SP-381
4-11

AgriLIFE EXTENSION
Texas A&M System

Texas Coastal Watershed Program

Texas Sea Grant and Texas AgriLife Extension
Texas A&M University System

Upper Texas Gulf Coast Pothole Wetlands:

New Research shows Significant and Profound Hydrologic Connections to Galveston Bay and other Area Waters

Issue: After the 2001 Supreme Court SWANCC decision, the US Army Corp of Engineers (USACE) Galveston District ceased jurisdiction over a class of wetlands referred to variously as coastal prairie or forested potholes, coastal depressions, coastal prairie potholes, etc. Wetlands not in the 100-yr floodplain and without a bed and banks connection to a waters of the U.S. were presumed to be hydrologically-isolated, closed depressions with no surface connection to waters of the US. Hundreds of thousands of acres of coastal pothole wetlands (CPW) on the Pleistocene and Lissie-aged geologic formations fell out of jurisdiction. Since 2001, losses of these wetlands to development have not been mitigated. Coastal Pothole Wetlands comprise the vast majority of wetlands lost to development on the Upper Gulf Coast of Texas. In Harris County alone, some 30% of all freshwater wetlands extant in 1992 were lost to development by 2008 (unpublished research, Texas A&M University, Texas Coastal Watershed Program).

Most of the wetland experts in the region believed CPW to be hydrologically connected to waters of the U.S., based on informal field observations over several years, but until recently there was no quantitative data to back up these observations. The 2007 Supreme Court Rapanos decision reaffirmed the long-standing legal concept of a “significant nexus” in determining jurisdictionality of potentially isolated wetlands. Justice Kennedy, in his “hinge” opinion of the Rapanos 4-1-4 split, declared that a significant nexus to a water of the U.S. could be determined for a class of wetlands, such that a full determination of that issue would not be needed for every wetland in that class. The Kennedy opinion has become *de facto* if not *de jure* guidance for Corps field offices. The studies reported here quantitatively demonstrate such a nexus for a broad class of wetlands on the Upper Texas Gulf Coast, and confirm long standing field observations.

Two New Studies

Two recently completed independent studies demonstrate that the coastal pothole wetlands of the Lissie and Beaumont Geologic Formations on the Upper Texas Gulf Coast have significant

John S. Jacob
Professor and Extension Specialist
March 2011
Department of Recreation, Parks and Tourism Sciences

and persistent hydrologic connections to waters of the US through a continuous wetland network of swales and poorly-defined concentrated flow paths. The two studies, listed below, used different but complementary methodologies to arrive at remarkably similar conclusions.

Forbes, M., R. Doyle, A. Clapp, J. Yelderman, N. Enwright, and B. Hunter. 2010. Final Report. Freshwater Wetland Functional Assessment Study. *Contract No. 582-7-77820.* Galveston Bay Estuary Program and Texas Commission on Environmental Quality.

Wilcox, B.P., D.D. Dean, J.S. Jacob, and A. Sipocz. 2011. Evidence of surface connectivity for Texas Gulf Coast depressional wetlands. Wetlands 31:451-458. DOI 10.1007/s13157-011-0163-x

The Forbes study looked at 6 wetland sites for 18 months and an additional 6 sites for 7 months. From their study: *Despite drought conditions for much of the study, all six wetlands overflowed during the monitoring period. The average duration of outflow was 27 days. On a volume basis, the six wetlands stored an average of 82% of incoming water and discharged 18%. Patterns of storage and discharge were strongly influenced by antecedent moisture conditions. These results, combined with the preliminary water level data from six additional CPWs, indicate that discharge appears to be a regular feature of most CPWs* (coastal prairie wetlands). Outflow from the first six wetland sites ranged from 7 to 28% of the total inflow.

The Wilcox study examined one wetland in detail over a 45 month period, measuring discharge directly. From the Wilcox study: *The results of this study indicate that surface runoff, although intermittent, occurred regularly and accounted for more than 17% of precipitation over the 45 months, with annual discharge ranging from 0% to 27%.*

In both studies, discharge from the wetlands was documented even in drier-than-normal years In both studies runoff from CPW is episodic, but can occur continuously for significant periods, ranging from 4 to 68 days and averaging 17 days in the Wilcox study. A similar range was observed in the Forbes study, where 3 months was the longest continuous period of runoff from a wetland.

The Wilcox study specifically measured runoff flowing through poorly-defined concentrated flow paths connecting pothole depressions to a well-defined water of the US. These swales had all 3 jurisdictional wetland parameters but did not meet the traditional bed and banks definition.

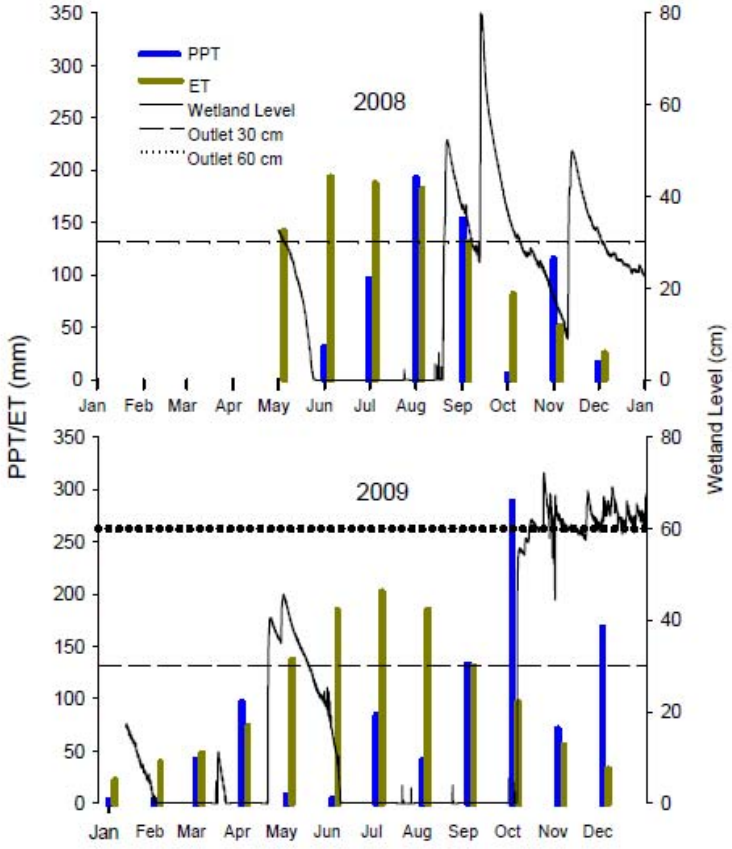
An important conclusion from both studies is that most if not all surface runoff from natural and farmed areas entering Galveston Bay and other waters passes through coastal pothole wetlands. This conclusion from the Wilcox study is relevant to both studies: [These] *findings provide strong evidence that shallow wetland depressions on the Texas coastal plain are not closed systems. Whenever their storage capacity is exceeded, they discharge excess water downslope, and their discharge can account for a significant portion of the annual water budget. Given the well documented water quality cleansing functions of wetlands , there can be little question that* [coastal pothole wetlands] *on the Upper Texas Gulf Coast contribute to the aquatic integrity* [of downstream water bodies].

The Forbes study specifically documented the water quality functions of coastal prairie pothole wetlands on the Upper Gulf Coast of Texas. Given the degraded water quality of water bodies in this area, we now have a much clearer picture of the important role these wetlands play in this area.

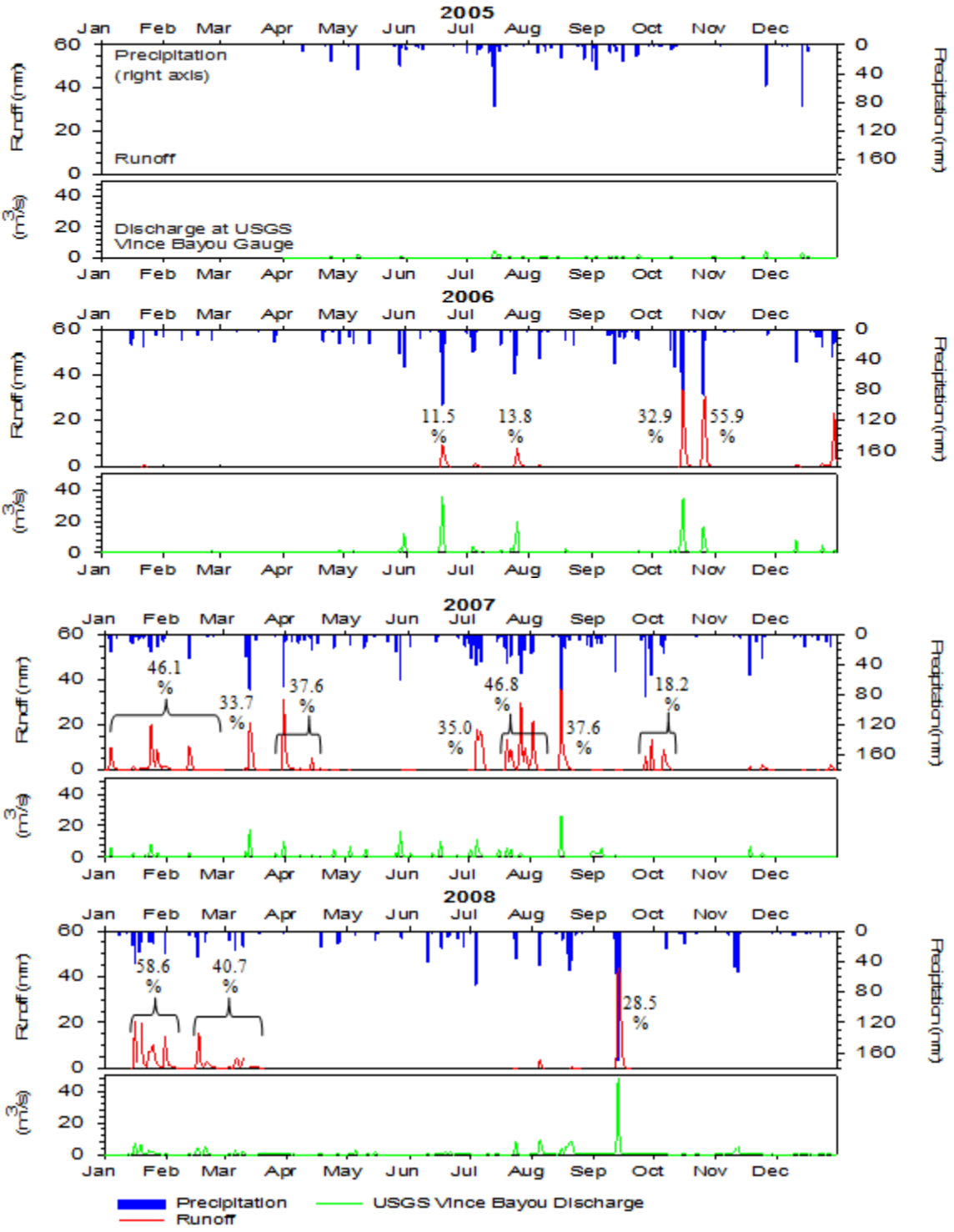
Significance

1. Coastal pothole wetlands on the Upper Texas Gulf Coast are not isolated in the sense of no hydrologic overflow. These depressions are frequently overtopped, even in dry years.
2. Overflow from these wetlands is entrained in a series of swales or somewhat poorly-defined flow paths with wetland characteristics that naturally or through imposed artificial drainage connect to waters of the U.S.
3. Because most surficial runoff in natural or farmed areas courses through CPW, these wetlands are a critical part of the aquatic integrity of our regional bayous and bays that constitute waters of the US.
4. In light of the documentary evidence that CPW on the Upper Texas Gulf Coast meet the significant nexus criteria outlined by Justice Kennedy in the Rapanos decision, this class of wetlands should therefore be considered jurisdictional unless isolation can be quantitatively demonstrated.

Figures



Hydrograph for 2008-9 for the Forbes study Chicken Road site. Discharge from this wetland constituted 23% of the inflow.



Hydrograph for the Armand Bayou Site of the Wilcox Study. Percentages are runoff volumes of the associated precipitation events.

Forbes Wounded Dove Site and Chicken Road sites. Notice continuous wetland swales connecting WD to the CR Swale which is connected to Bastrop Bayou. These depression are relict Pleistocene or early Holocene channels. Yellow scale bar is 2000 ft.

Classic prairie pothole topography near Damon. Notice virtually continuous network of potholes and swales connecting to natural or artificial drainage network. One of many potential flow paths shown: w=wetland, D=drain, arrows are poorly to moderately defined flow paths

Similar network adjacent to Hwy 146 in the League City area.