# *WATER QUALITY AND USE*

## BENEFICIAL USE ATTAINMENT

Missouri Department of Natural Resources (MDNR) evaluates water quality to insure that state waters can support designated uses including, but not limited to, fishing, swimming, public water supply, and agriculture (MDNR 1986b). Most of the basin, including the entire St. Francis River and Wappapello Lake are classified as full use attainment (MDNR 1986b). Parts of Wolf, Goose, Saline, Shays, Village, Mill, and Big creeks are listed as partial use attainment, meaning that there are some water quality problems (MDNR 1986b). Village and Mill creeks contain one-mile sections where uses are not met and serious water problems exist. Eroding lead mine tailings caused several habitat degradation (MDNR 1986b).

The mainstem of the St. Francis River, Big Creek, Little St. Francis River, and Wappapello Lake are classified for whole-body contact recreation (MDNR 1986a). The Little St. Francis River, above Saline Creek, (Fredericktown City Lake) is a designated drinking water supply (MDNR 1986a and Vandike 1995). Shepherd Mountain Lake, on an un-named tributary to Stouts Creek, is a designated drinking water supply for the communities of Ironton and Arcadia (MDNR 1986a and Vandike 1995).

In the lower subbasin, the lower St. Francis River is also classified for whole-body contact recreation (MDNR 1986a). Water quality is generally suitable for aquatic biota; however, the diversity and densities of biota have suffered because of habitat degradation due to channelization, sedimentation, turbidity, and occasional low dissolved oxygen concentrations (MDNR 1984). No surface water source is classified as a public drinking water supply.

## WATER USE

Two permitted water supply surface withdrawls exist in the upper subbasin. Fredericktown removes water (425,000 gallons per day) from Fredericktown City Lake and Ironton and Arcadia remove 290,000 gallons per day from Shepherd Mountain Lake.

Irrigation is a major use of groundwater in the Bootheel. More than 500,000,000 gallons were used for irrigation in 1984 in each of Stoddard and Dunklin counties (MDNR 1986a). Most of this water probably comes from shallow wells. MDNR (1986a) indicates that no irrigation occurs in the upper subbasin.

The entire basin provides some significant recreational opportunities. A 1977 statewide stream angling survey estimated 88,500 annual fishing trips, which ranked the basin 15th in angling pressure out of 38 basins surveyed (Hanson 1980). In 1981, a statewide recreational value survey ranked the basin 13th (out of 38) in total recreational worth (Bachant et. al., 1982). Intense agriculture, poor land use, and channel modifications were cited as the primary problems that lowered recreational worth in the recreational value survey. These types of problems are inherent to the lower subbasin and are not typically associated with the upper subbasin. In fact, much of

the upper river is included on the Interior Department's Nationwide Rivers Inventory, and a 17-mile segment is classified and managed as a heavily used "scenic waterway" in the Mark Twain National Forest (MTNF) Land and Resource Plan (Forest Plan).

Whitewater canoeing and kayaking are popular activities between Highways 72 and D on the mainstem in Madison County. The majority of activity occurs during the spring. Several sections are rated as class V rapids when the water levels are high.

## WATER QUALITY

Good water quality is generally shared throughout both subbasins and Wappapello Lake. No wide-spread chronic or persistent problems that affect aquatic communities are evident. Wappapello Lake is slightly eutrophic; low dissolved oxygen concentrations normally develop in the hypolimnion during summer stratification. During the summer, high water temperatures can occur in the lower river throughout a 20-mile reach between the mouth of Mingo Ditch and the Wilhelmina Cutoff. This occurs because the channelized reach is wide and shallow with poor riparian vegetation that limits shading.

Some detailed water quality information is collected at select USGS surface-water gage stations or at special water-quality monitoring sites. The water quality data can include sediment, chemical, or microbiological parameters. Gage records are available through annual USGS Water Resource Data water-year reports, or the USGS computerized data retrieval system, WATSTOR. The St. Francis River basin has two active and three inactive water-quality gage sites:

> Active gage No. 07037300; Big Creek at Sam A. Baker State Park; 1992 to present; microbiological and chemical (including heavy metals, chlorinated hydrocarbons, organophosphates); low frequency, continuing record.
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> Active gage No. 07036100; St. Francis River at Saco; 1988 to present; mean daily suspended sediments; continuous record.
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> Inactive gage No. 07036940; Big Creek at Chloride; 1969 to 1975 and 1983 to 1990; chemical (including heavy metals); low frequency, continuing record.
>
> Inactive gage No. 07036100; St. Francis River at Saco; 1983 to 1989; microbiological and chemical (including heavy metals); low frequency, continuing record.
>
> Inactive gage No. 07040100; St. Francis River at St. Francis, Arkansas; 1969 to 1975; chemical; low frequency, continuing record.

Another source of detailed water quality information is the USCOE limnological data currently being monitored at two sites in Wappapello Lake, two sites on the St. Francis River above the lake, and one site below the dam. The data includes sediment, chemical (including heavy metals, chlorinated hydrocarbons, organophosphates), and microbiological parameters, collected since

1983 at six-week intervals, March through November. The water quality data base is accessible through the Environmental Quality Section, St. Louis District, USCOE.

Section 303(d) of the Federal Clean Water Act requires states to list waters not expected to meet established state water quality standards (MDNR 1998). The Farmington West waste water treatment plant degrades approximately 1.5 miles of the upper St. Francis River. In this section, both biological oxygen demand (BOD) and ammonia standards are not met. Big Otter Creek, a tributary to Big Creek, has been affected by releases of heavy metals by the Doe Run Lead Smelter. Village Creek receives excessive sediment from Mine La Motte. Sawdust pile leachate and an unknown source decrease the pH at two locations on Trace Creek near Saco.

## NONPOINT SOURCE POLLUTION (UPPER SUBBASIN)

The basin has some of the lowest erosion potential in the state, which results in particularly low sediment yields, bed loads, and turbidities. The annual erosion rate for all land types in the upper basin totals only 2.9 tons/acre. Sheet erosion on tilled land is the most serious threat, at a moderate 13-18 tons/acre. Gully erosion and sheet erosion on permanent pasture and non-grazed forest is considered slight. Sediment yield to streams, typically low in the Ozark region, is extremely low at only 0.6 tons/acre/year (Anderson 1980).

## NONPOINT SOURCE POLLUTION (LOWER SUBBASIN)

Nonpoint sources are much more likely to impact water quality than point sources in the lower subbasin. The primary sources are nutrient and pesticide loading from agricultural runoff (90% of the subbasin is cropland and pasture). Nutrients entering the mainstem cause few water quality problems because of buffering and dilution. Enrichment in many of the smaller tributary ditches, however, can cause extreme turbidities, excessive growth of aquatic plants, and low dissolved oxygen concentrations, which can cause localized fish kills during summer low flow periods (MDNR 1984). Pesticide residues are present in surface and shallow groundwater supplies throughout the subbasin. Two percent of 124 wells in the alluvial aquifer exceeded drinking water standards for pesticides (atrazine, alachlor, or metolachlor) and Nitrate-N levels were exceeded in 17 percent of the wells (MDNR 1984).

The rates of soil erosion in the lower subbasin are similar to the low rates in the upper subbasin, even through most of the watersheds have been cleared for intensive row crop production. The Natural Resource Conservation Service estimated sheet erosion at 2.5 to five tons/acre/year and gully erosion at 0 to 0.16 tons/acre/year which are both considered slight to moderate (MDNR 1984). Nearly flat topography contributes to low sheet erosion. However, despite low stream gradients (≈1 ft/mi), headcutting and rill and gully erosion are substantial problems upstream from the channelized sections. An extensive depositional area of sand and silt is located on a reach of the mainstem channel immediately downstream from the Wilhelmina Cutoff at RM 259.2. In this area, the river changes from a channelized reach (26 miles were cut off) to a natural meandering channel. The gradient decreases at this point, which causes the deposition. Another depositional area is downstream of the Highway 84/90 bridge, west of Kennett, Missouri.

## POINT SOURCE POLLUTION (UPPER SUBBASIN)

From about 1720 until 1947, lead, copper, nickel and cobalt ores were mined from several locations near Fredericktown (MDNR 1984). This mining activity has periodically affected water quality by contaminating localized surface water, groundwater, channel substrates, and vegetation with heavy metals and other harmful mine, mill, or smelter byproducts (MDNR 1986a). The primary pollutants, which can often exceed State Water Quality Standards, are lead, zinc, iron, nickel, copper, cobalt, cadmium, chromium, airborne sulfur dioxide, and acid water. Village Creek, Mill Creek, and Toler Branch suffered from sedimentation from mine tailings. Goose and Saline creeks contained elevated levels of cobalt and nickel from artesian flow from the Madison Mine.

The Annapolis Lead Mine on Big Creek, the Pilot Knob Pellet Company on Brewers Creek, the Iron Mountain Mine on Indian Creek, and the Catherine Lead Mine on Logtown Branch all have tailing ponds or chat piles. Although safely contained at the present time, they have the potential to release toxic trace-elements into receiving streams.

Another threat of heavy metal trace-element contamination is the ASARCO lead smelter near Glover, Missouri. Smelter runoff entering nearby Big Creek once violated zinc and cadmium standards (MDNR 1984), and smelter smoke stack emissions, containing high concentrations of sulfur dioxide, can have negative impacts on downwind plant and animal communities. In the late 1980s, a water treatment facility was constructed that was successful in meeting state standards for zinc and cadmium (MDNR 1984). However, a health advisory was issued in 1999 by the Missouri Department of Health for Big Creek near Glover. Centrarchids were the only fish analyzed and found to be contaminated with lead. Subsequently, additional samples of centrarchids and catostomids were tested for contaminants. Although they did not exceed the action level of 300 ppb for lead, the advisory was continued in 2000 because of the previous results.

In June 1992, a breached tailings barrier at International Specialty Products spilled 1,500 cubic yards of non-toxic powdered rhyolite rock into Big Creek near Annapolis, Missouri. The spill deposited fine sediments, two feet deep, for a distance of one mile and temporarily caused extreme turbidities for 15 miles. No fish were killed, but macroinvertebrate communities did not fully recover until most of the sediment had been flushed out of the system by early 1994.

Municipal waste discharges, throughout this sparsely populated subbasin, are mostly small, adequately designed, and pose few serious threats to the water quality of receiving streams. Eight National Pollution Discharge Elimination System (NPDES) permitted wastewater discharges are located in the upper subbasin (Table 1). Upgraded facilities and improved operation and maintenance of the municipal sewage systems have reduced the frequency of untreated effluent releases, which most often resulted in only minor aesthetic impacts on six miles of permanent streams (MDNR 1984). Filamentous algal blooms often occur during the summer in the mainstem below Farmington, which indicates nutrient enrichment and the potential for periods of low dissolved oxygen. The planned upgrade in the Farmington Treatment Plant should alleviate this problem.

Point sources for non-municipal discharges are limited to 74 NPDES permits (unpublished data from MDNR 2001). The lagoons (associated with subdivisions, camp grounds, schools, hospitals) have no record of causing pollution problems, and are generally situated on first order dry-channel tributaries.

## POINT SOURCE POLLUTION (LOWER SUBBASIN)

Most point source discharges are restricted to a few watersheds in the northern portion of the subbasin. Eight NPDES permitted wastewater discharges are located in the lower subbasin (Table 2). In the southern reaches, mainstem levees constrict the width of the floodplain and increase flood stages, which greatly limits suitable space for municipal or industrial development. The total volume of municipal waste discharge is linked to the sewage lagoons in the small northern communities of Dexter, Bloomfield, and Dudley, which eventually drain into the Dudley Main Ditch tributary network. The lagoons in the northern community of Puxico drain into the Mingo Ditch network through Turkey Creek. Cardwell is the only southern community in the subbasin, and its three-cell system drains into Kinnemore Slough, which eventually enters the St. Francis River in the state of Arkansas. Lagoon effluent has never severely impacted water quality in any of the receiving streams, primarily because rapid soil infiltration and groundwater dilution rates limit effluent duration. The MDNR (1984), however, has suggested that the Puxico and Bloomfield facilities be eventually upgraded to three-cell systems.

Point sources for non-municipal discharges are limited to 62 NPDES permits (unpublished data from MDNR 2001). No complaints have been reported for these facilities.

Intensive poultry operations have increased in recent years. At present, 18 intensive poultry farms, all operating in Stoddard County, have the potential to cause water quality problems without proper waste control.

**Table 1. NPDES permitted wastewater discharges in the upper St. Francis River subbasin (unpublished data from MDNR 2001).**

| Facility Name | Receiving Stream | Location T-R-S | County |
|---|---|---|---|
| Annapolis STP | Big Creek | T31 R3E S22 | Iron |
| Acradia E Lagoon | Tributary to Stouts Creek | T33 R4E S5 | Iron |
| Arcadia W WWTF | Stouts Creek | T33 R4E S5 | Iron |
| Farmington E WWTP | Kennedy Branch/ Wolf Creek | T36 R6E S32 | St. Francois |
| Farmington W WWTF | Tributary to St. Francis River | T35 R5E S11 | St. Francois |
| Fredericktown WWTF | Saline Creek | T33 R7E S8 | Madison |
| Greenville WWTF | Tributary to St. Francis River | T28 R5E S1 | Wayne |
| Ironton WWTF | Stouts Creek | T34 R4E S32 | Iron |

**Table 2 NPDES permitted wastewater discharges in the lower St. Francis River subbasin (unpublished data from MDNR 2001).**

| Facility Name | Receiving Stream | Location T-R-S | County |
|---|---|---|---|
| Arbyrd WWTF | Tributary to Honey Cypress Ditch | T16 R8E S5 | Dunklin |
| Bloomfield Lagoon | Lick Creek | T26 R10E S14 | Stoddard |
| Cardwell WWTF | Tributary to Kennemore Slough | T16 R7E S2 | Dunklin |
| Dexter W Lagoon | Dudley Main Ditch | T25 R10E S20 | Stoddard |
| Dudley WWTF | Lick Creek Ditch | T25 R9E S28 | Stoddard |
| Puxico WWTF | Turkey Creek | T27 R8E S35 | Stoddard |
| Stoddard Co. PWSD #1 | Dudley Main Ditch | T25 R10E S29 | Stoddard |
| Stoddard Co. PWSD #5 | Tributary to Lick Creek Ditch | T26 R10E S12 | Stoddard |