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Educational Lessons and Strategies for Wildlife Educators and Teachers at Animal-Associated Wildlife Centers

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**Educational Lessons and Strategies for Wildlife Educators and Teachers at Animal-
Associated Wildlife Centers**

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M.S. University of Wyoming, 2017

Plan B Project Submitted in partial fulfillment of the requirements for the degree of Masters in
Science in Natural Science in the Science and Mathematics Teaching Center at the University of
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Laramie, Wyoming

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Abstract

Increasing industrialization and urbanization are causing a decreasing amount of non-urban wildlife interaction and nature experiences. Less contact with the natural world is potentially creating a lack of interest in the wildlife, ecology, and natural phenomena. Animal-associated wildlife centers (AAWCs) provide the public with unique opportunities to experience wildlife and nature directly and vicariously through educational programs. AAWCs are nonprofit organizations that provide sanctuary to native or exotic animals, rehabilitate and release native wildlife that is injured or orphaned, and/or house non-releasable wildlife for educational purposes. This applied project examined educational methods used by AAWCs within the United States and created an educational resource for wildlife educators. Information was collected from surveys of AAWCs and follow-up interviews with targeted organizations which informed the development of an educational resource website (<http://wildlifedresources.com>). The website provides easy to model lesson/program plans and resources for informal science education strategies. This paper expounds upon the development of the website and provides justification for the development process. Throughout the process of implementing this project, notable findings appeared in the literature as well as valuable insights from interviews and surveys with AAWC organizations. The influence that AAWCs can provide on their community and conservation education is substantial and should be utilized. Through the sharing and adaptation of successful lesson plans and the utilization of experiential learning, place-based education, education, active learning, storytelling, educational / ambassador animals, and the development of empathy, AAWC education programs can enhance their impact on students, participants, and the environment.

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Introduction

Background and Rationale

Increasing industrialization and urbanization are causing a decreasing amount of non-urban wildlife interaction and experience. In 2011, the Nature Conservancy polled 602 young adults across the United States between the ages of 13 and 18 and asked about their experiences and attitudes towards nature, the results were heartbreaking but not surprising. Only 10 percent of children said they spent time outdoors every day, 80 percent thought being outdoors was uncomfortable, and 62 percent indicated that they could not access natural areas (Nature Conservancy, 2011). As the human population grows, development encroaches further into wild spaces, creating fragmentation, disrupted ecosystems and human-wildlife conflicts. Less contact with the natural world is potentially creating a lack of interest in the wildlife, ecology and natural phenomena. Interests are turning towards human artifacts and spending time in human engineered environments (Patrick & Tunnicliffe, 2013). These shifts in attitudes and behavior pose a problem. If children are not getting outside, we are potentially relying on formal experiences and media to get them interested in the natural world. Informal science settings play an increasingly important role of providing the public with encounters and experience with wild animals and wild places, which they may not otherwise experience. We need to cultivate the next generation of environmentally minded politicians, conservationists, biologists, ecologists, and a caring and informed- public. How can we accomplish this goal if people are not getting outside?

Animal-associated wildlife centers (AAWCs) provide the public with opportunities to experience wildlife directly and vicariously through outreach programs, on-site tours, volunteer opportunities, demonstrations, and community events. These educational programs and experiences can provide connections to the natural world even in a classroom or a lecture hall.

AAWCs are often small, community involved nonprofits that provide sanctuary to animals and/or rehabilitate and release wild animals (Haas, 1998; Mullineaux, 2014; GFAS, 2017). The field of wildlife rehabilitation, which often includes AAWCs, is rapidly growing with hundreds of wildlife centers around the world rehabilitating and releasing thousands of animals (Dubois, 2000; Pyke, 2017). Wildlife rehabilitation centers combine various fields including natural history, veterinary medicine, animal welfare and environmental education (Dubois, 2000). Although many of these centers are founded with the goal to care for or rehabilitate wild animals, education often becomes a major component of the organization's mission. Thus, wildlife rehabilitation centers have the potential to foster interest in wildlife through public education, generating awareness, empathy, and support for wild animals (Dubois, 2000). Education is "a way to ensure positive, voluntary compliance and positive, voluntary involvement in our conservation mission" (Ardoin & Heimlich, 2013, p. 107). The potential exists for these organizations to provide a variety of opportunities in which to engage the public in wildlife education and nature experiences, and thus should be supported and researched.

Problem Statement

Although education has become a central component of many AAWCs, environmental educators often lack educational training and necessary tools that limit the successfulness of educational programming. Ardoin and Heimlich (2013) evaluated environmental educators and practitioners' perceptions, barriers, and goals of conservation education, and found that these groups often suffer from a lack of money, tools, and resources. Additionally, the results highlighted a lack of training in educational theory, noting that many environmental educators come to their position through unconventional routes without any formal training in education and program design. When providing recommendations that could help support their education

program development, responses included: concrete examples of conservation education programs, positive outreach stories, and “resources for bolstering understanding and dissemination of educational research and instructional methods” (Ardoin & Heimlich, 2013, p. 109). Unfortunately, there is no formal comprehensive resource on effective educational strategies used by AAWCs despite an increasing number of them in on-site educational programs and outreach programs.

Purpose and Research Questions

This applied project examined educational methods used by AAWCs within the United States and created an educational resource for wildlife educators. Information was collected through surveys and interviews with selected wildlife centers to inform these questions:

1. What are the common educational themes and strategies used by AAWCs in the United States?
2. Supplemental Questions:
 - a. What are the perceived benefits of using educational/ambassador animals in educational programs?
 - b. How can empathy be used to teach wildlife conservation?
 - c. How are Next Generation Science Standards or state science standards incorporated into educational programs?
 - d. How do educational programs impact other aspects of an organization?

Information collected from surveys of AAWCs and follow-up interviews with targeted organizations informed the development of an educational resource website (<http://wildlifedresources.com>) that provides easy to model activities to organizations developing or seeking to improve their educational activities. The website displays example

lesson plans from interviewed organizations, which are intended to be adapted and utilized by a range of AAWCs. The website also provides resources for informal science educational strategies and synthesizes common educational themes, theories, and practices used among AAWCs. This paper expounds upon the development of the website and provides justification for the development process.

Literature Review

AAWCs are seldom studied through an educational framework. The current body of research on these organizations mostly focuses specifically on the wildlife rehabilitation process, methods, and impact to conservation (Guy et al., 2013; Mullineaux, 2014; Pyke, 2017; Saran et al., 2011). Scholars have taken interest in the field of rehabilitation and few studies have surveyed the goals and motivations of rehabilitators (Dubois, 2000; Markus & Blackshaw, 1998; Siemer et al., 1991; Siemer & Brown, 1994; Tribe & Brown, 2000). The educational aspects of AAWCs and their potential for impact are often mentioned as a point of reference, but are not the focus of the study (Dubois, 2000; Markus & Blackshaw, 1998; Siemer & Brown, 1994; Tribe & Brown, 2000). Due to lack of research in this context, the following review borrows from well-documented informal science education (ISE) settings to help frame the project. These settings, which include zoos, aquariums, museums, science centers, botanical gardens, and summer camps, possess comparable aspects to AAWCs and provide insight into the potential educational opportunities and strategies. This literature review first reviews the settings, educational strategies, standards, content themes, and practices often encountered in ISEs and then differentiates AAWCs from other ISEs.

Informal Science Education

Rarely does learning occur within a single experience but instead results from a cumulative process, occurring over time and building upon multiple types of experiences. “Learning involves change in knowledge and understanding, capabilities and skills, ways of thinking-values, feelings and attitudes; and/or ways of acting-behaviors” (Krishnamurthi & Rennie, 2003, p.1). The current K-12 education system in the United States focuses on fact-based science and there is little emphasis on big ideas and meaningful understandings (Powell & Anderson, 2002). However, research on science education (see Fenichel & Schweingruber, 2010) shows that true scientific understanding requires much more than a fact-based body of knowledge. Meaningful science education also requires an understanding of nature and processes. Thus, informal education provides opportunities to engage in science nature and processes through personal and exciting experiences that supplement and reinforce learning in school settings. According to Rennie (2014) there are three major misconceptions causing a lack of support in ISE settings:

1. Playing and learning cannot occur at the same time
2. If learning occurs, it must occur in one event/ experience
3. What people learn is predictable and easily measureable

These misconceptions restrict funding and support for informal science settings. For example, field-trips and after-school programs are often the first to be eliminated when schools and educations must endure budget cuts. To help offset this impact, society needs to understand that it is necessity to harness and support a variety of learning experiences (National Research Council, 2009). ISEs can provide opportunities to engage learning by creating experiences that help spark interest in science, make science personally relevant to the learner and create a

positive learning experience (National Research Council, 2009). Rennie and Krishnamurthi (2003) defined ISE as “learning related to science that occurs in informal, out-of-school contexts” (p.1). There is a common misconception that learning takes place mostly in school settings. The average individual spends only nine percent of their life in formal school settings, often learning and building upon their knowledge throughout experiences at museums, zoos, aquariums, science and nature centers, media sources, after-school programs, and even from conversations with friends and family (National Research Council, 2009). ISE settings may take place in a wide range of environments, however there are some fundamental characteristics that apply to all informal science settings. These include engaging participants physically, emotionally and/or mentally; providing direct or vicarious experiences with phenomena of the natural world; exposing the multifaceted dimensions of science, expanding on the learner’s prior knowledge, experience and interests; and providing choice and control in their learning (Fenichelm & Schweingruber, 2010). To better illustrate the ISE learning experience, Fenichelm and Schweingruber (2010) provided the following scenario:

A family returns from a long day at the aquarium where they read interpretive signage about the marine animals they saw, and watched an IMAX film about marine ecosystems. The daughter connected the fish she saw at the aquarium to the fish in her classroom and the son talked about the ocean unit in school that he is learning about. When the family gets home they watch a 60 Minutes program on cage diving with sharks. The son becomes interested and goes online to find out more information. Although these experiences seem trivial they are contributing to the individual's' learning and building upon each other. An experience at the aquarium can make learning real and personal which can spark further exploration and interest in science. These experiences have

impacts on what people come to value and how they interact with the natural world. (p. 166)

The goals of ISE can also provide a platform for effective integration within schools and everyday experiences. According to the National Research Council (2007, 2009), ISE goals overlap and complement those of formal settings as well as personal endeavors and interests are portrayed in strands because “like the strands of a rope, the strands of science proficiency are intertwined” (p.36):

1. Strand 1: Experience excitement, interest and motivation to learn about phenomena in the natural and physical world.
2. Strand 2: Come to generate, understand, remember and use concepts, explanations, arguments, models, and facts related to science.
3. Strand 3: Manipulate, test, explore, predict, question, observe, and make sense of the natural and physical world.
4. Strand 4: Reflect on science as a way of knowing; on processes, concepts, and institutions of science; and on their own process of learning about phenomena.
5. Strand 5: Participate in scientific activities and learning practices with others, using scientific language and tools.
6. Strand 6: Think about themselves as science learners and develop an identity as someone who knows about, uses, and sometimes contributes to science. (2009, p.4)

Every strand makes up an important part of the of informal science learning process. They are interdependent and build upon each other, and they are all important to developing life-long learners and informed citizens. The strands set a high standard for goals and lay out the skills and abilities that informal science centers should strive to build in their participants. Recognition and

awareness of the ISE strands can help informal science centers set high expectations for their participants as well as align their mission and education programs to meet these goals.

Educational Strategies

Although education is becoming a central element of conservation initiatives, commitment to education does not guarantee that education is used effectively (Ardoin & Heimlich, 2013). Educators may apply strategies to educational program development without a true understanding of the process and what should be achieved (Harden et al., 1984). Education is a specialty and it takes expertise and training to know how to set and achieve goals and utilize educational methods. However, when investigating perceptions of conservation educators Ardoin and Heimlich (2013) noted that scientists are often tasked with educational responsibilities without any training in education. One of the participants of their study reported that, “Many scientists think there’s nothing to education and they can be good educators, too—that’s not necessarily true” (p.108). There is sometimes an assumption that if you know something, you can teach it although scientists often struggle to interpret their research and knowledge to a lay audience (NSTA, 2015). A lack of understanding about educational strategies and methods creates missed opportunities to engage the public in meaningful and impactful ways. Educational strategies are used to design effective lessons and units, provide instructional differentiation, and build skills and different types of knowledge (Silver et al., 2007). Approaches need to be directed by the vision of the learner’s outcomes and the thoughtful selection of appropriate methods (Fien et al., 2001). The use of educational strategies and methods within AAWCs can enhance programs and increase participant outcomes. The following sections describe educational strategies commonly used within and support informal science centers.

Experiential Learning

Wurdinger and Carlson (2010) describe experiential learning as a cyclical model of learning in which learners reflect on experiences to gain new knowledge and insights. Gained knowledge and insights are then tested, modified and then applied to different situations. Throughout the four learning cycles participants need to be encouraged to problem solve and use critical thinking. Experiences in which participants need to make decisions and process information to do so will extend engagement and participation with the process. This learning cycle is not only dependent upon the student's experience but it relies upon the reflection of the experience and intentional expansion of ideas (Dewey, 1997). Without reflection and application, an experience may not be processed and the outcomes of the experience may not be understood. It is the teacher's role to create an experience for the students and then facilitate reflection and evaluation through the four learning stages of experience, reflection, generalization and application (Kolb, 1984). Teachers and environmental educators can use experiential learning to achieve a range of learning outcomes in a variety of settings.

Experiential learning can be used within educational programs of AAWCs to elicit a change in attitude towards a particular species. Sporarski et al., (2016) developed an experiential education program to change individual's attitudes and emotions towards coyotes. The program, called Sharing Space: Living with Coyotes, was conducted in Cape Breton Highlands National Park of Canada. Participants progressed through five modules developed for the program that targeted "(a) attitudes towards, (b) fear of, (c) likelihood of, and (d) control over coming into contact with coyotes" (Sporarski et al., 2016, p. 296). Modules focused on personal experiences with coyotes, perceived and actual risk of human-coyote interactions, tracking coyotes with GPS points, backyard coyote attractants and defense against a coyote. After every module,

participants reflected and generalized their learning, then applied their learning to the next module. After completion, the program proved to have significant impacts on participant's attitudes towards coyotes. The pre- and post-questionnaires showed that the program had a positive effect on attitudes towards coyotes, decreased sense of fear, increased sense of control over coming into contact with coyotes and created realistic perceptions about the likelihood of contact. This study displays the potential for experiential education programs to impact affective attitudes and perceptions of wildlife through a variety of instructional practices and continued thought and reflection (Sponarski et al., 2016). Public attitude and perception of wildlife is an important concern for AAWCs, and the implementation of experiential learning programs may help educators foster these affective learnings.

Place-Based Education

Place-based education (PBE) can be used within wildlife centers to engage participants in aspects of their local ecosystems and to spark interest, care and love for the wildlife that they share their home with. Sobel (2004) defined PBE as:

“...the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies and other subjects across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases learning.” (p.6)

Place-based education can be used in any urban or rural place. It does not require a pristine wilderness area to teach science, it could be taught in a city park or even in the school's playground. The purpose of PBE is to connect content to relevant themes and resources available within the community. When used successfully, place-based education has the potential to enhance the health and environment of the community and foster connections between the

student and his or her place (Wurdinger & Carlson, 2010). One of the main components of PBE is to foster a love and appreciation for one's place through the development of connections outside of the classroom.

ISE programs offer diverse learning strategies, including PBE, that engage kinesthetic learners and increase learning motivation. Powers (2004) evaluated four place-based education programs in Vermont that engaged students from local schools with environmental themes and found a particular effectiveness of PBE programs for the learning process of students with special needs and increased levels of student motivation towards their schoolwork and their community. The programs also had positive impacts on teachers who reported that participation in the programs helped them to understand how math and science lessons can be incorporated into everyday life (Powers, 2004). Utilizing PBE principles within wildlife centers has the potential to elicit emotional connections to learning, engage learners in subject matter that is relevant and attainable, as well as foster connections and relationships within the local community.

Active Learning

Wurdinger and Carlson (2010) define active learning as, "The process of having students engage in some activity that forces them to reflect upon ideas and how they are using those ideas. Requiring students to regularly assess their own degree of understanding and skill at handling concepts or problems in a particular discipline" (p.17). There are many types of active learning techniques ranging from low-high participation. Choosing the right active learning technique depends upon an educator's goal, resources, time, and student needs and challenges (New York University, 2017). In order to choose the appropriate practice, an educator need to first possess a

knowledge of active learning techniques that are appropriate for the setting and content of their program.

Active learning supports informal science strands and engages learners by dynamically applying and transferring their learned knowledge while providing reasoning and inquiry opportunities (Feniechel & Schweingruber, 2010). This can be accomplished by engaging the learner in activities which foster them to process information and challenges the student to make generalizations about their learning. The National Research Council (2009) reviewed multiple studies evaluating the effectiveness of field trips and active learning. Studies found that programs with active participation were most effective. Children that engaged in hands-on activities such as handling materials, participating in activities and observing or handling animals, experienced more attitude changes and increased interest compared to children who were involved in passive learning experiences (Feniechel & Schweingruber, 2010). Such active experiences have the potential to make learning meaningful and relevant to one's own life and introduce content in novel ways more likely to cause retention of material than passive learning experiences (Guichard, 1995).

An impressive example of active learning comes from Guichard (1995) who studied the effects that an interactive exhibit had on children's anatomical learning. The exhibit featured a stationary bicycle that students could ride with a large mirror next to it. When the student rode the bike an image of a skeleton riding a bike was imposed into the person's reflection. 96% of the students who engaged with this exhibit were able to draw accurate depictions of joints and bones, whereas only 3% of the control group, who received direct instruction on the content, could draw accurate depictions. 93% of the students who visited the exhibit retained the knowledge that joints extended where the body bends eight months after visiting the exhibit. As

shown in this study, engaging a student physically in their learning can spark interest, make learning exciting and increase retention of knowledge (Guichard, 1995; Feniichel & Schweingruber, 2010). The use of active participation does not have to be as intensive as Guichard's exhibit, but can be as simple as involving student's in their own learning. AAWCs can incorporate active learning techniques into their presentations and programs without much difficulty, by probing participants to think, reflect, and problem solve.

Storytelling

Andrews, et al. (2009) asserted that storytelling is a teaching tool that elicits student's memory and emotions in order to convey material and content. The strategy provides the opportunity for students to create a complex understanding of new material by eliciting children's previous experiences and emotions, making content relatable and impactful to the individual learner (Abrahamson, 1998). It is important for science education to connect content to larger science themes that are relevant within a student's daily life, and storytelling has the ability to accomplish this goal through the use of relatable characters. Teaching science through storytelling can serve three main purposes: to bring factual information to life, to make abstract concepts concrete, and to guide the learner through scientific inquiry (Ellis, 2001). For example, telling a story about how a boy discovered the regeneration ability of cottonwood trees can relate this information in a concrete way. The learners can follow the character through the scientific process, and if the story is told well, the audience will feel as if they are engaged in this discovery too (Ellis, 2001). Storytelling enables students to retain information, gain curiosity, and bring excitement and energy into a formal setting (Horton, 2013). Research has shown that storytelling has the ability to enable retention of information longer than information received through a lecture.

Hadzigerogiou et al., 2011, conducted a study in Greece with 159 preschool students to assess the effectiveness of storytelling to increase student's knowledge about trees and the student's willingness to participate in a tree-planting activity. Two sessions provided students with the same information delivered through different strategies. The researchers used a control group, who received information through didactic instruction and the use of visual aid (pictures of trees), while the test group listened to a story about trees. Pre- and post-tests revealed that both groups showed an increase in knowledge and willingness to participate in a tree-planting activity. However, results showed a statistically significant difference in information retention between the two groups. The storytelling group showed an increased amount of information than the control group when surveyed one and eight weeks after their initial engagement with the content (Hadzigerogiou et al., 2011). Storytelling is a common and effective practice for wildlife centers to use, especially when teaching elementary and preschool children. Storytelling is often used to express the personal history of an AAWC educational animal to help form connections between the animal and a participant's everyday life.

Educational/Ambassador Animals

Science activities that create a positive learning environment and evoke positive emotional responses impact a student's learning and attitude towards science (King et al., 2015). Eliciting emotion, excitement, and wonder is a major characteristic of AAWCs who use ambassador/ educational animals within their programs. The use of ambassador/educational animals within wildlife centers is a debated topic between practitioners, (Dubois, 2000). Some practitioners believe that using wild animals for educational purposes is no different than a zoo and that organizations need to be limited in the amount of non-releasable animals they can care for (Dubois, 2000). However, there are many AAWC educators that use non-releasable or

captive breed wild animals for educational purposes because of the impacts they have on participants. These animals can serve as an “ambassador” for their species, and can help students apply science content to real life. Educational animals can also encourage a positive attitude change towards a species that may be thought of a scary or gross, such as bats, snakes, and wolves.

Whether engaged with wildlife through the rehabilitation process or educational programs, wildlife rehabilitation provides the opportunity for people to directly interact with wild animals which may develop a sense of environmental stewardship for the individual (Tribe & Brown, 2000). The potential for the development of stewardship and affective attitudes within participants supports the use of educational animals as a practice. Morgan & James (1989) studied the impacts that educational snakes, used within an environmental education program, had on an individual’s attitude change towards snakes. The level of involvement with the snake varied between mere exposure, snake is inside an aquarium and is revealed without direct message or action; modeling, snake is handled by educator who is respected or liked; and direct contact, participants have the opportunity to touch the snake. The researchers found that information alone did not produce a significant attitude change. The combination of information, mere exposure, modeling, and direct contact produced the highest attitude change in participants. However, there was no significant difference with or without direct contact. The results indicated that direct contact does not provide significant attitude change without provided information or message (Morgan & James, 1989). This study supports the importance of using multiple instructional practices. Differentiation in educational methods reinforces content, and provides learning experiences that suit all types of learners (Tomlinson, 2000). While one student may be too scared to be near a snake and would benefit more from information and exposure, another

student may not pay attention to an informational presentation but will be intrigued by watching an educator model the snake. Students may also be much more willing to learn about science content, such as adaptations, when they can see adaptations on a live animal right in front of them. When used along with other practices, the use of an educational animal to teach science concepts or attitude change can influence learning and affective outcomes.

Developing Empathy Towards Wildlife

The Seattle Aquarium (2015) defined empathy as "... a simulated emotional state that relies on the ability to perceive, understand, and care about the experiences or perspective of another person or animal" (p.3). Empathy can increase a student's understanding of concepts by eliciting sensitivity and fostering the ability to take different perspectives. McTighe and Wiggins (2012) argue when someone truly understands something, they show empathy and can take different perspectives on the concept applied. Educators are beginning to consider empathy as an important issue to address when targeting attitudes towards wildlife. Stern and Dietz (1994) proposed that people's attitudes and concern for the environment are based on the value they hold for themselves, others, and plants and animals. Educating people on the value of the environment, whether intrinsic or extrinsic, such as ecosystem services, may be the first step in developing an environment concern. An individual most likely will not be concerned for a wild animal or an ecosystem that they find no value in.

Empathy is a strong proponent of people's social and environmental motivations, and perspective taking through imagination is a widely-used technique for developing empathy (Schultz, 2000). When testing the relationship between empathy and an individual's concern for wildlife, Shultz (2000) compared how objective versus empathetic points of view affect environmental concern. Study participants were asked to view images of wildlife being harmed

by people in either an objective view or a perspective taking view. Participants who engaged in a perspective taking view-point had a significantly higher attitude of concern for the animal than the objective participants. Schultz suggested that his findings support how manipulation of perspective-taking produces feelings of empathy and how educators might use perspective taking to increase the concern for the welfare of the environment and wildlife. ISE settings, and especially AAWCs who care for non-releasable wildlife, can use empathy to develop these attitudes in participants. The Seattle Aquarium's (2015) best practices for facilitating empathetic learning in informal science settings recommend the use of framing, modeling, and increasing knowledge, providing experiences, practicing, and activating the imagination. These best practices can provide AAWC educators with the resources to use this strategy to provoke further engagement and understanding of desired outcomes.

Educational Standards and Outcomes

Wildlife centers are often community-based and rely on partnerships with schools to elicit programmatic funding year after year. Outreach programs in school settings, on-site programs, and guided tours to visiting school groups are a large part of AAWC educational programs (Tribe & Brown, 2000). To ensure a continued partnership between wildlife centers and schools, wildlife educators need to meet teachers and administrators' needs by aligning their programs to match curriculum and standards. Kisiel (2005) surveyed and interviewed upper elementary school teachers to identify themes in their motivation and agenda for school field trips. Kisiel found that 90% of teachers identified alignment with the classroom curriculum as a motivation. Similarly, Anderson and Zhang (2003) surveyed 93 teachers in British Columbia and found that 61% identified curriculum connection as a top motivation for choosing an informal science setting for a field trip. Creating classroom alignment with science curriculum

may not be a difficult transition for AAWCs because of the nature of their educational focus on life science concepts.

Public school teachers often follow a curriculum that strictly adheres to meeting state and national standards and teachers may have to prove to administration that their proposed field trip links to state or national standards and curriculum (Fenichel & Schweingruber, 2010). Integration of Next Generation Science Standards (NGSS) or state science standards within AAWC educational programs will help provide alignment with the curriculum taught in classrooms. Alignment of NGSS into educational programs will not only increase teacher motivation for field trips and outreach but can help wildlife educators understand learning expectations of grade levels and advance program outcomes. Unfortunately, there is a lack of best practices and research on the incorporation of standards in informal science settings which makes this process difficult for informal science educators who are unfamiliar with standards. However, the overlap and shared goals between national standards and the strands of informal science education help address this gap. The ISE strands can aptly supplement the strands of science proficiency as well as fill in the gaps which include sparking interest in and positive attitudes for science. AAWCs should not have to be solely responsible for teaching the entirety of a standard, however they can serve as an additional piece of the learning process. Out-of-school science experiences play a large role in an individual's understanding of science and support life-long science learning and interest in science; formal schools and informal settings need to work to create a cohesive and effective relationship (Fenichel & Schweingruber, 2010). This relationship can be fostered through a variety of opportunities provided by AAWCs that focus on a range of science concepts.

Educational Content Themes

ISEs teach a variety of content themes, and although different centers may care for different taxonomic groups, there is often overlap in big ideas. For example, a wolf sanctuary and a raptor rehabilitation center can both teach about ecology, but one uses raptors and the other uses wolves to teach these concepts. Siemer and Brown (1991) surveyed New York wildlife rehabilitators to understand what topics were being taught within their educational programs. The researchers found that 85% of rehabilitators taught about “how to tell if an animal needs help,” 81.5% taught the importance of habitat conservation, 80.9% taught how humans impact wildlife, 70.5% encouraged concern for individual animals, 68.8% taught basic ecology and natural history and 64.2% taught the importance of the natural systems that support wildlife (p.145). Further, Dubois (2000) found that many AAWCs are trying to decrease the numbers of patients they receive by targeting educational topics that help people develop care and concern for wild animals and become aware of the human impacts. These content themes may overlap with NGSS, specifically animal adaptations, ecology and biodiversity (NGSS Core States, 2013). Because of the overlap between standard topics and themes taught at AAWCs, educators can easily meet the needs of teachers to fit the curriculum being taught in a life sciences classroom. It is important for informal science centers to be aware of the learning outcomes from their programs so they can best adjust educational strategies to meet the desired goals of their programs as well as a teacher’s desired outcomes.

A research study in London, Kimble (2013), examined the major learning outcomes from three different informal science centers, including an environmental exportation center, a live animal show, and a natural history museum session with animal specimens. The researchers used

pre- and post-surveys, video data, and post interviews to understand the learning that occurred within the following five domains:

1. knowledge and understanding
2. skills
3. attitudes and values
4. enjoyment, inspiration and creativity,
5. activity behavior and progression

The informal science sessions were chosen because they address different plant and animal species and their habitats and adaptations. The researchers found the most popular learning subdomains from all three sessions were species name, student motivation for learning, description of animal, animal behavior, and what living things need. This study supports the notion that ISE settings have the ability to address these areas of content, unfortunately there is little research focused on learning outcomes and content themes specific to AAWCs.

Animal-Associated Wildlife Centers

Small-scale AAWCs, such as wildlife rehabilitation centers, sanctuaries, and rescues, provide rich opportunities for anyone to engage in active, experiential, and place-based learning. Traditional ISE settings also provide such opportunities; however, the scale, motivational foundation and histories of zoos and wildlife center cans differ dramatically. Wildlife centers' motivations stem from good-intentions and are often community-based organizations that rely heavily on volunteers (Tribe & Brown, 2000). Further, Guy et al., (2013), found that rehabilitation centers surveyed in Australia indicated animal welfare, conservation, and/or ecosystem and biodiversity conservation as primary organizational goals while also noting that none of the organizations indicated economic benefit as a motivation. Similarly, feelings of

moral responsibility, personal fulfillment, empathy for animals, and interest in the environment and conservation were common motivations for wildlife rehabilitators in New York (Siemer & Brown, 1994). Although ISEs and zoos may have similar motivations, their history and societal perception of them are different than AAWCs. Early zoos were originally collections of flora and fauna for the purpose of enjoyment, and the ownership and domestication of wild animals represented power and wealth; however, zoos today are considered a place for recreation, exploration, and education (Patrick & Tunnicliffe, 2013). Zoo and AAWCs are fundamentally different in their intentions and purpose. Most AAWCs fundraise to support their animals and staff, do not view themselves as a recreational facility, and are not built for the purpose of human enjoyment and entertainment.

Although there is a large variety in the specific mission and purpose of AAWCs, many provide on-site and/or off-site educational programs that target conservation and biodiversity themes. The majority of AAWCs have motivations for and provide public education about wildlife (Tribe & Brown, 2000). Educational services include presentations, media, written material and conversations with individuals who drop off an injured animal (Tribe & Brown, 2000). AAWCs provide a wide variety of unique educational opportunities and can utilize the proposed educational strategies and practices to improve the outcomes of their programs. Perhaps the most significant differentiation between AAWCs and traditional ISE settings lies in Tribe and Brown's (2000) following statement:

The greatest benefit from wildlife rehabilitation is likely to come from the educational message they inspire. This may be directly, through community involvement in the care of wild animals, local habitat protection and conservation, and indirectly through

promotion and coverage of wildlife problems and the efforts of wildlife careers to combat them. (p. 82).

Through the incorporation of educational strategies, AAWC's have the potential to engage participants in conservation education and foster an environmentally concerned public. This literature review prompted the creation of an educational resource website for AAWCs and the investigation of educational strategies and themes utilized by AAWC educators.

Project Methodology

Terminology

Initial development began by using the phrase *wildlife sanctuaries and rehabilitation centers* to label informal science education contexts for this project. This phrase came from personal experience working at a wolf sanctuary and an avian rehabilitation center as well as visits to centers that fall within one of these two categories, or both. Mullineax (2014) defined wildlife rehabilitation as “the treatment and temporary care of injured, diseased, and displaced indigenous animals, and the subsequent release of healthy animals to appropriate habitats in the wild” (p. 293). Similarly, wildlife sanctuaries are defined as “an establishment that provides lifetime care for animals that have been abused, injured, abandoned, or are otherwise in need. The animals may come from sources including, but not limited to, private owners, research laboratories, government authorities, the entertainment industry, and zoos” (Global Federation for Animal Sanctuaries, 2017, para. 2). While the definitions of wildlife rehabilitation centers and wildlife sanctuaries are different, neither definition addresses the educational potential, which is a commonality between the two. Further, research on these organizations revealed nuanced differences among mission statements and how individual organizations classified

themselves; e.g., clinics, rehabilitation/rehab centers, rescue groups, sanctuaries, conservation centers, etc.

Even though *wildlife sanctuaries and rehabilitation centers* are each unique and may have different intentions and missions, the two organization types are grouped together in this project for the purpose of education. Regardless of the animal species housed at the organization, both *wildlife sanctuaries and rehabilitation centers* use similar educational strategies to teach conservation, natural history, and human-impacts on wildlife. Combining the organizations for the purpose of further evaluating their educational practices created a benefit of shared resources.

After contacting approximately 208 *wildlife sanctuaries and rehabilitation centers*, two rehabilitation centers spoke out against being classified with wildlife sanctuaries. The organizations' leadership expressed concern for the public confusing the two types of organizations because they believed that *sanctuaries and wildlife rehabilitation centers* are inherently different and should not be associated (V. Tami, personal communication, January 1, 2017; L. Kit, personal communication, February 10, 2017). One of these rehabilitation centers commented that they would refuse to use or share the results of this project if it included sanctuaries. Out of the 61 responses received, only these two rehabilitation centers spoke out against the inclusion of sanctuaries. However, this feedback indicated a potentially significant obstacle to the success of this project, even if a minority opinion, a hypernym, or umbrella term, to describe both organizations needed to be developed.

Three different phrases were explored for the purpose of describing the informal science learning contexts for this project. The first hypernym developed was *conservation centers*. Conversation with organizations and experts on conservation revealed controversy over whether these organizations are contributing to conservation, either through education or rehabilitation.

Thus, the term was eliminated from consideration. Switching to the broader term of *wildlife centers*, the phrase was used during an interview with a raptor rehabilitation center. The organization contact asked for clarification and instead referred *animal-associated wildlife centers* (AAWC) (C. Becky, personal communication, March 15, 2017). The question indicated that *wildlife centers* was too general, and thus required a more specific term. The previous conversation with Becky prompted the switch to AAWCs as a possibly more inclusive phrase. For the purpose of this project, the following definition of AAWCs is posited, “Nonprofit organizations that provide sanctuary to native or exotic animals, rehabilitate and release native wildlife that is injured or orphaned, and/or house non-releasable wildlife for educational purposes.” The scope of this definition may include, but is not limited to, sanctuaries, rehabilitation centers and conservation centers. With an inclusive phrase in place to communicate with organizations, a more complete research process to investigate educational practices began.

Background Research

Initial background research for this project involved identifying AAWCs located in the United States through general web searches. This process required locating a list of licensed rehabilitators or sanctuaries located within each state, which identified hundreds of organizations. The next step involved searching for organization websites and scanning the site for information regarding educational programming. Next, the process required creating a matrix of AAWCs to include type (rehabilitation center, sanctuary, conservation center, etc.), location, species cared for, and educational programs offered. This matrix helped visualize the educational opportunities available within AAWCs and confirm the previous assumption regarding a commonality between *wildlife sanctuaries and rehabilitation centers*. While some AAWCs did

not have educational programs, many provided a large range of expertise and educational professionalism, including guided tours, lectures with educational animals, outdoor classrooms, professional development programs, formal curriculum for teachers, summer camps, and community events. As a result of the background research, the need for a website emerged. The website could help AAWCs looking to create educational programming by providing direct examples of programs from organizations who already use research-based educational foundational frameworks. Further, readily accessible information about these theories and practices as well as easy to follow lesson plans could be archived on the website. Ultimately, the website would primarily serve AAWC educational professionals and/or administrators. However, K12 educators looking to incorporate AAWCs into field activities for students could also benefit from such a resource.

To create such a website, however, more research would be necessary to identify the different lessons, educational strategies, and content themes used by AAWCs. To do this, a survey (Appendix A) was developed to collect general information regarding species, educational activities, content themes, educational volunteers, Next Generation Science Standards (NGSS), published curricula, educational/ambassador animals, practices, educational theories, curriculum sharing, and project interest. The survey was distributed to 208 organizations using Google Forms. To limit the scope of the project and reinforce the AAWC definition, the organizations selected met the following criteria:

1. Nonprofit organization located in the United States
2. Rehabilitates wild animals and/or provides sanctuary to wild and/or exotic animals that cannot survive in the wild
3. Not an affiliated with a zoo or aquarium

4. Currently conducts on-site or outreach educational programs, as indicated on their website

The decision to limit the project to AAWCs located in the United States was based upon keeping the resulting resources geographically and culturally relevant. Because of the distinction in scale, mission and societal perceptions between AAWCs and zoos, I chose to exclude organizations affiliated with zoos or aquariums due to the potential for an affiliated partner organization to influence the role and mission of an AAWC.

The background research survey provided responses that would help both catalog the kinds of educational programming happening at AAWCs as well as a list of AAWCs to contact for a more in-depth interview. Organizations were contacted via email with an invitation to complete the survey with two reminder emails in subsequent weeks. Of the 208 AAWCs contacted, 62 responded to the survey, and 1 organization submitted two responses. This organization was contacted and the response completed by the executive director was kept, the response submitted by a volunteer was deleted. This resulted in 61 responses, which represents a 29% response rate. It is unclear if the response rate is due to AAWCs not receiving the invitation, incorrect contact information or spam filters, or a lack of interest or resources. 2 organizations indicated they did not provide educational programs to the public, which terminated the survey, resulting in 59 legitimate and complete surveys. Among the 59 AAWCs that completed the survey, 5 AAWCs submitted surveys after the selection of interview participants, they were however included in the analysis of survey responses. 39 indicated a willingness to be interviewed for the project website. The general time limitations on this project necessitated reducing this number to 7-8 for initial inclusion on the website. The other

organizations may be contacted in the future as detailed in the Conclusions of this project. The following criteria, based on questions in the survey helped identify which AAWCs to interview:

1. Incorporates standards into some or all educational programs
2. Uses educational strategy/theory to develop some or all educational programs
3. Engages participants in “active learning”

These criteria were based on an assumption that the use of standards, educational theory/strategy, and active learning would satisfy most K12 teacher and/or administrator concerns with incorporating AAWC educational programming into field experiences for learners.

A series of reviews helped narrow the field of AAWCs to interview. The first exclusion removed all organizations that did not indicate alignment with state or national standards in their educational programs, which eliminated 19 AAWCs from consideration. Next, any organizations that did not use educational theories, philosophies and or strategies, as informed by question 10 in the survey was eliminated, which reduced the list by another 3 AAWCs. From the remaining organizations, AAWCs that indicated engaging participants in active learning strategies, as informed by question 9 in the survey were selected. This process resulted in 15 organizations from which contact was prioritized. These AAWCs were divided into three categories based on the amount of active learning programs they offered; 3 or more, 2, or 1. The prioritizing culminated in a list of 9 AAWCs who were interviewed for the project. Only eight of the organizations have been included on the website. One organization was excluded, because they stated during the interview that all their educational animals are solicited from breeders. Although this was not originally part of the project criteria, concerns expressed by other organizations regarding captive-bred wildlife contraindicated the AAWC mission. Due to the variation of opinions regarding breeding animals for education, a threshold of 49% was set,

meaning that the organization did not obtain a majority of their educational animals from breeders.

Interview questions (Appendix B) were developed prior to the survey being sent out. As indicated by the *guiding* and *optional* phrasing, the interview could be altered depending on responses to questions. The goal of the interviews was to collect information about the educational strategies used by AAWCs as well as gather detailed information about one of their educational programs/lessons to be featured on the website. Question phrasing was constructed to elicit a semi-structured conversation with the interviewee. Generally speaking, interviews consisted of nine questions, each with guiding or follow up questions from which I chose to ask depending on the flow of the conversation and the type of AAWC. Most interviews focused on the details of the educational program/lesson that would be displayed in the website. Conversations revealed detailed information about the educational goals, materials needed, age levels, standards used, sequence of events, etc. Detailed notes were taken of each conversation, and interviews were audio recorded with consent from the participant to verify notes and complete missing information. This information was then converted into a simplified lesson plan for viewers to easily read. All interviewees received copies of their lesson plan(s) to verify and modify before posting on the website.

Website Development

The website was developed using WordPress due to the ease of the platform, themes provided, and free hosting. The name Wildlife Education (<http://wildlifedresources.com>) was chosen because it covers a broad range of search terms and reflects the AAWC context. Further, the tag line “Resource for wildlife educators and teachers” is used to help visitors immediately

understand the purpose of the site. The site has five main pages, including the Index/About (configured to be the same page), Educational Strategies, Lesson Plans, and Educational Themes.

Each page serves a specific purpose, and some pages have subpages or “children pages” to provide more detail in an organized manner. The About page describes the purpose and intention of the website and why it was created. This page is also configured to be the index or landing page of the website that loads upon first visit. The Educational Themes page provides an overview of the major findings from the project and displays common educational themes, practices, and strategies gathered from the survey and interview responses. The Lesson Plans page displays a grid, created by the subsection of pages, populated with a list of all the organizations that provided lesson/program plans. Each organization’s subpage contains a summary profile about the AAWC, including type, location, mission, and a quote from the organization’s executive director or education director/coordinator. This page also includes a brief description, key words, and goals/objectives of the organization’s lesson plan/program. Site visitors can download the entire lesson plan as a PDF, if they choose. The Educational Strategies page provides a grid of seven educational strategies, created by a subsection of pages, displaying basic information that includes a definition of the strategy, description of its benefits and uses, an example, best practices if available, and resources for more information. The six strategies included are place-based education, experiential education, incorporation of standards, active-learning, storytelling, ambassador/education animals, and development of empathy. The reasons for focusing on these strategies include:

1. Organizations indicated that they use these strategies either on the survey or during the interview

2. Many organizations claimed they use these strategies, but interviews revealed that some AAWCs do so incorrectly; e.g., some organizations claimed they use experiential education but do not engage participants in reflection or application
3. These strategies can be incorporated into informal science settings, and organizations can enhance learning outcomes of their program/lessons by using them effectively

Providing a menu of educational strategies is intended to help site visitors develop interest in and potentially encourage research and practice in a specific strategy.

Continued Website Development

The website will be shared with all participating AAWCs once final approval of the project is received. Organizations who completed the survey but were not interviewed will also receive the link if they indicated interest in the project. Further, the website will also be shared with wildlife rehabilitation and wildlife sanctuary associations, such as the Global Federation of Animal Sanctuaries, National Wildlife Rehabilitators Association, International Wildlife Rehabilitation Council as well as state sanctuary and rehabilitation organizations and agencies. Future plans including continuing to develop the website by adding more example lesson plans from AAWCs not yet interviewed and expand the menu of educational resources. Providing contact information on the About page also provides an avenue for networking, feedback, and partnerships. In summary, the website in its current state is for project approval purposes, but there are plans to sustain and grow the project in the future.

Findings and Discussion

The purpose of this applied project was twofold; evaluate the ISE opportunities and educational strategies used by AAWCs and create a resource website for wildlife educators. Through surveys of 59 AAWCs and eight interviews with AAWC practitioners, multiple themes

arose to support the argument that AAWCs can have a significant educational impact and should be supported. The following questions guided information gathering necessary to complete this project:

1. What are the common educational themes, theories, and practices used by wildlife centers in the United States?
2. What are the benefits of using educational/ambassador animals in educational programs?
3. How can empathy be used to teach wildlife conservation?
4. How are NGSS or state science standards incorporated into AAWC educational programs?
5. How do AAWC educational programs impact other aspects of an organization?

I discuss the findings related to these questions as well as notable themes that arose, limitations and recommendations for further research.

Educational Components

Educational strategies provide a large framework for engaging in program and lesson planning, because they help facilitators set goals for the program/lesson and determine appropriate practices to use (Silver et al., 2007). Developing programs and lessons from the guidelines of a theory/ strategy requires planning, time, and intention. Question 10 of the survey asked if the organizations incorporated any of the provided theories/philosophies/strategies. A majority of AAWCs, 54.2%, indicated they were *unsure* regarding theory integration while 38.9% indicated they used experiential education, and 32.2% claimed they use place-based education in their programs.

Table 1

Most common educational strategies used at AAWCs

Strategy

Usage Rate

Unsure	54.2%
Experiential education	38.9%
Place-based education	32.2%

These findings indicate that it is common for organizations to say they use educational strategy such as experiential education, but may not follow the practices or even fully comprehend what the theories prescribe. For example, one organization claimed they use experiential education in their live animal demonstration program; however, when asked about the sequence of events during the interview, it was discovered that the program design did not intentionally engage the participants in reflection and application of their learning. Experiential learning is dependent on a notable experience that encourages students to make decisions in novel situations and may require students to apply mental and physical intelligence (Kolb, 1984; Sporarski et al., 2016). As it was explained by the AAWC, their demonstration program does not engage participants in decision making and experimentation with new ideas. Based on the survey and interview responses, experiential and place-based educational are the most commonly used strategies, whether or not they are used correctly is difficult to assess. More importantly is the finding that over 50% of organizations were “unsure” about educational theories/philosophies/strategies, indicating a lack a knowledge in this area.

Live animal demonstrations were one of the most common educational practices used by AAWCs, with more than 70% of organizations surveyed indicating that they engage in this practice. Although observing live animals may be considered active learning by some scholars (Feniechel & Schweingruber, 2010) and practitioners, this practice can quickly turn from active to passive learning depending on the educator and the animal, as well as the structure of the practice once learners move past the initial excitement of a live animal. Interest may wane if the

educator does not engage learners directly with the animal or if the animal does not perform or display behavior that excites the group. Thus, live animal demonstrations must draw upon research-supported educational theories, strategies, or other practices in order to fully engage learners in active learning techniques.

The use of educational/ambassador animals in programming is a strategy used by many of the AAWCs who participated in this project. Integration of this practice ranged from using educational/ambassador animals in all educational programming to not using this practice at all. Survey results of this practice are summarized in Table 2.

Table 2

AAWC usage of educational/ambassador animals

<u>Integration Level</u>	<u>Usage Rate</u>
All programs	22.1%
Some programs	52.5%
No programs	20.3%

The varied responses to this question may be due to the controversy of using wild animals for education. In a survey conducted in British Columbia on goals and motivations of wildlife rehabilitation centers, there were drastic differences in opinions about this practice (Dubois, 2003). A veterinarian interviewed as part of Dubois' (2000) work cautioned that centers with wildlife residents can become "zoos acting under the guise of public education" (p. 50).

Although there is controversy over this practice, the majority of the AAWCs who participated in this project felt that the use of educational animals is pivotal to the educational experience of their program. One organization reported that free flight demonstrations were the most impactful component of their programs because it generates engagement through the raptor's actions. As

explained by one of the educators, “To actually see the raptor, to have their eyes on you, to see their wings and the talons, it really impacts the audience that cannot happen in any other way” (A. Shona, personal communication, March 8, 2017). A raptor center in Colorado demonstrates another aspect of this practice when they use educational birds to develop connections between the audience and the species. The educator at this AAWC feels that the stories of the educational birds have an undeniable impact on people through the development of empathy (G. John, personal communications, March 15, 2017). People may come to develop an empathy for an animal or species after learning how human caused injuries are most often the reason the animal cannot be released back into the wild.

Storytelling emerged as a prominent active learning technique during the interview phase of this project. Five of the educators interviewed indicated using the stories about their educational animals to connect visitors to the animals and bring awareness to the human impacts that have caused them to be non-releasable. Although using animal’s histories presented through stories is a common theme that arose from the interviews, it was highly dissuaded by one rehabilitator. This educator stated that her organization had always used storytelling to convey an animal’s history; however, attending a conference and learning from another AAWC who expressed concern for this strategy highlighted that some learners leave with the wrong message (L. Kit, personal communication, April 6, 2017). More specifically, instead of learners leaving the educational experience thinking positive thoughts about the species, they would instead leave hyper-focused on the negative aspects of the story; i.e., that raptors there are “broken.” The AAWC has now moved away from using what they call *sob stories* and instead emphasizes the amazing adaptations of raptors, attempting to build connections through appreciation. The conversation provided interesting insight into a widely-used practice, which can be incredibly

beneficial to other AAWCs and the growth of their educational programs. Aside from this one negative potential, all the interviewed practitioners who used educational animals commented on the ability for or the animals to captivate and amaze an audience through a rare experience of seeing a wild animal up close. Further, the use of storytelling in conjunction with a picture book to engage younger students is a technique that arose within two of the example lesson plans. One organization combined storytelling with play, art, and nature experiences to engage preschoolers in nature themes topics, such as tracking or birding. Another organization used storytelling to engage younger children with an educational bird. The storybook read was written about the same species of the educational bird, in effect bringing the bird in the story “to life.” The combination of storytelling and the use of an educational bird, whether live or in a book, is a great way to provide engagement and keep the program active by eliciting emotions and memories.

Generally, educators’ use of active learning was evident throughout the interviews. Wildlife educators seem to understand the opportunity of their organization to provide active and hands-on education. One educator expressed how she wants their educational programs to be as active and hand-on as possible because it works best for young children (A. Shona, personal communication, March 8, 2017). This comment reflects a common theme among AAWCs. 86.4% indicated they use specimens and/or touchable objects in their educational programs which can actively engage participants’ senses and experience.

Table 3

AAWC educational practices

<u>Practice</u>	<u>Usage Rate</u>
Specimens and/or touchable objects	86.4%
Live animal demonstrations	76.3%

Injury/research projects	44.1%
Service learning	37.2%
Sign interpretation	35.6%

Content Themes

Seven content themes emerged from this project as most commonly used. These included conservation, wild animals do not make good pets, positive attitude change towards a species, human impacts on the environment, natural history, adaptations and ecology. Conservation education was the most common content theme with 88.8% of the AAWCs indicating that they reinforce the conservation mission in their educational programming. Discussions with the organizations indicated that all content themes include an overarching goal of eliciting conservation messages. Ballantyne et al., (2007) argued that educational programs focusing on affective attitudes towards the environment and increasing participants' awareness may lead to pro-conservation beliefs and actions.

Table 4

AAWC content themes

<u>Theme</u>	<u>Usage Rate</u>
Conservation	89.8%
Wild animals do not make good pets	88.1%
Positive attitude changes towards species of concern	85.4%
Human impacts on the environment	86.4%
Natural history	72.9%
Adaptations	72.9%
Ecology	71.2%

Empathy

The practice of developing empathy within participants is an emerging area of ISE and is still under exploration. Thus, it was not surprising to see empathy development surface as a prominent theme during interviews. Four organizations mentioned fostering participants' empathy for wildlife as a major component of their educational programs. A participating AAWC in Washington claimed that producing empathy for wildlife is an essential aspect of their organization and that this goal can be accomplished through education (A. Shona, personal communication, March 8, 2017). Another AAWC argued that building concern and empathy for wildlife helps conservation efforts (G. John, personal communications, March 15, 2017). These statements are supported by Schultz (2000) who believed that empathy should be used as a practice to encourage pro-environmental behavior. There was a common belief among four of the AAWCs that empathy engaged through education is a preventive measure to their organization's rehabilitation efforts. The logic here implies that encouraging visitors to empathize with a species makes them more aware of the impacts they have on the environment and adopt a heightened concern for the species. "Building empathy, and building awareness and a love of something is the first step in a long chain of education goals to get people to be conservation minded responsible adults" (L. Kit, personal communication, April 6, 2017). These findings support the Seattle Aquarium's (2015) claim that eliciting conservation actions relies on addressing internal motivators which may include "connectedness to nature, environmental identity, emotional affinity with nature, environmental self-efficacy, nature relatedness and empathy" (p. 2). Further, many organizations claimed that eliciting empathy was best done using storytelling, educational animals, sparking interest and appreciation for a species by teaching

about their adaptations and roles in the ecosystem, and making connections between people's daily actions and the impacts they have on these species.

Standards Integration

The guiding question related to standards integration, whether NGSS or state standards, proved to be the most difficult to answer. Incorporating standards into ISE settings is lacking in the literature and did not emerge as a priority for practitioners. The survey responses indicated that 49.2% of AAWC organizations use standards for some or all of their educational programs. Table 4 summarizes the standards integration responses collected during the survey. However, the interviews revealed that most organizations viewed their educational programs as adaptable to a teacher's desired standards rather than developed from standards. Only one of the eight organizations used national standards, because they teach students from New Hampshire and Maine. The remaining AAWCs indicated using state science standards. None of organizations suggested that standards were an integral piece in the development of the programs. One organization stated that they have developed a standards-based curriculum that teachers may request as evidence to administrators for permission to participate in a field experience. This organization also stated that they did not use this curriculum often, but that their typical live animal demonstration can be adapted to meet life science, physics, biology, and math standards as they naturally incorporate those topics.

Table 5

AAWC standards integration

<u>Integration Level</u>	<u>Usage Rate</u>
Yes, for all educational activities	16.9%
Yes, for some educational activities	32.3%
None	37.3%

None, but considering 13.5%

The AAWC interviews revealed a common belief that their educational programs naturally address multiple standards; thus, wildlife educators could easily adapt the programming depending upon teachers' needs. One organization in particular had a relatively lax view about standard incorporation, "We've found that teachers don't really care, to show that you've meet a standard you need to have a quantifiable assessment. We're the cherry on the top of the Sunday, so we're the application piece which definitely brings [the content] home" (K. Sarah, personal communications, March 16, 2017). This comment is an interesting perspective on the suggestion that incorporation of standards in informal science settings and a connection to curriculum will encourage teacher and administration motivation (Anderson & Zhang, 2003; Fenichel & Schweingruber, 2010; Kisiel, 2005) There is also no evidence from the interviews that the use of standards will increase an educator's awareness of how to teach science proficiency and age appropriate content levels, however I did not address this specifically in the interview and one can assume that increased knowledge of scientific standards won't hinder these understandings.

Educational Programming Impact

Although the question of how an AAWC's educational programming impacts other aspects of the organization was not addressed in the survey, the interviews revealed information regarding this topic. Organization leadership expressed strong opinions that their educational programs had a significant impact on other aspects of their organization. Funding was the most heavily reported influence within the AAWCs. Four organizations emphasized the large role that program fees provide for their budget, and one AAWC indicated that educational programs account for 30% of their funding (C. Becky, personal communication, March 15, 2017). Only one organization mentioned applying for grants in order to provide free eco-therapy programs for

visitors (O. Toni, personal communication, March, 7, 2017). Additionally, one executive director declared that private donors make up a large amount of their funding, and the donors provide funding because they value the organization's educational programs (G. John, personal communications, March 15, 2017). Funding from educational programs is a direct and prominent impact that many AAWCs rely heavily on to support their organization. Although funding is major reason for engaging in education, educational programs have other notable impacts that may be indirect or longer-term.

Other organizational aspects impacted by educational programming included volunteer recruitment and the ability to receive grants. One organization stated that "education is instrumental in getting grants" (S. Stephen, personal communication, March 29, 2017). Another AAWC suggested that educational programs involving community partnerships with schools has a significant impact on receiving grants (C. Becky, personal communication, March 15, 2017). Two organizations interviewed claimed that education as a prevention of human impact on wildlife is an important influence of their programs, by contributing to the care of the environment that they believed their education programs targeted. These suggestions conjure indirect and possibly longer-term impacts of AAWCs educational programs. Although these indirect connections are difficult to capture and quantify, they are nevertheless important to attend.

Notable Findings

Contributions to Conservation

The contribution of AAWCs, and specifically wildlife rehabilitation centers, towards conservation efforts is an argumentative topic. It should be noted that the direct contribution of wildlife rehabilitation centers to conservation through rehabilitation is outside the scope of this

project. However, the issue emerged both during the planning of this project as well as in reviewing the literature. Specific research on the impacts of AAWC's conservation impacts through education is scarce in the literature. Due to the wide variance of species cared for as well as rehabilitation and release methods, most impacts; which are often seen as limited, small scale, or ineffective; are often dismissed as *feel good* measures (Saran et al., 2011). However, some scholars interested in this field have noted the value in AAWCs' educational programming as a potential to contribute to conservation (Tribe & Brown, 2000; Mullineaux, 2014; Saran et al., 2011; Dubois, 2003). This debate prompted discussion with AAWCs interviewed regarding their perceptions of how, or if, their organization contributes to conservation. Responses were unanimous in supporting the claim that their impacts to conservation were largely reliant on the educational programs. "We're not trying to affect populations through rehabilitation, we're making connections and helping people get an emotional connection to environment through stories" (C. Becky, personal communication, March 15, 2017). Responses also indicated an emphasis on the power of building connections between people and the environment as a whole through the understanding that humans have impacts on wild animals and rehabilitation centers try to offset those impacts one individual animal at a time.

Multiple AAWCs expressed a passion for the impact that education can have in small but effective aspects of a person's life. These impacts may include behaviors such as voting and placing a bat or bird house in yards. One organization cautioned how ignorance plays a role in the destruction of the environment and further claimed that if people are unaware of ecological concepts and dynamics then they do not realize how they are impacting them. Thus education and awareness is the first step to solving this problem within the public. "We are looking at a long-term approach to educate the children of today who are the adults of tomorrow" (O. Toni,

personal communication, March, 7, 2017). Further, organizations often commented on the importance of their efforts to change public attitudes, perspectives, and appreciation towards wildlife; and in doing so, getting them to care. Some of the AAWCs spoke with an undeniable confidence that changing people's affective attitudes through education is worthwhile and an effective way to encourage people to think and act through a pro-conservation mindset.

Educational Resource Website

Organizations were asked in the survey to indicate if an educational resource website synthesizing common educational themes and practices of AAWCs would be helpful. It should be noted that while not explicitly stated, providing educational resources on strategies as well as example lesson and program plans emerged as a distinct need to support wildlife educators. Survey responses showed that that 54.2% of AAWCs said that such a resource might be helpful, 42.4% said that such a resource would be helpful, and 3.4% said that such a resource would not be helpful. During the interviews, AAWCs were asked to make recommendations for the website, specifically indicating what details or information would be most useful for them. Some organizations recommended providing information about grants/funding and information about program evaluation and assessment; however, these requests are outside the scope of this project. A few of the organizations commented on the usefulness of example lesson and program plans. An education coordinator from a raptor center said that a resource like this could assist organizations with sharing information and seeing what other AAWCs are doing (S. Stephen, personal communication, March 29, 2017). He noted that one of the challenges of rehabilitation and/or sanctuary work is that they are incredibly busy and do not have the time to make connections with other organizations. Another organization commented further on this challenge, stating that it is helpful to learn what other educators are teaching, how they are teaching, and the

power of sharing ideas with each other (A. Shona, personal communication, March 8, 2017).

Some organizations also asked about continuing to develop and sustain the website.

Additionally, two of the AAWCs expressed concerns about actively updating the website or the risk of becoming outdated as best practices change and new research becomes available (C.

Becky, personal communication, March 15, 2017; L. Kit, personal communication, February 10, 2017).

Limitations

The chief limitation to this project involved a dearth of research and literature regarding AAWCs and specifically their educational programs. Foundational literature relied largely on analogous ISE settings to support claims and assumptions. However, the distinct differences of AAWCs, as previously noted, provide a wide range of educational opportunities and practices ripe for investigation.

The interview process for this project revealed further limitations with respect to how organizations were selected for inclusion on the website. Initial criteria did not consider the source of an AAWC's educational animals. While interviewing a wolf conservation center in New York, it was discovered that the facility receives all their ambassador wolves from wolf breeders, which means they do not qualify as a sanctuary. Further, this is a controversial topic within AAWCs especially because the breeding of educational animals is largely what separates zoos from AAWCs. Organization websites served as the primary resource consulted to identify AAWCs and determine if they met the project's criteria. Unfortunately, most organizations did not indicate the source of their animals. Reflecting on this dilemma, the survey should have requested this information.

Another limitation involves the nature of this project. This paper and the affiliated website represent an applied project rather than a research project. Thus, concrete conclusions cannot be drawn regarding quantifiable significance in the findings or summaries of responses. Interpretations of and assumptions from available literature as well as perceptions of practitioners serve as the primary resource for this project.

Lastly, the information collected for the example lesson plans also has limitations. All detail was gathered from publicly available websites, the completed survey, and interviews. Thus, these sources are largely self-reported, which makes it difficult to assess or evaluate truthfulness or accuracy. Additionally, the lesson plans are provided from and credited to the organizations who developed them. The lessons themselves have not been vetted for alignment with a particular educational strategy. These limitations highlight the need for further investigation as well contingencies for further research.

Recommendations

AAWCs exist all over the United States and the field is rapidly expanding (Pyke, 2017; Dubois, 2003), but there is currently a gap in the research of these organizations and their educational programs. To my knowledge, there is no research on wildlife sanctuaries and investigation on the perceptions and impacts of sanctuaries could further evaluate the contested attitude towards them that were observed in this project.

Based upon the results of this applied project, AAWCs exhibit potential with respect to providing outstanding educational opportunities and thus deserve support and research. Three major aspects of AAWCs' educational programs demonstrate future areas for research; impacts and learning outcomes, assessment methods, and educational strategies used. Research in these fields can help support partnerships between formal and informal science and provide practices

for AAWC integration into formal curriculum. These recommendations should not be misconstrued to imply that AAWCs need to place an emphasis on developing formal education partnerships and curriculum. Rather, supporting the educational programming development at AAWCs represents cultivating more free-choice learning experiences that provide tangible and real experiences to supplement formal education. Additionally, developing best practices for the use of educational/ambassador animals could help organizations use this practice more effectively, potentially mitigating the negative effects of transitioning into a passive learning activity. Further research into the specific practice of using live animals in education within AAWCs could be integral to advancing learning outcomes and positive attitude change. Lastly, this project demonstrates a need to better focus on age appropriateness of AAWC educational programs. Attempts to classify the lesson plans provided on the website revealed a distinct lack of programs and lessons targeting secondary education learners. Generally speaking, lessons were either geared towards adults, all ages, or for elementary and early childhood learners. AAWC lessons built for secondary students with an emphasis on connecting to standards and curriculum could be beneficial to students and informal and formal educators.

Conclusion

The public plays a large role in conservation, their values affect their everyday decisions, their votes, and organizational funding. Supporting an eco- literate population that can make informed decisions and act as stewards to the environment must be a part of conservation efforts. AAWCs have the potential to help target these efforts as they generally have three similarities; they work towards larger conservation goals, they are small-scale or community based nonprofits, and their intentions stem from an empathy towards animals. Throughout the process of implementing this project, notable findings appeared in the literature as well as valuable

insights from interviews and surveys with AAWC organizations. The influence that AAWCs can provide on their community and conservation education is substantial and should be utilized. Through the sharing and adaptation of successful lesson plans and the utilization of educational animals, storytelling, development of empathy, place-based education, experiential education, and the incorporation of standards, AAWC education programs can enhance their impact on students, participants, and the environment.

The intention of this project was to provide educational resources to educators who work within AAWCs. Thus, the *Wildlife Education* website, <http://wildlifedresources.com/>, has been implemented, displaying resources and information about educational strategies that fit the needs and potentials of AAWCs. The website also provides examples of educational lessons/programs provided by participating organizations and a summary of commonly used educational strategies and themes. Environmental educators often do not have formal training or expertise in education, and concrete examples provide valuable resources for engaging in program development (Ardoin & Heimlich, 2013). It becomes imperative then to help share knowledge of educational theory to provide guidelines for instructional practices and goals (Collins & O'Brien, 2011). This project illustrates that many wildlife educators could greatly benefit from the successful incorporation of strategies and standards and as well as the sharing of ideas and lesson/program plans directly related to AAWCs. While this project does not address formal professional development for wildlife educators, it does provide initial resources to help achieve the overarching goal. All participating organizations expressed positive opinions about the resource website and felt it will become a valuable resource.

Although this project was built with the intention to provide resources for AAWCs educators, it can also help inspire a larger conversation about AAWCs and their educational

impacts. The background research identified 215 organizations in the United States, but there are likely many more both in the U.S. and around the world. Educational opportunities at *AAWCs* are readily accessible, and teachers, educational leaders, and the public should consider how to best take advantage of them, engaging in educational programming, volunteer opportunities, and conservation actions. Individuals engage in science education throughout their entire lives and through in a variety of settings. Participation with *AAWCs* is a great way to inspire an interest in science, engage in community and place-based learning, and develop a love for and appreciation towards wildlife.

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Appendix A

Animal-Associated Wildlife Center Education Survey

1. Does your organization/program participate in educational activities available to the public?

Educational activities include annual school/classroom visits, self-guided on-site tours, guided on-site tours, private tours and/or regularly scheduled on- or off-site activities.

- Yes
- No

2. What type of animal(s) does your organization/program rehabilitate or provide sanctuary for?

(Check all that apply)

- Bears
- Big cats (Exotic)
- Big cats (Native)
- Birds of Prey
- Coyotes
- Deer
- Elk / Caribou
- Foxes
- Large exotic mammals
- Marine mammals
- Moose
- Opossums
- Porcupines
- Primates

- Raccoons
- Reptiles
- Sea turtles
- Skunks
- Water Fowl
- Wolves or wolf hybrids

2(a). If you work with other species not listed above or would like to explain your response(s), please do so here.

3. What type(s) of educational activities does your organization/program provide? (Check all that apply) *

- On site public tours (guided or self guided)
- On site presentations
- On site private tours
- Camps (day or overnight)
- Museum/exhibits
- Outreach programs
- Public events
- Classes, courses or workshops for the public
- Teacher and/or professional development
- Nature tours/walks (guided or self guided)
- Other:

4. What content themes do your educational activities target? (Check all that apply) *

- Ecology

- Conservation
- Natural History
- Adaptations
- Human impact on environment / species of concern
- Sustainability
- Global climate change
- Scientific process/ circle
- Animal track and sign
- Geology
- Positive attitude change towards species of concern
- Stewardship
- Animal husbandry
- Wild animals do not make good pets
- Other:

5. Does your organization/program offer long-term volunteer positions or internships in the educational activities? *

Please do not consider operational maintenance or animal husbandry responsibilities.

- Yes
- No

6. Do your educational activities incorporate Next Generation Science Standards, state science standards, or another set of recognized standards? *

- Yes, for all educational activities
- Yes, for some educational activities

- No
- No, but we are considering it

7. Does your organization/program utilize Project Wet, Project WILD and/or Project Learning Tree curricula? *

- Yes, for all educational activities
- Yes, for some educational activities
- No
- No, but we are considering it

7(a). If your organization/program utilizes a published curriculum that was not mention above, or you would like to explain your response(s), please do so here.

8. Does your organization/program use ambassador animals for educational activities? *

- Yes, for all educational activities
- Yes, for some educational activities
- No
- No, but we are considering it

9. Which of the following practices does your organization/program incorporate within your educational activities? (Check all that apply) *

- Live animal presentations/ demonstrations
- Participant interaction with animal(s)
- Use of specimens and/or touchable objects
- Sign interpretation
- Inquiry/research projects

- Citizen Science
- Service learning
- Other:

10. Does your organization/program incorporate any of the educational theories/philosophies/strategies listed? (Check all that apply) *

- Experiential education
- Place-based education
- Constructivism
- Free-choice learning
- Unsure
- Other:

11. Please explain one or two of your most common or popular educational activities.

12. Has your organization/program developed formal curriculum and/or lesson plans that are available for individuals outside of your organization to use? *

- Yes
- No
- No, but we are considering it

12(a). If you answered yes or are considering making your activities publicly available, please describe how the materials are made available and if they are directed towards other wildlife centers, classroom/homeschool teachers, and/or the general public.

13. Would a website that synthesizes common educational themes and practices of wildlife sanctuaries and rehabilitation centers in the United States be of use to you? *

- Yes

- No
- Maybe

13(a). If so, would you like to be contacted about the website when it is available? Please enter your email address below. Your email address will not be shared, and you will only be contacted once when the website is launched.

14. We will be using this survey to help identify exemplary organizations/programs to highlight on the planned wildlife sanctuaries and rehabilitation education website. Please enter the name of our organization and contact information below if you would you be interested in being interviewed to build a profile about your organization/program.

Appendix B

Interview Questions

Interview questions may be altered in response to survey results. Interview will be conducted in an informational, conversational manner, which may change the direction and themes of the interview questions.

1. Please describe the mission and vision of your organization.
2. Tell me about how your organization approaches educational activities.
 - a. Follow-up/guiding: How much time is spent on planning activities? Who is involved in planning and delivery of activities? Do your activities align with your organization's mission statement? How do you promote your educational activities? What plans do you have for activities in the future (maintain, expand, scale back)?
3. Tell me about how your activities differ based on location (on-site/outreach).
 - a. Follow-up/guiding: How did these programs develop? How many students do you teach a year through these programs? What age levels do you commonly interact with? What areas of content do these programs focus on? What areas of practice do these programs utilize? What are your learning goals for these programs? What do you want students to come away with? Please tell me about the importance of educating students about ____ ?
4. Tell me about how your organization uses human-wildlife encounters in education.
 - a. Follow-up/guiding: What kind of ambassador animals do you use and what determines which animals you use and/or when to use them? Where did your ambassador animals come from? How did they end up as ambassadors? To what extent do participants interact with the animals? (Exposure, modeling, direct contact) Do you think encounters with ambassador animal's impacts participants? How?

5. How do you measure success in your educational programs?
6. Tell me how you approach educational theory or philosophy in your activities.
7. What are challenges that your organization faces in educational activities?
8. How do your educational activities impact other aspects of your organization? (Funding, volunteer recruitment, grants, etc.)
9. [optional] How and/or when do you seek advice/guidance from or partner with other educational programs/organizations?
10. How could my website be useful to your organization? (Information, resources, links, examples, etc.) Do we have permission to list your profile and a link to your organization on the website?