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Analysis of the

FOOD HABITS OF THE

BOBWHITE QUAIL IN MISSOURI

by
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by

Leroy J. Korschgen, Project Leader

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FOREWORD

If a man builds a violin of 13,000 match-sticks, the event will be noted in a thousand newspapers. It may become a museum-piece, and have a feature-story written about it. Man and violin become objects of marvelling respect for a multitude; rarely does anyone ask - "How well does it play?"

Here is a study built up of the analysis of some 13,000 quail meals. It will not be featured in the daily papers, but we know it never becomes buried in a museum. It will probably not receive the marvelling respect of the multitude, but unlike the match-stick violin, there is no question regarding whether or not it will "play". The information herein has already contributed more of solid worth to the Missouri quail management program than the violin in question ever will to music: It has told us what food-plants to emphasize in the quail habitat restoration program, and to that extent it has become a permanent part of the quail management structure.

The study serves game management in another way. Comparisons between this food list and those compiled elsewhere will show some sharp differences, especially regarding staple foods. Thus the study points out clearly, once again, the folly of the tendency for a state to neglect research on a subject "becuase some other state has already done this and found our answers for us."

--- Paul Q. Tulenko, Supervisor, Federal Aid Projects

SUMMARY

The objective of this investigation was to ascertain the food-habits of quail, with emphasis on the late-winter and early-spring season, as part of a year-around quail food-habits study. The period November - March inclusive was most heavily represented in the samples.

Quail droppings were used for study materials, since it was impracticable to collect quail crops out of season in sufficient numbers for study.

Nature Knights (school children enrolled in Conservation Club work) were enlisted as collectors, with credit toward a Nature Knight award being granted for each sample submitted.

A total of 1,358 samples covering an eight-months period (September through April) for three successive years supplied data for this investigation. Assuming an average of ten birds per covey from which samples were collected, these data cover the feeding of 13,580 birds.

Data are presented to show the principal foods of quail: (a) as revealed by the previous analysis of 5,472 crops; (b) for each month of the study period, as determined by droppings analysis; (c) for each of the major regions of the state--Prairie (agricultural) and Ozark (wooded); and, (d) as statewide averages by occurrence and volume.

A close correlation of data was obtained by the two methods, crops and droppings analyses. A few plant species were found to provide the bulk of the quail food supply throughout the eight months covered by this investigation.

Animal foods (mostly insects) were found to comprise a minor portion of the quail's diet, by volume.

The principal foods, by volume, were revealed to be: Korean lespedeza, 26.3%; common ragweed, 21.9%; corn, 17.4%; croton, 6.7%; yellow foxtail, 4.8%; wheat, 3.4%; lanceleaf ragweed, 2.5%; sumacs, 2.0%; sassafras, 1.6%; beggar-ticks, 1.6%; sorghum, 1.4%; acorns, 1.2%; and fall panic grass, 1.1%.

Agricultural crops, exclusive of the agricultural lespedezas, comprised 22.3 per cent of the total statewide quail diet. By major region, these foods made up 27.9 per cent of the total food, by volume, in the Prairie region and 16.2 per cent in the Ozark region.

Thirteen of 197 food items made up 1.0 per cent or more each and comprised 90.7 per cent of the total volume.

Seeds from annual plants made up the bulk of the quail's diet, but an almost equal number of annuals and perennials were identified.

INTRODUCTION

The native Bobwhite (Colinus virginianus) is the only non-migratory game bird in Missouri currently subjected to a legal hunting season. The Bobwhite population, which is statewide in distribution, sustains a legal hunter take of 2,000,000 to 2,500,000 birds annually. Because of the sporting and aesthetic value of the species, the Conservation Commission has taken steps to manage this resource and maintain the quail population at a high level.

Game managers have recognized that three habitat factors---food, cover and water are essential to game bird production or restoration in natural environment. The study herewith reported dealt with the first of these essential factors: it was conducted to learn what foods are most heavily utilized by quail, and when and where such foods are taken. The answers to these questions, incorporated with information on cover restoration, will go far toward providing knowledge as a basis for better management of the species. Incidental to the above information, data were accumulated on the extent to which quail are dependent upon agricultural crops for their food, and the effect of quail as a control upon agricultural pests during the fall, winter, and spring months. As they accumulated, data were incorporated as needed into the Commission's management and educational programs.

This project was begun during the summer of 1947 to further ascertain the food-habits of quail; a comprehensive study of late-fall and early-winter food habits (November-December) had been completed previously (Korschgen, 1947, 1948). Data in this report cover principally the information gained from a three-year study involving the examination of 1,358 quail fecal (droppings) samples. Each sample represents the foods of a covey of birds, and, therefore, it is probable that more than 13,000 quail meals are represented. Information in part from the previous crops study, involving 5,472 samples, also is incorporated for comparison of data and to summarize all of Missouri's quail food-habits information.

TECHNIQUES OF THE STUDY

Collection of quail crops in sufficient numbers and with wide distribution was impractical, since it was desired to obtain study materials throughout the year. Preliminary investigation by analysis of quail fecal materials revealed that the principal foods could be ascertained by that method. It was decided, therefore, to use quail droppings as study material.

The many collectors required to gather the out-of-season study materials were found in Nature Knight (Conservation Youth Club) groups which were active in some 900 schools throughout the State. Inasmuch as the Nature Knight program was being sponsored by the Education Section, Missouri Conservation Commission, approval was readily obtained to add quail droppings collecting as an approved activity by which participants could obtain credit toward an award. A major limitation to use of Nature Knights as collectors was the fact that they were active only during the school

year, September through April. A more satisfactory group of collectors could not be found, so the droppings study was confined to this period. No quail food-habits data in Missouri are available for the late-spring and summer months, May through August, inclusive. Yet, from the administration's viewpoint, it is considered that the most critical period in quail food supplies is covered.

All materials for collecting and mailing of samples were supplied to each Nature Knight group, upon request. Materials included 3" x 5" coin envelopes printed to show collector's name, date of collection, county, and locality; and Manila self-addressed, business reply envelopes, 7" x 10", for mailing the samples. A drawing fund deposited at the local Post Office eliminated the inconvenience of collect delivery, and permitted postage-free mailing of samples by the cooperators.

The fecal deposit from an entire covey of birds, consisting of numerous, individual droppings as found in a pile at a covey roost, was collected and analyzed as a single sample. Each sample was catalogued when received and cleaned of foreign materials - leaves, sticks, etc. - which adhered to the droppings when collected. The sample then was placed in a mortar and water-soaked briefly before the food particles were separated by gently working the sample with a pestle. The materials next were transferred to a small sieve, with 32 meshes per inch, and washed with a stream of water from the tap. The washing process removed most of the urea, along with the very fine residue of food particles which, for the most part, were of little value for identification. The remainder of the sample was transferred to blotting paper and oven-dried.

The dried materials were broken apart easily by rubbing and sifting through a 14-mesh per-inch screen, which allowed most of the particles to pass. The volume of the sample then was determined and the sample subjected to complete analysis.

Identifications were made of the various foods as the sample was examined with a microscope. Each item was assigned, by ocular estimate, a percentage of the total bulk. Ocular estimates of percentages were used as a basis for converting to volume for each item, using the previously determined bulk as 100 per cent. Example: A fecal sample which measured 5.0 cc. was determined by ocular estimate to contain: ragweed, 90%; croton, 5%; Korean lespedeza, 5%; and corn, trace. For purposes of calculating volume percentages, this sample was listed as having consisted of: ragweed, 4.50 cc.; croton, 0.25 cc.; Korean lespedeza, 0.25 cc.; and corn, trace. Ocular estimates of less than 1.0% were given "trace" values.

Few entire seeds survived the digestive processes; therefore, identifications necessarily had to be made of seed fragments. In very few instances did the bulk of the food residue defy identification. The task would have been much more difficult had it not been for the investigator's previous experience of analyzing more than 5,000 quail crops. Nevertheless, some foods could not be positively identified to species, and these were grouped under generic headings; e.g. crotons (Croton spp.) acorns (Quercus spp.), tick-trefoils (Desmodium spp.), and sumacs (Rhus spp.).

Equipment used in this study consisted of a binocular, dissecting microscope with 15x and 20x magnifications; Petri dishes; forceps; screen sieves; scalpel; glass cylinders,

graduated to 0.1 and 1.0 cc.; small tin scoop; wood tamping rods; and a reference collection of seeds of Missouri plants.

Percentage calculations were made both for occurrence and volume of each identified food item. Occurrence-percentages were obtained by dividing the number of samples in which a food item occurred by the total number of samples examined. Volume-percentages were obtained by dividing the total volume of a specific item (as determined from converted ocular estimate figures) by the total of all samples.

The technique described above for droppings analyses varies considerably from that used in crops analysis, due to the different nature of the study materials. Crops analyses were performed with the dry crop contents which, for the most part, consisted of whole seeds and large fragments or entire insects. The condition of food items in crops permitted complete separation and, therefore, more nearly accurate volumetric measurement of each component. Ocular estimates were not required for crops analyses. Crops, too, have the advantage that highly digestible seeds, or parts, are not lost to the analyst, as is the case when fecal materials are studied.

Plant classification as used in this report follows that of Gray's Manual of Botany, except for a few common names of plants.

DISCUSSION OF FINDINGS

The results of both the crops and droppings studies are shown in tabular form as Appendices to this report. Most of the tables contain food items listed with percentages by occurrence and by volume, in order of importance by volume.

Figure 1 shows the area included in each zoogeographic region of the State (Bennitt and Nagel, 1937), as used in the crops study (Korschgen, 1948); and also, the major regions designated as Prairie, Ozark, and Mississippi Lowland, as used in the droppings study. No fecal samples were received from the Mississippi Lowland region. Crops and droppings receipts, by area, are shown in Figure 1.

The distribution of study materials received does not necessarily coincide with quail populations or range conditions, but rather denotes more active cooperation of hunters and youth group collectors in areas of greatest returns.

Data in Table 1 include the principal foods, by volume, for each of eight zoogeographic regions of the State, as outlined in Figure 1. These data reveal a striking similarity in the feeding habits of quail from the Riverbreaks and Prairie regions, designated as PRAIRIE; the Ozark and Ozark Border regions, designated as OZARK; and the Mississippi Lowlands, a type of its own. Table 2 contains a complete list of foods identified in the crops study (Korschgen, 1947).

Tables 3 - 10 show by months, September through April, the foods identified in 1,358 fecal samples. These data are presented on a statewide basis, while Tables 11 and 12 contain droppings analysis data tabulated separately to show the principal foods taken in the PRAIRIE and OZARK regions. Table 13 contains a combined tabulation of foods identified from droppings, to obtain statewide averages, comparable to the data for crops presented in Table 2.

The Prairie region is highly developed agriculturally. It is characterized by soils of medium to high fertility, and level to rolling topography. The prairie and valley soils are under cultivation, while the river hills are mainly used for pasture. Diversified farming is the rule, largely based upon livestock production. The principal crops consist of corn, oats, wheat, soy beans, lespedeza, and the various grasses.

The Ozark region consists of rolling topography on the western border where the soils are light, gravelly, and with moderate to good productivity. Diversified farming is carried on and dairying is a major industry.

The northern and eastern part of the Ozark region is somewhat more dissected and hilly than the western part. The soils are of medium to low productivity and much of the land is used for pasture and woodlots, because its topography is too steep for cultivation. General farming is the common practice, with wheat and corn the important crops.

The central part of the Ozark region is hilly, the soil light, shallow, rocky, and of low productivity, with most of the land unsuited to agricultural uses. More than 60 per cent of the area is forested. The cleared upland is used mainly for pasture, with lespedeza the most important hay and pasture crop. The narrow creek bottoms are used for corn. Livestock is a major source of income, and the profits in farming are more limited than in any other part of the state. (Krusekopf, 1945).

The principal foods, as shown by droppings analyses for the eight month period, September through April, are graphically presented in Figure 2. This figure portrays the comparative degree of utilization of the most important foods for each month of the period studied. While nearly 200 plant and 27 animal foods were identified, Figure 2 reveals that only 13 plant foods comprising 1.0 per cent or more each made up approximately 90 per cent of the total volume. The seasonal degree of utilization for each item is represented by the vertical width of the band.

PRINCIPAL FOODS

Korean lespedeza (*Lespedeza stipulacea*) was first sent to the United States in 1919 by a medical missionary in Korea, (Pieters, 1939). The first seed was harvested at the Arlington Experiment Farm, Virginia, in 1921; and a small amount of seed sent to the Missouri College of Agriculture in 1922 marked its first introduction in the State. The College distributed small lots of seed to farmers, county agricultural extension agents, and vocational agriculture teachers during the winter of 1927, after six years of experimental study (Etheridge and Helm, 1936). Its use became widespread during the decade following 1930. The quail crops study begun in 1940 revealed that Korean lespedeza had become the most important quail food (from the standpoint of frequency and amount of use) only a few years after its introduction in Missouri. Korean's rank as the most important food has been maintained during the past decade, as confirmed by the droppings study, 1947-50. Today Korean lespedeza is widely used as a hay and pasture crop, and can be found on nearly every farm in the State.

Crops analyses revealed that seeds of this plant were taken by 44.8 per cent of the birds and comprised 17.4 per cent of the total food. Fecal analysis showed 57.3 per

cent by occurrence and 26.3 per cent by volume.

Use of Korean lespedeza by quail is negligible in September, but increases steadily through the fall and winter months. The greatest utilization occurred in March, with only a slight decrease in April. A prolific seed producer, it usually is available on wind-swept areas, sunny south slopes, and ditch banks, even during periods of extreme snowfall.

Corn (Zea Mays) commonly is grown as an agricultural crop throughout the state. It is readily available and much relished by quail during the fall, winter and spring months, with heaviest use during November and December. Widespread use of the mechanical cornpicker leaves a considerable amount of exposed grain in the field and thus makes this food more easily obtained than in past decades when the crop was cut and shocked, or left standing in the field until it could be gathered by hand. Use of the mechanical picker, however, may lessen availability of this food during periods of heavy snow or ice: the only grain left by the picker is on the ground, instead of on the stalk.

Corn ranked second and occurred in 22.2 per cent of the crops examined and comprised 16.8 per cent of the total volume. Droppings analyses showed that corn ranked third; occurred in 40.9 per cent of the samples, and made up 17.4 per cent of the bulk. The volume figure in this case probably is low, since corn is highly digestible and, therefore, the portion estimated in the samples likely was less than the proportion actually consumed.

Corn is an excellent winter quail food which can be made available in a variety of ways. Whether planted in food plots, or provided as rows left standing unharvested at the edge of the field, it should always be made available near natural coverts. Corn is often scattered as ears or grain in occupied cover when emergency feeding is required. The merits of established feeding shelters for quail are now considered less favorably than formerly because of the tendency of this procedure to concentrate game and thus attract predators to the feeding site.

Common ragweed (Ambrosia artemisiifolia) is general and common throughout the state. This annual is a despised weed throughout its range, especially because of its heavy production of pollen to which many hay-fever sufferers are allergic. It grows principally in small grain fields, pastures, abandoned fields, and along roadsides where it provides an abundant supply of food for quail. Seeds of this plant were found in 36.6 per cent of the crops examined and comprised 12.7 per cent of the total volume, for third place ranking. It was identified in 64.1 per cent of the droppings samples, and made up 21.9 per cent of the volume, as the second most important food.

Greatest utilization of ragweed by quail was made during October, November and December, following maturity of the seeds, and again during February, presumably after the winter snows.

Common weed control measures of close-mowing of small grain fields and pastures in mid-summer and early fall, and heavy grazing of pastures are detrimental to

greatest production of this excellent quail food. Because of its abundance and wide distribution, however, partial control measures probably have little limiting effect on its availability to quail. Chemical controls are, as yet, not used widely enough for their effects to be known.

Sorghum (Sorghum vulgare) of several varieties, including Kafir, Hegari, Feterita, Durra, and Milo maize, is grown for livestock feed, as fodder or ensilage; the sweet sorghum is commonly grown for molasses. The seeds of all varieties are relished by quail and rank high in the quail diet, where available. Crops analysis showed sorghum to be the fourth most important food, occurring in 13.1 per cent of the samples, and comprising 12.1 per cent of the volume. It ranked tenth and was identified in 3.7 per cent of the droppings samples, where it made up 1.4 per cent of the total volume. This latter percentage, like that for corn, is considered low due to the highly digestible nature of sorghum seed.

Sorghum as a quail food supply, or for emergency feeding, can be handled in much the same way as corn. Administration policy is not to encourage its planting to produce food patches, however, because it may be highly poisonous to livestock, especially when dwarfed by drought.

Crotons (Croton spp.) of three species are of general distribution in Missouri, but more common in the southern part of the state. Prairie-tea (Croton monanthogynus), hogwort (Croton capitatus), and sand-croton (Croton glandulosus) all are taken readily by quail and provide an important part of the diet.

These hardy annuals grow chiefly in old fields, heavily grazed pastures, and grasslands. The durable, hard-coated seeds, borne on the tips of stems and branches, remain available to quail throughout the winter and spring months. Greatest utilization of crotons was during April, but the seeds also were taken in quantity during December and January.

Combined utilization of the three species amounted to 18.9 per cent by occurrence in crops and 35.6 per cent in droppings. By volume, the percentages were 3.5 and 6.8 per cent, respectively. Encouragement of wider croton production seems doubtful land-use practice and is not advocated by the Commission at this time.

Acorns (Quercus spp.) from the many species of oaks indigenous to Missouri are readily taken by quail and were found each month of the study period. The small post-oak acorns often are eaten whole, while the larger acorns of other oaks usually are taken in fragmented portions. A part of this feeding may be as gleanings from the feeding of other birds and of mammals.

Acorns occurred in 12.1 per cent of the crops and 13.0 per cent of the droppings examined. By volume this item comprised 6.6 per cent of the crop and 1.2 per cent of the droppings contents. Oak mast ranked fifth by crops analysis and eleventh by fecal examinations. Acorn production is subject to wide fluctuation from year to year, yet acorns are important food for many species of wildlife. Improved forest and woodlot management tends to increase acorn production, and such management

is a part of the Commission's program.

Yellow foxtail (Setaria glauca) occurs commonly throughout the state as an annual grass in cultivated ground, recently abandoned fields, roadsides and similar places. The seeds, borne in a spike-like panicle, shatter soon after maturity, but are heavily utilized in the early fall. In the limited number of samples collected in September, this item occurred in 76 9 per cent of the samples and comprised 61.2 per cent of the total food. Lesser amounts were used throughout the remainder of the study period. Average utilization showed 12.2 per cent by occurrence in crops and 27.2 per cent in droppings. By volume the percentages were 1.5 in crops and 4.8 in droppings. A by-product of agriculture, foxtail is not at this time actively promoted in the game management program.

Sassafras (Sassafras albidum) fruit and seeds were taken each month of the study, with heaviest utilization during February, principally in the Ozark region. This plant does not have statewide distribution, as do most of the other important quail food plants. It is found along borders of woods and thickets, on dry or sterile soils south and east of a line drawn approximately from Hannibal to Kansas City. It reproduces from root-stocks and often forms dense stands. Since sassafras is a pioneer species on abandoned farm lands, it often supplies an important source of food for quail where other preferred items are lacking.

Sassafras was identified in 4.7 per cent of the crops and 9.4 per cent of the droppings samples. By volume it ranked sixth with 2.9 per cent, and eighth with 1.6 per cent, respectively in the two studies. Considered as a "weed" species by foresters and farmers, it is tolerated in many areas, but seldom promoted.

Wheat (Triticum aestivum) proved to be a favorite food of quail during the winter months. It is probable that most of this item consisted of waste grain left in the field from harvest. Wheat stubble fields, often in combination with Korean lespedeza, common ragweed, and foxtail, provide choice feeding grounds during the fall and winter months. Wheat was found in 3.1 per cent of the crops and 11.3 per cent of the droppings studied. This item made up 0.9 per cent of the crops volume, and 3.4 per cent of the volume of droppings, for sixteenth and sixth place rankings, respectively. Its use in game management is limited to plantings on state-owned areas; leaving a swath or two uncut along field borders to furnish wildlife food is a standard recommendation to farmers interested in game.

The small wild bean (Strophostyles leiosperma) and the large (trailing) wild bean (Strophostyles helvola) both are good quail foods. They occur generally throughout the state, but seldom attain dense stands. Like the seeds of other legumes, the wild beans are largely lost to the analyst in fecal examinations and were found only in trace amounts. In crops analysis the small wild bean occurred in 17.9 per cent of the samples and comprised 1.8 per cent of the total volume. The trailing wild bean occurred in 5.9 per cent of the samples and made up 1.4 per cent of the volume.

Lanceleaf ragweed (Ambrosia bidentata), like common ragweed, is a hardy annual of statewide distribution, being found generally on poor soils of over-grazed pastures, old fields, rocky prairies, and roadsides. A good quail food, this item was found in

7.1 per cent of the crops and 24.6 per cent of the droppings examined. By volume, the lanceleaf ragweed made up 0.7 per cent of the crops contents and 2.5 per cent of the droppings.

Soy beans (Glycine Max), commonly grown as a cash crop, were revealed by the crops study to be an important quail food. This item occurred in 5.4 per cent of the crops and comprised 2.6 per cent of the total volume. Greatest utilization was in the Mississippi Lowland region. Only a trace of soy bean was found in the droppings, probably because of the highly digestible nature of this seed. Often a part of the bean crop shatters out and remains after the harvest.

Tick-trefoils (Desmodium spp.) of seventeen species are native to Missouri, growing principally in rocky, open woods, but a few species also are native to the prairie lands. Crops contained tick-trefoils in 10.7 per cent of the samples, and this food comprised 2.3 per cent of the November-December diet. Like soy beans, this item made up only a trace amount in the droppings study.

Beggar-ticks (Bidens spp.) of at least twelve species occur throughout the state in wet ground near streams and ponds, in moist woods, thickets, and in waste ground. Consumption of the seed by quail ranks this group of plants as relatively important sources of quail food. Beggar-ticks occurred in 7.0 per cent of the crops and 13.7 per cent of the droppings samples. By volume they comprised 0.6 per cent and 1.6 per cent, respectively.

Sumacs of three species (Rhus glabra, R. copallina, and R. radicans) did not attain an important ranking individually during the crops study, the combined occurrence being 5.2 per cent and 1.0 per cent by volume. Droppings analysis, which continued through the winter, however, revealed a combined occurrence of 31.3 per cent and 2.0 per cent by volume. Greatest consumption of sumacs occurred during the late winter -- January, February, and March. All three species are general in distribution, with Rhus copallina commonest in southern Missouri.

There appear to be two lines of thinking concerning the value of sumacs as quail food. Because sumacs have wide distribution, are large-fruited, showy, and are taken by quail, they are considered by some to be good, sustaining foods. Others adhere to the theory that sumac fruits and seeds are largely fibrous in nature, have little nutritive value, and, therefore, are starvation foods which quail resort to when other foods are not available. This investigation neither proves nor disproves either theory, but indicates that sumac fruits may be considerably more than starvation foods. Collectively, the sumacs ranked from fifth to fifteenth in importance, by volume, each month from November to April, and occurred in more than one-third of the samples examined for this six-month period. These data place sumacs high on the list of preferred foods. King and McClure (1944) found that by chemical composition sumac fruits contain 28% more crude protein, 29% less carbohydrates, 32% more fat, 24% more calcium, and 130% more phosphorus than do post oak acorns. Analysis for carotene (Vitamin A) content has shown that sumac fruits contain from two to twenty or more times as much carotene as does yellow corn (Nestler, 1947), and yellow corn is reported to contain sufficient Vitamin A for survival, growth, and reproduction. Perhaps sumac fruits alone would not suffice as a complete diet, but when eaten to

supplement other items, they appear to play an important part in quail nutrition.

Other plants which were shown to be favorite quail foods, either because of their frequency in the diet, or the volume taken, included: ashes (*Fraxinus spp.*), Japanese clover (Lespedeza striata), rushfoil (Crotonopsis elliptica), fall panic grass (Panicum dichotomiflorum), wild grapes (Vitis spp.), and great ragweed (Ambrosia *trifida*).

None of the recently introduced quail food or cover plants now recommended by the Conservation Commission, including: Chinese (sericea) lespedeza (Lespedeza cuneata), shrub lespedeza (Lespedeza bicolor), or multiflora rose (Rosa multiflora) were found to be important items in the diet. This may largely be due to lack of distribution prior to the time that these studies were conducted. Use of some of these plants still is in the experimental phase.

The quail foods considered on the preceding pages have been shown to be most important during recent years. Introduction of new plants, changes in agricultural crops and practices, and use of chemicals for weed and insect control may bring about such environmental changes that the same list of foods will not be accurate a few years hence. The change in quail diet brought about by the introduction of Korean lespedeza is a good example of how rapidly an exotic can become an important source of food.

ANALYSIS AND RECOMMENDATIONS

Data obtained through the investigation of quail food-habits by the fecal and crops analysis methods revealed that essentially the same foods are most heavily utilized during the three seasons--fall, winter, and spring. Noted variation in degree of utilization of certain foods is influenced by season, weather conditions, and other factors. Korean lespedeza is not heavily utilized during November. The sumacs are little used during the early fall (except poison ivy which was an important food in September) but become an important source of food during the late-winter and spring months. In addition to Korean lespedeza, common ragweed, corn, and yellow foxtail appear to be staples. Other foods are heavily utilized in one part of the state and not in another due to distribution or availability. Such foods include crotons, acorns, and sassafras, all of which are more abundant in the southern part of the state. Weather conditions, too, may significantly increase use of an otherwise unimportant food, as shown by the eighth place ranking of catalpa during January. This disproportionate rating occurred as a result of extensive collecting of droppings by one group of cooperators during a severe ice storm. Discrepancies such as this are minimized, however, by compilation of the three years data.

Insects comprised only a minor portion of the quail diet during the period studied. Analysis of crops collected during November and December revealed 2.4 per cent animal matter, mostly insects, in the diet. Fecal samples collected from September through April showed an average of only 1.1 per cent animal foods. The greatest consumption of insects occurred during October when grasshoppers (Acrididae) comprised 4.0 per cent of the diet. Ground beetles (Carabidae) and stink bugs (Pentatomidae) were the next most important insect foods.

While this study does not include the summer months when insects are in greatest abundance, the fall and spring months should serve as indices to insect utilization by quail. The small percentage of grasshoppers, chinch bugs, weevils, wireworms, etc., in the diet indicates that quail play a minor role in control of agricultural insect pests.

Agricultural crops, including corn, wheat, sorghum, oats, soy beans, millet, timothy, and clovers, but exclusive of the agricultural lespedezas which commonly grow wild, comprised an appreciable percentage of the quail's diet. Crops analyses revealed that 33.4 per cent of the total diet was made up of these items during November and December. Fecal analyses showed that as a statewide average, agricultural crops comprised 22.3 per cent of the total. By region, these foods made up 27.9 per cent of the total food by volume in the Prairie region, and 16.2 per cent in the Ozark region. Including the agricultural lespedezas, farm crops comprised 56.5 and 41.2 per cent of the total diet in the Prairie and Ozark regions.

The findings by the two methods of study correlate well during the late-fall and early-winter period. Variations in availability of certain foodstuffs from year to year, varying degrees of digestibility of seeds, distribution of collections, and methods of analysis contribute to some differences in percentages, but droppings analysis appears to be a satisfactory means for ascertaining the principal foods of quail when crops are unobtainable.

It is recognized that some foods attain disproportionate ratings by the fecal analyses method. Certain legumes, especially tick-trefoils, wild beans, soy beans, and others are so highly digestible that they are seldom found by this method of study. Other of the larger seeds which contain a high ratio of embryo and endosperm to seed coat have their importance minimized by this method. In general, however, it is believed that a fair ratio exists among the indigestible residues of most seeds. Approximately one-third fewer plant foods were identified in 1,358 droppings samples than were found in 5,472 crops, the number of items being 197 and 300, respectively. A total of 29 animal foods were listed from the droppings and 75 from the crops examinations.

The actual number of samples obtained for the droppings study was considerably smaller than the number of crops studied. However, if it may be assumed that coveys from which fecal deposits were collected averaged ten birds each, the study covers the food consumption of 13,580 birds, with from 130 to 3,480 being represented for each month. This number of samples is considered adequate representation.

Thirteen foods which occurred as 1.0 per cent or more by volume comprised 90.7 per cent of the total diet.

Seeds from annual plants made up the bulk of the quail's diet, although the total food list included an almost equal number of annuals and perennials.

Wilson and Vaughn (1944·39) who used droppings to study quail food habits in eastern Maryland state: "Weather conditions and the mast and seed crops of wild

plants vary so much from year to year that a correct picture of the important foods present and used in a locality cannot be obtained until at least two or three seasons studies have been covered." Data in this report cover a three year period and no material change in data resulted from the third year's study.

Good correlations of data were obtained from quail crops method as compared to the droppings analysis method of study, as stated previously. Nevertheless, certain limitations to the use of droppings for food-habits studies must be recognized: (1) identification of food items is made much more difficult by fragmented materials; (2) preparation and analysis of droppings is more time consuming than is crops analysis; (3) only the poorly digestible or non-digestible portions of foods eaten are available for identification, and this may be the basis for discrepancies in percentages attributed to specific items; (4) foods eaten in small amounts, or wholly digestible foods may escape identification, and (5) sample contents judged by ocular estimate are accurate only within limits of the investigator's ability to ascertain the correct proportions.

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APPENDICES

TABLE 1. FORTY PRINCIPAL LATE-FALL AND EARLY-WINTER (NOVEMBER AND DECEMBER) MISSOURI QUAIL FOODS

(Items are listed in order of importance, by volume. Figures are percentages by volume. Figures below 1.0 per cent omitted.)

FOOD ITEMS	REGION							
	Prairie				Ozark			Lowland
	N.E.R.	N.R.	N.W.P.	W.P.	W.O.B.	N.E.O.B.	O.P.	M.L.
No. of Crops Examined - - -	1,361	388	128	672	524	677	1,521	201
Korean lespedeza (Lespedeza stipulacea)	8.0	4.7	3.2	9.4	23.9	29.2	24.5	5.9
Corn (Zea Mays)	30.8	38.1	45.3	12.3	8.6	8.7	5.0	27.4
Common ragweed (Ambrosia artemisiifolia)	12.5	10.1	14.8	13.5	10.8	10.2	15.5	3.3
Sorghum (Sorghum vulgare)	16.6	26.3	15.9	28.4	12.5	3.0	4.1	3.8
Acorns, unclassified (Quercus spp.)	4.8	5.3	1.1	2.5	8.4	6.8	8.6	18.1
Sassafras (Sassafras albidum)	-	-	-	-	3.0	2.6	6.5	4.9
Soy-Bean (Glycine Max)	5.6	3.3	1.7	-	-	2.2	-	12.1
Tick-trefoil (Desmodium spp.)	2.3	-	-	-	3.6	2.3	3.5	-
Small Wild Bean (Strophostyles leiosperma)	2.1	-	-	3.2	2.1	2.7	1.3	-
Prairie-tea (Croton monanthogynus)	-	-	-	-	2.0	1.1	4.0	-
Yellow Foxtail (Setaria glauca)	1.6	-	-	2.0	1.4	-	2.1	-
Trailing Wild Bean (Strophostyles helvola)	2.8	-	-	2.3	1.6	-	-	-
Ashes (Fraxinus spp.)	1.0	-	-	-	1.9	3.0	1.4	-
Japanese Clover (Lespedeza striata)	-	-	-	-	-	1.5	2.5	-
Hogwort (Croton capitatus)	-	-	2.9	2.8	1.2	1.2	1.1	-
Wheat (Triticum aestivum)	-	-	1.2	-	-	3.3	-	-
Rushfoil (Crotonopsis elliptica)	-	-	-	-	-	2.4	1.5	-
Lanceleaf Ragweed (Ambrosia bidentata)	-	-	-	-	1.3	-	-	-
Beggar-ticks (Bidens spp.)	-	-	1.0	2.2	-	-	-	-
Wild Grapes (Vitis spp.)	-	-	-	1.3	1.0	-	-	-
Great Ragweed (Ambrosia trifida)	1.2	1.8	1.2	-	-	-	-	-
Sand Croton (Croton glandulosus)	-	-	-	1.3	-	1.3	-	1.8
Cow-pea (Vigna sinensis)	-	-	-	-	-	-	-	7.5
Smooth Sumac (Rhus glabra)	-	-	-	1.3	-	-	-	-
Dwarf Sumac (Rhus copallina)	-	-	-	-	2.0	-	-	1.0
Beef-steak Plant (Perilla frutescens)	-	-	-	-	-	-	1.5	-
Post Oak Acorns (Quercus stellata)	-	-	-	-	3.0	-	-	-
Fall Panic Grass (Panicum dichotomiflorum)	-	-	-	-	-	1.0	-	-
False Buckwheat (Polygonum scandens)	-	2.3	-	-	-	-	-	-

(continued)

Oats (Avena sativa)	-	-	-	1.1	-	-	-	-
Italian Millet (Setaria italica)	-	-	-	1.9	-	-	-	-
Osage Orange (Maclura pomifera)	-	-	-	1.0	-	-	-	-
Sunflowers (Helianthus spp.)	-	-	-	-	-	-	-	1.4
False Buckthorn (Bumelia lanuginosa)	-	-	-	-	-	1.3	-	-
Hemp (Cannabis sativa)	-	-	4.6	-	-	-	-	-
Pin Oak Acorns (Quercus palustris)	-	-	-	-	-	-	-	1.3
Sweet Gum (Liquidambar Styraciflua)	-	-	-	-	-	-	-	1.1
Short-horned grasshoppers (Acrididae)	-	-	-	-	1.1	-	-	-
Stink bugs (Pentatomidae)	-	-	-	-	-	-	-	1.1
Ground beetles (Carabidae)	-	-	-	-	-	1.0	-	-
TOTAL	89.3	91.9	92.9	86.5	89.4	84.8	83.1	90.7

The full names of the Zoogeographic regions abbreviated in the table above are as follows, in order, from left to right as they appear in the column heading:

N.E.R.	Northeastern Riverbreaks
N.R.	Northern Riverbreaks
N.W.P.	Northwestern Prairie
W.P.	Western Prairie
W.O.B.	Western Ozark Border
N.E.O.B.	Northern and Eastern Ozark Border
O.P.	Ozark Plateau
M.L.	Mississippi Lowland

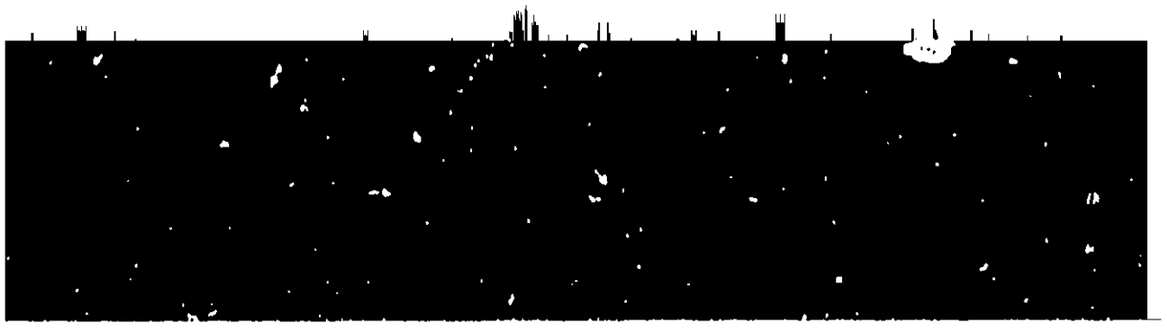


TABLE 2. LATE-FALL AND EARLY-WINTER (NOVEMBER AND DECEMBER) FOODS OF QUAIL IN MISSOURI

(Based Upon Examination Of 5,472 Crops)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	44.8	17.4
Corn (Zea Mays)	22.2	16.8
Common Ragweed (Ambrosia artemisiifolia)	36.6	12.7
Sorghum (Sorghum vulgare)	13.1	12.1
Acorns, unclassified (Quercus spp.)	12.1	6.6
Sassafras (Sassafras albidum)	4.7	2.9
Soy-Beans (Glycine Max)	5.4	2.6
Tick-trefoils (Desmodium spp.)	10.7	2.3
Small Wild Bean (Strophostyles leiosperma)	17.9	1.8
Prairie-tea (Croton monanthogynus)	10.0	1.7
Yellow Foxtail (Setaria glauca)	12.2	1.5
Large Wild Bean (Strophostyles helvola)	5.9	1.4
Ashes (Fraxinus spp.)	4.2	1.3
Japanese Clover	14.0	1.1
Hogwort (Croton capitatus)	5.6	1.1
Wheat (Triticum aestivum)	3.1	0.9
Rushfoil (Crotonopsis elliptica)	3.8	0.8
Lanceleaf Ragweed (Ambrosia bidentata)	7.1	0.7
Beggar-ticks (Bidens spp.)	7.0	0.6
Wild Grapes (Vitis spp.)	4.1	0.6
Great Ragweed (Ambrosia trifida)	3.9	0.6
Sand Croton (Croton glandulosus)	3.1	0.6
Cow-Pea (Vigna sinensis)	0.9	0.6
Smooth Sumac (Rhus glabra)	3.4	0.5
Dwarf Sumac (Rhus copallina)	1.8	0.5
Beef-steak Plant (Perilla frutescens)	0.9	0.5
Post Oak Acorns (Quercus stellata)	0.5	0.5
Fall Panic Grass (Panicum dichotomiflorum)	8.0	0.4
False Buckwheat (Polygonum scandens)	5.1	0.4
Oats (Avena sativa)	1.9	0.4
Flowering Dogwood (Cornus florida)	0.9	0.4
Hog-Peanut (Amphicarpa bracteata)	1.0	0.3
Italian Millet (Setaria italica)	0.7	0.3
Leaf Material	8.1	0.2
Milk-Pea (Galactia volubilis)	3.2	0.2
Touch-me-not (Impatiens pallida)	1.3	0.2
Osage Orange (Maclura pomifera)	1.0	0.2
Sunflowers (Helianthus spp.)	1.0	0.2
False Buckthorn (Bumelia lanuginosa)	0.6	0.2
Persimmon (Diospyros virginiana)	0.6	0.2
Black Locust (Robinia Pseudo-Acacia)	0.5	0.2
Paspalum (Paspalum ciliatifolium)	7.5	0.1
Old-Witch Grass (Panicum capillare)	7.1	0.1

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Crab Grass (Digitaria sanguinalis)	5.0	0.1
Partridge-Pea (Cassia fasciculata)	4.6	0.1
Bush Clovers (Lespedeza spp.)	4.6	0.1
Pinkweed (Polygonum pensylvanicum)	3.7	0.1
Ground-cherries (Physalis spp.)	3.6	0.1
Smartweeds, unclassified (Polygonum spp.)	2.3	0.1
Clammy Cuphea (Cuphea petiolata)	2.0	0.1
Small Crab Grass (Digitaria ischaemum)	1.2	0.1
Violets (Viola spp.)	1.2	0.1
Pink Wild Bean (Strophostyles umbellata)	1.1	0.1
Green Foxtail (Setaria viridis)	0.8	0.1
Undetermined Plant Material	0.8	0.1
False Pennyroyal (Isanthus brachiatus)	0.7	0.1
Drop-seed Grass (Sporobolus neglectus)	0.6	0.1
Johnson-Grass (Sorghum halepense)	0.6	0.1
Day-flowers (Commelina spp.)	0.6	0.1
Dogwoods (Cornus spp.)	0.5	0.1
Day-flower (Commelina erecta)	0.4	0.1
Rye (Secale cereale)	0.3	0.1
Raccoon Grape (Ampelopsis cordata)	0.3	0.1
Crotons (Croton spp.)	0.2	0.1
Hemp (Cannabis sativa)	0.1	0.1
Silky Dogwood (Cornus obliqua)	0.1	0.1
Panic Grasses (Panicum spp.)	5.5	trace
Wood-Sorrels (Oxalis spp.)	3.8	trace
Tall Red-top (Triodia flava)	2.1	trace
Three-seeded Mercury (Acalypha virginica)	2.1	trace
Prickly Mallow (Sida spinosa)	2.1	trace
Coralberry (Symphoricarpos orbiculatus)	1.7	trace
Amaranths (Amaranthus spp.)	1.6	trace
Plant Galls	1.3	trace
Buttonweed (Diodia teres)	1.2	trace
Poverty-Grass (Sporobolus vaginiflorus)	1.2	trace
Sedges (Carex spp.)	1.1	trace
Water-Smartweed (Polygonum punctatum)	1.1	trace
Three-seeded Mercurys (Acalypha spp.)	1.0	trace
Milkweeds (Asclepias spp.)	0.9	trace
Sensitive Plant (Cassia nictitans)	0.8	trace
Carpetweed (Mollugo verticillata)	0.8	trace
Biennial Gaura (Gaura biennis)	0.7	trace
Wing-stem (Actinomeris alternifolia)	0.7	trace
Poison Ivy (Rhus radicans)	0.6	trace
Black Nightshade (Solanum nigrum)	0.6	trace
Toothed Euphorbia (Euphorbia dentata)	0.6	trace
Goosefoots (Chenopodium spp.)	0.6	trace
Sand-Drop-seed (Sporobolus cryptandrus)	0.6	trace
Brome-Grasses (Bromus spp.)	0.6	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Lady's-thumb (Polygonum Persicaria)	0.5	trace
Smartweed (Polygonum virginianum)	0.5	trace
Bush Clover (Lespedeza capitata)	0.5	trace
Red Root (Geum canadense)	0.5	trace
Broom-sedge (Andropogon virginicus)	0.5	trace
Sumacs, unclassified (Rhus spp.)	0.4	trace
Bullnettle (Solanum carolinense)	0.4	trace
Eyebane (Euphorbia maculata)	0.4	trace
Spurges (Euphorbia spp.)	0.4	trace
Noseburns (Tragia spp.)	0.4	trace
Cranesbill (Geranium carolinianum)	0.4	trace
Avens (Geum sp.)	0.4	trace
Field Paspalum (Paspalum laeve)	0.4	trace
Milk-purslane (Euphorbia supina)	0.3	trace
Fragrant Sumac (Rhus aromatica)	0.3	trace
Bush Clover (Lespedeza intermedia)	0.3	trace
Pencil-flower (Stylosanthes biflora)	0.3	trace
Pellitory (Parietaria pensylvanica)	0.3	trace
Scorpion-grass (Myosotis verna)	0.3	trace
Nut Rush (Scleria ciliata)	0.3	trace
Spikegrass (Uniola latifolia)	0.3	trace
Drop-seed Grasses (Sporobolus spp.)	0.3	trace
Fall Witch-Grass (Leptoloma cognatum)	0.3	trace
Fescue-Grasses (Festuca spp.)	0.2	trace
Love-Grasses (Eragrostis spp.)	0.2	trace
Nimble Will Grasses (Muhlenbergia spp.)	0.2	trace
Triple-awned Grasses (Aristida spp.)	0.2	trace
Goose-Grass (Eleusine indica)	0.2	trace
Rice-Cut-grass (Leersia oryzoides)	0.2	trace
Hop-Hornbeam (Ostrya virginiana)	0.2	trace
Hackberry (Celtis occidentalis)	0.2	trace
Pigweed (Chenopodium album)	0.2	trace
Pokeweed (Phytolacca americana)	0.2	trace
Sweet Gum (Liquidambar styraciflua)	0.2	trace
Redbud (Cercis canadensis)	0.2	trace
Sweet Clover (Melilotus officinalis)	0.2	trace
Shrub Lespedeza (Lespedeza bicolor)	0.2	trace
Flowering Spurge (Euphorbia corollata)	0.2	trace
Painted-leaf (Euphorbia heterophylla)	0.2	trace
Box-Elder (Acer Negundo)	0.2	trace
Touch-me-not (Impatiens capensis)	0.2	trace
Indian Cherry (Rhamnus caroliniana)	0.2	trace
New Jersey Tea (Ceanothus americanus)	0.2	trace
St. John's-worts (Hypericum spp.)	0.2	trace
Gauras (Gaura spp.)	0.2	trace
White Vervain (Verbena urticifolia)	0.2	trace
Mock Pennyroyal (Hedeoma pulegioides)	0.2	trace

(continued)

Food Item	Per Cent By Occurrence	Volume
Cleavers (Galium Aparine)	0.2	trace
Asters (Aster spp.)	0.2	trace
Rosinweeds (Silphium spp.)	0.2	trace
Common Sunflower (Helianthus annuus)	0.2	trace
Field Thistle (Cirsium discolor)	0.2	trace
Canadian Lettuce (Lactuca canadensis)	0.2	trace
Red Cedar (Juniperus virginiana)	0.1	trace
Bentgrasses (Argrostis spp.)	0.1	trace
Timothy (Phleum pratense)	0.1	trace
Nimble Will (Muhlenbergia Schreberi)	0.1	trace
Tall Drop-seed (Sporobolus asper)	0.1	trace
Triple-awned Grass (Aristida longespica)	0.1	trace
Slender Finger-Grass (Digitaria filiformis)	0.1	trace
Paspalum Grass (Paspalum dissectum)	0.1	trace
Florida Paspalum (Paspalum floridanum)	0.1	trace
Panic Grass (Panicum flexile)	0.1	trace
Barnyard-Grass (Echinochloa pungens)	0.1	trace
Foxtail (Setaria verticillata)	0.1	trace
Sedges (Cyperus spp.)	0.1	trace
Hop (Humulus Lupulus)	0.1	trace
Japanese Hop (Humulus japonicus)	0.1	trace
Sheep-Sorrel (Rumex acetosella)	0.1	trace
Nodding Smartweed (Polygonum lapathifolium)	0.1	trace
Marsh Smartweed (Polygonum coccineum)	0.1	trace
Corn-Cockle (Agrostemma Githago)	0.1	trace
Purslane (Portulaca oleracea)	0.1	trace
Spicebush (Lindera Benzoin)	0.1	trace
Yellow Rocket (Barbarea vulgaris)	0.1	trace
Blackberries (Rubus spp.)	0.1	trace
Wild Cherry (Prunus serotina)	0.1	trace
Cherry or Plum (Prunus spp.)	0.1	trace
Sensitive Brier (Schamkia Nuttallii)	0.1	trace
Rattlebox (Crotalaria sagittalis)	0.1	trace
Red Clover (Trifolium pratense)	0.1	trace
Clovers (Trifolium spp.)	0.1	trace
Scurf-peas (Psoralea spp.)	0.1	trace
Goat's-rue (Tephrosia virginiana)	0.1	trace
Soup-Bean (Phaseolus vulgare)	0.1	trace
Rhynchosia (Rhynchosia latifolia)	0.1	trace
Sugar Maple (Acer saccharum)	0.1	trace
Redroot (Ceanothus spp.)	0.1	trace
Virginia Creeper (Parthenocissus quinquefolia)	0.1	trace
Velvet-leaf (Abutilon Theophrasti)	0.1	trace
Flower-of-an-hour (Hibiscus Trionum)	0.1	trace
Evening-Primroses (Oenothera spp.)	0.1	trace
Snakeroots (Sanicula spp.)	0.1	trace
Wild Carrot (Daucus Carota)	0.1	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Low Blueberry (Vaccinium vacillans)	0.1	trace
Wooly Vervain (Verbena stricta)	0.1	trace
Narrowleaf Vervain (Verbena simplex)	0.1	trace
American Germander (Teucrium canadense)	0.1	trace
Horsemints (Monarda spp.)	0.1	trace
Plantains (Plantago spp.)	0.1	trace
Elderberry (Sambucus canadensis)	0.1	trace
Goldenrods (Solidago spp.)	0.1	trace
Cup-plant (Silphium perfoliatum)	0.1	trace
Marsh-Elder (Iva ciliata)	0.1	trace
Ashy Sunflower (Helianthus mollis)	0.1	trace
Crown-beard (Verbesina helianthoides)	0.1	trace
Thistles (Cirsium spp.)	0.1	trace
Prickly Lettuce (Lactuca Scariola)	0.1	trace
Pondweed (Potamogeton foliosus)	trace	trace
Brome-Grass (Bromus secalinus)	trace	trace
Red-top (Tridoia flava)	trace	trace
Bluestem (Andropogon scoparium)	trace	trace
Hedgehog Club-rush (Cyperus ovularis)	trace	trace
Fimbristylis (Fimbristylis Baldwiniana)	trace	trace
Nut-Rushes (Scleria spp.)	trace	trace
Greenbriers (Smilax spp.)	trace	trace
Wild Yam (Dioscorea sp.)	trace	trace
Blue-eyed Grass(Sisyrinchium sp.)	trace	trace
Hickorynut (Carya sp.)	trace	trace
Pin Oak Acorn (Quercus palustris)	trace	trace
Hackberry (Celtis sp.)	trace	trace
Pellitory (parietaria obtusa)	trace	trace
Yellow Dock (Rumex crispus)	trace	trace
Dock (Rumex sp.)	trace	trace
Longstyle Smartweed (Polygonum longistylum)	trace	trace
Bristly Smartweed (Polygonum setaceum)	trace	trace
Mild Water-pepper (Polygonum hydropiperoides)	trace	trace
Spiny Amaranth (Amaranthus spinosus)	trace	trace
Wild Four-O'clock (Mirabilis sp.)	trace	trace
Chickweed (Cerastium sp.)	trace	trace
Pink (Dianthus Armeria)	trace	trace
Sleepy Catchfly (Silene antirrhina)	trace	trace
Peppergrass (Lepidium virginicum)	trace	trace
Peppergrass (Lepidium sp.)	trace	trace
Sycamore (Platanus occidentalis)	trace	trace
Ninebark (Physocarpus opulifolius)	trace	trace
Pear (Pyrus communis)	trace	trace
Wild Strawberry (Fragaria virginiana)	trace	trace
Cinquefoil (Potentilla sp.)	trace	trace
Rough Avens (Geum laciniatum)	trace	trace
Wild Senna (Cassia marilandica)	trace	trace
Big Bluestem (Andropogon scoparius)	trace	trace

(continued)

Food Item	Per Cent By Occurrence	Volume
White Clover (Trifolium repens)	trace	trace
Low Hop Clover (Trifolium procumbens)	trace	trace
Little Hop Clover (Trifolium dubium)	trace	trace
Tick-trefoil (Desmodium nudiflorum)	trace	trace
Flax (Linum sp.)	trace	trace
Mercury (Acalypha ostryaefolia)	trace	trace
Noseburn (Tragia cordata)	trace	trace
Wahoo (Eunoymus atropurpureus)	trace	trace
Bittersweet (Celastrus scandens)	trace	trace
Red Maple (Acer rubrum)	trace	trace
Redroot (Ceanothus ovatus)	trace	trace
Common Mallow (Malva neglects)	trace	trace
Globe-Mallow (? Sphaeralcea sp.)	trace	trace
Rose-Mallow (Hibiscus sp.)	trace	trace
St. Andrew's Cross (Ascyrum Hypericoides)	trace	trace
St. John's-wort (Hypericum Drummondii)	trace	trace
Green Violet (Hybanthus concolor)	trace	trace
Evening-Primrose (Oenothera laciniata)	trace	trace
Spermolepis (Spermolepis sp.)	trace	trace
Mock Bishop's-weed (Ptilimnium capillaceum)	trace	trace
Spotted Cowbane (Cicuta maculata)	trace	trace
Caraway (Carum Carvi)	trace	trace
Southwestern Carrot (Daucus pusillus)	trace	trace
Rough-leaved Dogwood (Cornus Drummondii)	trace	trace
Gray Dogwood (Cornus racemosa)	trace	trace
Blueberry (Vaccinium sp.)	trace	trace
Loosestrife (Lysimachia thyrsiflora)	trace	trace
Scarlet Pimpernel (Anagallis arvensis)	trace	trace
Gentian (Gentiana sp.)	trace	trace
Angle-pod (Gonolobus sp.)	trace	trace
Blue Morning-glory (Ipomoea hederacea)	trace	trace
Hedge Bindweed (Convolvulus septum)	trace	trace
Heliotrope (Heliotropium tenellum)	trace	trace
Turnsole (Heliotropium indicum)	trace	trace
Stickseed (Lappula sp.)	trace	trace
Vervain (Verbena sp.)	trace	trace
Selfheal (Prunella vulgaris)	trace	trace
Wild Bergamot (Monarda fistulosa)	trace	trace
Mountain-Mints (Pycnanthemum sp.)	trace	trace
Nettles (Solanum sp.)	trace	trace
Trumpet-creeper (Campsis radicans)	trace	trace
Lopseed (Phryma Leptostachya)	trace	trace
Ribgrass (Plantago lanceolata)	trace	trace
Bracted Plantain (Plantago aristata)	trace	trace
Hairy Bedstraw (Galium pilosum)	trace	trace
Buttonbush (Cephalanthus occidentalis)	trace	trace
Bluets (Houstonia caerulea)	trace	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Tinker's-weed (Triosteum perfoliatum)	trace	trace
Black Haw (Viburnum prunifolium)	trace	trace
Black Haw (Viburnum rufidulum)	trace	trace
Viburnums (Viburnum spp.)	trace	trace
Sweet Viburnum (Viburnum Lentago)	trace	trace
Catalpa (Catalpa speciosa)	trace	trace
Beaked Corn-salad (Valerianella radiata)	trace	trace
Indian-tobacco (Lobelia inflata)	trace	trace
Fleabanes (Erigeron spp.)	trace	trace
Leafcup (Polymnia canadensis)	trace	trace
Prairie-Dock (Silphium terebinthinaceum)	trace	trace
Compass-plant (Silphium laciniatum)	trace	trace
Coneflower (Echinacea purpurea)	trace	trace
Tickweed (Verbesina virginica)	trace	trace
Crown-beard (Verbesina sp.)	trace	trace
Tall-Thistle (Cirsium altissimum)	trace	trace
Bull-Thistle (Cirsium vulgare)	trace	trace
Sow-Thistle (Sonchus arvensis)	trace	trace
Blue Lettuce (Lactuca biennis)	trace	trace
Hawkweed (Hieracium sp.)	trace	trace
Animal Foods:		
Short-horned Grasshoppers (Acrididae)	7.7	0.8
Ground Beetles (Carabidae)	13.1	0.6
Stink Bugs (Pentatomidae)	5.4	0.3
Leaf Hoppers (Cicadellidae)	4.8	0.1
Spiders (Araneida)	5.3	0.1
Moths and Butterflies (Lepidoptera)	4.0	0.1
Ants (Formicidae)	10.9	trace
Snails (Gastropoda)	3.4	trace
Leaf Beetles (Chrysomelidae)	3.2	trace
Lygaeid Bugs (Lygaeidae)	2.3	trace
Leaf Bugs (Miridae)	2.2	trace
Assassin Bugs (Reduviidae)	1.5	trace
Millepede (Parajulidae)	1.4	trace
Snout Beetles (Curculionidae)	1.3	trace
Dung and June Beetles (Scarabaeidae)	1.1	trace
Squash Bugs (Coreidae)	1.0	trace
Long-horned Grasshoppers (Tettigoniidae)	0.9	trace
Crickets (Gryllidae)	0.8	trace
Burrower Bugs (Cynidae)	0.8	trace
Rove Beetles (Staphylinidae)	0.6	trace
Tineid Moths (Tineidae)	0.6	trace
Millepedes (Diplopoda)	0.6	trace
Millipedes (Polydesmidae)	0.6	trace
Centipedes (Chilopoda)	0.5	trace
Bugs, unclassified (Hemiptera)	0.4	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Ichneumon Flies (Ichneumonidae)	0.4	trace
Beetles, unclassified (Coleoptera)	0.3	trace
Millipedes (Julidae)	0.3	trace
Walking-sticks (Phasmidae)	0.2	trace
Leaf Hoppers (Homoptera)	0.2	trace
Spittle Bugs (Cercopidae)	0.2	trace
Tree Hoppers (Membracidae)	0.2	trace
Anthicid Beetles (Anthicidae)	0.2	trace
Flies (Diptera)	0.2	trace
Fungus Gnats (Mycetophilidae)	0.2	trace
Braconid Flies (Braconidae)	0.2	trace
Cockroaches (Blattidae)	0.1	trace
Damsel Bugs (Nabidae)	0.1	trace
Lace Bugs (Tingidae)	0.1	trace
Lantern Flies (Fulgoridae)	0.1	trace
Tiger Beetles (Cicindelidae)	0.1	trace
Click Beetles (Elateridae)	0.1	trace
Ladybug Beetles (Coccindellidae)	0.1	trace
Garden Spiders (Lycosidae)	0.1	trace
Bones and Egg Shells	0.1	trace
Undetermined Animal Matter	0.1	trace
Termites (Termitidae)	trace	trace
Ant Lions (Neuroptera)	trace	trace
Lace-wing Flies (Chrysopidae)	trace	trace
Water Boatman (Corixidae)	trace	trace
Unique-headed Bug (Entocephalidae)	trace	trace
Shield-backed Bugs (Scutellaridae)	trace	trace
Plant Lice (Aphididae)	trace	trace
Delphacids (Delphacidae)	trace	trace
Predacious Diving Beetle (Dytiscidae)	trace	trace
Metallic Wood-borers (Buprestidae)	trace	trace
Flower Beetles (Phalacridae)	trace	trace
Erotylid Beetles (Erotylidae)	trace	trace
Soldier Beetles (Cantharidae)	trace	trace
Darklin Beetles (Tenebrionidae)	trace	trace
Blister Beetles (Meloidae)	trace	trace
Long-horned Beetle (Cerambycidae)	trace	trace
Pea-weevils (Mylabridae)	trace	trace
Ambrosia Beetles (Scolytidae)	trace	trace
Coleophorids (Coleophoridae)	trace	trace
Four-footed Butterflies (Nymphalidae)	trace	trace
Blow-flies (Calliphoridae)	trace	trace
Sawflies (Tenthredinidae)	trace	trace
Chalcid Flies (Chalcidae)	trace	trace
Paper Wasps (Vespidae)	trace	trace
Jumping Spiders (Salticidae)	trace	trace
Spiny-jawed Spiders (Argiopodiae)	trace	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Scorpions (Scorpionidae)	trace	trace
Centipedes (Geophilidae)	trace	trace
Crustaceans (Crustacea)	trace	trace
Gravel	3.4	trace
TOTAL PLANT	97.6	
TOTAL ANIMAL	2.4	
TOTAL GRAVEL	trace	
TOTAL CONTENTS	100.0	

TABLE 3. SEPTEMBER FOODS OF QUAIL IN MISSOURI

(Based upon examination of 13 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Yellow Foxtail (Setaria glauca)	76.9	61.2
Fall Panic Grass (Panicum dichotomiflorum)	53.8	6.7
Corn (Zea Mays)	23.1	6.6
Crotons (Croton spp.)	46.2	6.5
Small Crab Grass (Digitaria Ischaemum)	53.8	4.7
Common Ragweed (Ambrosia artemisiifolia)	76.9	2.8
Poison Ivy (Rhus radicans)	23.1	2.7
Water-smartweed (Polygonum punctatum)	23.1	1.8
Tick-trefoils (Desmodium spp.)	38.5	1.6
Rice-Cut-Grass (Leersia oryzoides)	23.1	0.7
Paspalum (Paspalum ciliatifolium)	30.8	0.5
Lanceleaf Ragweed (Ambrosia bidentata)	15.1	0.4
Ground cherries (Physalis spp.)	46.2	0.4
Acorns, unclassified (Quercus spp.)	7.7	0.2
Rushfoil (Crotonopsis elliptica)	7.7	0.2
Sassafras (Sassafras albidum)	15.4	0.1
Dogwoods (Cornus spp.)	15.4	0.1
Green Foxtail (Setaria viridis)	7.7	0.1
Great Ragweed (Ambrosia trifida)	30.8	0.1
False Buckwheat (Polygonum scandens)	15.4	trace
Small Wild Bean (Strophostyles leiosperma)	7.7	trace
Panic Grasses (Panicum spp.)	15.4	trace
Coralberry (Symphoricarpos orbiculatus)	15.4	trace
Crab Grass (Digitaria sanguinalis)	7.7	trace
Sedge (Cyperus sp.)	7.7	trace
Wheat (Triticum aestivum)	7.7	trace

(continued)

Food Item	Per Cent By Occurrence	Volume
Nodding Smartweed (Polygonum lapathifolium)	7.7	trace
Smartweed, unclassified (Polygonum sp.)	7.7	trace
Korean Lespedeza (Lespedeza stipulacea)	7.7	trace
Cranesbill (Geranium carolinianum)	7.7	trace
Sumac, unclassified (Rhus sp.)	7.7	trace
Vervain (Verbena sp.)	7.7	trace
Animal Foods:		
Short-horned grasshoppers (Acrididae)	53.8	0.9
Ground beetles (Carabidae)	23.1	0.6
Stink bugs (Pentatomidae)	46.2	0.5
Ants (Formicidae)	23.1	0.2
Beetles, unclassified (Coleoptera)	23.1	0.2
Squash bug (Coreidae)	7.7	0.1
Leaf beetles (Chrysomelidae)	30.8	0.1
Bugs, unclassified (Hemiptera)	7.7	0.1
Assassin bugs (Reduviidae)	15.4	trace
Snout beetle (Curculionidae)	7.7	trace
Gravel	15.4	trace
Total		100.0

TABLE 4. OCTOBER FOODS OF QUAIL IN MISSOURI

(Based upon examination of 85 droppings samples)

Food Item	Per Cent by Occurrence	Volume
Plant Foods		
Common Ragweed (Ambrosia artemisiifolia)	82.3	23.6
Corn (Zea Mays)	38.8	21.8
Fall Panic Grass (Panicum dichotomiflorum)	42.4	14.0
Yellow Foxtail (Setaria glauca)	52.9	9.7
Crotons (Croton spp.)	31.8	7.2
Wheat (Triticum aestivum)	10.6	4.3
Acorns, unclassified (Quercus spp.)	9.4	3.1
Beggar-ticks (Bidens spp.)	5.9	2.1
Small Crab Grass (Digitaria Ischaemum)	44.7	1.9
Korean Lespedeza (Lespedeza stipulacea)	9.4	1.4
Lanceleaf Ragweed (Ambrosia bidentata)	16.5	0.7
Sassafras (Sassafras albidum)	17.6	0.7
Ground-cherries (Physalis spp.)	20.0	0.6
Sorghum (Sorghum vulgare)	1.2	0.5
Prairie-tea (Croton monanthogynus)	3.5	0.4
Blackberry (Rubus sp.)	2.4	0.2
Oats (Avena sativa)	11.8	0.2
False Buckwheat (Polygonum scandens)	7.1	0.2

(continued)

Food Item	Per Cent by Occurrence	Per Cent by Volume
Pinkweed (Polygonum pensylvanicum)	14.1	0.2
Old-Witch Grass (Panicum capillare)	7.1	0.2
Paspalum (Paspalum ciliatifolium)	18.8	0.2
Buttonweed (Diodia teres)	10.6	0.1
Barnyard-Grass (Echinochloa crusgalli)	2.4	0.1
Black Nightshade (*Solanum nigrum*)	3.5	0.1
Crab Grass (Digitaria sanguinalis)	12.9	0.1
Wild Grapes (Vitis spp.)	11.8	0.1
Indian Grass (Sorghastrum nutans)	1.2	0.1
Great Ragweed (Ambrosia trifida)	3.5	0.1
Water-Smartweed (Polygonum punctatum)	2.4	0.1
Panic Grass (Panicum spp.)	7.1	0.1
Paspalum, unclassified (Paspalum spp.)	7.1	trace
Sunflower (Helianthus sp.)	1.2	trace
Lady's-thumb (Polygonum Persicaria)	3.5	trace
Coralberry (Symphoricarpos orbiculatus)	10.6	trace
Smartweeds, unclassified (Polygonum spp.)	5.9	trace
Hogwort (Croton capitatus)	2.4	trace
Bullnettle (Solanum carolinense)	2.4	trace
Bush Clover (Lespedeza sp.)	1.2	trace
Wild Cherry (Prunus serotina)	3.5	trace
Partridge-pea (Cassia fasciculata)	3.5	trace
Velvet-leaf (Abutilon Theophrasti)	1.2	trace
Sumacs, unclassified (Rhus spp.)	5.9	trace
Wood-Sorrel (Oxalis spp.)	5.9	trace
Water-pepper (Polygonum Hydropiper)	4.7	trace
Leaf material	3.5	trace
Foxtail (Setaria verticillata)	2.4	trace
Plant gall	2.4	trace
Undetermined plant material	2.4	trace
Brome-Grass (Bromus sp.)	2.4	trace
Amaranth (Amaranthus sp.)	2.4	trace
Timothy (Phleum pratense)	1.2	trace
Dock (Rumex sp.)	1.2	trace
Shepherd's-Purse (Capsella Bursa-pastoris)	1.2	trace
Eyebane (Euphorbia maculata)	1.2	trace
Spurge (Euphorbia sp.)	1.2	trace
Prickly Mallow (Sida spinosa)	1.2	trace
Vervain (Verbena sp.)	1.2	trace
Mock Pennyroyal (Hedeoma pulegioides)	1.2	trace
Green Foxtail (Setaria viridis)	1.2	trace
Hackberry (Celtis sp.)	1.2	trace
Osage Orange (Maclura pomifera)	1.2	trace
Clover (Trifolium hybridum)	1.2	trace
Eclipta (Eclipta alba)	1.2	trace
Johnson-Grass (Sorghum halepense)	1.2	trace
Goosefoot (Chenopodium sp.)	1.2	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Animal Foods:		
Short-horned grasshoppers (Acrididae)	55.3	4.0
Stink bugs (Pentatomidae)	29.4	0.7
Bugs, unclassified (Hemiptera)	7.1	0.4
Ground beetles (Carabidae)	12.9	0.2
Leaf beetles (Chrysomelidae)	10.6	0.1
Insects, unclassified (Insecta)	2.4	0.1
Walking sticks (Phasmidae)	4.7	0.1
Beetles, unclassified (Coleoptera)	4.7	trace
Ants (Formicidae)	12.9	trace
Leaf hoppers (Cicadellidae)	1.2	trace
Long-horned grasshoppers (Tettigoniidae)	3.5	trace
Squash bugs (Coreidae)	2.4	trace
Assassin bug (Reduviidae)	1.2	trace
Lygaeid bug (Lygaeidae)	1.2	trace
Snout beetle (Curculionidae)	3.5	trace
Dung beetle (Scarabaeidae)	2.4	trace
Spider (Araneida)	2.4	trace
Wasp (Hymenoptera)	1.2	trace
Crayfish (Cambarus sp.)	1.2	trace
Mouse, unclassified	1.2	trace
Gravel	14.1	0.1
Total		100.0

TABLE 5. NOVEMBER FOODS OF QUAIL IN MISSOURI

(Based upon examination of 234 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Common ragweed (Ambrosia artemisiifolia)	82.5	32.4
Corn (Zea Mays)	55.6	21.6
Yellow Foxtail (Setaria glauca)	46.2	9.6
Crotons (Croton spp.)	27.4	6.9
Wheat (Triticum aestivum)	10.7	3.8
Korean Lespedeza (Lespedeza stipulacea)	35.9	3.2
Beggar-ticks (Bidens spp.)	26.1	2.5
Great Ragweed (Ambrosia trifida)	19.7	2.2
Lanceleaf Ragweed (Ambrosia bidentata)	25.6	1.9
Sassafras (Sassafras albidum)	8.1	1.6
Acorns, unclassified (Quercus spp.)	10.7	1.3
Sorghum (Sorghum vulgare)	3.0	1.2
Osage Orange (Maclura pomifera)	3.0	1.0
Small Crab Grass (Digitaria Ischaemum)	23.5	0.9
Fall Panic Grass (Panicum dichotomiflorum)	33.8	0.9

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
False Buckwheat (Polygonum scandens)	14.1	0.8
Smooth Sumac (Rhus glabra)	2.6	0.8
Sunflowers (Helianthus spp.)	3.8	0.8
Raccoon Grape (Ampelopsis cordata)	3.0	0.6
Smartweed (Polygonum pensylvanicum)	24.8	0.6
Prairie-tea (Croton monanthogynus)	9.8	0.5
Beef-steak Plant (Perilla frutescens)	6.0	0.4
Oats (Avena sativa)	3.4	0.4
Water-Smartweed (Polygonum punctatum)	6.8	0.3
Paspalum (Paspalum ciliatifolium)	19.7	0.3
Undetermined plant material	7.3	0.3
Old-Witch Grass (Panicum capillare)	7.7	0.2
Ground-cherries (Physalis spp.)	12.0	0.2
Bush clovers (Lespedeza spp.)	2.1	0.2
Chinese lespedeza (Lespedeza cuneata)	1.3	0.2
Wild Grapes (Vitis spp.)	22.6	0.2
Johnson-Grass (Sorghum halepense)	4.7	0.1
Tick-trefoils (Desmodium spp.)	3.0	0.1
Panic Grasses (Panicum spp.)	7.3	0.1
Sumacs, unclassified (Rhus spp.)	17.5	0.1
Bur-Cucumber (Sicyos angulatus)	0.9	0.1
Wild Plum (Prunus americana)	2.6	0.1
Black Nightshade (Solanum nigrum)	1.3	0.1
Crab Grass (Digitaria sanguinalis)	14.1	0.1
Smartweeds, unclassified (Polygonum spp.)	11.1	0.1
Dwarf sumac (Rhus copallina)	0.9	trace
Rice-Cut-Grass (Leersia oryzoides)	3.8	trace
Poison Ivy (Rhus radicans)	2.1	trace
Red Cedar (Juniperus virginiana)	0.9	trace
Buttonweed (Diodia teres)	10.3	trace
Lady's-thumb (Polygonum Persiacaria)	3.0	trace
Paspalums, unclassified (Paspalum spp.)	8.1	trace
Bush Clover (Lespedeza virginica)	1.7	trace
Coralberry (Symphoricarpos orbiculatus)	12.0	trace
Hogwort (Croton capitatus)	2.9	trace
Rushfoil (Crotonopsis elliptica)	3.8	trace
Soy-Bean (Glycine Max)	0.4	trace
Violet (Viola sp.)	0.9	trace
Prickly Mallow (Sida spinosa)	2.6	trace
Dogwoods (Cornus spp.)	3.4	trace
Japanese Clover (Lespedeza striata)	3.0	trace
Cheat (Bromus spp.)	1.7	trace
Sweet Clover (Melilotus ? officinalis)	0.4	trace
Aster (Aster sp.)	1.3	trace
Touch-me-not (Impatiens capensis)	0.4	trace
Small Wild Bean (Strophostyles leiosperma)	0.9	trace
Spike-rush (Eleocharis ? obtusa)	0.4	trace
Roses (Rosa spp.)	2.1	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Moss, unclassified	1.7	trace
Vervain (Verbena sp.)	1.3	trace
Goldenrod (Solidago sp.)	0.9	trace
Grass leaf	0.4	trace
Buttonbush (Cephalanthus occidentalis)	0.4	trace
Goosefoot (Chenopodium spp.)	5.6	trace
Wood-Sorrel (Oxalis spp.)	6.4	trace
Sedges (Carex spp.)	3.0	trace
Barnyard-Grass (Echinochloa crusgalli)	1.7	trace
Eyebane (Euphorbia maculata)	1.7	trace
Leaf material	1.7	trace
Field Paspalum (Paspalum laeve)	1.7	trace
Three-seeded Mercury (Acalypha virginica)	1.7	trace
White Vervain (Verbena urticifolia)	1.3	trace
Bullnettle (Solanum carolinense)	1.3	trace
Fleabane (Erigeron sp.)	1.3	trace
Jimson Weed (Datura sp.)	1.3	trace
Three-seeded Mercury (Acalypha sp.)	1.3	trace
St. John's-wort (Hypericum sp.)	1.3	trace
Cherry or Plum (Prunus sp.)	0.9	trace
Barnyard-Grass (Echinochloa sp.)	0.9	trace
Blackberry (Rubus sp.)	0.9	trace
Sedge (Cyperus ovularis)	0.9	trace
Mild Water-pepper (Polygonum hydropiperoides)	0.9	trace
Pellitory (Parietaria pensylvanica)	0 9	trace
Bluegrass (Poa pratensis)	0.9	trace
Green Foxtail (Setaria viridis)	0.9	trace
Triple awn grass (Aristida sp.)	0.9	trace
Tall Red-top (Triodia flava)	0.9	trace
Fescue (Festuca sp.)	0.9	trace
Bluegrass (Poa sp.)	0.4	trace
Foxtail (Setaria verticillata)	0.4	trace
Broomsedge (Andropogon virginicus)	0.4	trace
Bluestem (Andropogon sp.)	0.4	trace
Spike-rush (Eleocharis sp.)	0.4	trace
Fimbristylis (Fimbristylis Baldwiniana)	0.4	trace
Nodding Smartweed (Polygonum lapathifolium)	0.4	trace
Wild Cherry (Prunus serotina)	0.4	trace
Large Wild Bean (Strophostyles helvola)	0.4	trace
St. John's-wort (Hypericum Drummondii)	0.4	trace
Shrubby St. John's-wort (Hypericum spathulatum)	0.4	trace
Cleavers (Galium Aparine)	0.4	trace
Wild Carrot (Daucus Carota)	0.4	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.4	trace
Drop-seed grass (Sporobolus neglectus)	0.4	trace
Pokeweed (Phytolacca americana)	0.4	trace
Sedge (Cyperus sp.)	0.4	trace
Carpetweed (Mollugo verticillata)	0.4	trace
Low Hop Clover (Trifolium procumbens)	0.4	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Elderberry (Sambucus canadensis)	0.4	trace
Hackberry (Celtis sp.)	0.4	trace
Plantain (Plantago sp.)	0.4	trace
Goose-Grass (Eleusine indica)	0.4	trace
Nimble Will (Muhlenbergis sp.)	0.4	trace
Viburnum (Viburnum sp.)	0.4	trace
Love-Grass (Eragrostis sp.)	0.4	trace
Thoroughwort (Eupatorium sp.)	0.4	trace
Animal Foods:		
Short-horned grasshoppers (Acrididae)	36.7	0.4
Ground beetles (Carabidae)	14.1	0.1
Long-horned grasshoppers (Tettigoniidae)	1.3	0.1
Stink bugs (Pentatomidae)	16.2	0.1
Ants (Formicidae)	10.7	trace
Beetles, unclassified (Coleoptera)	13.2	trace
Walking-sticks (Phasmidae)	1.7	trace
Dung beetle (Scarabaeidae)	3.0	trace
Assassin bug (Reduviidae)	0.4	trace
Bugs, unclassified (Hemiptera)	9.8	trace
Squash bug (Coreidae)	3.4	trace
Snout beetles (Curculionidae)	1.7	trace
Leaf hopper (Cicadellidae)	0.4	trace
Snails (Gastropoda)	1.3	trace
Leaf beetles (Chrysomelidae)	5.6	trace
Insects, unclassified (Insecta)	5.1	trace
Spiders (Araneida)	1.3	trace
Undetermined animal matter	0.4	trace
Wasp (Hymenoptera)	0.4	trace
Moth (Tineidae)	0.4	trace
Ichneumon wasp (Ichneumonidae)	0.4	trace
Gravel	20.1	0.1
Total		100.0

TABLE 6. DECEMBER FOODS OF QUAIL IN MISSOURI

(Based upon examination of 242 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Corn (Zea Mays)	54.5	30.4
Common Ragweed (Ambrosia artemisiifolia)	71.5	19.0
Korean Lespedeza (Lespedeza stipulacea)	59.1	14.2
Crotons (Croton spp.)	38.0	7.9

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Lanceleaf Ragweed (Ambrosia bidentata)	45.9	7.6
Yellow Foxtail (Setaria glauca)	33.1	3.4
Wheat (Triticum aestivum)	13.6	3.2
Acorns, unclassified (Quercus spp.)	14 9	1.4
Sorghum (Sorghum vulgare)	5.4	1.3
Fall Panic Grass (Panicum dichotomiflorum)	20.7	1.1
Dwarf Sumac (Rhus copallina)	3.7	0.9
Marsh-Elder (Iva ciliata)	1.7	0.8
Beggar-ticks (Bidens spp.)	15.3	0.8
Sassafras (Sassafras albidum)	13.2	0.7
Great Ragweed (Ambrosia trifida)	11.6	0.7
Pinkweed (Polygonum pensylvanicum)	20.7	0.6
Hogwort (Croton capitatus)	4.5	0.4
Sumacs, unclassified (Rhus spp.)	23.6	0.4
Wild Grapes (Vitis spp.)	33.5	0.4
Sunflowers (Helianthus spp.)	2.5	0.3
False Buckwheat (Polygonum scandens)	13.2	0.3
Undetermined plant material	6.6	0.3
Prairie-tea (Croton monanthogynus)	5.4	0.2
Rushfoil (Crotonopsis elliptica)	3.7	0.2
Osage Orange (Maclura pomifera)	1.2	0.2
Poison Ivy (Rhus radicans)	1.7	0.2
Small Crab Grass (Digitaria Ischaemum)	19.0	0.2
Buttonweed (Diodia teres)	13.2	0.2
Tick-trefoil (Desmodium spp)	3.7	0.2
Panic Grass (Panicum flexile)	0.4	0.1
Ground-cherries (Physalis spp.)	13.2	0.1
Water-smartweed (Polygonum punctatum)	8.3	0.1
Ash (Fraxinus sp.)	1.7	0.1
Coralberry (Symphoricarpos orbiculatus)	14.0	0.1
Wild Plum (Prunus americana)	2.5	0.1
Bush Clover (Lespedeza virginica)	0.4	0.1
Wild Cherry (Prunus serotina)	1.7	0.1
Bullnettle (Solanum carolinense)	1.7	0.1
Bush Clover (Lespedeza sp.)	4.1	0.1
Haw (Viburnum sp.)	3.3	trace
Dogwoods (Cornus spp.)	5.4	trace
Smartweeds, unclassified (Polygonum spp.)	9.9	trace
Black Locust (Robinia Pseudo-Acacia)	0.8	trace
Black Nightshade (Solanum nigrum)	2.9	trace
Chinese Lespedeza (Lespedeza cuneata)	0.8	trace
Paspalums (Paspalum spp.)	14.5	trace
Japanese Clover (Lespedeza striata)	3.7	trace
Johnson-Grass (Sorghum halepense)	2.9	trace
Tragia (Tragia sp.)	1.7	trace
Brome-Grass (Bromus spp.)	3.3	trace
Paspalum (Paspalum ciliatifolium)	13.6	trace
Red Cedar (Juniperus virginiana)	2.1	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Smooth sumac (Rhus glabra)	0.8	trace
Morning-glory (Ipomoea hederacea)	0.4	trace
Lady's-thumb (Polygonum Persicaria)	2.5	trace
Field Paspalum (Paspalum laeve)	1.2	trace
Flowering Dogwood (Cornus florida)	0.4	trace
Old-Witch grass (Panicum capillare)	8.0	trace
Roses (Rosa spp.)	2.9	trace
Leaf material	1.2	trace
Three-seeded Mercury (Acalypha ostryaefolia)	0.4	trace
Cherry or Plum (Prunus spp.)	6.2	trace
Crab Grass (Digitaria sanguinalis)	8.3	trace
Oats (Avena sativa)	3.7	trace
Panic Grasses (Panicum spp.)	8.3	trace
Goosefoot (Chenopodium spp.)	6.2	trace
Sedges (Carex spp.)	5.8	trace
Fimbristylis (Fimbristylis Baldwiniana)	2.9	trace
Blackberries (Rubus spp.)	2.5	trace
Asters (Aster spp.)	2.5	trace
Moss, unclassified	2.1	trace
Small Wild Bean (Strophostyles leiosperma)	1.7	trace
Fleabane (Erigeron spp.)	2.5	trace
Timothy (Phleum pratense)	1.7	trace
Carpetweed (Mollugo verticillata)	2.1	trace
Wild Bergamot (Monarda fistulosa)	1.2	trace
Three-seeded Mercury (Acalypha virginica)	1.2	trace
Chufa (Cyperus esculentus)	1.2	trace
Three-seeded Mercury (Acalypha sp.)	1.2	trace
Vervain (Verbena sp.)	1.2	trace
St. John's-wort (Hypericum Drummondii)	1.2	trace
Wood-Sorrel (Oxalis spp.)	1.2	trace
White Vervain (Verbena urticifolia)	1.2	trace
Hackberry (Celtis occidentalis)	1.2	trace
Drop-seed Grass (Sporobolus neglectus)	0.8	trace
Triple-awn grass (Aristida sp.)	0.8	trace
Hackberry (Celtis sp.)	0.8	trace
Chickweed (Cerastium vulgatum)	0.8	trace
Spurge (Euphorbia sp.)	0.8	trace
Prickly Mallow (Sida spinosa)	0.8	trace
Mild Water-pepper (Polygonum hydropiperoides)	0.8	trace
Partridge-pea (Cassia fasciculata)	0.4	trace
Indian-Grass (Sorhastrum nutans)	0.8	trace
Bluestem (Andropogon Gerardi)	0.4	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.4	trace
Drop-seed Grass (Sporobolus asper)	0.4	trace
Grass Leaves	0.8	trace
St. John's-wort (Hypericum sp.)	0.8	trace
Blueberry (Vaccinium sp.)	0.8	trace
Sedge (Cyperus strigosus)	0.4	trace

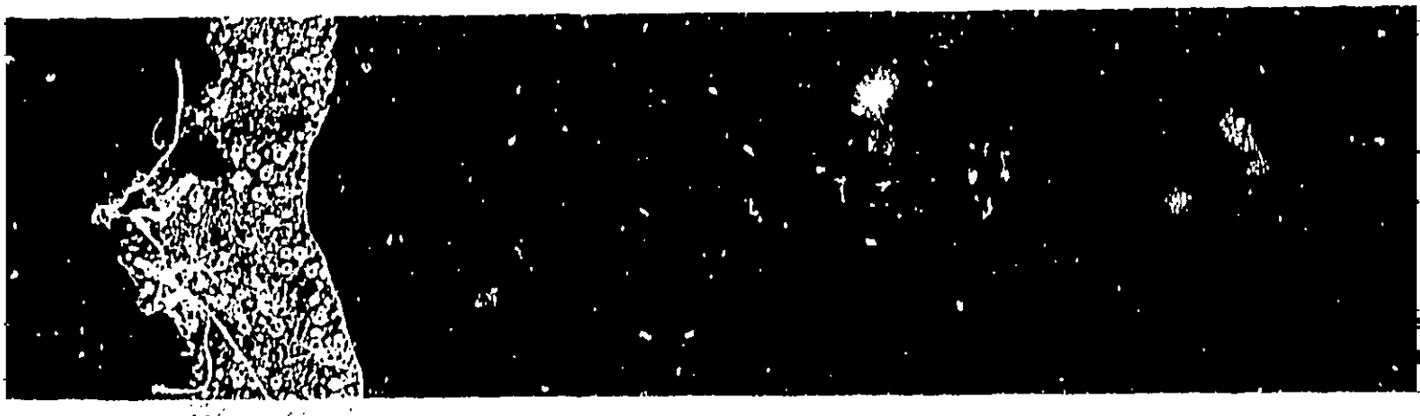
(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Dock (Rumex sp.)	0.4	trace
Marsh Smartweed (Polygonum coccineum)	0.4	trace
Amaranth (Amaranthus sp.)	0.4	trace
Hawthorn (Crataegus sp.)	0.4	trace
St. John's-wort (Hypericum mutilum)	0.4	trace
Clammy Cuphea (Cuphea petiolata)	0.4	trace
Button-Snakeroot (Liatris sp.)	0.4	trace
Ironweed (Vernonia sp.)	0.4	trace
Black-eyed Susan (Rudbeckia hirta)	0.4	trace
Plant gall	0.4	trace
Tall Red-top (Triodia flava)	0.4	trace
Pellitory (Parietaria pensylvanica)	0.4	trace
Purslane (Portulaca oleracea)	0.4	trace
Low Hop Clover (Trifolium procumbens)	0.4	trace
Three-seeded Mercury (Acalypha rhomboidea)	0.4	trace
Velvet-leaf (Abutilon Theophrasti)	0.4	trace
Mock Pennyroyal (Hedeoma pulegioides)	0.4	trace
Beef-steak plant (Perilla frutescens)	0.4	trace
Wild Lettuce (Lactuca canadensis)	0.4	trace
Fall Witch-Grass (Leptoloma cognatum)	0.4	trace
Broomsedge (Andropogon virginicus)	0.4	trace
Green Foxtail (Setaria viridis)	0.4	trace
Thoroughwort (Eupatorium sp.)	0.4	trace
Animal Foods:		
Short-horned grasshoppers (Acrididae)	40.1	0.4
Ground beetles (Carabidae)	16.9	0.1
Bugs, unclassified (Hemiptera)	9.1	0.1
Stink bugs (Pentatomidae)	14.0	0.1
Squash bugs (Coreidae)	1.2	trace
Long-horned grasshoppers (Tettigoniidae)	2.5	trace
Beetles, unclassified (Coleoptera)	11.2	trace
Snails (Gastropoda)	0.8	trace
Snout beetles (Circulionidae)	1.7	trace
Crayfish (Cambarus sp.)	0.4	trace
Wasp (Hymenoptera)	0.8	trace
Walking-stick (Phasmidae)	0.4	trace
Spiders (Araneida)	0.8	trace
Fungus gnat (Mycetophilidae)	0.4	trace
Ants (Formicidae)	9.1	trace
Insects, unclassified (Insecta)	3.7	trace
Dung beetles (Scarabaeidae)	2.1	trace
Leaf beetles (Chrysomelidae)	1.7	trace
Leaf hopper (Cicadellidae)	0.4	trace
Assassin bug (Reduviidae)	0.4	trace
Gravel	26.9	0.2
Total		100.0

TABLE 7. JANUARY FOODS OF QUAIL IN MISSOURI

(Based upon examination of 212 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	67.9	24.5
Common Ragweed (Ambrosia artemisiifolia)	53.8	23.2
Corn (Zea Mays)	34.4	13.1
Wheat (Triticum aestivum)	26.4	10.1
Crotons (Croton spp.)	44.3	10.0
Sorghum (Sorghum vulgare)	9.0	3.5
Yellow Foxtail (Setaria glauca)	17.9	2.6
Catalpa (Catalpa speciosa)	2.8	2.1
Wild Grapes (Vitis spp.)	31.6	1.5
Smooth sumac (Rhus glabra)	5.7	1.4
Acorns, unclassified (Quercus spp.)	20.8	1.3
Chinese Lespedeza (Lespedeza cuneata)	3.8	0.9
Sumacs, unclassified (Rhus spp.)	17.9	0.9
Sassafras (Sassafras albidum)	9.0	0.7
Japanese Clover (Lespedeza striata)	3.8	0.5
Beef-steak Plant (Perilla frutescens)	5.2	0.4
Lanceleaf Ragweed (Ambrosia bidentata)	18.4	0.4
Black Locust (Robinia Pseudo-Acacia)	0.9	0.3
Tick-trefoil (Desmodium spp.)	5.2	0.2
Beggar-ticks (Bidens spp.)	7.5	0.2
Bush Clovers (Lespedeza spp.)	4.2	0.2
Pinkweed (Polygonum pensylvanicum)	13.7	0.2
Oats (Avena sativa)	3.8	0.2
Great Ragweed (Ambrosia trifida)	9.0	0.2
Cherry or Plum (Prunus sp.)	4.7	0.2
False Buckwheat (Polygonum scandens)	5.7	0.1
Bush Clover (Lespedeza virginica)	0.5	0.1
Undetermined plant material	6.1	0.1
Coralberry (Symphoricarpos orbiculatus)	17.9	0.1
Persimmon (Diospyros virginiana)	0.9	0.1
Buttonweed (Diodia teres)	11.3	0.1
Prairie-tea (Croton monanthogynus)	4.7	0.1
Wild Plum (Prunus americana)	1.4	0.1
Fall Panic Grass (Panicum dichotomiflorum)	7.5	trace
Small Crab Grass (Digitaria Ischaemum)	9.4	trace
Red Cedar (Juniperus virginiana)	0.5	trace
Rushfoil (Crotonopsis elliptica)	5.7	trace
Water Smartweed (Polygonum punctatum)	1.9	trace
Paspalum (Paspalum ciliatifolium)	12.7	trace
Vervains (Verbena spp.)	2.4	trace
Plant galls	2.4	trace
Hackberry (Celtis sp.)	0.9	trace
Sunflowers (Helianthus spp.)	2.8	trace
Tragia (Tragia sp.)	1.4	trace



(continued)

Food Item	Per Cent By Occurrence	Volume
Sedges (Carex spp.)	3.3	trace
Dogwoods (Cornus spp.)	5.2	trace
Moss, unclassified	3.8	trace
Dogwood (Cornus capitatus)	0.5	trace
Ground-cherries (Physalis spp.)	2.8	trace
Brome Grasses (Bromus spp.)	2.4	trace
Roses (Rosa spp.)	2.8	trace
Small Wild Bean (Strophostyles leiosperma)	1.4	trace
Leaf material	3.8	trace
Smartweeds, unclassified (Polygonum spp.)	7.1	trace
Paspalums (Paspalum spp.)	5.7	trace
Red Clover (Trifolium pratense)	1.4	trace
White Verbain (Verbena urticifolia)	1.4	trace
Tall Red-top (Triodia flava)	0.5	trace
Panic Grasses (Panicum spp.)	6.6	trace
Crab Grass (Digitaria sanguinalis)	3.8	trace
Three-seeded Mercury (Acalypha spp.)	2.8	trace
Broomsedge (Andropogon virginicus)	1.9	trace
Goosefoot (Chenopodium sp.)	1.9	trace
Blackberries (Rubus spp.)	1.9	trace
Thoroughwort (Eupatorium spp.)	1.9	trace
Hawthorn (Crataegus spp.)	1.4	trace
Sedge (Cyperus ovularis)	1.4	trace
Prickly Mallow (Sida spinosa)	1.4	trace
Old-Witch grass (Panicum capillare)	0.9	trace
Nimble Will (Muhlenbergia sp.)	0.9	trace
Wood-Sorrel (Oxalis sp.)	0.9	trace
St. John's-wort (Hypericum Drummondii)	0.9	trace
Viburnum (Viburnum sp.)	0.9	trace
Three-seeded Mercury (Acalypha virginica)	1.9	trace
Jimsonweed (Datura sp.)	0.9	trace
Clover (Trifolium sp.)	0.9	trace
Rice-cut-grass (Leersia oryzoides)	0.9	trace
Sedge (Cyperus sp.)	0.9	trace
Witch-hazel (Hamamelis vernalis)	0.9	trace
Indian-Grass (Sorghastrum nutans)	0.5	trace
Nut Rush (Scleria sp.)	0.5	trace
Lady's-thumb (Polygonum Persicaria)	0.5	trace
Poison Ivy (Rhus radicans)	0.5	trace
Plantain (Plantago sp.)	0.5	trace
Self-heal (Prunella vulgaris)	0.5	trace
Nettle (Solanum sp.)	0.5	trace
Dodder (Cuscuta sp.)	0.5	trace
Elderberry (Sambucus canadensis)	0.5	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.5	trace
Grass leaf	0.5	trace
Partridge-pea (Cassia fasciculata)	0.5	trace
Three-seeded Mercury (Acalypha rhomboidea)	0.5	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Carpetweed (Mollugo verticillata)	0.5	trace
Yarrow (Achillea Millefolium)	0.5	trace
Spike rush (Eleocharis sp.)	0.5	trace
Fimbristylis (Fimbristylis Baldwiniana)	0.5	trace
Water-pepper (Polygonum Hydropiper)	0.5	trace
Hackberry (Celtis occidentalis)	0.5	trace
Amaranth (Amaranthus sp.)	0.5	trace
Low Hop Clover (Trifolium procumbens)	0.5	trace
Plantain (Plantago Rugelii)	0.5	trace
Bullnettle (Solanum carolinense)	0.5	trace
Goldenrod (Solidago sp.)	0.5	trace
Fleabane (Erigeron sp.)	0.5	trace
Animal Foods:		
Short-horned grasshoppers (Acrididae)	16.0	trace
Stink bugs (Pentatomidae)	18.4	trace
Bugs, unclassified (Hemiptera)	3.3	trace
Beetles, unclassified	9.9	trace
Ground beetles (Carabidae)	9.4	trace
Dung beetles (Scarabaeidae)	4.2	trace
Undetermined animal matter	0.5	trace
Leaf beetles (Chrysomelidae)	4.7	trace
Ants (Formicidae)	4.7	trace
Leaf hoppers (Cicadellidae)	2.8	trace
Insects, unclassified (Insecta)	2.8	trace
Snout beetles (Curculionidae)	1.9	trace
Spiders (Araneida)	0.9	trace
Snail (Gastropoda)	0.5	trace
Gravel	15.6	0.1
Total		100.0

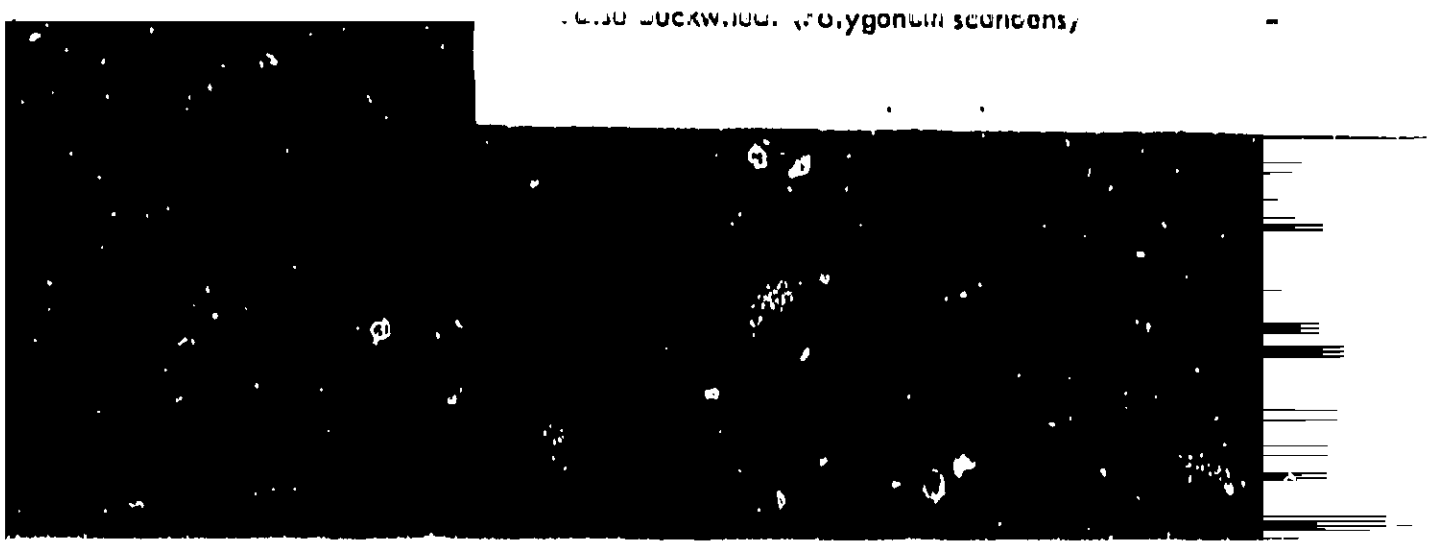
TABLE 8. FEBRUARY FOODS OF QUAIL IN MISSOURI

(Based upon examination of 348 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	67.0	46.0
Common Ragweed (Ambrosia artemisiifolia)	51.7	25.1
Corn (Zea Mays)	28.4	8.0
Sassafras (Sassafras albidum)	9.2	3.9
Crotons (Croton spp.)	16.4	2.3
Beggar-ticks (Bidens spp.)	12.6	2.0
Sumacs, unclassified (Rhus spp.)	37.1	2.0

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Yellow Foxtail (Setaria glauca)	11.5	1.3
Sorghum (Sorghum vulgare)	2.0	1.0
Japanese Clover (Lespedeza striata)	0.6	1.0
Acorns, unclassified (Quercus spp.)	10.6	0.8
Wheat (Triticum aestivum)	4.9	0.7
Rushfoil (Crotonopsis elliptica)	4.9	0.6
Smooth sumac (Rhus glabra)	1.1	0.6
Lanceleaf Ragweed (Ambrosia bidentata)	13.2	0.4
Chinese Lespedeza (Lespedeza cuneata)	4.6	0.4
Wild Grapes (Vitis spp.)	11.5	0.3
Tick-trefoil (Desmodium spp.)	2.3	0.2
Bush Clover (Lespedeza virginica)	1.4	0.2
Drop-seed Grass (Sporobolus neglectus)	0.6	0.2
Dwarf sumac (Rhus copallina)	2.0	0.2
Great Ragweed (Ambrosia trifida)	4.6	0.2
Leaf material	2.9	0.1
False Buckwheat (Polygonum scandens)	2.0	0.1
Maple (Acer sp.)	1.1	0.1
Rose (Rosa multiflora)	2.0	0.1
Oats (Avena sativa)	4.6	0.1
Nimble Will (Muhlenbergia sp.)	0.9	0.1
Buttonweed (Diodia teres)	8.9	trace
Bush Clovers (Lespedeza spp.)	2.3	trace
Sunflowers (Helianthus spp.)	2.0	trace
Coralberry (Symphoricarpos orbiculatus)	14.1	trace
Small Crab Grass (Digitaria Ischaemum)	6.0	trace
Grass leaf	0.3	trace
Vervains (Verbena spp.)	1.4	trace
Smartweeds (Polygonum spp.)	7.2	trace
Pinkweed (Polygonum pensylvanicum)	4.6	trace
Poison Ivy (Rhus radicans)	1.1	trace
Fall Panic Grass (Panicum dichotomiflorum)	4.6	trace
Paspalum (Paspalum ciliatifolium)	2.9	trace
Undetermined plant material	2.6	trace
Prairie-tea (Croton monanthogynus)	2.9	trace
Water-smartweed (Polygonum punctatum)	0.6	trace
Sensitive-brier (Schrankia Nuttallii)	0.3	trace
Osage Orange (Maclura pomifera)	0.6	trace
Paspalums (Paspalum spp.)	5.5	trace
Cherry or Plum (Prunus spp.)	0.9	trace
Large Wild Bean (Strophostyles helvola)	0.3	trace
Black Locust (Robinia Pseudo-Acacia)	0.3	trace
White Sweet Clover (Melilotus alba)	0.3	trace
Ground-cherries (Physalis spp.)	0.3	trace
Hazelnut (Corylus americana)	0.3	trace
Beef-steak Plant (Perilla frutescens)	0.3	trace
Small Wild Bean (Strophostyles leiosperma)	0.3	trace
Dogwoods (Cornus spp.)	1.4	trace



(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Panic Grasses (Panicum spp.)	7.8	trace
Pellitory (Parietaria pensylvanica)	0.6	trace
Red Cedar (Juniperus virginiana)	0.3	trace
Tall Red-top (Triodia flava)	0.3	trace
Barnyard-Grass (Echinochloa crusgalli)	0.3	trace
Brome-Grasses (Bromus spp.)	1.1	trace
Lady's-thumb (Polygonum Persicaria)	0.3	trace
Crab Grass (Digitaria sanguinalis)	3.4	trace
Sedges (Carex spp.)	3.4	trace
Old-Witch Grass (Panicum capillare)	2.0	trace
Three-seeded Mercury (Acalypha virginica)	1.7	trace
Nut Rush (Scleria sp.)	1.4	trace
Blackberries (Rubus spp.)	1.1	trace
Evening-Primroses (Oenothera sp.)	0.9	trace
Prickly Mallow (Sida spinosa)	0.9	trace
Johnson-Grass (Sorghum halepense)	0.9	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.9	trace
Wood-Sorrel (Oxalis sp.)	0.9	trace
Three-seeded Mercury (Acalypha sp.)	0.6	trace
Venus's Looking-glass (Specularia biflora)	0.6	trace
Rice-cut-grass (Leersia oryzoides)	0.6	trace
Sedge (Cyperus sp.)	0.6	trace
Goosefoot (Chenopodium sp.)	0.6	trace
False Buckthorn (Rumelia lanuginosa)	0.6	trace
Cleavers (Galium sp.)	0.6	trace
Dock (Rumex sp.)	0.3	trace
Wild Cherry (Prunus serotina)	0.3	trace
Soybean (Glycine Max)	0.3	trace
Three-seeded Mercury (Acalypha rhomboidea)	0.3	trace
Mullein (Verbascum sp.)	0.3	trace
Black Nightshade (Solanum nigrum)	0.3	trace
Fleabane (Erigeron sp.)	0.3	trace
Bluegrass (Poa pratensis)	0.3	trace
Broomsedge (Andropogon virginicus)	0.3	trace
Bluegrass (Poa sp.)	0.3	trace
Crab Grass (Digitaria filiformis)	0.3	trace
Sand-Dropseed (Sporobolus cryptandrus)	0.3	trace
Fall Witch-Grass (Leptoloma cognatum)	0.3	trace
Triple-awn grass (Aristida sp.)	0.3	trace
Chufa (Cyperus esculentus)	0.3	trace
Amaranth (Amaranthus sp.)	0.3	trace
Sensitive-Plant (Cassia nictitans)	0.3	trace
Tragia (Tragia sp.)	0.3	trace
Blueberry (Vaccinium sp.)	0.3	trace
Low Blueberry (Vaccinium vacillans)	0.3	trace
Scorpion-grass (Myosotis verna)	0.3	trace
Hedge-parsley (Torilis Japonica)	0.3	trace
Mock Pennyroyal (Hedeoma pulegioides)	0.3	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Nettle (Solanum sp.)	0.3	trace
Plant gall	0.3	trace
Animal Foods:		
Short-horned grasshoppers (Acrididae)	30.5	1.0
Ground beetles (Carabidae)	11.2	0.2
Snout beetles (Curculionidae)	2.6	0.1
Beetles, unclassified (Coleoptera)	8.6	trace
Stink bugs (Pentatomidae)	8.9	trace
Bugs, unclassified (Hemiptera)	5.7	trace
Insects, unclassified (Insecta)	5.2	trace
Lygaeid bugs (Lygaeidae)	0.6	trace
Dung beetles (Scarabaeidae)	1.4	trace
Long-horned grasshoppers (Tettigoniidae)	1.1	trace
Ants (Formicidae)	4.0	trace
Leaf beetles (Chrysomelidae)	2.0	trace
Spiders (Araneida)	0.6	trace
Walking-sticks (Phasmidae)	0.6	trace
Rove beetle (Staphylinidae)	0.3	trace
Gravel	8.9	0.1
Total		100.0

TABLE 9. MARCH FOODS OF QUAIL IN MISSOURI

(Based upon examination of 176 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	73.3	48.8
Corn (Zea Mays)	39.8	19.1
Yellow Foxtail (Setaria glauca)	22.7	5.0
Common Ragweed (Ambrosia artemisiifolia)	60.8	4.4
Beggar-ticks (Bidens spp.)	13.6	3.5
Lanceleaf Ragweed (Ambrosia bidentata)	26.7	3.2
Crotons (Croton spp.)	22.7	2.3
Sumacs, unclassified (Rhus spp.)	33.5	1.7
Field Paspalum (Paspalum laeve)	2.8	1.4
Smooth Sumac (Rhus glabra)	2.3	1.1
Leaf material	6.8	1.0
Great Ragweed (Ambrosia trifida)	11.9	0.9
Sorghum (Sorghum vulgare)	1.7	0.8
Fall Panic Grass (Panicum dichotomiflorum)	8.5	0.8
False Buckwheat (Polygonum scandens)	7.4	0.7
Tick-trefoil (Desmodium spp.)	6.2	0.6

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Acorns (Quercus spp.)	8.5	0.6
Wheat (Triticum aestivum)	3.4	0.4
Osage Orange (Maclura pomifera)	4.5	0.4
Small Crab Grass (Digitaria ischaemum)	9.7	0.3
Wild Grapes (Vitis spp.)	22.2	0.2
Bush Clovers (Lespedeza spp.)	2.3	0.2
Grass and sedge leaves	1.1	0.1
Coralberry (Symphoricarpos orbiculatus)	13.1	0.1
Paspalums (Paspalum spp.)	12.5	0.1
Oats (Avena sativa)	5.7	0.1
Undetermined Plant Material	5.7	0.1
Prairie-tea (Croton monanthogynus)	2.8	0.1
Paspalum (Paspalum ciliatifolium)	8.5	0.1
Sunflowers (Helianthus spp.)	3.4	0.1
Bush Clover (Lespedeza capitata)	0.6	0.1
Sassafras (Sassafras albidum)	4.5	trace
Pinkweed (Polygonum pensylvanicum)	6.2	trace
Cherry or Plum (Prunus spp.)	1.7	trace
Buttonweed (Diodia teres)	10.2	trace
Roses (Rosa spp.)	5.7	trace
Dogwoods (Cornus spp.)	1.7	trace
Three-seeded Mercury (Acalypha virginica)	3.4	trace
Small Wild Bean (Strophostyles leiosperma)	2.3	trace
Beef-steak Plant (Perilla frutescens)	0.6	trace
Bush Clover (Lespedeza virginica)	2.8	trace
Crab Grass (Digitaria sanguinalis)	8.5	trace
Water-Smartweed (Polygonum punctatum)	3.4	trace
Hickory Nut (Carya sp.)	0.6	trace
Blackberries (Rubus spp.)	3.4	trace
Rushfoil (Crotonopsis elliptica)	1.7	trace
Brome-Grass (Bromus sp.)	1.1	trace
Panic Grasses (Panicum spp.)	6.8	trace
Sedges (Carex spp.)	3.4	trace
Poison Ivy (Rhus radicans)	0.6	trace
Large Wild Bean (Strophostyles helvola)	0.6	trace
Smartweeds (Polygonum spp.)	11.9	trace
Red Cedar (Juniperus virginiana)	0.6	trace
Broomsedge (Andropogon virginicus)	4.0	trace
Goosefoot (Chenopodium sp.)	2.8	trace
Old-Witch Grass (Panicum capillare)	1.7	trace
Green Foxtail (Setaria viridis)	1.1	trace
Tall Red-top (Tridaia flava)	1.1	trace
Moss, unclassified	0.6	trace
Nimble Will (Muhlenbergia sp.)	0.6	trace
Nut Rush (Scleria sp.)	0.6	trace
Clover (Trifolium sp.)	0.6	trace
Three-seeded Mercury (Acalypha sp.)	0.6	trace
Dwarf Sumac (Rhus copallina)	0.6	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Bullnettle (Solanum carolinense)	0.6	trace
Hog-Peanut (Amphicarpa bracteata)	0.6	trace
White Vervain (Verbena urticifolia)	0.6	trace
St. John's-wort (Hypericum Drummondii)	0.6	trace
Wild Bergamot (Monarda fistulosa)	0.6	trace
Cleavers (Galium sp.)	0.6	trace
Evening-Primrose (Oenothera sp.)	0.6	trace
Thoroughwort (Eupatorium sp.)	0.6	trace
Ironweed (Vernonia sp.)	0.6	trace
Fescue (Festuca sp.)	0.6	trace
Barnyard-Grass (Echinochloa crusgalli)	0.6	trace
Johnson-Grass (Sorghum halepense)	0.6	trace
Sedge (Cyperus sp.)	0.6	trace
Water-pepper (Polygonum Hydropiper)	0.6	trace
Animal Foods:		
Short-horned Grasshoppers (Acrididae)	27.3	0.4
Ants (Formicidae)	15.3	0.3
Crayfish (Cambarus sp.)	1.7	0.1
Beetles, unclassified (Coleoptera)	11.4	0.1
Ground Beetles (Carabidae)	16.5	0.1
Snout Beetles (Curculionidae)	8.0	trace
Stink Bugs (Pentatomidae)	15.3	trace
Leaf Beetles (Chrysomelidae)	3.4	trace
Bugs, unclassified (Hemiptera)	9.1	trace
Dung Beetles (Scarabaeidae)	2.8	trace
Millepede (Diplopoda)	0.6	trace
Snail (Gastropoda)	1.1	trace
Insects, unclassified (Insecta)	2.8	trace
Squash Bug (Coreidae)	2.8	trace
Spiders (Araneida)	1.1	trace
Gravel	13.6	0.1
Total		100.0

TABLE 10. APRIL FOODS OF QUAIL IN MISSOURI

(Based upon examination of 48 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	75.0	47.8
Crotons (Croton spp.)	50.0	20.2
Common Ragweed (Ambrosia artemisiifolia)	47.9	6.6
False Buckthorn (Bumelia lanuginosa)	8.3	3.4
Corn (Zea Mays)	33.3	3.4

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Lanceleaf Ragweed (Ambrosia bidentata)	31.2	3.1
Rushfoil (Crotonopsis elliptica)	10.4	2.5
Osage Orange (Maclura pomifera)	4.2	2.4
Leaf material	20.8	2.2
Wheat (Triticum aestivum)	12.5	2.1
Acorns (Quercus spp.)	20.8	0.8
Sumacs, unclassified (Rhus spp.)	41.7	0.8
Yellow Foxtail (Setaria glauca)	22.9	0.5
Beggar-ticks (Bidens spp.)	2.1	0.4
Millet (Setaria italica)	2.1	0.4
Wild Cherry (Prunus serotina)	4.2	0.4
Wild Grapes (Vitis spp.)	22.9	0.3
Great Ragweed (Ambrosia trifida)	16.7	0.3
Tick-trefoils (Desmodium spp.)	6.2	0.2
Field Paspalum (Paspalum laeve)	6.2	0.2
Buttonweed (Diodia teres)	20.8	0.2
Japanese Clover (Lespedeza striata)	2.1	0.1
Oats (Avena sativa)	2.1	0.1
Brome-Grass (Bromus sp.)	2.1	0.1
Plant Gall	2.1	0.1
Sedges (Carex spp.)	12.5	0.1
Coralberry (Symphoricarpos orbiculatus)	16.7	trace
Roses (Rosa spp.)	6.2	trace
Smartweeds (Polygonum spp.)	8.3	trace
Pinkweed (Polygonum pensylvanicum)	6.2	trace
Small Wild Bean (Strophostyles leiosperma)	2.1	trace
Sassafras (Sassafras albidum)	2.1	trace
Sunflower (Helianthus sp.)	2.1	trace
Paspalum (Paspalum sp.)	12.5	trace
Chickweed (Stellaria media)	8.3	trace
Fall Panic Grass (Panicum dichotomiflorum)	8.3	trace
Crab Grass (Digitaria sanguinalis)	4.2	trace
Old-Witch Grass (Panicum capillare)	4.2	trace
St. John's-wort (Hypericum Drummondii)	8.3	trace
Panic Grasses (Panicum spp.)	6.2	trace
False Buckwheat (Polygonum scandens)	6.2	trace
Cherry or Plum (Prunus spp.)	4.2	trace
Paspalum (Paspalum ciliatifolium)	2.1	trace
Dogwood (Cornus sp.)	2.1	trace
Moss, unclassified	2.1	trace
Spike-Grass (Uniola latifolia)	2.1	trace
Small Crab Grass (Digitaria ischaemum)	2.1	trace
Drop-seed Grass (Sporobolus neglectus)	2.1	trace
Nut Rush (Scleria sp.)	2.1	trace
Rush (Juncus sp.)	2.1	trace
Hawthorn (Crataegus sp.)	2.1	trace
Blackberry (Rubus sp.)	2.1	trace
Clover (Trifolium sp.)	2.1	trace

Brome-Grasses (Bromus spp.)	0.6	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Goldenrod (Solidago sp.)	2.1	trace
Animal Foods:		
Short-horned Grasshoppers (Acrididae)	35.4	0.5
Mouse, unclassified	2.1	0.2
Ants (Formicidae)	18.7	0.2
Ground Beetles (Carabidae)	25.0	0.1
Stink Bugs (Pentatomidae)	12.5	0.1
Leaf Beetles (Chrysomelidae)	12.5	0.1
Bugs, unclassified (Hemiptera)	6.2	0.1
Snout Beetles (Curculionidae)	14.6	trace
Beetles, unclassified (Coleoptera)	10.4	trace
Spider (Araneida)	2.1	trace
Dung Beetle (Scarabaeidae)	4.2	trace
Plant Bug (Miridae)	2.1	trace
Squash Bug (Coreidae)	2.1	trace
Fly (Diptera)	2.1	trace
Insect, unclassified (Insecta)	2.1	trace
Snail (Gastropoda)	2.1	trace
Gravel	12.5	trace
Total		100.0

TABLE 11. FOODS OF QUAIL IN THE PRAIRIE REGION OF MISSOURI

(Based upon examination of 749 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	57.1	28.0
Corn (Zea Mays)	46.6	22.3
Common Ragweed (Ambrosia artemisiifolia)	67.3	16.1
Yellow Foxtail (Setaria glauca)	32.7	8.0
Wheat (Triticum aestivum)	8.0	3.2
Beggar-ticks (Bidens spp.)	20.2	2.7
Sorghum (Sorghum vulgare)	4.7	2.2
Fall Panic Grass (Panicum dichotomiflorum)	20.4	1.6
Crotons (Croton spp.)	20.4	1.5
Sumacs, unclassified (Rhus spp.)	27.8	1.3
Lanceleaf Ragweed (Ambrosia bidentata)	22.0	1.1
Great Ragweed (Ambrosia trifida)	13.6	1.0
Sassafras (Sassafras albidum)	6.9	0.9
Smooth Sumac (Rhus glabra)	2.4	0.9
Osage Orange (Maclura pomifera)	2.7	0.7
Wild Grapes (Vitis spp.)	23.0	0.6

(Continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
False Buckwheat (Polygonum scandens)	11.5	0.6
Chinese Lespedeza (Lespedeza cuneata)	3.9	0.6
Acorns, unclassified (Quercus spp.)	9.2	0.4
Tick-trefoils (Desmodium spp.)	5.1	0.4
Sunflowers (Helianthus spp.)	4.1	0.4
Small Crab Grass (Digitaria Ischaemum)	13.1	0.4
Dwarf Sumac (Rhus copallina)	1.1	0.3
Marsh-Elder (Iva ciliata)	0.5	0.3
Pinkweed (Polygonum pensylvanicum)	14.2	0.3
Field Paspalum (Paspalum laeve)	1.5	0.3
Oats (Avena sativa)	4.5	0.2
Raccoon Grape (Ampelopsis cordata)	0.9	0.2
Water-Smartweed (Polygonum punctatum)	5.5	0.2
Prairie-tea (Croton monanthogynus)	1.2	0.1
Leaf Material	2.9	0.1
Black Locust (Robinia Pseudo-Acacia)	0.7	0.1
Ground-cherries (Physalis spp.)	6.1	0.1
Old-Witch Grass (Panicum capillare)	3.5	0.1
Rushfoil (Crotonopsis elliptica)	1.3	0.1
Undetermined Plant Material	4.9	0.1
Poison Ivy (Rhus radicans)	2.5	0.1
Bush Clover (Lespedeza virginica)	0.8	0.1
Maple (Acer sp.)	0.5	0.1
Johnson-Grass (Sorghum halepense)	0.9	0.1
Coralberry (Symphoricarpos orbiculatus)	14.6	0.1
Panic Grass (Panicum flexile)	0.1	0.1
Panic Grasses (Panicum spp.)	7.6	trace
Buttonweed (Diodia teres)	5.7	trace
Rose (Rosa multiflora)	0.9	trace
Smartweeds (Polygonum spp.)	12.4	trace
Paspalum (Paspalum ciliatifolium)	9.3	trace
Bush Clovers (Lespedeza spp.)	1.1	trace
Wild Plum (Prunus americana)	0.9	trace
Crab Grass (Digitaria sanguinalis)	6.0	trace
Persimmon (Diospyros virginiana)	0.1	trace
Rice-Cut-Grass (Leersia oryzoides)	1.9	trace
Dogwoods (Cornus spp.)	3.9	trace
Paspalums (Paspalum spp.)	8.5	trace
Blackberries (Rubus spp.)	0.4	trace
Roses (Rosa spp.)	4.9	trace
Viburnums (Viburnum spp.)	0.8	trace
Lady's-thumb (Polygonum Persicaria)	1.3	trace
Red Cedar (Juniperus virginiana)	0.8	trace
Black Nightshade (Solanum nigrum)	1.3	trace
Brome-Grasses (Bromus spp.)	1.9	trace
Bush Clover (Lespedeza capitata)	0.1	trace
Cherry or Plum (Prunus spp.)	2.3	trace
Barnyard-Grass (Echinochloa crusgalli)	1.1	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Small Wild Bean (Strophostyles leiosperma)	1.3	trace
Noseburn (Tragia sp.)	0.3	trace
Bullnettle (Solanum carolinense)	1.2	trace
Grass Leaves	0.4	trace
Soy-Bean (Glycine Max)	0.3	trace
Violet (Viola sp.)	0.3	trace
Hogwort (Croton capitatus)	0.3	trace
Sedges (Carex spp.)	2.8	trace
Hickory Nut (Carya sp.)	0.1	trace
Prickly Mallow (Sida spinosa)	1.9	trace
Asters (Aster spp.)	1.2	trace
Large Wild Bean (Strophostyles helvola)	0.3	trace
White Sweet Clover (Melilotus alba)	0.1	trace
Yellow Sweet Clover (Melilotus ? officinalis)	0.1	trace
Green Foxtail (Setaria viridis)	0.4	trace
Tall Red-top (Triodia flava)	0.7	trace
Plant Galls	0.5	trace
Spike-rush (Eleocharis ? obtusa)	0.3	trace
Vervains (Verbena spp.)	1.1	trace
White Vervain (Verbena urticifolia)	0.8	trace
Goldenrods (Solidago spp.)	0.4	trace
Japanese Clover (Lespedeza striata)	0.1	trace
Velvet-leaf (Abutilon Theophrasti)	0.1	trace
Goosefoots (Chenopodium spp.)	2.8	trace
Fimbristylis (Fimbristylis Baldwiniana)	1.2	trace
Fleabanes (Erigeron spp.)	1.2	trace
Broomsedge (Andropogon virginicus)	0.9	trace
Three-seeded Mercury (Acalypha virginica)	0.8	trace
Wood Sorrel (Oxalis spp.)	1.1	trace
Sedges (Cyperus spp.)	0.8	trace
Water-pepper (Polygonum Hydropiper)	0.8	trace
Timothy (Phleum pratense)	0.7	trace
Moss, unclassified	0.5	trace
Three-seeded Mercurys (Acalypha spp.)	0.5	trace
Wild Cherry (Prunus serotina)	0.5	trace
Nimble Will (Muhlenbergia sp.)	0.5	trace
Thoroughworts (Eupatorium spp.)	0.5	trace
Jimsonweeds (Datura spp.)	0.5	trace
Eyebane (Euphorbia maculata)	0.5	trace
Wild Bergamot (Monarda fistulosa)	0.4	trace
Docks (Rumex spp.)	0.4	trace
Fescue (Festuca spp.)	0.4	trace
Amaranths (Amaranthus spp.)	0.4	trace
Carpetweed (Mollugo verticillata)	0.3	trace
Mild Water-pepper (Polygonum hydropiperoides)	0.3	trace
Partridge-pea (Cassia fasciculata)	0.3	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.3	trace
Hawthorn (Crataegus sp.)	0.3	trace
St. John's-worts (Hypericum spp.)	0.3	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Chickweed (Stellaria media)	0.3	trace
Witch-Hazel (Hamamelis vernalis)	0.3	trace
Nodding Smartweed (Polygonum lapathifolium)	0.3	trace
Beef-steak Plant (Perilla frutescens)	0.1	trace
Indian-Grass (Sorghastrum nutans)	0.1	trace
Bluestem (Andropogon Gerardi)	0.1	trace
Drop-seed Grass (Sporobolus asper)	0.1	trace
Hog-Peanut (Amphicarpa bracteata)	0.1	trace
Three-seeded Mercury (Acalypha rhomboidea)	0.1	trace
False Buckthorn (Bumelia lanuginosa)	0.1	trace
Cleavers (Galium sp.)	0.1	trace
Hackberry (Celtis occidentalis)	0.1	trace
Hackberry (Celtis sp.)	0.1	trace
Foxtail (Setaria verticillata)	0.1	trace
Bluegrass (Poa sp.)	0.1	trace
Triple-awn Grass (Aristida sp.)	0.1	trace
Bluestem (Andropogon sp.)	0.1	trace
Pellitory (Parietaria pensylvanica)	0.1	trace
Bluegrass (Poa pratensis)	0.1	trace
Chufa (Cyperus esculentus)	0.1	trace
Sedge (Cyperus strigosus)	0.1	trace
Marsh Smartweed (Polygonum coccineum)	0.1	trace
St. John's-wort (Hypericum mutilum)	0.1	trace
St. John's-wort (Hypericum Drummondii)	0.1	trace
Shrubby St. John's-wort (Hypericum spathulatum)	0.1	trace
Cleavers (Galium Aparine)	0	trace
Clammy Cuphea (Cuphea petiolata)	0.1	trace
Blueberry (Vaccinium sp.)	0.1	trace
Mullein (Verbascum sp.)	0.1	trace
Low Hop Clover (Trifolium procumbens)	0.1	trace
Clover (Trifolium sp.)	0.1	trace
Plantain (Plantago Rugelii)	0.1	trace
Spike-rush (Eleocharis sp.)	0.1	trace
Wild Carrot (Daucus Carota)	0.1	trace
Shepherd's-purse (Capsella Bursa-pastoris)	0.1	trace
Spurge (Euphorbia sp.)	0.1	trace
Mock Pennyroyal (Hedeoma pulegioides)	0.1	trace
Cranesbill (Geranium carolinianum)	0.1	trace
Button-Snakeroot (Liatris sp.)	0.1	trace
Ironweed (Vernonia sp.)	0.1	trace
Black-eyed Susan (Rudbeckia hirta)	0.1	trace
Animal Foods:		
Short-horned Grasshoppers (Acrididae)	34.2	1.0
Ground Beetles (Carabidae)	10.7	0.1
Stink Bugs (Pentatomidae)	14.7	0.1
Bugs, unclassified (Hemiptera)	6.4	0.1
Snout Beetles (Curculionidae)	2.4	0.1

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Long-horned Grasshoppers (Tettigoniidae)	1.1	trace
Ants (Formicidae)	8.4	trace
Beetles, unclassified (Coleoptera)	9.2	trace
Squash Bugs (Coreidae)	1.5	trace
Leaf Beetles (Chrysomelidae)	3.5	trace
Walking-sticks (Phasmidae)	0.9	trace
Assassin Bugs (Reduviidae)	0.5	trace
Lygaeid Bugs (Lygaeidae)	0.3	trace
Insects, unclassified (Insecta)	3.3	trace
Snails (Gastropoda)	0.5	trace
Dung Beetles (Scarabaeidae)	2.1	trace
Wasps (Hymenoptera)	0.5	trace
Leaf Hoppers (Cicadellidae)	0.4	trace
Spiders (Araneida)	0.7	trace
Crayfish (Cambarus sp)	0.1	trace
Undetermined Animal Matter	0.1	trace
Gravel	13.4	0.1
Total		100.0

TABLE 12. FOODS OF QUAIL IN THE OZARK REGION OF MISSOURI

(Based upon examination of 609 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Common Ragweed (Ambrosia artemisiifolia)	60.1	28.3
Korean Lespedeza (Lespedeza stipulacea)	57.5	24.3
Crotons (Croton spp.)	41.2	12.0
Corn (Zea Mays)	34.0	11.9
Lanceleaf Ragweed (Ambrosia bidentata)	27.8	4.2
Wheat (Triticum aestivum)	15.3	3.7
Sassafras (Sassafras albidum)	12.5	2.4
Acorns, unclassified (Quercus spp.)	17.6	2.0
Yellow Foxtail (Setaria glauca)	20.4	1.1
Japanese Clover (Lespedeza striata)	4.3	0.7
Catalpa (Catalpa speciosa)	1.0	0.7
Fall Panic Grass (Panicum dichotomiflorum)	11.5	0.6
Rushfoil (Crotonopsis elliptica)	7.6	0.6
Sumacs, unclassified (Rhus spp.)	23.2	0.6
Sorghum (Sorghum vulgare)	2.5	0.6
Great Ragweed (Ambrosia trifida)	7.1	0.5
Beggar-ticks (Bidens spp.)	5.7	0.4
Small Crab Grass (Digitaria Ischaemum)	17.6	0.4
Smooth Sumac (Rhus glabra)	1.6	0.3

(continued)

Food Item	Per Cent By Occurrence	Volume
Leaf Material	4.6	0.3
Beef-steak Plant (Perilla frutescens)	4.4	0.3
False Buckthorn (Bumelia lanuginosa)	0.8	0.3
Wild Grapes (Vitis spp.)	18.4	0.3
Pinkweed (Polygonum pensylvanicum)	12.0	0.3
Prairie-tea (Croton monanthogynus)	9.0	0.2
Undetermined Plant Material	4.9	0.2
Hogwort (Croton capitatus)	2.3	0.2
Bush Clovers (Lespedeza spp.)	4.8	0.2
Dwarf Sumac (Rhus copallina)	1.8	0.2
Paspalum (Paspalum ciliatifolium)	13.5	0.1
Buttonweed (Diodia teres)	17.2	0.1
Bush Clover (Lespedeza virginica)	1.5	0.1
Drop-seed Grass (Sporobolus neglectus)	1.0	0.1
Poison Ivy (Rhus radicans)	1.3	0.1
Ground-cherries (Physalis spp.)	7.2	0.1
False Buckwheat (Polygonum scandens)	3.6	0.1
Tick-trefoils (Desmodium spp.)	2.6	0.1
Wild Cherry (Prunus serotina)	1.1	0.1
Cherry or Plum (Prunus spp.)	3.0	0.1
Coralberry (Symphoricarpos orbiculatus)	13.5	trace
Sunflowers (Helianthus spp.)	0.8	trace
Wild Plum (Prunus americana)	1.3	trace
Ashes (Fraxinus spp.)	0.7	trace
Millet (Setaria italica)	0.2	trace
Bur-Cucumber (Sicyos angulatus)	0.3	trace
Grass Leaves	0.7	trace
Black Nightshade	6.6	trace
Nimble Will (Muhlenbergia sp.)	0.7	trace
Oats (Avena sativa)	4.6	trace
Paspalums (Paspalum spp.)	9.0	trace
Bullnettle (Solanum carolinense)	0.3	trace
Old-Witch Grass (Panicum capillare)	5.4	trace
Smartweeds (Polygonum spp.)	4.6	trace
Vervains (Verbena spp.)	1.6	trace
Red Cedar (Juniperus virginiana)	0.7	trace
Water-Smartweed (Polygonum punctatum)	2.0	trace
Roses (Rosa spp.)	4.4	trace
Brome-Grass (Bromus spp.)	2.0	trace
Plant Galls	1.0	trace
Osage Orange (Maclura pomifera)	0.5	trace
Sedges (Carex spp.)	5.1	trace
Crab Grass (Digitaria sanguinalis)	9.4	trace
Three-seeded Mercury (Acalypha virginica)	2.8	trace
Dogwoods (Cornus spp.)	1.6	trace
Indian Grass (Sorghastrum nutans)	0.7	trace
Morning-glory (Ipomoea hederacea)	0.2	trace
Panic Grasses (Panicum spp.)	7.2	trace

(continued)

Food Item	Per Cent By Occurrence	Volume
Small Wild Bean (Strophostyles leiosperma)	1.0	trace
Hackberry (Celtis sp.)	0.8	trace
Noseburns (Tragia spp.)	1.0	trace
Sensitive Brier (Schrankia Nuttallii)	0.2	trace
Moss, unclassified	0.7	trace
Field Paspalum (Paspalum laeve)	0.7	trace
Flowering Dogwood (Cornus Florida)	0.2	trace
Touch-me-not (Impatiens capensis)	0.2	trace
Hazelnut (Corylus americana)	0.2	trace
Lady's-thumb (Polygonum Persicaria)	1.3	trace
Chickweed (Stellaria media)	0.3	trace
Large Wild Bean (Strophostyles helvola)	0.2	trace
Three-seeded Mercury (Acalypha ostryaefolia)	0.2	trace
Viburnum (Viburnum sp.)	0.8	trace
Pellitory (Parietaria pensylvanica)	0.7	trace
Red Clover (Trifolium pratense)	0.5	trace
Partridge-pea (Cassia fasciculata)	0.5	trace
Buttonbush (Cephalanthus occidentalis)	0.2	trace
Goosefoots (Chenopodium spp.)	3.1	trace
Blackberries (Rubus spp.)	2.6	trace
Three-seeded Mercurys (Acalypha spp.)	1.8	trace
St. John's-wort (Hypericum Drummondii)	1.6	trace
Nut Rush (Scleria spp.)	1.3	trace
Broomsedge (Andropogon virginicus)	1.1	trace
Sedge (Cyperus ovularis)	0.8	trace
Carpetweed (Mollugo verticillata)	0.7	trace
White vervain (Verbena urticifolia)	0.7	trace
Triple-awn Grass (Aristida sp.)	0.7	trace
Evening-Primroses (Oenothera spp.)	0.7	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.7	trace
Hackberry (Celtis occidentalis)	0.5	trace
Chufa (Cyperus esculentus)	0.5	trace
St. John's-wort (Hypericum sp.)	0.5	trace
Green Foxtail (Setaria viridis)	0.5	trace
Thoroughwort (Eupatorium sp.)	0.5	trace
Hawthorn (Crataegus sp.)	0.5	trace
Clover (Trifolium sp.)	0.5	trace
Chickweed (Cerastium vulgatum)	0.3	trace
Spurge (Euphorbia sp.)	0.3	trace
Fleabane (Erigeron sp.)	0.3	trace
Tall Red-top (Tridoia flava)	0.3	trace
Low Hop Clover (Trifolium procumbens)	0.3	trace
Three-seeded Mercury (Acalypha rhomboidea)	0.3	trace
Fall Witch-Grass (Leptoloma cognatum)	0.3	trace
Blueberry (Vaccinium sp.)	0.3	trace
Cleavers (Galium sp.)	0.3	trace
Rice-Cut-Grass (Leersia oryzoides)	0.3	trace
Venus's Looking-glass (Specularia biflora)	0.3	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Amaranth (Amaranthus sp.)	0.3	trace
Nettle (Solanum sp.)	0.3	trace
Elderberry (Sambucus canadensis)	0.3	trace
Barnyard-Grass (Echinochloa sp.)	0.3	trace
Mild Water-pepper (Polygonum hydropiperoides)	0.3	trace
Foxtail (Setaria verticillata)	0.3	trace
Johnson-Grass (Sorghum halepense)	0.3	trace
Bluegrass (Poa pratensis)	0.3	trace
Mock Pennyroyal (Hedeoma pulegioides)	0.3	trace
Purslane (Portulaca oleracea)	0.2	trace
Velvet-leaf (Abutilon Theophrasti)	0.2	trace
Wild Lettuce (Lactuca canadensis)	0.2	trace
Spike-Grass (Uniola latifolia)	0.2	trace
Goose-Grass (Eleusine indica)	0.2	trace
Selfheal (Prunella vulgaris)	0.2	trace
Prickly Mallow (Sida spinosa)	0.2	trace
Persimmon (Diospyros virginiana)	0.2	trace
Eyebane (Euphorbia maculata)	0.2	trace
Pokeweed (Phytolacca americana)	0.2	trace
Love-Grass (Eragrostis sp.)	0.2	trace
Sedge (Cyperus sp.)	0.2	trace
Alsike Clover (Trifolium hybridum)	0.2	trace
Yerba-de-Tago (Eclipta alba)	0.2	trace
Jimsonweed (Datura sp.)	0.2	trace
Yarrow (Achillea Millefolium)	0.2	trace
Dodder (Cuscuta sp.)	0.2	trace
Plantain (Plantago sp.)	0.2	trace
Hedge-parsley (Torilis japonica)	0.2	trace
Scorpion-grass (Myosotis verna)	0.2	trace
Low Blueberry (Vaccinium vacillans)	0.2	trace
Sensitive Plant (Cassia nictitans)	0.2	trace
Sand-Drop-seed (Cporobolus cryptandrus)	0.2	trace
Crab Grass (Digitaria filiformis)	0.2	trace
Bluegrass (Poa sp.)	0.2	trace
Ironweed (Vernonia sp.)	0.2	trace
Wild Bergamot (Monarda fistulosa)	0.2	trace
Goldenrod (Solidago sp.)	0.2	trace
Rush (Juncus sp.)	0.2	trace
Animal Foods:		
Short-horned Grasshoppers (Acrididae)	30.5	0.3
Ground Beetles (Carabidae)	17.7	0.1
Stink Bugs (Pentatomidae)	15.8	0.1
Ants (Formicidae)	9.5	0.1
Beetles, Unclassified (Coleoptera)	11.8	trace
Crayfish (Cambarus sp.)	0.7	trace
Bugs, Unclassified (Hemiptera)	8.2	trace
Mouse, Unclassified	0.3	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Snout Beetles (Curculionidae)	4.1	trace
Dung Beetles (Scarabaeidae)	3.1	trace
Leaf Beetles (Chrysomelidae)	5.4	trace
Walking-sticks (Phasmidae)	0.7	trace
Insects, Unclassified (Insecta)	4.6	trace
Squash Bugs (Coreidae)	1.5	trace
Long-horned Grasshoppers (Tettigoniidae)	1.3	trace
Leaf Hoppers (Cicadellidae)	1.0	trace
Spiders (Araneida)	1.5	trace
Millepede (Diplopoda)	0.2	trace
Undetermined Animal Matter	0.2	trace
Snails (Gastropoda)	0.8	trace
Lygaeid Bug (Lygaeidae)	0.2	trace
Fungus Gnat (Mycetophilidae)	0.2	trace
Assassin Bug (Reduviidae)	0.2	trace
Plant Bug (Miridae)	0.2	trace
Rove Beetle (Staphylinidae)	0.2	trace
Fly (Diptera)	0.2	trace
Moth (Tineidae)	0.2	trace
Ichneumon Wasp (Ichneumonidae)	0.2	trace
Gravel	19.7	0.1
Total		100.0

TABLE 13 FOODS OF QUAIL IN MISSOURI (SEPTEMBER-APRIL)

(Based upon examination of 1,358 droppings samples)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Plant Foods:		
Korean Lespedeza (Lespedeza stipulacea)	57.3	26.3
Common Ragweed (Ambrosia artemisiifolia)	64.1	21.9
Corn (Zea Mays)	40.9	17.4
Crotons (Croton spp.)	29.7	6.5
Yellow Foxtail (Setaria glauca)	27.2	4.8
Wheat (Triticum aestivum)	11.3	3.4
Lanceleaf Ragweed (Ambrosia bidentata)	24.6	2.5
Sassafras (Sassafras albidum)	9.4	1.6
Beggar-ticks (Bidens spp.)	13.7	1.6
Sorghum (Sorghum vulgare)	3.7	1.4
Acorns, Unclassified (Quercus spp.)	13.0	1.2
Fall Panic Grass (Panicum dichotomiflorum)	16.4	1.1
Sumacs, Unclassified (Rhus spp.)	25.8	1.0
Great Ragweed (Ambrosia trifida)	10.7	0.7
Smooth Sumac (Rhus glabra)	2.1	0.6

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Wild Grapes (Vitis spp.)	20.9	0.5
Small Crab Grass (Digitaria Ischaemum)	15.1	0.4
Osage Orange (Maclura pomifera)	1.7	0.4
False Buckwheat (Polygonum scandens)	8.0	0.4
Japanese Clover (Lespedeza striata)	2.0	0.3
Catalpa (Catalpa speciosa)	0.4	0.3
Rushfoil (Crotonopsis elliptica)	4.1	0.3
Chinese Lespedeza (Lespedeza cuneata)	2.1	0.3
Pinkweed (Polygonum pensylvanicum)	13.2	0.3
Dwarf Sumac (Rhus copallina)	1.4	0.3
Tick-trefoils (Desmodium spp.)	4.0	0.2
Sunflowers (Helianthus spp.)	2.7	0.2
Leaf Material	3.7	0.2
Prairie-tea (Croton monanthogynus)	4.7	0.2
Marsh-Elder (Iva ciliata)	0.3	0.2
Field Paspalum (Paspalum laeve)	1.1	0.1
Beef-steak Plant (Perilla frutescens)	2.1	0.1
False Buckthorn (Bumelia lanuginosa)	0.4	0.1
Undetermined Plant Material	4.9	0.1
Oats (Avena sativa)	4.6	0.1
Raccoon Grape (Ampelopsis cordata)	0.5	0.1
Water-Smartweed (Polygonum punctatum)	3.9	0.1
Bush Clovers (Lespedeza spp.)	2.7	0.1
Hogwort (Croton capitatus)	1.2	0.1
Ground-cherries (Physalis spp.)	6.6	0.1
Bush Clover (Lespedeza virginica)	1.1	0.1
Paspalum (Paspalum ciliatifolium)	11.2	0.1
Buttonweed (Diodia teres)	10.9	0.1
Poison Ivy (Rhus radicans)	2.0	0.1
Black Locust (Robinia Pseudo-Acacia)	0.4	0.1
Coralberry (Symphoricarpos orbiculatus)	14.1	0.1
Old-Witch Grass (Panicum capillare)	4.3	0.1
Drop-seed Grass (Sporobolus neglectus)	0.4	0.1
Maple (Acer sp.)	0.3	trace
Wild Plum (Prunus americana)	1.1	trace
Johnson-Grass (Sorghum halepense)	0.7	trace
Cherry or Plum (Prunus spp.)	2.6	trace
Wild Cherry (Prunus serotina)	0.5	trace
Panic Grass (Panicum flexile)	0.1	trace
Smartweeds (Polygonum spp.)	8.9	trace
Panic Grasses (Panicum spp.)	7.4	trace
Paspalums (Paspalum spp.)	8.8	trace
Black Nightshade (Solanum nigrum)	3.7	trace
Rose (Rosa multiflora)	0.5	trace
Grass Leaves	0.5	trace
Ash (Fraxinus sp.)	0.3	trace
Millet (Setaria italica)	0.1	trace
Crab Grass (Digitaria sanguinalis)	7.5	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Bur-Cucumber (Sicyos angulatus)	0.1	trace
Dogwoods (Cornus spp.)	2.9	trace
Red Cedar (Juniperus virginiana)	0.7	trace
Roses (Rosa spp.)	3.6	trace
Persimmon (Diospyros virginiana)	0.1	trace
Rice-Cut-Grass (Leersia oryzoides)	1.2	trace
Nimble Will (Muhlenbeigia spp.)	0.6	trace
Bullnettle (Solanum carolinense)	0.8	trace
Blackberries (Rubus spp.)	1.4	trace
Brome-Grasses (Bromus spp.)	1.9	trace
Viburnums (Viburnum spp.)	0.6	trace
Lady's-thumb (Polygonum Persicaria)	0.9	trace
Vervains (Verbena spp.)	1.3	trace
Small Wild Bean (Strophostyles leiosperma)	1.2	trace
Noseburn (Tragia sp.)	0.6	trace
Bush Clover (Lespedeza capitata)	0.1	trace
Barnyard-Grass (Echinochloa crusgalli)	0.6	trace
Sedges (Carex spp.)	3.8	trace
Plant Galls	0.7	trace
Soy-Bean (Glycine Max)	0.1	trace
Three-seeded Mercury (Acalypha virginica)	1.7	trace
Violet (Viola sp.)	0.1	trace
Indian Grass (Sorghastrum nutans)	0.4	trace
Morning-glory (Ipomoea hederacea)	0.1	trace
Hackberry (Celtis spp.)	0.4	trace
Large Wild Bean (Strophostyles helvola)	0.2	trace
Sensitive Brier (Schrankia Nuttallii)	0.1	trace
Hickory Nut (Carya sp.)	0.1	trace
Moss, Unclassified	0.6	trace
Prickly Mallow (Sida spinosa)	1.1	trace
Flowering Dogwood (Cronus florida)	0.1	trace
Asters (Aster spp.)	0.7	trace
White Sweet Clover (Melilotus alba)	0.1	trace
Yellow Sweet Clover (Melilotus officinalis)	0.1	trace
Green Foxtail (Setaria viridis)	0.4	trace
Touch-me-not (Impatiens capensis)	0.1	trace
Hazelnut (Corylus americana)	0.1	trace
Chickweed (Stellaria media)	0.3	trace
Three-seeded Mercury (Acalypha ostryaefolia)	0.1	trace
Tall Red-top (Triodia flava)	0.5	trace
Spike-rush (Eleocharis ? obtusa)	0.1	trace
Pellitory (Parietaria pensylvanica)	0.4	trace
White Vervain (Verbena urticifolia)	0.7	trace
Partridge-pea (Cassia fasciculata)	0.4	trace
Goldenrods (Solidago spp.)	0.3	trace
Red Clover (Trifolium pratense)	0.2	trace
Velvet-leaf (Abutilon Theophrasti)	0.1	trace
Buttonbush (Cephalanthus occidentalis)	0.1	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Goosefoots (Chenopodium spp.)	2.9	trace
Blackberries (Rubus spp.)	1.2	trace
Three-seeded Mercurys (Acalypha spp.)	1.1	trace
Broomsedge (Andropogon virginicus)	1.0	trace
St. John's-wort (Hypericum Drummondii)	0.8	trace
Fleabanes (Erigeron spp.)	0.8	trace
Fimbristylis (Fimbristylis Baldwiniana)	0.7	trace
Wood Sorrel (Oxalis spp.)	0.6	trace
Nut Rush (Scleria spp.)	0.6	trace
Sedges (Cyperus spp.)	0.5	trace
Thoroughworts (Eupatorium spp.)	0.5	trace
Carpetweed (Mollugo verticillata)	0.4	trace
Poverty-Grass (Sporobolus vaginiflorus)	0.4	trace
Water-pepper (Polygonum Hydropiper)	0.4	trace
Eyebane (Euphorbia maculata)	0.4	trace
Jimsonweed (Datura sp.)	0.4	trace
Amaranth (Amaranth sp.)	0.4	trace
Timothy (Phleum pratense)	0.4	trace
Hawthorns (Crataegus spp.)	0.4	trace
Sedge (Cyperus ovularis)	0.4	trace
St. John's-wort (Hypericum sp.)	0.4	trace
Triple-awn Grass (Aristida sp.)	0.4	trace
Moss, unclassified	0.3	trace
Wild Bergamot (Monarda fistulosa)	0.3	trace
Mild Water-pepper (Polygonum hydropiperoides)	0.3	trace
Evening-Primroses (Oenothera spp.)	0.3	trace
Hackberry (Celtis occidentalis)	0.3	trace
Chufa (Cyperus esculentus)	0.3	trace
Clover (Trifolium sp.)	0.3	trace
Docks (Rumex spp.)	0.2	trace
Fescue (Festuca sp.)	0.2	trace
Three-seeded Mercury (Acalypha rhomboidea)	0.2	trace
Cleavers (Galium sp.)	0.2	trace
Foxtail (Setaria verticillata)	0.2	trace
Bluegrass (Poa pratensis)	0.2	trace
Blueberry (Vaccinium sp.)	0.2	trace
Low Hop Clover (Trifolium procumbens)	0.2	trace
Spurges (Euphorbia spp.)	0.2	trace
Mock Pennyroyal (Hedeoma pulegioides)	0.2	trace
Witch-Hazel (Hamamelis vernalis)	0.1	trace
Nodding smartweed (Polygonum lapathifolium)	0.1	trace
Bluegrass (Poa sp.)	0.1	trace
Ironweed (Vernonia sp.)	0.1	trace
Chickweed (Cerastium vulgatum)	0.1	trace
Fall Witch-Grass (Leptoloma cognatum)	0.1	trace
Venus's Looking-glass (Specularia biflora)	0.1	trace
Nettle (Solanum sp.)	0.1	trace
Elderberry (Sambucus canadensis)	0.1	trace

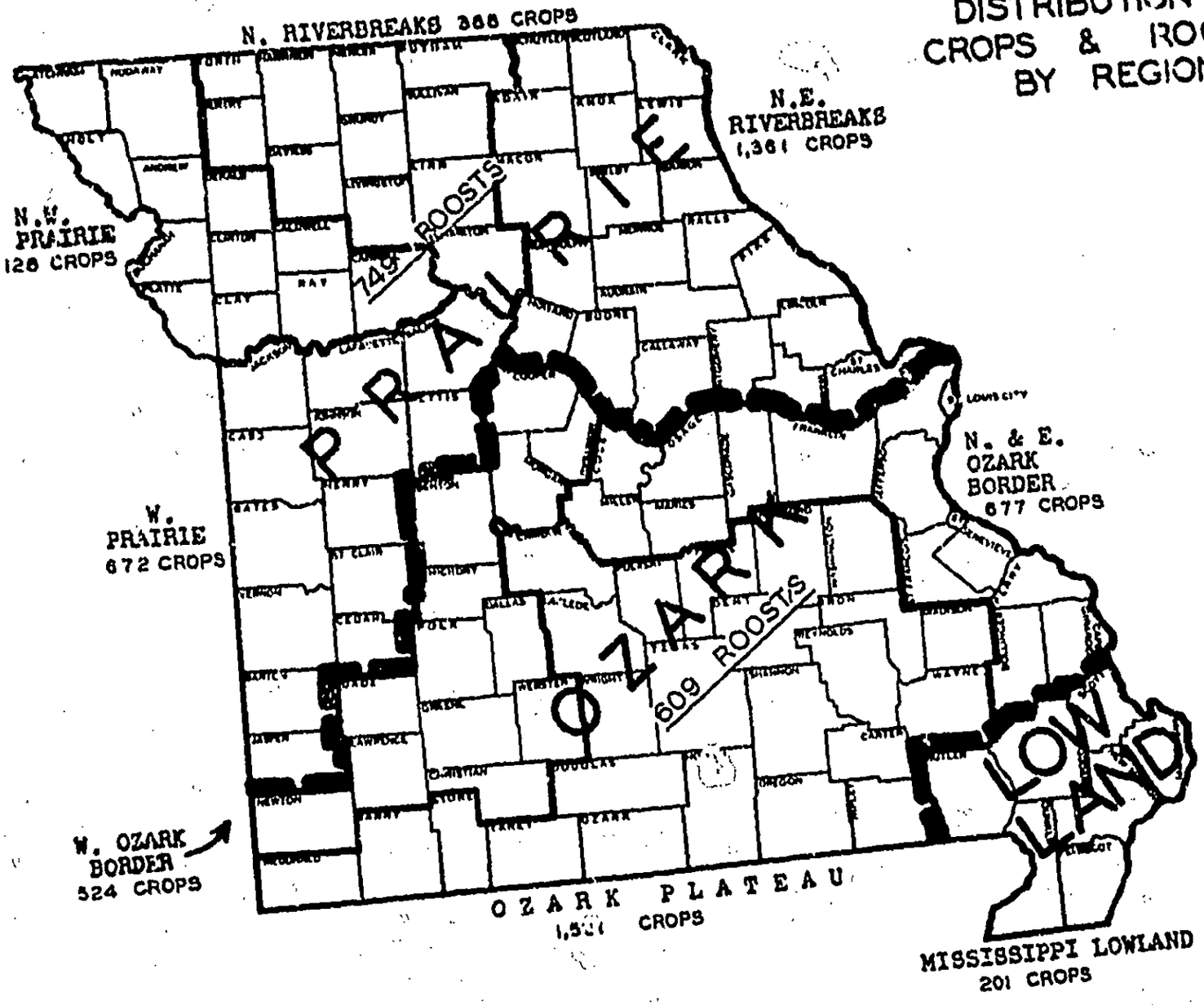
(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Barnyard-Grass (Echinochloa sp.)	0.1	trace
Bluestem (Andropogon Gerardi)	0.1	trace
Drop-seed Grass (Sporobolus asper)	0.1	trace
Hog-Peanut (Amphicarpa bracteata)	0.1	trace
Bluestem (Andropogon sp.)	0.1	trace
Sedge (Cyperus strigosus)	0.1	trace
Marsh-Smartweed (Polygonum coccineum)	0.1	trace
St. John's-wort (Hypericum mutilum)	0.1	trace
St. John's-wort (Hypericum spathulatum)	0.1	trace
Cleavers (Galium Aparine)	0.1	trace
Mullein (Verbascum sp.)	0.1	trace
Clammy Cuphea (Cuphea petiolata)	0.1	trace
Selfheal (Prunella vulgaris)	0.1	trace
Pokeweed (Phytolacca americana)	0.1	trace
Plantain (Plantago Rugelii)	0.1	trace
Spike-rush (Eleocharis sp.)	0.1	trace
Wild Carrot (Daucus Carota)	0.1	trace
Shepherd's-purse (Capsella Bursa-pastoris)	0.1	trace
Cranesbill (Geranium carolinianum)	0.1	trace
Button-Snakeroot (Liatris sp.)	0.1	trace
Black-eyed Susan (Rudbeckia hirta)	0.1	trace
Purslane (Portulaca oleracea)	0	trace
Plantain (Plantago sp.)	0	trace
Wild Lettuce (Lactuca canadensis)	0.1	trace
Spike-Grass (Uniola latifolia)	0.1	trace
Goose-Grass (Eleusine indica)	0.1	trace
Love-Grass (Eragrostis sp.)	0.1	trace
Alsike Clover (Trifolium hybridum)	0.1	trace
Yerba-de-Tago (Eclipta alba)	0.1	trace
Yarrow (Achillea Millefolium)	0.1	trace
Dodder (Cuscuta sp.)	0.1	trace
Hedge-parsley (Torilis japonica)	0.1	trace
Scorpion-grass (Myosotis verna)	0.1	trace
Low Blueberry (Vaccinium vacillans)	0.1	trace
Sensitive Plant (Cassia nictitans)	0.1	trace
Sand-Drop-seed (Sporobolus cryptandrus)	0.1	trace
Crab Grass (Digitaria filiformis)	0.1	trace
Rush (Juncus sp.)	0.1	trace
Animal Foods:		
Short-horned Grasshoppers (Acrididae)	32.5	0.7
Ground Beetles (Carabidae)	13.8	0.1
Stink Bugs (Pentatomidae)	15.2	0.1
Ants (Formicidae)	3.9	0.1
Bugs, Unclassified (Hemiptera)	7.2	trace
Beetles, Unclassified (Coleoptera)	10.4	trace
Snout Beetles (Curculionidae)	3.2	trace
Long-horned Grasshoppers (Tettigoniidae)	1.2	trace

(continued)

Food Item	Per Cent By Occurrence	Per Cent By Volume
Crayfish (Cambarus sp.)	0.4	trace
Squash Bugs (Coreidae)	1.5	trace
Leaf Beetles (Chrysomelidae)	4.3	trace
Walking-sticks (Phasmidae)	0.8	trace
Dung Beetles (Scarabaeidae)	2.6	trace
Mouse, Unclassified	0.1	trace
Insects, Unclassified (Insecta)	3.9	trace
Assassin Bugs (Reduviidae)	[illegible]	trace
Lygaeid Bugs (Lygaeidae)	0.2	trace
Snails (Gastropoda)	0.7	trace
Leaf Hoppers (Cicadellidae)	0.7	trace
Spiders (Araneida)	1.0	trace
Wasps (Hymenoptera)	0.3	trace
Undetermined Animal Matter	0.1	trace
Millipede (Diplopoda)	0.1	trace
Fungus Gnat (Mycetophilidae)	0.1	trace
Plant Bug (Miridae)	0.1	trace
Rove Beetle (Staphylinidae)	0.1	trace
Fly (Diptera)	0.1	trace
Moth (Tineidae)	0.1	trace
Ichneumon Wasp (Ichneumonidae)	0.1	trace
Gravel	16.2	0.1
TOTAL PLANT		98.9
TOTAL ANIMAL		1.1
TOTAL GRAVEL		0.1
TOTAL CONTENTS		100.0

FIG. 1
DISTRIBUTION OF CROPS & ROOSTS BY REGION



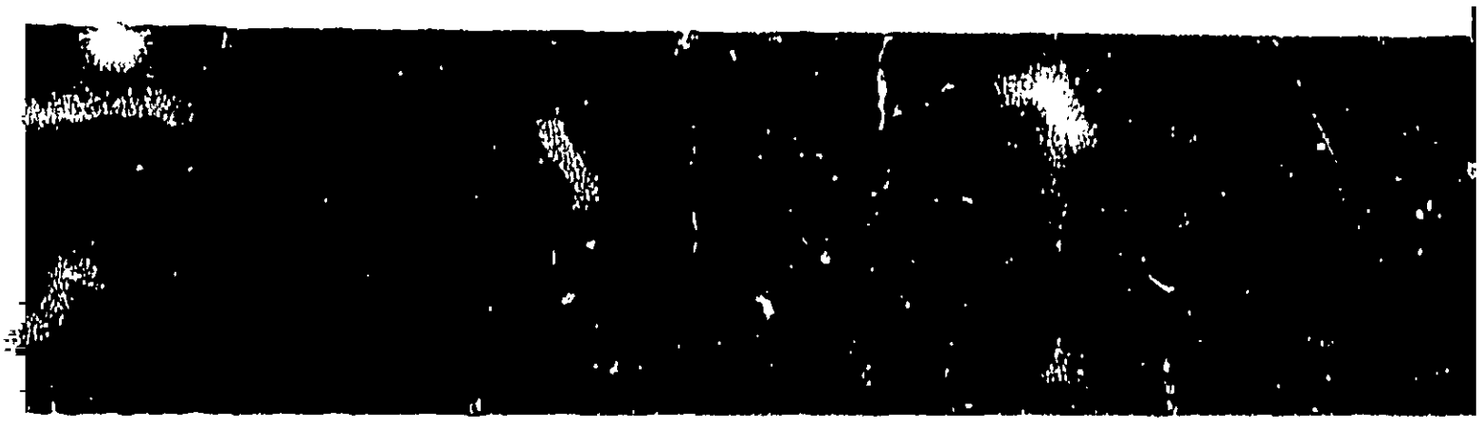
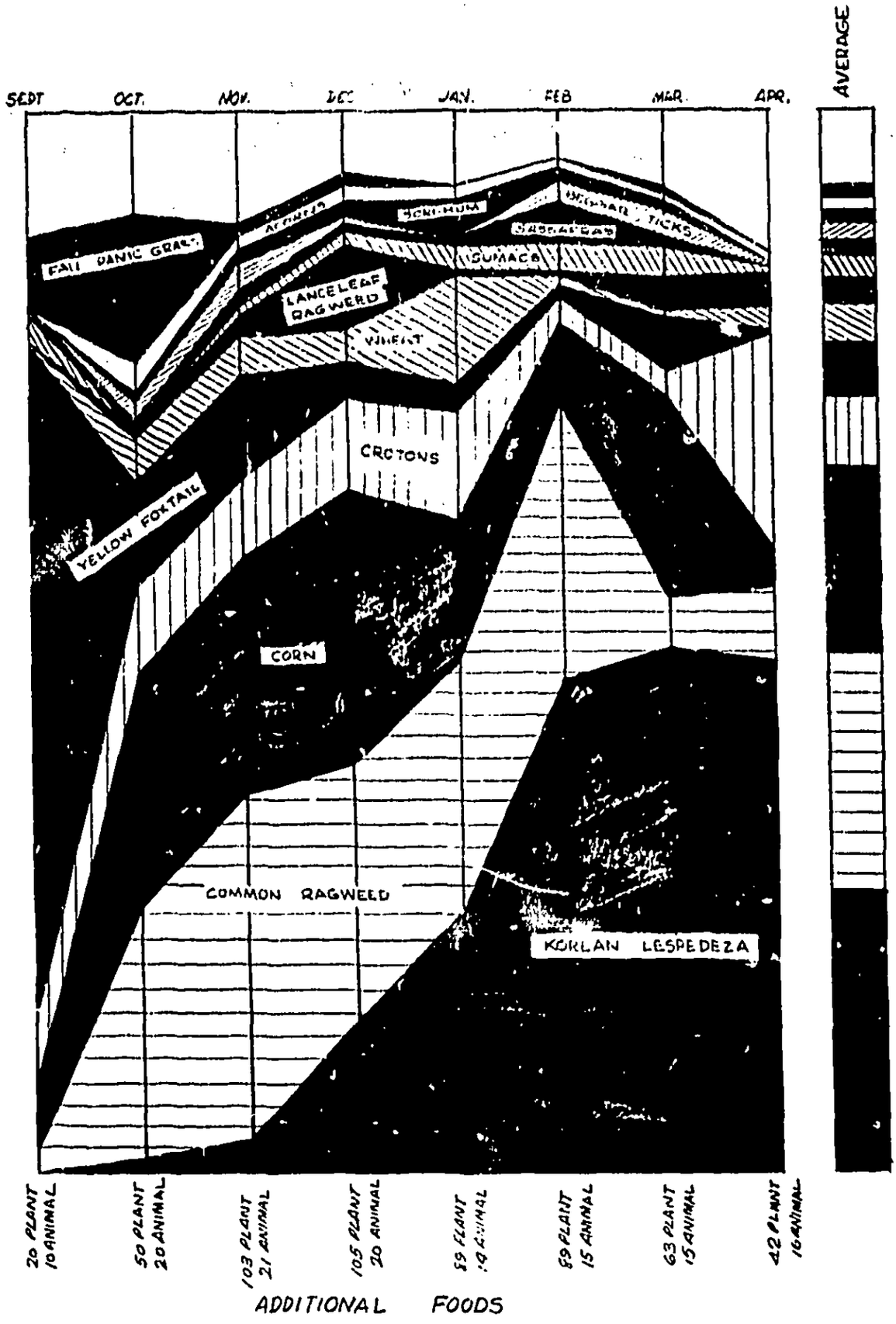
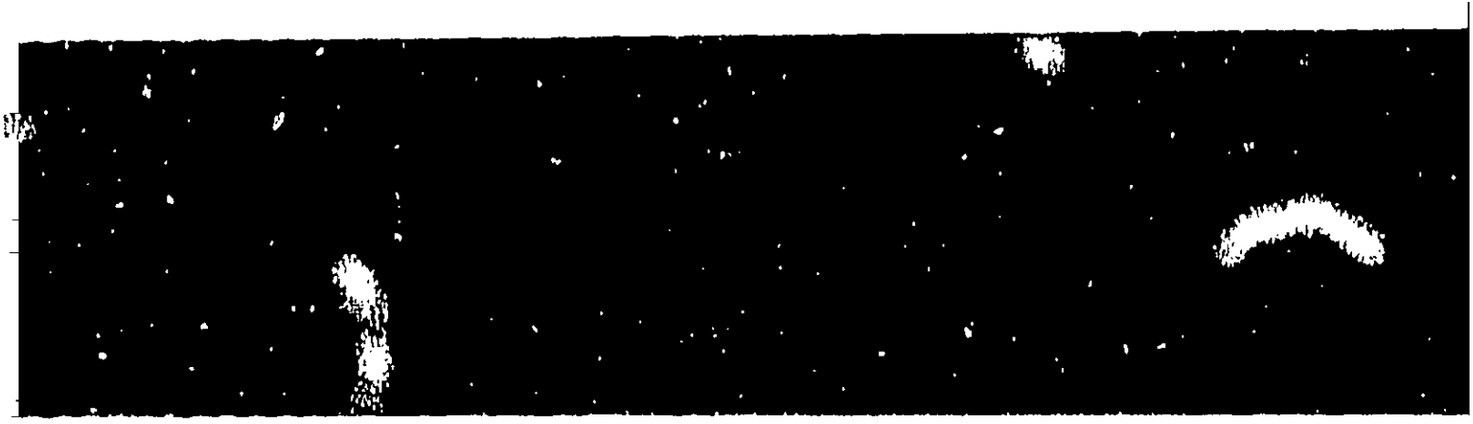


FIGURE 2.
THE THIRTEEN MOST IMPORTANT QUAIL FOODS IN MISSOURI .. SEPT. – APRIL, AS DETERMINED FROM THE EXAMINATION OF 1,358 DROPPINGS SAMPLES.





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