8.1 Introduction

The Hatchet Creek Watershed is located in the northeast quadrant of Alachua County. The main channel of the creek flows west to east and empties into Newnans Lake. The watershed is comprised of three sub-basins that encompass approximately 65 square miles of rural land (Figure 8.1). The majority of the watershed is located outside the Gainesville city limits. It begins just west of SR 121 in Gainesville and continues east to SR 26, and south to Newnans Lake. Land surface elevation ranges from 165 feet in the upper basin to 75 feet (NGVD) near Newnans Lake.

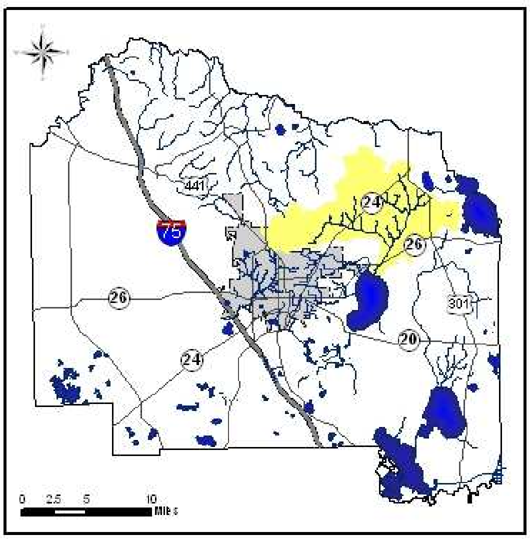


Figure 8.1 Location of the Hatchet Creek Watershed in Alachua County

The Hatchet Creek Watershed is located along the southern margin of the Northern Highlands physiographic province (White 1970). Land surface elevations decrease as Hatchet Creek reaches the northern end of Newnans Lake. Plio-Pleistocene terrace deposits of sands, silts, clayey sands, and sandy clays overlie the sediments of the Hawthorn Group formations (Thomas et al 1985).

The most common soil types in the Hatchet Creek Watershed include the Wauchula, Pelham, Pomona, Sparr fine, and Monteocha loamy sands (Thomas et al 1985). These soils are generally somewhat poorly drained to poorly drained sandy wet flatwoods soils with a water table typically less than 10 inches below land surface for one to three months or more during the year (Thomas et al 1985). The Monteocha loamy sand supports numerous water tolerant tree species including tupelo (black gum), pond pine, and bay. Areas of Millhopper sand, Tavares sand, and Candler fine sand, which are moderately well drained to excessively well drained soils, are also present in the watershed (Thomas et al 1985). As in the Lake Forest Creek and Little Hatchet Creek Watersheds, the poorly drained nature of the soils indicates the presence of the lower permeability Hawthorn Group formations below the Pliocene to recent surficial sands and clayey sands.

Approximately 50% of the land in the Hatchet Creek Watershed is devoted to silviculture, 20% to agriculture, and 20% to natural forest habitat. The remaining 10% is comprised of low density residential areas and commercial facilities, including a former Florida Department of Transportation (FDOT) sand borrow pit in Fairbanks. Agricultural land uses include cattle, dairy, produce farms, and the 1,138-acre University of Florida IFAS Beef Research Unit. Located south of Hatchet Creek between CR 225 and Waldo Road, the small rural community of Fairbanks is comprised of scattered single family dwellings and a few local businesses. The eastern portion of the watershed is occupied by the Newnans Lake Conservation Area.

8.2 Watershed Description

Baseflow in Hatchet Creek is derived primarily from springs and seeps from the surficial aquifer system. The headwaters are dominated by forested wetlands and pine flatwoods. The few channelized segments of Hatchet Creek are located primarily at major roadway crossings. The main channel begins west of CR 225 and north of NE 53rd Avenue, and flows northeast before reaching CR 225 where the channel begins flowing southeast. Four tributaries join Hatchet Creek before the channel turns to the southwest and discharges to Newnans Lake.

In 2002, a stream survey was performed by ACEPD personnel on a section of Hatchet Creek in the vicinity of CR 225 (Figure 8.2). Here, Hatchet Creek flows southeast, crossing under CR 225 via a 48-inch concrete triple box culvert. Streambed erosion and sand smothering are slight along this segment and little scouring was observed. Moderate sediment deposition and bank scouring was observed only near the box culverts. Banks in this area are low, stable, and well vegetated with native plant species. A healthy, natural riparian buffer borders the banks, protecting the creek from harmful runoff affects.

8.3 Physical Habitat and Biology

Primarily due to its rural setting and the presence of conservation areas, several segments of Hatchet Creek have characteristics of a healthy ecosystem including good habitat for macroinvertebrates and other aquatic life. Near CR 225, Hatchet Creek is characterized by low, stable banks, riffles, and pools followed by seg-

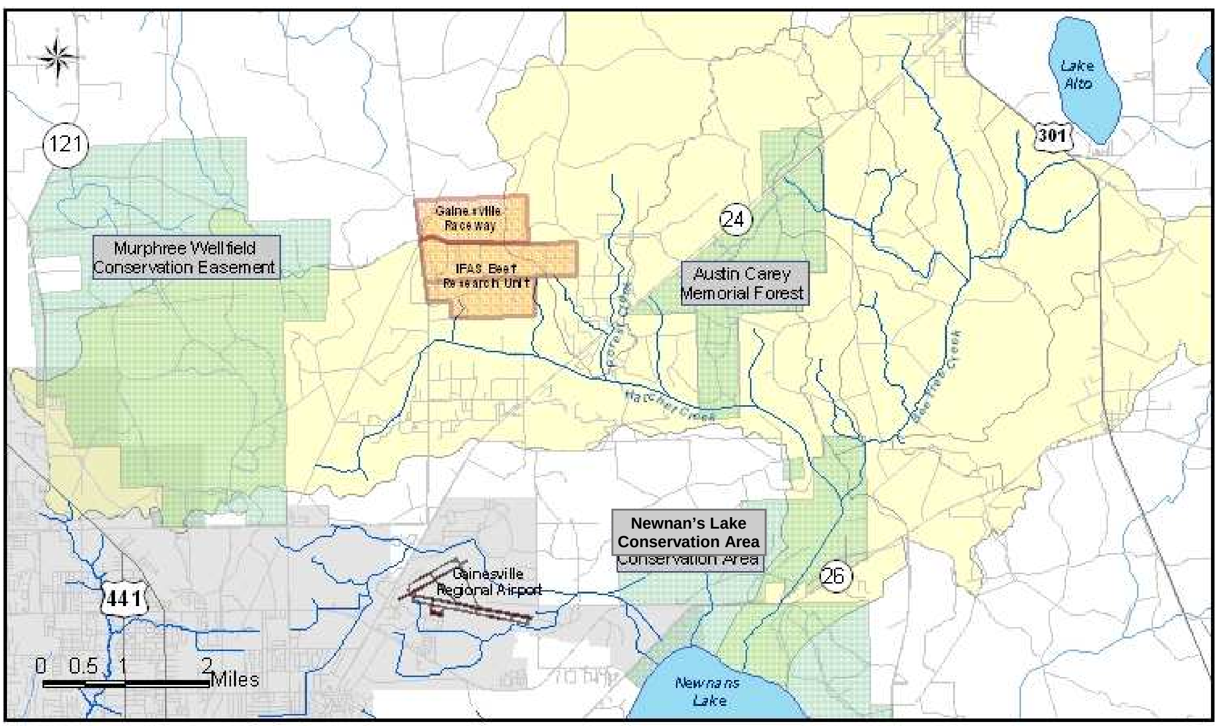
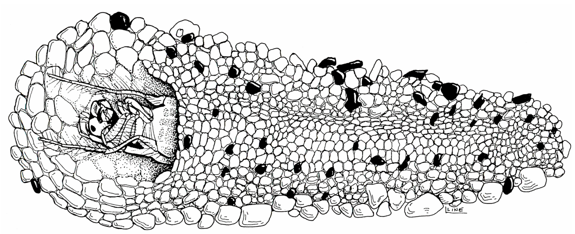


Figure 8.2. Notable features in the Hatchet Creek Watershed



Caddisfly *(Molanna tryphena)*– a species found in Hatchet Creek

ments of sediment-free root mats, snags, and leaf packs- all of which support macroinvertebrate populations.

8.3.1 Hatchet Creek at SR 26 (FDEP)

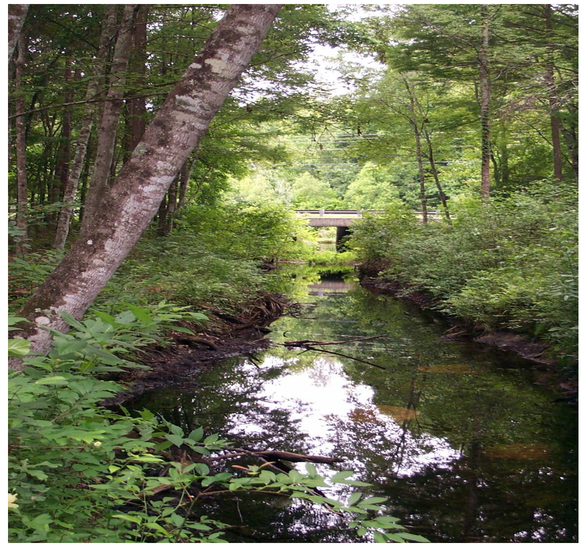
In 1997, a Stream Condition Index (SCI) was performed on Hatchet Creek at SR 26 (HAT26) by FDEP personnel from the Jacksonville Northeast District. The site was rated excellent in this assessment (Table 8.1).

8.3.2 Hatchet Creek at SR 26 (ACEPD)

In 2000, ACEPD personnel placed Hester Dendy samplers in Hatchet Creek at HAT26. Water and Air Research personnel identified the organisms that colonized these multi-plate samplers. The results of this sampling indicated an impaired rating for the site (Evans 2000). However, Hester Dendy samplers can underestimate the number of colonizers as they can function as a feeding station for larger organisms. These data alone may not provide a representative evaluation of the macroinvertebrate fauna present in the creek.

Table 8.1 BioRecon Scores for two sites on Hatchet Creek

Metric	Target Value	HAT26 (1997)	CR225 (2001)
Taxa Richness	**≥ 18**	**39**	**30**
EPT	**≥ 4**	**6**	**12**
FL Index	**≥ 10**	**11**	**18**
Metrics Passed		**3**	**3**
Biological Condition		**Healthy**	**Healthy**



Hatchet Creek at CR 225

8.3.3 Hatchet Creek at CR 225

In 2001, ACEPD and WAV personnel performed a Rapid BioRecon on Hatchet Creek at CR 225 (Table 8.1). It received a 110 out of 160, or 69%, on the Habitat Assessment. Considerable point deductions were made in both the water velocity and habitat smothering categories. Despite these deductions, this site was rated healthy by the BioRecon surpassing all three metric target values.

8.4 Pollution Sources

8.4.1 Point Sources

Most of Hatchet Creek flows through rural areas northeast of Gainesville and south of Waldo where pollution is dominated by nonpoint sources. One major point source, the Fairbanks sand pit, is located immediately south of the main channel, east of Waldo Road. The Fairbanks Pit was originally a sand borrow pit purchased by the Florida Department of Transportation (FDOT) in 1946 that pro-

Dredged portion of Hatchet Creek at Waldo Road (SR24)

vided sand and clay for road construction (Westinghouse 1995). It was subsequently used to dispose of wastes and topsoil collected from roadsides and demolition and construction debris beginning in 1956.

The Fairbanks pit was also used by the FDOT's Bureau of Materials Research Laboratory to dispose of non-recyclable wastes including chlorinated solvents, asphalt waste, paint, paint thinners, and paint waste beginning in the late 1950's. A total of 1,391 buried waste drums were removed from the site during physical closure activities between 1983 and 1990 (Westinghouse 1995). Of these drums, 814 were empty and the remaining contained mostly asphalt. It was determined that site contamination was due to chemicals dumped on the ground or buried elsewhere in the vicinity. No records exist to document the quantity of hazardous waste that was disposed of during site operations. Westinghouse (1995) reported that approximately 125,000 tons of contaminated soil were removed and properly disposed.

There has been documented contamination of groundwater in the surficial and intermediate aquifer systems at the Fairbanks FDOT site. At the present time, contamination is confined to an area beneath and immediately north and northeast of the pit, terminating in the area of Hatchet Creek. Groundwater remediation is occurring through the use of a pump and treat system. Reclaimed water from the system is discharged to a holding pond.

8.4.2 Nonpoint Sources

Nonpoint source pollution in the Hatchet Creek Watershed is dominated by silvicultural and agricultural activities. Because approximately 50% of the land is devoted to silviculture, there is the potential for increased runoff from clear cutting and from the reduced understory caused by monoculture maintenance. Runoff can impact water quality if fertilizers or pesticides are overused or not managed properly.

Agriculture comprises approximately 20% of the watershed. Sediment runoff and nutrient (nitrogen and phosphorus) loading can result from poor agricultural practices. Stormwater discharge from major roadways is another potential contributor of nonpoint source pollution.. Best management practices for these land uses are critical for water resource protection.

8.5 Baseflow Water Quality

Since 1998, ACEPD personnel have been sampling Hatchet Creek at SR 26 (HAT26), located just north of Newnans Lake. The site was chosen to monitor the contribution of Hatchet Creek to Newnans Lake, but may not be representative of the unchannelized, upstream segments.

8.5.1 Field Parameters

Parameters measured in the field include water temperature, pH, specific conductance, turbidity, and dissolved oxygen (DO). Table 8.2 compares data from Hatchet Creek with data from the other creeks within the Newnans Lake Watershed.

Median water temperature for Hatchet Creek was lower than all streams monitored in the Orange Creek Basin, with the exception of Lake Forest and Little Hatchet creeks. These relatively low median water temperatures reflect the forested nature of the riparian zone amongst the streams.

The median specific conductance and pH values in Hatchet Creek were the lowest of all streams monitored in this study. These low pHs and conductivities are expected for streams flowing through pine/cypress swamps.

Turbidity in Hatchet Creek is comparable to the other Gainesville area streams. The median dissolved oxygen (DO) in Hatchet Creek is lower than all of the streams monitored in this study, except for LHAT26 (3.49 mg/L) and TUM331 (2.13 mg/L). The lower DOs for HAT26 and LHAT26 reflect low primary productivity and high secondary productivity in these canopied watersheds.

Table 8.2 Comparison of baseflow water quality data for four creeks that flow into Newnans Lake

Parameter	HAT26	LHAT26	LHT26E	LFC329B
Water Temp ^{o}C	20.1	20.4	19.9	19.8
pH (SU)	6.12	6.20	6.54	6.86
Sp. Cond. (uS/cm)	99	120	143	189
Turbidity (NTU)	1.8	2.2	1.3	1.7
DO (mg/L)	5.46	3.49	5.48	5.51

8.5.2 Nutrients

Hatchet Creek has naturally high levels of organic carbon, which is mostly in dissolved form. These high levels, exhibited in both Hatchet and Little Hatchet creeks, are expected for streams flowing through heavily forested wetlands such as those found in the Newnans Lake Conservation Area. Median dissolved organic carbon (DOC) levels are over three times higher on these two creeks than all other creeks surveyed in this study (except for Calf Pond, which also flows through a wetland). Median DOC values are 35.8, 36.1, and 30.1 mg/L at HAT26, LHAT26, and LHT26E respectively.

Total nitrate plus nitrite (NO_x-T) concentrations are quite low in Hatchet Creek (median of 0.007 mg/L), while Total Kjeldahl Nitrogen (TKN-T) concentrations are elevated (median of 1.11 mg/L) compared to streams flowing through

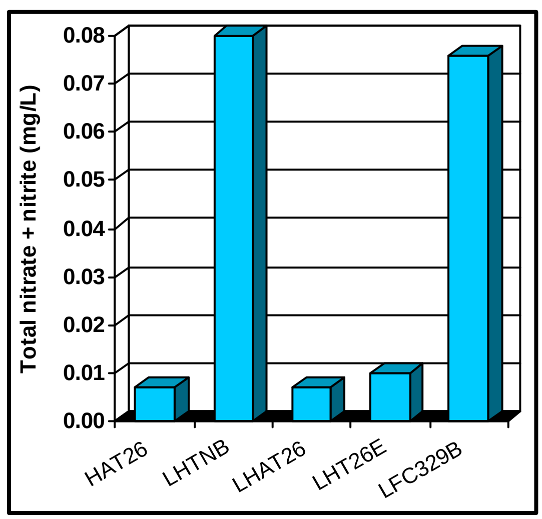


Figure 8.3 Comparison of total nitrate plus nitrite (NOx-T) among the tributaries of Newnans Lake

more urbanized watersheds (Figure 8.3). This suggests significant organic matter breakdown and bacterial/fungal metabolism in the stream, which transforms the available NO_x-T into organic nitrogen compounds . Similar results were observed at Little Hatchet Creek sites near the Newnans Lake Conservation Area.

Total phosphorus (TP-T) and total orthophosphate (PO_4-T) concentrations in Hatchet Creek (median concentrations of 0.123 mg/L and 0.082 mg/L respectively) were similar to those in the upper reaches of Sweetwater Branch and the lower reaches of Tumblin Creek (Figure 8.4). These concentrations were also similar to those in the East Branch of Little Hatchet Creek near the Newnans Lake Conservation Area and at Lake Forest Creek just downstream from its forested wetland.

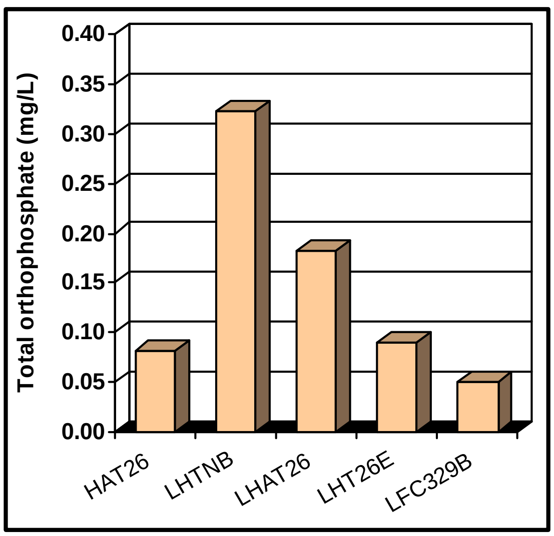


Figure 8.4 Comparison of total orthophosphate (PO_4-T) among the tributaries of Newnans Lake

8.5.3 Coliform Bacteria

Samples for fecal coliform bacteria were collected at HAT26 from March 2001 through December 2002 (Appendix C). Throughout the sampling period, fecal coliform levels fell below the Class III Recreational Waters one time maximum of 800 colony forming units (CFU)/100mL (FDEP 1996a).

8.6 Stormwater

Stormwater samples were collected from Hatchet Creek in the summers of 2000 and 2001. Organic carbon and nitrogen species showed noteworthy changes during storm flow conditions compared to baseflow conditions. Total organic carbon (TOC) concentrations increased 84% during stormflow (from a median baseflow value of 36.92 mg/L to 67.81 mg/L). Median NO_x-T concentrations increased 329% during stormflow (from a median baseflow value of 0.007 mg/L to 0.030 mg/L) (Figure 8.5). Only the West Branch of Little Hatchet Creek showed a greater increase. Total ammonia (NH_4-T) concentrations increased 91% during stormflow conditions (from 0.023 mg/L at baseflow to 0.044 mg/L), which was the second smallest increase of all streams monitored in this study. Total Kjeldahl Nitrogen (TKN-T) concentrations

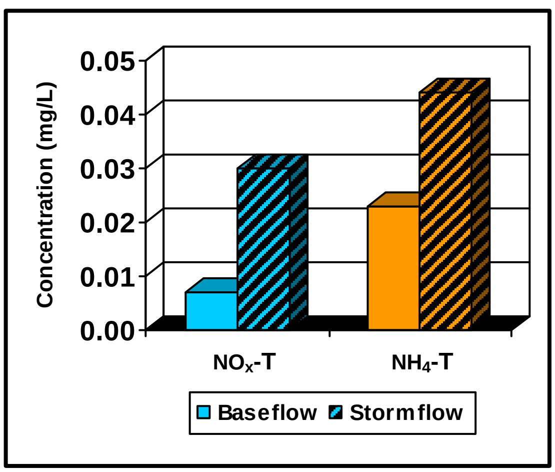


Figure 8.5 Increase in nitrate plus nitrite (NO_x-T) and total ammonia (NH_4-T) under stormflow conditions compared to baseflow at Hatchet Creek (HAT26)

increased by 47% (from a baseflow value of 1.110 mg/L to 1.630 mg/L); only the West Branch of Little Hatchet Creek and Lake Forest Creek had smaller increases. Median total orthophosphate (PO_4-T) concentrations increased from 0.082 mg/L during baseflow to 0.093 mg/L (13% increase) during stormflow, which was similar to the 11% increase observed in the East Branch of Little Hatchet Creek.

The noteworthy increases in nutrient concentrations, specifically TOC and NO_x-T, during stormflow conditions in streams flowing through forested wetlands can be difficult to qualify. Increases in TOC indicate there is more organic material within the stream flow. This likely results from increased areas of sheet flow during storm events which collect and transport decaying organic matter from the forested wetland floor. Storm related increases in NO_x-T can be the result of several factors. First, runoff from agricultural and residential areas has the potential to contain NO_x from fertilizer application. Second, NO_x is present in rainfall due to naturally occurring atmospheric deposition. In addition, NO_x-T levels can fluctuate in streams flowing through forested wetlands as the amount of oxygen within the water changes. Under aerobic conditions, which may occur during stormflow, NH_4 is converted to NO_x by bacteria. Under anaerobic conditions, which occur more often during baseflow, NO_x is converted to NH_4, thus decreasing NO_x-T levels while increasing NH_4-T levels. In summary, it can be difficult to explain changes in nitrogen species in forested wetlands during storm conditions due to the number of factors influencing concentrations.

8.7 Ecosystem Health

8.7.1 Biological Integrity

The Hatchet Creek Watershed has many natural, undisturbed areas with diverse habitats including mixed hardwood lowland forest, pristine wetlands, cypress (*Taxodium* sp.) and pine swamps, and upland longleaf pine (*Pinus palustris*)/turkey oak (*Quercus laevis*) associations.

Rich communities comprised of native species include titi (*Cyrilla racemiflora*), cypress, oak (*Quercus* sp.), pine (*Pinus* sp.), red maple (*Acer rubrum*), hickory (*Carya* sp.), dahoon holly (*Ilex cassine*), black gum (*Nyssa sylvatica*, var. *biflora*), and sweetgum (*Liquidambar styraciflua*).

There is a wide range of native understory and groundcover species such as redbud (*Cercis canadensis*), azaleas (*Rhododendron* sp.), wax myrtle (*Myrica cerifera*), mulberry (*Morus* sp.), grape (*Vitus* sp.), royal fern (*Osmunda regalis*), crossvine (*Bignonia capreolata*), Carolina jessamine (*Gelsemium sempervirens*), and fet-

***Salvinia* sp. and duckweed in Hatchet Creek**

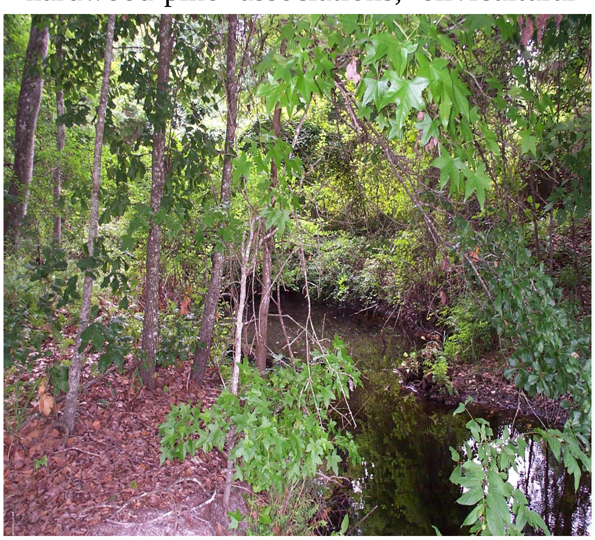
terbush (*Lyonia lucida*). Aquatic macrophytes include knotweed (*Polygonum* sp.), green arrow arum (*Peltandra virginica*), goldenclub (*Orontium aquaticum*), and exotic alligator weed (*Alternanthera philoxeroides*).

Like several other streams in the Orange Creek Basin, these diverse habitats also support many species of Florida vertebrate wildlife.

Silviculture comprises 50% of the land in the Hatchet Creek Watershed. The resulting monocultures of pine species greatly reduces habitat diversity and consequently faunal species diversity as well. The risk of fire is also greatly increased, as wildfires can sweep through pine plantations with great intensity, due to lack of varying understory or pasture that tend to temper their velocity.

8.7.2 Physical Integrity

The majority of Hatchet Creek retains its natural sinuosity, winding through natural areas such as forested wetlands and mixed hardwood-pine associations, silvicultural areas, and farmland. Only about 10% of the stream length has been channelized and these areas tend to be near major roadways. These areas are subject to sand smothering due to the channelization.



A natural, sinuous area of Hatchet Creek

8.8 Hydrology

The mean streamflow of Hatchet Creek, measured at the SR 26 crossing, is 5.9 cubic feet per second (cfs). Over 760 daily measurements of flow were made at this site by the St. Johns River Water Management District. The flow from Hatchet Creek is the largest inflow to Newnans Lake (Appendix F).

The maximum streamflow measured during the period of record at this site was 263.5 cfs, while the stream periodically dries up with zero streamflow. Flow is less than 1.0 cfs about 38 percent of the time, while it is greater than 10 cfs about 10 percent of the time (Appendix F).

These streamflow measurements were made in the upstream portion of the watershed, above the input of flows from Bee Tree Creek and several minor tributaries. Therefore, The Hatchet Creek streamflow measurements underestimate the volume of inflow to Newnans Lake from the Hatchet Creek Watershed. The mean streamflow for Bee Tree Creek is 7.9 cfs (Appendix F). While this mean flow is greater than the mean for Hatchet Creek, the period of record for Bee Tree Creek is shorter and does not include earlier drought years.

Both Sweetwater Branch and Hogtown Creek have higher mean streamflows than Hatchet Creek. Hatchet Creek streamflow is, however, greater on average than that for Tumblin and Possum creeks.

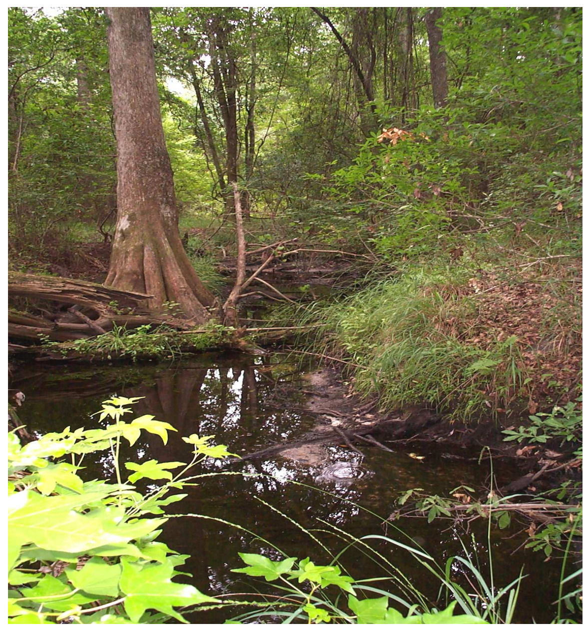
Twelve streamflow measurements were made on Hatchet Creek at SR26 under stormflow conditions. The maximum streamflow was 194.6 cfs, while the mean was 37.5 cfs under stormflow conditions.

8.9 Summary

The Hatchet Creek Watershed retains more of its natural habitats than any of the watersheds in the Gainesville urban area. Water quality is good and sand smothering is only significant in the channelized areas along major roadways. Stormwater quality data indicate that nitrogen species increase significantly during runoff events. While this may be a natural phenomenon for low gradient blackwater streams flowing through forested wetlands, a spatial analysis of stormwater nutrients should be conducted throughout the watershed. This analysis would determine whether the nitrogen increases are natural or anthropogenic.

The implementation of best management practices (BMPs) for silvicultural and agricultural activities are extremely important. The broad objectives of BMPs are to minimize the environmental impacts of particular land use activities and, in some cases, to provide ecological restoration benefits.

In conjunction with BMPs, the Florida Department of Agriculture, Division of Forestry, retains the requirement from the adopted Alachua County Comprehensive Plan that silvicultural activities maintain the overall ecological integrity of the wetland communities. This includes maintaining listed species populations onsite, planning harvests for varying age and height diversity, and maintaining natural hydrology (FDACS 2000).



A natural area along Hatchet Creek