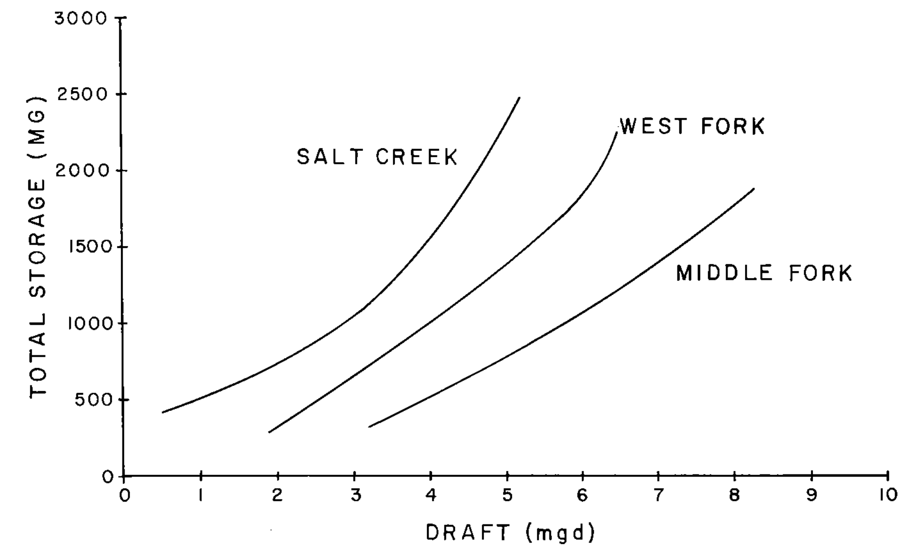

Figure 35. Draft — storage curves for significant sites

Batesville presently obtains its water supply from nearby reservoirs and therefore has facilities for the treatment of surface water. The **Salt Creek** site (see fig. 33, site 13, Qave = 24.4 mgd, DA = 34.4 sq. mi.) was chosen because the drainage area, excluding the drainage area of Lake Santee, is relatively large and is reasonably close to Batesville. The considered dam site is approximately 1.5 miles from the channel of Little Laughery Creek, which flows south past Batesville. To treat the water from Salt Creek, the water would have to be pumped from the reservoir over the Whitewater Basin divide and into Little Laughery Creek where it would then flow about 3 or 4 miles to Batesville. The water would have to be lifted approximately 165 feet from the reservoir to the basin divide.

Because there was no gaging station on Salt Creek, monthly discharges from Laughery Creek near Farmers Retreat were used in the YIELD program. Laughery Creek was selected because of its hydrologic similarity with Salt Creek. Unfortunately, the period of record for the Laughery Creek station was only 32 climatic years. Therefore, the storage capacities were adjusted to correspond to a dependability of 98 percent by using stream-flow data from a nearby station with a longer period of record.

Table 28. Draft-storage: West Fork of the East Fork Whitewater River

Draft		Storage	
cfs	mgd	ac-ft	mg
3	1.9	904	295
5	3.2	2163	705
7	4.5	3713	1210
9	5.8	5265	1715
10	6.5	6944	2262

Table 29 presents the draft-storage values for the Salt Creek dam site. The storage set aside for sedimentation was 1000 acre-feet (326 million gallons) and an evaporation rate of 3.13 feet per year was used. The sedimentation rate used was taken from a report on Brookville Lake (U.S. Army Corps of Engineers, 1978). The dead storage was rounded to 326 mg (1000 acre-feet).

Batesville has an existing water supply capacity of about 2.0 mgd. Although the projected demand for the year 2000 is only 1.5 mgd, the Salt Creek site could provide an additional supply for both Batesville and the surrounding area.

Fig. 36 shows the draft-storage curves for all three sites in non-dimensional form. These curves were developed by dividing active storage and drafts by the mean annual discharge (average discharge) for each site.

The curves for Middle Fork Reservoir and the West Fork site coincide because the inflows were derived

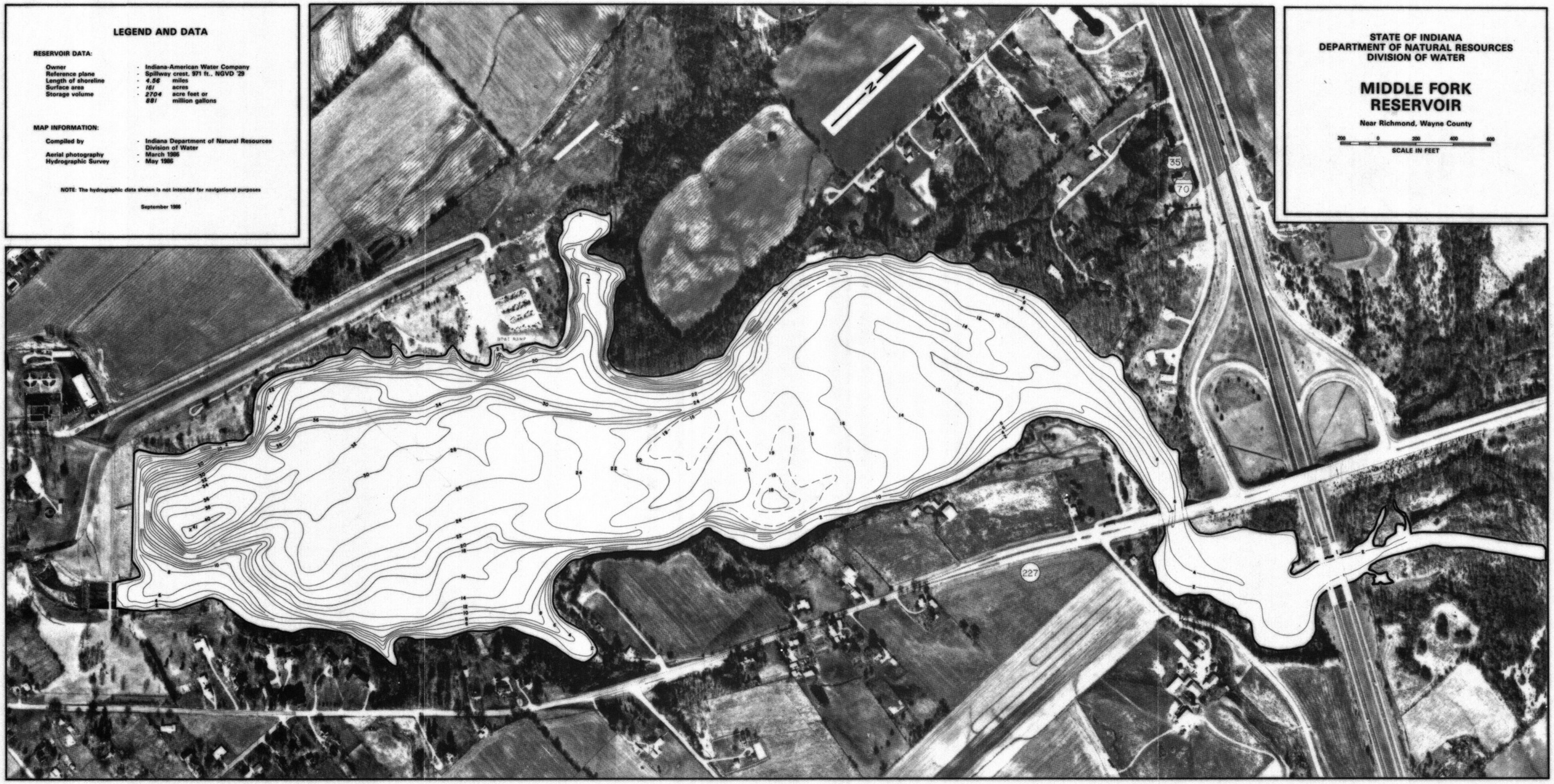

Figure 34. Depth contours of Middle Fork Reservoir

Table 29. Draft-storage: Salt Creek

Draft		Storage	
cfs	mgd	ac-ft	mg
1	0.7	1310	427
3	1.9	2179	710
5	3.2	3456	1126
6	3.9	4565	1487
7	4.5	5939	1935
8	5.2	7590	2473

from the same station. The Salt Creek site curve is above the other curve, indicating that the Salt Creek site requires more storage per average flow than the other two sites. Tributaries in the southern part of the basin have more variable flow than northern tributaries or the major northern rivers because of geologic and topographic differences.

The draft-storage curve for an ungaged site may be determined from a non-dimensional draft-storage curve of a hydrologically similar basin by multiplying selected pairs of values from the non-dimensional curve by the average discharge for the ungaged site.

The U.S. Army Corps of Engineers is responsible for the maintenance and operation of the **Brookville Lake** dam (site 25, Qave = 256 mgd, DA = 380 sq. mi.). The Corps has a computer model to simulate the operation of the reservoir. Using this computer model, the Corps has determined that Brookville Lake has a water supply capability of 90.5 mgd (140 cfs). This value is in addition to any required downstream releases. Again, this water supply capability corresponds to a dependability level of 98 percent (that is, no deficits allowed within a 50-year period of operation).

The Indiana Department of Natural Resources presently administers only one contract which involves the sale of water from Brookville Lake. This contract with the Franklin County Water Association is unique in that the water purchased is not withdrawn directly from the reservoir but rather from two wells located on the Fairfield causeway.

The wells are approximately 135 feet deep and utilize an outwash aquifer system which is artificially recharged by the reservoir. This situation results in a higher productive capacity for the system than would normally be anticipated. The contractual arrangement

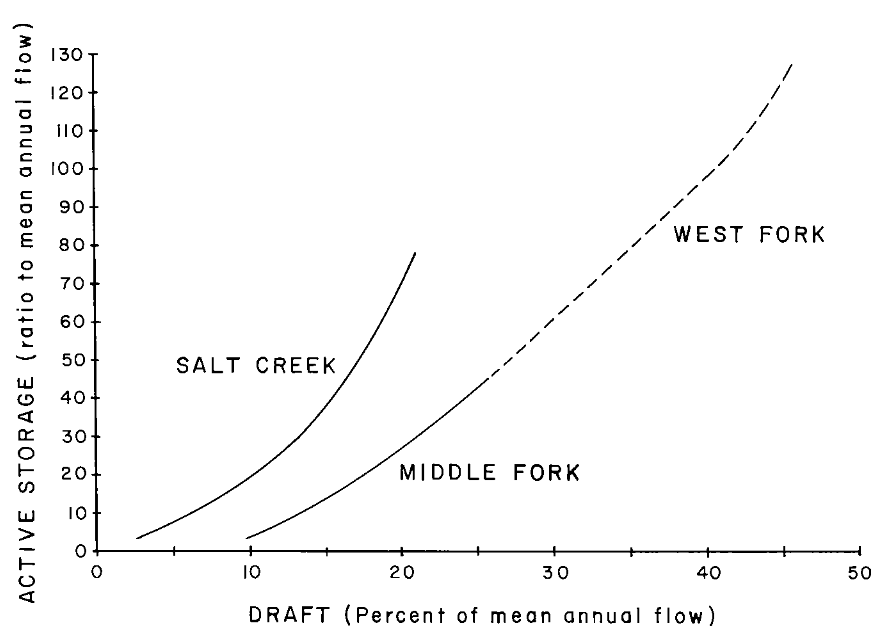

Figure 36. Non-dimensional draft — storage curves

was made based on the assumption that the wells can meet future water supply needs because of the reservoir's existence and the associated recharge of the underlying aquifer system by reservoir water.

Because the Division of Water's registration system for water withdrawal facilities only considers the type of withdrawal, water use by the Franklin County Water Association is registered and reported as a ground-water use. According to annual reports, the utility withdrew an average of 0.3 mgd in 1985 and 1986. The utility currently is allowed to purchase up to an annual average of 0.5 mgd.

In addition to the two Franklin County Water Association wells, four other public supply wells owned by the IDNR are located on or near the Fairfield and Dunlapsville causeways. Because no direct surface-water withdrawals are made for these public supply uses or other registered uses, Brookville Lake remains a largely underutilized source of water supply.

Streams

The dependability of a stream is the degree to which stream flow is sustained by base flow during dry periods. One measure of dependability is the 1-day, 30-year low flow (1Q30), because it is base flow and because the 30-year return interval represents a moderately dry period.

In order to compare stream-flow dependability throughout the Whitewater Basin, the 1Q30 per square mile of drainage area was computed for each of the stream gages in the basin. As can be seen from table 30, the 1Q30 per square mile of drainage area varies from gage to gage. This variation is due to the variation of base-flow rates along the length of each stream in the basin.

In general, the 1Q30 per square mile decreases going downstream on the Whitewater River and its east fork. The 1Q30 per square mile of the Whitewater River at Hagerstown, Alpine, and Brookville is 0.092, 0.067, and 0.055 cfs/sq. mi., respectively (table 30). The 1Q30 flow of the East Fork Whitewater River at Richmond (0.013 cfs/sq. mi.) is low because of flow regulation at Middle Fork Reservoir.

The 1Q30 per square mile flows of the major and minor tributaries are smaller than those of the main channels. Also, the 1Q30 per square mile flow is smaller the farther south the tributary enters one of the main channels. These differences are due to differences in hydrogeology throughout the basin. There is less outwash in the valleys of the minor tributaries. Also, these tributaries have developed on till or on bedrock in the southern part of the basin.

Stream flow is also more variable in the tributaries than in the main channels and even more variable in tributaries in the southern part of the basin. Streams which have much variability in their daily discharges have less sustained flow during dry periods and are less dependable.

Streams which have 7-day, 10-year low flows (7Q10) and 1Q30 low flows equal to zero are not dependable sources of water supply. The dashed line in fig. 33 was taken from Arihood and Glatfelter (1986). South of this line, 7Q10 and 1Q30 low flows are expected to be zero. However, as can be seen in table 30, there are also streams north of this line which have 7Q10 and 1Q30 equal to zero.

Because of the poorly sustained stream flow in the southern part of the basin, dependable sources of surface-water supply would have to come from reservoirs on tributaries or from the Whitewater River. The Whitewater River has previously been considered as a source of water supply in another study (Indiana Department of Natural Resources, 1983).

Wastewater Treatment Facilities

A wastewater treatment facility uses stream flow to dilute its effluent. The level of treatment that must be provided in order for the receiving stream to meet water quality standards downstream of the facility is determined in part by the magnitude of the 7-day, 10-year design flow at the point of wastewater discharge. Therefore, the 7Q10 represents an instream flow need for wastewater treatment facilities.

The wastewater treatment facilities are presented in table 31 (see fig. 33) along with the stream-flow parameters of the receiving streams. Significant withdrawals from streams above a wastewater plant could threaten stream quality below the plant if withdrawals are large during periods of low stream flow.

Presently, there are very few significant surface-water withdrawals in the basin. It is important, however, to monitor new withdrawals upstream of wastewater plants to determine potential effects on stream flow at the plant.

GROUND-WATER AVAILABILITY

Ground water in the Whitewater River Basin is available from unconsolidated materials and from bedrock. Water-bearing unconsolidated deposits are

Table 30. Surface-water availability based on stream-flow characteristics

Site[1]	Station number[2]	Station name	Total Drainage area (sq mi)	1-day, 30-year low flow			7-day, 10-year low flow		Average flow	
				cfs[3]	mgd	cfs/sq mi	cfs[3]	mgd	cfs[3]	mgd
1	03-274650	Whitewater River near Economy	10.4	0.30	1.90	0.029	0.36	0.23	10.8	7.0
3	03-274750	Whitewater River near Hagerstown	58.7	5.4	3.50	0.092	7.11	4.59	68.0	43.9
5	03-274800 L	Martindale Creek near Cambridge City	58.1	0.66[4]	0.43	0.011	1.20[5]	0.78	66.5[4]	43.0
7	03-274900 L	Greens Fork at Greens Fork	66.7	0.91[4]	0.59	0.014	1.60[5]	1.03	76.0[4]	49.1
10	03-274950	Little Williams Creek at Connersville	9.16	0.25	0.16	0.027	0.37	0.24	10.2	6.6
11	03-275000	Whitewater River near Alpine	522	35.0	22.6	0.067	45.5	29.4	552	357
15	03-275200 L	Salt Creek near Metamora	115	0.45[4]	0.29	0.004	0.90[5]	0.58	126[4]	81
18	03-275500	E.F. Whitewater River at Richmond	121	1.60[4]	1.03	0.013	4.20[5]	2.71	115	74
20	03-275576 L	Elkhorn Creek at Richmond	27.5	0[6]	0	0	0[5]	0	35.2[4]	22.8
21	03-275600	E.F. Whitewater River at Abington	200	13.7	8.9	0.069	18.9	12.2	229	148
22	03-275700 L	Silver Creek near Liberty	9.67	0[6]	0	0	0[5]	0	11.1[4]	7.2
24	03-275850 L	Hanna Creek near Roseburg	22.3	0.15[4]	0.10	0.007	0.30[5]	0.19	25.5[4]	16.5
26	03-276000	E.F. Whitewater River at Brookville	380	15.0[7]	9.7	0.040	20[7]	12.9	396	256
28	03-276500	Whitewater River at Brookville	1224	67.0[7]	43.3	0.055	89[7]	57.5	1273	823
29	03-276527 L	Big Cedar Creek at Cedar Grove	29.6	0[6]	0	0	0[5]	0	33.8[4]	21.8

[1]Site locations shown in figure 33.
[2]Low-flow partial-record station (L).
[3]From U.S. Geological Survey data through climatic year 1984 except as noted.
[4]Estimated with regression equation.
[5]From Stewart (1983); data through climatic year 1978.
[6]Assumed to be zero because 7-day, 10-year low flow is zero.
[7]Prior to construction of Brookville Lake.