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# More Than Just Pulling Weeds: A Case Study of Engaging Upper-Division Conservation Biology Students in Service-Learning

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**ABSTRACT.** The field of conservation biology focuses on maintaining biodiversity by mitigating both global and local threats. One of the top threats to biodiversity is the worldwide problem of invasive species. Each community has its own pests to control, and students can engage with this global issue on a local scale through well-designed service-learning courses. This article discusses how students engaged with conservation biology through an integrated service-learning project tackling invasive species at a local nature center. Products of the class, data from class artifacts, as well as student feedback on evaluations are also presented.

## Introduction

### *Conservation Biology and Service-Learning*

The mission-driven discipline of conservation biology draws from both the pure and applied sciences to address the goal of maintaining the planet's biodiversity (Soule & Wilcox 1980). The field is interdisciplinary and biological conservation must be practiced in the context of social, political, and economic landscapes (Hunter & Gibbs 2007), yet it has been

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argued for decades that training programs do not put enough focus on the human dimensions of environmental conservation (Cutler 1982; Jacobson & McDuff 1998; Stevenson & Peterson 2015). Incorporating service-learning in conservation biology classes increases student learning in the “soft skills” that will benefit them in their careers (Kilgo, Sheets, & Pascarella 2015; Stevenson & Peterson 2015). Conservation biology may be one of the most appropriate science courses in which to incorporate service-learning, as students can gain insight into how communities view conservation activities firsthand while they apply their scientific knowledge to solving real-world problems.

Despite this natural fit, Kirsten Work (2017) found that many courses in conservation biology are offered in the traditional lecture format, and those with laboratories often use computer simulations. This is likely because a one-semester course cannot adequately address real conservation issues on its own (Work 2017). Active participation in conservation projects with structured reflection and evaluation enhances student learning (Evely, et al. 2017), and working with a local community partner allows students to effectively address environmental problems as part of larger conservation efforts even within the short time frame of a single semester.

### *Course Design and Service-Learning Integration*

Service-learning is “a form of experiential education in which students engage in activities that address human and community needs together with structured opportunities designed to promote student learning and development. Reflection and reciprocity are key concepts of service-learning” (Jacoby 1996, 6). The pedagogy has the potential to prepare students to be active participants in their communities for years to come (Jacoby 2015). Studies examining the long-term impact of service-learning in environmental courses reveal that the pedagogy has lasting positive impacts on participants (MacFall 2012; Knackmuhs, Farmer, & Reynolds 2016).

The most effective service-learning courses do not just “add on” a project to a course. To provide students with a meaningful experience, our service-learning project was completely integrated within the fabric of a course. The first step we took was to examine course objectives and brainstorm potential themes that can be addressed through incorporating service-learning that align with course content. One of the objectives of this course was to “appraise the various threats to biodiversity.” There are a variety of threats to biodiversity ranging from global climate change to overharvesting. We decided to focus

on the impact of invasive species, as their impact is only second to habitat loss (Walker & Steffen 1997). Invasive species are non-native species that have been able to establish and wildly proliferate in the absence of natural controls.

A second course objective was to “explain the role of humans in species and ecosystem loss and conservation.” Invasive species have essentially all been caused by humans introducing species to new areas (Sakai, et al. 2001). Public education and engagement are key in preventing and removing invasive species. It is not something that scientists and conservation agencies can do on their own, thus any opportunity to engage more individuals on this issue is important. Not only it is much easier, through public outreach and civic participation, to prevent non-native species from taking over than it is to remove them once they have established, but also invasive species can only be controlled through continued local action (i.e., removal). Identifying and removing invasive species is an effective way for students to learn about a major concept threatening biodiversity while also making an impact on a local scale.

We reached out to possible community partners to identify needs that could be addressed and fit within the context of the course. Through this outreach, a local nature center was identified as a community partner. In order to promote the service-learning partnership, efforts were made to ensure it was “collaborative, mutually beneficial, and address(ed) community needs” (Billig 2011, 11). One of the needs that the nature center identified that fit within the course content was trail maintenance through the removal of invasive species. In addition to just removing the invasive plant species, the nature center requested a basic field guide that visitors could use while walking the trails to identify the non-native plants. While the students were completing the trail maintenance, they would investigate and evaluate the “Top Ten” invasive plant species at the nature center and then compile those into a field guide. Students were also given the opportunity to share this field guide and their findings via a lunch-and-learn presentation for community members and the staff at the center.

The IPARD/C (Investigation, Planning/Preparation, Action, Reflection, Demonstration/Celebration) process was followed to ensure a high-quality service-learning experience (Billig 2011). Through the first step in the process, Investigation, students collect data about a genuine community need (Billig 2011, 8). In this course, students examined the issue of invasive species through reading assignments and lectures. They also investigated the specific

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invasive plants at the nature center while they were in the field and, later, at home. During the Planning/Preparation phase, students decide exactly how they will address the community need (Billig 2011, 8). Students in this course planned their own schedules, prepared themselves by learning how to identify and remove the invasive plants, and decided how to document their findings. They also researched and wrote the content for a field guide and presentation. The Action component involves the actual service provided (Billig 2011), which for this course was the invasive plant removal from the trails. Students also created the printed field guide. Reflection should be ongoing and incorporated throughout the entire experience (Billig 2011). Each week, the class discussed various issues they experienced, the trail maintenance activity, and any problem solving they engaged in. They also discussed non-native plants regularly, and through reflection on their efforts they identified the “Top 10” invasive plant species at the nature center. At the conclusion of the course, the students’ final reflection focused on their articulating the knowledge and skills gained and documenting their experiences and products on their resumes. Finally, Demonstration/Celebration involves the display of the knowledge and recognition of a job well-done (Billig 2011). Students demonstrated their content knowledge on exams and by hosting a lunch-and-learn celebration with the community to present their field guide (see Figure 1).

Figure 1. The IPARD/C process



## Results

Seven of the eight students completed fifteen hours of invasive species removal on the trails, totaling 105 volunteer hours of trail maintenance at the local nature center. It was estimated that an additional five to ten hours each was spent gathering information for the field guide, taking photographs, practicing the presentation, and presenting at the lunch-and-learn. One of the students was unable to participate in trail maintenance due to medical issues, and an accommodation was made she could still partake in the service aspect, meet the learning objective, and benefit from the overall service-learning experience. After discussing some options with the student, it was decided that she would serve the community partner (still completing the required fifteen hours) via meeting with the university's professional designer to determine the layout of the field guide, coordinating the seven other students' textual submissions for the invasive species content, and then researching three of the other identified invasive species. In the end, every student had the opportunity to participate in and reap the benefits of this service-learning class, regardless of their physical abilities.

Through this service-learning course, the idea of invasive species became more than just something students read about in a textbook; they learned first-hand the difficulties and frustration experienced by conservation practitioners. They learned details about a number of invasive species of local concern through the creation of the field guide. Each student conducted research on the "Top 10" invasive plants for the guide, including the common and scientific names, basic facts about the plants, how to identify the species, and how to remove them. Many students also took photographs for the guide while they were in the field.

Students were engaged with the material, and they demonstrated proficiency on their exams when tested on the subject. On the second exam, students were asked four questions (two multiple choice, one short answer, and one optional bonus short answer) about content knowledge around invasive species. The multiple choice questions assessed if students understood the reasons how non-native species are introduced and general characteristics of invasive species. All eight students answered the two multiple choice questions correctly. The short answer question asked students to explain why ordinary citizens can make a huge impact regarding limiting the effects and distribution of invasive species. In answering this question, six of the eight

students focused on invasive plants only. Three of the eight students suggested connecting with garden centers to stop the sale of non-native and known invasive plants. Two students mentioned other advocacy through legislation. Seven of the eight brought up the need for public education on the topic. All students also answered the optional bonus reflection question concerning their experience to that point at the nature center. Many removed invasive Japanese stiltgrass (*Microstegium vimineum*), which was abundant. All of the students doing the trail maintenance reflected on how once they knew what they were looking for, they found it everywhere. One student wrote, “I removed mostly stiltgrass and although we removed an entire field, it still didn't make me feel like I did anything. Walk a few steps in any direction and there was still stiltgrass for as far as I could see. It helped me to digest the importance of early detection and it brings home the point that what we do has huge consequences and can't all be fixed like we hope it can. Depressing.”

## Benefits

The problems that conservation biologists face are global in nature, but working locally on small-scale projects can have big impacts. Students were able to apply their knowledge in the field to real-world problems. One student commented in her course evaluation, “This class definitely opened my eyes to different ways conservation should be practiced... It was a great learning experience and a great way to get involved in the community.” Additionally, it was clear to the students that invasive species are everywhere. One student commented in her reflection essay,

Often, we do not get to hear about or participate in the conservation efforts that occur close to home. For example, I have heard much more about the need to conserve the rainforest than I have the need to get rid of invasive plant species from Maryland. Typically, people tend to overlook the difference between invasive and native species when they are planting things in their gardens. If people were more conscious of the impact of their actions, they may be more inclined to choose the native plants over the invasive plants, which is something that I hope we accomplished in this project.

Another benefit students reported was the opportunity for career



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exploration. As a “career-focused liberal arts” institution, our academic programs are intended to prepare students for future employment. After participating in this service-learning course and completing the course evaluation, another student commented,

This course was incredibly helpful in my decision to pursue a career in conservation. The service-learning project at Irvine was also incredibly rewarding because we not only helped Irvine get rid of some of its invasive species, but we were able to educate the community on some of these species and how they can help get rid of these non-native species both at Irvine and in their home environments.

Since our students are especially driven by the practical nature of their degree, seeing the application of what they learn in the classroom is important to them. Research shows that college students who participate in service-learning have “demonstrated improved academic content knowledge, critical thinking skills, written and verbal communication, and leadership skills” (Cress, et al. 2010). These hands-on, authentic learning experiences provide the mechanism for students to also practice problem-solving and decision-making, which are desirable and transferrable skills that can be applied in future careers. Many of the same skills will prepare students for the job market as a conservation professional. Potential employers not only require disciplinary knowledge but also look for interpersonal and project management skills (Blickley, et al 2013; Stevenson & Peterson 2015). Integrating service-learning into a conservation biology class equips students with the tools and experiences needed to tackle and solve complex problems within conservation in the future.

This experience provided a mechanism for student learning, and it also provided information to community members about the issue. Subsequently, by creating the reusable field guide, students produced an artifact that will long outlive the course. The field guide was so well-received, the nature center asked us to print additional copies so they could sell them in their gift shop, which will result in additional monies for this non-profit organization. Since our work together, the nature center has also developed a service-learning curriculum for K-12 groups around invasive species at the nature center. The field guide we created for them is now provided to local teachers as a resource for them and their students. In addition, the university gained a solid partner for numerous future courses.

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