Ecological and Morphological Significance of Old Growth Deadhead Logs in Northwest Florida Streams

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Introduction

A deadhead log was sampled with a dipnet on March 11, 1999 to determine its habitat value. This monitoring was technical assistance for a Submerged Land and Environmental Resource Program permit application to remove these logs from state waters. The deadhead log sample site was located in the Choctawhatchee River (Lat 30° 54′ 3.1″ Long 85° 52′ 33.7″) 2 miles southwest of Curry Ferry Landing near Izagora in Holmes County. The Choctawhatchee River is designated by Florida Surface Water Quality Standards as Class III: Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife (FDEP 1996).

The deadhead log (pictured above) was winched from a depth of 28 feet approximately 20 feet from the eastern bank on a high velocity (0.5 -1 meter/sec) outside erosional bend. Wallace and Benke (1984) found most wood is located near the erosional bank in meandering Coastal Plain streams. The log's butt end faced upstream at an approximate 30° angle from the bank. This type of placement was ideal for stream bank protection (Rosgen 1993) as it deflected the current away from the bank back into the channel. This log was approximately 28 feet long and 18 inches in diameter (butt end). Only the portion shown above could be sampled with a dipnet. Caddisfly nets and midge cases (dominated by *Macrostenum and Rheotanytarsus*) covered the visible portion of the log. The photograph on the left showed the caddisfly *Macrostenum* removed from its case excavated in the wood.





Results and Discussion

The results of the one-half dipnet sweep (~ 0.25 meter area) of the deadhead log indicated a highly productive and diverse aquatic macroinvertebrate community. The one-half dipnet sweep sample surpassed the thresholds established for a 4 sweep BioRecon of multiple productive habitats in a 100 meter reach and BioRecons performed on 07/28-29/98 at Choctawhatchee River State Road 2 (CR2), Choctawhatchee River US 90 (CR90), and Choctawhatchee River State Road 20 (CR20). The biometric value comparisons of the 4 sites and western panhandle thresholds are as follows:

Biometrics	**Deadhead**	**CR2**	**CR90**	**CR20**	**Thresholds**
Taxa Richness	37	28	22	17	≥ 24
Florida Index	34	23	10	7	≥ 22
EPT	24	11	6	6	≥ 17

To demonstrate deadhead log collection techniques, the permit applicant dove down, found the log and attached a cable and winched the butt end up 28 feet. For observation, the log was towed 10-15 feet toward the riverbank in order to get out of the strong current. After a few moments, mayflies, stoneflies, and caddisflies crawled from the portion of the wood extending out the water. Algae, liverworts, and mosses that provide additional habitat were also observed on the log. Winching and towing dislodged much of the log fauna most likely. Sampling was difficult due to the position of the log on the winch and the river current. Original plans were to scrape an entire deadhead log to capture the dislodged wildlife with a drift net. However, because of the depth of 28 feet and the strong swirling currents, the drift net capture of dislodged organisms was negligible. Despite these difficulties, an impressive diversity with high productivity was found on a small sample of the deadhead log.

Erosion was reported to be a major concern of a TMDL minibasin study of the Choctawhatchee River conducted during the summer of 1998 (FDEP 1999). This report (in draft) found most sites sampled suffered from elevated turbidity, habitat smothering and/or bank instability. Habitat assessments at Choctawhatchee River sites at US 90 and State Road 2 found very poor substrate availability (2 to 4 %). Wood debris substrate was only 1 to 3 %. Beschta and Platts (1986) reported that researchers have recognized that many streams are relatively "starved" of large organic material in regard to channel stability.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). Wallace and Benke reported that snag, or woody, habitat was the major stable substrate in these sandy-bottom streams and is a site of high invertebrate diversity and productivity. Additionally Wallace and Benke 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 permit applicant had observed "deadhead logs covered with fish standing on their heads" as he pulled logs off the bottom. Wood enhances the ability of a stream to process and conserve nutrient and energy inputs and has a major influence on the hydrodynamic behavior of the river (Wallace and Benke 1984). Wallace and Benke stated the "quantification of wood habitat seems mandatory to assess past or potential impacts of snag removal on ecosystem processes in low-gradient streams". Organic (woody) debris is the foodstuff of decomposers and some aquatic invertebrates (Gordon, McMahon, and Finlayson 1994). Gordon et. al 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. 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 obstruction than was delivered to the drainage outlets. FDEP has observed numerous snags flood deposited on top of the banks of the Choctawhatchee River (and other panhandle rivers). In contrast larger old growth timber such as the deadhead logs remained in the water as habitat. Gordon et. al 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. FDEP has observed limestone outcrop riffle habitat in the upper Choctawhatchee River buried by sediment. Lisle (1983, p.46) stated that riparian trees and large woody debris should be treated as if they "belong to the aquatic ecosystem".



Conclusions

The upper Choctawhatchee River is listed as a Florida 303(d) waterbody because of its pollutant load. Water bodies on this list are required to have a Total Maximum Daily Load (TMDL) established to determine the amount of pollution reduction needed to restore the system to its designated use.

A more diverse and productive wildlife community was found in this small dipnet sample of a deadhead log than bioassessments of 100 meter reaches of river at State Road 2, US 90, and State Road 2. Removal of the portions of the remaining 2 to 4 % productive habitat (i.e. deadhead logs) could have substantial impact to the river's fish and wildlife community.

Threatened fish species such as the Atlantic sturgeon and speckled chub utilize these habitats for food and cover.

Erosion is a major concern in the Choctawhatchee River (FDEP 1999). Bank instability as shown in the above photograph accelerates when woody debris is removed from the stream channel. This streamside erosion not only directly affects property owners by losing land, but also fills the channel increasing the river basin's flood potential.

Restoration of historic concentrations of woody debris in the Choctawhatchee River would enhance fish and wildlife populations along with improving channel stability/stream morphology.

References

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STORET Station 32020045		**Location Choctawhatchee River 2 miles SW of Curry Ferry Landing, Izagora**
Latitude: N30 ° 54 ' 3.1 " Longitude: W85 °52 ' 33.7 "		**Watershed / Basin Choctawhatechee River/ Choctawhatchee Bay**
Date/Time Collected 03/11/99 1300 -1330		**Collected & ID'ed By Donald Ray, Laurence Donelan, sorted by K. Ferguson**
Taxa found in 4 sweeps:	1 sweep of 0.25 meter of deadhead log types of habitats sampled;	12 hours picking & ID time.

** **R**are (1-3), **C**ommon (4-10), **A**bundant (11-100), **D**ominant (>100).

Taxa	Fl	Tally	Abun Code
Diptera			
Ceratopogonidae			
Culicidae			
Empididae			**C**
Other Chironomidae			**A**
Rheotanyarsus sp.	2		**D**
Simulium sp.	2		
Stenochironomus sp.	2		**A**
Stratiomyidae			
Tipulidae			
Gastropoda			
Ancylidae			**R**
Elimia sp.	2		**R**
Physella sp.			
Planorbella sp.			
Hydrobiidae			
Viviparus			
Odonata			
Argia sp.	2		**R**
Boyeria sp.	2		
Calopteryx sp.	2		
Enallagma sp.			
Gomphus sp.	1		
Hetaerina sp.	2		
Ischurna sp.			
Libellulidae			
Macromia sp.	2		
Neurocordulia sp.	1		
Progomphus sp.	2		
Coleoptera			
Ancyronyx variagatus			
Curculionidae			
Dineutes			
Dubiraphia sp.			
Dytiscidae			
Gyretes sp.			
Microcylloepus sp.			**C**
Stenelmis sp.			**C**
Column Total: FI/Taxa	**8**	**9**	

Taxa	Fl	Tally	Abun Code
Trombidiformes			
Acarina			**A**
Oligochaeta			**C**
Naiidae			
Tubificidae			
Hirudinea			
Pelecypoda			
Corbicula sp.			**R**
Elliptio sp.			
Pisidiidae			
Megaloptera			
Corydalus cornutus	2		**R**
Sialis sp.			
Nigronia sp.			
Hemiptera			
Belostoma sp.			
Corixidae			
Hydrometra sp.			
Pelocoris sp.			
Pleidae			
Ranatra sp.			
Veliidae			
Other (name groups)			
COPEPODA			
Decapoda			
Palaemonetes sp.	1		
Procambarus sp.			
Amphipoda			
Gammarus sp.	1		
Hyalella azteca			
Crangonyx sp.			
Isopoda			
Caecidotea (Asellus)	1		
Column Total: FI/Taxa	**2**	**4**	

Taxa	Fl	Tally	Abun Code
Ephemeroptera			
Baetis sp.			**C**
Baetisca sp.			
Caenis sp.			
Callibaetis sp.			
Centroptilum sp.			
Heptagenia sp.			
Hexagenia sp.			**R**
Isonychia sp.			**R**
Leptophlebia sp.			
Neoephemera sp.			
Stenacron sp.	1		**R**
Stenonema sp. exiggum	2		**C**
Tricorythodes sp.	1		**R**
Eurylophella doria			**A**
Stenonem integrum			**R**
Ephemerillidae			**R**
Pentagenia sp.			**R**
Plecoptera	2		
Acroneuria sp.	2		
Amphinemura sp.	2		
Hydroperla sp.	2		
Isoperla sp.	2		**R**
Leuctra sp.	2		
Neoperla sp.	2		**R**
Paragnetina sp.	2		
Perlesta sp.	2		**R**
Perlinella sp.	2		
Pteronarcys sp.	2		
Taeniopteryx sp.	2		**R**
Talloperla sp.	2		
Nemocapnia carolina	2		**R**
	2		
	2		
Trichoptera			
Anisocentropus sp.			
Brachycentrus sp.	2		
Cheumatopysche sp.	1		
Chimarra sp. Molanna sp.	2		**R**
Diplectrona sp. Oecetis sp.			**R**
Hydroptila sp.	2		**R**
Hydropsyche sp.	2		**R**
Lype diversa			
Macrostemum sp.	2		**A**
Nectopysche sp.	1		**R**
Oecetis sp. cinerescens	1		**R**
Oxyethira sp.	2		
Polycentropus sp.	2		
Triaenodes sp.			
Ceraclea sp.			**A**
Paranyctiophlax sp.			**R**
Column Total: FI/Taxa	**24**	**24**	

BIOMETRICS	Value
Site Total Taxa Richness	**37**
Site Total Florida Index	**34**
Site Total EPT	**24**

Thresholds for impairment rating:

Panhandle			
West	East	Peninsula	NE
≥24	≥24	≥18	≥17
≥22	≥19	≥10	≥6
≥17	≥9	≥4	≥3

If 3metrics are > target values, site is **Healthy** ☒

If 2metrics are within target values, site is **Suspect** ☐

If less than 2 metrics are within target values, site is **Impaired** ☐