STREAM ECOSUMMARY

Johnson Creek above County Road 286, November 7, 2012

FDEP conducted Stream Condition Index (SCI) biological and water quality sampling at Johnson Creek in Calhoun County (**Figure 1**) on November 7, 2012. The monitoring was in support of a Florida Agricultural and Mechanical University (FAMU) agricultural research study: "Apalachicola River Basin: "Effects of Soil Erosion, Agricultural Management Practices and Land-use on Water Quality and Aquatic Ecosystem Health." The biological and water data, despite drought conditions, indicated that the stream met expectations for a healthy, well-balanced stream. The biology and flow at Johnson Creek appeared to be better than other streams observed in the area. During this study, we found a new Florida record for the stonefly, *Allocapnia starki* (**Figure 2**) http://www2.pms-lj.si/illiesia/papers/Illiesia08-01.pdf.



Figure 1. Stream Condition Index site for Johnson Creek on 11/7/2012.



Figure 2. Stonefly larva, *Allocapnia starki* from Johnson Creek County Road 286, a new record for Florida.

Background

Although healthy, well-balanced stream and river communities may be maintained with some level of human activity, such activities may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or pesticides from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of nuisance (generally exotic) plants and animals. DEP has methods to evaluate if human activities have resulted in the condition where a particular waterbody has exceeded water quality criteria (Chapter 62-302, Florida Administrative Code), including whether adverse impacts to biological communities have occurred. DEP water quality standards are designed to protect designated uses of the waters of the state (*e.g.*, recreation,

aquatic life support), and exceedances of these standards is associated with interference with the designated use. The Stream Condition Index (SCI) assesses how closely the macroinvertebrate community (*e.g.*, aquatic insects, clams, crayfish) of a stream resembles the macroinvertebrate community of an undisturbed or "reference" condition. The stream and river habitat assessment evaluates the availability and quality of habitat for macroinvertebrates, and can help diagnose the cause of a low SCI score.

Methods

This stream was sampled on November 7, 2012 by the DEP Northwest District Office following DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/sops.htm for details). Sampling and analyses met FDEP quality assurance/ quality control standards (see http://www.dep.state.fl.us/water/sas/qa/index.htm). The Stream Condition Index (SCI) was sampled per DEP SOP FS7420 and calculated per DEP SOP LT7200. The SCI consists of collecting macroinvertebrates via 20 D-frame dipnet sweeps (0.5 m in length) in the most productive habitats in a 100 m reach of stream. The organisms are sub-sampled, and identified to the lowest practical taxonomic level. The SCI is composed of ten metrics, eight of which decrease in response to human disturbance, with two metrics (% very tolerant and % dominant) increasing in response to human disturbance. According to DEP SOP LT 7000, the SCI score ranges and categories are: (68-100 Exceptional; (35-67) Healthy; and (0-34) Impaired. Proposed biological health assessment criteria state that a site is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of those scores is less than 35. The Stream and River Habitat Assessment was conducted per DEP SOP FT 3100. The Habitat Assessment is a rapid field method in which a sampler scores eight in-stream and riparian components to estimate the influence of habitat factors on the resident aquatic organisms. Habitat Assessment scores range from 11-160 and overall habitat quality is assigned to one of four categories: Optimal (120-160 points), Suboptimal (80-119 points), Marginal (40-79 points), and Poor (11-39 points).

Site Information

Johnson Creek is a third order stream at the sample site (STORET 31010246) located within the Dougherty Plain of the Southeastern Plains ecoregion 65g. This site (Lat/Long N30°36′ 8.7″ W-84°58′ 8.4″) is located 8.8 miles east northeast of Altha in Calhoun County (**Figure 3**). The sampling site was located upstream from County Road 286. The headwaters are in Jackson County at the I-10 weigh station. The watershed encompasses near I-10 to the north, County Road 286 to the south, Ocheesee Road to the East, and St. Rose Road to the west. County Road 286 and St. Rose Road cross Johnson Creek. The 2010 NWFWMD landuse lists roads and highways (includes I-10 weigh station), low density housing, high density mobile homes, community recreational facilities, electrical power transmission lines corridor, field crops, hay fields, improved pastures, unimproved pastures, range land herbaceous (dry prairie), mixed rangeland, forest regeneration, coniferous plantations, shrub and brushland, mixed wetland shrub, mixed scrub-shrub wetland, freshwater marshes, hydric pine flatwoods, pine flatwoods, upland coniferous forest, mixed wetland hardwoods, wetland forest mixed, cypress, hardwood coniferous mixed, and upland hardwood forest in the watershed See **Figure 4** for an aerial view of watershed. Garbage was observed in the sample reach; additional household waste was dumped downstream at the County Road 286 culvert.

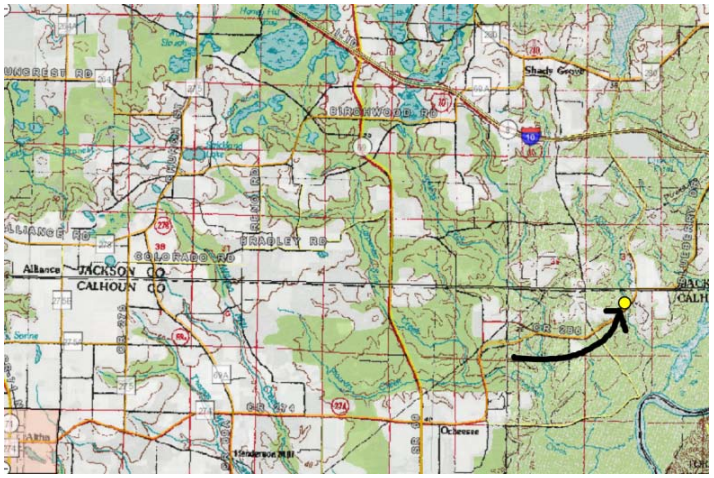


Figure 3. SCI sample location of Johnson Creek in Calhoun County.

Johnson Creek flows into Ocheesee Drain in the Apalachicola River floodplain, then to the river and into Apalachicola Bay. Fish were common, with shiners and a pirate perch observed. Florida Natural Area Inventory (FNAI) listed several species that are found in the watershed including the Gopher Tortoise *Gopherus polyphemus*, Pine-woods Bluestem *Andropogon arctatus*, Harper's Yellow-eyed Grass *Xyris scabrifolia*, and Yellow Fringeless Orchid *Platanthera integra* (**Figure 5**). The deciduous shrub, Ninebark *Physocarpus opulifolius* was found in the adjacent watershed to the east, less than a mile from Johnson Creek. At Jenkins Creek, located 1.3 miles to the west of Johnson Creek, three caddisflies listed by FNAI were found (Floridian Finger-net Caddisfly *Chimarra florida* Novasota Oxyethiran Microcaddisfly *Oxyethira novasota* , and Little-entrance Oxyethiran Microcaddisfly *Oxyethira janella*). While assisting the FAMU research study, a substantial population of the stonefly *Allocapnia* was

found in Johnson Creek. This enabled collecting enough specimens to rear to adults to determine it was *A. starki*, a new record for Florida.

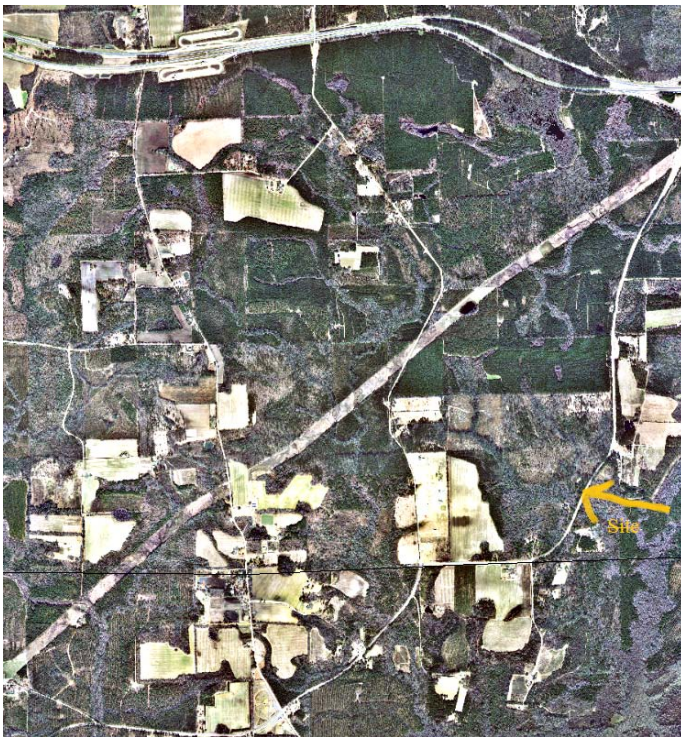


Figure 4. Johnson Creek watershed FDOT aerial imagery flight dates March 2010.



Figure 5. Fringeless Orchid *Platanthera integra* in bloom.

During the spring of 2011 and in early June of 2012, this reach of Johnson Creek was observed to be reduced to a series of isolated gravel substrate pools. Despite the low water levels, 62 aquatic macroinvertebrate taxa (counting 6 taxa observed below CR 286) including 4 stonefly species (*Allocapnia, Clioperla,* & an early instar Perlidae plus *Amphinemura* below CR 286) were collected in early November. Since this high-value natural community could be adversely affected by excessive groundwater use, it should be noted for consideration in future groundwater withdrawal permit decisions. http://www.nwfwmd.state.fl.us/rmd/mfl/mfl.htm. The Johnson Creek watershed appears well suited for studying the effects of surface and ground water withdrawal on stream ecosystems (compared to the more developed Jenkins Creek, Carpenter Sink Creek, Flowers Creek, Wilson Mill Creek, Thomas Mill Creek, Graves Creek, and Stafford Creek).

Results

Water Quality

The water quality samples complied with all Class III water quality criteria (Table 1). Nutrients were very low (total nitrogen 0.254 mg/L and total phosphorus 0.016 mg/L), typical of Panhandle streams In November, 2012, lack of flow appeared to limit the number of sensitive stoneflies collected to 4 individuals in 3 taxa. These were collected in three small riffles, one shown in **Figure 1**.These riffles in total were less than one square meter coverage of the sample reach because of low flow conditions. Many additional (hundreds) stoneflies were collected in leaf packs in a riffle with better flow below the County Road 286 road culvert. The low flow conditions probably contributed to a DO saturation (65%) that was slightly lower than the water quality criterion (67%).

Table 1. Water quality results from 11/7/2012 at Johnson Creek.

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	13.59		
Field pH (SU)	6.95		
Field Dissolved Oxygen (mg/L)	6.79		≥5.0
% Dissolved Oxygen Saturation	65		67
Specific Conductance (µmhos/cm)	134		Not to exceed 50% of background or 1275 µmhos/cm
Total Suspended Solids (mg/L)	2	I	
Alkalinity (mg $CaCO_3$/L)	52		
Color (PCU)	70		
Chloride (mg/L)	8.7		
Fluoride	0.052	I	
Calcium (mg/L)	11.6		
Magnesium (mg/L)	7.61		
Sodium (mg/L)	3.8		
Sulfate (mg/L)	1		
Chlorophyll a (µg/L)	0.55	U	

Total Phosphorus (mg/L)	0.016		*0.06 mg/L
Nitrate+Nitrite (mg/L)	0.004	I	
Ammonia (mg/L)	0.010	U	
Total Kejldahl Nitrogen (mg/L)	0.25		
Total Nitrogen (mg/L)	0.254		*0.67 mg/L
Organic Carbon (mg/L	7.2	I	

I – Result was between the method detection limit (MDL) and the practical quantitation limit (PQL)
U – Compound was analyzed for but not detected
* Federally promulgated numeric nutrient criteria for Panhandle West nutrient region

Habitat Assessment

The stream habitat assessment score was 126, which in the optimal range. Water Velocity (0.3 meters per second), Artificial Channelization, and Riparian Buffer Zone Width, rated optimal. Habitat Smothering, Substrate Diversity, Bank Stability (some bank sloughing), and Riparian Zone Vegetation Quality (invasive Chinese privet & Japanese climbing fern) scored suboptimal. Substrate Availability (10%) rated marginal.
In contrast habitat assessment scores in Wilson Mill Creek, about 6 miles west of Johnson Creek, scored in the suboptimal range. Wilson Mill Creek had more agricultural land use than Johnson Mill Creek. The Wilson Mill Creek HA scores were 99 above Colorado Road, 98 above Troy McCroan Road, and 105 above State Road 274. The first two Wilson Mill Creek sites were characterized by sediment deposition (likely from primarily agricultural runoff), which had caused braided channels.

Stream Condition Index

The SCI score for this site was 58, corresponding with a "healthy" designation. Since *Allocapnia starki* was a new record for Florida it was not in the biometric calculations for the SCI. The sample would score 60 if the biometrics calculations were updated to include *Allocapnia*. The most sensitive aquatic insect orders mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) (EPT) comprised 53% of the 297 organisms randomly sorted from the sample. A high percentage of EPT is typical from the least-impacted Panhandle streams. The EPT comprised 12 of the 56 taxa in the SCI sample (21%). The *Chimara* caddisfly larva in the SCI sample could be *C. florida,* listed by FNAI from the adjacent Jenkins Creek.

Periphyton

Attached algae in the stream were rare and only diatoms were observed. Some growth of algae (typically diatoms) is expected in a fully functioning stream, but an over abundance of algae (especially filamentous algae) may reduce habitat quality (from smothering) and lead to excess organic matter production (and decomposition), which can harm fish and invertebrates.

Conclusions

Johnson Creek appears to be among the healthiest streams in the area and could serve as a benchmark or background system for future biological/hydrologic studies in the region. Agricultural center pivot irrigation was observed in some watersheds of the area. Consumptive use permitting regulated by Florida Administrative Code is intended to prevent groundwater drawdown that would affect the surficial aquifer supply to area streams and wetlands. This goal is stated in Rule 62-40.410 (2) F.A.C., for Water Supply Protection and Management, where there are provisions to :assess: "(e) The extent and amount of harm caused; (f) The practicality of mitigating any harm by adjusting the quantity or method of use; (g) Whether the impact of the withdrawal extends to land not owned or legally controlled by the user; p) The amount of water which can be withdrawn without causing harm to the resource; (r) Whether the proposed use would significantly affect natural systems." Also, Rule 62-40.410(3) F.A.C, states that " Water may be reserved from permit use in such locations and quantities, and for such seasons of the year, as is required for the protection of fish and wildlife or the public health or safety."

Further study is needed to determine the minimal flows needed to preserve the natural stream community in the streams of this area.

Agriculture and silviculture activities should use Best Management Practices to protect riparian buffer zones and to prevent filling the stream channels with eroded soil runoff. The gravel habitat in near by Wilson Mill Creek was observed to be smothered by sand and silt runoff. The valuable stream gravel wildlife habitat found in Johnson Creek has become rare in the Florida Panhandle due to sediment runoff issues.

Thank you for your interest in conserving the water quality of Florida's streams and rivers. Please feel free to contact us if you have any questions.

Contact and resources for more information

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DEP biological assessment resources:
http://www.dep.state.fl.us/water/bioassess/index.htm