

A COMPARISON OF BREEDING BIRDS BEFORE AND AFTER CONSTRUCTION OF A RECREATION SITE IN NORTHERN IDAHO

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Abstract. The Coeur d'Alene Field Office of the Bureau of Land Management in northern Idaho, USA constructed a recreation facility in 2002 and 2003. This study compared the use of a riverine site by 44 breeding bird species for five years before construction versus six years during and after construction. Twenty-five percent alteration of habitat and 23 131 additional people visiting the study site per year after construction did not greatly change the number of either breeding species or their territories. Sixty-four percent of the 44 breeding species were common to both sample periods. Unlike potential impacts previously reported in the literature, many of the shrubs and mature trees remained standing in 75% of the habitat after construction was completed. Ground-nesters increased their number of breeding territories despite the conversion of 22% of habitat to asphalt and 3% to manicured lawn. The wooden boardwalk and viewing decks minimized the potential for habitat alterations and human disturbances within the riparian-wetlands.

Key Words: breeding bird census, habitat alterations, human disturbances, mitigated impacts, riparian-wetlands.

AVES DE CRIANZA EN UNA FACILIDAD RECREACIONAL DESARROLLADO: UNA COMPARACIÓN DE LOS AVES DE CRIANZA ANTES Y DESPUÉS DE LA CONSTRUCCIÓN DE UNA FACILIDAD RECREACIONAL EN IDAHO NORTEÑO

Resumen. La oficina de campo del Coeur d'Alene de la Agencia del Manejo de la Tierra en Idaho norteño, los E.E.U.U., construyó una facilidad recreacional en 2002 y 2003. Este estudio comparó el uso de un sitio ribereño por 44 especies de los aves de crianza por cinco años antes de la construcción contra seis años durante y después de la construcción. Alteración del 25% del hábitat y de 23 131 personas adicionales que visitan el sitio del estudio por año después de que la construcción no cambiara grandemente el número especies de criar ni de sus territorios. El 64% de las 44 especies de la cría era común a ambos períodos de la muestra. Desemajante de impactos potenciales divulgó previamente en la literatura, muchos de los arbustos y los árboles maduros seguían siendo permanentes en el 75% del hábitat después de que la construcción fuera terminada. Los especies que anidan sobre la tierra aumentaron su número de territorios de la cría a pesar de la conversión del 22% del hábitat al asfalto y el 3% al césped muy cuidado. El paseo marítimo entarimado y de las plataformas de la visión redujeron al mínimo el potencial para las alteraciones del hábitat y los disturbios humanos dentro de los pantanos ripícolas.

INTRODUCTION

The Bureau of Land Management (BLM) purchased Blackwell Island, which is 13 ha in size and covered with riparian woodland, near Coeur d'Alene, Idaho in 1994 with Land and Water Conservation Funds and assistance from Kootenai County's Lake Mitigation Fund. The purpose of this acquisition was to develop a seasonal, day-use recreation facility on the site. During the environmental review phase, two citizen groups and two private citizens appealed the BLM's decision to develop

Blackwell Island for public recreation. Among other items, the appellants argued that the proposed development would harm the local wildlife, especially birds.

The BLM mitigated impacts to wildlife by (1) waiting until the Memorial Day weekend to open the boat launch to public use, (2) planting shrubs and trees, (3) leaving 10.7 ha of the site undeveloped, and (4) requiring dogs to be restrained with a leash. The final decision ruled in favor of the BLM to proceed with development of the recreation facility. Site preparation began in 2001 and construction occurred during

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2002-03. In order to test the appellants' anticipated impacts to migratory birds, I initiated this study to test the amount of habitat alteration and added human disturbance against the (1) number of breeding species, (2) number of breeding territories, (3) Partner-In-Flight's (PIF) regionally important species for Bird Conservation Region (BCR) 10—Northern Rocky Mountains, (4) relationship to nest substrate, and (5) relationship to migration strategy.

METHODS

STUDY AREA

Blackwell Island is located near the junction of Coeur d'Alene Lake and the Spokane River (47°41'N, 116°48'W) in northern Idaho. Figure 1 displays the study plot overlain with a grid system and a schematic drawing of the constructed facilities. The plot of 9 ha had a triangular shape that was bounded by U.S. Highway 95 along the southern edge, the Spokane River along the eastern edge, and a manmade canal along the northwestern edge. An adjacent area of 4 ha could have provided an ideal control during the 11 years of this study, but was unavailable due to high water in the manmade canal.

The plot's open canopy was dominated by ponderosa pine (*Pinus ponderosa*), black cotton-

wood (*Populus trichocarpa*), and weeping willow (*Salix babylonica*). The canopy height ranged from 15 to 30 m. The understory was dominated by Wood's rose (*Rosa woodsii*), common snowberry (*Symphoricarpos albus*), and black hawthorn (*Crataegus douglasii*). Ground cover was dominated by the exotic invasive spotted knapweed (*Centaurea maculosa*), St. Johnswort (*Hypericum perforatum*), and non-native perennial grasses. The maximum width of the Spokane River was 300 m, and its maximum depth was 5 m. Up to 25% of the plot was covered with standing water during some of the breeding seasons. More than 75% of the plot's perimeter was bordered by the same habitat, and the plot laid within a tract of similar habitat 26 to 50 ha in size. The plot's terrain was nearly level, and its elevation ranged from 648 to 651 m.

The BLM constructed a seasonal, day-use recreation facility on Blackwell Island to specifically accommodate high visitor use levels. The primary function of the facility was to provide a four-lane boat launch, 130 parking spaces for vehicles with trailer, 34 parking spaces for single vehicles, and 150 m of boarding and short-term moorage docks. Its secondary function was to provide 14 individual picnic sites, one group picnic shelter, and 400 m of wooden boardwalk with three decks to watch wildlife. Construction was divided into three phases,

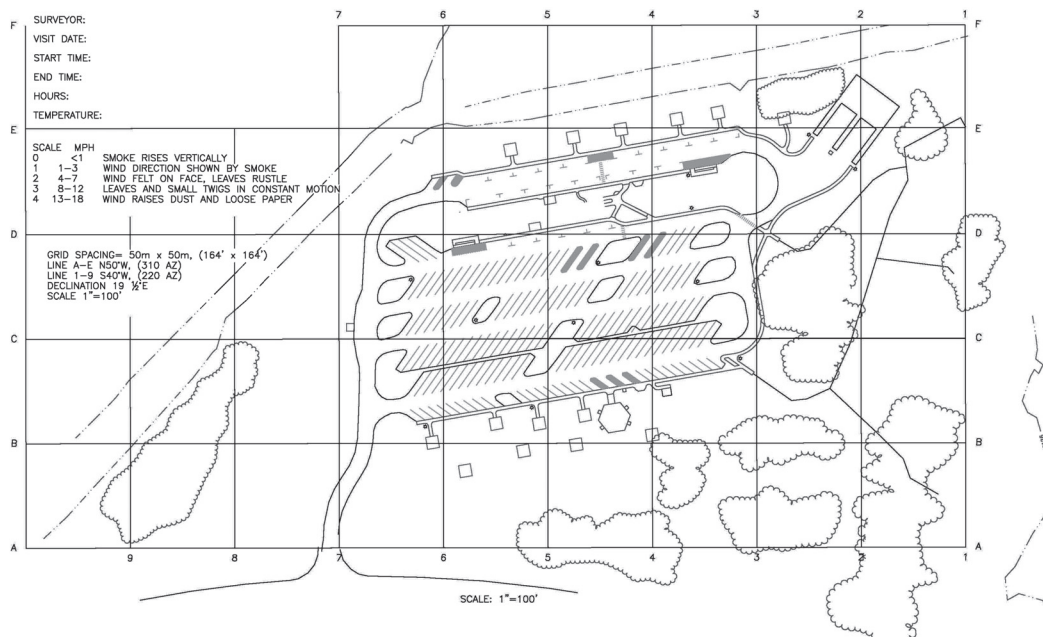


FIGURE 1. Blackwell Island study area overlain with a grid system and a schematic drawing of the constructed facilities.

(1) earth work and utilities including launch excavation and highway modification, (2) basic facilities including launch, docks, toilets, and aggregate surface, and (3) finishing touches including paving, landscaping, and construction of the wildlife observation trail.

FIELD METHODS

My objective was to count the number of species and their breeding territories during each year of the study. I conducted censuses of breeding birds before construction 1997–2001, during construction 2002–03, and after construction 2004–07. I followed the standard methodology described by Robbins (1970), which was used by the Cornell Laboratory of Ornithology for “Breeding Bird Census” (Gardali and Lowe 2006, Gardali and Lowe 2007). I identified all bird species by sight and sound. My hearing ability was mostly within normal range of hearing by using pure tone tests from 1000 to 8000 hertz with hearing threshold levels of 0–20 decibels (Ramsey and Scott 1981).

I visited the plot seven to 10 times from 3 May through 6 July, and formulated composite territory maps for each breeding species. Migrant and non-breeding species were also noted. My visits during the post-construction period began earlier in May to ensure a greater chance of accomplishing all required visits to the site. The pre-construction period included a mean of three sunset visits per year whereas the post-construction period had none because of logistical considerations. Otherwise, the total numbers of (1) site visits, (2) maximum observers per visit, (3) hours of censusing the plot, (4) ambient temperatures, and (5) average last visit were not significantly different between the two sample periods. Portions of the study plot flooded during the breeding season for two of the pre-construction years (1997 and 2000) and one of the post-construction years (2002).

I measured human use of Blackwell Island during the post-construction period by the number of individual and seasonal parking passes sold from June through September of each year. Each pass was multiplied by 3.5 visitors and by 1.1 to account for noncompliant visitors. Seasonal passes were multiplied an additional 12 visits for the year.

STATISTICAL ANALYSES

I used Student’s two-tailed, paired *t*-test (Microsoft 2003) to examine differences between the before and after samples. Significance was set at $P \leq 0.05$. I also used Jaccard’s index to measure the similarity of species between the before

and after samples (Real and Vargas 1996). I combined data from the two construction and four post-construction years into one sample because tests indicated no significant differences between these six years. I then compared this after sample period to the before sample period consisting of the five pre-construction years.

RESULTS

Much of the open space within the study plot was occupied by spotted knapweed. The constructed facilities replaced 2 ha of this noxious weed with asphalt and 0.3 ha with manicured lawn, which affected 25% of the study plot. Remaining noxious weeds were sprayed with herbicides during the bird breeding season. Many shrubs and trees were either transplanted or removed to make space for the constructed facilities. Some replacement nursery stocks were native species of shrubs and trees, while others were ornamental species of the same genera as native species. Several shrubs and trees that were beyond the reach of the constructed facilities, especially along the water’s edge, were left standing in their original locations.

I identified 44 species of birds with breeding territories at least once during the 11 years of this study (Table 1). Not all species were identified in all years. I found no significant differences between the mean number of species and the mean number of territories per year between the two sample periods (Fig. 2). Of these 44 species, 20 gained a mean of 13 territories per year, while 17 lost a mean of eight territories per year for an average net gain of five territories per year after construction. Seven species had the same mean number of territories per year in the two sample periods. I calculated Jaccard’s index of similarity for species of breeding birds:

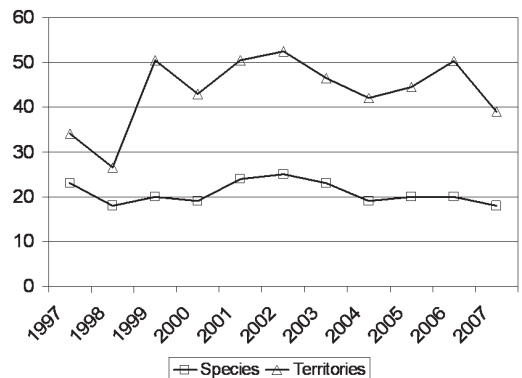


FIGURE 2. Number of breeding bird species and territories on Blackwell Island, 1997–2007.

TABLE 1. FORTY-FOUR BIRD SPECIES THAT ESTABLISHED TERRITORIES ON BLACKWELL ISLAND, 1997–2007.

Common name	Scientific name	Migrant status ¹	Nesting substrate ²	Mean Change No. of Territories ³
Tree Swallow	<i>Tachycineta bicolor</i>	B	TreeCavity	2.9
Mallard	<i>Anas platyrhynchos</i>	R	Ground	1.9
American Robin	<i>Turdus migratorius</i>	B	Deciduous	1.8
Spotted Sandpiper	<i>Actitis macularius</i>	B	Ground	1.1
Black-capped Chickadee	<i>Parus atricapillus</i>	R	TreeCavity	0.6
European Starling	<i>Sturnus vulgaris</i>	R	TreeCavity	0.6
Canada Goose	<i>Branta canadensis</i>	B	Ground	0.5
Ring-necked Pheasant	<i>Phasianus colchicus</i>	R	Ground	0.5
Downy Woodpecker	<i>Picoides pubescens</i>	R	TreeCavity	0.5
Hairy Woodpecker	<i>Picoides villosus</i>	R	TreeCavity	0.5
Northern Flicker	<i>Colaptes auratus</i>	B	TreeCavity	0.4
Bullock's Oriole	<i>Icterus bullockii</i>	A	Deciduous	0.4
Wood Duck	<i>Aix sponsa</i>	B	TreeCavity	0.3
Mourning Dove	<i>Zenaida macroura</i>	B	Deciduous	0.3
Gray Catbird	<i>Dumetella carolinensis</i>	A	Shrub	0.2
Yellow Warbler	<i>Dendroica petechia</i>	A	Shrub	0.2
California Quail	<i>Callipepla californica</i>	R	Ground	0.1
Killdeer	<i>Charadrius vociferus</i>	B	Ground	0.1
Willow Flycatcher	<i>Empidonax traillii</i>	A	Shrub	0.1
Brown-headed Cowbird	<i>Molothrus ater</i>	B	Deciduous	0.1
Rufous Hummingbird	<i>Selasphorus rufus</i>	A	Conifer	0.0
Violet-green Swallow	<i>Tachycineta thalassina</i>	A	TreeCavity	0.0
Western Wood-Pewee	<i>Contopus sordidulus</i>	A	Conifer	0.0
Yellow-rumped Warbler	<i>Dendroica coronata</i>	B	Conifer	0.0
Common Yellowthroat	<i>Geothlypis trichas</i>	A	Shrub	0.0
Song Sparrow	<i>Melospiza melodia</i>	B	Shrub	0.0
Red-winged Blackbird ²	<i>Agelaius phoeniceus</i>	B	Shrub	0.0
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>	A	Deciduous	-0.2
Red-breasted Nuthatch	<i>Sitta canadensis</i>	R	TreeCavity	-0.2
Pygmy Nuthatch	<i>Sitta pygmaea</i>	R	TreeCavity	-0.2
Western Tanager	<i>Piranga ludoviciana</i>	A	Conifer	-0.2
American Goldfinch	<i>Carduelis tristis</i>	B	Shrub	-0.2
Common Merganser	<i>Mergus merganser</i>	B	TreeCavity	-0.4
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	A	Ground	-0.4
Mountain Chickadee	<i>Parus gambeli</i>	R	TreeCavity	-0.4
Pine Siskin	<i>Carduelis pinus</i>	B	Conifer	-0.4
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	A	Deciduous	-0.5
Warbling Vireo	<i>Vireo gilvus</i>	A	Deciduous	-0.6
Spotted Towhee	<i>Pipilo maculatus</i>	B	Ground	-0.6
House Finch	<i>Carpodacus mexicanus</i>	R	Deciduous	-0.6
Chipping Sparrow	<i>Spizella passerina</i>	A	Conifer	-0.7
Calliope Hummingbird	<i>Stellula calliope</i>	A	Shrub	-0.8
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	B	Shrub	-0.8
Cedar Waxwing	<i>Bombycilla cedrorum</i>	B	Deciduous	-0.9

¹ A = long distance, B = short distance, R = resident.² Most likely location as defined by Ehrlich et al. (1988). Red-winged Blackbird nests in reeds, but was grouped with shrubs for purpose of this discussion.³ Listed from increasing to decreasing.

$n_{\text{before}} = 39$, $n_{\text{after}} = 33$, $n_{\text{common}} = 28$, and $J = 0.64$. Therefore, two-thirds of the 44 species were common to both sample periods. An additional 28 species visited the plot at least once during this study, but never established breeding territories.

The Mallard (scientific names given in Table 1), Spotted Sandpiper, and Tree Swallow had significantly more territories per year (1.9, 1.1, and 2.9 respectively) after construction than before construction. Installation of artificial nest boxes for Wood Duck contributed to the

increase of Tree Swallows. The control of noxious weeds amongst the increased growth of ground cover beyond the manicured lawn and within the wetlands may explain the increased number of Mallard territories. Flooding during the early years of this study would have discouraged Spotted Sandpipers from nesting during those years. More normal water levels during the latter years of this study provided nesting habitat for them.

The mean numbers of territories per year for the remaining 41 species of breeding birds

were not significantly different between the two sample periods. However, the mean number of territories per year for Downy Woodpecker (+0.5), Hairy Woodpecker (+0.5), Warbling Vireo (-0.6), American Robin (+1.8), Spotted Towhee (-0.6), and Brewer's Blackbird (-0.8) approached significance between the two sample periods ($P = 0.07-0.10$).

Partners-In-Flight (2005) identified 41 regionally important species for the BCR 10 - Northern Rocky Mountains. Of these 41 species, only Calliope Hummingbird (-0.8), Rufous Hummingbird (0.0), and Willow Flycatcher (+0.1) established breeding territories on Blackwell Island during the 11 years of this study (Table 1).

Additional differences in the number of breeding territories were revealed when birds were grouped by their migration strategy and nesting substrate. Eight species that nested mostly on the ground had significantly more territories after construction (Table 2). Twelve species that nested mostly in tree cavities approached a significant increase after construction ($P = 0.07$). Neither migrants nor residents experienced significant differences between the two sample periods (Table 3). Eleven resident species, however, approached a significant increase after construction ($P = 0.06$). The Downy Woodpecker, Hairy Woodpecker, Black-capped Chickadee, Mountain Chickadee, Red-breasted Nuthatch, Pygmy Nuthatch, and European Starling were resident species that nested in tree cavities on the study plot.

Regular dog-walkers and occasional bird-watchers were the primary users of Blackwell Island before construction. The BLM sold an average of 4556 individual and 121 seasonal parking passes (representing an estimated 23

131 visitors) per year, which was mostly from Memorial Day to Labor Day, after Blackwell Island opened to public use. Although the numbers of dog-walkers and birdwatchers were not measured, I assumed their numbers to be similar during both sample periods and much less than the number of people represented by parking passes.

DISCUSSION

Riparian-wetlands are transitional lands between aquatic and terrestrial habitats where the vegetation and/or soils reflect the water table at or near the surface, or where the land is covered by shallow water (Cowardin et al. 1979). Riparian habitats support higher population densities of birds than other forest habitats (Carothers 1977, Stevens et al. 1977, Stauffer and Best 1980).

For wildlife, riparian-wetlands provide food, water, shelter, and space within a small, common area. For people, these same areas provide flood-control, water for municipal and agricultural purposes, opportunities for water-based recreation, and cool shade to enjoy picnics and camping (Carothers 1977, Field et al. 1985). Construction of trails, picnic sites, and boat docks invites increased public use which may potentially conflict with wildlife (Thomas et al. 1979).

Recreation sites, particularly campgrounds, can affect breeding birds by decreasing their nesting habitat. Design, construction, and maintenance of these sites can remove ground, shrub, and tree cover that provide nesting substrates (Aitchison 1977, Blakesly and Reese 1988). Cavity nesters would be expected to decline after dead trees are removed. Stauffer and Best (1980) predicted the densities of 16

TABLE 2. CHANGES IN NUMBER OF TERRITORIES PER YEAR, BY NESTING SUBSTRATE, AFTER CONSTRUCTION ON BLACKWELL ISLAND, 1997-2007.

Nest Substrate	Total No. of Species	Gain/loss No. of Territories	<i>P</i> value
Deciduous trees	9	0	0.96
Shrubs	9	-1	0.67
Coniferous trees	6	-1	0.19
Tree cavity	12	4	0.07
Ground	8	3	0.02
Total	44	5	

TABLE 3. CHANGES IN NUMBER OF TERRITORIES PER YEAR, BY MIGRATION STRATEGY, AFTER CONSTRUCTION ON BLACKWELL ISLAND, 1997-2007.

Migration Strategy	Total No. of Species	Gain/loss No. of Territories	<i>P</i> value
Long Distance	15	-3	0.39
Short Distance	18	5	0.36
Resident	11	3	0.06
Totals	44	5	

species might decrease and six species would be eliminated, while 12 species might increase, if woody vegetation was reduced to narrow strips along the streams in Iowa. The present study identified 17 species that decreased and 20 species that increased (Table 1).

Human disturbances, including pet dogs, can interrupt territorial singing, alter nest defense, increase predation, and increase energetic demands when birds are flushed (Marzluff 1997, Rosenberg et al. 2004). The composition of bird communities would change as tolerant species replace less tolerant species. Predation and parasitism may increase as the species composition changes.

In this study, however, 25% alteration of habitat and 23 131 additional people visiting the study site per year did not greatly change the number of either breeding species or their territories. The only exceptions were Mallard, Spotted Sandpiper, Tree Swallow, and one group of eight ground-nesters which all experienced a significant increase of breeding territories. Moreover, 64% of the 44 breeding species encountered during this study were common to both sample periods.

In this study, Calliope Hummingbird experienced a decreasing trend, Rufous Hummingbird experienced a flat trend, and Willow Flycatcher experienced an increasing trend. The PIF's (2005) database reported a regional, breeding-season population trend of that is uncertain, highly variable, or unknown during the past 30 years for all three species. *Calliope and Rufous hummingbirds can expect future conditions for breeding populations to remain stable with no known threats. Willow Flycatcher, however, can expect slight to moderate decline in the future suitability of breeding conditions.*

Unlike the potential impacts reported by Aitchison (1977) and Blakesly and Reese (1988), many of the shrubs and mature trees remained standing in 75% of the habitat after construction was completed on Blackwell Island. Ground-nesters increased their number of breeding territories despite the conversion of 22% of habitat to asphalt and 3% to manicured lawn. Moreover, the wooden boardwalk and viewing decks minimized the potential for habitat alterations and human disturbances within the riparian-wetlands. This study demonstrated that careful planning and development of recreation facilities can alleviate potential impacts to local wildlife that inhabits the site.

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