Evaluating the Breeding Season Home Range and Foraging Habitats of the Slate River Great Blue Heron (*Ardea herodias*)

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Abstract. *The Great Blue Heron (Ardea herodias) is the largest, semi-aquatic waterbird in North America and nests in gregarious colonies. These birds nest throughout Colorado including at a unique site in the Slate River Wetlands near Crested Butte. The relatively large colony (>20 nests) represents a persistent heronry in a high-elevation conifer stand in the Rocky Mountains. The Crested Butte area is highly popular for outdoor recreation and the increasing presence of humans is potentially impacting wildlife. It is unclear whether the heronry is stable, but it is potentially threatened by human river recreation in the form of stand-up-paddle boards, kayaks, and small rafts. The purpose of our study is to document heron phenology, demographic characteristics, impacts of human activities, foraging habitat use, energetic costs and gains, and predator presence around the Slate River heronry. We are working closely with the Crested Butte Land Trust to gather data that will continue to inform their diverse stakeholder, adaptive management process.*

BACKGROUND

The Great Blue Heron (*Ardea herodias*) is the largest semi-aquatic wading bird in North America, whose populations depend on productive coastal or wetland habitats for successful reproduction (Vennesland and Butler 2011). The Great Blue Heron spends much of its life as a solidary hunter, but defy their normally private lives and assemble in colonial nesting sites during the breeding season for three proposed reasons: a colony acts as a central hub for foraging information, it provides better defense against predation, or it serves as a meeting

place for these otherwise unsocial birds to breed (Lack 1954, Simpson et al. 1987, Butler 1997). One such colony exists in the Slate River wetlands located outside of Crested Butte, Colorado. This heronry is unique compared to typical colonies in its high elevation (nearly 9,000 feet) and use of lodgepole pines (*Pinus contorta*) as nesting substrate (Magee and Zareba 2019). Herons are known to tolerate a spatial buffer of up to 300 m from human activity (Carlson and McLean 1996), and anthropogenic disturbances within this space have led to decreases in their reproductive success due to increased chick vulnerability and stress levels (Vennesland 2000; Vennesland and Butler 2004). The main current of the Slate River flows directly underneath this colony site and is a desirable destination for river recreators. The Slate River heronry is located on land owned and managed by the Crested Butte Land Trust (CBLT) who, in 2018, began tackling the arduous task of balancing not only the preservation of the sensitive ecosystems and wildlife habitats along the river, but the accessibility of recreators and naturalists to this pristine area as well. Our study looking at the effects of river recreation on the breeding and reproductive success of this heron population began in 2018 and has continued each year since. The data reported in the pilot study directed the adoption of a voluntary no-float period by the Slate River Working Group (SRWG) in 2019. In the 2021 season, our data will continue to focus on evaluating the impacts of river recreation on the breeding population while also incorporating an investigation into the potential risks to the population as a consequence to human disturbance events.

RESEARCH OBJECTIVES

The project was initiated in collaboration with the Crested Butte Land Trust in 2018 and was conceived as a 5-year study. Therefore, 2021 will be the fourth year of this study. In order to quantify the impacts of river recreation on the colony, we will 1) produce a detailed profile of the 2021 breeding phenology based on field observations of the timing and duration of heron life cycle events, 2) evaluate nesting demography by quantifying basic demographics, and 3) assess the impacts of river recreation by quantifying heron behavior before, during, and after floating events occur within the colony. Further, we will attempt to quantify the risks to the population as a consequence of human activity by 4) evaluating the foraging habitats used by adult herons and calculating their use efficiencies, 5) monitoring the movements of herons to and from the heronry in order to quantify the energetic costs (departure/return flights) and gains (adulting provisioning rates), and 6) surveying the local colony area for predator species.

METHODS

Study Design and Data Collection

Great Blue Heron Phenology. We will observe and document the phenology of annual life cycle stages of Great Blue Herons from spring arrival to fall departure by monitoring each individual nest. During each observation shift, we will record the date, time, weather, heron counts, and current life cycle event for each nest. We will determine the timing and duration of the spring arrival, nest building, incubation, hatching, brooding, and fledging life cycle events.

Great Blue Heron nesting demographics. During observations, we will conduct systematic scans of all the nests and count the number of adults and the number of chicks produced in

each nest. At the end of the season we will quantify the nest success (number of nests that produce at least one chick), fledging success (number of nests that produce at least one fledgling) and the fledgling success (number of fledged chicks out of total chicks produced) to provide useful metrics of heronry productivity.

Human Activities and Heron Disturbance. We will conduct 1-hour observations bouts and record all human activities on the Slate River Road, in the aerial environment overhead, in the wetlands, and on the Slate River. Locations and duration of the human activity will be recorded along with the number of people associated with each event, and heron response to activity. We will record the number of herons exhibiting disturbance behaviors which include altered posture and/or flushing from the nest. We focus on watercraft disturbance and will record type of craft, number of crafts and people, and various measures of floater behavior (group size, posture, loudness) associated with each floating event through the heronry.

Foraging Habitat Use. We will assess energetic costs of foraging habitats known to be utilized by the population within the 15 km radial foraging distance of the colony (Gibbs 1991). To do this we will spatially map these foraging sites, quantify the area of the habitat and distance from the colony, and calculate the use efficiency by dividing the distance travelled by the total area of available habitat.

Monitoring Energetics. We will record all departures and arrivals of adult herons from the colony throughout our observation bouts. We will also record every brood provisioning event that occurs within our observation bouts, record the number of chicks successfully fed out of the total brood size, and produce average provisioning success rates for each nest.

Predator Surveys. During observations, we will continuously monitor the landscape immediately surrounding the colony site for any wildlife that pose a predatory risk to heron adults, eggs, and chicks. Species will be identified and individuals counted along with the date and time of the event.

Expected Results

This will be the fourth year of our collaboration with the CBLT and SRWG in producing unbiased and meaningful data that is used as guidance for stakeholders when deciding on conservation measures for the Slate River system. The need for understanding the impacts of human activity on wildlife is becoming increasingly more prevalent in today's world. The Great Blue Heron is a species of high vulnerability to human disturbance, and these data from our study help stakeholders implement adaptive management strategies that enable human-wildlife conflict resolutions. A final report will be prepared for the Slate River Working Group and I will present these results at several venues, including a monthly DFO meeting.

BUDGET

Budget Item	Quantity	Cost	Waterbird Society	Denver Field Ornithologists	Private Donor Request	CBLT Request
Travel (Gunnison – Crested Butte)	4800 miles @ $0.53/mile	$2,544			$2,544	
Field Data Collection	480 hours @ $12/hr	$5,760	$3,000			$2,760
Samsung Galaxy Tablet	2 @ $599	$1,198		$1,198		
Dakota Alert BBT-4000	2 @ $260	$520		$520	$1,000	
Total Expenses		**$10,604**	**$3,000**	**$1,718**	**$3,544**	**$2,760**

Budget Justification

We request $3,000 from the Waterbird Society Kushlan Grant for a student research stipend ($3,000).

Research expenses include 80 trips from Gunnison to Crested Butte, totaling 60 miles round-trip. At a reimbursement rate of $0.53/mile, this equates to:

80 trips * 60 miles/trip * $0.53/mile = $2,544

Field effort for this research project includes 20 weeks during the heron field season from mid-March to September. The field data collection will require two researchers, including the Thornton student and a research assistant. Researchers will make 4 trips per week (2 per researcher) to the study site for a total of 80 days of sampling. For clarity, this project is part of a broader study on herons, so these researchers will be doing other duties through the week as well. Group tracking data collection requires at least 3 observers. The team will include the Thornton research student, the research assistant, and another Western student leading the complementary heron study (funding for this student is independent of this grant proposal). Each sampling day will require 6 hours of work at a rate of $12/hour, for a total field data collection cost of:

20 weeks * 4 days/week * 6 hours/day * $12/hour = $5,760

The Samsung Galaxy Tablet – Active Pro will provide our research with a much more streamlined data entry process in the field while decreasing the amount of paper wasted on datasheets. We require two tablets in order to facilitate the potential addition of a research assistant. The Dakota Alert BBT-4000 Break Beam Alarm System will be utilized upstream of the colony to detect floaters entering the area. This alert system will allow us to scan the colony

prior to the disturbance event. This alert system also has the capability to communicate directly with the requested tablets.