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Response of Water Birds to Hazing with a Laser

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Abstract: The use of lasers to prevent oiling of waterbirds at a spill is a new concept. Little is known how some species that could occur at a spill would respond. The objectives of this study were to: 1) identify species that respond to the laser, 2) document the immediate response of waterbirds to the laser, 3) determine if laser treatment during the early evening reduces bird numbers over the course of a night, and 4) determine if the laser treatment has any lasting effect over the short term after treatment has ended. The study was conducted in 2 parts. In Part 1 we used 5 locations in the Sacramento Valley of California. We visited the sites at dusk from October 2007 - March 2008 and opportunistically used the laser on any birds encountered. At each test session we recorded ambient light levels and the species and number of birds. We fired the laser, then recorded the immediacy and type of responses, and the number of birds remaining. A response was considered favorable if the bird left the site. For Part 2 we used a 20 ha marsh in Woodland, Yolo County. The study, conducted in March 2008, was divided into 3 periods (pre-treatment, treatment, and post-treatment) of 5 days each. We counted birds in the morning and at dusk each day. During the treatment period, we counted the birds at dusk, used the laser, then counted any remaining birds. We recorded the same information as described above for the random tests. In part 1 we tested the laser on 18 evenings and fired the laser 129 times at 2000 birds consisting of 25 species. Overall 1212 (61%) birds responded favorably. High proportions of pelicans and cormorants (100%), herons and egrets (99%), geese (93%), and diving ducks (85%) responded favorably. No grebes, coots, shorebirds, gulls responded favorably. Only 10% of the dabbling ducks responded favorably to treatment. In Part 2 we fired the laser 74 times at 3036 birds consisting of 16 species. Overall 2251 (74%) birds responded favorably. High proportions of herons (98%) and dabbling ducks (93%) responded favorably, but only 46% of the diving ducks responded favorably. No coots responded favorably. There was a significant decrease in bird numbers immediately after laser treatment. Bird numbers recorded the next morning were not significantly different to the levels present just before the laser treatment the evening before. There was a significant decrease of 47% in the average number of birds on the treated area from the pretreatment period (_ = 873.7; SD = 151.8) to the treatment period (_ = 463.9, SD = 171.3). Thereafter, the number of birds during the 5-day post-treatment period (_ = 530.8, SD = 206.6) was not significantly different from that during the treatment period. Suggestions are provided on using the laser at a spill event.

Key Words: hazing, laser, oil spill, waterbirds

INTRODUCTION

The use of lasers to haze bids is a relatively new development. Most hazing efforts have been undertaken with the goal of reducing crop damage or resolving human health and safety issues. Formal tests to evaluate lasers have involved double-crested cormorants (*Phalacrocorax auritus*) on night roosts near aquaculture facilities (Glahn et al. 2000), common eiders (*Somateria mollissima*) and common goldeneyes (*Bucephala clangula*) on mussel farms in Scotland (Ross and Furness 2002), Canada geese (*Branta canadensis*) in captivity (Blackwell et al. 2002, Werner and Clark 2006), Canada geese on lakes or reservoirs near urban areas (Delph 2001, Holevinski et al. 2007, Sherman and Barras 2004) and gulls (*Larus* spp.) on reservoirs near airports (Baxter 2007) and at a landfill (Chipman et al. 2004).

The use of lasers to prevent or limit oiling of birds at an oil spill is a new concept that has not been evaluated. The species mentioned above could occur at an oil spill. However, little is known how other species (e.g., coots, grebes, herons, dabbling ducks, diving ducks) that could potentially occur at a spill would respond to hazing with a laser. The laser could represent an important new tool for hazing birds at spills, particularly a tool for use at night or low-light situations. Currently there are few options for night-time hazing.

The objectives of this study were to: 1) identify the species of waterbirds that respond to laser light, 2) document the immediate response of waterbirds to laser light, 3) determine if laser treatment during the early evening reduces bird numbers over the course of a night (as evidenced by birds present the next morning), and 4) determine if the laser treatment has any lasting effect on waterbirds over the short term (5 days) after treatment has ended.

STUDY AREAS AND METHODS

Part 1

For objectives 1 and 2, we conducted random tests at 5 different locations in the Sacramento Valley region of California (Table 1). These locations were known to be used by birds and were situated relative to nearby structures or human activities such that the laser could be safely used.

We visited the sites at dusk on different evenings during the period from late October 2007 through mid-March 2008 and opportunistically used the laser on any birds encountered. At the start and end of each evening's treatment sessions (exposure to laser light) we used a light meter to measure the ambient light levels (taken and then averaged from the cardinal directions). We recorded the species and number present, fired the laser at the birds, then recorded the number remaining. We tested the laser around dusk but not under darkness. After using the laser the available light had to be sufficient for us to see and count any remaining birds. Each test firing of the laser at a bird or group of birds was termed a session.

We used an Avian Dissuader, a Class 3B 50 mW helium-neon laser, on the birds. The laser treatment was standardized in such a manner as to improve accuracy. The laser was first fired at the ground in front of the operator, lined up with the target, and then steadily raised towards the target. This procedure allowed the operator to easily follow the red laser dot as it moved towards the target. The laser dot was steadily brought to bear on the target, then when on the target, if necessary, the laser was moved rapidly back and forth, around and onto the target. The target was considered nonresponsive if there was no favorable response after 2 or 3 exposures of 10 seconds each.

The immediacy of birds' responses was recorded as: none, immediate or delayed (e.g., it took a few seconds or more before the birds responded). The type of response was recorded as none, took flight, swam away, flapped away over the water, ran away, walked away, alert only, dived. If the bird flew, then the flight response was further classified as flew away out of sight, landed nearby (e.g., on the same pool), or landed on an adjacent site. A response was considered favorable if the bird left the site by any means (e.g., flying, running, swimming).

Part 2

For objectives 3 and 4 we selected a study site in Woodland, Yolo County, along County Road 25 (Rd 25). The site was a man-made marsh of about 20 ha. The marsh, which extended for 0.8 km alongside Rd 25, consisted of stands of cattails and bulrush interspersed with pools of open water. We divided the marsh into 4 distinct count areas based on the pools of open water which were separated and delineated by the emergent vegetation. One area was selected at random to be an untreated site. The remaining 3 areas received the laser treatment. Due to their proximity to one another, we did not consider the treated areas to be distinct plots or independent of one another, thus we pooled the count data for subsequent analysis and considered that data to represent a total count for the treated portion of the marsh. Due to its' proximity to the treated area, the untreated portion of the marsh did not represent an independent control site, but rather served as a example of how bird numbers in an untreated portion of a laser-treated marsh might change. There were no other sites nearby with similar habitat conditions or species composition to serve as an independent control plot.

The study, conducted in March 2008, was divided into 3 time periods of 5 days each: pre-treatment, treatment, and post-treatment. We counted birds twice a day, once in the early morning and then again at dusk. Counts for each pool were done from a vehicle parked at a fixed point on the side of Rd 25. During the treatment period, we counted the birds on the control area first, then moved to the first pool to be treated. We would count the birds, use the laser, then count any remaining birds. The process would then be repeated for the remaining 2 pools to be treated. We recorded the same information (e.g., ambient light levels, response to laser treatment) as described above for the random tests.

We applied the laser treatment at the Rd 25 marsh in a standardized manner which differed somewhat from the technique used in the random tests. We fired the laser from a vehicle while parked at a fixed location next to each treated pool. We slowly made up and down movements of the laser around or on the target birds while generally sweeping horizontally across the area either from left to right. Individual birds or groups of birds encountered during the sweep received up to 6 to 8 sec of targeting if they did not react immediately. At the end of the 1st sweep, if any birds remained, a 2nd and if necessary, a 3rd sweep were made across the area. We considered birds nonresponsive if they remained after 3 sweeps.

RESULTS

Part 1

We tested the laser at 5 locations on 18 evenings (Table 2). We fired the laser 129 times at 2000 birds consisting of 25 species (Table 3). Overall 1212 (61%) of 2000 birds responded favorably by leaving the area. High proportions of pelicans and cormorants (100%), herons and egrets (99%), geese (93%), and diving ducks (85%) responded favorably. Grebes, coots, shorebirds, and gulls did not respond favorably to laser treatment. Only 10% of the dabbling ducks responded favorably to treatment. Out of 129 sessions, all birds either left the area on 75 occasions (58%) or did not on 51 occasions (40%). A partial response, where some birds stayed and others left occurred only during 3 sessions (Table 4).

We tested the laser in light conditions that ranged from 0.1 to 1154.2 lux. (For the purpose of comparison, a light level of 0.1 lux is equivalent to a full moon, 10.8 would be twilight, 107.5 lux would be a very dark day, and 1,075.3 lux would be an overcast day.) The average light level during the tests was 209.6 lux (n = 122, SE = 22.8). There was no relationship between light levels and the outcome of the laser treatment (χ^2=0.005, df = 1, P = 0.94). Most favorable and unfavorable outcomes occurred when light levels were <300 lux (Table 5).

Part 2

During the 5 evenings of treatment we fired the laser 74 times at 3036 birds consisting of 16 species (Table 6). Overall 2251 (74%) of 3036 birds responded favorably by leaving the area. High proportions of herons (98%) and dabbling ducks (93%) responded favorably. Coots did not respond favorably to laser treatment. Only 46% of the diving ducks responded favorably to treatment. Out of 74 sessions, all birds either left the area on 27 occasions (36%) or did not on 31 occasions (42%). A partial response, where some birds stayed and others left occurred during 16 sessions (Table 7).

The average light level at the start of the evening tests was 783.0 lux (n = 5, SE = 102.75), with a range from 533.8 to 1154.2 lux. The average light level at the end of the evening tests was 18.2 lux (n = 5, SE = 1.7) with a range from 13.5 to 23.2 lux. There was no difference in the average lux level at the start of laser treatment for each day (F = 1.8; df = 4, 15; P = 0.18) nor at the end of laser treatment (F = 0.33; df = 4, 15; P = 0.86).

Regarding objective 3, we found there was a significant decrease (F = 7.83; df = 2, 12; P = 0.007) in bird numbers immediately after the laser treatment (Table 8). However, bird numbers recorded the next morning were not significantly different to the levels present just before the laser treatment the evening before.

Regarding objective 4, we found there was a significant decrease of 47% (*F* = 15.25; *df* = 2, 27; *P* = 0.00004) in the average number of birds on the treated area from the pretreatment period (_ = 873.7; SD = 151.8) to the treatment period (_ = 463.9, SD = 171.3). Thereafter, the average number of birds during the 5-day post-treatment period (_ = 530.8, SD = 206.6) was not significantly different from that during the treatment period (Figure 1). We observed a similar pattern of change on the untreated portion of the marsh with pretreatment > treatment = post-treatment numbers (Kruskal-Wallis test, χ^2 = 9.4, *df* = 2, *P* = 0.009, Figure 1). Average bird numbers on the untreated portion of the marsh decreased by 67% from the pretreatment to treatment period.

Individual species reacted differently to the laser treatment. Most black-crowned night herons (98%) responded favorably to the laser treatment (Table 6) by taking flight immediately. However, the same number were present the next day. There was no significant change in heron numbers over the 3 time periods of the study (Table 9). There also was no change in the numbers of canvasback over the 3 time periods (Table 9). Canvasback were not as predictable in their response to laser treatment as were the herons. Out of 8 sessions during the treatment period (Table 10), all canvasbacks either left the area on 2 occasions (25%) or did not on 3 occasions (38%). A partial response, where some canvasbacks stayed and others left occurred during 3 sessions. The numbers of 2 species of diving ducks, the lesser scaup and the ring-necked duck, declined significantly during the treatment period and remained low during the post-treatment period as well (Table 9). Like the canvasback, the response of the scaup and ring-necked duck was not always predictable. Out of 20 sessions during the treatment period, all scaup or ring-necked ducks either left the area on 8 occasions (40%) or did not on 5 occasions (25%). A partial response, where some scaup and ring-necked ducks stayed and others left occurred during 7 sessions (Table 10). There was no change in the number of ruddy ducks over the course of the study (Table 9). On no occasion did all targeted ruddy ducks respond favorably to the laser (Table 10). On the majority of sessions (82%) ruddy ducks did not respond at all to the laser.

DISCUSSION

All of the species targeted in this study could potentially occur at an oil spill. In responding to a spill, personnel responsible for hazing birds must decide which tools to use, a decision in large part based on efficacy. It is apparent that some species, namely herons, egrets, and geese react immediately and dependably to the laser. Dabbling and diving ducks responded favorably on most occasions, although there were some times when they did not or only partially responded. In Part 1, only 10% of dabbling ducks responded favorably as opposed to 93% in Part 2 of the study. Most of the dabbling ducks in Part 1 were mallards targeted on an impoundment in an arboretum. The area was frequented by people during the day and early evening. We can speculate that mallards at this site were habituated to human presence and other disturbances and may have been less likely to respond favorably to the laser. Road 25, used for Part 2 of the study, was remote, had infrequent human presence, and was 1.6 km distant from the Yolo Bypass, a waterfowl hunting area. These factors may have predisposed the birds to react to disturbance and may have enhanced the response to the laser.

Some birds were problematic. Ruddy ducks usually did not respond favorably. Coots never responded favorably. Pied-billed grebes responded to the laser by diving or skittering across the water, but never to the extent that they left the area. It is likely that all grebes and other birds (e.g., loons) that typically dive rather than fly away in response to danger are poor candidates for hazing with a laser. Gulls, targeted on 2 occasions, did not respond favorably. This result was unexpected. Baxter (2007) dispersed over 30,000 gulls roosting on 2 reservoirs in the United

Kingdom using a laser. Only 4 sweeps of the laser across water were needed to move all gulls from each site. In this study gulls on both occasions were on land. In one instance the birds did not respond at all. In the 2nd instance the gulls responded to the laser by either jumping or flying up briefly and then landing again. None left the area.

As a stand-alone tool used just once in the evening, the laser caused and immediate decrease in bird numbers, but did not deter birds from returning by the next morning, and aside from scaup and ring-necked ducks, did not have any lasting impact once treatment ended. A notable example was the night herons. Herons left the roost in the marsh immediately upon treatment but were present in the same numbers the next morning. Baxter (2007) found a similar situation at gull roosts. His initial treatment was to use the laser at dusk and clear the birds. The gulls were present by the next morning. Adding 2 additional sweeps with the laser equidistant through the night also failed to prevent the gulls being present the next morning. Gulls stopped returning to the roost only after laser treatment was increased to every 30 minutes throughout the night.

At an oil spill where nighttime hazing was required, laser treatment could begin at dusk or earlier under conditions of heavy overcast or fog. The laser could be used repeatedly as needed to clear birds from the desired locations. Monitoring for returning birds would be necessary and hazing with the laser might be required throughout the night. Other hazing techniques (e.g., pyrotechnics, roving patrols from a boat) could be used for species not responding to the laser.

Lasers have several advantages that may be important at an oil spill. Lasers are light in weight, easy to carry, and have long range, up to 2.2 km or more depending on conditions. The portability and long range of a laser allow hazing personnel to efficiently and effectively treat a large area. In comparison, a propane cannon unit (which includes a propane tank) is less portable, has a smaller effective range, and is more difficult to deploy. Lasers can be used at night. Lasers are silent and can be used at locations where noise, particularly at night, is a concern. Lasers can be used in situations were flammable spill materials might prevent the use of pyrotechnics.

We did not test the laser at any coastal or bay locations. Additional testing should be undertaken at brackish or salt-water locations to increase the number of species evaluated. In particular we need more information on how cormorants, gulls, terns, shorebirds, loons, and marine ducks will respond to laser treatment.

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Table 1. Locations of sites used to test species responses to laser treatment in Part 1 of the study.

Table 2. Number of test days, sessions (number of times the laser was fired at target birds), and the number of birds targeted at 5 locations during Part 1 of the study.

Table 3. Bird groups, number of species in each group, sessions (number of times the laser was fired at target birds), birds targeted and responding favorably to laser treatment in Part 1of the study.

Table 4. Number of sessions in which none of the birds responded favorably, some of the birds but not all responded favorably, or all of the birds responded favorably in Part 1 of the study.

Table 5. Number of sessions with favorable or unfavorable responses under differing light levels during Part 1 of the study.

Table 6. Bird groups, number of species in each group, sessions (number of times the laser was fired at target birds), birds targeted and responding favorably to laser treatment in Part 2 of the study.

Table 7. Number of sessions in which none of the birds responded favorably, some of the birds but not all responded favorably, or all of the birds responded favorably in Part 2 of the study.

Table 8. Number of birds present just before laser treatment in the evening, immediately after laser treatment, and the next morning after treatment during Part 2 of the study.

Figure 1. Average number of birds per day (2 counts per day) over the pretreatment, treatment and post-treatment periods (5 days each) on the untreated and treated areas during Part 2 of the study.

Table 9. Average number of birds per count for 5 species over the pretreatment, treatment and post-treatment periods (5 days each) on the untreated and treated areas during Part 2 of the study.

Table 10. Number of sessions when a given percentage of birds responded favorably to laser treatment during Part 2 of the study.

Table 1. Locations of sites used to test species responses to laser treatment in Part 1 of the study.

Location	Nearest town	County	Description
Collins Lake	Oregon House	Yuba	650 ha lake
Lake Solano	Winters	Yolo and Solano	1 km stretch of Putah Creek near diversion dam, ~ 4 ha surface area.
Road 25	Woodland	Yolo	Irrigation ditch and impoundment alongside a road, ~2.7 km, 5.3 ha surface area.
Putah Creek	Davis	Yolo	Impoundment in an arboretum, 0.6 ha
Linden Road	West Sacramento	Yolo	Irrigation and flood water basin, 1.5 ha

Table 2. Number of test days, sessions (number of times the laser was fired at target birds), and the number of birds targeted at 5 locations during Part 1 of the study.

Location	Test days	Sessions	Number targeted
Collins Lake	3	8	130
Lake Solano	3	31	170
Road 25	9	66	1357
Putah Creek	2	21	338
Linden Road	1	3	5
Total	18	129	2000

Table 3. Bird groups, number of species in each group, sessions (number of times the laser was fired at target birds), birds targeted and responding favorably to laser treatment in Part 1of the study.

Group[a]	Species	Sessions	No. targeted	No. responding (%)
Grebes	1	5	6	0 (0%)
Pelicaniformes	2	2	16	16 (100%)
Herons, egrets	4	21	208	206 (99%)
Geese	2	17	412	385 (93%)
Dabbling ducks	3	28	372	38 (10%)
Diving ducks	8	40	665	566 (85%)
Raptors	2	3	3	1 (33%)
Coots	1	10	37	0 (0%)
Shorebirds	1	1	1	0 (0%)
Gulls	1	2	280	0 (0%)
Total	25	129	2000	1212 (61%)

[a] Group: grebes - pied-billed grebe (*Podilymbus podiceps*); Pelicaniformes - American white pelican (*Pelecanus erythrorhynchos*), double-crested cormorant (*Phalacrocorax auritus*); herons and egrets - great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), cattle egret (*Bubulcus ibis*); geese - Canada goose (*Branta canadensis*), greater white-fronted goose (*Anser albifrons*); dabbling ducks - mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), cinnamon teal (*Anas cyanoptera*); diving ducks - canvasback (*Aythya valisineria*), ring-necked duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), common goldeneye (*Bucephala clangula*), bufflehead (*Bucephala islandica*), hooded merganser (*Lophodytes cucullatus*), common merganser (*Mergus merganser*), ruddy duck (*Oxyura jamaicensis*); raptors - red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*); coots - American coot (*Fulica americana*), shorebirds - greater yellowlegs (*Tringa melanoleuca*); gulls - ring-billed gull (*Larus delawarensis*).

Table 4. Number of sessions in which none of the birds responded favorably, some of the birds but not all responded favorably, or all of the birds responded favorably in Part 1 of the study.

Group[a]	Number of sessions		
	None responded	Some responded	All responded
Grebes	5	0	0
Pelicaniformes	0	0	2
Herons, egrets	1	0	20
Geese	0	1	16
Dabbling ducks	22	0	6
Diving ducks	8	2	30
Raptors	2	0	1
Coots	10	0	0
Shorebirds	1	0	0
Gulls	2	0	0
Total:	51	3	75

[a] See Table 3 for the species in each group.

Table 5. Number of sessions with favorable or unfavorable responses under differing light levels during Part 1 of the study.

Response	Lux	
	$\leq$300	$\geq$301
Favorable	50	15
Unfavorable	42	13

Table 6. Bird groups, number of species in each group, sessions (number of times the laser was fired at target birds), birds targeted and responding favorably to laser treatment in Part 2 of the study.

Group[a]	Species	Sessions	No. targeted	No. responding (%)
Herons	1	6	1501	1470 (98%)
Dabbling ducks	7	14	208	194 (93%)
Diving ducks	7	46	1278	587 (46%)
Coots	1	8	49	0 (0%)
Total	16	74	3036	2251 (74%)

[a] Group: herons - black-crowned night heron (*Nycticorax nycticorax*); dabbling ducks - mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), American wigeon (*Anas americana*), northern shoveler (*Anas clypeata*), cinnamon teal (*Anas cyanoptera*), green-winged teal (*Anas crecca*); diving ducks - canvasback (*Aythya valisineria*), ring-necked duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), bufflehead (*Bucephala islandica*), hooded merganser (*Lophodytes cucullatus*), common merganser (*Mergus merganser*), ruddy duck (*Oxyura jamaicensis*); coots - American coot (*Fulica americana*).

Table 7. Number of sessions in which none of the birds responded favorably, some of the birds but not all responded favorably, or all of the birds responded favorably in Part 2 of the study.

Group[a]	Number of sessions		
	None responded	Some responded	All responded
Herons	1	3	2
Dabbling ducks	1	0	13
Diving ducks	21	13	12
Coots	8	0	0
Total:	31	16	27

[a] See Table 6 for the species in each group.

Table 8. Number of birds present just before laser treatment in the evening, immediately after laser treatment, and the next morning after treatment during Part 2 of the study.

	Number of birds		
Date	Present before laser use	Present immediately after laser use	Present next morning after laser use
10 March 08	767	54	677
11 March 08	759	423	476
12 March 08	624	104	393
13 March 08	368	11	178
14 March 08	377	38	352
_ ± SD	579.0 ± 196.9	126.0 ± 169.4	415.2 ± 182.3

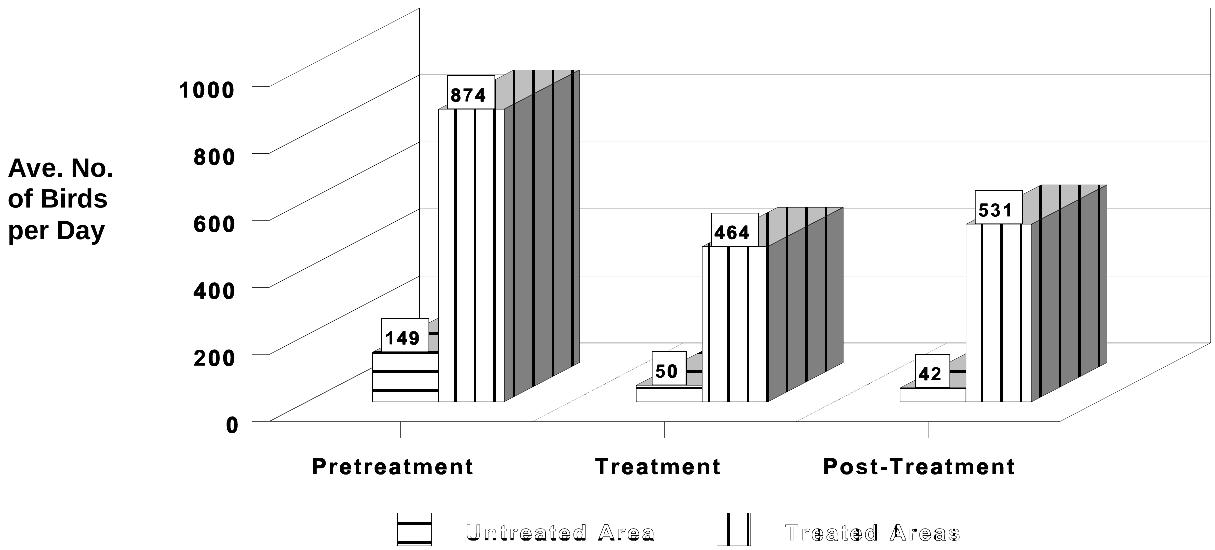

Figure 1. Average number of birds per day (2 counts per day) over the pretreatment, treatment and post-treatment periods (5 days each) on the untreated and treated areas during Part 2 of the study.

Table 9 Average number of birds per count for 5 species over the pretreatment, treatment and post-treatment periods (5 days each) on the untreated and treated areas during Part 2 of the study.

	Average number of birds ± SD			
Species	Pretreatment	Treatment	Post-treatment	Significant difference
Black-crowned night heron	262 ± 43	239 ± 88	222 ± 32	No[a]
Canvasback	144 ± 18	94 ± 79	89 ± 38	No[b]
Ring-necked duck	209 ± 52	41 ± 60	11 ± 6	Yes[c]
Lesser scaup	308 ± 116	32 ± 40	5 ± 4	Yes[d]
Ruddy duck	40 ± 21	55 ± 7	55 ± 19	No[e]

[a] Kruskal-Wallis test, $\chi^2 = 3.8$, $df = 2$, $P = 0.15$

[b] $F = 2.6$; $df = 2, 27$; $P = 0.09$

[c] Kruskal-Wallis test, $\chi^2 = 18.1$, $df = 2$, $P = 0.0001$; pretreatment > treatment = post-treatment

[d] Kruskal-Wallis test, $\chi^2 = 21.7$, $df = 2$, $P = 0.00002$; pretreatment > treatment = post-treatment

[e] $F = 1.8$; $df = 2, 27$; $P = 0.19$

Table 10. Number of sessions when a given percentage of birds responded favorably to laser treatment during Part 2 of the study.

Species	0%	1 - 49%	50 - 99%	100%
Black-crowned night heron	1	0	3	2
American wigeon	0	0	0	1
Cinnamon teal	0	0	0	1
Gadwall	0	0	0	1
Green-winged teal	0	0	0	1
Mallard	1	0	0	6
Northern shoveler	0	0	0	3
Bufflehead	3	1	0	1
Canvasback	3	2	1	2
Common merganser	1	0	0	0
Hooded merganser	0	0	0	1
Ring-necked duck	2	2	2	3
Ruddy duck	9	0	2	0
Lesser scaup	3	2	1	5
American coot	8	0	0	0