

Project: 1

Agency: Oklahoma Conservation Commission

In cooperation with:
Oklahoma State University

Title: **An HGM Approach for Assessing Wetland Functions in Central Oklahoma: Hydrogeomorphic Classification and Functional Attributes**

Geographic Location: Cross Timbers and Central Great Plains Ecoregions, HUC level 8 watersheds Lower Cimarron, Black Bear-Red Rock, Lower Salt Fork Arkansas, Lower Cimarron-Skeleton, Lower Cimarron-Eagle Chief, Middle North Canadian, and Lower Canadian-Deer, Washita.

Abstract: The HGM approach for wetland classification has been incorporated into a number of state wetland monitoring programs because it supports functional assessment of wetlands. In Oklahoma, wetland classification has largely followed the Cowardin system, which has limited use in functional assessment. We propose to classify a select group of wetlands in the Cross Timbers and Central Great Plains Ecoregions of Oklahoma using the HGM approach, evaluate the need for regional wetland subclasses within these ecoregions, and collect baseline abiotic and biotic data that can be used to support development of functional assessment models for these ecoregions. The study will not only support existing wetland projects in Oklahoma (e.g. development of a probabilistic monitoring design, approaches for use attainability evaluations), but will serve as a critical first step toward implementing functional assessment protocols as part of the State's wetland monitoring program.

Background: In Oklahoma, development and implementation of a comprehensive wetland monitoring program is a high priority. Wetland-focused projects conducted by the Oklahoma Conservation Commission and other cooperators include development of a probabilistic monitoring design, creation of an interactive wetland mapping system, and development of procedures to evaluate use attainability in wetlands. Recent Wetland Program Development projects conducted in association with Oklahoma State University (e.g., CA#CD-976016-01) have focused on indices of biotic integrity using different biotic assemblages for closed depressional wetlands and on how data may best be integrated to evaluate wetland condition during the wetland assessment.

Functional assessment of wetlands in Oklahoma is also of interest. Assessment of function provides some advantages over methods that focus on taxonomic structure because evaluation of function may be more broadly applicable and provide freedom

from the influences of biogeographic distributions of species. The Hydrogeomorphic (HGM) Approach, which was developed to facilitate rapid assessments of wetland functions, has been successfully used to measure the functional capacity of wetlands within several geographic regions in the U.S. (e.g., tidal fringe wetlands along Gulf Coast, flat wetlands in the Everglades, Prairie Pothole depressional wetlands, Rainwater Basin depressional wetlands). This approach initially classifies wetlands based on the position on the landscape, water source, and hydrodynamics. The further development of regional subclasses may also be undertaken to further group wetlands, reducing variability and improving resolution in the ability to detect functional changes. Following classification of wetlands, functions of each HGM wetland class are identified and reference wetlands are used to scale or measure the functional attributes of each HGM wetland class.

Wetland classification in Oklahoma has largely followed the Cowardin system (Cowardin et al. 1979), which has limited use in functional assessment. Part of the problem is that wetlands grouped according to the Cowardin system may be too disparate based on the attributes that are used to assign an HGM class, and so functional indicators may be highly variable between systems. With respect to HGM itself, while broader applicability of methods across regions has been proposed as one of the advantages of this approach, recent studies have indicated limits in this applicability (Cole et al. 2003). As such, an important precursor to the development of a functional assessment approach for Oklahoma wetlands will be an evaluation of the current classification of wetlands and the development of some regionally-specific assessment models that can be applied here. It is also important to note that the development of functional assessment methods does not imply that methods based on taxon presence would be replaced.

Project Goals: The current US EPA Region 6 solicitation for FY07 Wetland Program Development Grants lists the development of State/Tribal wetland assessment capabilities as a priority area for funding. Specific Region 6 foci include the further development of HGM models for regulatory and planning purposes. The primary goal of this project is to begin HGM characterization of wetlands in support of a functional approach to wetland assessment in Oklahoma and assist with further development of Oklahoma's wetland monitoring program. This process will include HGM classification of both randomly selected and targeted wetlands in the ecoregions listed above, and baseline monitoring of the systems to characterize key functional attributes. We believe the initial classification process will indicate whether further development of regional wetland subclasses will be necessary in these ecoregions, while the initial functional evaluations will provide baseline data for "characteristic" attributes that will ultimately support development of functional capacity indices.

Expected Outputs: 1) HGM classification of representative wetlands in the Central Great Plains and Cross Timbers Ecoregions of Oklahoma that will support functional assessment of these systems 2) Further development of GIS database/wetland maps for wetlands in these ecoregions 3) Initial development of functional models relevant to Oklahoma 4) A procedural template that can be used in the development of a functional

assessment approach and associated handbooks for other ecoregions of Oklahoma including checklists/assessment worksheets to facilitate data collection to support HGM classification and functional characterization.

Expected Outcomes: This project will be the first step towards development of a functional assessment scheme for wetlands throughout Oklahoma. As such, we are confident that this project will serve as an important template for the development of an HGM-based approach for other regions of the state.

Baseline for Measurement: The baseline for measuring environmental improvement will include the estimated percentage of the State's wetlands that can be classified on a functional basis. The functionally classified wetlands will be one step closer to being assessed for condition, which will be included with the determination of wetlands status and trends for the State.

Project Objectives:

1. Compile necessary frame materials to develop a spatial representation of wetlands greater than 1 ha in the northern, mid and southern thirds of the Central Great Plains and Cross Timbers Ecoregions of Oklahoma and add to the ongoing development of a GIS database for wetlands which should facilitate development of a probabilistic sampling design of representative wetlands in these sectors. We focused on these ecoregions because they provide a wide range of variability (e.g., climatic and soil type variability) and we can build on the data from our previous studies (e.g. projects associated with CA#CD-976016-02) to support initial functional characterization of wetlands and development of regional wetland subclasses within these ecoregions.
2. Prepare worksheets/assessment forms that can be used to classify wetlands according to the 3 key components of the HGM classification approach- geomorphic setting, water source and hydrodynamics.
3. Characterize a select subset of wetlands in the designated sectors according to the 3 key components of the HGM-based classification and compare the resulting wetland classes with the current wetland designations used in Oklahoma for these regions which largely follow Cowardin et al. (1979).
4. Develop further regional wetland subclasses (e.g., depressional wetland with precipitation and groundwater as water source and mostly vertical and unidirectional hydrodynamics; fringe wetland with later surface flow as water source and bidirectional hydrodynamics) as necessary to more effectively represent wetland classes in the study areas.
5. Develop functional profiles for wetlands sampled.

Workplan:

Task 1: Develop Quality Assurance Project Plan (QAPP)

Milestone Date: September 2007-January 2008

Cost: \$18,050 (\$13,538 federal)

Measure of progress: Completion of QAPP describing strategy for wetland selection, initial classification and sampling.

Task 2: Select wetlands for on-site evaluations. A target population of wetlands in the Central Great Plains and Cross Timbers Ecoregions will be developed based on frame materials that include existing GIS databases, digital orthophotos, NWI maps and existing wetland location data from ongoing studies at OSU. A probabilistic sampling strategy will be used to select the actual sampling units within pre-defined strata (e.g., major differences in soil type and geomorphic features) across these regions. A minimum of 15-20 sites of at least 1 ha will be selected across each ecoregion.

Milestone Dates: September 2007–May 2008

Cost: \$28,100 (\$21,075 federal)

Measure of progress: List of wetland sampling sites.

Task 3: HGM characterization of wetlands using landscape position, water source, and hydrodynamics as outlined by Brinson (1993). The site selection strategy will be designed to capture the variability in these attributes within the sampling population of wetlands across each ecoregion.

Milestone Dates: March 2008-September 2008

Cost: \$28,000 (\$21,000 federal)

Measure of progress: List of HGM-classified wetlands for both ecoregions.

Task 4: Wetland sampling for functional characterization. Initial functional categories will include maintenance of characteristic plant community, maintenance of wildlife habitat within the wetland, water storage (a critical factor because it drives the hydrology of the system and other functions), nutrient cycling-specifically detrital decomposition, and maintenance of invertebrates. These variables were selected based on our existing data from previous wetland monitoring studies and the key functional categories outlined by Brinson (1993). We do recognize that specific functional variables may need to be changed once site visits commence.

Milestone Dates: Will be ongoing as data are collected; May 2008- January 2010

Cost: \$106,150 (\$79,612 federal)

Measure of progress: Creation of datasets for each functional attribute evaluated and initial development of regional functional models.

Task 5: Data analysis to determine the need for regional wetland subclasses. Ordination techniques will be used to analyze functional data collected from the wetlands and to determine any grouping patterns that may exist. The definition of regional wetland sub-classes can help reduce variability in functional attributes that are caused by differences in wetland type.

Milestone Dates: January 2010- August 2010

Cost: \$76,024 (\$57,018 federal)

Measure of progress: These evaluations will be included in recommendations in the final report.

Task 6: Develop final report for the study
Milestone Dates: January 2010-August 2010
Cost: \$8,000 (\$6,000 federal)
Measure of progress: Quarterly and final reports

Deliverables:

Task	Deliverable	Completion Date
1	QAPP development	January 31, 2008
2	List of wetland sampling sites	May 31, 2008
3	List of HGM-classified wetlands for both ecoregions	September 30, 2008
4	Datasets for each functional attribute	January 31, 2010
5	Data analysis to determine need for regional wetland subclasses	August 31, 2010
6	Quarterly and Final Reports	December 2007—September 30, 2010

Budget:

	Federal	State	Total
Personnel	\$36,000	\$12,000	\$48,000
Fringe Benefits	\$10,800	\$3,600	\$14,400
Equipment	\$0	\$0	\$0
Travel	\$1,000	\$333	\$1,333
Supplies	\$500	\$167	\$667
Contracting*	\$140,583	\$46,861	\$187,444
Total Direct Charges	\$188,883	\$62,961	\$251,844
Ind. Chg. @ 20% pers.+ fringe	\$9,360	\$3,120	\$12,480
Total	\$198,243	\$66,081	\$264,324

*Contracting will pay for monitoring and consultation with OSU

“Other” Personnel:

<i>Personnel</i>	<i>Years</i>	<i>Cost</i>
Executive Director	.03	\$2,232
Assistant Director	.03	\$2,160
Administrative Officer	0.1	\$4,752
Administrative Assistant	0.1	\$2,856
Wetlands Program Coordinator	0.75	\$36,000
Total		\$48,000

“Other” Travel:

<i>Travel</i>	<i>Cost</i>
Annual Wetlands Conference/Training <ul style="list-style-type: none">- 1 trip out of state- 1 staff person per year for 1 year- Total cost per trip \$1,333	\$1,333
<i>Total</i>	<i>\$1,333</i>

National and Regional Priorities Addressed by the Project: This project addresses the national priority of monitoring and assessment by strengthening the Oklahoma’s wetland monitoring program. This work will serve as a model for further development of a functional assessment scheme for wetlands in the State. It will also augment ongoing state programs aimed at wetland mapping. It addresses the regional priority of developing an HGM-based assessment program by initiating classification of wetlands by the HGM method, indicating the need for the development of regional sub-classes within the HGM scheme, and initial development of functional models for the ecoregions covered.

Partnerships: The proposed study represents a collaborative effort between the Oklahoma Conservation Commission and the Departments of Zoology and Natural Resource Ecology and Management at Oklahoma State University. Representatives from each group will play a role in developing the quality assurance project plan and in overseeing data collection. Personnel from Oklahoma State University will do the majority of the field work with volunteer opportunities provided to members of the OSU student body as they become available. As chair of the Oklahoma Wetlands Working Group, the Oklahoma Conservation Commission will play an integral role to integrate the project results into the overall strategy for wetland monitoring and assessment in Oklahoma. Matching funds will be provided through the time and associated salaries of Drs. Bidwell and Davis.

QA/QC: QA/QC issues related to data collection and reduction will be addressed through the development of a Quality Assurance Project Plan. Personnel from the groups involved in the study have experience in QAPP development.

Staffing and Funding Resources/Facilities: Staffing for the project will primarily be undertaken through Oklahoma State University. A graduate student at the PhD level will be appointed to undertake the study for their dissertation research. A temporary field assistant will also be appointed to assist with data collection. The Ecotoxicology and Water Quality Research Laboratory at Oklahoma State University is well equipped to undertake wetland studies. Resources include field vehicles, macroinvertebrate and plant sampling equipment, microscopes and taxonomic keys for identifications, and computers and associated software for data reduction. Drs. Joseph Bidwell and Craig Davis have considerable expertise in wetland research in both Oklahoma and

Nebraska's Rainwater Basin Region. Mr. Chris DuBois, Wetlands Program Coordinator for the Oklahoma Conservation Commission, also has expertise in wetland assessment and has successfully managed and completed fourteen 104(b)(3) Wetland Development Grant projects since 2002.

Transfer of Results and Methods to other State Agencies, Tribes and Local Governments: Basic dissemination of data will occur through the publication of research articles in regional, national and international journals, through reports submitted to the Oklahoma Conservation Commission, and through presentations at state, national and international conferences (e.g., meetings of the Oklahoma Wetlands Working Group, annual meetings of the Oklahoma Clean Lakes and Watersheds Association, EPA Region 6 Wetlands Technical Conference and the Society of Wetland Scientists).

Past/Current Management of Federally Funded Projects:

1. U.S. Environmental Protection Agency FY 02 104(b)(3) Wetlands-CD-976016-01 Oklahoma Conservation Commission #566. Development of Oklahoma's wetlands water quality monitoring program. Sub-contract to Oklahoma State University, Bidwell and Davis- Co-Investigators: Development of a monitoring and data analysis protocol to determine beneficial use of wetlands in Oklahoma. This project is supporting the development of a comprehensive wetlands monitoring program in the state by evaluating the spatial trends in abiotic and biological parameters in wetlands, with emphasis on appropriate data reduction methods. The study is entering its final field season. This project was administered through Oklahoma's Office of the Secretary of the Environment (OSE) and OCC, with results reported to the OSE and EPA Region 6 on a quarterly basis.
2. U.S. Environmental Protection Agency FY 05 104(b)(3) Wetlands CD-966017-01 Oklahoma Conservation Commission #570. Wetlands Monitoring Program Development. The goal of this project is to further development of Oklahoma's wetlands monitoring program through the creation of a probabilistic monitoring design and interactive wetland mapping system, which will provide the ability to estimate wetlands gains/losses and eventually wetland quality statewide, with increased analytical opportunities for the public as well as the private sectors. This project was administered through Oklahoma's Office of the Secretary of the Environment (OSE) and OCC, with results reported to the OSE and EPA Region 6 on a quarterly basis.
3. U.S. Environmental Protection Agency. FY 2002 104(b)(3)- CD-976016-01 Development of a wetland monitoring program for the Iowa tribe of Oklahoma. Bidwell and Davis- Co-Investigators: This study assessed metrics from macroinvertebrate, plant and bird assemblages that could be used to develop indices of biotic integrity for wetlands assessment. The key deliverable was a wetlands monitoring manual that could be used by the Iowa Tribe of Oklahoma as part of their wetlands program. This project was administered through Oklahoma's Office of the Secretary of the Environment (OSE), with results

reported to the OSE and EPA Region 6 on a quarterly basis. A final report was submitted in September of 2006.

Literature Cited:

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

Cole, C.A., R.P. Brooks, P.W. Shaffer, M.E. Kentula. 2002. Comparison of hydrology of wetlands in Pennsylvania and Oregon (USA) as an indicator of transferability of hydrogeomorphic (HGM) functional models between regions. *Environmental Management*, 30:265-278.

Cowardin, L.M., V. carter, F.C. Golet and E.T. LaRoe.1979. Classification of wetlands and deepwater habitats of the United States. FWS/OBS-79/31. US Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.