BALD EAGLE NESTING AND PRODUCTIVITY
KATMAI NATIONAL PARK
1993

Abstract

Eagle surveys were conducted in Katmai National Park and Preserve in the Naknek drainage using fixed-wing aircraft. The protocol for eagle survey in Katmai National Park and Preserve developed in 1992 was used. Activity surveys were conducted in mid May and productivity surveys were conducted in late July. All nesting locations were mapped on USGS maps. Productivity values were calculated and are reported based on occupied, active and successful nests. Information gathered during these flights were used to estimate egg laying date, qualitatively compare nest success between 1991, 1992 and 1993, describe nesting substrate and individual site use including reoccupancy, and calculate distances between occupied nests.

Because methods of collecting data were adjusted to conform with methods used elsewhere in the state, productivity data are not statistically comparable to data collected previously for Katmai. In that respect, this year's data represent a baseline for Katmai National Park.

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INTRODUCTION

Pilot Joel Collins and I conducted surveys of nesting bald eagles (Haliaeetus leucocephalus) during 1993 in the Naknek drainage of Katmai National Park. We met the following objectives: 1) locate and accurately map all observed nests within the study area, 2) estimate eagle nesting productivity, and 3) to continue to gather information necessary to standardize surveys from year to year within the park and with areas outside of the park. The history of eagle studies at Katmai may be found in Savage (1993) and Dewhurst (1991) and for the Alaska Peninsula in Dewhurst (1991).

The 1993 data provided information about nesting stage that was analyzed to better predict mean egg laying date (ELD). These results reflect annual variation that needs to be taken into account to adjust survey dates.

STUDY AREA AND METHODS

Observations

We conducted aerial surveys using a Cessna 206 on floats as described in the "Katmai Eagle Survey Protocol" (Savage, 1993. Appendix I). The same areas as outlined in this protocol were surveyed except that we surveyed only downstream of the waterfall on Margot Creek. During the productivity survey an observer-in-training (Robin Hanna) sat in the right front seat and assisted in observation and mapping. Activity surveys were conducted on May 12 and 20, and the productivity survey was conducted on July 22. See attached memo's (Appendix I) for details. Completion of the activity survey required approximately 8 hours and 15 minutes flight time including transit time to King Salmon. Approximately 3-4 hours were required to fly the productivity survey.

I collected data on each nest and each individual raptor as outlined in the protocol. A column was added to the data sheet to identify the nest number from 1992 if the nest was recorded last year. All individual eagles and nests were marked (including number and date) on 1:63,300 USGS maps which will be kept for the sole purpose of eagle surveys. These data will eventually be digitized into the Katmai Geographic Information System.

Nesting activity and chick stage were described as suggested in the protocol with the inclusion of the activity codes "O?" indicating possibly occupied (1 adult and possible fresh material) and "E?" (no adults but possible fresh material). These were marked as such to ensure rechecking during the productivity survey. However all "O?" and "E?" nests were later scored as "Empty" because I was not confident that these nests had signs of fresh material and therefore any likelihood of occupancy.

During the productivity survey (survey to determine the number of young produced) we revisited all active, occupied, questionably

occupied and questionably empty nests. The pilot flew a straight line between nests. We collected the same attributes as during the activity survey. Because a complete survey was not done of the lake shore, we did not record incidental observations of individual eagles.

Analysis

Data regarding each nest were entered into a dBase file (eagnak93.dbf) of the structure identified in the protocol. A print out of the 1993 data is attached in Appendix II. Observations of individual eagles will be described in the results.

The locations of all nests are displayed in this report on photocopies of 1:250,000 USGS maps. Nest substrate use is reported in table format. Mapped nest locations (on 1:63,300 field maps) were used to measure straight line distances between all occupied nests. All known occupied nests were included. Distances were measured to the nearest 0.1 miles and the mean distance between nests was calculated. Distances between occupied nests (rounded to the nearest 1/2 mile as collected in 1992) were compared between 1992 and 1993 Naknek data using a Mann-Whitney U-test.

I calculated egg laying date (ELD) using the instructions in Bowman (1992) and Appendix II of Savage (1993). For all nests observed in 1993, the adults were incubating or brooding during the activity survey. Therefore no information on presence of eggs versus chicks or chick age is available from the first survey. ELDs were calculated using chick age as observed only during the productivity survey. Information was included from nests discovered during the productivity survey. ELDs were compared using a Mann-Whitney U-test to Naknek drainage egg laying dates for 1992.

Individual nest histories were used to describe nest reoccupancy from 1992 to 1993.

Nest productivity data was reported as raw values and as calculated values as suggested in the protocol. Only those nests observed on both surveys (except empty nests which were not revisited) were used for the productivity calculations. All chicks observed on the productivity survey had reached stage 3; stage 3 is the criteria used to score a nest as successful. Because the methodologies were not comparable (activity survey was conducted earlier than in previous years), productivity data cannot be statistically compared with previous years.

RESULTS & DISCUSSION

Collins and I flew activity surveys on May 12 and 20, a full month earlier than in 1992. The purpose of conducting the

activity survey earlier was to document nests shortly after the expected ELD so that early nesting failure would be documented and productivity would be based on number of nests initiated. If failure of nests early in the nesting season is common, this will produce a lower production value than one based on an activity survey conducted after those early failures have occurred. Raptor biologist (Bowman,1992; Postupalsky, 1973) feel that all forms of nesting failure should be documented, therefore these earlier surveys are desirable.

We flew the productivity survey on July 22, about the same time as in 1992. The area surveyed in 1993 compares to the 1992 survey except that several miles of the Savonoski River, the Grosvenor River and Margot Creek were added in 1993. This accounted for an addition of 1 active and 1 empty nest.

Confounding Factors

Before describing and discussing the collected information one note should be made. This was the first year that calculated ELD was used to schedule survey dates. This calculated date from 1992 was gathered during a year when break-up on the Naknek system began in mid April. Unfortunately, 1993 was as warm a year as 1992 was cold. In 1993 break-up began on the Naknek River toward the end of February and after that time very few cold days occurred. The influence this extremely unusual warm weather would have on eagle nesting data was, and still is, unknown. The surveys were not adjusted for this unusually warm spring. The productivity data detected an unexpectedly high proportion of empty nests by July 22. Many empty nests may reflect fledgling of nests that were ahead of schedule by 10-14 days. This phenomenon must be considered when weighing the reported values. If fledglings were missed, this will cause the remaining data to result in a later calculated ELD and lower productivity values.

Because of the potentially missed early nests, I made an addition to the protocol which will help adjust survey time to meet annual variation (see Appendix III).

Total Eagles

On the activity survey we observed a total of 70 bald eagles in the Naknek drainage. Eagles associated with nests included 24 (34%) adults and 1 (1%) 4th year bird. Eagles not associated with nests at the time of observation included 33 (47%) adults, 7 (10%) 4th year birds, 4 (6%) younger birds, and 1 (1%) bird whose age was hidden by thick foliage. The total number of eagles observed in 1992 was 87 birds and in 1991 was 50 birds. Although the totals vary from year to year, the proportion of adults to immatures has been consistent from 1991 (81% adults in 1993, 84% adults in 1992, and 82% adults in 1991).

Egg Laying Date

1993 was the second year that I made an attempt to calculate ELD. The estimated ELD was calculated using eight nests (6 active nests found on the activity survey and 2 active nests found on the productivity survey). The range of estimated dates was April 18 (nest #1, 5, 37) to May 15 (nest #36). The range was much reduced from 1992 (April 7-May 29) which gives some indication that early nests may have fledged before the productivity survey. The mean ELD was calculated at April 28 and 90% of the eggs were predicted to be laid by May 3.

Mean ELDs were compared between the 1992 and 1993 using a Mann-Whitney U-test and were not found to be significantly different at the 0.05 level (W=83.0, null hypothesis ELD '92 = ELD '93 vs. alternate hypothesis of ELD '92 # ELD '93 is significant at 0.9692, n=20).

Nest Activity and Productivity

Naknek eagle nests are plotted on Figures 1a-1c. We observed a total of 35 nests on the initial survey and an additional 2 nests (both with chicks) were found on the productivity survey (not used in productivity calculations). One of these productivity survey discovered nests (#37) was a nest also found only on the productivity survey in 1992. Of the 35 nests observed on the initial survey, we found 4 occupied, 11 active, and 20 empty. One of the occupied nests had 2 adults and a fourth year bird nearby (nest #12 by Brooks Camp Beaver Pond). All 11 active nests had actively incubating/brooding adults so the contents could not be seen. During the productivity survey 1 active nest was not found (#24, same nest not found on productivity survey in 1992). Of the 10 active nests, 4 failed, 2 raised 1 chick, and 4 raised 2 chicks for a total of 10 fledglings. During the productivity survey 1 occupied nest was not found. All 3 occupied nests failed. Thirty-three nests had complete data from both surveys. These data are presented in Table 1.

In 1993, 0.77 ($\pm$ 0.93, n = 13) fledglings were raised per occupied nests, 1.00 ($\pm$ 0.94, n = 10) fledglings were raised per active nest, and 1.67 ($\pm$ 0.52, n = 6) fledglings were raised per successful nest. Of 13 nests scored as occupied on the activity survey, 46% raised at least 1 offspring; of 10 nests scored as active on the activity survey, 60% of these raised at least 1 offspring. Calculated productivity rates are reported in Table 2 for 1991 through 1993. Productivity rates are useful to compare data sets from different geographic areas or different years when survey methodologies are similar between sets. Data sets from 1991-1993 are not completely comparable and these reasons are described in footnotes to Table 1.

When a single geographic areas is concerned, total production may be compared by examining the number of active/successful nests and young fledged. Comparing 1991 through 1993 values (Table 1) it appears that slightly fewer nests activated (item 6, Table 1)

and notably fewer chicks were raised (item 10, Table 1) in 1993. Activity survey data indicates in 1991, 17 nests were "occupied" (corresponds to 1993 active nests because of the late survey). In 1992 18 nests were "occupied" (corresponds more closely to 1993 active nests because of the late survey). In 1993 15 nests were occupied and only 11 nests were active. If the 1993 survey had been conducted later in May (as in 1991 and 1992), it is probably that occupied nests may not have been scored as occupied and some active nests may have failed resulting in less than 11 active nests. Regarding young fledged, in 1991 Squibb (1992) reported 13 young reached fledgling age by his July 10 productivity survey and estimated another 11 (of 14 downy young) fledged for a total of 24 fledglings. In 1992 16 chicks reached fledgling criteria. In 1993 only 10 chicks reached fledgling criteria. When the reader examines these numbers, consider that the area surveyed increased by at least one nesting territory in 1992 and at least two more nesting territories by 1993.

Table 1. Nest occupancy, activity, and success for 1991-1993.

	'91	'92	'93
Occupancy			
1. Nests found on Activity Survey (S1)	24	29	35
2. Nests with complete data (item 3+4+5, below)	23	28	33
Activity (Breakdown of item 2)			
3. Nests found on S1 that were empty	7	11	20
4. Nests that were occupied on S1	16[1]	1	3
5. Nests that were active on S1		16	10
6. Total S1 occupied/active nests (item 4+5)	16	17	13
Success			
7. Occupied nests (item 4) that succeeded by Productivity Survey (S2)	-[2]	0	0
8. Active nests (item 5) that succeeded by S2	-	11	6
9. Total Successful Nests	-	11	6
Chicks Raised			
10. Chicks produced from occupied nests	-	0	0
11. Chicks produced from active nests	-	16	10
12. Total chicks produced	24[2]	16	10

[1] Because the activity survey in 1991 was late, nests discovered on this survey correspond more closely with the definition of active used in 1993.

[2] 1991 data for successful nests and chicks fledged was based on estimated production because the productivity survey was conducted too early (7/10); many stage 2 young were detected which could not be confidently scored as fledged, see Squibb (1992).

Table 2. Productivity Calculations for 1991-93

	'91	'92	'93
Success based on Occupied Nests			
Young per occupied or active nest (item 12/item 6)	--	0.94	0.77
Percent occupied or active nest successful (item 9/item 6)	--	64.7	46.0
Success based on Active Nests			
Young per active nest (item 11/item 5)	1.49[1]	1.00	1.00
Percent active nests successful (item 8/item 5)	--	68.8	60.0
Success based on Successful Nests			
Young per successful nest (item 12/item 9)	1.86[2]	1.45	1.67

[1] See footnote 1, Table 1.

[2] Estimate, see footnote 2, Table 1.

Higher calculated production values in previous years could result from three causes: 1) activity surveys in previous years were conducted later in May subsequently missing early nest failures resulting in higher overall productivity values, 2) because of the early spring in 1993, fledglings leaving the nest before July 22 would not have been counted resulting in a lower estimate of production for 1993, and/or 3) 1993 may have been a year with lowered production. Activity survey information indicates that fewer nests were active in 1993 than in the previous two years, so even accounting for possibly missing fledglings because of the early spring, it is likely that total production of eagles was lower in 1993. There is no known reason why eagle production may have been repressed in 1993. Weather conditions were extremely favorable for incubation/brooding and early chick survival, the salmon run was earlier than usual, and salmon numbers were not known to be decreased. The total number and proportion of adult eagles observed in the Naknek drainage was intermediate between the number observed in 1991 and 1992, therefore indicating that there was no decrease in the number of birds available for breeding.

Nest Substrate

In 1993 Naknek system nests were located in cottonwood or spruce trees along the lake shore, or in trees on islands (Table 3). Only active/occupied nests that were located on both surveys are included in Table 3.

TABLE 3. Nest Substrate Use

	Empty	Active/Occupied Success	Failed	Total
Trees				
Cottonwood	11	3(6)[1]	4	18
Spruce	5	2(3)	1	8
Islands				
Cottonwood	4	0(0)	1	5
Spruce	0	1(1)	1	2
Cliff Top	0	0	0	0
TOTAL				33

[1] Number in parenthesis represents number of young.

Most nests, were located in cottonwood trees (70%). This was not always so in the past (See Savage, 1993). Most nests were located on the mainland (79%), the rest on islands. Only one island nest (in a cottonwood tree) was successful in raising one chick.

We detected more old empty nests in 1993. This may be because activity surveys were conducted before leaf-out increasing detectability of nests especially in cottonwood trees. This increased detectability of nests in cottonwoods may bias nest substrate data when compared to past years. We also speculate that nests in cottonwood trees have more supporting structure and survive severe wind storms better than those located in spruce trees.

Percent of Nests/Territories Occupied

We detected 37 nests in 1993. Approximately 10 of these represent territories that showed no sign of activity for 1 or more years. At least 3 nests appear to represent multiple nests per territory. Assuming approximately 34 territories in the Naknek system only 17 of these showed signs of occupancy in 1993 or an occupancy rate of 50%.

Nest Site Reuse

In 1992 the reoccupancy rate was calculated as the number of

active/occupied nests in 1992 that were counted in 1991 (10) divided by total 1991 nests relocated in 1992 (16) and was 63%. Of the 30 nests documented in 1992, 18 of these were relocated in 1993 and 11 were reoccupied for a rate of 61%. Note that not all of the 30 1992 nests were occupied in 1992 (i.e., some inactive 1992 nests reactivated and are reflected as reoccupancy in this calculation).

Examining reoccupancy based on nests that were active/occupied in 1992, of 19 nests known to be active/occupied sometime in the 1992 season, 9 of these were active or occupied in 1993. This is a reoccupancy rate of 47%. Of 11 known successful 1992 nests, 7 were active/occupied in 1993 and 5 of these were known to be successful in 1993 (does not include the nest found late both in 1992 and 1993 at the mouth of Headwaters Creek because in 1992 chicks in this nest were too young to be scored as successful). In other words, 5 of the 6 nests that were successful in 1993 had a history of success in the previous year.

Inter-nest Distance

I calculated mean inter-nest distance to get an idea of territory size/habitat quality and tolerance distance between pairs. The mean distance between 17 occupied nests was 3.2 miles ($\pm$ 2.7). This is less than the 4.4 miles ($\pm$ 2.6) reported in 1992. The range of distances was 1.1 to 12.2 miles. Naknek system inter-nest distance was compared statistically for 1992 and 1993 using a Mann-Whitney U-test and was not found to differ significantly (W=247, test of Null hypothesis distance '92 = distance '93 vs. Alternate Hypothesis of distance '92 # distance '93 is significant at 0.0535, n = 35). Although there were fewer active/occupied nests in 1993 over a greater area, inter-nest distance was probably slightly less because no nests were detected on the whole western portion of Naknek Lake, therefore reducing the functional area covered and thus the inter-nest distance.

Biases

As recommended in the 1992 report, changes are being made to the eagle monitoring protocol to adjust for biases created by past sampling schemes. In 1993 we accomplished a complete survey of the areas identified in the protocol. This will assist in standardizing the area sampled. The standardized definitions of active and occupied nests were also followed and production was calculated for both values. Occupied nest values should represent nests that were initiated by mid-May but fail to lay eggs, and early nest failures. We accomplished activity surveys before cottonwood leaf out so detection of nests was improved over previous years. However, detection of nests below the cottonwood canopy in July still prevents relocation of some nests on the productivity survey, and no solution to this problem is known.

The primary confounding factor for 1993 was early onset of spring. Hopefully the information gained this year will prevent this problem from affecting data in future years (see Appendix III).

Using the same observer and pilot both years improved nest detection.

Nest Numbering System

One further improvement is suggested for future surveys and that is to follow the number system suggested by Bowman (1992) and used on the Katmai coast in recent years. This will give each nest (or closely grouped nests) a number that will not change over successive years making tracking of individual nests and territories much easier (see Appendix III).

Other Raptor Observations

During the productivity survey we found an osprey nest. The nest was located on Headwaters Creek about 1-2 miles downstream from the eagle nests noted there. The osprey nest was located in the top of a dead spruce tree and may be an abandoned eagle nest. The nest was located by seeing the adult osprey perched in the tree. Two additional passes were required to see the contents of the nest. Three very dark partially contoured chicks were detected in the nest. The chicks blended much better with the nest materials and were more difficult to see than eagle chicks.

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APPENDIX I. Memos of 5/24/93 and 7/22/93 RE: Eagle Survey

APPENDIX II. Naknek Eagle Data 1993

NEST	NEST 92#	S1 AC	S2 AC	S1# ADT	S1# EGG	S2# ADT	S2# CHK	S2 STG	NESTSUB	HABITAT	S1/S2NOTE
006	025	A	1S	2	0	2	1	3B	SPRUCE	AMERICAN CREEK INCUB/BROOD CW	1 AD NEST/1 AD
008		A	1S	1	0	2	1	3B	ISL,SPRUCE	COVILLE LAKE INCUB/BROOD .24M ML SPRUCE	1 AD NEST/1AD
005	024	A	2S	1	0	1	1 1	3B 3D	COTTONWOOD	AMERICAN CREEK INCUB/BROOD	1 CHK 3B/1 CHK 3D/AD IN CW
13	017	A	2S	1	0	1	2	3B	SPRUCE	INCUBATING	1 AD NEST
001	003	A	S2	1	0	2	2	3C	COTTONWOOD	NAKNEK LAKE INCUB/BROOD ANOTHER	1AD CW/1AD CW
16	020	A	S2	1	0	1	1 1	3B 3C	COTTONWOOD	HEADWATERS CREEK INCUB/BROOD 3B	1 AD SPR/1CHK 1 CHK 3C
003	022	A	F	2	0	1	0		ISL,COTTON	COVILLE LAKE INCUB/BROOD NEST/NST MESS	1 AD IN CW NEAR
007		A	F	1	0	0	0		COTTONWOOD	COVILLE LAKE INCUB/BROOD	EMPTY

NEST	NEST 92#	S1 AC	S2 AC	S1# ADT	S1# EGG	S2# ADT	S2# CHK	S2 STG	NESTSUB	HABITAT	S1/S2NOTE
20		A	F	1	0	0	0		SPRUCE	NAKNEK L,NEAR SAVANOSKI INCUB/BROOD	EMPTY
22		A	F	2	0	0	0		COTTONWOOD	GROSVENOR R. FRESH MAT'L/INC/BRD 2ND MT NEST FOUND NEARBY	
24[1]		A	NF	2	0	0	0		COTTONWOOD	SAVANOSKI INCUB/BROOD IN AREA	R. 4 PASSES, 1 AD
036[2]		NF	S1	0	0	1	1 NEST	3A	ISL/SPRUCE LOOKS LIKE NEW	NAKNEK Lake	
037[2]	030 E	NF	S1	0	0	2	1	3C	SPRUCE	HEADWT'S CR/2ND 1 AD 1M. BL SHORE/SPRUCE	MEANDER
12 IN NEST, EMPTY/NO AD		O	E	3	0	0	0	E	COTTONWOOD		GRASS 1 AD IS 4TH YR.
14	016	O	E	2	0	0	0		ISL,COTTON	GRASS IN NEST,	BOTH ON NEST EMPTY
25		O	E	2	0	0	0		COTTONWOOD	NAKNEK L. RES'H	BAY

[1] Not included in production analysis because not refound on production survey.

[2] Not included in productivity analysis because not found on activity survey.

NEST	NEST 92#	S1 AC	S2 AC	S1# ADT	S1# EGG	S2# ADT	S2# CHK	S2 STG	NESTSUB	HABITAT	S1/S2NOTE
										FRESH MATERIAL EMPTY	
23[1]	011	O	NF	1	0	0	0		COTTONWOOD	SAVANOSKI R. FRESH MATERIAL 3 PASSES NO AD IN AREA	
All remaining nests scored as Empty for analysis											
18		O?	E	1	0	0	0		COTTONWOOD	NAKNEK LAKE SHORE MAY BE REPAIRED EMPTY	
009	006	O?	F	1	0	0	0		ISL,COTTON	NAKNEK LAKE NEW MAT, RECHE 2 AD ML CW 1M./NEST DISARAY	
002		E?	E	0	0	0	0		COTTONWOOD	NAKNEK LAKE NEW MUD? RECHECK,NO ADS EMPTY, NO AD	
31		E?	E	0	0	0	0		COTTONWOOD	GROSVENOR L. MAY HAVE FRESH MAT, RECK	
010	007	E	E	0	0	0	0		ISL,COTTON	NAKNEK LAKE 2 AD NEAR NEST/NO NEST FOUND	
15	019	E	E	0	0	0	0		SPRUCE	EMPTY 1 AD NEARBY	
004	023	E	NC	0	0	0	0		COTTON?	COVILLE LAKE	
011	013	E	NC	0	0	0	0		COTTONWOOD	STREAM MOUTH, NAKNEK L.	

NEST	NEST 92#	S1 AC	S2 AC	S1# ADT	S1# EGG	S2# ADT	S2# CHK	S2 STG	NESTSUB	HABITAT	S1/S2NOTE
17		E	NC	0	0	0	0		SPRUCE,DEA	BROOKS LAKE SHORE	EMPTY
19		E	NC	0	0	0	0		SPRUCE	NAKNEK LAKE SHORE	EMPTY,FALLING APART
21		E	NC	0	0	0	0		COTTONWOOD	SAVANOSKI	R. EMPTY
26	EMPTY	E	NC	0	0	0	0		ISL,COTTON	NAKNEK L.	B OF I
27		E	NC	0	0	0	0		COTTONWOOD	GROSVENOR L.	EMPTY
28	028	E	NC	0	0	0	0		SPRUCE	GROSVENOR L.	EMPTY, OLD ONLY LARGE STICKS
29		E	NC	0	0	0	0		SPRUCE	GROSVENOR L.	EMPTY
30		E	NC	0	0	0	0		COTTONWOOD	GROSVENOR L.	EMPTY
32		E	NC	0	0	0	0		COTTONWOOD	GROSVENOR L.	EMPTY
33		E	NC	0	0	0	0		COTTONWOOD	GROSVENOR L.	EMPTY
34	029	E	NC	0	0	0	0		ISL,COTTON	GROSVENOR L.	EMPTY

NEST	NEST 92#	S1 AC	S2 AC	S1# ADT	S1# EGG	S2# ADT	S2# CHK	S2 STG	NESTSUB	HABITAT	S1/S2NOTE
35		E	NC	0	0	0	0		COTTONWOOD	MARGOT CREEK	EMPTY

APPENDIX III. Addendum to Appendix I of Savage, 1993
Additional Considerations to Katmai Eagle Survey Protocol

ADJUSTING SURVEY DATES
Survey dates may require adjustment depending on weather conditions and/or anticipated leaf out for any particular year. Several indices of spring weather should be developed to help gauge these adjustments. These may include leafing/budding phenology of several local plants, arrival of specific migrant bird species, several measures of break-up or ice/snow free conditions or incidental observations of eagle nest activity. I suggest that activity surveys are not adjusted before May 5 until considerable data indicates changing this. This is the date estimating when 90% of 1992 nests had initiated (eggs laid). Activity surveys should be conducted before significant (1" leaves) cottonwood leaf out occurs (probably no later than May 25).

To prevent missing fledgling chicks, productivity surveys should be adjusted by checking several nests either for hatching date or for chick stage in the mid contour feather development period (aiming for stage 3B or 3C). To check for hatching count about four weeks past the activity survey or the estimated ELD. To check for feather development by counting about seven to eight weeks after the activity survey (about mid July). Correct the date of productivity survey accordingly. It is better to view some nests in the earlier stages of stage 3 than to miss nests because of fledgling. The goal is to check nests between ages 3B-early 3D.

NUMBERING NESTS
To better follow individual nest histories, individual nest numbers should remain the same from year to year. To accomplish this a numbering system for nests should be established according to Bowman (1992). Each nest should have a number corresponding to the 1:63,300 map code where it is located and then a consecutive number as discovered. It is desirable to begin this numbering system with historic data starting in 1991 or before. If it appears that nests are grouped, that grouping may receive a number (a territory number) and each nest may be sublettered. For example, the nests at Grosvenor Camp (on USGS map Mt. Katmai C-5) might be numbered
MTKA35, 6a, 6b, and 6c (corresponding to #7, 27 and 28 from 1993).