

A STUDY CONCERNED WITH THE TEACHING OF RANGE MANAGEMENT
IN HIGH SCHOOL VOCATIONAL AGRICULTURE DEPARTMENTS
ON THE EDWARDS PLATEAU OF TEXAS WITH
RECOMMENDED TEACHING PLANS

THESIS

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By

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CHAPTER I

INTRODUCTION

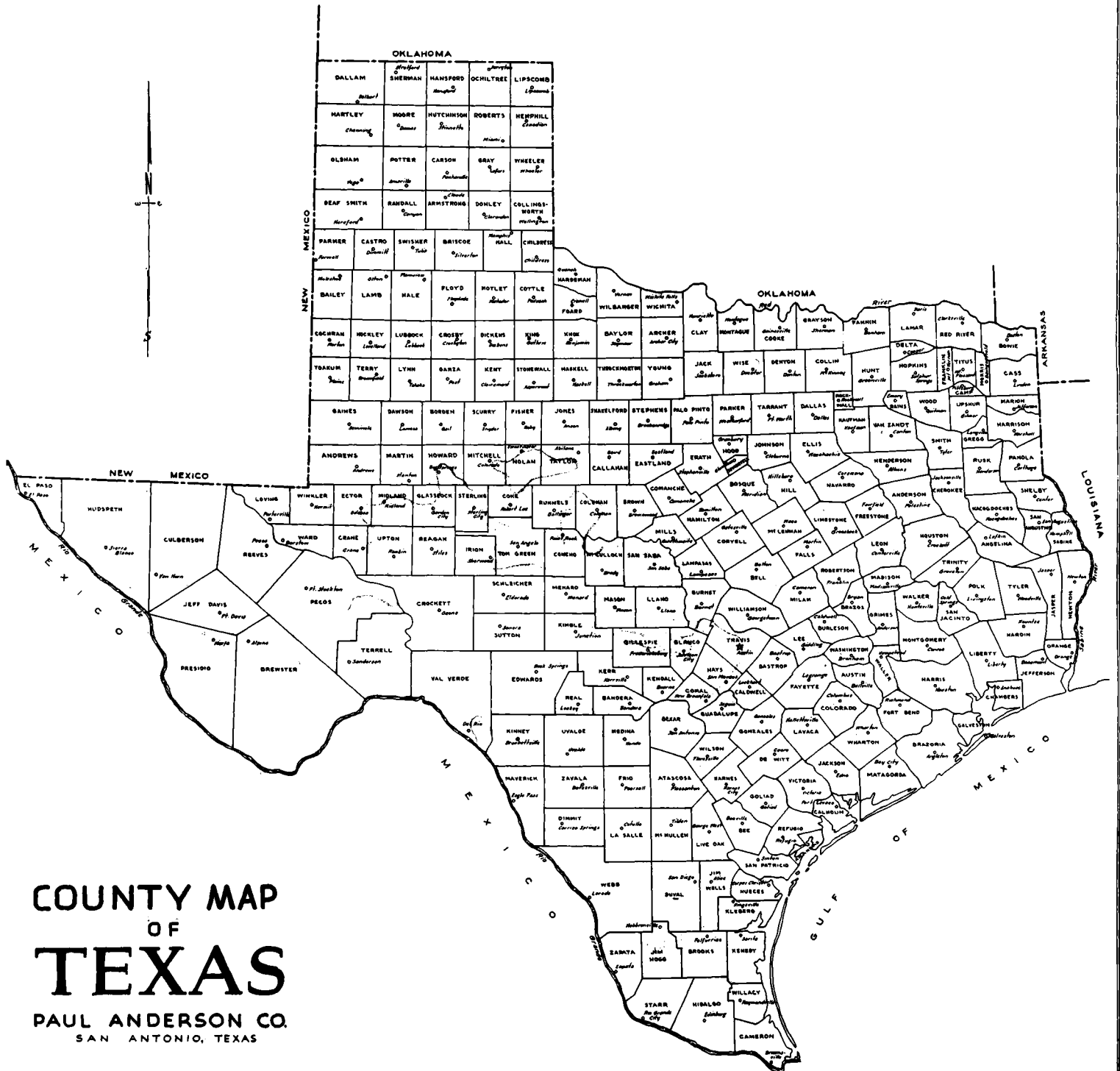
In recent years there has been an increased interest in the need for teaching range management in public schools of Texas. This increased interest has been brought about by the realization that natural resources are limited and exhaustible.

H. M. Bell and others stated that there are approximately 125,000,000 acres of land devoted to the production of native forage plants in Texas. The Edwards Plateau covers a large portion of this area consisting of 22,000,000 acres. The location of the Edwards Plateau is delineated on the map of Texas to be found on page two. These grazing lands represent a very large part of the agricultural income of the state. However, they are producing far below their potential due to present range conditions resulting from past use. Bell and others reported that three per cent of the range land in the state was in good condition, forty per cent was in fair condition, and forty-one per cent was in poor condition.¹

The grazing lands of Texas provided the basic existence for the pioneers. Grasses produced forage for game animals and domestic livestock in keeping with the climate of each

¹H. M. Bell, R. M. Milhollin, and C. A. Rechenthin, "Range Resources of Texas," Range Conservation Handbook, (2161.1).

MAP OF TEXAS DELINEATING THE EDWARDS PLATEAU



area. Originally there was a balance between plant communities and animal population. But as human populations increased, more domestic livestock were on the land. This development resulted in an acute problem of maintaining an adequate cover on the land to protect it while providing forage for increased animal populations.²

Statement of Purpose

The primary purpose of this study was to determine the problems confronting vocational agriculture teachers in public schools of the Edwards Plateau in teaching range management, to summarize their problems, and to offer some suggestions as to the solution of these problems. Concomitant aims are:

- (1) To obtain information from all vocational agriculture teachers in the Edwards Plateau through a questionnaire.
- (2) To analyze the results obtained from the questionnaire sent to vocational agriculture teachers.
- (3) To survey available literature in range management.
- (4) To determine the best techniques for the teaching of range management in vocational agriculture classes.

²Bell, Milhollin, and Rechenthin, loc. cit.

- (5) To prepare suggested teaching plans based upon the results of the survey.

Source of Data

Questionnaires were received from seventy-five vocational agriculture teachers on the Edwards Plateau. References from the library of Southwest Texas State College were surveyed. In addition to these sources, technical journals, United States Department of Agriculture bulletins, and progress reports were used as research material.

Limitation of the Study

This study has been limited to the teaching of range management problems in high school vocational agriculture departments located on the Edwards Plateau of Texas.

Definition of Terms

There are a few terms which have been used in this study that may not be fully understood unless they are defined. A definition of each follows:

1. Ranch is an area of 100 acres or more of range land used chiefly in sheep, goat, and cattle production.
2. Range condition is the stage of plant development or the state of health and productivity for both soil and forage on a given range.

3. Range site is an area that has similar soils and climatic conditions capable of producing certain kinds and amounts of native forage.

4. Deferred-rotation is the delay of grazing for a certain period on one part of the ranch while other areas are being grazed; then rotating part of the livestock to the area in a systematic operation.

CHAPTER II

REVIEW OF RELATED MATERIALS IN THE FIELD OF RANGE MANAGEMENT PROBLEMS

Range management is the science and art of planning and directing range use so as to obtain the maximum livestock production consistent with conservation of the range resources.¹ Range management, in a sense, is an old term that goes back to the days of the pioneers. However, it is relatively new in the field of education. In the review of literature the writer found that very little research has been conducted on the teaching of range management in the public schools. Therefore the review of literature is mostly concerned with research on range management problems of the Edwards Plateau and research in other areas that may be applicable to the Edwards Plateau.

From the beginning range management has meant that there was some limit on removal of the growth of plants, but the limit for acceptable management before 1900 was different by 1920, and the 1920 limit is not acceptable today. By 1920, and for some years thereafter, the most widely held

¹Lawrence A. Stoddart and Arthur D. Smith, Range Management, (first edition; New York and London: McGraw-Hill Book Company, Inc., 1943) p. 2.

opinion among professional range men was that at least fifteen per cent of the available crop of palatable herbage should be left unused at the end of the grazing season. Today the more common recommendation is to leave fifty per cent or more if grazing is during the growing season. This seems necessary to obtain maximum and long sustained production from any group of range grasses.²

Range Economics

Many ranchers understand that ranges are harmed by misuse, but some do not understand how directly this affects their income. Range economics must deal with long-term views rather than with immediate profits, according to S. V. Ciriacy-Wantrup and A. M. Schultz. Often there are long-term effects which are not possible to measure at once. These facts are particularly true of conservation measures on the range which may have had lasting effects on the water supply for a city or upon the value of land for recreation and wildlife. All of these things are of little or no profit to the owner, but present techniques of research are generally lacking in ways to measure such enduring benefits.³

²E. J. Dykesterhuis, "What is Range Management," Journal of Range Management, VIII (September, 1955) p. 193.

³S. V. Ciriacy-Wantrup and A. M. Schultz, "Problems Involving Conservation in Range Economics Research," Journal of Range Management, X (January, 1957) p. 12.

David F. Costello stated that a sound method of judging the range must have an ecological basis. It must recognize the structural characteristics of plant communities, characteristics which are susceptible to measurement as well as qualitative description. It must recognize the dynamics of vegetation and therefore range trend, which can be measured in terms of change in structure and yield over varying periods of time. It must recognize the physical environment, which includes climatic, edaphic, and biotic factors including animals and man. It must also recognize practical use of the multiple products of the land on a sustained-yield economy.⁴

There is much to be taught vocational agriculture classes through the development of an educational program of range management that will have practical application on farms and ranches as well as in the classroom. Range contests will stimulate learning by competition. Dick Wilson stated that Clarence Bunch, Oklahoma Extension Range Specialists, believes that a new era has dawned in grassland conservation and management education through judging contests.⁵

⁴David F. Costello, "Factors to Consider in the Evaluation of Vegetation Condition," Journal of Range Management, IX (March, 1956) p. 74.

⁵Dick Wilson, "Teaching Tomorrow's Ranchers Today," Journal of Range Management, VIII (September, 1955) p. 199.

David F. Costello alleged that range management essentially was vegetation management, attained through the handling of animal and mechanical devices. He revealed in his study that a vocational agriculture teacher would have a better basis for deciding what should be the nature of training given vocational agriculture students if he would keep in mind the scope of range management.⁶

Range Conditions

Range condition must be considered in planning range programs, but can not be used as a sole framework from which to design range improvements.

In the Big Bend Area range sites that were in good condition absorbed moisture five to six times faster than the same range sites in poor condition, according to Horace L. Leithead. The loss of moisture by evaporation from the first foot of soil was about three times greater on closely grazed range in poor condition than it was from the same sites in good condition that had been properly grazed. Moisture lost to evaporation was just as serious as moisture lost by runoff, even though it was less noticeable.⁷

⁶David F. Costello, "An Employer's View," Journal of Range Management, X (May, 1957) p. 122.

⁷Horace L. Leithead, "Runoff in Relation to Range Condition in the Big Bend - Davis Mountain Section of Texas," Journal of Range Management, XII (March, 1959) p. 87.

L. R. Short and E. J. Woolfolk pointed out that plant vigor, as reflected by height of bluestem wheatgrass plants, varied in their study from the effects of weather, of protecting from grazing, and of cumulative range condition. These variations established and strengthened "vigor" as a criterion of range condition. These findings demonstrated the soundness of the vigor concept and showed how it might be used almost any time of year on Northern Plains range to indicate current range condition.⁸

Joseph F. Arnold recognized that plant-life form provided a visual means of evaluating ecological range condition because the life forms that prevailed on a given range unit indicated conditions with respect to herbage yields, organic mulch, range vigor, and soil erosion. Arnold suggested the following recognition of plant-life form helps:⁹

- (1) To evaluate range productivity.
- (2) To establish the goals for proper stocking.
- (3) To distinguish differences in grazing preferences.

⁸L. R. Short and E. J. Woolfolk, "Plant Vigor as a Criterion of Range Condition," Journal of Range Management, IX (March, 1956) p. 69.

⁹Joseph F. Arnold, "Plant Life-Form Classification and Its Use in Evaluating Range Conditions and Trend," Journal of Range Management, VIII (July, 1955) p. 180.

- (4) To establish the needs for seasonal use and other systems of grazing.
- (5) To estimate the economic justification for restoring depleted ranges by artificial reseeding.

A total of eight habitat criteria were studied by Leroy J. Young to determine their relationship to the range condition class as determined by vegetational-composition. Of these criteria only one, density, was not associated with change in the range-condition class. The following habitat criteria were evidently associated with change in the condition class: forage production, litter coverage, root weight, soil aggregation, organic matter, soil temperature, and infiltration rate.¹⁰

In a study conducted by R. R. Humphrey it was observed that a large amount of precipitation may be intercepted by vegetation, these amounts being roughly proportional to denseness and volume of the plant cover.¹¹

¹⁰Leroy J. Young, "The Determination of Habitat Factors Associated With Different Range Condition Classes on an Upland Site In The Southeastern Edwards Plateau of Texas," (unpublished Doctor's Thesis, Agricultural and Mechanical College of Texas, College Station, 1955) p. 77.

¹¹R. R. Humphrey, "Forage and Water," Journal of Range Management, XII (July, 1959) p. 169.

Stocking Rate

Proper range management involves several factors. Among these are grazing the correct number of animals, stocking with the proper kind of stock, and grazing during the correct season. It also involves various livestock-management programs necessary to realize the greatest forage yield consistent with maintenance of the range.

August L. Hormay considered selective grazing of the vegetation as the prime cause of range deterioration. Selective grazing can not be prevented, but its harmful effects could be overcome by resting the range from grazing at intervals. Resting must be timed so as to provide the key forage species on the range the opportunity to reproduce on a continued basis. There was little doubt that periodic resting from grazing was essential for the improvement and maintenance of bunch-grass-type ranges and for maximum sustained livestock production.¹²

In a specific project under the direction of Leo B. Merrill and Vernon A. Young, a general grazing plan was outlined for the Texas Ranch Experiment Station at Sonora, Texas. They set up heavily-stocked pastures, moderately-stocked yearlong pastures, and lightly-stocked pastures.

¹²August L. Hormay, "How Livestock Grazing Habits and Growth Requirements of Range Plants Determine Sound Grazing Management," Journal of Range Management, IX (July, 1956) p. 164.

There was a decline in livestock weight and vegetation in the heavily-stocked pastures. On moderately-stocked year-long pastures slight improvement occurred in vegetational condition but livestock weights declined during the drouth from September, 1950, through June, 1951. The lightly-stocked pastures showed a marked improvement in both vegetational condition and livestock weights over the other two rates of yearlong stocking. Deferred-rotation pastures produced greater livestock gains both per head and per acre. These results indicated that a system of rotation should be practiced to obtain maximum weight gains and wool and mohair production as well as the maximum vegetational improvement.¹³

Drouth should be prepared for during periods of normal rainfall, according to C. A. Bonnen and J. M. Ward. They conducted a study of 162 ranches within a one-hundred mile radius of San Angelo in the Edwards Plateau during the drouth of 1943-53. From an economic standpoint, they summarized their study with the following range management program:¹⁴

- (1) Moderate rates of stocking.

¹³Leo B. Merrill and Vernon A. Young, "Range Management Studies on the Ranch Experiment Station," United States Department of Agriculture Progress Report 1449, p. 4.

¹⁴C. A. Bonnen and J. M. Ward, "Some Economic Effects of Drouth on Ranch Resources," United States Department of Agriculture Bulletin 801, (March, 1955) p. 2.

- (2) Deferred grazing of pastures to insure reseeding of better grasses.
- (3) Close culling to eliminate non-productive livestock.
- (4) Conservative use of credit.
- (5) Moderation in standards of living.
- (6) Adequate insurance for protection of family and to strengthen credit standing.
- (7) Reserves developed for rainless days.

It seems that through the years, according to the study of Donald L. Huss, approximately one-third of the land units of the Edwards Plateau were leased lands. These leased lands were usually over utilized. The faults of existing lease agreements contributed to this situation. A better understanding of proper land use by the lessee and lessor was the only stable manner in which this situation could be corrected. Until that time lease agreements which will lead to proper range use should be employed. In the more humid portion of the Edwards Plateau an average of one animal unit per twenty acres was suggested as a result of this study.¹⁵

¹⁵Donald L. Huss, "Leased Lands of the Edwards Plateau," Journal of Range Management, VIII (September, 1955) p. 201.

Brush Control

Brush had invaded many of the rangelands of Texas to the extent that grass production was below that necessary for the economic operation of a ranching unit. In these brush-infested areas, range improvement was nearly an impossible undertaking until control of brush could be accomplished, at least to a degree that it could be removed as a dominant user of available water and other plant requirements.¹⁶

Hurlon Ray listed brush as being high on the list of agricultural problems and stated that the annual loss in dollars due to brush invasion would be impossible to measure. Experience showed that in achieving successful control the efficiency of application was fully as important as the chemicals used. Brush control used most extensively has been the application of chemicals by airplane. The person who made the aerial application of the chemical should have had experience in brush-control work, and the area to be sprayed should be plainly marked and flagged. When complete eradication was desired it became necessary to make a repeated spraying to control undergrowth

¹⁶Jack Barton, "Chemical Control of Brush," (Cooperative Conservation Workshop, 1960), p. 1 (Mimeographed).

that was not affected with first application.¹⁷

It has been said that history repeats itself. The Bible gives evidence of brush invading the Biblical lands as early as 1500 B. C.

Yaaqov Orev related in his travels through Texas, New Mexico, Utah, Arizona, and California that there were millions of acres where brush was dominant. The invasion was so complete in places, as in South Texas, that woody species formed almost impenetrable thickets. He also stated that early American pioneers once described the same areas as a sea of grass.¹⁸

The value of brush control on grazing lands depends largely on the potential productivity of the kind and amount of brush, according to C. E. Fisher and Lawrence Quinn. Control of open to moderate stands of mesquite in West Texas was favored. Control of mesquite gave an increased carrying capacity of the land three-fold or more and established a highly productive pasture grass.¹⁹

¹⁷Hurlon Ray, "New Developments in Chemical Brush Control in Arkansas," Journal of Range Management, I (July, 1957) p. 195.

¹⁸Yaaqov Orev, "Brush Invasion 1500 B. C. and 1950 A. D.," Journal of Range Management, IX (September, 1959) p. 6.

¹⁹C. E. Fisher and Lawrence Quinn, "Control of Three Major Brush Species on Grazing Lands in the United States, Cuba, and Brazil," Journal of Range Management, XII (September, 1959) p. 248.

Erosion Control

Erosion-control measures resulted in great benefits both to the owner and to the public; to the landowner in the form of soil and moisture conservation, and to the public in the form of clearer streams and reduced flood heights. The adjoining owners of level lands were insured against overwash by barren soil from already denuded slopes. Erosion can be thought of partially as a function of the amount and rate of runoff considered in relation to physical and chemical characteristics inherent in the soil.²⁰

Norman H. French stated that accelerated erosion was a cancerous thing which may rapidly destroy the productive assets of a farm, a ranch, or a country. Man is affected by erosion, he may cause erosion, or he may work toward controlling it.²¹

J. H. Stallings related that the chief cause of soil deterioration on grazing land was the loss of plant cover. The plant cover was destroyed by overgrazing and poor range management practices, exposing the ground to wind and rain.

²⁰Quincy Claude Ayres, C. E., Soil Erosion and Its Control, (first edition; New York and London: McGraw-Hill Book Company, Inc., 1936) p. 7.

²¹Norman H. French, "A New Look at Erosion Control," Journal of Range Management, X (September, 1957) p. 149.

The impact of falling raindrops caused soil splash, puddle, and fertility erosion, heavy runoff, and other damages.

The quickest, most effective, and cheapest way to restore the range is by the use of the range practice best suited to the operation involved. Range practices should be effectively coordinated with growth habits and requirements of the principal forage plants.²²

²²J. H. Stallings, Soil Use and Improvements, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957) p.268.

CHAPTER III

PRESENTATION AND ANALYSIS OF THE DATA

The data presented in this chapter were obtained from a survey that was sent to ninety-four vocational agriculture teachers of the Edwards Plateau of Texas. Seventy-five teachers completed and returned their questionnaires. This study was based on the opinions of the vocational agriculture teachers. It was anticipated that the teachers would be able to use the findings as an aid in recognizing the problems of range management and in teaching range management.

A list of questions was prepared concerning the more important problems of range management. The questions were based on published literature and problems frequently encountered by teachers. These questions asked for the opinions of vocational agriculture teachers, as to the season of the year and the number of hours consumed in teaching each range management problem. The writer also attempted to ascertain the average number of college semester hours completed by vocational agriculture teachers in range management, also the number of college semester hours needed by a teacher to satisfactorily teach range

management in the public schools of the Edwards Plateau. The questions were made as brief as possible to insure maximum participation.

The data have been summarized into seven tables to clarify the understanding of the problems. The problems from each table have been treated in the form of discussions.

In the elucidation of the questionnaire results, the agriculture classes were divided into categories of Agriculture I, II, III, and IV. Answers to question numbers three, four, and eight were arranged in the form of tables. Questionnaire items two, five, six, and seven were treated in discussion form.

The first category, Table I, to be considered consists of opinions of vocational agriculture teachers in the Edwards Plateau concerning the seasons of the year and the average number of hours consumed teaching range management problems in Agriculture I Classes. The survey revealed that the majority of teachers were teaching a portion of each problem during this first year. It can be noted in Table I that the vocational agriculture teachers were of the opinion that certain problems should be emphasized in Agriculture I Classes. Sixty-one per cent of the teachers reported that identification and evaluation of range plants were taught during the first year. An average of twelve

hours per teacher was spent on this problem. A majority of the teachers preferred to teach this problem in the fall. Fifty-five per cent of the teachers reported that recognizing the economic importance of range management should be taught during this year. An average of five hours per teacher was used. The fall season was preferred as the time for teaching this range management problem. Forty-eight per cent of the teachers reported that erosion control was taught in the first-year classes. An average of six hours per teacher was spent on this problem. Erosion control was taught equally in the fall and spring. Four to thirty-two per cent of the vocational agriculture teachers were also teaching the other range management problems during the first year. The number of hours spent per teacher on these problems varied from one to three hours.

Table II presents the opinions of vocational agriculture teachers regarding the seasons of the year and the number of hours spent per teacher on range management problems in Agriculture II Classes. Reporting teachers conducted classes on each of the problems; however, more time was consumed in teaching supplemental feeding on the range, identifying and evaluating range plants, and recognizing economic importance of range management. Table II also reveals that

TABLE I

OPINIONS OF VOCATIONAL AGRICULTURE TEACHERS ON THE SEASONS
OF THE YEAR AND TIME (HOURS) CONSUMED TEACHING RANGE
MANAGEMENT PROBLEMS IN THE PUBLIC SCHOOLS OF THE
EDWARDS PLATEAU OF TEXAS

AGRICULTURE I

RANGE MANAGEMENT PROBLEMS	PER CENT OF TEACHERS	AVERAGE HOURS PER TEACHER	SEASON PREFERRED
A. Recognizing economic importance of range management.	55	5	Fall
B. Identification and evaluation of range plants.	61	12	Fall
C. Brush control.	31	2	Spring
D. Control of weeds and poisonous plants.	32	2	Spring
E. Reseeding range lands.	25	2	Fall or Spring
F. Systems of grazing.	29	3	Spring
G. Stocking rates.	28	2	Spring
H. Cross fencing.	15	1	Spring
I. Development of water facilities.	25	3	Spring
J. Supplemental feeding on the range.	29	2	Fall
K. Irrigating range lands.	4	1	Spring
L. Fertilizing range lands.	11	1	Spring
M. Erosion control on range lands.	48	6	Fall or Spring

brush control and control of weeds and poisonous plants were taught by a high percentage of teachers during the second year. Seasons of the year varied slightly from Table I. Supplemental feeding on the range was taught Agriculture II Classes in the winter rather than in the fall. Thirty-nine per cent of the teachers spent an average of four hours each on the problem of erosion control during this same year.

The contexts of Table III concern the opinions of vocational agriculture teachers on the seasons of the year and the average number of hours consumed in the teaching of range management problems in Agriculture III Classes. The teaching of erosion control on the range lands, systems of grazing, and stocking rates were emphasized during the third year. The time allocated to the teaching of range management was approximately the same for all problems. However, cross fencing was taught in Agriculture III Classes during the fall of the year rather than in the spring as in Tables I and II.

The survey indicated that only five vocational agriculture teachers were conducting Agriculture IV Classes in the Edwards Plateau. Table IV summarizes the reports of these teachers.

TABLE II

OPINIONS OF VOCATIONAL AGRICULTURE TEACHERS ON THE SEASONS
OF THE YEAR AND TIME (HOURS) CONSUMED TEACHING RANGE
MANAGEMENT PROBLEMS IN THE PUBLIC SCHOOLS OF THE
EDWARDS PLATEAU OF TEXAS

AGRICULTURE II

RANGE MANAGEMENT PROBLEMS	PER CENT OF TEACHERS	AVERAGE HOURS PER TEACHER	SEASON PREFERRED
A. Recognizing economic importance of range management.	53	5	Fall
B. Identification and evaluation of range plants.	55	6	Fall
C. Brush control.	45	4	Spring
D. Control of weeds and poisonous plants.	45	3	Spring
E. Reseeding range lands.	33	3	Spring
F. Systems of grazing.	37	3	Spring
G. Stocking rates.	37	2	Spring
H. Cross fencing.	27	2	Spring
I. Development of water facilities.	27	2	Spring
J. Supplemental feeding on the range.	67	8	Winter
K. Irrigating range lands.	5	1	Spring
L. Fertilizing range lands.	10	1	Spring
M. Erosion control on range lands.	39	4	Fall or Spring

TABLE III

**OPINIONS OF VOCATIONAL AGRICULTURE TEACHERS ON THE SEASONS
OF THE YEAR AND TIME (HOURS) CONSUMED TEACHING RANGE
MANAGEMENT PROBLEMS IN THE PUBLIC SCHOOLS OF THE
EDWARDS PLATEAU OF TEXAS**

AGRICULTURE III

RANGE MANAGEMENT PROBLEMS	PER CENT OF TEACHERS	AVERAGE HOURS PER TEACHER	SEASON PREFERRED
A. Recognizing economic importance of range management.	40	5	Fall
B. Identification and evaluation of range plants.	39	7	Fall
C. Brush control.	41	3	Spring
D. Control of weeds and poisonous plants.	34	4	Spring
E. Reseeding range lands.	41	3	Spring
F. Systems of grazing.	52	5	Spring
G. Stocking rates.	49	4	Spring
H. Cross fencing.	30	2	Fall
I. Development of water facilities.	44	3	Spring
J. Supplemental feeding on the range.	36	5	Winter
K. Irrigating range lands.	7	1	Spring
L. Fertilizing range lands.	8	1	Spring
M. Erosion control on range lands.	52	5	Fall or Spring

TABLE IV

OPINIONS OF VOCATIONAL AGRICULTURE TEACHERS ON THE SEASONS
OF THE YEAR AND TIME (HOURS) CONSUMED TEACHING RANGE
MANAGEMENT PROBLEMS IN THE PUBLIC SCHOOLS OF THE
EDWARDS PLATEAU OF TEXAS

AGRICULTURE IV

RANGE MANAGEMENT PROBLEMS	PER CENT OF TEACHERS	AVERAGE HOURS PER TEACHER	SEASON PREFERRED
A. Recognizing economic importance of range management.	1	8	Fall
B. Identification and evaluation of range plants.	4	5	Fall
C. Brush control.	4	5	Spring
D. Control of weeds and poisonous plants.	5	2	Spring
E. Reseeding range lands.	4	3	Spring
F. Systems of grazing.	4	3	Fall
G. Stocking rates.	4	4	Fall
H. Cross fencing.	1	1	Winter
I. Development of water facilities.	4	2	Fall
J. Supplemental feeding on the range.	5	5	Winter
K. Irrigating range lands.	4	2	Spring
L. Fertilising range lands.	5	2	Spring
M. Erosion control on range lands.	6	5	Fall or Spring

Table V gives the number of under-graduate college hours and the number of college graduate hours completed in range management by vocational agriculture teachers in the Edwards Plateau of Texas. A variation from zero to twenty under-graduate semester hours was reported in range management by vocational agriculture teachers, revealing that forty per cent had completed six semester hours, fourteen per cent had completed three semester hours, and thirty-three per cent had completed no college work in range management. There was a wide variation of graduate hours in range management reported by the teachers. Sixty-four per cent had no college courses, eighteen per cent had completed three hours, and ten per cent had completed six hours of graduate work. This table reveals that only forty per cent of vocational agriculture teachers in the Edwards Plateau have completed as much as six under-graduate college hours in range management, while the majority of the teachers have not obtained any graduate college hours in this subject. It will be noted that thirty-three per cent of the teachers have completed no college work in range management.

Opinions of vocational agriculture teachers in the Edwards Plateau of Texas concerning the number of college semester hours needed to satisfactorily teach range management is contained in Table VI. Teachers varied considerably in their opinions as to the number of college semester hours

TABLE V
 NUMBER OF COLLEGE SEMESTER HOURS COMPLETED
 IN RANGE MANAGEMENT BY VOCATIONAL
 AGRICULTURE TEACHERS IN THE
 EDWARDS PLATEAU OF TEXAS

PER CENT OF TEACHERS	UNDER-GRADUATE COLLEGE HOURS	PER CENT OF TEACHERS	GRADUATE COLLEGE HOURS
33	0	64	0
14	3	18	3
40	6	10	6
2	8	5	4
6	9	2	9
3	12	1	16
1	16	1	18
1	20		

needed to satisfactorily teach range management. Their opinions varied from zero to thirty college semester hours. Thirty-six per cent of the teachers were of the opinion that six college semester hours were necessary to teach range management, while twenty-six per cent suggested twelve college semester hours. It will be noted in Table VI that seventy per cent of the vocational agriculture teachers were of the opinion that a teacher should have completed six or more college semester hours in range management to satisfactorily teach this subject in the public schools of the Edwards Plateau of Texas.

The context of Table VII is comprised of the opinions of vocational agriculture teachers pertaining to the percentage of adult ranchers using improved range management practices. In the communities of forty-three per cent of the reporting vocational agriculture teachers less than twenty-six per cent of the adult ranchers were using improved range management practices. Twenty-five per cent of the vocational agriculture teachers reported twenty-six to fifty per cent were using improved practices, while nineteen per cent of the teachers reported from fifty-one to seventy-six per cent. Thirteen per cent of the vocational agriculture teachers reported that from seventy-six to 100 per cent of the adult ranchers in their communities were using improved range management practices.

TABLE VI
 OPINIONS OF VOCATIONAL AGRICULTURE TEACHERS IN THE
 EDWARDS PLATEAU CONCERNING THE NUMBER OF COLLEGE
 SEMESTER HOURS TO SATISFACTORILY TEACH
 RANGE MANAGEMENT

PER CENT OF TEACHERS	SUGGESTED SEMESTER HOURS IN RANGE MANAGEMENT
23	Unknown
1	0
3	3
3	4
36	6
1	8
1	9
26	12
1	15
3	16
1	18
1	30

TABLE VII
OPINIONS OF VOCATIONAL AGRICULTURE TEACHERS
CONCERNING THE PER CENT OF ADULT
RANCHERS USING IMPROVED RANGE
PRACTICES

PER CENT OF TEACHERS	PER CENT OF RANCHERS USING IMPROVED RANGE PRACTICES		
43	0	to	25
25	26	to	50
19	51	to	75
13	76	to	100

The writer has arranged four items of the questionnaire in the form of discussion. The items to be treated in this manner are (1) should more range management be taught in your vocational agriculture department? (2) what resource people do you use in teaching range management? (3) do you have a Young Farmers Organization? (4) if so, what per cent are using improved range practices? It was the opinion of sixty-one per cent of the reporting teachers that more range management should be taught in their departments, while thirty-nine per cent felt that they were teaching a sufficient amount of range management. The survey revealed that eighty-three per cent of the vocational agriculture teachers were using the Soil Conservation Service for resource information, while thirty per cent referred to local ranchers, and five per cent referred to county agents. Only a minority of the vocational agriculture teachers reported having a Young Farmers Organization; however, those reporting declared that a high percentage of the students were using improved range management practices.

In the survey it was noted that a high percentage of vocational agriculture teachers were without any college training in range management. The majority of the teachers also indicated that more range management should be taught in their vocational agriculture departments. Ninety per

cent of the teachers requested teaching plans to aid them in the teaching of range management problems.

The opinions of the majority of vocational agriculture teachers provided the basis for formulating the teaching plans on range management problems. The indications of these teachers concerning the importance of the range management problem, the agriculture class preferred, the time spent on the problem, and the season taught were utilized in the preparation of the teaching plans. Many of the reporting teachers indicated that supplemental feeding on the range was of major importance in teaching range management. The writer felt that a teaching plan on supplemental feeding on the range would not be necessary as most teachers include this range management problem when teaching the feeding of livestock. No teaching plans were prepared for irrigating range lands and fertilizing range lands as teachers reported very little time consumed on these problems. Similar range management problems were grouped together, and a teaching plan was prepared. For teaching plans see Appendix B of this study.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

The review of literature leaves the impression upon the writer that a study of the teaching of range management problems was overdue as very little research has been done on this portion of the problem.

The data of this survey were obtained through a questionnaire that was sent to ninety-four vocational agriculture teachers of the Edwards Plateau of Texas. Seventy-five of the questionnaires were completed and returned. The study was based on the opinions of the teachers.

It was the opinion of vocational agriculture teachers that a portion of each range management problem should be taught in Agriculture Classes I, II, and III. The majority of vocational agriculture teachers emphasized in Agriculture I Classes the teaching of identification and evaluation of range plants and recognizing the economic importance of range management. These range management problems were preferred to be taught during the fall of the year. Erosion control was also of importance during the first year; teachers preferred either fall or spring as the teaching season. Time spent in Agriculture II Classes indicated

that the teaching of supplemental feeding on the range was important. The teachers preferred to teach this problem in the winter. Both identification and evaluation of range plants and recognizing the economic importance of range management were taught by more than half of the teachers during this second year. The season preferred for teaching these problems was the fall. Brush control and control of weeds and poisonous plants were taught by forty-five per cent of the teachers in the second year. Most of the teachers taught erosion control on the range lands in Agriculture III Classes. Systems of grazing and stocking rates were also taught in this year. Spring was preferred as the season of the year for teaching these problems. Only five teachers reported Agriculture IV Classes being conducted in the Edwards Plateau.

Ninety per cent of the reporting vocational agriculture teachers requested teaching plans to aid them in the teaching of range management problems. Teaching plans, based on an analysis of this survey, were prepared for the requesting teachers.

In an attempt to determine the college work completed in range management by the vocational agriculture teachers on the Edwards Plateau the writer found that only forty per cent had completed as much as six under-graduate college

hours, while sixty-four per cent had not obtained any graduate college hours in this subject. It was the opinion of seventy per cent of the vocational agriculture teachers that a teacher should have completed six or more college hours in range management to satisfactorily teach this subject in the public schools of the Edwards Plateau. The majority of the teachers were of the opinion that more range management should be taught in their departments. Assistance from the Soil Conservation Service was received by many teachers in the teaching of range management. The teachers that reported having Young Farmer Organizations stated that a high per cent of these students were using improved range practices. Less than one-half of the teachers reported that more than fifty-one per cent of the adult ranchers of their communities were using improved range management practices.

Conclusions

The writer desires, at this time, to note a few conclusions which have been derived from this study. Many vocational agriculture teachers on the Edwards Plateau are without college training in range management; yet they feel the need for more emphasis on the teaching of this problem in their vocational agriculture classes. This indicates that teacher-training institutions need to stress and encourage

range management courses to insure adequate training of vocational agriculture teachers. Improving education in the use of the soil and its resources will lead to a higher percentage of improved range management practices.

APPENDIX A
LETTER AND QUESTIONNAIRE USED IN THE STUDY

May ____, 1962

Dear Mr. _____:

I am making a study of range management being taught in public schools of the Edwards Plateau of Texas, in the hope that the results of this study will be of value to vocational agriculture teachers in their efforts to teach and inform their community on this important subject.

I need information which can be obtained only through a survey of range management being taught in your area. I will appreciate your cooperation in completing the questionnaire and returning it to me as soon as possible.

It may be possible that little or no range management is taught by you, however it is of utmost importance that you return the questionnaire for the completion of this survey.

Information given will be treated confidentially and will be used collectively, not individually. Summaries of the survey will be supplied all vocational agriculture teachers denoting an interest in the results. For your convenience a self-addressed envelope is enclosed. Your assistance in giving the requested information will be greatly appreciated.

Sincerely yours,

Clayton A. Massey
Vocational Agriculture Teacher
Harper, Texas

SURVEY OF RANGE MANAGEMENT BEING TAUGHT BY VOCATIONAL AGRICULTURE
TEACHERS IN PUBLIC SCHOOLS OF THE EDWARDS PLATEAU OF TEXAS

Please complete the following as indicated:

1. How much time do you spend teaching the following range management problems?

Time spent on problem (indicate by number of hours)

Season taught (indicate by F-Fall, W-Winter, or S-Spring)

	AG. I		AG. II		AG. III		AG. IV	
	Time	Season	Time	Season	Time	Season	Time	Season
A. Recognizing the economic importance of range management.								
B. Identification and evaluation of range plants.								
C. Brush control.								
D. Control of weeds and poisonous plants.								
E. Reseeding range lands.								
F. Systems of grazing.								
G. Stocking rates.								
H. Cross fencing.								
I. Development of water facilities.								
J. Supplemental feeding on the range.								
K. Irrigating range lands.								
L. Fertilizing range lands.								
M. Erosion control on range lands.								
N. _____								
O. _____								

2. Do you think more range management should be taught in your vocational agriculture classes? YES ____ NO ____
3. How many college semester hours do you have in range management?
Under-Graduate ____ Hours Graduate ____ Hours
4. How many college semester hours should a person have to satisfactorily teach range management? ____ Semester Hours
5. List resource people that you use in teaching range management.
(1) _____, (2) _____, (3) _____
6. Do you have a Young Farmer Organization? YES ____ NO ____
7. If so, what per cent are using improved range practices? ____ Per Cent
8. What per cent of the adult ranchers in your community are using improved range practices? ____ Per Cent

NOTE: If you would like a summary of this study along with recommended teaching plans on each problem, please sign below:

NAME _____

ADDRESS _____

APPENDIX B
TEACHING PLANS

TEACHING PLAN

AGRICULTURE I

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
November		12 periods

A. Improving Plants (Identification and Evaluation of Range Plants)

1. Objectives:

- a. Lead the students to understand the purpose of plant identification.
- b. Lead the students to identify and recognize the grazing value of range plants.
- c. Lead the students to determine what range plants should be on their ranches.
- d. Lead the students to recognize the importance of having good grasses on their ranches.

2. Secure the students' interest.

- a. Have a range conservationist from the Soil Conservation Service talk to the class.
- b. Show the film "Grassland."
- c. Make a field trip to study different range plants.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. Have students clip ten different poor range plants and make comparison as to amount of forage produced from ten different good range plants.
- b. Have students bring plants from their ranches that have remained unused after range has been grazed.
- c. Have students compute the dollars and cents received from poor range as compared to good range conditions.

4. Lead the students to contribute all they know, have heard, observed, or read about the problem.

- a. Use leading question technique:
Ask what fathers are doing to improve their plants?

- b. Call for personal experiences and observations.
- c. Lead a class discussion on range plants.
- d. Present problems that are not apparent to students to stimulate their study interests.

5. Present authoritative information.

a. References:

- (1) Know Your Grasses, B-182, Texas Agriculture Extension Service, College Station, Texas.
- (2) Year Book of Agriculture, 1948, United States Department of Agriculture, Washington, D. C.
- (3) Range Plants of Texas, B-236, Agriculture Extension Service, College Station, Texas.
- (4) Native Grasses, Circular 558, Oklahoma A. & M. Extension Service, Oklahoma City, Oklahoma.
- (5) Range Grasses, MP-164, Agriculture Extension Service, College Station, Texas.
- (6) Pasture and Range Plants, (Section 1, 2, 3, and 4) Phillips Petroleum Company, Bartlesville, Oklahoma.
- (7) Grass for Conservation, FM-2093, United States Department of Agriculture, Washington, D. C.
- (8) Grassland, 16mm film, sound, black and white, running time 9 minutes, Cen-Tex Film Library, College Station, Texas.

b. Range plants.

- (1) Show students mounted plants or live plants.
- (2) Draw and label the parts of a plant.

c. Growing seasons:

- (1) Cool season plants.
 - (2) Warm season plants.
- (Reference 1)

d. Life span of plants.

- (1) Annual.
 - (2) Bi-annual.
 - (3) Perennial.
- (Reference 2)

e. Grazing value of range plants.

- (1) Excellent.
 - (2) Good.
 - (3) Fair.
 - (4) Poor.
- (Reference 1)

- f. Definition of terms:
 - (1) Increaser - a plant that increases in abundance on the range when overgrazed.
 - (2) Invader - plants which come in areas after the climax plants have been diminished by overgrazing, drouth, or fire.
 - (3) Decreaser - a plant that goes out when the range is overgrazed.
 - (4) Climax - top ranking plants in the areas given--must be native to fall in this group. (Reference 2)
 - g. Identify common range plants.
 - (1) Discuss different identifying characteristics with students.
 - (2) Name and collect samples of plants. (Reference 6)
 - (3) Discuss mounting of plants.
6. Assist the students in making the desired decisions and developing needed skills.
- a. Get students to select as many good plants as possible from their home ranches.
 - b. Aid students to recognize the value of good range plants on their home ranches.
 - c. Have students make a collection of range plants of the area.

TEACHING PLAN

AGRICULTURE I

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
November		4 periods

A. Improving Plants (Economic Importance of Range Management)

1. Objectives:

- a. To recognize the economic value in dollars and cents in the county and state.
- b. To recognize the effects in later years as to the soil erosion loss.
- c. To recognize the effects on livestock.

2. Secure the students' interest.

- a. Show students examples of eroded pastures.
- b. Compare livestock on properly managed range lands with livestock on improperly managed and eroded range soils.
- c. Study the most prosperous ranchers in the community to determine the range practices they are using.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. A field trip to check the erosion on various range soils.
- b. Recognize the fact that Texas has only three per cent of range land in excellent condition, sixteen per cent in good condition, forty per cent in fair condition, and forty-one per cent in poor condition.
- c. Lead the students to recognize the economic effects of poor range lands on the community.

4. Lead the students to contribute all they know, have heard, observed, or read about the problems.

- a. Ask students to tell what their fathers are doing to increase forage production on the range.
- b. Call for personal experiences and observations.
- c. List opinions and ideas on board.

5. Present authoritative information.

a. References:

- (1) Some Economic Effects of Drouth On Ranch Resources, B-801, Texas Agriculture Extension Service, College Station, Texas.

- (2) Year Book of Agriculture, 1948, United States Department of Agriculture, Washington D. C.
 - (3) The Effects of Stocking Rates On The Economic Returns From Ranch Lands, Leroy J. Young, Southwest Texas State College, San Marcos, Texas.
 - (4) Range Management, Stoddart and Smith, McGraw-Hill Book Company, Inc. (New York and London, 1943) pp. 1 and 2.
 - (5) Range Management Versus Drouth, C-320, Texas Extension Service, College Station, Texas.
- b. Using range condition averages have class compute the forage produced, using averages below for the county:
 - (1) Excellent 1,507 pounds forage per acre.
 - (2) Good 1,261 pounds forage per acre.
 - (3) Fair 1,095 pounds forage per acre.
 - (4) Poor 794 pounds forage per acre.
 (Reference 3)
 - c. Have class figure the additional livestock that could be run in the county if the range lands were in good condition. (cow requires five tons of dry grass per year, sheep one ton of dry grass, and goats 1,800 pounds of dry grass.)(Reference 4)
 - d. Why does range management have an economic importance on the ranch?
 - (1) Increases the income of the rancher.
 - (2) It helps to conserve the soil for future generations.
 - (3) It will aid in helping to produce more and better livestock with less diseases.
 - (4) Sound range conservation practices will have a stimulative effect on the community.
 (Reference 4)
6. Assist the students in making the desired decisions and developing needed skills.
 - a. Lead students to identify the economic problems of range management.
 - b. Lead students to realize the gain in dollars and cents, if the economic problems are solved.
 - c. Get the students to recognize the benefits from a strong economic community.
 - d. Lead the students to realize a need for a strong program in range management.

TEACHING PLAN

AGRICULTURE II

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
April		4 periods

A. Growing and Harvesting Crops (Controlling Undesirable Range Plants)

1. Objectives:

- a. Lead the students to understand the importance of controlling undesirable range plants.
- b. Recognize the different plants that are undesirable on the range.
- c. Recognize the effects of undesirable plants on the range.
- d. Determine the prevention or control of the undesirable range plants.

2. Secure the students' interests.

- a. Apply the subject to the local area.
- b. Make a field trip to study the different undesirable plants that are in the area.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. Have students to study specific areas to determine the percentage of undesirable plants.
- b. Help students to recognize the fact that trees use four times as much water to produce a pound of forage as compared to grass.
- c. Recognize that weeds also need four to eleven times the amount of water to produce a pound of forage as compared to good grasses.
- d. Have students to recognize the fact that thousands of dollars are lost in livestock by poisonous plants, without considering the loss of forage from undesirable plants.

4. Lead the students to contribute all they know, have heard, observed, or read about the problem.

- a. Ask for personal experiences and observations.

- b. Have members of the class list the practices that are being carried out on their ranches in the way of controlling undesirable range plants.
- c. Ask students to give practices that are being used by their neighbors.
- d. Ask students to give the approximate percentage of undesirable range plants on their ranches.

5. Present authoritative information.

a. References:

- (1) The Stockman's Handbook, M. E. Ensminger, (Second Edition) Interstate Publishing Company, Danville, Illinois, pp. 320-325, 496-509.
- (2) Sixteen Plants Poisonous to Livestock In The Western States, FB-2106, United States Department of Agriculture, Washington, D. C.
- (3) Mesquite Control, MP-386, Agriculture Extension Service, College Station, Texas.
- (4) Brush Control and Range Improvements, B-942, Agriculture Extension Service, College Station, Texas.
- (5) Prickly Pear Good or Bad, B-806, Agriculture Extension Service, College Station, Texas.
- (6) More Grass From Controlling Trees and Brush With Chemicals, B-800, Agriculture Extension Service, College Station, Texas.

b. Plants to control in range management are:

- (1) Brush.
- (2) Weeds.
- (3) Prickly pear.
- (4) Poisonous plants.
(References 1 and 5)

c. Brush control practices.

- (1) Mechanical control.
- (2) Grazing with goats.
- (3) Burning.
- (4) Chemical control.
(Reference 4)

d. Practices for weed control.

- (1) Chemical spraying.
- (2) Mechanical cutting.
- (3) Burning.
(Reference 1)

e. Prickly pear control.

- (1) Grubbing.
- (2) Chemical control.
(Reference 5)

6. Assist the students in making the desired decisions and developing needed skills.
 - a. Get as many students as possible to accept responsibilities for an improvement project involving weed control, brush control, or other noxious plants.
 - b. Make a study of a small area and lead the students to make a decision as to the methods that should be used to control the noxious plants.

TEACHING PLAN
AGRICULTURE II

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
December		10 periods

A. Growing and Harvesting of Crops (Proper Stocking Rates and Grazing Systems)

1. Objectives:

- a. Lead the students to evaluate the range conditions and sites.
- b. Lead the students to understand the importance of proper stocking rates.
- c. Lead the students to decide the proper stocking rate for their ranches.
- d. Lead students to understand the importance of grazing systems.
- e. Lead students to recognize the grazing system that should be used on their ranches.

2. Secure the students' interest.

- a. Make a field trip to a local rancher to study examples of proper stocking rates and grazing systems.
- b. Secure a prosperous rancher or a representative of the Soil Conservation Service to talk on stocking rates and grazing systems.
- c. Relate personal experiences on the subject.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. Ask students to tell how many acres they have in their ranches. List acres on board.
- b. Ask students to give number of cattle, sheep, and goats on their ranches. Figure the animal units for each boys' ranch.
- c. Ask students if they think ranchers are overstocked.

4. Lead the students to contribute all they know, have heard, observed, or read about the problem.

- a. Ask students to give their grazing systems and proper stocking rates.

- b. Ask students to give practices that ranchers are using in their communities.

5. Present authoritative information.

a. References:

- (1) Do You Know Your Range, B-864, Agriculture Extension Service, College Station, Texas.
- (2) Proper Grazing = More Profit, MP-259, Agriculture Extension Service, College Station, Texas.
- (3) Welcome to Substation No. 14, MP-270, Agriculture Experiment Station, Sonora, Texas.
- (4) Range Management for the Rolling Red Plains, B. J. Ragsdale and G. O. Hoffman, Extension Range Specialists, Texas A. & M. College, College Station, Texas.
- (5) The Effects of Stocking Rates On The Economic Returns From Ranch Lands, Leroy J. Young, Southwest Texas State College, San Marcos, Texas.
- (6) Increased Production Through Management, B. J. Ragsdale and G. O. Hoffman, Extension Range Specialists, Texas A. & M. College, College Station, Texas.
- (7) The Stockman's Handbook, M. E. Ensminger, (Second Edition) Interstate Publishing Company, Danville, Illinois. Pp. 226-227.

b. Distribute reference (1).

- (1) Study degree of utilization.
 - (a) Determine the different degrees of utilizations.
- (2) Study range sites.
 - (a) Describe a range site.
 - (b) Recognize different range sites.
- (3) Range condition classes.
 - (a) Give range condition classes and describe each.
 - (b) Recognize factors to consider in determining the range condition.
 - (c) Determine range conditions on the range.
 - (d) Study treatment for improving range condition classes.
 - (e) Give recommended treatment for improving the range condition. (Reference 1)
 - (f) Have class members compute the forage production on their ranches using the state average. (Excellent, 1,507 pounds per acre three per cent, Good, 1,261 pounds per acre sixteen per cent, Fair, 1,095 pounds per acre forty per cent, Poor, 794 pounds per acre forty-one per cent.) (Reference 5)

- (g) Have students determine the average forage produced on their ranches.
 - (h) Have class figure the additional live-stock that could be run, if the ranges were in good condition. (cow requires five tons of dry grass per year, sheep one ton of dry grass, and goat 1,800 pounds of dry grass.)
 - (i) Have class compute the profit that could be received, using the price of prevailing livestock.
- c. Distribute reference (2).
- (1) Signs of over stocking.
 - (a) Decrease in number and vigor of key plants.
 - (b) Livestock grazing poor plants.
 - (c) Baked condition of soil.
 - (d) Plants sitting on knolls.
 - (e) Many trails and bare spots.
 - (f) Invading plants increasing.
 - (g) Poor livestock.
 - (2) Signs of proper stocking.
 - (a) Increase in seedlings of plants.
 - (b) Livestock grazing good plants.
 - (c) Soil feels like a carpet.
 - (d) Soil erosion not evident.
 - (e) Bare areas covering.
 - (f) Fewer poor plants.
 - (g) Healthy, fleshy, livestock.
 - (3) How pastures are stocked.
 - (a) Wrong way to stock a pasture:
 - Necessity. Livestock condition.
 - Habit. As long as any kind of
 - Convenience. grass is left.
 - Past history.
 - (b) The right way to stock a pasture:
 - Forage production checked seasonally.
 - Graze half and leave half.
 - Leave abundance of litter and cover.
 - Run only one-half or three-fourth breeding stock.
 - Leave one-fifth of seed stalks of good plants.
 - Based on pounds of production per acre.
 - (4) How pastures can be increased in production of forage.
 - (a) Brush control.
 - (b) Deferred and rotation grazing.
 - (c) Reseeding.
 - (d) Livestock distribution.

- (5) The pointers for proper grazing.
 - (a) Stock on the basis of forage available instead of so many acres per cow, sheep, or goat.
 - (b) Check the grass crop instead of live-stock condition. Animals can live on poor vegetation for some time before they began to look bad.
 - (c) Provide a forage reserve of cured grass for winter grazing, as well as hay, silage, and concentrated feed.
 - (d) Allow for drouth years.
 - (e) Check the signs listed for range improvement or deterioration.
 - (f) Remember that pounds of production rather than number of head count at the market. (Reference 2)
 - (6) Animals required to make an animal unit when computing stocking rates. (one cow, five sheep, six goats, six deer, or one horse.) (Reference 4)
 - d. The most common grazing systems are:
 - (1) Continuous grazing.
 - (2) Deferred grazing.
 - (3) Deferred-rotation grazing. (Reference 7)
 - e. A four-pasture grazing system: One pasture rests while three are grazed. This may be operated on a calendar basis wherein each pasture rests four months and is grazed twelve months. (Reference 6)
 - f. Other grazing systems:
 - (1) The three-pasture system is where a pasture is rested for three months and grazed six months.
 - (2) The South African switchback system involves only two pastures and each is alternately rested or grazed during three and six month periods. (Reference 6)
6. Assist students in making the desired decisions and developing needed skills.
- a. Lead students to agree that better conservation practices should be carried out in stocking rates and grazing systems.
 - b. Lead students to agree that proper stocking rates are essential in good range management.
 - c. Lead students to work out stocking rates and grazing systems for their ranches.

TEACHING PLAN
AGRICULTURE III

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
April		4 periods

A. Soil and Water Conservation (Erosion Control on Range Lands)

1. Objectives:

- a. Determine the causes of erosion.
- b. Determine how to control erosion.
- c. Determine how to obtain aid in carrying out range conservation practices.

2. Secure the students' interests.

- a. Make a field trip to eroded areas, and areas that have been following conservation practices.
- b. Show films "More Good From Fewer Acres" and "In Common Cause."
- c. Demonstrate to the class the water absorption rate on good range cover as compared to bare soil.
- d. Relate personal experience such as lakes filling up, etc.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. Lead the students to recognize the proper conservation practices that should be carried out in range management programs.
- b. Lead the students to realize that without range conservation practices the ranch would be of little value.
- c. Lead the students to realize the need to increase range productivity for the ever increasing population.

4. Lead the students to contribute all they know, have heard, observed, or read about the problem.

- a. Use leading question technique.
- b. Ask students to give some practices that they are using on their ranches to prevent erosion.
- c. Have students give practices that their neighbors are using to prevent erosion.
- d. Lead class discussion on the problem.

5. Present authoritative information.

a. References:

- (1) Elements of Soil Conservation, Bennett, McGraw-Hill Book Company, Inc. (New York and London.)
- (2) Soil and Water Conservation Demonstrations, MP-397, Agriculture Extension Service, College Station, Texas.
- (3) More Good From Fewer Acres, film, Cen-Tex Film Library, Texas A. & M. College, College Station, Texas.
- (4) In Common Cause, film, Cen-Tex Film Library, Texas A. & M. College, College Station, Texas.
- (5) Range Management, Stoddart and Smith, McGraw-Hill Book Company, Inc., (New York and London) p. 320.
- (6) New for Old, B-185, Agriculture Extension Service, College Station, Texas.
- (7) Soils and How to Improve Them, B-189, Agriculture Extension Service, College Station, Texas.
- (8) Soil Fertility Removed In Crops, L-165, Agriculture Extension Service, College Station, Texas.

b. Types of erosion:

- (1) Wind erosion.
- (2) Water erosion.
(Reference 1)

c. Control wind and water erosion on range lands:

- (1) Maintain a good cover of grass at all times during the year. This cover will slow down the movement of water running off the soil, break the force of raindrops, and will aid in water penetration.
(Reference 5)

d. Aids for carrying out range conservation practices are:

- (1) Through the Soil Conservation District a person can receive technical aid to carry out conservation practices.
- (2) Through the Agriculture Stabilization and Conservation Administration financial assistance can be obtained.
- (3) Advice may be obtained from local ranchers as to how they are carrying out range conservation practices.

6. Assist the students in making the desired decisions and developing needed skills.
 - a. Lead the students to agree that range management practices should be followed in the community.
 - b. Lead the students to recognize that conserving our soil and ranges will be the future of the next generation.
 - c. Lead the students to recognize the steps that should be taken to improve the conservation program on their ranches.

TEACHING PLAN
AGRICULTURE III

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
April		3 periods

A. Growing and Harvesting of Crops (Reseeding Range Lands)

1. Objectives:

- a. Lead the students to determine the importance of reseeding.
- b. Lead the students to determine when to reseed range land.
- c. Lead the students to recognize the factors involved in reseeding.

2. Secure the students' interest.

- a. Discuss the importance of reseeding.
- b. Make a field trip to study range lands that have been reseeded.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. Lead the students to recognize that without reseeding it may take several years for the better grasses to get established.
- b. Lead the students to recognize that reseeding will increase the forage yield and value of the ranch.

4. Lead the students to contribute all they know, have heard, observed, or read about the problem.

- a. Ask students what methods they are using on their ranches in the way of reseeding.
- b. Discuss other ranchers in the community that have done some reseeding.

5. Present authoritative information.

a. References:

- (1) Range Management for the Rolling Plains,
B. J. Ragsdale and G. O. Hoffman, Extension
Range Specialists, Texas A. & M. College,
College Station, Texas.

- (2) Proper Grazing - More Profits, MP-259, Agriculture Extension Service, College Station, Texas.
 - (3) Seeding Arid Ranges to Grass, Circular 122, L. A. Stoddart, Agriculture Experiment Station, Utah State Agriculture Station, Logan, Utah.
 - (4) Do You Know Your Ranges? B-864, Agriculture Extension Service, Texas A. & M. College, College Station, Texas. p. 13.
 - (5) Range Management, Stoddart and Smith, McGraw-Hill Book Company, Inc., (New York and London, 1943) pp. 352-380 - 325-383.
 - (6) The Stockman's Handbook, M. E. Ensminger, (Second Edition) Interstate Publishing Company, Danville, Illinois. p. 227.
- b. Methods of reseeding:
 - (1) Natural reseeding.
 - (2) Artificial reseeding.
(References 6 and 1)
 - c. Successful reseeding.
 - (1) Consider the rainfall, soil, topography, and other factors.
 - (2) Prepare a weed free and firm seed bed.
 - (3) Plant seed during the most desirable moisture and growing conditions.
 - (4) Cover seed one-fourth to three-fourth inches in depth.
 - (5) Protect from grazing until plants become established.
 - (6) Practice conservation on reseeded area.
(References 5 and 6)
 - d. Failures in reseeding caused by:
 - (1) Low productive soil.
 - (2) Excessive grazing.
 - (3) Erosion by water.
 - (4) Weed competition.
 - (5) Planted too deep.
 - (6) No soil preparation.
 - (7) Climate condition. (Reference 5)
 - e. When to reseed:
 - (1) Poor range plants dominant.
 - (2) Bare soil.
 - (3) Less than ten per cent climax grasses present.
(Reference 5)
6. Assist the students in making the desired decisions and developing needed skills.
 - a. Get as many students as possible to accept re-seeding as an improvement project.
 - b. Make a study of specific ranches and have the students to agree which is the most economical way to reseed artificially or naturally.

TEACHING PLAN
AGRICULTURE III

<u>Month</u>	<u>Problems and Procedures</u>	<u>Periods</u>
May		3 periods

A. Growing and Harvesting Crops (Distribution of Grazing on the Range)

1. Objectives:

- a. Lead the students to recognize the needs for distribution of grazing.
- b. Lead the students to recognize the benefits from distribution of grazing.

2. Secure the students' interest.

- a. Make a field trip to study utilization around water and salting areas. Also study the utilization of grazing that is a mile or so from salt or water.
- b. Have a representative of the Soil Conservation Service talk on distribution of grazing.

3. Lead the students to recognize the problem as it affects them, their families, community, and nation.

- a. Lead the students to recognize the problem as it affects the ranch to the extent that without proper distribution the range will be over grazed in places and not grazed enough in others.
- b. Lead the students to recognize that more stock can be run on the range if the livestock are evenly distributed.

4. Lead the students to contribute all they know, have heard, observed, or read about the problem.

- a. Call for observed examples of poor distribution of grazing.
- b. Ask students to give examples as to what their fathers are doing to distribute their grazing.

5. Present authoritative information.

a. References:

- (1) Proper grazing = More Profit, MP-259, Agriculture Extension Service, College Station, Texas.
- (2) Range Management for the Rolling Red Plains, B. J. Ragsdale and G. O. Hoffman, Extension Range Specialists, Texas A. & M. College, College Station, Texas.
- (3) Range Management, Stoddart and Smith, McGraw-Hill Book Company, Inc., (New York and London, 1943) pp. 316-318.
- (4) The Stockman's Handbook, M. E. Ensminger, (Second Edition) Interstate Publishing Company, Danville, Illinois, p. 227.

b. What is distribution of grazing?

- (1) It provides for uniform use of forage all over the pasture. (Reference 1)

c. How can we increase the distribution of grazing on the range?

- (1) Have water places not more than a mile apart.
- (2) Place salt boxes away from watering places. (References 2 and 4)
- (3) By fencing pastures into smaller units.

d. What are the benefits of proper distribution of range lands?

- (1) Uniform grazing on the range.
- (2) Greater returns from the range.
- (3) Greater gains for the livestock.
- (4) Less erosion and less damage to plants. (Reference 2)

6. Assist the students in making the desired decisions and developing needed skills.

- a. Lead the students to agree to better distribution of grazing on the ranges.
- b. Lead the students to agree that proper distribution of grazing will mean additional income for the ranches.
- c. Lead the students to recognize the steps to take in improving the distribution of grazing on their ranches.

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