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

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Introduction

#1 Yellow River above US90, log anchored into the bank at 90.

Three submerged logs were sampled on May19, 1999 to determine their 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 log sample sites were located in the Yellow River near Highway 90 (lat. 30° 45′ 22.7″ long. 86° 37′ 36.0″, lat. 30° 45′ 19.8″ long. 86° 37′ 38.5, lat. 30° 45′ 04.7″ long. 86° 37′ 35.8) in Okaloosa County. The Yellow 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).

The log pictured above (11.6 feet length and 14 inches in diameter) was anchored into the bank of the river at the site above U.S. Highway 90. The logs were located by finding markers left by the permit applicant. The #2 photograph below showed aquatic mosses, liverworts and algae attached to the log. These plants provided food and habitat for fish and wildlife in addition to the habitat value of the log. The other 2 logs in the middle

#2 Mosses, liverworts, and algae growth on log.

#3 Yellow River above U.S. 90 < 1 meter depth 75 meters wide. ~99% sand.

of the channel created fish habitats in an otherwise unproductive shallow sand bottom. The stream channel was much shallower and wider in areas without woody debris. Most of the 1 mile of river surveyed above Highway 90 was in this condition with approximately 1-% woody debris present (see photograph #3 above).

Results and Discussion

The Yellow River at the time of sampling was at low stage (2.25 ft.), and flow (523 ft3/s). The flood thresholds are 12-ft. (stage) and 12,900 ft3/s (flow) at US90. This winter and spring had near record drought conditions that resulted in a much lower stream stage height than normal. This low river stage made the conditions favorable for locating submerged logs. Some logs marked by the applicants were exposed by the low flow conditions and appeared to have been cut recently (photograph # 4). There was severe bank erosion on bends in the river above US90 (photograph #5). The severe erosion caused by increased runoff from silviculture, agriculture, and urban lands along with dam failures had created numerous large sandbars (photograph #6).

 # 4 Recently cut log.

 # 5 Recently fallen trees on a river bend.

Sediments had smothered most fish and wildlife habitat in the area above US90. 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 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 #3) . 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".

 # 6 New sediment.

 # 7 Driftnet deployed behind log.

To determine the invertebrate aquatic community a brush was used to dislodge the aquatic invertebrate into a driftnet (photograph #7). The sampling results from the logs indicated a highly productive and diverse aquatic macroinvertebrate community. The logs surpassed the thresholds established for a 4 sweep BioRecon of multiple productive habitats (FDEP 1996b). The logs also had a more diverse and productive fauna than that found in a 20 sweep Stream Condition Index (FDEP 1996b) at a Yellow River reference site near Holt. The biometric value comparisons of the logs, Holt reference site and western panhandle thresholds are as follows:

Biometrics	**logs**	**Holt SCI**	**Thresholds**
Taxa Richness	52	43	$\geq$ 24
Florida Index	48	36	$\geq$ 22
EPT	30	20	$\geq$ 17

#8 Stonefly.

The log's healthy well-balanced aquatic communities were dominated by cleanwater indicators (photograph #8). Fish (darters, topminnows) were observed feeding on the logs. Fish and other invertebrate eggs including snails were observed attached to the logs 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. 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). Contrast the 43% woody debris to the approximately 1% found in this Yellow River reach above US90 to evaluate the removal of logs to the importance to stream's fishery. A Game and Fish Commission letter (1999) suggested no removal of deadhead logs from the Yellow River upstream of US90. Rosgen 1993 presented a guideline to assist fisheries biologist to evaluate the suitability of fish habitat structures including logs for restoration of different morphological stream types. 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. 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".

Conclusions

A more diverse and productive wildlife community was found on the old growth logs than bioassessments of 100 meter reaches of river at the Yellow River reference site near the Holt boat ramp. These findings are similar to the results of sampling deadhead logs on the Choctawhatchee River (FDEP 1999a) and the Chipola River (FDEP 1999b). 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 monitored by the USFWS utilize use the few remaining logs for food and cover.

Bank instability (photograph #5) accelerates when woody debris is removed from the stream channel. This adds the to habitat smothering (photographs #3 & 6) that has already indicated severe sedimentation problems. Restoration of historic concentrations of woody debris at proper locations in the Yellow River would enhance fish and wildlife populations. This restoration would also improve channel stability/stream morphology as observed at the sampled log sites (i.e. photograph # 1).

References

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STORET Station 33040004	**Location Yellow River @ Hwy. 90**
Latitude: N30 ° 45 ' 22.7 " Longitude: W86 °37 ' 36.0 "	**Watershed / Basin Yellow River/ Pensacola Bay**
Date/Time Collected 05/19/99 1300-1330	**Collected & ID'ed By Donald Ray & Laurence Donelan sort assist K. Ferguson**
Taxa found in 4 sweeps: types of habitats sampled; pine deadhead logs	20 hours picking & ID time.

**** Rare (1-3), Common (4-10), Abundant (11-100), Dominant (>100).**

Taxa	Fl	Tally	Abun Code	Taxa	Fl	Tally	Abun Code	Taxa	Fl	Tally	Abun Code
Diptera				**Trombidiformes**				**Ephemeroptera**			
Ceratopogonidae				Acarina			**C**	Baetis sp. intercalaris			**C**
Culicidae				**Oligochaeta**			**A**	Baetisca sp.			
Empididae			**C**	Naiidae				Caenis sp.			**C**
Other Chironomidae			**D**	Tubificidae				Callibaetis sp.			
Rheotanyarsus sp.	2		**A**	Hirudinea				Centroptilum sp.			**R**
Simulium sp.	2		**C**	**Pelecypoda**				Heptagenia sp.			**R**
Stenochironomus sp.	2		**C**	Corbicula sp.			**R**	Hexagenia sp.			**R**
Stratiomyidae				Elliptio sp.				Isonychia sp.			**R**
Tipulidae				Pisidiidae				Leptophlebia sp.			
Dixidae			**C**					Neoephemera sp.			
								Stenacron sp.	1		
Gastropoda				**Megaloptera**				Stenonema sp. exiggum	2		**C**
Ancylidae			**R**	Corydalus cornutus	2			Tricorythodes sp.	1		**A**
Elimia sp.	2		**C**	Sialis sp.				Pseudocloen sp.			**R**
Physella sp.				Nigronia sp.				Stenonema smithae	2		**C**
Planorbella sp.				**Hemiptera**				Stenomema integrum	1		**R**
Hydrobiidae				Belostoma sp.				Cercobrachys etowah			**R**
Viviparus			**C**	Corixidae							
				Hydrometra sp.				**Plecoptera**	2		**R**
				Pelocoris sp.				Acroneuria sp. c.f. arenosa	2		**R**
				Pleidae				Amphinemura sp.	2		
				Ranatra sp.				Hydroperla sp.	2		
Odonata				Veliidae				Isoperla sp.	2		
Argia sp.	2		**R**					Leuctra sp.	2		
Boyeria sp.	2							Neoperla sp.	2		
Calopteryx sp.	2			**Other (name groups)**				Paragnetina sp. kansensis	2		**C**
Enallagma sp.				**Turbellaria**			**C**	Perlesta sp.	2		**C**
Gomphus sp.	1							Perlinella sp.	2		
Hetaerina sp.	2		**R**					Pteronarcys sp.	2		**R**
Ischurna sp.								Taeniopteryx sp.	2		
Libellulidae								Talloperla sp.	2		
Macromia sp.	2		**R**	Nematoda			-	Acroneuria abnormis	2		**C**
Neurocordulia sp.	1								2		
Progomphus sp.	2								2		
									2		
								Trichoptera			
								Brachycentrus sp.	2		**A**
Coleoptera								Psychomia flavida			**C**

Ancyronyx variagatus			**R**	**Decapoda**				Cheumatopysche sp.	1		**A**
Curculionidae				Palaemonetes sp.	1			Chimarra sp.	2		**A**
Dineutes				Procambarus sp.			**R**	Diplectrona sp. Oecetis sp. 2	1		**R**
Dubiraphia sp.								Hydroptila sp.	2		**A**
Dytiscidae								Hydropsyche sp.	2		**A**
Gyretes sp.				**Amphipoda**				Lype diversa			
Microcylloepus sp.			**R**	Gammarus sp.	1			Macrostemum sp.	2		**R**
Stenelmis sp.			**R**	Hyalella azteca				Nectopysche sp.	1		**C**
Macronychus glaberatus			**A**	Crangonyx sp.			**R**	Oecetis sp. cinerescens	1		**A**
								Oxyethira sp.	2		
				Isopoda				Polycentropus sp.	2		
				Caecidotea (Asellus)	1			Triaenodes sp.			
								Hydropsyche sp. 2			**A**
								Neureclipsis sp.			**R**
Column Total: FI/Taxa	**14**	**16**		**Column Total: FI/Taxa**	**0**	**6**		**Column Total: FI/Taxa**	**34**	**30**	

BIOMETRICS	Value	Thresholds for impairment rating:			
		Panhandle			
		West	East	Peninsula	NE
Site Total Taxa Richness	**52**	≥24	≥24	≥18	≥17
Site Total Florida Index	**48**	≥22	≥19	≥10	≥6
Site Total EPT	**30**	≥17	≥9	≥4	≥3

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

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

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