

# Designing a Continuing Education Program for Pacific Northwest Restoration Practitioners

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## Table of Contents

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Introduction .....	1
Background .....	3
Methods .....	7
Results .....	11
Conclusions and Recommendations .....	21
Guidance from Educational Theory .....	23
Program Prospectus .....	25
Next Steps .....	41
References .....	43
Appendix A .....	47
Appendix B .....	49
Appendix C .....	51
Appendix D .....	55



## Introduction

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Over the last 10 years, restoration professionals in the greater Seattle area have expressed a need for increased professional restoration development opportunities to staff at the University of Washington Botanic Gardens (UWBG). Botanic gardens are well suited to support restoration education (Ewing and Reichard 2013), and restoration professionals have called on botanic gardens to increase their involvement in training practitioners (Hardwick et al 2011, UWBG staff). Staff at the UWBG requested my assistance in evaluating the needs of the regional restoration community in order to develop and offer an appropriate restoration continuing education program.



A riparian planting project in the Nookachamps watershed. *Skagit Land Trust*



## Background

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### Restoration Ecology: A Growing Field

The field of ecological restoration will only become more important as environmental degradation continues and climatic change stresses ecosystems. We know too much about the challenges our planet faces to wait any longer to apply scientific knowledge. Even as we continue to learn, ecology has matured to the point that it is time to adopt a prescriptive aspect (Mitsch and Jørgensen 2003). There has been increased policy support for restoration over time. Recent international examples of this support include the UN Climate Change policy proposals and biodiversity initiatives (Suding et al 2015). In 2001, restoration ecologists Hobbs and Harris noted that “if we are to persist on our planet, repair of Earth’s ecosystems and the services they provide will be an essential component of our survival strategy.” When *Science* produced a special issue focused on restoration ecology they made the observation that “our planet’s future may depend on the maturation of the young discipline of ecological restoration” (Roberts et al 2009). There is evidence that in some ecosystems, irreversible changes have already been made, further complicating restoration efforts and highlighting the need for fast, well-informed restoration actions (Norton 2009).

Ecological restoration has come a long way since it first emerged. Whole ecosystem experiments which set the base for understanding the capacity of ecosystems for self-design and self-organization, allowing scientists and land managers to begin to see how ecological restoration and ecological engineering might be implemented, were first carried out in the 1960’s by H.T. Odum (Mitsch et al 2004, Odum and Odum 2003). By the 1980’s, ecological restoration had been defined enough to be considered its own field. The Society for Ecological Restoration (SER) was founded in 1987. SER is a non-profit organization with a mission to “promote ecological restoration as a means of sustaining the diversity of life on Earth and reestablishing an ecologically healthy relationship between nature and culture” (SER 2016). SER is the principal membership organization of ecological restoration (Clewell and Aronson 2013).

Though it is necessary that ecological restoration mature quickly, it is incredibly challenging to do so in a responsible way. Ecosystems are complex systems which we do not fully understand and which are inherently unpredictable (Allen et al 2003). It is now obvious that the assumptions underlying many restoration projects are rooted in outdated ecological concepts (Hobbs and Harris 2001). One meta study evaluating restoration effectiveness in increasing biodiversity and ecosystem functioning found that while biodiversity and ecosystem functioning were increased relative to non-restored disturbed sites, they did not approach measurements from reference sites (Rey Benayas et al 2009). Examples such as this show that restoration practitioners must continue to learn from related fields and from our own efforts in order to achieve success.

Thus far, restoration ecology has primarily been developed on an ad-hoc basis, but it is vital that the field develop generally applicable restoration methodologies and processes to increase the success of projects at a variety of scales (Hobbs and Norton 2006). Restoration has been approached in many ways by practitioners. Murcia and Aronson compared several common approaches to restoration practitioners and scientists commonly use, using Aldo Leopold’s concept of ‘intelligent tinkering’. While they note that a rigorous scientific approach is preferred if adequate scientific information and resources are available, intelligent tinkering may be appropriate in some situations due to practical limitations. Even so, they note that as the restoration field matures, practitioners need to adopt more

scientific approaches in order to contribute to the field's body of knowledge (2014). Practitioners need clear guidance principles to ensure that restoration efforts are beneficial to the overall landscape (Suding et al 2015, Hobbs and Norton 2006) and a consistent conceptual basis to effectively set goals and measure success (Hobbes and Harris 2001). These goals need to be based on possible future conditions rather than past conditions, which may no longer be achievable (Jackson and Hobbs 2009). It is only possible to have this type of consistency within the field if practitioners continue learning and update their base of knowledge to match each other.

Continuing education opportunities are a vital component of a thriving professional community. Continuing to learn is especially important in ecological restoration, where scientific knowledge rapidly changes and practitioners need to follow newly established best practices in order to increase the success of their projects (Murcia and Aronson 2014, Norton 2009). In the Pacific Northwest, formal ecological restoration academic programs have only been available since the 1990's (see *History of Restoration Education in the Region*, pg. 5). Various authors have identified ways to improve undergraduate restoration education (Diemont et al 2010, Bakker et al 2009). Continuing education opportunities could meet some needs of the restoration field more efficiently than expanded formal education opportunities. They also provide a potential pathway into the field for individuals graduating from institutions without formal restoration programs.

Ecological restoration is not unique in needing greater opportunity for education. Several studies have found that there is inadequate recruitment into vital natural science fields. Ecological restoration developed concurrently with and is strongly related to ecological engineering (Clewel and Aronson 2013). Diemont et al conducted an international survey of the ecological engineering community to determine educational needs. Traditional engineering courses alone did not meet the needs of the community, which expressed a desire for a wider suite of natural and social science courses to complement engineering courses and provide graduates with an interdisciplinary outlook (2010). There has also been interest in developing professional certification for ecological engineers (Bergen et al 2001).

There is concern due to low recruitment in the geosciences (Cramer and Sciences 2015). A national survey recently found young professionals entering botanic fields from graduate programs to be lacking important professional skills. This may be partially due to the decline of more traditional organismal 'ology' courses (Sundberg et al 2011). Wetland scientists have also expressed a need for greater formal and alternative education opportunities and noted the importance of continuing education to keep up with new information (Wilcox et al 2008). Educational opportunities benefiting ecological restoration would also assist some of these related fields.

Botanic gardens are uniquely positioned to support ecological restoration work with their existing focus areas and resources. Hardwick et al discussed the potential for a mutually beneficial partnership, noting that "Many of the skills and resources already commonly provided by botanic gardens and arboreta to support plant conservation are also of fundamental importance to ecological restoration and the science on which restoration efforts are based" (2011). In particular, Hardwick et al call out the potential for botanic gardens to conduct restoration relevant trainings for both the public and practitioners, suggesting that "botanic gardens could facilitate the application of scientific principles and methods to improve restoration success incrementally as managers learn from experience and as new scientific findings emerge" (2011).

## History of Restoration Education in the Region

The University of Washington's School of Environmental and Forest Sciences (previously the College of Forest Resources) was established as one of the first natural resource programs in the country in 1907. The Center for Urban Horticulture, now part of UW Botanic Gardens, was opened in 1984 (UW 2016).

To his knowledge, Professor Kern Ewing offered UW's first truly restoration-focused course in 1993. That course was the precursor to Restoration of North American Ecosystems, a popular 400 level Environmental Science and Resource Management course currently offered at the Seattle UW campus (Ewing 2016). UW Professor Estella Leopold offered a botany restoration course titled Plant Communities – Restoration and Resilience from 1996-99. The University of Victoria's Restoration of Natural Systems Program was first offered in 1996. Consisting of several courses and developed by a group of faculty, it took a more generalist approach than many other programs and focused on integrating the social and scientific aspects of restoration (Biggs, 2016).

UW's Restoration Ecology Network (UW-REN) was started in 1999. This highly regarded program provides an opportunity for students at any of the three UW campuses (Seattle, Bothell and Tacoma) to earn an academic certificate in Restoration Ecology through participation in a year-long ecological restoration project. Students learn to apply their disciplinary knowledge to ecological restoration problems, work as a team to meet needs outlined by community groups, and get hands-on, real-world experience as they implement their projects (Gold et al 2006).

The University of Idaho, Evergreen State University and Oregon State University all currently offer at least one ecological restoration course. Additionally, each of these schools have ecological restoration certificates, degrees and/or labs focused on some aspect of ecological restoration.

The Pacific Northwest region has a wide variety of engaging and innovative restoration education programs, including trainings and workshops with a scope beyond traditional academic programs (see *Program Review* results, pg. 11). Even so, restoration professionals have expressed a desire for increased restoration-specific opportunities for some time. UWBG staff have notes from faculty discussing thoughts on creating a professional certificate program from 2002. In 2013, a group of local practitioners met with UWBG staff to begin planning a continuing education program. Though there was obviously enthusiasm for increased opportunities to learn, at that time the program did not have adequate funding or staff time to get off the ground. Many of the practitioners involved in the 2013 attempts to start a restoration certificate program served in an advisory function for the development of this proposal. *For a list of members of this advisory committee, please see Appendix E.*

## **University of Washington Botanic Gardens**

UWBG is part of the School of Environmental and Forest Sciences in the College of the Environment at the University of Washington. UWBG was officially established in 2005 in order to serve as an umbrella organization uniting the Washington Park Arboretum and the Center for Urban Horticulture, which houses the UW-REN program and manages the Union Bay Natural Area. The Union Bay Natural Area serves as an outdoor laboratory and wildlife area which students practice restoration within.

UWBG's mission is to sustain managed to natural ecosystems and the human spirit through plant research, display, and education. Their vision is that, "as an international hub for plant science, information, teaching, and stewardship, (UWBG) will promote an educated, inspired, and engaged society dedicated to sustainable ecosystem management" (UW 2016). UWBG offers a wide suite of educational opportunities, for all from preschoolers to undergraduate and graduate programs to professionals seeking certification credits, and administers several important research and conservation projects.

UWBG is already a prime example of a botanic garden engaging with important restoration topics. In the original Union Bay Natural Area Master Plan, Jones and Jones noted that some of the primary functions would be continuing education and practical demonstration/display facilities. Jones and Jones noted that at the time, no other city had such a university owned asset suitable for conducting environmental research (1974). Hardwick et al developed an extensive list of existing and potential services and expertise that botanic gardens could provide in order to support ecological restoration, including such varied items as seed collection and banking, plant identification, developing protocols for monitoring, GIS data and propagation. Staff, faculty and students at UWBG provide many of the possible services or fields of expertise identified by Hardwick et al to restoration professionals working on the ground, and in many ways UWBG already serves as an information hub for technical and design resources (2011).

## **Challenges**

There are several challenges associated with the creation of a continuing education program for restoration professionals which must be acknowledged up front in order to work towards creation of a successful continuing education program.

- Currently, funding has not been secured to offer educational opportunities. Thus, the program either needs to be financially self-supporting or program coordinators need to secure supporting funding.
- Many potential attendees work for non-profit organizations and have limited funding for educational opportunities.
- Current UWBG staff capacity to develop this program is limited.
- Due to UW policies, UWBG is unable to offer a formal certificate for completion of the program.
- There are other educational opportunities and market oversaturation is a possibility.

## Methods

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### Survey

In August 2015, I distributed a market survey to the regional restoration community. The survey was developed according to methods outlined by Dillman & Smyth (2009). It was based on input from UWBG staff, faculty and a group of restoration professionals serving as an advisory group. The survey was distributed via Typeform, an online survey creation and administration platform. As this project had limited funding, this survey was not intended to be a statistical survey. Rather, as a cross-sectional internet survey distributed primarily via email, the results provide a general view of the opinions of self-selecting professionals.

The survey was widely dispersed via multiple restoration related email subscription lists (including professional organizations related to restoration) as well as via personal requests to forward the survey to other restoration professionals. Professionals receiving emails containing a short project description, a request for participation and a survey link were encouraged to respond in two major ways. One, the emails noted that information gathered would be used to create programming which would directly support their professional work. Emails also appealed to professionals by noting that they were helping a graduate student conduct research (a position many of these professionals would sympathize with).

The participation request read as follows:

Hello,

I am a student in the Masters of Environmental Horticulture program at the University of Washington. I am helping University of Washington Botanic Gardens develop a restoration-focused continuing education program. Ideally, this program will be offered beginning in 2016.

If you are a restoration professional in the Pacific Northwest or could benefit from learning opportunities related to restoration, I would love to hear from you! Please take 5-10 minutes to complete a short survey that will provide guidance to ensure that the program meets your needs. (*link to survey*)

If you could pass this survey onto others involved in Pacific Northwest restoration, I would greatly appreciate it. If you have any questions regarding my project, please feel free to contact me at xxx@gmail.com.

Thank you so much for your time and thoughts!

Sincerely,

Regina Wandler

The survey contained a variety of questions intended to assist in understanding the needs of the regional restoration community and their interest in a variety of continuing education opportunities.

Survey questions consisted of the following;

- 1) Do you consider yourself an environmental restoration professional?
- 2) Is understanding environmental restoration a component of your profession?
- 3) Do you work and/or live within the greater Seattle area?
- 4) Do you work and/or live within the Pacific Northwest?
- 5) What is the highest level of formal education you have completed?
- 6) Do you supervise restoration staff?
- 7) What is your job title?

- 8) Which type of organization do you work at? (multiple choice)
- 9) Where do you work?
- 10) Which of the following ecosystems do you work within? (multiple choice)
- 11) How strong is the professional environmental restoration community in the greater Seattle area?
- 12) Would you like there to be a stronger community of environmental restoration professionals in the greater Seattle area?
- 13) Would you be interested in participating in any of the following activities if they were focused on topics relevant to restoration professionals?
- 14) Would you be interested in participating in workshops or classes in order to gain restoration professional certification?
- 15) What is your level of interest in learning about each of the following restoration-related topics? (followed by a list of 23 possible topics to rate on a scale as well as a write-in field)
- 16) Which factors limit your participation in professional learning opportunities?
- 17) Would you be interested in participating in webinars or online classes focused on restoration topics?
- 18) Which times might you be available to attend professional learning opportunities?
- 19) What would you expect to pay for a 4 hour long professional continuing education workshop on a topic of interest to you?
- 20) Would you like to receive limited updates on the status of the continuing education program?
- 21) May I contact you with additional questions or for clarification if needed?
- 22) What is your email? (optional)
- 23) What is your name? (optional)
- 24) Do you have any additional thoughts to share with me?

The potential topics included in question 15 were chosen from literature regarding restoration education as well as through input from community members at informal gatherings. Topics included: Project monitoring, adaptive management, communicating with the general public, GIS data management, GIS restoration applications, remote sensing applications, laws and regulations relevant to site and project planning, laws and regulations relevant to invasive species management, budgeting, project management, grant writing, community outreach, professional communication, soil science, scaling projects, interpreting monitoring results, restoration funding sources, project design, restoration professional resources, volunteer management, ecology, pests and disease, and plant identification.

Between August 2015 and January 2016, 158 individuals completed the survey. The survey was originally closed in September but was reopened in January to encourage a larger number of young, less experienced restoration professionals (primarily graduates of the Earthcorps program) to participate.

## **Program Review**

I compiled a list of education and certification programs in the greater Seattle area that offer courses which are explicitly restoration focused or courses potentially of interest to restoration professionals. 'Greater Seattle area' was generally defined as within a 2 hour drive of Seattle, though a few particularly strong restoration-focused programs from farther away in the Pacific Northwest were also included. I cast a wide net, based on personal knowledge of area programs, internet searches, suggestions from members of an advisory group of restoration professionals and from program leads I interviewed. The list includes information on a limited number of programs suggested by professionals and program leads which are no longer offered.

Information on each program was organized in a table and included the following information; program name, whether it was currently offered, the organizing entity, topics, program type, cost, structure, whether scholarships or support are available, and the program website. Though an important element for consideration, it was difficult to find a comparable way to measure the cost across different programs. It is important to note that there are likely additional programs which could have been included in this list. I found that it was surprisingly difficult to locate programs with potential to provide educational opportunities to restoration professionals. I depended heavily on recommendations from other restoration professionals.

I interviewed two educational program managers in order to learn about lessons learned from their program successes and failures. One manages the well-attended and highly recommended Coastal Training Program, administered by Washington State Department of Ecology. Another managed the final year of the Stream Restoration Certificate, a highly anticipated program that nonetheless failed after being offered for two years which was administered by University of Washington Professional and Continuing Education. They were very willing to share information and provide input on development of a new program.

## **Vital Partner and Target Audience Interviews**

The advisory committee and University of Washington faculty provided recommendations on groups that serve as vital partners in planning and implementing restoration projects. The complete list compiled from these sources included restoration crews (such as WCC or Earthcorps), landscape designers, horticulturists, landscapers and gardeners, urban and environmental planners, regulators with various government agencies, program/project managers and engineers. Due to time and funding constraints and difficulty in connecting with individuals able to participate, it was not feasible to carry out these target group interviews prior to developing the survey. Thus, these interviews were instead intended to provide information that would build upon findings from the survey and program review.

My interview structure was developed primarily via recommendations from Krueger and Casey's 2009 *Focus groups: A practical guide for applied research*. I adapted some of their strategies to use for individual as well as group interviews, including development of a questioning route below which I used to guide conversation (Appendix A).

I was able to interview representatives from two vital partner groups: landscape designers and/or horticulturists and environmental regulators associated with the Environmental Protection Agency. Individuals who participated in my landscape designer and/or horticulturist interviews represented a variety of different organization types and had experiences with private, non-profit and academic organizations. Some of them had worked with governmental organizations in more limited capacities. In order to engage with as many representatives from each group as possible, interviews were conducted in the most convenient way for the individual. Interviews occurred both in small groups and individually, and in person or as a conversation over the phone.

I was also able to interview representatives from two target restoration professional audiences, the Society for Ecological Restoration (SER) and Earthcorps. SER is an international ecological restoration membership organization with an active Pacific Northwest chapter (SER 2016). Earthcorps is a Seattle organization that "trains emerging environmental leaders" (Earthcorps 2016) by hosting Americorps volunteer opportunities for youth to serve on restoration crews in order to build leadership skills and ecological literacy. Again, in order to engage with as many representatives from each group as possible, interviews were conducted in the most convenient way for the individual. Interviews occurred both in small groups and individually, and in person or as a conversation over the phone.

## Results

### Survey

Tables summarizing all survey results may be reviewed in Appendix B.

#### ***Participant Demographics***

87% of participants considered themselves a restoration professional, and 97% of participants said that understanding restoration is a component of their profession. The remaining participants identified as retired volunteers, unemployed, or currently working in a different field of work. 76% of participants live and/or work within the greater Seattle area, and 97% live and/or work within the Pacific Northwest. Most participants had formal secondary education, having attained a Bachelor's degree or higher. 48% of participants supervise restoration staff (a number which goes up to 52% when considering only those who identified as restoration professionals, 51% of those with Master's degrees or higher, and 45% of those with education up to a Bachelor's degree). Participants worked in a wide variety of ecosystems, though alpine and grassland systems were the least selected.

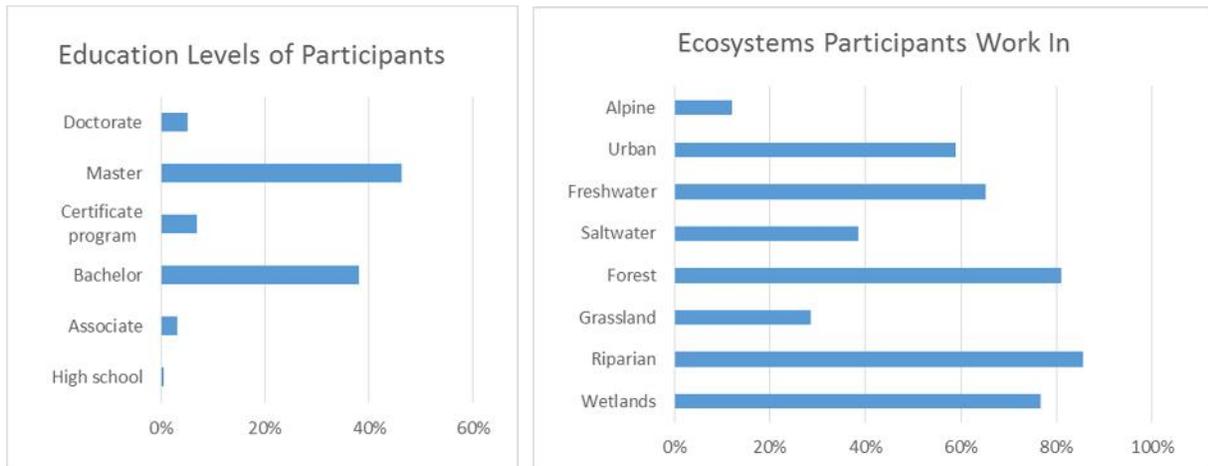


Figure 1 (left): Percentage of participants reporting their highest level of formal education.

Figure 2 (right): Percentage of participants working in different ecosystems. They were able to select more than one option.

The respondents were fairly uniform in their evaluation of the strength of the restoration community in Seattle, with an overall rating of 2.8 on a 0-4 scale. This number increased to 2.84 among those who identified as restoration professionals. Overall, 89% of respondents wanted a stronger restoration community. There was a notable difference depending on educational level - 83% of those with a Master's degree or higher wanted a stronger community and 96% of those with up to a Bachelor's degree wanted a stronger community.

#### ***Professional Certification***

Overall, 75% of participants were interested in participating in order to gain restoration professional certification. For those with a Master's degree or higher, this number was only 64%, while for those with education up to a Bachelor's degree it was 86%.

### Course Structure

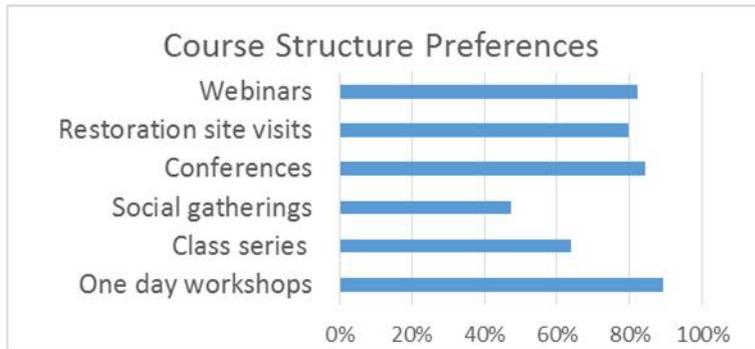


Figure 3: Program course structure preferences for all participants. Participants were able to select more than one option.

The majority – 89% - of participants were interested in one day workshops, with conferences and restoration site visits coming in close behind (84% and 80%). Class series were more of interest to those with educational levels of an Associates, Bachelor’s or Certificate – 68% - but less of interest to those with Master’s or PhD educational levels – 56%. Social gatherings were of lowest interest with only 47% interested overall, although they were of greater interest (51%) to those with educational levels below a Master’s or PhD. Participants with less formal education were more interested in all program structures.

### Course Timing

70% of participants were available to attend trainings during the work week. 53% of participants were available on evenings (defined as M-Th 5:30-9). Weekends were consistently worse options, with only about 30% of respondents available on either day. Participants with a Bachelor’s degree or lower education levels were more available than those with a Master’s degree or higher at all times except during work hours.

### Webinars or Online Classes

82% of participants were interested in participating in webinars or online classes. Interestingly, those with a Bachelor’s degree or lower education levels were less interested in webinars than those with more education (78% vs 86%). This may have been because they were also more likely to live in Seattle, relatively near in-person educational opportunities.

### Cost and Barriers

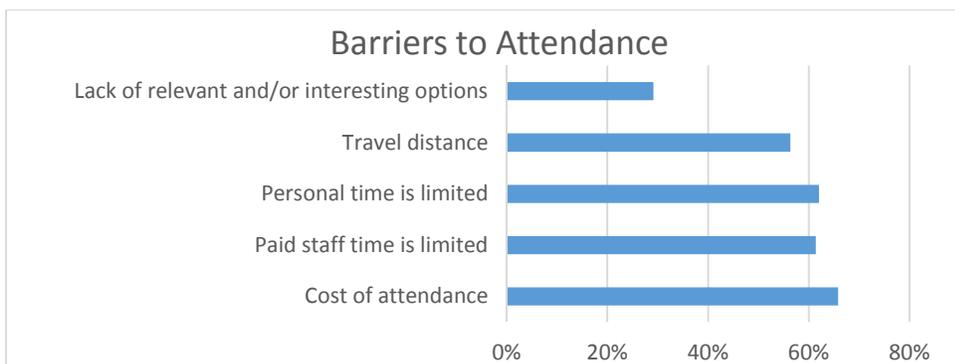


Figure 4: Participants barriers to attendance of educational opportunities. They were able to select more than one option.

Cost was the most significant barrier to attendance, noted by 66% of participants. Accessibility also plays a large limiting role for many participants, with 56-62% of participants noting time and distance barriers to attendance. For a 4 hour workshop, 53% of participants would expect to pay less than \$100, 34% would expect to pay \$100-200, and only 2 participants would expect to pay between \$300 and \$500.

### ***Topics of Interest***

Out of the 23 topics listed in the survey, participants were most interested in the following 10 topics (in descending order):

- Adaptive Management
- Project Management
- Project Design
- Restoration Professional Resources
- Ecology
- Project Monitoring
- GIS Restoration Applications
- Interpreting Monitoring Results
- Soil Science
- Communicating with the General Public

They were least interested in volunteer management. Participants also submitted the following potential additional potential course topics via the write-in field of question 15. Several topic ideas were submitted by more than one participant.

- Carbon sequestration, CO2 reduction
- Climate change
- Enhancement of other wildlife habitat on top of salmon restoration
- Ethics in purchasing and procurement, controlling conflict of interest
- Finding employment in restoration
- Funding for non-salmonid restoration
- Funding for restoration work that benefits underserved communities
- Garry oak prairie restoration, meadows
- Geomorphology, hydrology, flow modeling
- H – integration (coordinating salmonid habitat work with harvest and hatcheries)
- How to tailor a project to specific fish species
- In stream and riparian restoration methods and case studies
- Integration of environmental justice, ethics and sociology
- Local genetics
- Long term maintenance plans
- Marine nearshore ecology and processes
- Motivating unenthusiastic or skeptical stakeholders
- MTCA soil cleanups
- Native plant horticulture
- Negotiation and conflict resolution – multiple suggestions
- Novel ecologies
- Partnership and collaboration (one respondent said within Seattle)
- Permitting and regulatory oversight processes involved in restoration
- Public access considerations
- Recovery and natural disturbance ecology)
- Reviewing contractors
- Seedling recruitment
- Site control and title review for restoration on private property
- Social/economic drivers and obstacles
- Stewardship and best cultural practices (horticultural)
- Successes and failures, lessons learned – multiple suggestions
- Time management
- Translating science for the public
- Urban forestry and restoration
- Using technology in field applications – multiple suggestions
- Wetland restoration
- Working with decision makers

## **Programs Review**

More detailed information on identified educational and certification programs may be viewed in Appendix C.

### ***qEducational Programs***

There are a wide variety of educational opportunities related to various aspects of restoration in the Pacific Northwest. They can generally be grouped and described as formal academic programs, professional trainings and informal learning opportunities, though there is some overlap between these categories.

#### *Formal Academic Programs*

There are formal academic programs offering restoration degrees at educational institutions ranging from community colleges to research universities, including some certificate programs and technical programs. The majority of these programs are quite expensive and require a significant time commitment, as they are generally designed for full time students. Associates degrees available from community colleges are less expensive than other options in this category.

#### *Professional Trainings*

These trainings are available from many different organizations and includes certificates from universities that are designed for part time evening students and courses explicitly offered for professional certification credit. Certificate programs tend to have a longer time commitment and are expensive. Many existing professional certification credit granting courses are fairly expensive and may not be tailored to our region, though there are exceptions. There are currently no stand-alone certificates or locally focused, general ecological restoration-focused professional trainings consistently available within the Greater Seattle area.

#### *Informal Learning Opportunities*

This category includes volunteer trainings, extension events, enthusiast gatherings, and natural history or art courses. These tend to be more affordable than other educational opportunities, and are often intended for a non-expert audience (though there are exceptions).

I identified 36 educational programs overall, but Table 1 highlights the most relevant programs for this project. There are several ecological restoration professional certificates available throughout the region. However, there are limited opportunities for current professionals to take courses that cover core ecological restoration concepts or emerging concepts if they do not want to pursue a more in-depth certificate with a larger time commitment or specialize in one of the certificate topics. Occasionally, professional trainings relating to specialized aspects of ecological restoration are available through the Coastal Training Program, the NW Environmental Training Center or another organization. Other programs offer a wide variety of opportunities to learn and develop skills and knowledge in both formal academic settings and informal settings, but do not fit into the typical definition of professional continuing education.

Program	Topics	Type	Cost	Structure
Green Stormwater Infrastructure Design and Management Certificate, UW Professional and Continuing Education	Foundation in green stormwater, networking	Certificate	\$2,720	9 months of evening classes
Wetland Science and Management Certificate, UW Professional and Continuing Education	Foundation in wetland science, networking	Certificate	\$4,150	9 months of evening classes
River Restoration Professional Certificate, Portland State University Professional Certificate Programs	River restoration, collaborative processes and integration	Certificate	\$4000	Need 5 core courses offered over 1-4 days throughout PNW, also need 2 one-day elective courses
Wetland Mitigation, Construction, and Installation Certificate, Portland State University Professional Certificate Programs	Wetland mitigation, construction and installation	Certificate	\$1600	Courses offered over 1-4 days throughout PNW, need 2
Restoration of Natural Systems Certificate, University of Victoria	Ecological restoration	Certificate	\$5400	Possible to be primarily distance with two 5-day intensive field classes
Ecological Restoration Professional Specialization Certificate, University of Victoria	Ecological restoration	Certificate	\$3,125	Distance education
Coastal Training Program, Washington Department of Ecology	Primarily coastal restoration and mitigation, some wetland	Trainings	\$75-200 each course	Trainings vary in length, 1 to 3 days, some consecutive courses
Northwest Environmental Training Center	Environmental trainings on a wide variety of topics	Trainings	\$250-\$1000	Trainings vary in length, 1 to 3 days, in person and online

Table 1: The most relevant educational programs for Pacific Northwest region ecological restoration professionals.

### **Educational Program Interviews**

#### *McKay Caruthers, program manager of the UW Program for Continuing Education Stream Restoration Certificate*

Caruthers had taken over management of the Stream Restoration Certificate in the second and final year it was offered. The certificate consisted of three evening and weekend courses offered over nine months. In 2011-12, the program was full of roughly 20 qualified students with appropriate experience for the subject matter and had six passionate instructors. In 2012-13, the program was only 50% filled with 10 students, and was not offered again. Caruthers noted several reasons for the rapid decline of this highly anticipated program:

- Most participants in the 2<sup>nd</sup> year did not have the technical background necessary to excel at the course. The instructors had to cover prerequisite knowledge instead of the topics advertised, and those students who had been adequately prepared did not feel that they gained the skills they had enrolled in the program for.
- There had been 50% instructor turnover for the 2<sup>nd</sup> year (and program staff turnover – Caruthers had not set up the program originally). Remaining original instructors were unhappy with both the level of enrollment and student preparedness for the material.

Caruthers shared several ‘lessons learned’ from his experiences managing this program.

- The course targeted professionals in environmental engineering, hydrology, geomorphology, ecology and fisheries biology. The market for this course was fairly limited, and the first year exhausted the supply of qualified and interested students. Offering a certificate like this every year may be too often – it makes more sense to understand the cycles of demand for specific types of education. It may have made the most sense to offer this certificate on an alternating schedule with another ecology/restoration focused certificate, such as UW’s Wetland Science and Management certificate.
- A program with a nine month once a week commitment to meet in person in Seattle requires highly engaged and satisfied instructors and students. It must feel worthwhile for all involved in the process. Instructor participation is generally driven by a desire to give back to their community.

We did not talk about cost in the interview, but it is worth noting that UW Professional and Continuing Education programs (as do most certificates described in Table 1) generally cost several thousand dollars. They are affordable options compared to formal master degree granting programs, but are still a significant cost. Caruthers also manages UW’s successful Wetland Science and Management and GIS certificate programs. These programs have broader appeal and instructors who have remained engaged and satisfied with the program.

*Cathy Angell, program manager of the Coastal Training Program administered by the Washington State Department of Ecology*

Angell has managed the Coastal Training Program since it was started in Washington as part of a national initiative implemented by the National Estuarine Research Reserve System. This program was highly recommended by several restoration professionals I spoke with. It offers practical, science based professional training for those working on shoreline management throughout Washington. Many of the courses address regulatory questions. The program is based at the Padilla Bay Estuarine Reserve, but courses are held throughout the state. Angell is also currently enrolled in the Adult and Higher Education master program at Western Washington.

Angell noted several aspects of the program that contribute to its success.

- Every course is based on results from a needs assessment. This provides a base for success, and ensures that the courses are in demand because they help participants do their job better or meet certification requirements. Angell noted that the survey I was in the process of carrying out sounded like an appropriate needs assessment.

- Coastal Training Program classes are generally narrow in scope and deep in subject matter. Potential topics are often identified based on 'hot spots' – areas of frustration for many professionals. If you can appropriately identify these hot spots, your classes will fill.
- It has been important to determine the pool of participants for a particular topic to help determine the size of classes and the number of times a course might be offered.
- The full course catalog (available online) lists all courses that have been offered by the program. Classes are designed to be offered until demand wanes and class registration drops, and then are not scheduled again until they have been requested enough times to illustrate that demand is back up. Classes have been removed from the catalog when it is apparent that they are no longer necessary.
- Angell has a good record keeping system to track wait lists for courses, helping determine when a course should be offered again. She recommends keeping a database of restoration program attendees separate from other participant lists at UWBG to allow more targeted outreach and assessments.
- There are regular evaluations to ensure the program is meeting its goals.
- An engaged advisory committee serves as a think tank to help develop program assessments, evaluate data and come up with new course topics. They often also serve as instructors. They have been an invaluable resource. It is important to make sure their time is respected and that they can observe the difference they make in the program. Angell holds three meetings a year, provides them with lunch, and tries to make it well worth their time.
- Courses provide credits towards professional certification – she noted that she has connections with the American Planning Association and the Society of Wetland Ecologists. To support this, Angell provides each participant a certificate with the date, hours and course title at the end of the training.
- The only participant charges associated with the program are the costs of individual classes, which are kept low to encourage high attendance. Since this program is a national initiative, there has been some funding to set up a good structure from the start.

### ***Professional Certification***

I also gathered information on professional certification programs for fields that overlap with ecological restoration. My non-exhaustive list includes 12 programs. Some of these programs provide trainings relevant to ecological restoration locally, and some may be interested in offering certification credits for participation in ecological restoration focused courses. Information on these programs can also be viewed in Appendix C. SER is planning to offer Ecological Restoration Practitioners Certification beginning in fall of 2016, and will require professional development (such as participation in continuing education opportunities) for renewal of certification.

## **Vital Partner and Target Audience Interviews**

Citations for all interviews may be viewed in Appendix D.

### ***Landscape Designers and Horticulturists***

Individuals who participated in my two landscape designer and/or horticulturist interviews (one was with one, one was with two individuals) represented a variety of different organization types and had experiences with private, non-profit and academic organizations. Some of them had worked with governmental organizations in more limited capacities. This group was more familiar with and focused on concepts and scenarios from urban or suburban restoration than rural or wildland restoration. Members of this group expressed some strong and consistent messages, even in entirely separate interviews.

- Human safety should be a higher priority for restoration professionals. Restored or ‘natural’ areas are too often left alone, even when they need some management, which can create a safety risk for members of the public. Stewardship and maintenance staff need the skill set to identify potentially unsafe situations.
- Aesthetics are a more important part of landscape planning in areas with human use.
- In urban and suburban areas, restoration is an important piece of the landscape in select areas – for example, critical areas or bioswales – but will not be a consistent goal across the landscape.
- Restoration professionals need a better grasp of horticultural principles to more effectively implement projects.
- Restoration is not the highest priority for those in the private sector. Private sector practitioners are catering to the desires of landowners who will not necessarily support restoration as a site goal and who do not want to adequately fund maintenance. One successful way to combat this attitude may be by emphasizing savings over time if proper site preparation and maintenance are implemented.
- Entry level, practical training programs for horticulture and restoration have been reduced over time. Many existing programs have a greater emphasis on theory than practical application. Area programs that do focus on practical application, generally offered at institutions such as community colleges, have seen lower enrollment over time. Education is not held in high enough esteem in this field. As low cost programs vanish, it becomes even more difficult to ensure that practitioners know how to responsibly install and maintain landscapes.
- Horticulture is not widely acknowledged as a science or skilled field.
- Horticulturalists and partners (regulators and engineers were mentioned) need to learn more about topics such as hydrology, engineering, researching site history, plant biology, ecology and social sciences. You need interdisciplinary knowledge to solve many landscaping problems.
- Policy is an important tool, both to require that better projects be installed and to incentivize receiving education for horticulturists and landscapers.
- Certification has been invaluable for the horticulture field and would likely have immense benefit for restoration practitioners.

### ***Environmental Regulators***

I conducted two interviews with two environmental regulators working for the Environmental Protection Agency. They each have background in technical aspects of restoration, but currently

primarily support regional restoration efforts by providing technical support and reviewing projects applying for funding. Both conversations were relatively short individual interviews over the phone. They also expressed some strong and consistent messages. They noted that many restoration professionals they work with would benefit from developing stronger project development skills and suggested the following topics;

- Project design: Understand current site functions and articulate realistic and meaningful site goals.
- Project monitoring and evaluation: Identify ways to measure indicators of site ecological functioning and evaluate project success.
- Ecosystem Restoration 101: Understand the conceptual background of the science and theory of ecological restoration.
- Adaptive management: Understand how to develop and implement an adaptive management plan for a site.

Both interviewees emphasized the value of formal education and professional development, noting that opportunities to learn more about restoration can be difficult to find and are only offered irregularly. One interviewee noted the high value of getting out to restoration sites to evaluate them in person and see what did and did not work, seeing successful sites but also failures and lessons learned. The same interviewee noted the importance of understanding how to work as part of a team of specialists since restoration is complex and often requires more knowledge than one person can provide.

### ***Earthcorps***

I conducted one interview with two Earthcorps staff members in person at their office. They began by explaining the structure and mission of the Earthcorps program. Earthcorps members serve on a restoration crew and gain experience and technical skills by working together on restoration projects. Some crew members serve for two (or more) years, taking on more responsibility as time passes. The crews contain a mix of domestic Americorps and international members. Though they are known throughout the region for assisting with a wide variety of restoration projects, the larger goal of the Earthcorps program is to create leaders to help change the world. The staff note that members often choose to serve with Earthcorps because they have a strong desire to be part of an intentional community. Many organizations rely on conservation crews like Earthcorps (another regional crew service program is Washington Conservation Corps) to complete restoration projects at lower cost, and crew members often move on to professional restoration positions.

The staff noted that there is a need for opportunities for Earthcorps members to follow up on their experiences in the program. They have a wide array of in-service training opportunities on a variety of critical restoration implementation topics, including a project management series where they develop restoration plans, and members emerge with a broadly applicable skill set. Even with these opportunities to learn, members often emerge from the program unsure of where their path might lead. Members need more opportunities to learn at a level appropriate for an average restoration practitioner – for example, GIS and GPS courses that focus on field applications, basic data management and map creation. Many existing training options are too expensive and too broad to serve their needs. Staff members conduct regular evaluations of the program, giving them a fairly good idea of exiting member needs. Topics that would be of interest to Earthcorps members and staff include the following;

- Chemical control of invasive species: This includes understanding the proper use of chemicals, evaluating risk, general concerns and how to communicate with the public about chemical use.
- Climate change: How do practitioners begin to think through adapting restoration practices in consideration of climate change impacts?
- GIS and GPS technology: As noted above, technology trainings need to be affordable and scaled appropriately to the average work of restoration professionals.
- Community Relevance: Members are interested in gaining specific tools to help make environmental restoration relevant to all communities. This includes inclusive outreach and stakeholder identification to diversify restoration beneficiaries.
- Understanding the long term benefits and goals of restoration projects: This primarily relates to understanding and critically evaluating the scientific concepts ecological restoration is based upon.
- Field founding concepts and research of restoration: There are limited opportunities in the Earthcorps program for understanding the development of the field of restoration.
- Stormwater management: There are some trainings available, but not enough to gain the skills necessary to plan and implement projects.

### ***Society for Ecological Restoration (SER)***

I conducted two interviews with two SER members working to develop the Practitioner's certification program. Jen Lyndall provided me with the most extensive information and is currently on the certification committee. SER members have been working on some version of a certification program since the 90's. The current Executive Director of SER is very enthusiastic about certification and the possibility of offering continuing education opportunities to SER members. The SER certification committee is currently hoping to launch the program by fall of 2016, though there is always the possibility of unforeseen difficulties causing delay.

SER is hoping to offer recognition for two categories of restoration practitioners – Practitioners and Practitioners in training. Currently, the goal is that the program will have a continuing education component with a minimum credit requirement due each year to encourage practitioners stay up to date on new technology and important conversations within the field. Lyndall was happy to learn that UWBG requested this continuing education program proposal and is potentially interested in offering courses for the certificate program. After developing educational standards, SER would like to create collaborative agreements with groups like UWBG who could offer continuing education courses.

## Conclusions and Recommendations

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My results strongly indicate that there are gaps in desired regional educational opportunities for restoration professionals, which UWBG could help fill with an appropriate and affordable program. Practitioners across the Pacific Northwest were very interested in the survey and excited about the potential development of a continuing education program. I received over 100 responses in the first four days my survey was available, and many supportive comments from participants such as “thanks for taking the time to research this important topic.” Review of other programs supported this impression. Although other educational opportunities do exist, they do not meet all of the needs of the community.

Even as practitioners voice their desire to continue learning, it is important to remember that they are busy. Restoration practitioners often feel an ethical imperative to save the world (Roberts et al 2009), and juggle complicated projects, have limited staff capacity, and must be creative with very limited funding. To be successful, any new educational program needs to be affordable, accessible and provide relevant and useful information. Practitioners are more likely to make time and funding available if educational opportunities serve as one component of a meaningful professional structure (Angell 2015). Additionally, achieving positive outcomes as a result of continuing education will be dependent on well-designed curricula. It is important to follow field guidelines for curriculum in professional development (Matlock et al 2001). This recommendation is somewhat complicated since ecological restoration is still a relatively new field and professional guidelines are still in development.

SER has the potential to provide more comprehensive practitioner guidelines. SER is an international organization promoting “ecological restoration as a means of sustaining the diversity of life on Earth and re-establishing an ecologically healthy relationship between nature and culture” (SER 2016). SER has noted the need for more formalized recognition of restoration training and is addressing this need through development of a practitioners certification program (SER 2014), providing a way for practitioners to be recognized for their professional experience and relevant training. Hardwick et al note the value of an umbrella organization helping to implement and facilitate restoration information networks that botanic gardens could provide (2011), and it seems likely that SER could serve this function in the future.

No matter what role SER eventually adopts, it is worth noting that they are currently the preeminent restoration membership organization in the area, uniting practitioners with a wide array of specialties, backgrounds and experiences. This is particularly important since 89% of survey participants indicated that they desired a stronger community of restoration professionals in Seattle. A great deal of learning can occur in communities of practice, where professionals engage with others working in the field to learn from each other (Shacham et al 2009). There would be particularly high value in UWBG providing educational opportunities which enhance ecological restoration communities of practice by encouraging peer-to-peer transfer of knowledge (Furman and Sibthorp 2013).

## **Course Structure and Timing**

There are already organizations providing opportunities to attend large scale research focused restoration conferences in the Pacific Northwest (such as SER NW and the Northwest Scientific Association). The survey indicated that participants were less interested in attending educational opportunities requiring attendance at multiple sessions, and the program review showed that there are already several certificate programs offering courses over an academic quarter or semester. One day classes, field trips and symposia (1-2 day multi-speaker single topic events) appear to be the most appropriate niches for UWBG to fill.

The majority of survey participants indicated that weekday courses would be best for them. However, to engage the 30% of participants unable to participate in weekday courses, it would be worthwhile to occasionally offer evening courses. Fewer participants indicated that they would be able to attend weekend courses.

## **Course Topics**

The survey results illustrate the diverse interests and needs of the restoration community. One popular topic from the survey was Restoration Professional Resources. This made sense as it became apparent that it is challenging for restoration professionals to connect with appropriate educational opportunities. Some of the topics participants expressed interest in are already offered through other programs. Some topics would most effectively be addressed in formal academic courses, but could be addressed in a more limited way in professional trainings.

It seems possible to identify multiple 'hot spots' (as described by Angell 2016) that would draw sizeable audiences and improve the effectiveness of restoration throughout the region. There are several core ecological restoration topics that are unlikely to entirely lose an audience over time (for example, project design or communicating with the general public). Some topics may have more limited audiences or relevance over time. From conversations with other program managers, it is obvious that appropriately matching topics with course structure is a vital component of program success.

## Guidance from Educational Theory

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One of the most referenced books in education, Tyler's *Basic Principles of curriculum and instruction* "attempts to explain a rationale for viewing, analyzing and interpreting the curriculum and instructional program of an educational institution." I used the Tyler rationale (four questions focused on understanding and evaluating success of the educational purpose of an institution) to understand the information I gathered and help develop the program proposal which follows. Tyler emphasized understanding course objectives as changes in behavior relating to an area of life that could later be effectively evaluated.

Wiggins et al describe a curriculum development model based on Tyler's ideas – backward design – which I also relied upon. Backward design is a helpful method to work towards developing true understanding in students. Wiggins et al note that program designers must be mindful of their audience and guided by clear standards, in order to be thoughtful and specific about program purposes and implications. Curriculum should be derived from desired results, and concepts should be nested in a larger, more coherent framework (2005). One important aspect of this approach, complementary to Tyler's focus on evaluation, is that it allows for straightforward third party review of developed units.

Walter described five general philosophies of environmental education for adults – liberal, progressive, behaviorist, humanist and radical. Historically, botanic gardens have provided education in the 'liberal' school of thought, with the central idea that learning more about aspects of the natural world will result in better protection of the natural environment (Walter 2009). However, when training professionals already dedicated to protecting the natural world, it may be particularly useful to draw upon other philosophies – for example, 'progressive' concepts focused on broadening the site of education beyond the walls of a classroom. Keeping other motivations and approaches in the box of tools as this program is developed could more effectively enable cooperation and engage a wider audience.

The ultimate goal of an adult education and training program is 'Learning transfer', or use of the information and skills learned, ideally to improve professional outcomes. Experiential learning, an approach which emphasizes active learning, reflection and peer-to-peer interaction and is focused on constructing individual meaning, drawing upon prior experiences and concepts relating to social change, and is one particularly promising approach for professional transference (Furman and Sibthorp 2013). This approach emphasizes the importance of perceived value and relevance of course content to learners, and may combine strategies from several of the general philosophies described above. This approach would be especially effective in restoration, where practitioners often already learn experientially as they engage in intelligent tinkering and on the job learning as described by Murcia and Aronson (2014).



Program Prospectus  
University of Washington Botanic Gardens  
Restoration Continuing Education Program

Prepared for Jessica Farmer  
Adult Education Supervisor  
UWBG

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May 24<sup>th</sup>, 2016



## **Overarching Goal**

To increase effectiveness and success of ecological restoration projects throughout the Pacific Northwest.

## **Mechanism to Achieve Purpose**

Providing appropriate educational opportunities to restoration professionals and vital partners.

## **Program Structure**

This program should be overseen by a UWBG staff member. The staff member should be guided by the recommendations of a 4-6 member advisory committee composed of professionals working in the field of restoration (ideally including a representative involved with the Society for Ecological Restoration), a restoration faculty representative, and ideally 1-2 representatives from vital partner fields (such as regulators, planners or engineers). This advisory committee would assist with determining which rotating special topic courses should be offered, and whether there is adequate interest in new topics to develop courses. They may also assist with teaching courses. The staff member would be responsible for coordinating the advisory committee, applying their recommendations, scheduling courses and conducting course evaluations to determine whether the courses meet the needs of the restoration community and are adequately in demand. This administrative structure is based on the successful model utilized by the Coastal Training Program, administered by the Department of Ecology.

## **Time Commitment**

It will take a commitment of 10-20 hours a month of staff time to set up and manage the program for six months, including convening an advisory committee, determining initial topics, identifying instructors, advertising the classes and developing a method of program evaluation.

Once the program has been established, it will likely take 5-10 hours a month to manage advertising, enrollment, hold occasional meetings with the advisory committee, set a continuing schedule and conduct program evaluations.

## **Program Evaluation**

Metrics for program evaluation should be gathered before, during and after continuing education courses are offered. Metrics should attempt to measure success in reaching the overarching goal and participant satisfaction with courses. Overall program success should be evaluated annually and discussed by the advisory committee.

## **Role of Certification and Partnering With Other Organizations**

Due to UW policies, UWBG is unable to offer these courses as part of their own certificate program. However, providing some form of recognition of completion will be a vital component of program success. Many practitioners would like to be able to clearly illustrate their ecological restoration credentials to potential employers, partners or funders. Certification is especially important to practitioners with lower educational levels (86% vs 64% of those with a Master's or PhD). SER is currently developing a restoration practitioner's certification program. This program would provide a professional structure for restoration practitioners. Ensuring that these restoration courses qualify as certification credit for SER's certification would greatly increase the likelihood of UWBG's program's success and should reduce the associated staff workload. SER certification committee representatives noted that they hope to launch their much-anticipated certification program by Autumn 2016.

Prior to finalized SER certification, it would be ideal to work with SER NW to partner in offering courses and to offer a dated certificate of course completion for each training, with both UWBG and SERNW recognition of the value of the course. This will lend greater credibility to the courses and limit duplication of efforts. It would also be worthwhile to partner with the Washington State Nursery and Landscape Association (WSNLA) on explicitly horticultural focused class topics for the same reasons.

In order to meet the goal of engaging and educating vital restoration partners, UWBG should also plan on offering certification credits for those in professions who may be interested in course topics. Professional partners may include horticulturists, landscapers, landscape designers, planners, arborists, foresters, ecologists and wetland scientists. This list is not exhaustive, but includes professions with known certification programs.

- SER Practitioners Certification (coming)
- Certified Urban and Community Forester, Society of American Foresters (coming)
- Certified Arborist or Tree Climber, International Society of Arboriculture
- Certified Forester, Society of American Foresters
- Certified Ecological Designer Program, American Ecological Engineering Society
- Certified Ecologist, Ecological Society of America
- Certified Wetland Scientist, Society of Wetland Scientists
- Certified Landscape Architect, American Society of Landscape Architects
- ecoPRO, Washington State Nursery and Landscape Association and Washington Association of Landscape Professionals
- ProHort, University of Washington Botanic Gardens
- Pesticide Licensing, Washington Department of Agriculture
- Certified Floodplain Manager Program, Association of State Floodplain Managers

## **Course Types**

Three distinct course types were derived from data collected in a survey, discussion with select target audiences and interviews with administrators of other local educational programs.

### ***Classes***

One or half day courses focusing on supporting the core educational needs of the restoration community. These courses would primarily focus on establishing a common base of knowledge to help practitioners plan and implement successful projects. Many of these courses would be focused on understanding restoration project processes, while a few are focused on building vital technical skills and knowledge.

### ***Symposia***

Multi-day symposia with annually rotating topics provide the opportunity to cover more complex topics of great interest to the restoration community. These have the potential to engage a larger number of experts and vital partners.

### ***Field Trips***

Field trips may serve either as experiential restoration case studies or a restoration design charrette exercise. Attendees will learn about how restoration projects are planned, implemented and monitored by 1) visiting a site to observe results and ask questions of those involved in the project and learn about techniques they might utilize in their restoration, or 2) participating in a design process as a group.

Summary of Proposed Course Types

<b>Course Type</b>	<b>Classes</b>	<b>Symposia</b>	<b>Field Trips</b>
<i>Primary purpose</i>	Provide vital information on best practices within the restoration field in order to increase the success of ecological restoration projects.	Provide a thorough overview of a complex topic and create an environment encouraging in-depth discussion of complex restoration topics.	Opportunity for restoration practitioners to go into the field to observe how best practices and scientific findings have been applied, as well as how particular site conditions may lead to success or failure.
<i>Timing</i>	One or two courses offered quarterly in the Autumn, Winter and Spring. Not offered on a regular schedule – offered as adequate demand for each topic develops in the region.	One 2-day symposia offered each year.	Two field trips organized each year, primarily in the summer.
<i>Location</i>	At UWBG facilities, alternate locations across the state (as requested), and possibly online.	At UWBG facilities.	At locations across the state. At least one annually would occur within 2 hours of Seattle.
<i>Potential for partnership</i>	SER NW would be interested in partnering to offer some of these courses. This would lend more obvious professional value to these courses. It would be appropriate to partner with WSNLA for horticulture courses.	UWBG could choose to partner with appropriate organizations depending on the annual topic.	UWBG would need to build relationships with a wide variety of restoration practitioners and organizations in order to offer field trips.
<i>Potential for certification credits</i>	Since continuing education opportunities for those in restoration are limited, recognition by SER or SER NW of seminar completion would be particularly valuable for those without formal training. Classes could qualify for a wide variety of certification credits.	Depending on the topic, symposia could qualify for various certification credits. This should be evaluated for each topic.	Depending on the topic, field trips could qualify for various certification credits. This should be evaluated for each site.
<i>Level of UWBG support required</i>	These classes would require more time to develop curriculum and identify appropriate instructors up front, and then less staff time to continue offering them.	Since the symposia topic would change year-to-year, this would require more significant staff and advisory committee time.	Field trips would require less staff time than other course types. These would primarily involve connecting with restoration professionals.

## Proposed Classes

Classes would focus on providing restoration professionals with a tool set immediately applicable to their restoration projects. Each should be conducted by 1-2 competent and engaging instructors who have experience implementing restoration projects. They will all require some classroom time, but may also include field components. Each course will provide students with a handout with information on where to look for additional information on the topic.

These would be offered on an irregular basis, as demand in the region rises. UWBG could offer some of these as traveling courses which could be taught in other parts of the region. The majority of these courses should be offered M-Th, between 9 and 5. Occasionally, an in demand course might be offered in an evening or on a weekend day. Most of these courses are focused on general concepts rather than place-specific issues. Developing affordable, accessible webinar versions of the most popular of these courses would maximize the potential audience.

The following descriptions are suggestions for courses based on topics that the community and partners expressed interest in, and which are not currently offered by other organizations at a comparable level. The descriptions include course goals and provides a general outline of course content. Instructors should ensure that content supports the identified goals.



UW teaching assistant discussing methods of native plant propagation at the Center for Urban Horticulture.

## ***Full Day Classes***

### *Restoration Project Design*

- Class attendees will use a design process to plan and implement future restoration projects.
- Restoration projects will be more successful and cost less money over the long run.

Class attendees will learn about the restoration project design process in order to plan and implement more successful and cost effective ecological restoration projects. They will learn about the stages of restoration projects (including site evaluation, goal development, site preparation, installation, maintenance and monitoring) and leave able to identify important considerations for successfully planning their own projects.

### *Restoration Project Management*

- Class attendees will utilize project management tools as they plan and implement future restoration projects.
- Restoration projects will cost less money over the long run.

Class attendees will be introduced to restoration-relevant project management concepts in order to plan and implement more successful and cost effective ecological restoration projects. They will leave able to describe important considerations of project management, create a simple project schedule, and create a simple project budget, in addition to being able to identify the most important resources for restoration practitioners to refer to as they manage restoration projects.

### *Applying Ecological Concepts*

- Class attendees will apply general ecological concepts as they plan and implement future restoration projects.
- Restoration projects will be more successful.

Class attendees will learn about the most common restoration ecology theories and related techniques they might utilize in their restoration projects in order to increase the positive ecological impact of their restoration projects. They will learn about important ecological processes to consider when planning restoration projects. They will also receive an overview of basic ecological concepts and ways in which those concepts have been applied in several restoration projects (including both classic studies from the field and local examples).

### *Selecting, Installing and Caring for Plants*

- Class attendees will apply horticultural best practices as they plan, implement and maintain future restoration projects.
- Restoration projects will be more successful and cost less money over the long run.

Class attendees will gain a basic overview of horticultural considerations of restoration in order to increase the survival rate of their restoration project plantings. They will learn about selecting the right plant for the right place, finding appropriate sources for restoration plants, evaluating plant quality, installation techniques, and maintaining a planting after installation. It would be beneficial to offer this seminar in partnership with WSNLA.

### *Monitoring Projects*

- Class attendees will develop monitoring plans for their future restoration projects.
- Attendees will be able to determine whether restoration techniques were successful.

Class attendees will gain a basic overview of elements of a site monitoring plan and some monitoring tools they might use in order to evaluate the success of their restoration projects. They will learn about designing a monitoring plan that aligns to design goals, monitoring techniques and tools, and will be introduced to interpreting results.

### *Adaptive Management*

- Class attendees will apply adaptive management concepts to increase success of restored ecosystems as they plan and implement future restoration projects, with particular consideration of how to implement adaptive management plans.
- Restoration projects will be more successful.

Class attendees will be introduced to the adaptive management cycle in order to plan and implement more successful ecological restoration projects. They will become familiar with the adaptive management cycle and its purpose, look at how to incorporate adaptive management into restoration planning, and discuss how to move through the adaptive management cycle in real world scenarios. It would be beneficial to offer this seminar in partnership with staff from federal government agencies with extensive adaptive management expertise.

### *Soils in Restoration*

- Class attendees will apply soil management best practices as they plan and implement future restoration projects.
- Restoration projects will be more successful and cost less money over the long run.

Class attendees will be introduced to restoration-relevant soil science concepts in order to plan and implement more successful ecological restoration projects. They will learn about soil science considerations in restoration, including important soil characteristics, restoration challenges, best practices, and soil remediation methods. They will also work with NRCS soil survey information and consider how to incorporate soil information when designing a project.

### *Site Hydrology*

- Class attendees will utilize their knowledge of site hydrology as they plan and implement future restoration projects.
- Restoration projects will be more successful and cost less money over the long run.

Class attendees will be introduced to restoration-relevant surface-water hydrology concepts in order to plan and implement more successful ecological restoration projects. They will learn about evaluating site hydrology, identifying hydrological challenges associated with a project, hydrological best practices and methods to resolve hydrological problems. They will consider how to incorporate hydrological information when designing a project.

### *Building Resiliency*

- Class attendees will apply concepts to increase resiliency of restored ecosystems as they plan and implement future restoration projects, with particular consideration of likely impacts of climate change.
- Restoration projects will be more successful.

Class attendees will be introduced to restoration-relevant system resiliency concepts in order to plan and implement more successful ecological restoration projects. They will learn what ecological resiliency is, be introduced to examples of restored ecosystems designed to be resilient, and best management practices that might increase resiliency of restored ecosystems. They will also look at the most up to date climate change projections for the Pacific Northwest and consider how they could change restoration practices to adapt to likely future conditions.

## **Short Classes**

### *Using Technology for Restoration (GPS and apps, GIS)*

- Class attendees will utilize technology in the field as they plan, implement and monitor restoration projects.
- Restoration projects will be more successful and cost less money over the long run.

Class attendees will be introduced to a variety of technological tools they might use in order to plan and implement more successful ecological restoration projects. They will learn about GPS units, navigating and mapping apps, data collection apps, and data management considerations, and have the opportunity to try out a variety of tools in the field. They will consider how to incorporate new technology into restoration project planning, management and monitoring. *Instructors may choose to target this course to a particular tool and go into greater depth.*

### *Common Restoration Funding Sources*

- Class attendees will utilize a variety of common restoration project funding sources.
- More restoration projects will be funded through one or more sources identified in the class.

Class attendees will be introduced to a variety of common funding sources they might use in order to plan and implement more successful ecological restoration projects. They will learn about federal and state program opportunities and requirements as well as local programs, and meet some staff making funding decisions. They will consider how to identify the most appropriate source for their projects and how to more effectively leverage funding sources to accomplish restoration goals.

### *Talking About Your Project*

- Class attendees will utilize communication techniques to connect with both stakeholders and members of the public when talking about their projects.
- Restoration projects will be supported by a greater diversity of audiences.

Class attendees will be introduced to communication strategies they can use for connecting with diverse audiences. They will learn about the range of perspectives people may have on environmental work and restoration and the value systems leading to alternative views. They will consider communication strategies to leverage greater support for restoration projects.

### *Resources for Restoration*

- Class attendees will utilize available resources as they plan and implement future restoration projects.
- Class attendees will pursue opportunities for professional growth and learning discussed in the course.

Class attendees will be introduced to resources commonly utilized by Pacific Northwest restoration professionals in order to plan and implement more successful and cost effective ecological restoration projects. They will leave able to identify a wide variety of specific resources (including datasets, organizations, tools and additional learning opportunities) they are able to refer to.

## **Symposia**

UWBG already offers symposia which are relevant to many restoration professionals. These suggestions are for developing more advanced, explicitly restoration focused symposia.

Instructors and facilitators at symposia should assume attendees have more advanced knowledge. Symposia should focus on the topics which the community expresses greatest interest in to ensure adequate enrollment, and topics should be re-evaluated annually. The advisory committee should be heavily involved in determining the annual topic and developing the schedule. Each symposia should have 1-2 designated facilitators and 4-6 competent and engaging experts serving as instructors, most of whom will have experience implementing restoration projects. Symposia will most often take place within a classroom setting, though they may involve a field visit component.

All symposia should work towards one or more of the following results:

- Restoration projects will be more successful.
- Restoration projects should be more cost effective.
- Increased collaboration between restoration professionals and vital partners.

Symposia provide a positive opportunity to partner with organizations such as SER NW and WSNLA. Other organizations may be appropriate, depending on the topic, but have not yet been contacted.

Please note: The following topic suggestions are very general and content should be guided by the advisory committee.

## ***Suggested Symposia Topics***

### *Salmonids and Beyond*

Sessions exploring ways to explicitly tie restoration design objectives to specific salmonid ecology and habitat needs, and sessions on increasing site ecological functions and habitat for other species in salmonid-focused restoration projects. Potential to partner with Salmon Recovery Funding Board and representatives regional fisheries enhancement groups for some sessions.

### *Designing Experiments: Practical and Quantitative Considerations*

Sessions outlining important considerations in designing and implementing restoration experiments, with significant opportunities for attendees to work in small groups and receive support as they develop an experiment. Potential to partner with University of Washington professors and SER affiliated researchers.

### *Working Well With Others*

Sessions exploring ways to engage and communicate with stakeholders, communities influenced by restoration (particularly diverse communities), partners and regulators. This symposia would expand upon concepts and goals from the *Talking About Your Project* short class. Potential to partner with organizations representing a wide variety of stakeholder and community groups and

### *Special Topics on Ecology*

Two possible formats: A full 1-2 days going in-depth on a single ecology topic, or sessions on a wide variety of ecological topics of interest. Topics may include disturbance and recovery ecology, novel ecology, invasive ecology, or marine ecology. It would be best to offer this symposia on topic in a year when there is not a SER NW conference.

## Field Trips

Field trips have been successfully implemented in a variety of other regional educational programs. Washington State University (WSU) Extension Forestry holds several well attended field trips at locations scattered across the Puget Sound region to see management techniques and forest health problems in person, speak with the landowners and a forester, and visit with members of their community. Several chapters of the Washington Native Plant Society (WNPS) hold field trips throughout the year, providing opportunities for members and the general public to learn about plants in a wide variety of locations. Even advanced botanists and forest landowners participate in these fun, hands-on training opportunities.

One challenge for UWBG field trips that other regional programs do not necessarily have is that UWBG needs to generate revenue to cover associated costs. Other field trip opportunities are often free to participants. However, if the sites are interesting, participants gain quality information immediately applicable to their own restoration sites, and particularly if there is an opportunity to gain certification credit, the survey results indicate that a small cost would be acceptable to a majority of local professionals.

Field trips should be offered both close to and farther away from Seattle to engage a wider audience. Field trips would require less curriculum preparation as long as some staff involved in the project are able to speak about their techniques, challenges and successes as the group walks through a restoration site. 89% of survey respondents indicated that they would like there to be a stronger community of environmental restoration professionals in the greater Seattle area, and opportunities to meet and discuss challenges within the field with others in your profession can be a very effective way to build community.

85% of respondents work in riparian, 81% work in forests, 77% work in wetlands, 65% work in freshwater, and 59% work in urban areas. Field trips to these ecosystem types would be useful to the largest range of survey respondents. 42% of respondents work in agricultural, 39% work in saltwater, 28% work in grassland, and 12% work in alpine areas. These areas would be relevant to fewer respondents, but may be more appropriate in targeted regions. Field trips to these areas could be offered less often.

In some cases, field trips can provide an opportunity to connect attendees with recent research. If attendee's are able to read a relevant study prior to a field trip, they could discuss its potential for application while viewing a project. Most restoration professionals have limited opportunities to stay up to date on current research, which was noted in multiple articles and conversations. Directly connecting a field trip to research both expands the opportunity for worthwhile conversation while together and professionalizes the field. Integrating new research could increase the perceived value of a field trip. Field trips are also an ideal setting in which to develop native and invasive plant identification skills and observe environmental processes and ecological concepts in real-world situations.

Field trips would be dependent on identifying appropriate sites. The advisory committee would provide guidance and suggestions for destinations and likely partners.

## ***Field Trip Structures***

### *Experiential restoration case studies*

Attendees will learn about how a restoration project was planned, implemented and is being monitored by visiting a site to observe the results and ask questions of those involved in the project, learning about techniques they might utilize in their restoration projects in order to increase the positive ecological impact of their restoration projects.

### *Restoration design charrette*

Attendees will work together to go through a restoration design process for a particular site. They will conduct a site evaluation, develop project goals, and identify stakeholders and challenges. This would serve as an opportunity to refine their own design process. The hosting organization would gain a variety of ideas to incorporate into their own restoration planning. Participants will also have the opportunity to learn from others about techniques they might utilize in their restoration projects in order to increase the positive ecological impact of their restoration projects.



A current UWBG program offered at the Arboretum. *UWBG Staff*



## Next Steps

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### **Officially convene advisory committee of 4-6 members.**

- Potential advisory committee members (who have already participated and given input to program development) include: Rodney Pond, Alaine Sommargren, Anna Heckman, Rolf Gersonde, Kim Frappier and Rory Denovan.
- Rodney Pond and Rolf Gersonde are both SER NW board members. At least one advisory committee member should be a current SER NW board or committee member. Michael Hughes is SER NW's chair of the Program Committee and may be interested in being peripherally involved with the committee, though he lives in southern Oregon.
- It would be worth continuing to engage vital restoration partners by inviting members of those groups to serve on the committee. Promising contacts include: Kym Foley of EarthCorps (or a WCC staff member), Lisa Chang of the EPA, and Christina Pfeiffer, horticulture consultant and arborist.

### **Continue working with SER to ensure that UWBG will be in a position to offer certification credits.**

- Bethanie Walder, the Executive Director of SER, is very interested in developing continuing education opportunities for SER members.
- Mary Beth McCormack and Jen Lyndall are on the SER practitioner's certification committee. They are interested in working with UWBG to develop an MOU for UWBG to offer courses for the SER Practitioners Certificate.
  - Jen Lyndall: jen.lyndall@gmail.com
  - Mary Beth McCormack: mccormackmarybeth@gmail.com

### **Approach SER NW and WSNLA about officially partnering to offer appropriate material.**

- It would be appropriate to talk to Michael Hughes, Rolf Gersonde and Rodney Pond about partnering. SER NW may be able to provide instructors familiar with SER standards and recommendations, materials, and/or may be able to provide some funding enabling UWBG to offer classes and symposia at remote locations to connect with more members.
- WSNLA has indicated interest in this project throughout conversation with staff and financial support of my research into the topic.
  - Holly Osborne: holly@wsnla.org

### **Schedule the first year of continuing education seminars and field trips.**

- The advisory committee should work with the program manager to schedule this first year of opportunities.

### **Identify appropriate instructors for each course.**

- The advisory committee should work with the program manager to identify appropriate instructors.

**Develop evaluation tools and determine metrics for program success.**

- Proposed classes contain preliminary measureable goals that could be used as the base for program evaluation.

**Advertise continuing education opportunities widely.**

- 150 individuals signed up to receive updates about the continuing education program.
- SER NW would be willing to distribute information about program offerings to their membership.
- WSNLA has expressed support for restoration-focused educational opportunities and would likely be interested in distributing information about program offerings to their membership.
- It may be possible to connect with staff of the Washington Service Corps and distribute information to service member host sites.

**Consider the value of offering webinar versions of some classes.**

- Look into models of other program providers listed in the Programs Review spreadsheet.

## References

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- Allen, T. F. H., Giampietro, M., & Little, a. M. (2003). Distinguishing ecological engineering from environmental engineering. *Ecological Engineering*, 20(5), 389–407. doi:10.1016/j.ecoleng.2003.08.007
- Bakker, J. D. (2011). Supplementary Appendix S1 . Introductory Restoration Courses - Bakker & Howell Supplementary Appendix S1 . Introductory Restoration Courses - Bakker & Howell Page 2, 1–13.
- Bakker, J. D., & Howell, J. (2011). An assessment of introductory restoration courses in the United States and Canada. *Restoration Ecology*, 19(5), 572–577. doi:10.1111/j.1526-100X.2011.00799.x
- Bergen, S. D., Bolton, S. M., & Fridley, J. L. (2001). Design principles for ecological engineering. *Ecological Engineering*, 18(2), 201–210. doi:10.1016/S0925-8574(01)00078-7
- Biggs, L., University of Victoria (2016, April 18). History of RNS program [E-mail to the author].
- Clewell, A. F., & Aronson, J. (2013). *Ecological restoration: Principles, values, and structure of an emerging profession* (2nd ed.). Washington, D.C.: Island Press.
- Cramer, B. D., & Sciences, E. (2015). Who will build the 21st century? Addressing critical demographic gaps in the geosciences, (12), 36–37. doi:10.1130/GSATG243GW.1.8
- Diemont, S. a W., Lawrence, T. J., & Endreny, T. a. (2010). Envisioning ecological engineering education: An international survey of the educational and professional community. *Ecological Engineering*, 36(4), 570–578. doi:10.1016/j.ecoleng.2009.12.004
- Dillman, D., & Smyth, J. (2009). *Internet, mail, and mixed-mode surveys: The tailored design method*. (3rd ed.). Hoboken, N.J.: Wiley & Sons.
- EarthCorps: Home. (2016). Retrieved March 04, 2016, from <http://www.earthcorps.org/>
- Ewing, K. and Reichard, S. (2013). The University of Washington Botanic Garden and restoration ecology. *BG Journal*, 10(1).
- Furman, N., & Sibthorp, J. (2013). Leveraging Experiential Learning Techniques for Transfer. In *New Directions for Adult and Continuing Education* (pp. 17–26). doi:10.1002/ace
- Gold, W., Ewing, K., Banks, J., Groom, M., Hinckley, T., Secord, D., & Shebitz, D. (2006). Collaborative Ecological Restoration. *Science*, 312(5782), 1880–1881.
- Hardwick, K. A., Fiedler, P., Lee, L. C., Pavlik, B., Hobbs, R. J., Aronson, J., Hopper, S. D. (2011). The Role of Botanic Gardens in the Science and Practice of Ecological Restoration. *Conservation Biology*, 25(2), 265–275. doi:10.1111/j.1523-1739.2010.01632.x
- History of Restoration Education in the Greater Seattle Area [Personal interview]. (2016, March 25).

- Hobbs, R. J., & Harris, J. A. (2001). Restoration Ecology: Repairing the Earth's Ecosystems in the New Millennium. *Restoration Ecology*, 9(2), 239–246.
- Hobbs, R. J., & Norton, D. A. (2006). Towards a conceptual framework for restoration ecology. *Restoration Ecology*, 4(2), 93–110.
- Jackson, S. T., & Hobbs, R. J. (2009). Ecological restoration in the light of ecological history. *Science* (New York, N.Y.), 325(5940), 567–569. doi:10.1126/science.1172977
- Jones and Jones. (1976, October 27). Master Plan Union Bay Teaching/Research Arboretum [PDF]. Seattle: University of Washington Botanic Garden.
- Krueger, R., & Casey, M. (2009). *Focus groups: A practical guide for applied research* (4th ed.). Thousand Oaks, CA: Sage Publications.
- Matlock, M. D., Osborn, G. S., Hession, W. C., Kenimer, A. L., & Storm, D. E. (2001). Ecological engineering: A rationale for standardized curriculum and professional certification in the United States. *Ecological Engineering*, 17(4), 403–409. doi:10.1016/S0925-8574(00)00163-4
- Mitsch, W. J., & Day, J. W. (2004). Thinking big with whole-ecosystem studies and ecosystem restoration—a legacy of H.T. Odum. *Ecological Modelling*, 178(1-2), 133–155. doi:10.1016/j.ecolmodel.2003.12.038
- Mitsch, W. J., & Jørgensen, S. E. (2003). Ecological engineering: A field whose time has come. *Ecological Engineering*, 20(5), 363–377. doi:10.1016/j.ecoleng.2003.05.001
- Murcia, C., & Aronson, J. (2014). Intelligent Tinkering in Ecological Restoration. *Restoration Ecology*, 22(3), 279–283. doi:10.1111/rec.12100
- Norton, D. a. (2009). Species invasions and the limits to restoration: learning from the New Zealand experience. *Science* (New York, N.Y.), 325(5940), 569–571. doi:10.1126/science.1172978
- Odum, H. T., & Odum, B. (2003). Concepts and methods of ecological engineering. *Ecological Engineering*, 20(5), 339–361. doi:10.1016/j.ecoleng.2003.08.008
- Rey Benayas, J. M., Newton, A. C., Diaz, A., & Bullock, J. M. (2009). Enhancement of Biodiversity and Ecosystem Services by Ecological Restoration: A Meta-Analysis. *Science*, 325(August), 1121–1124.
- Roberts, L., Stone, R., & Sugden, A. (2009). The rise of restoration ecology. *Science* (New York, N.Y.), 325(5940), 555. doi:10.1126/science.325\_555
- SER (Society for Ecological Restoration). (2016). Retrieved March 04, 2016, from <http://ser.org/>
- SER. (2016). Society for Ecological Restoration. Retrieved April 12, 2016, from <http://www.ser.org/home>

- Shacham, M., & Od-Cohen, Y. (2009). Rethinking PhD learning incorporating communities of practice. *Innovations in Education and Teaching International*, 46(3), 279–292. doi:10.1080/14703290903069019
- Society for Ecological Restoration, SER Ad-hoc Certification Committee. (2014, March 24). Practitioners Certification Program [Press release].
- Suding, K., Higgs, E., Palmer, M., Callicott, J. B., Anderson, C. B., Baker, M., Schwartz, K. Z. S. (2015). Committing to ecological restoration. *Science*, 348(6235), 638–640. doi:10.1126/science.aaa4216
- Sundberg, M. D., DeAngelis, P., Havens, K., Zorn-Arnold, B., Kramer, A. T., Holsinger, K., Stritch, L. (2011). Perceptions of Strengths and Deficiencies: Disconnects between Graduate Students and Prospective Employers. *BioScience*, 61(2), 133–138. doi:10.1525/bio.2011.61.2.8
- Tyler, R. (1971). *Basic principles of curriculum and instruction*. Chicago: University of Chicago Press.
- University of Washington. (n.d.). School of Environmental and Forest Sciences. Retrieved April 18, 2016, from <http://www.cfr.washington.edu/>
- Walter, P. (2009). Philosophies of adult environmental education. *Adult Education Quarterly*, 60(1), 3–25.
- Wiggins, G. P., & McTighe, J. (2005). *Understanding by Design* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.
- Wilcox, D. a. (2008). Education and training of future wetland scientists and managers. *Wetlands*, 28(3), 578–584. doi:10.1672/06-144.1



## Appendix A

### Questioning Route Used for Interviews

Welcome and thank you for being willing to meet and participate in a focus group. As you know, I am a graduate student at the UW in the Environmental Horticulture program. For my masters project, I am working with UW Botanic Gardens to develop the framework for offering a Continuing Education program focused on restoration. I am looking for feedback to help ensure that the Continuing Education program meets the needs of various groups that are likely to utilize it. Most of you already participated in a survey I sent out this summer to gather information – thank you for your earlier feedback! I am interested in talking to you all because I would like to develop a greater understanding of the needs of the *landscaping and design community*. I have a series of questions I would like us to work through, and I'd like to set up some ground rules (just to make sure that I get the information I need!).

1. I will be recording our conversation so that I can refer back to it instead of taking extensive notes as we speak. Please speak clearly and in turn so that I can understand it when I play it back to myself.
2. If our discussion moves too far away from the question I posed, I will bring us back on topic – you might be anticipating questions that I will ask later on. Again, this is primarily to make sure we cover all areas and to ensure that I can find relevant information when I listen to the recording later on. If you are interested in talking more about something that comes up, please remember it and we should have a chance to return to it at the end.
3. Don't feel like you just need to talk to me – the best part of a focus group is that you can all speak with each other as well!
4. *We have 1 hour and 45 minutes in this room before we need to leave so that an artist can use it to set up for an exhibit. Because of this, I'll be conscious of time, and might have to move us along to make sure we make it through all of the questions. My apologies in advance if that forces us to move on prematurely from any topic!*
5. *There are sandwiches and beverages for our lunch in the middle of the table – help yourself! Feel free to eat as we start talking.*
6. I'll check in and see if we need a short break about an hour in.

Thank you all again for being willing to participate in this group! I really appreciate you taking the time to help me with this endeavor.

Let's start off by sharing our names, the town we live in and our favorite plant.

Ok, onto the next question! How would you define ecological restoration?

The Society for Ecological Restoration, an international not-for-profit organization with a goal of promoting ecological restoration, defines it as "the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."

Would you consider yourself a restoration professional?

Is restoration an important component of landscape design and horticulture?

Are there aspects of restoration project planning and implementation which you find frustrating?

What restoration-relevant topics would you personally be interested in learning more about?

What restoration-relevant topics do you wish your coworkers or colleagues in horticulture and landscape design would learn more about?

Do you think it would be worthwhile for horticulture and landscape design organizations to pay to send employees to occasional restoration continuing education courses?

What barriers might prevent you or others in your field from participating in interesting restoration learning opportunities?

Do you have any thoughts on how those barriers could be addressed?

We have made it through my list of questions. Before we adjourn – did anyone have thoughts or questions they would like to return to? We have (*check time*) minutes left to chat some more.

Appendix B

Restoration Professional Survey Results

This long table can be read from left to right, top of page down and onto the next page.

Participant Category	Do you consider yourself an environmental restoration professional? (% yes)	Is understanding environmental restoration a component of your profession? (% yes)	Do you work and/or live within the greater Seattle area? (% yes)	Do you work and/or live within the PNW? (% yes)	Do you supervise restoration staff? (% yes)	Which of the following ecosystems do you work within? (multiple choice)								
						Wetlands	Riparian	Grassland	Forest	Saltwater	Freshwater	Urban	Alpine	Agricultural
All	86.71%	96.84%	75.95%	96.84%	48.10%	76.58%	85.44%	28.48%	81.01%	38.61%	65.19%	58.86%	12.03%	42.41%
Masters +	83.95%	97.53%	69.14%	97.53%	50.62%	72.84%	87.65%	29.63%	79.01%	39.51%	70.37%	53.09%	12.35%	41.98%
Bachelors -	89.61%	96.10%	83.12%	96.10%	45.45%	77.92%	79.22%	25.97%	76.62%	37.66%	58.44%	61.04%	11.69%	42.86%
Restoration Professionals	100.00%	100.00%	76.64%	97.81%	51.82%	78.83%	90.51%	28.47%	82.48%	41.61%	69.34%	59.12%	13.87%	45.99%

How strong is the professional environmental restoration community in the greater Seattle area? (0-4 scale)	Would you like there to be a stronger community of environmental restoration professionals in the greater Seattle area? (% yes)	Would you be interested in participating in any of the following activities if they were focused on topics relevant to restoration professionals?					Would you be interested in participating in workshops or classes in order to gain restoration professional certification? (% yes)
		One day workshops (eg, a one day event)	Class series (eg, four weeks of Tuesday afternoons)	Social gatherings	Conferences	Restoration site visits	
2.80	89.24%	89.24%	63.92%	47.47%	84.18%	79.75%	74.68%
2.79	82.72%	88.89%	55.56%	38.27%	85.19%	77.78%	64.20%
2.80	96.10%	84.42%	67.53%	50.65%	77.92%	76.62%	85.71%
2.84	89.05%	90.51%	65.69%	47.45%	85.40%	79.56%	76.64%

What is your level of interest in learning about each of the following restoration-related topics? (0-4 scale)  
*If red - highest rating (above 3.00), orange (2.9-2.99), yellow (2.80-2.89), green (2.7-2.79)*

Project monitoring	Adaptive mgmt	Communicating with the general public	GIS data mgmt	GIS restoration applications	Remote sensing applications (eg, LiDAR, aerial imagery)	Laws and regulations relevant to site and project planning	Laws and regulations relevant to invasive species mgmt	Budgeting	Project mgmt
2.91	3.09	2.69	2.55	2.78	2.57	2.66	2.54	2.33	3.03
2.99	3.25	2.71	2.51	2.74	2.52	2.54	2.41	2.30	2.93
2.82	2.94	2.68	2.61	2.83	2.62	2.79	2.69	2.36	3.14
2.88	3.09	2.66	2.53	2.79	2.58	2.69	2.52	2.34	3.03

Continued

What is your level of interest in learning about each of the following restoration-related topics? (0-4 scale)

If **red** - highest rating (above 3.00), **orange** (2.9-2.99), **yellow** (2.80-2.89), **green** (2.7-2.79)

Grant writing	Community outreach	Professional communication	Soil science	Scaling projects	Interpreting monitoring results	Restoration funding sources	Project design	Restoration professional resources	Volunteer mgmt	Ecology	Pests and disease	Plant ID
2.37	2.61	2.35	2.69	2.48	2.78	2.77	2.96	2.97	2.12	2.95	2.37	2.55
2.44	2.60	2.46	2.58	2.51	2.86	2.80	2.85	2.90	2.12	2.85	2.27	2.54
2.30	2.62	2.25	2.82	2.45	2.69	2.73	3.06	3.05	2.12	3.05	2.47	2.57
2.34	2.58	2.31	2.70	2.50	2.71	2.74	2.96	2.99	2.01	2.93	2.32	2.48

Which factors limit your participation in professional learning opportunities?					Would you be interested in participating in webinars or online classes focused on restoration topics? (% yes)	Which times might you be available to attend professional learning opportunities?			
Cost of attendance	Time to attend as paid staff is limited	Time to attend on own time is limited	Travel distance	Lack of relevant and/or interesting opportunities		During the work week (M-F, 9-5)	Saturdays (9-5)	Evenings (M-Th, 5:30-9)	Sundays (9-5)
65.82%	61.39%	62.03%	56.33%	29.11%	82.28%	70.25%	31.65%	52.53%	28.48%
60.49%	61.73%	59.26%	58.02%	30.86%	86.42%	77.78%	25.93%	44.44%	19.75%
67.53%	58.44%	59.74%	50.65%	25.97%	77.92%	62.34%	33.77%	55.84%	32.47%
66.42%	64.23%	62.04%	56.93%	29.93%	81.02%	71.53%	32.85%	51.82%	29.20%

What would you expect to pay for a 4 hour long professional continuing education workshop on a topic of interest to you?		Would you like to receive limited updates on the status of the continuing education program? (% yes)	May I contact you with additional questions or for clarification if needed? (% yes)
<\$100	\$100-\$200		
52.53%	34.18%	74.05%	72.78%
56.79%	32.10%	70.37%	72.84%
48.05%	36.36%	77.92%	72.73%
52.55%	34.31%	76.64%	73.72%

Appendix C

Program Review

Program Name	Currently offered?	Organizing Entity	Topics	Type	Cost	Structure	Scholarships or Support Available?
<b>EDUCATIONAL OPPORTUNITIES</b>							
Stream Restoration Certificate	No	UW Professional and Continuing Education	Stream restoration	Certificate	N/A, likely several thousand dollars	9 month evening classes	No
Wetland Science and Management Certificate	Yes	UW Professional and Continuing Education	Foundation in wetland science, networking	Certificate	\$4,150	9 month evening classes	No
Green Stormwater Infrastructure Design and Management Certificate	Yes	UW Professional and Continuing Education	Foundation in green stormwater, networking	Certificate	\$2,720	9 month evening classes	No
Geographic Information Systems Certificate	Yes	UW Professional and Continuing Education	Foundation in GIS skills, networking	Certificate	\$4,745	9 month evening classes	No
Project Management Certificate	Yes	UW Professional and Continuing Education	Project management	Certificate	\$4,590	9 month evening classes	No
Plant Identification Workshops	Yes	Washington State Native Plant Society	Very specific plant ID skill development	Skill Workshops	\$350	2-3 day class	Yes, discounts for WPNPS members
Botany Washington	Yes	Washington State Native Plant Society	Plant ID focused field trip, community building	Development Trips	\$250	3-4 day trip	No
Plant ID Walks	Yes	Washington State Native Plant Society	Plant ID focused nature walks	Development Trips	Free	Generally less than 1 day	N/A
Master in Environmental	Yes	University of Washington	Horticulture, restoration	Master degree	\$5700/quarter	Generally 2 years	Yes
Certificate in Restoration Ecology	Yes	University of Washington	Ecological restoration	Certificate with Bachelors or Masters degree	*in larger cost	1-2 years within degree	Yes
Environmental Conservation AAS, ATA, BS, and	Yes	Skagit Valley Community College	Environmental science, GIS, Park Resource Management	Associates, Bachelors, Certificates	\$4800 at most	1 or more years, part to full time, some online, some in person	Yes
Natural Resources AA	Yes	Green River Community College	Forestry, park management, water quality, wildland fire	Associates	\$9000-\$20000	2 years within degree	Yes
River Restoration Professional Certificate	Yes	Portland State University Professional Programs	River restoration, collaborative processes and integration	Certificate	\$50-1200/course	Courses offered over 1-4 days throughout PNW, need 5	No
Adult Natural History and Art Classes	Yes	North Cascades Institute	Variety of natural history topics	Classes	\$75-510	Occasional 1-3 day classes, in Seattle or at NCI	Yes, for students and professionals
Wetland Mitigation, Construction, and Installation Certificate	Yes	Portland State University Professional Programs	Wetland mitigation, construction and installation	Certificate	\$1,600	Courses offered over 1-4 days throughout PNW, need 2	No

Program Name	Currently offered?	Organizing Entity	Topics	Type	Cost	Structure	Scholarships or Support Available?
<b>EDUCATIONAL OPPORTUNITIES</b>							
SER Design to Dirt Workshop Series	No	Society for Ecological Restoration NW	Urban restoration techniques	Workshops		6-1 day workshops, in Seattle at CUH	U/K
Project Management Certificate	Yes	Bellevue College	Project management	Classes and/or Certificate	\$4,000	Courses over 1-3 years	No
Municipal Risk Exposure Trainings	Yes	Washington Cities Insurance Authority	Project management, people management, public works	Risk management trainings	Unsure - free to members?	Wide variety of trainings offered on irregular schedule	Yes, discount for members
Restoration of Natural Systems Certificate	Yes	University of Victoria	Ecological restoration	Bachelors or Masters degree	\$5,400	distance with 2-5 day intensive field classes	Yes, for students
Ecological Restoration Professional Specialization Certificate	Yes	University of Victoria	Ecological restoration	Certificate	\$3,125	Distance education	No
Restoration Ecology Certificate	Yes	University of Idaho	Ecological restoration	Certificate with Masters degree	~ 1 quarter tuition	1 year within degree	Yes, for students
Master Gardener Program	Yes	Washington State University Extension	environmental stewardship	Volunteer Training	Volunteer hours	Online training, scheduled classes	N/A
Beachwatchers	No	Washington State University Extension	Marine stewardship and science	Volunteer Training	Volunteer hours	100 hours of training	N/A
Small Forest Landowner Coached	Yes	Washington State University Extension	Small landowner forestry and land management	Classes	\$200	8 evening classes over 8 weeks, culminating	No
Forest Stewardship University	Yes	Washington State University Extension	Small landowner forestry and land management	Classes	\$0	Available anytime online	N/A
Forest Owner Field Days	Yes	Washington State University Extension	Small landowner forestry and land management	Workshops	\$0	Several occur annually, 1 day event	No
Restoration Horticulture	Yes	Edmonds Community College	Environmental horticulture	Associates	\$8000 - \$19000	2 year traditional degree program	Yes, for students
Coastal Training Program	Yes	Washington Department of Ecology	Primarily coastal restoration and mitigation	Continuing	\$75-200	Trainings vary in length, 1 to 3 days, some consecutive	No
Environmental Workshops and Certifications	Yes	Northwest Environmental Training Center	Wide variety of environmental topics	Workshops and Professional Certifications	\$250-\$1000	Trainings vary in length, 1 to 3 days, in person and online	No
Bachelors in Ecological Restoration	Yes	British Columbia Institute of Technology	Ecological restoration	Bachelors	\$3500 tuition, not sure of how often	4 year traditional degree program	Yes, financial aid for students
Diploma in Fish, Wildlife and Recreation	Yes	British Columbia Institute of Technology	Resource management	Diploma	\$3500 tuition, not sure of how often	2 year traditional degree program	Yes, financial aid for students
Forest and Natural Areas Management	Yes	British Columbia Institute of Technology	Resource management	Diploma	\$3500 tuition, not sure of how often	2 year traditional degree program	Yes, financial aid for students
American Public Works Association trainings	Yes	American Public Works Association (WA Chapter)	Project management	CEU credits		Online training, scheduled classes	No

Program Name	Currently offered?	Organizing Entity	Topics	Type	Cost	Structure	Scholarships or Support Available?
<b>PROFESSIONAL CERTIFICATIONS</b>							
SER Practitioners Certification	Goal: 2016	Society for Ecological Restoration	Ecological restoration	Professional Certification	TBD, likely application and renewal costs + course fees	Formal education and/or professional experience, references, and continuing education, original research or teaching	TBD, likely discount for members
Certified Arborist or Tree Climber	Yes	Pacific Northwest Chapter International Society of Arboriculture	Forestry	Professional Certification	\$575 plus course fees of \$75-750	Test and continuing education courses	Yes, discount for members
Certified Ecological Designer Program	Yes	American Ecological Engineering Society	Ecological design	Professional Certification	\$200-250 annually, + cost of design charette and CE courses	Formal education generally required, participation in design charette, continuing education	Yes, discount for members
Certified Ecologist	Yes	Ecological Society of America	Ecology	Professional Certification	Widely varies, requires Bachelors	Formal education (Bachelors, Masters, PhD), professional experience, references	No
Certified Floodplain Manager Program	Yes	Association of State Floodplain Managers	Floodplain management related topics	Professional Certification	Widely varies	Webinars, conferences, in-person trainings	Yes, discount for members
Certified Forester	Yes	Society of American Foresters	Forestry	Professional Certification	\$335 plus course fees	Test and continuing education courses	Yes, discount for members
Certified Urban and Community Forester	Goal: 2016	Society of American Foresters	Forestry	Professional Certification	TBD, likely \$335 plus course fees	TBD, likely test and continuing education	TBD
Certified Wetland Scientist	Yes	Society of Wetland Scientists	Wetland science	Professional Certification	Widely varies, requires Bachelors	Formal education (Bachelors), professional experience	Yes, discount for members
ecoPRO	Yes	Washington State Nursery and Landscape Association and Washington Association of Landscape Professionals	Horticulture and landscaping best practices	Professional Certification	Generally \$350 +	3 day training, independent study, 1 day exam, refresher courses	No
Certified Landscape Architect	Yes	American Society of Landscape Architects	Landscape architecture (some CE opportunities mesh ecological restoration)	Professional Certification	\$585, plus course fees and regular licensure fees	Professional licensing exam, CE requirements (vary by state)	Yes, discount CE options for members
ProHort	Yes	University of Washington Botanic Gardens	Horticulturists, arboriculture, pesticide application	Professional Certification, Classes	\$30-85/class	Courses vary in length and number of meeting times, irregular	Yes, for volunteers
Pesticide Licensing	Yes	Washington State Department of Agriculture	Pesticide application	Professional Certification	\$25 test fee + course fees	Courses vary in length and number of meeting times, irregular	Yes, free course options



## Appendix D

### Interviews

- Angell, C. (2015, November 16). Developing a Restoration Continuing Education Program: Program Review of Coastal Training Program [Personal interview].
- Caruthers, M. (2015, May 5). Developing a Restoration Continuing Education Program: Program Review of UW Stream Restoration Certificate [Personal interview].
- Chang, L. (2016, February 5). Developing a Restoration Continuing Education Program: Environmental Regulators (Environmental Protection Agency) [Phone interview].
- DeMaria, K., & Pfeiffer, C. (2015, December 4). Developing a Restoration Continuing Education Program: Landscape Designers and Horticulturists [Personal interview].
- Farmer, J., Gersonde, R., Heckman, A. Pond, R. & Sommargren, A. (2016, January 7). Developing a Restoration Continuing Education Program: Advisory Committee [Personal interview].
- Foley, K., & Stampfer, R. (2016, January 15). Developing a Restoration Continuing Education Program: Earthcorps [Personal interview].
- Herzog, N. & Chung, R. (2015, March 17). Developing a Restoration Continuing Education Program: Educational Research [Personal interview].
- Lyndall, J. (2016, February 18). Developing a Restoration Continuing Education Program: SER Certification [Phone interview].
- Nelson, C. (2015, October 22). Developing a Restoration Continuing Education Program: SER Certification [Phone interview].
- Pasztor, Z. (2015, December 23). Developing a Restoration Continuing Education Program: Landscape Designers and Horticulturists [Personal interview].
- Pond, R. and social group (2015 April 10). Restoration Drinks Meetup at Forterra [Group interview].
- Thiesling, M. (2016, February 5). Developing a Restoration Continuing Education Program: Environmental Regulators (Environmental Protection Agency) [Phone interview].