

Service Learning for the Port Jefferson History and Nature Center: Senior Capstone Forestry Course

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ABSTRACT

A community partnership between the Collins Academy, Jefferson, Texas, and the Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, Texas, developed a plan to manage the 38-acre Port Jefferson History and Nature Center, located on Big Cypress Bayou. Students used knowledge of the resources, GPS (global positioning systems), ArcGIS 10.4, presentations, and posters to complete the project. The reflection and feedback with the community partners continued throughout the project and as guidance for future work. This partnership instilled in participating students the value of incorporating service learning into development of professional relationships for continued cooperation in vegetation removal, construction of gardens for the monarch butterfly and the Neches River rose mallow, and trail modifications. The project received a service-learning award for engaged student learning.

Keywords: reflection, invasive species, human dimensions, collaborative learning, service learning

INTRODUCTION

The capstone forestry course in the Arthur Temple College of Forestry and Agriculture (ATCOFA) at Stephen F. Austin State University focused on development of a comprehensive management plan of a forested property based on the needs of a community partner. Service-learning was emphasized for development of the long-term relationship of both the community and the university as partners. For this project, faculty and students met with the Collins Academy in Jefferson, Texas, to develop a plan for the 38-acre Port Jefferson History and Nature Center (PJHNC), located on Big Cypress Bayou, characterized by overstory baldcypress trees (*Taxodium distichum*). The objectives were threefold: 1) to develop maps of invasive species for potential control efforts; 2) to document habitat and

restoration for the monarch butterfly, a species declining in numbers, and habitat restoration of the threatened Neches River rose mallow (NRRM); and 3) to develop a sustainable community partnership with both the Collins Academy and the city of Jefferson.

To develop the management plan, tenets of both community engagement and service learning were integrated into the planning of the project, the development of collaborative ideas for the Port Jefferson History and Nature Center, and the completion of the project. With the plan in place, the Collins Academy and ATCOFA continued implementation of the project after completion of the capstone course. Essential to this relationship was a review by the participants of the ATCOFA monograph for producing society-ready foresters and essential skills acquired for the forestry pro-

fession (Bullard, Coble, Coble, Darville, Rogers, & Stephens Williams, 2014), and the mission statement of the Collins Academy. This joint discussion centered on the six community partner goals of Tinkler, Tinkler, Hausman, & Straus (2014) to develop a successful service-learning experience. Students read and reflected on the value of service learning by participating in “an organized service activity that meets community needs” that included reflection on both the activity and course content to build a broader sense of civic responsibility (Bringle & Hatcher, 1995, 2002). By adapting the service-learning approach, students, faculty, and the community partners reinforced community agency professionals as co-advisors and connected the groups in meaningful service activities that meet community needs (Bringle & Hatcher, 2002). At the organizational meetings with Collins Academy and ATCOFA, the goals and objectives of both agencies were outlined and presented. The central theme of community voice incorporated the connection of the forestry activity expanding both educational and management objectives (Bringle & Hatcher, 2009). Although not as clearly defined, service is one of the core missions in higher education along with teaching and research (Soska, Sullivan-Cosetti, & Pasupuleti, 2010) and became an essential part of community engagement with planning the Port Jefferson History and Nature Center. By aligning educational objectives with the needs of the community partner, community service enhances the learning and education (Thomson, Smith-Tolken, Naidoo, & Bringle, 2011).

For initial development of the plan, students reviewed documents completed by the U. S. Fish and Wildlife Service on the restoration of the Cypress Bayou where the PJHNC is located. Collins Academy, in cooperation with the city of Jefferson, Texas, provides management for the PJHNC for environmental education. The Collins Academy was founded in Jefferson, Texas, to create educational and economic opportunities for the community.

The Collins Academy mission is to establish a state and national model demonstrating the importance of creating community-focused education and professional development opportunities that lead to economic revitalization and the sustainability of rural areas....The Port Jefferson History & Nature Center is a hands-on, outdoor learning center and environmental park promoting habitat restoration along the historic riverfront in Jefferson, Texas. Educational programs, activities and outreach projects demonstrating the importance of history and nature are available to visitors. Programs are developed and managed by the Collins Academy team. (Collins Academy, 2014)

Within the Arthur Temple College of Forestry and Agriculture, the overall goal is:

...to produce foresters who are ‘society ready’ i.e, capable of dealing effectively with the complex economic, ecological, and social issues involving forest resources today...our BSF graduates must be prepared to effectively enhance the integrity, stability, and health of the environment through sustainable management, conservation, and protection of forests and natural resources. (Bullard, Coble, Coble, Darville, Rogers, & Stephens Williams, 2014, p. 1)

Collaborative learning, problem solving, and written and oral communication skills are desired traits for solving environmental needs (Sample, Block, Ringgold, & Giltmier, 1999), and their education must be relevant, rigorous, and build relationships (Bullard, 2015).

In preparation of the plan, students reviewed six community partnership goals from Tinkler, Tinkler, Hausman, and Straus (2014) to consider as essential for a successful service-learning community-university partnership, including: 1) being

attentive to the community partner's mission and vision, 2) understanding the human dimension of the community partner's work, 3) being mindful of the community partner's resources, 4) accepting and sharing the responsibilities for inefficiencies, 5) considering the legacy of the partnership, and 6) regarding process as important. These six factors were presented and discussed as part of both service learning and reflection of the process. As the plan developed, dialogue continued with the Collins Academy to ensure the needs of the community partner and the ATCOFA campus-community service-learning experiences were successful with the outcomes of projects and impact on community relationships, and growth community a priority based on successful service-learning programs (Marullo & Edwards, 2000; Bringle & Hatcher, 2002; Boyle-Baise & Langford, 2004; Tinkler & Tinkler, 2013).

Students were introduced to effective reflection to increase communication and critical thinking participating in both ongoing reflection (data acquisition and in-field report writing) and summary reflection in their final reports. Students were presented the framework of Eyler and Giles (1999) for connection of experience and knowledge; continual reflection before, during, and after the service; applying subject matter to real life situations; and mentoring.

BACKGROUND LITERATURE

Service learning encompasses the most central part of the mission of higher education, teaching, and learning, and leads to civic involvement that improves other scholarly activities (Benson, Harkavy, & Puckett, 2000). Service learning integrates academic material, relevant service activities, and critical reflection between partners that engages faculty, staff, and the community partners to achieve academic and civic success (Bringle & Clayton, 2012). Service learning for campus-community partnerships needs a clear sense of identity and purpose, with procedures and resources ef-

fectively communicated to each partner to broaden the experience (Bringle & Hatcher, 2002; Hatcher, Bringle, & Muthiah, 2004). Newman, Bruyere, and Beh (2007) identified leadership characteristics and effects of experiential learning on natural resource leadership, including service learning in the context of natural resources that allows the students to develop the habit of building an emotional, intellectual, and ethical bond to a piece of land. By setting a vision for good leadership, students can practice adaptive management on an individual or group level, setting their priorities for collection of information to meet the community partner goals while completing course objectives.

METHODS

Directors from the Collins Academy and students and faculty at ATCOFA outlined several natural resource management considerations including location of the threatened Neches River rose mallow, *Hibiscus dasycalyx*. In addition, they mapped milkweed gardens and butterfly nectar sources for the monarch butterfly, *Daneus plexippus*, a migrating butterfly, along with location and assessment of bat boxes, and identification and location of cultural artifacts in the area. Three invasive species, Chinese tallow (*Triadica sebifera*), Chinese privet (*Ligustrum sinense*), and sacred bamboo (*Nandina domestica*), were located and mapped using GPS (global positioning systems). Students measured trees using a diameter tape at 4.5 feet, a clinometer for tree height, and a Garmin e-Trex30 to locate invasive species and notable trees with GPS global positioning systems. Data from the GPS were downloaded into ArcGIS 10.4 at ATCOFA for spatial analysis and development of an ArcScene digital fly through. Students prepared a timed Power-Point slideshow (30 slides at 20 seconds/slide for a total of 10 minutes), and queries on spatial data from ArcGIS 10.4. Each group developed a 40 by 40-inch poster about the project and presented a written plan to both Collins Academy and

ATCOFA. To meet the outlined goals, on-site visits were required of the students, faculty, and community partners at the PJHNC. As the course developed, students, faculty, and community partners met to discuss data collected and presentation of the results. For reflection and service learning, students documented the six tenets of Tinkler, Tinkler, Hausman, and Straus (2014) and Bringle, Clayton, and Bringle (2012). To develop the plan, students acquired imagery of the property as either Pictometry® or orthophoto quadrangles for use in both base maps in ArcGIS 10.4 and location of natural resources at the site.

RESULTS

Students mapped out colonies of the threatened Neches River rose mallow (*Hibiscus dasycalyx*) that grows in wetland areas exposed to sun. The plants are in the east planting area away from the core zone to decrease hybridizing with other *Hibiscus*. Seeds were collected and stratified in the Collins Academy laboratory and ATCOFA for future plantings. Continued cooperation included growing out plants at ATCOFA and returning them to Port Jefferson for planting. The NRRM was recently added for consideration as a threatened or endangered plant (Federal Register, 2011) with a high priority for listing (Federal Register, 2012) and a final ruling in 2013 (Federal Register, 2013). Reflection over the current status and direction occurred both at the Collins Academy and ATCOFA during final presentations.

Milkweed gardens planted for the monarch butterfly, a migrating butterfly with the caterpillars feeding exclusively on milkweed, were mapped and located using GPS and uploaded into ArcGIS 10.4. Milkweed plants will be raised at the Collins Academy and ATCOFA and planted in both the core area and in the east area. Milkweed pods are being collected for seed extraction and planting of milkweed. Students were introduced to Citizen Scientist programs

with the monarch butterfly that can be used to both evaluate the migration and participate in milkweed restoration. These activities fit with the education and outreach activities of the Collins Academy and the Piney Woods Native Plant Center at SFASU. The monarch butterfly populations are in decline due to degradation of the forest in the overwintering areas, loss of breeding habitat in the United States due to expansion of herbicide resistant crops requiring more treatments with the subsequent loss of milkweed host plants, and severe weather (Pleasants & Oberhauser, 2012). The migration phenomenon of the monarch butterfly has been designated as an endangered biological phenomenon (Brower & Malcolm, 1991; Brower, Taylor, Williams, Slayback, Zubieta, & Israel, 2012).

Invasive species are a primary concern within the PJNHC and the objectives are to revert the landscape back to native vegetation as part of the legacy, vision, and resources of the partnership. The three primary invasive species were mapped using GPS and entered into ArcGIS 10.4 for spatial reference and size of the area (Figure 1).

Chinese tallow is a non-native tree classified as invasive due to its proliferation and high seed yield. Chinese tallow tree is native to eastern Asia. It has a high risk potential into upland and wetland sites as an invasive plant due to its adaptability to a wide range of soils, and dispersal by birds, water, and people. Chinese tallow is prized for its unique color by the horticulture industry (Jubinsky & Anderson, 1996).

Sacred bamboo, native to Asia, has naturalized and invaded habitats by spreading underground root sprouts and animal-dispersed seeds. Sacred bamboo persists for several years before maturing, and displaces native species and plant communities. Once established, sacred bamboo is difficult to control due to its extensive root system (Texas Invasive Plant Council, 2004). Hand-pulling can be effective, but large plants are difficult to dig out because of tap roots.

For herbicide use, repeated applications may be necessary.

Chinese privet is a common shade-tolerant evergreen shrub invading southeastern United States riparian forests. Control by mechanical means (chainsaw) removal followed by herbicide application is the most effective. Second year applications of herbicides are needed to kill seedlings and stump sprouts (Hanula, Horn, & Taylor, 2009). Cultural artifacts and bat boxes were mapped using Garmin eTrex30 GPS units (Figure 2). Reflection on the project was incorporated into field discussions, both from the Collins Academy and ATCOFA.

Discussion

The six guidelines of Tinkler, Tinkler, Hausman, and Straus (2014) were followed to further develop the community partnership and to ensure communication between the partners was progressing. Reflection occurred on site at the PJHNC, at the Collins Academy in Jefferson, and at presentations at the ATCOFA of posters, and through a PowerPoint presentation and demonstrations of the ArcGIS 10.4 digital maps that were created for the community partnership. These six steps are presented below.

1. Be Attentive to the Community Partner's Mission and Vision

Collins Academy and ATCOFA presented their mission and vision of PJHNC to develop innovative, educational programs that focus on environmental conservation and historic preservation, and relayed both the opportunities and concern for the area. The shared vision and understanding allowed the project to move forward, essential to community partnerships (Hosman, 2014). Students produced effective reflective activities with both the Collins Academy directors and the ATCOFA faculty linking Hatcher and Bringle (1997) to course content and learning theory. This assisted in producing a clear description of

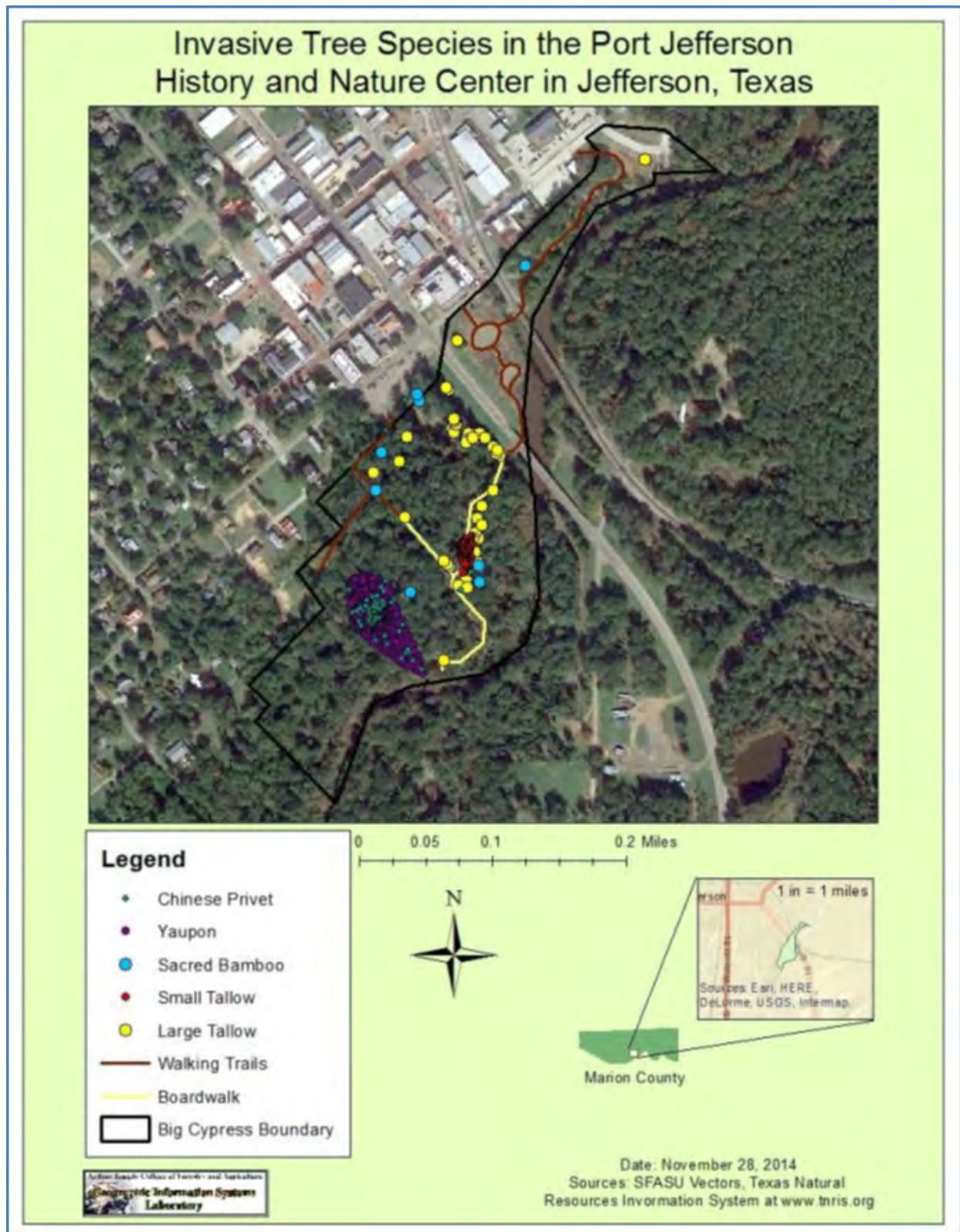
the expectations to assess the outcomes; reflecting on course expectations and content; interacting with the capstone course faculty team and the Collins Academy to develop the reflection; and providing the opportunity to explore and promote their values and solutions in the completed project.

2. Understand the Human Dimension of the Community Partner's Work

A raised bridge was a central aspect of the project (Figure 1) and served as a meeting point to view and discuss the project area with directors of the Collins Academy and faculty from ATCOFA. The students met with the growers of the milkweed for the monarch butterfly and the cultivation of the Neches River rose mallow for continuation of these species and promotion of conservation and preservation of this habitat. The continued discussion and reflection was integrated into their final reports and PowerPoint presentations. The importance of the human dimension factor was emphasized for both working with the property managers and the visitors to the site. Their digital stories reinforced the original goals of the project, necessary to reflection after service (Eyler, 2002). Students created an interactive ArcGIS 10.4 database that was presented to both the community and academic partners, and they developed queries of the database and presented this during their presentation, showing, for example, the distribution of the invasive Chinese tallow (Figure 1).

Students then returned to the site for further implementation of the service-learning project after completion of written and oral documents. This approach to service learning challenged the learners' perspective through identifiable instructor-partner-student learning outcomes (Tinkler & Tinkler, 2013; Tinkler, Tinkler, Gerstl-Pepin, & Mugisha, 2014). To reinforce the human dimensions aspects of the project, students met in small groups with the Collins Academy and ATCOFA faculty to dis-

Figure 1. Invasive Tree Species in the Port Jefferson History and Nature Center in Jefferson, Texas



cuss the importance of the proposed management actions to the expected park visitors and the City of Jefferson.

3. Be Mindful of the Community Partner's Resources

Collins Academy provided leadership in the location of the resource and guidance to the area to facilitate data acquisition. The Collins Academy directors interacted with the students at the PJHNC for initial location of invasive species (Figure 1), bat boxes, and culture resources of pilings in the Big Cypress Bayou (Figure 2). The use of ArcGIS 10.4, Pictometry®, and GPS by ATCOFA enhanced both the visual representation of the resource and the ability to demonstrate technology for measurements of natural resources, and validated the interactive hands-on instruction employed by the GIS faculty within ATCOFA (Unger, Kulhavy, Hung, & Zhang, 2015; Kulhavy, Unger, Hung, & Douglass, 2015). Knowledge areas from ATCOFA include invasive plants, insects, and diseases and their impact on forest diversity, productivity, health, and regeneration.

Importance and performance measures for forestry (Bullard, Coble, Coble, Darville, Rogers, & Stephens Williams, 2014) were reviewed, including understanding the ecological functioning of natural systems; restoring forest resources at the stand, forest, and landscape levels; understanding soil and water properties and processes; using geospatial technologies; managing forests for human use and enjoyment; acting with the interests of the larger community; and working well in teams. Forestry graduates need a strong foundation in technical forestry skills; however, “public scrutiny of forest management and the importance of broad social, economic, and ecological considerations in forestry decision making have greatly increased the need for competency in communication, ethics, collaborative problem solving, and managerial leadership” (Sample, Block, Ringgold, & Giltmier, 1999).

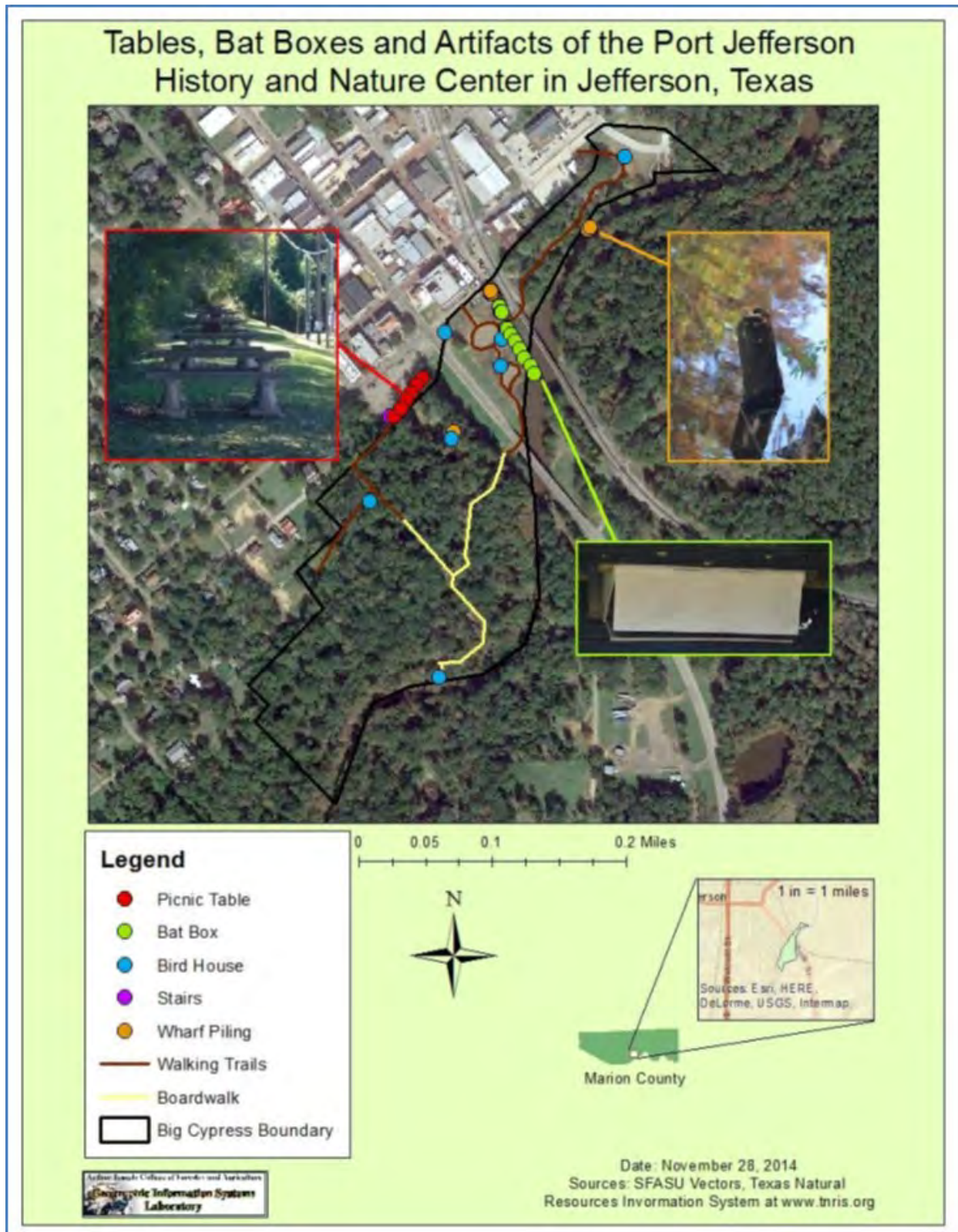
4. Accept and Share the Responsibilities for Inefficiencies

Inefficiencies in the project were not being able to download GPS data while in Jefferson, and not being able to review interactive GIS maps of the projects to discuss potential sites for planting sites and invasive species removal areas. Once ArcScene was developed as a digital flyover, students produced a digital movie for PJHNC. All GIS data were correctly collected and downloaded for each group, and interactive ArcGIS 10.4 files were created. Greenhouse space was available in Jefferson and plants were moved to the greenhouse prior to planting at the site. One of the inefficiencies was high water at the site and lack of raised bridge access for part of the project. Service learning for faculty, students, and partners takes additional time to develop a reciprocal relationship with reflection for students to process their experiences. Meeting with the faculty, students, and community partners developed the goals and relationships but required additional instruction from the community partners (Tinkler, Tinkler, Hausman, & Straus, 2014). In the field portion of the project, reflective time was taken to discuss the goals of the partnership. The service-learning activity was conducted using a problem-based learning approach with the community partners organized around a comprehensive community project (Eyler, 2002).

5. Consider the Legacy of the Partnership

The Collins Academy-ATCOFA partnership emphasized protection of the natural environment from invasive species in a wetland habitat for teaching future generations about ecosystem sustainability. As a result of the student actions, the project was continued to implement actions recommended in the capstone course. Immediate actions included increasing greenhouse space and seedlings for Neches River rose

Figure 2. Tables, Bat Boxes and Artifacts on the Port Jefferson History and Nature Center



mallow plants. Recommendations from ATCOFA were made for germination and growing of the plants to ensure increased survival. Additional actions included direction on growing milkweed to promote sustainability of the monarch butterfly, currently in a period of decline. The legacy of the community service-learning projects is to activate opportunities to create change for the students, faculty, and the community partner to promote critical thinking skills (Tinkler, Tinkler, Hausman, & Straus, 2014; Bringle, Clayton, & Bringle, 2015).

As the management plans students were only in Jefferson for one semester, it was important for them to understand the community of Jefferson and its commitment to the Port Jefferson park. The knowledge of the use of the Port Jefferson area for education enhanced the service-learning value, as students could identify with those brought to the site for environmental and natural resource education (Collins Academy, 2014). Public Participation GIS (PPGIS), considered GIS in practice (Sheppard, 1995; Brown, 2012), was used in the project to incorporate technical skills from students as stakeholders to foster social change from the project (Schlossberg & Shuford, 2005; Schlossberg & Wyss, 2007; Kulhavy & Unger, 2016). Shared vision of the community partner project included preparing resources to assist schools and teachers in the Jefferson area for use of Port Jefferson. The PJHNC project led to a second capstone project on an adjacent property to manage natural resources around a train route. Outcomes from the projects include increased performances on in-class material and student-directed learning. Goals included improving community natural resources for economic success of increased visitors and partnership interactions.

6. Regard Process as Important

Project objectives included locating invasive species with Garmin eTrex30 GPS units including Chinese tallow trees, Chi-

nese privet, sacred bamboo, Tree of Heaven, and Japanese climbing ferns. Following field data collection, students downloaded data into ArcGIS 10.4 software in the ATCOFA GIS Laboratory to create shapefiles and data points for the field measurements. Once the data files were created, students produced queries of the attribute table.

College students performing authentic service to the community are more likely to continue to participate in the community after graduation (Astin, Sax, & Avalos, 1999). When students share their conclusions with faculty and community partners, the conversations that ensue are often more compelling than typical student presentations. Incorporating the community into final reflective activities increases the engagement with the community. The final products produced a sense of professionalism in the students to do a better job (Eyler, 2002). Future use of these skills are enhanced by the ability to use problem-solving skills of ArcGIS 10.4, field measuring instruments and establishment of field plots for data collection and analysis, and construction and synthesis of data sets (Bransford & Nye, 1989; Eyler, 2002). Important in the process is the reality that both giving and receiving are required for completion of the work (Tinkler, Tinkler, Gerstl-Pepin, & Mugisha, 2014). Collins Academy received written reports, PowerPoint presentations, and a poster about each project. In return, Collins Academy supplied feedback to the students during all steps of the process, from reviewing the goals and mission of the Port Jefferson History and Nature Center, to field assistance instruction during the project, to review of the project at the conclusion of the capstone course.

Future Vision

The project is continuing with shared visions of habitat remediation, including annual installation of native hardwood trees, Neches River rose mallow,

milkweed, and other pollinator support species on public and private properties for monarch butterflies. Rose mallows and milkweed species will be reared in four production greenhouses at area schools supported by the Collins Academy. Additional activities include identifying and mapping significant trees with GPS in the PJHNC to create a fly through with ArcScene software. Visits are made from ATCOFA for planting spaces for both milkweed and the Neches River rose mallow. Management of invasive species included the use of the Extractigator[®] with the Big Foot attachment to remove privet, sacred bamboo, and Chinese tallow.

The attention to the six items for community partnerships proposed by Tinkler, Tinkler, Hausman, and Strouse (2014) added to the strategic conversation for the project. The ability of the students to present their shared vision of future plans for the PJHNC added to the authentic learning for the project. Continued relationships with both the Collins Academy and ATCOFA speak to the success of the project. Reflection throughout the process allowed time to discuss directions and, if necessary, choose alternative methods to complete the activities. The work outdoors reflected the mission of ATCOFA to produce “society ready” foresters and enhanced the viability of the capstone course working in concert with community partners. One student successfully executed a consulting agreement with Collins Academy for a special conservation project. The project received a service-learning award for innovation in implementation of the community partnership between the Collins Academy and the Arthur Temple College of Forestry and Agriculture.

Collins Academy has recently devoted additional resources to growing its relationship with ATCOFA by hiring two additional conservation experts and expanding relationships with public schools, entering into the first of two funding agreements

with U.S. Fish and Wildlife Service for public and private land remediation activities, and setting up production greenhouses at area schools. To continue the partnership, grants were submitted to enhance and expand both the educational mission and management of the monarch butterfly. In concert with the Collins Academy, ATCOFA students and Collins Academy personnel used an Unmanned Aerial System (UAS) DJI Phantom 4 to produce both a video of the central garden area, and a programmed flight to integrate with ArcGIS 10.4 in the Arthur Temple College of Forestry and Agriculture for future planning. This UAS flight produced resolution of 2 inches at 350 feet in altitude providing a visual reference for the future (Figure 3) using Drone2Map software in ArcGIS 10.4. This continued cooperation indicates the success of this cooperative program to promote natural resource management for the Port Jefferson History and Nature Center.

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Figure 3. Core Area of Port Jefferson History and Nature Center, UAS DJI Phantom 4 Image



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