



PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY

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April 26, 2012

Honorable Kimberly D. Bose, Secretary, and
Nathaniel J. Davis, Sr., Deputy Secretary
FEDERAL ENERGY REGULATORY COMMISSION
888 First Street, NE
Washington, DC 20426

VIA ELECTRONIC FILING

Re: **Lake Chelan Hydroelectric Project No. 637**
Article 406 – Wildlife Habitat Plan
Annual Winter Wildlife Survey Report for 2011

Dear Secretary Bose and Deputy Secretary Davis:

On April 10, 2008, the Federal Energy Regulatory Commission (Commission) issued the “*Order Modifying and Approving Wildlife Habitat Plan under Article 406*”¹ requiring the Public Utility District No. 1 of Chelan County, Washington (Chelan PUD) to provide an annual report on the results of the winter wildlife surveys by April 30 of each year to the Commission, the U.S. Forest Service (USFS), the U.S. Department of the Interior, National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS) and the Washington Department of Fish and Wildlife (WDFW).

In accordance with the above Order, Chelan PUD hereby files the Annual Winter Wildlife Survey Report for 2011 to the Commission. Copies of the report are being provided by copy of this letter with the above federal and state agencies.

Please do not hesitate to contact me or Von Pope at (509) 661-4625 regarding any questions or comments regarding this report.

Sincerely,

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Enclosure

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¹ 123 FERC ¶ 62,039 (2008) at P. 3

LAKE CHELAN ANNUAL WINTER WILDLIFE SURVEY REPORT

WINTER of 2011-2012



Public Utility District No. 1 of Chelan County

P. O. Box 1231

Wenatchee, Washington 98807

April 2012

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INTRODUCTION

Since 1982, the Public Utility District No. 1 of Chelan County (Chelan PUD) has monitored big-game and other wildlife that winter along the Lake Chelan Hydroelectric Project (License No. 637) as a Federal Energy Regulatory Commission (FERC) compliance measure. On 31 March 2004, the existing operating license expired, though monitoring continued during annual licenses. On 6 November 2006, a new operating license was awarded to Chelan PUD (FERC 2006). On 10 April 2008, the FERC approved the Lake Chelan Wildlife Plan, which prescribed the continuation of annual winter wildlife surveys similar to those conducted during the second license for the project (1974-2004). During consultation on the new Lake Chelan Wildlife Habitat Plan, the Lake Chelan Wildlife Forum elected to add water birds to the Lake Chelan winter wildlife survey for the 50-year-license period (2006-2056). The objective for the Lake Chelan winter wildlife survey is to monitor numbers of wintering big game, waterfowl, eagles, and other wildlife observed during the winter boating surveys. Results are documented in the Lake Chelan Winter Wildlife Survey Report, which is provided to FERC, the Washington Department of Fish and Wildlife (WDFW), the U.S. Fish and Wildlife Service (USFWS), the USDA Forest Service, and the National Park Service by 30 April annually as required by Article 406 in the operating license.

Lake Chelan provides a unique opportunity to monitor big game, waterfowl, eagles, and furbearers that tend to concentrate at lower elevations along the lake during the winter months. While surveys provide only minimum species numbers, repeated counts over time provide an index of population status for a number of wildlife species. Spatial and temporal information gathered on wildlife wintering along Lake Chelan provides useful information to state and federal natural resource management agencies for wildlife management along Lake Chelan. In addition, long-term population indices may be useful in observing the response of some wildlife species to wildfires that have occurred in the Lake Chelan basin over the past decade or so. The Rex Creek and Deer Point fires (2001 and 2002, respectively) burned a significant portion of deer winter range along the north shore, destroying extensive bitterbrush stands. More recently, the Flick Creek and Domke Lake Fires on the south shore have further altered the habitat along Lake Chelan. This report summarizes winter wildlife monitoring along Lake Chelan for the winter of 2011-2012.

STUDY AREA

Lake Chelan lies in central Washington on the east slope of the Cascade Mountains in northern Chelan County. The lake is approximately 1 mile wide and 50 miles long. It extends from the Columbia River breaks to the high Cascades. The lake's maximum elevation is 1,100 feet m.s.l., with mountain peaks in excess of 8,000 feet above the lake. Most of the survey area lies within both the Wenatchee National Forest and the North Cascades National Park complex. Six vegetation zones, described by Franklin and Dyrness (1973), lie within the study area: *Pinus ponderosa*, *Pseudotsuga menziesii*, *Abies grandis*, *Pinus contorta*, *Abies lasiocarpa*, and *Artemisia tridentata/Agropyron spicatum*. The study area (Figure 1) includes a 40 mile stretch of Lake Chelan and the surrounding terrain from First Creek, at Lake Chelan State Park (lake mile 13), to the mouth of the Stehekin River, at Stehekin (lake mile 54) and encompasses both shores.

METHODS

Survey Methods

Each winter season, Chelan PUD schedules 12 boating surveys along Lake Chelan to provide an index of wildlife wintering along the lake. The winter season is defined as late November through late March. Each winter season is divided into four periods with three surveys in each including: early (late November – mid-December), mid (late December – early January), late (mid – late February) and the green-up period (March). During each survey, the boat is driven up one shore of the lake (north or south) and down the opposite shore. Each year, the initial shoreline surveyed is chosen at random and the route alternates thereafter to balance the number of morning and afternoon sighting opportunities along each shore.

A minimum of 2 people conduct the surveys from an open boat to maximize visibility. The boat is driven at a slow cruising speed (~3,200 rpm) usually within 100-200 yards of the lake shoreline. Wildlife species observed are identified using 10 x 40mm binoculars from the boat or with spotting scopes (20-60 x 60mm and 6-100 x 100mm) from the shore. The same area (Lake Chelan State Park to Stehekin) is surveyed each survey (Lake mile 13.5 - 54.5, Figure 1) unless inclement weather (high winds or heavy snow) necessitate termination of a survey.

Big Game and Furbearer Observations

All big game and furbearer species observed are recorded to the nearest tenth lake mile and the shore on which they are observed (north or south). Mule deer (*Odocoileus hemionus*), mountain goat (*Oreamnos americanus*), and bighorn sheep (*Ovis canadensis*) may be classified by age and sex. The extent to which these animals are classified varies depending on the species, the winter period being surveyed, and visibility conditions. Other big game or furbearers that may be encountered such as black bear, cougar, and bobcat are recorded but not classified by age or sex.

Deer are classified by age, sex, and species to the extent possible during the first two survey periods (early and mid-winter). For bucks, the maximum number of antler points on one side is recorded. During the remaining two periods (late winter and green-up) deer are only classified by age (adult or fawn) and species since bucks have typically shed their antlers. When visibility is poor or long distances prevent age and sex identification, deer are recorded as unclassified. Mule deer are the dominant species observed, however, black-tailed (*O. h. columbianus*) or white-tailed deer (*O. virginianus*), and elk (*Cervus elaphus*) are observed occasionally and recorded by species, age, and sex where possible. Deer counts through mid-winter provide information on the buck populations and buck/doe ratios while late winter and green-up surveys provide an index of adult/fawn ratios and potential recruitment for portions of the Manson, Entiat, Slide Ridge, and Clark Game Management Units.

Typically, mountain goats are observed from long distances making sex classification more difficult. Therefore, mountain goats are only classified by age (adults and kids). Relative abundance, distribution, and age data provide an index for managing mountain goat in the Lake Chelan Basin. In past years the Stehekin Valley was surveyed once per winter (rarely twice) with binoculars and spotting scopes from observation points along the valley roads. These surveys have usually consisted of two consecutive days of surveying for goats, the afternoon of one day followed by the morning of the second day. The Stehekin Valley surveys supplement the surveys along the lake by adding information on goat abundance, distribution, and age composition in the Stehekin Valley. Results of these surveys have often been

influenced by weather conditions that limit visibility. The number of goats observed during these surveys has varied from zero to 40.

Historically, bighorn sheep were native to Washington and the Lake Chelan area. Unrestricted hunting and parasites and diseases carried by domestic sheep eliminated bighorns from Washington by the early 1900's. In March 1999, WDFW coordinated the release of 13 bighorn sheep onto the north shore of Lake Chelan along with the USDA Forest Service and the Foundation for North American Wild Sheep (FNAWS). Key to this re-introduction was the FNAWS negotiations to remove domestic sheep from the USDA Forest Service grazing allotment in that area of the north shore of Lake Chelan. An additional 34 bighorns were released in February and March 2000. The sheep were released between Grade and Coyote creeks. The transplanted bighorns were captured from expanding populations in Lincoln, Kittitas, and Yakima counties in Washington and from the Okanogan Valley of southern British Columbia. During 2009, 12 bighorn sheep along Lake Chelan were radio-collared by WDFW to monitor this population.

Information on bighorn sheep relative abundance and age and sex ratios is important for monitoring and managing this re-introduced herd. Winter surveys are optimum for gathering data on bighorn sheep abundance, age, sex, and distribution because the sheep congregate on winter range at relatively lower elevations (Geist 1971). Bighorn sheep observed are counted and classified by age (adult or lamb) and sex (ram or ewe) when conditions allow during each survey period. Bighorn rams are further classified as class 1, 2, 3, or 4 rams (Geist 1968).

Eagles, Waterfowl and Water Bird Observations

Eagles, waterfowl, and other water birds (grebes, gulls, loons) observed are recorded to the nearest tenth lake mile and to the nearest shore to which they are observed. When visibility permits, eagles, waterfowl, and other birds observed on the lake are classified by species using 10 x 40mm binoculars or variable power spotting scopes. In addition, eagles may be recorded as adults or sub-adults when conditions allow. When visibility is poor, ducks may be classified as dabblers or divers, or simply as unknown waterfowl. The mouth of the Stehekin River is generally surveyed from the shoreline with spotting scopes as visibility allows. This area generally exhibits the highest concentration and species diversity of waterfowl within the survey area.

Data Summary Methods

Data gathered are summarized for the overall winter season and by each winter period to provide population metrics (age and sex ratios) and/or allow for monitoring of specific trends (annual population indices) for the species observed. In addition, data may be summarized by shore (north or south) to provide similar information for different management areas. To provide a minimum estimate for the number of mountain goats observed in the study area by winter season, we tallied the maximum number of goats recorded within each particular band (or area) among all surveys. The geographic separation between areas where goat bands were observed is assumed to be large enough that goats are not moving between bands during the winter season which could lead to biased counts.

Since deer shed their antlers after the mid-winter period, the early and mid-winter periods are used to monitor buck ratios (bucks/100 does) and age structure (# of antler points). Throughout the winter survey season age data are recorded and summarized to determine fawn ratios (fawns/100 adults). Similar population metrics are calculated for bighorn sheep for all surveys. Unclassified animals are removed from the data set prior to calculating any age or sex ratios. Since visibility may limit the ability to classify animals and may greatly influence buck/ram and fawn/lamb ratios, only surveys that have a classification rate of 25% or greater are used to calculate these ratios.

The average number of all species observed during each winter period and for the winter season overall is calculated by totaling the number of animals observed during each survey and dividing by the number of surveys conducted in each period (typically 3). The overall average is calculated by totaling the number of animals observed over the entire winter survey season divided by the number of surveys collected (usually 12). Since the number of animals observed on any particular survey may vary drastically (especially for deer), the maximum number of animals observed on any one survey are reported to provide an indication of minimum numbers. However, relatively low numbers for any species observed does not necessarily indicate low population numbers. Winter and weather conditions may combine to limit the number of animals present or visible for one or more surveys conducted.

RESULTS AND DISCUSSION

During the winter season of 2011-2012, 12 surveys were conducted between 25 November 2011 and 29 March 2012 (Table 1). The area surveyed was consistent and complete for all surveys although visibility was reduced during a portion of 5 surveys due to low clouds or fog. Reduced visibility likely limited the numbers of animals seen, especially for mountain goats, which are frequently observed at higher elevations than deer and bighorn sheep. In addition to poor visibility, vegetative cover and topography undoubtedly further limited the number of animals recorded. Therefore, all numbers are considered to represent the minimum number present during any one survey.

Mountain Goats

Goat Counts

During the winter of 2011-12, an average of 96.0, 98.3, 41.3, and 44.3, mountain goats were observed per boat survey for the early, mid, late and green-up periods, respectively. The number of mountain goats seen per boat survey this past winter ranged from 33 to 128 (Table 1). The maximum number of mountain goats observed on any survey during the 2011-12 winter seasons was 128, on 4 January 2012. The maximum number observed along the north shore (n = 43) occurred on 29 November 2011; whereas the maximum number along the south shore (n = 108) occurred on 4 January 2012. A single survey for mountain goats was conducted in the Stehekin Valley above Lake Chelan on 10 February 2012 from accessible roads. One goat was observed during this single survey.

Estimated numbers

The minimum number of goats estimated for the Lake Chelan wintering area surveyed during the 2011-12 winter season was 159 (Figure 2). Again, the estimated number of mountain goats observed on the south shore (n = 116) was up considerably from previous seasons, but not as high as the estimated count during 2009-2010 (n = 128). However, numbers remained relatively high compared to the 30-year average of 55 due to several high counts obtained over the course of the 2011-12 surveys. The estimated number of mountain goats on the north shore (n = 43) is fewer than estimates obtained over the past few seasons (Table 2). Trend data (1982 to 2011) for estimated mountain goat population numbers (Figure 3) show that typically, the north shore has had more mountain goats, with the exception of surveys in the early – mid-1980's and in recent years (Table 2). While bands of goats were seen in similar places along each shore in previous seasons, the numbers of goats observed during the 2011-12 surveys were higher along the south shore and lower along the north shore. However, low snowpack during the late winter period this season left a majority of habitat open for goats at higher elevations, especially along the north shore. Therefore, even if some north shore individuals were missed entirely during winter surveys, the

total population could be much higher than the estimated minimum of 159 mountain goats. Even so, estimated numbers of goats observed for 2011-12 survey are the 8th highest since Chelan PUD began conducting big game winter surveys in 1982 (Table 2).

The ratio of kids/100 adults is a measure of mountain goat kid production and survival. Within the study area, a ratio of 28.0 kids/100 adults was observed (Figure 4) during the 2011-12 winter season. We observed 30.0 kids/100 adults (AVG = 22.3) along the north shore and 27.9 kids/100 adults (AVG = 27.1) along the south shore during the 2011-12 winter season. Kid ratios have been higher along the south shore for the last 10 survey seasons compared to that of the north shore (Table 2). During the 2011-12 surveys the ratio was slightly above the 30-year average (AVG = 27.1) for the south shore. The recent series of consecutive mild winters has likely influenced higher kid production and survival along Lake Chelan as seen on the south shore. In the early 1980's, kid ratios were slightly higher along the north shore of the lake, whereas the ratios have fallen and the south shore now demonstrates a higher kid to adult ratio (Figure 5).

From the winter for 1990-91 to 1999-00, the ratio of kids/100 adult goats along the north shore was relatively low (16.4) compared to ratios observed during the 1980's (24.3) and during the last decade (24.0). This year's ratio of 30.0 was higher than recent years, and higher than the 30-year average of 22.3 kids/100 adults along the north shore despite low numbers of goats observed. The relatively mild winter may have allowed goats to winter at higher elevations, as the north shore has a south aspect and much of the area had light snow cover during the winter. If goats were wintering at higher elevations, it would make goats more difficult to observe during our surveys.

During the past 20 years, much of the available mountain goat winter range along Lake Chelan has been underutilized by mountain goats. Until recently, goats were not using portions of their winter ranges that were used in the early to mid-1980's (especially along the south shore) or portions of winter ranges were being used by fewer goats. During 2011-12, goat observations were more widely distributed along both shores, making it difficult to determine separate "bands" of goats. However, few goat observations have been made in the area uplake of Riddle Creek along the south shore and Canoe Creek along the North Shore, and these portions of historic habitat appears to be underutilized. Surveys conducted within the Stehekin Valley have produced low numbers of goats during the last decade. Washington Department of Game surveys that were conducted within the study area between 1954 and 1970 (Fielder and McKay 1984) also recorded greater mountain goat use uplake of Canoe Creek along the north shore and in the Stehekin Valley compared to what we have seen in the last decade. However, relatively few surveys have been conducted in the Stehekin Valley in recent years.

Historically, the total mountain goat population along Lake Chelan has not shown strong growth in response to management efforts conducted since the late 1970's. Mountain goat hunting along the south shore of the lake and in the Stehekin Valley has been closed since the 1978 hunting season. Goat hunting on the north shore of the lake closed in 1980. In 2001, limited mountain goat hunting (1-2 tags) was resumed on the north shore. In 2012, the south shore opened to a limited number of goat tags.

After the introduction of goats from the Olympic Mountains in 1983 and 1984 (Fielder and Keese 1988) the overall population and the ratio of kids per 100 adults increased for several years, but then declined again (Figures 4 and 5). Prescribed fires and fertilization on goat winter ranges also have not resulted in a substantial increase in goat populations. Supplementation with mineral blocks containing 90 ppm of selenium to increase production (Fielder 1986) coincided with a local increase in kid production on the downlake portion of the goat winter range along the north shore. Recent wildfires within the Lake Chelan drainage have burned thousands of acres of mountain goat winter range. Johnson (1983) noted

that changes in habitat after fires may lead to population increases. Ratios of kids/100 adults for the entire survey area have generally been on the increase since the winter beginning in 1996. Continued monitoring of this mountain goat population after recent large-scale fires will provide a chance to explore this hypothesis.

During the summer of 2001, the Rex Creek Fire burned most of the area on the north shore from the lake to the ridge-top from approximately Moore Point to Safety Harbor Creek (18 miles). Almost every location along the north shore of the lake where mountain goats were observed during surveys suffered a 30-100% burn of vegetation. The recent fires in the Lake Chelan basin could give biologists an opportunity to test this theory. Chelan County PUD surveys have compiled 29 years of data on mountain goat abundance, distribution, and kid to adult ratios for the north and south shores of Lake Chelan. Continuing to monitor the population trends of mountain goats along Lake Chelan provides an opportunity to examine the effects of fire on goat winter range. Since the Rex Creek fire, goat numbers increased along the north shore of the lake, but we have also seen kid ratios lag slightly behind those of the south shore.

Deer

During the 2011-12 winter season 859 deer were observed for all surveys combined (Table 1). This was the 9th lowest count in the 30-year history; a sharp contrast to last year's record deer numbers. Of all deer recorded, 52% (n = 444) were observed on the north shore and the remaining 48% (n = 415) along the south shore. The greatest number of deer observed on a single survey n = 190 was obtained during the spring green-up period (2 March 2012). This survey day produced the highest numbers observed along both the north and south shores (93 and 97, respectively). Average deer numbers for the early, mid, late, and green-up winter periods were 27, 14, 155, and 90, respectively. The average number of deer observed per survey along the South shore (34.6) was well above the 30 year average of 20.5 (Table 3). The average number of deer observations per survey along the north shore (37.0) was substantially lower than the 30-year average of 100.4.

Total numbers of deer observed in 2011-2012 were low compared to previous years. For all surveys, 518 deer (60%) were classified by age (adult or juvenile). Along the north shore, 52% (n = 232) of deer observations were classified compared to 69% (n = 286) along the south shore (Table 4). Fawn ratios (fawns/100 adults) have been calculated beginning in the winter of 2007-08 (Table 4). Fawn ratios in winter seasons prior to 2007-08 can be calculated from archived data but were not completed in time for this report. The north shore fawn ratio observed for the 2011-12 winter season was 18.1 fawns/100 adults. The south shore fawn ratio was 23.0 fawns/100 adults. Overall, the ratio observed for the entire survey area was 20.8 fawns/100 adults.

During the early and mid-winter periods a cumulative total of 15 bucks were observed. Bucks were only observed and/or classified during 4 surveys: 25 and 29 November, 21 December, and 4 January. The number of bucks/100 does observed for the entire survey area during the early and mid-winter surveys was 21.6 bucks/100 does. Buck ratios on the north shore were 18.9 for the early and mid-winter periods combined. Buck ratios on the south shore were higher overall (28.6 bucks/100 does). The average number of 1, 2, 3, and 4 point bucks for the early and mid-winter period along both shores was 0.3, 0.8, 1.0, and 0.3, respectively. The average number of 1, 2, 3, and 4 point bucks observed along the north shore during the early and mid-winter period was 0.4, 0.6, 0.4, and 0.2, respectively. Along the south shore, the average number of 1, 2, 3, and 4 point bucks observed per survey for the early and mid-winter period was 0.0, 0.4, 0.6, and 0.2.

Along the south shore, 81% of the 415 deer observed were within a 15-mile segment of relatively east-facing shoreline located between First Creek (lake mile 13) and Still Creek (lake mile 28). Fifty-two percent of all mule deer observations on the north shore occurred within a 10-mile segment of shoreline from Antilon Creek (lake mile 18) to Falls Creek (lake mile 29). This area is where the majority of deer observations generally occur during each winter. Much of the bitterbrush forage within this north shore area was burned during the Deer Point fire in 2002. In early 2012, the Forest Service conducted a prescribed burn in the Coyote Creek vicinity to rejuvenate vegetation on the winter range. An additional 34% of north shore deer observations occurred within another 10-mile stretch located from Canoe Creek uplake to Moore Point. This area last burned during the Rex Creek fire in 2001.

Since the 1996-97 winter season, relatively fewer deer have been observed along Lake Chelan during annual winter surveys (Figure 6). The winter of 1996-97 was particularly harsh and an estimated 70% of the deer population in Chelan County was lost (WDFW 2003). While a recovery appears to be apparent based on winter survey data, the extent of the recovery is unknown since recent winters have been considered mild. In mild winters, deer may not descend to the lower elevations of winter range where they are easily visible from the lake. However, the 2010-11 survey average of 271 deer observed per survey was well above-average (AVG = 122.9) for the 30-year history of this monitoring. During the 2011-12 survey season, we saw relatively few deer during our surveys due to low snow depth at lower elevations. During one survey, two elk were observed along the north shore in the Rattlesnake Creek vicinity. Elk observations are rare along the lake, and have only occurred on 4 other surveys during the winter of 1987-88 along the south shore.

Bighorn Sheep

Bighorn sheep were observed during 11 of 12 boat surveys during the 2011-12 winter season. The average number of bighorn sheep observed during early, mid, late, and green-up periods was 19, 12, 34, and 8, respectively. The maximum number of bighorn sheep observed was 44. This maximum is lower than maximum numbers observed in the previous years (Table 3) and lower than average for all years since the sheep were re-introduced in 1999. No sheep were observed during the last survey on 29 March. Collared sheep were observed during many surveys. The majority of bighorn sheep (92%) were observed on the north shore between lake miles 17 and 32 during the winter surveys. The remaining observations were located between the vicinities of Point no Point and Lone Fir creeks.

During the spring of 2007, we began classifying all bighorn sheep (Geist 1968) observed on the Lake Chelan winter range. We classified 75% of all bighorn sheep recorded during the 2011-12 winter season and observed an average of 18 bighorn sheep per survey. An average of 9 ewes were observed on each survey. The ratio of rams/100 ewes observed was 35.2 rams/100 ewes (excluding surveys where <25% of sheep were classified). For classified rams, the maximums observed for any one survey by class was 2-Class I, 3-Class II, 2-Class III, and 5-Class IV. The lamb ratio was 17.6, calculated from surveys in which > 25% of sheep were classified. The maximum number of lambs observed (n = 10) occurred on 16 February. Since data on age and sex ratios has only been collected since 2006, future surveys will help establish trends for age and sex ratios for bighorn sheep. Although only a portion of the estimated 120 animals in the herd are observed during winter surveys, monitoring provides regular updates of herd composition and distribution.

Winter big game survey observations of bighorn sheep from 1999-01 through 2011-12 ranged from Stink Creek (lake mile 17) to the vicinity of Lone Fir Creek (lake mile 36). Most observations (93.2%) have occurred between Antilon Creek and the vicinity of Safety Harbor Creek, with the largest concentration of observations (66%) centered between Mitchell and Grade Creek. Expansion of grass

vegetation along the north shore following the Rex Creek and Deer Point fires may have a positive influence on this bighorn sheep population. Bighorn sheep prefer open grassland habitats, as they are grazers rather than browsers such as deer.

Eagles, Waterfowl, and Other Wildlife

Eagle numbers observed during winter surveys along Lake Chelan have been monitored since 1982. The average number of bald eagles (*Haliaeetus leucocephalus*) observed ($n = 3.8$) during the 2011-12 winter season was close to the historical average of 3.5 per survey (Table 5). During the 2011-12 winter season we observed an average 1.8 golden eagles (*Aquila chrysaetos*) per survey, equal to the historical average of 1.8 per survey. The maximum number of golden eagles observed during any one survey was 4. Eagle species are observed sporadically along either shore of the lake and are often found in large numbers associated with carrion along or near the shoreline.

Numbers of wintering waterfowl (Family Anatidae) and other water birds (grebes, gulls, loons) along Lake Chelan are a relatively new addition to the winter wildlife surveys with 2011-12 being the 5th year of this data collection. Water bird species numbers are recorded (Table 6) by location (tenth of lake mile) during each survey as part of the new Lake Chelan License. Water birds were concentrated primarily at the mouth of the Stehekin River with 74% ($n = 5,487$) of all observations ($n = 7,419$) occurring in the upper mile of the lake near Stehekin.

The composition of water birds observed was dominated by waterfowl which averaged 591 observations per survey and accounted for 96% of the total average (618) of all water birds observed for all surveys (Figure 7). American wigeon (*Anas americana*) were the most abundant waterfowl species observed and comprised 27% of total waterfowl observations, followed by Canada geese (*Branta canadensis*) (24%), ring-necked duck (*Aythya collaris*) (15%), mallard (*Anas platyrhynchos*) (11%), and trumpeter swans (*Cygnus buccinator*) (5%). Other species such as lesser scaup (*Aythya affinis*), bufflehead (*Bucephala albeola*), Barrow's goldeneye (*Bucephala islandica*), canvasback (*Aythya valisineria*), common goldeneye (*Bucephala clangula*), gadwall (*Anas strepera*), green winged teal (*Anas crecca*), northern pintail (*Anas acuta*), redhead (*Aythya americana*), and common merganser (*Mergus merganser*) were seen regularly but in smaller numbers and account for most of the remaining 18% of the total number of Anatidae observed during the 2011-12 winter season (Figure 8). In 2011-12, we observed a maximum of 35 trumpeter swans, including 3 cygnets. Table 6 shows the number and species of all water birds observed during the 2011-12 winter season.

Other water birds observed during the 2011-12 winter season included a surprising number of grebes (Podicipedidae), averaging 25 grebes per survey. Grebe species observed included horned (*Podiceps auritus*), western (*Aechmophorus occidentalis*), and pied-billed (*Podilymbus podiceps*) grebes. Horned grebes were the most common grebe species observed by far, accounting for 91% of all grebe observations and 4% of all waterbird observations. We observed a maximum of 43 horned grebes (25 November 2011) with an average of 23 horned grebes per survey for the winter season. Unlike the waterfowl, horned grebes were distributed throughout the survey area, with observations in all lake miles surveyed. Common loons (*Gavia immer*) were also observed occasionally, with a maximum of 2 observed on 23 March 2012. American coot (*Fulica americana*) and gulls (Laridae) were uncommon and accounted for just over 1% of the total average of water birds observed for the 2011-12 winter season.

During the 2011-12 winter season biologists also observed 3 black bear (*Ursus americanus*) and 1 coyote (*Canis latrans*). Carrion resulting from winter mortality and predation influences the number of predators and scavengers seen along the lake during winter wildlife surveys. Most big game winter

mortality generally occurs late in the winter when animals have exhausted their body fat and energy stores. The mild winter likely contributed to greater ungulate survival and lower over-winter mortality. The 3 black bear and 1 coyote were observed during the last survey on 29 March 2012.

Raptors other than eagles were also observed. One Northern goshawk (*Accipiter gentilis*), 4 red-tailed hawks (*Buteo jamaicensis*), 2 osprey (*Pandion haliaetus*), and 1 peregrine falcon (*Falco peregrinus*) were also observed during the 2011-12 survey season.

Fire Influence

The north shore has experienced a number of fires within the last decade. The Rex Creek Fire in the summer of 2001 burned 55,913 acres between Moore Point (lake mile 48) and Safety Harbor Creek (lake mile 30). The fire was started by a lightning storm on 12 August 2001 and eventually burned over much of the mountain goat wintering area between the lake and the ridge-tops along the north shore. The Rex Creek Fire burned goat foraging areas in a patchy, mosaic pattern due to the rocky nature of goat habitat. Goats may actually benefit from re-growth of vegetation on their winter ranges, especially fast growing grasses and forbs (Johnson 1983). Erosion from the steep charred hills in this region has been significant in some drainages due to lost vegetation.

During the summer of 2002, the human-caused Deer Point Fire burned over a large portion of the mule deer and bighorn sheep ranges along the north shore of Lake Chelan. The area burned consisted of approximately 43,000 acres situated between Coyote Creek downlake to near Green's Landing and included elevations ranging from lake level to high-elevation ridge tops. Much of the burn in lower elevations rejuvenated grasses and shrubs, but the extensive stands of bitterbrush that existed in the Camas Creek area were destroyed. Stand-replacing fires occurred within the Little Gold, Poison, and Camas Creek drainages at mid-to-high elevations. The Deer Point Fire burned large areas and removed most winter forage in areas downlake from Coyote Creek where bighorn sheep have been observed to winter. Lack of forage for deer and bighorns was a concern during the winter immediately after the fire. Feeding stations were established but the winter was mild and the stations were underutilized. In the years following the fires, mild winters with little snowfall have occurred, allowing mule deer and bighorn sheep to maximize use of available forage along the north shore. The bighorns seem to have taken advantage of vigorous re-growth of grasses following the Rex Creek and Deer Point fires. Grass forage for bighorn sheep should continue to be good if noxious weeds (especially cheatgrass) do not invade too heavily.

Mule deer may suffer the effects of the Deer Point Fire for decades. Both bitterbrush and sagebrush are important browse plants for mule deer (Young and Clements 2002), especially during harsh winters along the north shore of Lake Chelan. During mild winters, deer feed on grasses and forbs much of the winter and supplement these forages with bitterbrush. However, during winters with deep snow, deer depend on sagebrush and bitterbrush because the erect, woody stems are available above the snow. Intense fires that burn sage and bitterbrush stands may increase the risk of malnutrition or starvation during harsh winters, potentially leading to population declines. Bitterbrush plants live a long time; up to 70 years (Young and Clements 2002). It will be decades before extensive stands of bitterbrush again cover the north shore of Lake Chelan. Bitterbrush is very difficult to grow from seed or seedlings, even under good conditions. Poor access, dry south-facing slopes that face the direct rays of the summer sun, low precipitation, the reduction of an existing seed source on site (in the form of mature plants), and very poor access for planting will all combine to make re-establishment of bitterbrush stands on the north shore of Lake Chelan difficult. The winters of 2002-03 through 2005-06 were very mild with little snow and few deer were seen at the lower elevations along the lake. There was no evidence that an above normal

winter kill of mule deer occurred during the winters since 1996-97. However, during future winters with normal or above normal snow levels and duration, mule deer mortality along Lake Chelan may be high due to the lack of mature bitterbrush stands.

The Flick Creek fire started on 26 July 2006 and burned 7,993 acres of mixed low to mid-elevation forest between Purple Point Campground in Stehekin downlake to Fish Creek. The only area that has not recently burned along the north shore of Lake Chelan within the study area is the approximately two mile segment (lake mile 28-30) between Safety Harbor and Coyote creeks.

Until recently, the south shore had not seen a large wildfire in a number of years. The North 25-Mile Fire (8,845 acres) burned over some areas of winter range within the 25-Mile Creek and Box Canyon areas in 1998 (M. Lenz, pers. comm.). The Pot Peak (17,314 acres) and Deep Harbor (29,314 acres) fires burned large areas of the south shore in 2004. Much of the Deep Harbor complex burned through mixed coniferous forest in a mosaic. However, some areas (such as the Big Creek drainage) experienced stand-replacing fire events. Additionally, some portions of the Pot Peak Fire burned into regenerating forest within the North 25-Mile fire area. In 2007, the Domke Lake fire burned approximately 11,791 acres of thick, coniferous forest from the South Fork of Bear Creek north and west to Railroad Creek.

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Figure 1. Lake Chelan Winter Wildlife Study Area.

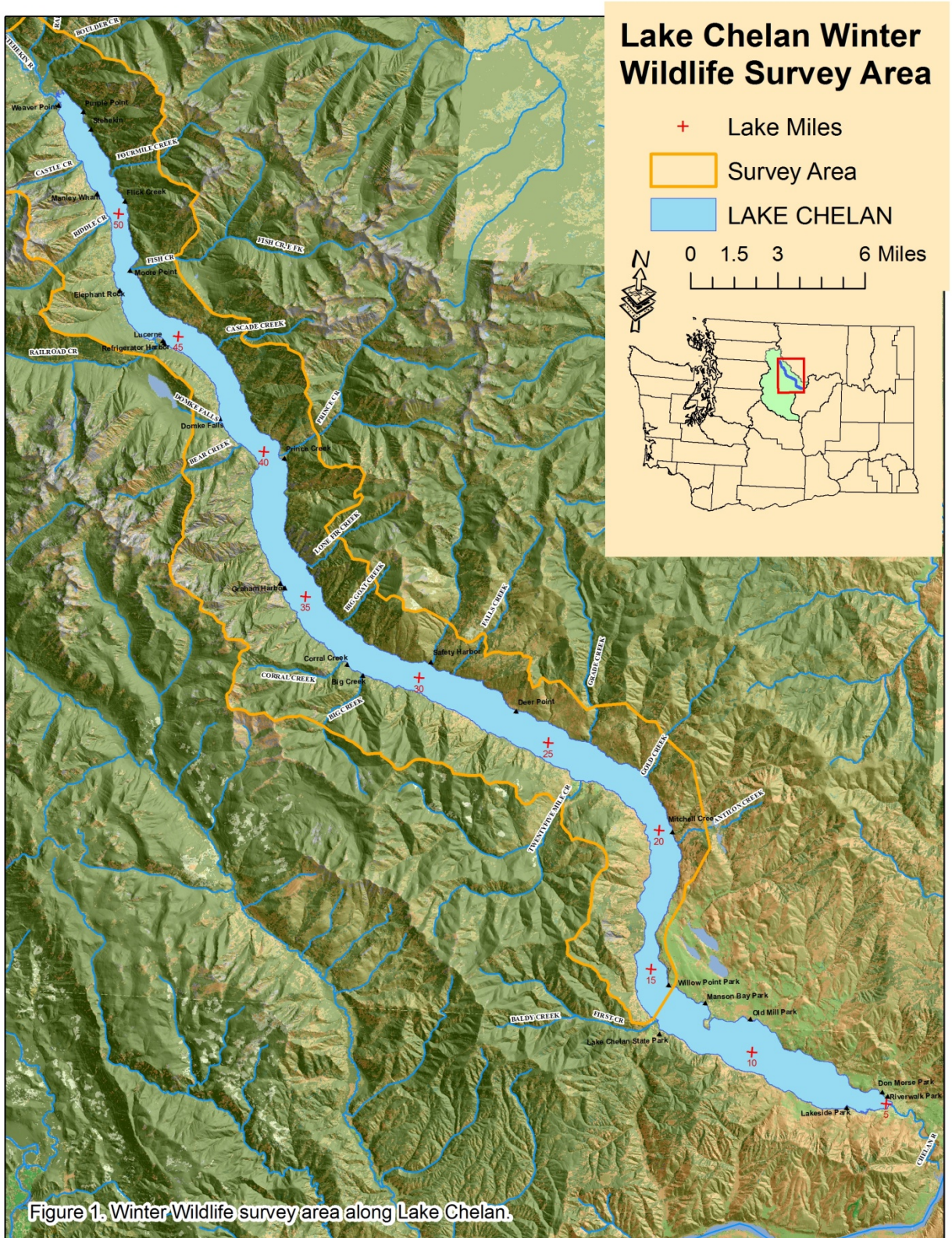


Figure 2. Goat observation areas along Lake Chelan; North shore and South shore groups observed during the winter of 2011–2012.

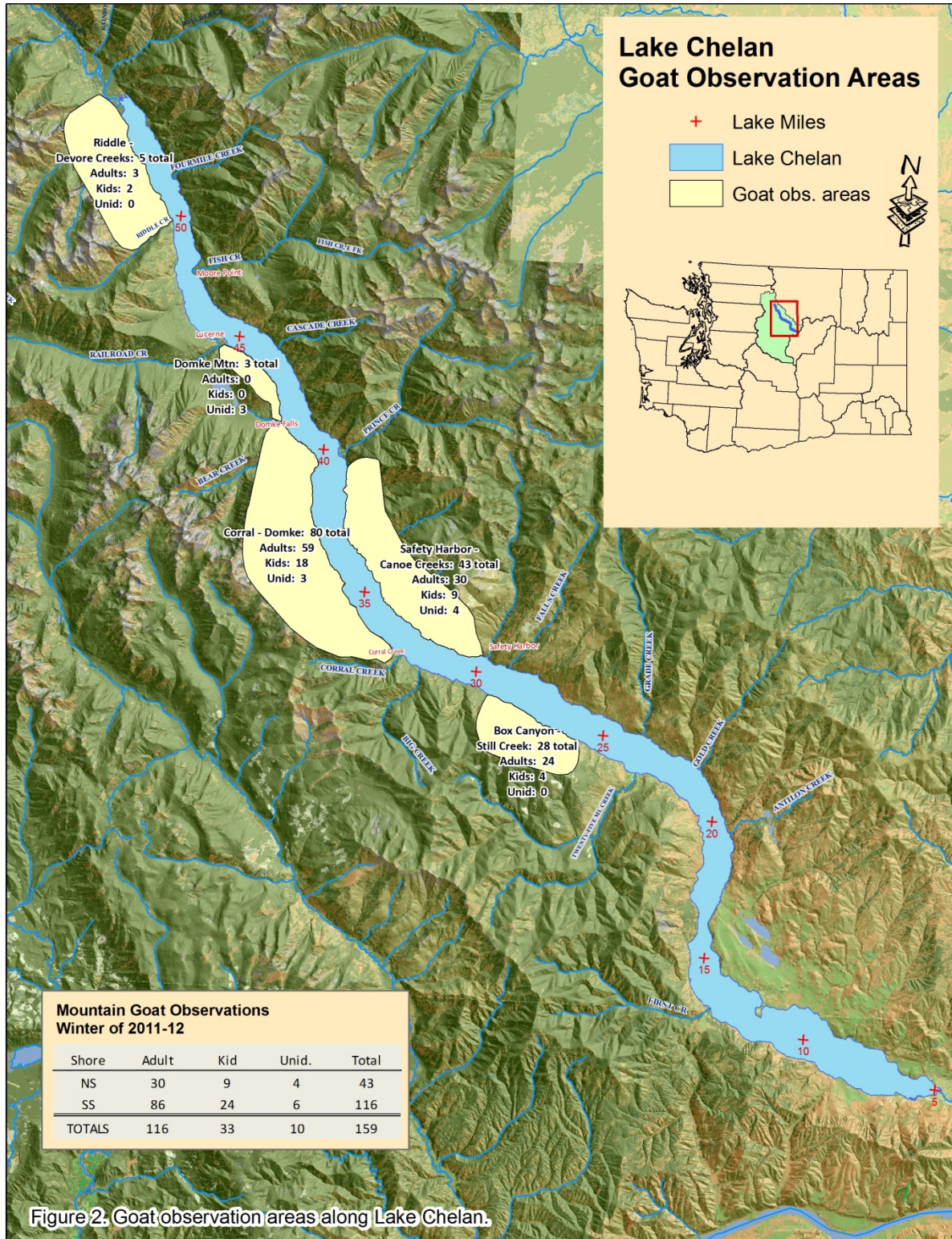


Figure 2: Goat observation areas along Lake Chelan.

Figure 3. Number of mountain goats estimated along Lake Chelan by shore including the Stehekin Valley during the winter seasons of 1982-2011.

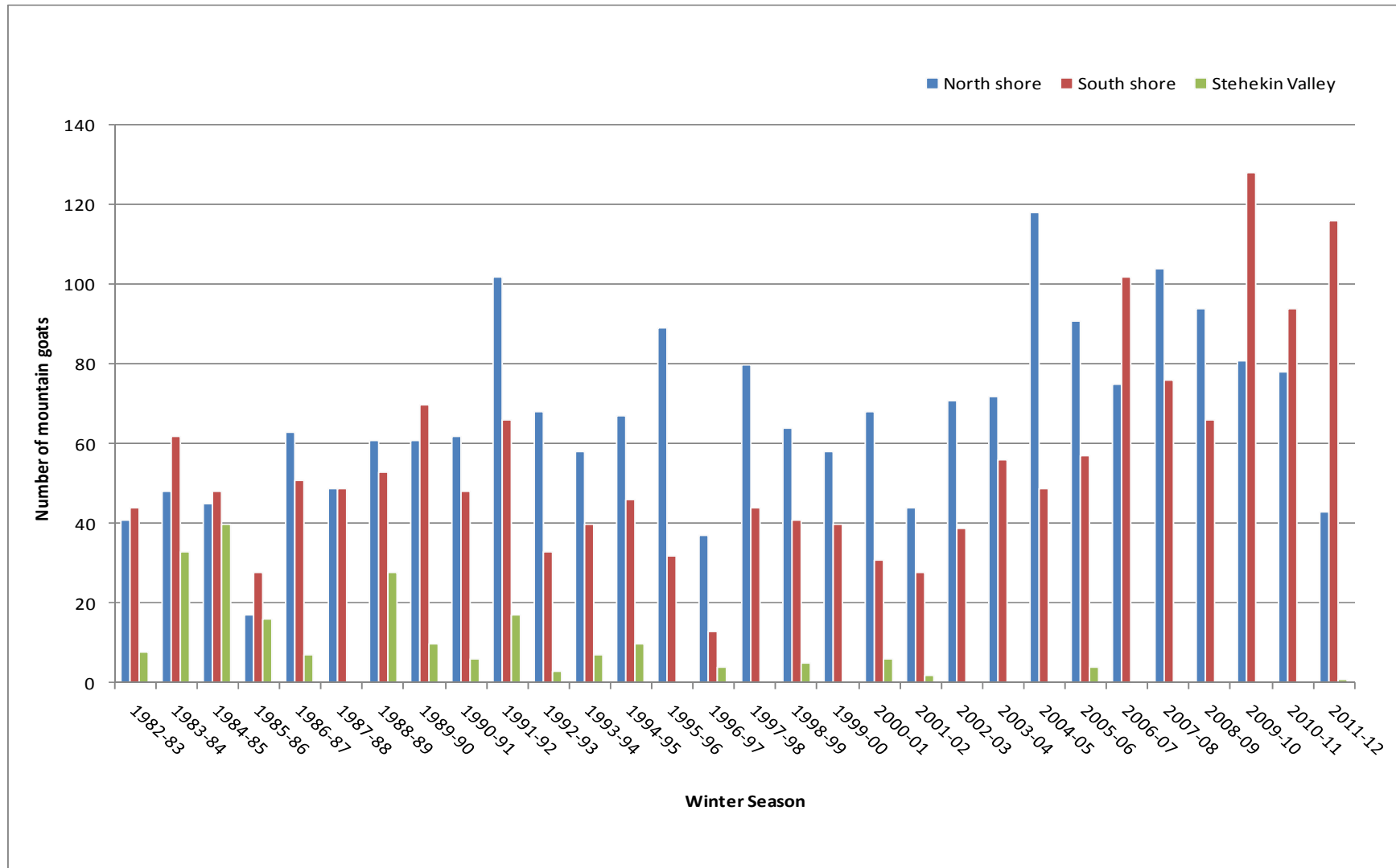


Figure 4. Mountain goat kid to adult ratios (kids/100 adults) for the entire survey area (north and south shores, including Stehekin Valley) during the winter seasons of 1982-2011.

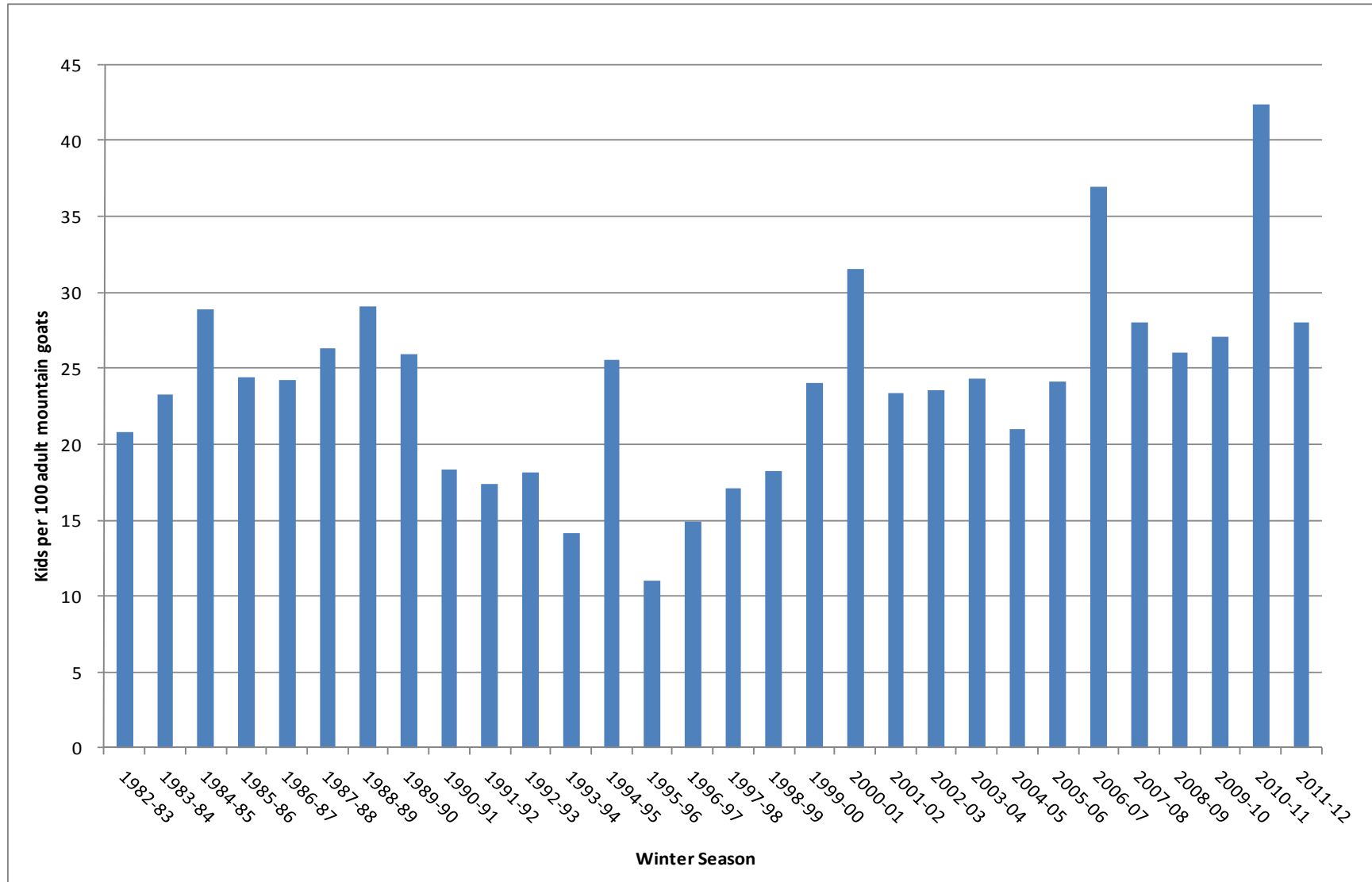


Figure 5. Mountain goat kids per 100 adults (by lakeshore) during the winter seasons of 1982-2011.

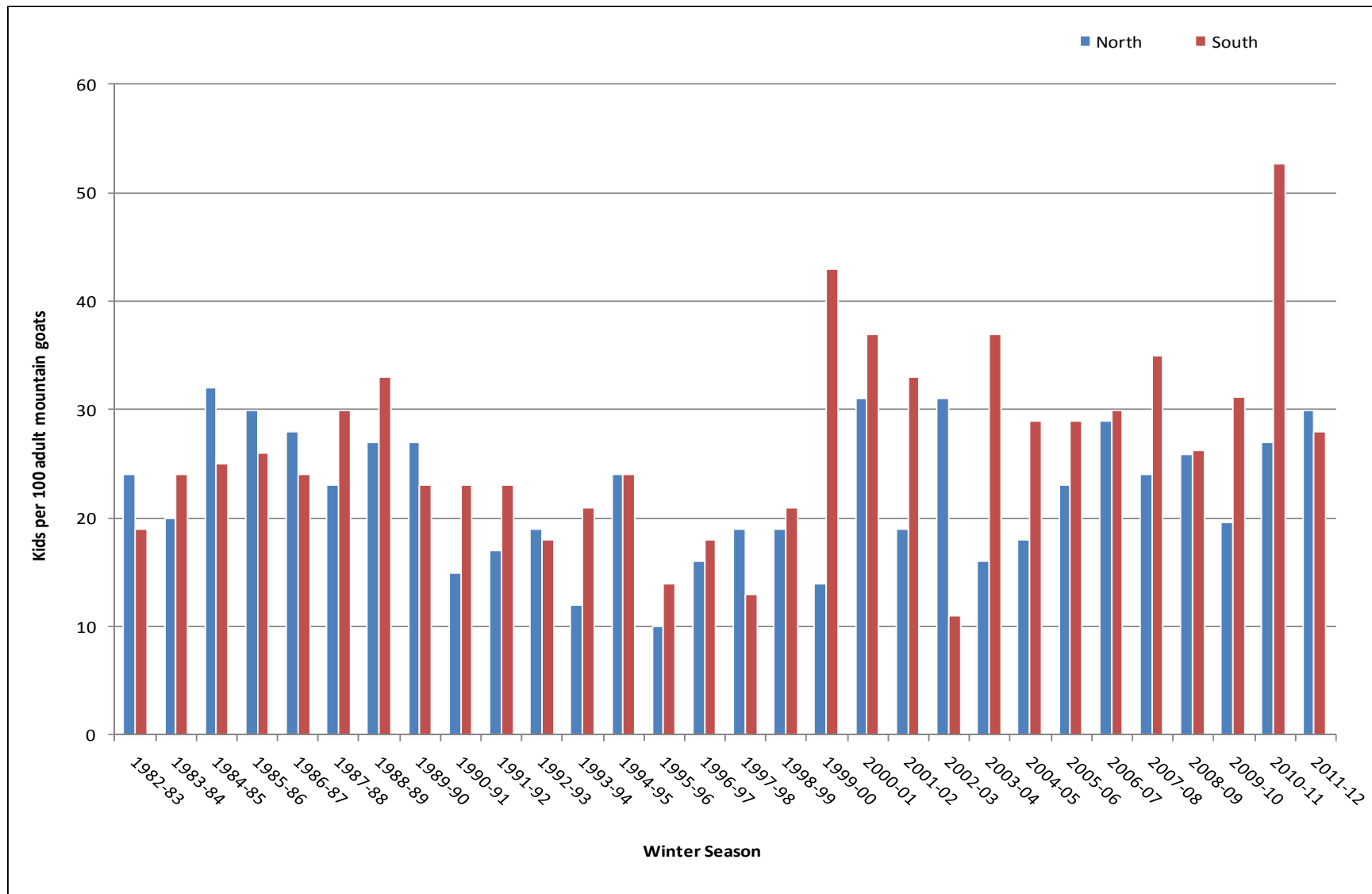


Figure 6. Ungulate maximum counts by year during the winter seasons of 1982-2011.

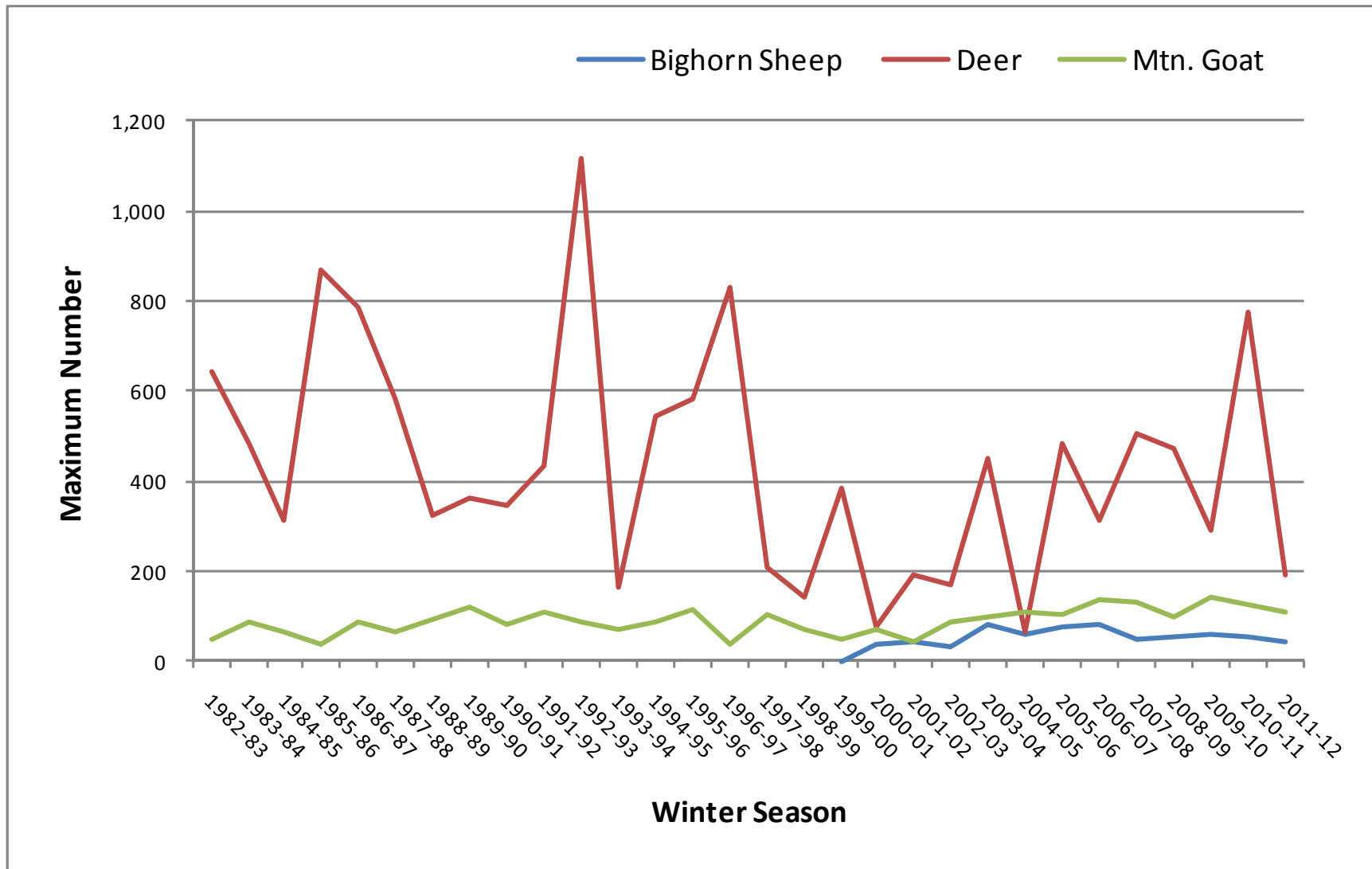


Figure 7. Mean number of deer observed per survey during the winter season on Lake Chelan Study Area 1982-2011.

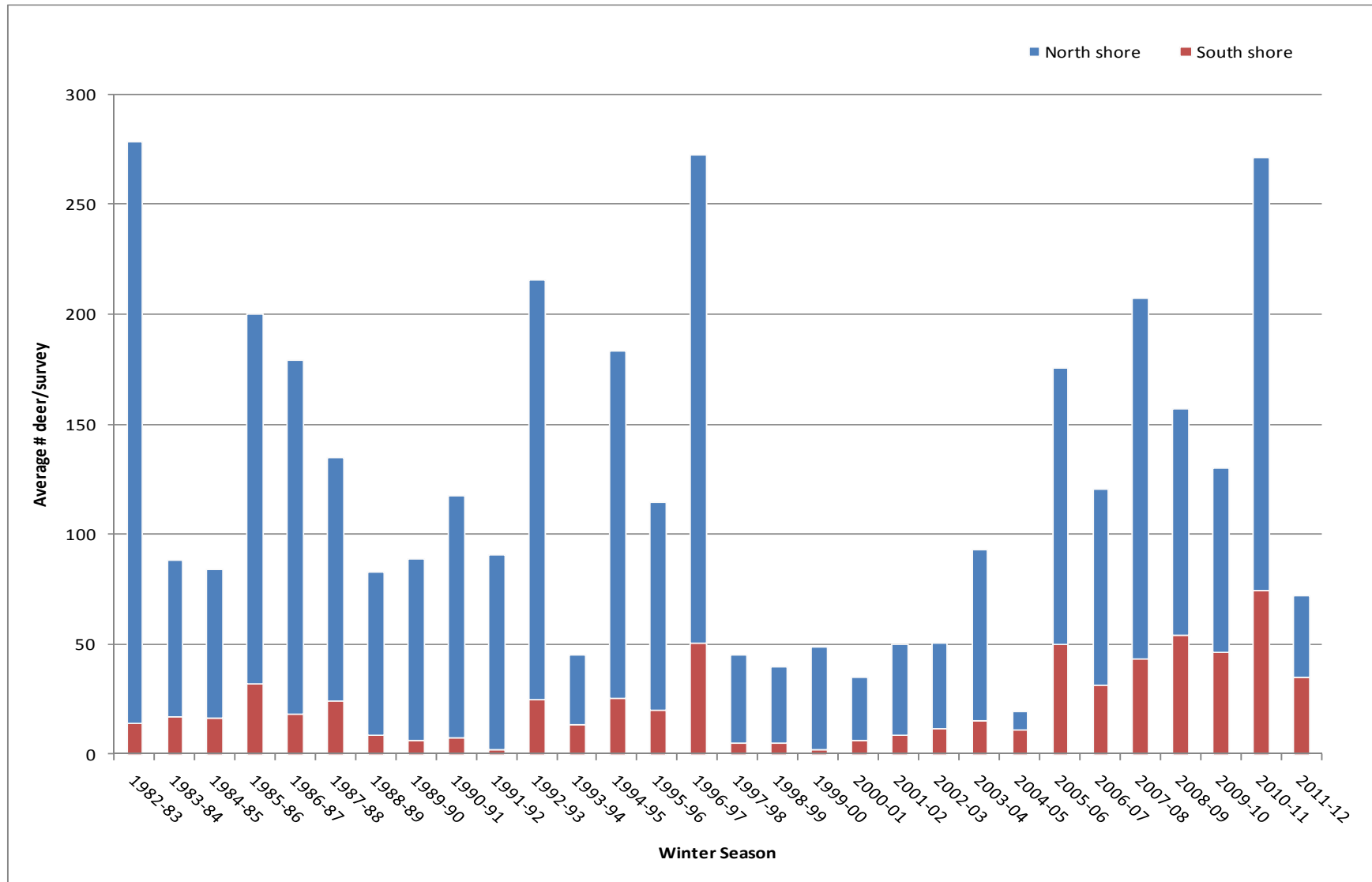


Figure 8. Avian composition by type represented as a percent of the total average of water birds observed for the Lake Chelan Study Area during the 2011-12 winter season.

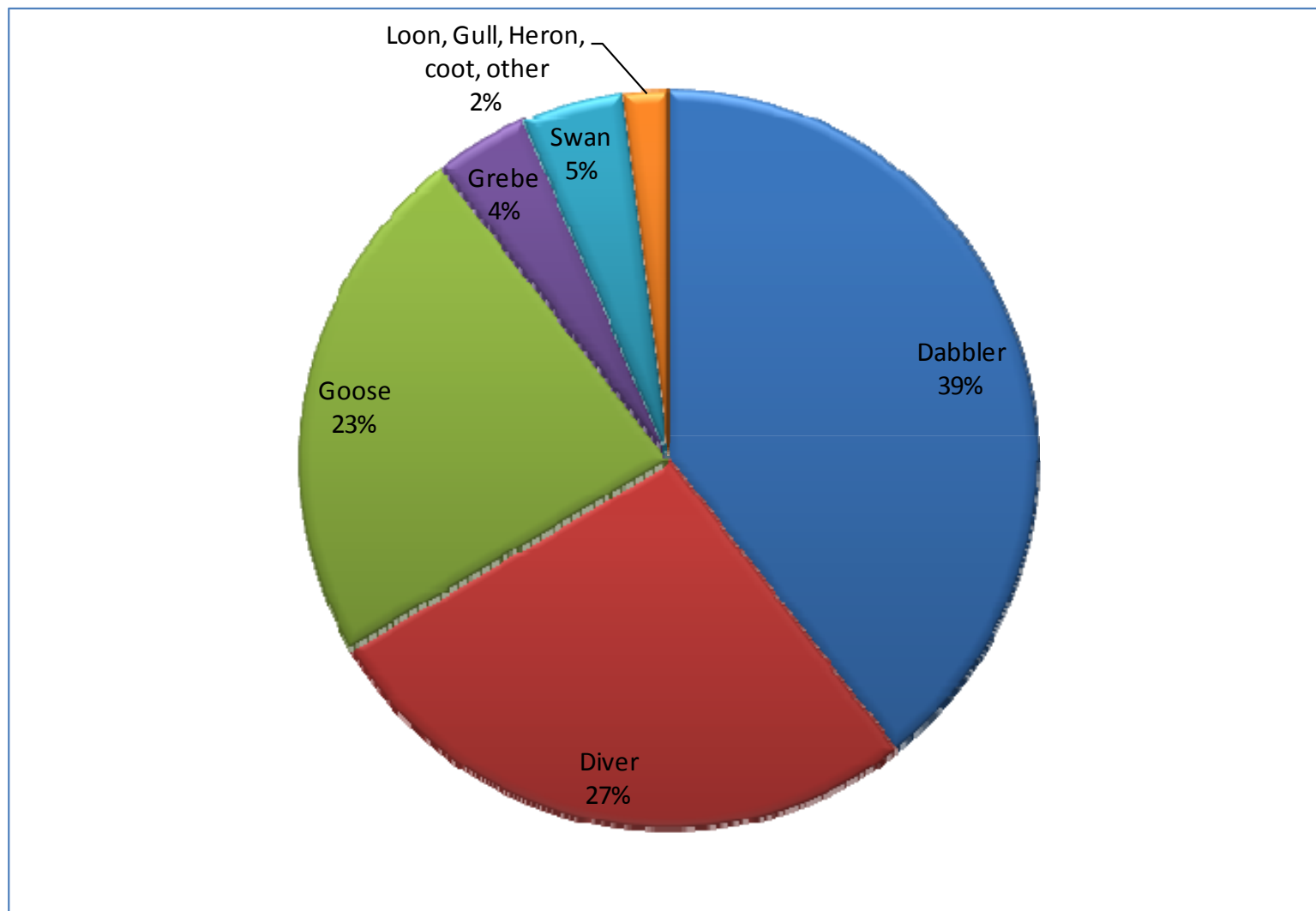


Figure 9. Composition of waterfowl (Family: Anatidae) observed for the Lake Chelan Study Area during the 2011-12 winter season.

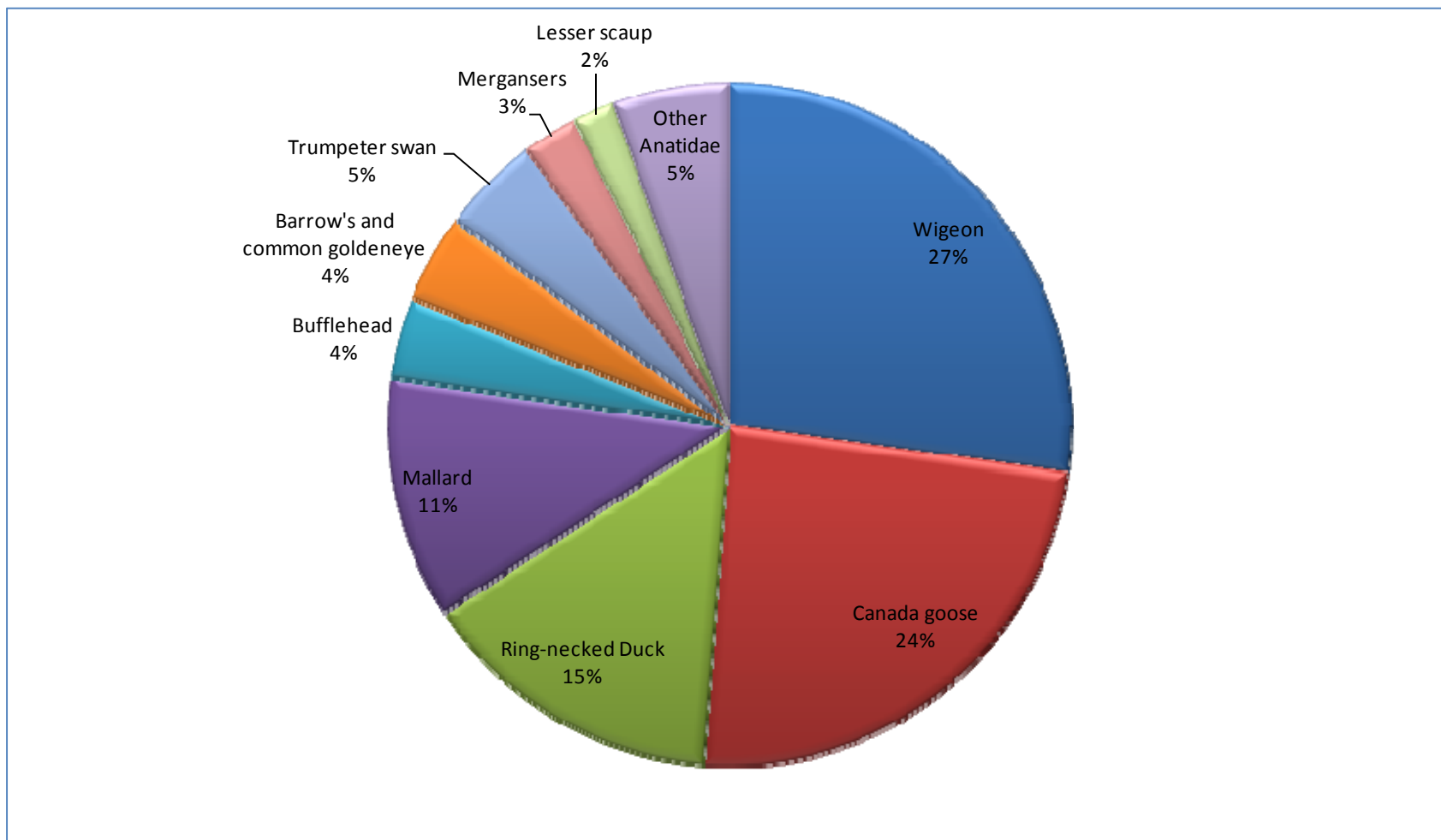


Table 1. Summary of cumulative wildlife observed during each winter period for the 2011-12 winter season.

| | Date | Mountain Goats | Deer | Bighorn Sheep | Bald Eagles | Golden Eagles | Waterfowl, grebes, & loons | Furbearer | Other |
|---------------|--------|-------------------|------------|------------------|----------------|------------------|----------------------------------|-------------------|-----------------------------------|
| Early-Winter | 25-Nov | 74 | 7 | 23 | 2 | 1 | 449 | - | 3 gulls |
| | 29-Nov | 111 | 67 | 13 | 5 | 2 | 521 | - | 1 great blue heron |
| | 13-Dec | 103 | 8 | 21 | 2 | 4 | 762 | - | 1 great blue heron |
| Mid-Winter | 21-Dec | 79 | 17 | 8 | 4 | 1 | 746 | - | - |
| | 29-Dec | 88 | 6 | 5 | 2 | 3 | 834 | - | 1 great blue heron |
| | 4-Jan | 128 | 20 | 23 | 6 | 1 | 842 | - | 1 great blue heron, 1 unid. Eagle |
| Late-Winter | 16-Feb | 36 | 155 | 44 | 9 | 3 | 586 | - | 2 elk, 1 gull |
| | 23-Feb | 33 | 119 | 38 | 4 | 0 | 736 | - | 1 red-tailed hawk |
| | 2-Mar | 55 | 190 | 21 | 2 | 2 | 460 | - | 1 unid eagle |
| Green-up | 14-Mar | 41 | 107 | 14 | 5 | 1 | 486 | - | 1 goshawk, 1 unid. gull 1 GBHE |
| | 23-Mar | 54 | 99 | 10 | 1 | 4 | 538 | - | - |
| | 29-Mar | 38 | 64 | 0 | 4 | 0 | 429 | 1 coyote, 3 bears | 1 peregrine falcon |
| Totals | | 840 | 859 | 220 | 46 | 22 | 7,389 | | |

Table 2. Mountain goat production within the study area; winters of 1982-83 through 2011-12.

| <u>North shore (WDF&W goat unit #6)</u> | | | | | | | <u>South shore (WDF&W goat unit #7)</u> | | | | | | | <u>Stehekin Valley (WDF&W goat unit #21)</u> | | | | | | | <u>TOTAL LAKE CHELAN STUDY AREA</u> | | | | | | |
|---|-------|-------|-----|------|-------|-----------------|---|-------|-------|-----|------|-------|-----------------|--|-------|---|-----|------|-------|-----------------|-------------------------------------|-------|-------|-----|------|-------|-----------------|
| Winter | Total | Adult | Kid | Unid | %kids | Kids/100 adults | Winter | Total | Adult | Kid | Unid | %kids | Kids/100 adults | Winter | Total | Adult | Kid | Unid | %kids | Kids/100 adults | Winter | Total | Adult | Kid | Unid | %kids | Kids/100 adults |
| 1982-83 | 41 | 33 | 8 | 0 | 20 | 24 | 1982-83 | 44 | 37 | 7 | 0 | 16 | 19 | 1982-83 | 8 | 7 | 1 | 0 | 13 | 14 | 1982-83 | 93 | 77 | 16 | 0 | 17 | 21 |
| 1983-84 | 48 | 40 | 8 | 0 | 17 | 20 | 1983-84 | 62 | 50 | 12 | 0 | 19 | 24 | 1983-84 | 33 | 26 | 7 | 0 | 21 | 27 | 1983-84 | 143 | 116 | 27 | 0 | 19 | 23 |
| 1984-85 | 45 | 31 | 10 | 4 | 24 | 32 | 1984-85 | 48 | 36 | 9 | 3 | 20 | 25 | 1984-85 | 40 | 30 | 9 | 1 | 23 | 30 | 1984-85 | 133 | 97 | 28 | 8 | 22 | 29 |
| 1985-86 | 17 | 10 | 3 | 4 | 23 | 30 | 1985-86 | 28 | 19 | 5 | 4 | 21 | 26 | 1985-86 | 16 | 12 | 2 | 2 | 14 | 17 | 1985-86 | 61 | 41 | 10 | 10 | 20 | 24 |
| 1986-87 | 63 | 47 | 13 | 3 | 22 | 28 | 1986-87 | 51 | 41 | 10 | 0 | 20 | 24 | 1986-87 | 7 | 7 | 0 | 0 | 0 | 0 | 1986-87 | 121 | 95 | 23 | 3 | 19 | 24 |
| 1987-88 | 49 | 39 | 9 | 1 | 19 | 23 | 1987-88 | 49 | 37 | 11 | 1 | 23 | 30 | 1987-88 | 0 | Poor weather conditions - no visibility | | | | | 1987-88 | 98 | 76 | 20 | 2 | 21 | 26 |
| 1988-89 | 61 | 48 | 13 | 0 | 21 | 27 | 1988-89 | 53 | 40 | 13 | 0 | 25 | 33 | 1988-89 | 28 | 22 | 6 | 0 | 21 | 27 | 1988-89 | 142 | 110 | 32 | 0 | 23 | 29 |
| 1989-90 | 61 | 48 | 13 | 0 | 21 | 27 | 1989-90 | 70 | 57 | 13 | 0 | 19 | 23 | 1989-90 | 10 | 7 | 3 | 0 | 30 | 43 | 1989-90 | 141 | 112 | 29 | 0 | 21 | 26 |
| 1990-91 | 62 | 54 | 8 | 0 | 13 | 15 | 1990-91 | 48 | 39 | 9 | 0 | 19 | 23 | 1990-91 | 6 | 5 | 1 | 0 | 17 | 20 | 1990-91 | 116 | 98 | 18 | 0 | 16 | 18 |
| 1991-92 | 102 | 87 | 15 | 0 | 15 | 17 | 1991-92 | 66 | 52 | 12 | 2 | 19 | 23 | 1991-92 | 17 | 16 | 0 | 1 | 0 | 0 | 1991-92 | 185 | 155 | 27 | 3 | 15 | 17 |
| 1992-93 | 68 | 57 | 11 | 0 | 16 | 19 | 1992-93 | 33 | 28 | 5 | 0 | 15 | 18 | 1992-93 | 3 | 3 | 0 | 0 | 0 | 0 | 1992-93 | 104 | 88 | 16 | 0 | 15 | 18 |
| 1993-94 | 58 | 52 | 6 | 0 | 10 | 12 | 1993-94 | 40 | 33 | 7 | 0 | 18 | 21 | 1993-94 | 7 | 7 | 0 | 0 | 0 | 0 | 1993-94 | 105 | 92 | 13 | 0 | 12 | 14 |
| 1994-95 | 67 | 54 | 13 | 0 | 19 | 24 | 1994-95 | 46 | 37 | 9 | 0 | 20 | 24 | 1994-95 | 10 | 7 | 3 | 0 | 30 | 43 | 1994-95 | 123 | 98 | 25 | 0 | 20 | 26 |
| 1995-96 | 89 | 81 | 8 | 0 | 9 | 10 | 1995-96 | 32 | 28 | 4 | 0 | 13 | 14 | 1995-96 | 0 | Poor weather conditions - no visibility | | | | | 1995-96 | 121 | 109 | 12 | 0 | 10 | 11 |
| 1996-97 | 37 | 32 | 5 | 0 | 14 | 16 | 1996-97 | 13 | 11 | 2 | 0 | 15 | 18 | 1996-97 | 4 | 4 | 0 | 0 | 0 | 0 | 1996-97 | 54 | 47 | 7 | 0 | 13 | 15 |
| 1997-98 | 80 | 67 | 13 | 0 | 16 | 19 | 1997-98 | 44 | 38 | 5 | 1 | 12 | 13 | 1997-98 | 0 | Poor weather conditions - no visibility | | | | | 1997-98 | 124 | 105 | 18 | 1 | 15 | 17 |
| 1998-99 | 64 | 54 | 10 | 0 | 16 | 19 | 1998-99 | 41 | 34 | 7 | 0 | 17 | 21 | 1998-99 | 5 | 5 | 0 | 0 | 0 | 0 | 1998-99 | 110 | 93 | 17 | 0 | 15 | 18 |
| 1999-00 | 58 | 51 | 7 | 0 | 12 | 14 | 1999-00 | 40 | 28 | 12 | 0 | 30 | 43 | 1999-00 | 0 | Poor weather conditions - no survey | | | | | 1999-00 | 98 | 79 | 19 | 0 | 19 | 24 |
| 2000-01 | 68 | 52 | 16 | 0 | 24 | 31 | 2000-01 | 31 | 19 | 7 | 5 | 27 | 37 | 2000-01 | 6 | 5 | 1 | 0 | 17 | 20 | 2000-01 | 105 | 76 | 24 | 5 | 24 | 32 |
| 2001-02 | 44 | 37 | 7 | 0 | 16 | 19 | 2001-02 | 28 | 21 | 7 | 0 | 25 | 33 | 2001-02 | 2 | 2 | 0 | 0 | 0 | 0 | 2001-02 | 74 | 60 | 14 | 0 | 19 | 23 |
| 2002-03 | 71 | 54 | 17 | 0 | 24 | 31 | 2002-03 | 39 | 35 | 4 | 0 | 10 | 11 | 2002-03 | | Poor weather conditions - no survey | | | | | 2002-03 | 110 | 89 | 21 | 0 | 19 | 24 |
| 2003-04 | 72 | 62 | 10 | 0 | 14 | 16 | 2003-04 | 56 | 41 | 15 | 0 | 27 | 37 | 2003-04 | | No survey | | | | | 2003-04 | 128 | 103 | 25 | 0 | 20 | 24 |
| 2004-05 | 118 | 100 | 18 | 0 | 15 | 18 | 2004-05 | 49 | 38 | 11 | 0 | 22 | 29 | 2004-05 | | No survey | | | | | 2004-05 | 167 | 138 | 29 | 0 | 17 | 21 |
| 2005-06 | 91 | 74 | 17 | 0 | 19 | 23 | 2005-06 | 57 | 42 | 12 | 3 | 22 | 29 | 2005-06 | 4 | 4 | 0 | 0 | 0 | 0 | 2005-06 | 152 | 120 | 29 | 3 | 19 | 24 |
| 2006-07 | 75 | 58 | 17 | 0 | 23 | 29 | 2006-07 | 102 | 71 | 31 | 0 | 30 | 44 | 2006-07 | | No survey | | | | | 2006-07 | 177 | 129 | 48 | 0 | 27 | 37 |
| 2007-08 | 104 | 75 | 18 | 11 | 19 | 24 | 2007-08 | 76 | 49 | 17 | 10 | 26 | 35 | 2007-08 | 0 | 0 | 0 | 0 | 0 | 0 | 2007-08 | 180 | 124 | 35 | 21 | 22 | 28 |
| 2008-09 | 94 | 54 | 14 | 26 | 21 | 26 | 2008-09 | 66 | 38 | 10 | 18 | 21 | 26 | 2008-09 | | No survey | | | | | 2008-09 | 160 | 92 | 24 | 44 | 21 | 26 |
| 2009-10 | 81 | 51 | 10 | 20 | 16 | 20 | 2009-10 | 128 | 93 | 29 | 6 | 24 | 31 | 2009-10 | | Poor weather conditions - no visibility | | | | | 2009-10 | 209 | 144 | 39 | 26 | 21 | 27 |
| 2010-11 | 78 | 37 | 10 | 31 | 21 | 27 | 2010-11 | 94 | 55 | 29 | 10 | 35 | 53 | 2010-11 | | No survey | | | | | 2010-11 | 172 | 92 | 39 | 41 | 30 | 42 |
| 2011-12 | 43 | 30 | 9 | 4 | 23 | 30 | 2011-12 | 116 | 86 | 24 | 6 | 22 | 28 | 2011-12 | 1 | 0 | 0 | 1 | n/a | n/a | 2011-12 | 160 | 116 | 33 | 11 | 22 | 28 |

Table 3. Average and maximum numbers of ungulate observations by species per survey during the winter seasons of 1982-83 through 2011-12.

| Winter | Average # Observed | | | | | Maximum # Observed | | | | |
|----------------|--------------------|-------------|--------------|-------------|---------------|--------------------|-----------------|------------------|-----------------|----------------|
| | Mountain goats | | Mule deer | | Bighorn Sheep | Mountain Goats | | Mule Deer | | Bighorn Sheep |
| | North shore | South shore | North shore | South shore | North shore | North shore | South shore | North shore | South Shore | North shore |
| 1982-83 | 12.4 | 19.1 | 264.0 | 14.0 | | 22 | 34 | 625 | 36 | |
| 1983-84 | 11.6 | 24.8 | 71.0 | 17.0 | | 44 | 47 | 410 | 72 | |
| 1984-85 | 8.8 | 22.3 | 68.0 | 16.0 | | 25 | 39 | 282 | 31 | |
| 1985-86 | 3.6 | 9.7 | 168.0 | 32.0 | | 11 | 26 | 768 | 103 | |
| 1986-87 | 14.2 | 16.5 | 161.0 | 18.0 | | 52 | 37 | 758 | 95 | |
| 1987-88 | 15.4 | 18.0 | 110.9 | 24.0 | | 43 | 30 | 534 | 64 | |
| 1988-89 | 15.4 | 27.8 | 74.5 | 8.3 | | 44 | 50 | 315 | 16 | |
| 1989-90 | 26.3 | 32.2 | 83.0 | 5.9 | | 54 | 64 | 357 | 43 | |
| 1990-91 | 32.9 | 20.1 | 110.4 | 7.1 | | 56 | 45 | 337 | 24 | |
| 1991-92 | 40.1 | 23.6 | 88.4 | 2.2 | | 79 | 35 | 427 | 9 | |
| 1992-93 | 30.0 | 14.6 | 190.3 | 24.9 | | 66 | 19 | 1039 | 75 | |
| 1993-94 | 19.4 | 14.8 | 31.8 | 13.3 | | 52 | 28 | 156 | 32 | |
| 1994-95 | 29.8 | 14.0 | 157.5 | 25.4 | | 59 | 31 | 536 | 69 | |
| 1995-96 | 27.3 | 10.5 | 94.3 | 19.8 | | 86 | 30 | 539 | 81 | |
| 1996-97 | 10.5 | 3.2 | 221.5 | 50.5 | | 35 | 8 | 709 | 123 | |
| 1997-98 | 25.3 | 11.6 | 40.3 | 4.8 | | 70 | 34 | 211 | 34 | |
| 1998-99 | 27.6 | 11.6 | 34.8 | 4.9 | | 56 | 24 | 143 | 32 | |
| 1999-00 | 13.3 | 7.3 | 46.3 | 2.2 | 1.3 | 34 | 20 | 375 | 8 | 2 |
| 2000-01 | 23.9 | 7.2 | 28.8 | 6.1 | 9.8 | 49 | 26 | 63 | 16 | 38 |
| 2001-02 | 14.0 | 9.8 | 41.3 | 8.6 | 10.2 | 29 | 27 | 192 | 29 | 46 |
| 2002-03 | 23.5 | 8.7 | 39.3 | 11.3 | 12.8 | 53 | 33 | 146 | 71 | 35 |
| 2003-04 | 26.0 | 17.2 | 77.3 | 15.3 | 29.4 | 77 | 48 | 388 | 65 | 82 |
| 2004-05 | 44.3 | 11.7 | 8.7 | 10.8 | 23.5 | 100 | 26 | 24 | 52 | 59 |
| 2005-06 | 28.3 | 18.0 | 125.4 | 49.7 | 37.5 | 78 | 41 | 429 | 160 | 79 |
| 2006-07 | 41.2 | 48.8 | 89.1 | 31.2 | 41.6 | 62 | 77 | 218 | 94 | 80 |
| 2007-08 | 48.4 | 20.8 | 164.4 | 42.9 | 28.8 | 97 | 42 | 388 | 131 | 51 |
| 2008-09 | 37.8 | 19.3 | 102.6 | 54.0 | 34.5 | 67 | 55 | 301 | 174 | 55 |
| 2009-10 | 36.3 | 59.5 | 83.8 | 46.3 | 34.7 | 56 | 108 | 257 | 111 | 58 |
| 2010-11 | 31.0 | 44.8 | 196.8 | 74.3 | 26.6 | 78 | 82 | 558 | 201 | 54 |
| 2011-12 | 23.0 | 47.0 | 37.0 | 34.6 | 18.3 | 43 | 108 | 93 | 97 | 44 |
| Average | 24.7 | 20.5 | 100.4 | 22.5 | 23.8 | max. 100 | max. 108 | max. 1039 | max. 201 | max. 82 |

Table 4. Lake Chelan study area wintering mule deer herd composition (percent by shore) during winter seasons of 1982-83 through 2011-12.

| Winter | North Shore | | | | | | | South Shore | | | | | | |
|------------|-------------|-----------|----------|--------------|----------------|--|-----------------|-------------|-----------|----------|--------------|----------------|--|-----------------|
| | % Does | % Fawns | % Bucks | % Classified | % UnClassified | Fawns/100 adults | Bucks/ 100 does | % Does | % Fawns | % Bucks | % Classified | % UnClassified | Fawns/100 adults | Bucks/ 100 does |
| 1982-83 | 57 | 37 | 6 | 68 | 32 | | | 68 | 30 | 1 | 87 | 13 | | |
| 1983-84 | 63 | 31 | 5 | 50 | 50 | | | 66 | 26 | 8 | 48 | 52 | | |
| 1984-85 | 52 | 37 | 11 | 23 | 77 | | | 71 | 24 | 5 | 39 | 61 | | |
| 1985-86 | 68 | 27 | 5 | 13 | 87 | | | 66 | 31 | 3 | 20 | 80 | | |
| 1986-87 | 75 | 23 | 3 | 25 | 75 | | | 54 | 29 | 17 | 16 | 84 | | |
| 1987-88 | 64 | 32 | 4 | 52 | 48 | | | 70 | 28 | 1 | 44 | 56 | | |
| 1988-89 | 68 | 30 | 3 | 25 | 75 | | | 74 | 19 | 7 | 27 | 73 | | |
| 1989-90 | 73 | 20 | 7 | 12 | 88 | | | 0 | 0 | 0 | 0 | 100 | | |
| 1990-91 | 76 | 13 | 11 | 22 | 78 | | | 57 | 6 | 37 | 55 | 45 | | |
| 1991-92 | 75 | 22 | 3 | 26 | 74 | | | 90 | 10 | 0 | 38 | 62 | | |
| 1992-93 | 66 | 29 | 4 | 20 | 80 | | | 60 | 23 | 18 | 27 | 73 | | |
| 1993-94 | 90 | 8 | 2 | 23 | 77 | Ratio data from 1982-83 through 2006-07 will be included in the 2012-13 report | | 74 | 18 | 8 | 58 | 42 | Ratio data from 1982-83 through 2006-07 will be included in the 2012-13 report | |
| 1994-95 | 67 | 25 | 7 | 33 | 67 | | | 68 | 27 | 4 | 51 | 49 | | |
| 1995-96 | 75 | 19 | 6 | 26 | 74 | | | 75 | 20 | 4 | 29 | 71 | | |
| 1996-97 | 81 | 16 | 3 | 58 | 42 | | | 80 | 16 | 5 | 53 | 47 | | |
| 1997-98 | 89 | 8 | 3 | 8 | 92 | | | 0 | 0 | 0 | 0 | 100 | | |
| 1998-99 | 77 | 21 | 2 | 9 | 91 | | | 50 | 30 | 0 | 3 | 97 | | |
| 1999-00 | 53 | 29 | 18 | 3 | 97 | | | 67 | 33 | 0 | 46 | 54 | | |
| 2000-01 | 66 | 32 | 3 | 47 | 53 | | | 68 | 26 | 6 | 51 | 49 | | |
| 2001-02 | 68 | 26 | 6 | 30 | 70 | | | 72 | 19 | 9 | 29 | 71 | | |
| 2002-03 | 66 | 33 | 0 | 2 | 98 | | | 56 | 21 | 13 | 12 | 88 | | |
| 2003-04 | 61 | 27 | 12 | 19 | 81 | | | 64 | 29 | 7 | 25 | 75 | | |
| 2004-05 | 64 | 36 | 2 | 42 | 58 | | | 64 | 32 | 4 | 22 | 78 | | |
| 2005-06 | 66 | 34 | 0 | 4 | 96 | | | 61 | 30 | 9 | 21 | 79 | | |
| 2006-07 | 55 | 37 | 8 | 86 | 14 | | | 51 | 29 | 20 | 86 | 14 | | |
| 2007-08 | 77 | 19 | 4 | 46 | 54 | 20.1 | 11.1 | 79 | 17 | 3 | 52 | 48 | 17.4 | 8.6 |
| 2008-09 | 82 | 17 | 2 | 63 | 37 | 20.1 | 7.5 | 74 | 21 | 5 | 51 | 49 | 25.2 | 17.7 |
| 2009-10 | 55 | 11 | 1 | 67 | 33 | 19.1 | 5.1 | 39 | 10 | 2 | 51 | 49 | 25.6 | 14.3 |
| 2010-11 | 65 | 25 | 10 | 61 | 39 | 38.5 | 20.8 | 43 | 18 | 11 | 72 | 28 | 37.8 | 26.2 |
| 2011-12 | 42 | 8 | 2 | 52 | 48 | 18.1 | 18.9 | 54 | 13 | 2 | 69 | 31 | 23.0 | 28.6 |
| AVG | 68 | 24 | 5 | 33 | 67 | 23.2 | 12.7 | 61 | 21 | 7 | 37 | 63 | 25.8 | 19.1 |

Table 5. Average and maximum numbers of avian observations by species and type per survey during winters of 1982-83 through 2011-12.

| Winter | Average # observed per survey | | | | | | | | | | Max. # observed per survey | | | | | | | | | | | | |
|----------------|-------------------------------|------------|------|---------|-------|-------|-------|------|------|------|----------------------------|-----------|-----------|------|---------|-------|-------|-------|------|------|------|------------|--|
| | Eagles | | Coot | Dabbler | Diver | Goose | Grebe | Gull | Loon | Swan | Other/unid | Eagles | | Coot | Dabbler | Diver | Goose | Grebe | Gull | Loon | Swan | Other/unid | |
| 1982-83 | 1.3 | 1.8 | | | | | | | | | | 5 | 8 | | | | | | | | | | |
| 1983-84 | 3.7 | 2.8 | | | | | | | | | | 12 | 4 | | | | | | | | | | |
| 1984-85 | 2.1 | 1.6 | | | | | | | | | | 8 | 3 | | | | | | | | | | |
| 1985-86 | 1.9 | 0.9 | | | | | | | | | | 7 | 2 | | | | | | | | | | |
| 1986-87 | 1.3 | 0.5 | | | | | | | | | | 6 | 2 | | | | | | | | | | |
| 1987-88 | 2.8 | 1.6 | | | | | | | | | | 10 | 3 | | | | | | | | | | |
| 1988-89 | 1.9 | 1.4 | | | | | | | | | | 5 | 7 | | | | | | | | | | |
| 1989-90 | 0.8 | 0.6 | | | | | | | | | | 3 | 2 | | | | | | | | | | |
| 1990-91 | 1.9 | 1.8 | | | | | | | | | | 6 | 5 | | | | | | | | | | |
| 1991-92 | 1.0 | 0.2 | | | | | | | | | | 6 | 1 | | | | | | | | | | |
| 1992-93 | 2.4 | 1.2 | | | | | | | | | | 9 | 6 | | | | | | | | | | |
| 1993-94 | 2.1 | 0.5 | | | | | | | | | | 6 | 3 | | | | | | | | | | |
| 1994-95 | 2.0 | 1.6 | | | | | | | | | | 9 | 8 | | | | | | | | | | |
| 1995-96 | 3.5 | 1.7 | | | | | | | | | | 7 | 5 | | | | | | | | | | |
| 1996-97 | 9.7 | 3.4 | | | | | | | | | | 27 | 6 | | | | | | | | | | |
| 1997-98 | 3.5 | 0.8 | | | | | | | | | | 7 | 4 | | | | | | | | | | |
| 1998-99 | 4.0 | 2.1 | | | | | | | | | | 7 | 4 | | | | | | | | | | |
| 1999-00 | 2.7 | 1.3 | | | | | | | | | | 7 | 5 | | | | | | | | | | |
| 2000-01 | 2.3 | 1.8 | | | | | | | | | | 6 | 4 | | | | | | | | | | |
| 2001-02 | 3.0 | 1.8 | | | | | | | | | | 9 | 8 | | | | | | | | | | |
| 2002-03 | 5.0 | 1.1 | | | | | | | | | | 14 | 4 | | | | | | | | | | |
| 2003-04 | 5.3 | 2.9 | | | | | | | | | | 13 | 9 | | | | | | | | | | |
| 2004-05 | 3.2 | 1.5 | | | | | | | | | | 6 | 4 | | | | | | | | | | |
| 2005-06 | 4.9 | 2.5 | | | | | | | | | | 12 | 6 | | | | | | | | | | |
| 2006-07 | 5.8 | 2.7 | | | | | | | | | | 13 | 6 | | | | | | | | | | |
| 2007-08 | 5.3 | 2.7 | 2.8 | 190.8 | 128.0 | 119.1 | 36.8 | 0.7 | 1.0 | 20.5 | 60.6 | 10 | 7 | 7 | 603 | 202 | 218 | 71 | 2 | 4 | 37 | 347 | |
| 2008-09 | 5.5 | 4.6 | 3.0 | 216.8 | 193.0 | 109.8 | 59.3 | 0.9 | 1.0 | 23.4 | 7.8 | 15 | 14 | 7 | 279 | 262 | 221 | 92 | 4 | 3 | 38 | 46 | |
| 2009-10 | 7.6 | 2.7 | 0.3 | 116.7 | 147.1 | 61.0 | 73.6 | 0.1 | 0.7 | 13.5 | 0.5 | 15 | 5 | 2 | 249 | 313 | 284 | 113 | 1 | 3 | 17 | 4 | |
| 2010-11 | 5.0 | 1.6 | 0.6 | 260.0 | 143.2 | 169.2 | 80.0 | 0.4 | 1.0 | 16.2 | 0.8 | 12 | 5 | 1 | 561 | 219 | 416 | 171 | 2 | 4 | 21 | 6 | |
| 2011-12 | 3.8 | 1.8 | 21.0 | 243.8 | 152.1 | 141.8 | 25.3 | 1.8 | 1.3 | 27.6 | 19.9 | 9 | 4 | 27 | 433 | 234 | 372 | 44 | 3 | 2 | 35 | 90 | |
| Average | 3.5 | 1.8 | | | | | | | | | | 27 | 14 | | | | | | | | | | |

Table 6. Water bird species numbers observed and average by survey for the 2011-12 Winter Wildlife Survey, Lake Chelan.

| Species | Survey | | | | | | | | | | | | Avg |
|--------------------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| American Coot | | | | | | | 17 | 27 | 18 | 19 | 21 | 24 | 10.5 |
| American wigeon | 83 | 179 | 217 | 145 | 186 | 208 | 183 | 181 | 142 | 164 | 148 | 94 | 160.8 |
| Barrows goldeneye | 24 | 25 | 25 | 28 | | 24 | 26 | 32 | 3 | 7 | 13 | 4 | 17.6 |
| Bufflehead | 24 | 18 | 27 | 23 | 22 | 29 | 27 | 22 | 16 | 15 | 22 | 27 | 22.7 |
| Canada goose | 73 | 65 | 192 | 214 | 299 | 372 | 66 | 136 | 54 | 86 | 73 | 72 | 141.8 |
| Canvasback | | | | | | | | 2 | 1 | 2 | 2 | 1 | 0.7 |
| Common goldeneye | 10 | 1 | 19 | 6 | 4 | 7 | 9 | 9 | 6 | 9 | 4 | 2 | 7.2 |
| Common loon | | 1 | | | | | | 1 | | | 2 | 1 | 0.4 |
| Common merganser | | | 67 | 88 | 2 | | 4 | 4 | 5 | 1 | 3 | 12 | 15.5 |
| Gadwall | | 6 | | | | | 5 | 4 | | 3 | 2 | | 1.7 |
| Great blue heron | | 1 | 2 | | 1 | 1 | | | | 1 | 1 | | 0.6 |
| Green-winged teal | 10 | 22 | | | | 6 | 31 | 16 | 20 | | 14 | 6 | 10.4 |
| Gull | 3 | | | | | | 1 | | | 1 | | 2 | 0.6 |
| Hooded merganser | 1 | | | | | | | | | | | | 0.1 |
| Horned grebe | 43 | 28 | 20 | 35 | 36 | 15 | 13 | 31 | 18 | 19 | 11 | 9 | 23.2 |
| Lesser scaup | | | | | | 2 | 5 | 68 | 2 | 10 | 52 | | 11.6 |
| Mallard | 101 | 70 | 44 | 77 | 233 | 51 | 35 | 65 | 43 | 24 | 38 | 34 | 67.9 |
| Northern pintail | 1 | | | | | | 5 | 2 | | 6 | 2 | 1 | 1.4 |
| Noerhtern shoveler | | | | | | | | | | 1 | 1 | | 0.2 |
| Pied-billed grebe | 1 | | | | | | | | 1 | | 1 | | 0.3 |
| Redhead | | 5 | 8 | 6 | 7 | 9 | 8 | 10 | 8 | 10 | 4 | | 6.3 |
| Ring-necked duck | 63 | 77 | 115 | 104 | | 89 | 117 | 91 | 105 | 78 | 88 | 106 | 86.1 |
| Ruddy duck | | | | | | | | | | | 1 | | 0.1 |
| Trumpeter swan | 15 | 20 | 25 | 20 | 28 | 26 | 33 | 31 | 35 | 30 | 34 | 34 | 27.6 |
| Unidentified (any) | | | | | 14 | 1 | | 1 | | 1 | | | 17.0 |
| Western grebe | | 4 | 3 | | 3 | 3 | 2 | 2 | | 1 | 2 | 2 | 1.8 |
| | 452 | 522 | 764 | 746 | 835 | 843 | 587 | 735 | 477 | 488 | 539 | 431 | 618.3 |