ABSTRACT

A NATIONAL PARK SERVICE INTERNSHIP AT ACADIA NATIONAL PARK

by John Clifford Williams

In fulfillment of the Masters of Environmental Sciences (M.En.) at Miami University, Ohio, I completed a seven month internship with the National Park Service (NPS) at Acadia National Park in Maine. I was able to participate in a wide variety of projects ranging from falcon and eagle banding to monitoring Common Loon nesting sites. All of the projects served to fulfill the NPS mission to preserve the parks natural beauty and wildlife for future generations.

A NATIONAL PARK SERVICE INTERNSHIP AT ACADIA NATIONAL PARK

An Internship Report

Submitted to the

Faculty of Miami University

in partial fulfillment of

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Master of Environmental Science

Institute for the Environment and Sustainability

by

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There are many people that assisted me through my two years at the Institute of Environmental Sciences and while at Acadia National Park.

I would first like to thank Bruce Connery of Acadia National Park for giving me guidance and insight while I worked with him at Acadia. Without his continual support and effort to ensure I had as many experiences while with the National Park service, I truly do not believe I would have had as enriching experience as I did.

I am also very thankful to my wife, without whom I would have never thought of graduate education. Without her love and understanding I would have never made as far as I am today.

I would like to thank my committee for their help through the process of navigating me through the writing process. Thank you Dr. David Russell, Dr. Sandra Woy-Hazelton, and Ms. Robbyn Abbitt.

Finally, I would like to thank IES for their continual support and nudges to make sure this opportunity did not pass me by, Thank you Suzi Zazycki!

Saved to future generations as it has been to us, in the wild primeval beauty of the nature it exhibits, of ancient rocks and still more ancient sea, with infinite detail of life and landscape interest between, the spirit and mind of man will surely find in it in the years and centuries to come an inspiration and a means of growth as essential to them ever and anon as are fresh air and sunshine to the body.

-George B. Dorr (1855-1944), "The Father of Acadia"

I. INTRODUCTION

In 2007 I began course work with the Institute of Environmental Sciences (IES) to receive my Masters of Environmental Science (M.En). As part of the requirements for graduation I completed an internship with Acadia National Park (ANP) as a Biological Science Technician in the Resource Management division. I was fortunate enough to intern for ANP over two summers. While working for Acadia I was excited to put to use the skills I acquired while studying with the IES. Furthermore I was able to use the education and skills I learned during my undergraduate studies.

I intend to provide a description of the many projects and experiences I was involved in for the two summers with the Acadia National Park and describe some of the challenges faced by the park in managing the resources of the park. I intend to also show that at Acadia the resources being protected are sometimes at odds with one another which presents its own challenges.

II. BACKGROUND

On August 25, 1916, President Woodrow Wilson signed the act creating the National Park Service, a new federal bureau in the Department of the Interior responsible for protecting the 40 national parks and monuments then in existence and those yet to be established.

This "Organic Act" of August 25, 1916, states that "the Service thus established shall promote and regulate the use of Federal areas known as national parks, monuments and reservations . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Acadia National park is located primarily on Mount Desert Island near Bar Harbor, Maine; there is a small portion of the park that is located to the north across Frenchmans Bay

called Schoodic peninsula and an Island to the south called Isle au Haut (Figure 1)The park also holds easements on many of the surrounding islands.

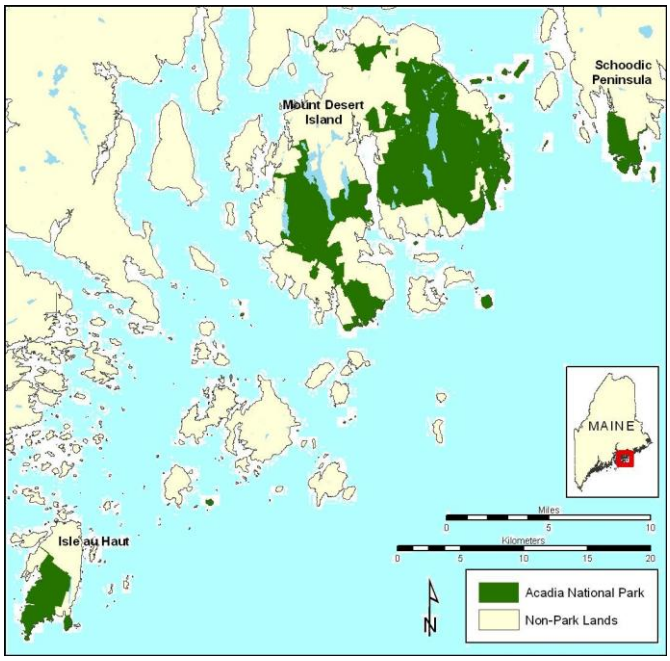

Figure 1 A map showing the park boundaries (Map by. Karen Anderson GIS admin Acadia National Park).

Acadia National Park was created, largely, through the donations of privately held land for the specific use as a national park. One of the persons that is recognized as a tireless worker for this park and dubbed the 'Father of Acadia' was George Dorr. Through his efforts and his own money he was able to get the park recognized first as a national monument by Woodrow Wilson in 1917 and then as a national park in February 1919. This was the first park created East of the Mississippi river and also the first to be created on a coastline(Foulds, Meier, and Olmsted Center for Landscape Preservation (U.S.) 1996). Another prominent figure that was central to shaping Acadia was John D Rockefeller. From 1915 to 1933 Mr. Rockefeller designed, financed and directed construction of a network of carriage roads(Thayer 2002).

There are over 50 miles of crushed gravel carriage roads and 125 miles of hiking trails that network throughout the entire park, which is over 47,000 acres in size. Water resources within or adjacent to Acadia include 14 Great Ponds, 10 smaller ponds, more than two dozen named streams and 10 named wetland areas. The park also includes such natural features as beaches, pine/cedar forests, deciduous forests, mountains and wetlands, marshes and swamps. During 1947 a fire burned nearly 17,000 acres of land which gives the park a unique patchwork of forested old growth conifers in the unburned portion of land and a successional growth forest in the burned section of island(Kaiser 2010).

One management concern is the American Beavers that can be found throughout the park and the dams that they build. The beavers have built dams in areas where the overflowing water crosses heavily traveled roadways causing accidents, particularly during the winter months. They were introduced twice to the area by George Dorr (Kaiser 2010). No one is quite clear why George Dorr released the beaver back to the island. It is possible that since they were there before being trapped to extinction he felt the need to restore the island fauna to its previous conditions in 1920 with the successful release of a pair of beavers near Eagle Lake. Another resource management concern is the protection of the Peregrine Falcons nesting at the park. While this species is not federally protected any longer, it is a state listed species in Maine.

III. ACADIA NATIONAL PARK INTERNSHIP

I was hired by Acadia National Park for a term of four months in the summer of 2009 and returned for the summer of 2010 for a period of three months. I was employed as a Biological Science Technician assigned to the Resource Management Division with the lead wildlife biologist as my direct supervisor. My primary duties were quite varied in scope and scale; unfortunately there were few opportunities to lead a long term project during either of my tours at Acadia. I was, however, involved in several long term reoccurring projects that have occurred over the past few years. The only project that I was able to lead was to design and begin a survey to identify breeding raptors within the Acadia park boundaries. This chapter will discuss the various projects, small and large, that I was involved in and the responsibilities associated with each project. All of these projects were conducted with the guiding principles of the National Parks Mission Statement to keep "the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Peregrine Falcon (Falco peregrinus)

Peregrine falcon populations were impacted by nest robbing, trapping, shooting, and most significantly, eggshell thinning caused by pesticides (e.g., DDT) that had accumulated in the

food chain from insects eaten by songbirds, which were in turn eaten by peregrines. In 1972, DDT was banned in the U.S., helping to set the stage for peregrine recovery.

Reintroduction of peregrine falcons to Acadia National Park was part of a large-scale cooperative effort to restore a self-sustaining population of peregrines to the eastern U.S. In the 1980s, the National Park Service joined with the U.S. Fish and Wildlife Service in launching The Eastern Peregrine Falcon Reintroduction Program. This national program established regional recovery goals and identified a target of 175 pairs of nesting falcons for the eastern recovery zone, estimated to be half the number thought to have been in this area historically.

Due to the success of this and other recovery efforts across the country, peregrine falcons were removed from the federal Endangered Species List in 1999; they remain on the Maine State Endangered Species List.("Maine Department of Inland Fisheries and Wildlife - http://www.maine.gov/ifw/wildlife/species/endangered_species/peregrine_falcon/index.htmn. Accessed Feb 2013).

From 1984 until 1986, 22 peregrine chicks were successfully "hacked" in Acadia National Park from a high cliff face overlooking Jordan Pond. "Hacking" is the process of reintroducing captive-raised chicks into the wild. Hacking ceased in Acadia in 1987 when a subadult male hacked the year before returned to the hack site, to ensure that he would not prey on new chicks. Peregrine falcons have been coming to Acadia National Park ever since, successfully raising chicks on their own. Acadia NP's cliffs provide important nesting habitat for peregrine falcons, which prefer the seclusion and safety of a steep rock face for nesting.

Acadia provides the perfect breeding habitat for these rock ledge nesting falcons with its sheer cliff faces that dot the island. As many as four nesting pairs are located on Mount Desert Island, all of which are on park property. Because of the falcons state endangered status, they are one of the top priorities for the Resource Management Division and the park works closely with the Maine Department of Inland Fisheries and Wildlife (MDIFW). The park has set up a location at one of the historical nesting sites, the precipice hiking trail

on Champlain Mountain, for a daily interpretive program which monitors the falcons and discusses their life history with visitors. This trail is closed from late March through September for the protection of the falcons as well as the safety of visitors. Peregrine Falcons are extremely territorial and will, without hesitation, defend their territory against all intruders including humans. The interpreters, while primarily there to interact with the public, have a secondary goal of collecting observational data about the falcon pair. This data is collated with previous years. We are able to determine average date of arrival, average date of egg laying, and when fledging can be expected. All of this data is important to the management of the precipice trail and its availability to the public.

Coinciding with the data collection the park puts forth a concerted effort to band every nest at every location every year. This is a logistical challenge of monumental proportions. There is a very small window in which to band the young falcons. Attempting to band them too early and there is a possibility that the band will slip down too far and impede the foot. Attempting to band too late and the young falcons may try to fledge early and fall from the nest site with fatal consequences. The best time to attempt such an endeavor is from day 25-27 after hatching. Hatch date can be estimated by a change in behavior of the adult pair. The pair begins bringing food to the nest rather than sitting on nearby rock outcrops. During this small window of opportunity, we need weather that includes low winds with no rain and we must be able to coordinate that with the schedules of one of our two rock climbing search and rescue rangers. Once we are able to get all these pieces in place the climber plans the route to the nest site and starts the ascent, the support staff positions themselves in a location safe for banding (Figure 2).

Figure 2 John Williams banding Peregrine Falcon chicks at Beech Cliffs nesting site Acadia National Park. [photo by. BConnery]

Figure 3 The climber in the photo, in the orange circle, is threatened by the adult Peregrine Falcon at Beech Cliff, Acadia National Park. [photo by. JCWilliams]

Chicks from the nest are aged, sexed, and given a USGS band with a color band provided by Maine Department of Inland Fisheries and Wildlife. During the entire process the adult pair is flying around the climber and banders. This is a dangerous for both teams as Peregrine Falcon can dive at speeds up to 200 MPH (Figure 3, Figure 4). Peregrine Falcon banding data from Acadia has been collected since the falcon's reintroduction to the area in 1984 ("Peregrine Falcons" 2013).

Figure 4 Adult Peregrine Falcon diving on climbers at precipice trail nest site. Acadia National Park [photo by. JCWilliams]

Beaver Management

One species on the island that has management implications are the American Beavers (*Castor canadensis*). The primary concern is the potential damage that beaver dams can have on the carriage roads, trails, and roadways of Acadia. These concerns were realized twice in the past few years. In one case a beaver family built a dam in an area that caused no damage to the roads nearby. It became an issue when there was a weeklong rain and flooded the area which in turn blew out the dam. The resulting damage washed out the roadway for about a 1/8th of a mile and took months to repair. The second incident was on another roadway in seal harbor the dam in this case cased water to overflow the road and it froze on the roadway which caused a fatal accident

to occur. Because the Carriage Roads are on the National Historical Register (Byrne, web, accessed 18 Feb 2013) and must be kept in its original condition it becomes imperative that the park manage for beaver activity.

The park had a prioritized list of known active beaver locations and actively checks these sites for beaver activity. During my first summer at Acadia while out walking the carriage roads I happened upon a small, new beaver dam at the south side of Eagle Lake (Figure 5). I mentioned this to my supervisor at work the next day and we went out to look. This was not currently listed as an active site. When we arrived I pointed out the small dam to my supervisor.

Figure 5 Beaver dam south side of Eagle Lake. (photo by. JCWilliams)

It was located 10 feet to the west of the carriage road in a small stream that fed into Eagle Lake. It was so small that we just removed the dam with hand tools. Now that there was some small activity in the area we were told to add this to our checks when going out in the park for our other duties. Several days later when our duties had us in the area we went to check on the area where we had removed the dam. The dam had returned and was slightly larger than before. We removed the dam again but we planned on returning the next day to investigate further.

The thought was that it was possible that the beaver building this dam was young and only practicing, but if the dam kept returning it was possible that the beaver was building a check dam to regulate the flow of water into the area, this could represent a larger issue. The next morning when we arrived at the area we found that the dam had been replaced. We removed the dam and began wading through the area to see where the family unit might be living. We did not have far to look, just beyond a small area of low thick shrubs we found a full dam and lodge, the living area for the family of beavers.

This suddenly had become a very large problem. With the beavers being so close to one of the most popular and active carriage roads in the park it was very important that we

remove the beavers soon. There were a few complications, the proximity to the carriage road, the removal of the existing dam and lodge, and relocation of the beavers. Since the dam was so close to the carriage road we needed to be very careful of how the issue was handled in front of the public.

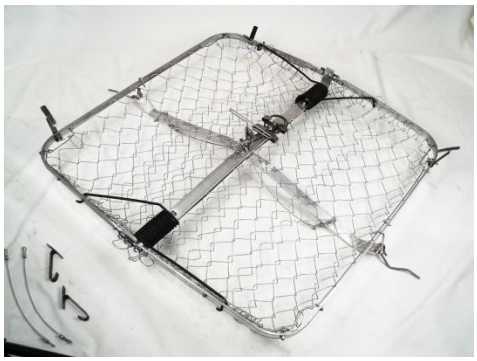

Figure 6 the Hancock live trap used by Acadia (photo from wildlifecontrolconsultant.com)

In such an area there is concern whenever the National Parks start trapping animals and how they are treated. There can be tension between the public and the parks as well as a wealth of rumors that might start if we were seen carrying a trap of beavers out of the water. So to avoid the any potential issues we decided to set our trap late in the evening to avoid large numbers of visitors and so that the trap locations would be relatively private.

We did not want anyone hurting themselves on the trap or to bother any beavers that may be caught. We also checked the traps early in the morning to avoid visitors and reduce the stress of any beavers that may have been caught overnight.

Figure 7 Bik Wheeler and Maddie Harrig release the second juvinile beaver at the release site. (photo by. JCWilliams)

The beaver traps (Figure 6) are a fast closing purse of chain link, they must be set at the water's edge where there is an obvious beaver trail. The trap must, when closed, remain half in the water for the beavers continued good health. A week later after we had permission from the state to relocate the beavers to a place off island with suitable habitat we began our trapping efforts immediately. On the first night of trapping we removed an adult female and one young. These two were transported to the off island location and released without incident. The second night we caught one young beaver and again transported to the off site location without incident (Figure 7).

One consideration that was involved with trapping these beavers was the time of year. You cannot trap beavers after a certain time of the year, transplanted beavers need time to adapt to the new location, build any new dams required, build a lodge, and begin storing food for the winter. This was a major factor in why we moved these beavers so quickly when we found them, it was getting late in the season and we could not risk leaving them in place during the winter months due to where they were located. There was a high probability that because of their dam the carriage road would have been destroyed.

Beaver Survey

Since we had a new active beaver that surprised us, it was decided by the wildlife supervisor that Acadia needed another full beaver survey. This had been done about 10 years previous, in 1999, and was a census of the beaver population within the boundaries of Acadia. The wildlife biologist took us out using maps form the original survey to show us what signs to look for that mean the site is active. He also showed us the two different styles of lodges, a lodge and a bank lodge. The regular lodge is easy to spot as it looks a bit like an island in the lake. The bank lodges were more difficult to find as it looks like a deadfall of trees that abuts to the bank of the lake. The process was accomplished by each member of the team taking waterways and walking the entire length. This meant that we were far removed from the trail and in the back country of the park. We would start at the head waters of the streams and follow it to a point where it either ran off park property or where it met the ocean. It was an interesting experience trudging through areas that probably had not seen humans in many years. I was able to see parts of Acadia that were

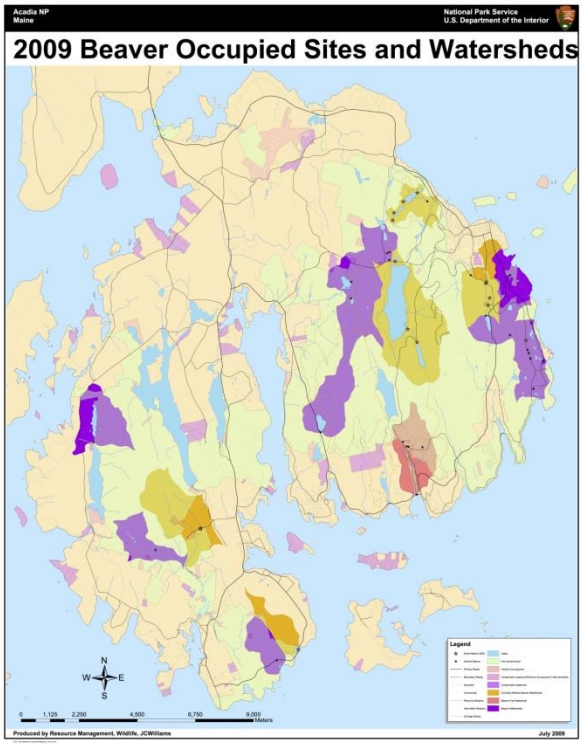

Figure 8 Beaver activity map (map by. JCWilliams)

breathtaking and untouched. This was a major undertaking that took approximately three weeks. The results were a complete survey/census of the waterways of the park property. The deliverable for this project was a map documenting the location of all active and inactive beaver locations (Figure 8). This map was to be used in the future as an aid to management in their decision making concerning beaver activity.

Raptor Survey

An important project I designed and led was the raptor (birds of prey) survey. How many and what species of raptors that nest within the Acadia park boundaries was unknown. The Wildlife Biologist saw I had a passion for and experience working with birds, so he determined I was well suited to plan and execute this project. The first thing that I had to determine was which raptors were expected to be nesting in the area. Bruce, my supervisor, gave me some suggestions of what I might expect in the area. I took that information and began searching bird books and previous sightings and produced a list of likely nesting species. The list I devised included Northern Goshawk, Red-tailed Hawk, Red-shouldered Hawk, Merlin, Sharp-shinned Hawk, Broad-winged Hawk and Cooper's Hawk. I found and copied, from Cornell University Bird Lab, sound recordings for each of the selected species as well as Great Horned Owl and Barred Owl. The last two species are considered a threat to the target species of the study during different times of the nesting cycle. Once the target species were selected I chose the most appropriate survey routes that covered the most area and were easiest to access (Figure 9).These routes needed to be easily accessed so that these surveys could be conducted in a timely manner. This helped to balance the surveys along with the other duties I needed to perform without putting any other project in jeopardy.

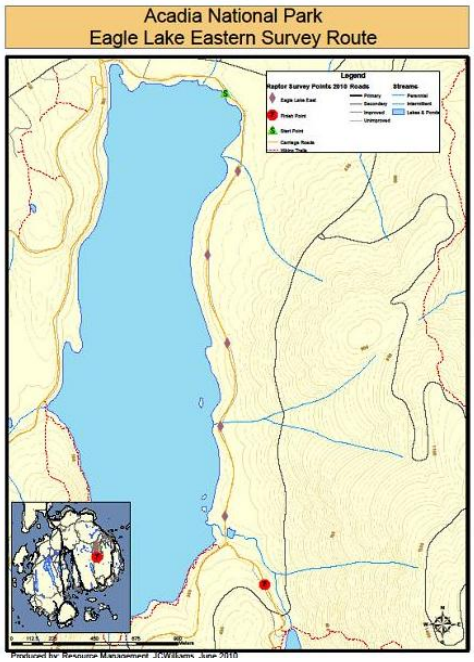

Figure 9 Map created for the use in raptor survey personnel. (map by. JCWilliams)

The routes, once selected, were to be surveyed every other day at sunrise. Each route was the same length and had the same number of survey points along the route. Each route followed an existing carriage road for ease of access. At each survey point the bird calls were played in order of size of species. The call would be played for 20 seconds then there would be a one minute pause before playing the next call. We would observe during the minute and mark call backs or observed flight of target species in the survey area. After collecting the data we could then see if we had any regular response from the survey points. If there was a pattern of response we could then hypothesize that the species was nesting or hunting in the area.

This survey was conducted for two summers with unsatisfactory results. While all of the species selected were observed during both summers, we had no responses to any of our playbacks. To this day we are uncertain why there was poor response to our call back methodology(Balding and Dibble 1984; Fuller and Mosher 1981). Balding and Dibble, 1984, showed that the higher the decibel of the playback system the better the response.

Following the completion of our second summer's survey, we discussed how we might improve our detections. My suggestion was the survey should be conducted away from high traffic areas, such as the carriage roads. I hypothesized that the high levels of summertime activity along the carriage roads lead the raptors choose locations in less populated areas. To test this hypothesis I suggested that new routes be chosen along trails through less populated areas using the same protocol. This suggestion, however, was not well accepted because it would take more time to accomplish and other projects would have to be neglected. It was left with the possibility that in the future if more time was allowed that the survey might be conducted in such a manner with access to more personnel.

Currently this project is not being conducted and is without prospect of continuing. This, in part, is due to the survey's poor response during the first two summers of testing. Additionally, there are not enough personnel to take on a large project like this in the current economic and political climate.

Brook Trout (Salvelinus fontinalis)

One of the first projects I was involved in during both seasons was a complete survey of Stanley Brook, which discharges into Seal Harbor, for Brook Trout (*Salvelinus fontinalis*). This species is green to brown in basic color, with a distinctive marbled pattern of lighter shades across the flanks and back and extending at least to the dorsal fin, and often to the tail. A distinctive sprinkling of red dots, surrounded by blue haloes, occurs along the flanks. The belly and lower fins are reddish in color, the latter with white leading edges. Often, the belly, particularly of the males, becomes very red or orange when the fish are spawning.

Figure 10 Stanley Brook study area. (map by. JCWilliams)

Typical lengths vary from 10 to 26 inches, and weights vary from 0.7 to 7.0 pounds. The Brook Trout inhabits small streams, creeks, lakes, and spring ponds. Some brook trout, referred to as sea-run brook trout, are anadromous. Brook trout are native to a wide area of eastern North America, but increasingly confined to higher elevations southward in the Appalachian Mountains to northern Georgia, Canada from the Hudson Bay basin east, the Great Lakes–Saint Lawrence system, and the upper Mississippi River drainage as far west as eastern Iowa.The portion of Stanley Brook surveyed runs through a forest comprised of cedar, fir and birch. The stream bed is made up of primarily cobble/gravel mix with depths varying from just a few inches to four feet and more. This waterway also comes very close to roadways and residential areas. With the increased population and roadways the runoff is slowly changing the makeup of the stream by depositing large amounts of gravel. With this deposition of gravel the course of the water way is being changed and undercutting the banks of the stream. Home owners are losing their backyards in some instances (Figure 10).

Figure 11 PIT tags used in the mark and recapture of Brook Trout. [photo by. JCWilliams]

This project has been a collaboration between the Conte Lab, UMass Amherst, University of Maine, and the National Park Service. At the UMass Amherst Conservation Genetics Lab, they are using genetic data to reconstruct pedigrees for all Stanley Brook Brook Trout collected within the two kilometer study reach.

The sampling is done twice a year, once in the spring and once in the fall, using electro-shocking backpacks. This is conducted by setting two blocking nets 40 meters apart, one upstream and one downstream. There are two personnel with backpack electro-shockers and dip nets and two others following with dip nets and buckets to collect the trout. After the fish are collected they taken to the field lab and measured, weighed, aged and if old enough given a PIT tag for later identification (Figure 11). Two PIT readers, one located at the outflow and the other about half-way up the brook, remotely read and log each fish as it swims past allowing for total automation of data collection. The array that is located halfway up the brook must be downloaded manually once a week because there is no power located nearby and it is necessary to restock with freshly charged batteries, and ensure that the array is recording information properly (Figure 12, Figure 13). The data is sent to our collaborators for further analysis.

Figure 12 The Data loggers and batteries located at the halfway point of the Stanley Brook research site. [photo by. JCWilliams]

A pedigree describes all genetic relationships of the fish sampled (e.g. parent-offspring, full-sibling, and half-sibling all the way through distant cousins). They will reconstruct pedigrees from genetic material already collected.

Efficient sampling is critical for pedigree reconstruction. Stanley Brook is a great place for this type of analysis – it is a small stream that allows sampling of the majority of the

Figure 13 The PIT tag reader at the halfway point of the Stanley Brook research site. [photo by. JCWilliams]

spawners in a given year, and then the following year allows for the recapture of most of the offspring. The initial analysis examined approximately 5,000 fish collected between 2008 and 2012. Once they reconstruct a pedigree, they will be able to examine what proportion of Brook Trout offspring are produced from parents exhibiting a 'sea run' versus resident life history. This information is then incorporated into a population projection model to improve understanding of the effects of restoration on Stanley Brook sea run Brook Trout populations. My supervisor, Bruce Connery, regards this as a very productive collaboration.

With the data collected from this study the park has been able to begin restoration of Stanley Brook and take measures to limit fishing during sensitive times of the year to allow for Brook Trout recovery.

Bald Eagle (Haliaeetus leucocephalus)

I took part in a long term study investigating the amount of mercury located in the waters surrounding Acadia was conducted through the coordinated efforts of Biodiversity Research Inc. (BRI) and the Maine Department of Inland Fisheries and Wildlife (MDIFW), and Acadia National Park. BRI's study is in the possibility of mercury being transported outside of the aquatic environment and biomagnified within the terrestrial environment.

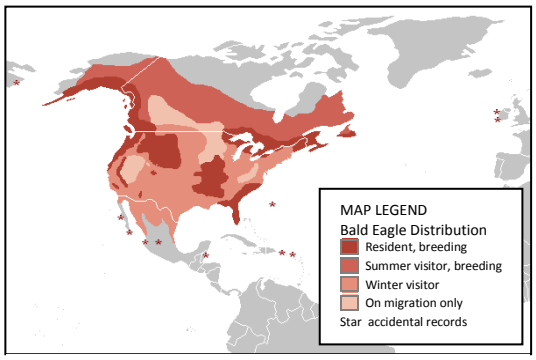

Figure 14 Range map for Bald Eagle (H. leucocephalus)

The plumage of an adult Bald Eagle is evenly dark brown with a white head and tail. The tail is moderately long and slightly wedge-shaped. Males and females are identical in plumage coloration, but sexual dimorphism is evident in the species in that females are 25% larger than males. The beak, feet and irises are bright

Figure 15 BRI Personnel climbing to the eagle nest located on Bar Island, Somes Sound, Acadia National Park [photo by. JCWilliams]

yellow. The legs are feather-free, and the toes are short and powerful with large talons. The highly developed talon of the hallux, the hind toe, is used to pierce the vital areas of prey while it is held immobile by the front toes. The beak is large and hooked, with a yellow cere.

The Bald Eagle's natural range covers most of North America, including most of Canada, all of the continental United States, and northern Mexico. It is the only sea eagle endemic to North America. Occupying varied habitats from bayous to the Sonoran Desert and the eastern deciduous forests of Quebec and New England, northern birds are migratory, while southern birds are resident, remaining on their breeding territory all year (Figure 14, "Distribution H. Leucocephalus.png"). At minimum population, in the 1950s, it was largely restricted to Alaska, the Aleutian Islands, northern and eastern Canada, and Florida. Today, they are much more common, and nest in every continental state and province in the United States and Canada.

The Maine Department of Inland Fisheries and Wildlife conducts aerial reconnaissance of the region early in the year, before leaf sprout, to determine the activity of all known nesting sites and to locate new eagle nests. Once the occupancy status of a nest has been established, a routine flight is set up to detect nesting behavior and egg-laying. When it has been established that a nest has eggs these nests are watched until hatching has occurred. BRI is given information regarding nests with successfully hatched chicks and from these, sites are prioritized for sampling. BRI has sampled several nesting sites in the jurisdictional boundaries of Acadia. The sites that have

Figure 16 Eaglet being lowered from the nest above. Acadia and BRI personnel are removing the canvas bag in preparation to take measurements and samples. Bar Island, Somes Sound, Acadia National Park. [photo by. JCWilliams]

years of data are prioritized higher than others. The actual eagle chick sampling is conducted by BRI and Acadia personnel with Acadia providing support for the BRI personnel and access to the park lands. Depending on the location of the nests, all of which were on isolated islands, it could take approximately six to eight hours to sample one nest site. This entails a boat ride out to the island, then typically a long arduous hike through rough terrain, followed by an extensive search for the exact tree in the thick forest with the nest. Once located, a BRI employee would climb the tree to the nest (Figure 15) capture the young chicks (~ 5-7 weeks old) and place them in a canvas bag to be lowered to the banders below (Figure 16). The bander would take a variety of measurements, a blood sample, a few down feathers, and finally place two bands on the eaglet (Figure 17, Figure 18). Once the eaglet was returned safely to the nest, the ground crew would search the area under the nest and collect any bones or carcasses of prey discarded from the nest. All of the collected items were then returned to BRI for mercury testing. A total of six nests and 11 eaglets were sampled in both years.

Figure 18 Equipment used to take samples, measurements, and band the eaglet. [photo by. JCWilliams]

Figure 17 Banded eaglet, Bar Island, Somes Sound, Acadia National Park. [photo by. JCWilliams]

Bird Banding Project

During my second season the University of Maine approached Acadia to apply for permission to conduct a bird migration study on federal land. The Wildlife Biologist was also interested in the study and what the results would show. He set a meeting to discover

more about what the University wanted to do. At the first meeting we discussed the scope of the project and the requirements necessary to accomplish the study. We also discussed if this would be a continuing study or only a single season of study. Both sides settled on making this a single season with the potential to continue for more years if everything worked out and the results were promising. As part of the project they wanted to look at three distinct locations, coastal, inland, and island and our first task was to look for suitable sites. We tried to satisfy all the requirements but had to compromise on one location, the inland site. The university wanted to look at a site on the mainland but we did not have access to any land, the compromise came in the form of placing a banding station located centrally on Mount Desert Island (MDI) that would simulate the mainland banding data the University wanted. The three locations were at McFarland Hill, Seawall, and Great Duck Island.

The first task was to prepare the three banding sites by cutting down vegetation and putting into place the poles used for capture. The banding sites were separated by miles and this was about a 10 day project. Our second task involved the park staff, who would be supporting the banders while working on the island. The park staff received training on the proper removal of birds from the capture nets, the proper handling of the birds, and how to collect the data necessary for the research project.

The project ran past my time at the park but I made inquiries as to how the project ran after my departure. The inland site at McFarland Hill was the slowest site of the three. There were few birds captured with limited species richness. The Seawall location did better and had a higher bird count and higher species richness. The Great Duck location was significantly higher in count and species richness.

Various Short Term Projects

While I was working for Acadia and performing my primary duties we had many small term projects that required a representative to accompany them while out in the parks. These visiting researchers sometimes only needed orientation and to be shown potential

research sites. This will be a listing of these types of interactions I had while working with Acadia

Hawk Watch

A raptor related project that I was involved with was inaugurating a hawk watch program. This new project looks at migrating raptors that pass over Isle au Haut, an island located south of Mount Desert Island (MDI). According to the United States Census Bureau, the town has a total area of 113.20 square miles, of which, 12.52 square miles of it is land and 100.68 square miles is water. Acadia National Park consists of approximately 7.5 square miles of the island. Isle au Haut is an island approximately 6 miles long by 2 miles wide in Penobscot Bay, part of the Gulf of Maine and Atlantic Ocean.

Mount Champlain, elevation 540 feet, is the highest point on the island, located on a north-south ridge occupying the island's center. Rocky Mountain, elevation 511 feet, and Sawyer Mountain, at 486 feet are neighboring summits along the ridge to the south. The terrain consists of low hills covered by temperate coniferous forests; the coastline is mainly granite boulders, with a few rocky beaches and salt marshes. Long Pond, a small freshwater lake, stretches down the eastern side of the island.

The state of Maine has been looking at several locations along its shore to place large offshore wind farms. The Wildlife Biologist concerned by the potential placement of one of these wind farms offshore of Isle au Haut, wanted to conduct this hawk watch to determine what raptors use this particular flyway. If we could gather data to show the state that due to high numbers of migrating raptors use this area they might consider other locations.

This new Hawk watch mirrored an already established program conducted on Cadillac Mountain every fall. The survey is conducted in the half of Isle au Haut owned by the National Park. Specifically, we had two observation posts one on Black Dinah Mountain and the other to the south on Duck Harbor Mountain. We chose these two locations so we could observe what utilizes a mid-island transect and what might use the southern Island (Figure 19).

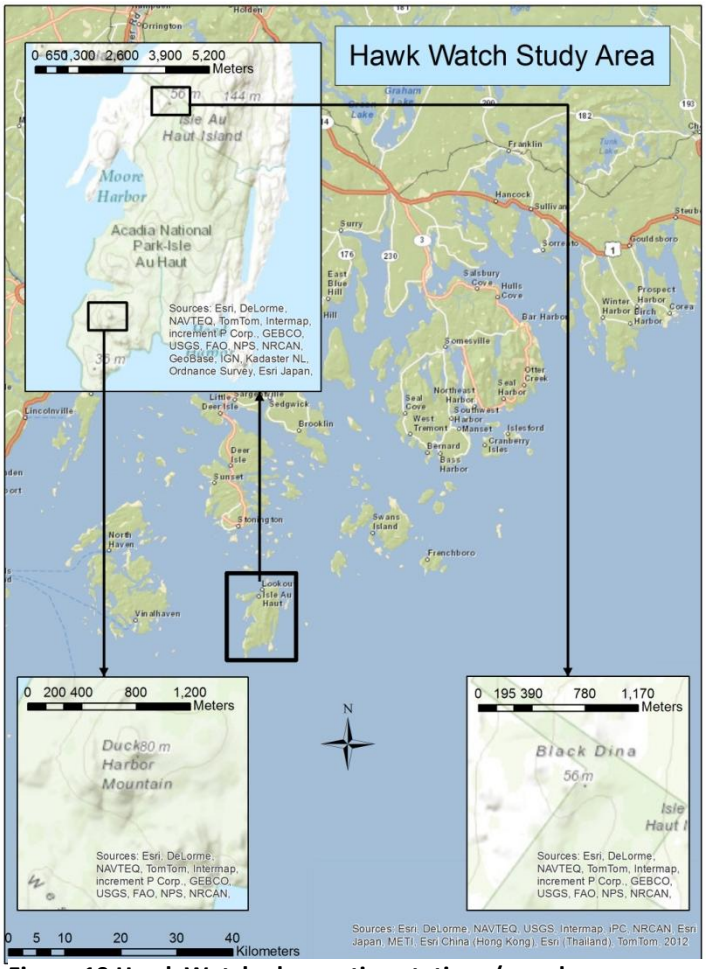

Figure 19 Hawk Watch observation stations (map by. JCWilliams)

While MDI has years of data regarding composition of species migrating over nearby Cadillac Mountain, there was a question if the same composition of species also migrated over Isle au Haut. The logistics of completing this survey were daunting. The South point of Isle au Haut is a two hour drive, 45 minute ferry ride and a 15 minute car ride to reach the observation station. Consequently, six hours of every field day would be spent in travel. The weather is a second major variable. We constantly monitored the weather reports both coastal and offshore locations; since the island is so far from the mainland it was necessary to include the offshore reports. If the weather was cooperative we would leave at 6AM and be on station by 9AM.

We took atmospheric readings, including wind speed and direction, humidity, and temperature, upon arrival and then every hour thereafter. Survey procedure was two

people scanning the sky identifying and recording all raptors using both binoculars and spotting scope.

Our findings showed there was a different composition of migrating raptors that used offshore routes over Isle au Haut than used the mainland pathway over the Cadillac Mountain. The Isle au Haut hawk watch showed that a significant amount of low altitude migrating raptors, primarily Peregrine Falcons, used the Isle au Haut flyway. These findings were supported during the second season of the hawk watch on Isle au Haut. The Wildlife Biologist hopes to use these findings to show that the offshore wind farm should be sited in a different location due to the large number of state endangered Peregrine Falcons that use the flyway over the island.

Fish Passage

Mount Desert Island (MDI) contains many streams and brooks that are home to Brook Trout. Of special concern to the park are the passages that these fish, particularly the Brook Trout use to travel out to sea. A fish passage is a manmade structure that allows a waterway to pass through some obstacle. These passages can be a small overpass with a large opening (eg. a bridge, Figure 20) or can be a fairly small culvert, occluding a large portion of the waterway (eg. carriage road bridges built in the 1800's, Figure 21). These smaller passages are detrimental to the trout. These types of passages do not provide the proper environment to encourage the trout up the stream. There are many suitable waterways within the park, however, only a few have the correct habitat suitable for the trout. A number of these waterways that could offer sanctuary to these species are not available due to inadequate passages.

One passage, in particular, is on the highly traveled roadway that loops through the park, and is one of the historically protected bridges that John D. Rockefeller Jr. built. During my first season there was the

Figure 20 Fish passage at the Seal Harbor outlet of Stanley Brook (photo by. JCWilliams)

Figure 21 Example of culvert type fish passage. Notice how it chokes down the actual stream width. It becomes a physical barrier during low flow periods. (photo from. www.obsidianportal.com)

potential for grant monies to open access to these waterways. It was necessary for us to gather data on all the obstructions. The data collected included 100 meters upstream of the obstruction, the obstruction itself, and downstream to the outlet of the stream where it meets the ocean. We used surveying tools exactly like those we used during the measurements class at IES.

With these tools we took transects of the stream every 10 meters measuring the wetted width along with several other morphometrics of the stream (Figure 22). We would also measure the obstruction with special attention to the water flow and depth under the bridges and roadways.

After all the measurements were taken and complied the Wildlife Biologist wrote the grant for the fish passage grant. The second season at Acadia I found that the park had been awarded partial grants to accomplish some of the work on some of the fish passages. One of the locations that received attention was a stream located at the out flow of Echo Lake replacing the small inadequate pipe under the roadway with a wide three arched underpass. This particular replacement opened up approximately 1.5 miles of premium habitat. There is still much work to be done on the other streams that were unfunded and to date no other fish passages has been replaced.

Figure 22 Acadia National Park personnel taking stream measurements. (photo by. JCWIlliams)

Dragonflies

We had a post-doctoral student that wanted to collect the chitin left behind from emerging adult dragonflies and damselflies. For three days we went to a variety of water bodies scattered around the park property and collected the chitin. I was required to accompany this particular researcher due to the majority of the water bodies she wanted to sample were off trail.

Barred Owl Study

A student, who also happened to work for the park for the season, was conducting a senior research project with Barred Owls and the effectiveness of play back surveys within Acadia National Park. This student had limited knowledge of how to conduct such a survey so our first week was spent looking at research articles over the subject and finding nesting location of the target species. The student set up a research protocol and I walked her through it for the next week so she could see how the playback system worked and what to expect as responses from the owls.

Her project stemmed from our first summers attempt at conducting raptor surveys within the park. The student needed a project so I and the Wildlife Biologist thought that this would satisfy two objectives. One it would give the student a project to work on and secondly it would provide us some data on how call back surveys worked in the Acadia forests.

Vernal Pool Surveys

A long running data collection project that has been conducted at Acadia is one where we survey approximately 30 – 40 vernal sites. Vernal pools are temporary pools of water that provide habitat for distinctive plants and animals. They are considered to be a distinctive type of wetland usually devoid of fish, and thus allow the safe development of natal amphibian and insect species unable to withstand competition or predation by fish. The data collected where number of egg masses, water depth at center of pool, and random samples around the pool using dip nets and identifying species that were collected.

Macroinvertebrate Sampling

The last project that I was involved in was a macroinvertebrate sampling of three streams on park property. The samples were taken from the intertidal zone and throughout the stream reach. This was done to see why Stanley Brook, where our Brook Trout research is being conducted, is being selected by the trout over the other two streams, Hunters Brook and Little Harbor Brook, which we sampled. Hunters Brook and Little Harbor Brook are

both similar in structure and access to the ocean but have a significantly lower Brook Trout population.

IV. INTERNSHIP REFLECTION

The primary focus of the Institute of Environmental Sciences (IES) concerned the problem solving process. This was drilled into us from our first semester and was practically taught through the Public Service Projects (PS) that all IES students participate in. The PSP gave so much value as a team building process and teaching tool that I see, now, why it is the central focus of our first year of graduate education. I found that the PSP prepared me greatly for working in a multi-agency, cooperative work environment. I was easily able to integrate myself in to all ready established working groups. Additionally, I was able to work through the stages that newly formed groups go through to arrive at the performing stage so that we were more productive. Understanding those stages learned through the PSP was incredibly helpful during my time at the parks. The problem solving process was terribly helpful while dealing with large projects and having a process that could deliver alternatives that we could use. These alternatives we arrived at were always a compromise of all the stakeholders involved and generally met with enthusiasm.

There was practical training through our measurements course that, while at the time I thought I would never use, was invaluable. Macroinvertebrate collection, stream measuring, fish collection, and bird banding; all of these skills I learned while in the measurements class and I used them all while working at Acadia.

I remember quite clearly a day we went out to take measurements of a stream for the fish passage work we were doing. I was comfortable and prepared to conduct such work out in the field. When we went macroinvertebrate sampling I remember laughing to myself thinking here is yet another aspect of my job IES prepared me to complete. While the practical knowledge I had gained while with IES was great the best was when I was able to use the problem solving process and applied it to my job.

I look back on this experience that I had and realize the incredible opportunity that I had while with Acadia and the National Park System. I truly believe that without the IES I would never have had such a wonderful opportunity. It was a wonderful feeling heading out to a position that I knew I could handle with the education that I received while with IES.

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