

**PROJECT:** Bald Eagle Monitoring, 2008-2009

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## **EXECUTIVE SUMMARY**

- Winter counts of bald eagles on lakes Mead and Mohave were successfully conducted in early January of 2008 and 2009, under favorable weather conditions.
- The official count for 2008 was 116 bald eagles (49 adults and 66 immature) which was the largest number of bald eagles counted to date. The official count for 2009 was 108 bald eagles (49 adults and 59 immature).
- Multiple surveys of the Overton route were performed each year in an effort to evaluate variation in numbers of bald eagles counted. These surveys suggest that peak numbers of bald eagles may not occur until later in January well after the official counts have been performed.
- The upward trend in bald eagles observed along lakes Mead and Mohave in recent years appears to reflect improvements in count methodology, but there is some evidence that the number of bald eagles using the lakes may also be increasing.
- Lakes Mead and Mohave appear to be important wintering areas for bald eagles.
- Continued adherence to methodology established in 2007 is recommended, as well as maintaining a qualified eagle count coordinator invested in the outcome of the counts.

## **INTRODUCTION**

Winter counts of bald eagles (*Haliaeetus leucocephalus*) in Lake Mead National Recreation Area (LMNRA) have been conducted in some capacity by the National Park Service (NPS) since 1981. The objective has been to document trends in the number of wintering bald eagles using lakes Mead and Mohave, and to identify important wintering areas. Bald eagles are gregarious in the winter, and mid-winter counts conducted across North America have been an important tool in estimating the total wintering bald eagle population in the lower 48 states (Steenhof et al. 2002). In more recent years, the annual count effort at LMNRA has grown to as many as 48 people and 8 boats. At this level of effort, the eagle counts provide opportunities towards team building within units of the NPS and across both federal and state agencies. In addition, the count has become an important local media event, generally resulting in several newspaper articles and occasional television and radio news spots. This media coverage allows opportunities for public outreach on conservation issues.

Since the inception of the counts at LMNRA, methodologies, level of effort, areas surveyed, and data recording have varied substantially. The historical data have been reviewed (by J. M. Hutcheson and J. R. Jaeger) for use in assessing trends in eagle numbers, but comparisons across these years are generally not meaningful, even for particular geographically constrained survey areas like the Overton Arm of Lake Mead. An effort to stabilize methodology began in 2000 when survey routes were standardized and multiple boat crews used to cover all shorelines of lakes Mead and Mohave without overlap, and if possible in a single day. In 2001 an eagle identification guide was compiled (from various photos and field guide drawings), and distributed to boat crews in order to assist with distinguishing immature bald eagles from golden eagles; modifications to this guide were made in 2006 to incorporate additional photos and field guide illustrations (Sibley 2000). Finally in 2007, following LMNRA partnership with the Public Lands Institute, University of Nevada, Las Vegas (UNLV), a standard operating procedures document (SOP) for the winter bald eagle count was created (see Fletcher 2007, updated 2009), and major changes were initiated to make the counts more rigorous and repeatable. These changes included: (1) limitation of the maximum boat speed; (2) adjustments to two of the routes to allow for more even coverage by crews under the new boat speed; (3) deployment of global positioning system (GPS) units with each boat in order to record boat survey paths and help monitor boat speeds; (4) more standardized mapping and recording of eagle activity; (5) separation of duties among lead observer, data recorder, and boat operator; and (6) establishment of training opportunities for lead observers and data recorders. The SOP has been a working document and small modifications have been made to improve performance over the last several years.

Although, the USFWS has delisted the bald eagle from endangered status (USFWS 2007), the national winter bald eagle count is considered important for monitoring population fluctuations post-delisting. Locally, the bald eagle is a watch list species under the Clark County MSHCP (Clark County 2000), and under that plan the NPS has committed to monitoring trends of wintering bald eagles at LMNRA. Herein, we provide a final report for work performed towards bald eagle counts during 2008 and 2009 at LMNRA by NPS personnel and UNLV researchers (under task agreement with the NPS).

## **METHODS**

### **Annual Count**

The eagle count is conducted on standardized survey routes during the first two weeks of January, usually occurring within one or two target dates established by the U.S. Geological Survey (USGS) Snake River Field Station. For the 2008 and 2009 bald eagle counts, lead observers, boat operators, data recorders, and observers were recruited predominantly from individuals in Resource Management at LMNRA and the Public Lands Institute, UNLV. Volunteers also included employees from Nevada Department of Wildlife, Bureau of Reclamation, and the Biological Resource Discipline, USGS.

Lead observers and data recorders were provided trainings focused on the use of data recording sheets and maps, GPS unit operation, and on the basic plumage characteristics used to distinguish juvenile bald eagles from adult and juvenile golden eagles. Survey protocols and eagle identification guides were provided to all field personnel. As in years past, all surveys were conducted by boat, and survey routes were planned to incorporate all shorelines

of lakes Mead and Mohave, with the objective of minimizing double-counts by completing all routes during a single day. Routes followed paths standardized in 2000, with the exception of modifications to the Overton and Boulder Canyon routes (see Figure 1) and consisted of 3 routes on Lake Mohave and 5 routes on Lake Mead (see Fletcher 2007). As established in the SOP, a maximum boat speed of 15 mph was followed. All boats were equipped with GPS units (Garmin models GPSmap 76, 76s, or 76Cx) with the track-log functions set to collect a position every 30 seconds. When an eagle was observed, the time from the GPS unit was recorded on the data sheet, but because eagles were often observed at a distance that did not necessarily match boat locations, observation locations were officially recorded on hardcopy maps to more accurately reflect the actual position. The species and age class of each eagle (as determined by the lead observer), along with activity (flying or perch) were then recorded on standard datasheets.

After completion of the counts, datasheets and maps were quality assured by the lead observer and then assessed for completeness by the count coordinator. Hand-plotted locations were digitized within ArcGIS and stored as a feature class in an ESRI geodatabase. Information about each observed eagle (e.g. species, age class, activity) was then entered into a related table within the geodatabase. All data entered by hand from data sheets into electron form were assessed for quality by a second independent technician, and assessed for accuracy following guidelines established through a data management plan.

### **Multiple Surveys of Overton Route**

To better understand the potential variation in count numbers, the Overton route was resurveyed each year, mostly within the targeted time window for the official eagle count. This effort began in 2007 prior to the initiation of this project. The approach was to follow the SOP using qualified personnel that also participate in the official count. The Overton route was selected because it represents a well-defined geographical region and has consistently returned the largest number of bald eagles during previous counts. A complete replicate count of lakes Mead and Mohave was not possible given limited resources.

## **RESULTS**

### **Annual Counts**

In 2008 the eagle count took place on January 7, under favorable weather conditions (i.e. light winds with early morning clouds clearing by afternoon). All survey routes were completed on that day. The survey effort totaled approximately 62 hours of search time, with 46 people on 8 boats. The total eagle count was 116 bald eagles (49 adults, 66 immature and 1 of unknown age). In addition, 2 adult golden eagles, 1 immature golden eagle, and 6 unknown eagles were also recorded (Table 1; Figure 2). The 2008 count returned the most bald eagles recorded to date. Conditions for this survey were ideal, and likely played a role in the large number of eagles observed.

In 2009, the eagle count also was conducted on January 7, under favorable weather conditions (i.e. light winds and clear skies), however, two routes (Overton and Cottonwood) were not completed on the target date because of mechanical problems with the boats. These routes were subsequently surveyed on January 8 under virtually identical weather conditions (i.e. light winds and clear skies). There is no evidence that the postponement of these two

surveys biased the count in one way or the other. Participants on the surveys included 48 individuals on 8 boats, with a total survey effort of approximately 55 hours. The count for 2009 was 108 bald eagles (49 adults and 59 immature), 3 adult golden eagles, and 6 unidentified eagles (Table 2; Figure 3).

### **Multiple Surveys of Overton Arm**

Two complete surveys were conducted on the Overton route in 2007. After initiation of this project, three surveys were conducted during 2008 and 2009 (including the official surveys). In order to control for observer bias, an effort was made to include at least some of the same highly qualified individuals on all three surveys each year and between years. In 2007 the national survey period occurred from January 3-14. Several attempts were made to conduct additional surveys of the Overton route in 2007, but because of inclement weather only two surveys were completed. In 2008, all three surveys of the Overton route fell within the national survey period (January 2-14). During 2008, the lowest count of eagles occurred on the official count day, which may be attributed to the inclusion of a media team that likely distracting the observers. In 2009, the surveys conducted before and after the official count occurred outside the national survey period (i.e., December 31, 2008 - January 14, 2009). In general, the additional surveys of the Overton route revealed an increase in the number of eagles recorded toward the later parts of January. These differences appear to be substantial, with the largest difference occurring in 2009 when the later survey was 58% larger than the official count. One possible explanation for the late season arrival of bald eagles at LMNRA is that this region is at the southern end of wintering areas used by bald eagles migrating from the Northwest, and these birds simply may not arrive in this area until later in winter (Buehler, 2000).

### **Annual Counts**

Bald eagle numbers have been increasing across North America since the banning of DDT and an emphasis on protecting nesting, roosting, and important feeding sites (Buehler, 2000). In general, the numbers of bald eagles at LMNRA appear to follow this broad upward trend. Unfortunately, the inherent differences in methodology over the past three decades make drawing strong conclusions from the long-term data at LMNRA impossible. Over the last nine years (Table 4), however, methodologies have been similar and some level of comparisons can be made. In general, the data suggest an upward trend in the number of bald eagles counted. This, however, may partly be an artifact of the methodological change initiated in 2007. On average from 2000 until 2006, prior to initiation of the SOP, the number of bald eagles observed per count was  $65 \pm 10$  (1 SD). This jumped to 87 bald eagles in 2007 with an average during 2007-2009 of  $104 \pm 15$  (average  $\pm$  1 SD).

Interviews with participants of these surveys through the years point to the limitations on boat speed and to the clearly defined role of lead observers as important factors in recent improvements in the observability and identification of eagles during these counts. In the past, boat operators often moved quickly to shorten survey times. Visual assessment of the numbers of golden eagles observed over the years suggests the possibility that misidentifications of these birds may have reduced the number of bald eagles identified on some earlier counts. There is some evidence, however, to suggest that the upward trend in bald eagles is at least partly caused by increasing numbers of these birds using lakes Mead and Mohave. There have been high percentages of immature bald eagles documented during

surveys (as high as 66% of total number observed; Table 4, Figure 3). The high percentage of immature eagles using these lakes may be an indicator of good regional recruitment and population expansion; however, we really do not know the structure of the population, or populations, using these lakes or whether the high numbers of juveniles simply reflects a bias in the use of this wintering area by younger eagles.

Regardless of historical differences in count methodologies, or in our lack of knowledge about the bald eagles using lakes Mead and Mohave, it is clear that these lakes are used by these birds throughout the winter months. Based on counts of eagles made during aquatic and shorebird surveys at several sites on both lakes (not associated with the project reported herein), bald eagles begin to appear in large numbers during December and leave in February with a strong peak in numbers in January (Figure 4). These data, along with the winter bald eagle count returns, clearly indicate that lakes Mead and Mohave are important wintering areas for regional bald eagles.

### **Recommendations**

Adhering to the methodology (SOP) established in 2007, with minor adjustments if deemed necessary, should provide a reasonable approach to assessing large-scale trends in bald eagle wintering numbers at LMNRA over time. The multiple surveys of the Overton route conducted over the past three years indicate that counts in early January may not represent the peak of eagle use on these lakes, which may not occur until the latter half of January. Potentially, counts in late January may provide a more accurate representation of bald eagles using lakes Mead and Mohave, and we recommend the consideration of conducting double counts during upcoming years to assess the actual scale of difference – one during early January (meeting the winter count requirement) and one during late January (to better assess the numbers of bald eagles using the area). Switching the official count to late January is not recommended as this would make the count fall outside regional sampling periods established at a national level, and again would constitute a large change in count methodology.

If consistency of data quality is to be maintained across years, maintaining a trained count coordinator is critical. The count coordinator must be invested in the count outcome and have enough influence within the LMNRA community to maintain the professionalism of the count. Continuing training of lead observers and data recorders, particularly any new personnel performing these roles, will be necessary.

If resources become limited in the future, we suggest that the surveys of lakes Mead and Mohave be split into separate back-to-back days before any individual routes are abandoned. The advantage of this would be that boats and certain crew members could participate on both days and other crew members would have some flexibility in the selection of participation dates. This approach would reduce the overall number of trained and qualified personnel needed to conduct the count and reduce the number of boats required. It would also allow selection of lead observers with the best qualifications. The main drawback of this approach may be an increase in count error as eagles might move between the lakes between survey days. Few bald eagles, however, have been observed along the areas that abut the two lakes and there is no reason to believe that there is a strong directionality to movements between the lakes during the survey period that could bias results. If resources are extremely limited and routes need to be abandoned, we recommend that the count of Lake

Mohave be dropped in favor of maintaining a long-term count along Lake Mead where the largest numbers of eagles are typically concentrated.

#### ACKNOWLEDGMENTS

The bald eagle winter counts would not be possible without the personnel and volunteers from all the various agencies that participate. Joe Hutcheson and Mark Sappington should be recognized for their work on GPS organization, map and datasheet production, and data management. Joe Barnes has consistently played an important role in the success of the counts in recent years, and was also responsible for collecting the information on seasonal arrival and departure times of bald eagles. This report benefited from the editing and comments of Ross Haley.

#### LITERATURE CITED

- Buehler, D. A. 2000. Bald eagle (*Haliaeetus leucocephalus*), The Birds of North America online (A. Poole. Ed). Cornell Lab of Ornithology; Ithaca, New York. Retrieved from: <http://bna.birds.cornell.edu/bna/species/506>.
- Clark County. 2000. Final Clark County multiple species habitat conservation plan and environmental impact statement for issuance of a permit to allow incidental take of 79 species in Clark County, Nevada. Unpublished document, Clark County Department of Comprehensive Planning, Las Vegas, Nevada and U.S. Fish and Wildlife Service, Reno Nevada.
- Fletcher, D. M. 2007. Winter bald eagle counts on Lakes Mead and Mohave, Lake Mead National Recreation Area guidelines and field protocols. Unpublished document (updated 2009), Lake Mead National Recreation Area, National Park Service, Boulder City, Nevada.
- Steenhof, K., Bond, L., Bates, K.K., and Leppert, L.L. 2002. Trends in midwinter counts of bald eagles in the contiguous United States, 1986-2001. *Bird Populations*, 6:21-32.
- Sibley, D.A. 2000. The Sibley Guide to Birds. Alfred A. Knopf, Inc., New York, New York.
- U.S. Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; removing the bald eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife. Unpublished document, U.S. Fish and Wildlife Service.

**Table 1.** Number of eagles recorded on Lakes Mead and Mohave on January 7, 2008.

Route	Total Bald	Adult Bald	Immature Bald	Unknown Bald	Adult Golden	Immature Golden	Unknown Golden	Unidentified Eagle
Boulder Basin	8	2	5	1	0	0	0	2
Boulder Canyon	23	10	13	0	0	1	0	0
Overton	20	15	5	0	0	0	0	2
Temple Bar West	26	9	17	0	0	0	0	2
Temple Bar East	17	5	12	0	0	0	0	0
Willow Beach	6	0	6	0	2	0	0	0
Cottonwood	14	7	7	0	0	0	0	0
Katherine	2	1	1	0	0	0	0	0
<b>Total</b>	<b>116</b>	<b>49</b>	<b>66</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>6</b>

**Table 2.** Number of eagles recorded on Lakes Mead and Mohave on January 7, 2009.

Route	Total Bald	Adult Bald	Immature Bald	Unknown Bald	Adult Golden	Immature Golden	Unknown Golden	Unidentified Eagle
Boulder Basin	0	0	0	0	0	0	0	3
Boulder Canyon	10	6	4	0	0	0	0	0
Overton	31	12	19	0	0	0	0	1
Temple Bar West	34	14	20	0	0	0	0	0
Temple Bar East	11	4	7	0	1	0	0	1
Willow Beach	7	6	1	0	0	0	0	1
Cottonwood	14	6	8	0	2	0	0	0
Katherine	1	1	0	0	0	0	0	0
<b>Total</b>	<b>108</b>	<b>49</b>	<b>59</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>6</b>

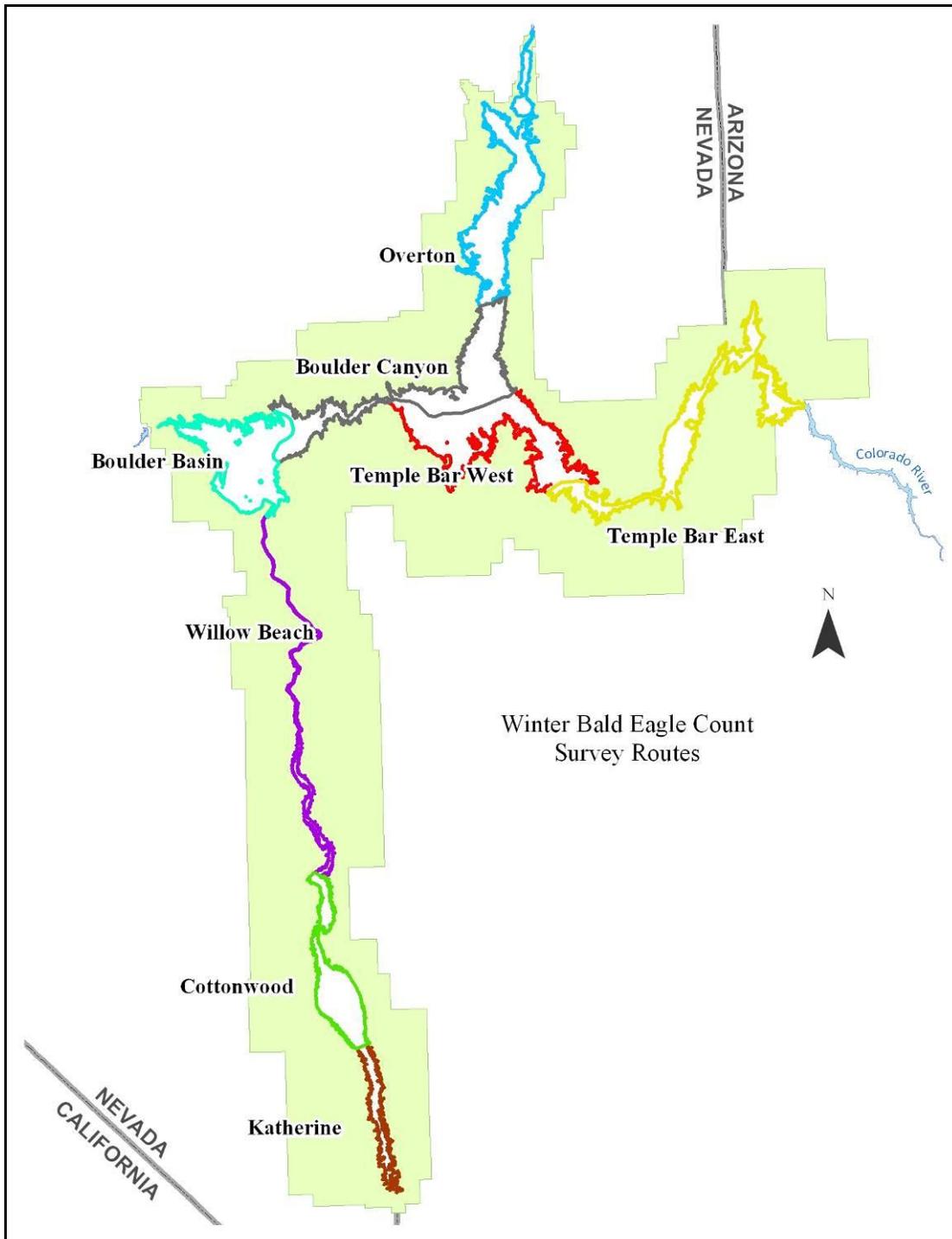
**Table 3.** Number of eagles observed on the Overton route (completed surveys only) on various survey dates from 2007 through 2009.

Date	Weather	Total Bald	Adult Bald	Immature Bald	Unknown Bald	Adult Golden	Immature Golden	Unknown Eagle
Jan 4, 2007	CL/CA	28	10	18	0	0	0	2
Jan 30, 2007	C/CA	43	16	27	0	0	0	2
Jan 3, 2008	C/CA	26	14	12	0	0	0	2
Jan 7, 2008	C to CL/Light	20	15	5	0	0	0	2
Jan 14, 2008	CL/Light to Mod	29	12	15	2	0	0	4
Dec 19, 2008	C/CA	22	10	11	1	0	0	1
Jan 8, 2009	CL/Light	31	12	19	0	0	0	1
Jan 26, 2009	CL/CA	49	16	33	0	0	0	3

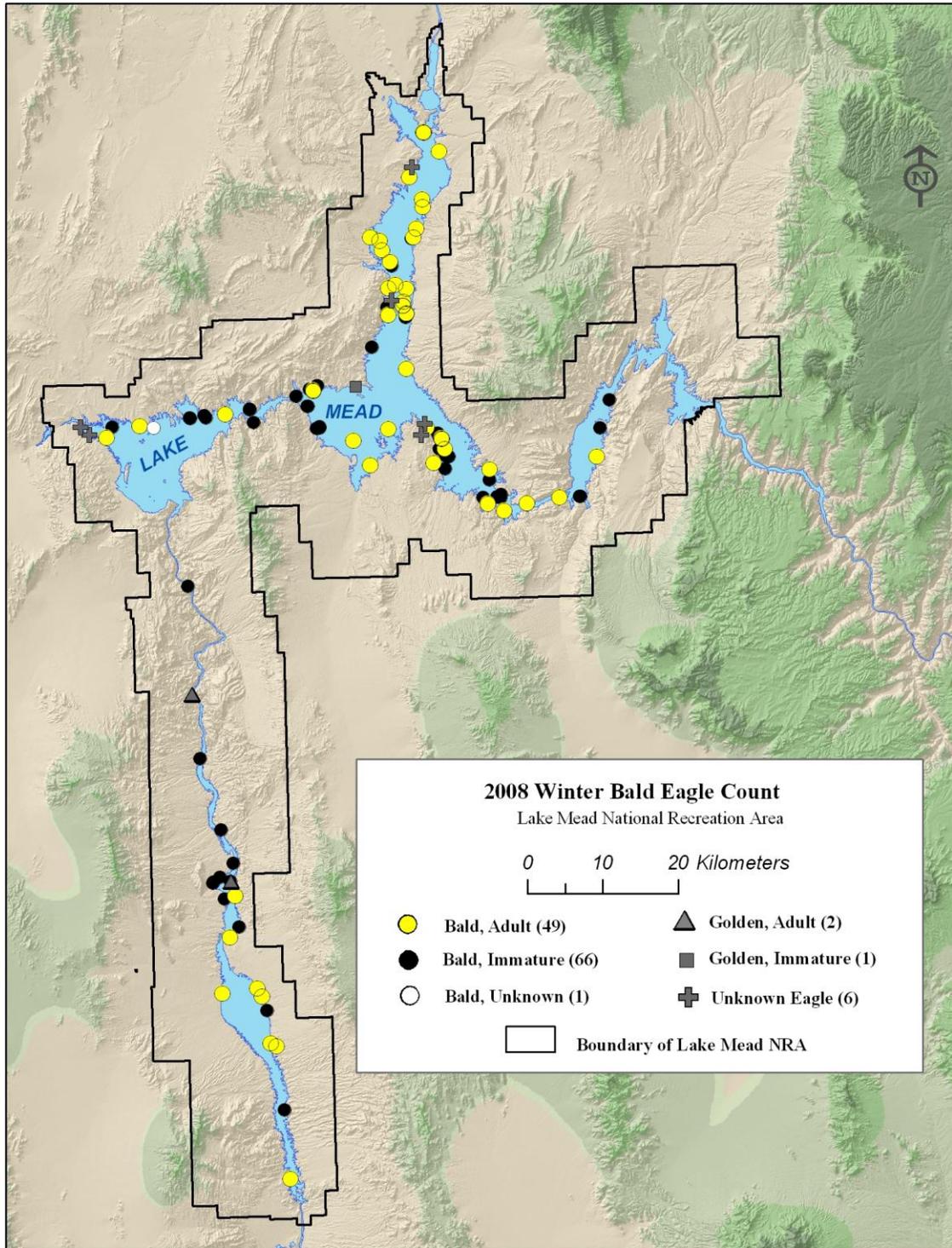
Legend: CL=Clear, C=Cloudy, CA=Calm, Light= Light wind, Mod= Moderate wind

**Table 4.** Number of eagles recorded from 2000 through 2009 during the winter count of Lakes Mead and Mohave. Note that methodologies have changed through time with routes standardized in 2000, and standard operating procedures implemented in 2007.

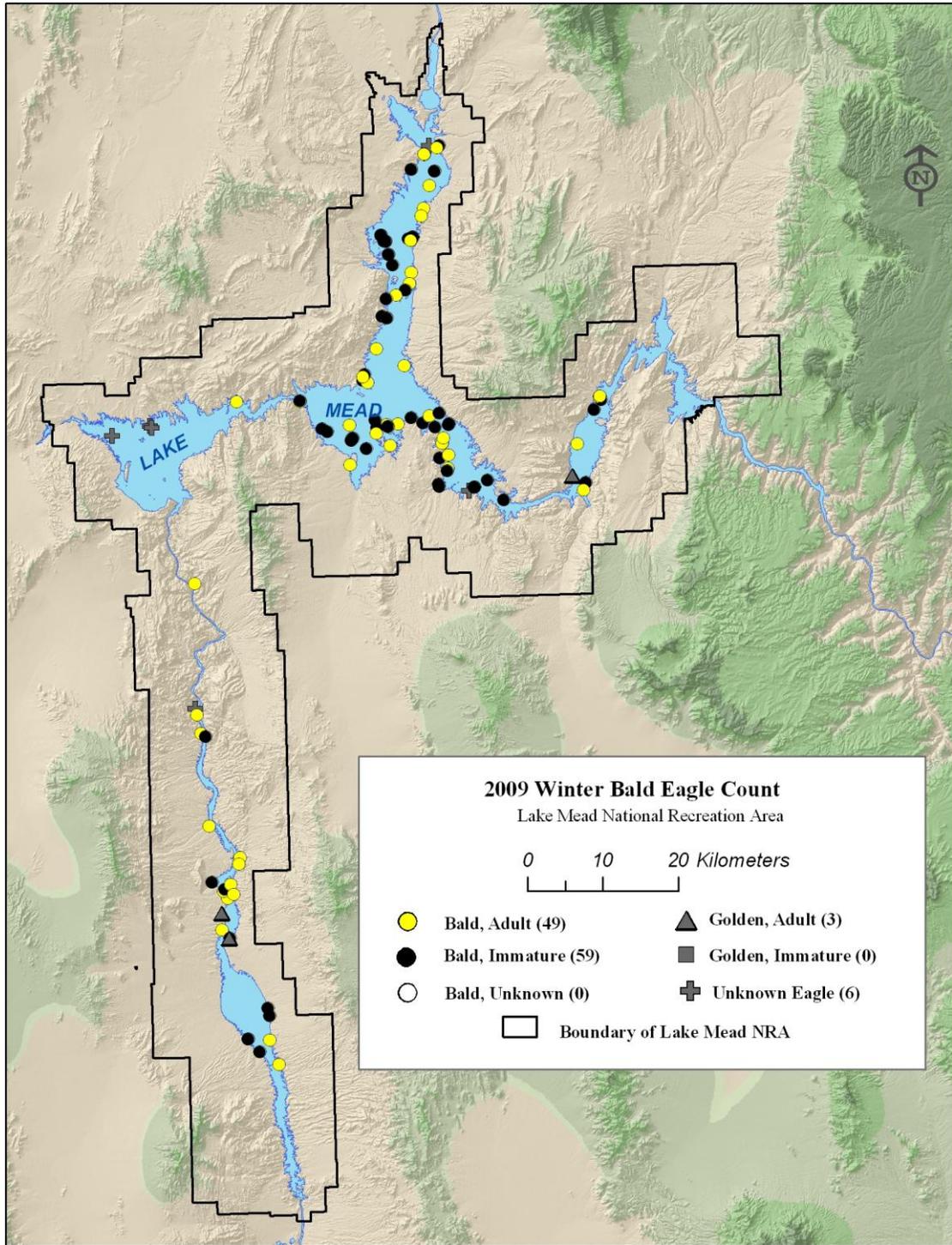
Year	Total Bald	Adult Bald	Immature Bald	Unknown Bald	Adult Golden	Immature Golden	Unknown Golden	Unidentified Eagle
2000	47	32	15	0	7	1	0	4
2001	60	29	31	0	1	1	0	7
2002	79	41	38	0	2	1	0	3
2003	68	37	31	0	2	7	0	8
2004	60	36	24	0	2	0	0	3
2005	67	42	25	0	3	2	0	15
2006	67	31	36	0	1	1	0	3
2007	87	30	57	0	0	1	0	4
2008	116	49	66	1	2	1	0	6
2009	108	49	59	0	3	0	0	6



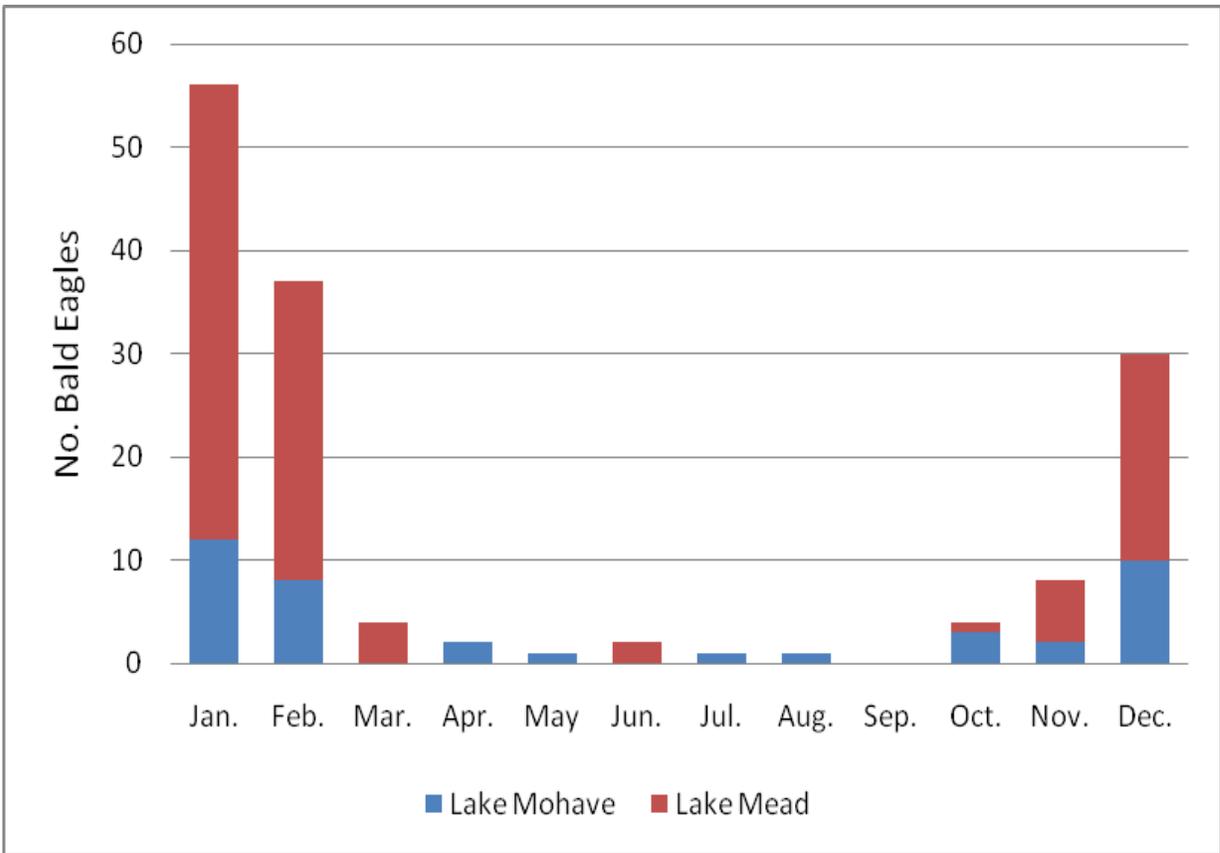
**Figure 1.** Eight established bald eagle survey routes (2007) within Lake Mead National Recreation Area. Routes are color coded (light blue = Overton, yellow = Temple Bar East, red = Temple Bar West, grey = Boulder Canyon, aqua = Boulder Basin, purple = Willow Beach; green = Cottonwood, and brown = Katherine).



**Figure 2.** Map of eagle locations documented during the January 7, 2008 winter bald eagle count conducted within Lake Mead National Recreation Area.



**Figure 3.** Map of eagle locations documented during the January 7, 2009 winter bald eagle count conducted within Lake Mead National Recreation Area.



**Figure 4.** Number of bald eagles (both adult and immature) counted per month from 2004-2009 during aquatic and shorebird surveys at 5 sites on Lakes Mead and 3 sites on Lake Mohave (these data were not collected as part of this project).