Waterfowl Hunting and Harvest on Sam Rayburn Reservoir, 1986–1987

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Abstract: Interviews and self-administered questionnaires were used to gather data to characterize waterfowl hunters and harvest on Sam Rayburn Reservoir in east Texas during the 1986–87 season. Interviewed hunters and those submitting questionnaires averaged 0.94 and 1.31 ducks per trip, respectively ($P = 0.003$). Hunters per party, hours per trip, shots per trip, and shots per duck bagged averaged 2.19, 2.96, 5.63, and 5.07, respectively. These values and ducks harvested per trip (1.18) varied significantly across the season ($P < 0.050$). Based on interviews, an estimated 7,971 ducks were bagged. Wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), lesser scaup (*Aythya affinis*), ring-necked ducks (*A. collaris*), gadwalls (*Anas strepera*), American wigeon (*A. americana*), and green-winged teal (*A. acuta*) dominated the harvest in that order. Proportions of the species in the bag varied significantly ($P = 0.015$) across the season.

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The U.S. Fish and Wildlife Service (USFWS) and the Canadian Wildlife Service (CWS) obtain information on waterfowl hunting activity to determine annual waterfowl harvest rates. Annually in each country, a predetermined percentage of the hunters is requested to maintain and submit records of hunting activity and success and duck wings. From these surveys, estimates of total numbers, species composition, sex ratio, age structure, and geographic distribution of the harvest enable waterfowl biologists to evaulate how hunting activity and harvest rates affect waterfowl populations throughout the United States and Canada (Brace et al. 1981, Martin et al. 1982).

State agencies also conduct waterfowl surveys to obtain a more accurate assess-

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ment of how hunting activity and harvest rates affect waterfowl populations within the state. In 1982, the Texas Parks and Wildlife Department (TP&WD) conducted a waterfowl harvest survey to estimate hunting pressure and harvest of major waterfowl species by ecological region. For the 1982–83 season, an estimated 69,549 ducks and geese were harvested in the 23-county Pineywoods Ecological Region of east Texas. The estimated number of hunters for that area was 10,276 (Barron and Frentress 1983). Although nationwide and statewide estimates provide indices to hunting pressure and the number and species composition of the waterfowl harvest, a more concentrated effort is essential to assess effects of hunting activity and harvest rates on a local basis.

In the 5 counties surrounding Sam Rayburn Reservoir in Texas, the average annual harvest was approximately 7,200 birds during the 1971–80 period (Carney et al. 1983). More recently, Rockwood and Whiting (1992) estimated that there were 8,480 hunter-trips (i.e., 1 person hunting 1 morning or 1 afternoon) on Sam Rayburn Reservoir during the 1986–87 duck season. The objectives of this study were to characterize hunter effort and success and to estimate total numbers, species composition, sex ratios, and age structures of ducks harvested on the reservoir during the 1986–87 season. Changes in these parameters as the season progressed were also evaluated.

Methods

Sam Rayburn Reservoir, filled in 1967, encompasses 57,750 ha and extends into portions of Angelina, Jasper, Nacogdoches, Sabine, and San Augustine counties. The reservoir includes large areas of the Angelina, Attoyac, and Ayish river bottoms.

Self-administered questionnaires and personal interviews were used to gather data. The procedures are described in detail in Rockwood (1987) and Rockwood and Whiting (1992). For this study, hunters were asked to contribute a wing from each duck bagged and to provide the following information: (1) date of hunt, (2) time of hunt, (3) number of hours hunted, (4) number of shots fired, (5) number of hunters in party, (6) total number of ducks harvested, (7) number of downed birds lost, and (8) was a retrieving dog used. The questions were printed on large envelopes within which wings were to be deposited. Hunters that contributed self-administered questionnaires were labeled respondents and those interviewed were interviewees; collectively they were labeled cooperators.

For 1986–87, Texas had a 3-way split waterfowl season. Season dates were 1–5 and 22–30 November 1986 and 13 December 1986–18 January 1987. We divided the season into 9 subseasons in order to make some comparisons on a periodic basis. Subseasons were chosen so that each contained a weekend. Inclusion of a weekend was judged to be more important than having subseasons of equal length, consequently numbers of days per subseason varied somewhat (Table 1).

Hunter success was computed by dividing the number of ducks harvested for

Table 1. Dates of subseason, numbers of hunter-trips by interviewees, respondents, and cooperators, and mean numbers of hunters per party, hours per hunter-trip, shots per hunter-trip, shots per duck bagged, and ducks bagged per hunter-trip by subseason. Data were gathered on Sam Rayburn Reservoir during 1986–87 duck season.

Parameter	November			December			January			Season total/ mean	*P*-value
	1–5	22–26	27–30	13–18	19–24	25–31	1–6	7–12	13–18		
Subseason	1	2	3	4	5	6	7	8	9		
Interviewee trips	60	96	63	125	65	40	37	40	53	579	
Respondent trips	78	37	71	87	17	18	10	14	18	350	
Cooperator trips	138	133	134	212	82	58	47	54	71	929	
Hunters/party	2.56A[a]	2.08BCD	2.22ABC	2.31AB	2.16BCD	2.32ABC	2.04BCD	1.74D	1.87CD	2.19	<0.001
Hours/hunter-trip	3.12AB	3.09AB	3.15A	3.20A	3.00ABC	2.36C	2.85ABC	2.45BC	2.51BC	2.96	0.014
Shots/hunter-trip	5.38AB	8.52C	5.68AB	5.75B	4.99AB	3.50AB	2.53A	5.04AB	5.10AB	5.63	0.001
Shots/duck bagged	5.51AB	5.20AB	5.86AB	6.01A	3.86BC	4.02ABC	2.40C	4.72ABC	4.37ABC	5.07	0.018
Ducks/hunter-trip	1.03A	1.80B	1.00A	1.10A	1.19A	0.86A	1.34AB	0.97A	1.12A	1.17	0.015

[a]Within rows, means with the same letter are not significantly different ($P > 0.05$).

each hunting party by the number of hunters in that party. These values were then averaged by subseason and for the whole season.

Two-tailed *t*-tests were used to evaluate differences in success of: (1) interviewees versus respondents, (2) morning versus afternoon hunting parties, (3) single versus multiple-party hunters, and (4) parties with retrievers versus those without. The same tests were used to evaluate differences in numbers of downed birds lost by parties with retrievers versus those without and numbers of dabblers versus divers bagged per hunter-trip. One-way ANOVA and Duncan's multiple range tests were used to determine if there were significant differences between subseasons in: (1) mean numbers of hunters per party, (2) mean time spent per hunter-trip, (3) mean numbers of shots fired per hunter-trip, (4) mean numbers of shots fired per duck harvested, and (5) mean numbers of ducks bagged per hunter-trip.

Waterfowl wings were identified to species, sexed, and aged according to Carney (1964). Wings that could not be identified were recorded as unidentified. Some respondents reported harvesting ducks but failed to include wings. If the numbers of ducks by species were written on the questionnaire, these data were recorded as such. If the number was reported but not the species, the datum was recorded as unknown.

The estimated total number of ducks harvested on the reservoir was the product of the average number of ducks harvested per hunter-trip multiplied by the estimated number of hunter-trips. Additionally, the percent of the harvest that each species comprised was determined for the whole season and for each subseason. Comparisons between subseasons by species were made using 1-way ANOVA and Duncan's multiple range tests.

For dabblers, these analyses were performed on wood ducks, mallards, gadwalls, American wigeons, and green-winged teal. The remaining dabblers, which included northern pintails (*Anas acuta*), blue-winged teal (*A. discors*), and northern shovelers (*A. clypeata*), were grouped due to low numbers harvested and likewise analyzed.

For divers, subseason analyses were performed on lesser scaup and ring-necked ducks. The remaining divers, redheads (*Aythya americana*) and common goldeneyes (*Bucephala clangula*), were grouped with hooded mergansers (*Lophodytes cucullatus*) and ruddy ducks (*Oxyura jamaicensis*) for analysis.

Chi-square tests of independence were used to examine changes in age and sex ratios of dabblers and divers. The alpha level of 0.05 and a null hypothesis of no difference between groups were used for all analyses.

Results and Discussion

Hunter Success

One hundred fifty-one hunting parties were interviewed and 275 submitted self-administered questionnaires. Interviewees and respondents averaged 0.94 ± 0.09 (SE) and 1.31 ± 0.09 ducks per hunter-trip, respectively; the difference was

significant ($P = 0.003$). Combined, cooperators averaged 1.18 ± 0.06 ducks per hunter-trip.

The higher success rate of respondents may be attributed to lack of response after unsuccessful hunts. Wright (1978) found that unsuccessful hunters were not as likely to fill out questionnaires as were successful hunters and that the total number of hunter-trips may have been under reported by as much as 10%. In this study, 20% of the respondents reported unsuccessful hunts as did 33% of the interviewees.

Prestige-bias, whereby hunters exaggerate the actual success, may also explain the higher success rate of respondents. Prestige-bias was 1 of 3 response errors in the USFWS annual Mail Questionnaire Survey of waterfowl hunters (Atwood 1956). Sen (1973) also found prestige-bias as a source of error in a study conducted in Canada where >25% of the unsuccessful hunters reported killing 1 or more ducks. Therefore, we assumed that the estimated hunter success of interviewees was more accurate than that of respondents.

Most interviews were conducted in the morning, so respondent data were used to compare morning versus afternoon hunter success. We assumed no difference in voluntary participation of morning and afternoon hunters. The 215 morning parties averaged 1.35 ± 0.08 ducks per hunter-trip whereas the 55 afternoon parties averaged 0.95 ± 0.14 ducks per hunter-trip ($P = 0.035$). Morning hunters averaged 3.04 hours per trip whereas afternoon hunters spent only 2.00 hours per trip, thus a higher success rate per hunter-trip would be expected of morning hunters.

The high point value of wood ducks (70 points each) may also have caused lower success rate of afternoon hunters. Wood ducks comprised 61% of the bag during afternoon hunts compared to 27% for morning hunts. As a result, the maximum allowable harvest for many afternoon hunters was only 2 ducks.

Single party hunters averaged more ducks bagged per hunter-trip ($\bar{x} = 1.46 \pm 0.23$, $N = 70$ vs. $\bar{x} = 1.13 \pm 0.06$, $N = 356$; $P = 0.165$) and spent slightly less time ($\bar{x} = 2.75 \pm 0.19$ hours vs. $\bar{x} = 3.01 \pm 0.07$ hours; $P = 0.196$) doing so than multiple-party hunters. This suggests that single party hunters were somewhat more efficient than multiple-party hunters.

The 50 parties using retrievers averaged 1.11 ± 0.15 ducks per hunter-trip whereas 101 parties not using retrievers averaged 0.86 ± 0.11 ducks per hunter-trip ($P = 0.178$). Parties with retrievers lost an average of 0.55 ± 0.14 ducks per party whereas those without lost an average of 0.61 ± 0.10 ducks per party ($P = 0.748$).

Zwickel (1980) wrote that the use of dogs by sportsmen will increase hunting success, reduce crippling loss, and aid in the enjoyment of the hunt. One explanation for the lack of differences in hunter success and crippling loss in this study may be the increasing water level of Sam Rayburn Reservoir during the season (Corps of Engineers, unpubl. data). Several hunters mentioned that they did not bring their retrievers due to high water. Also, the numbers of hunting parties using retrievers did decrease during the latter half of the season.

Cooperators reported 253 downed ducks lost during the season; this was 23.2% of the total harvest, similar to that of other waterfowl studies. Anderson (1983) reported an average of 23.2% crippling loss in Illinois. Similar results were reported

from Murphree Wildlife Management Area (WMA) in southeast Texas (22.9%) during the 1974–84 waterfowl seasons and on the Thief Lake WMA, Minnesota (22.6%) (Public Hunt Stat.-Murphree WMA, unpubl. data, and Maertens 1979, respectively).

Hunter Characteristics by Subseason

The seasonal mean number of hunters per party, based on all cooperators, was 2.19 ± 0.04. There were differences between subseasons ($P < 0.001$). The high value for subseason 1 (Table 1) may be attributed to large groups of hunters during the opening weekend. High numbers in subseasons 4 and 6 were probably due to Christmas break for students and Christmas holidays for all hunters, respectively. The general trend of decreasing party size as the season progressed was probably related to increasingly difficult hunting conditions.

Seasonally, hunters averaged 2.96 ± 0.07 hours per trip (Table 1). In a similar study, Maertens (1979) determined that hunters averaged 4.71 hours per trip during the 1972–77 waterfowl seasons. However, those hunters had a higher success rate than did the hunters in this study. For this study, longer hunts during the first 4 subseasons were probably due to high enthusiasm and better hunting conditions.

A seasonal mean of 5.63 ± 0.29 shots were fired per hunter-trip (Table 1). In other waterfowl studies, Blandin (1981) and Montalbano and Johnson (1985) reported 6.24 and 5.84 shots per hunter-trip, respectively. During subseason 2, hunters shot significantly more than during all remaining subseasons ($P < 0.001$); this suggests relatively high numbers of waterfowl were present on the reservoir during that subseason.

Hunters averaged 5.07 ± 0.23 shots per duck harvested for the whole season (Table 1). Hunters at the Murphree WMA in southeast Texas averaged 5.34 shots per duck harvested (Public Hunt Stat.-Murphree WMA, unpubl. data). In contrast, hunter performance surveys conducted during Florida's special September duck season indicated hunters averaged 3.61 shots per duck harvested (Montalbano and Johnson 1985).

The numbers of shots per duck bagged differed by subseasons ($P = 0.018$). The reasons for the unusually low number of shots per duck harvested during subseason 7 are unclear (Table 1). Mean numbers of shots per duck harvested decreased during the latter portions of the season as did mean numbers of hunters per party, mean time spent per hunter-trip, and mean numbers of shots fired per hunter. These data support Foote's (1971) statement that hunting pressure declines as the season progresses.

Waterfowl Harvest

Using interviewee data, an estimated 7,971 ducks were bagged on Sam Rayburn Reservoir during the 1986–87 regular waterfowl season. There were no reports of geese harvested.

Wood ducks dominated the harvest, followed by mallards, lesser scaup, ring-necked ducks, and gadwalls in that order (Table 2). In the Pineywoods Ecological

Table 2. Estimated numbers of ducks bagged by subseason on Sam Rayburn Reservoir during th 1986–87 season.

Species	Subseason									Total
	1	2	3	4	5	6	7	8	9	
Wood duck	430	402	183	475	81	160	102	132	168	2,133
Mallard	95	249	146	175	109	7	51	30	226	1,088
Lesser scaup	7	36	117	147	394	154	44	51	36	986
Ring-necked duck	117	139	168	198	95	43	36	95	43	934
Gadwall	212	256	132	30	7	0	0	0	7	644
American wigeon	36	132	51	102	0	0	7	44	0	372
Green-winged teal	22	124	36	51	29	0	0	8	59	329
Other dabblers[a]	15	59	36	7	0	0	0	0	0	117
Other divers[b]	0	22	15	36	0	0	8	7	0	88
Others[c]	73	241	81	628	73	8	110	7	59	1,280
Totals	1,007	1,660	965	1,849	788	372	358	374	598	7,971

[a]Includes northern pintails, blue-winged teal, and northern shovelers.
[b]Includes redheads, common goldeneyes, hooded mergansers, and ruddy ducks.
[c]Includes both unidentified and unknowns.

Region during the 1982–83 through 1984–85 waterfowl seasons, wood ducks and mallards dominated the harvest followed by green-winged teal, gadwalls, and lesser scaup (Stutzenbaker 1985, 1986). Differences between the 2 studies in the lower-ranked 3 species may be because Stutzenbaker included a variety of habitats while our study included only Sam Rayburn Reservoir. Also, high water on the reservoir during 1986–87 may have reduced habitat available to green-winged teal and increased habitat for divers.

Because of the small sample sizes, we based comparisons of subseason harvests on data submitted by all cooperators. The inclusion of respondents in these analyses assumes that bias in hunter success was distributed throughout the season.

There were significant differences in harvests among subseasons (Table 1). High numbers harvested during subseason 2 correspond with high numbers of shots fired per hunter-trip during that subseason. This further supports the assumption that there were high numbers of ducks on Sam Rayburn Reservoir during that period.

Differences in proportions of dabbling species in the bag were significant by subseason; American wigeons were the exception (Table 3). Trends among subseasons were very different between species. The decline in harvest rates of gadwalls and other dabblers after subseason 2 suggests that the reservoir served as a temporary resting area for these species.

For divers, only the proportions of lesser scaup were significantly different by subseason (Table 3). The high proportional harvest of lesser scaup during the middle of the season could be the result of a late passage of this species through east Texas. Two peaks for ring-necked ducks suggest that there may have been 2 distinct flights of this species through east Texas.

Dabblers and divers comprised 69.0% and 31.0% of the harvest, respectively ($P < 0.001$). During the first 4 subseasons, dabblers dominated the harvest (Fig. 1).

Table 3. Proportional harvests of ducks bagged per hunter-trip by subseason during the 1986–87 duck season on Sam Rayburn Reservoir.

Species	Subseason									Season mean	*P*-value
	1	2	3	4	5	6	7	8	9		
Wood duck	0.46B[a]	0.47B	0.18A	0.30AB	0.15A	0.49B	0.40AB	0.34AB	0.34AB	0.34	0.013
Mallard	0.10A	0.23AB	0.17A	0.09A	0.24AB	0.02A	0.17AB	0.06A	0.40B	0.16	0.007
Gadwall	0.22BC	0.25C	0.13AB	0.02A	0.01A	0.00A	0.00A	0.00A	0.03A	0.09	<0.001
Green-winged teal	0.02AB	0.11C	0.04AB	0.02A	0.05AB	0.00AB	0.00AB	0.02AB	0.12C	0.05	0.038
American wigeon	0.03	0.07	0.05	0.07	0.00	0.00	0.03	0.10	0.00	0.04	0.056
Other dabblers[b]	0.01A	0.09B	0.04A	0.00A	0.00A	0.00A	0.00A	0.00A	0.00A	0.02	0.007
Lesser scaup	0.01A	0.04A	0.08A	0.10A	0.52B	0.26AB	0.26AB	0.19A	0.06A	0.14	0.003
Ring-necked duck	0.10	0.15	0.21	0.14	0.12	0.07	0.14	0.21	0.08	0.14	0.866
Other divers[c]	0.00	0.03	0.01	0.02	0.00	0.00	0.02	0.02	0.00	0.01	0.617
Unknowns	0.07	0.36	0.05	0.33	0.10	0.02	0.32	0.03	0.10	0.18	0.273
Unidentified	0.01	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.749
Totals	1.03	1.80	1.00	1.10	1.19	0.86	1.34	0.97	1.13	1.18	0.015

[a] Within rows, means with the same letter are not significantly different ($P > 0.05$).
[b] Includes northern pintails, blue-winged teal, and northern shovelers.
[c] Includes redheads, common goldeneyes, hooded mergansers, and ruddy ducks.

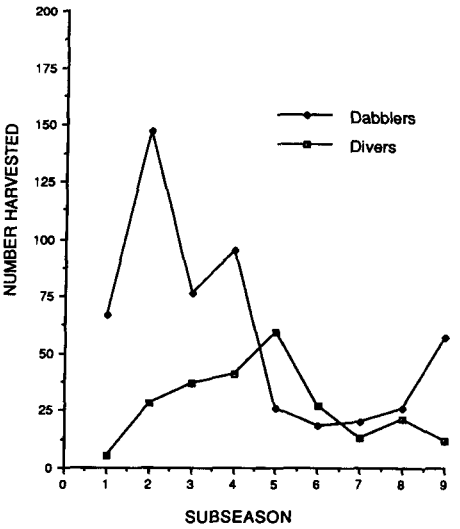

Figure 1. Numbers of dabblers and divers harvested by cooperators on Sam Rayburn Reservoir during the 1986–87 waterfowl season.

Divers dominated the harvest during subseason 5. Both groups were low during subseasons 6, 7, and 8. The increase in dabblers during subseason 9 was due to hunters harvesting mallards and green-winged teal (Table 3), possibly a result of an influx of new ducks and increased hunting pressure at the end of the season.

Dabblers harvested consisted of 48.3% adults and 51.7% subadults; of these 65.5% were males and 34.5% were females ($Z > 1.645$). Adult and subadult divers comprised 39.3% and 60.7%, respectively ($Z > 1.645$). These data suggest that male dabblers were more susceptable to harvest than females as were subadult divers when compared to adults.

Vulnerability depends on factors such as total population of ducks and hunters, vagaries of weather, migration patterns (Cooch et al. 1972), and hunting regulations. Some male dabblers (i.e., mallards, American wigeons, and pintails) are easily identifiable in flight and would logically be selected over female mallards which were 100-point ducks. However, both sexes of divers, which are difficult to distinguish in flight, had the same point value. Therefore, hunters probably took the easiest shot available thus harvesting high proportions of subadults.

Conclusions

Carney et al. (1983) estimated that 7,200 ducks and geese were harvested annually in the 5 counties surrounding Sam Rayburn Reservoir during the 1971–80 hunting seasons. If these estimates held true through the 1986–87 season, virtually all birds taken in those counties were bagged on the reservoir. Additionally, >10% of the waterfowl harvested in the Pineywoods Ecological Region may have been taken on the reservoir. These values emphasize the importance of the reservoir to water-

fowl and waterfowl hunters, and the need to consider ducks, geese, and other wetland species when the water level of the reservoir is manipulated.

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