



Preparing Students for Wetland Professions: A White Paper to Assist Planning by Institutions of Higher Education

**Association of State Wetland Managers
April 2017**



Table of Contents

Table of Contents.....	2
Problem Statement	3
Introduction.....	4
Purpose	4
Informing this Paper.....	4
Recommended Course Offerings.....	5
Education Delivery Preferences.....	6
Strengthening Capacity by Partnering with Existing Training Programs.....	6
Preferred Training and Skills for Emerging Wetland Professionals.....	7
Characteristics of High Quality Wetland Training.....	8
Overcoming Fundamental Barriers for Wetland Academic Programs.....	10
Providing Additional Supports to Wetland Students.....	11
Recruiting Students to Wetland Programs in Higher Education.....	12

Problem Statement

Wetland professionals require a prescribed set of training, skills and experience to allow them to be successful in the wetland field. Recent studies have shown that there is a growing number of experienced wetland professionals who either have just retired or are about to retire across the United States. When these professionals are replaced, it is often with junior, less-experienced staff members who lack the diverse knowledge base and on-the-ground experience to do their jobs effectively without additional training. The Association of State Wetland Managers has been working over the last two years to identify key needs and gaps in wetland training for wetland professionals.

Through this process, ASWM has identified several key themes that should be noted:



A Changing of the Guard

Across the United States, a notable number of long-term, experienced wetland professionals are approaching or entering retirement. Many wetland professionals started working during the early years of water and wetland regulation. These vacancies are resulting in the hiring of new professionals to fill these positions. The new staff members often have less wetland training and experience than those who they are replacing. This means new staff need both training and experience to conduct this work effectively. (Link to S&T report)

Seeking Qualified Applicants for Wetland Positions

While wetland professional positions are increasingly becoming available across the country, at the same time, there is a dearth of highly trained students and professionals prepared to step into these positions. While ASWM's study identified that more students interested in wetlands are entering the planning and engineering fields, less are entering the ecology and biology fields, and the natural resource field is holding steady. As state wetland programs, consulting firms and nonprofits seek professionals to fill these positions, they are not always finding applicants with the skills they need for their work.

New Opportunities for Students in Wetland Professions

While this changing of the guard presents a challenge for wetland management, it simultaneously offers an opportunity for students and professionals interested in the wetland field to find employment. Providing academic and professional training to prepare new professionals is a growing need. This paper provides the findings of ASWM's study to help prepare a new generation of wetland professionals to work in an increasingly complex social, economic and regulatory environment.

Introduction

The Association of State Wetland Managers (ASWM) has just completed a two year study of wetland training, including a needs assessment, research on the characteristics of high quality wetland training, required and preferred skills for wetland professionals entering both the public and private sectors, and evaluation of different training tools. As part of this project, ASWM has developed a set of recommendations for institutions of higher education designed to assist universities and colleges and support nationwide efforts to strengthen the education of wetland professionals and, consequently, their ability to conserve, manage and protect wetlands. This project was funded by an EPA Wetland Development Grant and was guided by a national workgroup. All project reports and products are accessible on the ASWM website ([Add Link Here](#)).



*Photo Caption: Wetland Science Graduate Students;
Photo Credit: Louisiana State University*

Purpose

This paper has been designed to assist academic institutions and their funders in exploring ways to strengthen the preparation of wetland professionals through academic training and resources. The white paper starts with a summary, project background and discussion of educational needs. Next, the paper outlines the standard necessary education and skills needed for wetland professionals, recommended course offerings to strengthen wetland offerings, and the hallmarks of quality wetland training, to assist institutions in the formulation of offerings. The paper goes on to discuss additional supporting resources that can draw students to wetland programs, a range of research opportunities institutions can capitalize on to address areas of inquiry by state and federal agencies, and ways that academia can engage with organizations that hire wetland professionals to obtain a better understanding of regional needs. The paper concludes with a series of key recommendations for academic institutions seeking to strengthen offerings for students seeking to enter careers in the wetland field.

Informing this Paper

The Association of State Wetland Managers formed a National Workgroup on Increasing Access to Quality Wetland Training in 2015. This project workgroup has been comprised of wetland professionals across the United States in state, federal, nonprofit, private and academic roles. Working together, the Workgroup has gathered data from a 2015 Status and Trends Report on State Wetland Programs, needs assessments, and training series to inform the content of this white paper. While recommendations provided in this paper are based on well documented needs and recommendations, this paper does not represent the findings of a formal academic research study. One of the recommendations of this paper is to conduct research to determine the most critical elements of training and education, to confirm or modify the findings of this paper.

For More Information on this project, please contact Brenda Zollitsch, PhD, ASWM Policy Analyst at the Association of State Wetland Managers at brenda@aswm.org or (207)892-3399.



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Recommended Course Offerings

Discussion with wetland professionals responsible for hiring and supervising on-the-ground wetland staff worked with ASWM to develop a listing of recommended course offerings (Table 1) to support emerging wetland professionals. The listing identifies what the workgroup considers essential education for professionals seeking to pursue a career in wetlands work. Working collaboratively with the national workgroup and a number of wetland academics, the following key educational elements were identified.

Table 1: Recommended Course Offerings

Background Courses	Chemistry	Physical Sciences, including Geology	Environmental/natural resource policy and law (incl. CWA 404 and 401)	Statistics
Core Courses	Hydrology (including hydro-biology connections)	Botany (Including plant identification)	Soils (General soils and one or more courses that focus on hydric soils)	Ecology (including elements of each of the following: Ecosystem/ community ecosystem; wetland; conservation; plant; animal /wildlife; soil)
Science Specialty Courses	Limnology	Ornithology	Oceanography	



Background Coursework

Students should be provided background courses in chemistry, geology, physical sciences, statistics, and environmental/ natural resource policy and law. A program seeking to attract a range of students interested in wetland work should also consider offering or co-listing a course on urban and environmental planning and management, with the ability to focus class projects on wetland planning and management decision making.

Core Coursework

Core coursework should be designed to include hydrology, botany, soils, and ecology courses. Hydrology courses should address the complex and variable hydrological conditions present in the range of wetland types and varying conditions. Botany should include elements of wetland plant identification. Soils coursework should incorporate not only general soils concepts and identification, but also include a focus on hydric soils). Wetlands are complex ecosystems, requiring professionals not only to be able to recognize elements of wetlands, but also how these elements work together. To prepare students to work with wetlands, ecology courses need to cover a range of ecological issues, including ecosystem/community ecology; wetland conservation ecology, conservation ecology; plant ecology, soil ecology and animal/wildlife ecology.

Specialty Coursework

Specialty courses are recommended both in science and non-science topics. Science specialty courses useful to wetland professionals include limnology, ornithology and oceanography. Recommended non-science specialty courses focus on skill building for work with others on wetland issues, such as project management, supervision, leadership development, facilitation, and conflict management.

Education Delivery Preferences

ASWM's national workgroup queried wetland professionals about their training delivery preferences. Evaluations indicate strong preferences for classroom learning coupled with field sessions to practice applied learning. Students and professionals alike seek opportunities to test their learning in the field and get feedback from their trainers. However, many wetland professionals indicated that they do not have access to adequate travel funds or time in their schedule to travel to wetland trainings. For this reason, there is a growing demand in the wetland field for web-based remote training opportunities.



EPA Region 7 Wetland Restoration Training with Tom Biebighauser. Photo credit: Jeanne Christie.

While the need is growing for anytime/anywhere accessible online training, wetland professionals are also seeking opportunities to apply this learning in the field. A new model of mixed training delivery – combining online training with local field sessions to apply the knowledge in a real-world setting is growing in popularity.

Strengthening Capacity by Partnering with Existing Training Programs

While a self-contained wetland curriculum is ideal, many institutions of higher education are not in the position to hire and maintain a full course load of wetland-focused courses. To develop options for students to work within the resources of these institutions, colleges and universities may want to consider offering credit for professional trainings offered by wetland training organizations and consulting firms or work in collaboration with nearby institutions that provide complementary course offerings. For a listing of training providers, please check out ASWM's training provider matrix on the ASWM.org website (ADD LINK HERE).



Photo Credit: Central Michigan University

Preferred Training and Skills for Emerging Wetland Professionals

In addition to identifying key coursework needed for most wetland professions, the national workgroup also explored what skills, training and certifications are preferred by those hiring new wetland staff. It is important to note that there are a range of wetland professions, with this variation requiring different skills for application in different work environments. However, working with partners in the field the workgroup identified skills and understanding of the following subject matter to be of key importance for most wetland positions. This information is presented by topic area, including the areas of wetland science, wetland regulation, wetland restoration, wetland water quality, and other preferred skills. Academia can assist in the preparation of students in many of these areas, through a combination of coursework, field experiences, access to internships, travel support and additional specialized trainings from professional trainers.



Photo Credit: ERDC

Wetland Science

- Background and core coursework; specialty coursework as appropriate
- Understanding of wetland hydrology and the hydrology-soil-plant connection
- Hydric soils training and field experience
- Understanding of measures of wetland condition, function & value/how to assess these measures
- Understanding of the complex and critical connections between wetlands and streams
- How to connect science with policy and decision-making

Wetland Regulation

- Knowledge of key elements of federal and state wetland regulatory programs
- Wetland delineation experience
- Understanding of how to review, condition and integrate requirements into a permit
- How to develop, implement and evaluate mitigation requirements, how to evaluate mitigation outcomes
- Understanding of how laws become rules and are applied

Wetland Restoration

- Training on components of restoration performance and how to measure performance
- How to review a restoration permit application
- Training on in lieu fee programs and mitigation bank development/financial and legal planning;
- Training on restoration techniques
- How to prioritize restoration site selection

Wetland Water Quality

- Understanding of what makes water quality standards for wetlands unique from other standards
- How to effectively use monitoring and assessment tools to measure performance
- How to access and use comprehensive GIS data layers for restoration planning and design
- Training on how to incorporate applicable recommendations to other (non-state) voluntary wetland restoration planning and implementation effort

Other Professional Skills

- Strong technical writing; project and time-management; facilitation/moderating skills
- Ability to identify differences in information quality
- Able to provide Wetland Professional Certifications

Characteristics of High Quality Wetland Training

As part of ASWM’s national project on improving access to high quality wetland training for wetland professionals, the workgroup conducted a review of characteristics of quality training. The workgroup and its partners across the country identified the following elements that are critical to the delivery of effective wetland-specific training (Table 2).



*Photo Caption: ASWM Region 7 Restoration Training;
Photo credit: Jeanne Christie*

Most of these characteristics will be familiar to academics, as they are hallmarks of quality educational experiences across fields. However, in the wetland field, professional trainings do not always meet these standards. As part of this project, the national workgroup has sharing this set of characteristics with both those designing and those selecting from among options for training opportunities. These characteristics focus on different elements of planning, curriculum development, training content, delivery and evaluation.

Table 2. Characteristics of High Quality Wetland Training

Is based on thorough assessment of target audience’s training needs	Limits participant numbers to allow for interaction appropriate to the training type	Provides opportunities for participants to ask questions
Is taught by high quality trainer(s)	Includes a diversity of participants and embraces different learning styles	Provides opportunities for participants to express personal perspectives
Identifies minimum skill-level required	Emphasizes how content could impact the work of participants	Provides opportunities for participants to interact with each other
Is based on sound science	Provides examples of the content/practices in use	Allows participants opportunities throughout to provide feedback to the trainer
Provides learning objectives	Includes experiential component, as appropriate for the training type	Provides opportunities to reflect on what was learned
Circulates a description of the training, speakers and agenda prior to the training activity	Provides opportunities for participants to share their own experiences	Includes evaluation and is accompanied by support resources
Is focused and well-paced; Has clear direction	Employs humor/fun in teaching	Has before-during-after strategies to ensure training is transferable directly to job
Is scheduled at convenient times and locations; regular schedule is provided for multi-session trainings	Utilizes engaging visuals	Provides a supportive post-training environment

Planning Training Opportunities

High quality wetland training is based on a thorough assessment of the target audience's training needs, is taught by high quality trainers, and identifies in advance the minimum skill levels/prerequisites for participating in the training. Selection of the appropriate delivery mechanism is key by matching the type of learning required with tools that can achieve these goals. For example, wetland plant identification or soils delineation training should, at some point, require a hands-on, experiential learning element in the field that allows participants to put to the test what they have learned in their classroom or through online training. Learning what something generally looks like on a PowerPoint (e.g. plant parts, soil characteristics, hydrology indicators) does not necessarily translate into the ability to differentiate and make decisions about those elements in the field.

Developers need to consider the pros and cons of different training options, including classroom training, field training, mixed classroom/field training, webinar-based, synchronous or asynchronous online training and others. Decisions need to be made that allows the trainers to connect where the participants are able to join them – perhaps by linking a training with an existing conference, workshop, meeting or educational institution's offerings. Alternatively, if training is to be offered remotely, will all the target participants have access to the necessary technology and programs to participate effectively?

Curriculum/Content Development

Content development should be based on sound science and delivered using teaching/training methods that embrace a diversity of learning styles. Especially critical in content development is making connections for the participants between the training content and how it can be incorporated into wetland work/impact outcomes of in-the-field application. Training should focus on established tenets of the field of learning, building on established research, theory, tools and approaches. Participants should have access to the citations and support materials that were used in this development process. Training should provide examples of the content and/or practices in use and include experiential learning opportunities, as much as is appropriate for the learning setting. Training must also take into consideration regional differences, as wetland training directed to specific wetland types from one area of the country is not generally transferable to another, given the diversity of the wetlands covered. Understanding the regional context and specializations required should be considered and conveyed to the participants.

Training Delivery

Quality training includes circulation of information about learning objectives, speakers and an agenda ahead of the training sessions to allow students/participants to make decisions about the quality of the offerings and determine if the training meets their needs. Research indicates that the ability to relate the concepts from their training to their personal work enhances knowledge acquisition. For this reason, training should endeavor to provide opportunities for participants to share their own experiences with trainers and their other trainees.

Delivery should include as much interaction as possible. Time for participants to ask questions of the instructor and engage in dialogue with others should be built into training, regardless of whether the training is in a classroom, in the field or offered remotely. Ideally, participants will be able to interact with each other, as shared learning is a powerful tool.

Hallmarks of quality training also include the use of engaging visuals, limiting the use of text in presentation materials, and sharing supplementary information for additional content. Design should

include before, during and after considerations that allow participants opportunities to reflect on what they have learned through the training and ways that they can apply this learning to their wetland work.

Evaluation

Quality training incorporates evaluation from the beginning of planning by identifying learning objectives and metrics to measure whether those objectives are met through the training activity. Measures can include outputs, such as the creation and delivery of a training, the number of participants, and the material delivered. However, to understand the impact of the training, outcomes should also be measured, assessing the knowledge gains of the participants, as well as how they plan to apply what they have learned and the quality of their learning experience.

Overcoming Fundamental Barriers for Wetland Academic Programs

Promote Academic Programs that Include Wetland Offerings

In many cases, academic programs that offer wetland courses or concentrations may not broadly publicize this track of study. While there are many undergraduate and graduate programs that offer a wetland focus or that can be individualized to focus on wetland work, there appears to be little investment across the country in promoting these opportunities to incoming students or recruiting students into these specific majors, minors and/or concentrations. Wetland-centric academic work is often not promoted as a standard part of academic offerings during college fairs or other recruitment practices. Targeted recruitment might focus on working to attract students from strong science programs, STEM programs or who have been involved in one or more science fairs or science bowls.



Address Gaps Created by Multidisciplinary/Multi-departmental Wetland Academic Programs

Many wetland academic programs rely on course offerings from multiple academic departments/programs. This leads to a number of challenges, including developing an academic calendar of offerings over a number of years to ensure students are able to get the full complement of courses necessary. Additionally, it is important for multi-disciplinary programs to be especially cognizant of engagement in cross-department hiring decisions to ensure wetland programs have a complement of faculty equipped to deliver the program. With this in mind, it is also important to assist students as they work among different departments to secure the necessary coursework and advocate on their behalf when conflicts or gaps occur.

Providing Additional Supports to Wetland Students

In addition to building a robust academic program, the national workgroup identified a number of other actions that can strengthen academic programs seeking to prepare emerging wetland professionals for wetland field and management positions.



Photo Courtesy: Stetson University

Scholarships and Student Assistantships

Many students can benefit from the ability to focus on their studies and professional development activities if they need to work only a limited portion of their time. Scholarships reduce this need, by providing funding to pay for some portion of the academic program costs. An example of a wetland scholarship can be found at the University of Maryland with their [Wetland Scholarship Award](#). For students seeking to learn more about the work of wetland faculty, conduct research and gain teaching experience, assistantships provide an avenue for gaining this experience. The ability to provide sustainable funding for scholarships, assistantships and endowed chairs all benefit from endowed funds. Working with institutional resource development staff may allow an institution to identify and secure a funder who is interested in wetlands and developing a dedicated fund .

Off-campus Internships/Work Experience with Mentoring

Whether or not student assistantships are available, work experience can be provided for students through connections with the professional wetland community to provide internships or other work experiences. Creating a partnership with state agencies, local planning offices, consulting firms, and nonprofits in the business of wetland work can provide students with hands-on experience that will translate into work-ready skills. Such skills include knowing how organizations function, work on wetland-focused, skill-building tasks, practice applying what they have learned in their coursework, and applying learning in real-world settings. Additionally, by “trying out” different jobs, students can begin to better understand the different roles they can play as wetland professionals and which they wish to pursue.

Connect Students with Entities that Can Provide Value-added Training

Students can benefit greatly from access to webinars, trainings and research conducted by academic wetland societies (e.g. Society of Wetland Scientists), Associations (e.g. The Association of State Wetland Managers) and other professional groups. Many of these programs offer discounts for student participants. Creation of a fund to help offset these costs would also bolster student participation.

Encourage Students to Present Research at Wetland Conferences

The ability to complete a research project, develop a working model to share and the abilities to present work in a public forum are all desirable skills for emerging wetland professionals (e.g. Society of Wetland Scientists Annual National Conference). Academic institutions should be aware of wetland conferences and other related workshops and encourage students to present their work at these events. The



experience is a good skill builder and enhances early-stage resumes. The provision of student registration, travel and lodging funds can also support this kind of student, including the possibility of funding (under certain circumstances) provided by non-academic sponsors.

Encourage Completion of Professional Certification Programs

Academic programs can help students better prepare for entry into the wetland workforce by encouraging students to earn specific certifications and licenses that are desirable professional credentials. Examples include those of Certified Delineator and the Society of Wetland Scientists' Professional Wetland Scientist Certification and Wetland Scientist-in-Training Program. These certifications signal to employers that students have studied and are competent in a range of critical wetland knowledge and skills.

Undergraduate/Graduate Wetland-related Clubs

An additional value-added offering for student can be the creation of undergraduate/graduate clubs that focus on wetland issues. By developing a cohort of similarly-interested students, they can support each other and develop activities and service opportunities that continue to strengthen their skill set (e.g. a wetland restoration club).

Recruiting Students to Wetland Programs in Higher Education

The work of recruiting students who may be interested in entering careers in wetlands requires special focus. ASWM's national project workgroup identified several recommendations for improving recruitment strategies. First, they recommend focusing on boosting the Internet presence and developing online marketing strategies using Internet-based tools and social media, as these are where most searches for academic programs are taking place.



Programs should integrate strong Internet-based search tools responsive to searches for such key word combinations as “wetlands and colleges”, “wetlands and undergraduate”, “wetland and courses”, and “wetland and program.”

Higher education institutions should develop wetland-focused messaging in recruitment materials and include wetlands-focused curriculum materials at college fairs. It is recommended that programs deliver messages about wetland careers at high school science fairs and specifically reach out to connect with high school STEM programs and undergraduate water programs (science, policy and law).



Preparing Students for Wetland Professions Checklist **A Planning Tool for Use by Academic Programs to** **Assess Current, Emerging and Potential Program Elements**

Introduction to the Tool:

The checklist identifies the key activities identified in ASWM's white paper, "Preparing Students for Wetland Professions: A White Paper to Assist Planning by Institutions of Higher Education". The checklist is designed to provide the opportunity to assess whether various approaches are in place, under development, for future consideration or not being considered. The checklist, consequently, can be used to identify areas to strengthen offerings that support emerging wetland professionals and stimulate dialogue with both academic leadership and potential partners.

Directions:

This tool is for use in reviewing your academic program course and resource offerings for emerging wetland professionals. Please check off one of the following boxes (in place, under development, in planning stage, for consideration, or not being considered at this time). This tool will allow institutions to look at the robustness of wetland-related offerings and determine additional elements to strengthen or develop. The last portion of the checklist provides planners with space to formulate next actions with space for determining a timeline for taking action and assigning responsible parties.

Offering/Support	Currently in Place	Under Development	For Short-term Consideration	For Long-term Consideration	Not Being Considered at this Time
Background Courses <ul style="list-style-type: none"> - Chemistry - Physical Science (incl. geology) - Environmental/ Natural Resource Policy and Law - Statistics 					
Core Courses <ul style="list-style-type: none"> - Botany (including wetland plant identification) - Soils (incl. focus on hydric soils) - Hydrology (incl. hydro-biological connections) - Ecology (range – see details in paper) 					
Science Specialty Courses Examples: <ul style="list-style-type: none"> - Limnology - Ornithology - Oceanography 					
Opportunities to Participate in External Training Programs					
Cross-Program work to Develop Complementary Course Offerings					
Cross-Program Participation in Relevant Faculty Hiring Processes					
Promotion of Wetland-specific Programs/ Offerings					
Academic Scholarships for Wetland Study/Research					
Graduate Assistantships for Wetland-specific Teaching/Research					

