A COMPARATIVE STUDY OF AVAILABILITY OF WATERFOWL FOODS AND WATERFOWL USE ON A SERIES OF CLEAN AND TURBID FARM PONDS IN NORTH-CENTRAL OKLAHOMA

By C. J. BARSTOW
Biologist, Tennessee Game and Fish Commission

ABSTRACT

Studies on twenty-one clear and twenty-three turbid ponds in Payne and Noble counties in Oklahoma were made during the 1956 late winter and spring waterfowl migration (February-May). A total of 5,402 waterfowl representing thirteen species was observed. Dabblers made up 84.6 percent of the total number observed. Waterfowl reached a peak during the first week of March and then declined sharply. This decline coincided with a decrease in available aquatic plants which were depleted by the feeding of large numbers of waterfowl. The clear ponds received 95.9 percent greater waterfowl use than the turbid ponds. The "type" of pond, whether open or ravine, does not seem to have any significance to waterfowl use. Conclusive data on the relation of pond size to use by waterfowl was not obtained in this investigation. Disturbance by man's direct activities was not considered as being significant during the period of this study. Creating and maintaining clear and productive farm ponds seems to be the most feasible and economical waterfowl management practice in this area.

INTRODUCTION

North American waterfowl have been the subject of intensive management by the Canadian Wildlife Service, the United States Fish and Wildlife Service, State Conservation Departments, and a few private organizations and individuals. Waterfowl seem to have responded well to the management practices which have been applied; however, there are still many serious problems obstructing their future security. Two of the most pressing problems recognized by waterfowl managers today are the need of more resting and feeding areas along the flyways, and more wintering grounds.

Oklahoma is estimated to have approximately 150,000 to 200,000 farm ponds (Dr. W. H. Irwin, personal correspondence, 1956). These appear to constitute a high potential of resting, feeding, and possibly wintering grounds. Even if only a small percentage of these ponds was managed to attract waterfowl, hundreds of acres of much needed habitat would be made available. Not only would this benefit the ducks on their fall and spring migrations, but it would also tend to hold the birds in this region; thereby improving waterfowl hunting in Oklahoma.

This project was set up to investigate the factors which make a farm pond attractive or non-attractive to waterfowl, and also to determine the relative importance of the farm pond to waterfowl migrating through the north-central Oklahoma area. Because of the colloid-clay turbidity problem of this region (Irwin and Stevenson, 1951), turbidity was one of the main factors considered in this investigation. From this project it was hoped to obtain information basic to future waterfowl management of farm ponds in north-central Oklahoma.

The data for this report was gathered during the winter-spring, 1956 period of waterfowl migration. Although the research period was comparatively short, it is believed that the information may be of interest and perhaps of use to individuals or organizations which are working on similar or related problems.

PROCEDURE

Twenty-one clear and twenty-three turbid ponds in Payne and Noble counties were selected for systematic observation of waterfowl use and waterfowl food availability. The selection of the study ponds began on February 10, 1956. Soil Conservation Service aerial survey maps, and an aerial reconnaissance were used to locate suitable ponds for this study. The main differentiating factors which were used in the selection and classification of the study ponds were: (1) clear or turbid water, (2) ravine or open type of pond, (3) size of pond, (4) type of watershed, and (5) location of the pond as to possible disturbance of waterfowl by man's activities.

The ponds were observed for waterfowl use at all times of the day and approximately two times per week, or an average of eighteen observations per pond during the study period (February 24, 1956 to May 6, 1956). Observations were made at various hours of the day. Bausch and Lomb, 7 x 50, binoculars were used as an aid in counting and identifying the waterfowl.

Information on the waterfowl foods available in the study ponds was obtained by the following methods:

1. General observations were periodically made of any aquatic plants present in the ponds.
2. A detailed investigation of the availability of waterfowl foods (aquatic flora and fauna) was initiated on three of the study ponds (2 clear and 1 turbid). This phase of the project included:
   a. Quantitative and qualitative studies of the aquatic vegetation were accomplished by the use of a modification of a survey technique used by Rickett (1922).
   b. Quantitative studies of seed and aquatic fauna on the bottom of the ponds were conducted by the use of an Ekman dredge.

RESULTS

Relative Abundance of Waterfowl

A total of 5,402 waterfowl, representing 13 species was observed on the study ponds during the spring migration (Table I). Of these, dabblers or river ducks made up 84.6 percent and diving ducks made up 15.4 percent. The top five species, in order of abundance, and constituting 81.1 percent of all waterfowl observed were: (1) pintail, (2) baldpate, (3) green wing teal. (4) gadwall, and (5) ringneck duck. The pintail made up 34.3 percent of the overall total, making it the most abundant of all the waterfowl observed on the study ponds.

The mallard, which is considered to be one of the most common ducks migrating through Oklahoma, made up only 1.3 percent of the waterfowl observed on the study ponds. A total of 311 mallards was observed on Boomer Lake, Payne County, Oklahoma, on three occasions. Several flocks of mallards were also observed utilizing grain sorghum fields in the immediate vicinity of the study ponds. The very limited use of ponds by the mallard seems to be due to a change in the "normal" habits of this species although further study, especially of fall migration, may not substantiate this.

TABLE I

WATERFOWL OBSERVED OF THE STUDY PONDS

Species	*Total Number*	*Percent of Overall Total*	*Ranking*
Pintail	1,878	34.30	1
Baldpate	956	17.59	2
Greenwing Teal	673	12.45	3
Gadwall	522	9.65	4
Ringneck	450	8.33	5
Bluewing Teal	327	6.05	6
Shoveller	234	4.33	7
Redhead	180	3.33	8
Lesser Scaup	132	2.44	9
Canvasback	70	1.29	10
Mallard	59	1.09	11
Coot	8	.14	12
Wood Duck	1	.01	13
TOTAL	5,402	100.00	..

Seasonal Abundance of Waterfowl

The highest waterfowl populations on the study ponds were noted the last week of February, which was during the beginning of the study period. From this peak the population decreased sharply until the middle of March, when it leveled off at a comparatively low level (Figure 3). This sharp decline of the

population does not appear to be a normal phenomenon of the spring migration of waterfowl through this region.

TABLE II

SPRING MIGRATION DATA—FEBRUARY 15 TO MAY 6, 1956

Species	*Date First Seen*	*Main Peak*
Mallard *	Feb. 15	Feb. 12–18
Pintail *	Feb. 15	Feb. 12–18
Baldpate *	Feb. 15	Mar. 6–13
Gadwall *	Feb. 15	Mar. 6–13
Greenwing Teal *	Feb. 15	Feb. 26–Mar. 3
Bluewing Teal	Mar. 27	Apr. 29–May 5
Shoveller *	Feb. 15	Mar. 23–Mar. 27
Ringneck	Feb. 27	Mar. 9–Mar. 16
Lesser Scaup	Mar. 9	May 1–May 6
Redhead	Mar. 6	Mar. 9–Mar. 16
Canvasback	Feb. 17	Feb. 17–Feb. 22
Wood Duck	Mar. 6	Mar. 6
Coot	Apr. 11	Apr. 12–Apr. 17

* Were noted on the first observation of the ponds; therefore they were probably in this area before the given date.

Comparison of Waterfowl Use of Clear and Turbid Ponds

A total of 5,179 waterfowl was observed on the clear ponds during the study period, thus giving an average total of 246.6 waterfowl per clear pond. During the same period only 223 waterfowl were observed on the turbid ponds, giving an average total of 9.7 waterfowl per pond (Table III).

The clear ponds received 95.9 percent greater waterfowl use than the turbid ponds. This clearly indicated that the waterfowl migrating through this area showed a decided preference for clear ponds rather than turbid ponds, and therefore, the greater importance of the clear ponds to migrating waterfowl. The attractiveness of the clear ponds was, in all probability, due to the abundance of waterfowl foods, which are usually typical of the clear ponds, but which are seldom available in quantity in the turbid ponds.

TABLE III

WATERFOWL USE OF CLEAR AND TURBID PONDS

Turbidity	*No. of Ponds*	*Waterfowl Use*	*% of Total Waterfowl Use*
Clear (—25 p.p.m.)	21	5,179	95.9
Turbid (+25 p.p.m.)	23	223	4.1
		5,402	100.0

Comparison of Waterfowl Use of Ravine and Open Ponds

These two terms were selected to represent the two basic physical types of farm ponds found throughout Oklahoma. The definitions of these two descriptive terms are:

1. Open—the open pond is usually formed in a gently sloping basin and is generally characterized by comparatively shallow water and gently sloping margins.
2. Ravine—the ravine pond is usually formed in a deep ravine or gully and usually characterized by comparatively deep water and steep margins.

There appeared to be little difference in the waterfowl use of the ravine and open ponds. Since the ravine type of pond received only 1.4 percent greater waterfowl use than the open type pond, it would seem that these two types are of approximately equal importance to waterfowl migrating through this area.

TABLE IV

WATERFOWL USE OF RAVINE AND OPEN PONDS

Pond Type	*No. of Ponds*	*Total Surface Acres*	*Waterfowl Use*	*Percent of Total Use*	*Percent Difference*
Ravine	25	29.0	2.739	50.7	. .
Open	19	17.5	2,663	49.3	. .
			5,402	100.0	1.4

Comparison of the Waterfowl Use of Farm Ponds in Relation to Pond Size

The data collected during this study indicate that the waterfowl use is inversely proportional to the size of the pond (Table V) (*o. e.*, the smaller class pond, less than one surface acre of water, received the greatest waterfowl usage). However, the importance of the size factor in attracting waterfowl to farm ponds is not considered to be clearly shown in the data collected during this investigation. The validity of this information is in doubt primarily because of the wide divergence in the size of the samples (both in number and total acreage) within the respective size classes, and, also, the arbitrary classification of farm ponds according to size is purely artificial and therefore could easily lead to erroneous conclusions.

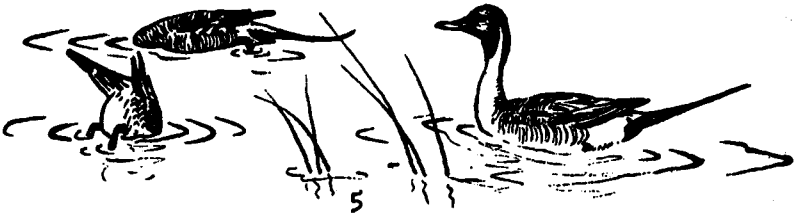


TABLE V

COMPARISON OF WATERFOWL USE OF THREE SIZE CLASSES OF FARM PONDS

Size Class	*No. of Ponds*	*Total Surface Acres*	*No. of Waterfowl*	**No. of Waterfowl Per Acre*
I. (0.0–0.9 Surface Acre)	16	10.50	2,933	186.9
II. (1.0–1.9 Surface Acre)	26	30.25	2,419	154.0
III. (2.0–4.9 Surface Acre)	2	6.50	410	26.2

* Total sum of the average number of waterfowl per surface acre for each of the pounds in a specific size class.

Waterfowl Food Availability

At the beginning of the study submerged aquatic vegetation was common in most of the clear ponds. *Najas quadalupensis, Potamogeton nodosus, Potamogeton pectinatus, Scirpus sp., Jessiaea decurrens, Typha latifolia, Nelumbo lutea, Sagittaria sp., Chara sp., Nitella Sp., Polygonum sp.,* and several genera of algae were found on the margins or in the study ponds. The turbid ponds, with few exceptions, were comparatively devoid of submerged aquatic vegetation. All of the plants listed above with the possible exception of *Nelumbo sp.* and some of the forms of algae are of importance in the diet of waterfowl migrating through this area (Hancock, 1953).

The following were believed to be the most important aquatic plants, (1) *Najas quadalupensis* was the most abundant and widely distributed of the aquatic plants found in the study ponds. Before heavy use by waterfowl the surface of many of the clear ponds was nearly covered with this plant. Both the seeds and the vegetative parts are relished by waterfowl. Because of its relative abundance, wide distribution, and known palatability as a waterfowl food (Han-

cock, 1953) *Najas quadalupensis* is the most important single source of waterfowl food in the ponds of north-central Oklahoma. (2) *Potamogeton nodosus* was ranked next in order of importance; however, it was not nearly as abundant nor widespread as *Najas quadalupensis.*

Bottom samples were taken from clear ponds having an abundance of aquatic vegetation and one turbid pond which was devoid of vascular aquatic vegetation. The samples taken from the clear ponds contained 300 times greater volume of animal matter and approximately 10 times greater volume of seed than the samples taken from the turbid pond.

Aquatic fauna, principally aquatic insects, amphipods and snails were found in abundance within the mats of aquatic vegetation in the clear ponds.

Comparison of Waterfowl Use and Food Availability

The spring migration in Oklahoma is usually accompanied by a prolonged stay of waterfowl (Dodson ——). However, a prolonged stay of waterfowl was not found during this investigation. Instead the number of waterfowl using the study ponds declined sharply from a relatively high to a very low population (Figures 1 through 5).

As previously stated, submerged aquatic vegetation was very common in the clear ponds at the beginning of the study; however, there was a rapid decrease in the quantity of submerged aquatics as the spring migration progressed. This decrease was very rapid in the small ponds of less than ¾ surface acre (Figures 4 and 5). The aquatic vegetation in many of these smaller ponds was consumed to a level of approximately fourteen inches below the surface of the water; thereby making the vegetation nearly unobtainable to the dabbler ducks, which made up 84.6 percent of all waterfowl observed on the ponds. The waterfowl use of these ponds changed from heavy to practically none as the aquatic vegetation became unobtainable. This phenomenon was also illustrated by the data obtained from the intensive investigation of the waterfowl food availability of three larger ponds (Figures 1 and 2), although it seemed to require a longer and heavier period of waterfowl use to deplete the aquatic vegetation in the large ponds.

Renewed or seasonal growth and lowering water levels are two factors which may make foods available over a longer period of time.

Human Disturbance

Disturbance by man's direct activities is not considered as being a serious limiting factor of the spring use of farm ponds by waterfowl. Several of the ponds which received heavy duck usage were subjected daily to man's direct activities such as cattle feeding, plowing, fishing, etc., and yet the birds would continue to use these ponds.

Also a total of fifty-two fresh, empty shotguns shells were collected from the margins of one of the best ponds during the spring season. This pond ranked fourth in total waterfowl usage.

MANAGEMENT

From the information obtained during this study it can be concluded that the comparatively small number of clear productive farm ponds in this area will attract a significant number of migrating waterfowl.

The majority of the farm ponds in this region are built for stock watering purposes; fishing and hunting being of very minor importance. Thus the most feasible and economical waterfowl habitat management in this area would be to create and maintain clear, productive farm ponds by good land use and soil conservation practices, which should be readily acceptable to the enlightened farmer or rancher.

SUMMARY

Studies on twenty-one clear and twenty-three turbid ponds in Payne and Noble counties in Oklahoma were made during the 1956 late winter and spring waterfowl migration (February-May).

A total of 5,402 waterfowl representing thirteen species was observed. Dabblers made up 84.6 percent of the total number.

Waterfowl populations reached a peak during the first week of March and then declined sharply. This decline coincided with a decrease in the available

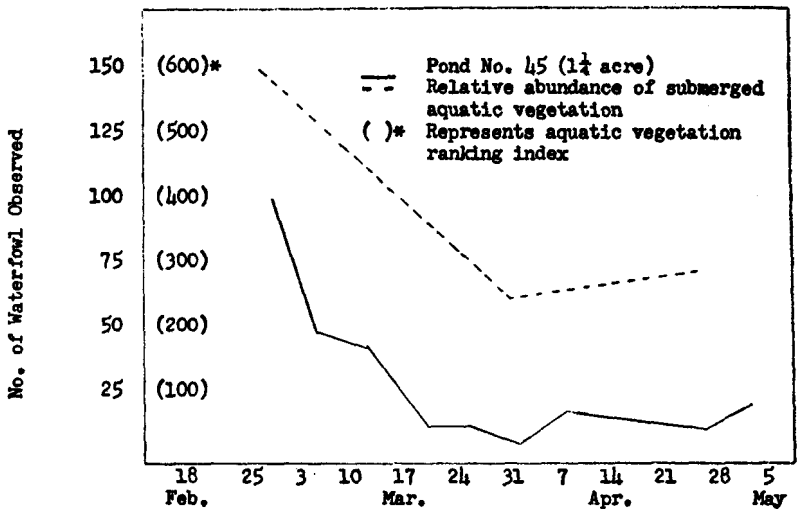


Figure I. Spring Waterfowl Migration and Relative Waterfowl Food Availability on Clear Study Pond No. 45, February 28 - May 6, 1956.

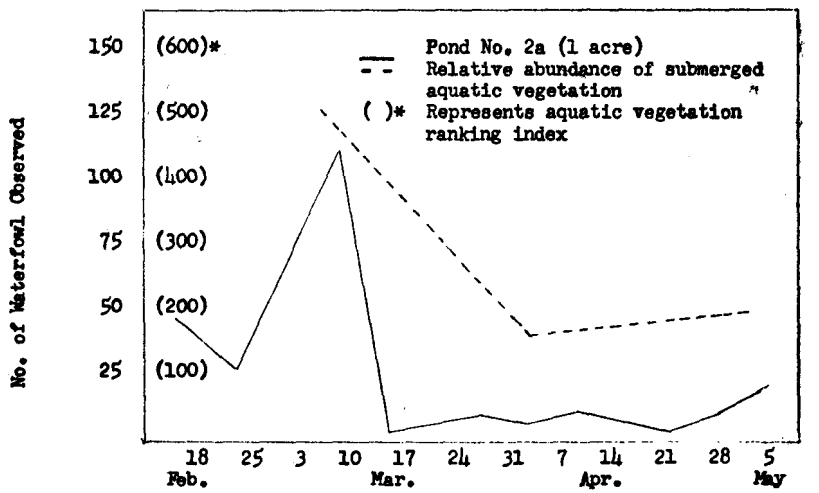


Figure II. Spring Waterfowl Migration and Relative Waterfowl Food Availability on Clear Study Pond No. 2a, February 12 - May 6, 1956.

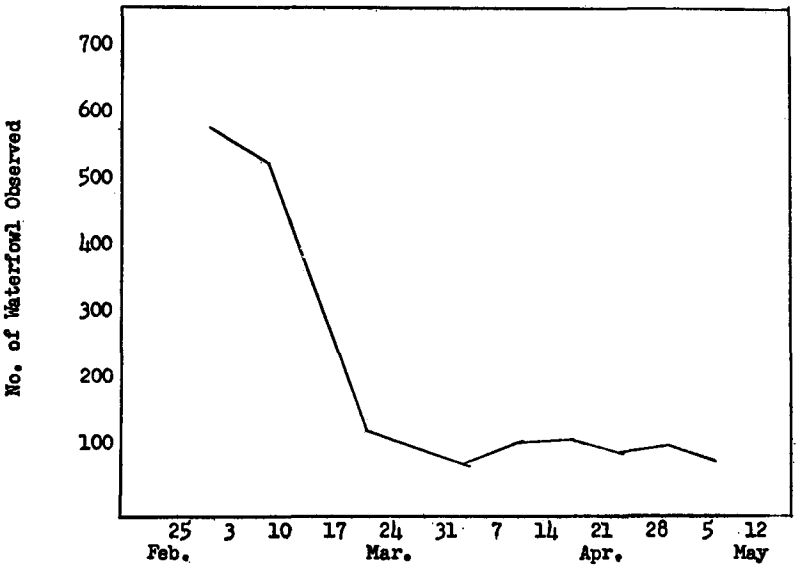


Figure III. Total Spring Waterfowl Populations Observed on Study Ponds, Spring, 1956.

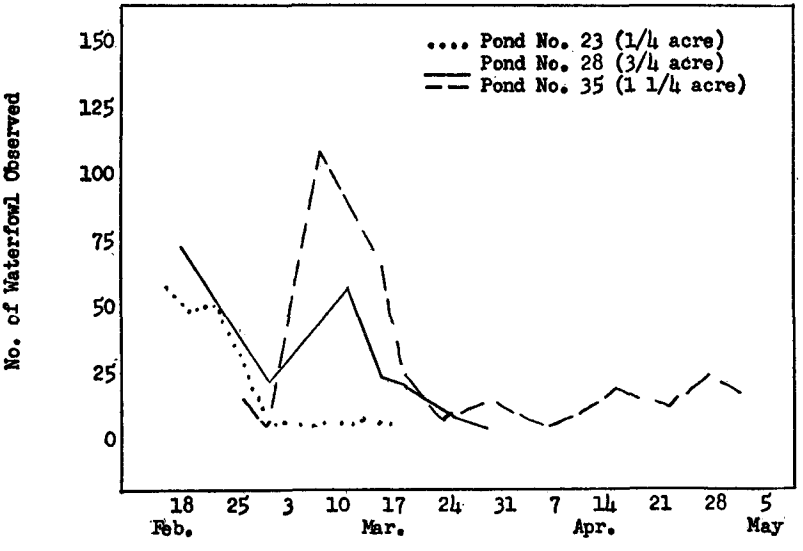
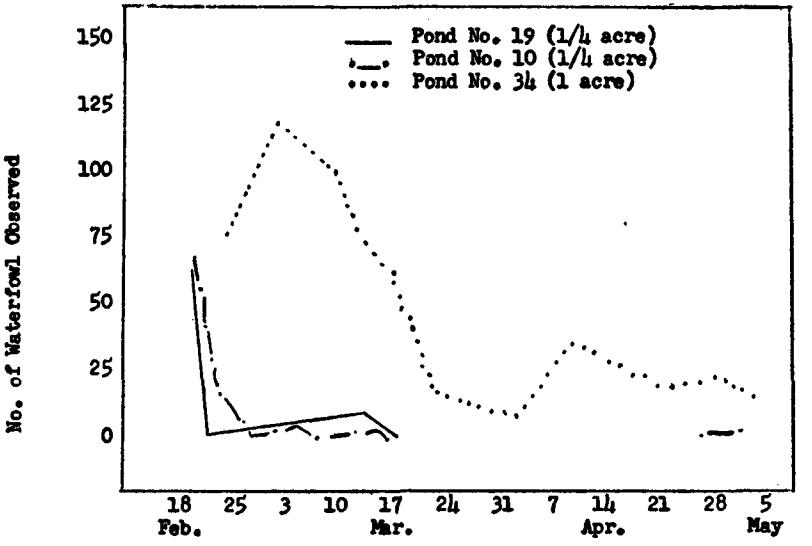


Figure IV. Spring Migration of Waterfowl on Clear Study Ponds Nos. 23, 28, and 35, February 12 - May 6, 1956.



aquatic plants, which were depleted by the feeding of large numbers of waterfowl.

The clear ponds were used by 95.9 percent of the waterfowl and the turbid ponds were used by 4.1 percent of the waterfowl observed during the study.

The clear ponds were much more productive of waterfowl foods than the turbid ponds.

The "type" of pond, whether, open or ravine, did not seem to have any significant effect on waterfowl use.

Conclusive data on the relation of pond size to use by waterfowl was not obtained in this investigation.

Disturbance by man's direct activities was not considered as being significant during the period of this study.

Creating and maintaining clear, productive farm ponds seems to be the most feasible and economical waterfowl management practice of this area.

ACKNOWLEDGMENTS

The investigator is grateful for the assistance and supervision of his graduate committee at Oklahoma State University. This committee was composed of Dr. F. M. Baumgartner, Dr. W. H. Irwin, Dr. A. M. Stebler, Dr. Roy W. Jones, and Dr. H. I. Featherly.

Special thanks and credit are due Dr. Baumgartner whose encouragement and technical assistance made the investigation possible.

Project support was provided by the Oklahoma Cooperative Wildlife Research Unit.*

REFERENCES

Dodson, Monte M. ——. Oklahoma Migratory Game Bird Study, 1949-1953. Oklahoma Game and Fish Department, Division of Federal Aid.

Hancock, Hunter H. 1953. Food Habits of Waterfowl Migrating through Payne County, Oklahoma. OAMC Research Foundation Publication No. 50.

Irwin, W. H. and James H. Stevenson. 1951. Physic-Chemical Nature of Clay Turbidity with Special Reference to Clarification and Productivity of Impounded Waters. OAMC Biological Series No. 4.

* Oklahoma Department of Wildlife Conservation, Oklahoma State University, United States Fish and Wildlife Service, and Wildlife Management Institute Cooperating.

Rickett, H. W. 1922. A Quantitative Study of the Larger Aquatic Plants of Lake Mendota. Trans. Wis. Acad. Sci., Arts, Let., 501-527.
————. 1953. Biennial Report, July 1, 1950-June 30, 1952, Oklahoma Game and Fish Department.
————. 1955. National Survey of Fishing and Hunting. USDI Circ. 44.

LAW ENFORCEMENT SESSION

GATHERING AND PRESENTING EVIDENCE

By BILL PARSONS
Alabama Game Warden

One of the responsibilities of the wildlife officer is to prepare enough evidence against the violator to justify taking him before the court with reasonable chances for a conviction. This preparation includes the identification, collection and the preservation of such kinds of evidence and in such a manner that the admissibility and effectiveness of the evidence in court will serve the ends of justice. He must know what constitutes evidence; what evidence is admissible in court; when and in what manner to apprehend presumed law violators so that no legal obstacles to conviction can arise from that source; how to develop information; how to recognize evidence in the field; how to collect and preserve evidence to safeguard its admissibility; how to obtain evidence from witnesses and from others who may be able to help; how to detect discrepancies, dishonesty or general lack of good faith; when to call upon experts for help; and how to testify, and other courtroom techniques. An officer may be required to appear in court either as a witness or as the prosecutor for his own case. In either event, adequate preparations and complete familiarity with the details are absolutely necessary. Although it is not expected that every prosecution will result in a conviction, at the same time the officer should have such grounds for instituting the proceedings as will justify him, in the opinion of the district attorney and of the judge who tries the case, in having brought the action. It is recognized that at times a prosecution is justifiable and desirable even when it is a moral certainty that a conviction will not be had.

Kinds of evidence include physical objects such as bodies of game animals, blood, weapons, empty shell cases, glass and articles of clothing; but to be used as evidence must be proved relevant to the issue. Probably before you can use some of these articles in court you will need to call in an expert to examine said article. Should these articles be sent to the lab. they should be handled very carefully. They should be wrapped securely and the box sealed and marked *evidence.* An invoice should be placed outside the box giving all details of the articles involved, thus helping the technician to know what to expect and also what you wish to prove. Field notes are probably one of the best courses of evidence on game and fish violations. These notes should be taken at the time of violation or when you contact the defendant or from witnesses examined and should include date, time, place and conversation and any other material used in violation.

The legal instrument that permits the prosecutor to view these grounds is the *brief.* By disclosing the strength and weaknesses of the prosecutor's position and the possible lines of defense, the brief enables him to determine if an arrest is justifiable under evidence submitted. Such a brief is particularly necessary when the defendant elects to fight the charges. For this reason, when in every case, no matter how trivial, the officer should prepare a brief of the evidence for his own and for the district attorney. The average district attorney handles dozens of cases a month and can give a misdemeanor charge only limited time. He may not be too familiar with game and fish laws, with game and fish conditions, or with practices prevailing in the field. If he can sit down with a brief of the case, illustrated with sketches and photos he is in better