

1. Introduction

The Charlotte Harbor National Estuary Program (Charlotte Harbor NEP) process involves the completion of four major elements:

- establishment of the Management Conference,
- characterization of the estuary and its watersheds (Synthesis of Existing Information),
- development of the Comprehensive Conservation and Management Plan (CCMP), and
- implementation of the CCMP.

1.1 Management Conference

The Management Conference is the decision-making framework for carrying out the NEP process. The members of the Management Conference work together in partnership to develop, through consensus, a master plan for the estuary called the CCMP. After the NEP has developed and adopted the CCMP, the CCMP is supported and carried out under state and local auspices. Essentially the members of the Conference identify major and significant potential problems (if any) in their estuaries, decide where to focus corrective actions, and agree to specific political, financial, and institutional commitments. Figure 1-1 illustrates the agencies, organizations, and interested parties, including the committees of the Management Conference, who provide critical input to, and review of, the CCMP.

The **Management Conference** is composed of a Policy Committee, a Management Committee, a Technical Advisory Committee (TAC), and a Citizen Advisory Committee (CAC). Through its committee structure and public outreach efforts, the Conference provides a forum for collaborative decision-making and consensus building around often conflicting issues.

The **Policy Committee** is composed of key officials (mayors, county commissioners, agency chiefs, etc.) or their designees, who help provide the resources to support the Management Conference. This committee makes the final decisions after considering the needs of the estuary ecosystem, the cost and benefits of restoration and protection strategies, and the value the community may be placing on the estuary.

CHARLOTTE HARBOR NATIONAL ESTUARY PROGRAM PROCESS

NEP MANAGEMENT CONFERENCE PARTICIPANTS

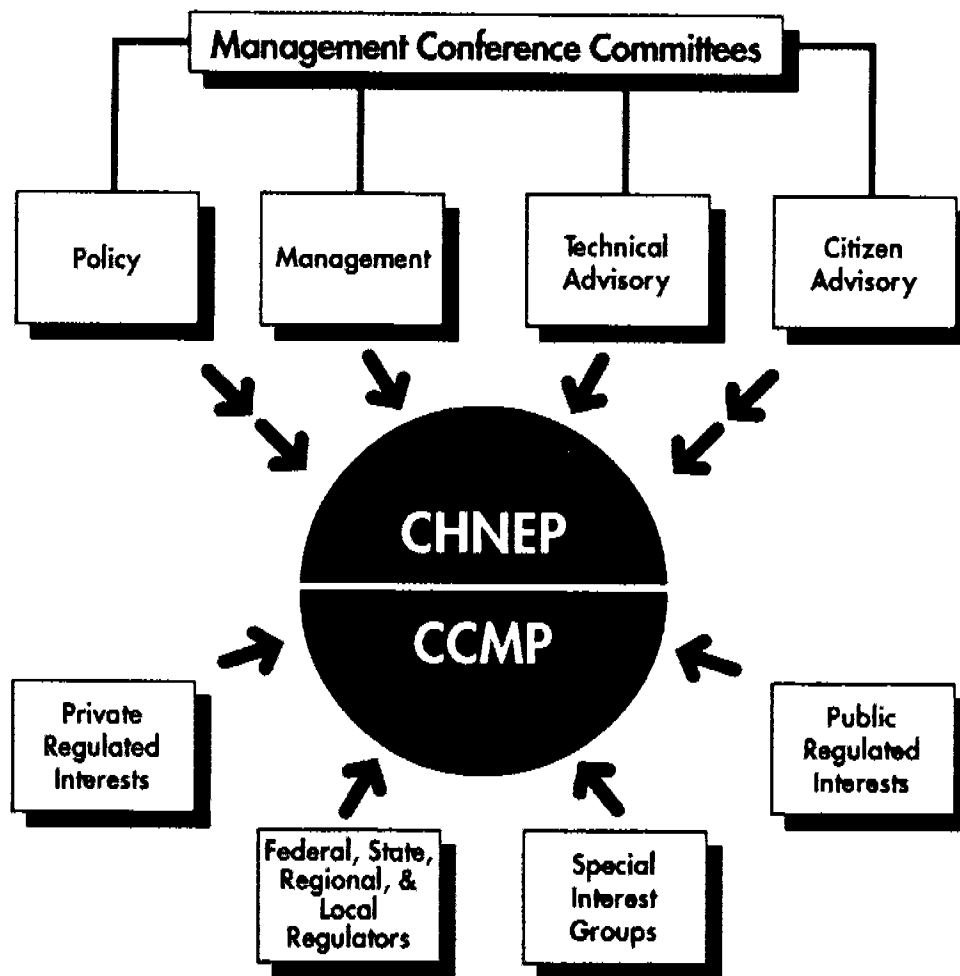


Figure 1-1. Organization of agencies, organizations, and interested parties, including the committees of the Management Conference, who provide critical input to, and review of, the CCMP.

The **Management Committee** is composed of local, regional, state, and federal agency managers who have environmental resource management responsibilities in the designated area of the estuary program. Through this committee, the Conference builds its support base from the key government agencies responsible for estuary-related activities which include: agricultural management, land use planning, fish and wildlife management, water management, and sewage treatment. Agencies represented on this committee also have potential CCMP implementation responsibilities, thus their input is crucial during the early development of the CCMP.

The **Technical Advisory Committee** is composed of interested technical experts working in, and with responsibility for, estuarine- and watershed-related scientific issues and projects in the NEP study area. Membership includes local scientists from both private and public sector organizations, and qualified individuals. This committee provides a forum to discuss and develop technical issues from the characterization of the system and the identification of priority problems, to the development of the most feasible and cost-effective management actions appropriate for implementation of the CCMP.

The **Citizen Advisory Committee** includes a representative cross-section of the general public living in the NEP study area. Members include representatives of major businesses, industries and their associations; environmental and civic groups; farmer and fishing groups; educators and other affected and/or interested citizens. This committee serves to inform the Conference of the concerns of the people living in the watersheds of the NEP and is instrumental in the dissemination of the plans and results of the NEP program.

A major responsibility of the committees comprising the Management Conference, therefore, is to build public support and political cooperation needed to complete a series of tasks leading to the development and implementation of the CCMP. Other interested entities will also provide input into the development of the CCMP.

1.2 Synthesis of Existing Information

The following document comprises the characterization element of the NEP process. This Synthesis of Existing Information is a critical step in providing an analysis and characterization of information in a form that will provide an appropriate foundation for the CCMP development process. The information contained within this document, when combined with other elements of the Charlotte Harbor NEP process (e.g., Compendium of Monitoring Programs, Base Program Analysis and Data Management Strategy), will provide the base information from which the CCMP will be developed.

In compiling and analyzing the information contained within this Synthesis of Existing Information document, the focus has been to establish the existing background information necessary to address

the three Priority Problems that have been identified as having the greatest potential for degrading the Charlotte Harbor system. These problems are:

- 1) **Hydrologic Alterations** - adverse changes to amounts, locations, and timing of freshwater flows, hydrologic function of floodplain systems, and natural river flows.
- 2) **Water Quality Degradation** - including but not limited to pollution from agricultural and urban runoff, point source discharges, septic tank system loadings, atmospheric deposition, and groundwater.
- 3) **Fish and Wildlife Habitat Loss** - degradation and elimination of headwater streams and other habitats caused by development, conversion of natural shorelines, cumulative impacts of docks and boats, invasion of exotic species, and cumulative and future impacts.

The CHNEP study area encompasses over 4,500 square miles along the southwest coast of Florida (Figure 1-2), and covers eight distinct sub-areas, or major basins, based on hydrologic, ecologic, and management characteristics (State of Florida, 1995). These previously identified basins include:

- Peace River,
- Myakka River,
- Coastal Venice,
- Charlotte Harbor Proper,
- Lemon Bay/Gasparilla Sound/Cape Haze Complex,
- Pine Island Sound/ Matlacha Pass,
- Tidal Caloosahatchee River, and
- Estero Bay.

Addressing elements of the three identified Priority Problems as they relate to each of these major basins will be a primary focus in development of the Charlotte Harbor NEP CCMP. To accomplish this, the following Synthesis of Existing Information seeks to:

- identify and compile relevant sources of information;
- to assess trends in the estuary's water quality, natural resources, and uses;
- to assess pollution loadings to the estuary and relate them to observed changes in water quality, natural resources, and land use; and
- to identify potential environmental problems.

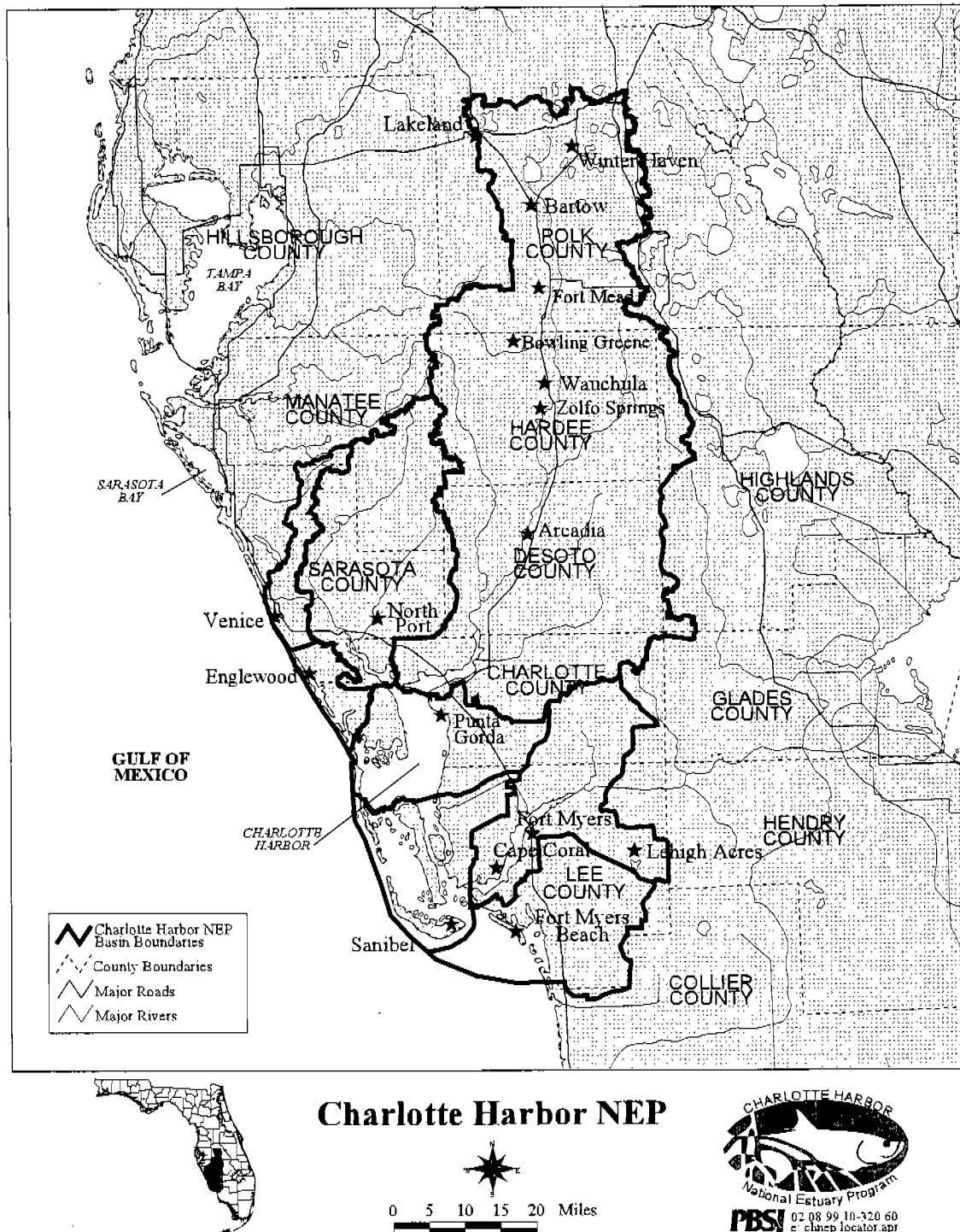


Figure 1-2. Charlotte Harbor NEP study area.

2. Myakka River Basin

This chapter presents a compilation and synthesis of information regarding the Myakka River Basin portion of the Charlotte Harbor NEP area (Figure 2-1). The following sections provide:

- a characterization of the physical setting, including topographic, geologic, soils, and land use descriptions of the basin;
- a review of the rainfall and hydrologic characteristics of the basin;
- a review of the water management practices and water uses within the basin;
- a summary of current and historical water quality conditions; and
- an estimation of pollution potential from nonpoint and point sources within the basin.

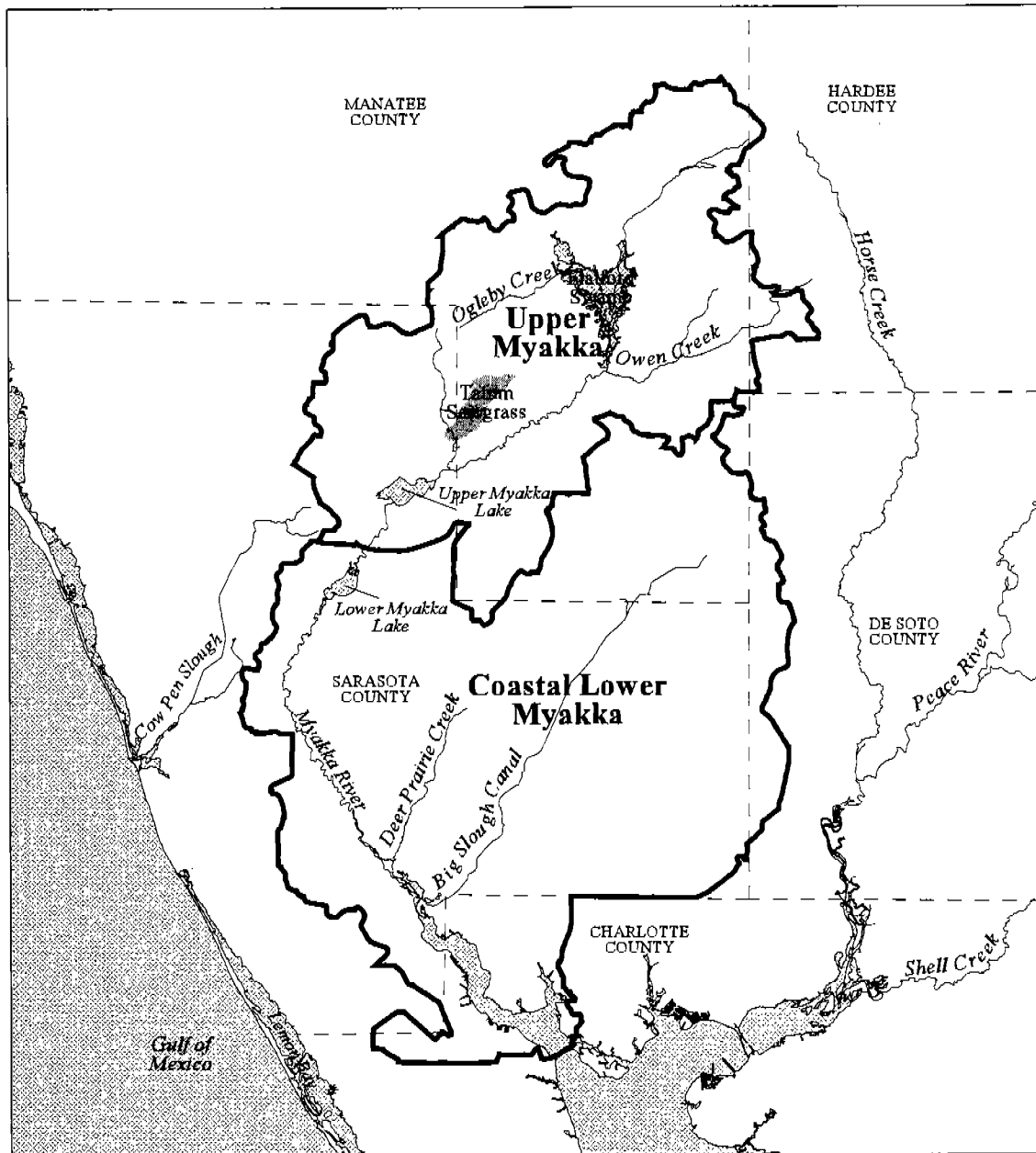
2.1 Physical Setting

The Myakka River Basin is located in the northwestern portion of the Charlotte Harbor NEP study area, with the Peace River to the east, the Manatee River to the north, Charlotte Harbor to the south, and a number of smaller coastal streams to the west. The headwaters of the river are in eastern Manatee County near Myakka Head, and the river flows in a southerly direction through Manatee, Sarasota, and Charlotte counties, where it empties into northwestern Charlotte Harbor at Hog Island.

The basin is approximately 600 square miles in area. The basin can be divided into two subbasins:

- the Upper Myakka River subbasin (area=372 square miles), which extends from the headwaters to the USGS gaging station near Sarasota; and
- the Coastal Lower Myakka Basin (area=225 square miles), which extends from the USGS gage to the mouth of the river near Hog Island (Figure 2-1).

Deer Prairie Creek and Big Slough are the principal tributaries to the Myakka River. Near the headwaters there is a large depression known locally as Flatford Swamp and marshes and swamps within the Myakka River Basin provide surface water storage. The Myakka River is the only stream channel that is primarily well-defined and naturally entrenched throughout its course in the basin.



LOCATION
Myakka River Basin

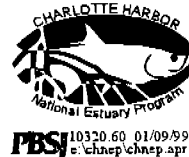


Figure 2-1. Location of the Myakka River basin in the Charlotte Harbor NEP study area.

2.1.1 Physiography

This section describes the topography, geology, soils, and land use in the Myakka River.

2.1.1.1 Topography

The maximum elevation within the Myakka River watershed is 116 feet (Joyner and Sutcliffe, 1976). Upper Myakka Lake has a water surface elevation of 13.6 feet above mean sea level (MSL) and the surface of Lower Myakka Lake is 9.9 feet above MSL.

The topography of the Myakka River Basin represents a series of relict marine terraces and is characterized as low flatlands, with moderate to gentle slopes limited to the peripheral areas in the northern half of the watershed. The terrain is generally flat and elevations along the Myakka River range from 0 feet above MSL along the tidally influenced coastal portion at the mouth of the river in Charlotte County to 50 feet above MSL in Sarasota County and to about 115 feet above MSL at the headwaters. The land along the upper reaches of the Myakka slopes about five feet per mile and then decreases to about 1 foot per mile near the mouth of the river. In some of the lower reaches, the floodplain may reach three miles in width.

The basin is characterized by lowlands along the coast, including most of the Myakka River Basin within Sarasota County. Farther north and east, within the DeSoto Plain, elevations gradually decrease from 100 to about 30 feet above MSL beyond the Myakka River Basin, separated by the Wicomico Terrace from the higher and more irregular terrain of the Bone Valley Uplands.

2.1.1.2 Geology

The Myakka River lies within two prominent physiographic regions, the Gulf Coastal Lowlands and the DeSoto Plain of the Central or Mid-Peninsular Zone of Florida. The watershed is part of the Manasota Basin and dominates the eastern and central portions of Manatee and Sarasota Counties, respectively. Most of the basin lies within the Gulf Coastal Lowlands. The Gulf Coastal Lowlands physiographic area parallels and borders the western coastal areas of the state. The surface and subsurface geology of the Myakka River basin are directly related to fluctuations in sea level. The rise and fall of sea level through geologic time resulted in the deposition of limestone and other sedimentary rocks.

The primary hydrogeologic units in the Myakka River Basin include the surficial aquifer, two intermediate aquifers and confining units, and the Floridan aquifer. The surficial aquifer is contained within the surface deposits, the Caloosahatchee Marl and the Bone Valley formation. The intermediate aquifers are contained in the Tamiami and Hawthorn Formations and parts of the Tampa Limestone. The Floridan aquifer includes part or all of the Tampa limestone, Suwannee Limestone, Ocala Limestone, and the Avon Park Limestone (Joyner and Sutcliffe, 1976).

In the northern portion of the Myakka River basin, the Floridan aquifer is the primary source of groundwater for irrigation and human consumption. The water table is approximately within 5 feet

of land surface in the basin. There are seasonal fluctuations in the water table. Lowest water table levels typically occur during May or June and the highest water table levels occur in September or October. The quality of water in the surficial and intermediate aquifers is usually acceptable for potable water except near the coast where water from the Floridan aquifer is too mineralized for potable water use and is used primarily for agricultural purposes (Hammett, 1988).

The intermediate aquifers consist of an upper (Tamiami-upper Hawthorn) unit containing phosphatic marl, shell, sand, clayey sand, and phosphatic limestone of mid-Miocene to Pliocene age, and a lower (lower Hawthorn-upper Tampa) unit made up of permeable limestone and dolomite of lower and mid-Miocene age (Duerr and Wolansky, 1986; Hammett, 1988). Thickness of the upper unit ranges from 200 to 400 feet, and the lower unit from 150-300 feet. The two aquifers are separated by a confining bed of relatively impermeable clay material, although breaches of the confining layer hydraulically connect the two.

There are two major springs, Little Salt Springs and Warm Mineral Spring, within the Myakka River basin. These springs discharge to the Myakka River via tributary channels. Little Salt Springs currently generates little if any flow. Warm Mineral Springs discharges through a tributary to the Myakka River. The discharge water is very saline and results from artesian flow from the Floridan aquifer.

Springs, seeps, and sinkholes indicate the presence of connections between the surficial aquifer and deeper water bearing units in the watershed. In the Myakka River Basin, the river channel and most lakes are underlain by impermeable clays. Surficial materials are dominantly sandy, occasionally with relatively clayey substrata, and with significant organic deposits. The Upper Myakka subbasin lies partially within the Central Lake district, a sandhill karst terrain with innumerable solution basins, and the principal recharge area of the Floridan aquifer (Stewart, 1980). The Upper and Lower Myakka Lakes appear to be solution features connected to lower aquifers.

The lower Hawthorn-upper Tampa aquifer is recharged by lateral flows and upward leakage from the Floridan aquifer, and discharges to the Tamiami-upper Hawthorn aquifer. In some portions of the basin the Tamiami-upper Hawthorn aquifer is also recharged by downward leakage from the surficial aquifer. A dense layer of impermeable clay in the most northern portion of the basin forms an impermeable layer between the overlying sandy material and underlying limestone and produces numerous collapse sinkholes in which the clay initially forms a bridge over a developing limestone cavity. Failure of the bridge leads to a sinkhole that may be small or very large. These sinkholes are rare farther south in the basin where the sedimentary cover is more than 60 meters thick.

2.1.1.3 Soils

The National Resource Conservation Service (NRCS) county soil reports and map provided most of the information discussed in this section. Flatwoods soils comprise the majority of the Myakka River Basin in Sarasota County, including the Eugallie-Myakka-Holopaw-Pineda and Pomello-Myakka-Eugallie series. They are nearly level, poorly drained to very poorly drained and have a sandy surface layer and sandy and loamy subsoils. Flatwoods and sloughs soils occur predominantly as Myakka, Oldsmar, and Immokalee soils series, or combinations of these. These soils are nearly level, poorly drained, sandy, and have loamy subsoils and the differences in these soil types are primarily related to the depth of organic-stained subsoils. Soils associations adjacent to the river channel occur as Felda series combinations. These soils are poorly drained sands over beds of sandy and loamy marine sediments and are characteristic of floodplains. The lower portion of the Myakka River in Sarasota County is a Kesson-Wulfert soil and is associated with mangrove swamps.

In the Coastal Lower Myakka subbasin, dominant soil types are Oldsmar-Myakka, Wabasso-Pineda-Boca, and Immokalee-Myakka soils across nearly 90% of the watershed in Charlotte County. Myakka and Immokalee soils are very poorly drained, while the Pomello and Cassia soils are moderately to well-drained soils of low ridges. The mouth of the Myakka River is characterized by Peckish-Estero-Isles tidal and barrier island soils (poorly drained mucky fine sands) in Charlotte County.

The Upper Myakka subbasin occurs in Manatee County where the flatwoods soils occur on Waveland-Pomello-Myakka and Myakka-Waveland-Cassia series across approximately 75% of the county. Hammock, floodplain, depression, and marsh soils also occur along the rivers. The soils in the DeSoto Plain in the most northeastern portion of this subbasin are characterized as nearly level, poorly drained, sandy soils, with weakly cemented sandy subsoil and poorly drained sandy soils throughout. The soils at the headwaters are nearly level sandy soils with dark subsoil.

Each soil series can be classified into a hydrologic soil group (HSG) based on its runoff-producing characteristics. The most important of these characteristics is the capacity of the soil to permit infiltration when bare of vegetation. The four major hydrologic soil groups are described below.

Group A (low runoff potential) - soils with high infiltration rates even when thoroughly wetted. Composed primarily of sands and gravel that are deep and well to excessively drained. These soils have a high rate of water transmission. Minimum infiltration rate is 0.30-0.45 in/hr.

Group B (low to moderate runoff potential) - soils with moderate infiltration rates when thoroughly wetted. The soils are typically moderately fine to moderately coarse in texture and have a moderate rate of water transmission. Minimum infiltration rate is 0.15-0.30 in/hr.

Group C (moderate to high runoff potential) - soils with slow infiltration rates when thoroughly wetted, often with a layer of soil that impedes the downward movement of water. The soils typically have a moderately fine to fine texture and a slow rate of water transmission. Minimum infiltration rate is 0.05-0.15 in/hr.

Group D (high runoff potential) - soils with very slow infiltration rates when thoroughly wetted. Primarily clay soils with a high permanent water table or shallow soils over nearly impervious materials, such as a clay pan or clay layer. These soils have a very slow rate of water transmission. Minimum infiltration rate is 0.0-0.05 in/hr.

A and B soils exhibit lower runoff potential and are better drained when compared to C and D soils. Most soils within the Myakka River Basin are classified hydrologically as hydrological soil group (HSG) B/D, as assigned by the NRCS. The B/D designation is assigned when a soil type exhibits different runoff characteristics under developed ("improved") and undeveloped conditions. "Improved" conditions which provide better drainage to a soil type are then designated B, while soils remaining in a less well-drained undeveloped condition are designated as a D soil. The Myakka River Basin includes approximately 73% B soils, nearly 20% D soils, and almost 8% of the basin with A or C soils (Table 2-1) (Figure 2-2).

Soil Type	Upper Myakka		Lower Coastal Myakka	
	Acres	%	Acres	%
A	6,101	4.2	104	< 0.0
B	114,742	79.7	165,196	69.4
C	14,093	9.8	9,016	3.8
D	8,978	6.2	63,881	26.8
TOTAL	143,913	100.0	238,197	100.0

2.1.2 Rainfall

The data discussed in this section were obtained from the National Weather Service, SWFWMD, or SFWMD. Rainfall in the Myakka River Basin, like the other basins, is a product of a wet subtropic (humic mesothermal) climate with a warm summer and no dry season, similar to the entire Charlotte Harbor NEP watershed. Annual precipitation on the Myakka River is about 50-55 inches,

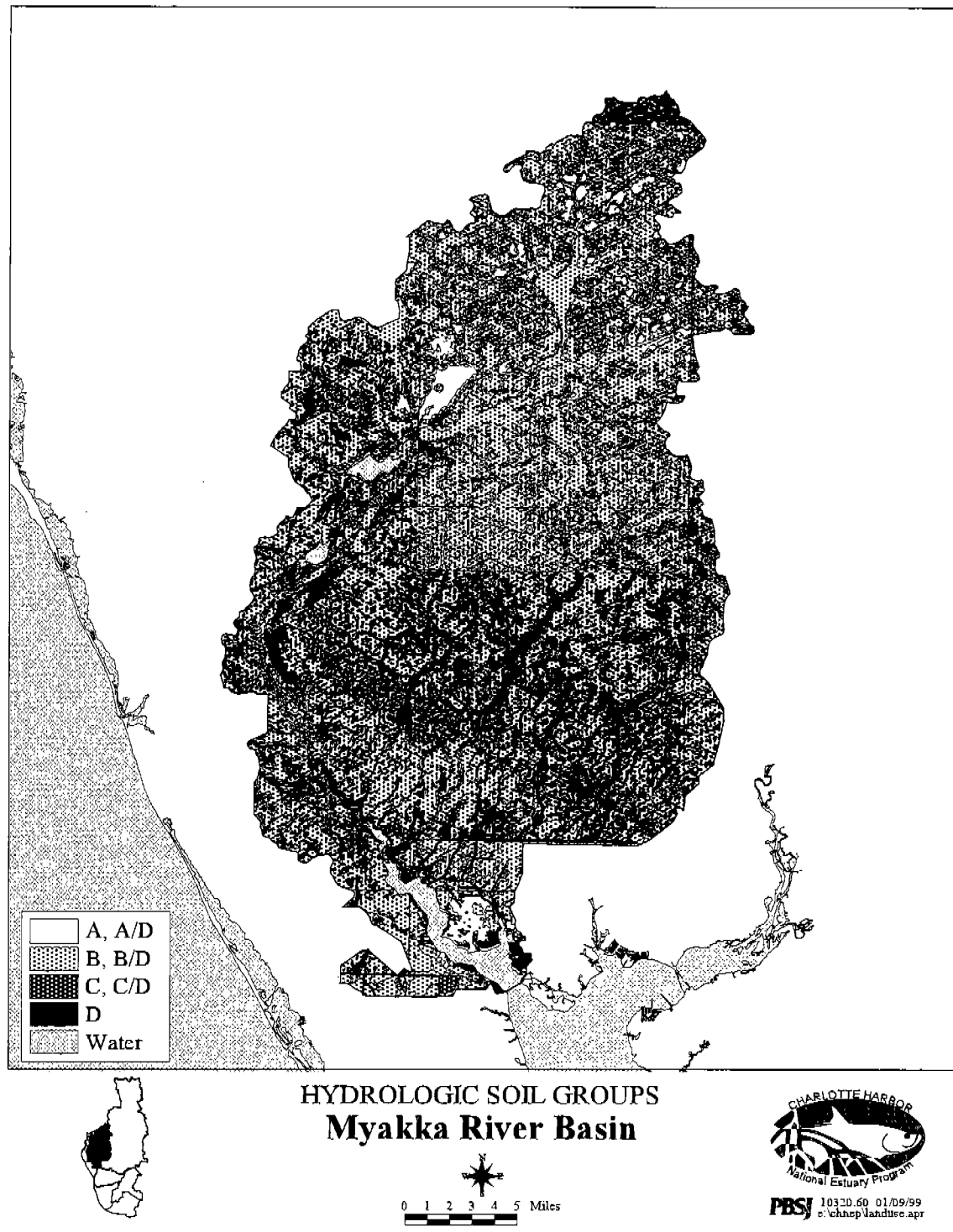


Figure 2-2. Hydrologic soil groups in the Myakka River basin.

with generally 6-8 months of low rainfall (2.0-2.5 inches/month) and 4-6 months of heavy, but spatially variable rains (5-8 inches or more/month). November is the driest dry season month as a result of the absence of both summer convection and winter frontal systems and the shift of tropical storms to the west of Florida. In mid-spring the frontal systems move north and the local seabreeze/convection circulation dominates the wet season rainfall. Most wet season rainfall is associated with frequent, but highly localized thunderstorms. Day-long wet season storms are infrequent and are generally associated with tropical disturbances. Heaviest wet season rainfall is associated with an up air trough that is centered over southern Florida in early and late summer.

Basin rainfall patterns were modeled using data from a network of rainfall gages throughout the Charlotte Harbor watershed. Data from a total of 18 rainfall gages were used in modeling the rainfall for the Myakka River Basin. Locations of these rainfall stations are shown in Figure 2-3. Total annual precipitation and average monthly precipitation from 1970 to present for the Coastal Lower Myakka and Upper Myakka subbasins are presented in Figures 2-4 and 2-5, respectively.

Total annual precipitation and average monthly precipitation were very similar in the two subbasins. Minimum total annual precipitation ranged from approximately 40 inches of rain (observed in 1990) to about 75 inches of rain in both subbasins. Average monthly precipitation patterns were seasonal and typical for Florida. Rainfall was highest from June to September, and wet season average values ranged from 7 to nearly 9 inches. Average monthly rainfall values were lowest during November and December (approximately 2 inches) and did not exceed 4 inches through May. Although there was a peak of nearly 4 inches in March, a bimodal pattern of wet season rainfall characteristic of south Florida was not apparent. Coastal Environmental (1996) examined the long-term trends in rainfall and flow in both the Peace and Myakka rivers and found a declining trend in rainfall for the Upper Myakka River with the estimated annual percent decline of 0.15%/year for the period 1948-1993.

2.1.3 Existing and Future Land Use/Cover

Land use data were obtained from SWFWMD, SFWMD, and the Southwest Florida Regional Planning Council (SWFRPC). Although other sources of data were available for various portions of the Charlotte Harbor NEP study area, these data sources provide a complete and consistent coverage for the entire study area.

Existing and future land use GIS coverages for the Charlotte Harbor NEP area are not always consistent in land use codes and coverages. Existing land use coverage presented in this document is a combination of 1990 Southwest Florida Water Management District (SWFWMD) and 1988 South Florida Water Management District (SFWMD) land use data. Land Use data from

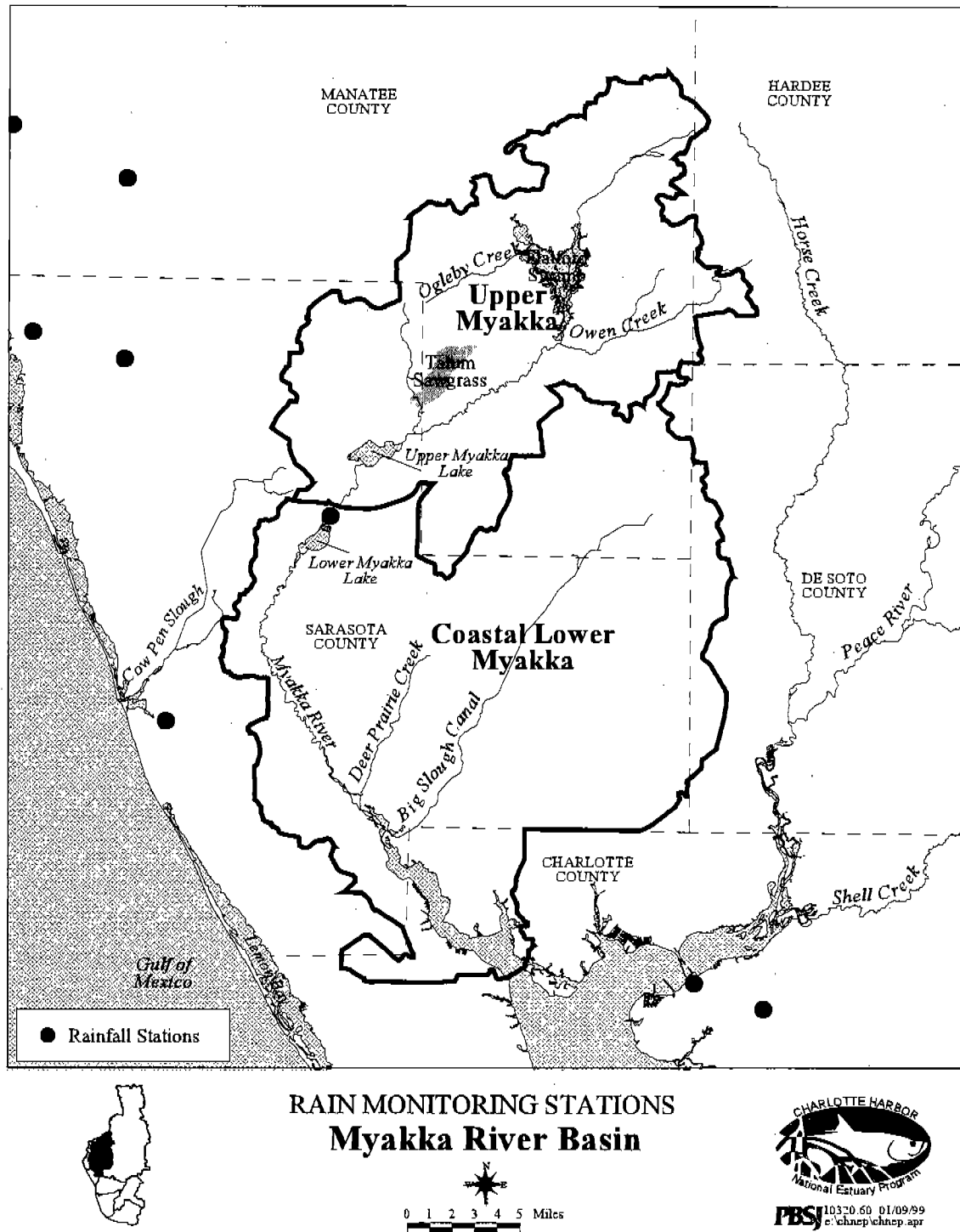


Figure 2-3. Rain station locations in the Myakka River Basin.

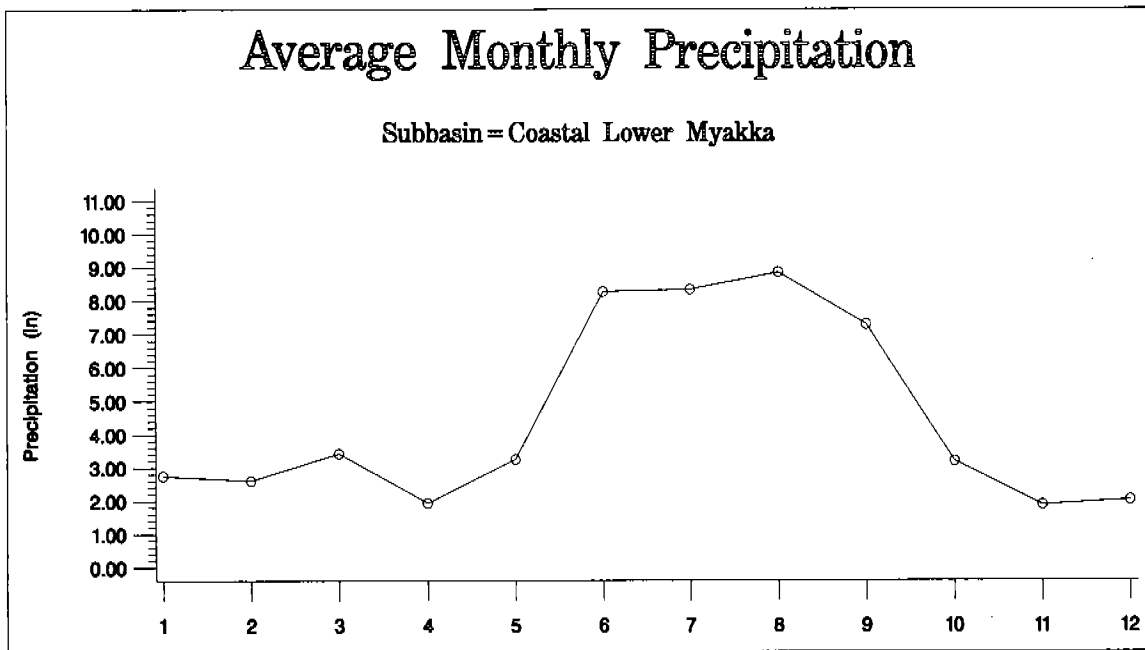
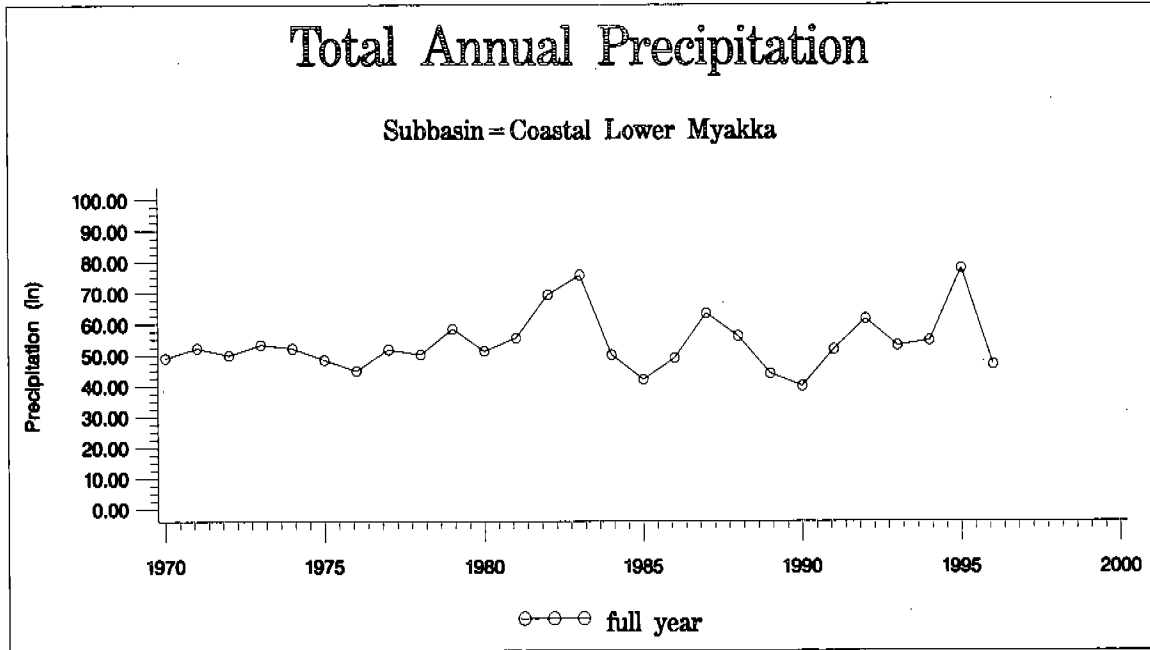


Figure 2-4. Total annual and monthly rainfall plots for the Coastal Lower Myakka subbasin.

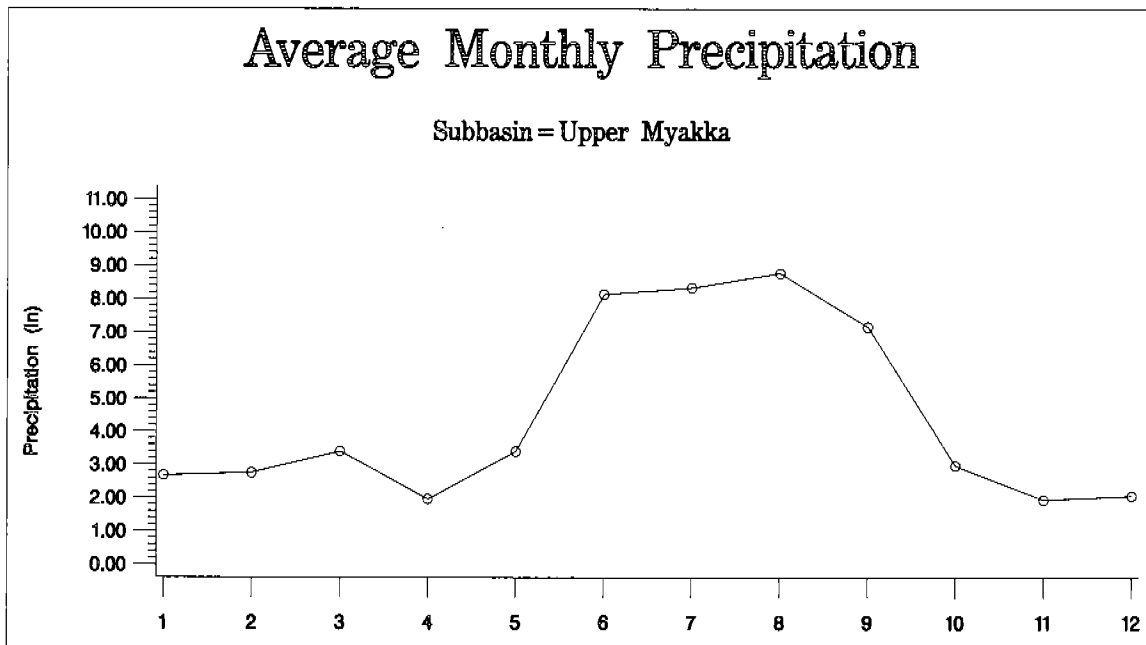
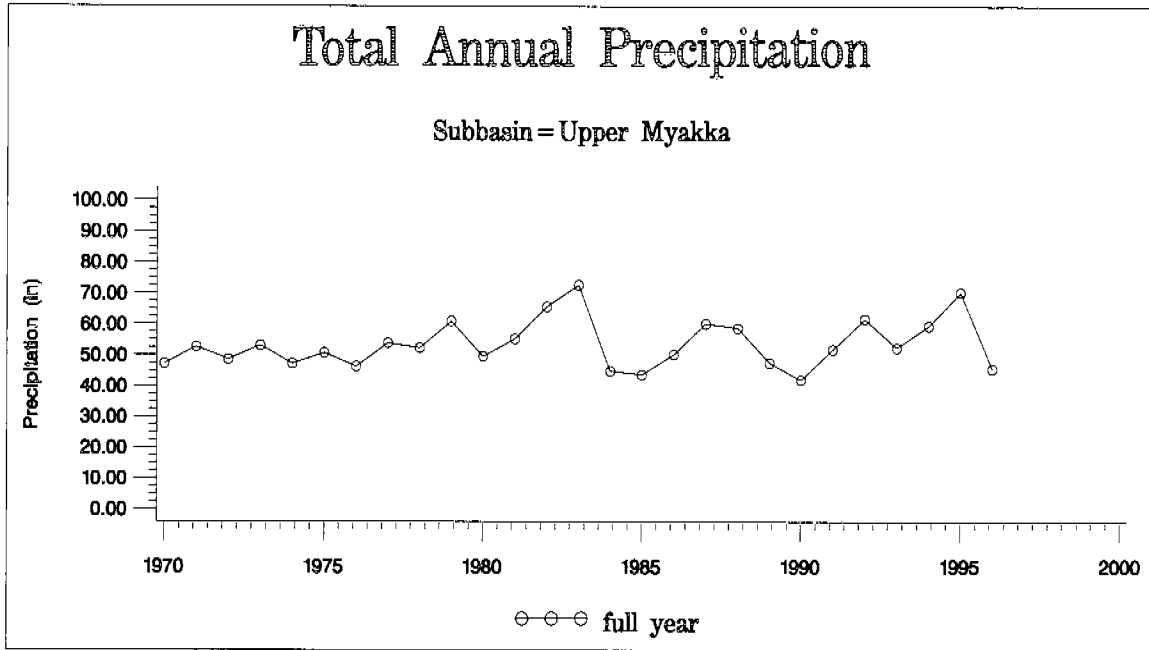


Figure 2-5. Total annual and monthly rainfall plots for the Upper Myakka subbasin.