Kodiak Island Cooperative Goldeneye Nest Box Project
2014 Progress Report

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and

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This project is a cooperative effort of the Alaska Department of Fish and Game, Kodiak National Wildlife Refuge, Lesnoi Corporation, U.S. Coast Guard - Integrated Support Command Kodiak, Koniag Corporation, and various private individuals.

Cover photo- Second Barrow's goldeneye hen captured and banded at Lee Lake nest box LL-1 on June 10, 2014 (D.Jackson photo).

Executive Summary

During the period 26 May to 6 Aug, 2014, nest boxes placed on seven different lakes along the Kodiak road system and Karluk Lake on the Kodiak National Wildlife Refuge were checked by the author(s). Two new road system nest boxes were added in 2014. One was added to Buskin Lake on 5 Feb, and another box placed on Aurel Lake 1 April. Both lakes were still ice covered. The added boxes increased the total number of Project boxes available in 2014 to 47 nest boxes.

Occupancy rate of available project nest boxes used by Barrow's goldeneye (*Bucephala islandica)* hen was 34% (16 of 47 boxes) in 2014, down from 40% in 2013 and 35% in 2012 but nearly double of 2011 box occupancy rate of 19%. A project first was reached when another cavity nesting waterfowl species, a common merganser (*Mergus merganser*), used a project nest box, increasing the 2014 total box occupancy rated to 36%. Neither newly added nest boxes on Buskin and Aurel Lakes nor a Kalsin Pond box moved in early January were used during the 2014 nesting season.

The estimated 2014 average clutch size of 7.2 eggs for the 16 goldeneye occupied boxes was down slightly from the 2013 average of 7.3 eggs, but still higher than the estimated clutch averages of 5.7 and 6.1 eggs in 2012 and 2011, respectively. However, an abnormally large number of unhatched eggs were found in the 2014 nest box clutches with 4 boxes containing only unhatched eggs resulting in a dismal estimated 2014 hatching success of only 63%.

Capture and banding of project box hens was continued in 2014, as new hens were captured and banded at boxes LL-1 and CL-1. A Kodiak National Wildlife Refuge volunteer fishing at Lee Lake on 28 June found a duck leg with a band in the water from a hen captured at box OL-2 in June, 2012.

The Kodiak nest box project was initiated in the spring of 2010 in an attempt to provide additional goldeneye nesting habitat and collect basic nesting ecology information.

Introduction

Kodiak Island is located at the far western edge of Barrow's goldeneye (*Bucephala islandica)* range. The specie is a common cavity nesting sea duck breeding throughout the archipelago's freshwater ponds, lakes, lagoons, and protected bays. Kodiak supports an extensive resident Barrow's goldeneye breeding population (primary author's unpub. data), and based on the large number of hunter band returns, a large migrant wintering population. Kodiak's wintering goldeneye are a highly prized target of both Kodiak subsistence and sport hunters. However, little is known of the resident breeding population's nesting ecology, size, or the contribution to the heavily hunted Kodiak wintering goldeneye population.

Study Area

Located in the northwestern Gulf of Alaska, the Kodiak Archipelago is separated from the Alaska mainland by 30 miles of water in Shelikof Strait. Kodiak National Wildlife Refuge occupies approximately 757,000 ha on Kodiak and Afognak Islands (Figure 1). The Archipelago is influenced by a maritime climate with an annual mean temperature of about 4 C°. Total annual precipitation varies from >250 cm along the eastern coast of the Archipelago to <60 cm over the western areas adjacent to Shelikof Strait. Mountains, several over 1220 m with permanent glaciers, traverse more than half the length of Kodiak Island. Vegetation

ranges from Sitka spruce (*Picea sitchensis*) forest on the northern end of the Archipelago to treeless tundra on the southern end of the Archipelago. The approximate locations of the seven Kodiak road system nest box lakes, Karluk Lake, and Hidden Basin are depicted in Figure 2.

Recommended Methods

1. An extension ladder is used to access the nest boxes to assess their status with the exception of the nest boxes at ground level at Lee, Caroline, and Aurel Lakes due to lack of large trees in the vicinity.
2. A minimum single annual nest box check for usage is recommended during the period 15 May to 15 August.
3. Banding capture of hens should be attempted during the period 15 May to 1 July which increases the probability the clutch hasn't hatched out yet and the hen will still be occupying the box.

   A small landing net attached to an adjustable pole (Figure 3) is put in position over the box entrance prior to placement of the ladder and is used to capture incubating hens at occupied nest boxes for banding. Captured hens have standard body measurements taken and are banded with standard 7A stainless steel bands provided by the US Bird Banding Laboratory.
4. The number of eggs, young, or egg membranes from hatched eggs found in the nest boxes are used to estimate clutch size (CS) and hatching success (HS). Membranes estimated to be more than 60% the size of a whole egg are counted as a single egg (Figure 4).
5. Wood shavings are added to boxes as needed in order to maintain adequate amounts of nesting material in the box. When an early period box check is conducted and unhatched clutches are present in the boxes, shavings should still be added to the box beneath the eggs. A wood shaving depth in of >2 inches appears to be a major factor in the initial and continued use of a nest box.

The 2014 box checks on the 26 Kodiak road system nest boxes and 21 Karluk Lake boxes located on the Kodiak National Wildlife Refuge were conducted from 26 May to 6 Aug, 2014.

Results

Of a total of 47 project nest boxes installed on the eight Kodiak lakes available for use by goldeneye in 2014, the 16 goldeneye occupied boxes (34%) had an estimated average clutch size (CS) of 7.2 eggs/box. The single nest box used by a common merganser (*Mergus merganser*) contained a clutch of 7 eggs. Nest box clutch sizes ranged from 1-18 eggs/box.

Estimated 2014 hatching success for the 16 boxes with goldeneye clutches was only 63% with 5 clutches having 1-12 unhatched eggs and four clutches containing only all unhatched eggs.. A Karluk Lake nest box (KL-12) contained 18 unhatched eggs, establishing a new project record size clutch. However, no down was present in the box, indicating the clutch was likely never incubated and/or a product of a multiple hens dumping eggs in the box.

Road system and Karluk Lake nest box installation dates and use histories from 2010-2014 nesting seasons are presented in Tables 1 and 2, respectively. Results from each of the project lakes are as follows:

Orbin Lake

Nest box OL-1 was checked for activity on 26 May and contained 12 eggs covered with down but no hen was present in the box. When the box was rechecked on 9 June, all 12 eggs were still present but no longer covered by down and were cold to the touch. Box OL-1 was again checked on 28 June and the clutch of 12 eggs were still present (Table 1;Figure 6) indicating the clutch was abandoned. The unhatched eggs were removed from the box and shavings added.

Nest box OL-2 was visited on 26 May and contained a 10 egg clutch covered with down but again no hen was present in the box. OL-2 was checked again on 9 June and only one unhatched egg remained (Table 1;Figure 6). It was removed and the other 9 egg membranes were collect before shavings were added.

Despite several attempts, the hen using box OL-2 in 2014 was not captured, and it is not known whether this was the hen whose banded leg was recovered from Lee Lake by Kodiak NWR volunteer, D. Hernandez, on 28 June, 2014.

No hens with broods or lone broods of Barrow's goldeneye were seen on Orbin Lake at any time during 2014.

Lee Lake

Nest box LL-1 (Table 1;Figure 6) was checked 10 June. The goldeneye hen incubating a clutch of 4 eggs was captured and banded. LL-1 was re-checked 21 July to find all 4 eggs hatched. The 4 egg membranes were collected and shavings added.

A Barrow's goldeneye hen with a brood of 6 ducklings were observed on Lee Lake 16 June and reported by local resident, D. Hueman. While certainly this is not the brood from nest box LL-1, at least two goldeneye hens have been found to nest on Lee Lake in the past. No other Lee Lake brood observations were made.

The fate of the first project hen banded from box LL-1 in 2012 is unknown.

Caroline Lake

When box CL-1 was installed on Caroline Lake on 4 April 2013, the lake was still completely covered with ice and the box went unused last year. A Barrow's goldeneye hen was present on Caroline Lake when Box CL-1 was checked for 2014 use on 14 June (Table 1;Figure 6). A Barrow's goldeneye hen that was found in the box with 7 newly hatched young was captured and banded. The goldeneye hen on the lake remained, calling during the approximately 5 minutes required to band the captured hen. About 10 minutes after the banding release and immediately departing the area of the box, a single hen was observed flying off Caroline toward adjacent Aurel lake.

The brood was observed to have left the box and joined the hen on the lake approximately 40 minutes after hen's banding release.

Egg remnants were collected and shavings added to CL-1 on 26 June. No waterfowl were observed on Caroline during the box maintenance visit. However, a Barrow's goldeneye hen with a single approximately 2 week old young was observed on adjacent Aurel Lake the same day and may have been all the remained of box CL-1's 14 June brood of 7.

Aurel Lake

A new project nest box, AL-1 was installed at Aurel Lake on 1 April, when the lake was still ice covered. Unfortunately, like box CL-1, that was installed prior to ice going out on adjacent Caroline lake in 2013, AL-1 was unused during it's first year of availability and was found empty when checked 14 June (Figure 6;Table 1). A Barrow's goldeneye hen approached to within about 100 meters calling as box AL-1 was being checked. Hopefully, this hen has claimed AL-1 for the 2015 nesting season.

The goldeneye hen with the single young observed 26 June on Aurel Lake that was mentioned above in the Caroline summary was the only waterfowl species seen on the lake.

Buskin Lake

BL-9, the other new project box, was part of a nest box decoying experiment described in the 2013 progress report.. The box's initial fall 2013 installation location on a old WWII era piling ~20ft from shore was sheared off when a record January rainfall caused the frozen lake ice to breakup and go out suddenly. BL-9 was installed at the current location immediately onshore of the 2013 location on 5 Feb after the lake had refrozen (Figure 6).

The decoying experiment was resumed 11 April with area in front of BL-9 photographed every 5 minutes by a game camera. Despite the 14 May presence of a pair of Barrow's goldeneye captured by the camera in the vicinity of BL-9 for over 40 minutes, the box had not been used when checked 16 May or when rechecked on 13 June.

The original 8 Buskin Lake boxes were checked 14 June, Box BL-3 had been used by a red squirrel but the remaining seven boxes had no use activity (Table 1;Figure 6).

A local resident, B. Donaldson, reported observing a Barrow's goldeneye hen with 4 nearly grown young along the northern shore of Buskin Lake just east of box BL-1 on 27 July.

Lake Rose Tead

Lake Rose Tead nest boxes were checked to determine activity status on 27 June. Red squirrel (*Tamiasciurus hudsonicus*) activity was again found in 7 boxes with RT-2 and RT-3 the only boxes spared from being stuffed with moss by the squirrels (Table 1;Figure 7).

Two pair, plus several extra males, of Barrow's goldeneye were observed doing breeding displays on Lake Rose Tead on 10 May. A Barrow's golden hen was observed flying near box RT-3 on 27 June. A lone common merganser hen was also seen on the lake that same day.

Kalsin Pond

In an attempt to attract goldeneye nesting use and stop continued red squirrel use, nest box KP-1, was moved to the north side of the Kalsin Pond on 8 Jan, prior to the nesting season (Figure 7).

The annual use checks carried out on 28 June showed the KP-1 move to be unsuccessful as red squirrel debris was again found in the box at the new location. Box KP-2 was again void of any kind of use. However, box KP-3 had been used for the first time since the box's May 2010 installation by a common merganser hen which hatched out a clutch of 7 eggs (Table 1;Figure 7). Figure 5 illustrates the basic coloration differences between the 2 species's egg shell and membrane colors used in determining which cavity nesting waterfowl species used KP-3. The shavings were replenished in all three boxes.

A Barrow's goldeneye hen with a single young was observed on the north end of Kalsin Pond

near KP-1 during the 28 June box check. Also present on Kalsin Pond that same day were a common merganser hen with 7 young, a mallard hen with 3 young, an American wigeon hen with 9 young, and a brood of 10 American wigeon without a hen. All the young ducklings were estimated to be less than 2 weeks old.

Karluk Lake

The 21 Karluk Lake nest boxes were checked for use activity on 5 and 6 August (Figure 8). Eleven of the 21 boxes had been used by Barrow's goldeneye during 2014, resulting in a box occupancy rate of 52%, that was down considerably from the 67% and 60% occupancy rates in 2013 and 2012, respectively (Table 2).

The 2014 estimated average clutch size for the 11 of 21 Karluk Lake nest boxes containing eggs was 7.2 eggs/clutch, down from 13 of 21 boxes with 7.4 eggs/clutch in 2013, but up from the 11 boxes in 2012 with 4.6 eggs/clutch and seven boxes with 5.6 eggs/clutch in 2011. Three Karluk nest boxes contained only unhatched eggs with box KL-12 having 18 unhatched eggs setting a new project clutch record. None of the 3 boxes with only unhatched eggs had any down in the box indicating these clutches had likely not been incubated. The record clutch was likely the result of hen(s) dumping eggs rather than a single individual. While box KL-4 contained only a single unhatched “dumped ” egg, this was the first time the box had any kind of use since being installed in 2005. Additionally, 4 other Karluk nest boxes with successfully hatched out egg membranes also had 1 to 4 unhatched eggs. The overall presence of the unhatched eggs resulted in an estimated record low HS of 63% for the 11 nest box clutches (Figure 8).

All the hatched egg membranes were collected and all boxes had shavings added. Two Karluk nest boxes that had never been used, KL-8 and KL-14, were moved to what are hoped to be locations that will attract future nesting goldeneye hens.

Comparisons of goldeneye occupancy of each of the Karluk nest boxes and current locations can be found in Table 2.

A brood of 3 Barrow's goldeneye young unaccompanied by a hen but close to flight were observed on 6 Aug near Halfway Creek.

Hidden Basin

Lynne and Wayne Murphy provided following information that was collected from six of their seven nest boxes positioned within a 230 meter circle adjacent to salt water at their Hidden Basin homestead (Figure 4). Box HB7 fell down and was not available for nesting use in 2014. They checked their boxes by ladder and photographed the box interiors to determine the extent of goldeneye use. Three of six boxes contained evidence of eggs or egg fragments resulting in an occupancy rate of 50%. Boxes HB1 and HB3 were used by goldeneye, having a minimum of three hatched membranes and HB6 a minimum of two membranes.

Discussion

While the cause(s) for the unusually large number of unhatched eggs in project nest box clutches during 2014 can only be speculated, a record warm May with only 20% of the average precipitation for the month could certainly have played a part. How or whether the warm dry May conditions may have also influenced the lack of box use, numbers of unhatched eggs, and poor hatching success seen in the nest boxes on Karluk Lake's northern

half (Figure 8) during 2014 cannot be determined. Perhaps the southern portion of Karluk Lake contains better goldeneye habitat, and was not as impacted by the unfavorable spring weather conditions, or there was some other factor(s) unrelated to the spring weather that was a mitigating component. Overall, the project nest boxes located on Karluk Lake's southern portion would appear to have had higher use and productivity to date (Table 2).

Barrow's goldeneye use of project road system nest boxes continues to be dominated by the smaller lakes (<20 acres) as another new small lake nest box on Caroline Lake installed in 2013 was used during 2014. With at least one large lake project box (KP-3) used by a different cavity nesting waterfowl species, a common merganser, perhaps there is hope that boxes on the 2 other large road system project lakes will also attract use. Observations of pairs of Barrow's goldeneye and even broods on all 3 of the larger road system lakes should raise the likelihood of use. In reality, this has not been the case despite moving 2 of the large road system lake nest boxes. However, there could still be hope that the 2 moved boxes may attract nesting goldeneye hens since during the course of the project, the majority of the newly installed nest boxes did not get any use until the second nesting season (Tables 1 & 2).

Squirrel use of installed project nest boxes on all the 3 large road system lakes has been problematic since the project was started (Table 1). Nest box occupation by red squirrels has undoubtedly been a factor in the road system lakes nest box use differences. While even moving locations as with KP-1, additional nest boxes on these 3 larger lakes will likely also have to be moved to combat future red squirrel incursions into the nest boxes.

The experiment initiated in 2013 to attract goldeneye hens to a new project nest box, BL-9, at Buskin Lake's outlet (Figure 6) was unsuccessful in attracting any goldeneye hen use. Despite photographs of several goldeneye hens captured by the game camera set up looking directly at the nest box in early May, the box was not used in 2014. Given the probability of use patterns seen with other new project nest box installation (Table 1), perhaps box BL-9's place as the first project nest box to be used on Buskin Lake will happen in 2015.

The capturing of a second goldeneye hen to use box LL-1 may indicate possible competition for that nesting box, low annual hen survival, or even a reflection of the unusually warm dry 2014 spring weather. The fortuitous 28 June recovery of the goldeneye leg with the band attached at Lee Lake from the hen captured box OL-2 in 2012 would add support to the second alternative. Since the band recovery at Lee occurred nearly 3 weeks after box OL-2's 2014 clutch was gone from the box at nearby Orbin Lake, the only thing that is certain is that it will be a different hen in the box if OL-2 is used in 2015.

Capture and banding of project nest box hens is planned to be continued for the 2015 nesting season. Adding to the number of project banded goldeneye can only increase our capability to gain knowledge about Kodiak's resident female Barrow's goldeneye nesting population annual survival data and reproductive capabilities.

Acknowledgment

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well as providing equipment needed to check the Karluk Lake nest boxes. The Alaska Department of Fish and Game, Division of Wildlife Conservation for their cooperation and expertise. Lastly, Dave Jackson for his assistance with the road system boxes, capture and banding, and taking photographs.

Table 1. Installation dates and goldeneye use of project road system nest boxes 2010-2014.

Nest Box	Install Date	Lake	2010	2011	2012	2013	2014
AL-1	04/01/2014	Aurel	-	-	-	-	NU
CL-1	04/04/2013	Caroline	na	na	na	P	C7-H7
LL-1	06/19/2011	Lee	na	na	C5-H5	C7-H5	C4-H4
OL-1	02/25/2010	Orbin	NU	NU	C14-H12	C15-H13	C12-H0
OL-2	03/01/2011	Orbin	na	C8-H5	C7-H6	C13-H12	C10-H8
BL-1	07/13/2010	Buskin	na	NU	NU	NU	NU
BL-2	07/13/2010	Buskin	na	P	NU	NU	NU
BL-3	07/13/2010	Buskin	na	SU	NU	NU	NU
BL-4	07/13/2010	Buskin	na	P	NU	NU	NU
BL-5	07/13/2010	Buskin	na	P	NU	NU	NU
BL-6	07/13/2010	Buskin	na	P	NU	NU	NU
BL-7	07/13/2010	Buskin	na	P	NU	NU	NU
BL-8	07/13/2010	Buskin	na	P	NU	NU	NU
BL-9	02/05/2014	Buskin	-	-	-	-	NU
KP-1	05/10/2010	Kalsin	NU	SU	SU	SU	SU
KP-2	05/10/2010	Kalsin	NU	P	NU	NU	NU
KP-3	05/10/2010	Kalsin	NU	SU	NU	NU	*C7-H7*
RT-1	04/29/2010	Rose Tead	NU	P	SU	SU	SU
RT-2	04/29/2010	Rose Tead	NU	P	NU	NU	NU
RT-3	04/29/2010	Rose Tead	NU	NU	NU	NU	NU
RT-4	04/29/2010	Rose Tead	NU	SU	SU	SU	SU
RT-5	04/29/2010	Rose Tead	NU	SU	SU	SU	SU
RT-7	05/04/2010	Rose Tead	NU	SU	SU	SU	SU
RT-8	05/04/2010	Rose Tead	NU	SU	SU	SU	SU
RT-9	05/04/2010	Rose Tead	NU	SU	SU	SU	SU
RT-10	05/04/2010	Rose Tead	NU	SU	SU	SU	SU

na = not installed yet
C# = estimated clutch size
H# = estimated number of eggs hatched
NU = not used
P = nest cup formed in box but no down
SU = Box used by red squirrel
Italics = use by common merganser

Table 2. Installation dates, goldeneye use history of Karluk Lake project nest boxes 2010-14, plus Karluk's 2014 estimated total number of eggs, unhatched eggs, estimated number of eggs per box clutch, percentage of box use, and estimated hatching success.

Nest Box	Install date	2010	2011	2012	2013	2014
KL-1	06/19/05	NU	NU	3	4	NU
KL-2	06/19/05	NU	NU	5	6	NU
KL-3	06/19/05	NU	NU	4	6	NU
KL-4	06/19/05	NU	NU	NU	NU	1*
KL-5	06/26/05	U	NU	5	6	NU
KL-6	07/11/10	na	NU	7	2	2*
KL-7	06/26/05	NU	9	NU	8	7-2*
KL-8	06/11/06	NU	NU	NU	NU	M
KL-9	06/11/06	U	NU	8	10	10-1*
KL-10	07/08/10	na	6	12	12	9-1*
KL-11	07/11/10	na	2	NU	3	5-4*
KL-12	07/11/10	na	7	NU	8	18*
KL-13	07/07/10	na	NU	**M**	NU	NU
KL-14	07/11/10	na	NU	NU	NU	M
KL-15	07/11/10	na	NU	NU	13	6
KL-16	07/09/10	na	5	2	5	3
KL-17	07/09/10	na	NU	2	NU	6
KL-18	07/09/10	na	NU	NU	P	NU
KL-19	07/09/10	na	NU	7	3	NU
KL-20	07/10/10	na	4	NU	NU	NU
KL-21	07/10/10	na	8	5	NU	4

* # Unhatched eggs

na = not installed yet
U – used in 2010 no clutch data
NU = not used
# = estimated clutch size
M – moved due to lack of use

	2014
Total Eggs	79
Unhatched	29
Eggs/Clutch	7.2
Hatch Succ.	63%
Box Use	52%

Figure 1. Location of the Kodiak Island Archipelago.

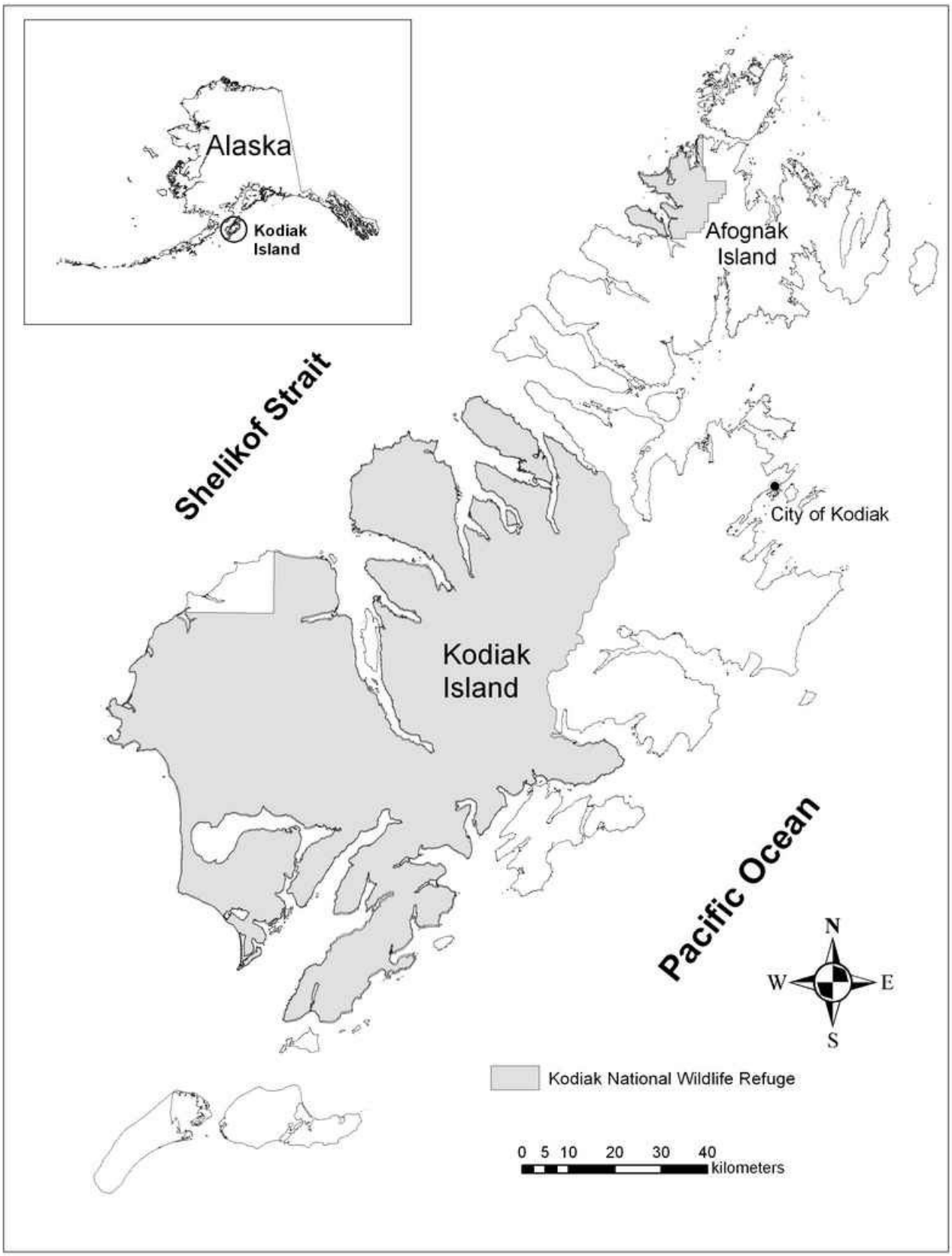

Figure 2. Kodiak Island Goldeneye Project nest box study locations in 2014.

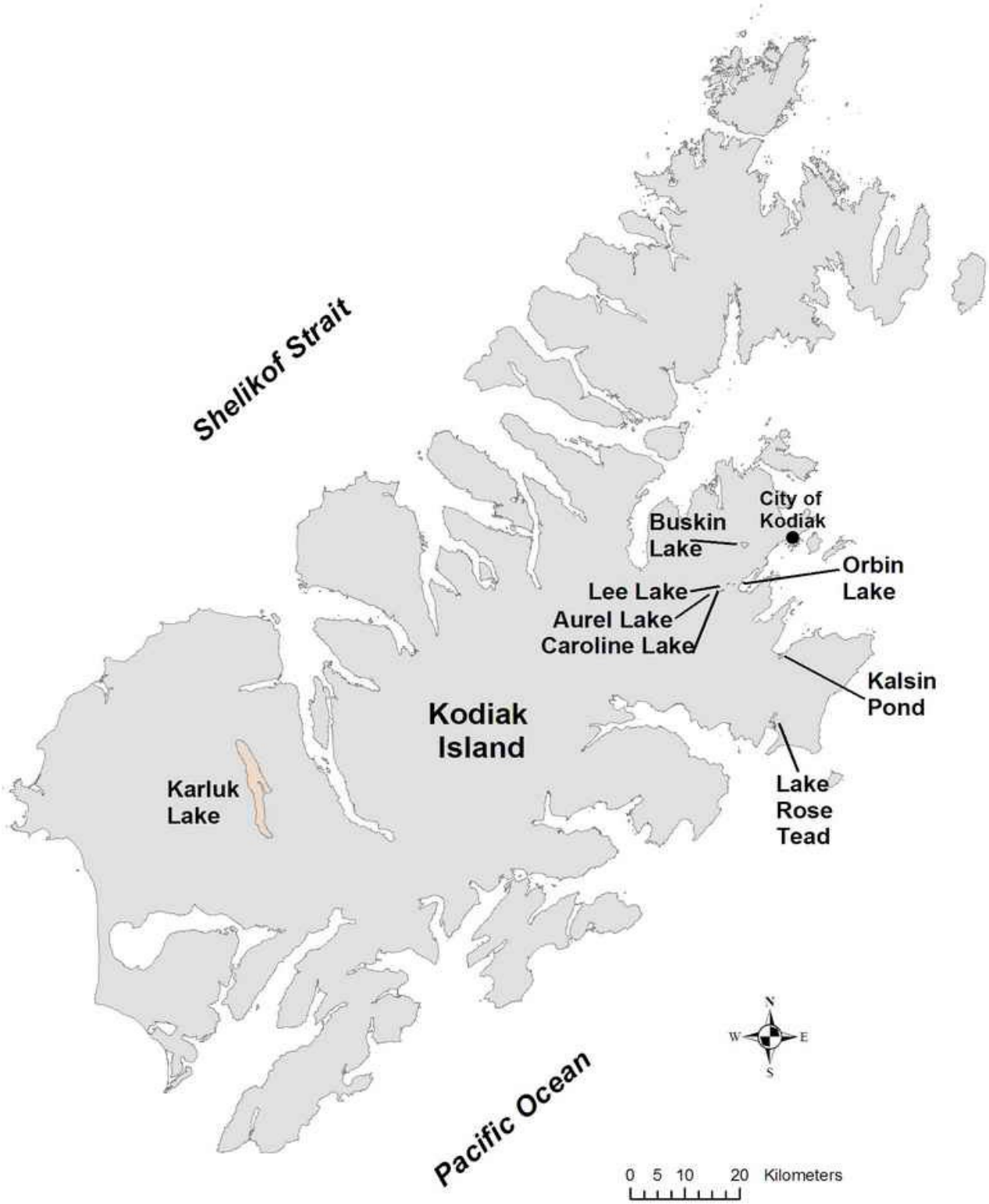

Figure 3. Landing net attached to the adjustable pole used to capture nest box hens.

Figure 4. Examples of a >60% Barrow's goldeneye egg membrane remnant's size. Each remnant of this size is counted as a single hatched egg.

Figure 5. Common merganser (above) and Barrow's goldeneye (below) egg shell and membranes.

Figure 6. Buskin, Orbin, Lee, Caroline, and Aurel Lakes nest box locations with alpha code nest box names on each of the project lakes.

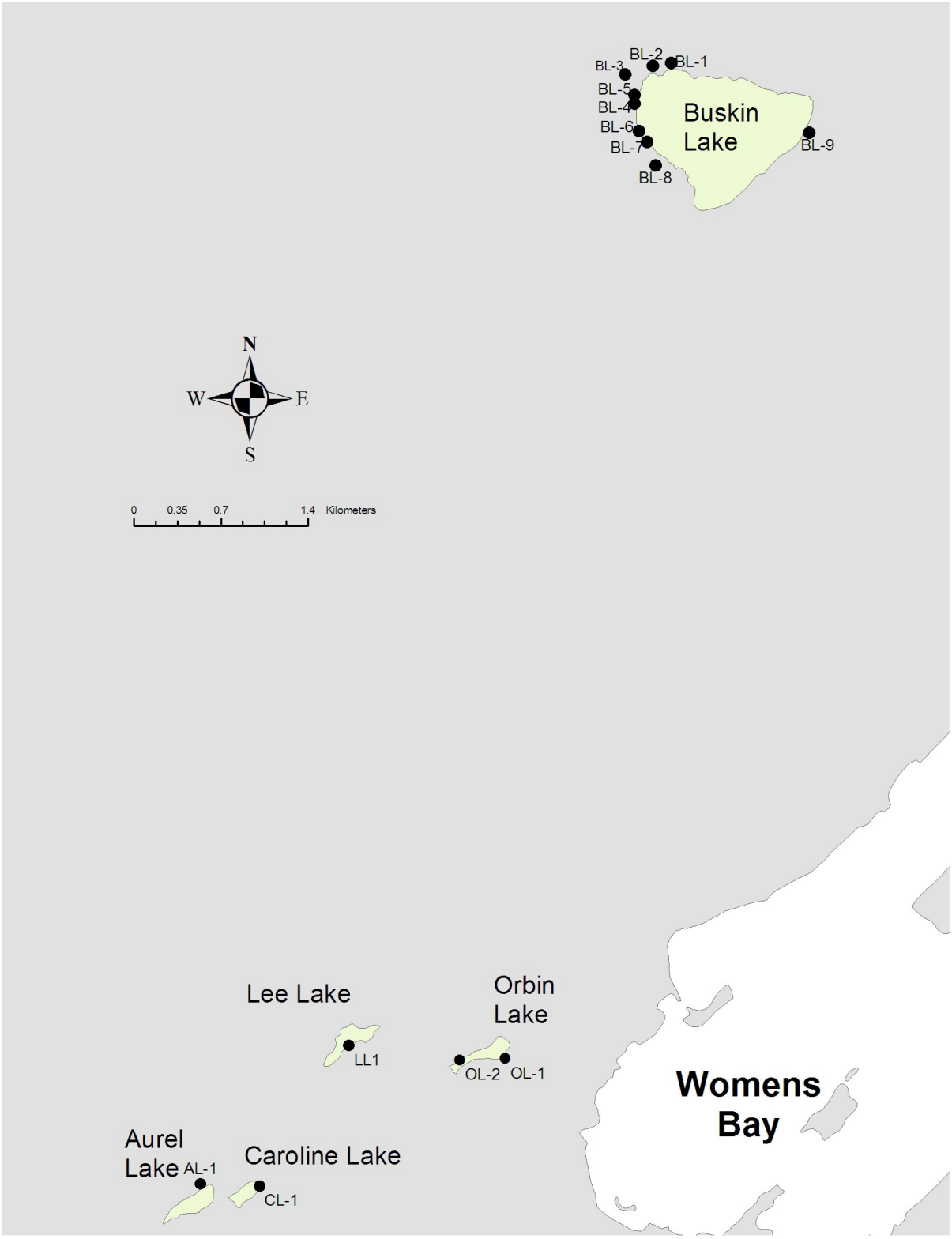

Figure 7. Kalsin Pond and Lake Rose Tead 2014 nest box locations with alpha code nest box names on each project lake.

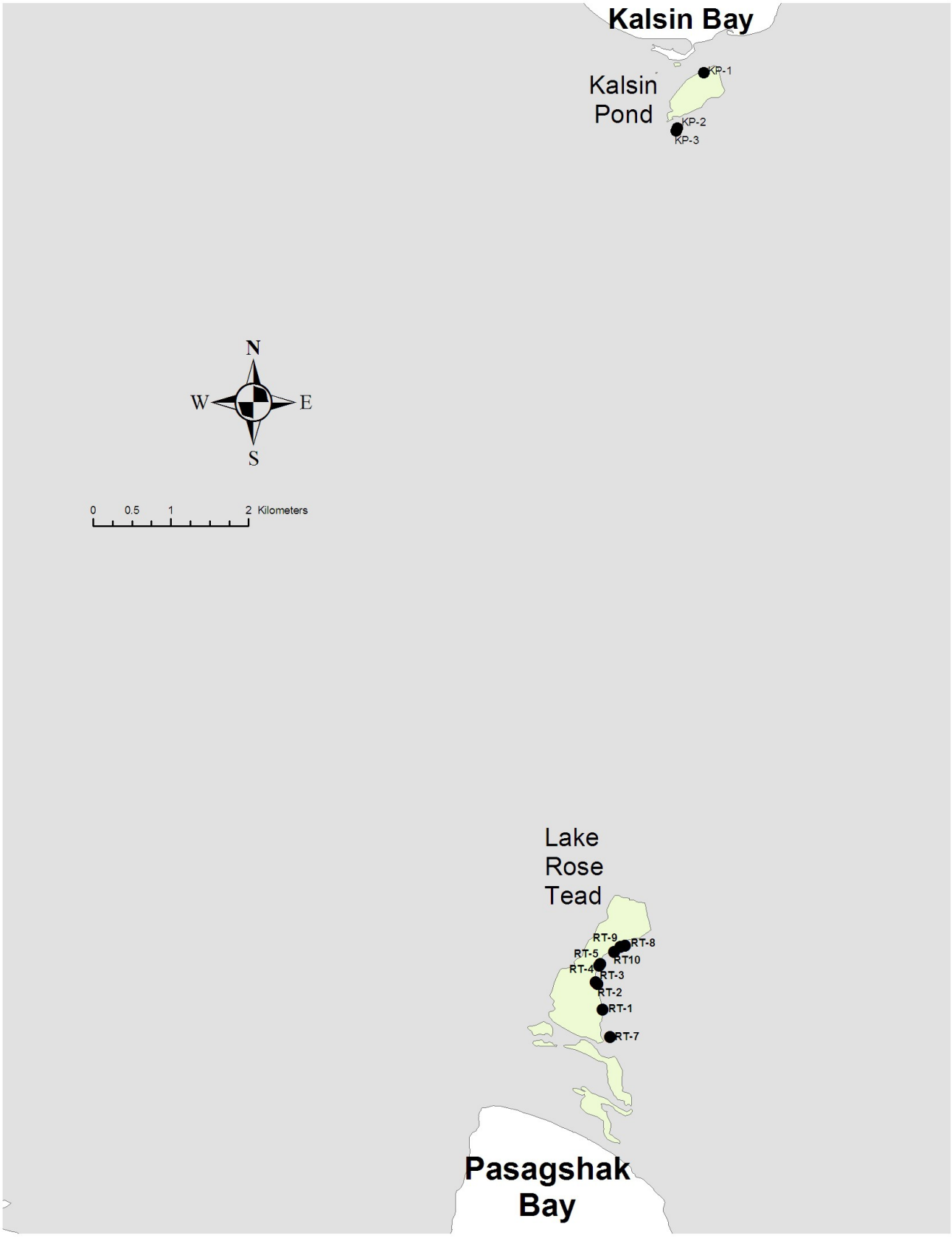

Figure 8. Map of Karluk Lake nest boxes with individual box labels, their locations on the lake, 2014 boxes used, 2014 boxes with unhatched eggs only, and boxes that were empty in 2014, along with the nest boxes moved in 2013 & 2014.