SESSION ON UPLAND GAME

CLIMATIC INFLUENCES ON THE AVAILABILITY OF SHRUB LESPEDEZA SEED FOR QUAIL

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Measurement is the essence of scientific method. Also it can be an important guide in the translation of technical knowledge from testing and development to applied practices. In a recent paper Davison *et al.* (1955) emphasized the need for more exact measurements of the yields and availability of seeds produced for wildlife food.

This paper presents the results of measurements taken on a series of shrub lespedeza borders, established long enough to have reached production stability and spanning a 200 mile range of latitude (Fig. 5). This range of latitude is significant because it extends from climatic conditions where frost rarely influences seed production into those where maturity of the seed is often reduced by early frosts. Other factors such as the effectiveness of fertilizer applications and various management methods were included in the planned observations. Three successive years of progressively severe drought conditions obscured any measurable differences, however.

Changes in land use patterns have also interrupted the continuity of some observations. The net result has been that the natural capacities and limitations of the shrub lespedezas stand out more clearly than they might have under more favorable study conditions.

LOCATIONS

Observations were started on eight locations. It soon became apparent that this involved more work than could be accomplished with the time and help available. The final selections were made so the collections of study samples could be made coincident with other work in the locality. Some significant features of the different locations are described as follows:

LOCATION A

Location A is in the A. P. Hill Military Reservation, Caroline County, Virginia. The planting was at least 3 years old at the start of the observations. It was established near an abandoned house site by planting nursery stock. The planting is predominantly lespedeza bicolor with occasional plants of L. japonica. It was selected because it is accessible and plans for use of the area called for the fields to be kept open. Those plans were changed, however, and pine trees have now closed in almost completely around it. We have never observed any use of this plot by quail and it represents a typical abandoned unused border.

LOCATION B

Location B represents typical field borders in farmland of the Northern Piedmont section of Virginia. Two borders were studied. Both were established by planting nursery stock of lespedeza bicolor. There are occasional plants of the L. japonica and L. cyrtobotrya. These borders have been clipped annually since 1952. A covey of quail uses each of these borders consistently.

LOCATION C

Location C in Prince Edward County, Virginia, represents Southern Piedmont conditions. Two borders were sampled. Both were established by planting nursery stock of lespedeza bicolor in severely eroded field borders adjacent to pine woods. The plants were set in subsoil but have grown vigorously. During the period of observation, one of the borders has been cut back once and fertilizer has been applied once. A covey of quail has used this border consistently although the field has been abandoned and now is practically closed in with pine trees.

LOCATION D

This location is in Martin County, N. C. and represents Coastal Plain conditions. Observations were made on 5 borders although most of the data used here were obtained on the one border which was not influenced by grazing or other land use changes during the period of observations. These borders are on the banks of hand-dug ditches and moisture conditions here probably account for sustained seed production through the drought seasons. The border from which most of the data were obtained was established by transplanting plants 2 and 3 years old from a border that was to be eliminated in rearrangement of fields. All of the borders on this location are used consistently by quail. They are on fertile cropland and the only management has been to cut them back at 2 or 3 year intervals.

METHODS

Collection and processing of samples were done according to the methods described by Davison *et al.* (1955). Without the use of the Graetz cleaning machinery such a study would be impractical. An occasional seed trap sample contained sufficient gravel to justify running it through the tetrachloride bath. Most of the ground samples required hand sorting to remove organic material which did not blow out in the cleaner and would not float out in alcohol. This material varied from about 1% to more than 20% of the weight of samples coming from the tetrachloride bath and could not be disregarded without influencing the results. In fact the alcohol bath was of so little help that it was used very seldom.

At the outset only ground samples were taken and samples were taken in midsummer as well as fall and winter. Summer sampling was discontinued when it became apparent that the summer samples were not sufficiently different from the fall season samples to justify the extra work entailed. A few of the late summer records have been substituted—dotted bars on charts ..... in instances where comparable fall season samples were accidentally lost or destroyed before processing was completed and records made.

A few seed trap samples were taken in 1952. Beginning in 1953 seed trap samples were systematically taken along with ground samples. Seed traps were put out in September or early in October before any seed had matured. The seed traps in locations A and B failed to collect seed of the 1952 crop because an early snow storm that arrived before the leaves fell, literally flattened the plants. They remained a tangled mat on the ground and the seed traps were either left with no seed above them or were buried under a mass of leaves and stems so thick that seed did not fall through.

In placing seed traps the only selection of position followed was to be sure that the trap was surrounded by vigorous seed producing plants and that there were no overhanging briars or other obstruction to prevent the free fall of seed into the trap. Ground samples were taken adjacent to each trap location where traps were used. Samples were taken only where the ground surface was accessible to feeding quail. No attempt was made to collect either type of sample according to a standard dimensional pattern. Either 3 or 5 samples were taken on each date. The numerical data used in the tabulations and bar charts are a simple arithmetic mean of the comparable samples. The fall season represents collections between October 1 and December 31. The winter season between January 1 and March 31.

RESULTS

The bar charts shown in Figs. 1-4 are pictorial rather than analytical. They are based on the numerical data given in Tables I and II. These values are the simple average of the weights of cleaned seed in the 3-5 samples taken at each sampling. It is apparent that production on all locations in 1951 was average or better since the available supply was not equalled or exceeded until 2 or more years later. Following the 1951 crop, locations B and D with an available supply of 4.2 c.c./sq. ft. and 4.0 c.c./sq. ft. compare favorably with the 4.7 c.c./sq. ft. reported by Haugen (1955) for Alabama patches. Locations A and C afforded 3.2 c.c./sq. ft. and 2.1 c.c./sq. ft. respectively. Even with

this relatively low availability quail used the borders on location C regularly. Low records of availability occurred as follows:

Location A	Fall 1953
Location B	Fall 1955
Location C	Fall 1955
Location D	Fall 1954

After an excellent crop of seed matured in 1955 all locations are back approximately to the availability levels at which the observations started.

DISCUSSION

Drought conditions in the summer of 1952 were noticeable but not severe. In 1953 drought effects were severe enough to retard blooming of the plants and delay maturity of the seed. A high percentage of the seed which formed on Locations A, B and C failed to fill out and mature before frost. Location D produced a very good yield and seed availability rose proportionately to 459 lb/A or 6.1 c.c./sq. ft.

For all locations except A, the low point in availability was recorded in the fall and winter after the almost total failure of the 1954 crop. Early frosts caught the seed before maturity and a high percentage of those which did appear to mature were small and compressed laterally or shriveled. Both locations A and C reached an availability below 50 lbs./A. At a low level of approximately .25 c.c./sq. ft. quail continued to feed on location C occasionally but the covey had been shot down to 3 birds.

It is interesting to note that location D showed high production in a season of drought so severe that farm crop failures were general over a large part of both Virginia and North Carolina. The production of 669 lbs./A represented a density of 9. c.c./sq. ft. Usually we would consider this site too wet for optimum growth and production of L. bicolor.

On locations A, B and C in 1954 there was a very heavy set of seed from the late flowers. Killing frosts came before the seed filled out, however. Material collected in the seed traps had the appearance of mature seed; but, when threshed and cleaned, yielded very few seed. Close examination showed that the aborted ovules were little more than an empty seed coat.

The low record for the fall of 1955—a good seed year—if considered without explanation is misleading. Weather was unusually mild with little strong wind and no snow or frozen rain. At least 90% of the seed crop was still clinging to the plants after December 31. The net effect of these circumstances was to inflate the values recorded in the winter season for 1955-56 i.e., the 1955 crop did not enter the traps until after the fall season records were taken.

Accepting Haugen's criteria as adequate, the records on location D indicate that lespedeza bicolor, if it produces a crop as often as every third year, will maintain an adequate level of available quail food as far north as the Coastal Plain of North Carolina. At the higher elevations of the Virginia Piedmont a good seed crop every third year maintains a level of available quail food about 25%-30% lower than under North Carolina Coastal Plain conditions. Some of the selected varieties of L. japonica mature as much as 2 weeks earlier than L. bicolor. These should be substituted wherever higher altitude or latitude increases the risk from early frosts.

Pending the selection of even earlier ripening varieties consideration should be given to an increase of 25% or more in the number of plants used on each location. Present specifications are based upon experience in localities where full maturity is rarely cut short by frost. Where the increment of seed carried over from each plant is smaller the reserve can be increased only by the addition of more plants up to a point where the area becomes too large for the birds to use efficiently.

Since the selection of earlier maturing varieties offers the best hope to extend the range of usefulness of the shrub lespedezas, local selection of superior plants becomes of increasing importance. Nature does a ruthless job of selection. Those who are using the plants in marginal range areas have an excellent opportunity to make selections of superior individuals from which better varieties may be developed.

Our hope that comparison of ground samples and seed trap records would give a simple and direct measure of utilization were not realized. Deterioration tests showed a loss of 50%-65% of the seed sample within 132 days after exposure under border conditions. Study of the ground samples suggested that factors other than immediate use were influencing the amount and quality of the seed found in them. After continuous exposure of 660 days 38.5 of the samples were still sound, and produced some seedlings when scarified by hand methods and planted in potted soil. There was no significant difference between L. bicolor and L. japonica in either deterioration rate or viability of the surviving seed. Presumably only the fully matured, hard seed contributes to the accumulation of seed reserve in the borders. Further selection of varieties may give a qualitative improvement of the seed along with earlier maturity.

ACKNOWLEDGMENTS

We wish to thank the landowners, Mr. J. R. Winslow, Dr. J. W. Sydnor and Mr. M. B. Broaddus, Jr., for permission to use their borders in this study. Similarly we acknowledge our indebtedness to Col. J. E. Raymond, Col. F. J. Gillespie and Col. Paul L. Burke for permission to collect on the A. P. Hill Military Reservation and to Mr. L. Wayne Ackerman, Forester for the 2nd Army for his assistance in locating borders and establishing study plots on the reservation. Thanks are due to Mr. Verne E. Davison for critical review of the work while it was in progress and the final manuscript. We appreciate especially the help of Mr. Earl E. Graetz in both the technical problems of cleaning the samples and rountine assistance in the dusty work of processing several hundred samples. For the use of the seed cleaning facilities we are indebted to the North Carolina Commission of Conservation and Development in the person of their Nursery Manager, Mr. Don Hankla. We regret that we cannot recognize by name the many others among Soil Conservation Service personnel who have contributed a helping hand all along the way.

SUMMARY

Measurements were made of (1) seed produced and (2) available quail food accumulated in shrub lespedeza borders. The period covered was one of progressively severe droughts. The locations studied represent a critical 200 mile range of latitude just outside the optimum climate range of shrub lespedezas in Southeastern United States.

Early frost was a factor in reducing seed yields. During drought years, and delayed blooming, late frosts damaged the crop.

Substitution of early maturing varieties of Lespedeza japonica for the later maturing L. bicolor is recommended. Further extension of the range of usefulness of the shrub lespedeza depends upon selection and development of varieties that mature even earlier than those now in use.

LITERATURE CITED

Davison, Verne E., L. M. Dickerson, Karl Graetz, W. W. Neely, Lloyd Roof. 1955. Measuring the Yield and Availability of Game Bird Foods. Jour. Wildlife Management, 19:302-308.

Haugen, A. O. and F. W. Fitch, Jr. Seasonal Availability of Certain Bush Lespedeza and Partridge Pea Seed as Determined from Ground Samples. Jour. Wildlife Management, 19:297-301.

TABLE I

GROUND SAMPLE RECORDS OF POUNDS PER ACRE (LBS./A) OF SEED AVAILABLE TO WILDLIFE IN SHRUB LESPEDEZA BORDERS

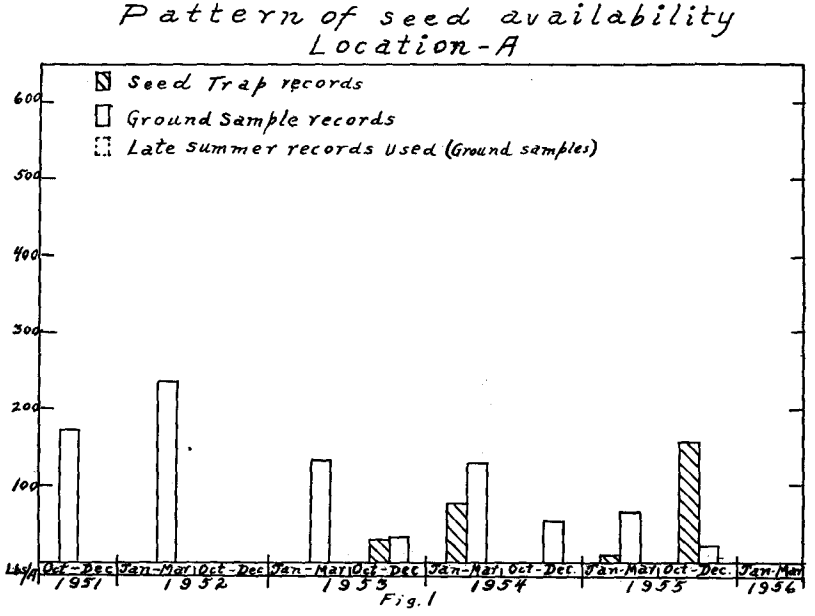
Season	*Locations*			
	A—Lbs./A	*B—Lbs./A*	*C—Lbs./A*	*D—Lbs./A*
Oct.-Dec., 1951	173	...	132	317
Jan.-Mar., 1952	236	298	159	285
Oct.-Dec., 1952	...	...	163	199*
Jan.-Mar., 1953	132	178	261	350
Oct.-Dec., 1953	34	234	161	459
Jan.-Mar., 1954	130	319	70	399
Oct.-Dec., 1954	54	230	209*	209*
Jan.-Mar., 1955	67	114	172	669
Oct.-Dec., 1955	21	106*	32	61
Jan.-Mar., 1956	...	173	110	376

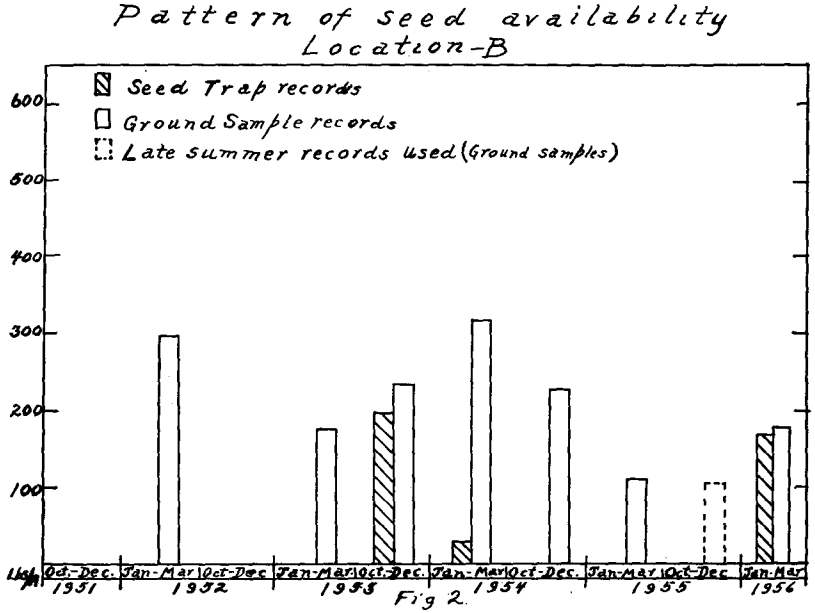
* Late summer ground sample records.

TABLE II

SEED TRAP SAMPLE RECORDS OF POUNDS PER ACRE (LBS./A)

Season	*Locations*			
	A—Lbs./A	*B—Lbs./A*	*C—Lbs./A*	*D—Lbs./A*
Jan.-Mar., 1953	...	...	242	...
Oct.-Dec., 1953	30	200	53	288
Jan.-Mar., 1954	78	27	27	48
Oct.-Dec., 1954	...	...	...	...
Jan.-Mar., 1955	9	9	107	265
Oct.-Dec., 1955	155	...	19	...
Jan.-Mar., 1956	...	164	235	375


Pattern of seed availability
Location-A
Seed Trap records
Ground Sample records
Late summer records used (Ground samples)
600
500
400
300
200
100
Lbs/A
Oct-Dec
Jan-Mar
1951
1952
1953
1954
1955
1956
Fig. 1


Pattern of seed availability
Location-B
Seed Trap records
Ground Sample records
Late summer records used (Ground samples)
600
500
400
300
200
100
Lbs/A
Oct-Dec.
Jan-Mar
1951
1952
1953
1954
1955
1956
Fig 2.

Pattern of seed availability
Location -C

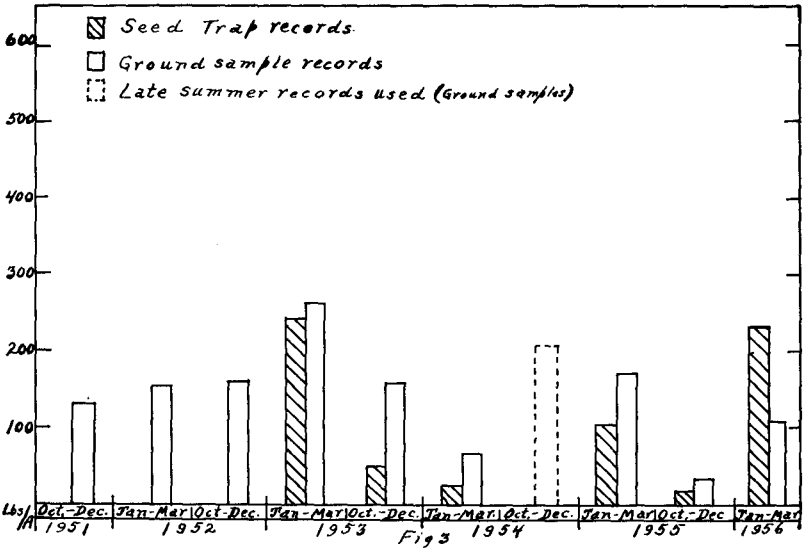


Fig 3

Pattern of seed availability
Location-D

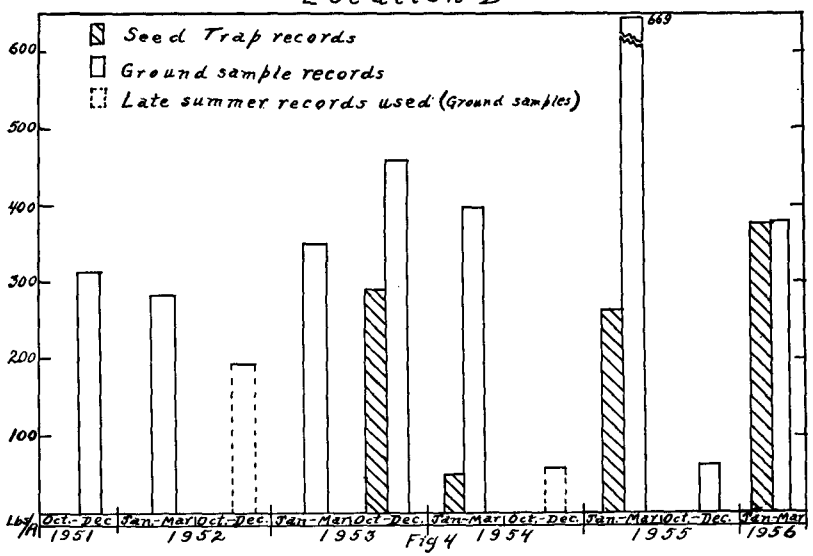


Fig 4

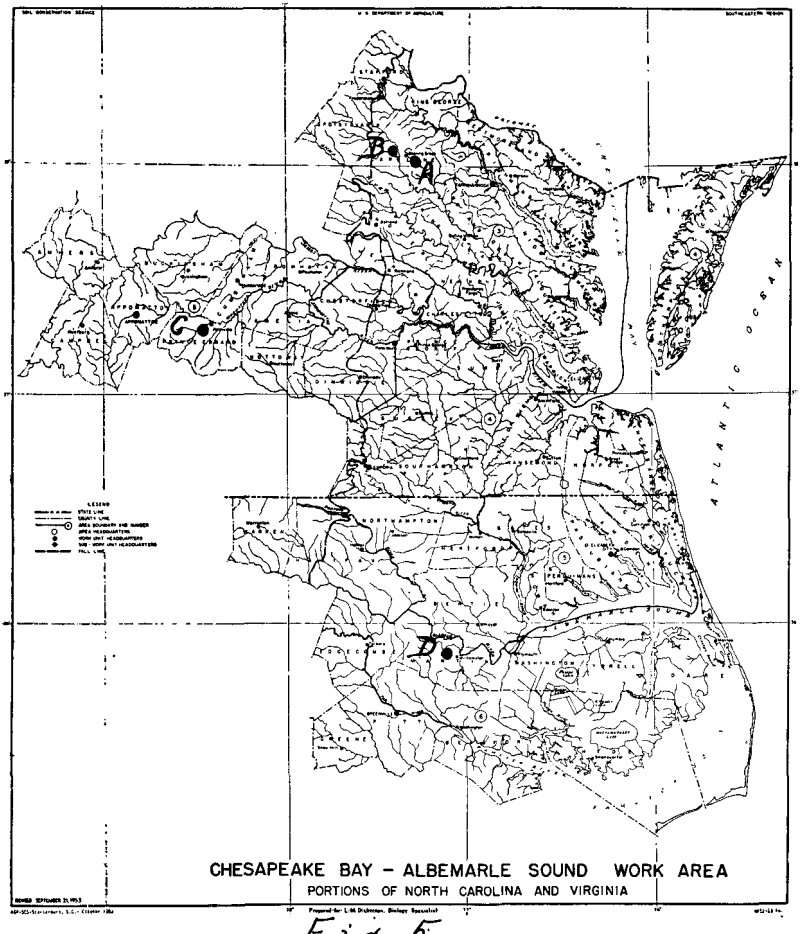

A
B
C
D
ATLANTIC OCEAN
CHESAPEAKE BAY – ALBEMARLE SOUND WORK AREA
PORTIONS OF NORTH CAROLINA AND VIRGINIA

Fig. 5