use for the area was all residential. The substrate was mostly gravel and pebble with some boulder.

Bear Creek:

There was one reach sampled along Bear Creek (T24N-R21W-S27). Bank stability was excellent with no signs of erosion. The cover was also excellent with 40% herbaceous cover and 30% cover of trees and shrubs. The width of the wooded riparian corridor was greater than 100 feet. The land use beyond the corridor was residential/commercial. The substrate consisted of mostly bedrock with some boulder and cobble.

Beaver Creek:

There were three reaches sampled along Beaver Creek (T25N-R17W-S27; T26N-R17W-S24; and T24N-R18W-S11). In all sample locations, the streambank stability was good. There was only a small area in which active erosion was present. This location did, however, have a good slope and was covered with minimal vegetation. Herbaceous vegetation was the dominant form of streambank vegetation. The vegetation coverage consisted of a large percent trees and shrubs in all locations. There were areas in all locations which were lacking in some form of streambank vegetation, but this was never more than 30% of the entire sampled reach. The width of the wooded riparian corridor in the upstream locations was excellent with most reaches having widths greater than 100 feet; only a few locations had corridors between 75 and 100 feet. The downstream location had a wooded riparian corridor width between 50 and 75 feet. Most of the land use beyond the riparian corridor for this stream was pasture. A small section had been left in forest. The substrate composition in this stream consisted of all sizes of material excluding clay. Gravel and cobble were the most prevalent, but boulder, sand, silt, and bedrock were also present at all locations.

Bull Creek:

Three reaches were sampled along Bull Creek (T25N-R20W-S31; T25N-R20W-S08; and T24N-R21W-S34). At all locations, streambank stability was good with no signs of active erosion. Vegetation consisted of mostly herbaceous vegetation with trees and shrubs also present to help stabilize banks. The downstream location had a wooded riparian corridor greater than 100 feet in width. The midstream and upstream locations both had left banks with wooded riparian corridor widths greater than 100 feet. However, the right banks in each location had a wooded corridor less than 25 feet in width. The land use beyond the corridor in all locations was forest and pasture. The substrate consisted of gravel, cobble, pebble, boulder, and bedrock in equal amounts.

Cane Creek:

The reach of Cane Creek (T23N-R18W-S18) that was sampled had excellent streambank stability conditions. Streambank vegetation consisted of mostly herbaceous plants (40%), but there was also trees (30%) and shrubs (30%) present to prevent erosion scour. The wooded riparian corridor was also in excellent condition with widths greater than 100 feet on both banks. Land use beyond the wooded corridor was partly pasture and residential. The substrate consisted of larger particles with boulder, cobble, and pebble the dominant forms.

Cowskin Creek:

Streambank stability at both sites (T26N-R16W-S05/08 and T27N-R16W-33) was good to excellent. In the upper reach of the two sites, 40% of the streambank lacked vegetation, but active erosion was not observed. The streambank vegetation was dominated by herbaceous species with trees and shrubs (20-25% each) also present. The wooded riparian corridor for both reaches sampled was excellent with widths greater than 100 feet. Only a small section had a wooded corridor width of 50-75 feet. Land use beyond the corridor for this stream consisted of mostly pasture with a small area set aside as forest. The substrate was a mix of gravel, pebble, and cobble with boulder and sand also present.

Little Beaver Creek:

Streambank stability in this stream was good. There were locations along the sampled reach (T25N-R18W-S15) where cattle were coming down to the stream, showing signs of active erosion. Streambank vegetation consisted of mostly herbaceous vegetation and shrubs. Some trees were also present to protect streambanks from scour. There was a small area (about 5% of the total reach) with no vegetation for protection. This was the cattle watering location. The upper end of the reach had a wooded riparian corridor width greater than 100 feet. This area was set aside for forest land use. The lower end of the

reach had wooded riparian corridor widths on the left bank between 11 and 25 feet, and on the right bank between 50 and 75 feet. Land use in this portion of the reach was set aside for grazing and pasture. The substrate consisted of all forms except clay, with pebble and cobble as the dominant forms.

Little North Fork:

Streambank stability for the reach sampled (T23N-R15W-S18) was good. There were areas where the streambank was bare of any vegetation (about 40% of the entire reach), but there were no indications of active erosion. The existing streambank vegetation was mostly herbaceous with some shrub cover. A few trees were also present along the streambank. The wooded riparian corridor in the reach was poor with widths ranging to only about 10 feet. The land use beyond the corridor was pasture. The substrate composition included all particles except clay and bedrock with cobble, pebble, and gravel as the dominant forms.

Pond Fork:

The streambank stability for the reach sampled (T23N-R16W-S15) was excellent. Bank vegetation consisted of mostly herbaceous vegetation (40%) with equal representation from trees and shrubs. The wooded riparian corridor was greater than 100 feet wide with pasture as the land use beyond the corridor. The substrate consisted of mostly bedrock, boulder, and cobble.

Roark Creek:

The reach sampled along Roark Creek (T23N-R22W-S23) was located in Henning Conservation Area. The streambank stability was excellent with predominately herbaceous vegetation. Trees and shrubs were also present to help prevent flood scour. The wooded riparian corridor was greater than 100 feet in width. The substrate was comprised of larger forms with boulder, cobble, and pebble as the dominant forms.

Roaring River:

There were two reaches sampled along Roaring River (T21N-R26W-09 and T21N-R27W-S01). The streambank stability for the downstream reach was good with only 20% of the entire reach sampled having no vegetation. The streambank vegetation was dominated by herbaceous species with shrubs and trees also present. The upstream location had excellent streambank stability with about equal representation among trees, shrubs, and herbaceous vegetation. The width of the wooded riparian corridor was greater than 100 feet in both locations, with forest as the land use beyond the corridor. The substrate was comprised of all forms except clay and silt with the larger sizes in the aggregate as the dominant forms.

Swan Creek:

There were three reaches sampled along Swan Creek (T26N-R19W-S34; T25N-R19W-S28; and T24N-R20W-S01). At all locations, streambank stability was good. There was a small section of the middle reach which had an 8-foot vertical bank with no vegetation. Herbaceous species dominated the streambank vegetation. In all location there were areas with no vegetation which never amounted to more than 30%. Trees and shrubs were also present in all locations to help prevent flood scour. The upstream reach had one bank with a wooded riparian corridor 10 feet wide, while the other had widths greater than 100 feet. The middle reach had a wooded riparian corridor of greater than 100 feet along both streambanks. The downstream reach had a wooded riparian corridor greater than 50 feet in width along both streambanks. The land use beyond the corridor was mostly pasture with some forest and residential areas. The substrate consisted of mostly cobble, pebble, and boulder.

Woods Fork:

The reach sampled on Woods Fork is found within the Busiek State Forest (T25N-R21W-S15). Therefore, streambank stability and wooded riparian corridor conditions were both excellent. Streambank vegetation was dominated by shrubs and herbaceous vegetation, but numerous trees were also present to prevent scour. The width of the wooded riparian corridor was greater than 100 feet. The substrate was comprised of all forms except clay with pebble as the dominant type.

Wooded riparian corridor estimates were completed on several major streams throughout the Missouri portion of the watershed using aerial videography. Roaring River, Dry Hollow (a tributary to Roaring River), Bull Creek, and Beaver Creek were videotaped by helicopter in March 1997. Swan Creek and Little North Fork White River were videotaped in March 1998. Corridor widths were mapped on 7.5 minute topographic maps using five categories: none, poor/none (single or clumped trees interspersed with areas of no trees), poor (less than 30 feet shown on the video as 1 or 2 rows of trees), good (30 to 75 feet), and excellent (75 feet or greater). The percent of each category was figured by stream and combined for all streams surveyed (Table HC04). The categories none, poor/none and poor, and good and excellent were combined, and the percent was calculated by stream and combined for all streams surveyed. The first combination could be considered unhealthy riparian conditions and the later combination healthy riparian conditions. It should be noted that the steams surveyed represent a very small percentage of the total watershed stream mileage, but should serve as good examples for riparian conditions watershed-wide.

Roaring River had the highest percentage of what would be considered healthy riparian conditions (68.8%), and Little North Fork White River had the lowest percentage (39.3%). Much of Roaring River is within Roaring River State Park and therefore protected from development, with

the exception of development associated with Roaring River Trout Park. Little North Fork White River contains a large number of cattle on pasture and most of the unhealthy conditions were associated with this land use practice. The highest percentage of no riparian corridor was found in Dry Hollow and Little North Fork White River. Both of these have large numbers of cattle on pasture. The largest percentage of poor/none was found along Roaring River (20.5 %) followed by Little North Fork (16.4%). This riparian condition along Roaring River was mainly associated with Roaring River Trout Park below Roaring River Spring. Much of the stream bank has been developed for access to anglers. Parking lots, roads and open areas are common in this area. The poor/none condition along LNF was mainly associated with cattle on pasture. Poor conditions were the highest along LNF (29.3%) and Swan Creek (25.5%). This is mainly due to land clearing for pasture. Beaver Creek (35.1%) and Bull Creek (26.8%) ranked first and second for good conditions. Roaring River (68.8%) and Swan Creek (65.2%) ranked first and second for excellent conditions.

Most good and excellent conditions were associated with steeper terrain and bluffs. A pattern was noted between steep bluffs with excellent riparian conditions in association with the opposite stream bank corridor being of poor condition. Steep terrain and bluffs are naturally protected from clearing and grazing. In most cases the bank opposite from a steep bluff has very level topography, making it most suitable for clearing and grazing. This pattern held true for all of the streams evaluated.

IMPROVEMENT PROJECTS

The Taney County Multi-Resource Project is a joint habitat improvement project supported by the Taney County Soil and Water Conservation District, Natural Resources Conservation Service, and Missouri Department of Conservation. The project is funded through MDC State Stewardship funds and all cooperating agencies are involved in providing technical assistance. Administrative guidance is provided by the MDC's Southwest Region Forestry staff. The project is designed to use an ecosystem, or multi-resource, approach to address natural resource issues in a highly sensitive area. Project objectives include: improve and protect water quality; promote glade and savanna restoration and management; improve management of woodland, grassland, and riparian areas; identify and encourage practices designed to protect species of federal or state concern found in the project area; and improve fish and wildlife habitat. Challenges and problems facing the area include: karst topography, poor soils, and critical water quality issues; savanna and glade management concerning woody encroachment; overgrazing of pastures and woodlands; and urbanization and large population increases. Landowners that own land in Taney County are eligible to apply for the program, but land that falls within the project boundaries will be given higher priority. Interested landowners can sign up anytime at the Taney County Soil and Water Conservation District in Forsyth, MO. At the time of writing, budgetary restraints have put the program on hold and future financing of the program is uncertain.

MDC has worked with other organizations and individuals to install fourteen habitat improvement projects throughout the Missouri portion of the watershed since 1991 (Table HC05). Six projects have been completed within Roaring River State Park with cooperation from MDNR. Two cedar tree revetments have been installed with the assistance of federal agencies; one with the USCOE and one with the USFS. MDC has provided assistance and cost sharing to individual landowners on six additional projects throughout the watershed. MDC fisheries biologist write 10-15 recommendations annually to watershed landowners, and are available for assistance with stream management issues, including: streambank erosion problems, riparian corridor re-establishment and protection, and alternative livestock watering projects (Martien, L., MDC, pers. comm.).

Table HC01. Unique terrestrial habitats in the Missouri portion of the White River watershed.

Community Type	Area Name	Size (acres)	Ownership*
Chert savanna	Skaggs-Keeter Ranch	1,320	Private
Dolomite glade	MO-AR state line	15	USFS
Dolomite glade	Smith Hollow Glades	20	Private/USFS
Dolomite glade	Butler Hollow	35	USFS
Dolomite glade	White Cedar Glade	6	MDNR/USFS
Dolomite glade	Boundary Line Glade	10	USFS
Dolomite glade	Rock Creek Glade	10	USFS
Dolomite glade	Busiek State Forest	30	MDC
Dolomite glade	White River Balds NA	100	MDC
Dolomite glade	Thorp Creek Glades	40	Private
Dolomite glade	McAdoo Creek Glades	50	USFS
Dolomite glade	Hercules Glades WA	40	USFS
Dry limestone/ dolomite cliff	Rock Spring Bluff	10	USCOE
Dry limestone/ dolomite cliff	Steep Bluff	N/A	USCOE
Dry limestone/ dolomite cliff	Oswalt Bluff	N/A	Private/ USCOE
Dry limestone/ dolomite prairie	Big Creek Prairie	23	Private
Effluent cave	Tumbling Creek Cave	N/A	Private
Limestone glade	Pine Hollow Ridge	1	USFS
Limestone glade	Beaver Creek Hollow	2	Private
Limestone glade	Dogwood Creek Glade	3	Private
Limestone glade	Gretna Glade	0.5	Private
Limestone glade	Garber Glade	0.5	Private
Limestone/ dolomite talus	Bull Creek	10	Private
Pond marsh	Drury-Mincy CA	0.5	MDC
Wet pit cave	Old Chiney Cave	N/A	Private
Xeric limestone/ dolomite forest	Ashe Juniper NA	25	Private/MDC

*MDC= Missouri Department of Conservation; USFS= United States Forest Service; MDNR= Missouri Department of Natural Resources; USCOE= United States Army Corps of Engineers
Source: Nelson (1987).

Table HC02. Natural areas (NA) in the Missouri portion of theWhite River watershed.

Name	County	Acres	Ownership*
Roaring River Cove Hardwoods NA	Barry	86	MDNR
Rock Spring Bluff NA	Barry	10	USCOE
Butler Hollow Glades NA	Barry	373	USFS
Ashe Juniper NA	Stone	35	MDC
White River Balds NA	Taney	364	MDC
Hayden Bald NA	Ozark	44	USFS
Caney Mountain NA	Ozark	1,458	MDC

*MDNR = Missouri Department of Natural Resources;
USCOE = United States Army Corps of Engineers;
USFS = United States Forest Service;
MDC = Missouri Department of Conservation
Source: Kramer, K., R. Thom, G. Iffrig, K. McCarty, and D. Moore (1996).

HC03. Recorded habitat conditions at MDC fish sample sites in the Missouri portion of the White River watershed during 1997.

Loc.[1] #	Bank[2] stability	Bank vegetation* (%)				Land use beyond riparian** (%)	Corridor width (feet)	
		T	S	H	N		Left descending bank	Right descending bank
2184	E	25	40	35	00	100F	>100	>100
1608	G	10	20	30	50	100R	>100	>50
2506	G	30	40	30	00	50F-50P	>100	>50
2458	G	30	30	30	10	50F-50R	1-10	>100
2314	G	20	30	30	20	100R	>50	>25
1624	F	10	20	40	20	75F-25P	>100	>100
2511	G	20	55	40	05	50F-50P	>50	>75
2507	G	20	40	30	10	100P	>50	>75
2234	NA	20	30	50	00	100P	>100	>75
2509	G	25	20	50	05	50F-50P	>100	>100
1985	E	30	30	40	00	50P-50R	>100	>100
1598	G	20	20	30	30	100P	>50	>50
2507	G	20	30	30	20	100P	>50	>50
1606	G	10	30	40	20	100F	>100	>100
1601	E	30	30	40	00	100F	>100	>100
1592	G	10	20	30	40	100P	1-10	1-10
2183	G	20	20	20	40	50F-50P	>100	>100
2197	G	20	20	20	40	50F-50P	>100	>100
1610	G	30	30	40	00	100R	>100	>100
1975	G	20	20	20	40	50F-50P	>100	>100
Total Avg.	G=74% E=21% F=5% P=0%	20	29	35	16		>100 = 60% >75 = 7.5% >50 = 22.5% >25 = 2.5% 1-10 = 7.5%	

[1]Location numbers correspond with those found in Figure BC01 and Table BC02.
[2]Bank stability was ranked as E=excellent, G=good, F=fair, and P=poor.
*Bank vegetation was classified as: T=trees, S=shrubs, H=herbaceous, and N=none.
**Land use beyond riparian corridor was classified as: F=forest, P=pasture, R=residential.

Table HC04. Estimated riparian corridor condition of major streams in the Missouri portion of the White River watershed.

Stream	None*	Poor/None*	Poor*	Good*	Excellent*	None Poor/None None*	Good Excellent*
Roaring River	5.6	20.5	5.2	11.3	57.5	31.2	68.8
Dry Hollow	17.6	6.4	16.6	5.2	54.3	40.6	59.5
Bull Creek	5.9	14.9	24.0	26.8	28.5	44.8	55.2
Swan Creek	4.6	4.8	25.5	23.6	41.5	34.8	65.2
Beaver Creek	5.7	8.9	23.4	35.1	26.8	38.0	62.0
Little North Fork	15.1	16.4	29.3	14.6	24.7	60.8	39.3
TOTAL	7.0	9.3	24.1	25.6	34.0	40.4	59.6

*Conditions: None=no corridor, Poor/None=single or clumps of trees interspersed with no trees, Poor=corridor less than 30 feet (usually 1 or 2 rows of trees), Good=30-75 feet of corridor, Excellent=75 feet of corridor or more.

Note: Numbers indicate category's percent of the entire riparian corridor.

Table HC05. Streambank and habitat restoration projects in the Missouri portion of the White River watershed.

Stream	County	Practice	Location	Cooperators	Date
Roaring River	Barry	Revetment & corridor re-establishment	22N 27W 34	MDNR/MDC	1990
E. Fork Big Cr.	Taney	Cedar tree revetment & corridor re-establishment	22N 17W 01	Private//MDC	1991
Swan Creek	Taney	Cedar tree revetment	23N 20W 28	USCOE/MDC	1991
Beaver Creek	Taney	Cedar tree revetment & corridor re-establishment	24N 17W 05	Private/MDC	1992
Roaring River	Barry	Gabion and bank sloping	22N 27W 35	MDNR/MDC	1993
E. Fork Bull Cr.	Christian	Cedar tree revetment	26N 20W 27	USFS/MDC	1994
Roaring River	Barry	Repair hard points, replace riprap, & repair gabion	22N 27W 35	MDNR/MDC	1995
Bailey Branch	Barry	Well and tanks for alternative watering source & corridor re-establishment	24N 25W 20	Private/MDC	1997
Bull Creek	Christian	Rock blanket & tree planting	25N 20W 08	Private/ MDC	1997
Goff Creek	Christian	Solar water tanks, spring development/protection, & corridor re-establishment	25N 22W 14	Private/MDC	1997
Roaring River	Barry	Disabled user access	22N 27W 27	MDNR/MDC	1998
Sugar Camp Cr.	Christian	Well, solar pump as alternative watering source, & corridor re-establishment	27N 18W 32	Private/ MDC	1998
Roaring River	Barry	Disabled user access and bank stabilization	22N 27W 35	MDNR/MDC	1999
Roaring River	Barry	Gravel retention structure maintenance	22N 27W 27	MDNR/MDC	ongoing

Figure HC01. The White River watershed's association to Missouri and Arkansas natural divisions.