

## THE STUDY AREA

### A. General Description

The Betsie River is located in Grand Traverse, Benzie and Manistee counties. The stream originates at Green Lake near the village of Interlochen and flows in a westerly direction to its outlet into Betsie Lake and Lake Michigan near Elberta and Frankfort. A large part of the river lies within the boundaries of the Fife Lake and Betsie River State Forests and flows through the Betsie River State Game Area near its mouth. The Betsie River drains a surface area of approximately 165,800 acres and includes about 93 linear miles of streams, 52 miles of which is mainstream.

Betsie Lake, located at Frankfort and at the entrance to Lake Michigan, provides important harbor facilities for the surrounding area. The harbor is used by automobile and railroad ferries as well as other commercial traffic and sport fishing craft.

The watershed and the three counties surrounding it comprise one of the most popular tourist centers in Northern Michigan. Combined annual tourist spending in Benzie, Grand Traverse and Manistee counties is estimated to be over \$8 million. Convenient access to water related activities is a major attraction. Tourism has expanded greatly in recent years with the development of the salmon-lake trout sports fishery.

Lakes, streams and forests provide recreational opportunities for fishing, boating and hunting. Lands adjacent to the lakes and streams are being developed for summer home and resort areas. The Betsie River, because of its size, volume and location, attracts fishermen, canoeists and other recreationists.

Local people, landowners, local government and other agencies have shown an outstanding interest in conservation programs. Several years ago an association of local people known as the Betsie and Platte Watershed Association was formed to promote and carry out organized watershed management on a multiple use basis. The Betsie River and Benzie County Sportsmen Clubs also have been an active and interested group. The Benzie County Board of Commissioners, Township Boards of Supervisors, Soil Conservation Service, County Planning Agencies, Extension Service, and Keep Benzie Beautiful, Inc., individually petitioned the Department of Natural Resources to consider the Betsie River as a candidate for the Natural Rivers Program. These agencies, through resolutions, pledged to assist in the planning toward protecting the Betsie River under this program. These agencies as well as other interested person have been instrumental in formulating the Betsie River Natural River Plan.

### B. Physiography

The topography of the watershed is typical of the northwest lower peninsula of Michigan. Generally, the upper two-thirds of the watershed consists of gently rolling hills of low relief and sandy plains interspersed with islands of soils of heavier texture. In the lower third of the watershed the land becomes more hilly with ridges and high plateaus.

Elevation at the headwaters of the Betsie River (Green Lake) is 825 feet above sea level; the mouth at Lake Michigan is at an elevation of 580 feet.

### C. Stream Characteristics

The Betsie River system is made up of 93 linear miles of streams. The headwaters consist of small lateral streams, lakes and lake outlets. The Little Betsie River and Dair Creek are the only sizable tributaries and they empty into the mainstream in its middle reaches.

#### Summary of Streams (Linear Length in Miles)

Stream	Trout Water	Warm Water	Total	Average Width
Betsie River	31.9	19.8	51.7	60 feet
Crystal Lake Outlet		1.2	1.2	40 feet
Cold Creek	2.0		2.0	5 feet
Rice Creek	1.7		1.7	4 feet
Dair Creek	7.9		7.9	10 feet
Little Betsie River	12.1		12.1	12 feet
Lateral Streams	<u>2.6</u>	<u>14.2</u>	<u>16.8</u>	
<b>TOTALS</b>	<b>58.2</b>	<b>35.2</b>	<b>93.4</b>	

There are 12 lakes and seven impoundments connected to the Betsie River system. These vary in size from 9.710 acres to three acres. Impoundments located on the mainstream are the Grass Lake Wildlife Flooding owned by the Department of Natural Resources and Thompsonville Dam, an old power dam is privately owned. Homestead Dam, a power generating facility formerly owned by Consumers Power has since been sold to private interests. The dam and about 8 acres immediately around the dam were given to the Department of Natural Resources, but the land rights in the impoundment area were retained by private interests.

The Michigan Water Resources Commission has established intrastate water quality standards and use designation<sup>1</sup> for the Betsie River. It is to be protected for recreation - total body contact (i.e., swimming); intolerant fish - cold water species; industrial water supply; agricultural and commercial water supply and other uses. Where water is to be protected for more than one use under these standards, the most restrictive individual standard of designated water use

<sup>1</sup> Use Designation Areas for Michigan Intrastate Water Quality Standards, published by Michigan Water Resources Commission, Surface Water Quality, Department of Environmental Quality, March, 1969.

applies. Also, if existing water quality is superior to the designated use requirements, it must be maintained at that level until it has been adequately demonstrated to the Michigan Water Resources Commission that the change in quality does not or will not become injurious to the public health, safety, or welfare, or become injurious to any other uses being made of such waters.

Studies<sup>2</sup> conducted on the Betsie River by the Surface Water Quality staff, Department of Environmental Quality, indicate that the quality of the waters within the Betsie River basin meet or exceed all criteria established by the water quality standards for the designated uses of the river. There is no known municipal or industrial waste being discharged into the Betsie River. The villages of Thompsonville and Benzonia are on septic tank-drainfield systems and Beulah disposes of its waste by land disposal methods.

The Betsie River is a marginal trout stream suffering from excessive warm water temperatures during the summer months. The headwaters of the Betsie are classified as warm water due to the influence of several connecting lakes. Cooling tendencies from spring seepage commence at Worlds Bridge and continue downstream to Thompsonville Dam while it merges with the Little Betsie River. Increased temperatures below the dam change the classification to warm water for a few miles. From Red Bridge downstream to Homestead Impoundment the waters are classed as marginal trout. From Homestead Dam downstream to the mouth the river is warm water, however, it is classed as trout due to spring and fall rainbow runs and runs of salmon in the fall.

Stream flow in the Betsie River is fairly stable having an average summer flow of roughly 50 cubic feet per second below Grass Lake Flooding and 100 C.F.S. above Homestead Dam. Spring floods normally raise stage heights from two to four feet in the upper and lower reaches, respectively.

The Betsie River has a moderate stream gradient dropping 250 feet in elevation from its outlet at Green Lake to Lake Michigan. Although some stretches have a greater gradient, the average drop in elevation is five feet per mile. The river possesses a fairly productive stream bottom. Gravel and rubble are dominant bottom types from Worlds Bridge downstream to County Line Bridge. Local areas of shifting sand and silt are common in this stretch. The lower reaches down to Homestead Dam consist mainly of shifting sand. The lower river below Homestead Dam has a dominant bottom type of shifting sand, however, there are many areas of gravel and rubble bottom in the riffle areas.

The Betsie River and its tributaries possess fairly wide flood plains. Spring floods usually spread out onto the flood plain easing damage to the stream channel. Slightly entrenched stream channels are present in local areas of the Betsie and Little Betsie. Flood plain vegetation consists of a mixture of bottomland hardwoods, cedar, hemlock and shrubs.

<sup>2</sup> Water Quality of Selected Lakes and Streams in the Grand Traverse Bay Region, published by the Michigan Water Resources Commission, Surface Water Quality, Department of Environmental Quality, March, 1970.



#### D. Structures for Natural Resources Management

The Soil Conservation Service and Department of Natural Resources have jointly been working on a program of streambank stabilization for the Betsie River. Three hundred fifty structures (including rock riprap, logjams, logjam deflectors, stump covers and log sod covers) have been planned for a 24-mile stretch of the Betsie River. The area in which the work is being done starts at Black Bridge (approximately one mile below the Thompsonville Dam) and continues downstream to the Crystal Lake outlet. To date 230 of these bank stabilization structures have been completed.

In addition to the bank stabilization work, the Grass Lake Dam was installed by the Wildlife Division and created a 482-acre waterfowl flooding near the headwaters of the Betsie.

#### E. Soils

Soils in the watershed are generally light textured, mostly sands, acidic and with low to medium fertility. Soil associations in the upper two-thirds of the watershed are Kalkaska-Rubicon sands. These are dry, loose sands, but locally contain enough silt to produce light sandy loams. Some areas are quite gravelly. In the lower third of the watershed, soils are of the Wexford-Emmet soil association. These soils are mostly sand, however, locally there are areas of red clay and gravelly soil.

#### F. Vegetation

Forest cover consists of sugar maple, elm, yellow birch, beech and basswood, but everywhere the forest contains a variable admixture of hemlock and white pine. In some areas there are stands of aspen and birch. In open areas or abandoned farms, plantations of red pine have been made.

Vegetation on the flood plain contains mixtures of bottomland hardwoods, cedar, hemlock and shrubs such as alder, dogwood and willow.

#### G. Climate

The climate in Benzie County is favorable for the summer recreationist with pleasant daytime temperatures and cool nights. Temperatures during the summer months average 5 to 10 degrees cooler than in southern lower Michigan. Prevailing westerly winds pick up moisture from Lake Michigan and as they rise over the area, release substantial amounts of rain and snow. The average annual precipitation is about 30 inches. Snowfall in the area averages about 70 inches.

## H. Ownership

Ownership within the watershed consists of 35,700 acres (22.6%) state land, 115,442 acres (68.6%) private land, and the remaining 14,658 acres (8.8%) are in lakes and streams. Approximately one-half of the total area is within the boundaries of the Fife Lake and Betsie River state forests. Of the privately-owned land, about 10.5% is in cropland, 0.6% in orchard, 3.5% in pasture, 53.6% in woodland and 31.8% in open wild land, recreation and other use.

Of the 40-acre tracts having water frontage on the Betsie River and its tributaries, roughly 5,560 acres are in private ownership. State ownership is about 3,040 acres, primarily located in the upper portion of the Betsie and Little Betsie and along Dair Creek. State ownership is limited along most of the mainstream below Wallin.

Ownership of the estimated 104 miles of frontage along the mainstream from Green Lake downstream to Betsie Lake, approximately 75% is in private ownership and 25% in state ownership.

## I. Accessibility

The Betsie River is accessible by improved state or county roads. US-31 crosses the Betsie in the western third of the watershed near Benzonia and M-115 angles through the central part of the watershed crossing the river twice. None of these public roads parallel the river. There are 20 road crossings from Worlds Bridge, below Grass Lake Wildlife Flooding, downstream to Betsie Lake.