WETLAND SCIENCE AND PRACTICE

VOL. 29, NO. 3
September, 2012

Variegated fritillary butterfly and goldenrod - Bear Meadows Natural Area, PA.
Photo by C.A. Cole.

WETLAND SCIENCE AND PRACTICE
Vol. 29, No. 3
September 2012

Contents

Aim and Scope of Wetland Science and Practice

The *WSP* is the formal voice of the Society of Wetland Scientists. It is a quarterly publication focusing on news of the *SWS*, at international, national and chapter levels, as well as important and relevant announcements for members. In addition, manuscripts are published on topics that are descriptive in nature, that focus on particular case studies, or analyze policies. All manuscripts should follow guidelines for authors as listed for Wetlands as closely as possible. All papers published in *WSP* will be reviewed by the editor for suitability. Letters to the editor are also encouraged but must be relevant to broad wetland-related topics. All material should be sent electronically to the current editor of *WSP*. Complaints about *SWS* policy or personnel should be sent directly to the elected officers of *SWS* and will not be considered for publication in *WSP*.

Wetland Science and Practice
2011-2012 CHAPTER PRESIDENTS

REGIONAL CHAPTERS - UNITED STATES

Alaska USA
President - Jeffrey Mason
Email: jmason@3ppi.net

Central USA
President - Craig Gump
Email: craig.gump@urs.com

Mid Atlantic (US)
President - Joe Berg
Email: jberg@biohabitats.com

New England (US)
President - Chester Bigelow
Email: chester.bigelow@jws.com

North Central (US)
President - Loretta Battaglia
Email: lbattaglia@plant.siu.edu

Pacific Northwest (US)
President - Leandra Cleveland
Email: leandracleveland@hdrinc.com

Rocky Mountain (US)
President - Andy Herb
Email: andyherb@alpine-eco.com

South Atlantic (US)
President - Christina Uranowski
Email: Christina.Uranowski@swfwmd.state.fl.us

South Central (US)
President - Carol Thompson
Email: cthompson@tarleton.edu

Western (US)
President - Michelle Stevens
Email: stevensm@csus.edu

REGIONAL CHAPTERS - INTERNATIONAL

Asia
President - Wei-Ta Fang
Email: wawaf@hotmail.com

Australasia
President - Max Finlayson
Email: mfinlayson@csu.edu.au

Canadian
President - Patricia Chow-Fraser
Email: chowfras@mcmaster.ca

Europe
President - Jos Verhoeven
Email: j.t.a.verhoeven@bio.uu.nl

International
President - Elijah Ohimain
Email: eohimain@yahoo.com

South America
President - Elier Tabilo Valdivieso
Email: etabilo@centroneotropical.org

Editor's Message

Editor's Note

Over the next few issues, you'll begin to see some of the changes in content that you've been promised and have been patiently waiting for (thank you very much). We don't have refereed content in this issue, but I expect several papers to be such for the December issue. For now, we've begun to explore issues of rain gardens – you'll see an issue focused mostly on that topic down the road a bit. For now, please continue to consider sending in materials to be reviewed by our editorial board – refereed manuscripts, if you will. We still need your input.

Andy Cole
WSP Editor

WSP Deadlines

Wetland Science and Practice now has the following deadlines established for the submittal of materials. Thanks for your help.

For informational materials only, please observe the following submittal deadlines:

March issue:	March 1st
June issue:	June 1st
September issue	September 1st
December issue:	December 1st

For non-refereed articles, the following deadlines apply:

March issue:	January 15th
June issue	April 15th
September issue	July 15th
December issue	October 15th

Articles that are to be refereed may be submitted at any time. At this point, we hope to have a 3 month turnaround time for a decision and printing. It might, perhaps, be longer.

Rain gardens: exploring solutions to non-point source pollution

Stephen Hofstetter and Eliana Bardi*
Alachua County Environmental Protection Department
408 W. University Ave, Suite 106
Gainesville, Florida 32601

*Corresponding Author: ebardi@alachuacounty.us
Phone: 352-264-6810
Fax: 352-264-6852

Introduction

Rain gardens offer several environmental benefits, including water conservation, groundwater recharge, stormwater treatment, reduced sedimentation, , and flood prevention (Kraus and Spafford, 2009). While rain gardens and other low impact development (LID) techniques are successfully implemented in several states, there has been limited application in Florida, and specifically in Alachua County, where end-of-pipe stormwater retention basins are the primary stormwater treatment for residential and commercial developments. This practice has been shifting in recent years after several studies have found that performance efficiencies of traditional stormwater management systems (wet and dry retention ponds) were much lower than previously assumed (Environmental Research & Design, Inc., 2007). Yet, large and small scale applications of LID stormwater treatment techniques are lacking in Alachua County and thus there is a need for on the ground projects and studies demonstrating their application and efficiencies.

The Alachua County Environmental Protection Department (ACEPD) developed a rain garden LID pilot project in Alachua County, Florida to teach students about the impacts of daily activities (such as littering, applying fertilizer and pesticides, and increasing stormwater runoff from developed areas) on water pollution in our creeks and watersheds. The focus of the project was to engage students in exploring solutions to non-point source pollution, as well as provide examples of low-cost techniques, such as installing rain barrels and constructing rain gardens, that could be adopted by homeowners.

Project Activities

The project took place during the 2011 school year and included a variety of educational activities presented to students to enhance their understanding of non-point source pollution issues and allow them to be active participants in finding solutions that they could share at home and with their peers. We conducted four interactive teaching modules:

1. An interactive classroom presentation on non-point source pollution using the Enviroscape® Model
2. A field trip to a local stormwater treatment wetland
3. A classroom planning workshop on designing and constructing the rain garden, and
4. Workdays for the construction of the rain garden

In the first module, the Enviroscape ® Model was utilized to illustrate the effects of daily activities, and point and non-point source pollution, on our water resources. This presentation was followed by a field trip to a local enhanced stormwater treatment, where students took turns at 5 interactive stations: 1. Soils, 2. Vegetation, 3. Hydrology and water quality, 4. Aquatic life, and 5. a wetland walk. At each station, students engaged in hands-on activities such as utilizing a YSI meter to test water quality, comparing infiltration rates of different substrates (sand, clay and organic matter), collecting upland and wetland vegetation, and calculating biotic index scores based on collected macro-invertebrates. Following the field trip, a presentation was given to review concepts and introduce rain gardens and native vegetation. This was followed by the students designing and landscaping their rain garden from a pre-determined native vegetation palette. The classroom workshop was integral in allowing students to take ownership in the project and preparing them for the construction of the rain garden.

Finally, workdays were scheduled for the construction of the rain garden exhibit, which consisted of building and connecting two rain collection barrels to existing roof downspouts and routing overflow to the rain garden. To receive stormwater treatment credit from Florida regulatory agencies, runoff volumes and infiltration rates have to be considered to properly size a rain garden that will meet the designed treatment volume. However, since we did not seek stormwater credit and were simply providing a demonstration project, we did not conduct extensive soil surveys and did not size the gardens based on runoff volumes.

Rain gardens were excavated approximately 8-12 inches deep and were 200 square feet in size, located in sandy soils with high infiltration rates. The roof size draining to the gardens ranged between 1,000 and 3,000 square feet, and any overflow under extreme rain events would simply sheet flow over a grassy field. In each garden, 65 plants spanning six different species (wild iris, swamp sunflower, swamp hibiscus, Fakahatchee grass, sand cord grass, canna, and blue eyed grass) were installed at approximately 2-foot centers spacing and in groupings by size. Soil amendments (manure and compost mixed in with native soil) and a layer of mulch were added to retain moisture, provide a carbon source for microbial activity, and enhance plant survival. The total cost of materials, including rain barrels and related supplies, plants, soil amendment, river rock for channel, mulch, and interpretative sign, was approximately $800.

Before construction, we administered a pre-quiz to determine students' baseline knowledge of the subject that focused on their understanding of concepts such as watersheds, point and non-point source pollution, and water quality. Following students' participation in the first three modules (Enviroscape ® Model presentation, fieldtrip, and rain garden workshop), we administered a post-quiz to determine their level of learning and understanding. In all, 231 students and 10 teachers from three Alachua County public schools (Glen Springs Elementary, Williams Elementary, and Kanapaha Middle School) participated in the project.

Results

The following goals were accomplished by completing the four modules at each school:

1. We developed an ongoing relationship with the schools for continued cooperation,
2. Increased teachers' knowledge about environmental issues and provided access to resources for future assistance,
3. Developed a curriculum tailored to our region's needs that will be adopted by a local agency and carried forward in other schools.
4.

Overall, students gained a significant knowledge about non-point source pollution, watershed protection, and water quality and conservation measures, with an average improvement of 64% (range 52-76%) above baseline scores (Table 1). At the end of the program, teachers were asked to evaluate the curriculum and modules, and the overall project scored an average of 9.3 out of 10 points.

Discussion

Our goal was to inspire students and the community to adopt some of these

	Pre-project % Correct	Post-project % Correct	% Improvement
Glen Springs	45	80	76
Williams	43	65	52
Kanapaha	65	Not Available*	Not Available*

*Unable to collect quiz due to teacher relocation.

Table 1: Pre and Post project quiz results (provided as a percentage of correct answers for each school).

Figure 1: Rain garden at Kanapaha Middle School, Gainesville, Florida.

practices and techniques in their everyday lives and homes by providing them with resources and low-cost solutions to improve our community's waters. The project complements ACEPD water quality protection goals and new water conservation initiative.

Early in the project it became apparent that many 5th and 6th graders lacked knowledge related to point and non-point source pollution, the source of our drinking water, and how everyday activities can impact our water resources. Many students had no knowledge of the issues of stormwater runoff and had never had the opportunity to investigate what happens to water running off developed areas, what types of pollutants it can carry with it, and where it eventually ends up. By the end of the project, many students could tell us the fate of rain water falling on their properties or school ground accurately, as well as discuss what types of contaminants water may carry depending on the source (parking lot vs. landscaped areas). In other words, many students began

Figure 2: Glen Springs Elementary 5th Grade class after completing their rain garden.

to critically think about the impacts of runoff, and suggest ways to improve the situation (such as install rain barrels, create rain gardens, and replace pavement with permeable pavers or asphalt). Many students also indicated that some of these projects were already taking place in their homes.

Creating the outdoor exhibit and planting the rain garden was by far the highlight of the project and every single student enjoyed the physical labor of digging and planting. One of the most significant findings was that several students in both 5th and 6th grade level classes had never been exposed to gardening or installing plants. This indicates that our student population lacks adequate exposure to outdoor environmental activities in elementary and middle school grade levels.

Many students who were having difficulty focusing and paying attention during the classroom activities were very much engaged and productive during our work days. In fact, because each student participated in the creation of the outdoor exhibit, they were able to ask questions and draw connections from our classroom learning experience through their work.

The authors' opinion and recommendation is that additional funds and resources should be devoted to environmental education activities that bring students outdoors and allow them to be actively engaged in outdoor "work," such as the creation of gardens or other outdoor exhibit, to achieve learning through doing as well as acquiring basic life skills.

Acknowledgements

Funding for this project was provided by the U.S. Environmental Protection Agency Environmental Education Grant program. The project could not have been possible without the expertise and assistance of Wendy Wilber, Institute of Food and Agricultural Sciences (IFAS) Extension Horticulturist, Dr. Mark Clark, University of Florida/IFAS Extension, University of Florida Wetlands Club, the Gainesville Clean Partnership, volunteers from the master gardener program, and additional staff from the Alachua County Environmental Protection Department. Finally, no educational activity can be carried out successfully without a good dose of enthusiasm on the part of teachers and students, who were outstanding in their reception of the activities.

References

Environmental Research and Design, Inc. (2007) Evaluation of Current Stormwater Design Criteria Within the State of Florida. Final Report submitted to the Florida Environmental Protection Department for Agreement S0108.

Kraus, H. and A. Spafford (2009) Rain Gardening in the South. Eno Publishers, Hillsborough.

Where is the wetland in a dambo?

Sebadduka J. Lugumira*
School of Environment, Washington State University, PO Box 642812, Pullman, WA 99164-2812, USA

*Corresponding Author: jerome.sebadduka@email.wsu.edu
Phone: 509.432.4722

Introduction

Ackermann (1936) was the first to introduce the term "dambo" in the scientific literature (Mäckel 1974). Used in Ci-Cewa to describe valley lands (Roberts 1988), Ackermann (1936) offered a hydrogeomorphic meaning to the term, defining dambos as periodically inundated grass-covered depressions on the headward ends of a drainage system in a region of dry forest or bush vegetation. They are channelless (Mäckel 1974; Boast 1990) shallow linear (Mäckel 1974; Meadows 1985) or lobate (Whitlow 1985) depressions, often with concave cross profiles (Acres et al. 1985; Boast 1990), where seasonal saturation and the closeness of the water table restrict all other vegetation apart from grasses and sedges (Mäckel 1974; Whitlow 1985). This results in a grassy flat (the dambo) that is sharply outlined against the surrounding bush country (Ackermann,1936), usually having miombo woodland on the interfluves (Roberts 1988). Echoed in Ackermann's (1936) definition and all other definitions in the dambo literature (Mäckel 1974; Acres et al. 1985; Mäckel 1985; Meadows 1985; Whitlow 1985; Boast 1990) is the observation that dambos are restricted to locations with seasonally high water content (Mäckel 1974; Mäckel 1985), such as in seasonally-wet tropics and sub-tropics (Meadows 1985). As a consequence, it appears some authors, like Balek (1977), rely on the singular characteristic of seasonal saturation to denote the entire dambo as a wetland.

Mitsch and Gosselink (2007), however, caution against demarcating wetlands based upon the sole presence of water; especially for such systems like dambos whose water table is reported to vary with seasons (Bullock 1990). Moreover, dambos are dynamic; drying up as the case may be when the water table lowers due to down-cutting along a stream channel and dambo dissection (Mäckel 1974; Mäckel 1985), although edaphic indicators of wetlands may be retained. Further, dambo characteristics are noted to vary along a cross profile (Mäckel 1974; Whitlow 1985) in response to the control of topography on hydrology and vegetation (von der Heyden 2004); so that they are not homogenous. This is illustrated by the tendency to sub-divide them into three zones: margin, floor and bottom (Acres et al. 1985); even though this spatial zonation is not always straight-forward (Whitlow 1985; von der Heyden 2004). The dambo margin is adjacent to the interfluve and is dominated by grasses (Bullock 1992). As conditions become progressively wetter towards the center (bottom), grasses give way to sedges (Bullock 1992). By implication, therefore, it is inappropriate to refer to the entire dambo as the swamp or wetland. This paper corrects this misconception by presenting cases that support the proposition that the wetland component of a dambo is the bottom; so that the transitional zone (floor) constitutes the dambo wetland fringe within which the wetland may expand in response to seasonal changes in moisture.

Dambo: the landscape feature and wetland

The earliest work on dambos focused on geomorphological aspects of these landscapes so that to a geomorphologist, these are landforms and vegetation is a secondary feature; its distribution merely mirroring the synergistic influence of landform and hydrology on species successional cycles. This view is emphasized by comprehensive reports describing dambo morphodynamics and morphology (e.g., Mäckel 1974; Acres et al. 1985; Mäckel, 1985), particularly stressing the role of geology and climate in the evolution of these unique landscapes. In this respect, many authors (e.g., Mäckel 1974; Meadows 1985; Thomas and Goudie, 1985) were more concerned with dambos as landscape features and have written insightful descriptions of the evolution of these features and how their characteristics, such as valley dimensions, shape and curvature, slope angle, soil characteristics, and height of the water table reflect the spatio-temporal variability of processes operating on the landscape. Looked at in this context, a dambo is a subsystem within a wider catchment and is best studied as a geomorphic unit.

At the same time, on the basis of the three features Mitsch and Gosselink (2007) showed to distinguish wetlands from other lands (hydrology, hydric soils, hydrophytic vegetation), it is possible to delimit a wetland component in a dambo landscape; hence sub-setting the landscape by locating an ecological unit which functionally differs from the rest of the dambo geomorphic unit. This is so because for a dambo, features vary along a cross-section, so that the extent of a dambo wetland is defined by determining the spatial limits beyond which all the three characteristics are not expressed. Thus the wetland would be that where there is seasonal inundation, evidence of hydric soils and dominance of water-tolerant plant species. A look at dambo cross profiles of sites located in different geographic regions shows dambo zones to vary with respect to soil and vegetation characteristics; these being an indication of the control frequency and magnitude of flooding have on the dambo landscape.

Generally, dambo bottoms have more organic content, usually restricted to the top horizon; but it may not rise above 10% due to oxidation during the dry season (Meadows 1985). It has been suggested that accumulation of organic materials in the dambo bottom is a result of slowed decomposition of plant materials due to anaerobic conditions associated with water-logging (Boast, 1990); sometimes leading to a build-up of a peat layer.

Furthermore, dambo bottoms are characterized by clay-rich soils (Mäckel 1974; Young 1976; Acres et al. 1985; Boast 1990; von der Heyden 2004). These may occur underneath the organic layer or the clay-rich layer may form the surface horizon. There is more clay here because the flat terrain restricts soil removal while at the same time it favors colluviation of well sorted clay particles originating from the washbelt and upland zones (Mäckel, 1974). This setting affects dambo bottom soil characteristics and hydrology, so that low hydraulic conductivity of the clay-rich soils (Bullock 1992), together with the restricted dispersion of surface water due to a flat terrain, encourage saturation of dambo bottoms. This accounts for the characteristic hydric soils, the gleys, which are the lowest member of the catena (Young 1976).

Ultimately, the unique environment of dambo bottoms selects for vegetation specifically adapted to the conditions. Typically this includes water-tolerant herbs (e.g., *Setaria sphacelata, Dyschoriste magchena, Emilia javanica, Scirpus spp, Scleria greigifolia, S. welwitschii, Dissotis canescens, Kniphofia linearifolia, Commelina subulata*), sedges (e.g., *Rhynchospora spp, Cyperus alba, Cyperus denudatus*) and ferns (e.g., *Thelypteris confluens*). The same species of plants may occupy the transitional zone, but this is true for dambo landscapes where the water table is relatively high. Otherwise, owing to the abundance of soil moisture at the bottom relative to the other zones, there is a notable dense coverage of grasses and sedges (about 85% to 95% of coverage), with the sedges usually forming a dominant cover (Mäckel 1974).

Since vegetation changes in character away from the center (Whitlow 1985), and that toward the interfluve, soils become more sandy (with pale grey bleached sand gley) (Young 1976), less organic, and less saturated, it is suggested that the wetland component of a dambo is limited to the bottom zone. This is where typical wetland conditions are manifested. The adjacent dambo floor defines the fringes of the wetland that may be constituted as part under conditions of sustained saturation, as may be the case following frequent inundation.

Conclusion

The misconception that the entire dambo is a seasonal wetland is partly because work on dambos has dominantly focused on their geomorphic characteristics; so much so that the question as to whether this characterization is consistent with established schemes for classifying wetlands has never been posed. This inaction is partly attributed to a lack of comprehensive survey of dambo vegetation (Whitlow 1985) and the reluctance to analyze the spatial variability of moisture within dambos (Bullock 1992); yet these are key ingredients in the definition of a wetland. However, illustrations of dambo cross profiles and analyses of selected reports show that the dambo wetland is confined to the bottom zone, where features satisfy the definition of a wetland. Edaphic and floral characteristics support the view that beyond the bottom is non-wetland, even when the water table periodically rises to the surface.

References

Ackermann, E. 1936. Dambos in Nordrhodesien. Wiss. Veroff. Dt. Mus. Landerkde. Leipzig, NF 4.147-175.

Acres, B. D., A. B. Rains, R. B. King, R. M. Lawton, J. B. Mitchell and L. J. Rackham. 1985. African dambos: their distribution, characteristics and use. Zeitschrift fur Geomorphologie, Supplementband 52:63-86.

Balek, J. 1977. Hydrology and water resources in tropical Africa. Elsevier Amsterdam; New York.

Balek, J. and J. E. Perry. 1973. Hydrology of seasonally inundated African headwater swamps. Journal of Hydrology 19:227-249.

Boast, R. 1990. Dambos: a review. Progress in Physical Geography Progress in Physical Geography 14:153-177.

Bullock, A. 1992. Dambo hydrology in southern Africa: review and reassessment. Journal of Hydrology 134:373-396.

Mäckel, R. 1974. Dambos: A study in morphodynamic activity on the plateau regions of Zambia. Catena 1:327-365.

Meadows, M. E. 1985. Dambos and environmental change in Malawi, Central Africa. Zeitschrift fur Geomorphologie, Supplementband 52:147-169.

Mitsch, W. J. and J. G. Gosselink. 2007. Wetlands 4th edition. John Wiley & Sons, New Jersey.

Roberts, N. 1988. Dambos in Development: management of a Fragile Ecological Resource. Journal of Biogeography 15:141-148.

von der Heyden, C. J. 2004. The hydrology and hydrogeology of dambos: a review. Progress in Physical Geography 28:544-564.

Whitlow, J. R. 1985. Dambos in Zimbabwe: a review. Zeitschrift fur Geomorphologie, Supplementband 52:115-146.

Young, A. 1976. Tropical soils and soil survey. Cambridge University Press, Cambridge; New York.

A Simple Device for Measuring Elevation Changes in Wetlands

Judith Stribling, PhD
Professor, Department of Biological Sciences
Salisbury University

Introducing students to the study of wetlands involves conveying both the science of wetlands and the process of wetland investigation. The starting point is often defining and characterizing hydrology, which is at the heart of every wetland. We explain to students the interplay between climate and basin geomorphology to bring hydrology to light (e.g. Mitsch and Gosselink 2007).

It is common to characterize hydrology by measuring elevation along one or several transects across ecological gradients. This exercise gives students a better understanding of how this physiographic feature serves as a structural control on wetland communities. As part of the activity, students may assess variability of other features such as plant community composition or soil texture in relation to the changing elevation. Hummock/hollow microtopography may also be included to illustrate the feedbacks between vegetation and geomorphology, for example, in forested wetlands. In tidal systems, quantifying the magnitude of change in elevation can provide a dramatic illustration of the inland propagation of apparently small increases in sea level. Other erosional and depositional dynamics also can be shown to depend on topographic variability.

The advantages of having students investigate elevation can be offset by the relative cost and logistic difficulty of using conventional surveying instruments to transfer the level of one point to another. These devices are difficult to set up and maintain in flooded, muddy, and uneven wetland terrain (they don't work very well when dropped in the mud!), and they are not useful for measuring elevation where sight is obscured by large trees as in a forested wetland.

A water level is a simple and ancient device based on the principle that water equalizes to the same elevation on both sides of a U-shaped tube. The tube thus establishes a reference to measure distance to the soil surface (Fig. 1). The distance is measured from the bottom of the meniscus within the tube, with the reference end of the water level positioned on the control (benchmark) elevation. Such instruments were used at least as early as the time of construction of the Roman aqueducts, to establish grade (Lyman 2012).

Our device consists of a 15-m length of clear laboratory tubing (I.D. 6.35 mm [1/4"]; wall thickness 1.6mm [1/16"], with quick-release clamps at each end. In controlled use, the accuracy of this water level is at least ±0.25 cm (Stribling et al. 2006).

To describe the elevation along a wetland transect, we choose a reference point (usually at the water's edge if there is surface water present). A fencing stake is planted and marked at an arbitrary 100 cm from the soil surface. This mark represents the control, and elevation measurements are made at intervals along the transect. One end of the water level is held above the reference point, while the other is positioned next to a 2 m measuring stick or folding rule, held vertically on the soil surface. The second end of the tube (end B) is moved up or down along the measuring stick until the water level in end A end meets the 100 cm reference point. The distance from the water level to the soil surface at end B (the 3 m point) is then measured with the 2-m stick.

A reservoir may be used at the reference end of the water level, which will increase accuracy of the measurements. However, if water spills out of the tube (which can happen easily in the field) the reference must be re-established, so for most applications the resolution provided by the tube alone is sufficient.

Elevation is calculated as the difference between the control and the measured distance to the soil surface. If the transect is longer than 15 m, repositioning of the control will be necessary, marking a fencing stake with the last reading at end B for a new end A. If the elevation change is greater than 100 cm, vertical repositioning of the control will be necessary; usually it's sufficient to simply add increments of 100 cm, remembering to adjust the elevation calculations accordingly.

Literature Cited

Lyman, J. 2012. Surveying. Encyclopædia Britannica Online. Retrieved 27 July, 2012, from http://www.britannica.com/EBchecked/topic/575433/surveying

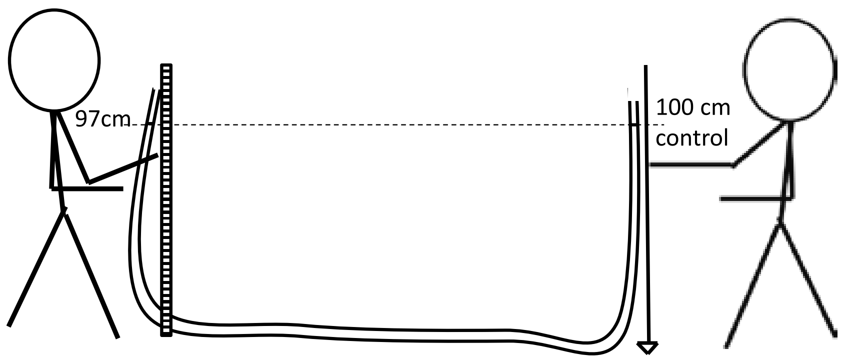


Figure 1: Using a water level to measure distance to soil surface.

Mitsch, W.J. and J.G. Gosselink. 2007. Wetlands, 4th ed. John Wiley and Sons, Inc., Hoboken, NJ. 582 pp.

Stribling, J.M., O.A. Glahn, X.M. Chen and J.C. Cornwell. 2006. Microtopographic variability in plant distribution and biogeochemistry in a brackish-marsh system. Marine Ecology Progress Series 320: 121-129.

Wetlands Education and Functions on a University Campus, Mississippi State University

Langley, K.[1], R. M. Kaminski[2], J. B. Davis2, Poor R.F.[3]
[1]Science Enrichment Program, Mississippi University For Women, Columbus, MS 39701
[2]Department of Wildlife, Fisheries & Aquaculture, Box 9690, Mississippi State University, Mississippi State, MS 39762
[3]Native Habitats, Inc., 188 Spring Creek Rd., Flora, MS 39071

Introduction

Creating human awareness to wetland values is an important step in safeguarding these critical resources. In 2006, the Department of Wildlife, Fisheries and Aquaculture, and Landscape Architecture at Mississippi State University (MSU) conceptualized the Wetland Education Theater (WET) project. The "seed" for WET was "planted" at MSU in 2002, mostly as a result of interest in a wetland site on the MSU campus studied by students enrolled in the course, Wetlands Ecology and Management (WFA 4383/6383). Since then, the concept evolved into a substantive effort that is embraced by various stakeholders at MSU and surrounding communities in Mississippi. The WET will become a >2 acre demonstration project that integrates wetlands and associated upland grassland communities on MSUs campus in Starkville, Mississippi (33° 27'; 88° 49').

WET History

The current School of Landscape Architecture buildings were constructed at MSU in 2001. Soon after, a naturally wet swale formed east of the new structures. Native wetland vegetation quickly established in the swale, and campus landscape maintenance crews were challenged by advancing succession of wetland herbaceous and woody vegetation. Although an "eyesore" to some, insightful university professors and students viewed the swale as a tremendous opportunity for education. For example, students from the Department of Wildlife, Fisheries & Aquaculture and Landscape Architecture swooped into the cattails (Typha sp.) and other native plants, extracting soil cores and otherwise investigating the new natural wetland treasure. Other classes seized opportunities to design unique storm-water retention facilities, such as bio-swales, rain gardens, runnels, and weirs in the wetland.

In fall 2006, three graduate students from the Wetlands Ecology and Management class at MSU began developing a landscape design and management plan for the site to earn graduate credit for the wetlands course, then under the instructorship of Dr. Rick Kaminski. The concept was so greatly regarded by faculty and students that these graduate students ultimately presented their vision to the MSU President, and seed money was provided by MSU to help leverage additional project funding. Eventually, a comprehensive promotional packet was produced in 2009. In 2010, Mr. C. Clark Young of West Point, Mississippi was introduced to WET and he eagerly supported it. Through a generous gift from him and his wife, MSU Foundation, Inc. retained a landscape architect to develop the design and layout.

WET's Design Process

A thorough design of WET was developed in 2012, after important baseline data, including soil pH and moisture profiles were identified. Case studies also were conducted of similar naturally occurring wetlands and grasslands in the area. For example, the contracted landscape architect investigated nearby Chickasaw and Osborn Prairies, the Sam D. Hamilton Noxubee National Wildlife Refuge, and habitat fragments surrounding MSU's Technology Park for environmental characteristics that might parallel those at the WET site. After a water management plan was developed, zones of plant communities were planned for the site relative to their hydrological adaptations. Based on existing soil and predicted flood conditions, plant communities and other resources pertinent to WET included:

- upland prairie (both alkaline and acidic soils)
- distinct wetland types
- emergent plants (persistent/temporarily flooded)
- forested wetland
- emergent plants (non-persistent/semi-permanently flooded)
- floating and submerged plants (intermittently or permanently flooded)
- deepwater habitat
- upland prairie integrated with forest edges and patches
- two types of upland forests transitioning to forested wetland

Because education of visitors is a fundamental goal of WET, identifying accessible areas for people was necessary. Final design efforts included placement of bridges, walks and structures in locations that incurred the least ecological impact. Structures were positioned so as to optimize natural function (e.g., bridges widths and orientations will allow sunlight underneath for plant growth). This design will encourage visitors to experience natural water flow between wetlands, native plant communities, use by wildlife (e.g., waterbirds, amphibians), and other local ecological features. Such a unique design approach will maximize perceptual experience while maintaining the integrity of the ecological community.

Given the ecological and social complexities of WET, campus-wide experts were invited to critically review the project. To date, personal meetings, questionnaires, e-mails, and telephone surveys with >25 faculty and staff from 10 campus departments greatly improved project design and awareness.

A most challenging aspect of WET was development of the wetland footprint and grading plan. Micrograding techniques will be used to create several wetlands with nexus, ranging from 3" – 6' depths to provide habitat diversity. Weirs, mud-flats, and small islands also will be created, along with gabions (i.e., blocks of wire wrapped stone) used in deeper areas to create a submerged wading deck. These wetlands will promote storm-water management and help retain sediments discharged from surrounding areas prior to their release into Catalpa Creek, a tributary of nearby Tombigbee River. Wetland cells > 6' deep will retain water year around and support aquatic life. Several species of native grassland and wetland plants will be established along gradients, representative of their niche in natural systems. Although ecological succession will be encouraged, periodic management, such as burning warm season grasses and managing any invasive species, will be implemented. Mississippi State University has authorized prescribed burning to maintain grassland integrity onsite. Safety policies for this and other practices are being developed and will be shared with visitors through signage installations. Interpretive displays will be developed and housed in separate structures throughout the site. Each educational assemblage will emphasize specific habitat communities and their values to wildlife and people. For example, specialized interpretive clusters will include:

- Wetlands – emphasizing three components necessary to comprise a jurisdictional wetland (hydrology, hydrophytes, and hydric soils)
- Hydrology and the beaver (Castor canadensis) as ecosystem engineer; and function of weirs for flood control and improvement of water quality
- Seasonally flooded Bottomland Hardwood – ecosystems and forest products
- Slope Hardwoods/grassland understory and pine savanna – ecosystems and forest products

- Upland prairie with variable pH and moisture, with structure that harvests rainwater
- Sustainable Sites Initiative with vegetated roof
- WET's unique design approach

As part of this interpretive/educational effort, there are plans for a comprehensive suite of technologies to integrate with the placards. Ideas include a comprehensive web site, touch screen technology, smart phone and tablet applications, time-lapse photography to document seasonal and successional dynamics, and podcasts providing guided tours.

Summary/Conclusion

The WET will: 1) educate the public about ecological benefits of wetland and associated upland communities, and 2) reduce runoff and improve water quality on a university campus that is incrementally growing. Project WET's network of pocket wetlands will enhance storm-water management and perform other ecological services. In addition, best management practices (BMPs) resulting from WET will benefit MSU's South Farm and downstream tributaries subjected to increasing rainwater overflows with campus and adjacent city expansion. Besides creating functional wetlands that perform natural services, WET will serve a unique role in outreach to educate students and visitors about storm-water management, the ecology and management of wetlands and grasslands, and create an overall awareness and appreciation for these critical systems, in a safe and convenient setting. To our knowledge, WET may be a unique venue on wetlands education, conservation, and demonstration nationwide on a university campus. Our vision is to attract thousands of visitors annually and provide a unique educational and aesthetic experience in an increasingly urban university setting. Design plans are nearly completed with initial ground breaking scheduled for fall 2012.

Figure 1: Rendering of WET, Mississippi State University campus, 2009. Graphic by K. Langley.

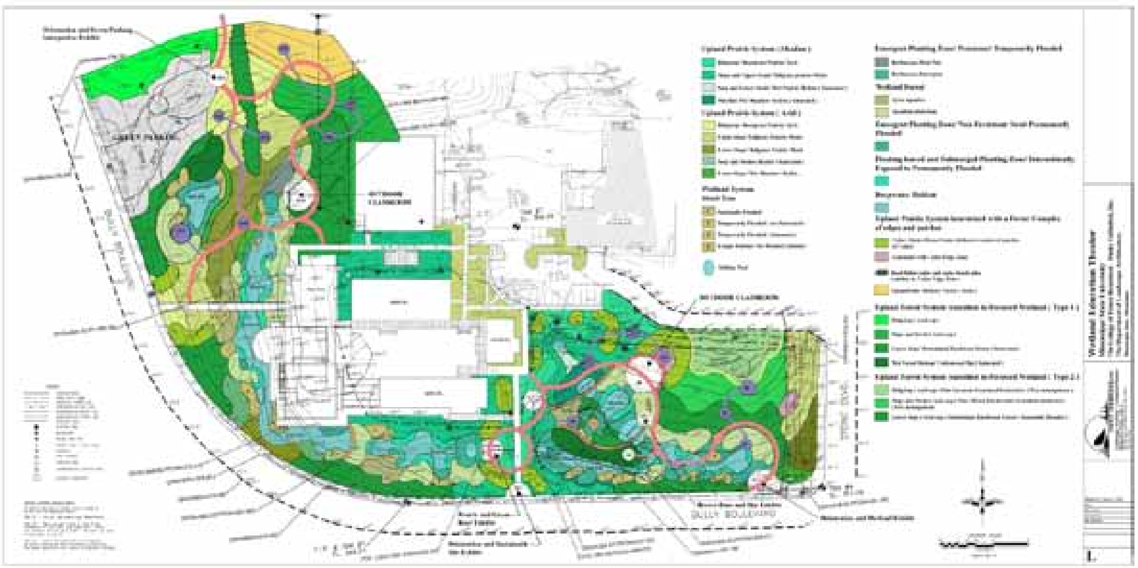


Figure 2: Rendering of Project WET in relation to existing infrastructure on the campus of Mississippi State University, 2011. Graphic by R. Poore.

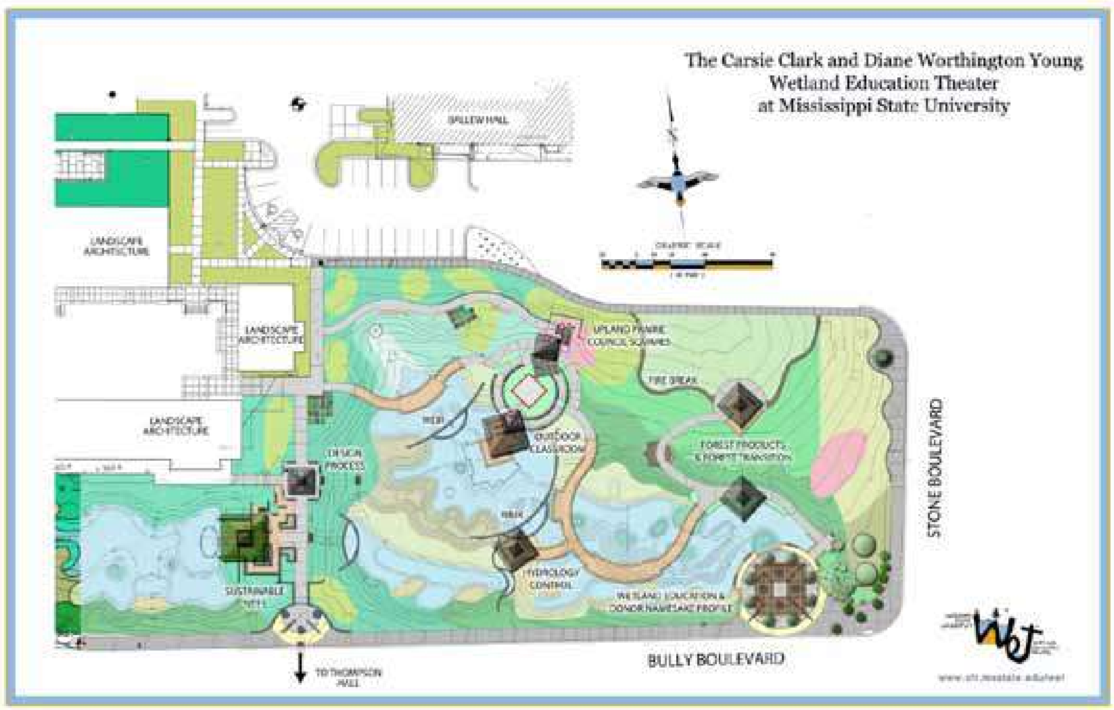


Figure 3: Rendering of Project WET with proposed grading plan, planting zones, walks, bridges, and structures, campus of Mississippi State University, 2011. Graphic by O. Harris.

Figure 4: Rendering of Project WET proposed classroom structure overlooking primary wetland unit, on campus of Mississippi State University, 2012. The structure has passive solar features, is fully ADA compliant, and can seat up to 50 students.
Graphic by D. Havelin

EDUCATION

SWS Diversity Program Undergraduate Mentoring Awards

We have just completed the 9th year of the SWS Undergraduate Mentoring Program, which brings students from underrepresented groups to our annual meeting and introduces them to career possibilities in wetland professions. During those nine years we have mentored 68 students from 45 different universities. We are now in the third year of a collaborative effort with the Ecological Society of America's renowned SEEDS Program. We send two participants from our program to the SEEDS Leadership Workshop each spring. For the past two years, we have brought our participants in the Leadership Workshop back to our annual meeting to lead a workshop and serve as peer mentors. This year's peer mentors were Shauna-kay Rainford (Cornell University graduate), Sheldon Watkins (Virginia State University graduate student), and Shelby Ward (now an environmental lawyer).

We were able to support 11 students for our meeting with INTECOL in Orlando, Florida in June. Sponsors included the National Science Foundation and several SWS Chapters (Mid-Atlantic, South Atlantic, South Central, North Central, Western, and Pacific Northwest). The 2011 award winners are:

- Rachel Augustine (SUNY Syracuse)
- Lindsey Callier (South Carolina State University)
- Mario Flunory (Stony Brook University)
- Jahuan Jarrett (Martin University)
- Edwige Lauture (Stony Brook University)
- Philip Peterson (Martin University)
- Chris Sanchez (University of Miami) – South Atlantic Chapter support
- Katherine Stewart (Northeastern State University) – Pacific Northwest Chapter support
- Sierra Taliaferro (Bethune-Cookman University)
- Angelique Taylor (Florida A&M University)
- James Totton (North Carolina A&T University)

Please think about getting involved with the program and contact Ralph Garono (SWS Diversity Committee Chair) at ralph.garono@ces.uwex.edu or me if you have questions or want to join us as mentors, workshop participants, or in some other capacity.

Frank Day fday@odu.edu
SWS Mentoring Program

Call for Mentors for the SWS Undergraduate Mentoring Program at the SWS Meeting in Duluth, Minnesota (June 2 - June 6, 2013).

This NSF and SWS sponsored program provides travel awards to our annual meeting and mentoring at that meeting for undergraduate students from underrepresented groups. The award recipients will have their travel expenses fully funded and receive guidance from mentors who will accompany the students to meeting events and activities. The mentors will attend major meeting activities with the student and attend a pre-meeting orientation session and a luncheon on the last day of the meeting. Mentors will also meet with the students daily to discuss the activities of the day. This is a call for mentor volunteers. We specifically are seeking mentors with a minimum of two years of graduate experience who have attended at least two prior SWS annual meetings. Mentors will be expected to be at the annual meeting for its duration, beginning with the pre-meeting orientation session. If awardees express an interest in a specific subdiscipline of wetland science (e.g., restoration, mitigation banks, animal ecology, hydrology, biogeochemistry), an effort will be made to match student awardees with mentors with similar interests. If you would like to be a mentor for this very important program, please contact Frank Day, Undergraduate Mentoring Program Coordinator (fday@odu.edu).

Figure 1: Mentoring program - 2012 Students
Front Row (left to right): Lindsey Callier, Edwige Lauture, Rachel Augustine, and Sierra Taliaferro.; Back Row (left to right): Mario Flunory, Jahuan Jarrett, Chris Sanchez, James Totton, Angelique Taylor, Katherine Stewart, and Philip Peterson.

Call for Applications for SWS Diversity Program Undergraduate Mentoring Awards for the SWS Meeting in Duluth, Minnesota (June 2 - June 6, 2013)

The Society of Wetland Scientists (SWS) announces the availability of undergraduate student awards for travel to attend the annual SWS meeting in Duluth, Minnesota June 2 – June 6, 2013. The mission of this SWS program is to increase diversity in the Society and the field of wetland sciences by offering full travel awards to undergraduate students from underrepresented groups and providing career mentoring and exposure to career options at the Society's annual meeting (see application form for eligible groups). These awards are supported by the National Science Foundation and several SWS Chapters (Mid-Atlantic, South Atlantic, South Central, North Central, Western, and Pacific Northwest). The areas of interest of the student participants range from freshwater to marine and involve a wide variety of organism types. Undergraduate participants must be citizens or permanent residents of the United States or its possessions. An undergraduate student is a student who is enrolled in a degree program (part-time or full-time) leading to a baccalaureate or associates degree. Spring 2013 graduates are eligible as well. Participants are selected based on academic promise, interest in exploring a career in the natural sciences, potential for serving as a mentor, and demonstrated commitment to increasing opportunities for underrepresented students. It is especially important that applications be complete and that the "tell us about yourself" essay clearly addresses the information requested and that it be well composed. Application materials and additional information are available from Dr. Frank P. Day, Old Dominion University (fday@odu.edu) and on the program's web page (http://www.sws.org/mentoring.mgi). An email to Frank Day expressing interest in the program can serve as a preapplication. Application deadline is November 16, 2012.

SWS Diversity Program

Undergraduate Student
Mentoring Awards

Increasing diversity among wetland scientists is a priority of the Society of Wetland Scientists. Undergraduate students from underrepresented groups who are considering environmental careers are eligible for travel awards funded by the National Science Foundation and SWS regional chapters. The SWS student mentoring program provides career guidance and networking with leading professionals in academia, government agencies, NGO's and private consulting at the Society's annual meeting.

The awards provide:

- All travel expenses to the 2013 SWS annual meeting, June 2-6 in Duluth, Minnesota. See application for details.
- Mentors to offer guidance and career advice
- Postgraduate and career workshops
- Networking opportunities to meet professionals from diverse fields
- The option to present a research poster

Annual Meeting 2013
SOCIETY OF WETLAND SCIENTISTS
Duluth, Minnesota June 2-6, 2013

Application deadline: November 16, 2012

Visit **www.sws.org/mentoring.mgi** for more information and to access the application materials. Questions? Contact Dr. Frank P. Day at **fday@odu.edu**.

SWS

SWS FYI

The Society of Wetland Scientists at the Ramsar Conference of the Parties

The 11th Meeting of the Conference of the Parties to the Convention (Ramsar COP11) was held in Bucharest at the Palace of Parliament, Romania between the 6th and 13th July 2012. The meeting was attended by over 2000 participants representing the 162 parties to the Convention, as well as the international organization partners (IOPs) of the Ramsar Convention, UN agencies, intergovernmental organizations and non-governmental organizations (NGOs).

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (which is more commonly known as the Ramsar Convention) was signed in Ramsar, Iran, on 2 February 1971, and came into force on 21 December 1975. The Convention provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

At COP 11 in Romania 22 resolutions were adopted. The resolutions adopted by the COP influence the actions of national governments and other stakeholders in their pursuance of the wise use of wetlands. Of the 22 adopted resolutions, nine involved input from the Scientific and Technical Review Panel (STRP) (the official subsidiary body to the Convention that provides scientific and technical advice and guidance). These nine resolutions included consideration of wetland issues as far ranging as tourism, energy, urbanisation, poverty eradication, health, climate change, agriculture and avoiding, mitigating and compensating for wetland loss and degradation. A full list of the adopted resolutions is available here http://www.ramsar.org/cda/en/ramsar-documents-cops-cop11-cop11-drs/main/ramsar/1-31-58-500%5E25607_4000_0__.

The Society of Wetland Scientists (SWS) is an invited observer organisation on the STRP and SWS members, both individually and through the Society's Ramsar Section, have contributed substantially over the past three years to the scientific and technical understanding underpinning the development of these resolutions and many SWS members took a lead on drafting the resolutions in advance of the COP. At the COP, SWS members worked tirelessly alongside their other STRP members, delegates and Ramsar Secretariat staff to redraft resolutions and accommodate the wishes and concerns of the Parties.

It is a positive message to the Society and its members that our work can contribute to governments signing up to commitments which will lead to the wise use and future protection of wetlands across the globe. If any member wants to get involved in this process please consider joining the Ramsar Section or contacting the Section Chair.

Rob McInnes
Ramsar Section Chair

Figure 1: STRP Chair and SWS member Heather Mackay with STRP Thematic Lead on Climate Change Max Finlayson (and current President of the SWS Australasia Chapter) redraft a resolution.

Figure 2: STRP and SWS members Royal Gardner and Randy Milton revise the draft resolution on an integrated framework for avoiding, mitigating, and compensating for wetland losses.

Figure 3: The plenary hall at the Palace of the Parliament in Bucharest, Romania.

CASS Briefing Summary: Wetlands Restoration and the 2012 Farm Bill

Adrienne Sponberg

Sponsors and Organizers: CASS (ASLO, CERF, SFS, SWS) and the Environmental Law Institute. For CASS, ASLO (Adrienne Sponberg) and SWS (Bill Morgante) took the lead in organizing this event. For ELI, Teresa Chan was the lead organizer.

Event Summary:

CASS's inaugural event took place on the afternoon of May 10 (invitation with agenda attached) in the Senate Dirksen building. The briefing was timed to coordinate with ELI's National Wetlands Award ceremony taking place later that day. The speakers were: Rob Brooks from Riparia at Penn State, Chris Craft from Indiana University and Scott Sutherland from Ducks Unlimited. While the group had initially planned on focusing the briefing on wetland delineation, when ELI announced that Chris Craft was the wetland science award winner, the organizers decided an alternative theme encompassing Craft's expertise in wetlands restoration would be more appropriate. After some discussion, the organizers decided that a theme of "wetlands and the Farm Bill" would be timely and well received.

The RSVP's for the event indicated that the topic was a good choice and as the Senate began marking up the Farm Bill the previous work, the timing was excellent. Around 40 people attended the event. The speakers did an excellent job and the talks went together very nicely.

2012 SWS South Central Chapter Annual Meeting

Conference Dates: October 18-20, 2012

Venue: Botanical Research Institute of Texas, Fort Worth.

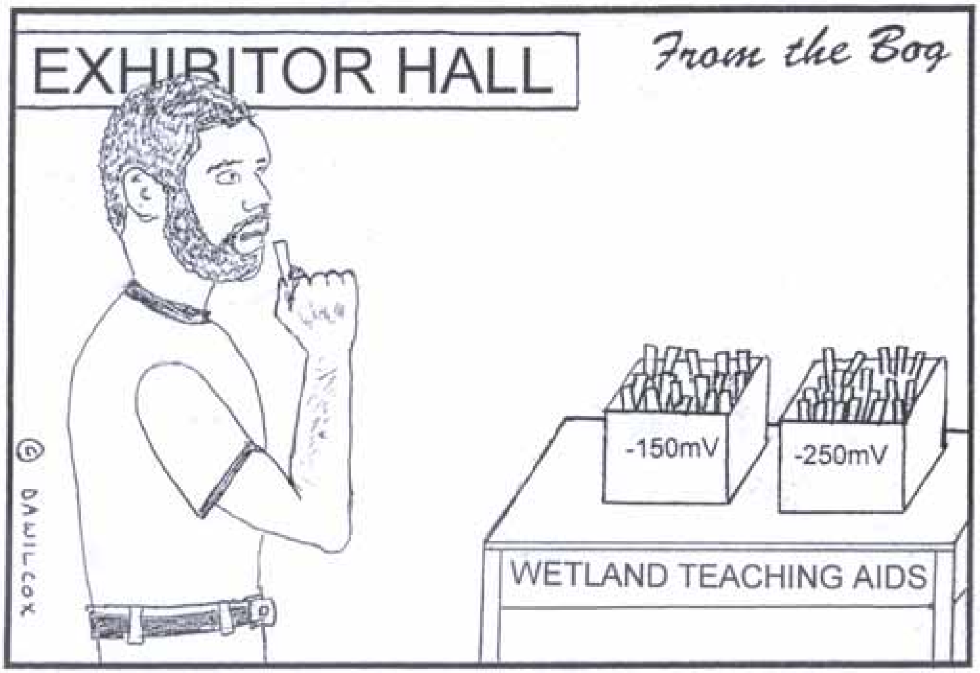
The South Central Chapter of the Society of Wetland Scientists is hosting its annual fall chapter meeting at the Botanical Research Institute of Texas (BRIT) in Fort Worth, TX. The meeting will bring students, scientists, consultants, and other professionals together to present and discuss the cutting edge of wetland science and research. The meeting includes oral and poster presentations, two educational workshops, a field trip to the John Bunker Sands Wetland Center, a BRIT tour and plant walk, and an evening social event. This is a wonderful opportunity for informational exchange and connecting with people, so please joins us this fall!
For more information, see: http://www.sws.org/regional/southcentral/ch_meetings.htm

LinkedIn: SWS South Central Chapter Group

Kevin Janni, board member of the South Central Chapter, created a chapter group on LinkedIn to connect chapter members and disseminate chapter information and updates, including the upcoming chapter meeting in Fort Worth, TX. The group encourages students, scientists, policy makers, regulatory staff, and consultants to use the page to make connections on related wetland interests, ask wetland related questions to the group, and coordinate logistics for the upcoming chapter meeting.

If you are interested in joining, use the Group search tool in LinkedIn and sign up today!

For more information, contact Kevin Janni, kjanni@swca.com



Scratch 'N' Sniff pads. Available in H_2S and CH_4

WETLAND SCIENCE AND PRACTICE

www.sws.org