Examining Sense of Place and Florida Black Bear Habitat Use in Florida's Northwestern Panhandle: A Social-Ecological Approach to Landscape Management

by

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Abstract

Florida's Northwestern Panhandle is one of the last undeveloped areas of Florida coastline and faces potential alterations in the near future. These changes will have landscape level impacts, and this study aimed at understanding the potential effects to both social and ecological systems. From a social standpoint, human-landscape relationships and sense of place were identified and mapped within Franklin and Gulf counties. From an ecological standpoint, habitat use patterns of threatened Florida black bears were examined within Apalachicola National Forest and Tate's Hell State Forest. Individuals' attitudes toward black bears and preferences related to managing human-black bear conflicts were also explored. Study findings revealed residents possess strong attachments to the landscape based on a variety of meanings, black bears are using Tate's Hell State Forest over Apalachicola National Forest, and residents' attitudes concerning bears and conflict management preferences varied greatly. Findings will assist with planning for impending development and creating management plans that correspond with residents' sense of place and local black bear habitat use patterns.

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Table of Contents

List of Tables

List of Figures

Chapter 1

Examining Human-Landscape Relationships:

A Qualitative and Spatial Analysis of Sense of Place

Abstract

Florida's Northwestern Panhandle is one of the last undeveloped areas of Florida coastline and faces potential alterations in the near future. This study identified places of importance, human-landscape relationships, and sense of place across a mixed landscape of both private and public lands within Franklin and Gulf counties in order to better plan for impending development. Relevant data was obtained through an innovative approach that utilized the combination of focus groups and spatial mapping procedures. Focus group discussions supplied rich understanding of human-landscape relationships, while participant mapping provided spatially explicit representations of those relationships. Study findings revealed a variety of place based meanings are present, locations of landscape attachments are spatially identifiable, and strong conservation and development preferences exist. In a broader context, study findings will provide natural resource managers with spatially explicit information needed to create management plans that correspond with local land use preferences and sense of place.

Introduction

Across much of the United States population growth and development continue to increase, resulting in major landscape modifications and land use changes. The implications of these changes have significant impacts on human systems, ecological systems, and the relationships between the two. The association between humans and their environments is highly interactive, with humans bound to the landscapes in which they live and landscapes subject to the actions of humans. As changes continue to occur and landscapes are altered, an improved understanding of human-landscape relationships and places of importance is needed.

This article's objective is to provide insight into and spatially represent local human-landscape relationships within two counties in the Florida Panhandle that contain a mix of land ownerships that are facing potential developmental threats. This task was undertaken by employing a novel approach which utilized the combination of focus groups and participatory mapping procedures. Specifically, meanings and attachments to the landscape resulting from livelihood and recreational interactions were sought. With development impending, opinions concerning places of ecological importance and preferences for conservation and development were obtained as well.

The benefit of such a methodology that utilizes both focus groups and participatory mapping procedures is that in-depth and personal insight into human-landscape relationships is obtained. Focus group discussions provide rich, comprehensive understanding of specific place meanings, landscape attachments, and the basis for those meanings and attachments across a range of stakeholders, while participatory mapping reveals the geographical dimensions and specific locations of those meanings and attachments. Furthermore, data collected at a fine scale, such as the county level as in this study, provides relevant and spatially detailed findings useful for future land use planning and management objectives. Thus, managers are afforded the ability to formulate land use plans that preserve human-landscape relationships and coincide with local land use preferences.

Conceptual Background

Across numerous disciplines multiple approaches have been developed to conceptualize the intricate relationships that exist between humans and landscapes (Davenport and Anderson 2005; Williams et al. 1992). An overarching concept that has emerged as an appropriate means for understanding the bonds between human and ecological systems is “sense of place” (Davenport and Anderson 2005; Jorgensen and Stedman 2001; Rogan et al. 2005; Stedman 2003; Williams and Stewart 1998). In its simplest form, sense of place is an interpretation of how humans identify and connect with the places or landscapes with which they interact (Williams and Stewart 1998). Sense of place, however, is a complex, multidimensional concept that has been described as a collection of meanings, values, attachments, bonds, feelings, symbols, perceptions, satisfactions, qualities, and characteristics that humans associate with a place (Brown 2005; Davenport and Anderson 2005; Eisenhauer et al. 2000; Fishwick and Vining 1992; Galliano and Loeffler 1995; Greider and Garkovich 1994; Kaltenborn 1998; Relph 1976; Rogan et al. 2005; Stedman 2003; Tuan 1977; Williams and Stewart 1998,).

The developmental process of sense of place can be viewed from what past researchers have termed an “interactionist perspective” (Berger and Luckmann 1967; Greider and Garkovich 1994) or as a “transactional concept” (Zube 1987). Both approaches demonstrate that sense of place develops through people actively living, participating, and interacting in and with places and landscapes. As people interact with their surroundings, they enjoy experiences, partake in activities, make observations, and instill value and meaning into specific places. Place meanings are shaped by both social influences and the physical landscape and do not have to be exclusively of a utilitarian or consumptive nature (Eisenhauer et al. 2000; Raymond et al. 2009; Williams and Stewart 1998). Social influences impacting meanings can include an individual's previous experiences, personal needs and desires, cultural heritage, family history, and lifestyle among other things (Williams and Stewart 1998; Zube 1987). The nature of the physical environment and specific attributes of a place operate in unison with these social influences to further mold the meanings that are associated with particular places and landscapes (Shields 1991; Stedman 2003). Place meanings ultimately shape the bonds and connections that develop between individuals and places.

Past efforts have intensively explored and aided in the conceptualization of sense of place. Early sense of place research revealed that individuals instill a variety of place meanings into specific locations and develop attachments based on a number of interactions with the landscape (Williams et al. 1992) such as, livelihood dependence (Davenport and Anderson 2005) and recreational use (Farnum et al. 2005; Moore and Graefe 1994). Place attachment was further suggested to comprise the additional components of place identity and place dependence (Moore and Graefe 1994; Williams et al. 1992), although debate still remains over the exclusivity of place attachment, identity, and dependence (Stedman 2003). Mesch and Manor (1998) identified the importance of perceptions of place, and Stedman (2003) substantiated the significance of place satisfaction as a core element of sense of place. Furthermore, Stedman (2003) demonstrated that in addition to social processes, the nature of the physical environment, termed as place characteristics, shapes sense of place.

These past endeavors reveal that sense of place can be defined as a multidimensional concept consisting of place meanings, place attachment which includes place identity and place dependence, place satisfaction, and place characteristics. Each of the four main domains operates separately, but more importantly, in conjunction to comprise the overall concept of sense of place. The interworking relationship between these four domains is best explained by Stedman (2003) who suggests that characteristics of the physical environment provide an outlet for place meanings to develop, and the ensuing meanings mold both place attachments and place satisfactions. The result of this process is a unique sense of place that elucidates the relationship between an individual and a place and sheds light onto why a place is deemed as important or as a “special place”.

The multifaceted nature of sense of place makes it an exceptional construct for developing insight into how particular communities relate to their surroundings and the importance of areas within the larger landscape. Answers to a variety of questions can be obtained such as, what makes a place important, how do environmental features shape connections with landscapes, and how do potential landscape alterations shape meanings, perceptions, and attachments. By examining these various questions deeper insight into human-landscape bonds and how those bonds can be maintained emerges. Understanding these relationships is a critical component of natural resource management, and thus the ultimate practicality of sense of place is that it allows managers to identify, understand, and consider human-landscape relationships prior to proposing and implementing management decisions (Williams and Patterson 1996). A thorough knowledge of a community’s sense of place provides valuable information needed to create management plans and formulate policies that coincide with locals' conservation and development preferences, help minimize potential conflicts, and preserve the complex bonds that exist between individuals and places.

Spatially Representing Sense of Place

As the concept of sense of place has continued to evolve, researchers have conceded that one of the greatest limitation of previous research has been the inability to spatially represent individuals' sense of place (Black and Liljeblad 2006; Brown 2006; Dixon and Durrheim 2000; Tyrväinen et al. 2007). The mapping of human-landscape relationships holds the potential to bridge the gap between theoretical sense of place research and applied land management. Representing an individual's knowledge within a spatial context is known as "participatory" or "bottom-up" geographic information systems (GIS), which is a valuable tool for identifying the spatial dimensions of sense of place (Abbot et al. 1998; Talen 2000).

Brown (2005) utilized participatory GIS by having Alaska residents place points on a paper map that represented specific landscape values (i.e., aesthetic, therapeutic, etc). Although Brown (2005) successfully identified the locations of place values, his study lacked qualitative understanding of whether those locations were important, and if so, what attachments, satisfactions, or physical characteristics contributed to the importance of the mapped places. Black and Liljebald (2006) utilized an alternative method to mapping landscape values in order to gain a fuller representation of place attachments held by Bitterroot Valley residents to the Trapper-Bunkhouse planning area in the Bitterroot National Forest. Black and Liljebald (2006) conducted in-depth interviews with participants and had each participant draw areas of importance or areas imbued with specific meanings. Black and Liljebald's (2006) approach provided the necessary link between mapping places of importance and understanding what meanings and attachments made those places important. Furthermore, by working at a fine scale participants were able to hand draw areas of importance. The advantage of having participants draw on maps is that specific areas or landscape features can be mapped, identifying both large geographical areas (i.e., hunting leases) and specific characteristics of a landscape (i.e., trailheads) that are important. The end product of Black and Liljebald's (2006) research endeavor was an in-depth understanding of residents' place attachments, underlying meanings for those attachments, and visualization of places of importance.

Study Area

The adjacent counties of Franklin and Gulf lie along the Gulf Coast of Florida's Northwestern Panhandle, 80 miles and 100 miles southwest of the state capital of Tallahassee respectively. Together, the two counties are one of the last remaining areas of undeveloped coastline in Florida, and a diversity of land ownerships and uses exist throughout both counties. Public lands comprise eighty-seven percent of the land mass in Franklin County and approximately fifteen percent of Gulf County. Public lands throughout the counties include national preserves, state forests, and other protected lands. Private lands consist of residential areas, timber and agricultural lands, coastal properties, and other land holdings. Both counties contain miles of pristine coastal shoreline, numerous beaches, expansive river systems, the Apalachicola and St. Joseph Bays, various aquatic habitats, and many local and state parks.

Both counties are predominantly rural, but residents vary demographically. The counties contain long term residents and retirees, second home buyers and newcomers, and individuals of various races, ages, occupations, and socio-economic statuses. Franklin and Gulf boast of being part of "Old Florida" and categorize themselves as the "Forgotten Coast" due to the minimal development that has occurred along the coastlines. The maritime culture of Franklin and Gulf counties is a significant aspect that further defines both counties, and Franklin County is especially known for its functioning waterfronts and prominent oyster industry.

The combination of diverse natural surroundings and traditional towns and communities has produced remarkably strong bonds between county residents and their surroundings (Johnson and Zipperer 2007). However, several land development companies own the majority of private lands remaining in Franklin and Gulf, and both counties are poised to undergo land use change in the future. As these changes manifest, the need to identify, understand, and verbalize the relationships between local residents and their surroundings has come to the forefront of natural resource management in both counties.

Methods

This study follows a similar methodology to Black and Liljebald (2006) in that participatory GIS is utilized to make the link between qualitatively understanding and spatially representing human-landscape relationships. In contrast to Black and Liljebald (2006), this study explores human-landscape relationships and sense of place across a mixed landscape of various private and public ownerships. Focus groups are used to capture detailed insight concerning the bonds between humans and landscapes, and participant drawing is employed to spatially document places of importance. Spatial data is collected at a fine scale where participants can easily identify and map specific locations. This approach undertaken at the local level provides managers and planners with understanding and visualization of important places, which can be integrated into appropriate land management policies and decisions.

Qualitative Methods and Analysis

A diversity of focus groups was conducted to represent a broad range of opinions, with the goal of in-depth and rich understanding of bonds shared between individuals and landscapes. Key informants within both counties assisted with identifying and recruiting a range of groups. Additionally, a snow ball sampling technique was employed to identify individuals with whom to conduct focus group discussions. A total of 19 focus group discussions and one interview were conducted in the summer of 2010. On average each focus group consisted of five to eight similar individuals. This small group size was ideal for discussing human-landscape relationships and sense of place because it encouraged self-disclosure among participants, allowed participants sufficient opportunity to explain and share their many experiences and attitudes, and provided participants with the opportunity to readily identify and draw their places of importance. Focus groups consisted of marine industry workers, ecotourism workers, realtors, small business owners, educators, second home buyers, new residents, long term residents and retirees, local recreational clubs, professional biologists and foresters, and concerned citizen groups.

To ensure consistency across focus groups, a questioning guide and follow up probes were developed. Open-ended questions were used to facilitate discussion specifically related to place meanings and attachments that result from livelihood dependence on the natural environment and recreating on the landscape. These two interactions were examined as they are the main interactions Franklin and Gulf County residents have with the landscape. Questions also explored opinions related to places of ecological importance and preferences for conservation and development. Insight into such opinions and preferences was obtained in order to understand the potential impact of future development on sense of place. All focus group discussions were audio recorded, and prior to formal analysis discussions were transcribed verbatim into an electronic text file. Each transcript was reviewed to ensure accuracy and completeness.

Upon finalization of all transcripts, qualitative analysis procedures were employed as outlined by Strauss and Corbin (1990). A start list of initial codes was developed based on sense of place theory and previous research. Initial codes were created to capture ideas related to the sense of place constructs of place meanings, place attachment and it's sub-components of place identity and place dependence, place satisfaction, and place characteristics (Mesch and Manor 1998; Moore and Graefe 1994; Stedman 2003; Williams et al. 1992). Place meaning codes included meanings resulting from livelihood and recreational interactions with the landscape (Davenport and Anderson 2005; Farnum et al. 2005; Moore and Graefe 1994). Ecological meanings associated with particular places were also coded (Davenport and Anderson 2005; Manning et al. 1999). Additional codes related to conservation and development preferences and attitudes toward development type were generated (Brown 2006; Davenport and Anderson 2005). Emergent coding categories were created as transcripts were read and common themes and responses not originally contained in the start list of codes became apparent. After initial and emergent coding categories had been proposed, project staff reviewed potential codes, and a final list of codes was formulated. Each main coding category consisted of subcategories that contained additional codes for capturing important subthemes, ideas, and relationships.

The qualitative analysis program NVivo v8.0 was used to perform all coding and coding summation. Within NVivo relevant passages and phrases from each focus group discussion were coded based on the content of the text. Every passage that referenced a specific drawn polygon was coded with the associated unique identifier for that polygon (see Spatial Mapping Methods). This allowed passages to be directly linked to the geographical location that the passage described. After all coding concluded coded transcripts were examined by additional project staff to assess the reliability of the coding. Necessary changes in coding were made to ensure all codes accurately and reliably classified the content of passages. Interpretation of coded passages identified major themes and attitudes related to place meanings, attachments, and overall sense of place.

Spatial Mapping Methods and Analysis

In order to spatially represent human-landscape relationships each focus group was presented with a 36 inch by 48 inch aerial photograph of both counties, with a scale of 1 inch equal to 1.43 miles. As each main topic was discussed participants were asked to draw areas (i.e., polygons) on the map that were related to the topic. For example, as participants discussed important areas for recreational use, they drew on the map areas where they conducted specific types of recreation. Furthermore, for each polygon participants discussed why that place was significant to them and what social and biophysical factors contributed to making that place significant. In order to ensure clarity during analysis, each polygon was assigned a unique identifier. As each polygon was discussed the moderator announced the unique identifier associated with that polygon, allowing each polygon to be linked to its associated recorded qualitative data. Prior to formal analysis all polygons drawn by participants were manually digitized into ESRI ArcGIS using the previously assigned unique identifier as the Polygon ID.

Once hand drawn polygons had been digitized into ArcGIS, all polygons from every focus group were merged into one new shapefile. Each polygon was assigned specific attributes based on the content of the passage associated with that polygon. This was done by creating a new field in the attribute table of the shapefile, and then classifying each polygon based on the particular attribute under review. For example, a new field labeled recreation was created, and every polygon that referenced an area related to recreation was assigned a value of 1 in the newly created recreation field. This process was completed for all polygons that were described by a particular passage.

The main spatial representation of human-landscape relationships for this study involved the creation of density maps, also referred to as hotspot maps. Density maps display areas that are most frequently identified (i.e., hotspots) in relation to a particular type of interaction that contributes to sense of place. These maps were created in ArcGIS by taking polygons that overlapped at any one location and summing them together. Multiple hotspot maps were created to visually demonstrate where certain human-landscape relationships and places of importance were geographically located within Franklin and Gulf counties. Once hotspots were identified the text associated with each polygon comprising a particular hotspot was referenced. This allowed for understanding of the place meanings, attachments, satisfactions, and characteristics underlying each hotspot. Careful consideration should be given to not interpret hotspots as the definitive most important places within both counties as focus groups were designed for breadth of understanding rather than representation of the greater population. Therefore, hotspot maps display the places most often identified as important by study participants only and demonstrate the spectrum of important places within the counties.

Study Findings

Participants attribute a range of meanings to their natural surroundings, which has resulted in the development of specific attachments and bonds to the landscape. Strong preferences were readily apparent when individuals discussed their attitudes toward future development, with the majority of participants placing a heavy emphasis on conservation of lands and disapproval of large scale development. What follows is a summary of resident's livelihood dependence on the environment, recreational use of specific places, and opinions concerning ecological places of importance. Selected passages from the focus group discussions are presented to emphasize why participants associate particular meanings with the landscape and how their attachments to the landscape have developed. Conservation and development preferences are further described to reveal how individuals' perceive potential landscape alterations. Hotspot maps representing participants' ties to the landscape are provided in order to spatially reference and visually display human-landscape relationships.

Livelihood Dependence on the Natural Environment

In both Franklin and Gulf counties livelihoods are almost solely derived from natural resource dependent industries. One participant states: "The whole economy and everything is dependent on a beautiful natural environment." In both counties the main livelihood strategies consist of working in either the seafood or tourism industry. Tourist based jobs consist of employment at local restaurants, shops, and other service oriented professions. In the seafood industry, products regularly harvested include fish, oysters, shrimp, and crabs. The historical and present day significance of the seafood industry is demonstrated by a participant who stated: "That's all they have ever done in Franklin County is fish, shrimp, oyster, crab, and whatever. That is the livelihood." Other employment opportunities exist in government, construction, real estate, and the timber industry. However, such jobs are rare due to downturns in the housing market and economy and increased public land purchases.

Meanings associated with places providing for livelihoods include economic, sustenance, cultural, and historical. The present day maritime culture, working waterfronts, and local seafood industry within both counties, especially within Apalachicola, is viewed by many as a vital aspect of the local communities' identity. The strong cultural meaning and attachment participants' have to the maritime tradition in both counties is summed up by a participant:

> To me personally and historically, when I drive over that bridge and I look out and I see them oystering that gives me a sense of connectedness to the past as well as future to see those guys out there making their living on the bay, tonging with the same wooden handled tongs that they have for years and years.

Within the seafood and tourism industries there is a strong dependence on the Apalachicola Bay, St. Joseph Bay, and Gulf of Mexico to harvest marine species and draw vacationers and tourists to the area (Figure 1). Several participants also make reference to the importance of the Apalachicola River and smaller river systems in maintaining the viability of the bays and Gulf. Additionally, the beaches located on St. George Island, Cape San Blas, and the St. Joseph Peninsula attract tourists to the area, which in turn provides employment opportunities for locals. The physical nature of the islands which draws vacationers to the area is described by one participant:

> A tremendous amount of people come here every year just to see that bay…That peninsula on outside beaches and on inside is probably some of the most beautiful waters and sand dunes that you'll see anywhere. We got sand dunes on that peninsula that's 100 feet high.

One participant sums up the extreme dependency on the bays and coastal properties for livelihoods: "The bays and the beaches drive the whole economy, whether it is tourism or seafood or just anything else." Another participant asserts that the bays are the "lifeblood" of the counties. These statements demonstrate that even livelihoods generated from other opportunities outside of seafood and tourism depend on a functioning natural environment to attract people to the area and live in the area.

Recreational Use of Specific Places

Recreational use of specific places includes both the terrestrial environment as well as a variety of water bodies (Figure 2). Multiple participants state recreational opportunities span the entirety of both counties: “The whole county is recreation” and “We got everything we want to do right here in Gulf County.” Recreational activities most frequently mentioned are similar to livelihood approaches and include crabbing, oystering, scalloping, and fishing within the rivers and bays. Other activities participants often partake in consist of beach going, wildlife viewing, boating, kayaking and canoeing, hunting, and camping. Participants state that the vast availability of numerous recreational opportunities contributes to their desire to live in the area: “I don’t know about you guys but one of the reasons I am here was because of the proximity and the availability to inshore and offshore fishing.”

Locations used for recreation contain a variety of meanings including spiritual, therapeutic, aesthetic, solitude, bequeath, wilderness and naturalness, social, and the meaning of recreation itself. The meaning of solitude can be observed as a one participant states: “We enjoy going up the river to swim. I love it because no one is ever there and you can park the boat in the middle of the river and jump in.” Discussions concerning recreation demonstrate that participants’ attachments to recreation sites are mainly based on either social or nature meanings. Social meanings related to “family”, “friends”, and “grandchildren” among others lead to place attachments. According to a participant:

> Wetappo Creek, the reason we go there is family. My great grandparents live there, so we love to go up. My brother comes down from Tennessee and as many family members,

> and we just enjoy being out on the water, seeing where our great grandparents lived and boated and enjoyed life.

Additionally, participants bond with particular recreational areas based on nature meanings concerning the physical characteristics of the environment such as “natural beauty”, “scenery”, “nice white beaches”, “abundant natural resources”, “fresh air”, “remoteness”, “unspoildness”, and “peacefulness.” One individual stated:

> The part I love the most is the sound. It is tidal. It is different every day. It is either got sparkles on the water or it is dry land or it is dark because there is a storm coming in or it is bright because the sky is blue or it’s choppy because the wind is blowing. Every time you look in any direction on any given day you never see the same thing.

The strong attachments individuals have developed with the landscape through recreation are summed up by an individual who claims:

> These natural resources are the reason that people come here. The reason that I came here was because of the natural resources, and I believe that there are always going to be people that want to experience natural resources in their recreational time.

Opinions Related to Places of Ecological Importance

Both counties are considered to be highly valuable from an ecological standpoint: “We love the environment” (Figure 3). Many participants emphasize that both counties, from recreation to livelihoods to historical relevance, depend on healthy terrestrial environments as well as on functioning watersheds, bays, and the Gulf of Mexico. As one participant claimed: “If you lose the environment you lose everything. If the environment is gone then the rest is all gone too.” Meanings associated with ecological places of importance include economic, sustenance, historical, intrinsic, therapeutic, aesthetic, wilderness and naturalness, recreational, and the meaning of ecological itself.

Participants indicate that it’s not individual components of the environment that are important, but it’s the interworking relationships among all ecological components that are vital:

> It’s so interconnected and so interdependent that if I tried to say the most important environmental thing in Franklin County is Nick’s Hole, well I can argue the other side of that and be absolutely convinced I’m wrong. You just can’t pull one thing out.

Within both counties participants stress the critical ecological role the terrestrial landscape, rivers, bays, estuaries, Gulf of Mexico, islands, and coasts play. Participants mention the amazing marine and terrestrial biodiversity provided by each of these. One individual notes:

> St. Vincent is unbelievably important. They still have red wolves, a pair that they use as semi-captive breeding. They have that, but the migratory birds, shorebirds, all manners of endangered species of birds it is important for. It also has turtle nesting beaches and nursery ground, these marshes, nursery grounds for fish for all the fish.

Furthermore, the characteristics of “naturalness” and “pristineness” within both counties are satisfying to numerous participants: “I came from Louisiana where you have no pristine environment, and that’s one of the things I love about this area.” Several participants explain how the area provides “clean” and ”fresh” air, “dark night skies” for “stargazing”, and “beautiful sunsets and sunrises.” On a larger scale participants appreciate the “natural” and “wild” state of the extensive river systems and the vast amount of wilderness lands present in both counties:

> One thing that impresses me is the fact that for 50 miles north and 100 miles wide from 319 we have national and state forests. That is roughly 5,000 square miles. It is one of the largest natural areas in the state of Florida, including the Everglades and over near Okefenokee.

Preferences for conservation and development

Conservation and development preferences among focus group participants are highly aligned with each other. Areas identified as important for conservation and protection from development closely resemble the hotspot map of ecologically important places (Figure 3), with the slight difference of increased emphasis being placed on the terrestrial landscape. Participants emphasize the importance of already preserved lands in both counties for environmental protection purposes. Furthermore, participants stress the need to protect the remaining coastlines in both counties from development for aesthetic, water accessibility, economic, community identity, and most notably environmental conservation reasons. One participant explains that conservation of coastlines and developmental restrictions are needed in order to ensure the long term functioning of marine ecosystems:

> The other really important land for conservation is the coastline, especially these really low elevation coastlines that with sea level rise are going to be under water. If we have development along the shoreline, we have sea level rise, it is going to be hardened shoreline, and we aren't going to have the marshes that support all the life of the bay and all.

Participants also place strong emphasis on conserving public access to the water and waterfronts for recreational and livelihood endeavors as both depend on available access points:

> As far as our economy of our area being related to commercial fishing, that's important to me that that not go away. I know you can't preserve a way of life. You can't mandate a way of life, but you can do things as a community or as a government to help encourage it, and one of those things that we've been working on for years in the county is finding places where people can get in and out of the water, and preserving some of our waterfront for commercial fishing and for recreational fishing.

Developmental preferences vary based on type of development. Most hold the belief that developmental expansion is not warranted unless it involves bringing clean industries to the area to stimulate job growth, diversify livelihood approaches beyond seafood products and tourism, and is clustered around currently existing population centers. Most participants agree that development "is not the best for the environment" and that "the environment is too important here to bring something in to destroy it."

Views toward residential development are uniformly negative and strongly against future developments. Development is viewed as a threat to the local "Forgotten Coast" identity that so many residents value: “I think when you mention the word development in Franklin County it’s usually a dirty word because people don’t want to end up like Destin. They don’t want high-rises.” Similarly, participants disapprove of private development companies pushing for increased development that is contrary to residents’ desires and the unique flavor of the area:

> Look at what happened in Eastpoint. This firm came in and bought up a lot of properties below the waterfront and was going to do this development. I remember the comment was, ‘you couldn’t have another building like the Gibson Inn if you don’t break the height limits.’ And everybody says ‘great we have already got one, we don’t need another one.’ That’s the thing, they never really got it. They were intent on doing something that was different than what people moved here for.

Commercial development in the form of more stores, restaurants, and shops is viewed in several contexts. Almost all participants view large chain stores as opposed to the local community identity: “If you want Starbucks go back to the big cities. That is not what we are about.” Another participant states that large chain stores would threaten existing livelihoods:

> All it takes is one Olive Garden and one Chili’s or Pepper’s and then pretty soon you’ve got local restaurants going out of business. It takes one Home Depot and you lose all your hardware stores. One Wal-Mart and everybody goes out of business. We don’t want the big chains in here…I like doing business with local businesses.

Several participants mention that from an economic growth and livelihood expansion perspective the establishment of a few more local shops and restaurants that fit in with the local character would be beneficial:

> As far as economic development or growth of businesses to me what would be good is to see it happen in the towns. Port St. Joe is a shell of a town. They are in the process of developing it back into a town center with recreation and businesses and that kind of thing. I’d love to see that happen.

Participants express the need for increased industrial growth but in a “clean” fashion that will not harm the environment or compromise current livelihood approaches. Most participants call for industrial development in order to promote economic expansion:

> Somehow there needs to be development for employment. It needs to be planned and done so it doesn't affect all the things that we have already talked about in a negative way. Somehow there needs to be some kind of industry that can employ these people.

A few participants are outright against increased industrial development as they believe it would harm the environment and jeopardize the local identity within Franklin and Gulf counties:

> What made this place special is its pristine environment, its seafood, people, and all that. I've lived in Louisiana by oil refineries and the industrial model doesn't value…It won't be a special place anymore; it will be another industrial place. And that will be a tragedy.

Discussion

Similar to past studies, findings from this study demonstrate that various place based meanings produce attachments between individuals and their surroundings. Place attachment within both counties consists of both identity and dependence constructs. Participants proudly identify the area as the Forgotten Coast, and recognize the maritime culture, water accessibility, and minimal development as defining components of the community. "Not being Destin" was a common theme and point of emphasis. Place dependence within both counties can be broken into several components. As past literature has cited (Davenport and Anderson 2005; Stokols and Shumaker 1981; Williams et al. 1992), place dependence results from recreational experiences that facilitate the development of traditional place meanings, such as aesthetic and solitude among others. However, as Davenport and Anderson (2005) brought to light, the additional element of livelihood dependence on the environment, which has often been ignored in understanding place attachments, heavily influences human-landscape relationships. The dependency participants have on natural resources to maintain a living conveys the significant role that the natural environment and healthy ecosystems play as a source of revenue. Such bonds cannot be viewed as insignificant, as economic security derived from the landscape heavily influences participants' sense of place.

In addition to place identity and place dependence, study findings demonstrate that place characteristics and the physical environment profoundly impact the bonds that develop between people and places (Black and Liljeblad 2006; Davenport and Anderson 2005; Stedman 2003). Participants clearly stated that certain areas are valued and important for their ecology and physical characteristics. Specifically two main place characteristics emerged as most influential on the formation of bonds between participants and places: naturalness and biodiversity. Often times, regardless of experiences or activities, participants instill value in, bond with, and find satisfaction with areas they deem as "natural", "wild", and "unspoiled" or places containing unique, endemic, or high concentrations of terrestrial and marine species. On a broader scale, individuals assert that the extensive water system consisting of the Gulf of Mexico, Apalachicola Bay and St. Joseph Bay, estuaries, rivers, and numerous tributaries is intrinsically "special" and "important" because such systems are rare elsewhere.

As participants demonstrated, place meanings and attachments and thus satisfactions are highly susceptible to change as landscape modifications manifest themselves in the form of future developments. Like Davenport and Anderson (2005), it was necessary to proceed beyond simply classifying individuals' perspectives as pro vs. antidevelopment in order to assess the impacts of development on the bonds between people and places. Meanings sighted as being impacted by developmental threats were most often associated with livelihoods, the environment, aesthetics, water accessibility, and local community identity. The potential development type was vital for understanding how participants' attachments and satisfactions would change as a result of landscape modifications. Development, especially in the form of either residential or large-scale commercial, is viewed as negatively impacting meanings and contradicting the “Forgotten Coast” mantra of the counties. Conversely, most view clean industry as beneficial for improving upon meanings related to livelihoods and economic security in the counties. However, such industry is only viewed as acceptable if it does not impede upon current meanings, community identity, and ecologically important places. Who would be conducting the development was also found to be important, as most individuals view large private development companies as stronger threats to current meanings and attachments. As demonstrated, the impact of development upon place meanings and attachments cannot be understood through a simple categorization of pro vs. antidevelopment. Impacts on specific meanings and attachments and subsequent changes in attitudes and satisfactions must be identified based on the manner of development and potential alterations.

The threat of development on local sense of place demonstrates that “natural resources exist in a social and political world” and that proper management decisions can only be formulated “by putting the human bond with nature in the foreground, rather than treating it as an interesting but insignificant feature of the background” (Williams and Stewart 1998). This study aids land managers in addressing Williams and Stewart’s (1998) assertions in a twofold manner: qualitatively understanding human-landscape relationships and spatially representing those relationships. Focus group discussions qualitatively addressed the “what” to manage question by providing the valuable link between identifying what places are important and understanding why those places are important. These discussions revealed the specific meanings associated with places of importance and how those meanings shaped the attachments that developed between participants and the landscape. Such an understanding of place meanings and attachments further provided deep insight into and a holistic representation of residents’ sense of place and relationships with the landscape. From a management standpoint, comprehensive understanding of sense of place was acquired across a range of constituent groups, permitting planners to integrate multiple stakeholder perspectives into management.

Spatially mapping place meanings and bonds between individuals and landscapes provided managers with the answer to the “where” to manage question. Specific meanings and attachments to places spatially varied but also overlapped across the landscape, demonstrating that each location on the landscape was unique from all others based on the specific meanings and attachments attributed to that place. Furthermore, this study addressed Brown and Raymond’s (2007) statement that, “mapping of landscape values and special places can provide an operational bridge between place attachment and applied land use planning.” Through participatory mapping procedures this “operational bridge” was created, which is vital for prioritizing management objectives, especially across landscapes containing mixed ownerships and land uses, as in this study. Unlike so many past efforts, this study provided local natural resource agencies with both qualitative and spatially explicit data on where specific bonds exist between community members and the surrounding environment. Just as importantly, spatial data was collected at the county level and at a fine scale resolution, allowing planners to readily incorporate findings into land use planning initiatives. As this research endeavor demonstrated, by qualitatively understanding human-landscape relationships and spatially mapping those relationships, management efforts can be formulated that are place based and aligned with residents’ preferences.

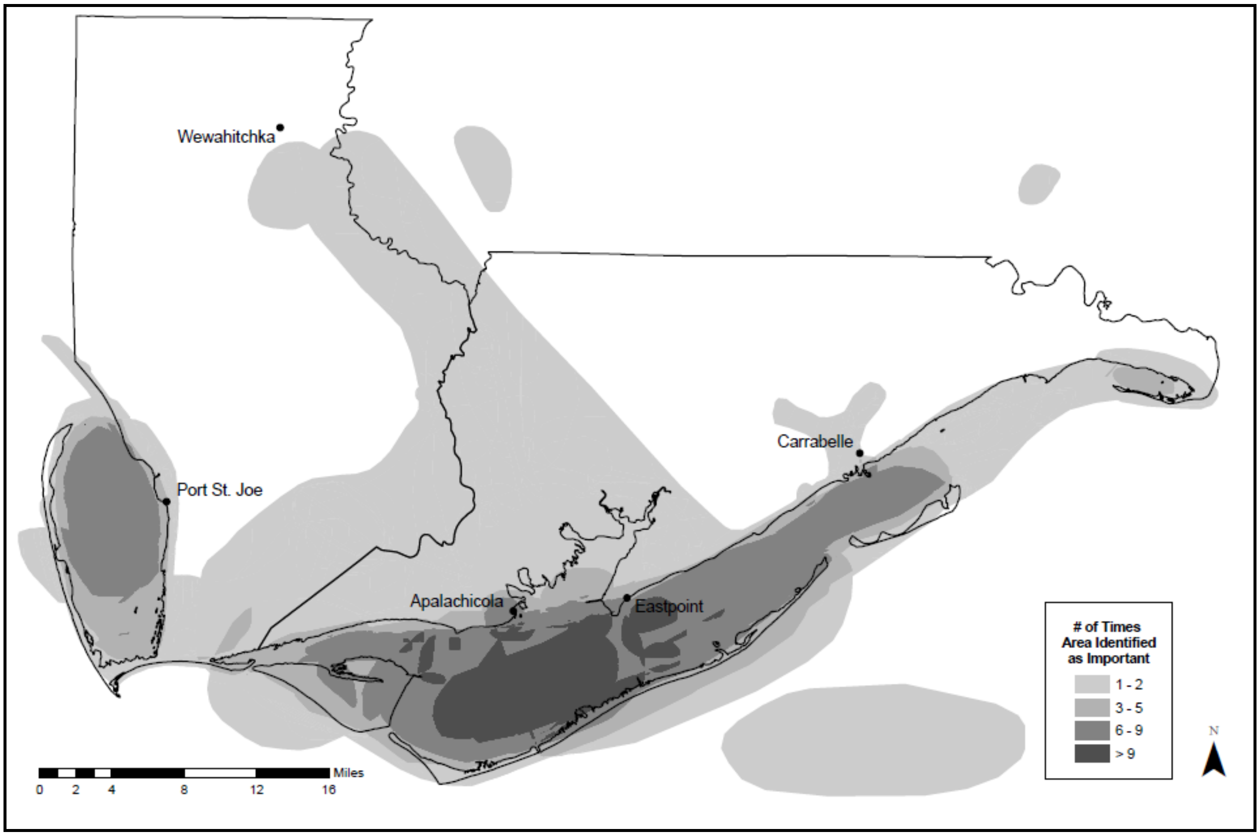

Figure 1. Map of places identified as important for livelihoods in Franklin and Gulf counties, FL by focus group participants.

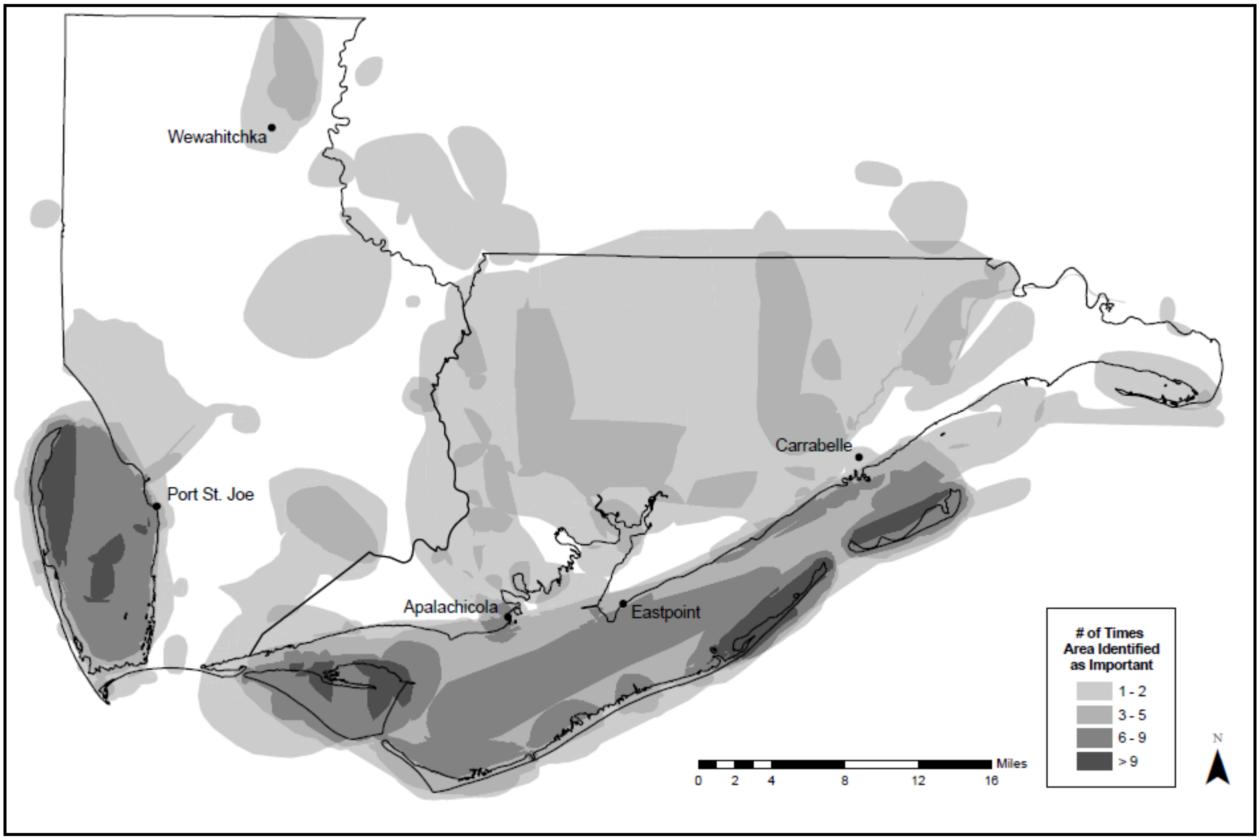

Figure 2. Map of places identified as important for recreation in Franklin and Gulf counties, FL by focus group participants.

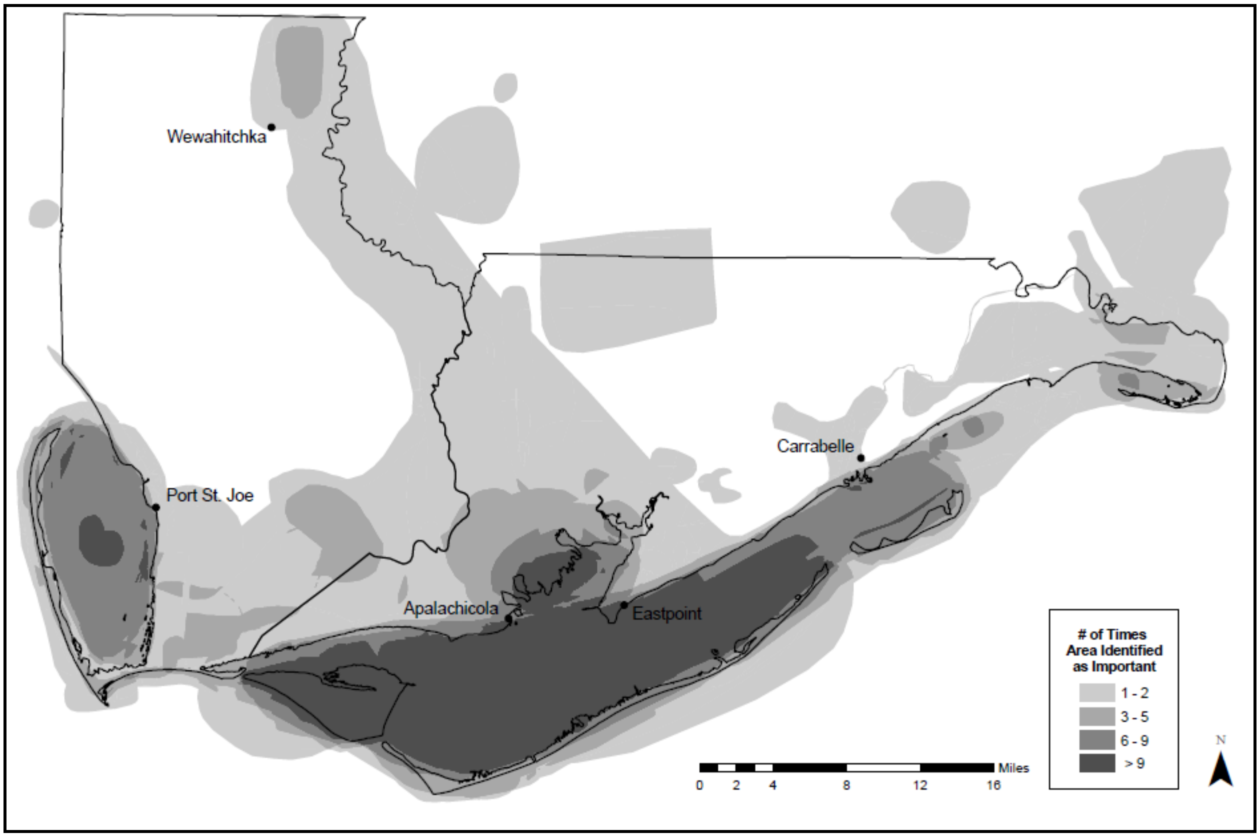

Figure 3. Map of places identified as ecologically important in Franklin and Gulf counties, FL by focus group participants.

Chapter 2

Habitat Use of Florida Black Bears in Florida's Panhandle

Abstract

Throughout the southeastern United States, *Ursus americanus floridanus* (Florida Black Bear) has been heavily impacted by habitat fragmentation and destruction. Successful Florida Black Bear conservation depends on proper habitat management, and the objective of this study was to understand the habitat use patterns of the Apalachicola subpopulation of Florida Black Bears within Apalachicola National Forest (ANF) and Tate's Hell State Forest (THSF) in the Florida Panhandle. A combination of remote cameras and scat detection dogs was employed in the summer and fall of 2010 to determine Black Bear habitat use. Occupancy modeling was conducted to determine the effect of vegetative land cover and habitat features on habitat use. Results from occupancy modeling revealed Black Bears use THSF more than ANF, suggesting that differences in past management of the two forests have resulted in differences in habitat suitability for Black Bears. Most other habitat variables only weakly described Black Bear habitat use. Future research is needed to understand why Black Bears prefer THSF over ANF. Such information is critical to the conservation and long-term persistence of Black Bears in Florida.

Introduction

Understanding a species' habitat requirements and habitat use is a fundamental component of successful wildlife management and conservation. For threatened and endangered species, a thorough knowledge of habitat needs and usage patterns is vital to managing for the continued existence of the species. In general, habitat use is based on an animal's behavior, with an animal using and selecting habitats that improve its chances of survival and reproduction. A variety of habitat characteristics may influence an individual's use of habitat, and information must be gathered on these characteristics in order to properly manage and conserve wildlife (Burt 1943; Fretwell and Lucas 1970; Powell et al. 1997). Only once a species' habitat requirements have been identified can habitats be preserved and managed to fulfill the needs of that species.

As human expansion and development have increased over time within the United States, numerous wildlife species have experienced drastic fragmentation and destruction of their habitats. One species that has suffered particularly from habitat loss as a result of human disturbance is *Ursus americanus floridanus* Merriam (Florida Black Bear) (Maehr 1984; McCown et al. 2009; Mykytka and Pelton 1990; Wooding and Hardisky 1994). As a result of human-induced range declines, Florida Black Bear populations are currently only found in isolated pockets in Florida, southern Georgia, and southern Alabama. Consequently, the Florida Black Bear is listed as a state threatened species in Florida and as a species of highest conservation concern in Alabama. With Florida Black Bears restricted to a few core areas in the southeast, increased emphasis has been placed on understanding bear habitat use and selection.

Black Bears are primarily forest dwellers, but they are also considered to function as habitat generalists because of their ability to utilize a variety of forest types and foods (Mykytka and Pelton 1990; Stratman et al. 2001; Wooding and Hardisky 1994). Nevertheless, in a broad sense, Black Bear habitat use is primarily a function of food availability and cover for seclusion (Clark et al. 1994; Costello and Sage 1994; Landers et al. 1979; Mollohan 1987; Mykytka and Pelton 1990; Schooley 1990). In most regions of North America food accessibility is the key factor determining bear habitat use (Clark et al. 1994; Costello and Sage 1994; Mykytka and Pelton 1990). Mast producing trees and other vegetation are energy rich food sources and key components of bear habitat, with bears often utilizing habitats where soft or hard mast is available over habitats lacking mast (Clark et al. 1994; Hellgren et al. 1991; Mollohan 1987; Mykytka and Pelton 1990). Escape cover is also a critical habitat component that influences bear habitat use. Habitats that consist of dense vegetation, closed canopies, and other vegetation structure provide bears with adequate concealment and are more likely to be used over habitats containing minimal escape cover (Benson and Chamberlain 2007; Hellgren et al. 1991; Landers et al. 1979; Wooding and Hardisky 1994).

Given the importance of understanding habitat use in successful Florida Black Bear conservation efforts, this study examined the habitat use patterns of the Apalachicola subpopulation of Florida Black Bears located in the Florida Panhandle. Specifically, this study explored the relationship between vegetative land cover and other habitat features on Black Bear use. In accordance with past findings, we predicted that Black Bears would select for areas where mast sources were abundant and seclusion cover was readily available. However, as past research on the specific habitat use patterns of the Apalachicola subpopulation has been minimal (Seibert 1993) this study takes an exploratory approach aimed at obtaining an improved understanding of the general habitat use patterns of the Apalachicola subpopulation. As the Apalachicola subpopulation faces a particularly high risk of habitat alteration and human disturbance due to its close proximity to the Gulf Coast and the area's allure to developers, an improved understanding of habitat use is vital to maintaining valuable Black Bear habitat.

Field-Site Description

Habitat use was examined for the Apalachicola subpopulation of Florida Black Bears in the core areas of Apalachicola National Forest (ANF) and Tate's Hell State Forest (THSF) (Figure 4). ANF consists of 231,111 hectares, and THSF comprises 81,923 hectares. Prior to government ownership, THSF was subject to timber extraction, which substantially altered the natural landscape and hydrology of the forest. Throughout THSF, an extensive system of dirt roads remains from past logging operations. Since government acquisition of THSF, restoration efforts have been initiated. Conversely, ANF has long been intensively managed to restore native longleaf pine (*Pinus palustris*) forests, contains expanses of pitcher plant (*Sarracenia flava*) prairies, and is regularly subjected to prescribed burning.

Bottomland hardwood stands consisting of cypress (*Taxodium spp.*)-water tupelo (*Nyssa aquatic*), sweetbay (*Magnolia virginiana*), black gum (*Nyssa sylvatica*), and red maple (*Acer rubrum*), as well as upland pine flatwoods and longleaf pine sandhills are found within both forests (Seibert 1993; Simek et al. 2005). Within the pine communities, numerous understory and groundcover species are present including several oak species (*Quercus spp.*), wiregrass (*Aristida beyrichiana*), saw palmetto (*Serenoa repens*), several gallberry species (*Ilex spp.*), and expanses of titi (*Cyrilla racemiflora)* and buckwheat tree (*Cliftonia monophylus*) (Seibert 1993). Notable soft mass producing species found throughout the forests include gallberry, blackberry (*Rubus spp.*), blueberry (*Ericacea spp.*), grape (*Vitis spp.*), and saw palmetto. Vast expanses of wetlands, wet prairies and flatwoods, swamps, bayheads, and shrub bays can also be found, each containing a variety of plant species.

Methods

Data Collection

Presence/Absence Data: A combination of remote camera surveys and scat detection dog surveys were employed to obtain data on Black Bear habitat use in ANF and THSF. Eighty-five remote camera surveys were conducted from May through July 2010, and 23 scat detection dog surveys were conducted from late October through late November 2010. Survey sites were determined within ArcGIS (ArcGIS 9.3.1, ESRI 2009) by creating a boundary around both ANF and THSF and then classifying the forests into major vegetative land covers based on the 2001 National Land Cover Dataset (NLCD) (USDA 2001). Stratified random sampling then was used to determine final survey sites, with samples within each vegetative land cover chosen in proportion to the percent make-up in the forests. Survey sites were located at least 1 km apart.

For the camera surveys, digital cameras (RapidFire™ PC85, Reconyx, Inc., Holmen, WI) were secured to a tree and positioned at a height that allowed for the effective detection and photographing of a Black Bear. In the detection zone of each camera, Caven’s Hiawatha Valley Predator Bait and blackberry jam were placed in a shallow hole in the ground and smeared on a tree as an attractant. Cameras were programmed to trigger on both a time lapse scale and when motion was detected. For the time lapse scale, cameras were programmed to take a picture every 2 minutes. Cameras were in place at each site for 7 days, and the cameras were active for 24 hours each day. Date and time were recorded for each picture taken. Upon the conclusion of each camera survey, the pictures were downloaded to a computer, and each picture was examined to determine if a bear was present.

For the scat detection dog surveys, a team consisting of a scat detection dog, dog handler, and orienteer was utilized. Sites were surveyed by creating a triangular transect around each survey site that was on average 900 m in length (range = 300 m-1500 m). Along the transect line, a single, off-leash dog searched for the presence of Black Bear scat within a 15 m buffer on each side of the transect line. The dog handler stayed with the dog at all times, and the handler and orienteer examined each scat located to verify the species that produced the scat. For each indentified Black Bear scat, the location was recorded with a global positioning system (GPS), a digital photograph was taken, and DNA samples were acquired for future analysis.

Habitat Data: A variety of habitat characteristics were examined in relation to Black Bear habitat use. For each remote camera survey site and each scat detection dog survey site, relevant information regarding major habitat type and habitat features was collected. On a broad scale, ArcGIS was used to classify each site as being located in a specific NLCD vegetative land cover and as either in ANF or THSF. Additionally, landscape-level habitat features that were examined for each site included distance to Gulf coast, distance to nearest water source, distance to nearest paved road, distance to nearest dirt road, road density, and distance to nearest human population center. All landscape-level habitat data needed for analysis was produced by and downloaded online in the form of shapefiles from the Geography Division of the US Census Bureau (2010). Distance measurements were calculated using ArcToolbox tools, and all measurements are in meters. Based on the spatial layout of roads in ANF and THSF, road densities were calculated by dividing the total length of roads within a 10.8 kilometer radius of each site by the total area within the search radius (i.e., road density = km/km^2) using the Spatial Analyst within ArcGIS.

Fine scale habitat data, which was collected in the field for only the camera surveys, consisted of percent canopy cover, percent understory density, and availability of mast crops at each survey site. Data regarding percent canopy cover, percent understory density, and availability of mast crops was not collected for the scat detection dog surveys because each of these variables varied greatly along each transect, and thus it was not possible to assign a single value for each of these variables to each transect. Canopy cover was measured using the point-quarter sampling method (Brower and Zar 1977). Standing at the location of the bait the survey site was divided into four quadrants using the cardinal directions as dividing lines. For each quadrant, the nearest tree within 25 m of the bait was identified. If a quadrant contained no trees within 25 m it was classified as containing 0% canopy cover. Once the nearest tree had been identified, the distance from the bait to the point where the canopy of the tree was directly overhead was recorded. Also, the distance from the bait to the trunk of the tree was recorded. Percent canopy cover for each quadrant was calculated by subtracting the distance to canopy measurement from the distance to trunk measurement and then dividing the difference by the distance to trunk measurement. Percent canopy cover was averaged across all four quadrants to obtain an overall percent canopy cover for each camera site.

Understory density was indexed using a 128cm by 64cm vegetation profile board that consisted of a checkered pattern of 8 cm white and orange squares (modified from Nudds 1977). At a distance of 15 m from the bait, the number of orange squares that could be entirely or partially seen was recorded in each of the cardinal directions. Percent understory density in each direction was calculated by dividing the number of visible orange squares by the total number of orange squares on the board and then subtracting from 1. Percent understory density was averaged across all four cardinal directions to obtain an overall percent understory density for each site.

Availability of mast crops was measured using a categorical and visual assessment of known Black Bear food sources at survey sites. Within a 20 m range of the bait the availability of food sources was rated along a scale of 1 to 5, with 1 representing low mast availability and 5 representing high mast availability. Acorns, gallberries, blackberries, blueberries, muscadines, and saw palmetto berries were included in mast calculations.

Data Analysis

Florida Black Bear habitat use and the effects of specific habitat features on use were analyzed via occupancy modeling by using the package Unmarked (Fiske et al. 2011) in the computer program R, version 2.11.0 (The R Foundation for Statistical Computing 2010). Occupancy modeling is a technique that estimates the probability that a site is occupied by a particular species based on the species' presence or absence and associated site characteristics (i.e., habitat features) (MacKenzie and Royle 2005; MacKenzie et al. 2002; Nichols et al. 2007; Royle and Nichols 2003). The power of occupancy modeling lies in its ability to account for instances where an animal may be present but goes undetected (i.e., imperfect detection). Unlike other analysis techniques, occupancy modeling appropriately deals with imperfect detection by simultaneously estimating the probability of detection and site occupancy. Thus, less biased measures of site occupancy and habitat use are obtained (MacKenzie 2006; MacKenzie and Royle 2005; MacKenzie et al. 2003).

In order for occupancy models to accurately determine habitat use, three main components must be included: the detection or non-detection of a species at a site (i.e., detection history), variables that affect the detection of a species at a site (i.e., detection covariates), and variables that affect the occupancy or use of a site by a species (i.e., site covariates). For the remote camera surveys, each 24 hour period spanning from 12pm to 12pm was considered a detection period. Therefore, each camera survey had a detection history consisting of 7 unique detection periods in which a bear was either detected or not detected. Detection periods of 24 hours were chosen in order to attain a detection history containing an adequate number of detection periods for analysis (MacKenzie et al. 2002). As Black Bears are crepuscular, detection periods were classified from 12pm to 12pm to ensure that a single detection of a bear at dawn or dusk was not classified as two detections within different detection periods. Detection covariates initially considered for analysis included amount of rain, mean temperature, maximum temperature, minimum temperature, and average wind speed within each 24 hour detection period. Site covariates initially considered for analysis included all of the previously mentioned variables listed in the habitat data section.

For the scat detection dog surveys a slightly different method was used to determine an appropriate detection history. In this instance every 90 m along the transect was considered spatial replicates for detection; assuming that the entire transect was either used or unused by bears (Kendall and White 2009; MacKenzie et al. 2006). Detection covariates initially considered for analysis included average humidity, mean temperature, maximum temperature, minimum temperature, average wind speed, and total distance searched by the dog along that transect. Covariates related to humidity, temperature, and wind speed were included to account for variation in scent deposition and in the dog's ability to detect the scent of a scat (Wasser et al. 2004). Total distance searched, and to a lesser degree humidity and temperature covariates, accounted for effects on dog stamina, which may influence the likelihood a dog detects a scat

(Wasser et al. 2004). Site covariates initially considered for analysis included all of the previously mentioned variables listed in the habitat data section, excluding distance to dirt road, road density, percent canopy cover, percent understory density, and availability of mast crops. Distance to dirt road and road density were excluded due to the close proximity of all transects to dirt roads. Data regarding percent canopy cover, percent understory density, and availability of mast crops was excluded from analysis because each of these variables varied greatly along each transect. Therefore, it was not possible to obtain a single value for each of these variables to associate with each transect.

Within the program R initial analysis consisted of conducting univariate analyses of detection and site covariates to determine the effect and strength of each variable on detection and occupancy. Colinearities and nonlinearities of variables were also explored. In addition to univariate analyses, past research on Black Bear habitat use was referenced to determine the most relevant variables to include in a global predictive model of habitat use for the Apalachicola subpopulation.

Two global models, one for the camera data and one for the scat detection dog data, were created. An all models subset approach was utilized based on the global models. A subset of models for the camera data was created by developing all possible models that consisted of all the unique combinations of variables that were within the global model. The same approach was utilized to create a subset of models for the scat detection dog data. For each model within the subsets, R provided the associated AICc, ΔAICc, and coefficient estimates for each covariate in that particular model. Model weights, which estimate the probability that a particular model is the best model out of all models being considered, were calculated for each sub-model based off of ΔAICc (Anderson et al. 2000). Model averaged coefficient estimates were calculated by summing the product of the weight of each individual model and the coefficient estimate for the given covariate. Standard errors for model averaged coefficient estimates were also calculated using methods outlined by Buckland et al. (1997) and Anderson et al. (2000). Additionally, cumulative covariate weights, which estimate the probability that a particular covariate is in the best explanatory model, were calculated by summing the model weights of all models that contained the particular covariate of interest. As well, the odds ratio for each covariate was calculated through the exponential transformation of model averaged coefficient estimates (i.e., exp^{β}).

Results

Presence/Absence Surveys

Examination of photographs from all 85 camera sites revealed that at least one bear was detected at 17 sites during the time span the cameras were in place. Furthermore, 4 of the 17 sites contained multiple detections of bears. In ANF 6 of the 49 sites surveyed contained at least one detected bear, and in THSF 11 of the 36 sites surveyed contained at least one detected bear. The naïve estimate of occupancy, calculated as the number of sites with a bear detected divided by the total number of sites, was 0.2. The raw daily detection rate of Black Bears, calculated as the number of detection periods with a bear detected divided by the total number of detection periods, was 0.034 for the camera surveys. Findings from the 23 scat detection dog transects consisted of 12 transects containing no detected scats, 6 transects containing one detected scat, 4 transects containing two detected scats, and 1 transect containing three detected scats. In ANF 4 of the 13 transects surveyed contained at least one detected scat, and in THSF 7 of the 10 transects surveyed contained at least one scat. The naïve estimate of occupancy was 0.478. The raw detection rate of Black Bear scats for the scat detection dog surveys was 0.073 per 90 meter section of transect.

Occupancy Modeling

The global model chosen for the remote camera data consisted of the detection covariates of rain amount and mean temperature. Site covariates included were percent canopy cover, percent understory density, THSF, evergreen forest land cover, woody wetland land cover, and all other land covers grouped together as a reference land cover. The global model constructed based on the scat detection dog data consisted of the detection covariate of mean temperature. Site covariates included were THSF, woody wetland land cover, and evergreen forest served as a reference land cover. Other habitat variables initially considered for inclusion in both global models were omitted based on the combination of lack of effect or significance in univariate analyses and insufficient evidence from previous studies to support their inclusion (Tables 1, 2) (Clark et al. 1994; Costello and Sage 1994; Landers et al. 1979; Mollohan 1987; Mykytka and Pelton 1990; Schooley 1990; Stratman et al. 2001; Wooding and Hardisky 1994). Univariate analysis of each detection and site covariate assisted with understanding the directional effect (i.e., positive or negative) each variable had on detection or occupancy and the statistical significance of that effect. Furthermore, findings from past studies were referenced to understand the effects and significance of specific habitat features on Black Bear habitat use. Thus, covariates were included in global models based on their strength of directional effect and statistical significance and support for inclusion from past findings related to the effects of particular habitat variables.

The all models subset analysis produced 128 individual models based on the camera data and 8 individual models based on the scat detection dog data (Table 3). The strongest individual model generated for the camera data contained the detection covariate of rain and the site covariate of THSF. The model weight for this model was 0.0712 and the weight relative to the null model was 3.0876. The strongest individual model generated for the scat detection dog data contained the detection covariate of mean temperature and no site covariates. The model weight for this model was 0.4842 and the weight relative to the null model was 9.0725.

Calculated model averaged coefficient estimates, standard errors, cumulative covariate weights, and odds ratios for both the camera and scat detection dog analyses can be found in Table 4. For the camera data, only the detection covariate for rain amount and the site covariate for THSF had strong support. The Akaike weight for rain amount suggested that there is a probability of 0.63 that the variable is in the best explanatory model, and the odds ratio suggested for each one inch increase in rain a Black Bear was 1.79 times as likely to be detected. The odds ratio for THSF suggested that THSF was 2.69 times as likely to be used by Black Bears compared to ANF; the Akaike weight suggested that the variable has a probability of 0.62 of being in the best explanatory model.

For the scat detection dog data, the detection covariate for mean temperature has a probability of 0.8 of being in the best explanatory model, according to the Akaike weight, and for each one degree Celsius increase in mean temperature a scat was 1.19 times as likely to be detected. The weight for the site covariate THSF indicated that the variable has a probability of 0.26 of being in the best explanatory model. Similar to the camera data, the odds ratio suggested that THSF was 1.53 times as likely to be used by Black Bears as ANF.

For both the camera and scat detection dog data, the average values of site covariates in ANF and THSF were compared to understand how differences in covariates between the two forests may account for black bear use of THSF over ANF (Table 5). Comparisons of covariates reveal that the two forests differ in the availability of different land covers, and survey sites between the two forests differed in distance to Gulf coast, distance to nearest water source, distance to nearest paved road, distance to nearest dirt road, road density, and distance to nearest human population center. Such variation in habitat features between THSF and ANF may aid in understanding observed differences in black bear use of the two forests.

Discussion

Model output related to both camera and scat detection dog data indicates that Florida Black Bears in the Apalachicola subpopulation tend to use THSF more than ANF. Although trends can be observed in the relationship between Black Bear habitat use and specific vegetative land covers and habitat features, model weights are weak and reveal little support for those variables as predictors of Black Bear habitat use (see Tables 1, 2, 4). Observed differences in use between THSF and ANF could be accounted for by major differences that exist between the two forests. A significant distinction between the two relates to management practices and fire history. ANF is intensively managed for stands of longleaf pine, and prescribed burning is heavily employed throughout the forest. Unlike ANF, THSF experiences relatively minimal burning, and current management does not focus on restoring the forest to a longleaf pine ecosystem. The impact of fire on Florida Black Bear habitat use was examined for the Eglin subpopulation in northwest Florida by Stratman and Pelton (2007) who discovered that within all habitat types Florida Black Bears used unburned areas more than burned areas. Therefore, this dichotomy in management and use of prescribed burning may assist in explaining differences in use between the two forests and serves as a starting point for exploring further differences between ANF and THSF.

As ANF is managed for longleaf pines, large portions of the forest consist of upland pine stands. Due to the proximity to the coast and presence of hydrologic features, the majority of THSF is comprised of woody wetlands and bottomland hardwood forests. Although effects of vegetative land cover on Black Bear habitat use were weak in this study, this broad scale difference in land cover type may aid in understanding Black Bear selection of THSF over ANF. Multiple studies have recognized that Black Bears, especially Black Bears of the southeast, often select swamps and riparian areas over other habitat types (Benson and Chamberlain 2007; Hellgren et al. 1991; Schooley et al. 1994; Stratman et al. 2001; Wooding and Hardisky 1994). Similarly, several studies have found lower use and densities of Florida Black Bears within longleaf pine communities (Simek et al. 2005; Wooding and Hardisky 1994). Unlike longleaf pine systems, swamps and riparian zones provide great escape cover for seclusion and often contain a variety of food sources, thus making them highly attractive to Black Bears. Thus, selection of THSF over ANF may be attributed to landscape level differences in land cover type.

Due to dissimilarities in management and major land cover type, plant species composition between the two forests is different. Longleaf pine stands within ANF contain an open understory, and the presence of mast producing species is often limited. Conversely, THSF management does not focus on a monoculture of longleaf pine stands. As such, THSF is believed to contain greater numbers of hard mast producing species, and a variety of soft mass producing species, such as blackberry, gallberry, and muscadines are present throughout THSF. Furthermore, due to the lack of intense burning, the understory layer in THSF consists of dense vegetation, which provides excellent escape cover compared to the open understory of longleaf pine forests. In this study the effects of understory and mast availability on Black Bear habitat use were found to be minimal, but when considering possible data limitations, these two features may aid in explaining the observed use of THSF over ANF.

The importance of escape cover and most likely understory density is also supported by the finding that no Black Bears were detected in open, prairie like habitats. This lack of detections is in agreement with the findings of past studies which have also concluded that Black Bears use open areas the least out of all habitat types, most likely due to the lack of cover they provide (Costello and Sage 1994; Hellgren et al. 1991; Landers et al. 1979; Mollohan 1987; Schooley et al. 1994).

Several plausible explanations exist for why most other habitat variables had such little support for explaining patterns in Black Bear habitat use. In this study, data limitations, in the form of small sample sizes and low detection rates, are one possibility. The limitation of sample size is an especially valid argument for scat detection dog data analysis, as only 23 sites were surveyed. Furthermore, detection rates for camera and scat detection dog surveys were 0.034 and 0.073 respectively, which is well below the suggested detection rate of at least 0.3 for obtaining unbiased estimates of covariate effects (MacKenzie 2002). Several covariates significantly differed between THSF and ANF (see Table 5), which could potentially account for observed differences in use between the two. However, support for those covariates in the univariate analyses and all models subset analyses was weak, which suggests data limitations may have limited the ability to assess the exact strength of effect of those variables as predictors of black bear habitat use.

Black Bear habitat use patterns may also appear to be absent due to the possibility that variables that account for variation in habitat use, such as the presence of specific mast species or the number of fallen trees at a site, may have been excluded during the data collection and data analysis process. Like all field studies, project and time constraints limited this study's ability to address all potential variable effects, and it is possible that pertinent variables impacting Black Bear habitat use were neglected from analysis.

Biological factors may also account for the lack of support most habitat variables received in explaining Black Bear habitat use. ANF and THSF comprise over 300, 000 hectares of contiguous, uninhabited forest and previous research has indicated that having a large tract of intact land may trump or overshadow the selection of specific habitat characteristics by Black Bears (Kindall and Van Manen 2005). As a result, particular habitat components may not be as important as simply the need for the existence of un-fragmented forests, thus potentially explaining weak support for most habitat variables in this study. Furthermore, weak selection of specific habitat features may result from Black Bears being generalists with large home ranges. Black Bear home ranges encompass an array of habitat types and features that bears are capable of exploiting for food, cover, and other necessities (Costello and Sage 1994, Mykytka and Pelton 1990, Schoen 1990). Thus, the selection of specific habitat features over others may not be strong for the Apalachicola subpopulation.

Management Implications

With Black Bears tending to use THSF over ANF, future research should aim to identify the exact drivers causing differences in use between the two forests. Observed habitat use patterns may be the result of differing habitat management practices, and additional studies are needed to understand the effects of specific management practices on Florida Black Bear habitat use. Future endeavors should also strive to gain a better understanding of how the availability of different land cover types, such as swamps and wetlands, within THSF and ANF may influence use patterns between the two forests. Variation in the composition of plant species between THSF and ANF, most notably in the form of differences in the availability of mast and understory density, should further be explored as potential factors resulting in differences in use between the two forests. Ultimately, an improved understanding of the mechanisms leading to habitat use differences between THSF and ANF will aid managers in identifying and preserving valuable habitat characteristics for Florida Black Bears.

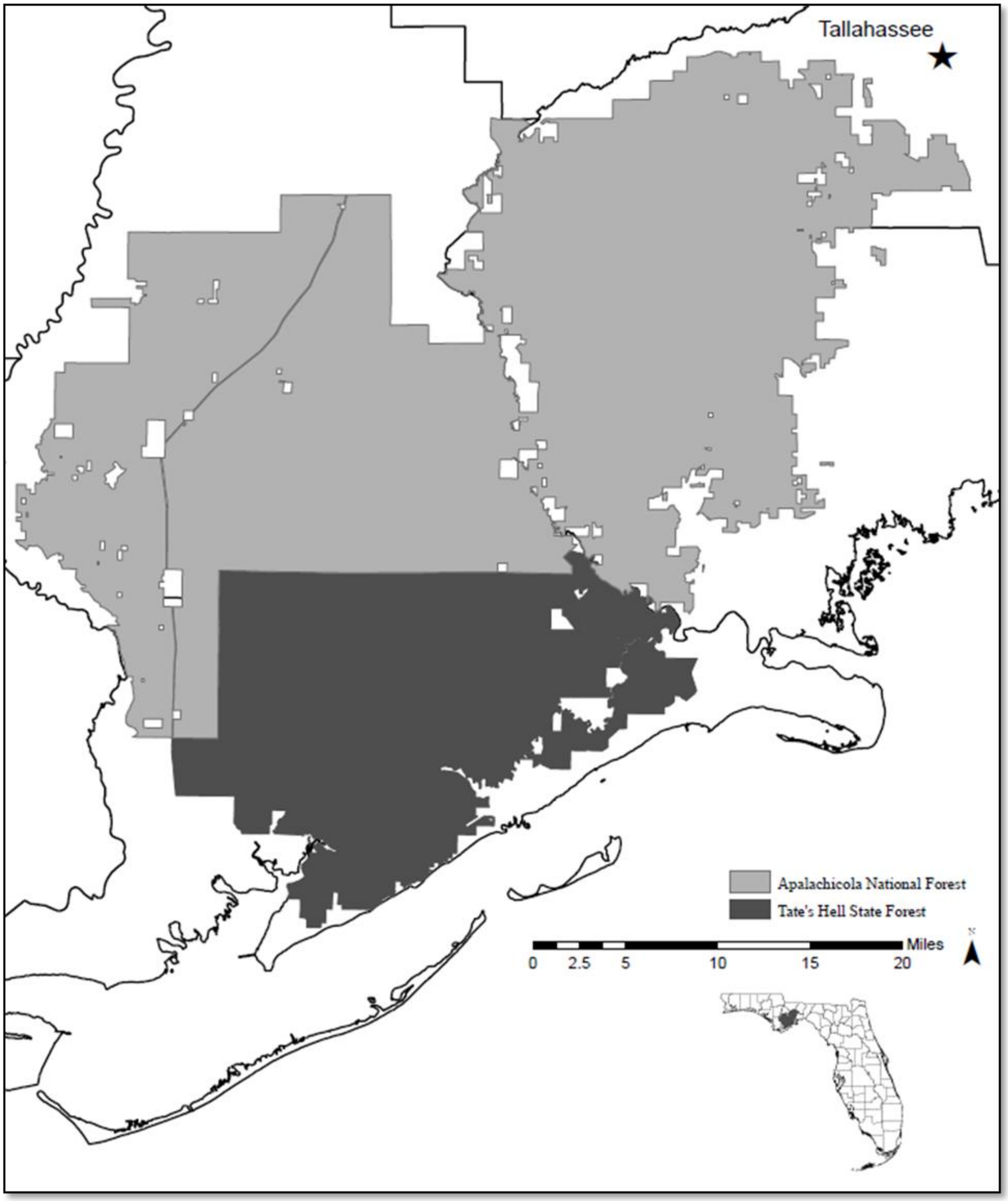

Figure 4. Map of Apalachicola National Forest and Tate's Hell State Forest where Florida Black Bear habitat use was studied in the summer and fall of 2010.

Table 1. Univariate analysis of camera covariate effects on habitat use of Florida Black Bears located in Tate's Hell State Forest and Apalachicola National Forest in 2010.

Covariate[1]	Estimate	Standard Error	P-value
p.Rain[2]	0.90	0.468	0.054
p.Mean Temperature[3]	-0.102	0.150	0.497
p.Maximum Temperature	0.127	0.111	0.251
p.Minimum Temperature	-0.142	0.130	0.275
p.Wind Speed	-0.0315	0.0671	0.638
psi.THSF[2]	1.394	0.867	0.108
psi.Woody Wetland Land Cover[3,4]	0.526	0.796	0.509
psi.Evergreen Forest Land Cover[3,4]	-0.210	0.897	0.815
psi.All Other Land Covers[3,4]	-0.670	1.060	0.527
psi.Distance to Gulf Coast	-5.10e-05	0.0005	.980
psi.Distance to Water	0.000375	0.0005	0.4159
psi.Distance to Paved Road	0.000416	0.0005	0.37
psi.Distance to Dirt Road	-0.00233	0.00247	0.345
psi.Distance to Humans	-1.42e-05	0.0002	0.955
psi.Road Density	2.33	1.92	0.226
psi.Percent Canopy Cover[4]	1.49	1.642	0.365
psi.Percent Understory Density[4]	2.25	1.88	0.231
psi.Availability of Mast	0.168	0.515	0.745

[1]p represents detection covariates. psi represents site covariates.
[2]Included based on p-value.
[3]Included for consistency with the scat detection dog global model.
[4]Included based on findings from previous studies.

Table 2. Univariate analysis of scat detection dog covariate effects on habitat use of Florida Black Bears located in Tate's Hell State Forest and Apalachicola National Forest in 2010.

Covariate[1]	Estimate	Standard Error	P-value
p.Humidity	-0.00717	0.0185	0.698
p.Mean Temperature[2]	0.221	0.0992	0.026
p.Maximum Temperature	0.220	0.0978	0.025
p.Minimum Temperature	0.174	0.0836	0.037
p.Wind Speed	-0.091	0.128	0.476
p.Distance Searched	-0.00128	0.0008	0.116
psi.THSF[3]	2.825	3.453	0.413
psi.Woody Wetland Land Cover[2,4]	2.304	1.535	0.133
psi.Evergreen Forest Land Cover[2,4]	-2.304	1.535	0.133
psi.Distance to Gulf Coast	1.40e-19	0.0001	1
psi.Distance to Water	0.000145	0.0004	.706
psi.Distance to Paved Road	0.000354	0.0002	.152
psi.Distance to Humans	0.00038	0.0003	.260

[1]p represents detection covariates. psi represents site covariates.
[2]Included based on p-value.
[3]Included for consistency with the camera global model.
[4]Included based on findings from previous studies.

Table 3. Models produced from the all models subset analysis based on the global predictive models of habitat use of Florida Black Bears located in Tate's Hell State Forest and Apalachicola National Forest in 2010.

Model[1]	No. of Parameters	AICc	Delta AICc	Weight
Cameras[2]				
p(Rain),psi(THSF)	4	198.1595	0.0000	0.0712
p(Rain),psi(THSF+UnderstoryDensity)	5	199.1139	0.9545	0.0442
p(Rain),psi(THSF+CanopyCover)	5	199.2045	1.0451	0.0422
p(Rain),psi()	3	199.3069	1.1474	0.0401
p(),psi(THSF)	3	199.4303	1.2708	0.0377
p(Rain),psi(UnderstoryDensity)	4	199.7485	1.5890	0.0322
p(),psi(THSF+UnderstoryDensity)	4	200.1481	1.9886	0.0264
p(rain),psi(EvergreenForest+THSF)	5	200.1640	2.0045	0.0261
p(Meantemp+Rain),psi(THSF)	5	200.3347	2.1752	0.0240
p(),psi()	2	200.4154	2.2559	0.0231
Scat Detection Dogs[3]				
p(Meantemp),psi()	3	120.0451	0.0000	0.4842
p(Meantemp),psi(THSF)	4	122.4577	2.4126	0.1449
p(Meantemp),psi(WoodyWetland)	4	122.5333	2.4882	0.1396
p(),psi(WoodyWetland)	3	124.0768	4.0317	0.0645
p(),psi(THSF)	3	124.0981	4.0530	0.0638
p(),psi()	2	124.4556	4.4106	0.0534
p(Meantemp),psi(WoodyWetland+THSF)	5	125.6555	5.6104	0.0293
p(),psi(WoodyWetland+THSF)	4	126.3854	6.3403	0.0203

[1]p represents detection covariates. psi represents site covariates.
[2]The top ten models and the null model from the subset analysis are given.
[3]All models from the subset analysis are given.

Table 4. Model averaged results from occupancy modeling of habitat use of Florida Black Bears located in Tate's Hell State Forest and Apalachicola National Forest in 2010.

Covariate[1]	Estimate	Standard Error	Weight	Odds Ratio
Cameras				
p.Intercept	-2.5370	1.5439		
p.Mean Temperature	-0.0040	0.0459	0.2562	0.9960
p.Rain	0.5797	0.5880	0.6251	1.7855
psi.Intercept	-1.3982	1.2591		
psi.THSF	0.9901	1.1117	0.6224	2.6915
psi.Woody Wetland	0.0205	0.3266	0.2611	1.0207
psi.Evergreen Forest	0.1508	0.4678	0.2764	1.1628
psi.Undersotry Density	0.7274	1.3459	0.3133	2.0696
psi.Canopy Cover	0.4579	0.9390	0.2517	1.5808
Scat Detection Dogs				
p.Intercept	-5.6984	2.6158		
p.Mean Temperature	0.1730	0.1239	0.7980	1.1889
psi.Intercept	0.8048	1.2647		
psi.THSF	0.4222	0.9711	0.2584	1.5252
psi.Woody Wetland	0.3911	0.8365	0.2537	1.4786

[1]p represents detection covariates. psi represents site covariates.

Table 5. The average values of site covariates in ANF and THSF, which were compared to understand the differences in habitat variables between ANF and THSF. P-values for comparisons of land cover types were generated using a chi-square test (i.e., comparison of binomial proportions). All other comparisons were made using a t-test.

Covariate[1]	THSF	ANF	P-value
Cameras			
Woody Wetland Land Cover	732741	1411436	<0.001
Evergreen Forest Land Cover	70076	951683	<0.001
All Other Land Covers	119309	217312	<0.001
Distance to Gulf Coast	11367.0420	31092.2248	0.001
Distance to Water	1603.3171	739.3320	0.004
Distance to Paved Road	6490.5647	3092.9664	0.001
Distance to Dirt Road	170.0803	264.1094	0.02
Distance to Humans	9161.0729	11642.5686	0.038
Road Density	1.4681	1.2472	0.018
Percent Canopy Cover	0.560	0.594	0.595
Percent Understory Density	0.633	0.574	0.313
Availability of Mast	1.58	1.49	0.555
Scat Detection Dogs			
Woody Wetland Land Cover	732741	1411436	<0.001
Evergreen Forest Land Cover	70076	951683	<0.001
Distance to Gulf Coast	11109.8482	32102.1757	0.001
Distance to Water	2731.3605	2151.5955	0.503
Distance to Paved Road	5857.7265	3698.5792	0.223
Distance to Humans	7452.9154	10816.6692	0.162

[1]Land cover measurements are total number of 90m^2 units present and not averages.
[1]Distance measurements are all in meters. Road density is km/km^2.

Chapter 3

Examining Human-Black Bear Conflicts in the Panhandle of Florida

Abstract

As human-black bear conflicts continue to increase throughout the USA, developing appropriate conflict mitigation strategies has become a primary objective of black bear management. In order to develop successful conflict reduction strategies, social understanding of conflicts should be obtained and supplemented with biological knowledge related to conflicts. In this study, focus groups were conducted with local residents and wildlife professionals in the Florida Panhandle to obtain participants' beliefs, attitudes, and preferences toward bears and conflict management approaches. Findings demonstrate that residents hold a variety of attitudes toward black bears, conflict management preferences vary, and discrepancies exist between the public and wildlife professionals concerning appropriate conflict mitigation strategies. To resolve discrepancies educational efforts should inform residents of the appropriateness and effectiveness of various mitigation techniques. Insight acquired from this study holds the potential to assist managers with implementing appropriate conflict mitigation strategies and identifying limitations where conflict management needs to improve.

Introduction

Across the United States interactions and conflicts between humans and American black bears (*Ursus americanus*) have greatly increased over the last quarter of a century (Baruch-Mordo et al. 2008; Beck 1991; Beckmann and Berger 2003; Carr and Burguess 2004; Zack et al. 2003). Consequently, preventing and reducing human-black bear conflicts has come to the forefront of black bear management. As conflict mitigation strategies have continued to evolve, there has been increasing recognition that understanding the human dimensions of conflicts is vital to successful mitigation (Decker et al. 1981; Don Carlos et al. 2009; Kretser et al. 2009). Understanding social factors, such as individuals' beliefs and attitudes about bears, acceptance levels of conflicts, and management preferences, can assist with formulating socially acceptable conflict mitigation strategies (Don Carlos et al. 2009). Furthermore, the viability of publicly preferred management strategies can be evaluated through comparisons with scientifically validated management options. Such comparisons provide insight into discrepancies that exist between the public and wildlife professionals concerning appropriate conflict management and can serve as the basis for future educational outreach efforts (Don Carlos et al. 2009).

To successfully manage human-black bear conflicts, social understanding should be accompanied by biological knowledge that is related to conflicts (Don Carlos et al. 2009). Understanding of biological factors such as black bear habitat use can aid in determining the likely spatial distribution of conflicts and whether conflict management strategies need to focus on bear or human related aspects or both. Furthermore, supplementing social understating with biological knowledge provides managers with the ability to create conflict mitigation strategies that address social concerns and preferences but also account for biological factors that contribute to the occurrence of conflicts.

One state that has observed a noticeable increase in human-black bear conflicts over the last 15 years is Florida (Eason 2003; Hristienko and McDonald Jr. 2007; Spencer et al. 2007). Florida contains several isolated populations of the Florida black bear (*U. americanus floridanus*). Since the banning of black bear hunting throughout Florida after 1993, black bear populations have responded positively and have increased in number (FWC 2000). Simultaneously, the human population within Florida has grown, resulting in expanded development and movement into previously unoccupied lands (U.S. Census Bureau 2010). As a result of this rapid growth in both bear and human populations, Florida has experienced an upward trend in the occurrence of human-black bear conflicts (Eason 2003; Hristienko and McDonald Jr. 2007; Spencer et al. 2007).

This trend of increasing populations and human-black bear conflicts has been observed for the Apalachicola subpopulation of black bears located in the Florida Panhandle. Additionally, general understanding of the habitat use patterns of the Apalachicola subpopulation reveal that black bears are using areas located closer to humans over other areas (Lowery 2011). Such findings suggest that as populations continue to expand the occurrence of conflicts will likely continue to increase. Therefore, this study aimed to understand the social factors related to the occurrence of human-black bear conflicts associated with the Apalachicola subpopulation. Specific objectives consisted of acquiring people’s beliefs and attitudes about black bears and their management, identifying the most common conflicts present, and understanding attitudes toward reinstating black bear hunting. Comparisons of preferred conflict management approaches between the public and wildlife professionals, which have been minimal in past research endeavors, were utilized to reveal knowledge gaps or discrepancies concerning appropriate conflict management strategies. A thorough examination of the social contexts in which human-black bear conflicts transpire, in light of recent findings concerning black bear habitat use, will assist managers with implementing appropriate conflict mitigation strategies, identifying limitations where conflict management needs to improve, and anticipating responses to future management solutions.

Study Area

Within Franklin (Population: 11, 549; U.S. Census Bureau 2010) and Gulf (Population: 15, 863; U.S. Census Bureau 2010) counties, Florida conflicts between human residents and black bears are increasing. In 2005, the Apalachicola subpopulation of Florida black bears consisted of approximately 438 to 695 bears within a primary range of 951, 944 hectares (Simek et al. 2005). The core area of the subpopulation is located in Apalachicola National Forest (ANF; 231, 111 ha) and Tate's Hell State Forest (THSF; 81, 923 ha) (Figure 5). Along the southern border of THSF the small towns of Carrabelle, East Point, and Lanark Village, which are in Franklin County, regularly experience human-black bear conflicts. Within Gulf County, which lies directly west of both THSF and ANF, conflicts occur in the small towns of Port St. Joe and Wewahitchka among several others (Figure 5). Both counties and the towns within are predominantly rural, but residents vary demographically. Franklin and Gulf counties contain long term residents and retirees, second home buyers and newcomers, and individuals of various races, ages, occupations, and socio-economic statuses. In both counties wildlife biologists devote substantial time and effort to mitigating human-black bear conflicts (Warwick and Telesco 2009, personal communication). Therefore, it is within those communities that the social aspects associated with conflicts were explored.

Biological Data: Black Bear Habitat Use

The habitat use patterns of the Apalachicola subpopulation of Florida black bears were examined in Apalachicola National Forest and Tate's Hell State Forest by Lowery (2011) who discovered that black bears are using THSF over ANF. Differences in use of the two forests may be the result of differences in management practices and the use of prescribed burning, variation in the availability of swamps and other bottomland areas, and differences in the composition of plant species between ANF and THSF (Lowery 2011).

Although the exact habitat components leading to different use patterns between THSF and ANF may be uncertain, the discovery that bears are using THSF more than ANF is not insignificant. The favored use of THSF by black bears is relevant as THSF is located closer to human population centers than ANF, and thus demonstrates that in general black bears are utilizing habitats closer to humans. Therefore, the use of THSF over ANF may aid in understating the increased occurrence of human-black bear conflicts in the towns bordering and surrounding THSF. Furthermore, the selective use of THSF by bears suggests that conflicts are not likely to dissipate based on black bears abandoning wildlands neighboring existing towns. Such findings reveal the need to understand the social contexts in which human-black bear conflicts occur in Franklin and Gulf counties and highlight the significance of augmenting social data related to human-black bear conflicts with biological knowledge.

Methods

Data Collection

Data regarding social factors related to human-black bear conflicts was obtained through focus group discussions. Focus groups allowed participants to emphasize what information they deemed as most relevant and provided in-depth and comprehensive understanding of participants' attitudes and beliefs. Key informants within both counties aided in recruiting participants and forming focus groups. A diversity of groups was sought in order to acquire a broad range of attitudes and opinions in relation to study objectives. A total of eighteen focus group discussions were conducted in the summer of 2010, with each group averaging 5 to 8 individuals. Final focus groups consisted of local marine industry workers, ecotourism workers, realtors, small business owners, educators, second home buyers, new residents, long term residents and retirees, local recreational clubs including a hunt club, and concerned citizen groups. Furthermore, a focus group consisting of state biologists and foresters was conducted for comparison with participants from the general public about viewpoints toward bears, conflicts, and management preferences.

Each focus group discussion followed a set questioning guide for consistency across groups. Questions posed to participants were open-ended and designed to facilitate discussion on four main topics: 1) general attitudes and beliefs about black bears, 2) types of interactions and conflicts encountered, 3) opinions concerning current conflict management and preferences for future conflict management, and 4) attitudes toward re-opening a season for hunting black bears. Each discussion was audio recorded, transcribed verbatim into an electronic text file, and reviewed to ensure accuracy and completeness.

Data Analysis

Qualitative analysis techniques, as described by Strauss and Corbin (1990), were employed to analyze each focus group discussion. A start list of primary codes was developed to categorize common responses concerning attitudes toward bears, conflicts encountered, conflict management opinions and preferences, and attitudes toward re-opening bear hunting. As transcripts were read, secondary codes were also generated to capture additional themes and opinions related to each primary coding category. Proposed coding categories were reviewed by project staff, and a final coding scheme was agreed upon prior to formal coding.

All coding was completed using the qualitative analysis software NVivo v8.0. For each transcript, pertinent passages were coded into appropriate categories based on the content of the text. Reliability of coded transcripts was assessed by additional project staff at the conclusion of initial coding, and necessary changes were made to ensure the accuracy and reliability of coded passages. Following the coding of all transcripts, similarities and dissimilarities in responses across constituent groups were explored to decipher differences in groups' views of bears, thoughts on conflicts, conflict management preferences, and attitudes toward re-opening black bear hunting. Comparisons of data provided by wildlife professionals and the other focus groups were utilized to identify discrepancies concerning appropriate management of human-black bear conflicts.

Results

Participants' attitudes toward black bears, conflicts encountered with black bears, preferred management approaches, and attitudes toward re-opening bear hunting varied greatly. Specific discrepancies between the public and wildlife professionals regarding appropriate management of conflicts were also brought to light. What follows is a summary of the 1) general attitudes and beliefs about black bears, 2) types of interactions and conflicts encountered, 3) opinions concerning current conflict management and preferences for future conflict management, 4) attitudes toward re-opening a season for hunting black bears, and 5) discrepancies in conflict management approaches between the public and wildlife professionals.

General Attitudes and Beliefs about Black Bears

The majority of focus group participants held bears in a positive light or were indifferent toward bears, regardless of the conflicts bears created. One participant stated: "It's one of the biggest thrills in my life down here when I spot a black bear. When I spot a black bear I can sit there and watch him, and to watch them run and move it's exciting to me." Numerous participants described bears as "beautiful" and "majestic." The unique scenario of having bears along the coast was mentioned multiple times and highly valued by most. Additionally, participants explained and expressed satisfaction knowing that the presence of bears in the area demonstrates that the counties are still "wild" and "pristine." A few participants, mostly long term residents, viewed bears strictly from a negative perspective and as "pests" because of the conflicts they have experienced with bears.

Human Interactions and Conflicts with Black Bears

Both wildlife professionals and nonprofessionals clearly stated that the most common conflict encountered was bears eating garbage and overturning trashcans: "I have a huge bear issue at my house. I have big bears that come to my house, and they will come to my trashcan all the time and dump it and whatever and drag it across the street." Property damage was another key conflict with multiple participants claiming bears damaged yards, gardens, bird and deer feeders, and grills. Participants noted vehicle collisions with black bears were increasing and stressed personal concern over colliding with a black bear. A few participants also mentioned bears hurting their pets and in some cases trying to enter their house. Participants also viewed the possibility of bears injuring small children as a serious potential conflict. Purposeful feeding of bears by individuals in the community was also viewed as a conflict which perpetuated other conflicts.

Conflict Management Opinions and Preferences

In general, some participants believed local wildlife professionals and agencies were satisfactorily managing conflicts, while a similar number of other participants believed agencies should be doing more to manage conflicts. Dissatisfied participants viewed management as needing to address both bear and human related problems. From a human standpoint, participants stated the need for improved educational efforts concerning conflicts, enhanced waste services, and mandates on garbage. One participant claimed: “The public has to be educated about how not to leave your garbage lying around, and it might be mandatory to literally have bear-proof trashcans around because that is 99% of the problem.” In order to reduce conflicts from a bear management standpoint, participants mentioned trapping and relocating bears, considering opening a bear hunting season, and improving habitat management away from population centers to help keep bears away from humans. A participant stated:

> Bring the hardwoods back to the plantation so there are acorns and those sorts of things. You have pushed bears out of the forest because they have taken a lot of the hardwoods and a lot of the habitat that the bears would have probably flourished in north of here and pushed them where the people are on the coast.

This statement is particularly relevant as it is in accordance with this study's hypothesis that the lack of available food may account for the finding that bears are using THSF and habitats closer to humans more than other habitats.

Wildlife professionals stated they were making progress in addressing conflicts given financial and agency limitations, but also agreed management needed to continue to improve. Professionals believed most conflicts were related to altering human behavior and managing people rather than strict bear management: "It is a people problem. Most of all bear management is managing the response level of people." To improve future conflict management, professionals proposed increasing educational efforts and outreach to the public, improving waste services or implementing an ordinance on the storing of garbage, and creating harsher penalties for purposefully feeding bears.

Attitudes toward Black Bear Hunting

Strong support and resistance to re-opening a hunting season for black bears was apparent. Supporters of hunting were mostly long term community members whose families had lived in the counties for multiple generations, where those opposed to hunting were mostly new residents or transplants to the area. Supporters believed hunting would reduce the occurrence of conflicts, and thus viewed hunting positively: "The black bears they better do something about them. They have become a nuisance. The best way to control it is open it to hunting." All supporters of hunting stressed the need for a controlled hunt with a set quota and limit on the number and types of bears that could be harvested.

Participants opposed to hunting believed nuisance bears would not be the ones harvested but rather bears in wildland areas not causing conflicts, and therefore viewed hunting negatively:

“The bears that are causing problems are in your neighborhoods. The bears that you hunt are out in the wilderness. So I think that is a very good reason for me to say no.” Concerns were also expressed that the local bear population may not be large enough to maintain a sustainable population with the onset of hunting. Wildlife professionals explained that human-black bear conflicts and hunting were two separate issues that overlapped minimally. Professionals stated that they understood the value of hunting for sustenance purposes and as a population control technique, but clearly stressed that hunting would not solve the problems individuals were having with bears.

Conflict Management Discrepancies

Discrepancies between the public and wildlife professionals concerning proper conflict management revolved around three main aspects: black bear hunting, trapping and relocating problem bears, and the alteration of human behavior. Hunting was viewed as an inappropriate management tool for reducing human-black bear conflicts by wildlife professionals, whereas some nonprofessional participants believed a hunting season would reduce the occurrence of conflicts. Relocating nuisance bears was also viewed as ineffective at solving conflicts by wildlife managers because attractants often remain in place and a new bear moves into the vacated area. However, multiple nonprofessional participants called for increased trapping and removal efforts. Altering human behavior was another topic of contingency, as professionals strongly believed many residents were oblivious to the role humans play in the management of conflicts. Professionals stated residents needed to improve efforts aimed at storing garbage properly, decreasing the attractiveness of their homes to bears, and understanding the role humans play in the creation of conflicts. Some nonprofessional participants echoed similar sentiments, but others were unaware of the role humans play in conflict mitigation and called for management approaches that primarily focused on altering bear behavior.

Discussion

The steady increase in human-black bear conflicts over the last 15 years in Franklin and Gulf counties has made the management of such conflicts a priority of local wildlife agencies. Study findings reveal black bears are using THSF over ANF, and therefore bears are residing in areas located closer to human populations (Lowery 2011). As a result, the small towns bordering THSF may be experiencing increased conflicts as bears exit THSF to locate easily accessible garbage and other attractants. Furthermore, the selective use of areas located closer to humans by black bears demonstrates the importance of addressing the social factors associated with human-black bear conflicts (Decker et al. 1981; Don Carlos et al. 2009; Kretser et al. 2009). Examination of individuals' attitudes toward bears reveals that attitudes vary, but overall most view black bears in a positive light, which is similar to findings from previous studies (Decker et al. 1981; Don Carlos et al. 2009; Kellert 1994). Furthermore, as in past studies, the acceptability of specific conflict management strategies varied among individuals (Don Carlos et al. 2009; Vaske et al. 2008; Wittmann et al. 1998; Zinn et al. 1998). The public and wildlife professionals agreed county provided waste service options and improved educational efforts were needed to reduce conflicts, and such efforts have been deemed necessary for successful management in other conflict prone locations (Hristienko and McDonald Jr. 2007; Kaczensky et al. 2004; Spencer et al. 2007). As bears are residing in habitats located in close proximity to humans, educational outreach should advise residents' of the need to securely stow garbage, place garbage out only on the day of pick up, feed pets indoors, remove wildlife feeders, and properly clean and store grills (Hristienko and McDonald Jr. 2007; Spencer et al. 2007). Also, due to discrepancies between the public and wildlife professionals concerning management preferences, educational efforts should provide information on the scientific basis concerning the effectiveness of specific conflict mitigation techniques, such as bear relocations, hunting, and the alteration of human behavior.

The acceptability of reinstating a hunting season was divided with mostly long term residents supporting hunting and newer residents and wildlife professionals opposing hunting as a conflict reduction strategy. Compounding the legitimacy of hunting as a conflict mitigation technique is the mixed conclusions past studies have garnered regarding the success of hunting programs. Several studies have demonstrated hunting aided in reducing conflicts by likely decreasing bear population sizes and causing bears to be more cautious of humans (Landriault 1998; McCullough 1982; Wolgast et al. 2005), while other findings revealed that hunting was ineffective at reducing conflicts (Tavss 2005; Treves et al. 2010). As the Apalachicola black bear population continues to grow in size and conflicts become more frequent, managers will have to determine the viability of hunting as a biologically and socially acceptable conflict reduction technique.

Wildlife professionals and the public also disagreed on the use of bear relocations as a viable approach to mitigating conflicts. Wildlife professionals espoused that relocating problem bears is ineffective at reducing conflicts as incentives that attract bears to an area often remain in place, problem bears carry their nuisance behaviors with them when relocated, and there is a shortage of relocation sites (Hristienko and McDonald Jr. 2007; Linnel et al. 1997; Spencer et al. 2007). Relocations are also problematic because relocated bears often attempt to return to their original home ranges (Hristienko and McDonald Jr. 2007; Landriault 1998). As bears attempt to return home they are likely to place themselves and motorists in danger by crossing roadways, or they find new human settlements and exhibit similar nuisance behaviors, thus shifting the problem to a different area. Nonprofessional participants were likely unaware of such factors regarding the shortcomings of relocations.

A final discrepancy between wildlife professionals and the public revolved around the role human behavior plays in conflict mitigation. Wildlife professionals exclaimed individuals needed to consciously alter their behavior to reduce the occurrence of conflicts by responsibly storing garbage and understanding the role garbage plays in creating conflicts. The need to securely store garbage is especially important as study findings revealed bears are utilizing habitats closer to humans, and thus are likely to seek out garbage. This viewpoint held by professionals differed from some participants who called for conflict management strategies solely or mostly related to altering bear behavior rather than human behavior. Such discrepancies as the ones present in this study reveal that desired conflict mitigation strategies can and often vary between those who manage wildlife and those for which wildlife is managed.

Conclusions

Managing conflicts between humans and black bears is a complex task. However, approaches that aim to utilize social understating of conflicts with supplemental biological knowledge are a much needed step in the right direction for reducing conflicts. By understanding both biological and social factors related to conflicts, conflict mitigation approaches can be developed that align social management preferences with scientific understanding of the biological drivers contributing to the occurrence of conflicts. For this study biological understanding of the local black bear populations' habitat use, as determined by recent studies, laid the foundation for appropriately addressing the social factors related to human-black bear conflicts.

Social understanding concerning human-black bear conflicts demonstrated that local residents maintain a variety of beliefs, attitudes, and preferences toward bears and conflict management approaches. As a result of this diversity in viewpoints, the public and wildlife professionals agreed and disagreed on the appropriateness of certain management approaches. Many nonprofessional individuals' attitudes toward particular conflict reduction techniques, such as relocating nuisance bears, were based off of incorrect or incomplete beliefs. Such knowledge gaps aid in explaining why discrepancies over appropriate conflict management methods exist and provide a strong case for increased educational efforts directed at informing the public of viable conflict reduction solutions. As managing human-black bear conflicts will likely only increase in relevance as both bear and human populations continue to increase, improved educational efforts will be essential to resolving discrepancies and mitigating conflicts.

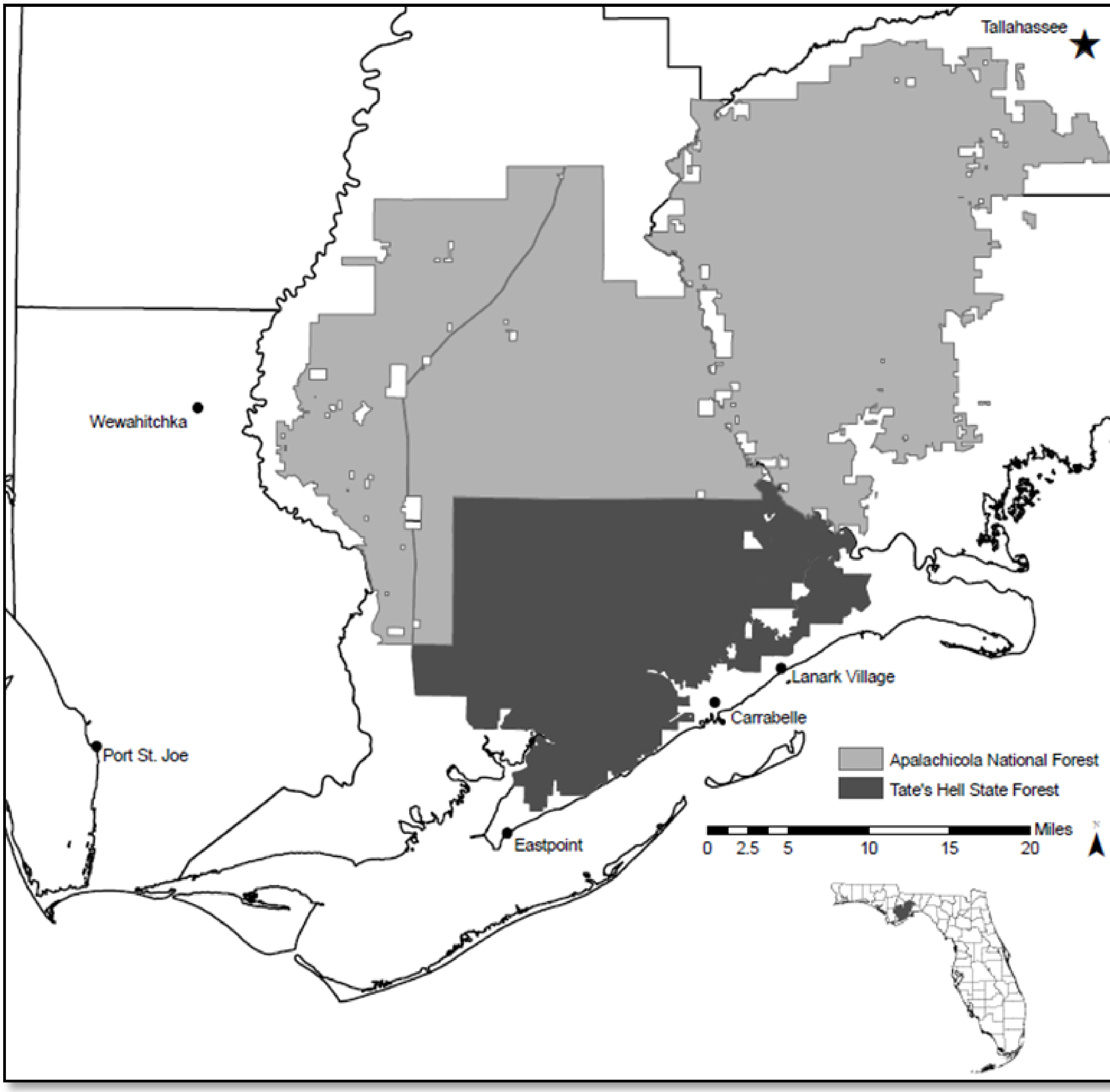

Figure 5. Map of study area located in the Panhandle of Florida where human-black bear conflicts were examined.

Epilogue

Franklin and Gulf counties, which are located in Florida's Panhandle, are a microcosm of the larger scale pattern of ever increasing development and expansion within the United States. Both counties currently have been minimally developed compared to most coastal areas, but Franklin and Gulf are poised to undergo development in the future. This general pattern can be seen across the United States as development is at an all time high and human populations continue to grow and expand into previously uninhabited areas. As a result of continued growth and sprawl, major landscape alterations and land use changes are likely to only increase as society progresses into the future. Such changes will alter both social and ecological systems.

As Franklin and Gulf prepare for oncoming development this study aimed to and successfully addressed aspects related to both social and ecological systems that will likely be impacted by landscape changes. The intricate bonds residents within Franklin and Gulf counties had developed with the natural landscape were remarkable. The strong dependency of the counties on the natural environment for recreation, livelihoods, and even historical and cultural identity was surprising as this is becoming a decreasing trend in many communities within the eastern United States. Furthermore, this study brought to light that improved understanding of social systems can be greatly enhanced by immersing oneself into a community and culture. By actively living within Franklin and Gulf counties and interacting with residents a greater understanding and appreciation for the area, its residents, and the relationships between the two were obtained.

Understanding of Florida black bear habitat use and human-black bear conflicts was an original and worthwhile undertaking for addressing the potential impact development may have on ecological systems within Franklin and Gulf. The findings that bears are utilizing habitats located close to humans and that a diversity of opinions exist concerning human-black bear conflicts demonstrate that the relevance of appropriate black bear management will likely only increase as alterations are made to the natural landscape. Additionally, insight was gained on the realization that the public and wildlife professionals often times do not agree on wildlife management strategies, but scientific understanding of biological processes, such as an animal's habitat use, can be utilized to formulate and educate the public about proper management strategies.

On a personal note, the willingness of local residents to fight for their cultural identity as the "Forgotten Coast" in the face of impending development was astounding and highly respected. However, the ability of residents to defend current social systems was countered by the inability of black bears and ecological systems in general to defend themselves as developmental expansion progresses. This dichotomy brought to light that future research efforts need to continue to explore ecological processes, such as habitat use, in order to better understand and prepare ecological systems for the potential impacts caused by development and other landscape modifications.

Perhaps most importantly, this study demonstrated that both social and ecological knowledge are needed for successful natural resource management. Natural resources and landscapes are not just elements within ecological systems but are also relevant components of social systems. Therefore, understanding of both systems is needed to obtain a complete picture of the potential impacts to landscapes and natural resources resulting from land use changes and landscape modifications. Only once the link has been made between understating how social systems interact and influence ecological systems and vice versa can proper and acceptable management decisions be formulated.

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