WATER QUALITY

Beneficial Use Attainment

There are no serious water quality problems in the Headwater Diversion Basin (MDNR, 1986a). In fact, full beneficial use attainment can be expected from about 571 miles (80%) of the total 715 miles of permanent streams in the basin (MDNR, 1986b). Water quality is suitable for fish, wildlife and livestock use. The Diversion Channel is the only designated drinking water supply (unused to date); however, all surface water in the basin will meet water supply standards after disinfection and removal of suspended solids. Whole-body contact recreation is a designated use in the Diversion Channel, Castor River, Whitewater River and Little Whitewater Creek.

The basin ranked last (38th out of 38) in a 1981 statewide survey of basin recreational values (Bachant, 1982). However, the basin ranked 21st (58,154 angling trips) in a 1977 statewide angling pressure survey (Hanson, 1980). Channel modification, poor land use and intensive agriculture were cited as the primary problems that lowered recreational worth in the recreational value survey. Actually, less than 5 percent of the basin's permanent stream mileage is channelized and most of the intensive rowcrop acreage is concentrated in 20 percent of the basin that is associated with drainage district floodways and water detention systems. Perhaps the recreational value survey reflects more on the perceived low value of the 34 miles of artificial Diversion Channel and not necessarily on the value of the entire basin (more than 250 floatable miles) where channelization is certainly not a negative factor.

Water Quality

Favorable hydrological and geological conditions (adequate precipitation, good infiltration, high subsurface storage capacity, minimal surface runoff) throughout the basin produce well-sustained base and subsurface flows that have no significant water quality problems (MDNR, 1984). Potential problems with aquatic communities exposed to low dissolved oxygen concentrations and wide temperature fluctuations during summer low flow or drought periods are typically neutralized by adequate base flow discharges. Acute water quality problems, which might involve low dissolved oxygen or high ammonia levels, tend to occur only in conjunction with an incidence of nutrient loading pollution.

The USGS does not maintain water quality records at the Zalma gage station. Deep and shallow well province records indicate that high quality surface and subsurface water is typically hard and well buffered, 300 to 500 mg/l calcium-magnesium-bicarbonate total hardness (MDNR, 1986a). In 1991, the Long Term Resource Monitoring (LTRM) facility at Cape Girardeau, Missouri established a chemical sampling station at RM 0.6 on the Diversion Channel to monitor possible trend relationships between land use and water quality. The LTRM sampling regime includes weekly chemical measurements of surface and bottom parameters plus selected mid-water measurements during periods of stratification. Data for the following variables are currently being recorded and are on file at the LTRM headquarters are:

Secchi	**Total phosphorus**	**Silica**
Temperature	**Soluble reactive phosphorus**	**Ammonium**
Dissolved Oxygen	**Total soluble phosphorus**	**Chloride**
Conductivity	**Total nitrogen**	**Dissolved calcium**
Ph	**Total soluble nitrogen**	**Dissolved manganese**
Velocity	**Nitrate/nitrite**	**Dissolved potassium**
Turbidity	**Chlorophyll a**	**Dissolved iron**
Suspended solids	**Phacophyton**	**Organic matter**

Fish Kills and Contaminants

No particular stream reaches in the basin have been identified that frequently suffer chronic benthos or fish kills. Only six fish kills have been reported since 1980. Five incidents involved partial fish kills from storm related discharges of livestock waste into small tributary streams. In 1990, a golf course application of a fungicide (chlorthalonil) was responsible for a total fish kill on 2.2 miles of Goose Creek, a small tributary to Randol Creek.

No recent attempts have been made by government agencies to collect fish tissue samples for contaminant analyses. Therefore, no basin health advisories have been issued. However, some Mississippi River fish populations (particularly catfishes, carp and long-fin suckers) are apparently attracted into the Diversion Channel backwater, especially during flood periods. It is not known what portion of the fish community in the Diversion Channel is resident or transient. Perhaps future health advisories issued for the adjacent Mississippi River should also consider including the Diversion Channel.

Water Use

There are few surface water withdrawals in the basin. All municipal, domestic industrial, and most agricultural water needs are supplied by wells which can collectively pump a maximum volume of 15.5 million gallons/day (MDNR, 1986a).

Point Source Pollution

Point source pollution is no longer considered a problem in the Headwater Diversion Basin (Figure ps). There are no mining or stream-threatening industrial discharges. The potential for point source discharge is associated with the municipal sewage treatment facilities at Jackson, Marble Hill and Scott City, on

Hubble, Crooked and Ramsey creeks, respectively. Upgraded facilities and the improved operation and maintenance of these municipal systems (lagoons and trickling filters designed for a total of 20,000 human population equivalents) have reduced the impacts and occurrence of untreated effluent releases. Raw sewage bypasses are expected to produce minor aesthetic stream impacts instead of major fish kills that once affected about four miles of permanent and intermittent streams (MDNR, 1984).

The low potential for non-municipal point source discharge is limited to 21 NPDES (National Pollution Discharge Elimination System) low flow lagoons (*eg.*subdivisions, schools, nursing homes). The lagoons, which have no record of causing pollution problems, are generally situated on small, dry-channel tributaries. Total design capacity is 2,863 Human Population Equivalents (PE).

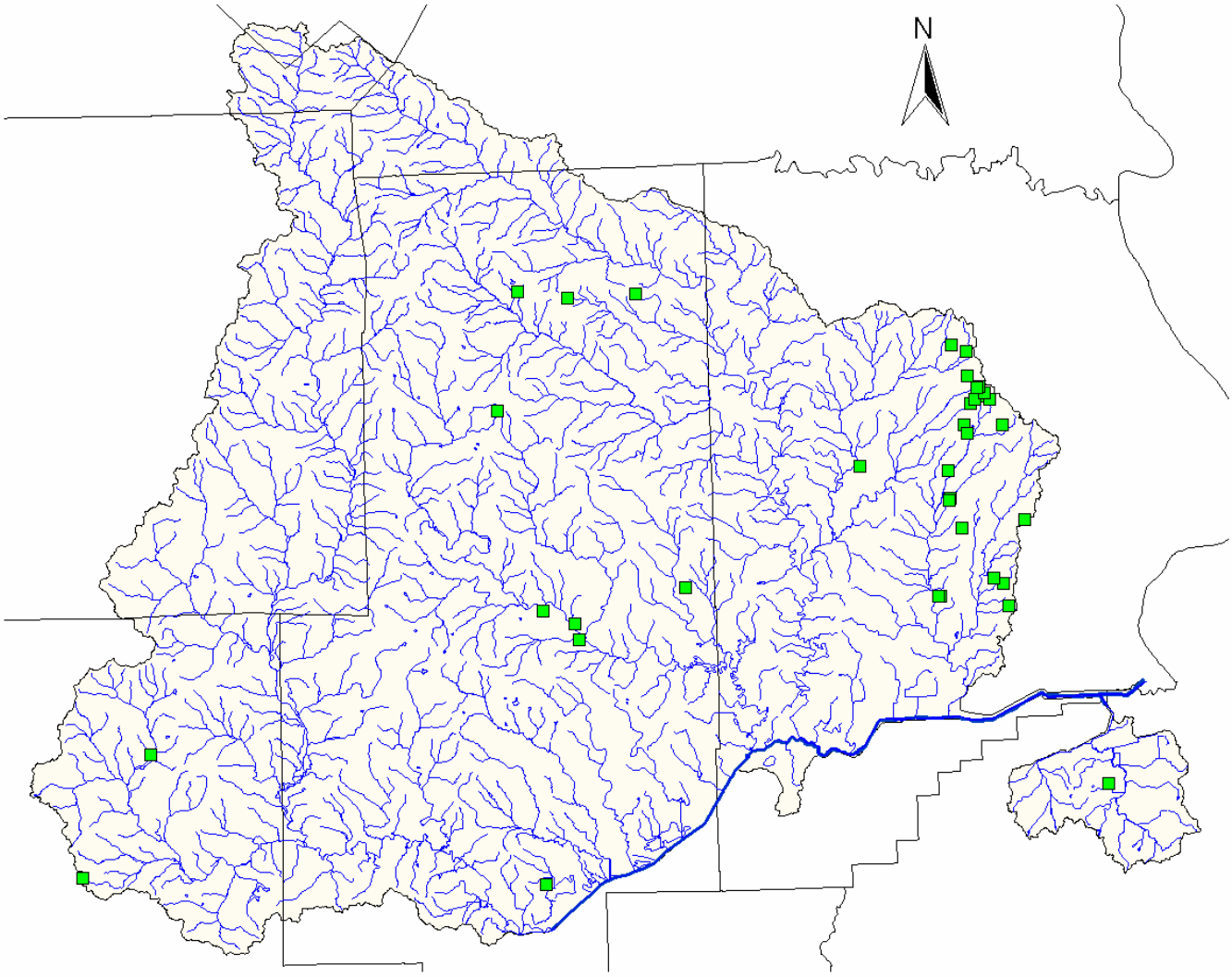
Prior to 1990, Biokyowa Industries of Cape Girardeau pumped industrial wastes directly into the Diversion Channel at RM 4.5. The unsightly effluent, a harmless purple lignin stain (MDNR, Personal Communications), generated numerous pollution complaints from private citizens. However, no fish kills occurred and MDNR NPDES Permit stipulations were never violated. In order to reduce complaints and improve public relations, Biokyowa installed a pipeline and since 1990 has discharged all plant effluents directly into the Mississippi River.

Nonpoint Source Pollution

The basin has no chronic or significant basin-wide problems related to nonpoint source pollution (MDNR, 1984). Sedimentation from erosion in disturbed watersheds and nutrient enrichment from livestock waste can contribute to some moderate, localized concerns.

Severe gully erosion (0.8 tons/acre) can create local shifting gravel bedloads, particularly in the upper watersheds. The gravel can fill pool habitats, change channel alignment or alter channel hydraulics, which can result in reduced habitat diversity and bank instability. Sheet erosion (up to 30 tons/acre) can produce fine sediment deposits that can impact local benthos communities. Inorganic turbidity, which occurs only for short periods during storm events, is definitely not a problem. Except for 34 miles of artificial Diversion Channel, channelization is uncommon and of little water quality concern.

Runoff from livestock waste (1,101,000 PE) probably constitutes the largest potential nonpoint source pollution threat in the basin. Organic loading from pasture grazing and stream watering livestock is not considered as much of a pollution threat as runoff from confined feedlot operations and no-discharge waste lagoons. Approximately 60 lagoon facilities in the basin can generate about 52,700 PE of livestock waste (MDNR, 1984). Occasional lagoon breaches have caused fish kills. The chip mill industry represents another nonpoint source pollution threat, as part of two chip mill source areas are located within Castor River watershed. The environmental impact of forest product industries in Missouri depends on whether best management practices (BMP's) are used during harvest and total volume of wood harvested. Potential impacts from improper lumbering practices includes sedimentation, soil compaction, degradation of aquatic species, and water contamination.



5 0 5 10 15 Miles

Legend

- Point Source Pollution
- Streams
- Headwater River
- Counties
- Headwater Basin

Figure ps. Point source pollution sites in the Headwater Diversion Basin, in Missouri