Peace River Basin Resource Management Plan

In 2003, the Florida Legislature directed the Florida Department of Environmental Protection (DEP) in consultation with the Southwest Florida Water Management District, to study the cumulative effects of major changes in "landform and hydrology" in the Peace River basin (Chapter 2003-423, Laws of Florida, as amended). Through a competitive solicitation process, the DEP selected Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) in late 2004 to conduct the evaluation. The contractor published the final *Peace River Cumulative Impact Study* on January 26, 2007 and the document is available from the DEP's website at www.dep.state.fl.us/water/mines/prcis.htm.

The law also charged the DEP to prepare this resource management plan. The agency engaged a stakeholder group consisting of representatives from local governments, regional water suppliers, regional planning councils, mining industry, agriculture interests, development groups, environmental organizations, and fishing interests within the basin. Stakeholder meetings were held in the Peace River basin to discuss the *Cumulative Impact Study* and its implications. The substantive discussions during these meetings and the comments provided by stakeholders have been critical to the development of this plan. (Stakeholder meeting information, summaries and comments received are available on the DEP website at http://www.dep.state.fl.us/water/mines/prcis.htm.)

The plan that follows summarizes the information in the *Cumulative Impact Study*, identifies major impacts to the water resources and their causes, evaluates the success of existing regulatory and non-regulatory programs, and sets forth recommendations for actions necessary to avoid, minimize, mitigate, or compensate for cumulative impacts in the Peace River basin.

1.0 Introduction

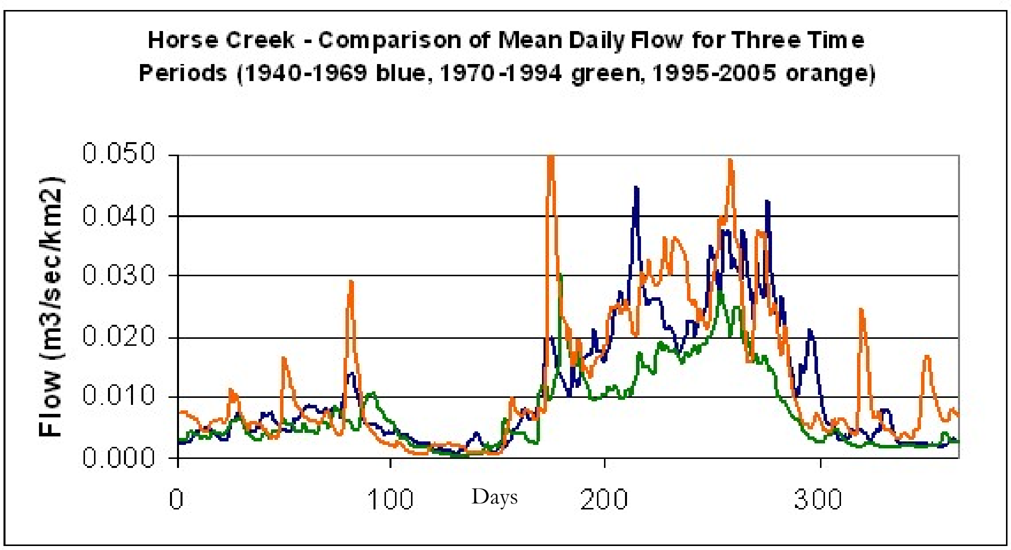
From its beginning at the confluence of the Peace Creek Drainage Canal and the canalized portion of Saddle Creek north of Bartow in Polk County, the Peace River flows approximately 105 miles in a generally southerly direction through Polk, Hardee, and DeSoto counties before emptying into Charlotte Harbor near Punta Gorda in Charlotte County. Covering approximately 2,350 square miles (1.5 million acres) the majority of the Peace River's watershed is found in the four counties just identified, with small portions located in Hillsborough, Manatee, Sarasota, Highlands, and Glades counties. The river drops over 200 feet in elevation from its headwaters to discharge. The Peace River is the dominant fresh water system entering the Charlotte Harbor estuary. Flows from the river, especially the high flows during the summer months, are essential to the overall health and productivity of the estuarine waters of the Harbor.

The nine sub-basins comprising the Peace River watershed display a variety of hydrologic, geologic, vegetative, and land use characteristics. All nine exhibit varying degrees and types of man-made impacts that affect the basin's resources, including the surface waters, groundwaters, wetlands, fisheries, aquatic habitats, and water supplies.

A steady, long-term change in Peace River flows has been observed since the early 1960s, the causes of which are complex and multifaceted. Climate variability has played a significant role in the observed changes, as has the presence of karst (very porous, with depressions and sinkholes) hydrogeologic features in the upper sub-basins. Widespread land use changes and the associated water use, alterations of surficial flow patterns, and direct loss of wetlands and streams are also contributing factors. The effect of agriculture (improved pasture, citrus, row crops, etc.), development (residential, commercial, and industrial), and extraction (primarily phosphate mining) on the available native upland habitat are contributing to reduced low flows and water quality degradation as well as the direct limitation on wildlife.

Florida suffered a drought of historic proportions from 1999-2001. In the Peace River watershed the drought manifested two noteworthy phenomena: the upper portion of the Peace River between Bartow and Fort Meade went completely dry for an extended period of time and the water supply of the City of Punta Gorda was placed in jeopardy because of water quality problems in the Shell Creek Reservoir. Both these phenomena have root causes that extend back prior to the drought.

Recent studies have established the influence of long-term rainfall patterns on stream flow in the Peace River watershed (Flannery and Barcelo, 1998; Basso and Schultz, 2003). Long-term records show that annual rainfall during the past 30 years has been about five inches per year lower than the period from 1940-1970 (Basso and Schultz, 2003). This trend appears to be changing with the return of more active tropical weather seasons. A comparison of the flow patterns over time of the Peace River, other rivers in Florida, and other rivers in the southeastern United States has revealed a cyclic pattern of decades-long wetter and drier periods. A theory called the Atlantic Multidecadal Oscillation has been postulated that attributes this cycle to variations in rainfall caused by slight changes in sea surface temperature in the North Atlantic Ocean (Gray, Sheaffer, and Landsea, 1997; Enfield, Mestas-Nunez, and Trimble, 2001). The Atlantic Multidecadal Oscillation theory corresponds well with observed data and fundamentally explains most of the observed changes in the medium and high flows of the Peace River (Figures 1.1 through 1.3). It does not, however, adequately explain the changes in low flows, especially the low flow pattern of the upper river sub-basin.



M. Kelly (2006)

Figure 1.1

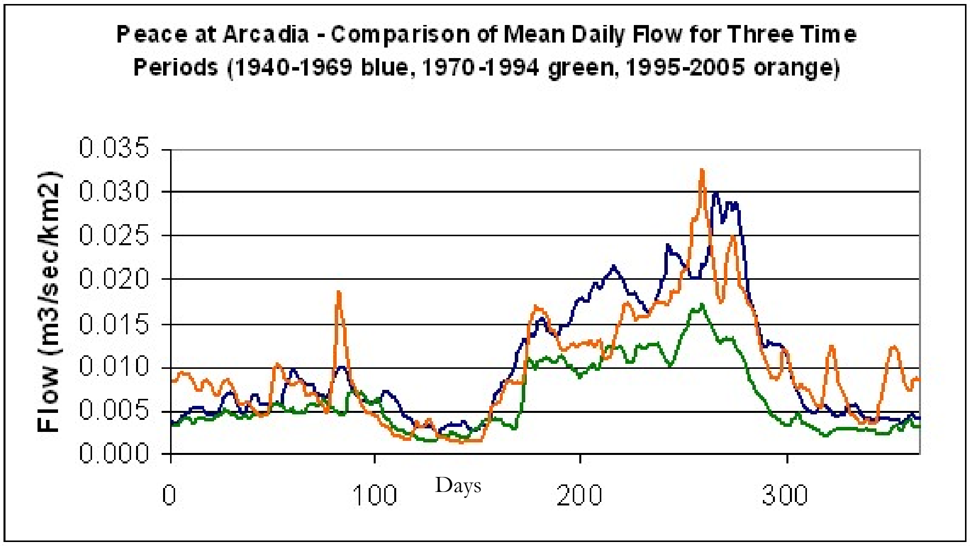


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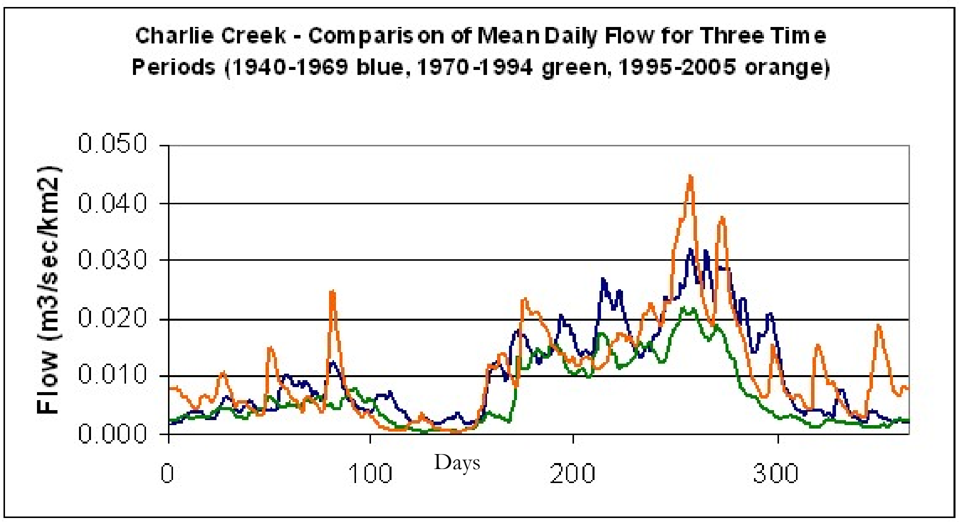
Figure 1.2



M. Kelly (2006)

Figure 1.3

The upper Peace River has a geology that is unique from the remainder of the watershed. Between Bartow and Fort Meade in Polk County, a number of karstic features occur in the limestone beds that form the river channel and associated floodplain (Figure 1.4). Limestone, with its high calcium carbonate content, is easily dissolved by the weak solution of carbonic acid in rainwater and most natural Florida surface streams. When this acidic water enters the ground and interacts with the limestone, the water dissolves the limestone to form karst topography—a combination of caves, underground channels, and an irregular ground surface. This area of karst creates a direct connection between the river channel and the Floridan aquifer, as demonstrated by the history of Kissengen Spring, which before 1950 supplied the upper Peace River with 15-30 cubic feet per second of spring flow. Kissengen Spring ceased continuous flow by 1950. The karstic section of the Peace River channel was first observed to go dry during unusually dry spring seasons in the 1980s. Following the severe drought of 1999-2001, however, the channel has gone dry every spring except during the above-average rainfall years of 2003-2005.

Fricano fracture.

Midway sink.

Dover sink.

The crevasses.

Figure 1.4 Karst Features of the Upper Peace Basin

Historical groundwater withdrawals since the early 1930s for mining, agriculture, and public water supply have lowered the potentiometric surface (generally, the rise of water under pressure) of the Floridan aquifer about 30 to 50 feet in the northern Peace River basin. This drop has effectively caused the river to drain into the karstic features in the riverbed between Bartow and Homeland—technically, it has reversed the hydraulic gradient between the upper Peace River and underlying aquifers, causing induced recharge by gravity. During periods of drought, especially coinciding with the typically low rainfall spring period, the riverbed now goes dry as a result of losses to the aquifer. The effect of the pumping-related drawdowns in the upper Floridan aquifer is the primary cause of the upper Peace River flow disappearing during dry periods in 1999, 2000, 2001, 2002, and 2006 (PBS&J, 2007). The drought revealed the magnitude of this problem and its severe effects on the upper portion of the Peace River.

The City of Punta Gorda uses the combined flows of Shell and Prairie creeks as its sole source of potable water supply. Land use practices in the sub-basin containing these two creeks have steadily shifted to more intensive forms of agriculture, with the associated need for more water for irrigation and freeze protection. Because high-quality fresh groundwater is very limited in this sub-basin, water of higher mineral content from the upper Floridan aquifer is used to ensure adequate agricultural supply. During the severe drought of 1999-2001, the quality of Punta Gorda's drinking water declined because agricultural discharges of mineralized groundwater increased the salt content of the surface water supply (PBS&J, 2007). At times, the city's drinking water was in violation of secondary (aesthetic) water quality standards. The drought has revealed the extent to which the long-term use of mineralized groundwater for agriculture has increased salts in the area's fresh surface waters and associated surficial aquifer.

Land use and cover patterns in the Peace River watershed have changed dramatically since the 1940s, with most of the documented changes occurring prior to 1979. Developed land uses in the Peace River watershed increased from 13% in the 1940s to 50% by 1979 and to 64% by 1999. In turn, undeveloped land uses decreased from 85% of the watershed in the 1940s to 48% by 1979 and to only 33% by 1999 (PBS&J, 2007). Land uses in several sub-basins throughout the watershed also show these dramatic changes from the 1940s to 1999 (Table 1.1). One of the more striking examples is the increase in improved pasture in the Charlie Creek sub-basin from 1,595 acres in the 1940s to 78,180 acres by 1999, an increase from 1% to 45% of the total acreage in that sub-basin. Phosphate-mined lands in the Payne Creek sub-basin increased from 774 acres in the 1940s (1% of the sub-basin) to 50,238 acres by 1999 (63% of the sub-basin). Urban areas in the Coastal Lower Peace River sub-basin increased from 2% to 27% of the total sub-basin, an increase from 3,222 to 44,072 acres between the 1940s and 1999.

Table 1.1 Developed land uses (acres and %) of major sources of stress, by sub-basin, during 1940s and 1999

Sub-Basin	Improved Pasture		Intensive Agriculture		Phosphate Mining		Urbanization	
	1940s	1999	1940s	1999	1940s	1999	1940s	1999
	Acres (%)	Acres (%)	Acres (%)	Acres (%)	Acres (%)	Acres (%)	Acres (%)	Acres (%)
Peace River @ Bartow (233,761 ac)	5,889 (3)	34,054 (15)	44,682 (19)	31,919 (14)	2,575 (1)	19,977 (9)	7,553 (3)	61,359 (26)
Peace River @ Zolfo Springs (197,668 ac)	8,794 (4)	43,360 (22)	23,115 (12)	29,428 (15)	4,109 (2)	65,324 (33)	2,642 (1)	14,105 (7)
Payne Creek (79,561 ac)	1,821 (2)	6,527 (8)	5,936 (7)	7,799 (10)	774 (1)	50,238 (63)	144 (0)	1,002 (1)
Peace River @ Arcadia (128,186 ac)	3,027 (2)	45,836 (36)	10,457 (8)	25,376 (20)	0 (0)	187 (0)	339 (0)	3,804 (3)
Charlie Creek (173,573 ac)	1,595 (1)	78,180 (45)	7,148 (4)	32,318 (19)	0 (0)	0 (0)	36 (0)	81 (0)
Horse Creek (128,435 ac)	1,380 (1)	47,903 (37)	4,672 (4)	12,303 (10)	0 (0)	7,295 (6)	46 (0)	1,596 (1)
Coastal Lower Peace River (154,571 ac)	4,756 (3)	25,263 (15)	6,885 (4)	14,411 (9)	0 (0)	0 (0)	3,222 (2)	44,072 (27)
Joshua Creek (77,391 ac)	3,431 (4)	31,941 (41)	3,918 (5)	23,947 (31)	0 (0)	0 (0)	468 (1)	2,960 (4)
Shell Creek (213,537 ac)	301 (0)	52,331 (25)	8,946 (5)	66,284 (31)	0 (0)	0 (0)	227 (0)	3,264 (2)

Peace River Cumulative Impact Study (PBS&J, 2007)

Many parts of the watershed have undergone considerable alteration to natural drainage patterns in order to facilitate agricultural and residential/urban development, including ditching and interconnecting poorly drained wet prairies and isolated wetlands to improve water conveyance and lower the water table. Total wetland acreage in the basin decreased from approximately 25.4% to 15.6% by 1999, with the majority of the losses occurring before regulatory programs took effect. Historical phosphate mining practices altered not only drainage patterns but also the structure of the landscape (PBS&J, 2007).

While groundwater has historically served the majority of consumptive uses of water in the basin, surface water for public supply has become increasingly important in the southern basin, and declining flows during drought periods have at times impeded public supply. The Peace River Manasota Regional Water Supply Authority withdraws an average of 32.7 million gallons per day (mgd) from the Peace River to supply citizens in Charlotte, DeSoto, Manatee, and Sarasota counties. The river is anticipated to provide additional supply for growth in the future. Water quality is another critical factor for water supply. Drinking water treatment facilities are designed to treat the quality of water from the supply source; thus, declines in source water quality may threaten public water supplies and increase the cost of drinking water treatment.

The severe statewide drought was a wake-up call to the problems facing the water resources of the Peace River basin. In recognition of these growing concerns, the Florida Legislature in 2003 directed the Florida Department of Environmental Protection (DEP) to conduct a cumulative impact study and prepare a management plan for the Peace River watershed in consultation with the Southwest Florida Water Management District. DEP was charged to conduct an objective assessment of the individual and collective impacts of man-induced and natural stresses on the Peace River basin and its water resources. This management plan is to identify regulatory and non-regulatory means to minimize future impacts and mitigate past impacts.