Name	Thomas Smallwood
Date submitted	4/22/2019 FINAL PROJECT
UTCID	BSZ362
Your track	○ MPA: Local government management concentration ○ MPA: Nonprofit management concentration ◉ MPA: Generalist
Title of project #1	Hellbender Conservation Program
Organization name	Chattanooga Zoo
Organization URL	www.chattzoo.org
Is this a service-learning project?	◉ Yes ○ No
Is this project "real" or a simulation?	◉ Real ○ Simulation
Title of project #2 (if applicable)	
Organization name	
Organization URL	
Is this a service-learning project?	○ Yes ○ No
Is this project "real" or a simulation?	○ Real ○ Simulation
Title of project #3 (if applicable)	
Organization name	
Organization URL	
Is this a service-learning project?	○ Yes ○ No
Is this project "real" or a simulation?	○ Real ○ Simulation
Where is the research synthesis requirement met? (Please describe and provide a page number.)	The research synthesis is about Conservation Education Pages 24-31 of main paper

Before submitting, be sure to:

- merge this cover sheet, project paper(s), and meta-paper into a single PDF; and
- clearly indicate in the meta-paper where and how you have demonstrated proficiency in each of the 8 skill areas/crosscutting competencies, keeping in mind that at least one project must demonstrate proficiency in each of the skill areas (1-4) and that all projects must demonstrate proficiency, to the degree appropriate, in each of the crosscutting competencies (5-8).

Hellbender Conservation Program

Introduction

The following project is a comprehensive plan for the implementation of a conservation program for the local eastern hellbender species. Hellbenders are a salamander, and part of the amphibian taxonomy. The eastern variety of this species ranges from southern New York to northern Georgia. They can grow up to 12-29 inches as adults, which makes them the largest salamander in the United States. Their most unique characteristic is that they absorb 95% of their oxygen through their skin, making them very sensitive to the water quality they live in. As a result, they are excellent indicators of water quality. Because of how they absorb oxygen, they tend to thrive in fast flowing, well oxygenated, and non-polluted rivers and streams, the latter of which are becoming rarer every year. Within those streams, they like to live near large, flat rocks under which they can hide, and they feed mostly on crayfish, fish, and invertebrates.

The project was executed with the collaboration of the Chattanooga Zoo (www.chattzoo.org). The zoo is a nonprofit organization that relies on community engagement and support to grow. The Chattanooga Zoo is comprised of an executive committee of 9 people, a board of directors, and the staff. In total, the zoo counts approximately 100 employees. Its mission is as follows,

> *"The mission of the Chattanooga Zoo is to engage and inspire our community to better understand and preserve wildlife by creating meaningful connections between people and animals. With our intimate, innovative exhibits, wide-ranging educational offerings and commitment to conservation, our vision is*

to be a top destination for residents and visitors alike and the pride of our community."

The Chattanooga Zoo's accrediting body is the Association of Zoos and Aquariums (AZA, https://www.aza.org). The AZA helps raise the standards of animal care across the country and by doing so, they hope to develop the Zoos and Aquariums movement. Their mission is as follows,

"The Association of Zoos and Aquariums helps its members and the animals in their care thrive by providing services advancing animal welfare, public engagement and the conservation of wildlife."(https://www.aza.org/strategic-plan)

This project will include the main planning steps necessary to develop a sound program, the human resources and financial implications of implementing such a program, research supporting the various decisions taken during this process, and an evaluation tool in order to measure its effectiveness once it is implemented.

Program Planning

Mission

> *"The mission of the Chattanooga Zoo is to engage and inspire our community to better understand and preserve wildlife by creating meaningful connections between people and animals. With our intimate, innovative exhibits, wide-ranging educational offerings and commitment to conservation, our vision is to be a top destination for residents and visitors alike and the pride of our community." (chattzoo.org)*

The Chattanooga Zoo strives to follow this mission statement by working to maintain standards of excellence in zookeeping daily by thinking of the animals' wellbeing and comfort before anything else. Another meaningful way for the zoo to move towards its mission is by creating and participating in conservation programs. Most of the zoo's animals are part of conservation programs called Species Survival Plans (SSPs) that stem from the AZA. Some zoos also engage in *local* conservation programs that concern local species, and these initiatives are often very popular and effective in the surrounding population. This Hellbender Conservation Program is meant to be Chattanooga Zoo's local conservation program and attempts to get it started have been made throughout the years, without enough structure and resources to make them successful.

This program intends to fully embody the Chattanooga Zoo's mission by putting in the resources and time necessary to create a professional, successful, and sustainable program that will help the local populations of eastern hellbenders re-grow to self-sustainable numbers.

Needs Assessment

All kinds of amphibians including frogs, toads, salamanders, newts, and caecilians all over the country are suffering from loss of population due to habitat loss or degradation, and the rapidly spreading infectious disease chytridiomycosis. The International Union for Conservation of Nature (IUCN)'s *Red List of Threatened Species* (2018) has even estimated that nearly half of known amphibians' species are threatened with extinction, which puts them at a higher rate than birds and mammals. As a result, creating managed populations of amphibians could be the only conservation hope for many species that are faced with imminent extinction. The AZA and its accredited members are dedicated to fighting this decline and protecting amphibians. The Amphibian Taxonomy Advisory group (ATAG) and many Species Survival Plans (SSP) across the country have been participating in conservation efforts for these rapidly disappearing species. (AZA writers, 2016).

The eastern hellbender is one of these suffering amphibian species and is listed as endangered in Maryland, Ohio, Illinois and Indiana and is threatened in Alabama. Throughout the country, they are tagged as "decreasing" (IUCN, 2018). Their current situation has been the result of a strong decline over the last 40 years, and many scientists have been expressing the need to engage in conservation efforts for this species due to drastic loss of wild population. Declines in this population were being noticed since the 1980s, but it wasn't until 2005 in New York State that scientist noticed a 40% decrease of the number of adult hellbenders in the monitored sites (Lee, 2013).

In Tennessee, according to Dr Brian Miller (TSWAP, 2015), the eastern hellbender population suffered a 10-year crash between the early 1990s and the early 2000s, going from low density populations to nearly non-existent. There is a lack of precise information on the topic

which prevents experts from determining exactly when the decline started and how big it has been, but it is undeniable that a decline is happening. As a testimony of this, a study was conducted in the Susquehanna River drainage basin, and "All animals captured were estimated to be 25 years of age or greater, indicating an ageing population with little or no successful reproduction." (Department of Environmental Conservation, n.d.).

Some populations of hellbenders are healthier than average, like in Georgia or some Tennessee populations. Most of those are found on public land which usually presents more unaltered forests and streams which is directly correlated with water quality and hellbender health. Preserving healthy streams and their hellbender populations as well as studying them in order to try and reproduce them will be the main focuses of hellbender conservation efforts. Within these efforts, the Chattanooga Zoo is ideally placed since there is a "hellbender hotspot" in this area with healthier populations as near as the Hiwassee River. This opportunity is a great one to take advantage of in the fight for hellbender conservation.

Goal Statement

The Hellbender program intends to help increase the wild population of eastern hellbenders within the coming years to help the species get off the list of threatened species across the country.

Program Context & External Environment

This program is essentially an improvement plan for the existing situation. Currently, the Chattanooga Zoo is home to 12 adult hellbenders, kept in water tanks in backrooms of the zoo. Breeding attempts have been unsuccessful, and the space allocated to the animal is not sufficient

for keepers to conduct research that is thorough enough to allow improvement in the methods used to breed this species. Therefore, an expansion is needed and will take the form of a research facility that would include:

- Ample zookeeper research and work area;
- Spacious area for youth programming to be conducted with student participation in the Hellbender research program;
- A man-made stream for Hellbender breeding purposes;
- A space for all zoo visitors to view, observe, and learn about hellbenders.

The need for this building is also the source of many challenges to the development of this program, most of them financial. Within the Zoo, there are very little slack resources to work with. The staff have a space in mind in which to place the new building dedicated to the hellbenders, but that is mostly it.

The financial resources that the zoo has accumulated in the last years through sales, fundraising, and other means were mostly intended to go towards what they call their "African Expansion", which includes bringing giraffes to the zoo. The ground was recently broken for the construction of the giraffe building, so that is their major focus at the moment. What this means for the hellbender program is that it needs to be initially funded by grants.

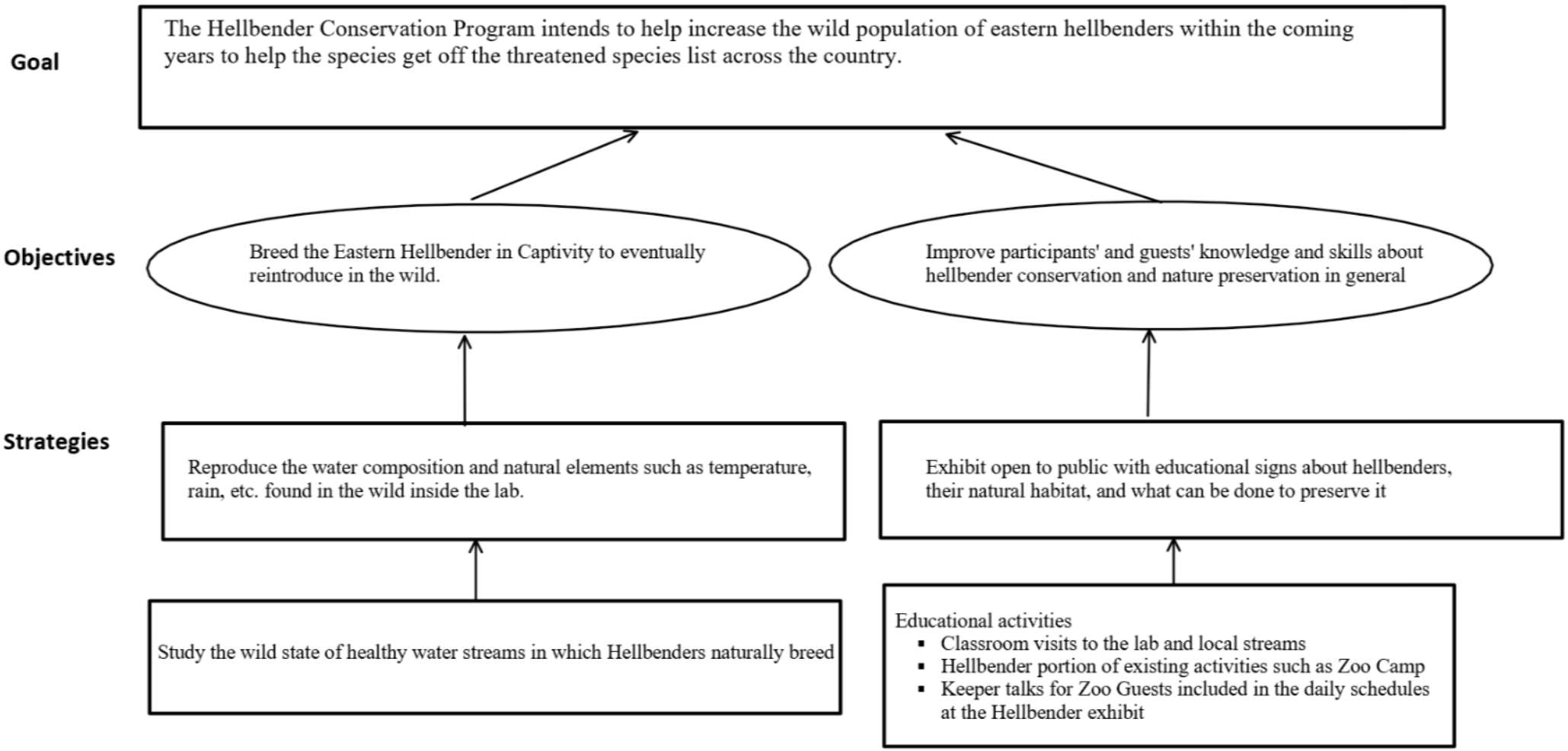
In terms of the external environment surrounding this project, the zoo is accredited by the AZA and therefore can benefit from support from their accrediting body in programs such as this one. The AZA community is also a great resource for consulting other zoos and exchange experiences with them about their conservation efforts. For this program, the Chattanooga Zoo is

aiming to reproduce a very successful program that was created at the St-Louis Zoo for the Ozark hellbender, a close sub-species of the eastern hellbender studied here in the Chattanooga area. The St-Louis program culminated in the creation of the *Ron Goellner Center for Hellbender Conservation*. This center offers 64 feet of swimmable stream for the animals, with sprinklers simulating rain showers, and video surveillance to study their movements and mating habits (Crone, 2010). The program found success when the keepers of the St-Louis Zoo were able to hatch 63 baby hellbenders in November 2011 in what was known as the *World's First Captive Hellbender Breeding* (St-Louis Zoo, 2011). Taking inspiration from such experiences and being able to be in contact with other zoos who have succeeded will be a positive advantage for the Chattanooga Zoo.

On a more local note, the Chattanooga Zoo is part of a group of organizations committed to the research about Hellbenders in Tennessee founded in 2003 by the Nashville Zoo and Middle Tennessee State University, later joined by the Chattanooga Zoo, Lee University, and Zoo Knoxville.

Beyond their positive relationship with other AZA accredited organizations and their local connections with organizations also conducting research about hellbenders, the Chattanooga Zoo benefits from a good community engagement in the Chattanooga area. Donors have expressed interest in providing grants for projects relating to hellbenders, and some have already provided the funds, such as the Lyndhurst Foundation.

Objectives and Strategies



This program is most easily portrayed if it is broken down into two main objectives, stated in the figure above. The first one relates to the breeding of the hellbenders in captivity and will be reached by studying the precise water composition and characteristics of the natural habitat of healthy hellbender populations. This includes rainfall, water temperature and its variation through the seasons, and chemical composition of the water.

A great example that the Chattanooga Zoo is trying to follow in this process is the Saint-Louis Zoo. In their program, the Saint-Louis Zoo created a setup that ended up being very successful for them and included sprinklers simulating rainfall, temperature-controlled streams for the hellbenders to live in and reproduce, and tightly controlled water composition. To achieve the perfect combination of minerals, pH, and other water elements, the Saint-Louis Zoo did what is called a *reverse osmosis* which is a water filtration method that strips water from most of its contaminants and all its minerals. Once the water was stripped, they artificially reintroduced the exact quantities of minerals and reproduced the pH that they observed in the wild. This allowed them to very closely reproduce the conditions that the hellbenders are used to in their natural habitat, and eventually led to successful breeding. In its hellbender program, the Chattanooga Zoo will attempt to reproduce these steps in order to achieve the same breeding success for the eastern hellbender.

The second objective of this program is to increase peoples' awareness, knowledge, and skills in relation to hellbender conservation and nature preservation in general to improve the natural habitat of local species and more specifically the local water quality to prevent the further deterioration of the eastern hellbender's natural habitat. This is an objective of the zoo in general that is achieved through the education of guests towards nature and how harmful pollution can be

to animals' habitat, but this objective is more specifically geared towards the eastern hellbender and what can be done to preserve its habitat.

In order to achieve this objective, the zoo will create a hellbender exhibit in the new building that will be open to the public. This will include the educational material that is used at every exhibit, meaning large posters with information about the species' range, its living habits, what it needs to be healthy, and a few simple environmentally friendly habits for us humans that could improve the local water quality if executed consistently. The presence of such an exhibit will also improve guests' awareness about the species and will be a big step towards the zoo's mission to "[create] meaningful connections between people and animals". The zoo also organizes informational "keeper chats" throughout the day at different exhibits, and one will be added at the hellbender exhibit in order to put in place some interaction between the keepers and the guests about this unpopular species. One of the greatest dangers to hellbenders are humans because of our ancient false beliefs that hellbenders are poisonous, which is the reason why many people kill them when they see them. Educating people about the harmlessness of this species will therefore be an important step towards its conservation.

Beyond the creation of the exhibit, the zoo's ambition is to create educational content and activities for incoming groups such as schools. These activities would include trips to the local rivers in order to lead the participants in the collection of samples, show them wild populations of hellbenders and how to keep track of the individuals, where they live, what they need to be healthy, etc. Bringing the groups to the natural streams will also be an opportunity to educate them on the impact of waste and pollution on local watersheds by physically showing them how it can affect the local species who live in them. The groups will then return to the zoo and observe and participate in the analysis and treatment of those samples.

This experience will teach many new skills to the participants and will show a direct correlation between their actions and the impact they have on nature and on the animals living in it. These activities will be a great way to get guests more involved in the process and provide them with experience-based motivation to spread awareness about this local species and the environmentally friendly habits that would help in preserving them and many other species.

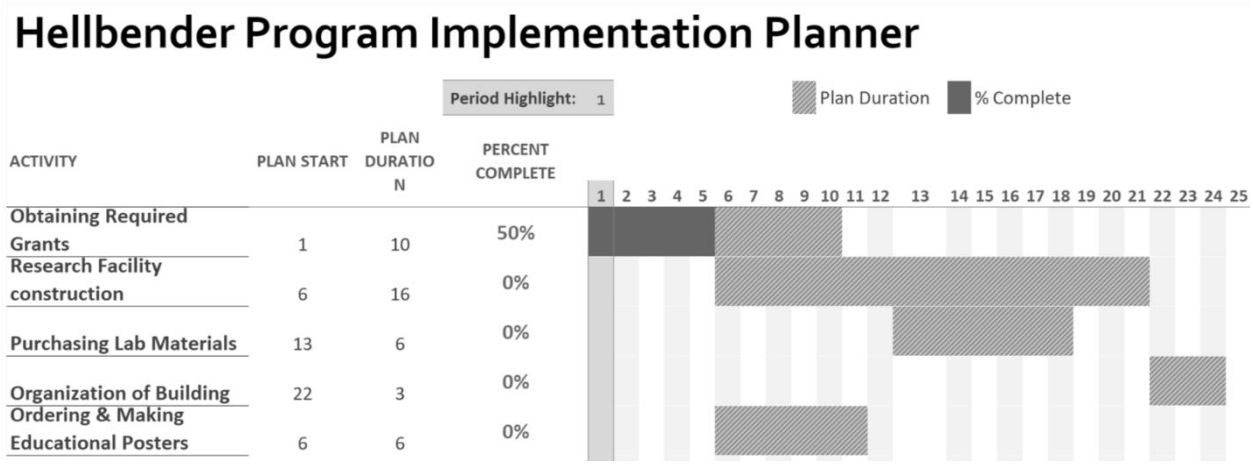
HELLBENDER CONSERVATION PROGRAM

Logic Model

Inputs	Activities	Outputs	Immediate outcomes	Short-term outcomes	Longer-term outcomes
Grant from Lyndhurst and other grants New research facility financed by Grants Zoo public and camp participants New materials Transportation to streams	Education on hellbenders and the effect of water quality on their living conditions and environment Education on trash disposal and its effects on local water quality Daily monitoring and analysis of the water in the exhibit's streams Experimentation on water composition and its effects on breeding Trips to natural hellbender-populated streams to collect and analyze samples Hiring a new member of staff for FY20 starting July 1, 2020	1 research facility dedicated to Hellbenders 1 artificial hellbender living stream exhibit open to the public 1 Educational poster about the Hellbender, its history, range, characteristics, false beliefs, … 1 Educational poster about the Hellbender, its natural habitat and conservation 1 program activity available for booking, focused on hellbender conservation (trip to streams) 1 daily keeper chat about the hellbenders on the daily zoo program	Visitors and camp members receive information about how they can affect this animal's living conditions in the wild More attention in the zoo is focused on hellbenders and the ideal water composition for their breeding and general needs The Hellbenders captive habitat conditions are closer to their natural habitat conditions The hellbenders have better living conditions and better care	Visitors and camp members notice the behavioral changes that they could make in their daily lives in order to reduce the pollution of their local environment Visitors and guests spread their new knowledge about hellbenders and conservation The hellbenders are bred in captivity and reintroduced in the wild	Visitors and camp members have changed their behaviors towards polluting their environment and contribute to the betterment of their local wildlife's living conditions The hellbender species is no longer threatened in the Tennessee area

Program Implementation

Following is a Gantt Chart representing the estimated duration of various phases of the program in weeks.



The zoo intends to have the research facility built by the end of 2019 in order to move the hellbenders into better living conditions. After that, the timeline is vague and will be dictated by the reception of additional grants, and the extra staff member being hired at the start of the next fiscal year. The construction of the facility can start before additional grants are received, because only the Lyndhurst grant was required to start the construction.

The challenges of creating a precise timeline for the program after the construction of the facility are linked to the fact that the evolution of the program after that will rely on hiring a new position and receiving additional grants.

Program Evaluation

Once this program is implemented, there will be two distinct ways through which we will be able to evaluate its effectiveness. First, the indicator we will use to assess the success of the hellbender breeding goal of the program will be the number of healthy hellbender eggs that the program produced. Establishing a specific number of eggs as a goal is not appropriate here, because if the program successfully breeds the hellbenders there will automatically be several healthy eggs, and that would be a satisfactory achievement regardless of exactly how many there are. The program will then be able to learn and grow from its first success. If this goal is not achieved within the first year, it will be important to analyze all the steps that were taken by zoo staff (who will have documented their progress throughout the process) in order to identify potential missteps that can be rectified during the second year.

One way of putting this evaluation into a design would be to establish the implementation of the program as the intervention (X), and the observations (O_n) would consist of noting how many eggs have been found healthy and to study the notes of the keepers in order to establish a connection between their observations and the number of eggs. The different numbers associated with the observations represent the year (O_1 = observation after the program's first year). This evaluation will therefore be a yearly evaluation of hellbender breeding, following this design:

$$X \quad O_1 \quad O_2 \quad O_3 \quad \ldots$$

The educational goal will be evaluated by a pre-test/post-test design that will assess how much information the participants learned about hellbenders and their conservation, if they intend to change their behaviors for the good, and whether or not they intend to share the information they learned with their entourage. Questions 1-5 in both surveys are the same and will allow us to assess how much knowledge was learned during the program, and how accurately it was communicated. The design is built as follows:

$$O_1 \quad X \quad O_2$$

The pre-test survey (O_1) will be given to participants at their arrival at the zoo, before they participate in the program. Here is the Survey Monkey link to the pre-test survey, and it can also be found as a text document in the appendices (Appendix C).

The post-test survey (O_2) will be given to participants after they finish the program in a follow-up email. The importance of their feedback will be stressed to them before they leave the zoo, and they will be offered 2 free zoo tickets if they complete the survey within the next month. Here is the Survey Monkey link to the post-test survey, and it can also be found in the appendices (Appendix D). This post-test has additional items that are aimed to gain feedback on the overall program experience to assess participant satisfaction as well as program effectiveness.

The evaluation process for this program will be executed by the education department of the zoo, who will be responsible for keeping records of the yearly evaluation of hellbender breeding and distributing and analyzing the results of the two surveys discussed above. The open ended questions presented in the survey will be coded for the behaviors mentioned in the

program, and will then be added to the scores taken from the multiple choice questions in order to obtain a final score and compare the total scores form pre-test to post-test on the items that are on both surveys. The general experience and satisfaction questions added to the post-test will be considered as a separate entity and used to evaluate the enjoyability of the program, as well as take into considerations the suggestions for improvements of participants. These items will also be a good opportunity to assess what the most popular parts of the program are and figure out why that is.

Budget & Finance Considerations

Budget

With the collaboration of the Chattanooga Zoo, a baseline budget for the Hellbender Program was created and sent as a grant demand to the Lyndhurst Foundation. Obtaining these funds will allow the zoo to build the facility and move the animals into their new living situation.

Structure

- PermaTherm Insulated Metal Building 16'W x 40'L — $30,000
  - PermaTherm Insulated Buildings are custom engineered with strong, lightweight, and easy-to-install insulated metal panels, making them an ideal choice for commercial, industrial, agricultural, greenhouse, hydroponic, and fodder system applications.
- Electrical Work — $5,500
- Plumbing Work — $4,000
- Concrete Work — $15,000
- Site Work — $6,000
- Large Reverse Osmosis Water Unit — $3,200
- 2,500gal Holding Tank for RO water — $900
- Integrated Water Pump — $100

Stream Components

- Water Tanks — $15,000
- (3) Water Pumps (two installed, one backup) — $3,060
- 10' x 50' Pond Liner Underlay — $110
- Pond Liner — $1,000
- Large Water Chiller — $2,400
- Filtration System with UV Sterilizer — $1,000
  - For biological/mechanical/chemical filtration needs
- Aeration System — $300

Vertical Egg Incubator

- Keetonaqua (4) Tray System — $1,172

- ➢ Water Pump $200
- ➢ Filtration/Aeration System $400

Juvenile/Headstart Racks:

- ➢ (40) Aquatic Tanks with Lids (predrilled) $4,000
- ➢ (2) Filtration Systems with UV Sterilizer $500
  - o For biological/mechanical/chemical filtration
- ➢ (2) Small Water Chillers $1,700
- ➢ (4) Water Pumps (two installed, two backup) $1,200
- ➢ Shelving/Racks $1,000
- ➢ Aeration System $200

Visitor Viewing Space

- ➢ 6’ x 8’ viewing window $1,800

TOTAL: **$99,742**

Long-term financing plans

The Lyndhurst Foundation grant is enough to get the program started by covering the baseline budget detailed above. As the main priority for the zoo staff at the moment is to get the hellbenders in a better living environment, this first step of building the facility and equipping it with the water tanks, pumps, artificial stream, etc. will be put in motion before the end of the calendar year 2019. Once that step is completed, the education program will be put in place as soon as possible, depending on when the next grants are received and when a person is found to fill the new program position.

The cost of operations after the construction of the facility will mostly come from the Capital General Expense, the Exhibit & Maintenance Expense, and the Wages Expense budgets. These sections of the proposed Chattanooga Zoo budget for FY20 are broken down in the

appendices (Appendix A and Appendix B). The operating costs of the Hellbender Conservation Program associated with the hiring of a new position will fall into the Wages Expense budget's line item "Wages – Keeper". The costs associated with the maintenance of the exhibit will fall under all the line items listed for the Exhibit & Maintenance expense budget. Finally, the costs associated with marketing the program and creating the educational posters will fall into the Capital General Expense budget under "Advertising- Capital" and "Graphics/Interpretation".

An estimation of the yearly costs related to the running program is presented in the following table. This is a first-year estimation and will be adjusted according to need during that first year and for the following years. The numbers are based on an estimation of 60 trips to the Hiwassee River per year (average of 1 per week, 2 per week during the summer Jun-Jul-Aug).

Estimated First Year Costs

Item	**Cost**	
New bus for stream transportation (one-time cost)	$	15,000.00
Fuel	$	2,000.00
Employee Wage	$	28,000.00
Sampling & Lab Equipment for participants	$	700.00
Bus / Exhibit maintenance	$	500.00
Marketing	$	200.00
Other	$	200.00
Total (First year)	**$**	**46,400.00**
Total (yearly)	**$**	**31,400.00**

Human Resources Management Considerations

New Position

The plan for this program is to start it with existing zoo staff members until a new hire is made for the fiscal year starting on July 1st, 2020. Until then, the responsibility would fall on the current herpetologists who would oversee the caretaking of the hellbenders (which they already do) and the experimenting with the stream water composition in order to reproduce the composition found in local streams in which healthy hellbender populations are living.

After that, the zoo will incorporate a new position into its budget for FY20 starting on July 1st, 2020. In preparation for this position, I have developed a job description for a future full-time position within this program and had it reviewed by Liz Crowe (COO & Human Resources at the Chattanooga Zoo). This job description is presented on pages 22-23.

Who will be involved in the final program?

In its final form, the program will be a collaboration between various types of people. The zoo keepers and more specifically the new program's main position will have a central role in experimenting with the living conditions of the hellbenders to encourage their natural reproduction and will also be key players in the educational part of this program because of their interaction with program participants. Next, the education team will also play an important role in developing the details of the educational part of the program and interacting with participants and their teachers and group leaders. Finally, volunteers will also be part of the program as they will be a useful aid in leading the groups of participants, making sure the safety regulations are being followed, and helping the zoo employees wherever it is needed during the program.

A specific volunteer plan for this program will not be developed, because the zoo has a volunteer sign up system that allows applicants to select, if they desire, specific departments or programs within the zoo that they want to help with and the zoo desires to keep it that way. The applicants for this program might have certain requirements they need to meet in order to be accepted as volunteers for this program such as physical abilities for example, but that will be it.

Job Description for new Hellbender Keeper position

CHATTANOOGA ZOO

301 North Holtzclaw Avenue
Chattanooga, TN 37404
(423) 697 - 1322 ext. 5708

Job Title:	Zookeeper – Hellbender/Herps	**Job Category:**	Animal Keeper
Department/Group:	Zookeepers	**Job Code/ Req#:**	n.d.
Location:	Chattanooga, TN	**Travel Required:**	Some
Level/Salary Range:	$12-$14 per hour	**Position Type:**	Full time
HR Contact:	Liz Crowe	**Date Posted:**	TBD
Will Train Applicant(s):	On the job training	**Posting Expires:**	When position is filled
External Posting URL:	n.d.		
Internal Posting URL:	n.d.		

Applications Accepted By:

EMAIL:	**MAIL:**
lcrowe@chattzoo.org Subject Line: Hellbender Keeper Position	Liz Crowe Chattanooga Zoo 301 North Holtzclaw Avenue Chattanooga, TN 37404 (423) 697 - 1322 ext. 5708

Job Description

PURPOSE OF THE POSITION

The purpose of this position is to carry out the purposes and goals of the Hellbender Conservation Program, which are:

- to breed the Eastern Hellbender in captivity in order to reintroduce populations into the wild
- to educate the public about natural habitat preservation and hellbender conservation in order to improve their behaviors

ROLE AND RESPONSIBILITIES

The incumbent of this position will be at the head of our new Hellbender Conservation Program. Responsibilities included are listed below, as well as the estimate percentage of total responsibilities that they represent:

- Daily caring for the hellbenders **(35%)**
- Experimenting with aquatic systems and composition in order to recreate a breeding environment for the hellbenders **(30%)**
- Educating program participants about the hellbenders, their natural habitat, and conserving them in the wild **(20%)**
  - Leading trips to local streams in order to collect samples and study field populations with program participants (10%)
  - Analyzing samples with program participants (10%)
- Educating daily zoo guests by conducting the hellbender keeper chat **(7%)**
- Writing colloquial and scientific articles for our community in relation to the zoo's work with Hellbenders **(4%)**
- Helping other herpetologists with tasks when needed **(3%)**
- Helping other zoo staff members with general zoo tasks when needed **(1%)**

CHATTANOOGA ZOO

301 North Holtzclaw Avenue
Chattanooga, TN 37404
(423) 697 - 1322 ext. 5708

QUALIFICATIONS AND EDUCATION REQUIREMENTS

Applicant must hold a bachelor's degree in relevant biological field, or the equivalent combination of training and/or experience required. Professional animal care experience required. Must possess an understanding of practical principles of animal behavior and the ability to work with live animals safely; and have the ability to perceive and act upon relevant changes in animal behaviors and conditions. Knowledge or experience about animal husbandry, but specifically care of salamanders is also required.

PREFERRED SKILLS

Preferred animal experience includes dealing with amphibians and more specifically salamanders.
Experience in dealing with aquatic systems and water quality is preferred.
Experience in educating the public about animal care, welfare, and conservation is preferred as this will be a major part of this position.

Below is a list of Knowledge, Skills, Abilities, and Other Characteristics (KSAOCs) required for this position:

- Animal behavior
- Salamander habitat
- Salamander breeding habits
- Current research findings in the field
- Water quality testing techniques
- Experimental methodology
- Animal handling abilities
- Public presentation of results and process
- Ability to work independently and think critically and apply the scientific method

Reviewed By:	Liz Crowe	Date:	4/18/19
Approved By:	Liz Crowe	Date:	4/18/19

Research Synthesis: Conservation Education

For this section I will dive into the literature regarding the topic of conservation education, why it is relevant, how it has been done in the past, what it needs to be successful, and how the specialists think it should be done.

Conservation education is actively part of the zoos and aquariums landscape. In this regard, the mission of the Chattanooga Zoo is not very different from most zoos and aquariums in the United States. Indeed, Patricia Patrick et al. studied 136 mission statements of AZA-accredited zoos and aquariums in their paper *Conservation and Education: Prominent Themes in Zoo Mission Statements* (2007). They studied them for the mentions of education and conservation, and the relationship between the two concepts. In their results, they noted that 131 out of 136 mission statements mentioned education, and 118 of them specifically mentioned conservation. But what is conservation education? Patrick et al. defined this concept, "The specific aim of conservation education is to develop lifelong knowledge and skills for conservation action." and asserted that it was "designed to affect the awareness, attitudes, and behaviors of people toward natural resources." (Patrick et al., 2007).

Susan K. Jacobson et al.'s book *Conservation Education and Outreach Techniques* (2015) also does an outstanding job of describing conservation education and how important it is. Environmental management efforts are often a policy processes, and those are heavily influenced by the public. As a result, conservation efforts are as much of a social challenge than they are a biological one. When the people are ignorant about the current situation regarding nature conservation, it is extremely difficult to gather public support for policies intended to

improve local watersheds or protect local species, even when they are based on years of biological research and advancements. Striving to educate the public and raise their awareness and knowledge about their local natural environment and what it needs is a crucial step towards community-wide initiatives towards conservation, and successful conservation and outreach programs have been very influential in improving public awareness and support towards local conservation (Jacobson et al., 2015).

An example of a program that has found success in educating people about conservation all around the world is the Global Rivers Environmental Education Network (GREEN), which is a program dedicated to monitoring water quality. GREEN has connected watershed conservation efforts and results across the world, through a global communication network connecting countries such as Bangladesh, Australia, Argentina, Italy, Kenya, and many more. While these countries have vastly different cultures, they share similar conservation challenges linked to the pollution and degradation of their water systems. It is stated in Jacobson et al.'s book that "Through our common need for healthy rivers and watersheds, GREEN has helped learners take action to address local watershed issues in more than 49 participating country programs, 26 of which received media coverage totaling over 14 million mentions from Internet, television, and print sources" (Jacobson et al., 2015).

Another important issue identified by Jacobson et al. is the fact that the public's attention to conservation efforts are uneven because of the fact their support for wildlife tends to focus on "attractive and emotionally appealing species". This point is illustrated by the fact that among U.S. citizens, 89% believe that the endangered Bald Eagle should be protected, whereas only 24% believe that similarly endangered Kauai wolf spider should be protected (Jacobson et al., 2015). As a general observation, invertebrates are treated with indifference, regardless of their

crucial impact on our environment, which is part of the conservation problem. Conservation education and outreach programs related to these species that are deemed less attractive is therefore more needed than for other species.

As a result of these observations, Jacobson et al. share the five goals developed by UNESCO (1978) that conservation education shares with the broader field on environmental education. These include giving the learners opportunities for:

- **Awareness**: to acquire an awareness of and sensitivity to the environment and its associated problems;
- **Knowledge**: to gain a variety of experiences in and acquire a basic understanding of the environment and its associated problems;
- **Attitudes**: to acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection;
- **Skills**: to acquire the skills for identifying and solving environmental problems;
- **Participation**: to encourage citizens to use their knowledge to become actively involved at all levels in working toward resolution of environmental problems. (UNESCO, 1978)

The framework that Jacobson et al. offer in order to effectively create conservation education and outreach programs that achieve these goals is strikingly similar to the one taught in UTC's MPA program's Program Evaluation course, and therefore presents broadly the same steps that were followed for the development of the Chattanooga Zoo's Hellbender Conservation Program:

- Planning
    - Review the mission
    - Identify goals and objectives
    - Identify target audiences
    - Include audience members and potential partners
    - Make an inventory of resources and constraints
    - Select activities and messages
- Implementation
    - Pilot test activities
    - Program operations
- Evaluation
    - Designing an evaluation
    - Evaluation objectives
    - Data collection for an evaluation

(Jacobson et al., 2015)

The importance of this type of education is also underlined in Carol Brewer's article *Cultivating conservation literacy: "trickle-down" education is not enough* (2001), when she argues that,

> *"We do not have the time to wait for our discoveries to 'trickle down' to the public through the filters of textbooks and other media. We must take more responsibility for translating the results and significance of our research in a way the public—our families, neighbors, and communities—can understand."*

The rest of her paper explains how modern scientists need to be capable of educating non-scientists about their knowledge in order to spread it more efficiently (Brewer, 2001). Just like John Steinbeck said in his book *The Log from the Sea of Cortez,* he had never seen a scientist who couldn't discuss freely and interestingly with a child (1941). Brewer believes that all scientists should be able to do so (Brewer, 2001). This is so important because not only does it make the information more accessible, but it also makes it more interesting and potentially entertaining, allowing children and non-scientists to think about that information in a more critical way that will lead them into action.

This type of education is consistently offered by AZA accredited zoos and aquariums across the country, providing information to over 180 million visitors, including 51 million students each year, about wild animals, their natural habitats and related conservation issues, and the role they can play in their preservation (AZA, n.d.). This was expressed on their website,

> *"AZA-accredited zoos and aquariums enhance the public's understanding of wildlife and the need to conserve the places animals live. Visitors believe zoos and aquariums play an important role in conservation education and that when they experience a stronger connection to nature, are prompted to reconsider their role in environmental problems and conservation action and see themselves as part of the solution as a result of their visit." (AZA, n.d.)*

In Carol Brewer's next article published a year later, *Outreach and Partnership Programs for Conservation Education Where Endangered Species Conservation and Research Occur* (2002), she applies her enquiries to the specific topic of endangered species and the communities surrounding them by trying to find answers to the question, "As conservation biologists, how can

we cultivate ecological and conservation literacy in communities adjacent to threatened and endangered species and their habitats?" (Brewer, 2002). In response to this question, Brewer develops five main guidelines that are essential in her vision of the successful conservation outreach program.

First, she defends the importance of the experience element of the program for the development of ecological literacy by putting forward the fact that participants need to actually "experience the wonders of science" and not only be fed data about the findings, allowing participants to find and evaluate their own data, share it with their peers and discuss it (Brewer, 2002). This experiential learning will reinforce the connection between the participants and the science in order to make the program more engaging, interesting, educational, and eventually have a greater impact on behaviors and conservation literacy.

Second, the importance of the program leaders' relationship with the participants' teachers (in the case of classes participating in the program) is put forward by Brewer, arguing that they are the people who have the closest relationship with the participants, and are ultimately the people who determine if the participants will continue engaging in conservation programs or not (2002).

The third point that Brewer makes is about teaching the scientists within the program how to make the experience successful for both the participants and themselves. This is often accomplished by paring a scientist with an educator who is skilled in presenting scientific education to audiences across various levels and disciplines (2002). However, pairing is often bypassed by having a scientific staff that is trained in education and can communicate their knowledge, skills, and findings to non-scientists, even children. In my conversations with the Chattanooga Zoo staff about the creation of the job description presented in this project, it was

made clear that in our time, incumbents of zoo keeping positions have no choice but to be in direct contact with the public every day. This means that all of today's zoo keepers need to be able to not only care for the animals, but also communicate about those animals and explain scientific processes involved in animal care in a way that is understandable to all. Therefore, Brewer's third point is a very important aspect of our Hellbender Conservation Program.

The fourth guideline presented by Brewer is the importance of training the participants in the activities that they will be executing. This not only teaches new skills to the participants, but also allows them to execute accurate data collection and evaluation, which makes their work more valuable to the institution offering the program and becomes information that can be presented to decision makers with as much confidence as information presented by the scientists themselves (2002). By allowing the information to become useful, training the participants will make their experience more rewarding and meaningful, turning the program into an even more positive and memorable experience and increasing the long-lasting impact it will have on participants.

Brewer's last point is about the importance of assessing the programs once they are implemented, especially if the methods in place are being used for the first time (2002).

To illustrate the points previously mentioned, Brewer used a case study about a program trying to track and protect sea turtles in Costa Rica. This program had school children partake in scientific activities related to the protection of sea turtles such as gridding the beaches in order to log the evolution of tracked animals over time, count healthy eggs in nesting areas, and more. These activities were not only educational and entertaining for the children but were also very useful for the researchers, because of the volume of work executed in a much more efficient

manner than if the scientists were alone (Pankratz, 2000). This practice is a great example of the above-mentioned guidelines recommending experience-based programs, training of participants, and successful implementation of a program by the scientists.

The feedback from the community and the teachers to this program was exceptional, as one high-school teacher even commented, "I believe that our Ministry of Public Education needs to include this type of experience for all schools. This type of learning is very important for our country" (Pankratz, 2000). This case study was also a great testimony of how accurate the data collection can be, even when collected by program participants who are not specialists. One of the measurements taken by the children was the sea turtles' carapaces' width and length, which, when compared to measurements taken by specialists only a few weeks earlier, only varied by 1-2% (Pankratz, 2000).

Another benefit of long-term monitoring like the one displayed in the sea turtle program is the building of ongoing relationships between local schools and institutions such as zoos and aquariums. This would allow a continuous income of program participants, and it would allow for a large and ongoing spread of educational information and experiences about conservation and nature preservation to the local population, increasing overall conservation literacy. In Brewer's words,

> *"long-term monitoring programs can benefit from cultivating relationships with schools in nearby communities via a steady supply of energetic research assistants and the reliable data they collect. Partnership and outreach programs can forge cultural connections because, through their shared work, local participants and scientists come to know each other and understand something about the connections each has to the ecosystem being studied." (Brewer, 2002).*

References

Association of Zoos and Aquariums. www.aza.org/

AZA. (2016). Amphibian Conservation. Retrieved from https://www.aza.org/amphibian-conservation

AZA. (n.d.). Conservation Education. Retrieved from https://www.aza.org/conservation-education

Brewer, C. (2001). Cultivating conservation literacy: "trickle-down" education is not enough. Conservation Biology, 15(5), 1203-1205.

Brewer, C. (2002). Outreach and Partnership Programs for Conservation Education Where Endangered Species Conservation and Research Occur. *Conservation Biology, 16*(1), 4-6. doi:10.1046/j.1523-1739.2002.01613.x

Chattanooga Zoo. www.chattzoo.org/

Crone, T. (2010). Hanging with the Hellbenders. Retrieved from https://www.stlmag.com/news/Hanging-with-the-Hellbenders/

Department of Environmental Conservation. (n.d.). Eastern Hellbender Fact Sheet. Retrieved from https://www.dec.ny.gov/animals/7160.html

Equal Employment Opportunity Commission. (n.d.). Employers. Retrieved from https://www.eeoc.gov/employers/

Esp. Water Products. (n.d.). Understanding RO filtration & water purification. Retrieved from https://www.espwaterproducts.com/understanding-ro/

IUCN. (2018). The IUCN Red List of Threatened Species. Retrieved from https://www.iucnredlist.org/

Jacobson, S. K., McDuff, M. D., & Monroe, M. C. (2015). *Conservation education and outreach techniques*. Oxford: Oxford University Press.

Lee, J. J. (2013). U.S. Giant Salamanders Slipping Away: Inside the Fight to Save the Hellbender. Retrieved from https://news.nationalgeographic.com/news/2013/12/131220-hellbender-salamander-conservation-endangered-animals-science/

Long, D. (2018). Lyndhurst Foundation Grant Request.

National Council of Nonprofits. (2019). Fundraising. Retrieved from https://www.councilofnonprofits.org/tools-resources/fundraising

Pankratz, S. (2000). Partners in conservation education: scientists, teachers, students, and sea turtles in Costa Rica. M.S. thesis. University of Montana, Missoula.

Patrick, P. G., Matthews, C. E., Ayers, D. F., & Tunnicliffe, S. D. (2007). Conservation and Education: Prominent Themes in Zoo Mission Statements. *The Journal of Environmental Education, 38*(3), 53-60. doi:10.3200/joee.38.3.53-60

Pynes, J. E. (2013). *Human resources management for public and nonprofit organizations: A strategic approach* (4th ed.). San Francisco: Jossey-Bass.

Steinbeck, J. (1941). The log from the Sea of Cortez. Viking Press, New York.

St-Louis Zoo. (2011). World's First Captive Hellbender Breeding. Retrieved from https://www.stlzoo.org/about/contact/pressroom/presskit/world-s-first-captive-hellbender-breeding

St-Louis Zoo. (n.d.). Ron Goellner Center for Hellbender Conservation. Retrieved from https://www.stlzoo.org/conservation/wildcare-institute/hellbendersinmissouri

Tennessee State Wildlife Action Plan (TSWAP). (2015). TENNESSEE CASE STUDY: The Eastern Hellbenders of Tennessee - A species indicative of good water quality provides a

focus for conservation statewide. Retrieved from http://www.tnswap.com/files/Hellbender%20statewide%20conservation%20case%20study-TN1.pdf

UNESCO. (1978). UNESCO-UNEP Environmental Education Newsletter. Retrieved from www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=12&ved=2ahUKEwipt9mOrN_hAhUKIKwKHfdBB7UQFjALegQIABAC&url=https://unesdoc.unesco.org/in/rest/annotationSVC/DownloadWatermarkedAttachment/attach_import_6945ec0d-ef71-406f-a886-d224fc20343a?_=156393engb.pdf&usg=AOvVaw0zdsxp95EUCm4rObvEd-9F

Appendix A

Proposed Exhibit & Maintenance Expense Budget and Proposed Wages Expense Budget

EXHIBIT & MAINTENANCE EXPENSE	
Cleaning Supplies	11,300.00
Cleaning Services	22,104.00
Electrical - Contractors	17,812.00
Equipment Rental	782.00
HVAC Maintenance	18,850.00
Maintenance	29,841.00
Maintenance - Exhibit	3,300.00
Landscaping	8,205.00
Vehicle Maintenance & Gas	1,800.00
Pest Control - Maintenance	10,880.00
Waste Disposal - Maintenance	11,816.00
Total Exhibit & Maintenace Expense	125,390.00
WAGE EXPENSE	
Wages - Birthday Parties	47,613.56
Wages - Camel Rides	42,405.48
Wages - Education	159,937.70
Wages - Facility Rental	22,064.64
Wages - Keeper	610,927.17
Wages - Maintenance Supervisor	34,433.60
Wages - Maintenance/Landscape	97,445.12
Wages - Marketing	94,241.44
Wages - Membership	29,702.40
Wages - Rehab	11,032.32
Wages - Special Events	20,579.52
Wages- Rides	46,629.72
Wages - Zoo Camp	31,020.00
Wages Administrative	125,323.76
Wages - PEDZ	31,751.96
Wages- IT	38,188.80
Wages- Security	25,968.40
Wages- Zoo Director	80,663.20
Wages-Vet Tech	52,976.32
Billing Impound	8,050.00
Employer Payroll Tax Expense	182,430.06
Total Wages Expense	1,793,385.17

Appendix B

Proposed Capital General Expense Budget

Account Description	FY20 Full Budget
CAPITAL GENERAL EXPENSE	
Animal Acquisitions	13,220.00
Carousel	0.00
Development Expense	0.00
Equipment - Capital	50,000.00
Exhibit Construction	15,000.00
Africa Expansion Construction	1,500,000.00
Africa Expansion Marketing	40,000.00
Africa Expansion Fundraising	39,000.00
Advertising-Capital	3,775.00
Improvements - Capital	10,000.00
Graphics / Interpretation	13,800.00
Capital - Merchant & CC Fees	745.00
IT- End User Equipment Capital	9,381.00
IT- Application Licensing	8,606.00
IT Contract	1,000.00
Office Supplies - Capital	0.00
LED Lighting Project	0.00
Architectural Expense	6,000.00
Strategic Plan	0.00
Tiles	0.00
Radios	0.00
Recognition	300,000.00
Africa Interpretation	15,000.00
Interest Expense	2,880.00
Misc expense capital	0.00
Total Capital General Expense	2,028,407.00

Appendix C

Program Evaluation pre-test survey (www.surveymonkey.com/r/ZKN2B5B)

1. I know what a hellbender is
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

2. I know where hellbenders usually live
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

3. List all the behaviors you can think of that would be detrimental to the hellbenders' natural habitat

4. List all the behaviors you can think of that individuals could engage in to actively help maintain the hellbenders' natural habitat

5. I believe that my actions influence the quality of the Hellbenders' natural habitat
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

6. How many times have you participated in conservation programs?
    a. This is my first
    b. I have participated in 2 or less before coming to this program
    c. I have participated in 3-5 conservation programs before attending this one
    d. I have participated in over 5 conservation programs

7. How did you hear about our program?

Appendix D

Program Evaluation post-test survey (www.surveymonkey.com/r/Z8MR2WD)

1. I know what a hellbender is
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

2. I know where hellbenders usually live
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

3. List all the behaviors you can think of that would be detrimental to the hellbenders' natural habitat

4. List all the behaviors you can think of that individuals could engage in to help maintain the hellbenders' natural habitat

5. I believe that my actions influence the quality of the Hellbenders' natural habitat
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

6. After attending the program, I intend to change my actions in order to protect the natural habitat of amphibians such as the eastern hellbender
    a. Strongly Disagree
    b. Disagree

c. Neither agree nor disagree
d. Agree
e. Strongly Agree

7. I am likely to share the information I learned during the program to my friends and family
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

8. After attending this program, I am more interested in participating in animal conservation programs
    a. Strongly Disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree

9. On a scale of 1 (I didn't learn anything) to 10 (I feel like I know all there is to know about the Eastern Hellbender), how much did you learn during the program?

10. Please share with us what you enjoyed about the program, what could be improved, and any other comments you may have about your experience. Thank you!

Capstone Meta-Paper

Thomas Brian Max Smallwood

University of Tennessee at Chattanooga

Meta-paper

Organizational development and/or program planning

The program planning component of the project is detailed between pages 3-13 of the main paper. Each of the program planning steps were completed and were based on published research and on program planning best practices taught in UTC's MPA program. The program plan offers a simple and clear logic model (page 12) and a graphic representation of the program's goal and main objectives and strategies (page 8). The planning process explained and considered the program's organizational context and external environment, made sure it was in sync with the organization's mission and resources, and demonstrated the need for the program (pp 3-7). The implementation section also represents a rough outline of how long program stages are expected to take, even though a precise timeline and more detailed Gantt chart were not an option given the lack of precise information from the zoo as to exactly when they plan to implement the different sections.

Program evaluation or applied empirical research more generally

This project's evaluation plan is on pages 14-16 of the main paper. This evaluation plan abides by the AEA Guiding Principles for Evaluators and displays a systematic collection of data following a detailed structure that will inform the zoo's leadership about the effectiveness of the program.

Financial management, including, at a minimum but more broadly as appropriate to the project, budgeting and finance

The budget and financial aspects of this project were described on pages 17-19 of the main paper. These included the program budget necessary to start the construction of the facility and the purchase of the equipment necessary to start the program and move the hellbenders into their new living situation. This budget was presented in a grant request to Lyndhurst foundation and that grant was received.

This section also offers an estimation of yearly costs that the program will generate (page 19). This budget is an estimation that is based on general numbers, which will no doubt be adjusted during the first year in order to achieve a higher level of precision in the prediction of the following years' costs. This estimation was presented within the context of the zoo's projected FY20 budget, broken down in more detail with the presentation of Chattanooga Zoo documents in appendices A & B (pages 35-36).

Human resource management

The human resources part of this project included a job description for the new position that the Chattanooga Zoo will be hiring to run the program starting at the beginning of FY20 starting on July 1st, 2020. This job description is presented on pages 22-23 of the main paper and was created following the professional standards recommended by the Society for Human Resource Management (SHRM) and followed the policy requirements posted by the Equal Employment Opportunity Commission (EEOC).

Around this job description, the planned timing of the related HR events as well as the different actors who will be involved in running the program in its final form were also described on pages 20-21 of the main paper.

Alignment with the organization's mission, structure, resources, and external environment, including, but not limited to, its public policy context

This program is in direct accord with the Chattanooga Zoo's mission related to conservation. Their accrediting body (AZA) regularly encourages their zoos and aquariums to engage in local conservation efforts such as the Hellbender Conservation Program and often offer help implement them. This program is a perfect example of "creating meaningful connections between people and animals" (Chattanooga Zoo, Mission Statement). The Program is also thoughtfully included in the zoo's other current programs and activities and takes into consideration the zoo's various commitments and financial barriers. More information about these points can be found on pages 3-7 of the main paper.

Some important policies also had to be considered in the development of this program. First, the job description that was created as part of this project (presented on page 22-23) adheres to the Equal Employment Opportunity policies regarding what employers can and can't do when posting jobs. These policies prohibit employment discrimination based on "race, color, religion, sex (including pregnancy, gender identity, and sexual orientation), national origin, age (40 or older), disability or genetic information." (Equal Employment Opportunity Commission, n.d.). This was satisfied by making sure that the requirements listed in the job description are solely based on skills and academic/professional experience and are not limiting the potential applicants to certain ethnicities, age groups, sexes, or backgrounds.

Next, the zoo was bound by the IRS fundraising guidelines for tax-exempt organizations and were required to publicly disclose their reception of the Lyndhurst grant. These policies must be followed by nonprofit organizations when engaging in fundraising activities in order to keep their tax-exempt status.

Finally, the program is designed to welcome many groups of children and adolescents, and therefore must comply with childcare policies. These policies were researched and taken into consideration. First, the zoo is already a licensed childcare provider because they have hosted summer camps for many years. They are therefore licensed, aware, and able to uphold the requirements for taking care of minors for long periods of time. These regulations include background checks on staff members and volunteers, number of staff/children ratio depending on the ages of the children, safety regulations, and more (Department of Human Services, n.d.).

Intentional, institutionalized pursuit of high standards of professional ethics

High standards of professional ethics were of the utmost importance when developing this program, throughout all its stages. Here, I will break down exactly how these standards of ethics were followed.

Overall, the development of this program was, and its implementation will be, executed in tight accordance with the *AZA's code of ethics* (AZA, 1976, last amended 2017). Although all points covered in this code were followed (if applicable), here are a few that were most actively represented in this program and its elaboration:

- "Promote the interests of wildlife conservation, biodiversity, and animal welfare to the public and to colleagues"
    - This represents the main objective of this program.

- "Maintain high standards of personal, professional, and business conduct and behavior"
    - All meetings and communications with the Chattanooga Zoo were conducted in the most professional manner in order to create a useful and successful program.
- "Cooperate with qualified zoos/aquariums and other qualified persons/organizations in breeding programs of endangered and other species"
    - This program will be implemented by an accredited AZA zoo and is the result of a collaboration between the Chattanooga Zoo and other accredited organizations such as the Saint-Louis Zoo.

The *grant requesting process* executed by the zoo for this project followed the ethical fundraising guidelines (National Council of Nonprofits, 2019, Ethical Fundraising). These guidelines state that communication with donors should be honest and precise, that the organizations need to disclose their sources of revenue for the public to see on their website, that donors should be thanked in a timely manner after their contributions, that donors' restrictions on their gifts should be respected at all times, and that donors should be publicly acknowledged (or not, if they desire to remain anonymous) in the manner in which they desire to be acknowledged, and more. All these guidelines were followed rigorously by the zoo and I in the grant request process.

The *evaluation plan* strived to meet the American Evaluation Association's (AEA) Guiding Principles for Evaluators. The evaluation plan offered for this program offered integrity/honesty by transparently disclosing the purposes of the evaluation to the program

participants. It also demonstrated a desire to improve the common good by making sure that the knowledge and skills that are intended to be transmitted to the public are indeed being well received, that the information is accurate and useful to the participants, which will in turn improve their daily behaviors towards nature and in the long term improve the eastern hellbender's health in the wild. Making sure that the program is working as planned will also be a great opportunity for the zoo to bring in more guests and therefore create more connections and spread more knowledge about all the other animals at the zoo, ultimately improving the fulfillment of their mission. The evaluation plan also demonstrates respect for the people by asking them for their permission to contact them via email for the post-test survey, and by making both surveys optional for everyone. The plan will be executed by professionally competent people in the zoo's education department who are used to evaluating their educational programs and have experience in this domain. Lastly, within the available resources in the organization, the evaluation plan adheres to systematic inquiry standards by striving to collect precise and informational data, analyzing that data in a professional manner using the results to inform leadership on the effectiveness of the program. More details about the evaluation plan are on page 14-16 of the main paper.

Identification and incorporation of perspectives of diverse constituencies

The elaboration of this program had to take into account several perspectives in order to become successful and aim to maintain that success for years to come. First, there were multiple perspectives represented within the zoo itself. During my meetings with the zoo, I spoke with some of the leadership team (COO, Human Resources Director, General Curator, Director of Advancement), staff members directly linked to the implementation of the program (Facility

Manager, Manager of Events and Advancement, Education Director), and also spoke to the current head Herpetologist who will be in charge of the program until the new position is hired. These were various perspectives that were all valuable to the process in different ways. The leadership team provided the drive to make it happen, the insight on resources necessary/available for the program, and the background knowledge on previous attempts. The advancement/marketing and education teams were instrumental in acquiring the funds by writing grants and providing insight on the connection between leadership and donors, and between animal programs and their educational components. Finally, the keepers and maintenance/facilities staff were instrumental in providing the knowledge necessary to understand the different dynamics of the program, whether scientific (explaining the reverse osmosis process and how it affects breeding), or practical (what will it take to build the facility, where it will be, the estimated timeline, etc.).

Outside of the zoo, various perspectives were also necessary. Taking into consideration the views and opinions of conservation education specialists, as well as specific zoological experience from the AZA databases was essential. The AZA is a very complete source of information about conservation science, field conservation, and similar domains. They offer breakdowns of what has been working and what hasn't in the field, they provide reports of conservation efforts, and many more documents on their Conservation page (AZA, n.d.). The conservation education sources were extensively talked about throughout the research synthesis part of the main paper, on pages 24-31.

In a broader way, this program incorporated the perspectives of different constituencies such as the zoo itself, the donors (by exchanging with them about grants, engaging in ethical behaviors with them, and considering how to make the program an interesting recipient of

financial gifts from them), the city (by striving to create fruitful relationships between the zoo and local schools and other types of groups), and the participants (by aiming to provide them with new applicable skills, asking them for feedback in order to improve the experience for future participants, by making the program an attractive and experiential learning opportunity).

Synthesis and application of theory, empirical evidence, and recognized professional standards

The synthesis of a body of research related to the program was presented on pages 24-31 of the main paper. This body of research was constructed around the topic of conservation education, described exactly what that is from different perspectives, provided examples of how successful programs with similar goals have been created in the past, and provided insight on what specialists on the matter think the most important aspects of these education programs should be. These findings provided empirical evidence for the decisions made in the elaboration of this program, making it a good example of the professional standard expected for this kind of project in this field.

The program design was planned according to a framework presented in Jacobson et al.'s extensively peer reviewed book, *Conservation Education and Outreach Techniques* (2015). This framework was cited on page 27 of the main paper and applied to this particular program from pages 3 to 16.

Next, the five guidelines to a successful outreach program presented by Carol Brewer in her article *Outreach and Partnership Programs for Conservation Education Where Endangered Species Conservation and Research Occur* (2002) were also carefully considered and incorporated in the elaboration of our Hellbender Conservation Program. The program shows

elements of experiential learning in the field, training the participants on new skills in the lab, the importance of having scientists with educational skills in the job description, and evaluating the practices in place with our evaluation plan.

The Hellbender Conservation Program was also designed to provide all five of UNESCO's environmental education goals mentioned on page 26 of this paper. The program did so by raising participants' awareness, providing them with knowledge, attitudes, and skills to recognize and act upon the world's conservation problems, and giving them an opportunity to participate in these conservation efforts and therefore providing them with the chance to make a difference in their local environment.

Finally, the job description presented on pages 22-23 of the main paper was created following the guidelines and examples provided by professional organizations that set the professional standard in this field (SHRM, 2018), and organizations that offer professional examples of job descriptions that are posted daily (AZA, n.d., Jobs; Wright State University, n.d.).

References

American Evaluation Association. (n.d.). Guiding Principles for Evaluators. Retrieved from https://www.eval.org/p/cm/ld/fid=51

AZA. (1976, last amended 2017). Code of Professional Ethics. Retrieved from https://www.aza.org/code-of-ethics

AZA. (n.d.). Conservation. Retrieved from www.aza.org/conservation

AZA. (n.d.). Jobs. Retrieved from https://www.aza.org/jobs

Brewer, C. (2002). Outreach and Partnership Programs for Conservation Education Where Endangered Species Conservation and Research Occur. Conservation Biology, 16(1), 4-6. doi:10.1046/j.1523-1739.2002.01613.x

Chattanooga Zoo. www.chattzoo.org/

Department of Human Services. (n.d.). Child Care Laws, Rules, Guidelines & Policies. Retrieved from https://www.tn.gov/humanservices/for-families/child-care-services/child-care-laws-rules-guidelines-policies-public-chapter-1070.html

Equal Employment Opportunity Commission. (n.d.). Employers. Retrieved from https://www.eeoc.gov/employers/

Jacobson, S. K., McDuff, M. D., & Monroe, M. C. (2015). *Conservation education and outreach techniques*. Oxford: Oxford University Press.

National Council of Nonprofits. (2019). Fundraising. Retrieved from https://www.councilofnonprofits.org/tools-resources/fundraising

National Council of Nonprofits. (2019). Ethical Fundraising. Retrieved from https://www.councilofnonprofits.org/tools-resources/ethical-fundraising

SHRM. (2018). Job Descriptions. Retrieved from https://www.shrm.org/resourcesandtools/tools-and-samples/job-descriptions/pages/default.aspx

Wright State University. (n.d.). Writing an Effective Job Description. doi:10.1080/01973762.1990.9658884