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Executive Summary

Background Approach Simulated application for Pennsylvania Summary of accomplishments (Figure 1)

Acknowledgements

- I. New Approaches for Wetlands Monitoring and Assessment
 - A. Background

Brooks, Robert P., and Doreen Vetter. Wetlands Protection: Evolving from Quantity to Quality (Submitting: National Wetlands Newsletter)

B. Rationale for the Cooperative Agreement - Brooks, Robert P.

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C. Wetlands Monitoring Matrix

Brooks, Robert P., Denice Heller Wardrop, and C. Andrew Cole. Monitoring wetlands for inventory, condition assessment, and restoration potential on a watershed basis; a case study from the Spring Creek watershed, Pennsylvania, USA. (Submitted: Environmental Management)

II.!Methods, Results, and Products

A. Reference Wetlands and Hydrogeomorphic Classification

Concepts of Reference Wetlands Use of Reference in the Hydrogeomorphic (HGM) Approach Selection of Reference Wetlands in Pennsylvania Classification of Reference Wetlands in Pennsylvania Recommended Steps for Establishing a Regional Set of Reference Wetlands Terminology and Definitions HGM Wetland Classification Key for Pennsylvania (Figures 1-7, Summary Table)

B. Wetlands Monitoring Matrix - Levels 1, 2, and 3

- 1. Level 1 Remote Inventory and Condition Assessment
 - a. Level 1 Synoptic Watershed Assessments

Brooks, Robert P., Denice Heller Wardrop, and Joseph A. Bishop. 2004.! Assessing wetland condition on a watershed basis in the Mid-Atlantic region using synoptic land cover maps.! Environmental Monitoring and Assessment 94:9-22.

b. Level 1 - Pennsylvania Wetlands Assessment

Brooks, Robert P., Joseph A. Bishop, and Denice Heller Wardrop.! 2004.! Preliminary Wetlands Condition Assessment for Pennsylvania using the National Wetlands Inventory.

- 2. Level 2 Enhanced Inventory and Rapid Condition Assessment
 - a. Level 2 Enhanced Wetlands Inventory Geology as a predictor of wetland occurrence within the Ridge and Valley physiographic province of central Pennsylvania. McLaughlin, Karen, Denice Heller Wardrop, Jennifer K. Perot, and Robert P. Brooks. (Submitted:! Journal of the Pennsylvania Academy of Science)
 - b. Level 2 Rapid Condition Assessment Brooks, Robert P., Denice Heller Wardrop, and Joseph A. Bishop. (Figure 1, Figures 2 & 3)
- 3. Level 3 Intensive Condition Assessments (HGM and IBI)
 - a. Wetland Sampling Protocol in support of Hydrogeomorphic (HGM) Functional Assessment. Wardrop, Denice Heller, Robert P. Brooks, Laurie Bishel-Machung, C. Andrew Cole and Jennifer M. Rubbo.
 - b. Hydrogeomorphic Functional Assessment Models (HGM)
 - Clairain, Ellis J. 2002.! Hydrogeomorphic approach to assessing wetland functions:! Guidelines for developing regional guidebooks; Chapter 1, Introduction and overview of the hydrogeomorphic approach.! Pages 1-27 in ERDC/EL TR-02-3, U.S. Army Engineer Research and Development Center, Vicksburg, MI. (not included here)
 - 2. Hydrogeomorphic Model Building Process.! Rubbo, Jennifer M., and Robert P. Brooks. (Ecoregion Table)
 - Hydrogeomorphic Variables:! Definitions, Rationale, and Scoring.! Brooks, Robert P., Denice Heller Wardrop, Jennifer M. Rubbo, Wendy M. Mahaney, and C. Andrew Cole.
 - Hydrogeomorphic functional assessment models by wetland type for Pennsylvania ecoregions.! Brooks, Robert P., Jennifer M. Rubbo, Denice Heller Wardrop, Wendy M. Mahaney, and C. Andrew Cole.
 - Riparian Depression Isolated Depression Slope Headwater Floodplain Mainstem Floodplain (available at a later date) Fringe (available at a later date)
 - 5. Level 3 Reference Wetlands HGM Scores for Pennsylvania.! Penn State Cooperative Wetlands Center. (Tables)!!!
 - 6. Hydrogeomorphic Functional Assessment Models Sensitivity Analysis. Brooks, Robert P., Denice Heller Wardrop, and Jennifer Masina Rubbo
 - c. Indices of Biological Integrity (IBIs) Flora and Fauna
 - 1. Flora
 - a. Vascular Plants

i. Miller, Sarah J., Denice H. Wardrop, Wendy M. Mahaney, and Robert P. Brooks. Plant-based indices of biological integrity for wetlands in Pennsylvania.!(Figures, Tables)

ii. Miller, Sarah J., and Denice Heller Wardrop.! 2004.! Adapting the Floristic Quality Assessment Index to indicate disturbance in central Pennsylvania wetlands. (submitting to Plant Ecology)

b. Greenhouse Experiments on Wetland Stressors

i. Mahaney, W. M.! 2001.! Impacts of human-mediated stressors on wetland plant community development.! M.S. Thesis. Ecology. 94pp.!

ii. Walls, Ramona L., Denice Heller Wardrop, Robert P. Brooks. 2004.! The impact of experimental sedimentation and flooding on the growth and germination of floodplain trees. Plant Ecology (in press).

iii.! Mahaney, W. M., D. H. Wardrop, and R. P. Brooks.! Impacts of human-mediated stresses on wetland plant community development.! Plant Ecology (in press).

iv.! Mahaney, W. M., D. H. Wardrop, and R. P. Brooks.! Germination and growth of wetland plant species under sedimentation and nutrient stressors. Wetlands (in press).

2.! Fauna - Macroinvertebrates

a.! Wetland Macroinvertebrates

Laubscher, Susan E., and Angela M. Conklin. Wetland Macroinvertebrates in Pennsylvania:! Level 3 Condition Assessment using Indices of Community Integrity (ICIs)

Introduction Methods Depressions Slope Wetlands (Table 4.2, Figures 4.2-4.5, Figures 4.6-4.7) Riverine Wetlands (Tables 5.2-5.11, Figs. 5.1-5.14, Figs. 5.15-5.18, Figs. 5.19-5.21, Figs. 5.22-5.25, Figs. 5.26-5.28, Figs 5.29-5.32) Fringe Wetlands (available at a later date) Conclusions (Tables, Figures) (Appendix A) (Appendix B)!(Appendix C) (Appendix D)

b. Conklin, Angela M.! 2003.! Macroinvertebrate communities as biological indicators of condition in Pennsylvania depressional wetlands.! M.S. Thesis.! Ecology.! 312pp.!

3.! Fauna - Vertebrates

a. Amphibian index of biological integrity for headwater complex wetlands in the Ridge and Valley Province of Pennsylvania, USA.! Farr, Melinda M., and Robert P. Brooks. (Submitting:! Wetlands).

b.! F	arr, Melinda M.! 2003.! Amphibian assemblage response to anthropogenic disturbance in Pennsylvania wetlands.! M.S. Wildlife and Fisheries Science.! 190pp.!
	Wetland Birds IBI.! Brooks, Robert P. and Timothy J. O'Connell (available at a later date)
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III.!Recommendations	
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Please cite the overall report as follows:

Brooks, R. P. (ed.).! 2004.! Monitoring and Assessing Pennsylvania Wetlands.! Final Report for Cooperative Agreement No. X-827157-01, between Penn State Cooperative Wetlands Center, Pennsylvania State University, University Park, PA and U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC.

Individual sections should be cited using the format of this example:

Laubscher, Susan E., and Angela M. Conklin.! 2004.! Wetland Macroinvertebrates in Pennsylvania:! Level 3 Condition Assessment using Indices of Community Integrity (ICIs).!! Part! II.3.c.2.a. lin R. P. Brooks (ed.).! Monitoring and Assessing Pennsylvania Wetlands.! Final Report for Cooperative Agreement No. X-827157-01, between Penn State Cooperative Wetlands Center, Pennsylvania State University, University Park, PA and U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC.