Ecological and Morphological Significance of Old Growth Deadhead Logs in the Apalachicola River

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Introduction



#1 Cypress deadhead log on Apalachicola River below Kennedy Creek-note mosses/liverworts/algae.

On July 6, 1999 a submerged log was sampled to determine its habitat value. This monitoring was technical assistance for a Submerged Land and Environmental Resource Program permit application to remove logs from waters within a 20-mile reach of the lower Apalachicola River. The log sample site was located in the Apalachicola River below Kennedy Creek near the mouth of the Brushy Creek oxbow (lat. 30° 00′13.6″ long. 85° 03′18.0″) in Liberty County near the Gulf and Franklin County lines. The Apalachicola River is designated by Florida Surface Water Quality Standards FAC 62-302.530 as "Class III: Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife" (FDEP 1996). It is listed as a "Special Protection, Outstanding Florida Waters, Outstanding National Resource Water" under FAC 62-302.700 (FDEP 1996).

The cypress deadhead log pictured above (12 feet length and 30 inches in diameter) provided the little fish and wildlife habitat present in the river at this site. Note the aquatic mosses, liverworts, and algae attached to the log in the photograph. These plants provide additional food and habitat value of the log for fish and wildlife (#3). This area of the river shown in photograph #2 had less than 1% woody debris. Habitat assessments at 2 downstream sites done at low river stage found 1% woody debris (FDEP 1999e). Inland waterway maintenance by the Corps of Engineers removes woody debris and periodically dredges the river channel. The log removal and bottom dredging in the channel has eliminated habitats for fish and wildlife resulting in a relativity unproductive sand bottom.



#2 Apalachicola River below Kennedy Creek.



#3 Hellgrammite.

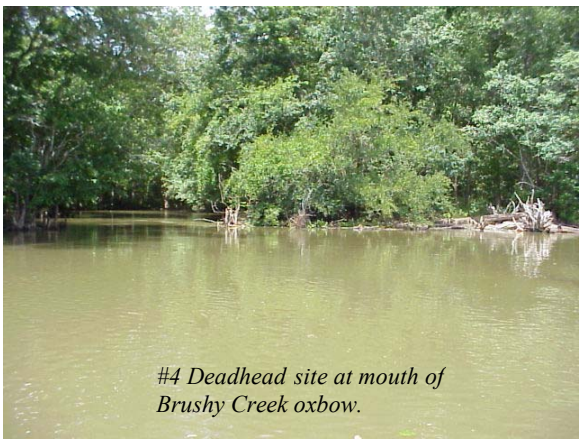
Results and Discussion

The habitat values were determined by dislodging the stream invertebrates from the log with a brush into a driftnet. Sampling results indicated a highly productive and diverse aquatic macroinvertebrate community. The

biota of the log surpassed the thresholds established for a BioRecon of multiple productive habitats (FDEP 1996b). The log also had a more diverse and productive fauna than that found in 13 qualitative benthic macroinvertebrate samples collected at an Apalachicola River Primary Network Station (PNS) reference site downstream at old buoy 40. The biometric value comparisons of the deadhead log, Apalachicola reference site, and western panhandle thresholds are as follows:

	Taxa Richness	Florida Index	EPT
Deadhead	**48**	**22**	**24**
PNS 8/22/83	15	3	5
PNS 2/16/83	20	8	11
PNS 4/14/82	22	9	7
PNS 10/21/81	26	9	8
PNS 7/8/81	19	8	6
PNS 7/980	19	10	6
PNS 1/10/79	26	17	11
PNS 10/3/79	30	13	10
PNS 8/1/78	27	14	12
PNS 4/4/78	35	16	17
PNS 12/7/77	31	18	8
PNS 1/25/77	38	20	13
PNS 8/31/76	37	15	16
Thresholds	**24**	**22**	**17**

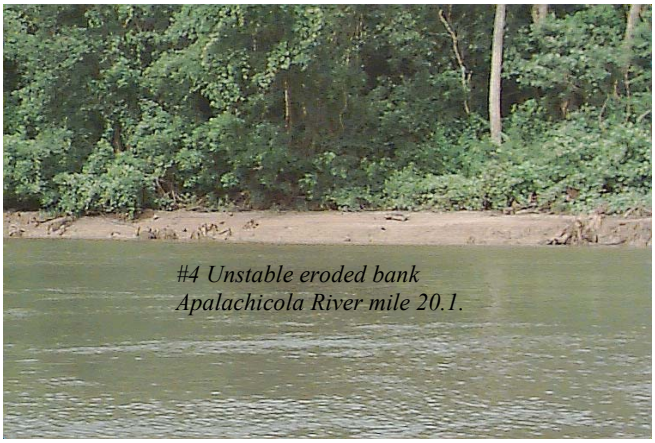
These results indicate the importance of large woody debris for the Apalachicola River's aquatic wildlife habitat. The above PNS monitoring data was from sampling the productive habitats in the immediate vicinity (100 meters) of the station. Deadhead logs were not found at the PNS station during the monitoring period. The sampled cypress log was located in a logjam at the mouth of the Brushy Creek oxbow shown in photograph #3.



#4 Deadhead site at mouth of Brushy Creek oxbow.

Fish and their larva were collected on the deadhead log. Fish eggs and other invertebrate (i.e. sponges) were observed attached to the log and the vegetation growing on the wood. Wallace and Benke (1984) found wood is important to fishes, providing a rich source of invertebrate food, habitat, and cover. Benke et al (1979) reported several species of game fish forage almost exclusively on invertebrates associated with these woody substrates. The most valuable type of woody debris is provided by logs greater than 20 inches in diameter and is referred to as large woody debris (Knutson et al. 1997). The structural diversity created by instream woody debris was found to be essential in providing adequate fish habitat, particularly for spawning and rearing, in all sizes of streams and rivers (Bilby 184, Harmon et al. 1986, Bisson et al., 1987, Robison and Beschta 1990, Morman 1993). The most valuable species are large logs of decay-resistant trees such as cypress, cedar, and pine because they form stable features that may persist in the streambed for over 100 years (Franklin et al. 1981). Conifer logs persist longer than deciduous logs (Anderson et al. 1978, Swanson and Lienkaemper 1978, Keller and Tally 1979) and therefore

have a greater capacity to form and maintain diverse structural features needed by fish and wildlife (Knutson et al. 1997). Rosgen (1993) presented a stream restoration guideline to assist fisheries biologist in evaluating the use of fish habitat structures such as logs. Wallace and Benke (1984) reported that snag or woody habitat was the major stable substrate in southeastern Coastal Plain sandy-bottom streams and a site of high invertebrate diversity and productivity. Wood was found to be a major structural feature (43%) in a study of middle-order streams (fourth to seventh) of the southeastern Coastal Plain (Wallace and Benke 1984). They stated the "quantification of wood habitat seems mandatory to assess past or potential impacts of snag removal on ecosystem processes in low-gradient streams". Habitat assessments made in the lower Apalachicola River to quantify woody debris during June 1999 found only approximately 1 % as available habitat (FDEP 1999d). To evaluate the impacts of log removal to the Apalachicola River fishery, compare the 43% woody debris that was naturally present in coastal streams to the approximately 1% now found in the lower River. Wallace and Benke (1984) found wood has a major influence on the hydrodynamic behavior of the river. Gordon et.al (1994) reported that larger woody debris may play an important part in channel stabilization and removal may have long-term effects on both a stream's ecology and morphology. Beschta and Platts (1986) reported that researchers have recognized that many streams are relatively "starved" of large organic material in regard to channel stability. Gordon et. al (1994) stated "when organic debris no longer enters a stream the banks become unstable, streamside erosion accelerates and the channel topography can be smothered from the filling of pools and flattening of riffles" (see photograph #2) . A 6-year study (Megahan 1982) concluded that logs were the most important type of obstruction in stream channels because of their longevity and the large volume of sediments trapped behind them. Megahan's study found only large stable obstructions remained in the channel during a high-flow year and fifteen times more sediment was stored behind obstructions than was delivered to the drainage outlets. Larger old growth timbers such as the deadhead logs remain in the water as habitat during high flow periods. Lisle (1983, p.46) stated that riparian trees and large woody debris should be treated as if they "belong to the aquatic ecosystem".



#4 Unstable eroded bank
Apalachicola River mile 20.1.

Conclusions

A more diverse and productive wildlife community was found on a old growth log than 13 bioassessments of 100 meter reaches of river at the Apalachicola River Primary Network Station (PNS) reference site downstream at old buoy 40. These findings are similar to the results of sampling deadhead logs on the Choctawhatchee River (FDEP 1999a), Chipola River (FDEP 1999b), Yellow River (FDEP 1999c), and the Blackwater River (FDEP 1999d). Removal of an unquantified amount of the few remaining logs would have a negative impact to the river's fish and wildlife community. Threatened fish species such as the Atlantic sturgeon utilize use the logs for food and the deep holes created by the logs for cover. Bank instability (photograph #4) accelerates when woody debris is removed from the stream channel. This adds the to habitat smothering and channel filling which prompts costly dredging activities. Restoration of historic concentrations of woody debris at proper locations in the Apalachicola River would enhance fish and wildlife populations and improve channel stability/stream morphology.

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