FRANKLIN'S GULL (LARUS PIPIXCAN) BREEDING COLONIES AND ASSOCIATED HABITATS IN MINNESOTA, 1984

Progress report
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Nongame Wildlife Program
Minnesota Department of Natural Resources

by

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Excellent Discussion !!!
Some questions re: Results

Thinks that Lake Ossabis may have a colony again in the future; but everything seems against them - humans

What are summering birds doing? What are these birds doing with their time?

Would like to see Banding study at Agassiz → long-term monitoring study.

INTRODUCTION

Franklin's gulls nest in scattered colonies, over water in the emergent vegetation of large, semipermanent marshes. Their breeding range encompasses much of the prairie pothole region of central North America from southeastern Alberta to central and southern Manitoba, south through western Minnesota and west through northeastern South Dakota to northern Utah (Bent 1921). Franklin's gulls are the only gulls known to nest exclusively in marshes (Burger 1974).

Few studies exist on the breeding ecology of Franklin's Gulls. Two of the more important works were performed in Minnesota. Roberts (1900) reported on his observations of a breeding colony at Heron Lake (Jackson County), and Burger (1974) studied the bird's adaptation to marsh habitats at Agassiz National Wildlife Refuge.

Roberts (1932:549) listed Franklin's Gull as an abundant summer resident, breeding throughout western Minnesota. However, he warned that wetland drainage would have a serious impact on the bird's status in this state. Forty-three years later, Green and Janssen (1975:100) reported the bird as a common migrant, but breeding colonies had been noted from only two locations since the mid-1960's. In 1981, the gull was classified as rare by the Minnesota Natural Heritage Program (Pfannmuller and Wells 1981). Currently, breeding populations of Franklin's Gulls in Minnesota appear to be stable, largely due to the continued success of a

large colony at Agassiz National Wildlife Refuge (NWR). The bird's relatively narrow habitat tolerance should make it a species of special concern, despite locally abundant populations (Niemi 1982). The objectives of this study are to identify the active Franklin's Gull colonies in Minnesota in 1984; assess nest densities within these colonies; and quantify habitat characteristics of colony locations and nest sites.

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METHODS

Colony Location

A search for active colonies (as indicated by groups of adult gulls field feeding or concentrated near wetland habitats) was conducted in June. Search efforts were concentrated in the vicinity of former colony locations, primarily, in Kandiyohi, Stearns, Pope and Todd Counties. Search efforts were supplemented by contacting ornithology groups and personnel of the Minnesota

likes doing a post nesting success inventory → if no one is sitting on nest, nest material is stolen by others → so # nests left = reproductive success.

Just thought 5 plots would be enough → but there was too much variability so she went with 10 on July.

Department of Natural Resources located in potential Franklin's gull breeding range and requesting information about possible colony sites.

Nest Density and Habitat Measurements

nests always have a handful of pebbles in the nest - why

Nest densities and emergent cover were measured using 100 m^2 (11.2 m diameter) circular plots. Plots were located within the colony using random angles (three digit number less than 360) and distances (2 digit number greater than 49). A base point was chosen by canoeing to a point well within the colony, choosing a random angle (Hays, et. al. 1981) and proceeding in that direction until a nest was intercepted. This nest became the base from which the first plot was selected. Each plot became a new base point.

a different sampling periods

Nest density and emergent cover were measured in mid-June using five plots. The number of nests, water depth, nest concealment, and a releve' was recorded in each plot. Nest concealment was determined using a modified robel technique (Robel et. al. 1970), where the height above the water line to which vegetation concealed 100 percent of a robel pole (height-density) was measured from a distance of 2 meters for the four cardinal points around nests within the plot. A modified releve' technique (Mueller-Dombois and Ellenburg 1974:45-63) was used to quantify emergent cover at each sample plot. Cover classes are from Baily and Poulton (1968). Ten additional releve's and nest density plots were measured in mid-July following the brood-rearing period.

5 random plots in June → with nests

10 random plots in July → decision in July that she would rather have a larger sample

why sample nest density 2x?

1. felt she was too early in June; wanted birds to be on nest longer
2. had to pick a point somehow → canoed into center of colony; chose random angle → see methods

Statistical Analysis

A Kruskal-Wallis k-sample test (Steel and Torrie 1980:544-545) with a significance level of 0.06 was used to test the null

Semi-open marsh → right after ice-thawing or when lake is opening

edge is a preferred habitat overall for the birds but you take your chances birds not now using cattail at Agassiz - only open sedge

if sedge + cattail too dense the birds wouldn't select it.

hypothesis that median nest densities are equal at all sites and dates. The Wilcoxson-Mann-Whitney two-sample test (Steel and Torrie 1980:542-543) with a significance level of 0.01 was used for two-way comparisons of the median number of nests per plot between sample dates and areas.

RESULTS

Since 1974, Franklin's Gull colonies have been observed in Marshall, Todd, Jackson (Minnesota Natural Heritage Program Colonial Bird (MNHPCB) files) and Lac qui Parle counties (Eckert 1978). Two colonies were active in 1984. An estimated 2,000 pairs nested in the emergent fringe at Heron Lake and about 17,000 pairs nested in Agassiz Pool at Agassiz NWR (Marshall county). Franklin's Gulls did not nest at Lake Osakis in Todd County (pers. obs.) and, apparently, the gulls did not nest at Marsh Lake in Lac qui Parle Wildlife Management Area (J. Schladweiler pers. comm.).

Agassiz Pool and Heron Lake represent large, remnant, semipermanent wetlands with extensive stands of semi-open emergent vegetation. Both areas offer the gulls a high degree of isolation from direct human disturbance, and both lakes are moderately to severly impacted by wetland drainage within the watershed. Row crops, primarily corn (*Zea mays*) and soybeans (*Glycine max*), are the dominant cover type on the land surrounding Heron Lake, while small grains are the dominant crops on lands outside the boundaries of state and federal wildlife areas in Marshall County. Frequent tillage of black fallowed cropland provides a ready source of invertebrate food resources for the Agassiz colony

during the breeding season.

Nest Density

Franklin's gulls nested in two colonies in North Heron Lake. One colony was located along Division Creek in the southern portion of the lake, while a second group of birds nested along a channel through the emergent fringe in the north section of the lake. Field work was confined to the southern colony.

The Heron Lake colony was visited on 6 June by J. Schladweiler, D. Wells and myself. Water marks on the emergent vegetation indicated that lake levels had dropped about 75 cm since the birds had initiated nest building. By early June most nests were located over exposed substrate. No nest density measurements were taken at this time.

The colony was revisited on 21 June after several severe thunderstorms had swept southern Minnesota. Water levels in the colony had risen approximately 150 cm in the two week interval between visits. The colony was more restricted than it had appeared on 6 June with most nests concentrated near Division Creek and around the edges of openings in the emergent vegetation.

Field sampling was hampered by high water and rain, and a random sample of plots in the colony was impractical. Field methods were modified to subsample only nest sites (i.e. there were no zero plots), and sampling was stratified to sample nests along habitat edges.

The median number of nests per plot in the edge habitats was 4 (Range = 1 to 8, n = 5). The average water depth at nest sites was 111 cm. Cover height-density measurements were meaningless for the Heron Lake nest sites, since the flood waters had nearly

over-topped the emergent vegetation. Eighty percent of the nests sampled had completed incubation. Chicks observed ranged up to about 10 days old, indicating that most nests were initiated between the first and third week of May.

Ten additional habitat and nest density samples were taken at random locations within the interior of the colony on 18 July. The median nest density was 0 (Range = 0 to 1, n = 10). Flood waters had subsided and the average water depth in the emergent habitat was about 45 cm. Most of the gulls had abandoned the colony and fewer than 200 gulls, mostly flying immatures, remained.

The density estimates for the edge habitats may be biased upward by the method of plot selection and sample date. However, observations of nest location on both sampling dates suggest that the nest densities obtained reflect the stratified nature of nest site location, rather than a reduction of nest density caused by abandonment or a severe bias resulting from the lack of zero plots.

For the third consecutive year, a large colony of Franklin's Gulls nested in the mixed emergent habitat of Agassiz Pool at Agassiz NWR. The colony was located in approximately the same area as in 1983, and the population appeared to be stable (J. Mattsson pers. comm.). Nest densities and cover were sampled with five and ten, 100 m^2 plots on 23 June and 20 July, respectively.

In June, the median number of nests per 100 m^2 was 2 (range = 1 to 4, n = 5). The average water depth was 95 cm. The mean height-density reading was 1.56 cm (s = 6.45 cm, n = 48). The

cover provided little visual screening for nesting birds. Incubation was completed in 83 percent of the nests sampled (10 of 12). Chicks observed were all less than 7 days old.

Ten additional plots were sampled on 20 July. The median number of nests per plot was 1 (range = 0 to 4). Average height-density was 1.21 cm (s = 4.0, n = 56). Water depth had decreased an average 29 cm during the brood rearing period.

A Kruskal-Wallis k-sample test of the median number of nests per plot, using samples from each date as separate populations, indicates that some inequality exists ($H = 14.3$, $p < 0.005$). The results of two-sample comparisons (Wilcoxson-Mann-Whitney two-sample test) of median nest densities are shown in table 1. Nest

Table 1. Median nest density per 100 M^2 and T' values for two way comparisions using the Wilcoxson-Mann-Whitney two-sample test (Steel and Torrie 1980:542). Values are for Heron Lake "edge" habitat (at hatch (HLA)), Heron Lake "interior" habitat (at abandonment (HLB)), and Agassiz Pool "interior" habitat samples (at hatch (APA) and at abandonment (APB)).

	HLA	HLB	APA	APB
HLA (n=5)	M=4	16* p<0.01	25 p>0.05	26 p>0.05
HLB (n=10)		M=0	16* p<0.01	78.5 p>0.05
APA (n=5)			M=2	29 p>0.05
APB (n=10)				M=1

density for the "edge" nests at Heron Lake was significantly greater than the nest density in the interior of the emergent habitat, but not significantly different from the Agassiz samples. At Agassiz, nest density measured in July was less than that sampled in June, but the decline during the brood rearing period was not significant.

Vegetation

Typha glauca (cattail) and Phragmites communis (common reed)

were the only emergents recorded in the releve's at Heron Lake. Common and scientific names of plants are from Scott and Wasser (1980). Cattail occurred in all fifteen plots, while Phragmites was recorded in eight of the fifteen plots. Within the colony, Phragmites was most abundant along Division Creek with occasional small clones distributed throughout the cattail stand. No nests were recorded in plots which did not show some component of Phragmites (table 2). In fact, only one plot

Table 2. Frequency of each cover class* for the emergent vegetation recorded in 15, 100 M2 releve's and the number of nests per plot.

Species	Typha						Phragmites					
Cover Class	0	1	2	3	4	5	0	1	2	3	4	5
Number of Nests												
0	0	0	1	5	2	1	7	0	2	0	0	0
1	0	1	0	2	0	0	0	0	2	1	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	2	0	0	0	0	1	1	0	0
8	0	0	0	0	1	0	0	0	0	0	1	0

was only on edge; when they initiate nests these stems are flattened mat; cattail doesn't form floating mats

* percent cover in each cover class
0 - did not occur
1 - 0 - 1 percent
2 - 1 - 5 percent
3 - 5 -25 percent
4 -25 -50 percent
5 -50 -75 percent
6 -75 -95 percent
7 -95-100 percent

containing Phragmites did not have at least one nest.

The flood had a devastating impact on the cattail at Heron Lake. Most of the stand at the colony site was left flattened by receding water levels. Phragmites remained erect and appeared to offer some protection for cattail in mixed stands. By the end of the brood rearing period, most of the emergent vegetation left

standing was concentrated along Division Creek. Therefore, the majority of nests were located in the emergent habitat which was able to withstand the heavy inundation of water in June.

The mixed emergent marsh of Agassiz Pool exhibits a much greater species richness than that of Heron Lake. Nine species of emergents were recorded in the 15 releve's within the gull colony at Agassiz (table 3). Sedges (Carex lacustris and Carex

Table 3. Frequency of each cover class for emergent vegetation occurring in more than 50 percent of the releve's at Agassiz Pool and number of nests per 100 M2 of emergent habitat within the colony (n=15).

Species*	T.G.					P.C.				Carex				S.A.		Salix	
Cover Class**	0	1	2	3	4	0	1	2	3	0	1	2	3	0	1	0	1
Number of Nests																	
0	1	1	0	2	0	3	1	0	0	0	0	0	4	1	3	4	0
1	0	1	2	1	0	1	2	0	1	0	0	3	1	1	3	2	2
2	0	1	1	0	0	0	0	2	0	0	0	2	0	0	2	0	2
3	0	1	0	0	1	0	1	0	1	0	0	1	1	0	2	0	2
4	1	2	0	0	0	0	2	1	0	0	0	1	2	0	3	1	2

* Species abbreviations
T.G. = Typha glauca
P.C. = Phragmites communis
Carex = C. lacustris and C. atherodes
S.A. = Scirpus acutus
Salix = Salix spp.

**See table 2 for definition of cover classes.

atherodes) were recorded in 100 percent of the releve's. Typha glauca and Scirpus acutus (hardstem bulrush) were recorded in 87 percent of the plots followed by Phragmites communis with a frequency of 73 percent.

The emergent marsh utilized by the gulls in Agassiz Pool is semi-open, continuous and varied. Observations of nest location suggest that the "edge effect" in nest density seen at Heron Lake

Jennie - said she could expand on nest site selection in relation to habitat type + density - What more would she add?

was practically non-existent at Agassiz, but there does appear to be a tendency for birds to prefer more open nest sites (table 3).

DISCUSSION

Colony Site Selection

Heron Lake and Agassiz NWR each have a long history of use by Franklin's gull colonies. Records of colonies at Heron Lake date back over 100 years (Roberts 1900). The lake and associated wetlands were home to a colony of gulls from prior to European settlement through the first half of this century. Apparently, breeding colonies were absent from Heron Lake from 1949 to 1983, when after nearly four decades of absence, the birds were again observed nesting at Heron Lake (L. Pfannmuller pers. comm.)

In contrast, I was unable to document Franklin's gull breeding colonies at what is now Agassiz NWR prior to the area's being drained in 1911 (Hunt and Magnus 1954). The birds quickly colonized the area following the restoration of wetland habitats with the creation of Mud Lake (Agassiz) National Wildlife Refuge in 1937. A colony has occupied eastern Marshall County since 1939 (Burger 1974; MNHPCB files).

Two factors appear to influence the occupation of suitable breeding habitat by gulls and terns, site tenacity and the presence of larids. Gulls and terns exhibit strong tenacity toward breeding sites (Bongiorno 1970; Southern 1977; Erwin et. al. 1981). Franklin's gulls are known to show less tenacity toward specific colony sites than other gulls. However, upon arrival, Franklin's gulls will return to the location of the

previous years colony to display, even if that site is subsequently abandoned. This behaviour may facilitate formation of social bonds among breeders (Burger 1974). The gulls have exhibited strong tenacity for the wetland complex at Agassiz NWR. The colony has abandoned the refuge only four times in four decades, generally, in response to drought. On these occasions the colony relocates to Thief Lake approximately 20 km north of Agassiz NWR and, alternatively, Thief Lake is readily abandoned in favor of Agassiz when suitable nesting conditions return. Roberts (1932:552) reported similar observations for Franklin's gulls at Heron Lake and satellite marshes.

McNicholl (1975) reviewed larid site tenacity in relation to habitat stability. Marsh dwelling larids do not exhibit strong nest site tenacity, but do show colony site tenacity. He postulates that these larids have strong group adherence allowing colonies to quickly relocate to more suitable sites when former colony locations become unsuitable.

The presence of larids seems to be an important habitat feature for gulls and terns (Klopfer and Hailman 1965). Inexperienced breeders appear to be attracted to sites where larids are displaying, rather than returning to their natal colony location (Burger 1974; Southern 1977). Forster's tern (Sterna forsteri) colonies may serve to attract pioneering Franklin's gulls to new colony sites in Minnesota. This may explain the appearance of a few pairs of nesting gulls at Lake Osakis which have been observed since 1980. In recent years, Lake Osakis has been the site of a large (est. 1000 pairs) Forster's tern colony (MNHPCB files).

Nest Site Selection

Franklin's gulls generally arrive at their Minnesota breeding marshes in mid-April and initiate laying three to four weeks later (Roberts 1900, Burger 1974). Burger (1974) found that upon spring arrival, Franklin's gulls return to former colony sites to display; however, these sites are readily deserted. Old colony sites were always abandoned prior to initiation of nest building, usually in favor of more open emergent habitat. The interval between arrival and laying may allow the birds to gather important information about the suitability of specific nest sites (Montevecchi 1978).

Both interspersion and density of emergent vegetation are important factors for nest site selection in marsh birds (Weller and Spatcher; Weller and Fredrickson 1974). Franklin's gulls exhibited a significant preference for nesting along the cattail-open water interface at Heron Lake. The nest density in this edge habitat was over four times as great as that in the interior of cattail stands (table 1). Burger (1974) noted similar nest site selection for gulls nesting in cattail habitats at Agassiz. She found an average nest density of 12.9 ± 3.6 nests per 6 m^2 along the cattail-open water edge, while the nest density in the interior of cattail stands was only 4.0 ± 1.27 nests per 6 m^2. Gulls nesting in the mixed-sedge habitats in Agassiz Pool (this study) did not appear to exhibit a preference for nesting along the emergent-open water interface.

Burger (1974) found openings are important habitat features for nesting Franklin's gulls. Openings provide sites for landing,

bathing, displaying, and gathering nest material, as well as providing an avenue of escape. She noted an inverse relationship between nest density and cattail stem density; although, the interior of cattail stands does offer the nestlings and adults some protection from avian predators and hailstorms, and nests protection from being dislodged by high water and wave action. The mixed-sedge habitat at Agassiz provided adequate space to meet the birds needs for openings as well as some degree of the protection afforded by selection of interior nest sites. Nest densities at Agassiz decline as the emergent habitat became more sparse toward openings (nest site limiting), and nest densities declined as the habitat became more dense (openings limiting).

Aggression is the ultimate mechanism for nest dispersion in gull colonies. High nest densities such as observed in the cattail habitat at Agassiz are possible only in situations which provide adequate openings and screening to prevent visual contact between neighboring pairs (Burger 1974). Neither the cattail habitat at Heron Lake, nor the mixed-sedge community at Agassiz provided much screening for nesting gulls. The birds initiated nesting at Heron Lake on mats of floating debris (J. Schladweiler pers. comm.). New growth of vegetation during the nesting period, generally, provides screening for adjacent pairs allowing new nests to be established within a subcolony as the nesting season progresses (Burger 1974). Flooding prevented this situation from developing at Heron Lake until well into the brood rearing period. The structure of the mixed-sedge community at Agassiz was too open to provide much isolation for breeding pairs. At Agassiz, the vast expanse of suitable habitat (est. 500 ha) is, apparently,

Is this why there were more samples in July

adequate compensation for lack of privacy for nesting pairs. The similarity between nest densities at Agassiz and the Heron Lake edge may suggest that the birds were nesting near a theoretical maximum density for habitats which offer little screening.

Management Implications

As Dr. Roberts warned in the early part of this century, wetland drainage is probably, the single greatest factor responsible for the reduction of Franklin's gull breeding populations in western Minnesota. Drainage has eliminated potential breeding marshes, but perhaps more importantly, has eliminated alternate breeding sites in the event that the primary colony site becomes unsuitable. This forces the colony to abandon an area entirely. Erwin et. al. (1981) observed gull and tern colonies on the Atlantic coast which were frequently abandoned, were smaller than stable colonies.

Removal of wetlands within a watershed eliminates the flood control capacity of those wetlands. This leaves any remaining wetlands subject to severe, rapid increases in water levels in the event of heavy rains (Novitzki 1978). The emergent habitats of Heron Lake, Agassiz Pool, Marsh Lake at Lac qui Parle, and Thief Lake are all subject to intense, rapid floods.

Water level modification toward the goal of deepening and stabilizing water levels on shallow prairie lakes is a less conspicuous, but equally damaging and widespread form of wetland habitat destruction. While stabilized water levels are important during the breeding season, stabilization of water levels over several years will result in the elimination of semi-open emergent

habitats favored by Franklin's gulls. In stable lakes, any remaining emergent habitats are generally restricted to sparse islands of hardstem bulrush (Scirpus acutus) or dense stands of monotypic emergents, usually cattail, restricted to the shallow regions of the lake.

Marsh nesting larids stand to be some of the primary beneficiaries of lake management for emergent vegetation, particularly, in large, shallow wetland systems. The largest Franklin's gull colonies recorded in Minnesota (Heron Lake - 50,000 nests in 1916; 100,000 nests in 1937 (Green and Janssen 1975:100); and Agassiz NWR - 32,500 nests in 1982 (MNHPCB files)) have been noted in years following drought (see Baker et. al. 1967). Presumably, these dry periods functioned to rejuvinate the emergent habitats in favored colony locations by creating mud-flat conditions necessary for germination of emergent vegetation. In fact, the majority of the birds nesting at Agassiz in 1982 were nesting in the emergent habitats of Agassiz Pool which re-established following complete dewatering in 1980 (Vorland 1982).

Franklin's gull colonies can be quite sensitive to human disturbance during laying, early incubation and brood rearing periods (Burger 1974). While disturbance is minimal in colonies at locations such as Heron Lake and Agassiz NWR, it would, undoubtably, be a factor on a major recreational lake such as Osakis. The presence of boats in and around nest sites will elicit mobbing behavior in adults, causing the chicks to leave the nest platform. Once in the water, they become susceptible to wetting and exposure, aggression by older chicks and in older chicks aggression by adults (Roberts 1900; Burger 1974). Burger

(1974) noted that undisturbed chicks rarely leave the nest platform until they are ready to fly, and chicks prevented from escaping the vicinity of the platform by enclosures had greater survivorship than chicks not prevented from wandering during periods of disturbance.

Small refuges around colony sites during the breeding season may help mitigate some of the damaging effects humans can have on nesting larids. A refuge should protect the colony from human intrusion, which would result in adults leaving the nest platform, and provide a buffer zone to help minimize impacts such as wave action created by passing motor boats.

Franklin's gull's habits of field feeding in freshly plowed agricultural land are well known. Burger (1974) demonstrated the bird's reliance on upland food resources during the breeding season. As agriculture becomes increasingly dependent on pesticides (Committee on Impacts of Emerging Agricultural Trends on Fish and Wildlife Habitats 1982:105), it is important that wildlife resource agencies be aware of the types of chemicals being used and any possible threats these substances pose to the long-term health of wildlife in Minnesota. Potentially, pesticides could impact the birds through direct toxicity, or short-term reduction of food resources during critical periods in the bird's life cycle. Research is necessary to identify what threats, if any, environmental contaminants may pose to Franklin's gulls.

The continued existence of Franklin's gulls as a breeding species in Minnesota is largely dependent on the success of the

Agassiz NWR colony. This colony should continue to benefit from marsh management practices designed to enhance waterfowl production in aquatic habitats. The maintainance of large expanses of semi-open emergent habitats should enhance the productivity of gull colonies. Thief Lake provides a ready outlet when marsh conditions at Agassiz are temporarily unsuitable, providing an element of stability for this colony lacking in most areas of the state.

The future of colonies not associated with Agassiz is far more tenuous. The long-term success of colony sites such as Heron Lake, depends on the presence of suitable emergent habitats. It is difficult to predict the impact short-term pertebations (such as dewatering) would have on small colonies which do not have an alternate breeding site in the vicinity of the primary wetland. Yet, the sudden appearance of breeding gulls in suitable wetlands in the past illustrates the birds flexibility in pioneering new colony sites. The alternative, loss of semi-open emergent habitat with stabilized water regimes, will certainly result in colony abandonment.

Franklin's gulls should benefit from protection and restoration of prairie wetland systems; although, from the standpoint of drainage, most of the damage to marshes utilized by breeding Franklin's gulls has already been done. It may be possible to mitigate some of the wetland loss to drainage by restoring shallow prairie lakes which have been affected by lake stabilization to allow for natural cycling of the marsh system. Ideally, a wetland should be wholly or partially dewatered when the marsh has become so open that it provides little food or cover

for wildlife (Weller 1978). This will allow natural germination of important wetland plants as food and cover for wetland associated wildlife.

Franklin's gulls can serve as an indicator of environmental health in the prairie regions of Minnesota. The decline in resident populations in the past 50 years indicates that we have not done very well in protecting our wetland resources. Hopefully, the knowledge we have gained in wetland values and management can be applied to enhance and protect future breeding colonies of Franklin's gulls and prevent further degradation of our natural resources.

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