1981

Bald Eagle Investigations

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PERFORMANCE REPORT

STATE:	Virginia	PROJECT NO.:	EW-1-5
PROJECT TYPE:	Research and/or Survey	STUDY NO.:	II
PROJECT TITLE:	Virginia Endangered Species Investigations	JOB NO.:	II-A-1, II-A-2, II-A-3, II-A-4, II-A-5
STUDY TITLE:	Bald Eagle Investigations		
PERIOD COVERED:	July 1, 1980 - June 30, 1981		

JOB II-A-1 OBJECTIVE: To obtain a winter inventory of Bald Eagle numbers and determine range of these birds in Virginia.

JOB II-A-2 OBJECTIVE: To determine hatching and rearing success of Bald Eagles in Virginia.

JOB II-A-3 OBJECTIVE: To develop and utilize techniques to introduce Bald Eagles into formerly occupied habitat through hacking techniques and to introduce captivity reared bald eagle young into foster parent nests.

JOB II-A-4 OBJECTIVE: To determine post nesting dispersal and other movements of young eagles through the use of radio-telemetry equipment.

JOB II-A-5 OBJECTIVE: To monitor activities at two active eagle nest sites from egg laying through fledging of young through the use of video equipment. In addition, all aspects of incubation and post incubation behavior will be observed from blinds at two additional sites.

SUMMARY:

Aerial and ground surveys resulted in the location of 39 active bald eagle nests from which 41 young were produced and 40 fledged. This resulted in a production of 1.02 fledgings per active nest and 1.48 fledgings per productive nest.

Thirty-two young eagles of the 41 produced were banded and also marked with coded orange vinyl leg band tags.

Analyses were begun of foraging data acquired from television observations at three nest sites.

Preliminary analysis was begun of post-fledging movements of eleven radio-tagged young.

SURVEYS:

(a) Breeding surveys- aerial surveys were conducted during March, April, and May to locate active nests and to monitor the fate of each located nest.

As in 1980, aerial surveys were not conducted on any of the inland lakes as there had been no additional evidence to suggest nesting birds in these areas.

Aerial surveys in the Tidewater Area resulted in the location of 36 active nests. Three additional nests were located as a result of information reported by landowners. All nest locations were plotted on 7 1/2 minute topographic sheets. Fate of each active nest is shown in Table 1.

Table 1. Location and Productivity of Active Bald Eagle Nests in Virginia, 1981.

County	Nest Number	Reproductive Success	No. of Young Fledged
Accomac	80-01	Productive	2
Charles City	81-01	Productive	1
Essex	78-01	Productive	2
Fairfax	81-01	Unproductive	0
Gloucester	81-01	Productive	1
James City	64-1	Unproductive	0
King George	78-04	Productive	1
King George	80-01	Productive	2
King George	80-04	Productive	1
King George	80-05	Unproductive	0
King George	81-01	Unproductive	0
King George	81-02	Productive	1
King William	79-01	Productive	2
King William	80-01	Unproductive	0
Lancaster*	75-01	Productive	0
Middlesex	77-01	Productive	2
Middlesex	81-01	Productive	2
Middlesex	81-02	Productive	1
New Kent	77-01	Unproductive	0
New Kent	79-04	Productive	1
New Kent	80-01	Productive	1
Northumberland	70-01	Unproductive	0
Northumberland	79-01	Productive	1
Prince George	61-01	Productive	3
Richmond	71-01	Unproductive	0
Richmond	74-01	Productive	1
Richmond	78-01	Productive	2
Richmond	81-02	Unproductive	0
Richmond	79-02	Productive	2
Surry	81-01	Productive	1
Westmoreland	71-04	Productive	2
Westmoreland	77-03	Unproductive	0
Westmoreland	77-04	Productive	1
Westmoreland	78-01	Unproductive	0
Westmoreland	78-05	Unproductive	0
Westmoreland	79-01	Productive	3
Westmoreland	79-04	Productive	1
Westmoreland	79-05	Productive	2
Westmoreland	81-01	Productive	1

*Produced one young which was lost in storm prior to fledging

Of the 39 active nests, 27 were productive and 12 were unproductive for a success rate of 69 percent. Total production was 41 young of which one was lost in a storm prior to fledging. Forty young successfully fledged for an average of 1.02 fledglings per active nest.

Data on productivity for the period, 1977-1981, are summarized in Table 2. Productivity remained relatively stable in each of the three years, 1977-1979. In both 1980 and 1981, productivity increased dramatically as did the percentage of nests which were productive. Productivity of 1.00 and 1.02 fledglings respectively would appear to be above the population maintenance level for the species. Two pairs in the state produced 3 young, the first triplets in the state in several years.

Table 2. Bald Eagle Productivity in Virginia for the Period 1977-1981.

Year	Total Active Nests	Total Prod. Nests	Total Unprod. Nests	Percent Nests Prod.	Total Young Fledged	Fledglings/ Productive Nest	Fledgling Active Nest
1977	33	13	20	39	18	1.38	0.54
1978	37	14	23	38	18	1.29	0.49
1979	33	15	18	45	20	1.33	0.61
1980	35	23	12	66	35	1.52	1.00
1981	39	27[A]	12	69	40[B]	1.48	1.02

A. Includes nest from which young was lost in storm

B. Does not include one young lost in storm

It was indicated in the performance report of 1980 that evidence suggested the James River might again be suitable for occupancy by bald eagles. This suggestion was based on the fact that a pair of bald eagles in 1979 reoccupied a historical nesting territory after an absence of 20 years. These birds produced young in both 1979 and 1980 and the pair at this nest produced three young in 1981. In addition, two additional pairs occupied territories on the James in 1981 and one pair occupied a territory on the Chickahominy River, a tributary of the James. Two of the James River pairs as well as the Chickahominy pair occupied historical territories. In fact, two of the pairs occupied the original nest tree within the territory, suggesting the continued suitability of both the nest site and the territory. Of these four nests in the James River system, three were productive with a total of five young.

In addition, one historical site on both the Potomac and Piankatank Rivers were reoccupied following several years during which birds were absent from these territories. More and more pairs showing reproductive success are at nest sites where the nesting individuals have had a long history of reproductive failure.

It is believed that many old pesticide-contaminated breeding birds are being replaced by less contaminated birds. This was known to be the case at two nests in 1981 where the females could be identified as new breeders on the basis of distinctive tail markings.

(b) Winter Survey - Personnel on the project, in conjunction with cooperators, participated in the mid-winter bald eagle survey sponsored by the Raptor Information Center, National Wildlife Federation. The James River, Chickahominy River, Potomac River, and the Eastern Shore of Virginia were covered completely by aerial survey. The Rappahannock River was covered partially by aerial survey incidental to waterfowl surveys. All of the inland impoundments were covered by ground and boat survey.

Table 3. Mid-winter Bald Eagle Survey-Virginia-1981.

Area	Adult Bald Eagle	Immature Bald Eagle	Total Bald Eagles
James & Chickahominy Rivers, Diascund Reservoir	25	37	62
Rappahannock, Great Wicomico Rivers	9	9	18
Potomac River	24	9	33
Mattaponi River	1	2	3
Inland Impoundments	5	1	6
Mountains	1	0	1
	65	58	123

The total of 123 eagles observed in 1981 represents a decline from 166 observed in 1980. At least part of this decline probably is attributable to the lack of aerial coverage on the York River system and the incomplete aerial coverage of the Rappahannock River. The relatively large concentration of birds on the James-Chickahominy probably is due to the heavy icing conditions and lack of water on the Potomac River which normally supports the highest wintering population of birds in the state. Of particular interest, as in 1980, was the relatively high ratio of juveniles to adults as well as the fact that all subadult age groups were represented in the immature group.

Banding and Marking Program:

In collaboration with the Raptor Information Center, National Wildlife Federation, banding and color marking activities were conducted. Results of the banding activities are summarized in Table 4.

Table 4. Summary of 1981 Bald Eagle Banding Activities

No. of Act. Nests	No. of Act. Nests Visited	No. of Suc. Nests	No. of Suc. Nests Visited	No. of Aban. Nests	No. of Aband. Nests Visited
39	33	27[1]	23	12	10

No. of Eaglets	No. of Eaglets Banded	No. of Eaglets Radio-tagged	No. of eggs Collected	No. of Egg Fragments Collected	No. of Eaglets Not Banded
41[2]	32	1	5	7	8

1. Includes one nest in which one young hatched but which subsequently was lost in a storm

2. Includes the eaglet reported above as lost

As may be seen in Table 4, 32 of 40 successful fledglings were banded with aluminum Fish and Wildlife Service Bands and numbered orange vinyl band tags. Eight known young were not banded, three being too old, two being in an unsafe tree, and three being in nests for which there was no landowner permission for visitation.

Several band tags from previous years were observed but the identifying code could not be read. (Banding activities are reported on more completely in a separate report.)

Contaminant Analyses

Five eggs were collected for contaminant analyses and for eggshell thickness measurements. Chemical analyses have not been completed on these eggs. Egg fragments were collected from seven additional eggs.

Eggshell thickness measurements were made on four whole eggs and 4 eggshell fragment samples.

The whole eggshell thicknesses varied from 9% to 22% below the pre-1946 norm. One egg from nest (Ri-81-02) had a shell thickness which was 9% below the norm and contained an embryo approximately 25 days of age. The pair in this territory have had a history of reproductive success for the past several years.

Whole eggs from nests (Ri-74-01)(N.K.-79-04) and K.W.-80-01) showed 16%, 19%, and 11% thinning, respectively. Pairs from which all four of the inviable whole eggs were collected were successful, each producing a single eaglet.

Eggshell thickness measurements from the four shell fragment collections ranged from 11% to 30% below the pre-1946 norm. Specific thicknesses were: Va-Mi-81-02(11%): We-77-03(14%): J.C.64-1A(22%); and K.G.-80-05(30%).

Nest Va-Mi-81-02 contained a single young. Nest J.C.-64-1A was reoccupied by a pair after many years of absence. The pair failed to produce young. Nest We-77-03 is in a territory which has been active since 1973 with the exception of 1979 and 1980 when no active nest was located. The birds in this

Table 5. Time use by adult male & female bald eagles at nest WE-79-01 based on 126.6 hours of observation.

		Male		Female	
		Observations	% time used	Observations	% time used
Present at or near nest		---	25.29	---	36.63
Depart	Return				
with nothing	with prey	17[a]	15.95	20	23.38
with nothing	with nothing	18	25.11	15	23.69
with nothing	with nest material	2	0.86	0	-
unobserved[b]	with prey	7	11.40	4	7.35
unobserved[b]	with nothing	3	6.81	1	0.96
with nothing	unobserved[c]	10	10.97	6	4.09
unobserved[b]	unobserved[c]	1	3.62	1	3.88

a. includes one fish brought to nest and consumed entirely by the male

b. adult not present when observations began

c. adult not present when observations ended

Table 6. Percent time spent perched near nest WE-79-01 by the adult male and female during each observation period. Based on 122.1 hours of observations.

Time	Male	Female	One or both adults present
05:30 - 09:00	12 ± 7.6(7)[a]	20 ± 9.8(7)	30 ± 12.0(7)
09:00 - 13:00	28 ± 11.9(9)	35 ± 10.0(9)	54 ± 12.4(9)
13:00 - 17:00	31 ± 7.6(12)	38 ± 10.5(12)	59 ± 10.1(12)
17:00 - 20:30	24 ± 7.6(10)	52 ± 12.1(10)	64 ± 11.1(10)
Overall	25 ± 4.4(38)	38 ± 5.6(38	54 ± 5.7(38)

Mean ± standard error (no. of observation periods)

Table 7. Stepwise Regression: Percent time adults spend perched near nest WE-79-01 during each observation period.

Dependent Var.	Sig. Ind. Var.	P[a]	[b]β±s.e.	[c]R^2 for model	P of model
% time ♂ perched near nest	Absolute day of year	0.027	-0.007±0.0030	0.136	0.027
% time ♀ perched near nest	Absolute day of year	0.0001	-0.014±0.0032	0.356	0.001
% time one or both adults present	Absolute day of year	0.0001	-0.018±0.0031	0.493	0.001

a. Probability that β=0

b. Regression coefficient (slope of regression line) ± standard error

c. Correlation coefficient; (proportion of variation at dependent variable explained by model)

Table 8. Average Food Delivery Rate Per Observation Period.

	Nest			
Time	KG[a]	WE[b]	MI[c]	Total
05:30-09:00	0.26±.161(5)[a]	0.56±.214(7)	0.12±.125(4)	0.36±.115(16)
09:00-13:00	0.28±.054(14)	0.26±.084(9)	0.12±.044(8)	0.23±.043(31)
13:00-17:00	0.12±.057(11)	0.35±.098(12)	0.08±.042(9)	0.20±.047(32)
17:00-20:30	0.19±.061(9)	0.41±.161(10)	0.04±.039(7)	0.23±.071(26)
	0.21±.035(39)	0.38±.067(38)	0.09±.035(28)	0.24±.031(105)

a. Deliveries/Hr. ± standard error (no. of observation periods)

b. Nest produced two young

c. Nest produced one young

territory have never been known to produce young. Nest KG-80-05 is occupied by a pair which has not been productive in either year of nest occupancy.

The two nests (J.C.64-1A) and K.G.-80-05) probably have eggshell thinning sufficient to cause reproductive failure. Although many factors undoubtedly are involved, it appears that most eggs fail when shell thinning exceeds 20% of the pre-1946 norm.

Television Monitoring Studies

During 1979 and 1980, three Virginia bald eagle nests were observed for a total of 365 hours. Each nest was observed either directly, using a 30X telescope, from blinds mounted on 10 meter steel towers, and/or indirectly, using a closed circuit television system which has been described in previous reports. Nest We was located at the edge of a steep, wooded ravine. By positioning an observation blind across the ravine from the nest, it was possible to observe the activities of the adults whenever they were within approximately 300 to 400 meters of the nest. In contrast, local topography and vegetation at nests KG and MI essentially limited the field of view to the nest itself and the types of data which could be collected at these two nests were limited.

In order to minimize the chances of nest site abandonment by the adults as a result of research activities, television equipment was not installed at the nest sites until the young were approximately five-six weeks of age. Although waiting until this point in the nesting cycle reduced the amount of data, the chances of nest site abandonment by the adults at this stage is drastically reduced. Preliminary observations at nest We began prior to camera installation when the young were approximately two weeks old.

During 18.8 hours of observation on 5 days at nest WE prior to camera set up, the rate of food delivery averaged 0.45 deliveries per hour (standard error=0.206). On 23 May, the day after the camera was installed, the nest was observed for 11.2 hours. The observed delivery rate of 0.18 deliveries per hour was not significantly different from the rate of food delivery prior to camera set up ($t=1.057$, $0.4>P>0.2$). The observed delivery rate during 107.8 hours of observation on 10 days with the camera in place averaged 0.37 deliveries per hour (standard error=0.047) and was not significantly different from the observed delivery rate prior to camera installation ($t=0.515$, $0.9>P>0.5$). Assuming that the size distribution of prey items brought to the nest before and after camera installation were similar, the above data suggest that the presence of the video camera in the nest tree did not significantly affect the amount of food supplied to the young.

At nest WE, it was possible to distinguish between the adult male and female onthe basis of size; overall time use for these adults is summarized in Table 5.

There was no significant difference between the percentage of time spent perched near nest WE by the adult male and female, nor was there a significant difference in the percentage of time spent perched near the nest during the four observation periods (two-way analysis of variance, $P=0.07$, $P=0.23$ respectively; see Table 6; the eight variances were not significantly heterogeneous, Barlett's test, $0.9>P>0.5$). The results of the stepwise regressions which included the percentage of time spent perched near nest WE by the adults are presented in Table 7. The percentage of time spend perched near the nest by the adult male and adult female each had a significant regression coefficient with the absolute day of the year. These relationships explained 13.6 percent and 35.6 percent of the variation in percent time spent perched near the nest by the male and female, respectively. The percentage of time during which one or both adults were present at or near the nest had a significant regression coefficient with the absolute day of the year. These relationships accounted for 49.3 percent of the variation in the percentage of time during which one or both adults were present.

Although sizes could not be recorded for all prey items, it appeared that the size distributions of prey delivered to each nest were similar. Of those prey items which could be confidently identified, 60 of 61 were fish, with menhaden (Brevoortia tyrannus) and american eel (Anguilla rostrata) as the most common species. A single eastern gray squirrel (Sciurus carolinensis) was also brought to a nest.

The average delivery rate at each nest site, during each observation period is shown in Table 8. The twelve variances were significantly heterogeneous (Bartlett's test, $P<0.005$) and therefore the effect of nest site and observation period on delivery rate were analyzed separately using Kruskal-Wallis tests. Although there was no significant difference between the average delivery rates during each of the four observation periods (=0.568), the rates of food delivery at the three nest sites were significantly different ($P=0.001$). Nests KG and WE each contained two young while nest MI contained one young. When delivery rates are calculated on the basis of deliveries/hour/young, the rates at the three nests (WE=0.19, KG=0.11, MI=0.09) were also significantly different (Kruskal-Wallis test; $P=0.017$). Assuming that the size distribution of prey items at each nest was similar, these data suggest that the young at nest WE received substantially more food than the young at nests KG and MI.

The rate of food delivery (deliveries per hour) during each observation period had significant regression coefficients with the number of young in the nest, the distance to the nearest open water, the maximum wind speed observed during the observation period, the average temperature during the observation period and the dummy variable indicating the observation period. These five factors explained 25.8 percent of the variation in the delivery rate during each observation period (Table 9). The dummy variable for the event of food delivery during each observation period had a significant regression coefficient with the number of young and the average sunniness. These two factors explained only 11.2 percent of the variation in the event of food delivery during each observation period.

Table 9. Stepwise Regression: Rate of prey delivery during each observation period

Dep. Var	Sig. Ind. Var.	P	$\beta \pm$s.e.	R^2 for model	P of Model
Delivery rate (Del/hr. during each obs. per.	No. of young	0.0012	$0.30 \pm .091$		
	Dist. from nest to water	0.0023	$0.0002 \pm .00006$		
	Max wind speed	0.0032	$0.03 \pm .010$		
	Mean Temp.	0.037	$-0.02 \pm .010$		
	Dummy Var. for obs. period	0.044	$-0.07 \pm .034$	.25%	0.0002
Dummy Var. for the event of prey del. during obs. per.	No. of young	0.018	$0.32 \pm .133$		
	Mean sunniness	0.034	$0.0034 \pm .0016$	.112	0.007

At nest WE, there was no significant difference between the rate of food delivery by the male (mean=0.02 deliveries per hour, standard error=0.051, n=38 observation period) and the female (mean=0.17 deliveries per hour, standard error=0.040, n=38 observation periods; t=0.438, $0.9>P>0.5$). The female fed the young following 17 of her 24 observed food deliveries. In contrast, the male fed the young on only 11 occasions following his 23 observed food deliveries and more importantly, on 7 occasions following a food delivery by the male, the female took possession of the prey item and fed the young. On 4 of these 7 occasions, the female was brooding the young when the male arrived, on 2 occasions the female was perched in the nest tree and on 1 occasion the female was already feeding the young when the male arrived. Six of these seven observations were made when the young were less than 5 weeks old, suggesting that the female may do most of the feeding of the young during the early phase of the nesting cycle.

The duration of successful hunting flights at nest WE by the adult male (mean=71 minutes, standard error=25, n=17 flights) and female (mean=89 minutes, standard error=30, n=20 flights) at nest WE were not significantly different (t-0.456, $0.9>P>0.5$). Sample size was not sufficient to examine the duration of successful hunting flights during each of the four observation periods. The overall duration of a successful hunting flight for both adults at nest WE averaged 81 minutes (standard error=19, n=37 flights, range: 5-607 minutes. Since many of the prey items brought to the nest had already been partially consumed, the average time required to obtain a prey item must actually be somewhat less than 81 minutes. The overall rate of food delivery at nest WE averaged 0.382 deliveries per hour (Table 8). Based on these figures, each adult must spend approximately 25.8 percent of the daylight hours foraging (0.382 deliveries per hour X 81 minutes per delivery X 1 hour per 60 minutes X 0.5). This estimate is consistent with the observation that flights when the male and female returned to the nest with a prey item accounted for 27.35 and 30.73 percent of the total observation time, respectively (Table 5).

The combined data for the duration of successful hunting flights at nest WE by the male and female had significant regression coefficients with the maximum wind speed, the minimum wind speed, and the average difference between the maximum and minimum wind speeds recorded each hour during the adult's absence (Table 10. These relationships accounted for 60.2 percent of the variation in the duration of successful hunting flights by the adults (Table 10).

Table 10. Stepwise Regression: Duration of successful hunting flights by adult male and female at nest WE-79-01.

Dep. Var.	Sig. Ind. Var.	P	$\beta \pm$s.e.	R^2 for model	P of F
Duration of successful hunting flight	Max. wind speed	0.0001	75±12.9		
	Min. wind speed	0.0001	-71±11.7		
	"Gustiness"	0.0111	-61±22.3	0.602	0.000

The elapsed time between successive deliveries had a significant regression coefficient with the distance from the nest to the nearest open water, the maximum wind speed since the previous delivery, the minimum wind speed since the previous delivery, and the average difference between the maximum and minimum wind speed during each hour since the previous delivery. These relationships accounted for 69.8 percent of the variation in the elapsed time between successive deliveries (Table 11).

Table 11. Stepwise Regressions: Time between successive food deliveries.

Dep. Var.	Sig. Ind. Var.	P	$\beta \pm$s.e.	R^2 for model	P of Regres.
Time between successive del.	Distance to open water	0.0202	0.07$\pm$.030		
	Max. wind spd.	0.0001	52$\pm$6.7		
	Min. wind spd.	0.0001	-58$\pm$7.9		
	Mean gustiness	0.0022	-52$\pm$15.8	0.698	0.0001

Further analysis of video tapes and observational data are in progress and will be reported upon in a subsequent report as will a thorough discussion of this phase of the study.

Radio-telemetry Studies:

Small back-mounted radio transmitters were fitted to eleven nesting bald eagles (Haliaeetus leucocephalus) during the summers of 1979, 1980, and 1981. Only a single bird was fitted with a transmitter in 1981 and this individual still is being monitored. Telemetry studies primarily were designed to study post-nesting dispersal movements of newly fledged eagles as well as to ascertain whether radio-tagged eagles from other river systems were utilizing the Kepone-contaminated James River following dispersal.

During the summers of 1979, 1980, and 1981 eleven nestling Bald Eagles (Haliaeetus leucocephalus) were fitted with small radio transmitters and monitored for over 500 hours after fledging. The data are still being analyzed, however, preliminary analysis has provided some insight into the manner in which movement patterns may affect the opportunities for assimilation of environmental contaminants. It is important to point out that in a discussion of the effect of eagle movement patterns on the assimilation of a contaminant, it is assumed that the contaminant in question is found in the environment in more or less discrete patches. Movement patterns would have little effect on the assimilation of a contaminant which is present on a more or less uniform basis throughout the environment.

DDT was historically applied to large areas throughout the world and very quickly became widely distributed throughout the environment. For this reason it was inevitable that Bald Eagles and many other species came into contact with DDT. Kepone is believed to have been introduced into the environment in large quantities from only one source. We should not, therefore, expect kepone to be widely distributed throughout the Chesapeake Bay region. For this reason, we should only expect kepone to affect Bald Eagles which nest on or near the James River or which feed there at some season. In fact, kepone has been found in all inviable Bald Eagle eggs analyzed from throughout the Chesapeake Bay region (Byrd, unpublished data). This fact suggests that: (1.) kepone has been released into the environment from more than one source; (2.) kepone originating on the James River has circulated throughout the Chesapeake Bay region; or (3.) movement patterns of the birds may bring them into the vicinity of the James River. We are aware of no data in support of the first two explanations. The data presented here seem to support the third explanation.

In Virginia, adult Bald Eagles normally begin courtship and nest building activities in late January to early February (Byrd, unpublished data). Most pairs will have eggs in late February to early March (Byrd, unpublished data) and the eggs will hatch within 35 to 37 days (Maestrelli and Wiemeyer, 1975). Young eagles commonly leave the nest in late June and early July (Table 12). After fledging, the young remain relatively close to the nest (Figure 1), ranging over approximately 0.25 to 0.65 hectares. During this period the young are completely dependent on the adults for food (this study, Kussman 1976). These data suggest that during the breeding season, any given pair of Bald Eagles and their young could be expected to assimilate environmental contaminants only if contaminants are present in the area in which the adults forage. No detailed data are available from Chesapeake Bay concerning the movement patterns of adult Bald Eagles during the breeding season. It seems reasonable, however, to assume that since adults must make frequent food deliveries to their young, the adults must restrict their foraging activities to a relatively small area near the nest. This would seem to indicate that for a pair of eagles which is not nesting in the vicinity of the James River, the probability of picking up kepone during the breeding season is probably very low for both the adults and their young.

Bald Eagles are present in the Chesapeake Bay area throughout the year, however no detailed data are available concerning the movement patterns of adult Bald Eagles during the nonbreeding season. There is, however, some circumstantial evidence suggesting that the adults may remain in, or very near their breeding territory throughout the nonbreeding season. This evidence is based on the frequent sightings of pairs or solitary adults near known breeding territories during the nonbreeding season (Byrd, unpublished data) and the fact that the nonbreeding season is so short. At nest KG-79-02, which was under intensive observation in 1979, the two radio-tagged young remained in the natal area, and were apparently dependent on the adults, until early September (Table 12). On 25 November, two adult Bald Eagles, presumably the same pair, were observed beginning construction of a new nest within 400 m. of KG-79-02. If the adults do remain in or near their breeding territories throughout the year, it seems likely that pairs not nesting on or near the James River have a low probability of coming into contact with kepone.

After the young became independent and began to disperse from the natal area in early September (Table 12), it became very difficult to maintain contact with them. The limited amount of data that we have been able to obtain concerning post-dispersal movements are presented in Table 13. Band recovery data for Bald Eagles banded in the Chesapeake Bay region are presented in Table 14. Although limited, these data suggest that following dispersal from the natal area, juvenile Bald Eagles wander nomadically over an extremely large area. The birds may remain in favorable areas for several days or for several weeks. The stimuli for movement out of an area remains unknown but is probably related to food availability, weather or human disturbance (Kussman 1976). Our data would seem to suggest that it is during this nomadic phase that Chesapeake Bay Bald Eagles are most likely to come into contact with kepone or other localized contaminants. This would seem to imply that if a juvenile does not come into contact with kepone prior to its first breeding attempt, it is unlikely to do so as a breeding bird. Since kepone has been found in inviable Bald Eagle eggs throughout the Chesapeake Bay, and if the above conclusions are correct, it seems apparent that some juvenile Chesapeake Bay eagles do end up on the James River for a period of time prior to their first breeding attempt.

The adult Chesapeake Bay Bald Eagle population does not appear to be migratory however, the more northern Bald Eagle populations do undergo a southward migration during the fall and winter months. Although few data are available, many eagles from the northeastern U.S. and Canada may winter in the Chesapeake Bay area. On 28 August, 1980, a three year old, color-marked Bald Eagle, which had been released as a fledgling in Montezuma National Wildlife Refuge in upstate New York, was observed near one of our study sites in King George County on the Potomac River. This bird is part of a Bald Eagle transplant program designed to reintroduce Bald Eagles to New York state. On 16 October, 1980, a two year old radio-tagged Bald Eagle which may have been produced in Maine was located on the Potomac River near Coles Point. This bird had been injured near a reservoir at Pittsfield, Massachusetts and was captured and rehabilitated by state biologists. After recovery, the bird was fitted with a radio transmitter and released near the point of capture on 30 September, 1980. In 1979, 1980, and 1981 during the first week in January, we surveyed the state by ground and air to locate wintering Bald Eagles. The survey was carried out as part of a nation-wide mid-winter Bald Ealge census which was coordinated by the Raptor Information Center of the National Wildlife Federation. The survey was carried out at a time when most Chesapeake Bay Bald Eagles should be on their breeding territory. The survey results and the number of known, active nests on each river system for each year are presented in Table 15 (also see table 3). The important points to note in these tables are the number of adults observed on each river system and the number of known active nests on each river system in each year. In almost every case, the number of adults observed exceeds the number required for occupancy of the known nests. These excess adults are probably wintering birds from more northern areas. These data, though limited, provide clear evidence of the importance of the Chesapeake Bay region as a wintering area for Bald Eagles.

As previously discussed, Chesapeake Bay Bald Eagles appear to be less likely to contact contaminants after they become breeding birds. Northern Bald Eagle populations seem to be quite different in that adults leave their breeding territory during migration, hence the adults may be just as likely to pick up contaminants as the juveniles. For this reason, it seems clear that contaminant problems within the Chesapeake Bay region, even if restricted to a localized area may have profound effects on breeding Bald Eagles far removed from the Chesapeake Bay area itself.

Figure 1: Typical movement patterns of radio-tagged Bald Eagles prior to dispersal from natal area.

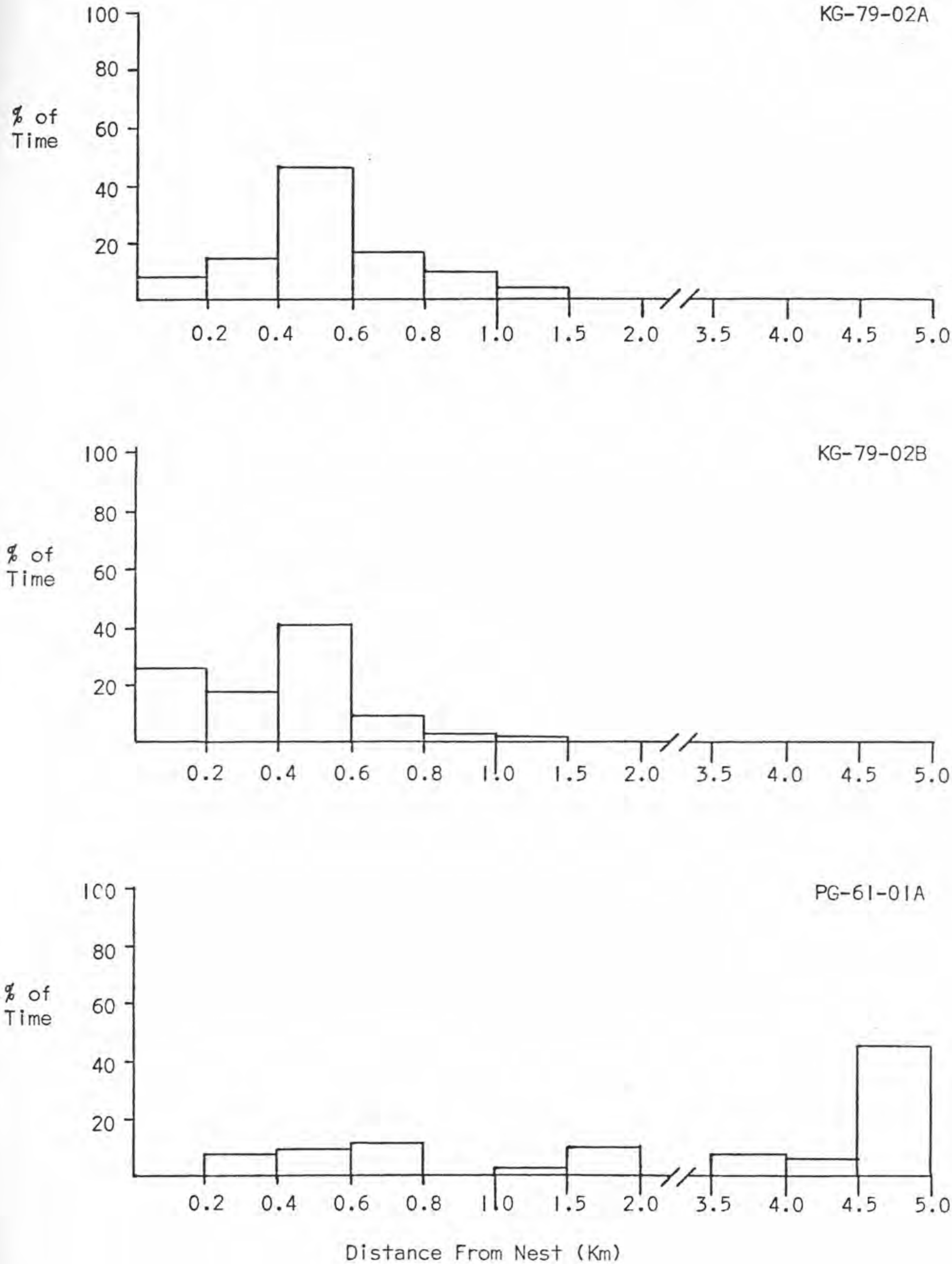

Table 12: Summary of Approximate Fledging Dates, Approximate Date of Departure From Natal Area for Radio-tagged Bald Eagles in Virginia.

ID#				
KG-79-02A	Potomac	7/10/79*	9/9/79	62
KG-79-02B	Potomac	7/9/79 *	9/9/79	63
NO-79-01A	Potomac	7/18/79	9/16/79	61
RI-78-01A	Rappahannock	7/27/79	9/5/79	41
RI-78-01B	Rappahannock	7/27/79	8/23/79	28
MI-78-01A	Rappahannock	6/19/79	8/17/79	60
PG-G1-01A	James	6/20/79	10/6/79	109
LA-75-01A	Rappahannock	6/9/80	7/28/80	50
RI-74-01A	Rappahannock	7/1/80	9/18/80	80
RI-80-01B	Rappahannock	7/21/80	7/27/80	98

* Exact fledging date

Table 13: Movements of Radio-tagged Hatch Year Bald Eagles After Departure From Natal Area.

ID#	River System	Number of Relocations	Cumulative Minimum Distance Traveled	Maximum Dist. From Nest	Date of La Contact
KG-79-02A	Potomac	1	2 km	2 km	9/15/79
KG-79-02B	Potomac	5	123 km	36 km	10/16/79
MI-78-01A	Rappahannock	3	146 km	98 km	10/16/79
LA-75-01A	Rappahannock	9	208 km	173 km	10/16/80
RI-80-01B	Rappahannock	1	19 km	19 km	

Table 14: Recoveries of Bald Eagles in the Chesapeake Bay Area (most or all banded as nestlings).

New Jersey Bandings:

Banded 4 April 1937 at Seaville.
Shot 19 January 1939 at Berlin, Worcester Co., Maryland.

Delaware Bandings:

Banded 5 May 1928 at Delaware City
Captured alive in trap at Olivet, Calvert Co., Maryland on 4 February 1931.

Banded 20 May 1938 at Bombay Hook NWR.
Found exhausted at Chatham, Massachusetts on 25 August 1938.

Three banded in norther Delaware as nestlings; two recovered in winter, one in Dorchester Co. and one in Calvert Co., Maryland. One recovered in Calvert Col, Maryland in September. (The winter recovery in Calvert Co. may refer to the first Delaware banding listed above).

Maryland Bandings:

Banded 26 May 1934 in Anne Arundel Co.
Recovered in Maryland on 3 December 1936 within 35 miles of banding point.

Banded 23 April 1936 in Montgomery Co.
Recovered in northeastern Ohio in August 1936.

Banded 23 June 1936 in Baltimore Co., at Back River Neck, 15 miles east of Baltimore.
Shot at Laurel, Maryland on 20 October 1937.

Banded 6 May 1940 in Charles City.
Recovered in central North Carolina on 20 September 1940.

Banded 5 May 1978 at Blackwater NWR, Cambridge, Maryland.
Found dead 5 December 1978 on the Bruce Peninsula in Southern Ontario.

Table 15. Summary of 1979 and 1980 mid-winter Bald Eagle survey results an active nests by river system. The increase in the number of bir sighted between 1979 and 1980 is due primarily to more complete survey coverage and ∴ probably does not reflect a real increase in the number of birds present.

	ADULTS		IMMATURE		KNOWN ACTIVE NESTS	
	79	80	79	80	79	80
James R., Chickahominy R., Diascund Reservoir	14	21	13	19	1	1
Rappahannock, Great Wicomico	18	32	5	15	11	11
York, Pamunkey, Mattaponi, & Piankatank R.	7	5	1	2	7	5
Potomac R.	29	39	19	29	13	17
Inland Impoundments	4	3	2	0	0	0
Eastern Shore, Back Bay, Seashore St. Park, Norfolk	1	1	0	0	1	1
TOTALS	73	101	40	65	33	35

Literature Cited

Kussman, J.V., 1976. Post-fledging behavior of the Northern Bald Eagle (*Haliaeetus leucoephalus*) in the Chippewa National Forest, Minnesota; Univ. of Minn., Ph.D.

Maestrelli, J.R. and S.N. Wiemeyer, 1975. Breeding Bald Eagles in captivity; *Wilson Bull*. 87:45-53.

TARGET DATE FOR COMPLETION: June 30, 1982

STATUS OF PROGRESS: On Schedule

SIGNIFICANT DEVIATIONS IN PROGRESS: None

RECOMMENDATIONS: Continue with Remaining Project Plans

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DATE: August 1, 1981

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