DRAFT PROCEEDINGS

of the

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MYAKKA RIVER *WORKSHOP*

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ABSTRACT

The Myakka River Basin (550 sq. miles) dominates the eastern portions of both Manatee and Sarasota Counties. The headwaters are in the Myakka Head/Wingate Creek area and, by the time it reaches Charlotte Harbor, the Myakka has traversed approximately 62 miles (as the crow flies), and drained parts of five counties, which are under the jurisdiction of two Regional Planning Councils. Unique features of the Myakka River include: containing four large basins; no cypress swamp habitat; extremes in flow; and undeniable aesthetics (e.g. Myakka River State Park). Because of: the geologic and climatic history of the area (which has resulted in varied topography and soils); the transitional location of the Myakka River Valley (between the more temperate northern peninsular area and the more southern subtropical end of the state); and the lack of historic development pressures, the Myakka basin is an extremely biologically valuable and interesting region. No less than 51 species of vertebrates, considered rare, of special concern, of undetermined status, threatened or endangered, are found in the Myakka River Valley. In addition, a number of wildlife species reach their most southern limits in this valley. Finally, and most importantly, the future continued productivity of the Charlotte Harbor estuary, (called by many, the most pristine estuary in the southeastern United States) is inextricably linked to the heavy combined freshwater flows of the Peace and Myakka Rivers. Threats to the river include: upstream phosphate mining, general streamside development; the possibility of the juxtaposed MacArthur Tract (32,608 acres) and associated West Water Management District being developed; increased demands for scalping the Myakka River for potable water; and a myriad of land-use changes resulting from the construction of I-75. In view of its many unique qualities, its critical habitat and corridor values to several endangered and threatened species, the many normal functions of its wetlands (water purification, flood alternation, etc.) and the life-sustaining relationship this river has to the productive Charlotte Harbor estuary, it was concluded that an holistic management plan, which transcends political, normal planning and basin boundaries, should be developed to protect the entire functioning river and its juxtaposed wetlands and uplands.

PREFACE

FORWARD

OPENING REMARKS

by
Jack Whelan, Chairman
Myakka River Coalition

(TO BE COMPLETED AFTER
TEXT IS IN FINAL FORM)

AN OVERVIEW OF THE MYAKKA RIVER VALLEY

by

Julie Morris
The Naturalists
Sarasota, Florida

The Myakka River drains water from five counties (Figure 1). These five counties are under the jurisdiction of two different Regional Planning Councils. As the crow flies, from Myakka Head down to Charlotte Harbor, the river would be about sixty-two miles long. The watershed contains approximately 550 square miles.

The Myakka River has a number of distinctive features. First, as shown in Figure 2, it has four large wetland basins in the middle of the river system, which is unusual for a river in southwest Florida. The four basins: Flatford's Swamp, which is north of Myakka City; Tatum Sawgrass marsh, just above the Park; and Upper and Lower Lakes in Myakka River State Park. Second, the river lacks significant development of the cypress swamp habitat.

Another well-known feature of the river is its tendency to have annual periods of low flow. This low flow results from water in the river originating mainly from rain runoff, with no significant contribution from spring water. Because of the County's seasonal rainfall pattern, most precipitation is concentrated in the summer months. At the end of the dry season (i.e., late spring), the flow levels are dramatically low. What isn't as commonly known about the river, however, is that as often as low flow conditions occur, flood stage and high flow rates occur during the wet season.

The river flows through Myakka State Park, which is the largest of Florida's State parks. People from all over the country are familiar with its outstanding wildlife habitat and aesthetic values, primarily through the Parks' interpretive programs.

In my opinion, the river is on the threshhold of a change. Though there is, as yet, no mining in the upper watershed of the river and its tributaries, Big Slough and Deer Prairie Slough, five phosphate mining companies own large acreages on which they intend to strip-mine. These are: United States Steel and Swift Chemicals Corporation in the Myakka Head area; Beker Phosphate in the Wingate Creek area; Grace Chemical Corporation in Flatford Swamp; and both I.M.C. and Phillips Mining Company own property in both the above tributary sloughs. Depending on the EPA standards that are adopted to regulate the central Florida phosphate industry, between nine and twenty-four thousand acres of the Myakka River Watershed will eventually be strip-mined. Clearly, that would have a significant effect on the nature of the river and its watershed.

Additionally, there is an area south of the park that has been organized into the West Water Management District. Approximately one year

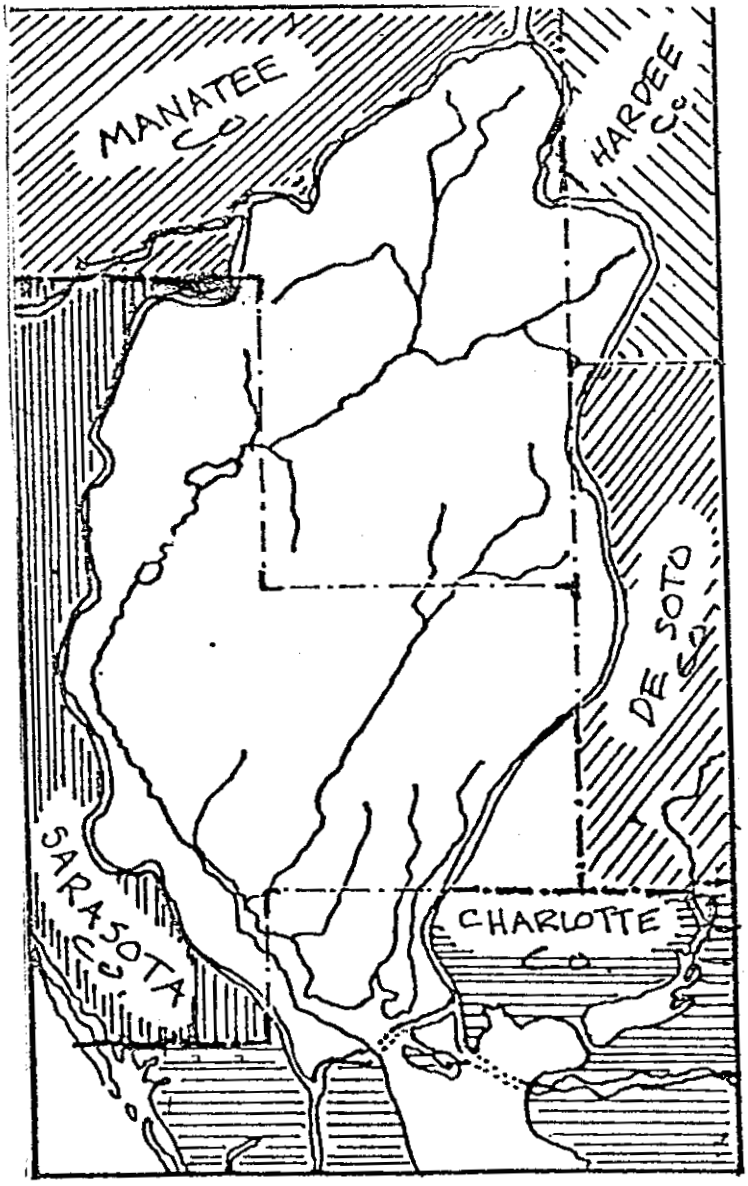

Fig. 1. The Myakka River Basin.

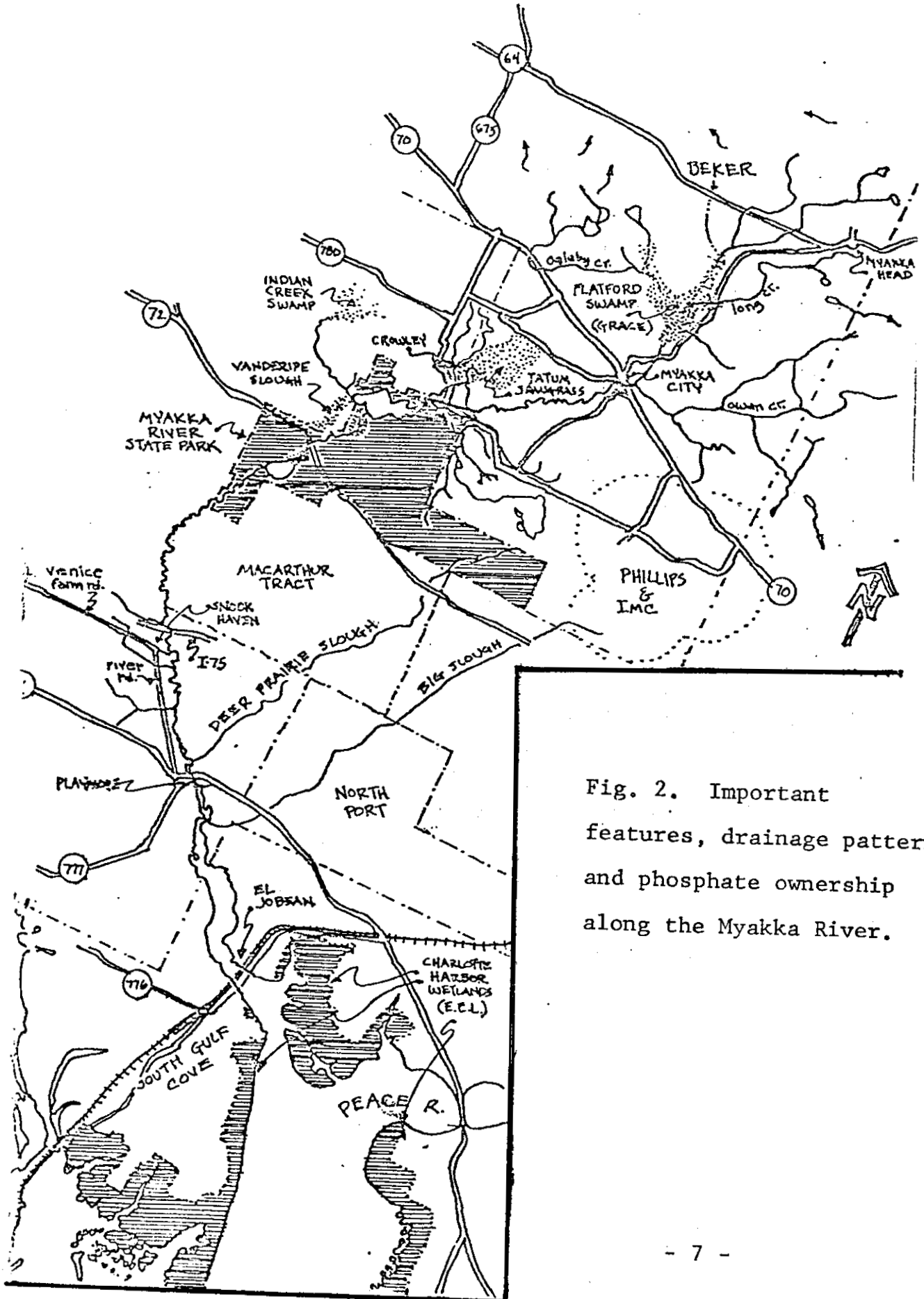

Fig. 2. Important features, drainage patterns, and phosphate ownership along the Myakka River.

remains in the District's organizational papers for drainage plans to be filed. This area, known as the MacArthur Tract, is about fifty square miles, and is managed by a development company (Magna Corporation) that could initiate extensive drainage for residential development purposes.

Because of the increase in population and water demand in Sarasota County, some people have also been considering the possibility of creating a reservoir, using Myakka River water for a municipal supply. That also would involve great changes in the river.

I-75 is already being constructed and the recent paving of River Road, between Snook Haven and Highway 41, is likely to stimulate commercial and recreational development along the river in that area. Finally, in Charlotte County, much of the riverfront has already been converted to dredge-and-fill waterfront-type developments.

The Myakka faces all these real and potential changes with its natural features still largely intact, its uplands used primarily as range, and its lowlands providing recreation and important wildlife habitat.

What I'm going to do now is go through a series of aerial slides to familiarize you with the river.

This infrared aerial shows the whole region between the Manatee and the Peace River. I'd like to point out the spatial relationship between the Manatee, the Peace, and the Myakka rivers. This large, arrowhead-shaped red area is Flatford Swamp. This dark area is Tatum Sawgrass, with the Upper Lake and the Lower Lake below. You can see that the area east of the river seems to be a lot wetter than that west of the river. This area (the MacArthur Tract) has quite a development of flatwood depressions, sloughs, and over 900 wet-weather ponds.

If you go up to Highway 64 in Manatee County and look north, this is what the river looks like during the driest time of the year. It doesn't appear to be much more than a cow path but, during the wet season, it can be an impressive river channel. Going north from there brings you to the Wingate Creek area, where the Beker property is located. Beker is the farthest along in obtaining permits for strip mining in the Myakka watershed.

As the river winds southward, you can see the development of the hammock creating a river corridor. Off to the east lies a high scrub area. Here, the river chooses the low ground, going around the high places.

The road in the corner of this slide is the Myakka City-Wauchula Road--that nine-foot patchwork grade that connects Highway 70 with Highway 64. The hammock in this area is a mixed hardwood hammock with bay trees, oaks and ash, with a fern understory, indicating periodic flooding.

This is the river channel and hammock corridor just above Flatford Swamp. Flatford Swamp is a confluential swamp, formed by seven different named tributaries coming together at the Myakka River. A hydro-

logical report (Florida Bureau of Geology, 19__), states that the swamp has been known to absorb the waters of an entire rainfall event upstream, which reflects its large water-holding capacity. It is obviously an extremely valuable area. Grace Chemical states that they don't plan to mine or alter this area during this century.

Immediately below Flatford Swamp, the river channel is swampy, characterized by popash and marshes.

In Myakka City, some straightening and alteration of the riverbed has taken place. Also notice how Myakka City itself is set back from the edge of the river. Because of the flooding character of the Myakka, the village structures were located a safe distance away from the high water.

Below Myakka City, the hammock changes into what becomes the dominant river hammock the rest of the way down the river, with cabbage palm, live oak and laurel oak being the major tree species.

This is an aerial shot, again infrared, of the hammock corridor from below Myakka City down to the Park. You can see the sun glistening off the bends of the river wandering back and forth across that hammock. The use of adjacent uplands is agricultural. Notice the dramatic difference (delineated by the Park's boundary) in the color and the texture of the vegetation.

Just above the Park, the river channel splits and two streambeds carry river water into the Park. These are Clay Gully and the Myakka River. Most of the low flow goes through Clay Gully, I've been told.

This is the southern marshy end of Tatum Sawgrass, where the Crowley Nature Center is located.

This marshy area continues south until it broadens out into the Upper Lake. Upper Myakka Lake is infamous for its aquatic weed problem, which restricts its recreational use and prematurely ages the lake [see Alvarez paper--the Editor]. The floating mats of hyacinths, and the hydrilla under the water, have the capacity of eliminating open water in the lake during certain seasons. The marshes above the Upper Lake provide good waterfowl habitat; however, they aren't as accessible as the Lower Lake marshes and are, therefore, not as well known. The Upper Lake is stabilized by an impoundment, but only when it reaches a relatively low water level. Below the Upper Lake there is a marshy area named Big Flats. The land west of Big Flats is known as Shep's Island. It went out to the west through van der Ripe Slough and southwest through Big Flats. The two channels wandered down through the Park and reunited above the Lower Lake. Sometime in the 1940s, the owner of van der Ripe Slough, which stood outside the Park boundary, constructed a dike across that channel and now the Big Flats route is the only channel by which water normally leaves the lake.

Note how wet the Big Flats are in this picture. The river meanders within the marsh and then the hammock closes in for a short distance, opening up again at the marshes above the Lower Lake.

Below the Lower Lake, the hammock closes in again along the river channel, and no more large wetland basins occur until tidal conditions prevail downstream. Below this point on the river, the hammock is predominately live oaks, laurel oaks and cabbage palms. There is much evidence of seasonal flooding in the hammock and the river channel meanders.

This is an aerial shot looking south. To the left, and the east is the MacArthur property. You see it is mostly in native range. Off to the west, in the upper righthand of the picture, is a large area of improved pasture. There is typically better road access to the western shore of the river along this section and, consequently, higher intensity land uses occur along that shore.

In this area between the Park and Snook Haven, I-75 is going to cross the river. Construction is probably much farther along at this point than this slide indicates. I-75 will improve access and, therefore, stimulate development along this portion of the river.

Looking towards the northeast, you can see River Road paralleling the river, approximately at a hundred-year flood distance away from the river. Tidal marsh begins to appear as pockets along the river near Snook Haven. Downstream, it becomes a continually widening strip between the hammock and the river. Rambler's Rest Camping Resort is now the only development along the river between Snook Haven and Route 41.

At Playmore, improved access has led to residential development. Where Highway 41 crosses the river, the dredge-and-fill of Lazy River Mobile Home Development is quite evident from the air.

Below here, pockets of residential development focused on access to the Myakka are found on both sides of the river. Downstream, the river widens dramatically and islands, mangroves and tidal marsh all dominate the landscape.

The Myakka, as you can see, is a valuable natural resource, which is quite pristine in many areas. Its value is not, however, only recognized by local people. For instance, the entire river, below Myakka River State Park, is designated critical habitat of the endangered manatee. Additionally, and very importantly, the Myakka has been nominated for inclusion in the National Wild and Scenic Rivers Program.

GEOLOGY OF THE

MYAKKA RIVER BASIN

by
Horace Sutcliff
U.S. Geological Survey

(IN PREPARATION)

FLOODING IN NON-

TIDAL AREAS OF THE

MYAKKA RIVER

by
Jim Turner
U.S. Geological Survey

(IN PREPARATION)

THE MYAKKA RIVER BASIN:

Characteristics of a Watershed

by
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PHYSICAL CHARACTERISTICS

GENERAL DESCRIPTION. As shown in Figure 1, the Myakka River basin occupies a position dominating the eastern halves of both Manatee County and Sarasota County, Florida. The drainage area for the Myakka River is 550 square miles (Kenner, et. al. 1967). For purposes of this report, however, Big Slough, which drains a large area in southeastern Sarasota County, has not been included and the effective remaining drainage area of the Myakka River is 382 square miles.

The topography of the Myakka basin is characterized as low, flat land with moderate to gentle slopes limited to the peripheral areas in the northern half of the basin. Numerous, small wet prairie depressions dot the landscape that is dominantly pine flatwoods and saw palmetto prairies.

The unique morphology of the Myakka basin is exhibited by the four large depressions that occupy the middle half of the basin. The Upper and Lower Myakka Lakes, situated in Myakka River State Park are the largest bodies of open standing water in the area. North of these lakes is Tatum Sawgrass, a 4300 acre marsh traditionally filling the role as a natural catch basin for flood waters. The fourth area is Flatford's swamp, formed at the confluence of Ogleby Creek with the Myakka. Above the swamp, the terrain rises rapidly into the slightly elevated DeSoto Plain and again into the Polk Uplands which occupy the northeastern quarter of Manatee County (White, 1970).

The lower third of the basin can only be characterized as extremely flat. Surface water accumulates in the numerous ponds and except during the extreme wet season or in areas where drainage programs have been instituted, the transition to the main river channel is not clearly delineated.

SUB-BASINS. The Myakka basin has been divided into eight tributary sub-basins and two sub-basins centered on sections of the main stem of the Myakka River (Figure 2). The boundaries of these sub-basins were derived almost exclusively from the 1:24,000 scale USGS topographic maps. A brief description of each sub-basin follows:

[1]Present address: Sarasota County Planning Dept.

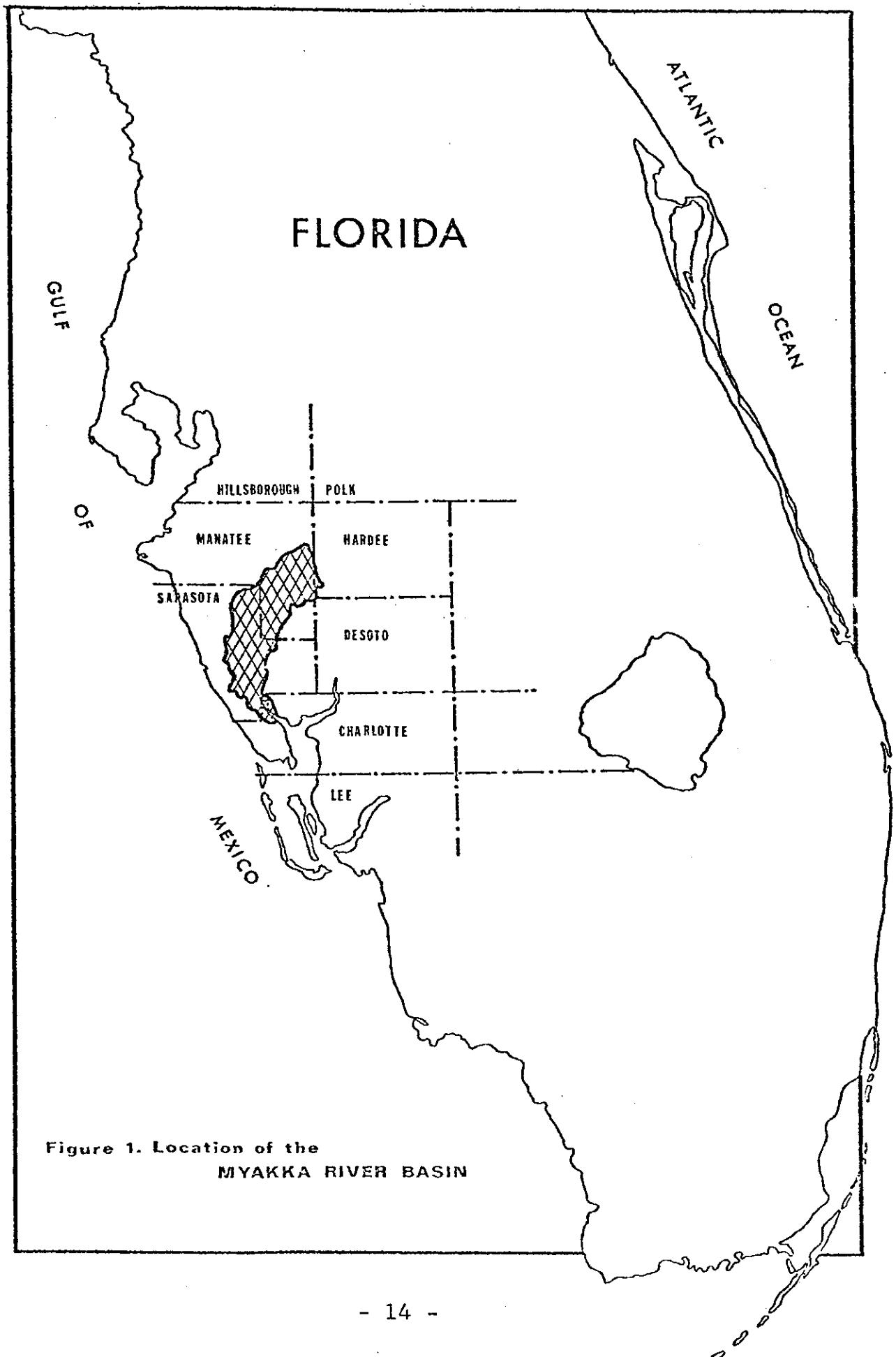


Figure 1. Location of the MYAKKA RIVER BASIN

MYAKKA HEAD/WINGATE CREEK. This is the largest of the tributary basins. Its 54 square miles represents 14 percent of the land area of the Myakka basin. This sub-basin is an amalgamation of several hydrologic entities, comprising the headwaters of the Myakka River as well as Taylor, Wingate and Johnson Creeks to the north and with Long Creek and Maple Creek tributary systems have been combined for a number of reasons. These two northern creek share a mutual topography and their individual basins are either ill-defined or so small that separately they would detract from the relationships that exist among all of the creeks in this sub-basin. Furthermore, the topographic ridge lines delineating the Ogleby Creek and Owen Creek tributary basins to the west and east, respectively are more important than any of the smaller areas that would be created by further subdividing the Myakka Head/Wingate Creek basin.

OGLEBY CREEK. Although slightly smaller than the Myakka Head sub-basin, the Ogleby Creek system, representing 11 percent of the Myakka basin, contains the longest single tributary north of the lakes. This quantity has been standardized through the development of a topological concept called basin diameter.

The diameter of a river basin is defined as the greatest distance within a basin from its mouth to its source measured "along the most direct flow though the network" (Jarvis 1967c). The diameter of the Ogleby Creek basin is 13.1 miles. Most of the land area of this sub-basin is still in its native state, with the predominantly pine flatwoods and open prairie areas being utilized as native pasture lands. In the vicinity of Verna, at the extreme western edge of the sub-basin, a five square mile area has been cleared and drained for use as improved pasture and a couple of small citrus groves.

OWEN CREEK. Like Ogleby Creek, this sub-basin is composed predominantly of undisturbed pine flatwoods and palmetto prairies. There is some improved pastureland and cultivation along the ridge line it shares with the Myakka Head sub-basin. Southeast of Myakka City, a drainage system dug in 1970 is apparantly reverting to its natural form (Morris, 1974). Own Creek originates in a swamp located just below Myakka Head. This swamp also serves as the source for a tributary of the Horse Creek river system adjoining the Myakka basin. The Owen Creek basin is 39 sq. mi. in area.

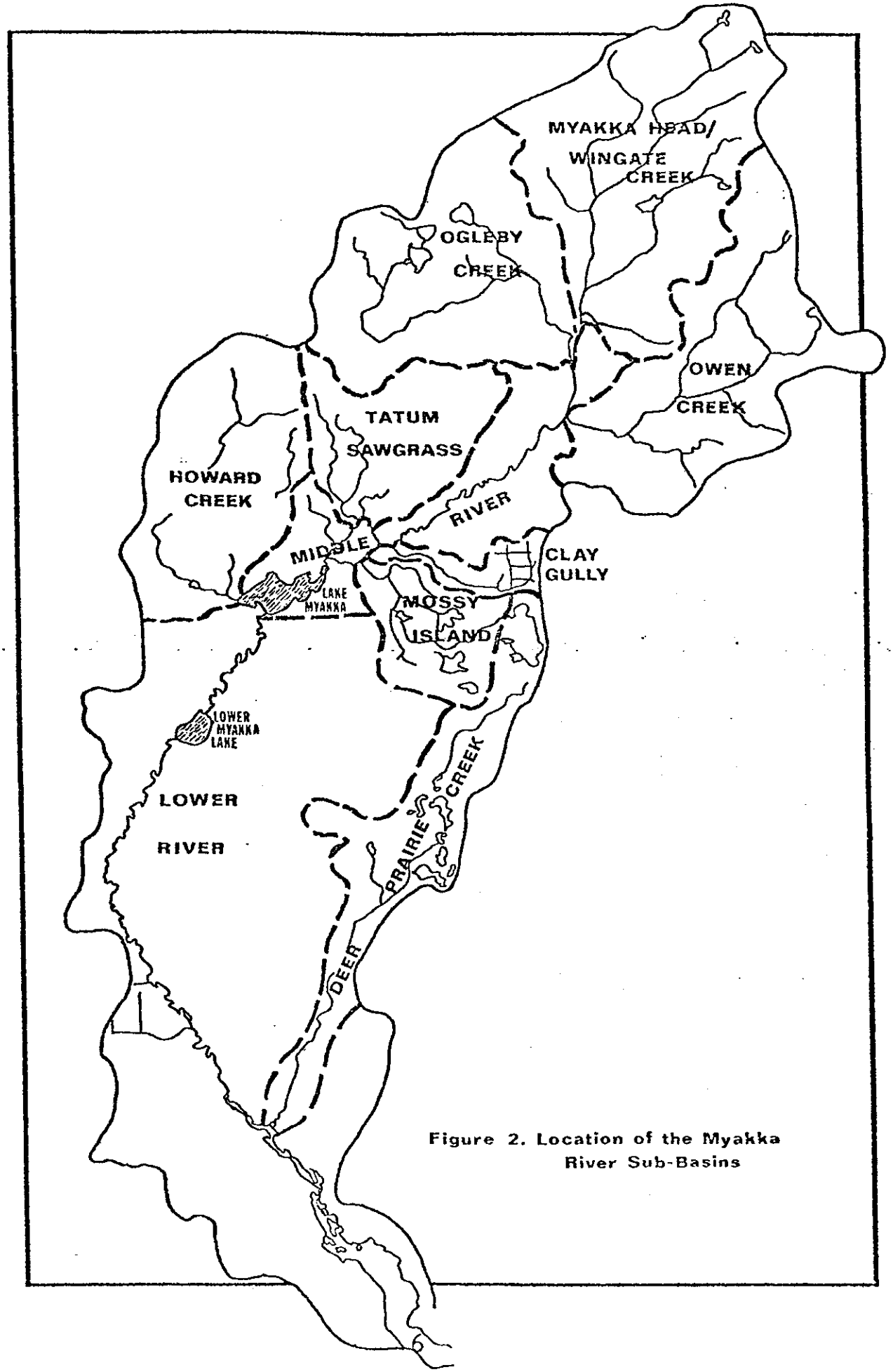


Figure 2. Location of the Myakka River Sub-Basins

TATUM SAWGRASS. This sub-basin, half the size of either the Ogleby or Owen watersheds represents an interesting combination of topographic contrasts. While exhibiting steeper slopes than any of the other tributary basins, as measured by the average slope throughout the sub-basin and by the rate of elevation drop along the basin diameter, this drainage basin also contains the largest expanse of flat swampland north of Myakka State Park. The 4300 acre Tatum Sawgrass Marsh occupies 35 percent of the land area of the sub-basin. It is recognized as a valuable resource because of its potential for attenuating the effects of flooding and excess sedimentation on the downstream portions of the Myakka River. An extensive study of the man-made dikes and water diversion systems within the sawgrass area is presently being readied for publication by U.S. Geological Survey (personal communication, Mr. Jim Turner, USGS, Tampa). This sub-basin is 19 sq. mi. in area.

HOWARD CREEK. This is the largest developed sub-basin (31 sq. mi.) within the Myakka system. More than 90 percent of its land area has been drained, cleared, or otherwise prepared for use as improved pasture, tree farms, crop cultivation or subdivisions. The main stream of this sub-basin flows into the western tip of Upper Myakka Lake. During the rainy season, this water flows through Vanderipe Slough, which is parallel to the Myakka River in the marshland separating the two lakes.

CLAY CULLY. The smallest of all the sub-basins (6 square miles), Clay Gully readily shows evidence of man's impact upon the natural system. A brief inspection of the drainage pattern, as illustrated in Figure 1, shows the straight lines indicative of human involvement. In this particular case, the repetitive nature of the drainage pattern probably represents a common arrangement where a land owner had his land cleared and drained (i.e. made available for use as improved pasture). By leasing his land to farmers engaged in the production of money crops, such as watermelon, the owner is relieved of the initial burden of clearing his land. [The financial responsibility is assumed by the lessee upon termination of the lease, the land reverts to the owner ready for development into improved pasture (personal communication, Bob Hill, Ranger, Florida Forest Service).]

MOSSY ISLAND SLOUGH. Because of its low, wet topography, 70 percent of this sub-basin has remained in its natural state of saw palmetto prairie mixed liberally with wet prairie depressions and marshes. While the northern section of the sub-basin bordering Clay Gully has been cleared for improved pasture, its not being rigorously maintained and is currently designated as semi-improved pasture. The natural limits of the sub-basin have been modified by human activity. The eastern boundary has been changed because drainage activities in neighboring Deer Prairie Slough have diverted water away from Mossy Island Slough. Drainage from the south is limited by the abandoned railroad bed formerly used to connect Sarasota to the Arcadia-Cape Haze line; while the northern limits are defined by the embankment along Clay Gully Road. The area of Mossy Island Slough sub-basin is 12 sq. mi.

MIDDLE RIVER. This 27 square mile area was designated as a sub-basin in order to represent the remaining northern area of the Myakka Basin. The eight sub-basins thus delineated identify the entire drainage area (229 square miles) corresponding to the USGS streamflow data.

DEER PRAIRIE SLOUGH. This sub-basin (27 square miles) consists of linear arrangements of intermittently flowing prairie depressions and swamps. Drainage has been facilitated through the lower half of the basin by channels that connect the marsh areas into a drainage network. The northern extremities are likewise characterized by numerous canals, but these appear to be primarily for local use. It is doubtful that continuous flow exists between these two sections except during the rainy season.

LOWER RIVER. The designation of the remaining area as a sub-basin was not entirely haphazard. The lower river area (126 square miles) is a relatively homogeneous, low, flat region dominated by pin flatwoods, saw palmetto and dotted with wet prairie depressions. Drainage in this sub-basin consists primarily of small unbranched tributaries and drainage canals emptying into the main channel of the lower Myakka River. Drainage improvements similar to those in the Deer Prairie region have also been developed here. In the southwest section of the Lower River basins is an extensive system of canals apparently for the purpose of draining ponds into the Myakka River. The precise nature of natural drainage through this flat terrain is unknown. There appears to be no coherent drainage pattern above the twenty foot contour level. Although the effective drainage area of this sub-basin could very well be limited to within a couple of miles of the river, this could only be ascertained through an extensive topographic survey.

TRIBUTARY SUB-BASINS	AREA		DRAINAGE EFFICIENCY				SLOPE		HYDROLOGIC SOIL GROUPS, %			
	SQUARE MILES	% OF TOTAL	NETWORK MAGNITUDE	AVE. NET. MAGNITUDE	STREAM LINK DENSITY	DRAINING DENSITY	AVE. BASIN SLOPE, %	LONGITUDINAL SLOPE, FT./MI.	A	B	C	D
Myakka Head/ Wingate Creek	54	14%	44	0.81	1.5	1.3	.60	6.1	33	8	4	55
Ogleby Creek	41	11%	55	1.34	2.4	1.3	.66	4.2	32	2	-	66
Owen Creek	39	10%	46	1.18	2.1	1.2	.72	4.9	18	5	8	69
Tatum Sawgrass	19	5%	41	2.16	4.2	2.3	.86	13.3	61	5	2	32
Howard Creek	31	8%	66	2.13	3.8	1.8	.61	5.1	45	-	26	29
Clay Gully	6	2%	27	4.50	8.1	3.8	.53	7.4	75	-	17	8
Mossy Island Slough	12	3%	23	1.92	3.6	1.9	.45	5.3	50	-	17	33
Deer Prairie Creek	27	7%	27	1.00	1.8	1.5	.31	2.3	3	-	6	91
Middle River	27	7%	50	1.85	3.7	2.3	.85	1.5	33	-	15	52
Lower River	126	33%	101	0.80	1.5	0.8	.08	0.4	11	-	39	50
Myakka River Basin Totals	382	100%	434	1.13	2.3	1.4	.45	2.0	26	2	19	53

TABLE 1. PHYSICAL CHARACTERISTICS - MYAKKA RIVER SUB-BASINS

THE DRAINAGE NETWORK. The drainage network represents the interface between the hydrologic cycle of rainfall and runoff and the physical components of the basin. Its components range from the smallest rivulet marking the beginning of overland runoff flow to the creeks and tributaries that comprise the permanent drainage pattern of the basin. The extent to which this drainage network covers a river basin is defined as the drainage efficiency of the system.

Traditional discussions of drainage networks have dealt with (1) the order of streams, (2) the length of tributaries, (3) stream density and (4) drainage density representing a measurement of overland flow (Wisler and Brater, 1963). Each of these factors have been constructed as an approximation of the extent on efficiency of a drainage network. However, until the advent of sophisticated data processing techniques combined with the development of a topological theory of river basins, these factors have not been consistently suitable for the comparative analysis of differenct basins.

The method for delineating the stream network in the Myakka basin was derived from Jarvis (1976c). He offers two plans for solving the problem. The first is to accept the "blue line" network, depicted as perennial or intermittent streams on large scale topographic maps, as the best available information. The second involves the development of "valley networks" as indicated by the contour crenulations of the map. These valley streams are regarded as extensions ob lue line streams "wherever cusps in the printed contours indicate significant indentations of the topographic surface." The valley network was developed to account for environmental sensitivity to extreme events. The extreme pattern of precipitation in this region of Florida contributes to potentially unusual runoff events that may not be confined to normal channels, including intermittent stream beds. The valley network method has been used to account for paths that may be used simply because of the intensity of local convective rainfall. The stream link (Jarvis, 1976a) is the smallest element along the streambed delimited by two junction points on the river. A length of stream occupying the initial segment from the stream source to the first junction point is defined as an exterior stream link. The remaining stream segments are called interior stream links. This concept is illustrated in Figure 3.

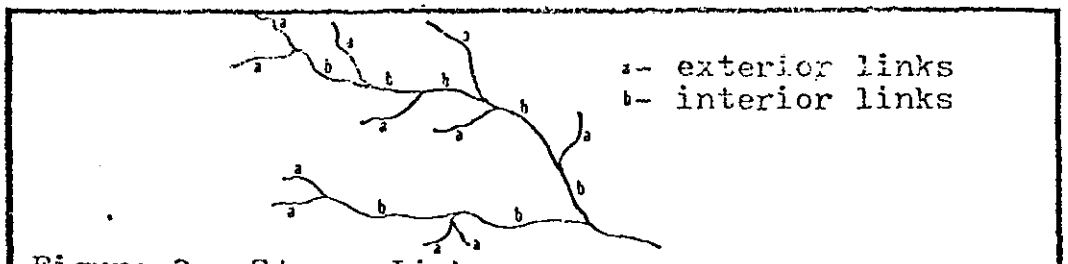


Figure 3. Stream Links

Three closely related parameters have been used to described the drainage efficiency of the sub-basins of the Myakka River. They are: (1) network magnitude, (2) stream link density and (3) drainage density. Their value for the respective sub-basins are presented in Table 1.

The network magnitude identifies the number of first order tributaries, i.e., exterior stream links, that originate within a given watershed. Although the network magnitude represents the number of sources within a basin, it is a fairly insensitive indicator of drainage efficiency. For comparing basins of disparate sizes, it may be more advantageous to think in terms of densities and relegated concept network magnitude to the role of identification.

Stream link density relates the total number of stream units to the total basin area. Drainage density represents a measurement of the total length of the stream channel per unit area and is considered to vary "inversely as the length of overland flow" thus providing some indication of drainage efficiency (Wisler and Brater 1963). These two concepts are almost interchangeable in their usage. The two measurements cannot be compared directly but if the stream links are evenly distributed throughout a basin, the two density measurements should represent the same relative ranking when compared to other drainage basins. Conceivably, a drainage basin having a network of many short stream links, clustered in the lower half of the basin, could have a high stream link density but a low drainage density. The sub-basins of the Myakka River displays identical rankings for both of these parameters.

Table 1 shows that Clay Gully, Howard Creek and Mossy Island Slough occupy the most efficient drainage networks. These are the three basins in the Myakka watershed that have been subjected to the most intensive development programs.

The impact of channelizing upon the natural drainage efficiency of the basin (realizing, of course, that this is the express purpose of drainage canals) can be seen even more clearly by comparing the current drainage network of Clay Gully with its natural state, as approximated by the "valley network" method a stream link density of 1.9 in its natural condition Clay Gully had and a drainage density of 1.6; compared with values of 8.1 and 3.8, respectively, for its present state. For "drainage" systems that have not been extensively developed altered the efficiency with which surface waters drain is largely dependent upon basin morphalogy and slope.

SLOPE. Slope is one of the important factors for determining the potential rate and volume of surface runoff in a drainage system (Rickert, et.al 1975). The steepness of slope has a direct effect on the time of overland flow and, therefore, "the concentration of rainfall in the drainage system" (Wisler and Brater, 1963). Drainage basins that are steep and well-drained tend to have "numerous small tributaries. While none of the sub-basins contribute to a high stream link density in the Myakka watershed can be regarded as having steep slopes, the two tributary basins exhibiting the highest percent slope. Middle River and Tatum Sawgrass, were the two relatively undeveloped basins having the greatest drainage efficiency (Table 1).

Two types of slope were calculated for ths report: the average basin slope and the longitudinal slope of the basin diameter. The source of information for these calculations were 1:24,000 scale USGS, Florida series, 7.5 minute quadrangle topographic maps. All measurements were taken from these maps.

The average slope of a basin was determined from the contour lines drawn on the map. For two dimensional slope determination of a linear segment, a transect can be drawn normal to a series of contour lines. The difference in elevation represented by the first and last contours in the series is the divided by the ground distance of the transect. To determine the average slope of an area, this method was expanded to solve the three dimensional problem as follows:

The average slope(s) between contour lines equals the contour internal (d) divided by the average width (w) of the strip defined by the contour lines. The number of strips contained within the area for which the average slopes is being computed is dependent upon D. If l and a represent the length and area, respectively, of the stip then

$$s = \frac{D}{w} = \frac{Dl}{a}.$$

By weighting each strip according to its area,

$$S = \frac{Dl1}{a1} \cdot \frac{a1}{A} + \frac{Dl2}{a2} \cdot \frac{a2}{A} + \ldots + \frac{Dln}{an} \cdot \frac{an}{A} \quad (1)$$

where A = total area of the basin
S = average slope of the basin.

This method can be practically applied to topographic maps by defining the dimensions of the individual strips as follows:

ln is the length of a printed contour line such that wn, the average width, is defined by the strip boundaries drawn midway from ln to the adjacent contour lines ln+1 and ln-1, given a particular contour interval D. (see figure 4).

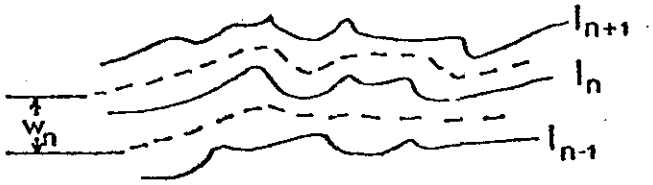


Figure 4. Slope Determination.

From equation (1)

$$S = \frac{D}{A} (l1 + l2 + . . . + ln) = \frac{DL}{A} \qquad (2)$$

where L = the total sum of the contour lengths.

Equation (2) was used to determine the average basin slopes as presented in Table 1. Measuring the five foot interval contour lines on the topographic maps proved to be extremely time consuming. Wisler and Brater (1963) report satisfactory results by measuring contour lengths at twenty to forty foot intervals for small or flat areas. For the purposes of ths study a twenty-five foot contour interval was selected, which fell within the suggested range and neatly divided the 0 to 115 foot elevation range of the basin. These contour lines are shown in Figure 5.

Longitudinal slopes were computed for the sub-basins by dividing the length of the basin diameter, defined as the longest continuous stream channel from source to outlet within a drainage basin, by the total drop in elevation. The results were expressed in terms of the drop in elevation (in feet) per mile of stream channel. Figure 6 is a longitudinal cross section of the main stream of the Myakka River. The Middle River and Lower River sub-basins are situated along the main channel between the 10 and 28 mile marks and the 28 and 60

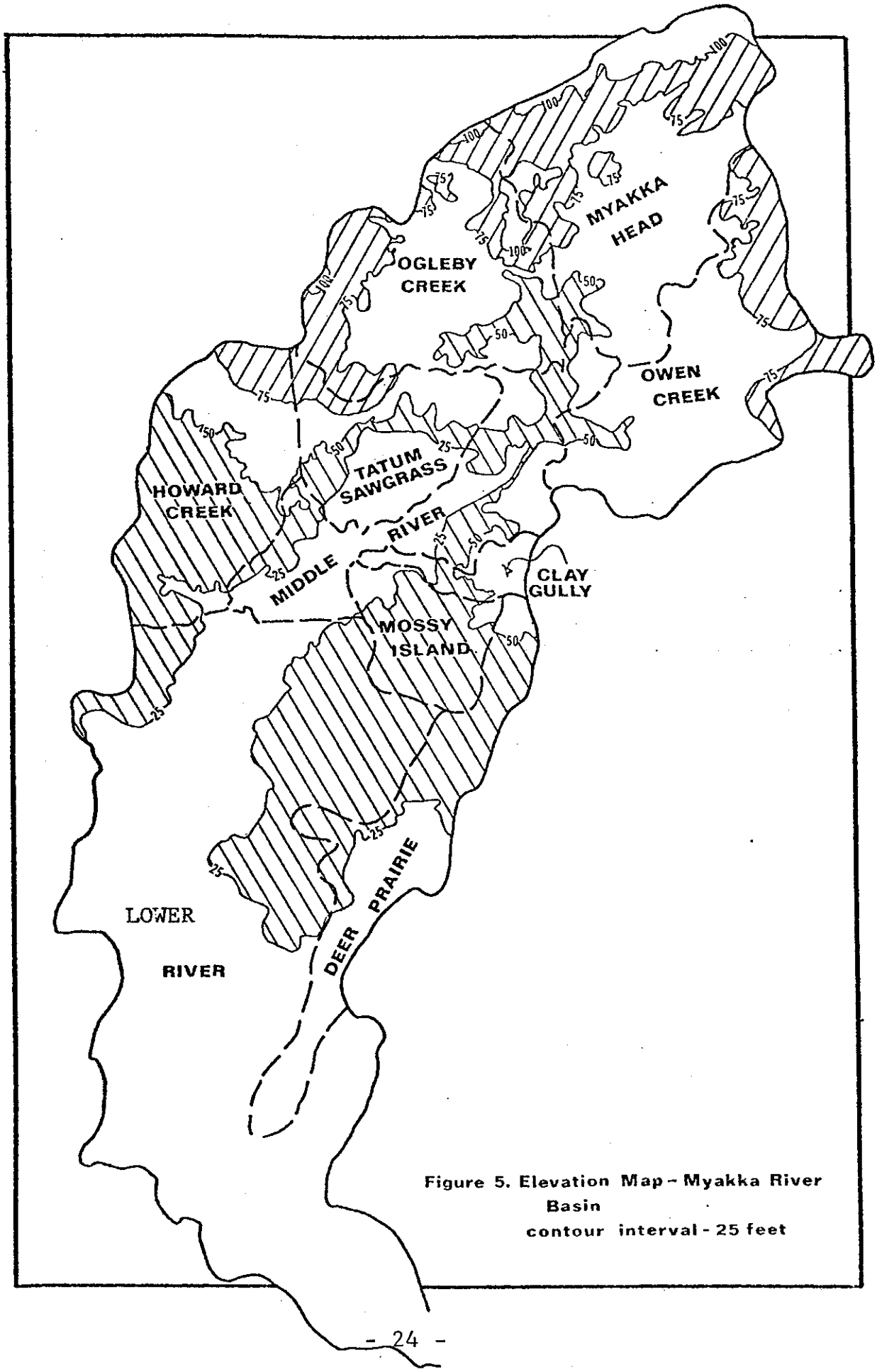


Figure 5. Elevation Map - Myakka River Basin
contour interval - 25 feet

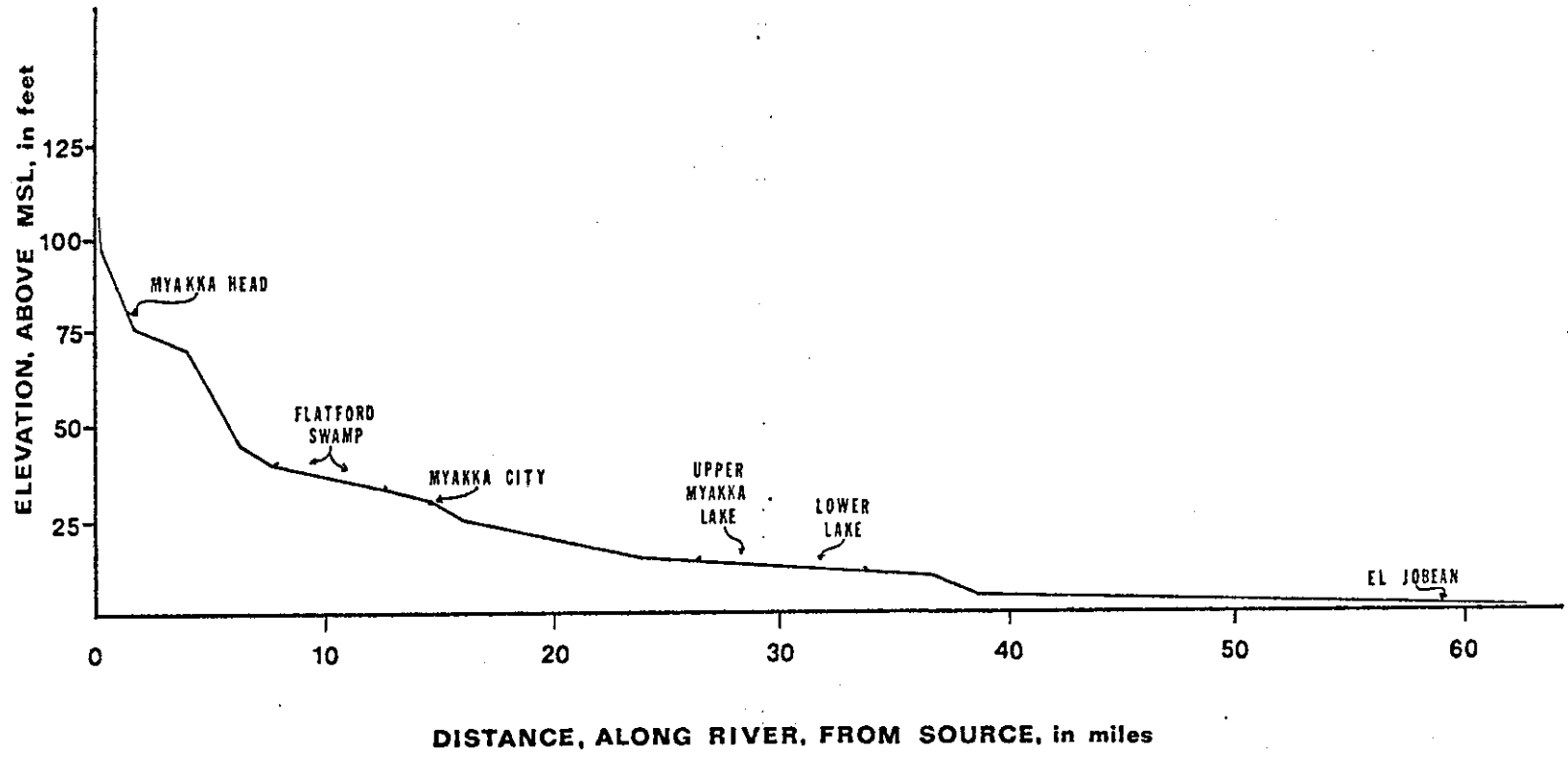


Figure 6. Longitudinal cross-section of the Myakka River.

mile marks respectively. The other basins have longitudinal slopes closely resembling those found between the 0 to 5 or 5 to 10 mile ranges. By themselves, the longitudinal slopes offer little more than a vague notion that a basin with a higher value will display greater channel velocities.

More definitive information on the stream basins can be obtained by using the longitudinal slopes in conjunction with average basin slopes. This combined perspective affords a description of basin morphology, thus facilitating comparative analysis between basins, especially in area as semingly homogeneous as the flat Myakka basin. A few examples will illustrate this. The Middle River drainage area displays a unique combination of having the second steepest average slope while at the same time exhibiting the second flattest longitudinal slope. Pictorially, this sub-basin can be described as a trough, with the Myakka River flowing down the middle and steep sides supplying additional water. Similarly, the Deer Prairie Creek basin can be represented as a long, thin trough with sides that are about one third as steep as those of Middle River; and Lower River, not as a trough, but as a long, broad drainage sink with just the hint of a groove down the middle to direct the flow. The upland drainage basins, with steeper longitudinal slopes, more closely resemble amphitheaters with the water funnelling through an outlet drain at the bottom.

These descriptions assume importance when they are considered in conjunction with the overall flatness of the Myakka River basin. For example, an area is designated as flat when its slope is less than 2 percent (U.S. Department of Agriculture, 1971). None of the average basins slopes or longitudinal slopes that were computer for this study approach the 2 percent figure. The steepest longitudinal slope reported was 13.3 feet/mile in Tatum Sawgrass which is equivalent to only a 0.25 percent slope. There are, however, some points in the Tatum Sawgrass basin and in Middle River where the slopes reach 3-4 percent but these are isolated occurrences.

The general flatness is at least part of the explanation for the pattern of flooding that is experienced in the Myakka basin. During the rainy season, the Myakka River overflows its banks, inundating large areas, but not subjecting its upland area to forceful flooding (Morris and Miller, 1976). This phenomenon is illustrated by the three major swamp areas located along the river course. The

relatively steep (i.e., less flat) uplands of the Tatum Sawgrass, Howard Creek and Middle River sub-basins drain into the extremely flat expanse in the vicinity of Upper Myakka Lake. The water can not drain throught the flat terrain as rapidly as it is being supplied from the uplands, resulting in an accumulation of the excess water in the form of perenial inundation of large expanses of the low, flat terrain, e.g., Tatum Sawgrass Marsh, the Upper and Lower Myakka Lakes and the swamp located between the lakes. Of course, the extent of this inundation is dependent upon seasonal and annual precipitation patterns. In a similar manner, the relatively steep Myakka Head/Wingate Creek and Ogleby Creek basins supply water into the sluggish Middle River trough and account for the formation of Flatford Swamp north of Myakka City.

RAINFALL DISTRIBUTION

The distribution of rainfall in the Myakka River basin is governed by two distinctive weather patterns. The pattern that is present during the summer rainy season, when 70 percent of the total rainfall can be expected, consists of localized convective showers of high intensity and relatively short duration. The rainfall that is received during the remaining months of the year is brought to the Florida peninsula by the frontal systems that comprise the hemispheric cyclones that sweep across North America.

RAINFALL STATISTICS -- MYAKKA RIVER BASIN. The data presented in this section were derived from rainfall statistics at ten monitoring stations in, or in the vicinity of the Myakka basin. The stations were located at Arcadia, Ona, Wauchula, Ft. Green, Parrish, Bradenton, Sarasota, Venice, Punta Gorda and Myakka River State Park as shown on Figure 12. With the exception of data from Ona, all of the information was derived from official National Climactic Center in Asheville, North Carolina. The Agricultural Research Center in Ona, Florida supplied the data from that station.

Twenty-five year monthly, and annual, averages were computed for each of the ten stations. These figures are presented in the Appendix. With these data, isohyetal maps were constructed illustrating the average distribution of precipitation through the Myakka basin. Figure 13 is the isohyetal map depicting the average annual precipitation. Similar isohyetal maps for monthly averages are included in the Appendix.

From the isohyetal maps, average rainfall totals were computed for the tributary sub-basins according to the method offered in Wisler and Brater (1963) using the equation:

$$P = \frac{A1}{A} P1 + \frac{A1}{A} P2 + \ldots + \frac{An}{A} Pn$$

Where P = mean rainfall for basin
A = area of a basin
A1, A2,....An = areas between successive isohyets
P1, P2,....Pn = mean rainfalls on respective areas.

The application of this equation is analagous to the procedure used for determining average basin slopes in an earlier section of this report. The results are presented in Table 5.

RAINFALL ANALYSIS. An inspection of the rainfall data and isohyetal mass reinforces the idea that the nature of precipitation in this region is predominantly dependent upon local influences. The establishment of areas of preferred convection would, therefore, be useful in understanding the phenomenon of precipitation within the Myakka basin. The following discussion relates the weaknesses inherent in the available rainfall data for determining significant differences in the spatial distribution of rainfall.

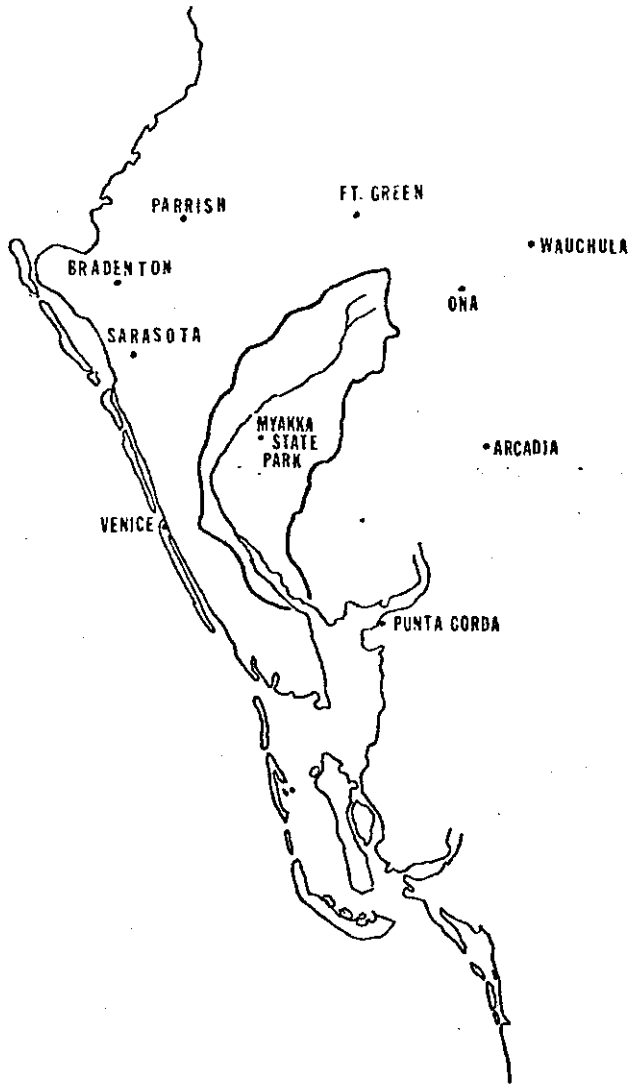


Figure 12. Location of Rainfall Stations

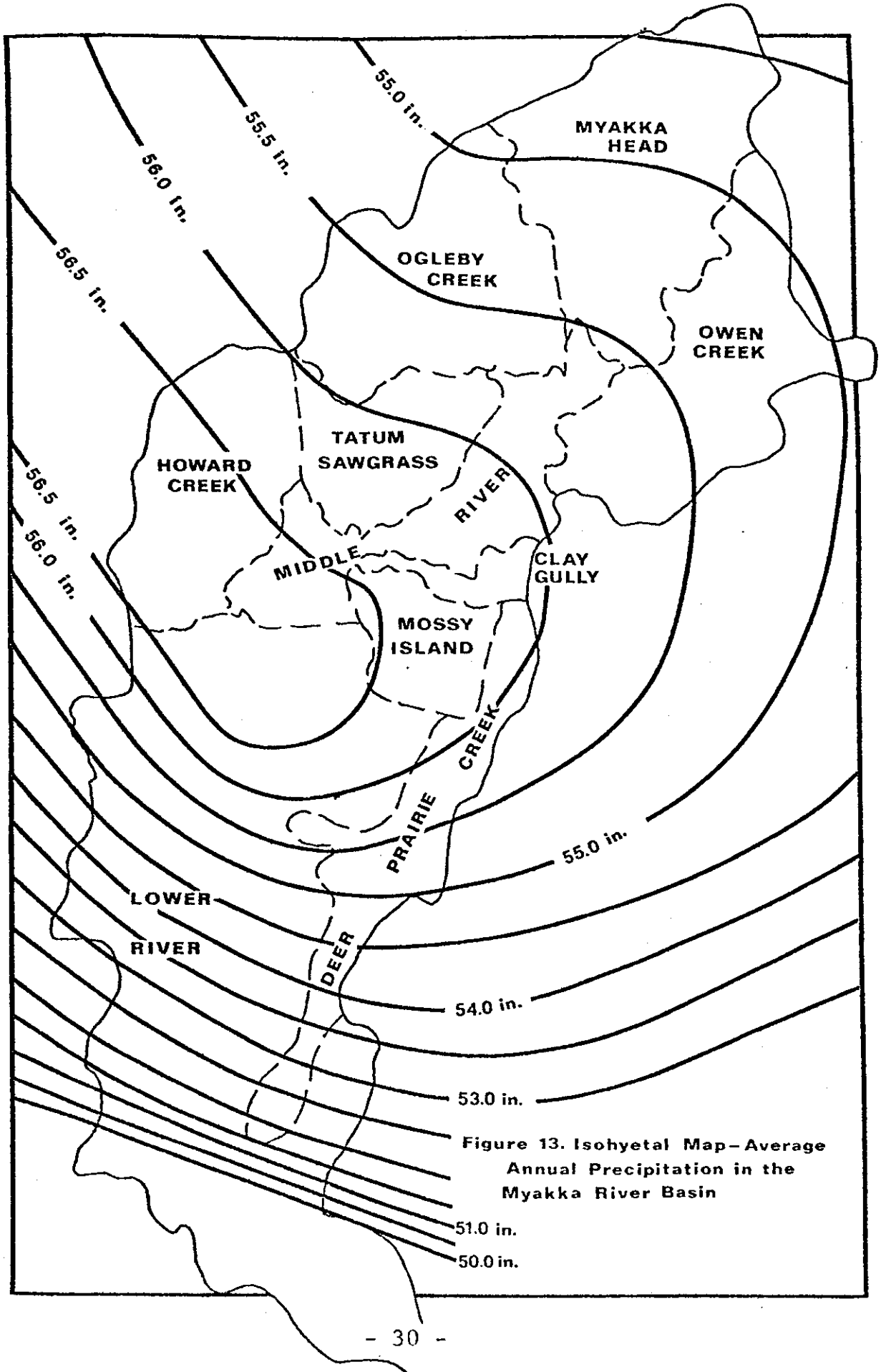


Figure 13. Isohyetal Map–Average Annual Precipitation in the Myakka River Basin

TRIBUTARY SUB-BASIN	JAN.	FEB.	MAR.	APR.	MAY	JUN.
Myakka Head/ Wingate Creek	2.25	3.22	3.26	2.16	3.89	8.82
Ogleby Creek	2.26	3.27	3.31	2.13	3.89	8.82
Owen Creek	2.18	2.98	2.99	2.22	4.05	8.64
Tatum Sawgrass	2.22	3.18	3.15	2.16	3.97	8.73
Howard Creek	2.33	3.16	3.14	2.06	3.91	8.55
Clay Gully	2.16	3.00	2.99	2.20	4.10	8.61
Mossy Island Slough	2.15	3.00	2.98	2.17	4.11	8.60
Deer Prairie Creek	2.11	2.90	2.89	2.07	4.02	8.28
Middle River	2.18	3.12	3.08	2.21	4.03	8.68
Lower River	2.24	2.90	2.92	2.08	3.77	7.92
TOTAL	2.22	3.05	3.06	2.13	3.90	8.42

TABLE 5. AVERAGE MONTHLY PRECIPITATION - MYAKKA RIVER SUB-BASINS.

TRIBUTARY SUB-BASIN	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL TOTALS
Myakka Head/ Wingate Creek	8.58	8.48	7.00	3.17	1.84	1.97	54.64
Ogleby Creek	8.58	8.68	7.15	3.18	1.88	2.00	55.15
Owen Creek	8.40	8.47	7.61	3.45	1.91	1.96	54.94
Tatum Sawgrass	8.46	8.77	7.60	3.35	1.98	2.01	55.58
Howard Creek	8.52	9.06	7.94	3.36	2.00	2.06	55.99
Clay Gully	8.34	8.70	7.90	3.55	2.05	1.96	55.56
Mossy Island Slough	8.32	8.72	7.96	3.58	2.06	1.96	55.61
Deer Prairie Creek	7.99	8.56	7.96	3.62	1.95	1.90	54.25
Middle River	8.41	8.75	7.77	3.42	2.02	1.99	55.66
Lower River	7.52	8.22	7.92	3.50	1.92	1.88	52.79
TOTAL	8.14	8.51	7.66	3.40	1.94	1.95	55.34

TABLE 5. AVERAGE MONTHLY PRECIPITATION - MYAKKA RIVER SUB-BASINS (cont.).

In Figure 13 an apparent corridor of maximum rainfall extends northwest from the center of the basin. Since more than 70 per cent of the total annual precipitation is recorded during the season dominated by convectional storms, there was a strong inclination to identify this corridor as an area of preferred convection. Before this could be done, two determinations had to be made. The first concerned the possibility that the corridor was due to a coincidental combination of cyclonic as wellas convectional rainfall totals. An inspection of the monthly isohyetal maps (located in the Appendix) located the areas of maximum precipitation for each month. The only possible pattern that was identified by relating each of the maxima to the others, occurred during the months of June through September. For these summer months the corridor of maximum rainfall appeared to shift from a position along the eastern edge of the Myakka basin in June to a position along the coast by September. The individual monthly areas of maximum rainfall are depicted on Figure 14.

The results obtained through this graphic investigation of rainfall distribution patterns is in line with the idea that the area of preferred connvection is dependent upon the interaction of factors such as the effects of sea breezes and local convecting potential. Figure 14 suggests that the influence of these factors is governed by environmentals constraints associated with the summer. Further study would be necessary to determine whether the limiting factor for the apparent location of these areas of maximum rainfall was due to the extent to which sea-breezes were confined closer to the coast as summer progressed, or to changes in the pattern of convectional potential due to the advancing season.

The other consideration that leaves doubt as to the significance of the corridors as areas of preferred convection is in the nature of the data itself. There is obviously some doubt whether the nature of such isolated, localized rainfall as that which occurs in the Myakka basin can be described by ten data points that are so widely separated . Woodall, et. al. (1974) report that "for the gage-derived area mean rainfall to be within a factor of two of the true area mean rainfall 99 and 50 per cent of the time, gage densities of 5 sq. mi./gage and 80 sq. mi. /gage respectively, are required." The nature of the data is further underscored by the high standard deviation values for the monthly station averages as presented in the Appendix. The statistical analysis suggests that individual storm intensities are greatly controlled by local effects and therefore, are not accommodated by such general data. This is not to say that areas of preferred convection do not occur; nor does it mean that such areas can not be mapped. The conclusion is that such accuracy can only be established through the utilization of a much denser rain gage network (as per Woodall) or through a more complete understanding of the complex relationships that comprise the formation of convective cells.

RUNOFF

In a sense, every section of this report has thus far dealt with runoff. Every factor that has been discussed - drainage, soils, topography, land use, vegetation, rainfall - influences the ultimate quantity and quality of runoff that eventually flows into the river. Therefore, the volume of runoff made available to a river can be measured in terms of the rate of flow of the river. For example, data from the USGS streamflow gage located on the Myakka River at Myakka State Park are considered to reflect the runoff for the 229 square mile drainage basin upstream of the gage. However, just as average precipitation data do not accurately portray the nuances and variations of rainfall intensity and distribution, neither can the true character of storm runoff be deduced from the data collection at one streamflow gage.

According to statistics furnished by the U.S. Geological Survey in Tampa, Florida, the mean annual streamflow of the Myakka State Park gage is 250 cubic feet per second (cfs) which converts to a value of 14.9 inches per year. This means that the 250 cfs represents enough water to cover the 229 square mile area to a depth of 14.9 inches. Previous sections of this report have illustrated that the physical facors affecting runoff vary throughout the basin. It would, therefore, be unreasonable to assume that every area within the basin will equally contribute 14.9 inches of runoff. Obviously some regions will contribute more than the average; some will contribute less. More importantly, it will be shown how certain areas can account for a negative runoff effect, extracting water from the system that had been contributed as runoff from other areas of the basin. This suggests that streamflow statistics for a heterogeneous watershed do not reflect the true measure of runoff as much as they do the total water losses occurring in the basin.

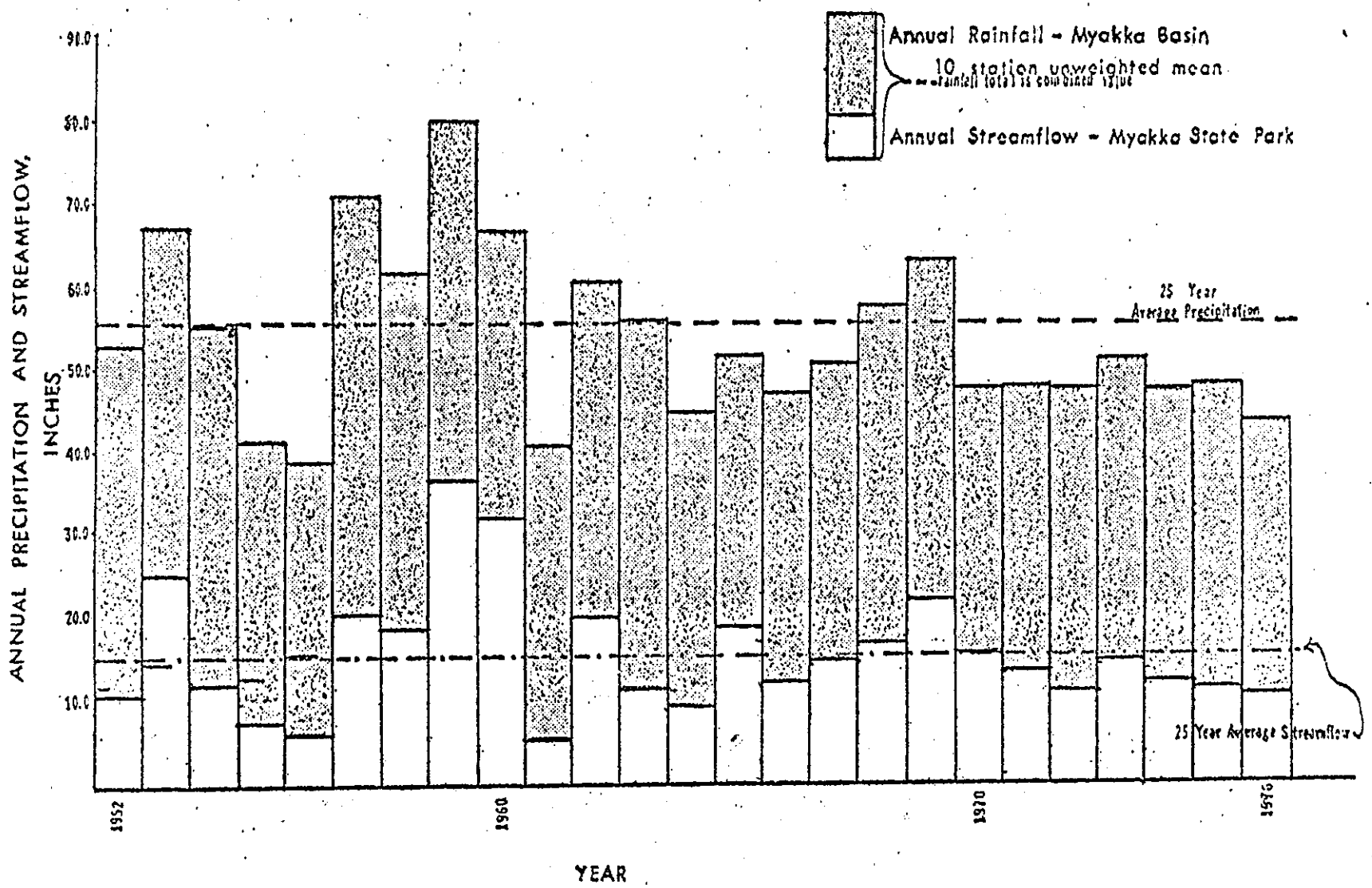
The actual determination of water losses is complex because of the many factors that contribute to the loss of water from a watershed. Often the effects of these different factors overlap, making accurate assessment difficult, if not impossible. In semiarid regions (characterized by two distinct seasons, wet and dry) such as southwest Florida, it has been traditional to identify water losses as the difference between precipitation and streamflow (Christian and Parsons 1963). In a low, flat area such as the Myakka basin, where the combined water losses may be the limiting factor regulating the maximum streamflow possible, perhaps it would be more realistic to identify areas of differing water loss and establish a streamflow gaging network based on the water loss assessment. This approach would also be helpful for the subsequent development of water quality monitoring because the gage network would more accurately measure true runoff totals by concentrating in relatively homogeneous hydrologic units.

STEAMFLOW. Through the years a number of stations have been established along the Myakka River to measure the amount of runoff that flows into the river channel. Only one station, located at Myakka State Park, has remained operative for a long enough time to compare with the rainfall data presented in this report. In addition to the Myakka City, U.S.F.S. stream flow gage which has been mentioned previously, about a half dozen gages were maintained for a study of the low-flow characteristics of the Myakka River (Flippo and Joyner 1968). The 229 square mile drainage area that contributes to the streamflow recorded at the Myakka State Park gage comprises the eight northern most sub-basins, (i.e. Lower River and Deer Prairie are not included).

In Figure 15, 25 years of streamflow data are compared with corresponding rainfall totals. Figure 16 shows a comparison between the monthly precipitation and streamflow records. The utility of this type of generalized data (i.e., one data point representing a 229 square mile drainage area) lies preimarily in the realm of retroactive trend analysis rather than in resource management decision making. The latter process should be based on more precise cause and effect relationships. An example of trend analysis that can be effected with available information is illustrated in Figure 15 where both rainfall and streamflow are shown to be below average for each of the seven years since 1970. Joyner and Sutcliffe (1976) report two years since 1933 in which the rainfall was less than 40 inches, but the current situation is the longest sustained below average rainfall in that period. Although this drought period has not been linked with any specific causes that could be projected for future trends, it is valuable information that is directly applicable to current water use problems.

Another aspect of streamflow that can be explored with the available data is its origin. Figure 17 is a flow-duration curve for the Myakka River basin based on 1936-64 streamflow data from Heath and Wimberley (1971). This is a cumulative frequency type graph indicating the percent of time that a given discharge was equaled or exceeded. Flow duration data reflect the topographic, hydrologic and geologic character of the basin. A steep curve like the one in Figure 17 indicates a streamflow that is highly variable and mostly dependent upon storms, with no sustained flow from either surface storage or ground water. This is another indication that streamflow, as recorded at the U.S.G.S. gage, is primarily dependent upon saturated surface flow. Water that percolates through some of the highly permeable uplands soils and reaches a relatively deep water table probably only remains as subsurface flow until it reaches one of the swamp areas, at which time the water returns to surface flow and the evapotranspiration system. This description must remain in the realm of speculation until more detailed streamflow data are available.

One final observation concerning the available data is made by Flippo and Joyner (1968) who suggest that the topographically flat area in the vicinity if Upper and Lower Lakes is a major catchment area and, therefore, susceptible to high evaportranspiration rates.



Average Annual Precipitation & Streamflow - Myakka River Basin, 1952-1976

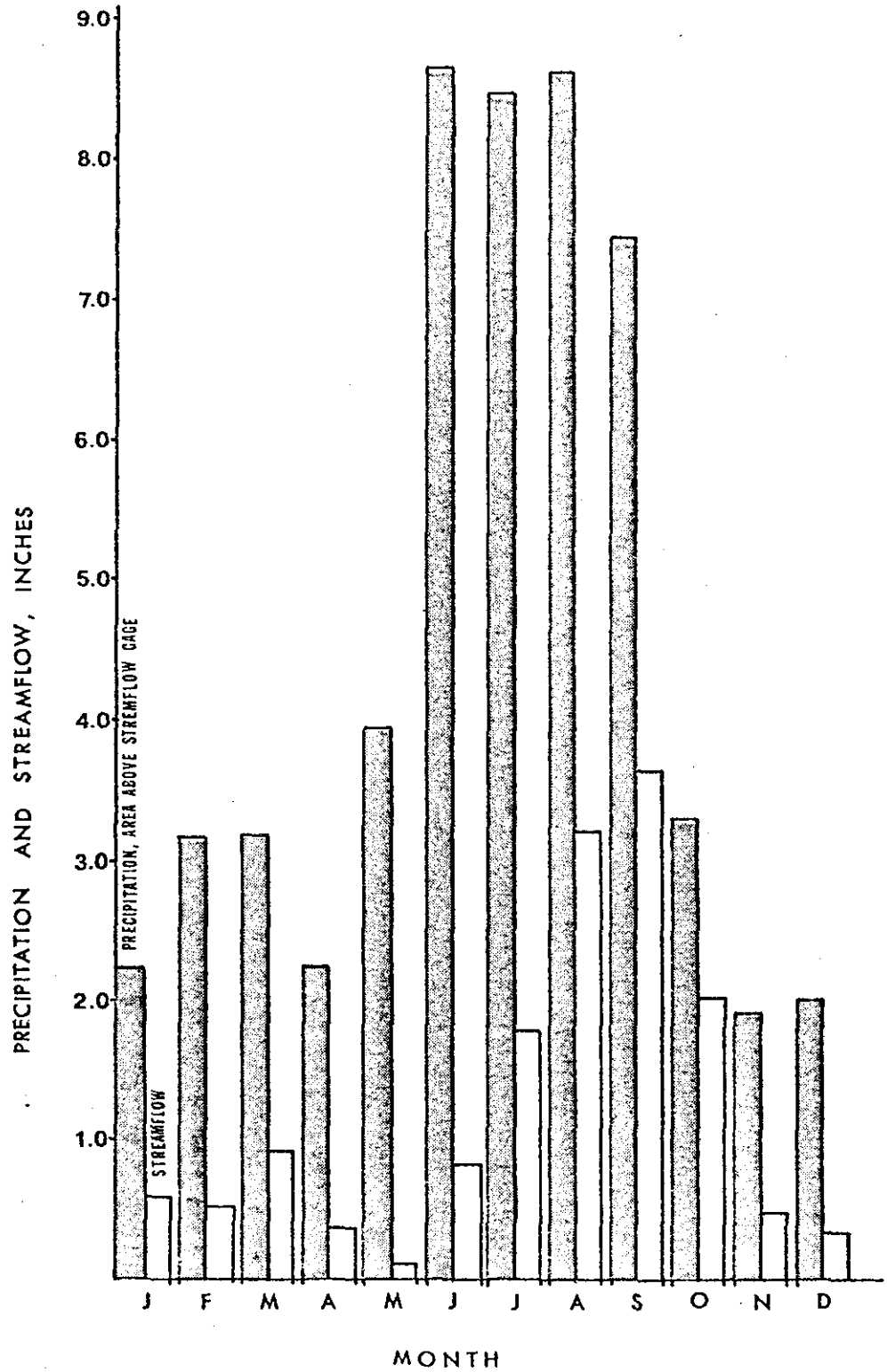


Figure 16. Average Monthly Precipitation & Streamflow - Myakka River

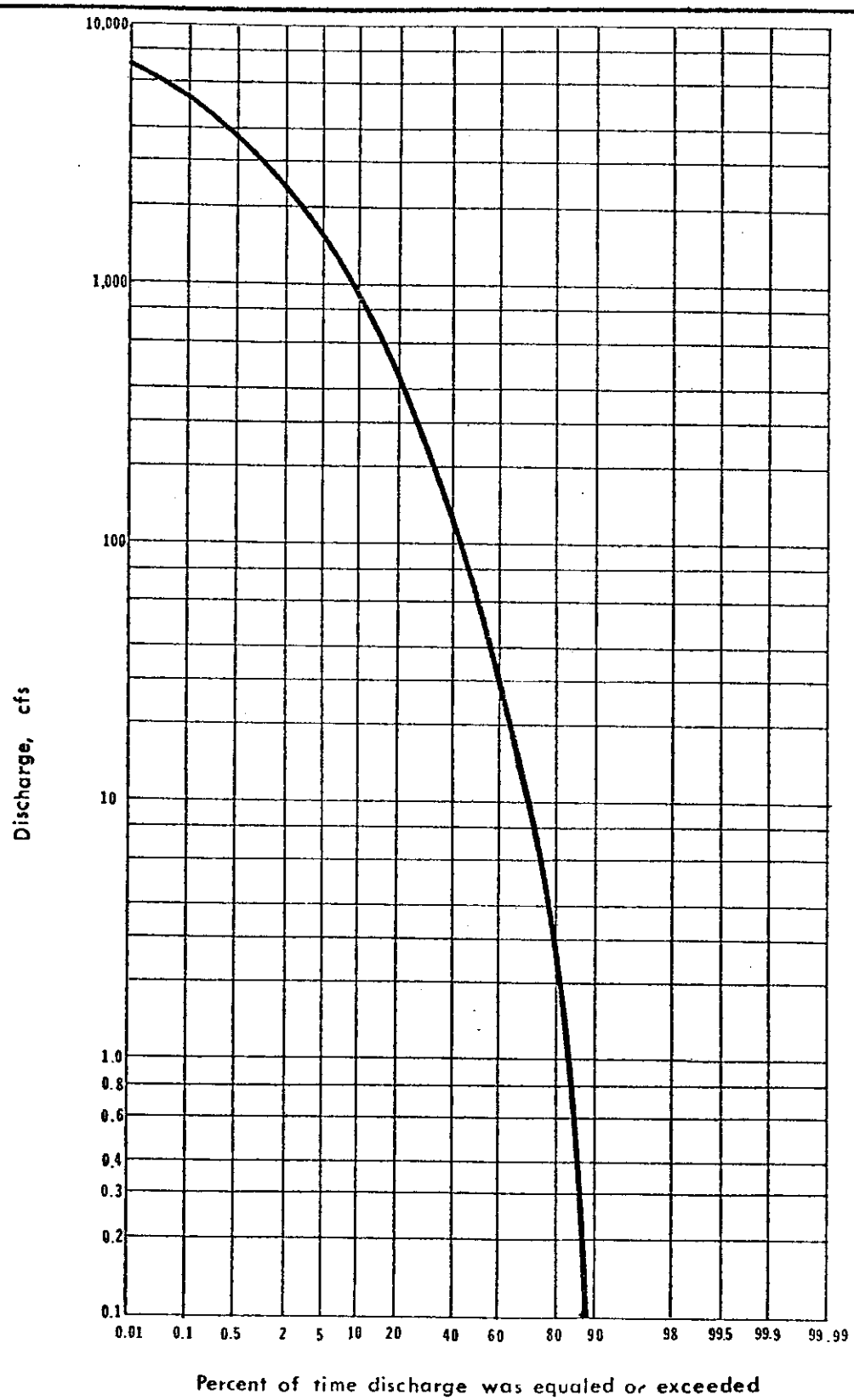


Figure 17. Flow-Duration Curve, Myakka River-1936-1964

Thus, during periods of low rainf.ll, the streamflow station located between the lakes in the State Park will record no flow conditions more often than other streams in the basin. Also, because of the through-like morphology of the Central River Sub-Basin and the relatively high drainage efficiency of the surrounding areas, this area may be susceptible to extreme high flows during the wet season.

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AQUATIC MACROINVERTEBRATES OF CHARLOTTE HARBOR AND THE MYAKKA RIVER

by

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The Florida Department of Environmental Regulation (DER) monitors two stations within the Myakka River basin--a primary station which is sampled monthly for water chemistry and quarterly for biological parameters (located on the lower river immediately upstream of Border Drive), and a station in Upper Myakka Lake which is sampled annually.

Obvious features of the Myakka River differ little from those of the adjacent Peace and Little Manatee river drainages. Tannic acids from bordering river swamps impart a tea color to the water which absorbs light and limits primary productivity. Concentrations of dissolved oxygen vary according to stream flow and season, with peak flood flows of the summer typically producing the lowest values. Other dissolved chemical species may also exhibit lowest concentrations during summer flows; however, total loading (concentration times flow) may be at peak levels. Perhaps the most unique character of the Myakka River is what has been described as "zero flow," a feature which exerts profound influence upon the stream aquatic biota.

The monitoring strategy utilized by the DER hinges upon analysis of that assemblage of aquatic macroinvertebrate organisms known as the benthic community, or "benthos." The structure and stability of this assemblage is a response to the physiochemical characteristics of the drainage basin, stream channel and water column.

Findings and Discussion

Based upon the monitoring to date, the freshwater component of the Lower Myakka River benthos is comprised of species common to the majority of southwest Florida streams. Noticeably absent, or existing in small populations, are several rheobiontic and rheophilous organisms abundant in adjacent drainages. These species are dependent upon permanently flowing water for feeding and/or respiration requirements.

A second feature of the Myakka River benthos is the large number of estuarine species that penetrate far upriver. Again, this is related to the zero flow phenomenon.

While the flow regime is of critical importance to the species composition of the benthos, at least one additional factor of biological significance differentiates the Myakka from other southwest Florida

streams: channel configuration. In many places along the lower river, the stream channel has many characteristics of an artificial canal. These include steep banks, a highly uniform bottom (often of solid limestone with little sand detrital or rubble cover), and a paucity of log snags and detrital leaf accumulations. Coupled with the flow cycle, these factors limit the diversity of microhabitats available for colonization.

The aesthetics of the Myakka River are undeniable, yet biologically the river is rather common. None of the aquatic invertebrate species encountered are unusual, rare or endangered. The benthic community can be characterized as tolerant to seasonally depressed dissolved oxygen concentrations (not necessarily of pollutional origin) and substantial periods of lentic conditions.

One might well ask the importance of maintaining the Myakka in its natural condition. Aside from its beauty and interesting hydrological and geological characteristics, the Myakka exerts an important influence upon the biological productivity of Charlotte Harbor.

Charlotte Harbor has been described as the least-disturbed of Florida's estuaries. Towards the goal of maintaining that distinction, the State has purchased the majority of wetlands bordering the harbor. This was a positive and necessary step, yet it leaves the job only half-complete. Preserving the quality, quantity and season cycle of freshwater inputs from the Peace and Myakka Rivers is equally, if not more, important, the wetland acquisition.

A short synthesis of work conducted by DER and General Development Water Quality Laboratory (GDWQL) will illustrate the importance of the freshwater flow, to which the Myakka makes a significant contribution.

Seasonally, with the heavier stream flows of the summer rainy season, the upper one-third to one-half of Charlotte Harbor undergoes density stratification wherein a flow of fresh to brackish water of riverine origin slides over a more saline (hence, denser) benthic water mass of marine or lower estuarine origin. Density differences retard mixing between the two water masses and a semi-bilayered system is produced. The area and intensity of the stratification is flow-related with the greatest river flows creating the largest area of stratification in the harbor. During stratification, the benthic water mass is isolated from atmospheric oxygen exchange as it flows upstream under the less dense surface layer. Demands upon the thusly limited dissolved oxygen content of the lower layer from respiration and decomposition results in a depression of the dissolved oxygen concentration. At times of intense stratification, oxygen levels can be very low.

Research by GDWQL has shown that both an increase in phytoplankton primary productivity of the surface layer and a migration of fish and large motile invertebrates out of the depressed oxygen areas accompany the river flow-induced stratification. Benthic studies in Charlotte Harbor conducted by DER documented a dramatic increase in population densities of infaunal macroinvertebrates within the stratified zone. The benthos is apparently physiologically adapted to exploiting the stratification-depressed dissolved oxygen phenomenon which provides

abundant food in the form of planktonic fallout from the surface layer, and an important reduction in predation. Estuarine invertebrates are typically tolerant organisms having evolved in response to a fluctuating and stressing environment. Many species have physiological mechanisms which permit the organism to respire anaerobically during periods of low oxygen availability. Shifts in the area and intensity of stratification caused by fluctuations in river flows and wind-driven turnover, which disrupts the stratification by providing a force of sufficient magnitude to mix the water column, function as relief mechanisms, whereby the benthos is periodically irrigated with oxygen-laden waters.

The net result of the biological responses to heavy river flow-stratification is an abundance of benthic infauna which serves as a food supply for shrimp, crabs and juvenile and adult fishes returning to the upper harbor following the end of the rainy season. River flows, especially peak seasonal flows, therefore, provide the driving force for a major component of the estuaries' nursery function. The extreme importance of maintaining the natural character of the Myakka and also the Peace River is thus obvious.

Alteration of river flows poses the spectre of potentially detrimental effects upon Charlotte Harbor, which is perhaps the most pristine estuary in Florida. Too often heard is the misconception that freshwater flowing to the sea is "wasted." As can be seen from the above discussion, nothing could be more erroneous. Scalping of peak flows for either domestic or industrial use needs careful and detailed study; peak flows are not necessarily excess water. Recent water shortages in southwest Florida have prompted many plans to meet the shortfall. Some provide for retentions of urban and agricultural stormwater, while others concentrate on acquisition of large blocks of freshwater wetlands. Both serve other beneficial functions such as pollution abatement, wildlife enhancement, and recreational sites.

A few individuals, however, still envision the destructive practice of stream impoundment. The artificial environment created by in-stream reservoirs is conducive to choking growths of exotic aquatic vegetation and to water quality degradation. The deterioration of Upper Myakka Lake by the combined effects of hydrilla, water hyacinths and siltation is illustrative of the types of problems that can plague impoundments in South Florida. Most recent sampling (July, 1978) of the lake station revealed extremely poor bottom conditions with little or no dissolved oxygen in the water. A total of nine dredge samples of lake sediment contained only 19 organisms of three species.

Conclusions

In conclusion, the Myakka River is an exceptionally picturesque watercourse with unusual hydrological characteristics. The indigenous macroinvertebrate fauna of the lower river is an assemblage of common, basically tolerant freshwater forms with a large component of estuarine organisms. Perhaps the most important consideration is that heavy summer freshwater flows of the combined Peace and Myakka Rivers are

inextricably linked to the continued productivity and environmental quality of Charlotte Harbor.

THE MYAKKA CORRIDOR: A VEGETATIONAL PHENOMENON

by

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Introduction and Background

In December of 1975, Mrs. Betty Rushton appeared before the Sarasota County Board of Commissioners to make a presentation dealing with the water quality of the Myakka River. As a result of her presentation, the Board voted to have the Planning Department draft an ordinance pertaining to stream protection and related regulations for the Myakka River.

At the request of the Planning Department, Julie Morris and I (working as "The Naturalists") were retained by Sarasota County to study the relationships between vegetation, soils, flooding, and other factors to develop a river protection strategy to attain the goals alluded to by the Commission and Mrs. Rushton.

Findings and Discussion

Our findings, made available to the Planning Department and others, have never been generally presented to the public (as of October, 1979). Nor has the County adopted a river protection plan. At this time, I would like to review some of our findings as they apply to the river corridor.

Initially, interest had been expressed by the planners in a river protection zone, based upon vegetation and soils that were obviously allied with the river system. The existence of "anomalous" vegetation types, such as pine flatwoods, along the river bank suggested that: a vegetationally defined corridor may not be entirely appropriate; and that accurate mapping of the vegetation along the Myakka would be needed.

Our first order of business became the preparation of vegetation maps covering roughly a third of the river (from Myakka River State Park to Charlotte County) that could be used for general planning purposes, as well as for comparison with existing soil maps.

We began by borrowing ASCS maps at a scale of 1:16,440 from our local Soil Conservation Service office. These were recent enough (1969) and small enough (about thirteen inches) to be used in the field. We protected these valuable photographs by sandwiching them between

masonite and mylar. By taping the edges of the mylar to the masonite, we created waterpoof, scratchproof containers that could receive our penciled annotations directly above the image.

Field checking involved a hyacinth-cursed three-day canoe trip from Highway 72 to south of U.S. 41. We stopped regularly to correlate changes in the imagery with on-the-ground vegetational changes.

Final maps were prepared at our local Soil Conservation Service office using 1974 ASCS imagery at 1:7920 as base maps. We utilized two additional sources of imagery in problem areas. Color (Mark Hurd) IR photos, at a scale of 1:80,000, were particularly good for identifying popash heads and other wet depressions. We also made good use of 1957 ASCS aerials at 1:7920 to trace successional trends. The finished maps were reduced to 1:20,000 so as to be comparable with the published soil survey.

In the process of mapping, we identified eight types of plant association that fell within three groups. The first group consisted of "river-independent" natural plant associations that form a matrix through which the river flows. Next, we had Man-disturbed associations that consisted of areas where the original native vegetation had been significantly modified by acts of Man. Third and finally, we had a group of three riverine corridor plant associations that were found only in association with the Myakka River and its tributaries.

The river-independent group includes the following associations: dry prairie, pine flatwoods, and flatwoods depressions--familiar plant associations found throughout the County and much of Southwest Florida.

The man-disturbed group includes Man-altered associations such as hammocks that have had their understory removed, and improved pasture. In addition, severely disturbed associations, such as dredged ponds, bare ground, and residential or recreational development were included in this group.

The river-related vegetation group includes low upriver, low downriver, and oak-cabbage palm hammock associations, each of which is described in a following paragraph.

The low upriver associations are very small in extent and may be defined as frequently flooded freshwater associations. Popash heads, mixed meadows (of buttonbush, popash, and water locust), and willow points were generally found in the more northern part of our study area near the Park. The trees of these three vegetative types "like" to have their "feet" wet by river water, pond water, or a very high water table. Willow is common on the accreting portions of the river banks and islands. Popash heads are found in ponded areas within the hammock, almost exclusively west of the river. The mixed meadows are found adjacent to the river and sometimes within the hammocks.

The low downriver associations are frequently submerged with tidal water and include the brackish marsh and mangroves. These brackish associations first appear just south of Snook Haven and increase in extent as one moves downstream. Rush, cordgrass, leather fern, and cat-

tail are common brackish marsh components. The first mangroves appear on an island about a mile north of the U.S. 41 bridge. There are relatively few mangroves along the Myakka in Sarasota County. Of these few, most are red or white mangrove.

Oak-cabbage palm hammocks first appear along the river at Myakka City. Above that point, maples, bays, and popash dominate the river tree canopy. Various mixtures of laurel oak, live oak, and cabbage palm comprise the dominant species of the various hammocks found along the river. The higher hammocks are typically dominated by live oak and frequently have an understory of saw palmetto. On lower hammock land, pure stands of laurel oak, or mixed laurel oak-cabbage palm hammocks, with a more open understory, are common. Hammocks adjacent to tidal marsh are frequently dominated by cabbage palms.

Taken together, the low upriver and downriver associations and the hammocks generally define a river corridor that must be recognized as characteristic of the Myakka, second only to the river itself. The riverine associations do not strictly define the river corridor as a result of the anomalous outcroppings of upland vegetation mentioned earlier. It became important to learn the reasons for, and the implications of, these anomalies.

Our canoe trip had revealed that these anomalous patches of vegetation were virtually always on bluffs on the east, west, or south banks of the river; furthermore, that they were always on the outside of a turn. A review of the mechanisms of the bending and looping of the river, called "meandering" (after the Maiandros River of Asia Minor), revealed that the meanders move inexorably downstream due to the increased erosion on the outside and downstream portions of the meanders. Like a whip being cracked in slow-motion, the bends of the river proceed downstream, flicking easily eroded sands away. Eventually, the Myakka may erode the remaining "spurs" of upland and meander only through the hammocks and wetlands it has already eroded and deposited at least once in the past. At the moment, however, several areas remain where the river is cutting into uplands (the anomalies) and not stream-deposited material.

The realization that these lands are relatively high and actively eroding complicates the planning strategy for the river. If one relies upon a corridor of protection, based solely on riverine vegetation or soils, then many of the most likely areas for development (and erosion) are omitted. The bluffs along the river provide an attractive view, with reduced danger of flooding, so people have sought them out as development sites. The inevitable mixture of erosion and fumblings at bank stabilization suggest that the problems inherent in attempting to develop such sites have usually not been overcome.

A more pleasing discovery was that some ranchers have left swaths or "curtains" of hammock between their agricultural operations and the river, thus preserving most riverine corridor functions with a modest loss of farmland. Among the functions of the existing riverine vegetation are its scenic/aesthetic value; its function as an actual transportation corridor for waterfowl, people, and other animals including bear and panther; shading of the river water; and filtering of runoff.

Because the river system is a complex, changing one of spur-trimming, water flow alterations, land-clearing and other dynamic actions, it became obvious to us that the vegetationally defined corridor of protection, that had originally appeared so elegent, was insufficient and overly problematic for a County solution. At the same time, it was realized tht the corridor of riverine vegetation possesses hazards so great and values so immense that it deserves protection as much as the aquatic part of the river. For, without the riverine vegetation, there would be relatively little value in "saving" the stream channel alone.

Conclusions and Recommendations

We concluded that there were three separate, but entirely compatible, strategies for maintaining, or improving, the quality of human and non-human life along the river: (1) water quality protection; (2) prevention of flood damage; and (3) preservation of natural features. Each of these has the potential to protect both the river and its corridor, but they do not yield the same results. A comprehensive program of protection for the Myakka River would, therefore, likely contain all three.

Water quality protection is aimed at maintaining, or improving, the quality of the water in the stream channel and tributaries. It involves regulations extending through the watershed and directly protects the corridor in that most water quality ordinances include buffer zones along waterways that prohibit clearing and reduce potential pollution sources. This feature is a recognition of the importance of river corridor vegetation to the health of the waterway.

Ordinances designed to prevent flood damages can rely upon various combinations of keeping houses, fill, and polluting materials out of the flood zone and permitting such uses under strict guidelines. There is great potential for protecting the riverine corridor as floodway in such ordinances.

It is difficult to preserve natural features, such as the scenic beauty of the riverine corridor, purely by ordinance. Education and purchase are frequently more realistic. Easements and tax incentives are also possibilities. We recommend that the attitudes of riverfront owners be solicited and that additional, more stringent, standards be set for septic tank permitting along the river.

Finally, we found that the riverine vegetational corridor of the Myakka must be considered, and included, in any realistic Myakka protection plan. The public perception and management of the river starts with a concern for the water in the river as a detached entity and must necessarily spread through the riverine corridor, ultimately, to the whole watershed.

WILDLIFE OF THE MYAKKA RIVER VALLEY

by

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Introduction and Background

Because the aquatic and wetland biotas are intimately linked to that of the uplands, I think that from the standpoint of the wildlife resources of the Myakka River area, the scope of consideration should be the entire basin as a single, interacting system.

The Myakka River basin is characterized by a relatively impressive assemblage of wildlife species. Although the region is not identified as a major biogeographic area like the Lake Wales Ridge or the Appalachicola Bluffs, it is, nevertheless, an interesting wildlife area. I think that, at least, three factors contribute to this. First of all, the geological and climatic history of the area, which have been discussed earlier, have produced a variety of topographic conditions and soils which have favored the development of a wide range of wildlife habitats. For the basin as a whole, at least eight major natural terrestrial vegetation types can be recognized, and these can be further subdivided without much difficulty into at least eighteen subtypes. The four major aquatic habitats in the area (i.e., the river itself, small tributaries, ponds of various sizes, and lakes) can, in turn, be subdivided into a variety of lesser habitat types. Such environmental diversity, of course, favors wildlife. In addition, the geographic location of the Myakka River Valley is in the area of transition between the more temperate northern peninsular area and the more subtropical southern end of the State. Therefore, species or subspecies of northern and southern affinities can both occur in the region. The third, and most important, reason why the Myakka basin has such relatively rich and diverse wildlife resources is the fact that, by some stroke of good fortune, it has thus far escaped some of the intensive development pressures that have affected many other parts of Florida.

In my discussion, I will confine myself to one particular group of wildlife species, the vertebrates. In so doing, I realize, I will be leaving out most of the majority of the region's species, which are invertebrates. Rick Cantrell has, however, talked about some of the aquatic invertebrates of the area. Even by restricting my coverage to the vertebrates, however, I can only hit the high points.

Knowledge of the vertebrate animals of the Myakka River Valley is relatively good as far as knowing what species are there, their broad environmental requirements, and their general population status are concerned. However, such details as specific habitat requirements, actual densities, and where the population concentrations are located, specific

breeding requirements, and so forth--the type of data we really need for in-depth planning for management of an area in terms of wildlife--are largely lacking.

There are several major sources of information on the wildlife of the Myakka River Valley area. One of the most important is the checklist of the vertebrates of the Myakka River State Park prepared by Ken Alvarez. This is probably the best single source of information available for the area. It lists species that occur in the Park and gives brief, but useful, descriptions of the habitat requirements and some indication of population status.

Another useful data source for the area is a progress report on the Myakka River State Park, with preliminary checklists of the vertebrate fauna, that was done in 1941 by George Van Dyne. This is an interesting document, in that you can compare his comments on the relative abundance of various species with the more recent checklist (published in 1976) to get at least some "ballpark" ideas as to the long-term trends in their populations.

Phillips Petroleum Company's Development of Regional Impact application, prepared in 1975, covers a portion of the eastern part of the Myakka River Valley and contains some original data, including habitat and population information, on vertebrate species occurring in that area.

In 1977 my organization, the Archbold Biological Station, compiled for the U.S. Fish and Wildlife Service all available information on the vertebrates of the seven-county area included in the central Florida phosphate industry environmental impact study conducted by the U.S. Environmental Protection Agency. As part of this study, we accumulated much information on the vertebrates of the Myakka Valley area.

In addition to the general sources just mentioned, there are a few studies or data sources for particular taxonomic groups of vertebrates. Wang and Rainey of the Mote Marine Laboratory studied the fishes of Charlotte Harbor. This work provides information on the fishes occurring in the vicinity of the mouth of the Myakka, and also gives some information on freshwater species which come down into the lower reaches of the river.

As far as the birds are concerned, this is the one group where data are available that can be used to provide some quantitative indication of trends in populations. In two areas within the Myakka River Valley region, Christmas bird counts have been carried out for a number of years. The Myakka River count has been made in most years since about 1947. One generally used method to provide a semi-quantitative index of abundance, based on Christmas count data, is to express the number of individuals of different species seen as individuals per ten party hours. The U.S. Fish and Wildlife Service also directs breeding bird counts in different parts of the United States, and two of the breeding bird counts in Florida include northern and northeastern parts of the Myakka River Valley. A report in 1942 prepared by Oscar Baynard on the birds of the Myakka River State Park is also a valuable source of historical information on bird populations in the area.

Fish and Wildlife in the Valley

I would like to review briefly the number of species in different groups of vertebrates occurring in the Valley and then make some general comments on trends within each group.

A total of 362 species of fishes, amphibians, reptiles, birds, and mammals has been recorded from the Myakka River Valley, including the entire basin. This is 56% of the vertebrate species total known from the entire seven-county area mentioned earlier (i.e., from DeSoto, Charlotte, Hardee, Hillsborough, Polk, Manatee, and Sarasota counties). Based on what is known about habitat requirements and distribution of vertebrates in Florida, we might expect up to 50 to 55 additional species to be eventually recorded in the Myakka River area. Thus we potentially have 460 or so vertebrate species that could occur in this region. This figure does not include marine fishes which might wander upstream in the lower Myakka. The number does, of course, include many species (especially birds) for which few records exist and which are just stragglers or accidental in the area.

Fourteen percent of the known vertebrates are fishes; 49 species, not including marine species, have been recorded from the Myakka River alone. The Myakka fish fauna is characterized by an abundance of sun fishes (Centrarchidae) and top minnows (Cyprinodontidae). There are, however, four species of shiners (genus Notropis), that are associated with relatively clear high-quality water, that exist in the Myakka. This genus of minnows is very common in the northern United States, but becomes scarcer in southern peninsular Florida. One of the species of the genus (the sailfin shiner, N. hypselopterus) apparently reaches the southern limit of its range in the Myakka River. It is interesting to note that there are no--as far as we know--established exotic fish in the Myakka River. In fact, there are relatively few exotic vertebrates established in the Myakka River Valley at all. However, I did learn yesterday from Dr. Walker Courteney, who is an authority on exotic fishes in Florida, that the walking catfish is apparently expanding its range significantly from the Ruskin area where it was separately introduced. Thus, this species may eventually show up in the Myakka.

Twenty species of amphibian (salamanders, frogs, and toads) are recorded from the area, and at least one additional species probably occurs, making a total of about 21 species. Salamanders are relatively scarce this far south, and the predominant amphibians are the tree frogs, ranid frogs (genus Rana), and true toads. At most, only one exotic amphibian is established.

Thirty-three species of reptile have been recorded from the Myakka Valley, and 14 others possibly occur, giving a potential total of 47 species in the area. The reptile fauna includes one native crocodilian, the alligator (the American crocodile has been reported from the area, but this record almost certainly represents an escapee); seven species of turtle; five lizards; and 19 snakes. No exotic reptiles are known to be established, although I suspect that there may be a colony of the introduced anole, Anolis sagrei, somewhere in the region. Two species of reptiles, the southern hognose snake and the pinewoods snake, reach

the southern limit of their distribution in the Myakka River Valley area. One significant feature of the reptile fauna of the Myakka River Valley is that it lacks most of the species that are closely associated with the well-drained, sandy soils with scrub vegetation that are so characteristic of the Lake Wales Ridge section of the State. Since such habitats, although very restricted, do occur in the Myakka Valley, some of these species may turn up in the region in the future.

Birds make up the lion's share of the vertebrate fauna of the area, as you might expect. About 228 species of bird have been recorded from the Myakka River Valley, and at least 33 others conceivably could occur there, giving a potential total of about 261 species. As far as the bird species composition is concerned, there is a relatively high proportion of wetland species--waders and waterfowl. At least three breeding rookeries of wading birds are known in the region. The best-established one (at least of those most recently active) is in the lower reaches of the Myakka River, in Charlotte Harbor. The Myakka Valley is the southernmost known locality of the white-breasted nuthatch. The peninsular Florida race of the red-shouldered hawk (a well-marked form with an almost white head) was originally described from the Myakka River Valley--"Old Miakka" is the type locality of this distinctive race. Unlike Miami, there are not a lot of strange parrots and other tropical birds flying around the Myakka Valley. The only two established exotics, which have been here so long that we tend to consider them part of the picture now, are the house sparrow and the starling. As an example of how people may be biased in their reporting of wildlife species, in our study we could find detailed records of rare birds--such as the Everglade kite--that have shown up in the seven-county region; but we could not locate a single record of a house sparrow from Charlotte County: we had to call somebody in the county and ask them to look out the window and report a house sparrow for us.

Mammals comprise about nine percent of the vertebrates of the region. The occurrence of 32 species is documented, and six others possibly occur there, bringing the potential total to about 38. There are relatively few bats reported from the Myakka River Valley, which resembles the picture in South Florida, where bats become very scarce compared to the northern part of the State. Some of the rodents, such as the old field mouse, Florida mouse, and southeastern pocket gopher, that are so typical of sandy soils, are absent, reflecting the scarcity of such habitats. Four established exotic mammals in the region include the black rat, house mouse, nine-banded armadillo, and wild hog.

Rare and Endangered Species

A number of the vertebrates of the region are regarded as rare or endangered. This is a group that should be emphasized in an evaluation of the status of the wildlife in a region, as such species are usually specialized for specific environmental conditions and are easily disturbed by man-related activities. Because of this, they serve as sensitive indicators for monitoring the health of a natural environment. There are 51 vertebrate species from the Myakka River Valley that are

included on some list as "endangered," "threatened," "rare," "species of special concern," or "species of undetermined status." The latter category is used where there is evidence that a species is under some threat but there is not enough information available to assign it to one of the other categories.

The three lists that are primarily referred to in Florida are: (1) the federal list developed by the Department of the Interior, (2) the official State list under the jurisdiction of the Florida Game and Fresh Water Fish Commission, and (3) the list promulgated by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA). The FCREPA list is the most comprehensive in that it recognizes more status categories and includes both animals and plants. In addition to the species that are on one or more of the three lists, 22 species of birds known from the region are included on the most recent Blue List of the National Audubon Society. The purpose of the Blue List is to identify species that seem to be declining and that, although in critical shape as yet, bear watching.

Let me quickly mention the species found in the region that are included in the endangered and threatened categories, which are the most critical. I will only mention species that appear to exist in the area in significant numbers.

As far as the fishes are concerned, none of the fishes of the Myakka River are presently considered endangered or threatened.

The one species of amphibian listed in either category is the Florida gopher frog, which is considered threatened on the State list. This species is intimately associated with the gopher tortoise. It lives in the burrows of the tortoise and apparently cannot survive without them. It is therefore associated with well-drained sandy soils, sand ridges, sand pine scrub, and sand hill vegetation. These habitats are relatively scarce in the Myakka River Valley area and are usually fairly small in area and isolated. The Florida gopher frog in this region is thus rare and locally distributed.

There are three species of reptile in the threatened or endangered categories. One of these is the alligator, which is considered threatened on the federal and State lists. Some populations outside Florida and Louisiana are still classified as endangered. I do not think that there is any question that the alligator population seems to be holding its own and perhaps increasing at the present time. However, this situation may not continue if we get around to legalizing alligator products again in Florida, as some would have us do. Certainly, the alligator now is a relatively common species throughout the Myakka River Valley. The second listed reptile is the gopher tortoise, considered threatened at the State level. It is a burrowing form that requires fairly well-drained habitats and is relatively rare in the Myakka River Valley area--although it may be locally common in preferred habitats. You might be interested in the overall population estimates of this species in Manatee and Sarasota counties. In 1973, Dr. Walter Auffenberg, of the Florida State Museum, estimated that about a thousand gopher tortoises were found in the two counties, with the populations in these counties, as in the State as a whole, showing a steady decline. There

is now pressure to remove the gopher tortoise from the threatened list so it can continue to be taken for food. At the present time, although listed as threatened, the animals can still be captured for personal consumption. The third reptile species in the endangered or threatened cateogories is the eastern indigo snake, which is included on both federal and State lists as threatened. One of the main reasons for the decline of the indigo snake has been its exploitation for the pet trade.

Among the birds are nine species in the Myakka River Valley area that have endangered or threatened status. The wood stork is listed as endangered on the State lists and there is interest in adding it to the federal list. Wood stork populations have shown a long-term Statewide decline. The decline is linked to the loss of wetlands. This species requires habitats with proper fluctuation of water levels for feeding. The Myakka River Valley area and the surrounding central Florida region provide important feeding areas for wood storks, although I do not believe there are any known nesting colonies in the Myakka River Valley at present.

The bald eagle, regarded as endangered on the federal list and threatened on the State list, is a relatively frequent visitor to the Valley, but we have records of only one probable nest site. The State population of bald eagles is now estimated at about 500 pairs.

The osprey, or fish hawk, is listed as threatened on the State lists. Ospreys are relatively frequent in the Myakka River Valley area, with apparently at least two nests in Myakka River State Park. The species also nests in the Charlotte Harbor area. There is a need for more detailed data on the status of this species in the Myakka Valley.

Aubudon's caracara, a bird I have been interested in for a number of years, is listed as threatened at the State level. This is a bird that belongs to the falcon family, but has a vulture-like tendency to eat carrion, as well as some structural features that go along with this habit. It prefers open areas, with scattered, single or groups of trees. It usually nests in cabbage palms. It does a lot of scavenging but also frequently captures its food live as well. We know of a minimum of about four established pairs in the Myakka River Valley, and there are at least 100 active territories in the entire State at the present time. It is possible that the caracara was once more abundant in the Myakka River Valley than now. Perhaps in earlier times there was more frequent burning of the woodlands in the area and thus more open habitats of the type preferred by this species.

Another bird of prey that is on the State threatened list and which occurs in the Myakka River Valley area is the southeastern kestrel. This is the race of the American kestrel found from southern Georgia, South Carolina, and Alabama southward through the Florida peninsula. The Florida population of this race has declined in the past ten or fifteen years. It has now disappeared from the Miami region and is scarce or gone from the Lakeland region. Habitat changes, including the loss of mature pine lands with old stubs that are used as nest sites, are probably responsible. The southeastern kestrel is relatively rare in the Myakka River Valley at the present time, although during the 1940s it was common. Northern kestrels are abundant in the region during winter.

The Florida sandhill crane, which is regarded as threatened on the State list, has a Statewide population estimated between 3000 and 6000. This bird is relatively common in the Myakka River Valley area. I think there is a significant breeding population in this region. It generally requires standing water for nesting, so marshes are important to its existence. Improved pastures apparently provide adequate foraging, but the availability of marshes with suitable water levels for nesting is becoming an increasingly critical concern. During the winter months, another race of sandhill crane, the greater sandhill, is also found in the area. These northern birds do not appear to be common in the Myakka River Valley.

The red-cockaded woodpecker, which is considered endangered on both the federal and State lists, may occur in the Myakka River Valley but there are no good data on its status in the region. Suitable habitats occur in the Myakka River Valley, but, to my knowledge, they have not been thoroughly surveyed. This species is dependent upon pine trees infected by redheart disease, which softens the wood so that the woodpecker can dig a hole in the live tree for nesting.

The Florida scrub jay, which is regarded as threatened on the State list, is associated almost exclusively with sand pine scrub or other scrubby habitat types. It appears to be rare in the Myakka River Valley area. There are some scrubs in the region that appear to have all the components of good scrub jay habitat but do not appear to have scrub jays. I do not believe that these isolated scrubs in the Myakka River Valley area have been thoroughly surveyed, so there is some question about the actual status of the scrub jay population.

Four mammals in the threatened or endangered categories occur in the area. Sherman's fox squirrel, considered threatened at the State level, is a species of pine flatwoods which are periodically burned. It is also found in open oak hammocks or pasture areas with scattered oaks or pines. It is relatively rare in the Myakka River Valley area.

The Florida black bear, considered threatened on the State list, appears to be rare in the Myakka River Valley area, although there have been recent sightings from the vicinity of Old Miakka; and a map prepared by the Game and Fresh Water Fish Commission some years ago shows part of the Myakka River Valley as one of the principal population centers in the State. The Statewide population of this species is probably less than 500 at the present time.

The Florida panther is listed as endangered on both federal and State lists. The status of this cat in Florida is quite controversial, and estimates of numbers range from 20 to 300. Much of the difference of opinion concerns the weight to be given to reports of sightings without actual physical evidence to back them up. Using the most conservative evidence--casts or photographs of tracks or actual specimens killed--we know of established populations in the Fahkahatchee Strand-Big Cypress area and Everglades National Park. However, there are many sightings, a number of which are accompanied by good descriptions or were made by qualified observers, from the Myakka River Valley area. My personal opinion is that there is an established panther population in this region, but incontrovertible proof is still needed. How many there

are is another question. The panther is an example of the difficulty of separating the river and the uplands when talking about wildlife. The bulk of the sightings from the Myakka River Valley area are located close to the river, especially in the upper regions, where the tributaries are lined with swamp forest. Our impression, subject to confirmation by actual studies at some future date, is that panthers probably use the wooded water courses as travel ways from one area of their range to another. Therefore, they are closely tied in with the river system.

The last of the mammal species that concern us here is the West Indian manatee, which is considered endangered on both the federal and State lists. Manatees occur in the lower portion of the Myakka River. That portion of the river from the southern boundary of Myakka River State Park to Charlotte Harbor is included in the "critical habitat" area of the species as designated by the Department of the Interior. The total State population now is variously estimated at from 750 to 1000. A significant number of manatees appear to utilize the lower Myakka habitats.

What the Future Will Bring

I believe that the future welfare of the wildlife resources of the Myakka River Valley will depend upon how well the integrity of all natural habitats in the Valley can be maintained. We cannot simply concentrate efforts on preserving the river corridor and forget about what's going on in the uplands. Despite our best efforts to protect the Valley, I think that a long-term reduction in the diversity and abundance of wildlife in the Myakka River area is inevitable. The causes of this decline will come from several sources. One source is more intensive agriculture, that will turn more natural or semi-natural areas into improved pastures, citrus groves, or croplands. Another is expansion of phosphate mining. This seems certain to have a major impact on native biota and, I believe regardless of how careful we are in regulating pollution from mines and so forth, there is inevitably going to be loss and deterioration of habitat from direct and indirect effects of mining. Finally, it will be very difficult, if not impossible, to stem the growth in the human population of the region. Every time I come to Sarasota, there are houses in areas where there were none before. Thus, it looks like growth, no matter how carefully you attempt to regulate it, is going to continue to encroach upon remaining natural habitats.

Recommendations

Regarding critical habitat types in the Myakka Valley, it seems to me that particular efforts should be made to preserve wetlands--swamps, marshes, and wet prairies--in which many of the characteristic vertebrate species of the region are found and also xeric scrub and woodland habitats with which so many of the unique Florida wildlife species are associated.

MYAKKA RIVER STATE PARK AND ITS IMPORTANCE TO THE MYAKKA RIVER SYSTEM

by

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Introduction and Background

Florida's State park system originated during the Great Depression. The Civilian Conservation Corps was one of the government projects designed to provide employment. The idea was to provide young men with work in national and state parks and forests. At that time, the State of Florida had no parks or forests, so the State Legislature got busy and created some.

Originally, there were four State parks: Myakka River, Highlands Hammock, O'Leno, and Florida Caverns. The model for a park system at that time was the National Park System, which set aside some of the most scenic parts of the country for public recreation. The Florida State Park System was based on the same objective, but was carried out on a smaller scale. Myakka was selected as a park because of its exceptional natural beauty. It pre-sented scenic vistas of expansive marshes and oak/palm hammocks, and exceptionally fine displays of native wildlife. One of the early reports indicated that it was one of the finest wading bird sanctuaries in the eastern United States. Large numbers of waterfowl were present, especially during the winter. So the above four parks were initially selected; subsequently, the State Park System has grown to 123 units.

Problems in the Park Lakes

Today, although the park has several serious problems, the most severe of these is the result of the introduction of an exotic water weed called hydrilla. Hydrilla probably originated somewhere in East Africa and was brought into the United States for use in aquaria. The plant was first recorded in Florida around 1950. Since that time, it spread dramatically and now poses a serious threat to Florida's aquatic systems. Some lakes, like Orange Lake in Marion and Alachua counties and Lake Jackson in Leon County, are good examples of the rapid takeover of a lake by hydrilla. There, it was observed to cover up to 5000 acres in a single growing season. Within three years, the lakes were filled with this exotic waterweed.

Hydrilla evolved in tropical regions of the world in intense competition with other plants. It evolved many mechanisms to compete suc-

cessfully with these plants. For instance, it can photosynthesize in one candlepower of light--about what is created on a light moonlit night! This enables it to grow in the depths of dark, tanin-stained water. If the body of water that it grows in should dry up, it will respond by producing little structures called turions, that will produce a new plant when the water returns. Hydrilla is quite widespread and has become a disaster for the entire State of Florida.

In the halcyon, pre-hydrilla days at Myakka River State Park, the Civilian Conservation Corps built a spillway at the point where the Upper Myakka Lake empties into the Myakka River. The purpose was to maintain a point below which the level of the lake would not fall. At that time, it was considered a logical thing to do, since the lake had a tendency to partially dry up during the winter-spring dry season. This structure would obviously facilitate recreational activities in the lake by maintaining a stable water level.

Since those Depression days, we have learned a great deal about reservoirs and the problems they may create. Another problem, in addition to exotic weeds, is siltation. Suspended particles, carried along by rivers, tend to sink to the bottom of the reservoir when the river enters it and the velocity of the water decreases. The filling in of a reservoir by siltation, however, is a very slow process. A more rapid development is the build-up of organic sediments in the lake bottom. With the long growing season in Florida, and the shallow lakes at Myakka River State Park (allowing sunlight to penetrate to or near the bottom), aquatic plant growth is rapid. When the plants die, they sink to the bottom, creating an organic bottom sediment that makes it difficult for fish to spawn. Freshwater fishing has been a highly valued traditional use of the lakes at Myakka. The stabilization of water levels in the lake and the subsequent build-up of organic matter has caused this use to decline. As mentioned above, the park has long been valued as a waterfowl refuge and has attracted large numbers of birders over the years. As the organic matter has accumulated, the diversity of aquatic plants has declined, also affecting the wintering populations of waterfowl that depend on these plants for food.

Management and Results

To alleviate these problems, we altered the water control structure in 1974. Culverts and flashboards were installed with the idea of returning the system to a natural seasonally fluctuating water level. The results were both good and bad. The good was that bottom sediments were exposed and oxidized. The waterfowl populations then improved as indicated by the Audubon Christmas bird counts since 1974. Fish populations also improved. A bass fishing contest in 1977 yielded some impressive results--the winning angler caught 24 pounds of bass, and the person in second place wasn't far behind. The "bad" resulted from the fact that hydrilla was coincidentally introduced into the lake the year that we started the drawdown, and soon filled it completely just as it had done in many other Florida lakes.

So, while we had some success in restoring the biological health of the lake by implementing a drawdown, we simultaneously suffered a severe setback with the introduction of hydrilla--a setback that could ultimately undermine all our efforts. At the present time (1979), we are continuing the drawdown and maintaining some control around the lake edge where the bottom is exposed, but that's about all. The center of the lake remains filled with hydrilla.

The drawdown itself is a problematical tool. It is dependent on "normal" weather conditions. The idea is that the gates will be opened during the dry season for the water to run out of the lake. If the dry season is not dry during a particular year (and it frequently isn't), then there is no drawdown.

The layman will ask, "Why don't you get a mechanical harvester?" The answer is that most noxious aquatic weeds grow faster than they can be harvested; and by fragmenting the plants, the harvester may actually increase the rate of spread.

So what is the outlook for the future? What tools do we have at our disposal to deal with this problem? A traditional approach is to contract local scientists to search for host-specific organisms or pathogens that will attack the introduced exotic weed. This involves a long period of quarantine and testing to ensure that whatever is introduced won't create more problems than it solves. The problems with this biological approach are primarily: monetary (it is very expensive and will be more so in the future); and public opposition. Because of the frequent problems caused by exotics, people are often opposed to additional introductions.

In considering a solution to the exotic waterweed problem, it may be most realistic to first consider what is available at the present. The methods presently available in addition to (physical) drawdown, are chemical and biological. The chemical approach would be to treat portions of the lake bottom with a soil sterilent to prevent the growth of hydrilla. A possible biological control is the Asian grass carp, a vegetation-eating fish that was introduced to control waterweeds. However, the grass carp has created a storm of controversy and many people are strongly opposed to its introduction. Its future role in the control of waterweeds, at this time, is uncertain.

At the present time, the drawdown provides a measure of control over hydrilla. However, it is doubtful that this will provide a long-term solution.

Additional and Potential Problems

In addition to hydrilla, there are other potential problems for the park. The proposed phosphate mining operation upstream is a cause for concern. A phosphate spill from a retaining pond could be a disaster for the aquatic wildlife in the park. Nutrient runoff from cattle pastures upstream may increase the growth of aquatic waterweeds and also

constitute a problem. Damming projects, such as the one that occurred in Tatum Sawgrass a few years ago, reduce the capacity of such areas to store floodwaters and increase the intensity of flooding downstream.

Discussion

A meeting like this is very encouraging. It is an attempt to look at the entire Myakka River System, in order to determine its value to us and to try to determine how those values can be preserved. What might happen in this watershed in the next thirty-five years? How will it affect us and those who will live here after us? Can these changes be directed so that the values will be preserved? Can some of the proposed changes be prevented? If so, how?

SUCCESSIONAL SURVEY OF THE FIRE CLIMAX COMMUNITIES OF MYAKKA RIVER STATE PARK

by
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(IN PREPARATION)

WORKSHOP: IDENTIFICATION OF THE RIVER'S PROBLEMS AND NEEDS

Jonathan Miller, Moderator

Note: The questionnaire on the following page was distributed to the Workshop attendants, filled out, collected, analyzed, and the results are forthcoming.

MYAKKA RIVER WORKSHOP

1. Why are you interested in the river?

2. List the most important problems you feel the river faces.

CLOSING REMARKS

by
Jack Whelan, Chairman
Myakka River Coalition

(TO BE COMPLETED AFTER
TEXT IS IN FINAL FORM)

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