Improvements to Wildlife-Oriented Boy Scout Merit Badges

An Honors Thesis (HONR 499)

By

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Abstract

The Boy Scouts of America (BSA) is a wonderful organization for boys to get experiences in life or fields of study that they may not otherwise have throughout their schooling or home life. One means that the BSA uses to teach scouts is through merit badges. These can cover a wide variety of subjects, but my main focus is on the badges within my field of study, wildlife biology. I reviewed the requirements for each badge and discussed potential changes that could improve their quality. This was accomplished through a series of steps within the reviewing process. I looked at completion time, necessary education level, and relevance of information for each merit badge. The requirements may have parts changed or requirements may be added to the badge to improve their content. The field of wildlife biology covers nine of the 132 obtainable merit badges. My thesis covers five of these nine: Plant Science, Mammal Study, Bird Study, Reptile and Amphibian Study, and Fish and Wildlife Management. The number of changes for each badge varies from almost every requirement needing a change to none at all. Many of the changes are small, this can make a big difference in the way a scout learns from the badge. The goal for this thesis is to send it to the BSA and that they consider these proposed changes and implement them into their merit badges.

Process Analysis

The inspiration for the topic of this essay stems from my passion for wildlife and the environment and my past experience with the Boy Scouts of America (BSA). The manner that I went about researching simply started with me reading through the various badges that I would be analyzing online. They are available on the BSA’s website to the public. The changes that I propose don’t come from any resource, but rather from my own knowledge of the subjects that I learned at Ball State University mixed with my experience as a former scout. This also required me to understand how the BSA went about creating or omitting merit badges from their system. I came to find out that they do make changes periodically to their badges, while also removing or adding badges. This is all based on the how often scouts take the badges and their interest in the topics. Many of the changes that are made in the badges come from the publics recommendations that are sent to them, which gave a sort of relevance to this thesis since this was my ultimate goal. I gained more from writing this thesis that I had originally thought I would. It allowed me to reflect on what I had learned thus far in my major and apply it in a way that never occurred to me before. Writing the thesis also gave me great insight into the process of writing a proper thesis and the challenges that are involved.
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Introduction

The Boy Scouts of America (BSA) was established in the United States in 1910, adopted from the original movement in the United Kingdom in 1907 (History 2017). Along with it came the merit badge system, a series of educational “courses” designed to give youth in depth knowledge of subjects that they might have an interest in (Boy Scouts of America 2017a). These can vary in topics from community service, aquatic, shooting, nature, and many more. When scouting started in America there were only 14 merit badges. A year later that number increased to 57 and since then number of badges has changed from year to year. This is due to the addition of new badges, the consolidation of subjects into one badge, the separation of subject into different badges, or the removal of a badge from the program. Today a scout has an opportunity to earn 137 different merit badges. To become an Eagle Scout (highest earnable rank), one must complete a total of 27 merit badges; 13 of which are part of the mandatory list (Henning, 2016).

The process by which a Boy Scout receives a merit badge is relatively simple. Each badge has a set of requirements that must be completed by the Boy Scout. This can either be done by completing them on their own or with the aid of a merit badge counselor (Boy Scouts of America 2017a). If it is done on their own, they must provide to a counselor documentation that they have completed the work using means that are suitable for those requirements (pictures, presentation of knowledge, etc.). The merit badge counselor is generally trained in that particular field or has been trained in a class where they can be certified to become a counselor (Boy Scouts of America 2017b). The number of requirements for each badge varies, but most are around ten. A scout may also complete a portion of the badge and wait to complete the rest later. In this case, they will be given a partial completion card that indicates what requirements they have completed. They may compete the badge at any time up until the scout turns the age of eighteen (Boy Scouts of America 2017b).

The purpose of this thesis is to evaluate the merit badges that would fall under the wildlife or nature type categories and to critically analyze them. I hope to use my knowledge as a wildlife biologist and an Eagle Scout to evaluate and give suggestions about how they could be improved for a better educational experience for Boy Scouts interested in these merit badges.

Methods

Each merit badge is evaluated with a series of steps. I will review each merit badge requirement to gain an understanding of the overall goals for the merit badge. Then, I will assess the difficulty for each of the requirements. This will be assessed based on the time it should take to complete and the level of education or background knowledge necessary. If needed the requirements can be adjusted to the appropriate level of difficulty, which includes a moderate to beginner level of knowledge of the subject up to a high school level of education. I will also assess the relevance and correctness of the requirements to the merit badge based on whether the
requirement or parts of it fit within the subject of the badge. Requirements or parts may be omitted, altered, or moved to another badge that is more suitable. Then, I will look at the overall badge to see if there is the potential to add a requirement(s) to the badge to improve its content. Lastly, I will look across the different badges for continuity of the level of the requirements and effort to complete.

**Results and Discussion**

The field of wildlife biology encompasses many topics including those that involves plants, animals, and the management of both. As was previously mentioned, there are 132 obtainable merit badges within the Boy Scouts of America organization (Boy Scouts of America, 2017a). Of these merit badges, nine fit within the topic of wildlife biology: Plant Science, Mammal Study, Bird Study, Reptile and Amphibian Study, Fishing, Fish and Wildlife Management, Insect Study, Forestry, and Nature.

In my thesis, I reviewed five of these merit badges: Plant Science, Mammal Study, Bird Study, Reptile and Amphibian Study, and Fish and Wildlife Management. Of these, one badge needed a complete rework for most of the requirements, which included additions, rewordings, and removals of parts of the requirements. Three other merit badges needed a moderate to low amount of improvements to their requirements, which included additions to requirements, rewordings of requirements, and complete reworking other requirements. One of the badges didn’t need any modification and is fine the way it is. Through this review process I also created two new merit badges.

**Plant Science**

This merit badge teaches the introductory topics of botany. It seems the main goal for this badge is to allow the scout to understand how interconnected plants are to their surrounding environment and how important they are to people and the environment. However, in doing so some parts seem highly specific or unrelated to original topic. Through the process of assessing the badge I found the potential for two additions to requirements to increase difficulty, five rewording of requirements to improve clarity or adjust difficulty, and three removals of all or parts of requirements to adjust difficulty or for overall quality of the badge. Each requirement is listed directly from the merit badge handbooks provided on the BSA website (Boy Scouts of America 2016a).

1. Make a drawing and identify five or more parts of a flowering plant. Tell what each part does.

The purpose of this requirement is not clear. Therefore, it is difficult to say what should be changed. The main questions I considered when looking at this requirement was the importance of each part. Botany is much more than just flowering plants, so why not include all types? Also, knowing the anatomy of a plant, there are many parts that are
important that could simply be ignored. It seems that what the scout identifies to complete the requirement could leave them lacking knowledge of some of the more important aspects of plant anatomy. If flowering plants wants to be the focus of requirement, then maybe a new requirement should be added that discusses the differences flowering and non-flowering plants. Along with this, the difference between male and female parts should be stressed in identifying parts.

2. Explain photosynthesis and tell why this process is important. Tell at least five ways that humans depend on plants.

The first part of this requirement is fine; it is the second portion that bothers me slightly. The dependency of humans on plants is a good topic, but it seems unrelated to the topic of photosynthesis. I would suggest making a separate requirement for this portion with the addition of making the scout identifying five or more things in their life that are made using plants, but only two of them can be food related. This would allow them to relate the dependency to their everyday lives. For the photosynthesis portion, continuing the requirement with a part about what the root system provides the plant will help give an overall picture of how a plant operates.

3. Explain how honeybees and other pollinating insects are important to plant life.

The only problem I have with this requirement is that it is extremely focused on insects only. There are other types of pollinators other than insects, although insects do make up the majority. It would not make the requirement much more difficult to discuss all of them (i.e. birds, bats, etc.). So, I would recommend just rewording it to include the other groups besides insects.

4. Explain how water, light, air, temperature, and pests affect plants. Describe the nature and function of soil and explain its importance. Tell about texture, structure, and composition of fertile soil. Tell how soil may be improved.

Much of the first portion is fine, but I would recommend including disease in as well since they would also be an important inhibiting factor like pests. The remainder of the requirement deals with soil. While I agree that soil is extremely important for plants, this seems potentially overloaded. This part doesn’t seem like it can be done by the scout alone without a lot of background research. Meaning that most of this requirement will be dependent on the presence of a counselor. If this is the goal, then the requirement is fine as it is. If not, then I think the best solution would be to just leave in the first sentence regarding soil and omit the rest.

5. Tell how to propagate plants by seeds, roots, cuttings, tubers, and grafting. Grow a plant by ONE of these methods

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The only issue I have with this requirement is the last sentence. It says to grow a plant, but what does it mean by grow. One could get a plant to germinate from a seed just by watering it for a week. In this case, it would not mean much and does not seem like much of a challenge. I would recommend adding that the plant grow and be maintained for a certain amount of time.

6. List by common name at least 10 native plants and 10 cultivated plants that grow near your home. List five invasive, nonnative plants in your area and tell how they may be harmful. Tell how the spread of invasive plants may be avoided or controlled in ways that are not damaging to humans, wildlife, and the environment.

   Overall, I think that this requirement is very good, but I will be discussing the invasive portion when I continue with requirements 7 and 8.

7. Name and tell about careers in agronomy, horticulture, and botany. Write a paragraph about a career in one of these fields that interests you.

   The concept of this requirement is fine; however, I would recommend changing the wording to just a field in botany. This requirement should not restrict them to just these three fields. These could be listed as examples after the sentence, but not in the main body of the requirement.

8. Portions about agronomy, horticulture, and field botany.

   I will not be stating these requirements in full because they are very long and I am recommending that they be omitted. Requirement 8 takes these three fields and gives them as options to be completed, each with their own set of requirements. Not only does this expand the badge much further than it needs to be, but it also makes it unattractive to take for a scout. Instead of such a long, tedious approach to showcasing the various fields of botany, I would suggest creating new merit badges and leaving the plant science merit badge as a pre-requisite to taking the others. I feel like the field of botany goes highly underrepresented in scouting. I have created two merit badges that could represent field botany: Invasive Plants and Woody Plants. Agronomy and horticulture can also have new badges created from the options, but I am not familiar enough in these fields to create the merit badges necessary. The following list of requirements are how I feel the new Plant Science merit badge should look after my suggested changes.

**Recommended Revisions to Plant Science**

The following are the proposed edited and revised requirements for the Plant Science merit badge. These should be new language used by the BSA for the Plant Sciences Badge.

1. Make a drawing and identify five or more parts of a flowering plant. Distinguish male and female parts/flowers and tell what each part does.
2. Explain photosynthesis and tell why this process is important. Explain how roots aid in allowing plants to transport nutrients and water. Name at least five everyday items that you use that are made from plants.

3. Identify five different pollinating organisms and explain why they are important to plant life.

4. Explain how water, light, air, temperature, pests, and diseases affect plants. Identify the important aspects of soil that influence plant growth. Tell how these parts can be improved to allow for better plant growth.

5. Tell how to propagate plants by seeds, roots, cutting, tubers, and grafting. Grow and maintain a plant for at least two months by one of these methods.

6. List by common name at least ten native plants and ten cultivated plants that grow near your home. Distinguish how they may be alike and how they are different.

7. Name and tell about a career in the various fields of botany (including but not limited to agronomy, horticulture, field botany, etc.). Write a paragraph about a career in one of these fields that interests you.

New Field Botany Merit Badges

The creation of the new merit badges was a means of refining the original Plant Science merit badge. The last requirement for this badge had scouts choose a topic between agriculture, horticulture, or field botany and complete a set of requirements. I felt that this approach was much too difficult and made the badge unappealing for a scout to take. Thus, the two proposed badges here are to expand the field of botany in the scouting program. I chose these two topics, Invasive Plants and Woody Plants, to represent field botany because of their importance to the subject. Invasive plant control is a very important aspect to managing wildlife habitat and I feel that the scouts learning about this may help in educating the not only them but also the general public about the danger these plants pose to the environment. The reason I chose woody plants over any other grouping of plants is that these tend to be the largest and easiest to learn plants in the environment. They also are a group that tend to persist throughout the year, so they can be observed and taught at any point.

Invasive Plants

1. Identify what defines a plant as being considered invasive. Explain what the term naturalized means for a nonnative plant.

2. Identify at least 3 ways that invasive plans are introduced to a new area.

3. Explain at least 3 ways that invasive plants are removed/controlled. Explain the potential impacts these methods might have on the environment.
4. Collect and identify 5 invasive plants in your area. Tell the range of the United States that each of these plants are found and where they are native to.

5. Participate in at least 6 hours of service for an organization working to remove invasive plants from their or others property.

6. Explain how invasive plants impact human life (positive or negative). Name ways that the community can help to remove invasive plants from their area.

7. Write a plan for invasive species removal including where, size of area, species being targeted, method of removal, cost, hours of work, estimated time of completion, etc.

Woody Plants

1. Define the parts of a woody plant make it fit into that category.

2. Collect and correctly identify at least 10 native leaves or twigs of trees and at least 5 leaves or twigs of bushes, brambles, or vines.

3. Distinguish the various types of growing patterns that woody plants exhibit (compound vs. simple, alternate vs. opposite, etc.) Tell the differences between deciduous vs. coniferous woody plants.

4. Show that you know how to use a tree key or guide to correctly identify 5 woody plants.

5. Look up and present a career that tends to or manages woody plants in some way. Present what you would need to get a job in this field.

6. Identify at least 4 diseases or pests that fatally impact trees in your area.

7. Make your own key to distinguish at least 5 similar species (i.e. Ashes, maples, oaks, etc.) You may not use a published key for assistance.

Mammal Study

The mammal study merit badge is meant to help the scouts understand the unique qualities of the mammal group. This badge seems to have a lot of focus on evolution of the group and observing animals. However, the badge is quite short compared to many other badges. Through the process of evaluating this merit badge I found that there needed to be four additions, one to an existing requirement to increase difficulty and three were the addition of new requirements to improve the quality of the badge. There were also two rewording of requirements to increase difficulty and for clarity of the requirement. One requirement was changed completely because I found it not to be effective in its goals. All requirements listed are taken directly from the merit badge handbooks provided on the BSA website (Boy Scouts of America 2014b).

1. Explain the meaning of “animal,” “invertebrate,” “vertebrate,” and “mammal.” Name three characteristics that distinguish mammals from all other animals.
I think this requirement is fine as it is. The unique qualities of the mammal group are very important for people to understand in order to learn more about them.

2. Explain how the animal kingdom is classified. Explain where mammals fit in the classification of animals. Classify three mammals from phylum through species.

I also think that this requirement is well done. Understanding the system that is used to classify animals will help scouts understand where they diverge from other groups. I will suggest that putting in something about evolutionary history may help improve it. Showing the concept of ancestry might help them understand how diversity within the group has arisen.

3. Do ONE of the following:
   
a. Spend three hours in each of two different kinds of natural habitats or at different elevations. List the different mammal species and individual members that you identified by sight or sign. Tell why all mammals do not live in the same kind of habitat.

b. Spend three hours on each of five days on at least a 25-acre area (about the size of 3.5 football fields). List the mammal species you identified by sight or sign.

c. From study and reading, write a simple life history of one nongame mammal that lives in your area. Tell how this mammal lived before its habitat was affected in any way by humans. Tell how it reproduces, what it eats, and its natural habitat. Describe its dependency upon plants and other animals (including humans), and how they depend upon it. Tell how it is helpful or harmful to humankind.

The option aspect of this requirement suits it well, but the first two options seem very similar and not all that difficult. Depending on where one is, they could only see maybe two mammals in that time period each time they go out, which seems unbeneificial to them. I like the report theme of option C though, so one way to fix this requirement would be to make a theme out of each of the options. So, option A could focus on habitat use and niches. Telling about how the animals uses it niche and compare that to other mammals in the same area. Option B could focus on population dynamics and movement. So, the scout could report on how many live in a certain area, whether they live in groups, how much they interact with each other, whether they stay in the same area, have territories, etc. Then option C would remain relatively the same with a focus on reproduction, diet, range of distribution, and other basic information about the mammal.

4. Do ONE of the following:
   
a. Under the guidance of a nature center or natural history museum, make two study skins of rats or mice. Tell the uses of study skins and mounted specimens respectively.
b. Take good pictures of two kinds of mammals in the wild. Record the date(s), time of day, weather conditions, approximate distance from the animal, habitat conditions, and any other factors you feel may have influenced the animal's activity and behavior.

c. Write a life history of a native game mammal that lives in your area, covering the points outlined in requirement 3c. List sources for this information.

d. Make and bait a tracking pit. Report what mammals and other animals came to the bait.

e. Visit a natural history museum. Report on how specimens are prepared and cataloged. Explain the purposes of museums.

f. Write a report of 500 words on a book about mammal species.

g. Trace two possible food chains of carnivorous mammals from soil through four stages to the mammal.

This requirement has a lot of options, and many of them are very good. With so many of them, I feel like there are a lot of lost opportunities for them to learn some important things about mammals, so I would suggest increasing the "one of the following" option to two or three.

5. Working with your counselor, select and carry out one project that will influence the numbers of one or more mammals.

I also like the idea of having opportunities for the scouts to do some service projects. However, I do not like the idea of restricting them to only working with the counselor, so I would include the ability to work with a university or organization that has the same goals in mind.

**Recommended Revisions to Mammal Study**

The following is a rewritten version of the merit badge with my suggestions. As I stated previously, this badge is quite short when compared to other badges, so I added onto this list requirements 6, 7, and 8 to improve the overall quality of the merit badge.

1. Explain the meaning of "animal," "invertebrate," "vertebrate," and "mammal." Name three characteristics that distinguish mammals from all other animals.

2. Explain how the animal kingdom is classified. Explain where mammals fit in the classification of animals and how they diverged from their ancestors. Classify three mammals from phylum through species.

3. Do ONE of the following:

a. Through study and reading, write a brief report on a nongame mammal in your area. Include in this report what habitat this mammal occupies, the range it lives in, and its niche. Compare this to an animal that occupies a similar niche and describe how they are different
and/or similar. Describe how this mammal is being affected positively and negatively by humans.

b. Through study and reading, write a brief report on a nongame mammal in your area. Include in this report the population dynamics and movement of the mammal. Describe how it may interact with other animals in its area. Tell how the population or movement of this mammal is being negatively impacted by human activity.

c. Through study and reading, write a brief report on a nongame mammal in your area. Include in this report the reproduction, diet, and a simple life history of the mammal. Tell whether this mammal is being adversely affected by human activities.

4. Do THREE of the following:

a. Under the guidance of a nature center or natural history museum, make two study skins of rats or mice. Tell the uses of study skins and mounted specimens respectively.

b. Take good pictures of two kinds of mammals in the wild. Record the date(s), time of day, weather conditions, approximate distance from the animal, habitat conditions, and any other factors you feel may have influenced the animal’s activity and behavior.

c. Write a life history of a native game mammal that lives in your area, covering the points outlined in requirement 3c. List sources for this information.

d. Make and bait a tracking pit. Report what mammals and other animals came to the bait.

e. Visit a natural history museum. Report on how specimens are prepared and cataloged. Explain the purposes of museums.

f. Write a report of 500 words on a book about mammal species.

g. Trace two possible food chains of carnivorous mammals from soil through four stages to the mammal.

5. Working with your counselor, university, or other organization, select and carry out one project that will influence the numbers of one or more mammals.

6. What distinguishing characteristics separate the main three groups of mammals (Marsupials, Monotremes, and Eutherians).

7. Visit and talk to a mammal rehabilitation facility or individual certified as a rehabber. Find out what certifications you need to care for mammals. Find out how they get their funding. Find out how they care for their particular mammals or other animals they may care for.

8. Research and present potential careers involving mammals (vet, research, zoo, etc.) Write a brief report about a career that interests you in this field.

Bird Study
The bird study merit badge has a heavy emphasis on recreational birding and stresses the importance of knowing what birds look like as well as their calls. Most of the badge is well written, but some of the requirements fall a little short in their potential material. Through evaluating this merit badge, I found the potential for one addition to a requirement to increase its difficulty, two rewording of requirements for clarity, and one requirement was completely replaced to add better content in its place that covers an aspect of bird study that is not covered in the rest of the badge. All requirements listed are taken directly from the merit badge handbooks provided on the BSA website (Boy Scouts of America 2013).

1. Explain the need for bird study and why birds are useful indicators of the quality of the environment.
   
   This requirement is fine as it is, but I would like to add a small bit about bird impact on human life. This would connect the study of birds to an aspect that impacts humans.

2. Show that you are familiar with the terms used to describe birds by sketching or tracing a perched bird and then labeling 15 different parts of the bird. Sketch or trace an extended wing and label six types of wing feathers.
   
   This requirement emphasizes the importance of bird anatomy and structure of the wing. I have no recommendations for changes to this requirement.

3. Demonstrate that you know how to properly use and care for binoculars.
   a. Explain what the specification numbers on the binoculars mean.
   b. Show how to adjust the eyepiece and how to focus for proper viewing.
   c. Show how to properly care for and clean the lenses.

   This requirement targets one of the important aspects of recreational birding that was mentioned previously. Binoculars are an essential tool to study birds in the wild. I would leave this requirement as it is.

4. Demonstrate that you know how to use a bird field guide. Show your counselor that you are able to understand a range map by locating in the book and pointing out the wintering range, the breeding range, and/or the year-round range of one species of each of the following types of birds:
   a. Seabird
   b. Plover
   c. Falcon or hawk
   d. Warbler or vireo
   e. Heron or egret
f. Sparrow

g. Nonnative bird (introduced to North America from a foreign country since 1800)

This requirement also focuses on an important part of birding, the field guide. It also touches on some of the many groups of birds that occur in North America. Although this is not an exhaustive list, it does get the main objective across, so I would not change anything in this requirement.

5. Observe and be able to identify at least 20 species of wild birds. Prepare a field notebook, making a separate entry for each species, and record the following information from your field observations and other references.

a. Note the date and time.

b. Note the location and habitat

c. Describe the bird’s main feeding habitat and list two types of food that the bird is likely to eat.

d. Note whether the bird is a migrant or a summer, winter, or year-round resident of your area.

This requirement enacts what was learned from the previous two requirements. One issue I have with this requirement is the need for the scout to record the feeding habit of the bird. Unless the bird is eating a bird feeder, I think it would be difficult to know what the bird eats in the wild without doing some research afterward. I would change part C into a report that is entered in the notebook after doing the field observations.

6. Explain the function of a bird’s song. Be able to identify five of the 20 species in your field notebook by song or call alone. For each of these five species, enter a description of the song or call, and note the behavior of the bird making the sound. Note why you think the bird was making the call or song that you heard.

I also think this a good skill to learn when birding, but the scout may have to learn the songs and calls before they go out to make field observations. Also, the reasoning for songs and calls is more information that they may need to learn, so they can make more accurate predictions when observing. The scouts will either need to do some research before going out or they will need assistance from a counselor when in the field.

7. Do ONE of the following:

a. Go on a field trip with a local club or with others who are knowledgeable about birds in your area.

i. Keep a list or fill out a checklist of all the birds your group observed during the field trip.

ii. Tell your counselor which birds your group saw and why some species were common and some were present in small numbers.
iii. Tell your counselor what makes the area you visited good for finding birds.

b. By using a public library, the Internet, or contacting the National Audubon Society, find the name and location of the Christmas Bird Count nearest your home and obtain the results of a recent count.
   i. Explain what kinds of information are collected during the annual event.
   ii. Tell your counselor which species are most common, and explain why these birds are abundant.
   iii. Tell your counselor which species are uncommon, and explain why these were present in small numbers. If the number of birds of these species is decreasing, explain why, and what, if anything, could be done to reverse their decline.

This is also a good requirement to either allow the scouts to get field experience in observing birds in the field or the help them learn how populations can change over time. It also stresses the differences in abundance of certain species opposed to others.

8. Do ONE of the following. For the option you choose, describe what birds you hope to attract, and why.
   a. Build a bird feeder and put it in an appropriate place in your yard or another location.
   b. Build a birdbath and put it in an appropriate place.
   c. Build a backyard sanctuary for birds by planting trees and shrubs for food and cover.

This requirement is fine as it is, although it is quite simple and does not really flow with the rest of the badge. I would rather see a requirement focused around hunting of game birds. It should focus on identifying which birds are considered game, when they can be hunted, and how one gets a license to hunt them.

Recommended Revisions to Bird Study

The majority of this badge has good content for presenting the important aspects of birding and the study of birds. The changes I propose deal with the minor aspects of the badge that may make the badge more appealing for a scout to take. The following are my proposed rewritten requirements for the Bird Study merit badge. These new requirements should be used in place of the current requirements to enhance the quality of the badge.

1. Explain the need for bird study and why birds are useful indicators of the quality of the environment. List some ways that humans and birds impact each other either positively or negatively.

2. Show that you are familiar with the terms used to describe birds by sketching or tracing a perched bird and then labeling 15 different parts of the bird. Sketch or trace an extended wing and label six types of wing feathers.
3. Demonstrate that you know how to properly use and care for binoculars.
   a. Explain what the specification numbers on the binoculars mean.
   b. Show how to adjust the eyepiece and how to focus for proper viewing.
   c. Show how to properly care for and clean the lenses.

4. Demonstrate that you know how to use a bird field guide. Show your counselor that you are able to understand a range map by locating in the book and pointing out the wintering range, the breeding range, and/or the year-round range of one species of each of the following types of birds:
   a. Seabird
   b. Plover
   c. Falcon or hawk
   d. Warbler or vireo
   e. Heron or egret
   f. Sparrow
   g. Nonnative bird (introduced to North America from a foreign country since 1800)

5. Observe and be able to identify at least 20 species of wild birds. Prepare a field notebook, making a separate entry for each species, and record the following information from your field observations and other references.
   a. Note the date and time.
   b. Note the location and habitat
   c. Describe what you think the bird’s main feeding habitat is and list two types of food that the bird is likely to eat.
   d. Note whether the bird is a migrant or a summer, winter, or year-round resident of your area.

6. Explain the function of a bird’s song. Be able to identify five of the 20 species in your field notebook by song or call alone. For each of these five species, enter a description of the song or call, and note the behavior of the bird making the sound. Discuss with your counselor why you think the bird was making the call or song that you heard.

7. Do ONE of the following:
   a. Go on a field trip with a local club or with others who are knowledgeable about birds in your area.
      i. Keep a list or fill out a checklist of all the birds your group observed during the field trip.
ii. Tell your counselor which birds your group saw and why some species were common and some were present in small numbers.

iii. Tell your counselor what makes the area you visited good for finding birds.

b. By using a public library, the Internet, or contacting the National Audobon Society, find the name and location of the Christmas Bird Count nearest your home and obtain the results of a recent count.

i. Explain what kinds of information are collected during the annual event.

ii. Tell your counselor which species are most common, and explain why these birds are abundant.

iii. Tell your counselor which species are uncommon, and explain why these were present in small numbers. If the number of birds of these species is decreasing, explain why, and what, if anything, could be done to reverse their decline.

8. Identify at least three game birds. For one of the birds you identify, write a brief report about when they can be hunted, how one hunts them, and what requirements need to be met in order to hunt them.

Reptile and Amphibian Study

The primary purpose of this badge is to introduce the main concepts involved with learning about reptiles and amphibians, or in more proper terms, herpetology. When reading through each of the requirement for this merit badge, I found it difficult to find anything wrong. So instead of listing each requirement and discussing them, I will simply state that the entire merit badge is fine as it is. The detail that many of the requirements for this badge has should be an example for how other wildlife badges should be presented. All requirements listed are taken directly from the merit badge handbooks provided on the BSA website (Boy Scouts of America 2016b).

1. Describe the identifying characteristics of six species of reptiles and four species of amphibians found in the United States. For any four of these, make sketches from your own observations or take photographs. Show markings, color patterns, or other characteristics that are important in the identification of each of the four species. Discuss the habits and habitats of all 10 species.

2. Discuss with your merit badge counselor the approximate number of species and general geographic distribution of reptiles and amphibians in the United States. Prepare a list of the most common species found in your local area or state.

3. Describe the main differences between:
   a. Amphibians and reptiles
   b. Alligators and crocodiles
c. Toads and frogs
d. Salamanders and lizards
e. Snakes and lizards

4. Explain how reptiles and amphibians are an important component of the natural environment. List four species that are officially protected by the federal government or by the state you live in, and tell why each is protected. List three species of reptiles and three species of amphibians found in your local area that are not protected. Discuss the food habits of all 10 species.

5. Describe how reptiles and amphibians reproduce.

6. From observation, describe how snakes move forward. Describe the functions of the muscles, ribs, and belly plates.

7. Describe in detail six venomous snakes and the one venomous lizard found in the United States. Describe their habits and geographic range. Tell what you should do in case of a bite by a venomous species.

8. Do ONE of the following:
   a. Maintain one or more reptiles or amphibians for at least a month. Record food accepted, eating methods, changes in coloration, shedding of skins, and general habits; or keep the eggs of a reptile from the time of laying until hatching; or keep the eggs of an amphibian from the time of laying until their transformation into tadpoles (frogs) or larvae (salamanders).
   b. Choose a reptile or amphibian that you can observe at a local zoo, aquarium, nature center, or other such exhibit (such as your classroom or school). Study the specimen weekly for a period of three months. At each visit, sketch the specimen in its captive habitat and note any changes in its coloration, shedding of skins, and general habits and behavior. Find out, either from information you locate on your own or by talking to the caretaker, what this species eats and what are its native habitat and home range, preferred climate, average life expectancy, and natural predators. Also identify any human-caused threats to its population and any laws that protect the species and its habitat. After the observation period, share what you have learned with your counselor.

9. Do TWO of the following:
   a. Identify at night three kinds of toads or frogs by their voices. Imitate the song of each for your counselor. Stalk each with a flashlight and discover how each sings and from where.
   b. Identify by sight eight species of reptiles or amphibians.
   c. Using visual aids, give a brief talk to a small group on three different reptiles and amphibians.
10. Tell five superstitions or false beliefs about reptiles and amphibians and give a correct 
explanation for each. Give seven examples of unusual behavior or other true facts about 
reptiles and amphibians.

**Fish and Wildlife Management**

The Fish and Wildlife Management merit badge is meant to teach the scouts about the many 
things that these kinds of managers must do to care for an area. I like how it incorporates small 
parts from the many fish and wildlife oriented badges. However, there are some things that I 
would like to see in this merit badge to improve it. Through evaluating this merit badge, I found 
the potential for two additions to requirements to increase the difficulty and get the scout more 
involved in their community. There was also three rewording of requirements to improve the 
difficulty or improve the clarity of the requirement for the scout to understand what they need to 
do to complete it. All requirements listed have been taken directly from the merit badge 
handbook provided on the BSA website (Boy Scouts of America 2014a).

1. Describe the meaning and purposes of fish and wildlife conservation and management.

   The requirement itself is fine as it is, but I would like to add a small part to it that may 
   help scouts understand more about management. I would like the scouts to describe the 
differences between conservation, preservation, and management. Each of these are 
slightly different and impact the goals that one has when taking care of an area.

2. List and discuss at least three major problems that continue to threaten your state's fish and 
   wildlife resources.

   I think the main points of this requirement are fine as they are, but I feel that one could 
   still easily name five problems opposed to just three. The requirement says "at least", but 
   increasing the minimum should make them think more about the problems that face their 
   state.

3. Describe some practical ways in which everyone can help with the fish and wildlife 
   conservation effort.

   Again, the content of this requirement is fine, but I would like to add to it. Since the 
   scouts discuss how people can help with the conservation effort, a small volunteering 
   requirement should be added so they might implement the things that they talk about. 
   This could also be in the form of a project that they create with their counselor.

4. List and describe five major fish and wildlife management practices used by managers in 
   your state.

   I think that this requirement is fine as it is. This may require the scouts to talk to a fish 
   and wildlife manager, or to look up what is being done. Finding out the practices being
done will help them understand more about the issues in their state and how they are being battled.

5. Do ONE of the following:
   
a. Construct, erect, and check regularly at least two artificial nest boxes (wood duck, bluebird, squirrel, etc.) and keep written records for one nesting season.

b. Construct, erect, and check regularly bird feeders and keep written records of the kinds of birds visiting the feeders.

c. Design and implement a backyard wildlife habitat improvement project and report the results.

d. Design and construct a wildlife blind near a game trail, water hole, salt lick, bird feeder, or birdbath and take good photographs or make sketches from the blind of any combination of 10 wild birds, mammals, reptiles, or amphibians.

   Although these options seem somewhat similar, they do each offer a slight difference in how the scout looks at the wildlife they are observing. Also, it is possible that some individuals may already have the bird feeders or boxes available, so requiring them to build new ones seems a little excessive. Aside from these small observations I made about the requirement, it is acceptable the way it is.

6. Do ONE of the following:
   
a. Observe and record 25 species of wildlife. Your list may include mammals, birds, reptiles, amphibians, and fish. Write down when and where each animal was seen.

b. List the wildlife species in your state that are classified as endangered, threatened, exotic, game species, fur-bearers, or migratory game birds.

c. Start a scrapbook of North American wildlife. Insert markers to divide the book into separate parts for mammals, birds, reptiles, amphibians, and fish. Collect articles on such subjects as life histories, habitat, behavior, and feeding habits on all of the five categories and place them in your notebook accordingly. Articles and pictures may be taken from newspapers or science, nature, and outdoor magazines, or from other sources including the Internet (with your parent’s permission). Enter at least five articles on mammals, five on birds, five on reptiles, five on amphibians, and five on fish. Put each animal on a separate sheet in alphabetical order. Include pictures whenever possible.

   Each of the options given in this requirement are very good. Option A, I would like to add that they observe them in at least three different environments, so they get a good variety of wildlife. The concept in option B is good to teach the different categories that
managers fit wildlife into. Option C, although quite verbose, is also good to teach them about the many aspects of wildlife that biologists must take into account when managing them.

7. Do ONE of the following:

a. Determine the age of five species of fish from scale samples or identify various age classes of one species in a lake and report the results.

b. Conduct a creel census on a small lake to estimate catch per unit effort.

c. Examine the stomach contents of three fish and record the findings. It is not necessary to catch any fish for this option. You may visit a cleaning station set up for fishermen or find another, similar alternative.

d. Make a freshwater aquarium. Include at least four species of native plants and four species of animal life, such as whirligig beetles, freshwater shrimp, tadpoles, water snails, and golden shiners. After 60 days of observation, discuss with your counselor the life cycles, food chains, and management needs you have recognized. After completing requirement 7d to your counselor's satisfaction, with your counselor's assistance, check local laws to determine what you should do with the specimens you have collected.

I understand why this requirement exists within this badge, since fish are somewhat unrecognized throughout the rest of the badge, but it does seem quite involved in some parts that would require a lot of assistance from a counselor or expert. Therefore, the scout may not get the hands-on experience that they could have with fish. There is the potential for the scouts to do some netting or field guide identifying that would be a bit more hands-on while also teaching them about different groups of fish in their area. If this were to replace two of the current options, I would get rid of B and C since those would require the most help to accomplish.

8. Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about three different kinds of work done by fish and wildlife managers. Find out the education and training requirements for each position.

This requirement is similar to the career finding requirements found in other merit badges, but since the career is already implied in the badge itself, it shortens and makes it more detailed about the different kinds of managers. The requirement is fine as it is.

_Recommended Revisions to Fish and Wildlife Management_

The badge altogether is well done, but I would like to see some content about learning some of the laws that managers must consider when they are doing their jobs, such as the Endangered Species Act. Learning some of the laws may also help the scouts understand why
these laws were created and their overall purpose for the wildlife they impact. The addition of
this content may be put within another requirement or stand alone as a new requirement. The
following is a restated version of the requirements implementing my suggestions.

1. Describe the meaning and purposes of fish and wildlife conservation and management.
   Describe the differences between conservation, preservation, and management and the goals
   each strives to achieve.

2. List and discuss at least five major problems that continue to threaten your state’s fish and
   wildlife resources.

3. Describe some practical ways in which everyone can help with the fish and wildlife
   conservation effort. With a counselor or other qualified organization, carry out a project that
   improves a fish and wildlife resource.

4. List and describe five major fish and wildlife management practices used by managers in
   your state.

5. Do ONE of the following:
   a. Construct, erect, and check regularly at least two artificial nest boxes (wood duck, bluebird,
      squirrel, etc.) and keep written records for one nesting season (Unless they are already
      owned).
   b. Construct, erect, and check regularly bird feeders and keep written records of the kinds of
      birds visiting the feeders (Unless they are already owned).
   c. Design and implement a backyard wildlife habitat improvement project and report the
      results.
   d. Design and construct a wildlife blind near a game trail, water hole, salt lick, bird feeder, or
      birdbath and take good photographs or make sketches from the blind of any combination of
      10 wild birds, mammals, reptiles, or amphibians.

6. Do ONE of the following:
   a. Observe and record 25 species of wildlife. Your list may include mammals, birds, reptiles,
      amphibians, and fish. Write down when and where each animal was seen.
   b. List the wildlife species in your state that are classified as endangered, threatened, exotic,
      game species, fur-bearers, or migratory game birds.
   c. Start a scrapbook of North American wildlife. Insert markers to divide the book into
      separate parts for mammals, birds, reptiles, amphibians, and fish. Collect articles on such
      subjects as life histories, habitat, behavior, and feeding habits on all of the five categories
      and place them in your notebook accordingly. Articles and pictures may be taken from

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newspapers or science, nature, and outdoor magazines, or from other sources including the
Internet (with your parent’s permission). Enter at least five articles on mammals, five on
birds, five on reptiles, five on amphibians, and five on fish. Put each animal on a separate
sheet in alphabetical order. Include pictures whenever possible.

7. Do ONE of the following:

a. Determine the age of five species of fish from scale samples or identify various age classes
of one species in a lake and report the results.

b. Conduct a creel census on a small lake to estimate catch per unit effort or use a fish net and
estimate the number of species you think is in the lake.

c. Catch and identify at least ten species of fish in a lake near you using a field guide and
determine its age using scale rings.

d. Make a freshwater aquarium. Include at least four species of native plants and four species
of animal life, such as whirligig beetles, freshwater shrimp, tadpoles, water snails, and
golden shiners. After 60 days of observation, discuss with your counselor the life cycles,
food chains, and management needs you have recognized. After completing requirement 7d
to your counselor’s satisfaction, with your counselor’s assistance, check local laws to
determine what you should do with the specimens you have collected.

8. Using resources found at the library and in periodicals, books, and the Internet (with your
parent’s permission), learn about three different kinds of work done by fish and wildlife
managers. Find out the education and training requirements for each position.

Conclusion

This thesis covered the improvements I envisioned within the Boy Scout merit badges
oriented in the field of wildlife biology. The reason that I felt the interest and need to do this is
linked to my knowledge as an Eagle Scout and my degree in wildlife biology and conservation.
The Boy Scouts of America emphasizes the need for scouts, when they leave scouting as a youth,
to give back in some way in the future to continue the organization. I feel like this thesis is one
way that I can give back to the program that taught me so much growing up. The goal for this
thesis is to provide the Boy Scouts of America with improved badges to further improve the
merit badge system for future scouts.

The field of wildlife biology is well represented in the Boy Scouts. Since the creation of
the Boy Scouts of America, merit badges have been created and revised to accommodate the new
knowledge gained in each field of study. Even though the badges are regularly looked at for
revisions, there is always room for improvement. Although the amount of change for each badge
is different, subtle differences can result in a new perspective for the scout working on the badge.
From completing these badges, scouts could gain an interest in the field and may one day become future wildlife biologists.
Work Cited


