common loon research at seney national wildlife refuge

2007 field season



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Figure 1. The ABJ, one of the first common loons to be color-marked as a chick at Seney in 1987. In 2007 he occupied the same territory and nested with the same female for the eleventh consecutive season, and – at twenty – was the oldest common loon of known age in the world.

Introduction

In the early spring of 2007, after a winter spent on southern waters, adult common loons (*Gavia immer*) once again returned to the managed impoundments of Seney National Wildlife Refuge. Many of these males and females quickly formed or re-formed pair bonds, and promptly established large territories – typically one or two per pool – into which intruders were understood to proceed with risk. These pairs then set about the business of nesting, and – if a month-long incubation of eggs proved successful – subsequently hatched one or two chicks in June or July. Although the ensuing duties of parenting occupied the majority of their responsibilities, time and energy was often necessitated in other capacities as well: In addition to breeding pairs, the refuge harbored numerous lone adults who, when not feeding upon non-territorial pool regions, frequently *did* proceed with risk into the domain of these established partnerships. The duration and tenor of these intrusions varied widely. While the incursions were often brief and without confrontation, occasionally an encounter escalated to the point of vocal or physical aggression. Less frequently, this turnult resulted in a dramatic shift – the eviction of a breeding adult from its territory by an intruder.

Discerning such an event requires the capacity to differentiate between loons, and in this respect the population at Seney is singularly accommodating. Since 1987 a research project at the refuge has utilized a safe, efficient nighttime capture method to color-mark nearly 200 adult and juvenile loons with plastic leg bands that uniquely identify individuals, and thus permit intensive long-term monitoring. Through these efforts it was first demonstrated that the intrusions cited above can periodically catalyze a turnover in pairing – that is, that loons do not in fact mate for life. By the same process it was also shown that a significant percentage of these intruders are former refuge chicks who, after spending two or three years reaching maturity on the ocean, have returned north as adults to challenge for territory and mate. In some instances, these returnees actually encroach upon their parents...

This study of color-marked loons, which was originally initiated at Seney in order to illuminate aspects of the species' population dynamics and breeding biology, has since widened in both scope and extent. Issues such as contaminant exposure and genetic relatedness are now central to the information gathered from loon capture, and the work itself – conducted by the nonprofit group Common Coast Research & Conservation (CCRC) – incorporates populations stretched across Michigan's Upper Peninsula. Nonetheless, the refuge, which still harbors loons banded during the initial years of the project, remains of central importance for investigations involving color-marked adults and juveniles. This report briefly summarizes the main objectives currently attending CCRC's loon research at Seney, the parameters of the 2007 refuge population, highlights from the field season, and the past history and present status of each Seney pool utilized by common loons.



Figure 2. Four facets of loon capture are illustrated clockwise from lower left: (A) Feathers are collected from a five week-old chick for the purpose of analyzing mercury exposure; (B) bill and (C) weight measurements are taken from a fully-developed nine week-old chick; (D) a plastic alphanumeric colorband and a metallic U.S. Fish & Wildlife Service identification band are applied to the legs of a six-week old juvenile, in this case the sole 2007 chick from C northeast.

Research objectives

The Michigan DNR's Loon Recovery Plan, drafted in 1992 in response to the listing of the species as Threatened within the state, asserted that "accurate information obtained through research is essential for determining loon population size, identifying problems, suggesting proper management, and assessing the effects of management. Unfortunately, our base of information on Michigan loons is incomplete...We lack information on many aspects

of basic loon biology, such as age of juveniles returning to breed, and longevity..." Research at Seney is attempting to address these deficiencies of understanding. For example, the exceptionally high return rate for color-marked adults [Table 1] suggests that approximately 40% of refuge loons will live beyond 30 years of age. This estimate, while encouraging in itself, bears important and somewhat counterintuitive implications for the broader-based modeling of long-term loon viability. Such models attempt to statistically meld population dynamics parameters derived from banding studies with occupancy and productivity data derived from extensive surveillance in order to yield more accurate insight into the overall stability of a given species within a given region. In the case of loons in northern Michigan, a protracted longevity suggests that the impact of low productivity (a chronic phenomenon across many of the state's loon lakes) will not necessarily be detected by traditional survey methods for many years. This likely lag time in response places a premium upon the kind of scrupulous statewide atlasing and monitoring that, sixteen years after the creation of the Loon Recovery Plan, Michigan is currently lacking. It also underscores the necessity of pro-active management strategies on federal, state and local levels that address aspects of loon protection and conservation from forward-looking perspectives.

| | banded refuge adults | | | | banded refuge juveniles returning as adults (ABJs) | | | | |
|-------------|---------------------------|----------------------------|--------------------------|--------------------------------|--|--------------------|-----------------------|---------------------------|-----------------------------------|
| <u>vear</u> | eligible <u>adults</u> | returning <u>adults</u> | total <u>return %</u> | territorial <u>return %</u> | eligible juveniles | new <u>ABJs</u> | active <u>ABJs</u> | cumulative <u>ABJs</u> | cumulative <u>ABJ return %</u> |
| 1992 | 9 | 9 | 100% | 100% | 9 | 2 | 3 | 3 | 33% |
| 1993 | 14 | 14 | 100% | 100% | 17 | 0 | 3 | 3 | 18% |
| 1994 | 17 | 17 | 100% | 100% | 19 | 1 | 4 | 4 | 21% |
| 1995 | 18 | 17 | 94% | 94% | 23 | 0 | 1 | 4 | 17% |
| 1996 | 18 | 17 | 94% | 100% | 27 | 0 | 1 | 4 | 15% |
| 1997 | 18 | 17 | 94% | 94% | 30 | 2 | 3 | 6 | 20% |
| 1998 | 17 | 16 | 94% | 100% | 33 | 0 | 2 | 6 | 18% |
| 1999 | 18 | 17 | 94% | 100% | 35 | 1 | 3 | 7 | 20% |
| 2000 | 20 | 18 | 90% | 100% | 38 | 0 | 2 | 7 | 18% |
| 2001 | 19 | 19 | 100% | 100% | 47 | 0 | 2 | 7 | 15% |
| 2002 | 20 | 20 | 100% | 100% | 55 | 1 | 3 | 8 | 15% |
| 2003 | 20 | 20 | 100% | 100% | 69 | 5 | 8 | 13 | 19% |
| 2004 | 20 | 19 | 95% | 100% | 80 | 5 | 13 | 18 | 23% |
| 2005 | 20 | 18 | 90% | 95% | 92 | 4 | 15 | 22 | 24% |
| 2006 | 23 | 23 | 100% | 100% | 98 | 1 | 14 | 23 | 23% |
| 2007 | 25 | 24 | 96% | 96% | 105 | 2 | 13 | 25 | 24% |

Table 1. The annual site fidelity for adult Seney loons is quite high – a color-marked territorial male or female who migrates in autumn has over a 97% likelihood (in red) of returning to refuge pools in the subsequent spring. The rate of re-observation at Seney for banded chicks (in green) is considerably lower because of the mortality associated with juveniles' extended tenure on southern oceanic waters prior to their return as breeding adults, and the geographic dispersal of many of these returned birds to off-refuge lakes at distances of 50 miles or more.

The central objective of current loon research at Seney, then, is to improve the resolution of this population dynamics data (and thus the accuracy of predictive models) through continued color-marking and observation. Ancillary projects to this effort presently include 1) the study of less directly quantitative aspects of loon behavior and natural history such as the mid-summer "social gatherings" that can include fifteen or more adults in ephemeral, ritualized interactions, 2) the publication of a book on Seney loons in collaboration with the photographer Rod Planck, 3) the genetic analysis of the sex ratios of juvenile loons and the inter-relatedness of refuge adults, and 4) inquiry into loon mercury exposure via fish consumption. The last effort, which involves

using both adults and juveniles to quantify temporal changes to the toxic metal's bioavailability within specific waterbodies, was detailed in the 2005 CCRC report *Mercury exposure in common loons at Seney NWR*.

Parameters of the 2007 refuge population

Twenty four of 25 color-marked loons who were active on the refuge in 2006, and who were originally banded as adults, reappeared on Seney pools in the spring of 2007; this 96% return rate was consistent with the site fidelity that the population has expressed over the course of the research project [Table 1]. Among these 24 birds were fourteen who had been monitored on refuge for at least a decade. Also present were an additional thirteen color-marked adults who were originally banded as chicks, and who returned to the refuge after spending at least two years reaching maturity on southern oceanic waters. These prodigal loons are designated by the acronym ABJ; somewhat confusingly, the first such banded juvenile to reappear at Seney – the F/East male of Figure 1 – has long been granted the term as a moniker. Eight ABJs – all males – held Seney territories in 2007 [Figure 4], while the remaining five formed a subset of the refuge's unpaired intruders.

A total of 31 color-marked loons constituted 86% of the refuge's record eighteen territorial pairs on A, B south, B west, C south, C northeast, D, E central, F/E east, G, I, J, A2 East, C2, M2 east, M2 west, T2 West, C3 and Marsh Creek. As an increase from the sixteen pairs of 2006, both C northeast and I represented newly-established territories. All eighteen pairs attempted nesting, of which fifteen (83%) were successful. Their collective 24 hatched and 20 fledged chicks exceeded the previous acmes of 20 and 16, respectively. Table 2 underscores the degree to which 2007 represented a new collective highpoint for the Seney loon population.

| | 1007 0000 | 2007 |
|-----------------------------------|-----------|------|
| | 1987-2006 | 2007 |
| territorial pairs | 11.4 | 18 |
| nesting pairs | 9.8 | 18 |
| successful nesting pairs | 6.4 | 15 |
| chicks hatched | 9.6 | 24 |
| chicks fledged | 8.0 | 20 |
| chicks hatched / successful nes | t 1.5 | 1.6 |
| chicks fledged / territorial pair | 0.70 | 1.11 |
| chicks fledged / nesting pair | 0.82 | 1.11 |
| successful nesting pair rate | 65% | 83% |
| fledging rate | 84% | 83% |



Table 2. Measures of total loon occupancyand productivity in 2007 greatly exceededthe long-term averages at Seney NWR.

Figure 3. The three-year moving averages for refuge loon occupancy and productivity demonstrate that the success of the 2007 season formed part of a broader trend of increasing refuge fecundity over the past decade.

The 36 territorial adults responsible for this achievement were complemented by at least another fourteen nonterritorial birds – the unpaired intruders. From the standpoint of the former, the presence of the latter was largely unwelcome and, at times, even perilous. Nonetheless, these 'surplus' loons were likely a manifestation of a healthy refuge population. Seney's long-term productivity of 0.74 fledged chicks per territorial pair is significantly higher than that of other well-monitored Michigan study sites (including Isle Royale National Park and the Ottawa National Forest), and approaches that of the highest published rates for populations across North America. This success is significantly indebted to the protection that Seney loons have always received – the refuge is functionally unique in prohibiting water-borne visitor recreation, which can often inadvertently but irrevocably disturb nesting loons. Furthermore, while this rate of fledged chicks per pair – a barometer of efficiency – has remained relatively stable since 1987, the average number of total nesting pairs and total fledged offspring have both increased substantially in the last decade [Figure 3]. This achievement has coincided with management strategies that have promoted high, stable water levels on a large percentage of refuge pools, thereby generating more overall habitat for loon occupancy and reproduction. The logical inference that a positive feedback loop exists between heightened productivity in one generation and subsequent occupancy in the next has been supported by the aforementioned return of numerous refuge ABJs.



Figure 4. Monitoring summaries for Seney loons, 1987-2007. Each blue (male) or orange (female) vertical line charts the known refuge history for a color-marked adult who has held territory at Seney NWR. While most of these birds were first banded as adults, a minority – in green squares – are among the 25 color-marked refuge chicks who have reappeared at Seney as breeding adults... the ABJs [Table 1]. These summaries – which collectively entail 400 seasons of observation – do not include those ABJs who did not or have not yet acquired a refuge territory, nor those who have been discovered off-refuge.

2007 field season highlights

Over the past decade Seney loons have typically been observed for the entirety of the breeding season, from the spring arrival of territorial adults (late March-early April) to the autumn departure of fledged juveniles (early September-early October). Although this pattern continued in 2007, the total number of hours devoted to monitoring increased substantially – on average, 40 hours per week were assigned to field observation. This effort was both dictated and complemented by the work of photographer Rod Planck, with whom CCRC is collaborating on a book project involving Seney's loons that will be narratively structured around the events of the 2007 season. Rod's thousands of high-resolution images – in addition to forming the aesthetic basis of the book – contributed substantial insight into the population dynamics of the 2007 season. In one example, Rod captured the intrusion of a female who was originally banded in 1997 on Kennedy Lake, five miles to the southeast of Seney. She went absent from that territory in 1999, and had gone subsequently unobserved until her photographed visit to the refuge's C northeast territory in June 2007 – her first sighting in over eight years.



Figure 5. Orange AT, a four-year old ABJ who was hatched on B south in 2003. He returned to Seney as a breeding adult in late spring, and in his repeated territorial intrusions was likely responsible for the June failure of the F pool nest.



Figure 6. The half-buried colorbands of the G male, who had been monitored at Seney since 1993. He was discovered in late October on the Lake Michigan shoreline near Birch Point, Mackinac County, an evident victim of type E botulism.

In late summer all twenty extant refuge loons chicks were color-banded during nighttime capture [Figure 8]. Since the initiation of research activities in 1987, 159 of 180 fledged Seney juveniles (88%) have been marked; 122 of 127 (96%) have been marked since 1997. All twenty 2007 chicks were banded between five and nine weeks of age, and all successfully fledged following capture.

While the Seney field season generally concludes with the departure of these juveniles, in 2007 an autumn outbreak of type E botulism poisoning on Lake Michigan prompted extensive surveying by CCRC along beaches in both the eastern Upper and northern Lower Peninsulas. This canvassing, which ultimately covered 96 miles between Sleeping Bear Dunes National Lakeshore in Leelanau County and the Garden Peninsula in Schoolcraft County, was intended to assess the scope, density and demography of common loon mortalities associated with the die-off, and to search for color-banded birds from Seney and other Upper Peninsula study populations. In late October the carcass of the 2007 G male – an adult banded on C3 pool in 1993 – was located near Birch Point in Mackinac County, 23 miles to the southeast of his Seney territory [Figure 6]. As one of 520 deceased common loons documented by CCRC surveying (and one of an estimated 2000-3000 who died across the entire northern Lake Michigan region), his discovery partially undermined the hope that most Michigan loons – numbering less than 1000 breeding pairs – had likely migrated south out of the afflicted area before the die-off peaked in late autumn. The 2008 spring return rates at Seney and other Upper Peninsula sites will further illuminate, if indirectly, the extent to which the botulism outbreak impacted the local population.

Pool summaries

Each Seney pool with a history of loon occupancy is described below by a series of descriptive characteristics assembled from long-term refuge monitoring. *Fledged chicks* records the total number of offspring produced on the pool from 1987-2007. *Chicks per year* divides *fledged chicks* by the total number of territorial pairs that have occupied the pool. *Last territorial occupation* lists the most recent year in which the pool harbored a territorial pair. Lastly, *priority* is a subjective classification based upon a) the pool's overall productivity, especially over the past decade, and b) the pool's potential for future productivity as suggested by its current loon usage and the overall quality of its habitat. Below these diagnostics are short summaries of loon activity during the 2007 season.

UNIT 1

A fledged chicks: 4 chicks per year: 0.33 last territorial occupation: 2007 priority: MODERATE

The color-marked male and female on A pool have been paired since 1997, during which time their productivity has been considerably less than that of other long-term partnerships monitored on the refuge. In 2007, however, they hatched one chick in mid June – only their third offspring in eleven nesting seasons. The drought-induced low water levels which characterized all refuge impoundments in July and August were particularly pronounced on A, and kept the chick confined to a small southwestern section of the pool, and prompted its parents to spend unusually large amounts of time feeding away from the refuge. Nonetheless, the A juvenile was healthy and well-fed (3.3 kg) during capture at seven weeks, and successfully fledged the pool in early September.

B fledged chicks: 25 chicks per year: 0.93 last territorial occupation: 2007 priority: HIGH

Since 1987 B pool has produced more chicks than any other Seney impoundment, an achievement abetted in 2007 by both of its territorial pairs. The B south partnership included the B south female, who has occupied the territory without interruption since 1994. With her mate of four years, an ABJ [see the Parameters section above] who was first color-marked as a refuge chick in 1993, she hatched and fledged one offspring in 2007. The B west male from 2006 failed to return this spring, and was replaced by an eight-year old – also an ABJ – who had previously nested only once, unsuccessfully, on G pool in 2005. With an unbanded female he hatched and fledged two chicks of distinction: the first fourth-generation color-marked loons at Seney. Red G4, one of these juveniles, is shown during early August capture in Figure 8, while its third-generation father is highlighted below in Figure 7.



Figure 7. White T7 as a six week-old F pool chick in July 1999 and as the eight year-old B west male in June 2007. Originally hatched to the ABJ [Figure 1], who was himself hatched to the original banded G male in 1987, T7's two 2007 chicks became the first fourth-generation color-marked loons on refuge.

C fledged chicks: 7 chicks per year: 0.70 last territorial occupation: 2007 priority: HIGH

A second breeding territory was established in the northeast portion of C pool in 2007. The C northeast female was evicted from J pool in 2004, and had spent the intervening two years as an unpaired refuge floater; with her new unbanded mate she hatched and fledged one chick. The pool's traditional territory in C south harbored the same pair as in 2006; one of their two hatched offspring survived to fledging.

D fledged chicks: 18 chicks per year: 0.86 last territorial occupation: 2007 priority: HIGH

The D female, Scarecrow, was color-marked in 1989, and has occupied the pool without interruption for a record nineteen years. In 2007 she hatched two chicks with the D male, both of which survived to fledging.

E fledged chicks: 22 chicks per year: 0.76 last territorial occupation: 2007 priority: HIGH

In 2007 E pool harbored two loon pairs for the seventh consecutive year. The eastern section of the impoundment formed half of the F/E east multi-pool territory claimed by the 20 year-old ABJ [Figure 1] and his mate of eleven years; they nested unsuccessfully on F. The E central pair hatched and fledged two offspring for the third consecutive breeding season.

F fledged chicks: 8 chicks per year: 1.60 last territorial occupation: 2007 priority: MODERATE

After a four year hiatus prompted by low water levels, F pool was again utilized for nesting by the F/E east pair. Their only attempt, however, ended in failure, and was likely caused by repeated intrusions from the four year-old Orange AT [Figure 5], one of two new refuge ABJs in 2007.

G fledged chicks: 14 chicks per year: 0.70 last territorial occupation: 2007 priority: HIGH

The G male and female, banded on the refuge since 1993 and 1999, respectively, produced one chick from their second nesting attempt on July 14, a comparatively late hatch date. While this juvenile fledged without incident, the G male, who lingered on the pool into early September, was subsequently discovered dead in late October on the Lake Michigan shoreline, an evident victim of botulism poisoning [Figure 6].

Gray's Creek fledged chicks: 1 chicks/year: 1.00 last territorial occupation: 1987 priority: LOW

The small pool again housed only sporadic feeders, most frequently the pair from the adjacent C northeast territory.

- **H** *fledged chicks:* **2** *chicks per year:* **0.67** *last territorial occupation:* **2000** *priority:* **MODERATE** H pool, with its water level drawn down, served only as an occasional way station for unpaired adults.
- I fledged chicks: 0 chicks per year: ~ last territorial occupation: 2007 priority: HIGH

After abundant usage by a variety of loons in recent years, I pool was finally established as a breeding territory in 2007. The male, an ABJ hatched on B south in 2002, nested unsuccessfully with an unbanded female, after which he was evicted in early July by a floater (Headwound, first color-marked on C2 in 1998) who subsequently held the territory for the remainder of the summer.

J fledged chicks: 8 chicks per year: 0.73 last territorial occupation: 2007 priority: HIGH

The J male was originally banded on C2 in 1995, and has occupied J since 2001. With his mate of three years, he hatched and fledged two chicks in 2007.

UNIT 2

A2 East fledged chicks: 11 chicks per year: 0.58 last territorial occupation: 2007 priority: HIGH

The A2 East female, like her counterpart on D, was color-marked as an adult in 1989, and was thus at least 21 years old in 2007. With her partner of fourteen years – a record for mate fidelity – she hatched and fledged one chick.

A2 West *fledged chicks:* 0 *chicks per year:* 0.00 *last territorial occupation:* 1994 *priority:* LOW A2 West pool, which has not supported a breeding territory since monitoring was initiated in 1987, was utilized sporadically for feeding by the A2 East pair.

C2 fledged chicks: 13 chicks per year: 0.81 last territorial occupation: 2007 priority: HIGH

C2 was occupied for the third year by an ABJ hatched on B south in 2000 and the C2 female, marked as an adult on the territory in 2004. They hatched and fledged two chicks.

M2 fledged chicks: 15 chicks per year: 0.71 last territorial occupation: 2007 priority: HIGH

The traditional M2 territory – a vast area incorporating almost all of the expansive pool – was subdivided in 2006 by the arrival of the T2 East pair of 2005; this division remained in place during 2007. The M2 east pair hatched and fledged two chicks, while the M2 west pair lost one of their two offspring within a week of its hatching.

T2 East *fledged chicks:* **0** *chicks per year:* **0.00** *last territorial occupation:* **2005** *priority:* **LOW** A pool drawdown precluded loon occupancy on T2 East during 2007.

T2 West fledged chicks: 10 chicks/year: 0.63 last territorial occupation: 2007 priority: MOD.

The T2 West female has occupied the pool without interruption since her color-marking in 1992. In 2007 she and her mate of ten years hatched one chick. Despite a draught-induced low water level which, as on A pool, drastically shrank the functional size of the territory during late summer, the juvenile fledged successfully in late September.

UNIT 3

Big Spur fledged chicks: 1 chicks per year: 0.25 last territorial occupation: 2002 priority: LOW

Big Spur is the only impoundment in the unregulated chain of Unit 3 spur pools (including Delta Creek) that has harbored nesting since 1987. In 2007 its water level was low enough to preclude loon usage.

C3 fledged chicks: 19 chicks per year: 0.95 last territorial occupation: 2007 priority: HIGH

In spring of 2006 the C3 male – who had been paired to the C3 female since 1993 – unexpectedly relocated to G pool. Even more unexpectedly, in his absence the C3 female paired with her own son, a

four year-old ABJ hatched on the territory in 2002. Their one nesting attempt was unsuccessful. In 2007 this male moved to Marsh Creek, while the C3 female paired with yet another ABJ, a six year-old hatched to the F/E east pair in 2001. Their single nesting attempt failed in late June.

Marsh Creek fledged chicks: 2 chicks/year: 0.50 last territorial occupation: 2007 priority: MOD.

The banded Marsh Creek male – color-marked in 2005 – was one of two territorial 2006 refuge loons who did not return in the spring of 2007. His place was taken by a five year-old ABJ from C3; the two chicks he hatched with an unbanded female were both lost, for reasons unknown, within two weeks – the only successful refuge nesting which failed to fledge in any chicks in 2007.



Figure 8. Red G4, hatched to the B west pair in early June, during nighttime capture in early August. The juvenile and its sibling (Green VZ) represent the first fourth-generation colormarked loons at Seney NWR.

Acknowledgements

The Seney Natural History Association generously provided funding in 2007 for the most central aspect of loon research at the refuge – the nighttime sampling and color-marking of the population. Rod Planck courteously shared the entirety of his photographic output to both assist in demographic observations and to illustrate CCRC documents and presentations. The refuge itself – under the guidance of manager Tracy Casselman – continued offer vital logistical support in the form of transportation and housing, and biologist Dave Olson and forester Greg Corace considerately modified their own field projects so as to minimize disturbance to nesting loon pairs. Lastly, for the 34th and final season Terry Papple deftly managed the flow of water through the refuge's interconnected impoundments, once again establishing a stable, dependable aquatic environment for Seney loons. We wish him well in his retirement.



Common Coast Research & Conservation is an Upper Peninsulabased nonprofit that addresses itself to the study and protection of loons and their aquatic habitat. For more information please contact Damon McCormick at dlm@commoncoast.org or (906) 202 0602.