

**Post-Breeding Season Behavior of Bald Eagles (*Haliaeetus leucocephalus*) at Avenue Point, San Juan Island.**

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## ***Abstract***

After considerable increase in numbers over the past decades, Bald Eagles (*Haliaeetus leucocephalus*) may have reached carrying capacity in western parts of Washington. I studied the behavior of a Bald Eagle pair at Avenue Point, San Juan Island, Washington from 8-20 August 2011. Specifically, I recorded four behavior types (sitting, scanning, preening, and moving) at four-minute intervals during an observation period. I also noted eagle vocalizations and the relative distance between pair members along the shoreline. Behaviorally, eagles spent the majority of their time sitting (46%), followed by scanning (26%), preening (20%), and moving (7%). This might be justified energetically, due to the necessity during the post-breeding season of conserving energy for migration to wintering grounds. I saw only two predation attempts, both entailing fish prey and both unsuccessful, though other observers reported successful fish and gull predations during my study period. Vocalizations were separated into “chatters” and “peals”. Chatters were 8 times more likely to be used when two or more eagles were present, whereas “peals” were 5 times more likely to occur when either one or > two eagles were present. This result suggests that chatter calls are used for communicating within a pair, while peals are used for territorial purposes. The pair of eagles I studied spent >70% of their time between 5 m and 300 m apart from one other. This suggests that during the post-breeding stage they prefer to separate themselves spatially along their territory’s shoreline, as opposed to perching close together. However, evidence of the pair’s bond was still seen during this period, and I would occasionally see playful nipping of each other’s bills and mutual greetings.

Keywords: Bald Eagle, *Haliaeetus leucocephalus*, behavior, Avenue Point, post-breeding.

## ***Introduction***

After 50 years of conservation efforts, numbers of Bald Eagles (*Haliaeetus leucocephalus*) have increased nearly 10-fold (Stinson *et al.* 2001). This recovery entails one of the most successful conservation stories in the history of the Endangered Species Act. However, in Washington State, the Bald Eagle population may now have reached carrying capacity (Stinson *et al.*, 2001). Despite these circumstances, little research has been devoted to studying the effects of rapid growth of the Bald Eagle population in Washington. Puget Sound and the San Juan Islands support the highest density of nesting Bald Eagles in the state (Schirato 2006), meaning that potential behavioral changes might be most apparent here. Behavioral observations can help inform energetics, including responses to change in the breeding cycle or environment. Post-breeding behaviors are especially poorly studied, despite the importance of adults regaining body condition during this time, which can affect their success during the following season (Hansen and Hodges 1985).

My study focuses on one particular pair of Bald Eagles that successfully reared two offspring in the 2011 breeding season and that could be observed regularly from close proximity. The objective of my study was to examine the ways in which this pair uses their territory after the breeding season. Specifically, I recorded the frequency of different behaviors (including time spent in flight, preening, sleeping, or scanning), vocalizations, and spatial relationships of the pair members. I also assessed the within-day variability of the frequency of these behaviors and compared these with time of day.

## ***Methods***

### Study area:

I conducted this study on San Juan Island from 8–20 August 2011. In order to reliably find Bald Eagles, I chose to observe in the vicinity of a known nest from the 2011 breeding season. The nest at Avenue Point was reported by two individuals to have been active, and successfully fledge two offspring. Avenue Point (48.46 N, 122.96 W) is located on the west side of Cattle Pass—a narrow channel between San Juan and Lopez islands. The nest of the Avenue Point Bald Eagle pair is located at the intersection of Island Drive and Driftwood Lane (48.46 N, 122.96 W). On either side of the spit leading out to Avenue Point is a small cove with a pebble beach, referred to as North and South Cove. Approximately 800 m to the south is Goose Island, home to breeding colonies of Glaucous-winged Gulls (*Larus glaucescens*) and Double-crested Cormorants (*Phalacrocorax auritus*) in addition to other cormorant and gull species, Harlequin Ducks (*Histrionicus histrionicus*), and Harbor Seals (*Phoca vitulina*).

### Behavioral surveys:

I conducted observations of Bald Eagles from two different locations—the southern tip of Avenue Point and the west side of the point, referred to as Site 1 and Site 2 respectively (Fig. 1). For each observation period, I noted the start and end time, in addition to the starting cloud cover, air temperature, wind, tide, and observation site. If only one individual was present, I used a scope for observations. If more than one individual was present, I used the scope for the most distant individual and binoculars for the closer individual(s). Every four minutes, I noted the behavior of each individual present, and the sex if identifiable. Sex cannot be confirmed without a hands-on

examination of the bird. I only recorded sex if I saw the birds within five meters of each other and could easily recognize a size difference, and would record the larger of the two as female (Bortolotti 1984).

I classified behaviors into the following categories:

- Preening*: The rearrangement or cleaning of feathers using the bill (excludes scratching with feet or rousing).
- Scanning*: The bird was seen moving its head, looking around. Any movement of the head constituted “scanning”, even if it was small. This includes any other movement that’s not flight.
- Sitting*: The bird is motionless. Includes sleeping.
- Moving*: Any flight, long or short. Does not include small stationary movements.

I categorized vocalizations into two distinct types as defined by Verner and Lehman (1982): 1) “a ‘chatter call’ described as consisting of 3-4 introductory notes separated by short gasps of silence (<1 sec) followed by a rapid sequence of descending notes, usually 6-9 notes in sequence (*kwit kwit kwit kwit kee-kee-kee-kee-kee*), and 2) a ‘peal’ consisting of a high-pitched, prolonged, gull-like cry, often repeated 3-5 times. I did not observe any instances of a third category defined by Verner and Lehman (1982): a ‘wail’ call”, during my study.

To determine how eagles position themselves spatially along their costal territory, I recorded their distances in relation to each other. I separated the eagles’ locations into “near” and “far” perches in terms of their relative distance from sites where I made observations at Avenue Point (Fig. 1). Their specific perches within these two categories

were not precisely recorded, unless more than one eagle was present in the same site. In this case, their positions were described relative to each other on a scale of ranges: <1 m apart, 1 - 5 m apart, 5 - 20 m apart, 20 - 300 m apart, and unknown distance when an eagle moved out of visibility.

#### Data Analysis:

For the within-day change in behavior, I broke the day into 4 even segments based on the earliest and latest observations recorded: 0800–1045, 1045–1330, 1330 – 1615, and 1615–1900 hrs. The observations of individual birds were counted separately. For example, if two birds were present and both were preening, preening was recorded twice. I also included a data set from a sub-adult Bald Eagle that was present on August 12<sup>th</sup>, as well as an auxiliary pair of eagles present on August 18<sup>th</sup>. Thus some 4-minute intervals have 4 data points, one for each individual within sight. Data were summarized using Microsoft Excel.

### ***Results***

#### Behaviors:

Observations were conducted on 10 different days. I made both morning and afternoon observations on August 17<sup>th</sup> and 18<sup>th</sup>. The total observation time over the 10 days was 1281 min. The time that one or more eagles was present totaled 993 min. I observed one or more eagles during 77% of my survey time at Avenue Point. Across all 10 observation days, I took a total of 394 instantaneous observations spanning 5 different eagles, of which 180 counts of sitting (46%) of observations, 103 counts of scanning (26%), 80 counts of preening (20%), and 29 counts of movement (7%). The majority of

observations were made on August 17<sup>th</sup>, where I was at Site 2 for 6 hours and 19 minutes and took 171 observations (44% of total observations across study). Behaviors ranged from slowly falling asleep to attempted predation. Though I do not analyze predation attempts in this paper, on two occasions an eagle would skim close to the water. Only once did an eagle physically reach into the water, the product of which was a clump of eel grass which was dropped in flight 30 seconds later. The other attempt also appeared to be for fish, but the eagle failed to open its talons or touch the water and merely let its feet hang above the water as it flew by. I did not observe any predation attempts on the gulls at Goose Island. However, on two occasions other observers at Avenue Point informed me of a recent attack (both unsuccessful) of eagles near the island. I was also informed of an eagle's attempted predation on a salmon that had been chased onto the rocks by a Harbor Seal (though the salmon escaped both predators). I also noted instances of eagles either tucking one foot under their belly feathers, or letting one leg hang down below their perch with the fist balled. Collectively, I observed these behaviors 4 times with each occurrence lasting <20 minutes.

#### Vocalizations:

I recorded a total of 55 vocalizations, 38 (69%) of which were “chatters” and 17 (31%) of which were “peals”. Chatters were 8.5 times more frequent when more than one eagle was present, whereas peals were 4.7 times more frequent with either one or more than two eagles present. Chatters also decreased in frequency when there were more than 2 eagles. In general, chattering was more common between two members of a pair, whereas peals were more prolific when only one individual was present (Figure 2). The only two instances when there were more than 2 eagles present, was when 1) a sub-

adult Bald Eagle flew over the pair and 2) when another pair was sitting approximately 50 meters south of the other along the shoreline. I made no effort to distinguishing which was the focal pair and recorded the behaviors of both. Of the total number of “chattering” observations, 15 out of the 38 calls (39%) occurred when one member of the pair flew into the area and perched within the 300 meters of shoreline between the near and far perch. The chattering greeting call was always accompanied by the synchronized bobbing of heads by the pair. The distance between pair members upon arrival did not appear to affect their greeting protocols.

#### Distance between pair members:

Of the 7 hours and 54 minutes that I observed multiple Bald Eagles at the same time, they only spent 29% of their time within 5 meters of each other, while the other 71% they spent between 5 and 300 meters apart (Table 1).

#### Within-day variability of behavior:

Figure 6 shows the proportions of time individuals spent sitting, scanning, preening, or moving, displayed in order from lowest energy cost (sitting) to highest energy cost (moving). In general, there is a lag in activity between 13:30 and 16:15 when they spend more time sitting and less time moving than during any other time block (Fig. 6a). The amount of time allocated to preening remains fairly steady throughout the day, as does time spent scanning. Figures 6a and 6c have extracted the known female and male data, respectively. These graphs indicate that males spend more time sitting during the middle of the day, whereas females are more active during the middle of the day and sit earlier in the morning and later at night. Both males and females show increased movements between 08:00 and 13:30. The graphs also show an increase in scanning as

the day progresses. The percent of observations of eagles sitting is nearly twice that of percent spent scanning, preening, and moving, which are all seen with the same frequency (Fig. 4).

## ***Discussion***

### Behaviors:

While observing eagles, I devoted most of my time to analyzing what they did as they sat. After they landed, they remained in an alert state for 5 to 10 minutes with their feathers slicked down and their necks stretched, looking around. This usually led to prolonged preening. Despite constant human presence on Avenue Point and occasional human or canine activity along the shoreline, the eagles were never flushed from their perches. This leads me to assume that they are relatively desensitized to human presence. I did note when the eagles appeared to be looking directly at me. This behavior was reasonable, as both observation sites were in plain view of the eagles. Their glances were rarely in response to my movements, but rather at random moments, suggesting that they were constantly aware of my presence. While one of the main conservation concerns for Bald Eagles is human influence on shoreline territories (Schirato and Parson 2006), I saw no behavioral evidence of this particular pair becoming stressed in the presence of humans, which can be indicated by flattening of the feathers, alarmed calls, or relocation. However, because the eagles are in their post-breeding season, they may be losing the territoriality and sensitivity to disturbance that frequently causes declines in reproductive success (Steidl and Anthony 2000).

### Vocalizations:

The majority of chattering happens when two bald eagles are present, demonstrating the need for vocal signals in a pair bond. Every time a pair member arrived along the shoreline, the pair would either remotely or proximally chatter to each other and simultaneously bow and tilt their heads up. The other instances when vocalizations occurred within pairs were at random times and did not seem related to any external factor. The chatter calls between pair members did not change in frequency or intensity relative to the distance by which they were separated. There was another instance of an individual making “peal” calls periodically, to which I couldn’t hear another bird’s response. Whether this was a way to detect a mate or to casually establish territory, it would be difficult to tell without prolonged observations. However, because the peals were made more frequently both when an individual was alone or when a extra-pair bird was near, peals may be used for establishing territory or simply for making presence known. Alternatively, chattering is for social interactions either between a pair or their offspring.

Distance between pair members:

The Bald Eagle pair I studied spent 71% of its time between 20 and 300 m apart from one another. During the winter, pair bonds break down and migrating Bald Eagles roost and feed together. Hundreds of eagles winter within a small area with only minor squabbling, usually limited to “displacements” and only occasionally leading to pursuit or talon presentation (Griffin 1981). In contrast, during the breeding season, eagles maintain a territory and will monitor it closely. Their reaction to intruders, however, is less severe or lacking after chicks have fledged (Mahaffy and Frenzel 1987). The purpose of this study was to see if the pair remained in close proximity to each other

between breeding and wintering. It would seem that while they spend most of their time on either end of the shoreline, they maintain vocal ties by occasionally calling to each other. The time that they spend within 5 m often includes the same sitting, scanning, and preening patterns, though I observed a pair playfully nipping at each other's bills while another pair was sitting within 50 m. This suggests that while they may spread out across the shoreline near their nest, they do spend social time together and tolerate sharing the location with other birds, including eagles.

#### Within-day variability of behavior:

Although variability in my behavioral data was high, the eagles I observed spent most of their time sitting, followed by scanning, and then preening and moving. From an energetics perspective, this makes perfect sense. Because the category of "sitting" required that eagles be completely still, sitting should be the least costly of the four behaviors. Because sitting is the most prevalent behavior, eagles may be conserving energy, and only occasionally expending the energy to preen or fly. This may also be the product of their hunting strategy, which requires short, low expenditure flight.

#### Future Research:

Because Bald Eagles in Washington are in a unique point in their population growth, it is necessary that we understand what reaching carrying capacity will mean for eagle conservation. For birds with large home ranges, high densities can lead to violent competition during the pre-breeding season and reduced territory size, which can in turn lead to more limited resources and lower reproductive success (Anthony 2001). To understand limiting factors for local Bald Eagle populations, studies are needed for all stages of the life cycle and across varying habitat types. Improvements to this study

would be to observe for longer each day, spanning across all time periods and tidal phases. On the two days spent almost entirely in the field, the trends in the distributions of behaviors seen in Figure 4 are more obvious, with greater differences in frequencies of behaviors.

Of recent interest is how Bald Eagles affect the declines of other marine species, such as the many sea ducks and gulls upon which they prey or otherwise disturb. Recent behavioral observations of eagles have shown that they contribute to lower reproductive success in Glaucous-winged Gulls (Hayward *et al* 2010) and Common Murres (Parrish *et al* 2001). To accurately and efficiently measure eagle movements, radio or satellite tracking devices are needed. Eakle *et al* (1989) describe the method of tracking individuals by call, which is preferred to banding or other disruptive identification strategies. Studies such as these are important for developing our knowledge of how eagles use vocalizations, how they interact with visiting eagles, and what activities they prioritize between breeding and wintering. By monitoring how eagles are allocating their time and energy during this stage, we can more accurately predict their habitat needs as their population continues to change.

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Table 1. Distances (m) between the members of a Bald Eagle pair at Avenue Point, San Juan Island, Washington from 8 – 20 August 2011.

	time	proportion
total time < 1 m	1:12	0.15
total time 1-5 m	1:07	0.14
total time 5-20 m	2:32	0.32
total time 20-300 m	3:03	0.39
total time 2 eagles present	7:54	1.00

Figure 1. Location of Bald Eagle perch and nest sites (red points) and of observation stations (yellow points) at Avenue Point in the San Juan Channel, Washington.



Figure 2. Call type and frequency among lone individuals, pairs, and visiting Bald Eagles at Avenue Point, San Juan Island, Washington from 8–20 August 2011.

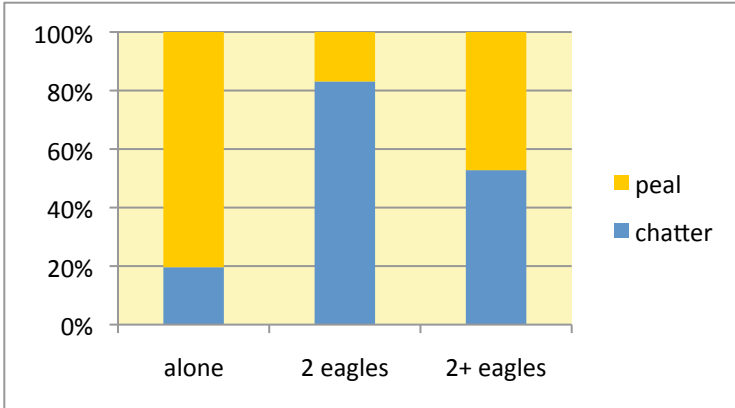
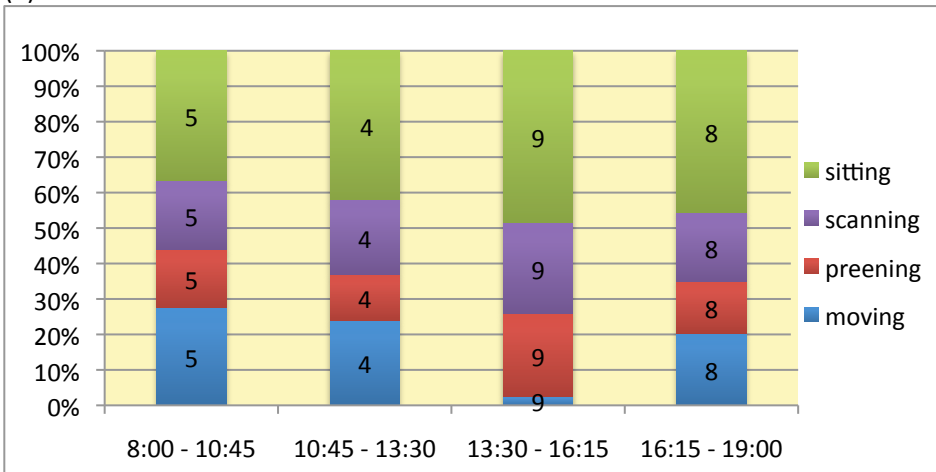
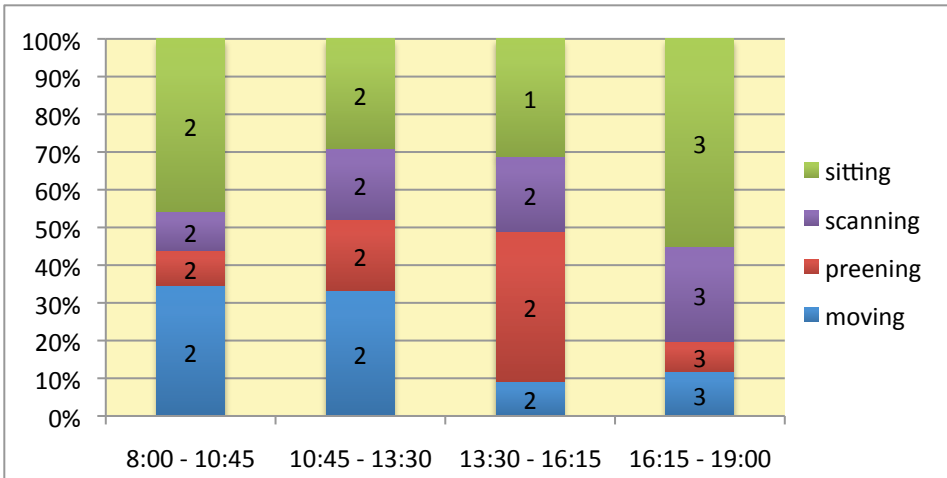


Figure 3. Mean percentage of behaviors by daily period at Avenue Point, San Juan Island, Washington from 10-20 August 2011 (sample sizes are indicated inside columns). Results are for (a) total numbers, (b) female, and (c) male Bald Eagles observed.

(a)



(b)



(c)

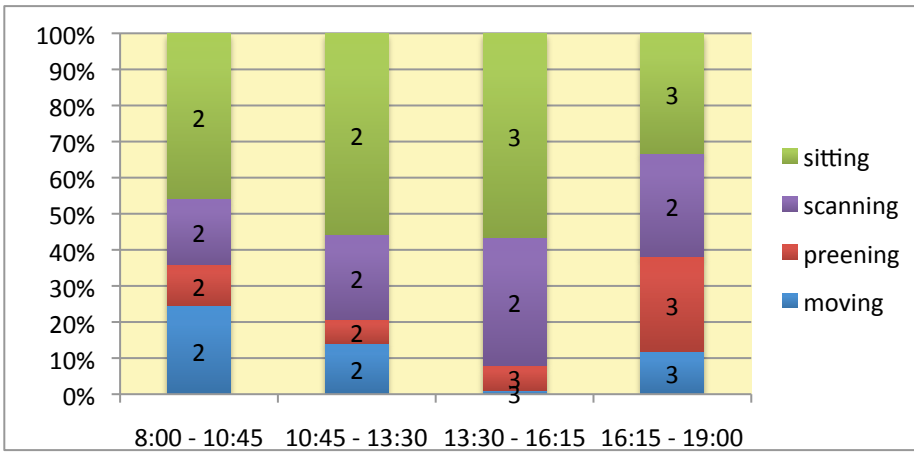


Figure 4. Mean daily percent of 4 Bald Eagle behaviors seen at Avenue Point, San Juan Island, Washington from 8-20 August 2011

