

An Analysis of Human Perceptions of the American Black Bear

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Abstract

The American black bear (*Ursus americanus*) is known to be a very adaptable mammal. Historically black bear populations were distributed across most of North America. The early 1900s had no restrictions on hunting or managing black bears, eventually extirpating them from many U.S. states. By 1972 black bears were a protected animal in many areas, resulting in population and distribution growth. At the same time, human populations have been increasing steadily over the past few decades. As both populations grow and land becomes more limited, humans and black bears are required to live in closer proximity than before. Sightings are now being reported in states that have not had bears for decades and an increasing number of incident reports are reported to local agencies across North America. Human perception surveys about black bears help convey whether they are accepted by society, if they are considered a nuisance, and whether local wildlife agencies need to create a better management plan. In this project human perception studies from Tennessee and Florida were evaluated to see which factors influence local perception of black bears. Data sets were provided by the Tennessee Wildlife Resources Agency (TWRA) and the Florida Fish and Wildlife Conservation Commission (FWC). Chi-square tests were run to see which responses were significant. The results suggest that most individuals are supportive of both bears themselves and the agencies managing them. As both populations and incidents continue to increase, it will become important for local agencies to have good management plans in place to prepare for such occurrences. Results from this study can help determine how residents feel toward bears and how management plans can be structured across North America.

Introduction

With the rise of human population and urbanization, stresses are constantly being put on resources and habitable land to be used for residential purposes. Limited land space, due to population growth, makes housing human beings harder than ever before. Urban sprawl, or the unregulated development of urban areas, is a large contributing factor of the stress being put on wildlife habitats. Previously uninhabited and often wild land is destroyed in order to construct buildings, expand city limits and create space for recreational past-times of human beings. While expanding “human territory” is beneficial to our society, it is detrimental to other residents of the

land and the wildlife that lives there. Not only is it limiting habitable lands for wildlife, it is likely to cause increased human interactions. Increased wild life and human interactions may involve factors relating to loss of habitat such as lack of food in a given area or food that is not in close proximity to animals, requiring them to travel more for their food (if they did not already).

Black bears in particular are known for wandering into residential areas in search of food, which is normally caused by low food availability in the forests that they reside in. While deforestation has an aid in low food availability, there may be additional factors such as less rain or lower temperatures which may stunt a crops growth that season. Even in cases where food is available, residential areas have an abundance of garbage around them that wild animals are often attracted to, regardless of natural food availability. This alone can almost guarantee that humans and forestland animals will encounter each other at some point. As human populations continue to rise, certain wildlife populations are beginning to rise as well. American black bears (*Ursus americanus*) are an example of such wild populations increasing throughout North America.

Although black bears have been present in some communities for quite some time, growth of black bear populations would require more shared space for humans and bears. Smaller individual ranges may be adapted over time, but it is likely that increased human/black bear interactions will occur as competition for available food and range develop as well. With this expanded overlapping range of shared land between bears and humans, not all communities are used to living among black bears. Something that was never a thought before for families may become a new concern as black bear distribution shifts as a result of growing populations. A portion of individuals already have clear opinions of living among black bears, but this will become more important to know as state agencies determine what to do about black bear management.

Human perceptions of black bears may change or be formulated based on forthcoming interactions as black bears move into areas they have not inhabited previously. Is there any significance in the way that humans feel based on the amount of interaction they have had previously with black bears and is knowledge a factor in how humans are developing opinions of black bears? If this is the case, black bear management will be increasingly important, especially in areas that have not seen this animal in decades. Understanding the reasons behind human

perception of bears in areas with established and establishing bear regions will aid wildlife management agencies in the future in developing management plans for black bears if and when their distribution shifts into a new area. Wildlife agencies will be able to evaluate public opinion on bears and the reasons behind them to determine how to set up their own management programs.

Literature Review

Black Bear Identification

The American black bear is the smallest of the three types of bear species found in America and are specifically located throughout North America. Their fur ranges from black, brown, blonde and occasionally white. They are most distinguishable by their size and the shape of their shoulders and ears, which are key ways of determining whether a bear is a black bear or a brown bear (*Ursus arctos*). Smaller in size, males typically range between 125-500 pounds, though some black bears on record have been larger, while females are smaller than males (Rogers, 1992). Adult black bears are typically between 50 to 80 inches from nose to tail. The North American black bear is now being spotted in areas that they have not lived in for decades and some places where they have never been located previously. Knowing the difference between species of bears is beneficial to humans when such interactions already occur and may be increasing as bear populations continue to increase.

Black Bear Distribution

The American black bear is believed to have been on earth for five million years, based on genetic evidence (bear.org). There is sufficient evidence of black bears from three million years ago based on fossil records (bear.org) as well, meaning that black bears are known to have existed during the Pliocene Epoch (Unger et al., 2013). Black bears are widely adaptable mammals and generalist species, which is likely a factor of their survival through the Pliocene Epoch and into the current Holocene, out-living some other bear species of that Period such as the Giant Short-faced bear and other mammals of that time.

It is also believed that black bears have been in existence longer than some of the other common bear species today; brown bears and polar bears, based on fossil and genetic records (McLellan & Reiner 1994). Tentative phylogenetic trees (Figure 1) have been created to map out the species ancestry of the Subfamily Ursinae, tracing approximately when each bear species evolved. Of the different species around still today, black bears appear to be the most adaptable, therefore having the largest distribution.

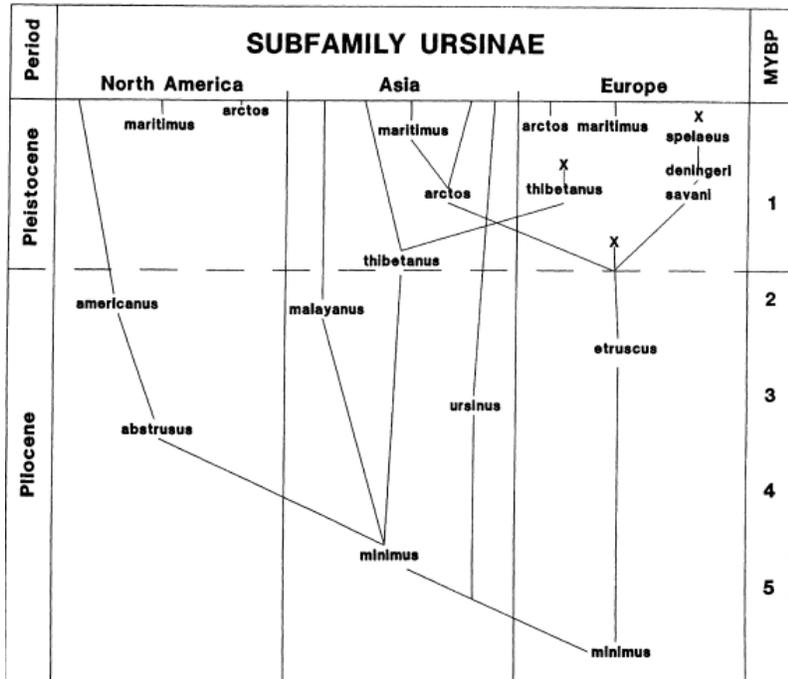


Figure 1. Tentative Phylogenetic tree created by McLellan and Reiner to follow evolution of all bear species.

Black bear distributions vary greatly today compared with how they once were historically. Prior to the 19th century, black bear distribution covered an expansive amount of North America (Figure 2). They were located almost entirely throughout Canada, most of the United States and Northern parts of Mexico (Scheick and McCown 2014). Black bears were able to have such a wide distribution due to their adaptability, omnivorous lifestyle and mobility, which allowed them to inhabit a variety of habitats ranging from swamps to sub-tropics and boreal forests to parts of the tundra (Scheick and McCown 2014) including multiple different forest types (Fecske, Barry, Precht, Quigley, Bittner & Webster. 2002).



Figure 2. Historical range of the American Black Bear prior to large extirpation across North America (www.bear.org).

Once humans began settling in North America, black bear populations began to be targeted, eventually being extirpated from most of their historical range. Extirpation of the bears were largely caused by habitat loss and hunting (Garshelis, Crider, & van Manen 2008). During the 1800's logging became a popular industry. Forests were also being cleared for development and agricultural purposes. In addition to habitat loss, black bears were heavily hunted to rid the area of them, for sport and for personal gain. Prior to the 1900's there was no formal protection of black bears. They were not seen as an important mammal at the time and there were no regulations in place for hunting them. Black bear parts were used for many items and bounties were set up across North America with the purpose of extirpating them from whichever areas the bounty was being offered.

Once considered to be vermin, opinions of the American black bear began to change during the 1900's and regulations on hunting began to be put in place. Protection and recovery occurred state-to-state and province-to-province beginning in 1902 and largely until 1983

(Garshelis et al., 2008). It was around this same time that many state wildlife agencies were organized to handle wildlife management. States began creating management plans through their local wildlife agencies and for a time black bears were listed as a protected, threatened animal. Changes included setting hunting and timber harvest limits, creating protected wild areas to conserve wildlife and beginning to enforce laws and fines (Unger et al., 2013) to ensure new measures were being followed. Black bears becoming protected, wildlife agencies monitoring populations and restored wild lands allowed for black bears to begin recolonizing historic distributions where they had once been extirpated.

Two states in particular, Florida and Tennessee, were historically populated with black bears and are among the states that still have black bear populations currently. Like the nation, the population diminished from what the historic range used to be, however in both states black bear populations have been increasing over more recent decades. Black bears in Florida only occupy part of their historical range now, but this increase in population is partially due to the Black Bear Management Plan set in place by the state, Florida residents increased knowledge of them and the Florida black bear being added to the Threatened species list in 1974 (FWC Florida Black Bear Management Plan 2012).

Prior to the 1900's the historic range of black bears in Florida spanned throughout the entire state. A multitude of factors such as unregulated hunting and habitat removal led black bear populations to dip as low as 300-500 by the 1970s (Humm, McCown, Scheick & Clark 2016), almost eliminating them from the state completely. Once listed as a Threatened species, the black bear population was able to begin recovering and has continued to do so over the last forty years. Recent studies in Florida suggest that approximately 45% (Humm et al 2016) of the state of Florida is currently occupied by black bears. Figure 3 is the most recent black bear distribution map that has been released by the FWC, detailing the five regions of black bear populations and their abundance. Additionally, there are approximately 4,000 black bears currently part of the Florida population, which is about a third of what the historical population was estimated to be.

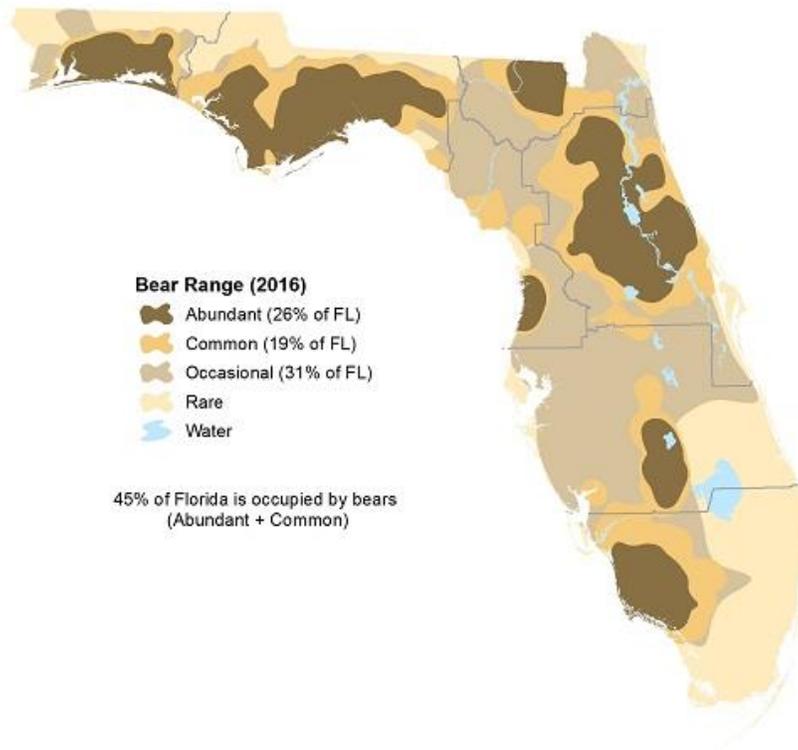


Figure 3. Black bear distribution map as of 2016, created by FWC.

Like in other states across the USA, Tennessee has a population of black bears that has seen decreases and increases in numbers throughout the 1900s. Early in the 20th century, Tennessee black bears faced the same environmental constraints and human impacts that many populations did across the country. Additionally, about 100 years ago a major crop in the black bear diet, the American chestnut, was wiped out, causing a large disruption in the black bear diet (Ebersole 2005). However, these populations were beginning to increase again by the 1970s (tn.gov), largely due to the establishment of the Great Smokey Mountain National Park (GSMNP) and the Cherokee National Forest (CNF) in the 1930s. These, the creation of wildlife rehabilitation sanctuaries, hunting harvest caps, and multi-faceted management plans enabled the population to grow. Agencies like the TWRA were created to protect black bears, conserve Tennessee natural areas and provide information for citizens living nearby.

Recent distribution of black bears is limited to the central and Eastern regions of Tennessee. The state is broken up into three regions: non-bear, establishing, and established. A visual of these regions can be seen in Figure 4, which indicates that the non-bear region is from the far west area of the state. The establishing area is the central and central-eastern part of the

state and the established region is the eastern part of the state where the GSMNP and CNF are located. The Great Smoky Mountains are one of the largest protected areas in the Eastern part of the United States, providing habitable forest for the approximated 1,500 black bears in the national park (nps.gov) alone.



Figure 4. Black bear regions of Tennessee map from TWRA Human Perception study of 2012.

Environment & Habitat

Quality habitats play a vital role in black bear survival and population growth along with having a profound effect on black bear movement, including distribution changes. According to Dr. Lynn Rogers, there are four vital requirements to make a habitable environment for black bears: food, water, thermal cover and escape cover (Rogers 1993). Historically, black bear populations ranged from Mexico to Florida and north to Canada, indicating that although these habitat requirements are demanding, black bears were able to thrive. The far range of black bears indicates that they are very adaptable mammals and can live in almost any area throughout North America, provided there are forests available for them to receive food and shelter from. Due to their adaptability black bears are referred to as indicator species; “their presence indicates ecosystem integrity, whereas declines in distribution or numbers suggest ecosystem deterioration” (Fecske et al., 2002). Food availability is among the most important factors that determine if an environment is livable for a bear and if the given area is capable of sustaining black bear population growth. Plants in particular make up a large percentage of black bear diets,

meaning that continual low plant productivity may cause a black bear to either migrate seasonally for food or ultimately change its home range (Mosnier, Ouellet, & Courtois 2008).

Lack of food in an area leads to limitations on populations and is a contributing factor in black bear distributions changing. Bears will go to greater lengths to find food, such as travelling further and even establishing new individual ranges if they find a new permanent food source. Having a keen sense of smell, black bears will often travel up to 100 miles during a stage called hyperphagia to obtain nutrient and protein rich foods, such as nuts (Dybas 2011). Behavior is also effected from lack of food, because more pressure is put on the specific habitat due to greater population than food surplus. Bears become more aggressive and competitive toward one another over the nearby available food. In addition to this, Dr. Rogers mentions how survival itself is challenged and starvation becomes an issue among cubs and yearlings. Predation may increase from older bears preying on younger ones in the absence of food (Rogers 1993), however it is likely they could be killed due to competition. Most importantly though, is the connection between semi-urban residential areas in close proximity to bear-populated forests and the “availability” of garbage.

Though water may seem to be a given necessity of a habitat for any organism, during the summer months water is needed in a great abundance for black bears as a way to cool off. In addition, rainfall has a major impact on forest growth, particularly nuts and berries, which make up a large percentage of the black bears’ diet. This is yet another factor that will indirectly cause black bears to travel for food and potentially re-establish themselves in areas with better food availability. Drought is a common issue in northern forests, causing berry crop failures. Even late frosts can negatively affect growth and cause a delay in food production.

Thermal cover is another requirement for black bear habitats. Forests and woodlands need to provide crevices and burrow areas for bears to use as dens during hibernation, especially in northern dwellings. Thermal cover is also necessary when black bears emerge from hibernation, but still need somewhere to sleep or leave cubs behind. If these are not available, survival rates may be at a constant low for cubs. In general, lack of thermal cover creates greater risk for bears because of the prolonged exposure to the elements and other potential threats, such as hunters or predators.

Escape cover may be one of the most important factors in whether an environment is habitable for a black bear. Escape cover is a means of protection for black bears from predators, whether it is adults from hunters or cubs from other bears or other predators. Typically this is defined as being some sort of tree of which a mother could put her cubs or an adult black bear could climb on their own. According to Rogers, the tree must be “large...with sturdy, creviced bark that cubs can safely climb” (Rogers 1993). Large trees are a means of refuge for bears and especially in the northeast, white pines and hemlocks seem to be most preferred by black bears and cubs, because of the ease of climbing these species. Escape cover by means of tree is another example of why forest environments are so beneficial to black bears. Daybeds are often chosen by the base of a tree, usually a white pine, so cubs can easily escape at the first sign of danger (Fecske et al 2002). These kinds of trees are preferred due to the weight they can support and the ability for the bears to hook their claws in without sliding down the tree. This is particularly important if cubs, yearlings or adults are trying to get away from a predator and do so without falling out of the tree.

Habitat preferences are often seen among black bears, based on where they are geographically located. This can be specific to a type of area (i.e. swampland, boreal forest, deciduous forest etc.), or solely focus on the types of vegetation in the area. A study of Florida black bears in the Ocala National Forest discovered that seasonal ranges may differ, where some seasons bears have range preferences and some seasons, there may be no true preference determined by the bears (Moyer, McCown and Oli 2008). States such as Florida are much more wet, warm and humid, providing the type of environment conducive to swamps or with more moist conditions, whereas in northern states such as Wisconsin or Minnesota, this may not be so. Just as habitats differ, preferred vegetation will differ as well. White pines and hemlocks are popular among bears of the Midwest whereas hardwood and scrub oak are commonly preferred by bears in southern states like Florida. Another study was conducted in Maryland on female black bear habitat preference where many bears preferred mixed forests, which included conifer stands, for escape measures along with wetlands (Fecske et al 2002). Studies like these become beneficial to wildlife management agencies for understanding changes in population, behavior or habitat of black bears along with aiding in any reintroduction efforts, if this is a goal in the area.

Social structure may also be a factor of habitat selection (Fecske et al 2002). Adult black bears are responsible for claiming their own land once they have separated from their mothers. Often females will provide a small amount of land for female cubs, while sub-adult males must travel and set up their own range, overlapping theirs with multiple females for mating purposes. Adult females require larger home ranges and will compete with other females to expand, taking over another females range. This is done because a mother black bear will allow female cubs to take over part of her own land, leading to increased pressure for territory expansion in time for the next litter of cubs. In addition, mother black bears have greater pressure to find a home range that will provide enough food for her and the cubs, shelter and trees for means of escape. Male black bears that need to set up territories may compete for a female and will not share territories.

According to Moyer, McCown and Oli, Florida black bears have a wide variety of habitats to choose from for home ranges and may even utilize many different habitats within that designated home range, in the event that all requirements needed in a habitat are still present; adequate food sources, safety, shelter or potential den sites, and stable trees that will not splinter and strip as the bears climb them (Moyer, McCown & Oli 2008). Seeing that black bears are very easily adaptable mammals, this may provide a correlation to why black bears have become common “dumpster divers.” In other words, the adaptability of black bears may be a factor in their attraction to human garbage, due to the ease of accessibility. Especially in a year where a drought may occur that may produce a poor crop yield, black bears who live close to urban or rural residences will likely be inclined to take advantage of the abundance of new food opportunities (bird feeders, left-over garbage, waste, etc.) rather than being forced to travel far for natural preferred foods. In addition, they will likely remember or be able to find their way back to such residences where it was easy to find available food previously, thus leading to greater nuisance bears and interactions with human beings.

Diet

Black bear diets are relatively expansive when looking at the species as a whole. It is commonly believed that black bears hunt and eat a lot of other living organisms, however this is not often the case. While black bears will eat fawn, it is typically shortly after they have been birthed and do not know better to run. Black bears will eat carrion or left over fish entrails, but

they do not hunt nearly as much as people believe them to, unless it is necessary. Some may hunt, but it is not as common for them to do so, due to energy expended with such efforts. The black bear diet comprises of a vast majority being nuts and berries. While this does not sound like a lot, there are many specific fruits and berries that bears seek along with different kinds of nuts, which make up a great amount of the protein they need. Depending on what region the black bear is part of, there will be differences in preferred foods (Baldwin & Bender 2009). For example, hazelnuts tend to be a favored nut among black bears to the point that they will travel to try to find hazelnuts. While this preference for hazelnuts is true of bears in the Midwest, it could be true of other foods in different areas. Often the largest percentage of protein in a black bears diet comes from different insects that are located among black bears of that area (Baldwin & Bender 2009) with smaller percentages owed to other mammals. However in Northern habitats, black bears can be known to consume ungulates ranging from elk to moose and may even consume beavers, woodchucks, or rabbits, on occasion (Mosnier, Ouellet & Courtois 2015).

Due to the size of black bears and their lifestyle demands for food because of pressure for weight gain, thousands of berries are required a day for black bears to sustain themselves and be able to put on enough weight for hibernation. In addition to such high demands for foods, preference tends to vary slightly depending on the season and location of bear population. Such demands are enough of an example of why there are pressures on black bears and may be a factor in distribution shifting. With populations increasing, sustainability of bears in forests may become an issue if there is a shortage of food available. This is especially a concern when black bears enter hyperphagia. Hyperphagia typically takes place at the end of the summer and is a period where black bears enter an “over-eating frenzy” to build up fat reserves and greatly increase their caloric intake in preparation for hibernation (Dybas 2011). Essentially at this point in the season, bears spend most of their time looking for food.

One of the goals of Baldwin and Bender’s study was to compare current black bear diets of the Rocky Mountain area with historical diets using scat analysis. Scat analysis is one of the most common ways scientists are able to determine what a given black bear has eaten. In this particular study, samples showed that there are increased anthropogenic foods discovered in scat samples of black bears including, but not limited to plastics, paper, rubber, and aluminum foil (Baldwin & Bender 2009), supporting the theory that supplementation of anthropogenic foods

aided black bear populations to grow in that area and for individual bears to achieve such body masses in that area. This may also be a linking factor of increased sightings of bears, due partially to increased populations and partially to lack of natural available food causing them to find food where it is available and abundant; feeders, garbage, and so on. And though lack of natural food causing increased time spent in urban areas searching for food is among many factors, the findings of Merkle, Robinson Krausman and Alaback suggest that specific plant or fruit growth in urban areas may be an attractant to bears regardless of wild food availability (Merkle, Robinson, Krausman and Alaback 2013). It was also discovered that male black bears have a greater tendency to frequent urban areas than female black bears, potentially having to do with females protecting cubs from the risks associated with exposing them in urban areas.

Interactions

Black bear and human populations are steadily growing every year. With both of these populations growing and available land becoming more limited, interactions between humans and black bears are becoming more frequent as well. Not only are interactions happening in areas with established bear regions, but black bear population growth has caused distributions to shift to areas that previously have not had bears or haven't had bears in decades. This shift indicates that such human-bear interactions will continue to take place in established black bear ranges, but will also become prevalent in the areas that black bears are now moving into. A human-black bear interaction can be anything ranging from a mere sighting while on a walk to a bear damaging property. Interactions can be regarded as positive or negative by the individual involved, based on what occurred. Understanding interactions is important when incident reports are made to fully understand what behavior was displayed and if the bear was a threat. Wildlife management agencies are needed to decide how to deal with a nuisance bear along with creating a management program to monitor black bear populations (Wilton, Belant & Beringer 2014). In the event that a human reports a black bear incident, the wildlife management agency is responsible for helping residents adjust to living among black bears, often providing suggestions to keep black bears away from the property.

Depending on the kind of interactions humans and black bears experience when confronted by one another will likely be a determining factor of how the individual will feel

about black bears living in the area. If a person has a negative interaction with a black bear, it may have an effect on their views of bears, just as it would with someone who may have a positive interaction. Examples of positive interactions could be sighting a black bear in the woods, spotting a mother black bear and cubs and potentially watching them from afar. Due to the black bear's adaptability, some negative feelings toward bears may come from their willingness to eat residential garbage, bird seed from feeders and even crops such as corn.

Additional negative experiences one might experience could be any kind of threatening behavior such as a warning charge at an individual, if the bear damages one's property, causes damage to livestock, injures a pet, or if an individual was attacked. Angelici states that human-black bear conflict is defined in two ways: "actions by wildlife conflict with human goals" such as life-style and livelihood and the second being "human activities threaten the safety and survival of wildlife" (Angelici 2016). Interference is experienced by both humans and black bears due to close proximities of the two. One can view such interactions as wildlife being problematic, though humans settling in America could also be viewed as problematic for wildlife. It is because of these dual-conflicts that co-existence is what wildlife management agencies hope to achieve through monitoring and regulating black bear populations.

A unique type of interaction is one in which humans seek out black bears for sport and black bears in turn, must adapt to such instances and learn to avoid or survive such occasions. This sport is the black bear hunting season, which some states allow from the end of summer through the beginning of autumn. Around this time black bears are in hyperphagia. This time typically lines up with hunting season in most states in which "most hunters attracted bears with bait," though Noyce and Garshellis stated that "migrating bears were less likely to be killed by hunters, suggesting that they were...vigilant" (Noyce & Garshellis 2011). This type of interaction is different because it is one in which humans intentionally enter forests or woodlands in search of bears, rather than avoiding them or bears coming onto a human's property. Hunters will often hunt bears for food and resource requirement, solely for sport or all of the above. This type of interaction is one of benefit for humans and a negative experience for black bears because it is a direct risk and also indirect by causing bears to alter behavioral patterns and movement. Hunting has proven another way in which black bears adapt to their environments and the risks they face; during hunting seasons black bears "decreased their distance from paved

roads and increased their distance from non-paved roads,” (Stillfried, Belant, Svoboda, Beyer & Kramer-Schadt 2015) meaning that bears were tracked spending more time near roads with vehicles than deeper in the forests. Black bears also increased their “road crossing frequency, especially at night for both road types which indicates they are more active when hunters are absent” (Stillfried et al 2015) and have changed their behavioral patterns and movement to reduce interactions.

Human Population Growth

Black bear and human interactions are largely due to the limitations on available land space for both species, resulting in the two encountering one another because of the close proximity in which they live. While these interactions have occurred for centuries, they have increased over the past few decades resulting in cause for greater concern now. Black bear populations are on the rise again due to adaptation and reintroduction, among other factors. Human population growth is also a factor in these encounters. Since the beginning of the 1900s, human populations on earth have grown from 1.65 billion individuals to over 7 billion currently (ourworldindata.org) with an annual population growth rate of one percent in the United States (Salonius 1999). The population of humans on earth has grown over 6 billion individuals in roughly 100 years compared to lower populations sustained for longer periods of time prior to the 1900s, as seen in Figure 5.

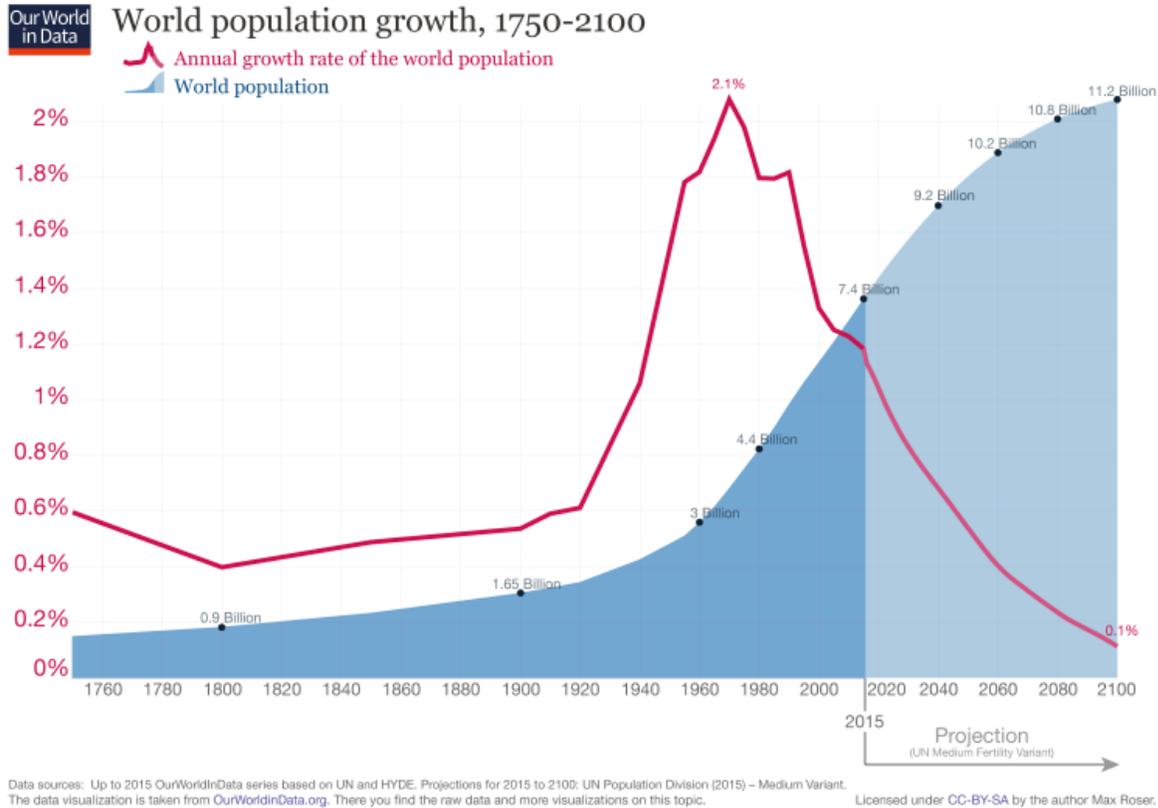


Figure 5. Human population growth on earth from ourworldindata.org and the corresponding annual growth rate.

Such growth in such a short amount of time led to many people needing to find new places to live, especially in the U.S. Humans expanded territory increasingly as need for space grew along with population trends. Such actions resulted in wildlife being converted into urban areas, forests being cut down, highways put in, and wildlife needing to relocate or adapt. “Human population size is positively correlated with habitat alteration,” (Evans, Rensburg, Gaston & Chown 2006) along with other pressures “such as over-harvesting and physical disturbance” (Evans et al 2006). It can be expected that continued population growth will alter habitats more and cause urban sprawl to continue. Human populations are expected to continue growing over the next century and are quickly leading to the world reaching carrying capacity. If human population reaches carrying capacity, there may no longer be enough resources on earth to sustain the number of individuals it contains. This does not take into account the other wildlife on earth and the effects population growth among wild species may have against the earth as well. On a smaller scale, the United States has one of the largest percentages of people who make up everyone on earth. With this being said, it is understandable that wildlife-human

interactions happen quite often because of the biodiversity of a given area and the high population numbers of humans throughout the states.

Variation in Perceptions of bears

Humans' views on living among black bears and their perceptions of black bears can vary depending on whether they have encountered black bears before and how that encounter occurred. There are a range of different reactions that people can have, some of which are negative, while others may be positive. There are many factors that can cause a person to feel a specific way about bear populations, whether it is based on personal experience or merely based on what they have learned or heard from others around them. Just with any other topic, there is no defined "right" or "wrong" feeling and it is not likely there will be a unanimous opinion about a topic such as this, because of the many factors that may bring a person to the perception that they have. In addition to differing opinions, people often change their minds, which can be such with this topic as well. Whether something positive or negative happens to alter an individual's perception, it is not set in stone that they will always feel a certain way toward black bears.

A perception study was published in 2010 by Michael Campbell and Betty-Lou Lancaster to determine public attitudes of black bears and cougars on Vancouver Island. Through this study, Campbell and Lancaster determined what some of the causes were for people to feel a certain way about black bears (and cougars). According to this study, some of the reasons for negative opinions of black bears were due to troublesome behavior and the potential danger that the animal posed (Campbell and Lancaster 2010). It is safe to say that such fears or concerns could be said for people anywhere who dislike living among bears. Negativity based on the animal being dangerous was largely due to them potentially attacking a human, their size and power and the potential to harm children or pets. Other possible negative opinions toward black bears could be due to being nuisance bears by destroying property, getting into garbage and disturbing an individual's quality of life.

Though there are valid reasons for people concerned about black bears moving into the area or increasing in numbers, there are also people who do not share those same opinions. Some feel that black bears positively contribute to a community. Studies such as Campbell and

Lancaster's show that this is a topic divided. Some reasons behind people accepting black bears living in their areas are that they are aesthetically pleasing, while others are not concerned that black bears are a threat. Certain areas that have had black bears living near them for a long time have adapted to living together. Just as quality of life can be affected negatively for people dealing with black bears, others feel that black bears living in the area improves their quality of life and that black bears are not dangerous (Campbell and Lancaster 2010). This could be anything from enjoying their presence to making one feel more connected with nature. Such opinions are specific to the individual as to why they feel greater quality of life from the presence of black bears. Additionally, individuals who have done any research or have had experiences with black bears are able to learn that they are generally a timid animal that are relatively easy to scare away, if need be. This could be another factor of why some believe they are tolerable to live among.

Experience and knowledge play a large role in developing a person's opinion on any matter. It is easy to form a rash opinion or make a rash decision when you do not know all of the information, and this is such with people and black bears as well. Personal experience is a crucial part of people's opinions of black bears, which can ultimately determine how the person feels about them. If an individual's first interaction with a black bear was being attacked, this would likely lead to fear and distrust of living near bears, whereas someone who has a pleasant experience, such as viewing a bear from afar, may have a more positive opinion and understanding of bears. In addition to this, people's opinions are easily influenced. Human perceptions can easily change based on the feelings of a loved one or a friend, regardless of whether this was that person's true opinion to begin with (Siemer, Sol Hart, Decker & Shanahan 2009). Credibility on behalf of the outlet that provides information on black bears will determine whether or not individuals will form accurate opinions about black bears. In addition, knowing and understanding black bear behavior can be advantageous to an individual that comes in contact with a bear, because they are able to identify how to react to that bear being near. Studies suggest that a general knowledge of black bears and their behavior is beneficial to people, because they are better able to understand what is happening and why, if they are to encounter a bear for whatever reason (Siemer et al 2009).

Black bear distribution ranges throughout North America, but there is also a range within states. Some states have black bears present throughout, while others such as Florida, Tennessee and Wisconsin have black bears in specific regions. Tennessee is a great example of the variation in abundance of black bears in a given state. Black bears are most prevalent in the Eastern part of the state, somewhat abundant in the central part of the state and not common or even rare in the western part of the state. With such drastic differences in population abundance throughout the state, residents on the East are likely to be more attuned to dealing with bears, whereas those on the West may not know much about bears. The difference in experience between those communities can result in drastic differences between perceptions of state residents (Tennessee Wildlife Resources Agency, Tennessee Black Bear Public Opinion Survey 2012). Where a person lives and whether or not they have lived with black bears does have an effect on their knowledge of bears along with their overall opinion of black bears.

Depending on a person's views, positive or negative, Campbell and Lancaster surveyed individuals on how they felt a black bear should be dealt with. The three provided answers to choose from (those of which are also applicable to feelings of individuals outside of the study) were to either tolerate the bear, relocate the bear or kill it (Campbell & Lancaster 2010). Typically people who felt more positively toward bears would prefer a bear to be relocated or to just tolerate the bear, while others would be comfortable with the bear being killed. Again, such opinions are based on the individual's experiences with black bears that caused them to form the opinions that they have.

Objective

This analytical study aims to evaluate survey data sets from multiple states about human perceptions and opinions of black bears in order to determine if there is significance in people's view of living among bears. Data sets were run separately and then compared to each other to determine if individuals share similar views, though they may be from different areas. Human perception surveys allow wildlife management agencies to receive feedback from the community on their performance and whether they need to alter the management plans in place for black bears. Questions considered were whether there was a connection between the Tennessee and

Florida data, if black bears are generally accepted by both areas, and if there is significance in how respondents answered which may suggest why they answered the way they did.

Methods

This study is considered to be a secondary analysis of surveys using previous studies to compare overall opinions about black bears across more than one state. Data sets were acquired from two different states to compare the effect on quality of life from black bears. Tennessee Wildlife Resources Agency (TWRA) and the Florida Fish and Wildlife Conservation Commission (FWC) allowed for their data to be compared for this study. Both organizations were asked permission for access to data prior to use. Access and use were approved by both TWRA and Responsive Management for the Tennessee Black Bear Management Report. Sarah Barrett of the FWC approved the use of a human perception survey conducted by interns and published in 2015.

Tennessee Wildlife Resources Agency teamed up with an organization called Responsive Management, a wildlife human dimensions survey organization, to conduct a survey for the residents of Tennessee. Rather than sending out paper surveys in hopes that they would be sent back, TWRA and Responsive Management conducted telephone surveys, utilizing telephone databases. A questionnaire was developed for surveyors to follow while on the phone with Tennessee residents. Survey Sampling International and Database 101 were used to generate who would be contacted. The survey was conducted with goals of surveying each region of Tennessee (established bear region, establishing bear region and non-bear region) in regards to black bear population to obtain an overall idea of the human perception of black bears in Tennessee, while comparing population sizes and overall experience of each region.

Approximately 400 respondents were interviewed for each of the three regions of Tennessee. Established bear region corresponds with the far West region of the state, establishing bear region is the West-Central region and non-bear region is the Eastern part of the state. Interviews were collected for respondents 18 years of age and older. Though there were approximately 1,200 respondents interviewed for the entire study, TWRA and Responsive Management weighted the study to the actual population of the entire state of Tennessee. Due to

the hi-weighting of data, tables may vary slightly. In addition to being weighted by region, the data was also weighted by demographic and geographic characteristics to ensure the “sample was representative of Tennessee residents 18 years of age and older” (TWRA).

Surveys were conducted every day during January. Monday through Friday, calls were made from 9:00 am to 9:00 pm. Saturday calls were made from 12:00 pm to 5:00 pm and on Sundays calls were made from 5:00 pm to 9:00 pm. A callback system was also put in place where each individual received an attempt to be contacted a maximum of five times. Questionnaire Programming Language (QPL) was used while collecting data through phone calls and Statistical Package for the Social Sciences (SPSS) was used by the researchers to analyze the data. Responsive Management also developed a software to analyze the results, including demographics.

The data set received from FWC is a survey that was conducted by FWC interns during the spring of 2013. This survey was of a bit of a different nature, focusing largely on reported sightings or incidents with black bears over the last few years. The interns who worked on the project conducted follow-up surveys with individuals who contacted the FWC previously about black bear encounters, sightings or issues on property. The purpose of the survey was to evaluate if Florida residents that have had issues with black bears have spoken with FWC, followed advice given and whether problems are persisting or if they have receded. Unlike the Tennessee survey, this survey from FWC only contacted individuals who have previously dealt with black bears. The FWC survey consisted of data from 1,965 respondents who dealt with black bear incidents between 2008 and 2013.

Though there are differences in the two types of data sets acquired, the two sets were compared to determine if there are any similarities that can be drawn from both. Human perception of bears and opinion of the local agencies were evaluated and compared by drawing from the data provided. Regions within each state were regarded for both data sets to discover if there is a significance of opinion and incidence based on what region respondents were from.

Data Analysis

Statistical Package for the Social Sciences (or SPSS) is a statistical analysis program that was used to analyze and compare the data of the target states. The data provided by TWRA and Responsive Management was the most conclusive and complex set that was received, providing details on the number of interviewees, opinions, location and experience with black bears. TWRA data was opened in SPSS and analyzed for the most important questions of the study. Question 32 of the questionnaire outright asks what the individual's view about black bears is, becoming a dependent variable of the comparative analysis and is likely the most important question of TWRA's study. Independent variables that were tested are the region humans live in, urban versus rural land amongst bears, respondents' gender, overall view of TWRA, respondents' opinion of hunting in Tennessee, views of hunting if regulated by TWRA, human beliefs of bear populations and age of respondents.

Question 32 was originally coded by TWRA and Responsive Management in the data set to have seven different values: 1. Invalid answer, 2. strongly support, 3. moderately support, 4. neither support nor oppose, 5. moderately oppose, 6. strongly oppose and 7. Don't know. These values were recoded on SPSS to combine some values, allowing for the Chi-Square test to be easier for others to read with less values to look at. Question 32 was recoded to instead have three values: 1. Moderate + strongly support, 2. neither, and 3. Moderate + Strongly Oppose. In this recode, moderate and strongly support values were combined into one value and moderate and strongly oppose values were also combined. "Neither support nor oppose" was left as a value to acknowledge that some individuals may either be unsure of their opinion of black bears being nearby or may see benefits and negatives of having black bears around. A frequency test was run first on Question 32 to determine what the overall opinion of black bears was in Tennessee before comparing variable factors. Valid percentages were used for all of the statistical tests. A histogram by percentages was also created (Figure 6) of Question 32 based on the frequency test prior to other variable testing to illustrate the respondents' views of black bears.

Contingency tables were run for the independent variable, Question 32, using SPSS with the individuals view on how the TWRA has done with managing black bears in Tennessee. Contingency tables are functions that combine data from one or more sources and compares a variable to another. The main question focused on was Question 32: "In general, do you support

or oppose having black bears in Tennessee?” This question, being a dependent variable of this data set was then cross-tabbed with Question 37: “Overall, do you think the Tennessee Wildlife Resources Agency has done an excellent, good, fair, or poor job of managing black bears in Tennessee?” to determine if there was any significance between the two questions and the way they were answered.

A Chi-Square test was run with each cross-tabulation to determine if there was a significance between the two selected questions. Chi-square tests are statistical hypothesis tests where the sampling distribution is a chi-square distribution when the null hypothesis is true. Chi-square tests are used to determine if distributions of categorical variables differ from one another. The chi-square test also identifies whether the two variables that were cross-tabbed are significant or not. When testing a null hypothesis, the Chi-square test is run to see what the chance is that the independent variable has nothing to do with the dependent variable (people’s view on black bears). Significance of a chi-square test is looking at a 1 in 1000 chance that the contingency table does not relate. Anything below .05 indicates that there is a five percent chance that the variables are not related. Anything below this indicates that variables are associated. The lower the number identifies that the chances are lower that the variables are not related, meaning that there is less than a 1/1000 chance of having no relation between tested variables. Similar tests were used to compare the independent variable and further dependent variables using frequencies, cross-tabs and chi-squares.

A Chi-Square test was run on the type of residence where most humans live, in relation to where black bears are abundant; question 24. Values were used in the original coding created by the TWRA and Responsive Management. These values were “urban area,” “suburban area,” “rural area,” and “don’t know.” Like with Question 37, the chi-square test tests the significance of where respondents live in relation to their attitude toward black bears. Chi-square tests were run for question 29 as well. Question 29 asked respondents which group they considered themselves to be part of: non-bear county, establishing bear county or established bear county. These regions are those associated with being in the west, west-central and eastern part of the state.

Demographics were included as some of the independent variables tested against Question 32 to see if there were significant differences based on the demographics of

respondents and the way that they answered. Such independent variables were the respondents gender (Question 101) and the respondents' observed age (Question 94). Question 101 was originally coded by the TWRA with values being 1. Invalid, 2. Male, 3. Female, and 4. Don't know. For efficiency purposes, the question was recoded to show results and data solely for respondents who were categorized as male or female. This was done simply by filling out the missing values column for invalid or don't know answers. Question 94 was originally coded with the following values: 1. 65 years old or older, 2. 55-64 years old, 3. 45-54 years old, 4. 35-44 years old, 5. 25-34 years old, 6. 18-24 years old, 7. Under 18 years old, 8. Don't know, 9. Refused. Again, missing values were assigned to some values due to efficiency of determining if age was a significant factor on view of black bears in Tennessee. Recorded missing values were "under 18 years old," "don't know," and "refused." Significance tests were run after all recodes and/or missing values were filled out for each question.

Additional independent variables tested for significance against the dependent variable question 32 were respondent's views on hunting in Tennessee (question 38), respondent's view on hunting in Tennessee if black bear populations are monitored by TWRA (question 40), and whether respondents feel that black bear populations in Tennessee have increased, remained the same or decreased over the past decade (question 20). Both question 38 and 40 were originally coded with the following values: 1. Invalid, 2. strongly support, 3. moderately support, 4. neither, 5. moderately oppose, 6. strongly oppose, and 7. don't know. Both questions were recoded to combine and limit the number of values, resulting in the following recode: 1. Moderate plus strong support, 2. neither, 3. Moderate plus strong oppose. Original coding by TWRA for question 20 was 1. Invalid, 2. Increased, 3. Stayed about the same, 4. Decreased, 5. Don't know. The question was recoded to only run values 2 through 4 during the statistical tests.

The final TWRA question tested with the dependent variable was Question 34: If respondents have encountered black bears in the wild, in their opinion was the interaction positive, neutral or negative? Original coding for the answer choices were 1. Invalid, 2. Strongly positive, 3. Somewhat positive, 4. Neutral, 5. Somewhat negative, 6. Strongly negative or 7. Don't know. The question was recoded to combine options and limit the number of values, for convenience purposes. The resulting recode was: 1. Strong plus somewhat positive, 2. Neutral, and 3. Somewhat plus strong negative.

The FWC provided a human perception survey that was conducted by interns and published during 2015. This survey was administered to individuals who specifically reported encounters with black bears in previous years as a follow-up survey to determine if these individuals are still experiencing problems with black bears. Already, this data set determines that each respondent has some level of experience dealing with black bears, unlike the Tennessee data. This data set was a lot smaller, providing fewer questions to draw upon, though there were still some relevant, key questions selected to use. SPSS was also used for this study to run contingency tables and chi-square tests. Questions of interest were of what region of Florida the respondent is part of, the nature of their report to FWC or their disturbance reported to FWC, the year of each documented report, number of interactions in the year prior to contacting FWC, and what measures were suggested by the FWC. Additional questions were whether respondents were still experiencing problems with black bears, how long problems persisted with black bears for those who no longer have black bear problems, and whether or not the FWC was helpful. Valid percentages were used when analyzing frequencies or contingency tables between different questions to achieve the most accurate reading of the results.

Each question was initially run on its own as a frequency test to determine which variables stood out for each. Prior to running any tests, answer values were added from the survey to the all of the questions being analyzed. The question asking which region the individual lives in became the dependent variable for FWC because the regions are based on black bear abundance due to the number of recorded calls. Because of this, the region that an individual lives in and reported an incident from indicates where the largest black bear populations are for Florida. Region values added were 1. Northwest, 2. North Central, 3. Northeast, 4. Southwest and 5. South. Values added for the nature of the report were 1. Apiary, 2. Attacked animal, 3. Dead bear, 4. Bear in area, 5. In building, 6. In crops, 7. In feed, 8. In feeder, 9. In garbage, 10. In yard, 11. In tree, 12. Killed animal, 13. Property damage, 14. Sick/injured bear, 15. Threatened animal, 16. Threatened human. Year of report values were 2008 through 2012 (listed in order from value one through five). The values for the number of bear interactions prior to contacting FWC were as follows: 1. 0-5, 2. 6-10, 3. 11-15, 4. 16+. Measures suggested by FWC were given the following values from the survey: 1. Stayed away, 2. Proper trash handling, 3. Altering pet/livestock feeding, 4. secure bird feeder, 5. Scare bear away with noise or light, 6. Electric fencing, 7. Keep grills clean, 8. Maintain clean property, 9.

No measures offered, 10. Communicate with neighbors, 11. Combination/other and 12. Unwelcome mat.

A question was asked whether individuals were still experiencing bear problems after suggestions were followed from FWC. These values were added as the following answer responses: 1. Yes, 2. No, 3. N/A. For those who answered no to the previous question, a follow-up question asked them how long it took for bear problems to stop. Answer values were 1. Never saw a bear again, 2. Less than a week, 3. 1-4 weeks, 4. 5-8 weeks, 5. 9-12 weeks, 6. 13-16 weeks, 7. 17-20 weeks, 8. 6 months or more, 9. Bears come around, but they are not a problem, 10. N/A. The final question used from the study was whether respondents felt that FWC staff was helpful. Answer values added were 1. Helpful, 2. Slightly helpful, and 3. Not helpful.

In addition to running a frequency test for each question already mentioned, contingency tables were created to compare several of the questions in the study to determine if there was significance between the ways that questions were answered. The first contingency table run was which region individuals were from and the nature of the report to the FWC. This question and other questions were run with the region question to determine if there were correlations based on where it appeared that black bears and humans had more interactions. Region and nature of the report to FWC were run in a contingency table as well. Following contingency tables were run for the question of the individuals region and the following: which suggested measures worked best, if individuals are still experiencing bear problems, and whether the respondents felt that the FWC was helpful. A separate contingency table was run for the nature of the report and which suggested measures worked best to see if suggested measures were relevant to what was reported and if it solved the problem.

After running each data set separately, results of both surveys were analyzed and visually compared for potential correlations or relationships between the two states, their overall general opinion of black bears in the area and opinions of the local agencies, among some other variables. Initially a data triangulation was going to be run between both surveys in SPSS, however, due to the two surveys being more different than expected, the data triangulation would not have produced worthwhile results, mainly due to the lack of standardization between the two surveys. The first comparison between TWRA and FWC data is the region of the two states. Both regions are determined based on the black bear populations present, allowing for

comparisons to be made between the two. A loose comparison was evaluated between questions from TWRA survey regarding perceived population levels of black bears compared to the “year of report” numbers, which indicate effects on population. Human perception questions 34 and 32 (type of incident, positive or negative and over-all opinion of black bears) were also compared to question “which suggestion worked best” and “how long did problems continue before stopping?” Finally the overall opinion of agencies from respondents will be compared as well.

Results

Question 32 was the independent variable of the study, what is the respondents’ attitude toward black bears in Tennessee? The frequency test run for the independent variable shows valid percentages of the three recoded values. Values were recoded to combine “moderate plus strongly support”, “neither”, and “moderate and strongly oppose” bears in Tennessee. The frequency distribution for the dependent variable general attitude about bears in Tennessee shows that eighty-eight percent of the respondents answered “moderately” or “strongly” in support of black bears in Tennessee, six percent responded “neither” and six percent chose “moderately” or “strongly” oppose black bears being in Tennessee (Figure 3). Generally, these findings suggest very high levels of favorable attitudes toward bears in Tennessee.

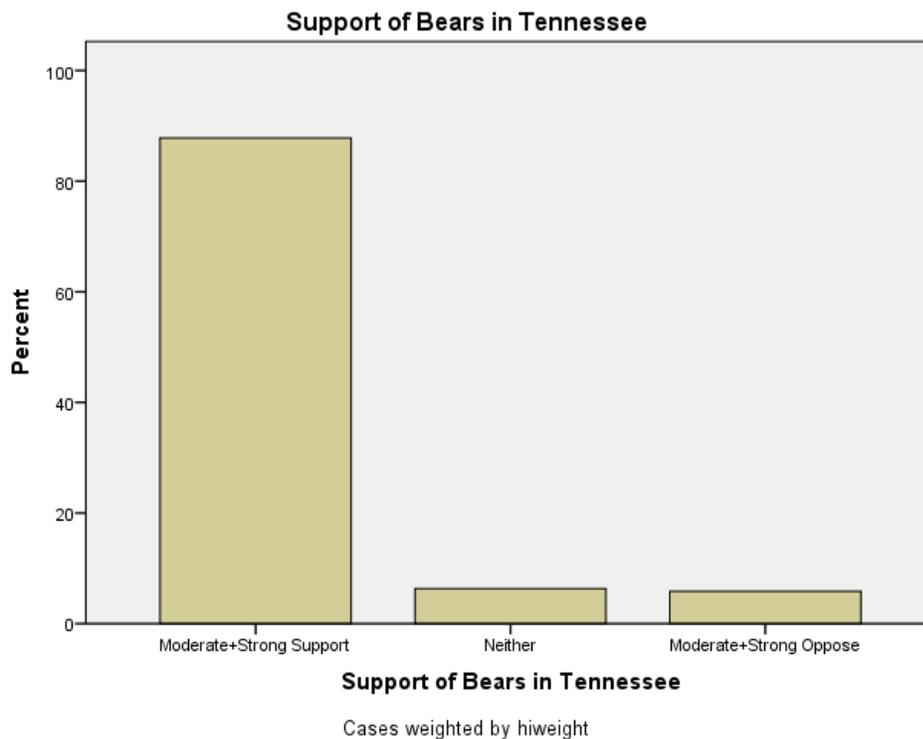


Figure 6. Question 32 responses from TWRA data on human support of black bears frequency of Tennessee.

Question 37 asked respondents to rate how well the TWRA has done with managing black bear populations. Among respondents who assess the TWRA is doing an “excellent” job in managing the bear population, ninety percent moderately or strongly support having bears in Tennessee ($p = .000$) compared to seventy-four percent of those who rate the TWRA as “poor” and support bears in Tennessee. Ten percent of respondents who answered “poor” also moderately or strongly oppose black bears being in Tennessee. A majority of respondents moderately or strongly support black bears in Tennessee and answered that the TWRA does fair to excellent at managing bear populations.

A Chi-Square test was run on the type of residence where most humans live (Question 24), in relation to where black bears are abundant. Values were used in the original coding created by the TWRA and Responsive Management. These values were “urban area,” “suburban area,” “rural area,” and “don’t know.” Like with Question 37, the chi-square test tests the significance of where respondents live in relation to their attitude toward black bears. For those respondents who reside in urban areas, ninety percent chose “moderate” or “strong” support for black bears compared to eighty-nine percent of suburbanites and dropping to eighty-six percent for those in rural areas. Residential location is associated with attitude about bears ($p = .000$).

Chi-square tests were continued for dependent variables in relation to the independent variable. Question 29 asked respondents whether they were part of the non-bear county, establishing bear county or established bear county. Of the respondents who lived in non-bear county or region, eighty-five percent chose “moderate” or “strong” support for bears, compared to increasing percentages among respondents living in establishing or established bear counties. Establishing bear counties had an increased response of eighty-nine percent answering “moderate” or “strong” support of bears, whereas established bear county had respondents answer ninety-two percent in favor of black bears in Tennessee. Based on black bear abundance, there is a significant connection ($p = .000$) between favorable attitudes toward black bears and abundance in regions.

A contingency table was run with Question 32 and Question 101 to discover if there was significance between respondent’s gender and their opinion of black bears. Of the respondents who identified as being males, ninety percent chose “moderate” or “strong” support of black

bears, five percent neither support or oppose black bears and 5 percent answered “moderate” or “strongly” oppose black bears in Tennessee. On the other hand, respondents who identified as being female eighty-five percent answered “moderate” or “strongly” support black bears, eight percent neither support or oppose black bears, and seven percent chose “moderate” or “strong” opposition to black bears being in Tennessee. Results show that males are generally more accepting of black bears being in the area than females, however, the majority of respondents from both genders support black bears being in Tennessee. The corresponding Chi-Square test showed that these results are significant ($p=.000$).

Question 94 is a demographic question about the respondent’s age. A contingency table between Question 94 and dependent variable Question 32 revealed that the age group who is most accepting and supportive of black bears in the area were those between ages 35-44 years old with ninety-one percent support. Although each age group identified as a whole as being at least eighty-three percent “moderate” or “strong” support of black bears in Tennessee with a total respondent percentage of eighty-eight percent. The youngest age group, ages between 18 and 24 had the largest percentage for “moderate” or “strong” opposition to black bears at ten percent. There appears to be a pattern of increased acceptance up until the peak group of 35-44 years. Acceptance drops by two percent for the following group (ages 45-54), increases again to ninety percent for ages 55-64 and drops to eighty-four percent for those 65 years or older.

Question 38 asked respondents about their opinions on hunting black bears in Tennessee. A contingency test was created between this question and the dependent variable. Ninety percent of respondents who answered that they moderately or strongly support hunting also answered that they support black bears in the area. Eighty-four percent of respondents chose neither support or oppose hunting also with moderate to strong support of black bears in the area. Those who answered moderate or strong opposition of hunting also answered that they support black bears being in Tennessee. Results show that more residents are in favor of hunting black bears in Tennessee while still supporting living among the animals. A Chi-Square test of these results revealed that these numbers were significant findings ($p= .000$).

A follow-up question was also asked; Question 40: views on hunting if the bear population is monitored. Of the respondents who answered moderate or strong support of monitored hunting, ninety-one percent strongly or moderately support black bears in Tennessee.

Of those who answered neither support or oppose monitored hunting, seventy-three percent also identified moderate to strong support of black bears in the area. However twenty-two percent answered neither to both questions. Seventy-seven percent of respondents answered moderate to strong opposition of hunting and moderate to strong support of living among black bears. Though this number is high opposition of harming black bears, most individuals felt it was okay to hunt black bears, whether they support them in the area or not. The highest amount of support of hunting came from those who support them being in the area. A Chi-square test reveals significance in the results ($p=.000$) which reveals that hunting, whether monitored or not, is associated with respondents views toward black bears.

Respondents were asked if they think black bear populations have increased or decreased over the past decade (Question 20). A contingency test with Question 32 revealed that of those who answered increased, eighty-eight percent of those respondents moderately or strongly support black bears in the area. Of those who answered the population has stayed the same, ninety-two percent support black bears in the area. Eighty-nine percent of respondents answered that the population decreased and moderately or strongly supported black bears. Significant findings ($p= .000$) for this contingency test reveal that most respondents support black bears and feel that the population has stayed roughly the same.

The final TWRA contingency test was between dependent variable: Question 32 and Question 34. Of those who felt their experiences with black bears were strongly or somewhat positive, ninety-six percent strongly or moderately support black bears in Tennessee. Those who believe to have had neutral experiences (neither positive nor negative), eighty-five percent moderately or strongly support black bears whereas eight percent strongly or moderately oppose black bears in Tennessee. Among those who experienced a somewhat or strongly negative interaction with black bears, seventy percent support bears in Tennessee, whereas thirty percent strongly or moderately oppose black bears in Tennessee. These findings significantly ($p= .000$) suggest that such interactions may be a factor in how opinions have been formed or changed. Though most experiences were from those who support bears, respondents who had negative interactions with bears had the highest percent of individuals who moderately or strongly oppose black bears in Tennessee.

The first tests run for the Florida data were all frequency tests of independent questions that were chosen to be focused on for this study. The purpose was to see if there was significance alone in the answers provided for each question. Region, the dependent variable, was one of such questions. The frequency test indicated that most black bear incidents were reported in the Northwest and Northeast regions of Florida (Figure 7), which tend to have less drastic temperatures and more forested areas. Incident reports reported from the other three regions were relatively low compared to these two Northern regions. A frequency test was done on the years that incident reports were called in to FWC, which indicated that reports increased each year until a reduction in 2012. After 2008, there was a spike in reports that almost doubled from one year to the next. A frequency test was also run on the nature of reports claimed by individuals who dealt with bears. The top three reported “nature of incidence” were “in garbage” which comprised almost half of all reports, “in yard” and “property damage.” Together, the top three reported incidents made up eighty-one percent of all disturbances called in by individuals.

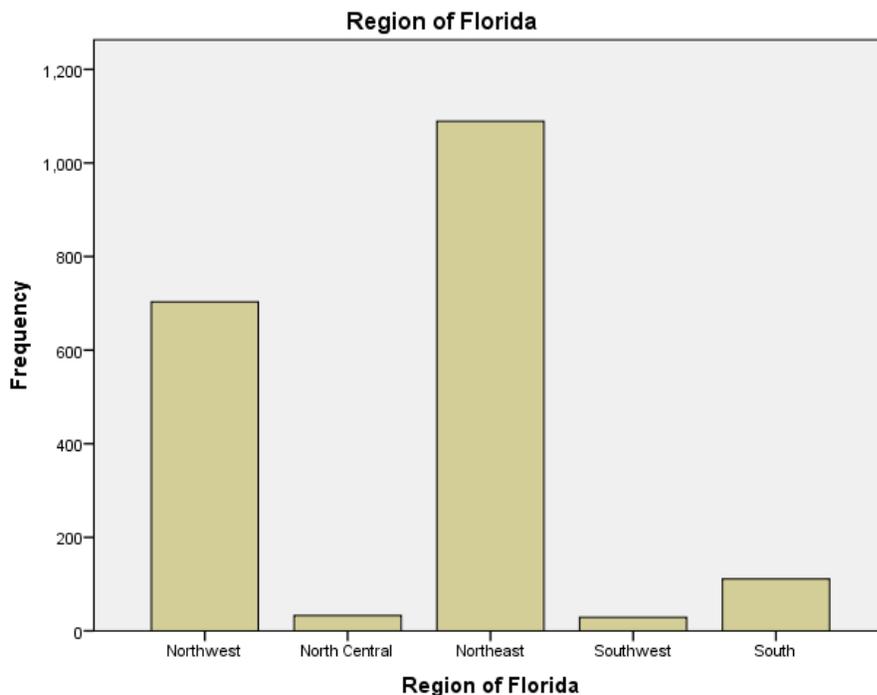


Figure 7. Black bear incidents reported to FWC between 2008 and 2013, based on region.

A frequency test was run for a question that asked about the number of interactions that respondents experienced in the year prior to making their report. Sixty-seven percent of individuals experienced up to five black bear incidents in the year prior to reporting to the FWC.

Respondents were asked which measures suggested by the FWC to curb black bear incidents were the most effective in reducing problematic issues. The frequency test for this question revealed that properly storing trash was one of the most effective measures one could take to eliminate problematic bears from a person's property. Forty-eight percent of respondents answered that storing trash properly or changing how they store trash was the most effective measure taken. Sixteen percent of respondents answered that it avoiding black bears and leaving them alone was effective and twelve percent reported that a combination of different measures worked best with deterring bears. Frequency tests revealed that when respondents were asked whether they were still experiencing problems with black bears, thirty-six percent were still having problems with bears and sixty-two percent were no longer dealing with black bear problems.

Of the respondents who answered "no" to still experiencing problems with black bears, a follow-up question asked them how long problems persisted before bears stopped coming on to properties. The top three answers respondents provided were that they never saw a black bear again (twenty percent), bears stopped returning after 1 to 4 weeks (ten percent) and bears stopped returning in less than a week (seven percent). The final independent frequency run was a question that asked respondents how they felt about the FWC services provided. Sixty percent of respondents answered that FWC was helpful, twenty-eight percent answered that FWC was not helpful and eleven percent answered that FWC was slightly helpful.

Questions somewhat relevant and similar to the TWRA data were selected to be run in contingency tables. These were created for the following questions comparisons: region and nature of report, region and year report was made, region and which suggested measures worked best, region and whether respondents are still experiencing problems with bears, region and how long problems persisted, region and whether FWC was helpful and nature of the report with which measures worked best to deter bears.

The contingency table between the region of Florida and nature of the report indicated whether or not there was a significant result of different kinds of bear experiences depending on the region the respondent is from. Of the respondents who listed apiaries as the nature of their report, thirty-nine percent of respondents were from the Northeast region, while twenty-eight percent were from the Northwest and seventeen percent from the South region. Of those who reported attacked animals, sixty-two percent were from the Northeast region, while nineteen

percent were from both the south and northwest regions. Sixty-five percent of “in area” reports were from the Northeast, while twenty-three percent were reported from the Northeast. Eighty-one percent of respondents who answered “in building” were from the Northeast region, while Northeast had the second highest “in building” reports at nine percent. Respondents who answered “in crops” were only found in the northwest and northeast regions, seventy-one percent in the Northeast and twenty-nine in the Northwest.

Again, Northeast and Northwest had the highest amount of reports for “in feed” responses: seventy-one percent for Northeast and fourteen for northwest. Of the respondents who answered “in feeder” for the nature of the report, fifty-four percent were reported from the Northeast and thirty-four percent were from Northwest. For those who reported “in garbage,” forty-eight percent were from the Northeast and forty-two percent were from the Northwest, seven percent from the South. Fifty-five percent of “in yard” reports came from the Northeast region, thirty-seven from Northwest and five from South. “In tree” reports were also largely from the Northern regions; fifty-five percent Northeast, thirty-seven percent Northwest, six percent south. One hundred percent of “killed animal” reports were from the Northeast region. Seventy-four percent of property damage reports came from the Northeast and twenty-three from Northwest. Of threatened animal reports made, forty-seven percent were from the Northeast region, thirty-three were from the Northwest and ten were from the south. Threatened human reports were only recorded in the Northwest and Northeast; sixty-seven percent in the Northwest and thirty-three percent in the Northeast. Overall, the extreme northern regions always had the largest amount of each type of report. The contingency table between these two variables were significant ($p=.000$) in determining if there was a relationship between types of reports and region. In addition to these two variables being associated together, this cross-tab also indicates that there is likely also a relationship between black bear population variation throughout Florida, suggesting that greater numbers of bears reside in Northern regions and the southern region more so than the central regions of the state.

A contingency test was run between the region of Florida that reports originated from and the year of the report. This test was conducted to see if there was a significance in the amount of reports made in the same region over the five years of data that was assessed for the survey. Of the respondents who filed reports in 2008, sixty-two percent of respondents were located in the Northeast region and thirty-four in northwest. Of reports made in 2009, forty-five percent were

from the Northwest region and forty-four were from the Northeast region. 2010 reports consisted of forty-eight percent from Northeast region and forty-seven percent Northwest. In 2011, sixty-one percent of reports were from individuals in the Northeast region and twenty-nine in the Northwest. Of those who reported black bear incidents in 2012, fifty-nine percent of reports were from the Northeast region, and twenty-nine were from the Northwest. From 2008 to 2012, percentages of reports from the Northwest peaked in 2010. Northeast fluctuated; it decreased, increased and then decreased. For North Central, the year with the highest reports were from 2009. Southwest percentages fluctuated over the years and South percentages increased over the years. There was a significant relationship ($p=.000$) between the regions and the year the reports were made that suggests population and distribution changes over the years, along with data supporting the likelihood that populations are higher in areas that have more reports.

A contingency test was run between the regions of Florida and the question which measures suggested by FWC worked best for respondents. This contingency test was conducted to determine if there was a correlation between the regions that reports are made and specific methods to reduce bear encounters. Of the different measures tested, Northwest and Northeast regions always had the highest percentages for each types of method of deterring black bears. Although the trend of larger percentages for Northwest and Northeast regions continued with this test, there were actually not significant findings ($p=.730$) as to whether or not specific measures tried had greater success from region to region. This could potentially be due to high variability and lack of black bear populations in the area, rather than methods not being effective.

Another contingency test was run between the region of Florida and whether respondents were still experiencing black bear problems. Of the respondents who answered yes to still experiencing problems, the largest percentage of residents with bear issues was in the Northeast region, followed by the Northwest region. Sixty-two percent of respondents who answered yes to continual problems with black bears were in the Northeast ($p=.000$) and twenty-nine percent were in the Northwest. Of the individuals who answered no when asked if they were still experiencing black bear problems, the highest percentage of respondents were also from the Northeast region, followed by the Northwest region. Fifty-two percent of respondents who answered no were from the Northeast whereas forty percent of respondents who answered no were from the Northwest regions. More respondents are still experiencing problems with black bears in the Northeast than in the Northwest.

Region of reported call was run with the question “Was the FWC helpful?” for another contingency table in efforts to determine if there was a significant response or feeling toward the FWC following the reported black bear incidence and FWC help. Of the individuals who answered that FWC was helpful, fifty-one percent of them were from the Northeast region and 40 percent were from the Northwest region. Five percent were from the South region. Among those who answered “slightly helpful” sixty-one percent were from the Northeast region and thirty percent were from the Northwest. Six percent were from the southern region. Of those who answered “not helpful” about the FWC, sixty-two percent of them were located in the Northeast region, thirty percent in the Northwest region and seven percent in the Southern region. Findings were significant ($p=.002$) that FWC was helpful based on the region the reports came from.

The final contingency test created from the Florida data was of the region the respondent was from and how long it took to stop experiencing black bear problems. This contingency test appeared to have greater variability than other cross-tabs ($p=.634$) resulting in insignificant findings, despite the bear problems eventually dissipating. Of the individuals who reported black bear problems in the Northwest region, thirty-one percent reported never seeing a bear again, twelve percent answered “less than a week,” eighteen percent answered “1-4 weeks.” The percentage continually decreased for greater amounts of time, but nine percent of respondents answered that “bears come around, but are not a problem.” Of the respondents who reported bears in North Central region, there were fifty-seven percent who answered “never saw a bear again” though fourteen percent of respondents also answered that “bears come around, but are not a problem.” Respondents who indicated they dealt with black bears in the Northeast region had more variable numbers with thirty-six percent answering “never saw a bear again”, sixteen percent answered “1-4 weeks” and eight percent reported seeing black bear that were not a problem. Respondents in the southwest region answered forty-one percent never saw a bear again, twenty-three percent answered “1-4 weeks” and eighteen percent answered “5-8 weeks.” Respondents from the South region answered thirty-nine percent “never saw a bear again”, fourteen percent for both “less than a week” and “1-4 weeks” and nine percent for bears.

For both Tennessee and Florida, respondents were categorized into region groups in accordance with the black bear population in that area of the state. In both studies, abundant bear populations were labeled and most interactions took place in those such regions. Differences between Florida and Tennessee in regards to black bear population regions were that Florida had

five regions versus Tennessee having three, and the abundant black bear population regions of Florida could be found at the northernmost regions (Figure 3) whereas Tennessee black bear populations became more abundant the further East one looked (Figure 4), along with getting closer to protected areas such as the Great Smoky Mountains. It was also supported by both studies that those who lived in abundant black bear regions had more reported incidents and more experience in general with dealing with bears. In addition to regional similarities, similar questions that dealt with black bear distributional changes and population changes were Question 20 of the TWRA survey, which asked if respondents felt populations were changing, the year of the reports from FWC and whether respondents from FWC survey are still experiencing problems. Based on Q20 from TWRA, most individuals felt that black bear populations have increased, though some do think the population decreased as well. This question was not actually asked in the FWC survey, but there is a rise in recorded incident reports from 2008 until 2012, also suggesting that populations have grown. In addition, abundant black bear areas have a lot of individuals who responded to the survey stating that black bear problems remain an issue. These numbers were highest for those living in the abundant regions (Northeast and northwest) compared to those in other regions.

Overall opinion of black bears in Tennessee and Florida did seem to vary throughout the state, which is understandable. A slight connection can be made between Florida and Tennessee just to distinguish similarities based on individuals' opinion of black bears and opinions of interactions that have taken place with place bears. Tying in Florida, reports to FWC the majority of Florida survey respondents did not initially contact FWC about black bear problems until after several instances had occurred ranging from between zero and five to respondents waiting until 15 or more incidents had taken place to call. Like with Tennessee, correlations between overall opinions and how those individuals felt about interactions that occurred with bears, it could be that respondents' opinions determined whether they would call FWC right away or wait to see if problems persisted.

Probably the strongest comparison between the two surveys were questions asked of similar nature for both types of respondents. Question 37 (TWRA) asked the respondents opinion of TWRA while question 10 (FWC) asked respondents if they viewed FWC as being helpful or not. In both cases, the way respondents answered was dependent on if their problems went away and how they initially felt about the agency. In both states, there were individuals who were

satisfied, felt neutral and were not satisfied with the agency, correlating with a negative opinion or experience they had either with the agency or after receiving help from the agency.

Discussion

The TWRA 2012 human perception survey turned out to be very conducive to the goal of this study. The expansive array of questions provided for a dependent variable and multiple independent variables to be selected in order to determine if there were different facets to determine how an individual felt about black bears in that state. Overall, a majority of the individuals who lived in established bear areas were supportive of black bears being in the area, which was not what I expected to find. When I started working with this data set, I expected to see a majority of negative opinions about black bears, regardless of which region was being looked at, because of the problems that arise with “nuisance bears” when living among them. Demographics did end up being important in this study, as more men appeared to support black bears in the area, possibly for multiple reasons such as general supportive opinion or ability to hunt (though women did have a high percentage of supporting bears as well). Several factors such as people’s beliefs about state agencies, their age and views on hunting all contributed to how an individual answered question 32.

Of this survey, the main limitations were not being able to know or understand an individual’s reasoning for answering a question the way they did. The downside of conducting a study like this is that surveyors are unable to obtain any explanation about answers provided. Further studies conducting a wide-ranging survey like the one done by the TWRA along with adding character profiles could really help identify if respondents have biased opinions, why they have these opinions and why they chose to answer questions the way they did. Benefits of such extensive surveying and unearthing such biases or deep-rooted opinions could aid the agency in developing new ways of bettering their management programs and working on ways to make sure residents opinions are heard and not overlooked.

The FWC survey was far less complex than the TWRA survey, having less questions, less variable and therefore less possible tests to run. This survey was of a bit of a different nature than the TWRA survey, which focused on opinions of all Tennessee residents about black bears, experience or not. The FWC study goal was focusing specifically on individuals who have

experience with living among black bears and have experienced an array of interactions such as nuisance behavior, threats or mere sightings. The most relevant finding from this study was the correlation between the most abundant bear regions (northeast and northwest) and the number of reports called in to FWC. A frequency test indicated that reports increased from the years of the study timeline, 2008 to 2012, which suggests that black bear populations have grown, distributions have shifted or widened, habitat, diet and/or forest factors are causing black bears to stray from forests or a combination of the above. Nuisance bears were the highest reported incidents, with the top being bears getting into garbage, also suggesting the factors listed above have an impact on such behaviors. A decrease in reported calls from 2011 to 2012 could be due to protective measures being taken by property owners, leading to more bears being deterred from land. However, seeing that it is still higher than 2008 and 2009, I believe it is possible that had measures not been taken in previous years, the amount of reported calls would be at its highest, potentially due to continued population growth. Like with TWRA data, when asked about FWC's service, the surveyors received varied responses, though the majority believed they were helpful.

Unfortunately, because this survey was on such a small scale with a limited number of questions, I was unable to analyze if there were any similarities between demographics of Florida and Tennessee, which could have been very interesting. This survey being so small resulted in a number of limitations, one of which was that it did not stand up as well to the TWRA data, resulting in limited analysis potential. The study also did not mention if it was weighted to the state of Florida, if it was weighted to a specific region or if it was unweighted. The lack of information makes me believe it was unweighted, which then effects if it is truly representative of the state. An additional limitation of information was where data was taken from. There was no mention of a database or where the data that was used came from.

Analyzing each data set independently and comparing the two after was, in my eyes, beneficial to understanding the nature of each survey and the purpose that surveyors had in mind. Independently, both surveys were very strong and provided clear results that indicated how respondents felt prior to comparing state by state. Additionally, since these two surveys were different, analyzing them separately allowed for full potential to discuss significant perception related findings for each survey prior to comparing the two. This allowed me to discover

significant findings in each study and also determine if there were any correlations between the two.

When it finally came time to compare the two datasets, it proved to be very difficult due to the difference in types of questions asked and the nature of each survey. Had there been a bit more information from the Florida survey, some stronger connections probably could have been made. Unfortunately this is not the case, resulting in few correlations and lack of expected results. This is also partially due to a lack of standardization of surveys from state to state. There does not appear to be any standards or guidelines for conducting wildlife-human perception surveys across the nation, which is why two data sets like the ones I analyzed, ended up being so different and difficult to compare. While this analysis still provided valuable and interesting findings, there could have been way more valuable correlations and findings had there been some sort of guideline or format for conducting such studies. In addition, because of these limitations, my findings from comparing the two datasets are more speculative than proven because of the inability to analyze a lot of comparable data.

Despite how humans may feel, black bear distributions are changing. While there is not much that people can do to stop black bear population growth and distribution range changes, wildlife management agencies can manage black bear populations and educate residents on how to live among black bears. Individuals that live in areas where black bears are spreading can actively learn about what they can do to avoid black bear conflicts as a means of limiting the amount of interactions that will take place between them. Understanding how individuals feel that already live among black bears will allow wildlife agencies of regions currently without black bears to develop a management plan based on those in bear regions or states already. Management plans for black bears created in areas that are beginning to have black bears again can be modeled on those that are already in place for states that live with black bears based on human perceptions and feedback. Managing black bears will continue to be of importance as black bear distributions continue to change due to population growth and spread.

While data provided for this study was very useful, the datasets provided produced limitations in regards to the individuals who partook in the survey. The answers provided by respondents was very useful, however truly understanding why an individual answered the way they did limited the study from understanding bias to answers along with being unaware of

where pre-conceived notions may have developed. In addition, it was unclear at times if someone answered a certain way because of personal experience or what that person may have learned through another or from social media. While this may not seem to be an important factor, it does have an effect on whether the answers submitted would have been different based on the source of knowledge the individual had prior to the survey. For example, if an individual answered the survey questions without having personal experience or interactions with a bear, they may have answered differently than if their knowledge was firsthand, effecting the results of the study entirely. In addition, in certain circumstances, respondents may have bias behind their answers that surveyors were unaware of, such as distrust or dissatisfaction with the state effecting their opinions of wildlife.

Further research is necessary to continue compiling information for wildlife management agencies to use when creating management plans in order to understand human's opinions and concerns. A larger study could be done in the future to include multiple states, while using the exact same questionnaire to reduce the amount of assumptions or inferences made from using different studies. Such a study could provide better data for use across the nation when considering distribution changes and how to move forward as a society living among bears.

Perhaps an in-depth study to follow up human perception surveys could be one focused on greater conversations with respondents following a survey. Even just having such conversations with a smaller representative sample could provide more accurate insights into why people respond certain ways to questions and their reasoning behind answering questions a certain way. Furthermore, creating a standardization for human perception studies can be very beneficial for further studies, especially those encompassing multiple states. Such guidelines would allow statewide surveys to be conducted across the nation on an individual level, but would make it possible to conduct a cross-national perception study to provide nation-wide perception data. This could not only benefit further, complex studies of the American black bear, but it could also be applied to other potentially problematic species as well.

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