Since none of the 91 wild boar transplanted from the Great Smoky Mountains National Park were retrapped within the boundaries of the park during the study period and none of the 44 wild boar killed by park rangers within the park were transplanted swine, it is reasonable to assume that wild boar do not have a tendency to return to former home ranges when removed distances of 13 or more airline miles, even when habitat conditions appear similar to those within the hogs' original home range. Data collected during the course of this study indicates a tendency on the part of transplanted wild boar to travel distances of several miles in a relatively short time, establish new home ranges at or near release sites (particularly immature hogs), or move from areas frequented by hunters and dogs to other areas before establishing a new home range. No tendency to return to former home ranges was indicated.

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NUTRITIONAL ANALYSES OF SELECTED DEER FOODS IN SOUTH CAROLINA

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INTRODUCTION

A comprehensive nutritional analysis was initiated on selected wild browse plants that were considered principal deer foods in the state of South Carolina. These samples were collected monthly over a period of one year, starting in early 1965, from seven specific areas in the state (Figure 1). The areas were carefully selected in order to include samples from each of the different geographical regions in the state, thus enabling the writer to determine what correlation existed between the geographical locations and the chemical composition of the browse species.

The nutritional analyses included the following determinations: moisture, nitrogen, crude protein, crude fiber, ether extract (crude fat), nitrogen free extract (carbohydrate), and ash. The ash was further analyzed for the following minerals: phosphorus, calcium, magnesium, and potassium. Soil samples were also analyzed for each area from which plant species were collected. These soil samples were tested for available phosphorus, potassium, calcium, and magnesium so that a comparison of the available mineral contents of the soils could be made with the associated plant species.

The primary objective of the present investigation was to determine whether a sample collected during any given month of the year would be representative of the nutritional value of that species for the entire season. The secondary objective was to determine if the chemical composition of a specific plant would vary from area to area. Another ob-

jective was to compare the mineral contents of the plant species with the available mineral elements present in the associated soil samples.

METHODS AND MATERIALS

Plant Collections

In the collecting of plant samples, the game biologists selected from two to five plant species which the white-tailed deer were using at the time for browse. If honeysuckle and greenbrier were native to the area, these two plants were included in the monthly samples. If these species

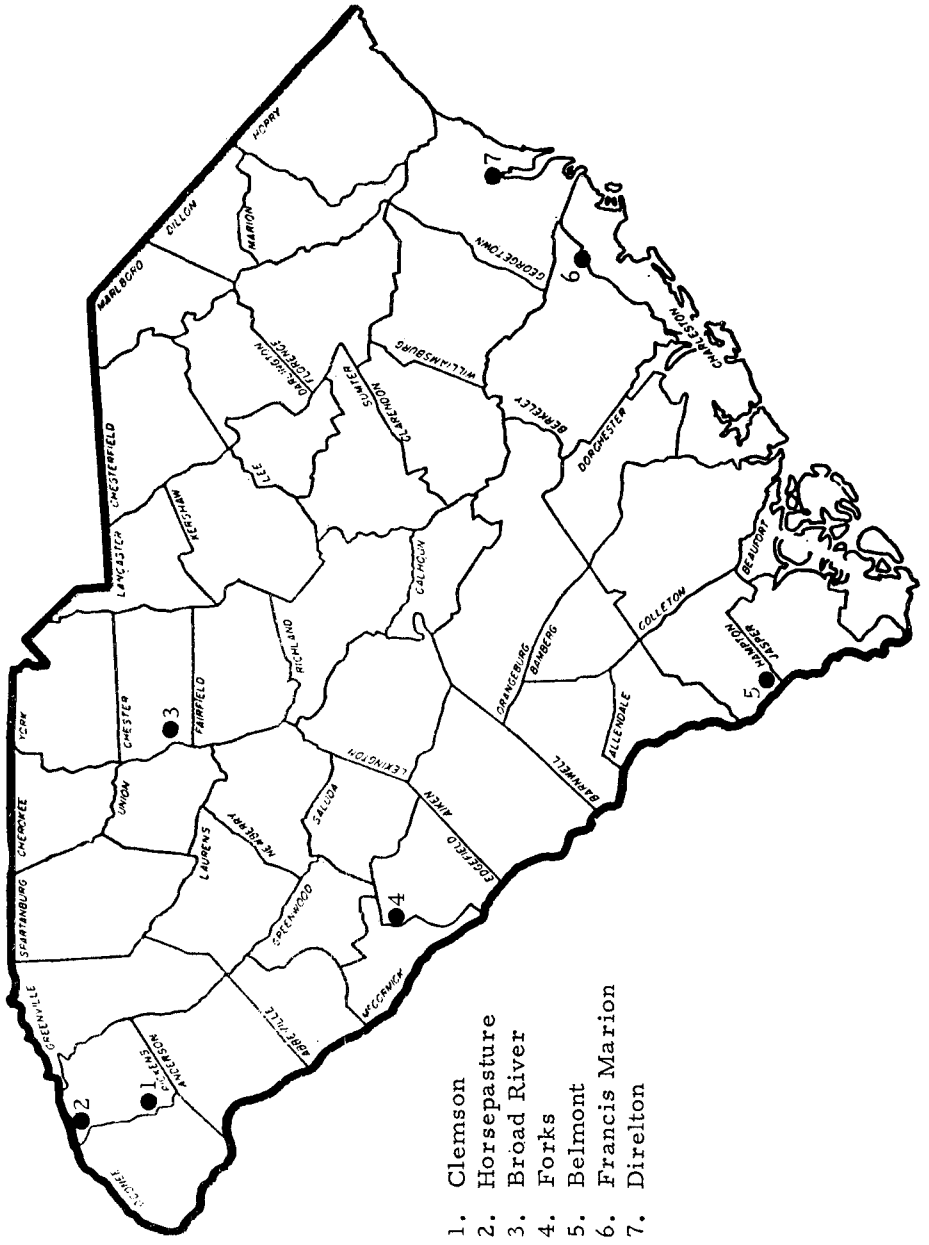

Figure 1. General location of browse collection areas

were not native to the area, the two most important deer browse foods were collected along with less important browse species. When plants other than greenbrier or honeysuckle were selected for analyses, the plants were collected for at least three consecutive months, if possible. As a result, monthly comparisons of the nutritional values of the browse species were available. When they were being consumed by deer, fruiting bodies of the native plants were also collected for analyses.

Browse samples were collected monthly, usually on the third Monday or Tuesday of each month. Each sample consisted of exactly one-half pound or 227 grams of fresh material that was collected, packed in air-tight mailing tubes, and mailed to the author. No samples were collected when dew or other excessive moisture was present. The samples were taken from the same general sites throughout the study. Whenever possible the browse samples that were collected included terminal leaves plus approximately one-half inch of stem. The exceptions to this will be noted later in the discussion.

Analyses

As soon as the samples were received in the laboratory, they were placed for one week in drying cabinets at a temperature of 65°C. This quick drying treatment was used to stop bacterial action, so that the samples could be stored without important or significant changes in their chemical make-up.

After drying, the samples were re-weighed. A record was made of the loss of weight, which represented the water or moisture content of the plant. The samples were next run through a Wiley mill, equilibrated at room temperature, and stored in sealed jars.

The standard methods of the Association of Official Agricultural Chemists (1965) were used to make the browse analyses in terms of moisture, crude protein, crude fiber, and ether extract (crude fat). The ash was determined by using a dry ash method devised by Peech of Cornell University and described by Jackson (1958). The percentage of nitrogen free extract (carbohydrates) was obtained by adding the percentages of equilibrated moisture,[1] ash, protein, crude fiber, and ether extract, and subtracting the sum from 100 percent.

The additional determinations of calcium, potassium, and magnesium were made by using the Perkin-Elmer atomic absorption spectrophotometer, model 303. The phosphorus content was determined spectophotometrically using the method devised by Dyer and Wrenshall (1938).

Soil samples were collected from each plant collection site and analyzed by the Soil Testing Laboratory at Clemson University for phosphorus, potassium, calcium, and magnesium.

The following species of browse plants were included in this study: honeysuckle (*Lonicera japonica* Thumb.), greenbrier (*Smilax* spp.), blackberry (*Rubus* spp.), sweet gum (*Liquidambar styraciflua* L.), yellow jessamine (*Gelsemium sempervirens* (L.) Ait. f.), reed cane (*Arundinaria gigantea* (Walt.) Muhl.), henbit (*Lamium purpureum* L.), nut grass (*Cyperus rotundus* L.), honeylocust (*Gleditsia triacanthos* L.), rhododendron (*Rhododendron maximum* L.), hydrangea (*Hydrangea aborescens* L.), sweet pepper bush (*Clethra alnifolia* L.), sassafras (*Sassafras albidum* (Nutt) Nees), trumpet creeper (*Campsis radicans* (L.) (Seen.), yellow poplar (*Liriodendron tulipifera* L.), oak acorns (*Quercus* spp.), sumac fruits (Rhus spp.), dock (*Rumex* spp.), mimosa (*Albizia julibrissin* Durraz), and sweet bay (*Magnolia virginiana* L.).

RESULTS AND DISCUSSION

Moisture

Water (moisture) was the largest single constituent of nearly all plant samples collected. The lone exceptions were the plant fruits, which included acorns and sumac fruits.

[1] Equilibrated moisture percentages were not recorded in Tables 1 to 5. They can be determined by adding crude protein, ether extract, crude fiber, ash, and nitrogen free extract together and subtracting the sum from 100 percent.

The greatest monthly differences were found in the moisture content. Generally the moisture content was highest in the growing season and lowest in the dormant season. An example is shown in Figures 2 and 3. During the growing season most plants contained 70 to 80 percent of water, while during the dormant season moisture values were around 50 to 60 percent. On a yearly basis, reed cane had the lowest moisture content; whereas, honeysuckle had the highestmoisture content of plants analyzed from the Clemson area (Figure 2). The monthly moisture content of honeysuckle did not fluctuate as much as the moisture content of other browse species examined from the Clemson and Broad River areas (Figures 2 and 3). This could possibly account for the heavy utilization of honeysuckle by the white-tailed deer during the dormant season. Greenbrier average moisture values were slightly lower than honeysuckle in most areas, although during the growing season in the Broad River Area, greenbrier achieved higher moisture values (Figure 3). The annual average moisture content of greenbrier was similar to that of honeysuckle primarily because greenbrier samples were not collected during many of the dormant months.

Crude Protein

The term crude protein, also referred to as protein, includes all the nitrogenous compounds in the browse plants that were analyzed. It is to be noted that crude protein values are given on a dry weight basis. Twenty percent protein means that of each one hundred pounds of dry matter, twenty pounds is protein. The situation in a pound of actual forage consumed is quite different. A plant analyzing 20 percent protein in the spring on a dry weight basis may contain only seven to eight percent protein on a wet or actual field weight basis. To further illustrate: Plant X has a protein value of 15 percent (dry weight basis). During the growing season, this plant has a moisture content of 67 percent; thus for every hundred pounds of plant material, 67 pounds are moisture or water, and 33 pounds are dry matter. The protein value on a dry weight basis has already been mentioned as 15 pecent, but the protein content on a wet or actual field basis is only 4.9 percent.

In the fall or dormant season, plant X has a moisture content of 50 percent; hence, for every hundred pounds of plant material, fifty pounds is moisture and fifty pounds is dry matter. The 15 percent on a dry weight basis would therefore contain 10 percent on an actual field basis. As a result, it is quite possible for deer feeding on plants during the growing season to have less protein per unit of food eaten than deer eating drier dormant vegetation in the fall or winter (De Nio, 1938).

The protein content generally varied considerably from month to month, but the most striking example was that of sweet gum. During March and April the protein value of this plant approximated 20 percent in three locations (Clemson, Broad River, and Francis Marion National Forest). The protein content of sweet gum decreased rapidly at approximately the same rate until the protein value during September and October was about seven percent (Figure 4). In most cases, the protein content was highest during the growing seasons (spring and summer) and was lowest during the dormant period (fall and winter) as shown in Figure 5 for honeysuckle and greenbrier.

The protein levels of all plants appeared higher in the Broad River area (Table 4). It is also interesting to note that soils tested from the Broad River Area have higher mineral values than soils from other areas (Table 5). Honeylocust, mimosa, and dock (Figure 6) were the plant species with the highest protein levels; all three species having been collected from the Broad River Area. With the exception of the Direlton Plantation area, greenbrier, honeysuckle, and blackberry had comparable protein values when compared area to area. These values were between 10 and 17 percent. In the Direlton area, the protein levels were six to 10 percent higher (Table 3). The data from Direlton Plantation represented only six samples collected during the growing season and were not sufficient to compare with other areas.

Acorns, sumac fruit, and rhododendron were extremely low in protein; this could possibly explain why deer only browse rhododendron

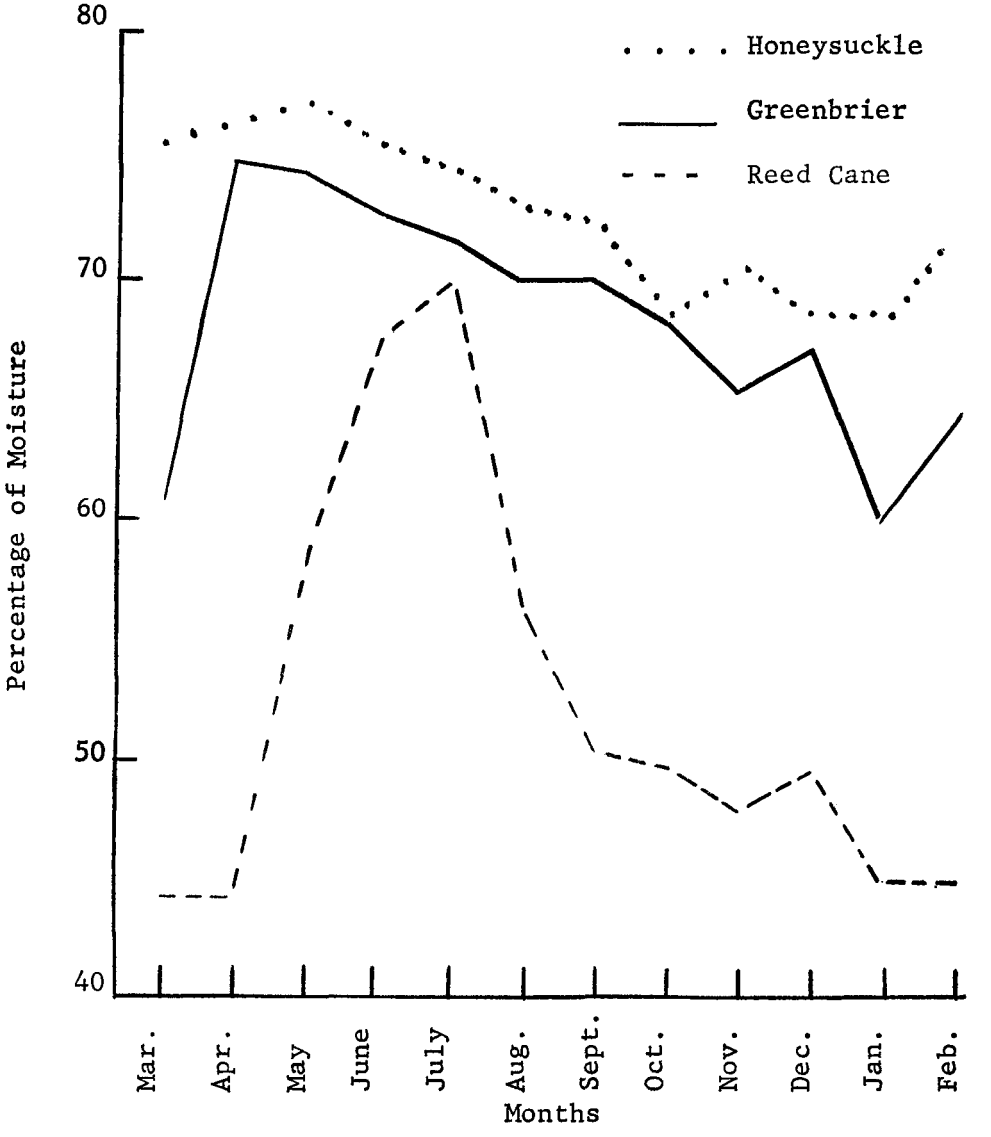

Figure 2. The Variations in Moisture Contents of Plant Species Analyzed in the Clemson Area, March 1965 through February 1966 (Air Dry Weight)

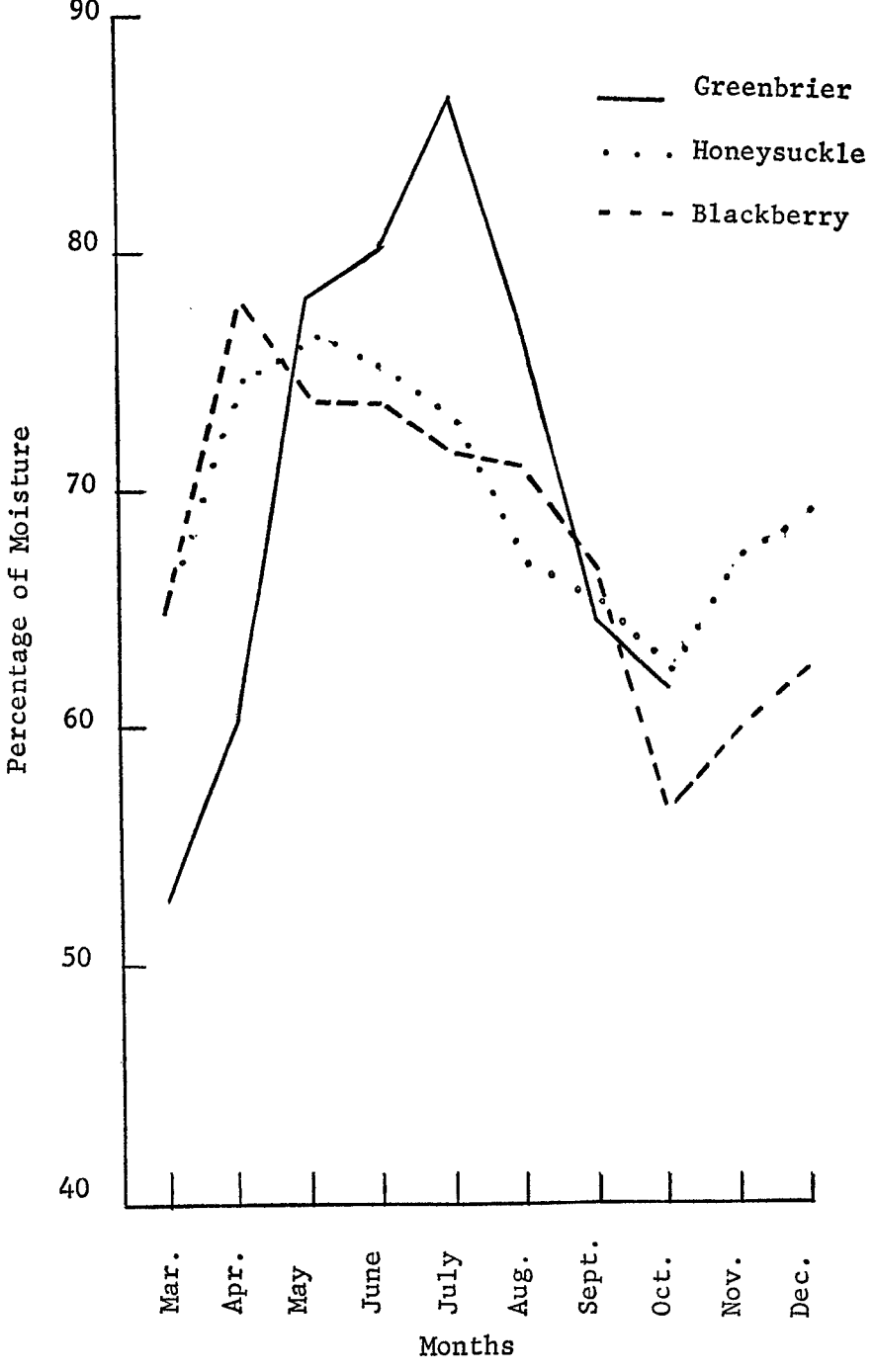

Figure 3. The Monthly Variations in the Moisture Contents of Plant Species Analyzed in the Broad River Area, March 1965 through December 1965 (Air Dry Weight)

heavily as a starvation food. Acorns and sumac fruit, as will be pointed out later, have high carbohydrate and fat contents. This may be the reason that acorns are preferred foods for the white-tailed deer. In fact, acorns compare favorably with corn in food value with the exception of protein (Morrison, 1951).

Ether Extract

The fats, oils, plant pigments, and related substances are of great importance, in both plants and animals. These substances are soluble in ether. Therefore, in analyzing browse foods, ether was used for the extraction of fats and oils. Thus all substances dissolved with ether are included under the classification of ether extract. In acorns and other fruits, nearly all the ether extract is true fat. However, in green material, a considerable part consists of other substances (chlorophyll, etc.).

Because of volatile oils, gums, pigments, and resins found in the different species, the fat (ether extract) analyses were the most difficult to make and proved to be very unreliable. Acorns and sumac fruit were the only species that showed a considerable amount of fat (Table 3). The other species contained relatively small quantities of fat. The fat values in all species ranged from 1.5 to 12.9 percent. The monthly variations of ether extract were insignificant.

Crude Fiber

The carbohydrates are separated into two classes of substances. The first group, called crude fiber (fiber), includes the insoluble carbohydrates such as cellulose, lignin, etc. The more digestible carbohydrates are represented in the nitrogen free extract, which will be discussed later in the text. It is important to know the fiber content of the browse plants. Plants or feeds high in fiber are less digestible, and, as a result, less nutritious than those lower in fiber (Morrison, 1951).

There was an indirect relationship between protein and crude fiber values. It has been stated earlier that the protein values were highest during the spring and summer; at the same time, crude fiber values were lowest. In the fall and winter, when protein values were at their lowest levels, the crude fiber values were highest (Figures 7 and 8).

When the different species were compared, it was noted that the average crude fiber values were highest in reed cane and sweet bay. The crude fiber values for reed cane were over 25 percent (dry weight basis) in Clemson and Francis Marion National Forest. The sweet bay had a crude fiber value of 28 percent. When compared with other locations, the crude fiber values of greenbrier and blackberry were considerably higher in the Broad River and Belmont areas (Figure 8). This difference stems from the fact that the greenbrier and blackberry samples received from Broad River and Belmont contained a large quantity of woody material. This different sampling technique accounted for the higher crude fiber values. Acorns and sumac fruit were also high in crude fiber values, but this is due primarily to the low moisture contents present in these fruits.

Nitrogen Free Extract

The more valuable carbohydrates such as the sugars, starches, hemicelluloses, and pentosans are included in the nitrogen free extract. It should also be noted that the N. F. E. also contained the more soluble parts of cellulose and lignin.

As has been mentioned earlier, the N. F. E. was found by difference and not by actual analyses. As a result, the N. F. E. values reflected any errors made in the moisture,[2] protein, fat, fiber, and ash analyses. After having analyzed the data, the writer was unable to make any direct correlations with regard to the monthly variation of the N. F. E. values. There was a slight relationship between N. F. E. protein and crude fiber. When either protein or crude fiber was low, these results were reflected by high N. F. E. values. The opposite was true when the protein and fiber values were high. Sweet gum was the plant species

[2] Equilibrated moisture.

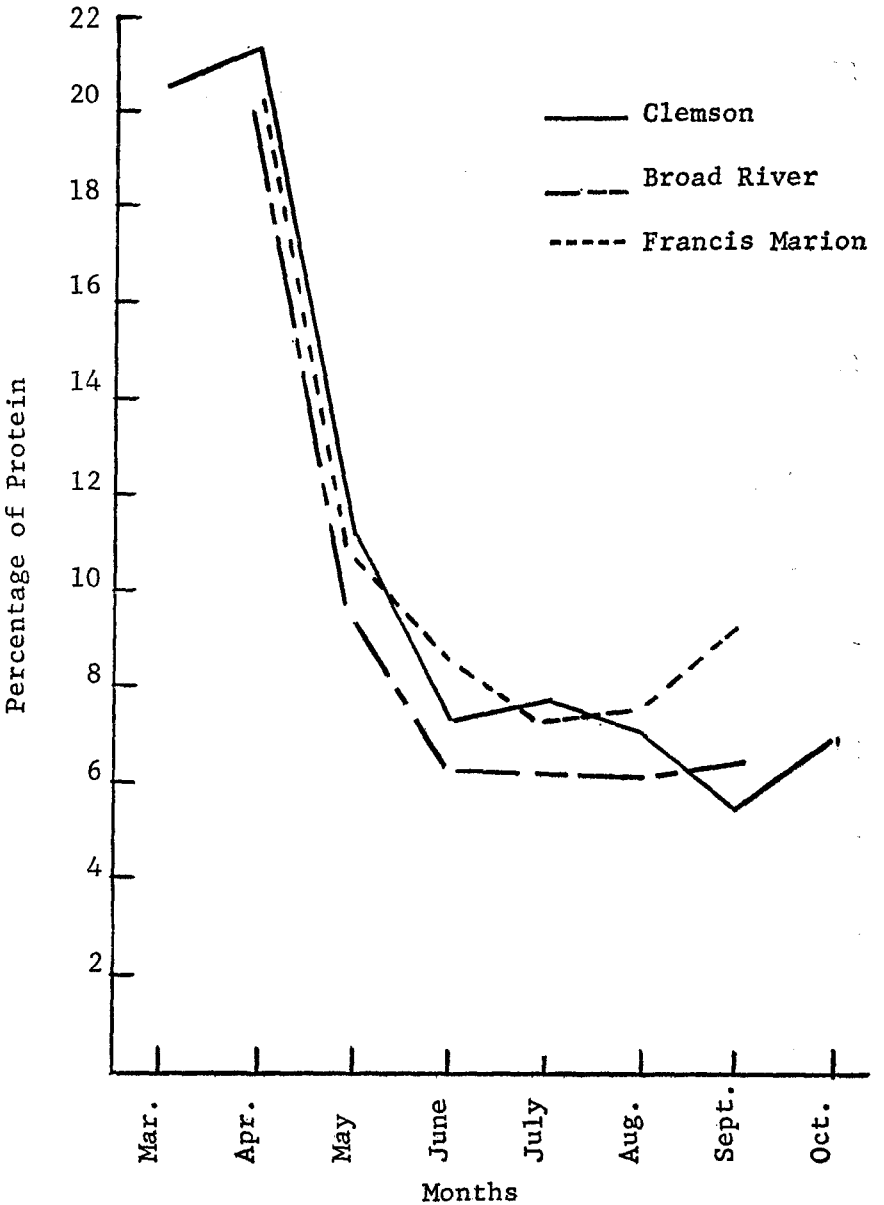

Figure 4. Monthly Variations in the Crude Protein Content of Sweet Gum Analyzed from Three Areas, March 1965 through October 1965 (Air Dry Weight)

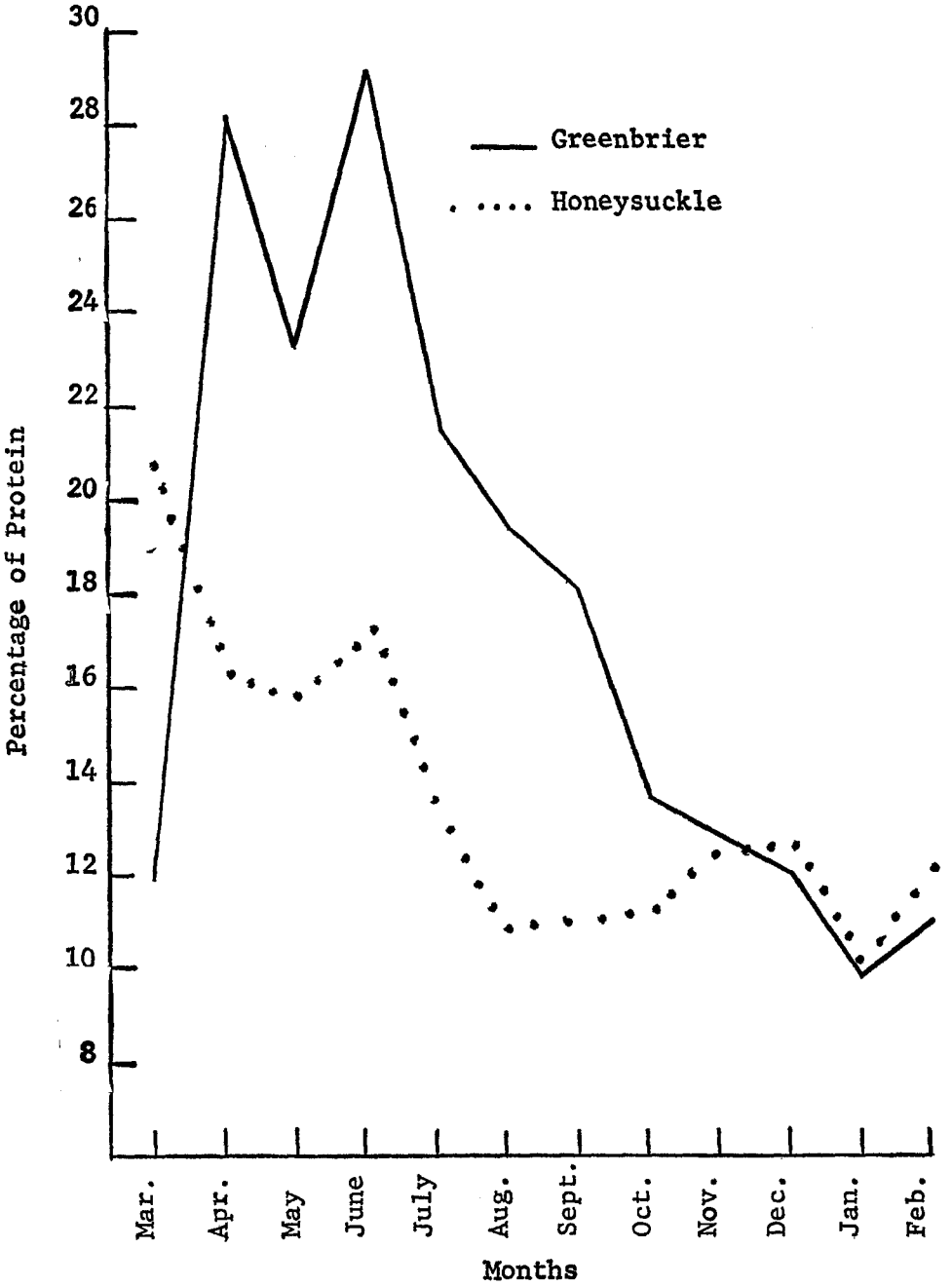

Figure 5. The Monthly Variations in Crude Protein Contents of Greenbrier and Honeysuckle Analyzed from the Forks Area, March 1965 through February 1966 (Air Dry Weight)

highest in N. F. E. values, running as high as 70.8 percent. Most other browse species ranged from 35 to 60 percent in N. F. E. values.

Mineral Matter (Ash)

Both the mineral analyses of the browse samples and the analyses of the soil samples provided vital information. In many cases, there was a relationship between soil mineral content and plant mineral content. Figure 9 graphically indicates that the phosphorus content in honeysuckle is directly related to the phosphorus content of the soil. Figure 10 indicates this same principle to a lesser extent.

Generally, it can be stated that all plants analyzed for the mineral elements phosphorus, calcium, magnesium, and potassium (hereafter referred to as minerals) were found to have greatest proportions of

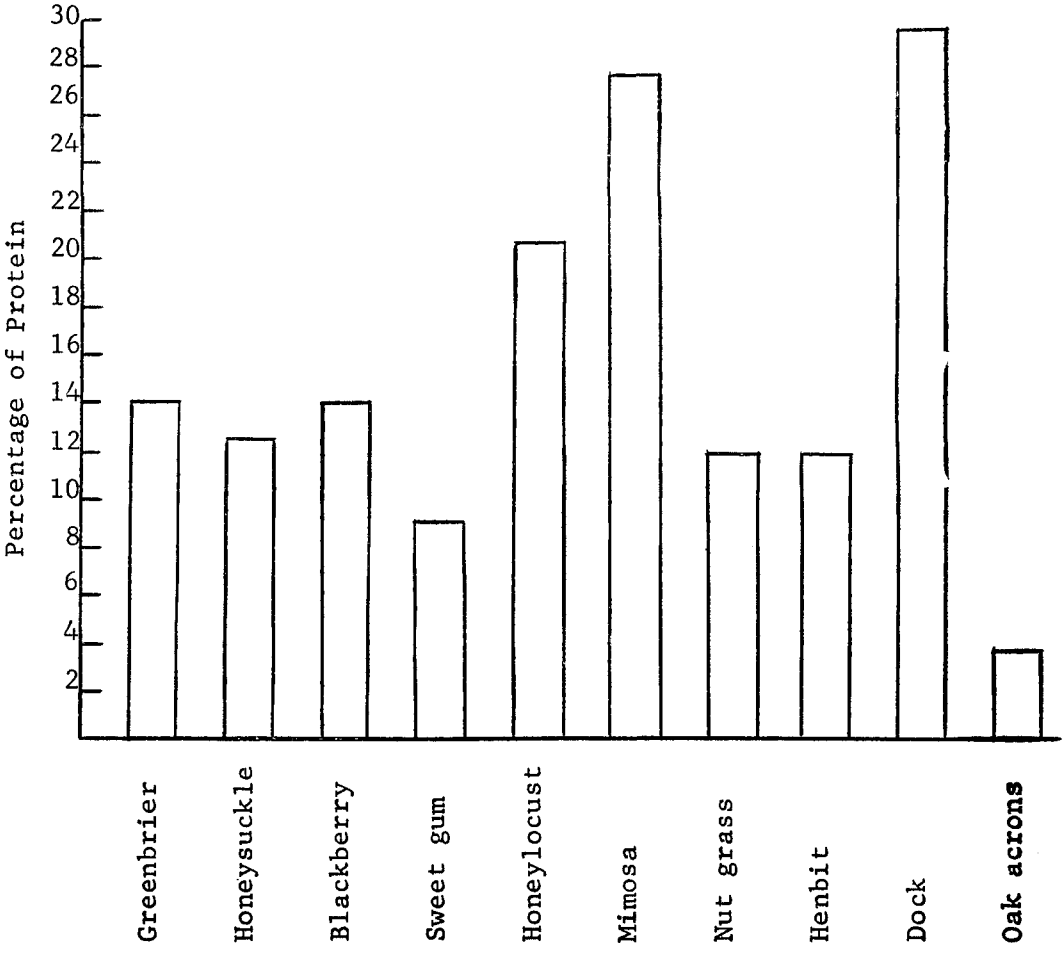

Figure 6. A Comparison of the Average Crude Protein Contents in Plant Materials Analyzed from the Broad River Area, March 1965 through December 1965 (Air Dry Weight)

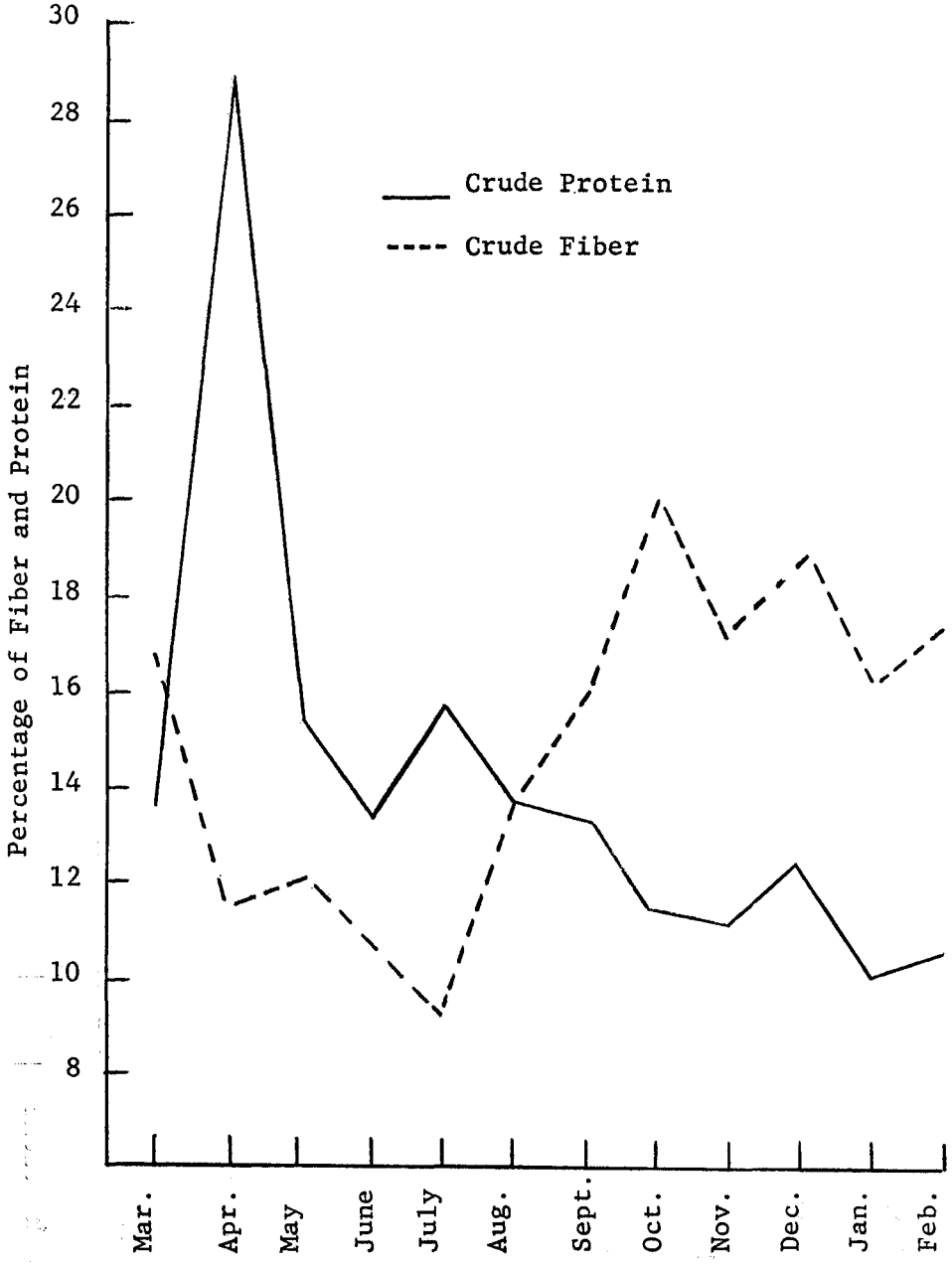

Figure 7. A Comparison of the Monthly Variations in Crude Protein and Crude Fiber Contents of Greenbrier Analyzed from the Clemson Research Area, March 1965 through February 1966 (Air Dry Weight)

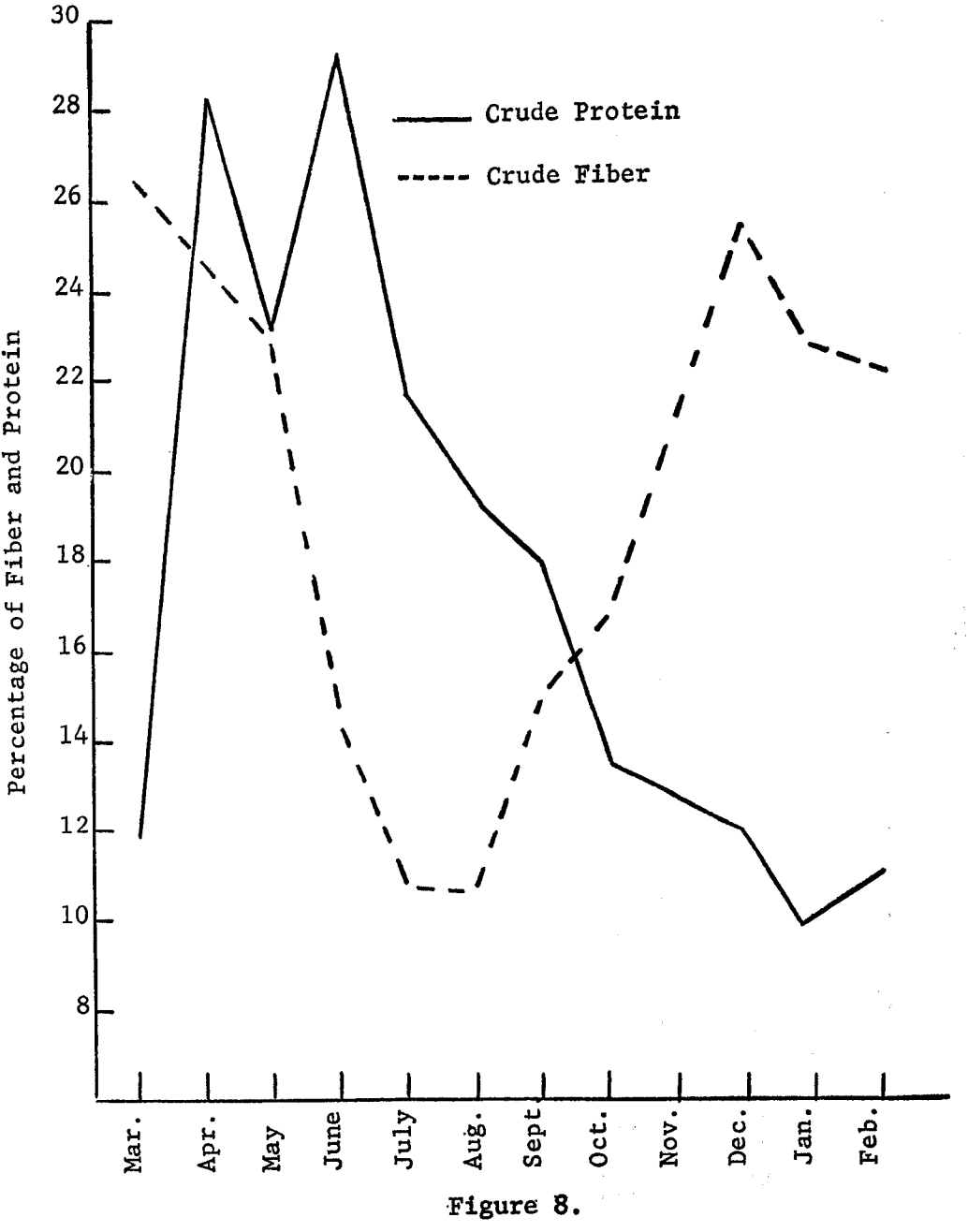

Figure 8.

A Comparison of the Montlhy Variations in the Crude Protein and Crude Fiber Contents of Greenbrier Analyzed from the Forks Management Area, March 1965 through February 1966 (Air Dry Weight)

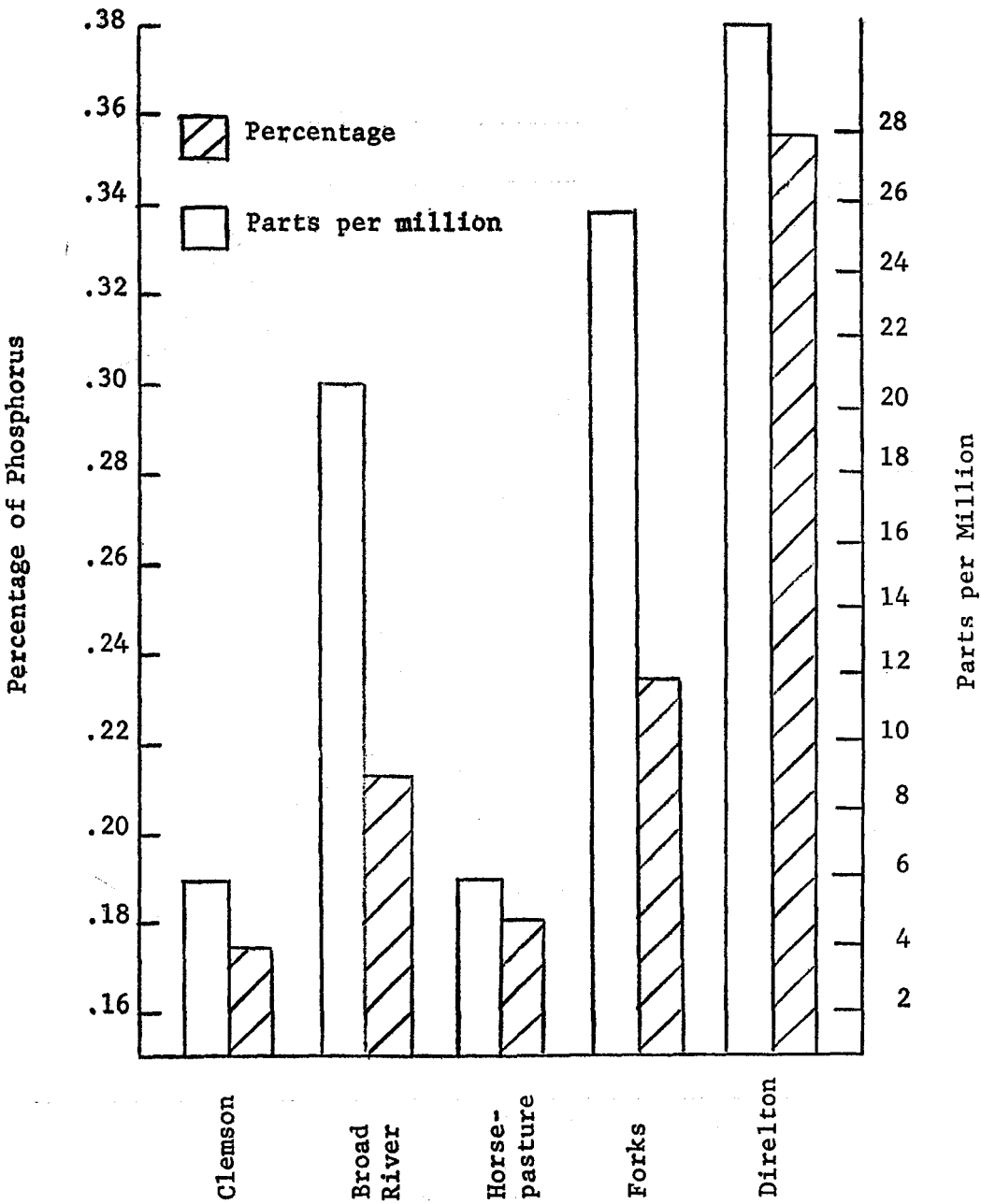

Figure 9. Data from Five Areas Comparing the Average Phosphorus Content in Honeysuckle (percent) with the Available Phosphorus in Associated Soils (ppm)

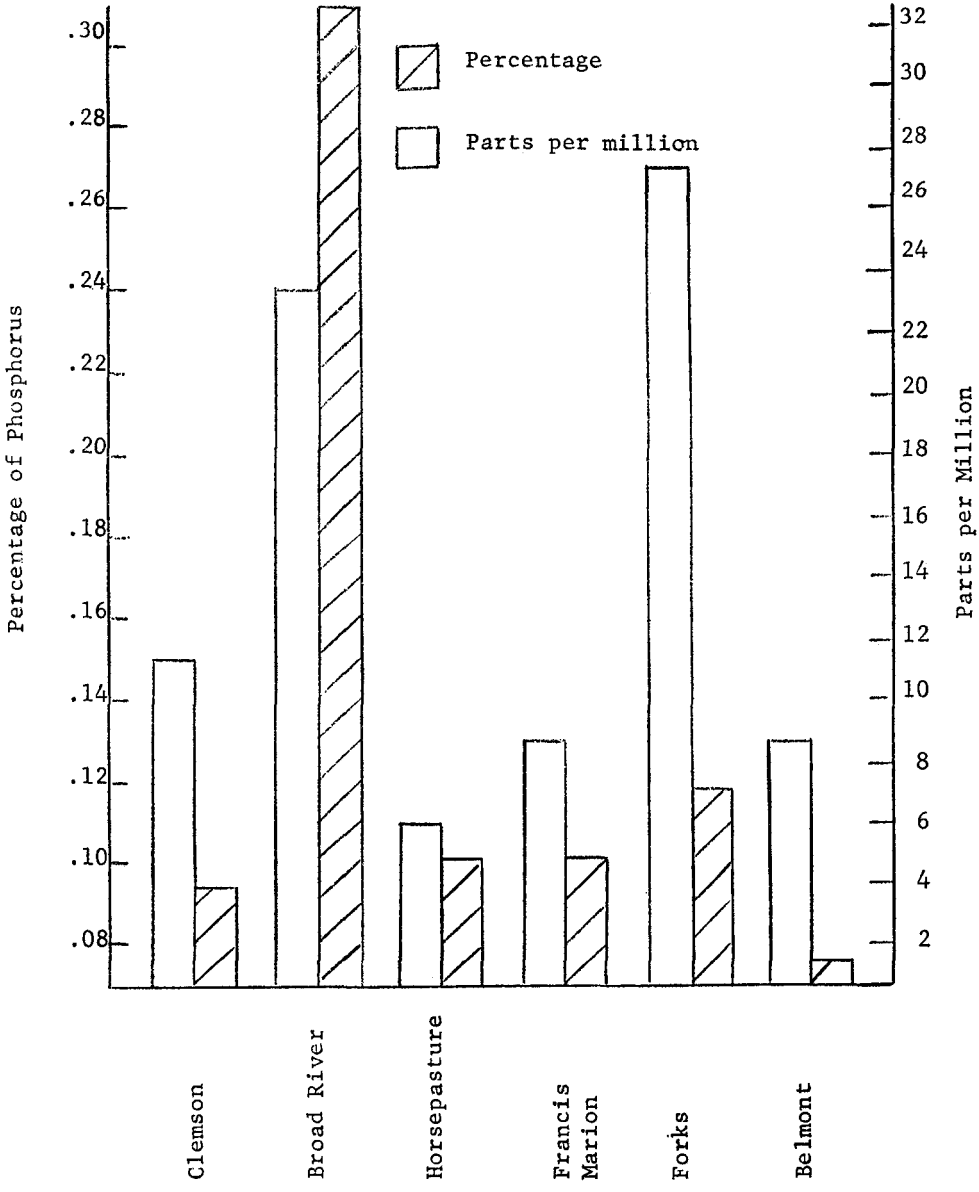

Figure 10. Data from Six Areas Comparing the Average Phosphorus Content in Greenbrier (percent) with the Available Phosphorus in Associated Soils (parts per million)

minerals during the growing season; whereas, these minerals tapered off slightly during the fall and winter. An indication of this trend is evident in the mineral potassium (Tables 1 and 2).

Most of the plant samples had concentrations of between one and two percent of calcium and potassium. Soils were also high in these two minerals. As mentioned earlier in the text, McEwen (1957) stated that a calcium level around 0.64 percent was necessary for healthy white-tailed deer. Most plant samples analyzed were well above that figure. Acorns and sumac fruit were the only plant samples that were strikingly deficient in calcium (Table 3).

According to Morrison (1951), magnesium is present in only very small amounts in the bodies of animals (0.02 to 0.05 percent). Most deer browse plants contain ample amounts of this mineral. Most plant samples analyzed for magnesium were above the 0.05 percent level. Acorns, again, proved to be very low in magnesium content. In fact, acorns were found to be very poor sources of the mineral nutrients.

The phosphorus levels were extremely low in the browse samples analyzed, with those browse plants from Direlton being the lone exceptions. With the exception of Direlton, the soil samples received low and very low ratings with regard to their phosphorus levels (Table 5). These low phosphorus levels in the soil may be a possible explanation of the low phosphorus content in most of the browse species studied. In conclusion, the phosphorus levels, in most of the plant samples, were well below the average 0.56 percent indicated as minimum by McEwen (1957) for the white-tailed deer.

During the past hunting season, the live weights of 784 deer were recorded. The highest average weight per deer was reported from the Broad River Area (Webb, 1966). It is also interesting to note at this point that the browse plants selected from Broad River had higher nutritive values than those from other areas. The lowest average weight per deer was reported from Belmont Plantation (Webb, 1966). Table 4 clearly shows that the browse plants selected from Belmont had lower nutritive values than any other location. These two examples could be definite contributing factors to this weight difference.

SUMMARY

Samples of plants browsed by deer were collected from seven selected locations in South Carolina, at monthly intervals, and analyzed chemically to detect area variations and monthly variations in their composition. Soil samples were also included from each collection site and tested for available mineral contents.

The plant species were analyzed using the standard methods of the Association of Official Agricultural Chemists (1965) to determine crude protein, ether extract, crude fiber, ash, N. F. E., and moisture. The ash was further analyzed for phosphorus, calcium, potassium, and magnesium. Phosphorus was determined colorimetrically; whereas the calcium, potassium, and magnesium contents were determined by using the atomic absorption spectrophotometer.

Moisture, crude protein and crude fiber contents of the plant species indicated seasonal variations. Moisture and crude protein levels were highest in spring and summer, when plants were succulent and growing, and lowest in fall and winter, when plants were dormant. Most plant species contained the 17 percent protein required by deer to maintain health (McEwen, 1957).

Crude fiber values were related to the crude protein values. When the crude protein values were highest, the crude fiber values were at their lowest levels. In fall and winter, crude fiber contents were highest. There were variations in crude fiber comparing area to area; this was probably due to differences in collecting techniques.

Fat (ether extract), ash, and N. F. E. were inconsistent. These data failed to show any striking trends. Due to method of determination, N. F. E. was unreliable. Because of the gums, volatile oils, and pigments (chlorophyll, etc.) found in the different species, true fat determination was difficult to make.

Table 1. Monthly Variations in the Nutritional Contents of Greenbrier (Smilax spp.) Forks Management Area, March 1965 through February 1966.

		Percentage Based on Equilibrated Air Dry Weight*								
Month	Percent Moisture	Crude Protein	Ether Extract	Crude Fiber	Ash	Nitrogen Free Extract	Phosphorus	Calcium	Potassium	Magnesium
Mar.	68.3	11.9	4.7	21.0	6.0	52.6	0.15	1.46	1.08	0.28
Apr.	79.0	28.3	2.3	14.6	8.2	40.6	0.60	0.66	2.58	0.26
May	79.3	23.1	6.5	10.7	7.5	50.3	0.06	0.49	2.03	0.22
June	78.9	29.1	2.8	10.7	8.4	42.1	0.50	0.55	2.70	0.12
July	81.9	21.6	2.3	15.0	6.5	47.8	0.36	0.79	2.55	0.20
Aug.	80.2	19.4	2.9	16.9	6.4	47.8	0.37	0.79	2.49	0.21
Sept.	72.0	18.1	4.6	21.1	6.1	49.1	0.26	0.92	1.54	0.24
Oct.	67.8	13.6	7.3	25.5	5.7	42.9	0.18	1.34	0.71	0.36
Nov.	65.6	12.8	3.3	22.8	5.2	51.2	0.20	1.10	0.96	0.20
Dec.	64.3	12.1	3.4	22.3	4.4	53.3	0.18	0.98	0.47	0.21
Jan.	60.8	9.8	4.3	26.5	5.0	48.8	0.15	1.10	0.72	0.31
Feb.	63.4	11.1	3.2	24.6	4.9	52.7	0.18	0.98	1.04	0.26
Mean	72.1	17.5	4.1	18.7	6.3	48.1	0.27	0.93	1.58	0.24

*Equilibrated moisture contents not included.

Calcium and potassium were the minerals that indicated the same general trends as did protein and moisture; whereas phosphorus and magnesium showed little or no monthly variation.

There was a relationship between mineral contents in the soil samples and plant mineral content, which was especially evident with the mineral phosphorus. A poor soil was usually reflected by plants with low mineral values.

The analyses showed that the Broad River Management Area had the most nutritious plants. In general the soils from this area contained the highest mineral contents. This was supported by the average live weight of deer killed on the Broad River Area during 1965-1966 being higher than that of deer killed on any other area involved (Webb, 1966). The plant species from the Belmont area and the Francis Marion National Forest were lowest in nutritional contents. This was substantiated by these areas having soils with the lowest mineral contents, and the average live weights of deer killed on these areas being lower than those for deer killed on any other study area.

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Table 2. Monthly Variations in the Nutritional Contents of Honeysuckle (Lonicera japonica) Forks Management Area, March 1965 through February 1966.

		Percentage Based on Equilibrated Air Dry Weight*								
Month	Percent Moisture	Crude Protein	Ether Extract	Crude Fiber	Ash	Nitrogen Free Extract	Phosphorus	Calcium	Potassium	Magnesium
Mar.	80.2	20.7	7.4	11.1	7.4	49.0	0.27	0.52	2.74	0.31
Apr.	80.2	16.3	1.5	10.0	8.9	57.3	0.29	0.55	2.42	0.37
May	77.1	15.9	4.6	12.3	7.4	53.6	0.27	0.41	2.13	0.26
June	76.2	17.2	2.1	12.9	8.1	54.4	0.36	0.94	2.45	0.37
July	75.8	13.3	2.5	15.0	7.4	57.0	0.36	0.84	2.66	0.33
Aug.	75.8	10.9	3.0	17.2	8.3	56.0	0.23	0.45	2.10	0.15
Sept.	73.8	11.0	3.8	18.7	8.3	56.2	0.28	0.88	2.01	0.38
Oct.	70.9	11.3	3.0	18.7	8.6	53.7	0.26	1.68	1.84	0.64
Nov.	71.8	12.6	5.5	18.4	9.3	49.6	0.52	1.86	1.66	0.50
Dec.	70.9	12.6	3.2	16.4	9.9	53.5	0.56	1.96	1.91	0.45
Jan.	67.0	10.0	7.3	13.8	8.1	55.4	0.28	1.24	1.49	0.54
Feb.	74.4	12.1	6.6	14.2	8.4	53.2	0.34	1.09	2.11	0.40
Mean	74.4	13.9	4.3	15.3	8.4	53.2	0.34	1.09	2.11	0.40

*Equilibrated moisture contents not included.

Table 3. The Nutritional Contents of Selected Deer Browse Plants Collected in South Carolina March 1965 through February 1966†

Location & Sample	Percent Moisture	Percent Equilibrated Air Dry Weight*								
		Protein	E.E.	C.F.	Ash	N.F.E.	P	Ca	K	Mg
Clemson										
Oak acorns (Quercus spp.)	32.3	5.0	9.7	33.5	2.0	46.4	0.08	0.04	0.71	0.09
Sumac fruit (Rhus spp.)	23.7	3.9	17.6	40.1	2.7	31.7	0.14	0.07	0.73	0.11
Broad River										
Oak acorns (Quercus spp.)	28.6	3.8	12.9	36.1	2.4	41.8	0.06	0.03	0.56	0.07
Dock (Rumex spp.)	87.7	29.7	4.2	10.4	14.3	36.5	0.60	0.76	5.45	0.30
Nut grass (Cyperus rotundus)	73.1	12.0	1.5	24.2	12.9	41.9	0.09	0.48	1.92	0.19
Henbit (Lamium purpureum)	80.6	12.0	3.6	12.6	28.4	37.4	0.04	1.10	3.01	0.35
Horsepasture										
Oak acorns (Quercus spp.)	39.5	4.3	4.3	24.9	2.4	60.1	0.12	0.06	0.81	0.08
Forks										
Trumpet (Campis radicans)	69.6	11.1	2.0	12.5	5.4	63.2	0.28	1.05	1.55	0.42
Belmont										
Sweet bay (Magnolia virginiana)	62.3	8.8	10.6	28.5	5.7	39.3	0.11	0.83	0.59	0.32
Direlton										
Greenbrier (Smilax spp.)	83.0	26.4	5.1	18.1	8.6	35.9	0.53	0.70	2.85	0.24
Honeysuckle (Lonicera japonica)	78.0	17.5	4.1	14.8	7.0	50.7	0.38	0.37	2.36	0.31

†As these plant samples were not collected the required three consecutive months, only averages are given.

*Equilibrated moisture contents not included.

Table 4. Nutritional Values of All Plants Computed by Area in South Carolina March 1965 through February 1966.

Area	Percent Moisture	Percentage Based on Equilibrated Air Dry Weight								
		Crude Protein	Ether Extract	Crude Fiber	Ash	Nitrogen Free Extract	P	Ca	K	Mg
Clemson	63.4	14.1	4.4	18.5	6.8	50.6	0.16	0.80	1.25	0.29
Francis Marion	67.2	12.3	4.5	19.3	6.1	52.2	0.11	0.73	1.05	0.22
Broad River	70.1	16.0	3.4	20.9	6.1	46.4	0.29	0.76	1.83	0.31
Horsepasture	66.8	12.2	3.7	19.3	6.9	51.8	0.14	1.08	1.54	0.32
Forks	73.0	15.2	4.1	16.5	7.1	49.5	0.30	1.00	1.80	0.32
Belmont	66.1	9.8	5.8	26.5	4.3	50.4	0.16	0.77	0.83	0.30
Direlton	80.5	21.9	4.6	16.4	8.0	43.3	0.46	0.53	2.61	0.28

Table 5 . Mineral Composition of the Soil Samples Collected in South Carolina January 1966

Location of Plant	Expressed in ppm P	Ca	K	Mg	Total P, Ca, K & Mg	pH
Clemson						
Greenbrier	4	450	40	67	561	5.9
Honeysuckle	4	465	32	77	578	5.8
Blackberry	5	708	56	96	865	5.8
Sweet gum	7	382	20	60	469	5.8
Reed cane	5	355	30	63	453	6 0
Oak acorns	4	550	81	77	712	6.5
Francis Marion						
Greenbrier	5	295	38	71	409	5.2
Sweet gum	7	254	32	52	345	5.9
Reed cane	4	210	15	14	243	5.2
Yellow jessamine	7	340	10	8	365	5.4
Broad River						
Greenbrier	31	480	117	80	708	6.1
Honeysuckle	9	415	71	67	562	5.9
Blackberry	27	440	53	50	570	6.0
Honeylocust	10	432	117	96	655	6.4
Mimosa	12	332	36	96	476	5.2
Horsepasture						
Greenbrier	5	365	51	25	446	5.8
Honeysuckle	5	230	17	4	256	5.6
Blackberry	7	285	75	39	406	5.9
Oak acorns	7	355	38	15	415	5.2
Hydrangea	3	285	82	45	415	5.7
Yellow poplar	7	125	53	24	209	5.8
Rhododendron	7	270	30	25	332	5.9
Forks						
Greenbrier	7	350	59	77	493	5.7
Honeysuckle	12	275	33	48	368	5.6
Trumpet	6	165	29	27	227	5.8
Belmont						
Greenbrier	1	195	20	7	223	4.7
Blackberry	1	195	20	7	223	4.7
Sassafras	1	295	23	33	352	5.5
Sweet pepperbush	1	265	17	15	297	4.2
Direlton						
Greenbrier	16	405	21	4	446	4.5
Honeysuckle	28	220	30	8	286	5.3