

2000  
Richardson Lake Common Loon Population Survey  
and Management Plan

*(Report BRI 2001-05)*

*(Middle Dam Project)*



**Submitted to:**

William Hanson  
FPL Energy Maine Hydro  
150 Main St.  
Lewiston, Maine 04240

**Submitted by:**

Lucas Savoy and Dave Evers  
BioDiversity Research Institute  
411 U.S. Route 1, Suite 1  
Falmouth, Maine 04105  
[Lucas.Savoy@BRIlloon.org](mailto:Lucas.Savoy@BRIlloon.org)

**Submitted on:**

**April 4, 2001**

**Please cite this report as:** Savoy, L. and D.C. Evers. 2001. Richardson Lake Common Loon Population Survey and Management Plan: 2000 Season. Report BRI 2001-05 submitted to FPL Maine Hydro and the Federal Energy Regulatory Commission (FERC). BioDiversity Research Institute, Falmouth, ME. 28pp.

**INTRODUCTION..... 4**

    ABOUT THE STUDY SITE ..... 4

    HISTORY AND PURPOSE OF STUDY ..... 4

**PROJECT OBJECTIVES..... 5**

**PROPOSED METHODS ..... 6**

    1. POPULATION AND NESTING SURVEYS..... 6

    2. SURVEYING FOR MARKED INDIVIDUALS..... 6

    3. ABANDONED EGG COLLECTION ..... 7

    4. LOON NESTING ACTIVITIES IN RELATION TO WATER LEVEL FLUCTUATIONS ..... 7

    5. IMPLEMENTING RAFTS AS A MANAGEMENT TOOL ..... 8

*Management Considerations for Artificial Nesting Islands* ..... 8

*Avian Guards* ..... 8

*Signs*..... 9

    6. EXPLANATION OF THE RANKING PROCESS FOR THE QUALITATIVE AND QUANTITATIVE EVALUATION OF TERRITORIES ..... 9

**SURVEY SUMMARY AND DISCUSSION..... 10**

    7. RICHARDSON QUALITATIVE PRODUCTIVITY SUMMARY (2000) ..... 11

    8. QUALITATIVE TERRITORY SUMMARY FOR PLACEMENT OF RAFTS ..... 13

    9. RECOMMENDATIONS ..... 15

**LITERATURE CITED ..... 16**

**Summary of Tables**

Table	Title	Page
1	Lake Survey visit record for Richardson Lake, 2000	

**Summary of Figures**

Figure	Title	Page
1	Richardson Lake Territory Boundaries	

**Summary of Appendices**

Appendix	Title	Page
1	Quantitative Territory Summary	
2	Quantitative Territory Ranking Process	
3	Avian Guard Diagram	
4	Richardson Water Level Elevations (1997-2000)	
5	Definition of Terms	

**MAPS**

- Map 1:** Fish Brook territory 2000 nest site and proposed raft site
- Map 2:** Beaver Island territory 2000 nest site and proposed raft site
- Map 3:** Rocky Cove territory 2000 nest site and proposed raft site
- Map 4:** Halfmoon Cove territory 2000 nest sites and proposed raft site
- Map 5:** Buttonhole territory historical nesting site and proposed raft site
- Map 6:** Carry Cove territory 2000 nesting sites and proposed raft site
- Map 7:** South Arm territory 2000 nesting sites and proposed raft site

## **INTRODUCTION**

### **ABOUT THE STUDY SITE**

*Richardson Lake is a 7,470- acre reservoir meandering through Magalloway, Richardstown, and Township C, Maine (Figure 1). These townships lie in the northwest portion of Maine. The reservoir is managed by FPL Energy Maine Hydro (FPL), through Middle Dam, located in Township C, Maine. Richardson Lake is mostly fed by Upper Dam, located on Mooselookmeguntic Lake, in Township C, Maine. The reservoir drains through the Rapid River and Pond-in-the-River, emptying into Umbagog Lake (Magalloway PLT, Maine).*

### **HISTORY AND PURPOSE OF STUDY**

Due to the significant water level fluctuations on reservoirs during the nesting season, the Common Loon (*Gavia immer*) has been identified by the U.S. Fish and Wildlife Service, and other natural resource trustees, as a species to be evaluated in connection with the Federal Energy Regulatory Commission (FERC) licensing of certain reservoir projects. The Union Water Power Company obtained a FERC license and initiated a study to evaluate Common Loon populations, productivity, and the related effects of water level management in 1995 (Fair 1995). The following report summarizes BioDiversity Research Institute's Richardson Lake survey efforts in 2000 and outlines a proposed management plan for the 2001 common loon's breeding season.

**PROJECT OBJECTIVES**

1.
  - a. To determine whether artificial nesting islands are necessary and feasible on Richardson Lake, and to identify a specific site for each.
  - b. To survey Richardson Lake's loon population and to determine the number of non-breeding and breeding loons, territorial and nesting pairs, nest sites, and chicks hatched.
  - c. To determine overall productivity of the Richardson loon population through late summer surveys and historical records.
  - d. To assess the placement need of artificial nesting islands based on biological necessity and availability of sites for proper placement.
2. To establish a long-term loon management and monitoring project on Richardson Lake. We will monitor site-specific nesting activities and factors affecting the productivity of the Common Loon population on Richardson Lake. Emphasis is placed upon monitoring the effects of current water level management practices and the effectiveness of artificial nesting islands, as well as monitoring and quantifying the impact of human and animal disturbances on loon productivity
3. To construct full recommendations for an implementation plan for the manufacture, placement, and maintenance of artificial nesting islands determined necessary.
4. To extend chick monitoring into the late fall to document chick survivorship, and fledge times.
5. To evaluate between-year territory fidelity, mate fidelity, territorial persistence, estimated adult minimum survivorship and natal site fidelity, for all banded loons on Richardson Lake.

## **PROPOSED METHODS**

### **1. POPULATION AND NESTING SURVEYS**

In 2000, surveys were conducted on Richardson Lake starting on May 3 and ending on August 28 to establish territory boundaries and confirm the presence/absence of Common Loons and document their nesting activities (Table 1). The bulk of the survey effort was concentrated on the Common Loon nesting onset and hatching period from May through July. Survey methods were consistent with those reported by Fair (1995), with a few changes to address objectives 4 and 5. We surveyed all known territories and surrounding areas on Richardson Lake from an 18' boat using 10X binoculars and occasionally a 15-45X spotting scope. Every effort was made to gather information from the greatest distance possible in order to minimize impacts on nesting and brooding activities. Since nesting evidence may be obscured by vegetation, it was often necessary to search for presence/absence of nest evidence by foot. We performed searches for evidence of natural nesting attempts by walking the perimeter of the available nesting habitat in loon territories. All known historical nesting sites previously reported by Jeff Fair and Bill Hanson were checked regularly for nesting evidence both above and below the waterline in response to fluctuating water levels. These surveying methods will be continued in the 2001 season.

**Table 1: Lake Survey visit record for 2000 on Richardson Lake, Maine**

Month	Visit dates
May	3, 12, 25, 30
June	5, 12, 22, 26
July	5, 12, 18, 21
August	7, 28

**TOTAL:** 14 visits

### **2. SURVEYING FOR MARKED INDIVIDUALS**

Surveying for marked individuals will help us achieve objective 5. From 1996-2000, 9 adults and 1 juvenile Common Loons had been captured (using a night-lighting technique developed by Evers (2001)) on Richardson Lake and uniquely color marked. Each captured individual was custom fitted in the field with one or two bands on each leg (one USFWS band plus 1-3 color bands per bird). These color bands are visible both above and below the water with binoculars and/or a spotting scope. We opportunistically identified marked individual loons to track site and mate fidelity (Objective 5) of the Richardson Lake loon population. We recorded the color combination thought to be seen in the field, and later referenced a color banded loon ID list to confirm the individual(s) observed. We also recorded the location and general behavior of both banded and unbanded individuals at the time of observation.

### **3. ABANDONED EGG COLLECTION**

We will collect abandoned Common Loon eggs whenever possible to archive for future analysis. This analysis may provide insight into causes of nest failure.

Loon eggs will not be collected unless abandonment or failure can be confirmed beyond a reasonable doubt. We will attempt to immediately collect abandoned eggs before they are predated or destroyed. When uncertainty exists in the determination of the absolute abandonment of the eggs by the adults, we will gently pencil an “X” on the “upside” surface of the egg(s) in question. Eggs will be checked no less than 24 hours later and those that had not been rolled will be considered inviable and will be collected, and placed in a labeled plastic bag, and frozen for future egg analysis.

### **4. LOON NESTING ACTIVITIES IN RELATION TO WATER LEVEL FLUCTUATIONS**

Reservoir operations attempt to capture and store water including sudden precipitation events such as thunderstorms. Because of this, water levels often increase during and immediately after rain events. Since loons tend to nest adjacent to the water’s edge, these increases are the most common cause of nest failures on natural sites for reservoirs, and many times for natural lakes. (DeSorbo and Evers 2000). Research in New Hampshire and elsewhere has shown that water level increases of over 0.5 feet or decreases of over 1.0 feet during the 28-day incubation period are likely to cause nest failure through flooding or necessary abandonment (Fair 1995).

Weekly lake levels for Richardson Lake during four nesting seasons (1997-2000) are shown in Appendix 4. Richardson Lake’s water level is controlled by a hydro dam, and therefore fluctuates greatly throughout the loon’s breeding season. Appendix 4 shows that from 1997-2000, water levels fluctuated dramatically throughout the loon’s nesting period (late-May to early July). In 2000, a thorough productivity survey of Richardson Lake was conducted to establish loon territories and productivity status. Nesting periods on Richardson Lake ranged from May 31 to July 12. Water levels decreased dramatically from late May throughout the remainder of the breeding loon’s breeding season (Appendix 4). These water level changes and others could potentially have a negative effect on overall loon productivity for Richardson Lake.

Other factors affecting loon productivity related to water level fluctuations are: 1) the abandonment of young (less than five weeks old) due to a greater number of unsuccessful pairs which temporarily leave their territories and may interfere with nesting of brooding of other pairs, 2) later hatch dates due to later nesting or renesting, both of which are likely on lakes with greater water level fluctuations, and 3) a reduction in nesting because traditional sites are more often under water or difficult to approach (Fair 1995).

## **5. IMPLEMENTING RAFTS AS A MANAGEMENT TOOL**

Implementing artificial nesting islands (rafts) has proven to be an effective management tool for Common Loons nesting on large reservoirs. Long-term studies have been conducted on Aziscohos and Flagstaff Lake (hydro-dam controlled reservoirs) comparing the productivity between natural nesting sites and raft sites, among Common Loons. Over a 14-year study (1986 to 2000), Aziscohos Lake produced an average of 0.36 chicks per territory from natural sites compared to 0.82 chicks hatched per territory from rafts (DeSorbo and Evers 2000). From 1993 to 2000, Flagstaff Lake produced an average of 0.35 chicks per territory from natural sites, compared to 1.02 chicks per territory from raft sites (Yates et al. 2000).

### **Management Considerations for Artificial Nesting Islands**

Rafts are most successful only in situations where loons have established territories and nested. Pairs that exhibit repeated nest failures are prime candidates for this type of management assistance. Although one past study indicated rafts were not useful for (1) encouraging occupancy of new areas by potential breeding pairs or (2) enticing non-breeding pairs to nest (MacIntyre 1975), recent evidence from our studies and those of biologists with FPL Energy Maine Hydro strongly indicate otherwise.

Proper placement of rafts is crucial for successful nesting pairs. Rafts should be placed in an area that is sheltered from the wind (turbulent waters) and from human disturbances. Placing a raft in an inadequate area poses a greater risk of nest failure. If a territory does not contain a suitable area to place a raft, one should not be instituted (Fair 1995).

### **Avian Guards**

Avian predation of loon nests (natural and raft sites) has been documented on numerous occasions. Jeff Fair reported avian depredation for 3 of 7 loon nests on Aziscohos Lake in 1987 and 1988. The frequency of nest failures from avian predation necessitated preventative management. The implementation of avian guards was established and was proven to be effective. From 1987 to 1992, no fully covered raft failed due to avian predation in 18 instances (Fair 1992).

We will continue the practice of attaching (using staple-nails) avian guards made of metal fencing and camouflage mesh (Cabella's® CAT order # HK22-0081-168 phone # 1-800-237-4444) to all rafts as was initiated by Jeff Fair in 1988 (Fair 1988, Fair 1992) (Appendix 3). Burlap camouflage mesh was also occasionally used and was determined to be adequate for single-season use (Appendix 3). Avian guards are effective in lessening raft visibility and nest exposure from aerial predators and human lake users, which decreases flushing events and disturbances to nesting loons. Avian guards may therefore increase incubation time and hatching success of raft nesting loons. Guards will

be covered with camouflage mesh material, which will be removed at the end of the season to avoid further degradation.

## **Signs**

The South Arm Pair and possibly the Beaver Island Pair on Richardson failed due to disturbance by humans in the 2000 season. Many of these disturbances are unintentional and would likely be avoided by placing informational signs both at the launch sites and at some nesting/brooding areas where deemed necessary. FPL biologists occasionally distribute signs (“Loon Nesting Area Please Keep Away”) for use in protecting these areas from human disturbances. The decision of whether or not to place a sign in a territory is often a difficult one based on their variable effectiveness as management tools. The character of and type of lake users as well as the configuration of the territory and location of nest site will influence their efficacy. Sign placements will be based on previous reports’ recommendations, knowledge of typical lake use patterns and previous site-specific nest failure history. Signs will not be implemented before nesting activity had been found (and therefore will not be used for territorial pairs which do not attempt nesting), and should be taken down after nesting and/or brooding activities cease. They should also not be implemented in cases where it’s determined that their cost (potentially attracting attention to a nest site) outweighs the benefit (notifying unsuspecting lake users to stay away) (DeSorbo and Evers 2000).

## **6. EXPLANATION OF THE RANKING PROCESS FOR THE QUALITATIVE AND QUANTITATIVE EVALUATION OF TERRITORIES**

Two ranking exercises by the authors provide context for prioritizing the overall demand for the implementation of rafts in each loon territories. One was a quantitative exercise based on a simple ranking system that provided a matrix with a final index rating (Appendix 1). All the territories that supported a pair of Common Loons in the 2000 season were ranked according to the parameters in Appendix 1. They received a ranking value for each parameter via information gathered from field surveys conducted by Jeff Fair, FPL, and BioDiversity Research Institute from 1995 to 2000. These values were summed for each territory and then divided by the number of points used in the analysis.

This quantitative rank was then reviewed by the authors and integrated with their qualitative review. The qualitative ranking was based on our professional judgment of the territory characteristics. The quantitative and qualitative aspects of this ranking exercise were then designated into two categories of raft necessity for 2001 management: 1) highly recommended (2) not recommended. These final rank designations follow each territory in the Qualitative Territory Summary. The final rankings were important in prioritizing our recommendations.

## **SURVEY SUMMARY AND DISCUSSION**

A total of 26 paired adult common loons held territories on Richardson Lake during the breeding season of 2000. Five non-breeding and two immature common loons were occasionally seen on the lake as well. Non-breeding loons frequently use large water bodies such as Richardson Lake.

A total of 13 territorial pairs were recorded on Richardson Lake during the 2000 breeding season. Of these, 9 nested (3 territories renested), four successfully hatched six chicks, of which two fledged (Table 2). The approximate territorial boundaries are illustrated in Figure 1. These territories were previously documented and identified through Jeff Fair's survey of the lake in 1995. To maintain consistency, the names of the 13 territories remained that of which were designated by Fair (1995). The territories are referred to as follows:

Beaver Island  
Black Cat  
Black Point  
Buttonhole  
Carry Cove  
Cranberry Cove  
Fish Brook  
Halfmoon Cove  
Mill Brook  
The Narrows  
Pine Island  
Rocky Cove  
South Arm

Fair documented two additional pairs in 1995, which did not exist in 2000. These territories are known as the Dam Pair and Little Mosquito Pair. Non-breeding common loons were occasionally seen in these two historical territories in 2000. Adequate nesting habitat and historical documentation indicate that the two territories could each potentially support a pair of loons in the future.

**TABLE 2: Common Loon Productivity and Nesting Summary (2000)**

---

13 Territorial Pairs
9 Nesting Pairs
12 Nesting Attempts
3 Renests
4 Successful Pairs
6 Chicks Hatched from all territories
2 Chicks Fledged from all territories
7 Nest Failures
3 Nest Failures due to mammalian predation
1 Nest Failure due to human disturbance
2 Nest Failure due to avian predation
1 Nest Failure due to decrease in water level

---

## **7. RICHARDSON QUALITATIVE PRODUCTIVITY SUMMARY (2000)**

We present productivity information for the Richardson loon population for the 2000 season. Below, we summarize overall lake-wide productivity, nest failures and renests. Territory-specific productivity data is summarized in the Qualitative Territory Summary (Territory maps can be found in the Maps section and Figure 1).

### Mill Brook

The previously banded adult male returned to the Mill Brook territory, with an unbanded female. The pair built a nest on the northeast side of an island between 5/31 and 6/4. Two eggs were seen in the nest, located about 4-5 feet from the water's edge, on 6/5. Two chicks hatched between 6/22 and 6/26. Two egg membranes within the nest were collected on 6/26. Both adults and one chick were seen together on 6/26. Upon the next survey visit, the chick was not seen; however the adult's territorial behavior indicated that the chick might have been presently stashed. Within the next several survey visits, the adults were seen without the chick.

### Fish Brook (Map 1)

An unbanded pair occupied the Fish Brook territory in 2000. A nest was built along a rocky section of the west shoreline between 5/31 and 6/5. Upon arrival of the 6/5 survey visit, the Fish Brook pair was seen close to the shoreline displaying aggressive behavior towards a pair of Common Ravens, perched on a large rock. This area was investigated later in the survey. Eggshell fragments were found in the nest; it appeared that the eggs were predated by the pair of ravens. The Fish Brook pair never attempted a renest, but was regularly seen together, within their territory for the remainder of the season.

### Beaver Island (Map 2)

The traditional banded Beaver Island pair did not return to its territory in 2000. The pair shifted to a neighboring territory south of the Beaver Island territory, called Rocky Cove. The new, unbanded Beaver Island pair nested within a cove on the southern most "Beaver Islands" between 6/23 and 6/26. Two eggs were laid and were later abandoned between 7/12 and 7/17. A third egg (completely intact and severely bleached) was found a few feet from the 2000 nest site. This third egg was most likely from a 1999 nest site, due to its condition. The two eggs from the abandoned 2000 nest along with the third egg, were collected on 7/18. The 2000 nest was most likely abandoned due to a large decrease in water level. Upon collection of the abandoned eggs, the nest was approximately 45-50 feet from the waterline. The pair did not attempt a renest.

### Rocky Cove (Map 3)

The banded pair that previously occupied the Beaver Island territory shifted their territory to Rocky Cove. The pair nested along the shoreline within Rocky Cove. One egg was laid between 5/31 and 6/5. A chick was hatched from the egg between 6/28 and 7/3 and fledged from the lake. The male was recaptured and the chick was also captured and banded. Both adults and chick were last confirmed on 8/28.

### Cranberry Cove

Two unbanded adults occupied the Cranberry Cove territory this year, and remained throughout the season. Two adults from this territory were captured and color marked in 1996; neither of these adults occupied this territory this season. The traditional female (captured in 1996) shifted to the Black Point territory. The 2000 Cranberry Cove pair nested upon a large floating bog mat, located in the southwest portion of Cranberry Cove. Two eggs were laid between 6/23 and 6/26. At least one chick hatched between 7/19 and 8/3. We did not confirm whether the second egg hatched because of access difficulties; water levels decreased dramatically, closing off the entrance of Cranberry Cove from boats. Both adults and one chick were confirmed at the mouth of Cranberry Cove on 8/4; the chick appeared to be about one week of age. The chick disappeared between 8/4 and 8/7. The adults remained in the territory throughout the remainder of the season.

Halfmoon Cove (Map 4)

The Halfmoon Cove territory supported a pair of unbanded adults in 2000. The male captured in Cranberry Cove in 1996 occupied this territory in 1999. Two eggs were laid in a nest between 5/31 and 6/4. The nest failed between 6/5 and 6/12. Eggshells were found and collected near the nest on 6/12. It appeared the nest failure was attributed to mammalian predation. Many small pieces of eggshells were found near the nest site. The pair renested in a different location, laying two eggs between 6/23 and 6/26. The renest failed between 6/26 and 7/5. The renest also appeared to have failed from mammalian predation; small eggshell fragments were found in and near the nest. The pair remained in the territory throughout the remainder of the season.

Black Point

The female banded in the Cranberry Cove territory in 1996, occupied the Black Point territory with an unbanded male throughout the 2000 season. The pair of adults were confirmed regularly in the territory. No evidence of nesting was found.

Pine Island

The Pine Island territory supported a pair of unbanded loons in 2000. The pair was regularly confirmed, but evidence of nesting was not found.

The Narrows

A pair of unbanded adults occupied The Narrows territory in 2000. On numerous survey visits to this territory, multiple (3 to 4) loons were confirmed together, performing territorial displays. This is potentially a new pair attempting to establish a territory that is being contested by the Pine Island pair. Evidence of nesting was not confirmed in this territory in the 2000 season.

Buttonhole (Map 5)

The Buttonhole territory supported a pair of unbanded adults this year. The pair was regularly confirmed within the territory, but evidence of nesting was not found. An old nest (1999 or older) site was found within a small cove located along the eastern shore of Richardson Lake. The nest site contained a noticeable dish behind the root mass of a downed tree.

Carry Cove (Map 6)

A pair of unbanded adults occupied the Carry Cove territory in 2000. The pair nested between 6/13 and 6/22. The nest failed between 6/14 and 6/22; a whole egg was found with a large hole cut into it, a few feet behind the nest. It appeared that the cause of failure was due to avian predation. The pair renested in a new site, laying two eggs between 6/27 and 7/12. The nest site was on a large sandy, rocky shoal that was exposed from decreasing water levels. The nest failed between 7/12 and 7/21. It appeared the eggs were predated (mammalian); small eggshell fragments were found near the nest site. The loons may have potentially abandoned the nest before it was predated because of water level decrease. At the time of this final nest investigation, the nest site was about 20 feet from the waterline. The pair of adults remained in the territory throughout the season.

Black Cat

The traditional banded female returned to the Black Cat territory with an unbanded male. The pair nested, laying two eggs between 6/23 and 6/26. It is assumed that both eggs hatched, however only one chick was confirmed. The pair and chick were first confirmed on 8/4 and were last confirmed on 8/28.

South Arm (Map 7)

The South Arm territory supported a pair of unbanded adults in 2000. The pair built a nest in a small cove at the southern tip of the lake between 5/30 and 6/5. Eggs were never confirmed at this nest site. It appeared that a nest was constructed but eggs were never laid; probably due to human disturbance. The area hosts abundant camping and boating activity. The pair renested in a new nest site, laying two eggs between 6/13 and 6/22. The nest site was on a large bog mat within a cove at the southeast tip of the lake. The nest failed again most likely because of human disturbance, between 6/26 and 7/5. The eggs were not recovered.

## 8. QUALITATIVE TERRITORY SUMMARY FOR PLACEMENT OF RAFTS

Reporting productivity data in a quantitative summarized form often inadvertently overlooks some important details. We report territory-specific information here in a qualitative descriptive format to minimize this potential loss of information. All territories and other areas of interest are listed from north to south. Map numbers are also given, which display locations of historical nest sites and potential areas for raft placement (Evers, DeSorbo, Savoy, Nelson 2000).

The following synopsis is a territory-by-territory review of known productivity history for the 13 territories on Richardson Lake. The overall evaluation of each territory is based on the information in Appendix 1.

### **Mill Brook**

The Mill Brook pair has successfully produced chicks (1996, 1998 and 2000) from a well-hidden nest sight located on a small island. The nest site is traditionally found at the base of a large white pine, camouflaged by dense shrubs. The small nesting island does not seem to draw any recreational activity. Due to the availability of the nesting island and the past success of nesting pairs in this territory, we feel neither a raft nor signs should be placed in this territory. **(Quantitative Ranking: 0.77) (Qualitative Ranking: Not recommended)**

### **Fish Brook (Map 1)**

The Fish Brook pair has known nesting attempts in 1996 and 2000. Chicks were not produced in either year. In the 2000 season, the nest site was predated by Common Ravens; the pair never re-nested. Since a history of known nesting has been established and chicks never produced, we feel the Fish Brook territory should contain a raft for the 2001 breeding season. **(Quantitative Ranking: 0.88) (Qualitative Ranking: Highly Recommended)**

### **Beaver Islands (Map 2)**

Nesting has occurred in the Beaver Islands territory during the 1996, 1999, and 2000 season. Although chicks hatched in 1996, nest failures occurred in the 1999 and 2000 season. The nest failed from an unknown cause in 1999 (1 whole egg collected) and failed because of decreasing water levels in 2000 (nest site 40-50 feet from the water). We feel a raft and signs should be placed within the cove of the southern most Beaver Island. This cove traditional contains the nest sites for the Beaver Island Pair. We strongly recommend that signs be placed in and around the cove to deter human disturbances. This island is a popular recreational site for campers and boaters. **(Quantitative Ranking: 0.66) (Qualitative Ranking: Highly Recommended)**

### **Rocky Cove (Map 3)**

Nesting has never been observed in the Rocky Cove territory prior to the 2000 season. The pair nested and fledged a chick in the 2000 season. The nest site was located along a

rocky section of shoreline within a shallow cove. Although the pair was successful, the nest was a several feet from the water. Rocky Cove's habitat consists of no islands and a rocky shoreline with little vegetation for nesting. This territory could effectively support a raft for the 2001 season. **(Quantitative Ranking: 0.66) (Qualitative Ranking: Highly Recommended)**

#### **Cranberry Cove**

Cranberry Cove's abundance of floating bog mats, dense vegetation, and its remote location make it an exceptional loon territory. Chicks have been confirmed in this territory in 1995, 1996, and 2000. Access to this cove is difficult due to its shallowness and numerous underwater obstacles (i.e. rocks and stumps). We feel a raft is not necessary in this territory because of the habitat composition and historical nesting success. **(Quantitative Ranking: 0.88) (Qualitative Ranking: Not Recommended)**

#### **Halfmoon Cove (Map 4)**

Nesting has been documented in the Halfmoon territory in recent years (1996 and 2000), none of which have been successful. Nest failure causes have been attributed to nest predation and water level changes. The territory composition consists of forested shoreline without quality nesting habitat. Two heavily used campsites are located along the northern shoreline. Halfmoon Cove supports recreational activity throughout the loon's breeding season. The past nesting sites have been located on the points of small coves. We feel a raft could be effectively utilized in this territory. **(Quantitative Ranking: 0.44) (Qualitative Ranking: Highly Recommended)**

#### **Black Point**

Evidence of nesting has never been documented in the Black Point territory. Pairs were consistently seen in 1995, 1996, and 2000. The territory contains adequate nesting habitat within an isolated cove, with little human disturbance. We feel a raft should not be placed in this territory for the 2001 season due to the territories absence of a nesting pair. **(Quantitative Ranking: 0.33) (Qualitative Ranking: Not Recommended)**

#### **Pine Island**

Nesting within the Pine Island territory was documented in 1995, both attempts failing from water level reduction. A pair is consistently seen here (1995, 1996, 2000). This territory attracts heavy recreational activities (i.e. camping, boating, swimming, fishing) throughout the loon's breeding season. Availability of quality sites to place a raft is limited in this territory because of the heavy disturbance pressure from the recreational activities mentioned above. We feel placing a raft in the Pine Island territory would become a focus point for visitors and would negatively impact the nesting success of the loons. **(Quantitative Ranking: 0.44) (Qualitative Ranking: Not Recommended)**

#### **The Narrows**

The status of The Narrows pair is unknown. One to two loons are regularly seen within this narrow section of Richardson Lake; considering this a territory is not yet determined. We feel a raft should not be placed in this potential territory because of an inconsistency

to support a territorial or nesting pair. **(Quantitative Ranking: 0.00) (Qualitative Ranking: Not Recommended)**

**Buttonhole (Map 5)**

Evidence of nesting has been recorded in the Buttonhole territory during the 1996 and 1999 breeding season (old dish found in 2000, assumed to be built in 1999). All known nest sites have been found within a small cove along the east shoreline of Richardson Lake. Chicks hatching from this territory have not been confirmed. The cove is protected from wind and wave-action and supports adequate nesting habitat. We recommend placing a raft within this cove for the 2001 season. **(Quantitative Ranking: 0.33) (Qualitative Ranking: Highly Recommended)**

**Carry Cove (Map 6)**

Nesting was confirmed in the Carry Cove territory during the 2000 season. Two nests were built, both eventually failing from predation (avian and mammalian). Chicks have never been confirmed within this territory. The territory habitat composition consists of rocky shoreline surrounding small coves. Quality nesting habitat is limited to a small grassy strip of shoreline, located in the southern most cove of the Carry Cove territory. We feel a raft could be effectively utilized within this established nesting cove. **(Quantitative Ranking: 0.33) (Qualitative Ranking: Highly Recommended)**

**Black Cat**

Successful nesting has been confirmed within the Black Cat territory during the 1996, 1999, and 2000 season. The pair traditionally nests beneath a large pine tree, located in a small, protected cove along the west side of Richardson Lake. We feel a raft is not necessary in this territory because of the pair's consistent nesting success. **(Quantitative Ranking: 0.88) (Qualitative Ranking: Not Recommended)**

**South Arm (Map 7)**

Unsuccessful nesting has been confirmed within the South Arm territory during the 1996 and 2000 seasons. The nests were most likely abandoned because of human disturbance. The South Arm territory contains heavy recreational activity (i.e. camping, boating, swimming, fishing) throughout the loon's breeding season. We feel with the proper placement of a raft and use of signage, the South Arm pair could successfully utilize a raft. South Arm also heavily requires cooperation from lake users, and with the addition of public awareness, we feel could be a productive territory. **(Quantitative Ranking: 0.44) (Qualitative Ranking: Highly Recommended)**

**9. RECOMMENDATIONS**

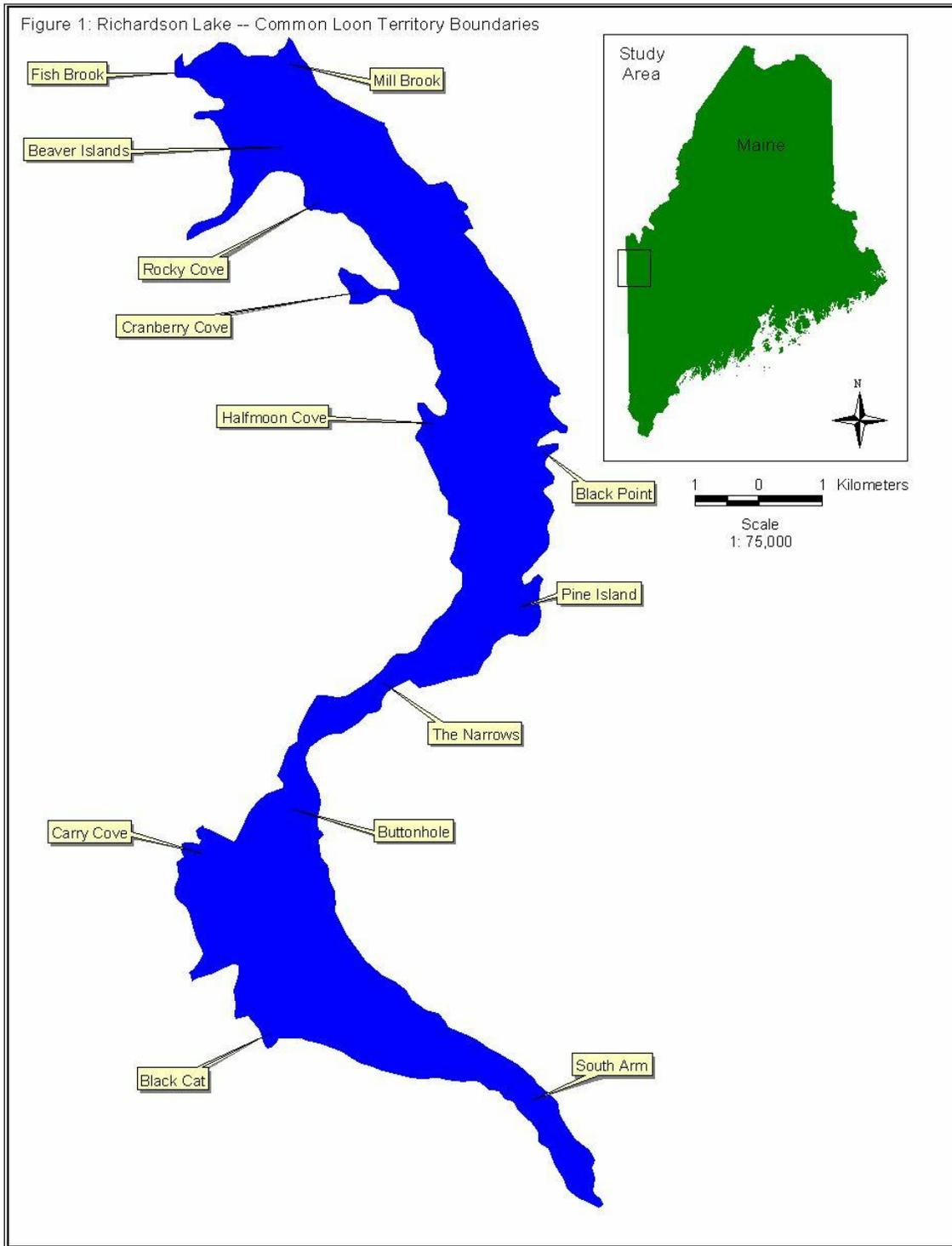
Because of the water level fluctuation pattern on Richardson Lake, artificial nesting islands (rafts) will be useful for enhancing loon productivity. The following seven sites are feasible and therefore have been selected to support rafts in 2001: (Territory maps can be found in the Maps section)

Fish Brook  
Beaver Islands  
Rocky Cove  
Halfmoon Cove  
Buttonhole  
Carry Cove  
South Arm

**LITERATURE CITED**

- DeSorbo C., and D.C. Evers. 2001. Aziscohos Lake Common Loon population survey and management report, 2000. Upubl. Rep. to FPL Energy Maine Hydro, Augusta, Maine.
- Evers, D.C., DeSorbo, C, Savoy, L, Nelson, M. 2000. Evaluation of habitat quality and documentation of the reproductive success of the Common Loon on selected lakes in the Rangeley Lakes and Allagash Regions. Unpubl. report to New England Forestry Foundation.
- Evers, D.C. 2001. Common Loon population studies: Continental mercury patterns and breeding territory philopatry. PhD Dissertation, University of Minnesota, St. Paul, MN.
- Fair, J. 1986. Aziscohos Lake 1986 common loon population survey results and Management plan. Upubl. Rep. To Androscoggin Reservoir Co. for submission to F.E.R.C. 17 pp. plus figures.
- Fair, J. 1992. Cover for loon rafts to obstruct avian depredation. 1992 American Loon Conf. Proc. Pp. 235. U.S. Fish and Wildl. Svc. Concord, NH.
- Fair, J. 1992a. Common Loon nesting success and productivity with regard to lake level fluctuations and management plan implementation on Aziscohos Lake (F.E.R.C. project no. 4026): Five-year progress rep. 1987-1991. Upubl. Report to Androscoggin Reservoir Co. 42pp.
- Fair, J. 1995. Richardson Lakes common loon and waterfowl population and productivity surveys and autumn migrational shorebird surveys. Upubl. Report to Union Water Power Company, Lewiston, Maine.

- McIntyre, J.W. 1975. Biology and behavior of the Common Loon (*Gavia immer*) with reference to its adaptability in man-altered environment. PhD Dissertation. University of Minnesota, Minneapolis. 243pp.
- McIntyre, J.W. 1988. *The Common Loon: Spirit of northern lakes*. Univ. Minn. Press, Minneapolis. 228pp.
- Titus, J.R. and L.W. Van Druff. 1981. Response of the Common Loon to recreational Pressure in the Boundary Waters Canoe Area, northeastern Minnesota. Wildl. Monogr. 79, The Wildlife Society.
- Yates, D., DeSorbo, C. and Evers, D.C. 2001. Flagstaff Lake Common Loon population survey and management report, 2000. Unpubl. Report to FPL Energy Maine Hydro, Augusta, Maine.



**Appendix 1 : Quantitative Territory Summary for Richardson Lake**

	Productivity Parameters						Territory Characterization			Results
	1	2	3	4	5	6	7	8	9	10
Territories	TP	NP	CH	CS	Hist. NP	Hist. CH	Islands Av.	Devel	Activity	Quan Rank
Mill Brook	1	1	1	0	1	1	1	1	1	0.88
Black Cat	1	1	1	1	1	1	0	1	1	0.88
Cranberry Cove	1	1	1	0	1	1	1	1	1	0.88
Beaver Islands	1	1	0	0	1	1	1	1	0	0.66
Rocky Cove	1	1	1	1	0	0	0	1	1	0.66
Fish Brook	1	1	0	0	1	0	0	1	1	0.55
Halfmoon Cove	1	1	0	0	1	0	0	1	0	0.44
South Arm	1	1	0	0	1	0	1	0	0	0.44
Pine Island	1	0	0	0	1	0	1	1	0	0.44
Carry Cove	1	1	0	0	1	0	0	0	0	0.33
Buttonhole	1	0	0	0	1	0	0	1	0	0.33
Black Point	1	0	0	0	0	0	0	1	1	0.33
The Narrows	?	0	0	0	0	0	0	0	0	0.00
<b>Total Mean Rank</b>										<b>0.52</b>

\*\* See Appendix 2 for explanation of category rankings

## **Appendix 2: Quantitative Territory Summary Ranking Process**

**1. Territorial Pair (TP):** The basic quantification of occupancy of a territory by a Common Loon pair from 1996 – 2000.

0 = Established pair not present

1 = Established pair present

**2. Nesting Pair (NP):** Categorized based on findings of nesting evidence within a territory from 1996 – 2000.

0 = No nesting evidence found

1 = Evidence of nesting found

**3. Chick Hatched (CH):** Categorization based on whether or not loon chicks were actually hatched from a nest, regardless of whether or not they left the nest or survived (2000).

0 = No chicks hatched

1 = Chicks hatched

**4. Chick Survival (CS):** Ranked based on whether or not Chicks hatched on a territory actually survived to a minimum of seven weeks old (known by change in molt) in 2000. Because of the difficulties associated with actual confirmation of the young fledging from a territory and very low mortality of chicks > 7 weeks (i.e. <5% loss), young that reach this age are assumed to have fledged.

0 = Chicks did not survive to 7 weeks of age

1 = Chicks survived to 7 weeks of age

**5. Historical Nesting:** Ranked based on actual findings or reports from reliable sources of historical nesting from 1996 – 2000 in a territory.

0 = Historical nesting absent

1 = Historical nesting present

**6. Historical Chicks Hatched:** Ranked based on actual findings or reports from reliable sources of historical chicks hatched from 1996 – 2000 in a territory.

0 = Historical chicks hatched absent

1 = Historical chicks hatched present

**7. Islands Available:** Loons typically choose nesting sites on islands and have higher reproductive success vs. mainland sites (McIntyre 1988). Although both sites can be successful, island nest sites have an advantage in that they limit exposure to mammalian predators. Categorization was based on whether or not islands suitable for nesting were present within each territory.

0 = No islands available for nesting within that territory

1 = At least one island suitable for nesting was present within that territory

**8. Development:** Shoreline development often displaces and/ or destroys loon nesting habitat, but also is a representation of human activity (which is often associated with increasing predator densities) on a water body. Although many developed lakes are productive, and, conversely, many lakes that have no development are not productive- we assume loon territories with minimal development generally create fewer potential threats to nesting loons and their chicks. Territories were ranked based on the amount of developed shoreline within their borders.

0 = Shoreline development is abundant

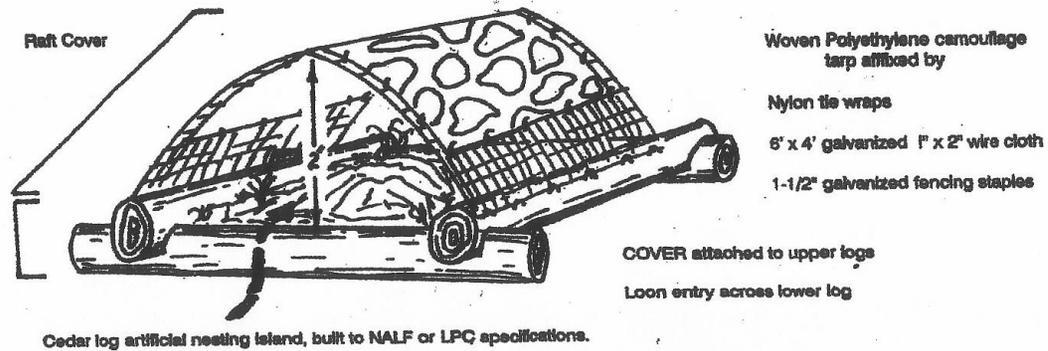
1 = Shoreline development is minimum

**9. Activity:** Presence or absence of a boat ramp on a water body will typically affect the level of boating activity on a lake, and therefore a loon territory. Human disturbances are often a cause for nest failure, and boats may collide with adults and/or young, risking injury or death. Increased human activity also affects loon survival due to the use of and improper disposal of fishing line and lead sinkers (Taylor and Vogel 2000). It is recognized that smaller boats such as canoes and kayaks also may disturb loons during incubation and/or brooding (Titus and VanDruff). Therefore we categorized loon territories on whether or not they contained heavy boating (i.e. motorboats, canoes, kayaks) during the 2000 season.

0 = Activity within the territory is high

1 = Activity within the territory is low

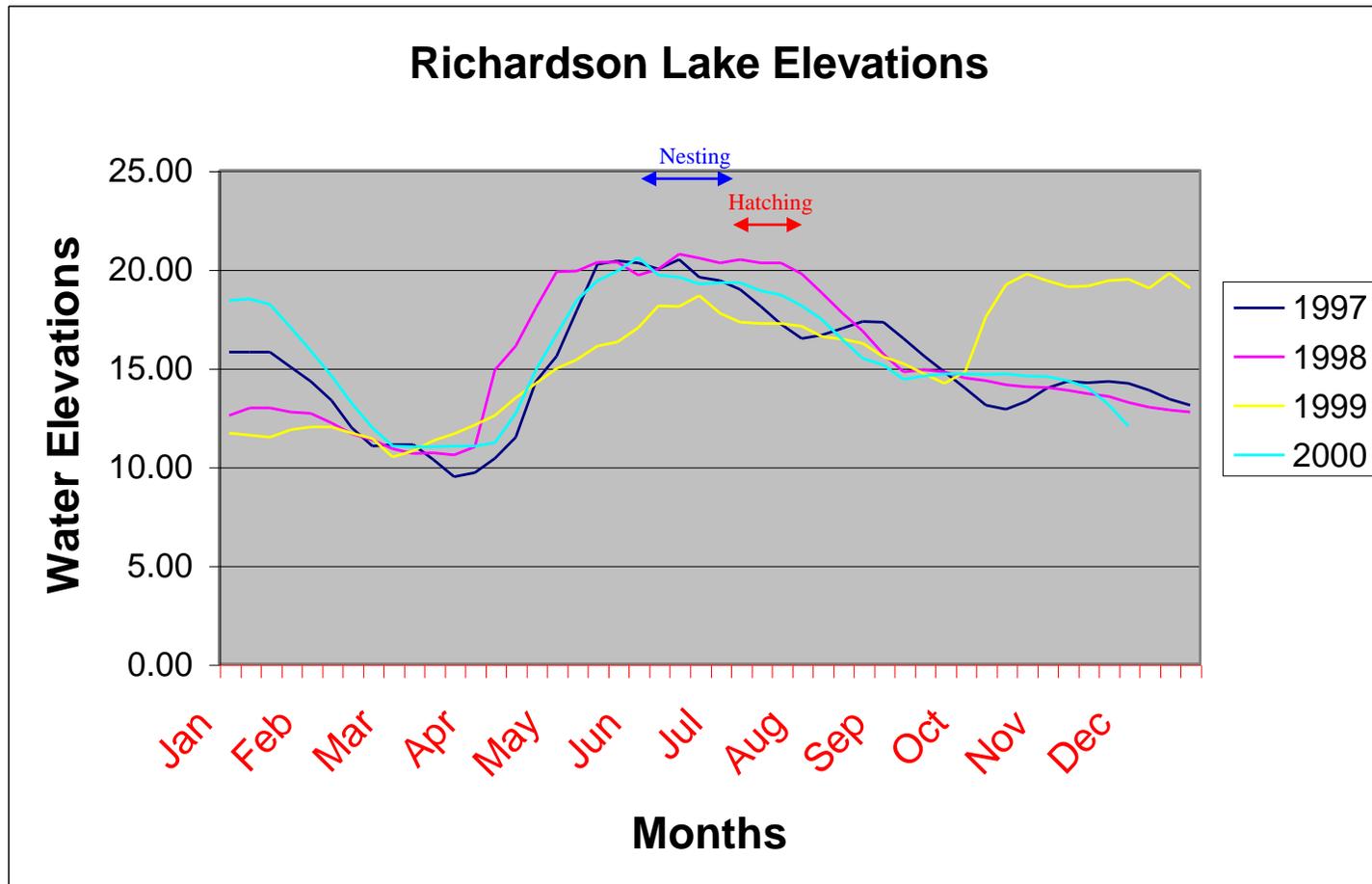
### Appendix 3: Avian Guard



**NOTE: The raft cover is a tool for application only in those rare cases in which loon rafts are suffering avian egg predation. ADDITION OF COVERS TO RAFTS WILL INCREASE VISIBILITY OF RAFTS AND WILL THEREFORE INCREASE THE LIKELIHOOD OF HUMAN DISTURBANCE AND RESULTANT NEST FAILURE.**

Guidelines for construction and use of artificial nesting islands for common loons are available through the North American Loon and the New Hampshire Loon Preservation Committee.  
J. Fair, Consulting Biologist, Box 55, N. Sandwich, NH 03259 11/92

Appendix 4: Richardson Lake Daily Water Level Elevations (1997-2000)



\*Chart prepared by William Hanson (FPL Energy Maine Hydro)

## **Appendix 5: Definition of Terms**

**Artificial nesting island** – A man-made, floating platform for use as an alternate nesting site for common loons as described by the New Hampshire Loon Preservation Committee (LPC)(Fair 1989) and in some cases adapted to prevent avian egg predation through the addition of a cover described by Fair (1992). Artificial nesting islands were first developed and employed as a common loon research tool by McIntyre (1977) in a different form, later improved for management use by LPC. The term “raft” is synonymous with “artificial nesting island” in this report.

**Avian guard** – A camouflage mesh cover that is attached to artificial nesting islands with the intent of minimizing the visibility of the nest and eggs from avian predators and boat traffic.

**Between-year territory fidelity** – The return of an established territory holder to its previously occupied territory.

**Breeding Adults** – Established territory holders, and those with transitional territories that attempted breeding

**Chick survival** – Number of loon chicks fledged divided by the number of loon chicks hatched; often expressed (x 100) as a percentage.

**Chicks fledged** – Number of loon chicks to survive past eight weeks of age were assumed to have fledged.

**Chicks hatched** – Number of chicks hatched completely out of their eggs, not necessarily departing from the nest.

**Established Territory** – Paired adults found on territory for at least three consecutive weeks for three consecutive years

**Individual performance** – Tracking the reproductive success of marked individuals over time.

**Long-term productivity** – a measure of productivity taking into consideration the number of years the territory has existed or has been monitored. Calculated by dividing the number of chicks hatched divided by the number of years during which the parameter was measured. This measure is analyzed by territory and nest site selection in Appendix 4.

**Loon** – Common loon (*Gavia immer*); no other loon species nested in the study area during the report period.

**Mate fidelity** – The known pairing of an adult with the previous years’ mate

**Nest attempt** – Presence or evidence of any loon nest constructed or scraped that contained eggs, evidence of eggs, or constructed on a site where a previous nest contained eggs; this excludes copulatory platforms and nests of uncertain origin.

**Nest failure** – Any nest attempt that fails to completely hatch or at least one egg.

**Nest success** – Any nest attempt in which at least one chick completely hatches from its egg.

**Nesting pair (NP)** – A territorial loon pair, which undertakes one or more nesting attempts on a given year. All territorial pairs are considered potential nesting pairs. Nesting pairs comprise a subset of territorial pairs.

**Nesting season** – That part of the year encompassing early reproductive behavior on the breeding grounds through late hatching of chicks. Nest building may begin prior to complete ice-out of aquatic systems in Maine and New Hampshire and hatches may occur as late as mid August in western Maine (Fair unpubl. Data). Nesting season varies from year to year and across latitudes and from lake. On Richardson Lake during this study period, nesting season may be generally defined as May 15 – August 5.

**Nesting success** – The rate of nest success by pairs; number of loon pairs hatching at least one chick divided by total number of pairs exhibiting at least one nesting attempt; usually expressed (x 100) as a percentage.

**Production** – The absolute number of chicks fledged (surviving to migrate) within a given time period by a given loon population.

**Productivity** – The number of fledged chicks divided by the number of territorial pairs in a given population, expressed as number of chicks per territorial pair. Less thorough studies have reported productivity in terms of number of chicks (sometimes young chicks) per known nesting pair, not recognizing non-nesting and unsuccessful pairs, and chick mortality on the breeding lake. Certain ecological studies have reported loon productivity in chicks per water surface area. Productivity here reflects the total population of territorial (potential breeding) pairs, nesting frequency, nesting success, and chick survival, and is therefore a more precise and thorough reflection of the reproduction rate of the entire population.

**Raft** – Artificial nesting island for loons.

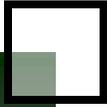
**Renest** – Any nest attempt by a pair subsequent to its original nest attempt on a given year.

**Successful nest** – Any nest attempt resulting in at least one chick hatching completely out of its egg, though it may never depart the nest dish.

**Successful nesting pair (SNP)** – A loon pair that hatches at least one loon chick completely out of its egg on a given year, regardless of failures of former nests that year.

**Territorial pair (TP)** – A loon pair which exhibits territorial and paired behavior including territorial defense gestures, male yodeling, and close physical association within a defined territory during the nesting season; all nesting pairs are considered territorial pairs. Not all territorial loon pairs nest every year.

**Territory** – An area of still water used by a bonded pair of common loons for feeding, resting, breeding, nesting, chick rearing that is behaviorally protected against incursion by most other loons (and sometimes waterfowl) for a minimum of 4 weeks. Loon breeding activities were formerly described with reference to loon pairs, about under light of new evidence of infidelity among individuals of loon pairs, the territory has become the more certain and useful unit of reference in describing loon breeding activity and rates. Territories are recognized as being either “established” or “transitional.” Long term monitoring will be necessary in order to classify a territory into one of these territory subgroups.



Richardson Lake  
2000 COMMON LOON POPULATION SURVEY  
SUMMARY AND MANAGEMENT PLAN



*BioDiversity Research Institute is a Maine-based nonprofit research group dedicated to progressive environmental research and education that furthers global sustainability and conservation policies. Fundamental studies involve avian conservation and aquatic toxicology. We believe high trophic level piscivorous wildlife are vital indicators of aquatic integrity.*

*To obtain copies of this report contact:*

*BioDiversity Research Institute  
411 US Route One, Suite 1  
Falmouth, ME 04105  
(207) 781-3324*

*staff@briloon.org  
www.BRIloon.org*