HABITAT CONDITIONS

CHANNEL ALTERATIONS

No channel alterations have occurred in the upper subbasin. However, extensive alterations have occurred in the lower subbasin (USCOE 1991). Under provisions of the 1849 Swamp Lands Act, swamp lands were donated to the states with the requirement that the proceeds from land sales be used to construct levees and drainage ditches. The preparation of a comprehensive flood plan was begun by local citizens through the St. Francis Valley Drainage Association, which was organized in 1904. A comprehensive flood plan was adopted in 1911, and eventually became the St. Francis Basin Project. However, by 1911 the local citizens had already begun construction of levees along the river from Wappapello, Missouri to St. Francis, Arkansas. A levee was completed on the west bank in 1922, by local interests, from near where Wappapello Dam now exists to the Missouri-Arkansas state line. A levee was also completed along the east bank in 1923. These levees provided inadequate flood protection. Congress enacted the Flood Control Act of 15 June 1936, which authorized levees, channel diversions, and channel enlargements to control flooding. Furthermore, the Chief of Engineers could, and did, modify the plan to include a detention reservoir, eventually known as Wappapello Lake. The federal government subsequently reconstructed the levees and constructed Wappapello Dam in 1941. Above Crowleys Ridge the levees are fairly close to the river bank. But, from Crowleys Ridge to the state line, the flow is confined by a leveed floodway, which varies from 0.75 to 2.5 miles wide.

Channelization of the river from the lower end of Wilhelmina Cutoff to the mouth of Mingo Ditch began in 1966 and took approximately nine years to complete. The lower river was channelized from RM 259.2 to RM 278.1 and now ranges from 120 to 200 feet wide. The mainstem was designed to contain 7,000 cfs plus tributary flow.

Between the confluence of Mingo Ditch and Highway 62, 28.3 miles of stream was lost to channelization. This amounts to a 51 percent loss of stream and an increase in gradient from 0.63 ft/mi to 1.27 ft/mi. The creation of the Wilhelmina Cutoff reduced the length of that reach of river from 18.65 miles to 6.6 miles, a 65 percent loss. The gradient increased in this reach from 0.54 ft/mi to 1.52 ft/mi. Moderate to severe habitat destruction has occurred and will continue to occur throughout the subbasin upstream of the channelization. Headcutting in the mainstem, tributaries, and lateral ditches has caused lower stream bed elevations, wider and shallower stream channels, and steeper banks, which are experiencing severe sloughing and erosion in many locations. Increased deposition downstream is causing abundant unconsolidated sediments, decreased depths, and accelerated bank erosion. Most of the lower subbasin tributaries have also been channelized--with similar consequences.

High water temperatures, particularly in the smaller lateral ditches, can occasionally cause stress and mortality of fish and invertebrates during summer low-flow periods. Increased water temperature is influenced by channelization and ditch maintenance which increases channel widths, reduces water depths, and removes riparian shade.

The main channel from 0.5 miles upstream from Highway 84 to 6.5 miles downstream has almost completely filled in with sediment, logs, and other debris. This log jam has been accumulating additional trees, logs, and sediment for many years and has diverted the majority of the flow east and west adjacent to the levees. The USCOE is developing a plan to deal with the log jams.

STREAM HABITAT ASSESSMENT

The MDC Stream Habitat Assessment Device (SHAD), version II, was used to describe the quality of streambank, corridor, and channel habitat conditions in the basin. SHAD uses objective measurements and subjective ratings to rank particular habitat parameters into categories that allow inter- and intra-basin evaluation and comparison. Sixty-six and thirty SHADs were conducted in the upper and lower subbasins, respectively.

All fourth order streams and larger were assessed, plus a few third order streams. The selection and distribution of SHAD sites were dictated by stream order, gradient, and access, and location of representative sites within that stream reach. The length of individual SHAD sites was adjusted (usually extended to include more pool/riffle sequences) to enhance the accuracy if an obvious anomaly was measured. Channel conditions such as pool/riffle ratio, cover density, average width, and maximum average depth were calculated for each site.

SHAD evaluations suggest that most of the surveyed habitats in the upper subbasin are generally in good condition. The problems that occur are usually minor, scattered, and most often associated with streambank instability.

In lower subbasin streams, channelized sections are in very poor condition due to headcutting and sloughing streambanks. Depositional reaches (*e.g.* below Wilhelmina Cutoff and below Highway 84/90) are also suffering poor habitat conditions. The remaining areas of the lower subbasin are in good condition, with only minor problems. Specific discussion on habitat conditions will be separated by subbasin.

Upper Subbasin

Streambank Conditions: Analysis of the SHAD summaries suggest that streambank erosion is not excessive (Table 1). At least 82 percent of the streambanks that were surveyed were not experiencing any accelerated erosion and very little severe erosion was identified. Streambank protection quality was quite variable (Table 1). The St. Francis River and Stouts Creek were mostly good while Big Creek and Little St. Francis River were rated good to fair. Only Wolf Creek and a few smaller mainstem tributaries had a poor protection rating. Bottomland hardwoods were the dominant vegetation, followed by shrubs (understory vegetation), and annual vegetation. Some large granite rocks and outcroppings provide additional streambank protection.

Corridor Conditions: The quality of the forested portion of the riparian corridors is rated as good (dense stand of trees and understory) throughout most of the subbasin (Table 2). Only the Little St. Francis River and Wolf Creek basins contained corridors rated as poor. The mainstem and

western tributaries (Big and Stouts creeks) tended to have wider forested riparian corridors, while the eastern tributaries (Little St. Francis River and Wolf Creek) have much narrower corridors.

Channel Conditions: Channel substrates are generally stable and quite diverse, primarily composed of gravel and cobble, followed by sand, boulders, and rock outcroppings. Big Creek contains a greater percentage of gravel while the Little St. Francis River probably contains more sand than other subbasin streams. The pool/riffle ratio in the mainstem is as high as 22:1 and averages 4.5:1. Smaller basin streams have much smaller ratios, usually below 5:1. Average maximum pool depths in the mainstem generally ranged from 4 to 7.5 feet deep. Abundant woody cover (e.g. logs, rootwads, fallen trees) provides excellent fish habitat. The average amount of woody cover in the mainstem, Big Creek, Little St. Francis River, and Stouts Creek was 53, 60, 33, and 24 woody structures per mile, respectively.

Lower subbasin

Streambank Conditions: SHAD summaries suggest that streambank erosion is not excessive (Table 3). The greatest amount of erosion is occurring in the channelized sections of the mainstem and tributaries. Headcutting has lowered the stream bed elevations, and has also begun to cause gully erosion in the smaller tributaries. Sloughing of bank soils and rill erosion have also caused problems. Extended periods of high discharge from Wappapello Dam after storm events probably increases the erosion potential. Very little streambank erosion is occurring in the leveed floodway below Highway 84, west of Kennett, because flow is distributed over a wider area, thus reducing the erosive power of the flow.

Only about half of the streambanks were rated as having good quality vegetation to protect against streambank erosion (Table 3). The channelized sections of the mainstem and tributaries probably account for the majority of poor streambank vegetation because the banks are often too steep to allow the growth of woody vegetation. It is possible that the soil composition (mostly clay), low gradient (1 ft/mi), and the engineered design of the channel assist with streambank protection and stabilization. Vegetative bank protection improves in the leveed floodway.

Corridor Conditions: The quality of the forested portion of the riparian corridor is rated as 84 percent good and 16 percent fair along the mainstem (Table 4). The majority (86%) of Mingo Ditch is also rated as good, but 14 percent is rated as poor. The corridor quality along Varney River and Dudley Main ditches are mostly poor (75% and 87%), with only small areas of good quality corridor vegetation. The average width of the forested corridor is also much less for Varney River and Dudley Main ditches than for the mainstem or Mingo Ditch. The width of the wooded corridors is dependent on the extent of agricultural activity.

Channel Conditions: Throughout the subbasin, the stream bed is primarily composed of clay and sand, with very little diversity. Excessive sedimentation is occurring below the channelized sections between the lower end of the Wilhelmina Cutoff and Highway 62, and below Highway 84. The abundance of woody cover varied considerably, with a greater amount of cover in the unchannelized sections. The mainstem contained an average of 69 logs, trees, or rootwads per mile. Even Varney River Ditch and Mingo Ditch averaged 47 and 51 woody structures per mile, respectively. No woody cover was located in Dudley Main Ditch.

IMPROVEMENT PROJECTS

Since 1990, improvement projects have been installed on four streams in the basin for the purposes of streambank stabilization, streambank revegetation, corridor revegetation, elimination of headcutting, or creation of instream fish habitat. Three of the projects are located on public lands owned by either MDC or DNR and one MDC Landowner Cooperative Project (LCP) has been installed on private land.

SAM A. BAKER STATE PARK Cedar Tree Revetment Project: Big Creek at RM 1.75 ; fifth order; 313-foot-long eroding streambank; single row tree revetment installed in October 1990; additional trees added in subsequent years; willow stakes planted March 1991 to 1993. The revetment eventually stabilized the eroding streambank toe. Natural revegetation and willow staking have been successful in establishing vegetation on the site.

VIRGINIA MELLOR LCP Cedar Tree Revetment Project: Twelvemile Creek at RM 13.7; third order; 300-foot-long eroding streambank; single row tree revetment installed October 1994; additional cedars added June 1996; willow stakes and tree seedlings planted February and March 1995; additional willow stakes added spring 1996 and 1997. A major flood during the spring of 1999 removed most of the cedar trees in the revetment and because of recurring problems, the revetment may not be repaired.

BEAVER LAKE OUTLET DITCH (Otter Slough C.A.) Headcutting Control Project: A large grade control structure was constructed at the mouth of the ditch in 1994. A pipe was placed along the entire length (352 ft) of the outlet Ditch between Beaver Lake and Dudley Main Ditch (Ditch #12) to carry the flow. The project has successfully halted the headcutting.

BRADYVILLE DITCH (Otter Slough C.A.) Headcutting Control Project: In 1999, four grade control structures were constructed in the lower 460 feet of Bradyville Ditch, a tributary to Dudley Main Ditch. The lower 110 feet of the ditch was lined with riprap over the entire channel. The banks were re-sloped to a 3:1 grade. The project has been successful in stopping the headcutting.

UNIQUE HABITATS

MDC's Natural Heritage Database lists 25 high-quality natural communities in the St. Francis River basin (Table 5). Nelson (1987) describes in detail the different community types. Flatwoods have an impermeable or slowly permeable subsoil hard-pan layer over poorly drained level land. Mesic bottomland forests contain mixed bottomland hardwoods on level to gently sloping natural levees or higher elevations of floodplains, with soils that are moderately well drained. Oxbows are sections of former stream meanders that have become isolated from the main channel. Swamps and shrub swamps are depressions, oxbow ponds, or backwater sloughs, with poorly drained soils, that are inundated for extended periods of time. Wet bottomland forests contain bottomland hardwoods or cypress trees found on level stream corridors associated

with poorly drained soils that are wet for significant periods. Wet-mesic bottomland forests are also composed of bottomland hardwoods or cypress trees which are located on level to gently sloping stream corridors on somewhat poorly drained soils that are seasonally or intermittently wet for significant periods.

Ten natural areas exist in the basin (Table 6) (MDC 1996). Natural areas were established to preserve, manage, and restore extant natural communities, ecological processes, and geological areas.

Table 1. Streambank protection and erosion ratings in the upper St. Francis River subbasin as determined by SHAD surveys.

	Streambank Protection Rating (%)			Streambank Erosion Rating (%)		
Stream	**Good**	**Fair**	**Poor**	**None**	**Moderate**	**Severe**
St. Francis River	89	11	0	93	6	1
Big Creek	66	34	0	93	4	3
Little St. Francis River	58	33	9	89	5	6
Stouts Creek	100	0	0	98	2	0
Wolf Creek	32	44	24	97	3	0
Other Tributaries	52	37	10	82	17	1

Table 2. Riparian corridor information in the upper St. Francis River subbasin as determined by SHAD surveys.

	Corridor Quality (%)			
Stream	**Good**	**Fair**	**Poor**	**Average Width (Ft.) Forested Corridor**
St. Francis River	89	11	0	85
Big Creek	84	16	0	90
Little St. Francis River	70	21	9	60
Stouts Creek	83	17	0	74
Wolf Creek	54	42	4	36
Other Tributaries	75	25	0	84

Table 3. Streambank protection and erosion ratings in the lower St. Francis River subbasin as determined by SHAD surveys.

	Streambank Protection Rating (%)			Streambank Erosion Rating (%)		
Stream	**Good**	**Fair**	**Poor**	**None**	**Moderate**	**Severe**
St. Francis River	54	46	0	92	8	1
Varney River Ditch	24	37	38	100	0	0
Dudley Main Ditch	34	25	41	84	16	0
Mingo Ditch	73	13	14	100	0	0

Table 4. Riparian corridor information in the lower St. Francis River subbasin as determined by SHAD surveys.

	Corridor Quality (%)			
Stream	**Good**	**Fair**	**Poor**	**Average Width (Ft.) Forested Corridor**
St. Francis River	84	16	0	70
Varney River Ditch	25	0	75	15
Dudley Main Ditch	13	0	87	13
Mingo Ditch	86	0	14	68

Table 5. High-quality natural communities in the St. Francis River basin.

Community Name	Area Name*	Size (Acres)	Ownership *
Flatwoods	Cypress Lateral Ditch	10	Private
Flatwoods	Cypress Lateral Ditch	10	Private
Flatwoods	Cypress Lateral Ditch	75	Private
Flatwoods	Otter Slough CA	20	MDC
Mesic Bottomland Forest	Peppermint Creek	40	USCOE
Mesic Bottomland Forest	Mud Creek NA	157	USFS
Mesic Bottomland Forest	Willow-Oak RNA	40	USFWS
Oxbows and Sloughs	Otter Slough NA	5	MDC
Shrub Swamp	Otter Slough NA	10	MDC
Shrub Swamp	Mingo NWR	520	USFWS
Shrub Swamp	Ben Cash Memorial CA	10	MDC
Swamp	Bradyville NA	4	MDC
Swamp	Indian Hill Island	40	Private
Swamp	Otter Slough NA	275	MDC
Swamp	Otter Slough NA	5	MDC
Swamp	Ben Cash Memorial CA	83	MDC
Wet Bottomland Forest	Ben Cash Memorial CA	107	MDC
Wet Bottomland Forest	Mingo NWR	180	USFWS
Wet Bottomland Forest	Elm-Ash-Maple RNA	72	USFWS
Wet-Mesic Bottomland Forest	Bradyville NA	135	MDC
Wet-Mesic Bottomland Forest	Mingo NWR	60	Private
Wet-Mesic Bottomland Forest	Cherrybark RNA	60	USFWS
Wet-Mesic Bottomland Forest	Ben Cash Memorial CA	63	MDC
Wet-Mesic Bottomland Forest	Mingo NWR	---	USFWS
Wet-Mesic Bottomland Forest	Mud Creek NA	157	USFS

* NA= natural area, CA=conservation area, NWR=national wildlife refuge, RNA=research natural area; USFS=U.S. Forest Service, USCOE=U.S. Army Corps of Engineers, MDC=Missouri Department of Conservation, USFWS=U.S. Fish and Wildlife Service

Table 6. Natural areas located in the St. Francis River basin.

Natural Area	County	Size (Acres)	Ownership*
Beech Springs	Stoddard	35	MDC
Bradyville	Stoddard	139	MDC
Buck Mountain	St. Francois	120	MDC
Cash Swamp	Dunklin	310	MDC
Holly Ridge	Stoddard	84	MDC
Mud Creek	Butler	1038	USFS
Mudlick Mountain	Wayne	1370	MDNR
Otter Slough	Stoddard	20	MDC
Royal Gorge	Iron	80	MDC
St. Francis River	Madison	1.2 stream miles	MDC

* USFS= U.S. Forest Service, MDC=Missouri Department of Conservation, MDNR=Missouri Department of Natural Resources