The Effects of Proposed Restoration of the Ocklawaha River in the Vicinity of the Rodman Basin on Manatees and Manatee Habitat

Report for
The Office of Greenways and Trails
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Introduction

The restoration of the Oklawaha River by elimination of the Rodman Reservoir has long been a contentious issue for resource managers and environmental policy makers alike. Some public benefits provided by the creation of the reservoir will be lost with planned restoration. However, reestablishing the natural flow of the Oklawaha River and management of restored lands by the Office of Greenways and Trails within the Florida Department of Environmental Protection (FDEP) will provide both environmental benefits and expanded recreational opportunities on reclaimed public lands.

This report has been prepared by Kent Smith, Biological Scientist with the Bureau of Protected Species Management within the Division of Marine Resources of the FDEP at the request of the Office of Greenways and Trails. The report summarizes the history of Rodman Reservoir, historical manatee use, mortality and habitat information for this reservoir and the previously free-flowing Oklawaha River, and predicted effects on manatee habitat quality and regional manatee populations using this system after planned restoration efforts are completed.

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History of the Rodman Reservoir

The Rodman Reservoir (Ocklawaha Lake) was created by the impoundment of the Ocklawaha River in Putnam and Marion Counties in September, 1968 as part of the Cross-Florida Barge Canal project (Warr, et al, 1994). This reservoir extends from Rodman Dam west to Orange Creek and then south to the Eureka Dam (about 15 miles in length and up to 2 miles wide) and encompasses an area of 3887 hectares (9600 acres) which consisted of hardwood floodplain that was partially cleared prior to flooding. Although the initial water level was set at 6.1 meters (20 feet) above the 1929 National Geodetic Vertical Datum (NGVD), the reservoir was drawn down to 5.5 meters (18 feet) NGVD in 1972 where it has remained except for temporary drawdowns for natural resource management purposes.

Rodman Reservoir has three artificial structures associated with its creation. They are Rodman Dam, the H.H. Buckman Lock off the St. Johns River and the Eureka Dam near the town of Eureka. Two of these structures, Rodman Dam and Buckman Lock, have been responsible for a total of 9 recorded manatee deaths from 1974-1997 (Figure 1).

Rodman Dam is a 7,200 foot earthen dam built across the Ocklawaha River with a manually operated 4 gate spillway to control water levels within the reservoir (Rodman Reservoir fact sheet). This dam is 22 feet above natural ground elevation with a sloping concrete apron extending down from the gates to a basin lined with rip rap to dissipate spillway water turbulence (Kipp Frohlich, memo to Fred Ayer dated August 24, 1995). Water is released by the vertical opening of the gates which allows water to flow down the concrete apron into the lower Ocklawaha. Turbulence in the water at the base of the dam creates an hydraulic effect which along with the operation of the gates, rocky substrate at the base of the dam, and severe water pressure maintained by the height of the reservoir water relative to that of the Ocklawaha River has been responsible for 7 verified manatee deaths from 1974-1997 (Table 1). In August of 1995, two manatees deaths that were documented 11 days apart resulting from the operation of the dam spillway gates caused the Bureau of Protected Species Management (BPSM) to recommend operational procedure changes (e.g. opening the gates to a height of 2.5 feet) intended to reduce the risk of manatee mortality (Kipp Frohlich memo to Fred Ayer, dated August 24, 1995). At that time, recommendations were also made to the U.S. Army Corps of Engineers (USACE) to install manatee barriers similar to those used on water control structure in south Florida. Operational changes were implemented and were maintained until a January 1996 aerial survey of the Silver River, Ocklawaha River and Rodman Reservoir was conducted by BPSM and Office of Greenways and Trails (OGT). No manatees were observed during the survey. Kipp Frohlich reported that, as manatees were not seen at known warm water sites and along other areas within the aerial survey route and the fact that the Buckman Lock was non-functional (preventing manatees from entering the system), the likelihood of manatee injury from Rodman Dam was minimal (Kipp Frohlich memo to Fred Ayer, dated January 31, 1997).

The H.H. Buckman Lock is a 600 foot long 84 foot wide lock that is 14 feet high over the gate sills (H.H. Buckman Lock fact sheet, January, 1989). Buckman Lock is 8 miles southwest of Palatka off State Road 19. There are approximately 7 miles of 12 foot deep artificial canal waters to either side of this lock that connect the St. Johns River 5 miles south of Palatka to Rodman Reservoir. The lock was constructed to allow the passage of barge and other commercial vessel traffic from the St. Johns River on the east coast to the Withlacoochee River on the west coast. The lock is comprised of two sets of miter gates which are 48 feet wide by 41 feet (downstream side) and 19.5 feet (upstream side) high and weigh 158,449 and 80,640 pounds respectively. They are constructed of concrete reinforced steel on a foundation of wooden pilings. Construction of the lock was
Manatee Mortality in the Vicinity of Rodman Reservoir
January 1974 through April 1997

Deaths
- Watercraft
- Flood gate/lock
- Other Human
- Perinatal
- Other Natural
- Undetermined

Figure 2: FDEP FMRI Manatee Mortality Map (January 1974-April 1997)
Table 1: Rodman Reservoir Flood Gate and Canal Lock Manatee Mortality

**County:** Putnam

**Deathcode:** Flood Gate/CanalLocks

**Mortality:** January 1974 through December 1996

<table>
<thead>
<tr>
<th>Waterway</th>
<th>Year</th>
<th>Mo</th>
<th>Day</th>
<th>FieldID</th>
<th>Locality</th>
<th>Cause</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Florida</td>
<td>77</td>
<td>10</td>
<td>23</td>
<td>M093</td>
<td>Buckman Locks at E end of the Cross Florida Barge Canal.</td>
<td>Probably caught in the lock - massive hemorrhaging in head and shoulder area.</td>
<td>Scrape marks on head</td>
</tr>
<tr>
<td>Barge Canal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rodman Dam</td>
<td>79</td>
<td>5</td>
<td>11</td>
<td>M149</td>
<td>In boat canal just S of Rodman Dam, approx. 100 yds from lock.</td>
<td>Crushed in flood gate - massive internal damage.</td>
<td>R ribs 8,9 broken. L ribs 6-13 broken approx 5 cm from proximal end. Break in vert col btwn thor 8 &amp; 9. Pleural cavity full of clotted blood. Dermis in head and shoulder region hemorrh. UF No. G79-79</td>
</tr>
<tr>
<td>Cross Florida</td>
<td>80</td>
<td>6</td>
<td>30</td>
<td>M195</td>
<td>Cross Florida Barge Canal, Buckman Lock.</td>
<td>Drowned in canal lock - scrape marks on skin suggest that M-195 was pinned.</td>
<td>Manatee had scrape marks and concrete abrasions on body suggesting that it was pinned btwn lock gate and wall during gate opening. GI tract full. No broken bones or hemorrhagic tissue present.</td>
</tr>
<tr>
<td>Barge Canal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rodman Dam</td>
<td>83</td>
<td>6</td>
<td>22</td>
<td>M338</td>
<td>Rodman Dam, under flood gate</td>
<td>Crushed/Drowned in flood gate-fresh scrapes and rivet marks on body.</td>
<td>Demis bruised. Lungs saturated with blood. GI tract full. Heavy fat deposits present. Three nails on each flipper. FMP Case No. 1122.</td>
</tr>
<tr>
<td>Rodman Dam</td>
<td>83</td>
<td>6</td>
<td>23</td>
<td>M339</td>
<td>Rodman Dam, under flood gate</td>
<td>Crushed/Drowned in flood gate-fresh scrapes and rivet marks on left side.</td>
<td>Severe ante-mortem bruising of musculature on left side from flipper to mid-fluke. Lungs saturated with blood. GI tract full. Heavy fat deposits present. FMP Case No. 1122.</td>
</tr>
<tr>
<td>Rodman Dam</td>
<td>83</td>
<td>8</td>
<td>8</td>
<td>M344</td>
<td>Rodman Dam, under flood gate</td>
<td>Crushed/Drowned in flood gate-fresh scrapes and rivet marks on body.</td>
<td>Massive ante-mortem bruising of musculature beneath scrapes. Left scapula broken, Lg. hematoma. Shock syndrome: ischemic kidneys, little blood in heart. L. flipper missing beyond humerus, healed.</td>
</tr>
<tr>
<td>Oklawaha</td>
<td>91</td>
<td>6</td>
<td>24</td>
<td>MNE9113</td>
<td>Palatka, 1/2 mile downstream of Rodman Dam in overflow canal.</td>
<td>Animal died in the water control gates of the Rodman Dam. Distinctive markings on</td>
<td></td>
</tr>
</tbody>
</table>
Table 1: Continued

<table>
<thead>
<tr>
<th>Waterway</th>
<th>Year</th>
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<th>Day</th>
<th>FieldID</th>
<th>Locality</th>
<th>Cause</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oklawaha</td>
<td>95</td>
<td>8</td>
<td>9</td>
<td>MNE9514</td>
<td>Palatka, floating 200 yds. down river of the Rodman reservoir</td>
<td>карcass corresponds to structures on the gates.</td>
<td>GFC case # 1029.</td>
</tr>
<tr>
<td>Oklawaha</td>
<td>95</td>
<td>8</td>
<td>20</td>
<td>MNE9515</td>
<td>Palatka, in the Oklawaha River floating 500 yds, downstream from the Rodman Reservoir Dam.</td>
<td>Complete vertebral separation between ribs #9-#10 and #12-#13. Left ribs #9+#12 subluxated, #10 luxated, #12-#13 broken. Torn muscle tissue.</td>
<td></td>
</tr>
</tbody>
</table>

begun in November of 1964 and the lock was opened on December 4, 1968.

Manatees use this lock as the only portal from the St. Johns River to Rodman Reservoir and thereby the upper Oklawaha and Silver Rivers. Access to these systems from the lower Oklawaha River is blocked by the Rodman Dam. Operation of Buckman lock has been documented as causing two manatee deaths, one in October, 1977 and one in June, 1980 (Figure 1 and Table 1). In order to help prevent further manatee mortality, bubble screens were placed on the down stream side of the lock by the USACE. It was felt that bubble screens would deter manatees from entering the lock, but it has since been shown that manatees habituate to such deterrents and pass through them making them ineffective. Buckman lock was officially closed to the public on December 8, 1995 upon the decommissioning of the Barge Canal and at a time when manatees were recognized as not using Rodman Reservoir and associated waters. Aerial surveys and a lack of reports of manatees from this system, especially around identified sources of warm water, after lock closure suggested that manatees were not trapped in this section of the Barge Canal (Kipp Frohlich and Jim Valade, personal communication).

Undetermined manatee mortalities on the lower Oklawaha and eastern Barge Canal waters have also occurred. Three dead manatees were recovered from the waters east of Buckman Lock and one was recovered 100 yards down stream of the Rodman Dam (Figure 1). In all cases, biologists were unable to determine the exact cause of death. However, these manatee carcass recoveries augment other manatee use information for this area.
The Eureka Dam and Lock was never completed, so the Oklawaha River is not impeded by this structure. The Oklawaha River flows in its original bed by this USACE structure complex without alteration. Manatees can easily access the upper reaches of the Oklawaha and Silver River by swimming around this incomplete structure.

The Cross-Florida Barge Canal has been federally deauthorized since 1994 and portions of this system are under consideration for restoration to pre-canal conditions. The Florida Department of Environmental Protection has been delegated management authority over much of the old canal lands and waterways through the Office of Greenways and Trails. Rodman Reservoir has been studied by the Department and the St. Johns Water Management District for the effects of varied levels of restoration on natural systems since 1994 (Warr, et al, 1994). Partial restoration of this system is currently planned (Debra Fiesler, personal communication). Such a restoration effort will involve the closure and securing of the Buckman Lock portion of the canal severing this travel route for manatees from the St. Johns River. Due to restoration cost considerations, backfilling of the canal will not be performed unless deemed necessary. The canal will instead be allowed to naturally fill in over time. Deep Creek and Camp Branch Creek will also be restored, as they are currently bisected by the canal. Sheetflow to the Oklawaha will also be restored. Partial restoration also will result in the removal of the Rodman Dam including some 2000 feet of the structure and the return of the Oklawaha River to its normal river bed and elevation. This will reestablish traditional manatee access routes to upper Oklawaha River reaches and tributaries. When restored, the Oklawaha River in the vicinity of the Rodman Dam will maintain adequate depth for manatees to traverse this section of the free-flowing river. Normal current speed along the river will not be great enough to prohibit manatees moving into and through the river system.

Historical Manatee Use

Little information exists concerning manatee use of the Oklawaha River prior to the creation of Rodman Reservoir. The quality of the habitat that this system once afforded manatees (submerged aquatic vegetation (SAV) forage abundance, quiet backwaters, and warm water refuge sites), its previous accessibility, 15 recorded manatee deaths in associated systems from 1974-1996, the presence of manatee skeletal remains and the proximity of the Oklawaha River to the St. Johns River, a system with recognized use by east coast and resident manatees, leads to an inference that manatees may have used this river frequently (Hartman, 1974; Campbell, 1976; Lefevbre, et al; 1989; Warr, et al, 1994). The mouth of the Oklawaha empties into Little Lake George 1.5 miles from Welaka Springs and 13 miles from Silver Glen Springs both historically recognized warm water refuge sites for manatees using the St. Johns River (Beeler and O'Shea, 1988). The Oklawaha River may have provided both abundant aquatic vegetation and additional warm water refuge sites for manatees in this area.

The Oklawaha River was historically a free-flowing tributary of the St. Johns River. Its waters are clear during periods of drought and stained by the tannins of adjacent wetland plant communities during wet years. Abundant SAV communities comprised of such native species as eelgrass (Vallisneria americana), coontail (Ceratophyllum demersum), southern naiad (Najas guadalupensis), pondweed (Potamogeton spp.) and red ludwigia (Ludwigia repens) most likely persisted in the Rodman Reservoir section of the river prior to dam construction (Burks, 1996). After the development of Rodman Dam, flooding waters created more habitat for such SAV communities, but the introduction of the exotic aquatic species hydrilla (Hydrilla verticillata), water lettuce (Pistia stratiodes) and waterhyacinth (Eichhornia crassipes) with a lack of co-evolved environmental controls, caused a decline in the abundance of native species. Hydrilla was first noted in Rodman
Reservoir in 1971 and was the dominant submerged species by 1974 (Bureau of Aquatic Plant Management (BAPM), 1994). Natant species, especially waterhyacinth, overgrew the surface of the reservoir and reduced SAV abundance as well. In order to get these exotic species under control, over $500,000 were spent on herbicides applied by aircraft between 1970-1972 (BAPM, 1994). Control of these aggressive non-native species has been afforded by maintenance applications of herbicides and regular drawdowns from 1975 to 1996. Despite the overwhelming biomass of exotic vegetation in this system, up to 50 species of aquatic plants have been recorded in Rodman Reservoir during annual surveys of this system by the BAPM since 1982.

Several artesian springs were also flooded by the formation of Rodman Reservoir. The most notable is Blue Spring located about 5 miles east of the town of Orange Springs and 800 feet south of the Ocklawaha River bed (Rosenau, et al, 1977). This spring maintained a flow of 10.6 ft³/s as measured in October, 1935. Blue Spring provided a large pool of upwelling groundwater that was both accessible to manatees and used by them (observational reports in Beeler and O'Shea, 1988). Such springs may have provided manatees with sources of warm water in which they could find refuge from colder river waters during the cold season (October to March). Silver Spring, a first magnitude artesian spring, provides abundant warm water to the Silver River which has had reports of manatee use (Campbell, 1976). Although this system has always been accessible to manatees using the upper Ocklawaha River, it may become a more important warm water refuge if manatee use of a free-flowing Ocklawaha River increases. Manatee use of the Ocklawaha and its tributaries has been documented, but survey conditions along the length of much of the river is difficult due to over hanging vegetation, and concerted efforts related to determining manatee use of the system amount to less than 20 aerial surveys over a 20 year period, over half of which were performed during 1975 by the U.S. Fish and Wildlife Service-Sirenia Program (Kipp Frohlich, personal communication; Campbell, 1976).

Campbell (1976) flew 10 aerial surveys over the Ocklawaha segment of the Cross Florida Barge Canal at irregular intervals, mostly during the winter months in 1975 with an additional 5 flights made in August 1976. A total of 7 manatees were recorded in the Barge Canal east of the Buckman lock. These flights were made specifically to determine the manatee use of Barge Canal waters to assess the effects of the planned completion and operation of the canal. Campbell also documented two respondent sightings of manatees from the east canal of Buckman Lock. In this study, interview reports documented manatees in the Ocklawaha River (below Rodman Dam) and passing through Buckman Lock into Rodman Reservoir. Staff from the Florida Game and Freshwater Fish Commission (FGFWFC) also provided reports of manatees in the Silver River and Ocklawaha River at Eureka (Campbell, 1976). Unconfirmed reports of manatees in the Ocklawaha River just below Rodman Dam were also noted by Hartman (1974). During the Spring months of 1979-1983, 8 radio tagged manatees that traditionally used Blue Spring dispersed from this warm water refuge site and to the area of the Barge Canal where they remained for various periods of time (Bengston, 1981 in Beeler and O'Shea, 1988). These telemetry studies recorded manatee feeding, resting and mating activities in the Barge Canal and adjoining St. Johns River clearly demonstrating that Blue Spring manatees use the Barge Canal. Springtime and warm season manatee use of the St. Johns River within a 2 mile radius of the Barge Canal entrance was documented by aerial surveys performed by Jana Pennington in 1994-1995 (FDEP, Jacksonville field station). A total of 29 manatees were found in this area (7 within the Barge Canal east of Buckman Lock) during this aerial survey effort in the months of March to October. This survey effort continued to document manatee use of St. Johns River waters in close proximity to the Barge Canal and mouth of the Ocklawaha River through 1996. Beeler and O'Shea (1988) tabulated verified sightings of manatees by the general public in segments of the Barge Canal in Putnam and Marion Counties. Manatees were recorded at the mouth of the Ocklawaha River, Rodman Reservoir, State Road 19 Bridge and Buckman Lock, St. Johns Bridge (Buckman Lock), between the Buckman Lock and the St. Johns River, Rodman Dam Spillway, Rodman Canal, near Blue Spring, and at the junction of the Ocklawaha and Silver
Rivers. Lynn Lefevbre (National Biological Survey USGS) reported observations of a manatee in 1977 some 2 miles down stream from Cedar landing, near Blue Spring within Rodman Reservoir and another upstream of the confluence of the Silver and Ocklawaha Rivers (Warr, et al, 1994; Lefevbre, personal communication). Warr reported that a former director of the Silver Springs attraction observed two manatees in Silver Springs in July of 1987. In May, 1994 staff from the St. Johns River Water Management District observed two manatees moving into Rodman Reservoir through Buckman Lock and one manatee moving from the reservoir into the lock (Warr, et al., 1994). Warr and coworkers also reported that Buckman Lock operators frequently observed groups of manatees (4-5) attempting to move into the lock headed towards the reservoir. In fact, lock tenders have recorded as many as 28 manatee sightings within a one month period. A disproportionate number of sightings were recorded in the vicinity of the USACE structures (Rodman Dam and Buckman Locks) due to the significant time lock operators and maintenance personnel were stationed at these sites. Such an artifact may misrepresent use of the Ocklawaha system farther up stream in more remote locations.

Recent aerial surveys of the Rodman Reservoir and associated waters have found no manatees in the artificial lake. Jim Valade flew aerial surveys for the Save the Manatee Club along the St. Johns River in the vicinity of the barge canal, and observed 3 manatees on the eastern side of the Buckman Lock during a July 25, 1991 survey. As mentioned previously in this report, Kipp Frohlich and Phil Worley flew an aerial survey of the Ocklawaha River system and observed no manatees on January 23, 1996 after the closing of Buckman Lock. A June 16, 1996 aerial survey of the Rodman Reservoir and upper Ocklawaha River was performed by Jana Pennington (FDEP-FMRI, Jacksonville Field Station), during which no manatees were observed. The results of these most recent surveys and a lack of reports of manatees within this system indicate that access to the upper Ocklawaha will be granted to manatees only as a result of planned restoration efforts.

Effects of Proposed Restoration Efforts on Manatee Habitat and Use

Restoration of the Ocklawaha River as proposed will eliminate the Buckman Lock route of known manatee access to the upper Ocklawaha, Rodman Dam and Rodman Reservoir. The loss of each of these components of this system will mean loss of certain recorded aspects of manatee habitat in this area, but will ultimately provide benefits to manatees using the Ocklawaha and St. Johns River systems.

Recent lack of operation of the Buckman Lock has already resulted in the elimination of the only access corridor that manatees can use to get into Rodman Reservoir and upstream waters. Although this lock was never fully exploited by commercial and recreational vessel traffic, manatee use of the canal associated with the lock placed manatees at an increased risk of death or injury from vessel strikes. The narrow nature of the waterway and the amount of vessel traffic on a fully operative barge canal would likely have caused increased manatee watercraft deaths (Campbell, 1976). Securing or removal of the lock structures themselves will eliminate a known source of manatee mortality, which will benefit the St. Johns River manatee population. If the canal itself will not be backfilled, manatees may use these waters as quiet resting or calving areas if water levels remain as they are. There is, however, some risk of watercraft strikes to manatees if canal waters are used extensively by watercraft for other purposes, a risk that would be eliminated by backfilling or blocking the system to manatee or watercraft access.

Restoration of the Ocklawaha River will be primarily accomplished by removal of the Rodman Dam and the subsequent return of the Ocklawaha to its river bed. Removal of the dam will open a manatee access corridor
to the rest of the Oklawaha system that was most likely historically used by these animals. Dam removal will also result in the elimination of known source of significant manatee mortality and the only known source of water control structure mortality on the St. Johns River system. The combination of securing the Buckman Lock and dam removal means that manatees will have unobstructed access to the waters of the restored Oklawaha River with no risks of structure related injury or mortality. Manatees will be able to more freely access significant sources of warm water such as the Silver River and to potential warm water refuge sites, like Blue Spring, long buried under the artificial flood waters of Rodman Reservoir. Use of these warm water sites might be of special significance to some manatees moving out of Blue Spring State Park waters, especially during the early or late cold season. If manatees happen to currently be trapped behind this dam, despite evidence to the contrary, these individuals would be allowed to interact with manatees in the St. Johns River once again and become part of the east coast breeding population once more contributing to the genetic health of this population.

Habitat considerations for this restoration effort will also result in a net positive benefit to manatees. Rodman Reservoir with its high biomass of SAV will be drained and this manatee foraging resource will be reduced. However, a preponderance of this SAV is comprised of the exotic species hydrilla, which alters native SAV communities or eliminates native aquatic plant competitors. The return of the Oklawaha River to its original river bed may allow the return of native SAV communities that are more resistant to environmental variables that can devastate exotic monoculture stands of vegetation. Diversity of foraging habitat provides manatees with a variety of plant species that allows these aquatic herbivores to better meet their metabolic and nutritional needs. Although it is unlikely that hydrilla and other exotic aquatic plants, such as water lettuce and waterhyacinth, will be eliminated, the natural succession of the hydric flood plain to a wetland community dominated by hardwood species will most likely result in shaded, tannin stained river waters where native SAV species can compete with non-native plants (BAPM, 1994; Burks, 1996). Management recommendations made in the BAPM document (1994) and by Burks (1996) designed to facilitate the return of these aquatic and woody wetland species should be followed.

In summary, manatees will benefit from proposed restoration of the Oklawaha River by virtue of reduced risks of mortality from water control structure operation. Habitat quality and accessibility will also likely improve over operative Barge Canal conditions. Predictions for future manatee use of this system can best be assessed by comparing historical manatee use of adjacent waterways with more focused manatee surveys. During the 1975 cold season, 26 known manatees used the Blue Spring warm water refuge in Volusia County (Campbell, 1976). The population of manatees using this spring system as a warm water refuge has long been recognized as a major component of the St. Johns River manatee population. During the 1996 cold season, upward of 90 individually identified manatees used this same spring system (Wayne Hartley, Blue Spring State Park biologist, personal communication). This represents more than a tripling of the known population of manatees that are recognized as spending time near the mouth of the Oklawaha River throughout the year (Bengston, 1981). Given this level of growth in manatee use of this area, it is highly likely that the restored Oklawaha River will also see increased use by manatees and may become an important manatee habitat in the future.
References


Personal Citations:
Debra Fiesler: FDEP, Office of Greenways and Trails, Tallahassee, FL
Kipp Frohlich: FDEP, Bureau of Protected Species Management, Tallahassee, FL
Jim Valade: U.S. Fish and Wildlife Service, Jacksonville, FL