STATE OF MINNESOTA
PROFESSIONAL AND TECHNICAL SERVICES CONTRACT – 2011 PROGRESS REPORT

POPULATION DYNAMICS AND MANAGEMENT IMPLICATIONS FOR AMERICAN WHITE PELICANS BREEDING AT MARSH LAKE, LAC QUI PARLE WILDLIFE MANAGEMENT AREA, MINNESOTA

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INTRODUCTION

Level K

Public interests in American white pelicans (*Pelecanus erythrorhynchos*) range from concerns over possible threats to economically important fisheries by foraging pelicans, to angst over

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Consultant's Report

failures in breeding success and colony abandonments seen in some Upper Midwest white pelican colonies. Listed as a Species of Special Concern in Minnesota, such divergent concerns demonstrate a need for information on the population dynamics of pelicans breeding on Marsh Lake; currently the largest known white pelican colony in North America. This report chronicles progress during the 2011 field season. Final analyses will include preliminary data collected during 2007-2009 and annual banding data since 1972.

2011 FIELD SEASON

Breeding Census: An aerial census was flown at 9:00 am on May 26 to obtain vertical aerial photographs of incubating birds. Flown intermittently since 2003, and annually since 2006, the 2011 census was the second year of a transition from traditional film photography to digital photography. Images were recorded from an altitude of 1,000 feet with a 15.1 megapixel camera at ISO 200, f/4-4.5, 1/800 second, with an average focal length of 60 mm (55-70 mm).

Automated and manual census counts of nesting pelicans were obtained from digital images using UTHSCSA ImageTool software (The University of Texas Health Science Center, San Antonio, TX). Nest distribution in 2011 was influenced by summer-long high water levels that left one island submerged, as well as, low areas of three others. Pelicans nested on higher areas of three islands and the mainland peninsula; however, some nests were flooded on Big and Currie islands. Results of the census indicated 17,758 incubating pelicans (Table 1), reversing a modest downward trend that began after the colony peaked at 19,396 breeding pairs in 2006 (14,155 in 2010). The count does not include some birds obscured by vegetation, early nests that had been flooded, or late nests initiated after the census flight. Noticeable clusters of late-nesting pelicans are often noted during years in which substantial numbers of early nests are lost to flood or inclement spring weather, leading to speculation that the late nests are second attempts. Regardless of the identity of late-nesting pelicans, few, if any, chicks that hatch in July and August survive to fledge.

Table 1. American white pelican nests by nesting area, Marsh Lake, 2011.

Big Island	Eight-acre Island	Currie Island	Peninsula	Total
339	1,140	6,755	9,524	17,758

Banding: A crew of 33 volunteer banders was assembled to band on the weekend of June 25-26. However, shortly after banding began on the morning of June 25, a steady rain moved in forcing the volunteers to retreat. With conditions and weather forecasts for the rest of the weekend deteriorating throughout the rest of the morning, the crew disbanded. A sufficient crew for a second attempt could not be assembled on short notice, but 523 local pelicans (2,000 quota) were banded prior to the rain on the main banding day (26 with wing tags). Six experimental local pelicans were also banded on July 2, another 5 on July 7, and 1 adult was banded on July 21. Blood samples were taken from 31 local pelicans banded on July 25. Banding accomplishments are summarized in Table 2.

Table 2. American white pelican banding accomplishments, Marsh Lake, 2011.

Nesting Area	Date	Age	Sex	Number Banded
Peninsula	6/25	L	U	523
	7/7	L	U	5
	7/25	L	U	31
Currie Island	7/2	L	U	6
	7/21	AHY	U	1
Total				566

Pelican Production: Since 2007, a second census flight has been flown in July to estimate pelican production. In 2011, that flight was pushed back to August 4, and was flown from 8:30-9:00 am to obtain digital images of near-fledged local pelicans while few adults were present. Images were recorded as described for the first flight, with the camera at ISO 100, f/4-5, 1/800 second, and variable focal lengths from 70-109 mm. The count was completed in the same manner as the nest count, indicating 8,931 near-fledged local pelicans, or 0.50 young/pair. Counts by nesting areas are not useful, as by that point in the summer chicks were readily moving between islands.

Prior to adopting digital photography for the census, adult pelicans were not discernible from chicks on census photographs, and it was assumed from what was observed on the ground that few adults were present at the time of the flight, and any counted would be negligible. Current higher resolution digital images do allow for the identification of adults based on the brighter bill and foot color, as well as grayish-black feathers on the crown and nape. In addition to the 8,931 chicks counted, an additional 370 adults were present in the colony, accounting for 4.0% of all pelicans present. However, a majority of those (251) were found in larger groups in areas away from any nests or young, and would have been recognized as loafing adults and not counted regardless of the image resolution. The remaining 119 adults actually mixed in with the young could suggest that approximately 1% of the chicks counted in previous years may have actually been adults, confirming earlier suspicions that the number would be nominal.

Pelican Diet: With ample samples collected during 2010, as well as preliminary collections during 2007-2009, diet sampling was suspended in 2011 in favor of concentrating efforts towards relocating marked cohorts of young.

Chick Performance: Three cohorts of approximately one day old pelican chicks were marked in May and June to track growth and development. Hatchlings were marked with individually colored nape tags, and if recaptured when large enough, banded with a federal leg band and color-marked with a yellow patagial tag (black code) on the left wing. On May 17, an early-hatched cohort of 27 chicks was measured and marked on the peninsula. Two were relocated on June 11, and one was recaptured a third time on June 16, with five others that had not been seen since the initial measurement.

A mid-season cohort of 25 chicks on Currie Island was marked on May 26. Thirteen were recaptured on June 16, and eight on July 2. Six of the eight were large enough to band and color-mark. Two of the color-marked birds were found dead on August 5 from what appeared to be bald eagle (*Haliaeetus leucocephalus*) predation. One of the color-marked chicks was captured again on August 21.

The last cohort of 25 chicks was marked on June 16; 15 on Currie Island and 10 on the peninsula. When revisited on July 2, the nests for the third cohort on Currie Island had flooded, and the chicks were gone and presumed dead. On July 7, five of the third cohort birds on the peninsula were recaptured. These birds were banded, but were not yet large enough for patagial tags. Two of them were relocated on July 18, at which time patagial tags were added. The two birds were caught three more times, on July 21, August 5, and August 10. One of them was caught a final time on August 21.

Statistical analysis of growth data is ongoing. Valuable insight gained from observations during 2011 regarding nest-site fidelity and chick feeding behavior should aid a more efficient revisitation schedule in 2012.

Colony Security: White pelicans are well known to be sensitive to disturbance during the breeding season, and prone to respond with colony abandonment. Since the origins of the Marsh Lake pelican colony in 1968, and the start of annual banding operations in 1972, the colony has thrived and expanded because of its relative seclusion and lack of disturbance. Visits to the colony have always been staggered to ensure several days of "rest" between disturbance events. This approach has worked because there were no additional sources of repeated disturbance.

In recent years, however, increased interest in the colony has resulted in increased pressure on the birds, ultimately adding to their allostatic load. Effective scheduling of researcher visitation to manage frequency and timing of disturbance events becomes difficult when there are additional sources of disturbance.

Examples of pelican behavioral responses to increased disturbance were noted during 2011. When the colony is visited while pelicans are incubating, they normally part to allow passage, and then quickly close back to their nests. When visited after a morning of extended survey flights, however, adults on the entire island took flight and circled the island emitting a low, croaking call; behavior alarmingly similar to that described for Chase Lake, North Dakota pelicans immediately prior to their mass abandonment of eggs and young in 2004. In addition, double-crested cormorant (*Phalacrocorax auritus*) collections caused nesting pelicans to flinch every time the shotgun fired. With increased flights and visits, better coordination of disturbance events would seem advisable, and perhaps a monitoring system needs to be implemented that would allow for the quantitative assessment of the impact of these disturbance events.

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INTRODUCTION

Public interests in American white pelicans (*Pelecanus erythrorhynchos*) range from concerns over possible threats to economically important fisheries by foraging pelicans, to angst over failures in breeding success and colony abandonments seen in some Upper Midwest white pelican colonies. Listed as a Species of Special Concern in Minnesota, such divergent concerns demonstrate a need for information on the population dynamics of pelicans breeding on Marsh Lake; currently the largest known white pelican colony in North America. This report chronicles progress during the 2010 field season. Final analyses will include preliminary data collected during 2007-2009 and banding data since 1972.

2010 FIELD SEASON

Breeding Census: An aerial census was flown from 9:30 am to 10:00 am on May 20 to obtain vertical aerial photographs of incubating birds. Flown intermittently since 2003 and annually since 2006, the 2010 census experienced a transition from film photography to digital photography made possible by a Minnesota Ornithologist's Union Savaloja Grant to purchase a digital SLR camera. Images were recorded from an altitude of 5-600 feet with a 15.1 megapixel camera at ISO 100, f/5, 1/800 second, with an average focal length of 100 mm.

Automated and manual census counts of all species were obtained from digital images using UTHSCSA ImageTool software (The University of Texas Health Science Center, San Antonio, TX). Ground counts supplemented aerial counts for species difficult to discern on photographs such as black-crowned night-herons (*Nycticorax nycticorax*) and great blue herons (*Ardea herodias*). The nesting areas of the Marsh Lake colony consist of five islands and a mainland peninsula. Bird use of individual areas varies from year to year, as does annual distribution and density of species. Results of the census indicated 14,155 incubating pelicans (Table 1), continuing a

modest downward trend that began after the colony peaked at 19,396 breeding pairs in 2006. Typically, double-crested cormorants (*Phalacrocorax auritus*) nest on Hermit and Big Islands, and herons and egrets nest on One-acre and Big Islands, and occasionally on Currie Island. For the first time, some double-crested cormorants, great blue herons, and great egrets (*Casmerodius albus*) nested on the mainland peninsula. No cattle egrets (*Bubulcus ibis*) or Forster's terns (*Sterna forsteri*) nested at Marsh Lake in 2010.

Table 1. Marsh Lake colonial waterbird nests by species and nesting area, 2010.

Species	Hermit Island	One-acre Island	Big Island	Eight-acre Island	Currie Island	Peninsula	Total
Ring-billed gull	618		6,277				6,895
Double-crested cormorant	556	1	245			96	898
American white pelican		36	1,253	555	6,029	6,282	14,155
Great blue heron		5	5			4	14
Great egret		7	64			57	128
Black-crowned night-heron			20				20

Since the first aerial census in 2003, the goal has been to refine imaging techniques and ImageTool processing to achieve computer-generated counts with acceptable precision and accuracy to negate the need to verify with time-consuming manual counts. Automated counting routines in the past were generally lower than the actual number produced with a manual count, and averaged within 7.6% of the actual number. The 2010 automated count was within 2.6% of the actual number, suggesting the desired level of accuracy may have been attained. High resolution, large format digital images facilitated rapid and accurate counts, and the ability to download images directly from the camera's flash memory card to the computer (bypassing the need to scan photographs) greatly reduced the turn around time between the flight and completion of the count.

Banding: The main banding day was June 26 when 2,000 pelicans and 400 ring-billed gulls (*Larus delawarensis*) were banded (Table 2). The majority of the pelicans banded were flightless young (local), but four were adults (after hatch year). In addition, two previously banded adult pelicans were recaptured and released. Another 33 experimental local pelicans were banded on June 30, five on July 18, and one on July 21. Sixty-five great egrets and eight black-crowned night-herons were banded on July 10.

Pelican Production: Since 2007, a second census flight has been flown in July to estimate pelican production. On July 23, the second flight was flown from 9:30 am to 10:00 am to obtain digital images of near-fledged local pelicans while few adults were present. Image analysis is ongoing and results will be forthcoming.

Pelican Diet: To typify pelican diet (as fed to chicks), regurgitated boluses of prey items were collected during the brood-rearing period. A random walk sampling scheme was employed, using random numbers to determine compass bearing and paces traveled. All boluses within

two meters of indicated sampling locations were collected. Sampling continued until approximately 20 samples had been collected, or until 150 random points were visited. Collected samples were rated for quantity (complete bolus, partial bolus, unknown, single large fish, or single/scattered small items) and quality (little/no digestion, partial digestion – prey identifiable, or substantial digestion – prey unidentifiable). Samples were chilled with ice in the field, and frozen within 2 hours. Seven collections were made from four of the six active pelican nesting areas on six days between June 13 and August 9 (Table 3). Laboratory analysis of collected samples is ongoing.

Table 2. Banding accomplishments at Marsh Lake, 2010.

Species by nesting area	Date	Age	Sex	Number Banded
Peninsula				
American white pelican	6/26	AHY	U	4
American white pelican	6/26	L	U	1,996
Big Island				
Ring-billed gull	6/26	L	U	400
American white pelican	7/21	L	U	1
Great egret	7/10	L	U	65
Black-crowned night-heron	7/10	L	U	8
Eight-acre Island				
American white pelican	6/30	L	U	33
American white pelican	7/18	L	U	5

Table 3. Pelican diet sampling at Marsh Lake, 2010.

Date	Nesting area	Sampling locations visited	Boluses collected
6/13	Big Island	150	11
6/29	Peninsula	61	20
7/22	Big Island	20	20
7/28	Eight-acre Island	60	20
7/28	Peninsula	110	22
8/3	Currie Island	77	21
8/9	Peninsula	150	19
Total			133

Chick Performance: Scheduling to mark and monitor three cohorts of chicks (hatched early-, mid-, and late-season) was hampered by frequent inclement weather creating hazardous boating conditions on Marsh Lake, and other human activities on days with good conditions. Cognizant that white pelicans are prone to abandoning breeding areas from excessive disturbance, and that young chicks cannot thermoregulate, time spent near active nests was kept to a minimum, and visits to the colony were staggered so birds would have at least two

days rest after any disturbance event. In addition, a contract with the MN DNR Nongame Program to share census data assured there would be no colony access conflicts with contractors performing a 2010 statewide white pelican survey.

The first pelican eggs to hatch were observed on May 15 on the east end of the peninsula; the area with the highest nest density in the colony. Plans were made to return on May 17 to mark and measure the first (early-season) cohort of one day old chicks; however, it was learned that Marsh Lake had not been removed from the statewide pelican survey as had been stated, and those contractors were planning on flying over the colony on May 17, canceling any ground visit. Their flight plans were delayed a number of times, and the colony could not be revisited until May 26. By then, the early-season chicks had been missed so 25 older chicks located where the first eggs had hatched were marked and measured. With the late date, this would have been considered the second encounter with the early-season chicks (the first encounter having been missed). When revisited on June 30, none of the marked pelican chicks could be located in the thousands of chicks that were by then roaming the east end of the peninsula.

A second (mid-season) cohort of one day old chicks consisted of nine birds marked and measured May 26 on Big Island, and 16 captured May 28 on Eight-acre Island. Three of the nine birds marked on Big Island were recaptured on June 16, and 14 of the 16 on Eight-acre Island on June 9. A third visit to Eight-acre Island on July 18 yielded six recaptures, but none of the marked chicks from the group on Big Island were seen again. By early July, young pelicans began swimming between the nesting islands, and by mid-July most young pelicans on Big Island seemed to be abandoning the island in favor of the larger pelican concentrations to the north. One of the chicks marked on Eight-acre island was recaptured a fourth time on August 6 (71 days old).

A third (late-season) cohort of 21 chicks was marked on June 19 in a pocket of late-nesting pelicans in the center of Big Island. When revisited on July 5, no adults were attending the nests and chicks were displaying symptoms of extreme heat stress (lying prostrate in nests, panting heavily). Looking for a cause of the disturbance, a photographer's blind was seen at the edge of the nests. From the degree of distress displayed by chicks, the photographer had likely been there for quite some time keeping the adults from brooding their young. With that level of disturbance, the colony was exited immediately after informing the photographer that he was trespassing in a sanctuary. When visited again on July 8, at least half the chicks in that area were dead. From their postures and degree of decomposition, it appeared they had died from heat stroke on the day the photographer was there. Nine of the marked chicks, however, were located and measured for a second visit. Only one chick was found during a third visit on July 21. As mentioned above, by this time most young pelicans were leaving Big Island to join larger concentrations of birds.

Attempts to monitor chick growth and performance during 2010 were disappointing. Weather is always a factor with field studies, and hopefully it will be more cooperative in 2011. Difficulties in relocating marked chicks could be facilitated in 2011 by choosing from nests in more isolated pockets of the colony so chicks do not mix as quickly with the larger groups.

However, in the case of early- and late-hatched chicks, where those adults choose to nest will determine sampling locations. The most serious impediment faced in 2010 was the unexpected actions of other individuals that either kept the colony off-limits, or forced a retreat as soon as arriving. When already responding to unfavorable weather or equipment issues, such unplanned disturbances can impede time-critical scheduling which results in missed data.