

Kodiak Island Cooperative Goldeneye Nest Box Project 2016 Progress Report



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

Cover photo- Barrow's goldeneye hen banded from Karluk Lake nest box KL-6 prior to release after banding on June 14, 2016. The hen proceeded to hatch out the complete project record 18 egg clutch. Photograph courtesy of Laura Kromrey, Kodiak NWR volunteer.

Executive Summary

During the period 15 May to 6 August, 2016, nest boxes located at eight different lakes on the Kodiak road system and Karluk Lake on the Kodiak National Wildlife Refuge were checked by the author(s). Aurel Lake nest box AL-1 had the door blown off and Karluk Lake box KL-17 tree blew down reducing the total number of project boxes available in 2016 to 45.

Occupancy rate of available project nest boxes used by Barrow's goldeneye (*Bucephala islandica*) hens was 38% (17 of 45 boxes) in 2016, matching 2015 and higher than the previous 5-year average of 31% occupancy. Three of the Buskin Lake nest boxes moved in 2015, were successfully used by common mergansers (*Mergus mergus*) during the 2016 nesting season, increasing the total 2016 nesting waterfowl project nest box occupancy rate 44%.

The 2016 estimated average clutch size of 9.3 eggs (range 1-18 eggs) that occurred in the 17 occupied project goldeneye boxes was a substantial increase from the previous 5-year annual average of 6.9 eggs per clutch from 2011 to 2015. Box KL-6 hatched out a project record 18 egg clutch. Similar to 2014 and 2015, unhatched eggs (N=21) were found in 4 project nest boxes during 2016. Nest boxes, NL-1 and KL-18 contained only unhatched eggs with non-incubated clutches of 1 and 17, respectively. The 2016 estimated hatching success of 80% from known outcome nest boxes (N=14) was higher than the 76% in 2015 and slightly lower than the previous 5-year project mean hatching success of 85%.

Capture and banding of goldeneye hens using project nest boxes continued in 2016 with 7 Barrow's goldeneye hens and 3 common merganser hens captured and banded during the 2016 nesting season.

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. To date, over 550 Barrow's goldeneye young have been hatched from project nest boxes.

Introduction

Kodiak Island is located at the far western edge of Barrow's goldeneye (*Bucephala islandica*) range. The species 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 eight 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 2016 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 15 May to 6 August.

Results

Over winter, Aurel Lake nest box AL-1 door was blown off and Karluk Lake box, KL-17's tree blew down reducing the total number of project boxes available in 2016 to 45 (Tables 1 and 2). Of a total of 45 project nest boxes installed on the nine Kodiak lakes available for use in 2016 (Figures 2, 5, 6, & 7), 17 boxes were occupied by goldeneye (38%) and had an estimated average clutch size (CS) of 9.3 eggs/box (Tables 1 and 2). Three project nest boxes were used by common mergansers with an average clutch of 8.7 eggs/box increasing the total 2016 cavity nesting waterfowl box occupancy rate to 44% (Table 2). Nest box clutch sizes ranged from 1-18 eggs/box during 2016 (Tables 1 and 2).

Estimated 2016 hatching success (HS) for the 14 of 17 nest box clutches checked was 80% with 4 clutches having 1-17 unhatched eggs. Two of those clutches contained only

unhatched eggs with no down, indicating incubation was never initiated. Additionally, nest boxes KL-21 and OL-1, each had 2 dead young along with the hatched out membranes but were included as unhatched in the determining the goldeneye's 2016 HS (Tables 1 and 2). The 3 common merganser clutches contained only 1 unhatched egg for a HS of 97% (Table 1).

All road system and Karluk Lake nest box results, installation dates and use histories from 2010-2016 nesting seasons are presented in Tables 1 and 2, respectively. An annual project summary of nest boxes available, number used with percent used, total eggs laid in all used boxes, mean clutch size per nest box, and number eggs hatched with percent hatching success along with 2016 comparison to past averages of these categories are presented in Table 3.

Individual project lake results ordered by first visit date are as follows:

Buskin Lake

The Buskin Lake nest box BL-9 (Table 1)(Figure 5) was initially checked on 15 May and was found to be occupied by a common merganser hen with a clutch of 9 eggs. Box BL-8 (Table 1)(Figure 5) was also occupied by a common merganser hen with a clutch of 9 eggs and when checked on 5 June, the hen was captured and banded. The remaining 7 Buskin nest boxes (Table 1)(Figure 5) were checked for activity on 8 June. Six of the boxes were inactive, however, box BL-3 was found to be occupied by a common merganser hen with a clutch of 8 eggs which was also captured and banded. Box BL-9 was also revisited on 8 June resulting in the capture and banding of the common merganser hen occupying that nest box. The 3 active Buskin Lake nest boxes occupied by the merganser hens had a HS of 97% when checked on 6 August with only a single unhatched egg in box BL-9's clutch of 9 eggs. All boxes had shavings added. Boxes BL-3, BL-8, and BL-5 were moved to new locations.

Orbin Lake

Nest box OL-1 (Table 1)(Figure 5) moved ~75 feet down slope to the road right-of-way immediately adjacent to Orbin Lake in 2015 was checked for activity on 7 June. The box was not used but may have been prospected as a nest cup depression had been formed in the box's shavings but no down was present.

Nest box OL-2 (Table 1)(Figure 5) was visited on 7 June and contained a 5 egg membranes and 2 dead young goldeneye. The membranes were collected and dead young removed before shavings were added.

No hens with broods or lone broods of Barrow's goldeneye were seen on Orbin Lake at any time during 2016.

Nyman Lake

Nest box NL-1 was checked for activity on 8 June and was found to contain a single unhatched egg. The egg was not covered by down indicating it was never incubated. The egg was removed and more shavings were added to the box.

Lee Lake

Nest box LL-1 (Table 1)(Figure 5) was checked 12 June. The box was a third full of moss from a red squirrel (*Tamiasciurus hudsonicus*). The 2016 nesting season is the first time LL-1 had not been used by goldeneye since the box was installed in 2011. No goldeneye or other waterfowl with or without broods were observed on the lake. The moss was removed and

more shavings were added.

Caroline Lake

Box CL-1 was checked for use on 12 June (Table 1)(Figure 5). A goldeneye hen incubating a clutch of 5 eggs in the nest box was captured and banded. The box was checked again on 11 July and all 5 eggs had hatched out. The egg membranes were collected before shavings were added.

Aurel Lake

Box AL-1 was checked 12 June (Figure 5)(Table 1). The nest box door was completely missing, apparently blown off by the wind. The door was replaced and more shavings added.

Karluk Lake

The 21 Karluk Lake nest boxes were checked for use activity on 13-15 June . The cottonwood tree supporting box KL-17 had blown over during winter 2016 leaving 20 boxes available for nesting use (Figure 7). Fourteen of the remaining 20 boxes were used by Barrow's goldeneye during 2016 (Table 2), resulting in a box occupancy rate of 70%, up from Karluk Lake's previous 5 year average occupancy of approximately 53%.

The 2016 estimated average clutch size (CS) for the 14 Karluk Lake nest boxes in use was an amazing 10.3 eggs/clutch (range 6-18)(Table 2). This is up considerably from the 6.4 eggs/clutch the Karluk nest boxes averaged for the first 5 years of the project.

Of the 14 active nest boxes located during June, 5 of the boxes had clutches that had already hatched out. Two boxes, KL-4 and KL-19 (Figure 7), also contained a single unhatched egg. Box KL-18 (Figure 7) contained 17 eggs but no down covering the eggs indicating this was "dump nest" and was not or would be incubated. The remaining 8 Karluk Lake nest boxes used in 2016 contained hens actively incubating clutches. Six of these 8 hens were captured and banded. The hen captured in box KL-6 (Figure 7) was incubating a project record clutch of 18 eggs. The entire 18 egg clutch was hatched out when the box was checked on 18 July. Kodiak National Wildlife Refuge volunteers, D. Hernandez and L. Kromrey also re-checked the hatching success of the hens banded from nest boxes KL-6, KL-13, KL-15, KL-16, and KL-21 on 18 July. Unfortunately, Box KL-21 had 2 dead hatched out goldeneye young but all the eggs in the remaining clutches had successfully hatched. Egg membranes and dead young were removed from the boxes and saved with shavings added to all 5 boxes. The volunteers also replaced a missing nail needed to hold the door closed on nest box KL-16.

The 2016 estimated hatching success (HS) for the 11 of 14 active Karluk Lake nest boxes with a known outcome was 81% which is down from the previous 5 year project average HS of 95% for Karluk Lake's nest boxes.

All the hatched egg membranes were collected and shavings added. Nest box KL-17 that blew down was re-installed in a tree near the vicinity of the box's original Meadow Creek location (Figure 7).

Kalsin Pond

The status of the 3 Kalsin Pond nest boxes was checked on 19 June (Table 1)(Figure 6). Box KP-1 contained a red squirrel nest that was removed, and the other 2 boxes showed no sign of activity. All three boxes had the shavings replenished.

Lake Rose Tead

Lake Rose Tead nest boxes were checked to determine activity status on 19 June (Figure 6).

Red squirrel activity was again found in 5 boxes with RT-2 and RT-3 the only boxes spared from being stuffed with moss by the squirrels (Table 1). Moss was removed and shavings were added to all 7 boxes.

Hidden Basin

Lynne and Wayne Murphy provided the following information that was collected from their seven nest boxes positioned within a 230 meter circle adjacent to salt water at their Hidden Basin homestead (Figure 4). They checked their boxes by ladder and photographed the box interiors to determine the extent of goldeneye use. Four of seven boxes contained evidence of eggs or egg fragments resulting in an occupancy rate of 57%. Boxes HB-1, HB-2, HB-3, and HB-7 were all successfully used by goldeneye during 2016. HB1 contained a minimum of 6 membranes and HB2 a minimum of 4 hatched out egg membranes. Box HB-3 set a new Kodiak Island record for an earliest brood hatch when a brood of 8 young goldeneye was seen with the hen on the morning of 26 May by the Murphys. In the afternoon on that same day, W. Murphy heard calling and rescued an additional late-hatched goldeneye which he placed in the water where the hen and brood had been seen that morning but were no longer visible. This increased the brood size to 9. It is not known whether the family was reunited. Box HB7, which had set a project record in 2015 for the latest brood hatched date, 7 August, 2015, also produced a brood in 2016 when a newly hatched out brood of 8 was observed nearby the box on 7 July, 2016. At least 2 other goldeneye broods not associated with their nest boxes were observed by the Murphy's in the Hidden Basin area during the 2016 nesting season.

Discussion

The National Weather Service reported that the summer of 2016 was the warmest on record for Kodiak Island after being preceded by near record warm winter and spring weather conditions. Summer 2016 also experienced well below average precipitation though not record-breaking. How these conditions may have influenced the Barrow's goldeneye 2016 nesting season is unknown but overall appeared to be positive (Table 3). The 2016 nesting season was also extraordinary for project nest boxes on several fronts including the mean clutch size and the record 26 May early goldeneye brood date observation made in Hidden Basin. The majority of the record production success was driven by Karluk Lake's goldeneye nesting population (Table 2). The 3 project nest boxes located on Karluk Lake's Camp Island (KL-6, KL-13, and KL-21)(Figure 7), alone hatched out 41 young goldeneye in 2016 with clutches of 8, 15, and 18, respectively (Table 2). Of the 14 active Karluk nest boxes, all but 1 (KL-16) had 2016 clutch sizes above the project's previous 5 year clutch size average of 6.9 eggs/ nest box (Tables 2 and 3) illustrating this year's phenomenal success.

While goldeneye use of the project's road system nest boxes did decrease in 2016, the occupation of 3 project Buskin Lake nest boxes by common mergansers did result in an increase in overall use of project road system boxes by waterfowl (Table 1). We are hopeful that there will be more goldeneye use of these Buskin Lake nest boxes (Figure 5). This optimism stems from the 2016 use after the boxes had been moved to their present locations last year with 1 of the nest boxes (BL-9) used by mergansers in 2016, also having been successfully used by a goldeneye hen in 2015. The reality that cavity nesting waterfowl now have knowledge of Buskin Lake project nest box locations will hopefully raise the probability of use by Barrow's goldeneye.

The lack of any goldeneye use or presence on Lee Lake (Figure 5) in 2016 is somewhat

troubling. Lee Lake has a history of annual multiple goldeneye brood observations even before a project nest box was installed on the lake. Hopefully the squirrel use of box LL-1 during 2016 will be an isolated incident and not a continuing onslaught. Diminished red squirrel use certainly hasn't been the case for the Pasagshak Lake Rose Tead nest boxes (Figure 6)(Table 1). However, a couple of those nest boxes haven't been occupied by red squirrels every year. Nest box occupation by red squirrels will undoubtedly continue to be a factor in road system nest box use differences particularly at Lake Rose Tead and Kalsin Pond box locations (Figure 6)(Table 1). Whether moving nest box locations promotes goldeneye use or just provides red squirrels new dens to stuff with moss remains to be seen. To date, it appears squirrels will continue to use a box if left in the same location and that use precludes any goldeneye hens from using the nest box.

Kodiak Island Cooperative Goldeneye Nest Box Project continues to provide nesting habitat and basic nesting ecology information from an increasing number of goldeneye hens. Since 2011, it is estimated over 550 Barrow's goldeneye young have been hatched from project nest boxes.

The numbers of Project banded Barrow's goldeneye continues to go up with the capture and banding of 7 more goldeneye from project nest boxes in 2016 which doubles the project banding total to 14 hens. There has been 1 project band return when the leg of the hen banded at box OL -2 in 2012 was found at Lee Lake in 2014. Increasing the sample size of banded hens can only increase our ability to gain knowledge about Kodiak's resident female Barrow's goldeneye and common merganser nesting population annual survival data and reproductive capabilities. This effort is planned to continue in 2017.

Acknowledgments

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Table 1. Installation dates and goldeneye use of project road system nest boxes 2010-2016.

Nest Box	Install Date	Lake	2010	2011	2012	2013	2014	2015	2016
AL-1	04/01/2014	Aurel	-	-	-	-	NU	C6-H6	NA
CL-1	04/04/2013	Caroline	na	na	na	P	C7-H7	C14-H0	C5-H5
LL-1	06/19/2011	Lee	na	na	C5-H5	C7-H5	C4-H4	C8-H0	SU
OL-1	02/25/2010	Orbin	NU	NU	C14-H12	C15-H13	C12-H0	NU	P
OL-2	03/01/2011	Orbin	na	C8-H5	C7-H6	C13-H12	C10-H8	C8-H5	C7-H5
BL-1	07/13/2010	Buskin	na	NU	NU	NU	NU	NU	NU
BL-2	07/13/2010	Buskin	na	P	NU	NU	NU	NU	NU
BL-3	07/13/2010	Buskin	na	SU	NU	NU	NU	NU	<i>C8-H8</i>
BL-4	07/13/2010	Buskin	na	P	NU	NU	NU	NU	NU
BL-5	07/13/2010	Buskin	na	P	NU	NU	NU	NU	NU
BL-6	07/13/2010	Buskin	na	P	NU	NU	NU	NU	NU
BL-7	07/13/2010	Buskin	na	P	NU	NU	NU	NU	NU
BL-8	07/13/2010	Buskin	na	P	NU	NU	NU	NU	<i>C9-H9</i>
BL-9	02/05/2014	Buskin	-	-	-	-	NU	C5-H4	<i>C9-H8</i>
KP-1	05/10/2010	Kalsin	NU	SU	SU	SU	SU	NU	SU
KP-2	05/10/2010	Kalsin	NU	P	NU	NU	NU	NU	NU
KP-3	05/10/2010	Kalsin	NU	SU	NU	NU	<i>C7-H7</i>	NU	NU
NL-1	04/29/2015	Nyman	-	-	-	-	-	-	C1-H0
RT-1	04/29/2010	Rose Tead	NU	P	SU	SU	SU	SU	R
RT-2	04/29/2010	Rose Tead	NU	P	NU	NU	NU	SU	NU
RT-3	04/29/2010	Rose Tead	NU	NU	NU	NU	NU	SU	NU
RT-4	04/29/2010	Rose Tead	NU	SU	SU	SU	SU	NU	SU
RT-5	04/29/2010	Rose Tead	NU	SU	SU	SU	SU	P	SU
RT-7	05/04/2010	Rose Tead	NU	SU	SU	SU	SU	R	R
RT-8	05/04/2010	Rose Tead	NU	SU	SU	SU	SU	SU	SU
RT-9	05/04/2010	Rose Tead	NU	SU	SU	SU	SU	SU	SU
RT-10	05/04/2010	Rose Tead	NU	SU	SU	SU	SU	NU	SU

na = not installed yet

NA = Not Available/Repairs needed

C# = estimated clutch size

H# = estimated number of eggs hatched

NU = not used

P = nest cup formed in box but no down

R = box removed

SU = Box used by red squirrel

Italics = use by common merganser

Table 2. Installation dates, goldeneye use history of Karluk Lake project nest boxes 2010-16, plus Karluk's 2016 box 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	2015	2016
KL-1	06/19/05	NU	NU	3	4	NU	0	0
KL-2	06/19/05	NU	NU	5	6	NU	2	0
KL-3	06/19/05	NU	NU	4	6	NU	0	12
KL-4	06/19/05	NU	NU	NU	NU	1*	5	9-1*
KL-5	06/26/05	U	NU	5	6	NU	0	7
KL-6	07/11/10	na	NU	7	2	2*	10	18
KL-7	06/26/05	NU	9	NU	8	7-2*	7	7
KL-8	06/11/06	NU	NU	NU	NU	M	0	0
KL-9	06/11/06	U	NU	7-1*	10-1*	10-1*	9	9
KL-10	07/08/10	na	6	12	12	9-1*	9	8
KL-11	07/11/10	na	2	NU	3	5-4*	8	0
KL-12	07/11/10	na	7	NU	9-1*	18*	0	10
KL-13	07/07/10	na	NU	M	NU	NU	4	15
KL-14	07/11/10	na	NU	NU	NU	M	0	0
KL-15	07/11/10	na	NU	NU	13-1^	6	6	11
KL-16	07/09/10	na	5	2-2*	5	3	3	6
KL-17	07/09/10	na	NU	2	NU	6	6	B
KL-18	07/09/10	na	NU	NU	P	NU	8	17*
KL-19	07/09/10	na	NU	7	3	NU	5	7-1*
KL-20	07/10/10	na	4	NU	NU	NU	0	0
KL-21	07/10/10	na	8	5	NU	4	0	8-2^

* # Unhatched eggs

^ # dead young

na = not installed yet

U – used in 2010 no clutch data

NU = not used

= estimated clutch size

M – moved due to lack of use

B – box tree blew down

14 of 20 Available-	%Box Use	2016
	Total Eggs	70%
	Eggs/Clutch	142
Known Outcome -	%Hatch Success	10.3
11 of 14 boxes	Unhatched Eggs	81%

2016

Bold box clutches not included in %Hatch Success

Table 3. Summary of the annual number of nest boxes available, number used with percent used, total eggs laid in all used boxes, mean clutch size per nest box, and number eggs hatched with percent hatching success.

Year	Boxes Available	#Boxes Used/ %	Total Eggs	Mean Clutch	#Hatched/ %
2011	42	8 / 19%	49	6.1	46 / 94%
2012	43	14 / 33%	87	6.2	80 / 92%
2013	45	16 / 36%	125	7.8	113 / 90%
2014	46	15 / 33%	112	7.5	69 / 62%
2015	47	18 / 38%	123	6.8	107 / 87%
2011-2015 Averages	44.6	14.2 / 32%	99.2	6.9	83 / 85%
2016	45	17 / 38%	158	9.3	-
		14* / 82%	127*	9.1*	101* / 80%

* - 2016 nest boxes with known hatching outcomes along with percentage of success.

Figure 1. Location of the Kodiak Island Archipelago.

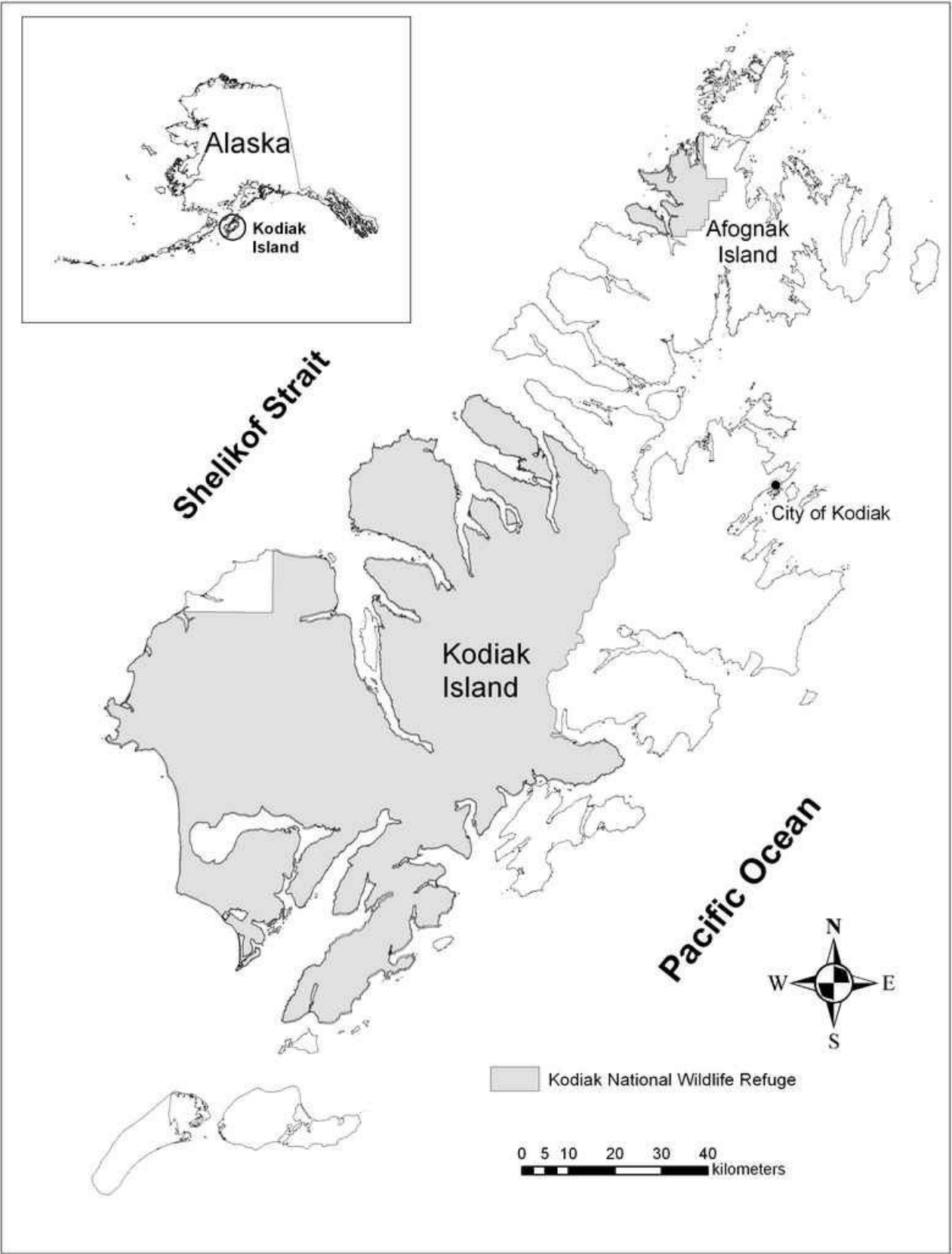


Figure 2. Kodiak Island Goldeneye Project 2016 nest box lake locations.

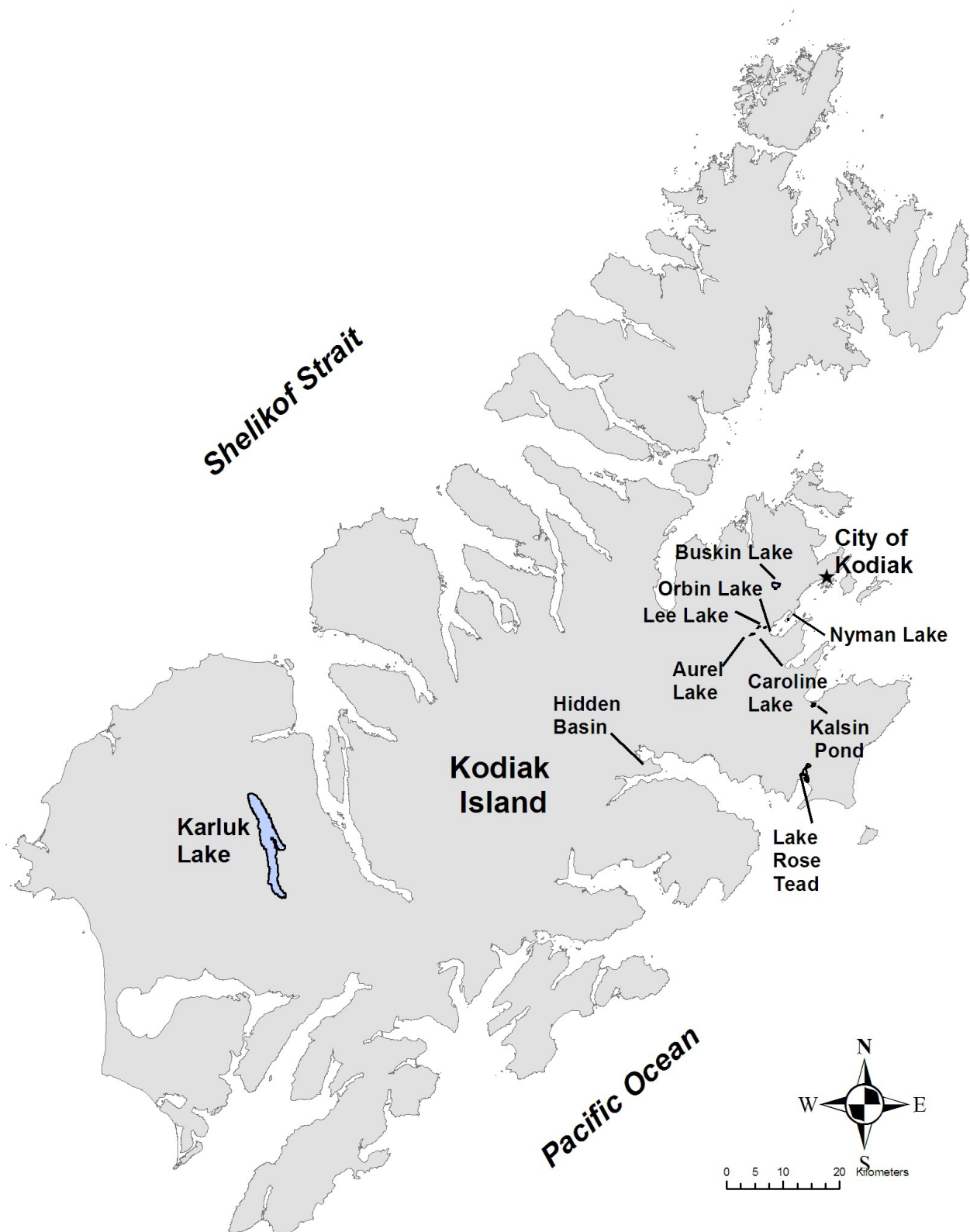


Figure 3. Landing net attached to the adjustable pole used to capture nest box hens.



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. Buskin, Nyman, Orbin, Lee, Caroline, and Aurel Lakes 2016 nest box locations with alpha code nest box names for each of the northern road system project lakes.

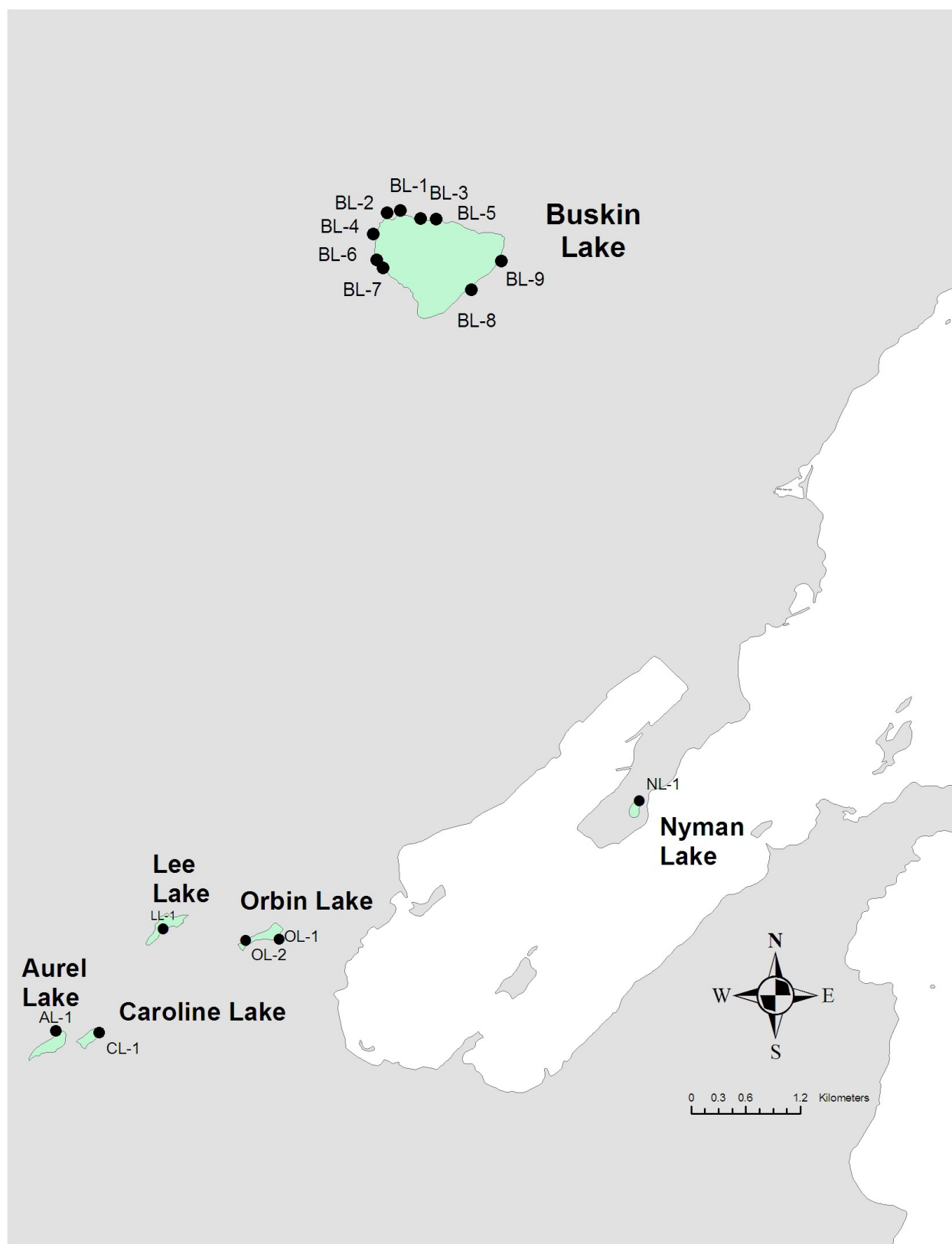


Figure 6. Kalsin Pond and Lake Rose Tead 2016 nest box locations with alpha code nest box names for each project lake on southern Kodiak road system.

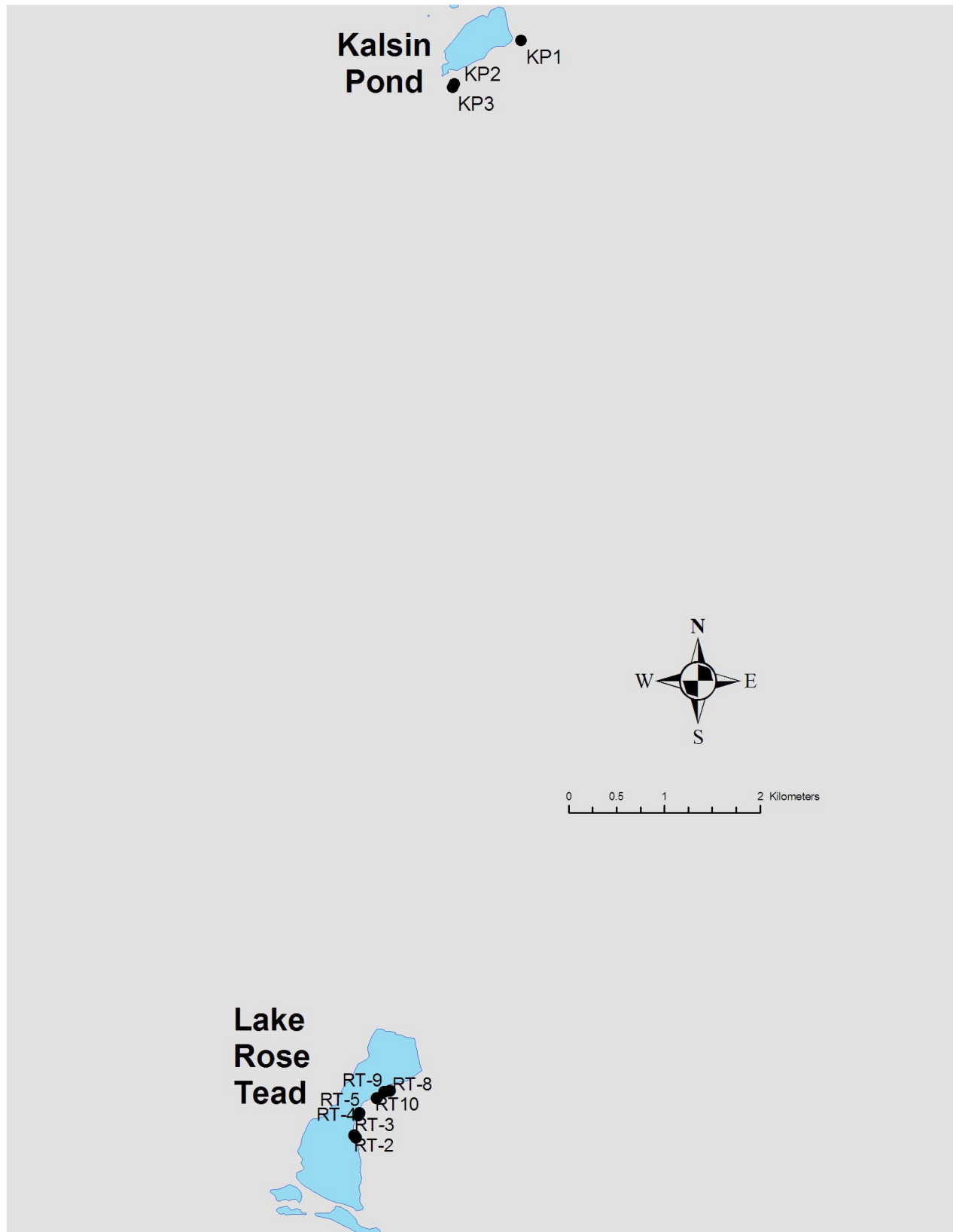


Figure 7. Map of Karluk Lake 2016 goldeneye nest box locations with individual box labels. Nest box KL-17 (underlined label) was unavailable for use in 2016.

