The Point Observation Plot Method Of Range

Survey As Used By The Western Division Of

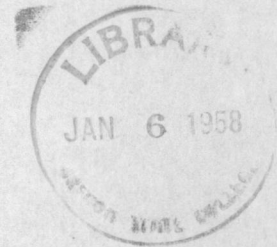The Agricultural Adjustment Administration

In 1937

and

A Comparison Of Weight Estimates With Esti-

mates Of Density For Indicating The Amount

Of Forage On An Area

By

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A Thesis

Presented to the Faculty

of the

School of Forestry

Oregon State College

In Partial Fulfillment

of the requirements for the Degree

Bachelor of Science

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Approved:

Redacted for privacy

Professor of Forestry

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Weight Estimate Method

OBJECT

To compile in such a manner the procedure of the
field work in using the Point Observation Plot Method
of range survey as used by the Agricultural Adjustment
Administration on private lands of eastern Oregon and
Washington in 1937; to give some comparative results of
the survey of 1937 with estimates of carrying capacity
of the different counties and the three Pacific Coast
states; to make available a sample survey and procedure
used in the field in arriving at the carrying capacity
of a range unit (and to include problems in the sample
which were confusing to the range examiners when first
encountered in the field); and to give a general intro-
duction of the possible use of the Weight Estimate
Method[3] over the Density Estimate Method of determining
the amount of forage on an area.

Execution of the field work in conducting range
surveys by the Point Observation Plot Method is of prime
importance to the range examiner; however, it is approx-
imately of equal importance that the range examiner
should know the results obtained by such forage inven-
tories and the basis of arriving at the formula for
determining carrying capacities. Also, it is important
that the range examiner know the basis of the factors
used in the formula.

The Point Observation Plot Method.

The Point Observation Plot Method is commonly called

the "Square Foot Density Method"[1] because density is measured in square feet of ground covered by each species as viewed from above on a circular plot inscribed in the soil enclosing one hundred square feet of ground area. This being the case, the number of square feet of vegetation on the plot is read directly as a percentage of the total area of the plot. "The Point Observation Plot Method is a system of sampling vegetation by randomized and replicated plots."[1]

Preliminary Considerations.

That you may understand to best advantage the object and mechanics of this method of survey, it is desirable to have a general understanding of the values included in palatability tables, density, and forage acre requirement factors.

Palatability Tables.

The palatability of a species is "the percentage of the readily accessible herbage of a species that is grazed when the range is properly utilized".[4] A special board was appointed, including members who represent all agencies involved, to make a standard palatability table for all forage plants occurring on the ranges of eastern Oregon and Washington. This table was made to facilitate uniformity of range surveys which were being carried on by the different agencies of the Cooperative Western Range Survey Project. It should be noted that percentage

utilization of a plant species by an animal has little relation to nutrition value. This being the case, size of plant and nutrition value of that plant should be correlated. As far as this consideration goes, we will be obliged to accept palatability ratings of plant species as they are now formulated for there are no studies available that will allow palatability tables to be formulated with due consideration to nutrition value of plant species.

Density Estimates.

Density of each species occurring on a particular plot is estimated individually but not as a percentage of the total density. The total density of each plot will be the sum of the densities of the species occurring on that particular plot. The total density will be in square feet or percentage of total plot area. The estimator should carry a wire frame, one foot square, divided into quarters, which will aid him in determining the number of square feet or part of a square foot of density on the plot. Another very common aid is to divide the one hundred square foot plot into quarters and then count the number of square feet of density in one quarter. This should only be practiced where the entire one hundred square foot plot is uniformly covered by all species present. By determining the amount of density for each species on one quarter, the value may be applied to the remaining three-quarters of the plot area.

"Density for each species should be based on the apprearance of the plants when they have attained their full normal growth. In other words, the plants should mentally beconstructed to compensate for one or all of the following conditions: (1) growth still to be attained, (2) portions already eaten, and (3) abnormal total forage production."[1]

"In considering a double story of vegetation the density of each layer should be estimated."[1]

Examiners should check their estimates daily by pulling the vegetation on a given plot and placing species in the wire frame so as to be representative of 10/10 density for square feet or any part of a square foot. This should be done by all members of the crew as the success and accuracy of the method depends upon the uniformity and accurate estimating by all examiners.

Forage Acre Requirement Factors.

"In Oregon and Washington a large number of ranching units were given a preliminary examination in order to make inventory of the forage resources as an aid to this inter-agency group in determining a forage acre requirement for cattle and sheep. In selecting these sample units, an effort was made to exclude lands known to be either greatly under utilized or greatly depleted since to have included such lands would have introduced an element of personal judgment which it was desired to eliminate. In other words, the lands to be examined for

this purpose were to be those in reasonably good condition, full but not overstocked, and operated by men who could be depended upon to provide reasonable complete and accurate histories of grazing use extending over a period of five or more years."[2]

The forage acre requirement factor is a figure that is set up to be the amount of forage required to carry a cow or sheep animal unit for one year. The forage acre requirement factors that were decided upon for the Oregon and Washington division of the Western Range Division were 1.2 forage acres per animal unit for sheep and 1.68 forage acres per animal unit for cattle. It should be noted that these figures for forage acre requirement vary. To be an accurate survey, these figures would vary by types, regions and altitudes.

Field Procedure.

The procedure was to pass through the center of each section or part of each section. The control was section corners or one-quarter corners. The customary procedure was to tie into a known corner at least every two sections. Direction was obtained by hand compass and distance measured by pacing. Plots were started by pacing 4 chains in from the section line and across the section until ten plots were taken. The tenth plot should fall 4 chains short of the opposite side of the starting side of the section. The standards set up by the Western Range Survey Instructions for minimum number of plots to sample

various sized types are: 10 to 20 acres, 3 plots; 20 to 80 acres, 5 plots; and 80 to 640 acres, 10 plots.

Mapping.

All cultural features were to be placed on the map sheet which was on a scale of 2" to the mile. All seasonal water sources were to be mapped in with an approximate accuracy requirement. Types were to be mapped in to a minimum size of 10 acres. Poisonous plant and rodent infested areas were to be mapped and designated by their proper symbols.

How To Lay Out Plots.

A circular plot of 100 square feet in area inscribed in the surface soil by using a radius of 5.64 feet long (or 5 feet 7.8 inches). The place to inscribe the plot is mechanically chosen by using the point on the ground where the pacer's heel strikes at the end of the distance between plots. In other words, the distance from center to center of each plot is pre-determined. This is done to obtain an average sample of the vegetation and to eliminate the individual from choosing the spot to take the sample. In case it is desirable to have a representative number of plots in a type within a section other than the main type, the examiner should go through the type in a straight line and place plots at pre-determined intervals. In case of small types of 10 to 20 acres, the distance between plots doesn't necessarily have to be eight chains.

Care should be taken in inscribing the boundaries of the plot, as an error of six inches in the diameter of the plot will result in an error of thirteen square feet in area.

The instruments for laying out plots are several in number. The best method is to use two sharpened iron pins attached by a chain 5.64 feet long. The chain should be fastened to the iron pins approximately six inches from the sharpened end, at which point there should be a swivel placed on the chain or a large link that will allow the chain to turn on the pin. This is important because if the chain becomes twisted the area of the circle will not be correct. The chain and pins should be made of light material, as added weight is not desirable to the average hiker.

How To Estimate And Record Density.

The best method of estimating and recording density, as practiced in the field, is to first list by symbol all plant species on the plot that will have 0.5 feet or over of density. The grasses are listed in a group at the top of the column provided for species on the write-up sheet; the weeds are listed in a group approximately mid-way down in the species column; and lastly, the shrubs are grouped at the bottom of the column for species. It is well to note that following this systematic procedure all species are estimated and none are omitted. In estimating the different species of plants occurring on a plot, the estimator should reconstruct those species that are not at the maximum growth stage. Certain early plant

species should be accounted for by remnants of current dead material. An example of one of these plants is filaree (*Erodium cicutarium*) which is an early spring plant with high palatability. Livestock operators in eastern Oregon depend upon this plant species on their early spring range. Fig. 1.

In estimating density of grasses (especially those belonging to the bunchgrass genus (*Agropyron*)), the grass-stalks should be raised and gently pressed together to the extent of ten-tenths density for each stool or individual clump. Each stool may then be accurately estimated separately by placing the density frame over the stool and the sum of the values of all stools of the same species on the plot will give the total number of square feet for that species. In estimating annual grasses the estimators should pick all annuals on a sample plot at least once every two or three days and lay the picked herbage in the density frame. The plants should not be crowded tightly together to determine ten-tenths density. Before picking the plants on the sample plot, the estimators should record the density individually and keep in mind a mental picture of the stand before it is picked. After measurement is completed, the estimators should mentally adjust his original estimate to fit that obtained by actual measurement. All examiners working on the same survey area should be together when this check is made in order to keep the individual

estimators of the group somewhat uniform.

Weeds, with the exclusion of rosette types, are raised to approximately fourty degrees and then estimated according to procedure of estimating annual grasses. Rosette type of weeds are estimated as full coverage.

Explanation Of Field Write-up Sheets.

Type or Transect No. This is nothing more or less than the type identification number. For each type a transect is set up. A transect is a series of plots placed within a given type that is either closed naturally by other types or by boundary of unit. In progressing through the first type, the type or transect number will be number one. Upon crossing from one vegetative type into the second, a new series of write-up sheets are used and the second vegetative type will be the second transect and thus the type or transect number will become two. The type or transect number should be placed on field map sheet so that the write-up sheets bearing the same type or transect number may be easily compared as to location and number of plots. Fig. 1 and 7.

Project, examiner's name, type, date and location (section, township, and range) should be written in the spaces provided on the write-up sheet before any density estimates are recorded. Fig. 1.

Type: There were eighteen general vegetative type classifications used on the survey in eastern Oregon and Washington. These general type classifications are

as follows:

Type 1. Included grassland other than meadow and secondary meadow. Perennial grasses determine the aspect and are usually predominant. Weeds and browse may be present and still be a number one type.

Type 2. Meadow (dry and wet).

Type 3. Perennial forbes (weeds).

Type 4. Sagebrush.

Type 5. "Browse - Shrub. Examples of sub-types are mountain mahogany, bitter brush, willows, Ceanothus - Manzanita, California Chaparral, etc."[1]

Type 6. Conifers.

Type 7. "Waste. This type includes all areas of dense timber and brush which have no value for grazing or have such slight value that they cannot be used economically."[1]

Type 8. Barren.

Type 9. Pinon - Juniper.

Type 10. Broad Leaf Trees.

Type 11. Creosote.

Type 12. Mesquite.

Type 13. Saltbrush.

Type 14. Greasewood.

Type 15. Winterfat.

Type 16. Desert Shrub.

Type 17. Half Shrub.

Type 18. Annuals (weeds or grasses). Fig. 5 and 6.

Species symbols.

Species symbols will consist of the first letter of
the Latin name followed by the first two letters of the
specific name. For instance, Agropyron spicatum will be
symbolized as Asp. In case of conflicting symbols, the
first three letters of the generic name are used. This
also may be the case when all species of a certain genus
are to be included in one symbol. When letters of the
genus name are used, the symbol is capitalized. Palata-
bility tables give the correct symbol for each plant listed.

Species density part of write-up sheets.

Plot number should be written in consecutive order
horizontally across the write-up sheet. Plot numbers re-
main in consecutive order until a change of type is en-
countered, then write-up sheets are changed and plot
numbers start at one again. Fig. 2 and 3.

Density: The vertical columns below the plot num-
bers are for recording density. The first space below
the plot number is for total density on each plot of all
species of grasses, weeds and shrubs. The remaining
spaces below the double line are for each species density.
The vertical column below species is for plant symbols.
Density is recorded under proper plot column for each
species. After all densities are recorded for a plot,

the total density for that plot is recorded directly under
the plot number in the horizontal column labelled "density".
When a sheet is filled with 10 plots the totals for each
species is placed in the vertical column labelled "total
density". Total density for all plots is placed in first
space of "total density" column. Total density for all
species should be added in the vertical column labelled
"total density" and this figure, if correct, will equal the
total density of all plots which is in the first space of
the "total density" column. Fig. 2.

Average density. To get the average density for all
plots, divide the total density of all plots by the number
of plots. This figure will be placed in the first space in
the column labelled "Average Density". To get average
density of each species, divide the total density of each
species by the number of plots and this figure will be
placed in the proper species space in the "Average Density"
column. After this is done for each species the total of
these species averages should be equal to the average
density of all plots which occurs in the first space in
the "Average Density" column. Fig. 1 and 5.

Palatability. In the vertical column labelled "Pal.",
the palatability percentage for each species is taken from
the Standard Palatability Table for the proper stock using
the area and placed in the proper space for each species
listed on write-up sheet. Fig. 1 and 5.

Forage factor. To get the (F.F.) forage factor, the
average density of each species is multiplied by the pal-

atability percentage for that species and then divided by 100. This figure is placed in the proper space for that species in the "F.F." column. This is the forage factor for each species. After this is done for each species the "F.F." column is totalled and this figure is the forage acre factor for the type and is placed at the top of the sheet in the space provided for the "F.A.Factor". Fig. 1.

Surface acres. To get the surface acres of the type, the examiner takes the area from the field map sheet (Fig. 7.) and writes this value on the write-up sheet directly below the "F.A.Factor" figure. Fig. 1.

Forage acres. To get the forage acres for the type, the forage acre factor (F.A.F.) is multiplied by the surface acres of the type. This figure is labelled "Forage Acres" and is written in on write-up sheet directly below "Surface Acres". Fig. 1.

Animal units. To get the animal units on the type, the forage acres are divided by the forage acre requirement factor (F.A.R.). This figure is then written in on write-up sheet and labelled "Animal Units". Fig. 1.

Summary sheet. To save time in compilation, a group of write-up sheets belonging to the same type or transect may be summarized on a write-up sheet and labelled at top, "Summary Sheet". If this procedure is followed, the average density, palatability, and forage factor compilations on individual write-up sheets will be eliminated and done only on "Summary Sheet". Fig. 1 and 5.

Reverse side of write-up sheets will be filled out

as soon as the type has been completely sampled. If the
"Summary Sheet" procedure is followed, then only the re-
verse side of the "Summary Sheet" need be filled in. Fig.
1 and 5.
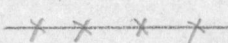
Sample Survey.

The privilege to use the Forest Service "Reconnaissance
Map Sheets" and "Range Survey Write-Up Sheets" is appreci-
ated by the author. Fig. 1 to 8.

The sample survey of a hypothetical area is included
for explanatory and procedure purposes only.

The method of indicating plots, transects, type sym-
bols, and type lines are shown in Figures 7 and 8. Type
or transect numbers are the circled numbers in red. Types
are indicated by the symbols 1-Pse-Asp and 18-Bte. Each
individual map sheet is   representative of only one
quarter of any particular township. Areas of the transects
occurring on each map sheet are indicated at the bottom
of each map sheet. Fig. 7 and 8.

The following symbols are used in Figures 7 and 8:

Boundary line .... ─────────

Boundary fence .... ─x─x─x─x─

Cross fence .... ─x─x─x─x

Type or transect number ... ① ②

Type symbols 1-Pse-Asp

Permanent stream .... ←───────

Intermittant stream .... ──── · · ──

Permanent springs .... ⊙──→

Temporary springs ....   o—→

Poor road ....   = = = = = =

Type lines ....   ———

Known section corners ....   ♦

Corral ....   C—

Summary Sheet

RANGE SURVEY WRITE-UP SHEET

ADAPTED TO SQUARE FOOT DENSITY METHOD

PROJECT John Doe

TYPE OR TRANSECT NO. 1

EXAMINER H. Hessig

DATE Aug. 24, 1937

TYPE 1-Pse-Asp

LOCATION S. 8,3,10,9,&4: T.5S; R.26E

TOTAL DENSITY

S., T. & R. - AERIAL PHOTO NO.

FORAGE DENSITY _____ % PAL.

TIMBER

F.A. FACTOR .0460 FOR C & H

(COMP.)   (COND.)

Surface Acres- 1510   C & H OR S & G
Forage Acres - 69.46
Animal Units - 41.3

(REPROD.)   (DENS.)   (AGE)

(INJURY)   (CAUSE)

UTILIZATION CUTS:- SLOPE ____ % TIMBER ____ % ROCKS ____ % LACK OF WATER ____ % EROSION ____ %
UNSTABLE SOILS ____ %   TOTAL CUT _____

SPECIES DENSITY

(S.3 &10) (S.9 & 4) (S. 8)

PLOT NUMBER		10	9	10					TOTAL DENSITY	AVERAGE DENSITY	PAL.	F.F.
DENSITY		93.5	69.5	94.5					257.5	8.9		
SPECIES												
Pse		61.0	33.0	43.5					137.5	4.7	60	.0282
Asp		14.0	10.5	15.5					40.0	1.4	70	.0098
Bte		1.5	6.5	4.0					12.0	0.4	20	.0008
Eco			1.0						1.0	0.3	60	.0018
Fid				2.0					2.0	0.1	60	.0006
ERO		4.0	2.5	3.5					10.0	0.3	00	.0000
Ala		2.5	5.0	4.0					11.5	0.4	20	.0008
ERG		1.0	1.5						2.5	0.1	20	.0002
Eck		4.0	2.0	8.5					14.5	0.5	60	.0030
AST		2.5	1.5						4.0	0.1	00	.0000
Saj			1.0						1.0	---	10	.0000
Ptr		3.0	3.5						6.5	0.2	40	.0008
Atr			2.5	12.5					15.0	0.4	00	.0000
												.0460

FORM 764B (BACK)

TYPE COMMENTS

CURRENT FORAGE UTILIZATION: OVER-PROPER-UNDER
                             (CHECK ONE)

PLANT VIGOR: POOR-FAIR-GOOD
              (CHECK ONE)

RANGE CONDITION: POOR-FAIR-GOOD
                  (CHECK ONE)

RELATIVE PRODUCTIVENESS OF SITE: LOW-AV.-HIGH
                                  (CHECK ONE)

WATERING PLACES _2 springs and on stream__ OK
                 (KIND - LAKE, SPRING, ETC.) (DISTANCE) (ADEQUACY)   (PERM. - TEMP.)

POISONOUS PLANTS _None of importance_____
                  (KINDS)   (RECOMMENDATIONS)

KIND OF STOCK BEST SUITED TO RANGE: CATTLE-HORSES-SHEEP-GOATS
                                     (CHECK ONE OR MORE)

PROPER GRAZING PERIOD: SPRING-SUMMER-FALL-WINTER-YEAR LONG
                        (CHECK ONE OR MORE)

WILDLIFE _Deer, coyotes, and sage hens___ Not abundant
          (GAME, PREDATORS, RODENTS - SPECIES AND ABUNDANCE)

SOIL EROSION (CHECK ONE OR MORE)

SOIL TEXTURE (TO SIX INCHES DEEP)
CHECK IN APPROPRIATE BLOCKS

		GRAVELLY	STONY
LIGHT			
MEDIUM			
HEAVY			

SHEET EROSION EVIDENT

°GULLY EROSION
  OCCASIONAL GULLIES - SHALLOW
  OCCASIONAL GULLIES - DEEP
  FREQUENT GULLIES - SHALLOW
  FREQUENT GULLIES - DEEP

WIND EROSION
  DEPOSITION EVIDENT
  REMOVAL EVIDENT

ALKALI (CHECK IF EVIDENT)

SLOPE IN PERCENT (CIRCLE APPROPRIATE CLASSIFICATION) 0 TO 5, 6 TO 10, 11 TO 20, 21 TO 40, 41 TO 60, 61 TO 80, 81+

°EXPLANATION OF GULLY TERMS: OCCASIONAL GULLIES ARE GULLIES MORE THAN 100 FEET APART. FREQUENT GULLIES ARE GULLIES LESS THAN 100 FEET APART. SHALLOW GULLIES ARE THOSE EASILY CROSSABLE BY STOCK. DEEP GULLIES ARE THOSE DEEP ENOUGH TO INTERFERE WITH STOCK MOVEMENTS.

ADDITIONAL TYPE COMMENTS _____
_____
_____
_____
_____
_____
_____
_____

NOTE:
    THE INFORMATION CONTAINED ON THIS SHEET IS PRIMARILY A FORAGE INVENTORY. WHEN AND IF FURTHER DATA ARE SECURED ON TIMBER, WATER, SOILS, EROSION, WILD LIFE, ETC., BY EXPERTS ALONG THESE LINES, SUCH INFORMATION SHOULD BE FURTHER CORRELATED TO BEST SERVE RANGE MANAGEMENT.

RANGE SURVEY WRITE-UP SHEET

ADAPTED TO SQUARE FOOT DENSITY METHOD

PROJECT __John Doe__
EXAMINER __H. Hessig__
TYPE __1-Pse-Asp__
TOTAL DENSITY _____
FORAGE DENSITY _____ % PAL.
F.A. FACTOR _____ FOR __C & H__
C & H OR S & G

TYPE OR TRANSECT NO. _I_

DATE __Aug. 24, 1937__
LOCATION __Sec. 8; T.5S; R.26E.__
S., T. & R. - AERIAL PHOTO NO.

TIMBER _____
(COMP.) _____ (COND.) _____

(REPROD.) _____ (DENS.) _____ (AGE) _____

(INJURY) _____ (CAUSE) _____

UTILIZATION CUTS:- SLOPE ____% TIMBER ____% ROCKS ____% LACK OF WATER ____% EROSION ____%
UNSTABLE SOILS ____% TOTAL CUT _____

SPECIES DENSITY

PLOT NUMBER	1	2	3	4	5	6	7	8	9	10	TOTAL DENSITY	AVERAGE DENSITY	PAL.	F.F.
DENSITY	6.5	10.0	9.0	10.0	10.5	12.5	10.0	6.5	11.5	8.0	94.5			
SPECIES														
Pse	3.0	4.0	2.5	6.0	6.5	4.5	3.5	2.5	7.5	3.5	43.5			
Asp	1.5	2.5	2.0	1.0	1.5	1.5	1.0	---	3.0	1.5	15.5			
Bte	---	---	0.5	---	---	0.5	1.0	1.5	0.5	---	4.0			
Fid	---	---	---	---	---	---	---	0.5	---	1.5	2.0			
Eck	0.5	1.0	2.0	1.5	0.5	---	1.0	2.0	---	---	8.5			
Ala	0.5	---	---	---	1.0	0.5	0.5	---	0.5	1.0	4.0			
ERO	---	0.5	0.5	0.5	1.0	0.5	---	---	---	0.5	3.5			
Saj	---	---	---	---	---	1.0	---	---	---	---	1.0			
Atr	1.0	2.0	1.5	1.0	---	4.0	3.0	---	---	---	12.5			

TYPE COMMENTS

CURRENT FORAGE UTILIZATION: <u>OVER—PROPER—UNDER</u>   PLANT VIGOR: <u>POOR—FAIR—GOOD</u>
                                (CHECK ONE)   (CHECK ONE)

RANGE CONDITION: <u>POOR—FAIR—GOOD</u>   RELATIVE PRODUCTIVENESS OF SITE: <u>LOW—AV.—HIGH</u>
                    (CHECK ONE)   (CHECK ONE)

WATERING PLACES _____
                (KIND — LAKE, SPRING, ETC.)   (DISTANCE)   (ADEQUACY)   (PERM. — TEMP.)

POISONOUS PLANTS _____
                        (KINDS)   (RECOMMENDATIONS)

KIND OF STOCK BEST SUITED TO RANGE: <u>CATTLE—HORSES—SHEEP—GOATS</u>
                                        (CHECK ONE OR MORE)

PROPER GRAZING PERIOD: <u>SPRING—SUMMER—FALL—WINTER—YEAR LONG</u>
                            (CHECK ONE OR MORE)

WILDLIFE _____
                (GAME, PREDATORS, RODENTS — SPECIES AND ABUNDANCE)

SOIL EROSION (CHECK ONE OR MORE)   SOIL TEXTURE (TO SIX INCHES DEEP)
                                          CHECK IN APPROPRIATE BLOCKS

  SHEET EROSION EVIDENT

		GRAVELLY	STONY
° LIGHT			
°GULLY EROSION	MEDIUM		
OCCASIONAL GULLIES — SHALLOW	HEAVY		

    OCCASIONAL GULLIES — DEEP
    FREQUENT GULLIES — SHALLOW   ALKALI (CHECK IF EVIDENT)
    FREQUENT GULLIES — DEEP
  WIND EROSION
    DEPOSITION EVIDENT
    REMOVAL EVIDENT

SLOPE IN PERCENT (CIRCLE APPROPRIATE CLASSIFICATION) 0 TO 5, 6 TO 10, 11 TO 20, 21 TO 40,
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ADDITIONAL TYPE COMMENTS _____
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Figure 3.

RANGE SURVEY WRITE-UP SHEET
ADAPTED TO SQUARE FOOT DENSITY METHOD

PROJECT __John Doe__
EXAMINER __H. Hessig__
TYPE __1-Pse-Asp__
TOTAL DENSITY _____
FORAGE DENSITY _____ % PAL.
F.A. FACTOR _____ FOR __C & H__
C & H OR S & G

TYPE OR
TRANSECT NO. __T__

DATE __Aug. 24, 1937__
LOCATION __S. 9 & 4; T. 5S; R. 26E__
S., T. & R. — AERIAL PHOTO NO.

TIMBER _____
(COMP.)   (COND.)

_____
(REPROD.)   (DENS.)   (AGE)

_____
(INJURY)   (CAUSE)

UTILIZATION CUTS:-   SLOPE ___% TIMBER ___% ROCKS ___% LACK OF WATER ___% EROSION ___%
UNSTABLE SOILS ___%   TOTAL CUT _____

SPECIES DENSITY

PLOT NUMBER	11	12	13	14	15	16	17	18	19		TOTAL DENSITY	AVERAGE DENSITY	PAL.	F.F.
DENSITY	8.0	6.5	8.0	9.0	6.5	5.5	8.0	9.5	8.5		69.5			
SPECIES														
Pse	4.0	3.5	5.5	4.0	2.5	2.0	3.0	4.5	4.0		33.0			
Asp	1.0	0.5	1.0	---	2.0	0.5	1.5	2.5	1.5		10.5			
Bte	---	1.5	0.5	1.5	---	---	0.5	1.0	1.5		6.5			
Eco	---	---	---	---	---	---	---	---	1.0		1.0			
Ala	1.0	0.5	0.5	---	1.0	0.5	1.0	0.5	---		5.0			
ERO	0.5	---	---	1.0	0.5	0.5	---	---	---		2.5			
ERG	---	---	0.5	0.5	---	---	---	---	0.5		1.5			
Eck	---	---	---	0.5	---	---	0.5	1.0	---		2.0			
AST	---	---	---	---	---	0.5	1.0	---	---		1.5			
Ptr	1.0	---	---	1.5	---	0.5	0.5	---	---		3.5			
Atr	0.5	0.5	---	---	0.5	1.0	---	---	---		2.5			

TYPE COMMENTS

CURRENT FORAGE UTILIZATION: <u>OVER—PROPER—UNDER</u>
(CHECK ONE)

PLANT VIGOR: <u>POOR—FAIR—GOOD</u>
(CHECK ONE)

RANGE CONDITION: <u>POOR—FAIR—GOOD</u>
(CHECK ONE)

RELATIVE PRODUCTIVENESS OF SITE: <u>LOW—AV.—HIGH</u>
(CHECK ONE)

WATERING PLACES _____
(KIND — LAKE, SPRING, ETC.)   (DISTANCE)   (ADEQUACY)   (PERM. — TEMP.)

POISONOUS PLANTS _____
(KINDS)   (RECOMMENDATIONS)

KIND OF STOCK BEST SUITED TO RANGE: <u>CATTLE—HORSES—SHEEP—GOATS</u>
(CHECK ONE OR MORE)

PROPER GRAZING PERIOD: <u>SPRING—SUMMER—FALL—WINTER—YEAR LONG</u>
(CHECK ONE OR MORE)

WILDLIFE _____
(GAME, PREDATORS, RODENTS — SPECIES AND ABUNDANCE)

SOIL EROSION (CHECK ONE OR MORE)

SHEET EROSION EVIDENT

°GULLY EROSION
    OCCASIONAL GULLIES — SHALLOW
    OCCASIONAL GULLIES — DEEP
    FREQUENT GULLIES — SHALLOW
    FREQUENT GULLIES — DEEP
WIND EROSION
    DEPOSITION EVIDENT
    REMOVAL EVIDENT

SOIL TEXTURE (TO SIX INCHES DEEP)

CHECK IN APPROPRIATE BLOCKS

	GRAVELLY	STONY
LIGHT		
MEDIUM		
HEAVY		

ALKALI (CHECK IF EVIDENT)

SLOPE IN PERCENT (CIRCLE APPROPRIATE CLASSIFICATION) 0 TO 5, 6 TO 10, 11 TO 20, 21 TO 40, 41 TO 60, 61 TO 80, 81+

°EXPLANATION OF GULLY TERMS: OCCASIONAL GULLIES ARE GULLIES MORE THAN 100 FEET APART. FREQUENT GULLIES ARE GULLIES LESS THAN 100 FEET APART. SHALLOW GULLIES ARE THOSE EASILY CROSSABLE BY STOCK. DEEP GULLIES ARE THOSE DEEP ENOUGH TO INTERFERE WITH STOCK MOVEMENTS.

ADDITIONAL TYPE COMMENTS _____
_____
_____
_____
_____
_____
_____
_____
_____

NOTE:
    THE INFORMATION CONTAINED ON THIS SHEET IS PRIMARILY A FORAGE INVENTORY. WHEN AND IF FURTHER DATA ARE SECURED ON TIMBER, WATER, SOILS, EROSION, WILD LIFE, ETC., BY EXPERTS ALONG THESE LINES, SUCH INFORMATION SHOULD BE FURTHER CORRELATED TO BEST SERVE RANGE MANAGEMENT.

Figure 4.

RANGE SURVEY WRITE-UP SHEET

ADAPTED TO SQUARE FOOT DENSITY METHOD

PROJECT _John Doe_

EXAMINER _H. Hessig_

TYPE _1-Pse-Asp_

TOTAL DENSITY _____

FORAGE DENSITY _____ % PAL.

F.A. FACTOR _____ FOR _C & H_

                    C & H OR S & G

TYPE OR TRANSECT NO. _1_

DATE _Aug. 24, 1937_

LOCATION _S. 3 & 10; T.5S; R. 26E._

    S., T. & R. — AERIAL PHOTO NO.

TIMBER _____

  (COMP.)   (COND.)

  (REPROD.)   (DENS.)   (AGE)

  (INJURY)   (CAUSE)

UTILIZATION CUTS:- SLOPE ___ % TIMBER ___ % ROCKS ___ % LACK OF WATER ___ % EROSION ___ %

UNSTABLE SOILS ___ %   TOTAL CUT _____

SPECIES DENSITY

PLOT NUMBER	20	21	22	23	24	25	26	27	28	29	TOTAL DENSITY	AVERAGE DENSITY	PAL.	F.F.
DENSITY	10.0	12.0	8.5	7.0	11.5	11.5	7.5	8.0	9.0	8.5	93.5			
SPECIES														
Pse	6.0	7.0	5.0	4.0	8.0	10.0	6.0	5.0	6.0	4.0	61.0			
Asp	1.0	2.0	1.0	2.0	1.0	---	1.0	2.0	1.0	3.0	14.0			
Bte		0.5	1.0	---	---	---	---	---	---	---	1.5			
ERO	1.0	0.5	1.0	---	---	0.5	---	---	1.0	---	4.0			
Ala	0.5	0.5	---	0.5	0.5	---	---	---	---	0.5	2.5			
ERG	---	---	0.5	0.5	---	---	---	---	---	---	1.0			
Eck	1.0	0.5	---	---	---	---	---	1.0	0.5	1.0	4.0			
AST	---	---	---	---	1.0	1.0	0.5	---	---	---	2.5			
Ptr	0.5	1.0	---	---	1.0	---	---	---	0.5	---	3.0			

FORM 764B (BACK)

TYPE COMMENTS

CURRENT FORAGE UTILIZATION: <u>OVER-PROPER-UNDER</u>   PLANT VIGOR: <u>POOR-FAIR-GOOD</u>
                                (CHECK ONE)   (CHECK ONE)

RANGE CONDITION: <u>POOR-FAIR-GOOD</u>   RELATIVE PRODUCTIVENESS OF SITE: <u>LOW-AV.-HIGH</u>
                        (CHECK ONE)   (CHECK ONE)

WATERING PLACES _____
                        (KIND - LAKE, SPRING, ETC.)   (DISTANCE)   (ADEQUACY)   (PERM. - TEMP.)

POISONOUS PLANTS _____
                                (KINDS)   (RECOMMENDATIONS)

KIND OF STOCK BEST SUITED TO RANGE: <u>CATTLE-HORSES-SHEEP-GOATS</u>
                                        (CHECK ONE OR MORE)

PROPER GRAZING PERIOD: <u>SPRING-SUMMER-FALL-WINTER-YEAR LONG</u>
                            (CHECK ONE OR MORE)

WILDLIFE _____
                (GAME, PREDATORS, RODENTS - SPECIES AND ABUNDANCE)

SOIL EROSION (CHECK ONE OR MORE)   SOIL TEXTURE (TO SIX INCHES DEEP)

                                              CHECK IN APPROPRIATE BLOCKS

   SHEET EROSION EVIDENT

		GRAVELLY	STONY
LIGHT			
MEDIUM			
HEAVY			

   °GULLY EROSION
      OCCASIONAL GULLIES - SHALLOW
      OCCASIONAL GULLIES - DEEP
      FREQUENT GULLIES - SHALLOW   ALKALI (CHECK IF EVIDENT)
      FREQUENT GULLIES - DEEP
   WIND EROSION
      DEPOSITION EVIDENT
      REMOVAL EVIDENT

SLOPE IN PERCENT (CIRCLE APPROPRIATE CLASSIFICATION) 0 TO 5, 6 TO 10, 11 TO 20, 21 TO 40,
                                41 TO 60, 61 TO 80, 81+

°EXPLANATION OF GULLY TERMS: OCCASIONAL GULLIES ARE GULLIES MORE THAN 100 FEET APART. FREQUENT
   GULLIES ARE GULLIES LESS THAN 100 FEET APART. SHALLOW GULLIES ARE THOSE EASILY CROSSABLE BY
   STOCK. DEEP GULLIES ARE THOSE DEEP ENOUGH TO INTERFERE WITH STOCK MOVEMENTS.

ADDITIONAL TYPE COMMENTS _____
_____
_____
_____
_____
_____
_____
_____

NOTE:
   THE INFORMATION CONTAINED ON THIS SHEET IS PRIMARILY A FORAGE INVENTORY. WHEN AND IF FURTHER
DATA ARE SECURED ON TIMBER, WATER, SOILS, EROSION, WILD LIFE, ETC., BY EXPERTS ALONG THESE LINES,
SUCH INFORMATION SHOULD BE FURTHER CORRELATED TO BEST SERVE RANGE MANAGEMENT.

RANGE SURVEY WRITE-UP SHEET
ADAPTED TO SQUARE FOOT DENSITY METHOD

PROJECT __John Doe__   TYPE OR
EXAMINER __H. Hessig__   TRANSECT NO. __2__
TYPE __18-Bte__
                                              DATE __Aug. 24, 1937__
TOTAL DENSITY _____   LOCATION __S. 3&4 T. 5S; R. 26E.__
FORAGE DENSITY _____ % PAL. _____   S., T. & R. -   AERIAL PHOTO NO.
F.A. FACTOR __.0207__   FOR __C & H__   TIMBER _____
Surface Acres- 570 A. C & H OR S & G   (COMP.)   (COND.)
Forage Acres - 11.80
Animal Units - 7.02   (REPROD.)   (DENS.)   (AGE)

                                              (INJURY)   (CAUSE)
UTILIZATION CUTS:-   SLOPE ___ % TIMBER ___ % ROCKS ___ % LACK OF WATER ___ % EROSION ___ %
                      UNSTABLE SOILS ___ %   TOTAL CUT _____

SPECIES DENSITY

(S.3)   (Summary of S.4)

PLOT NUMBER	11		(10 Plots)						TOTAL DENSITY	AVERAGE DENSITY	PAL.	F.F.
DENSITY	11.0		82.5						93.5	8.5		
SPECIES												
Bte	4.5		45.0						49.5	4.5	20	.0090
Bbr	1.0		2.5						3.5	0.3	30	.0009
Pse	1.0		3.0						4.0	0.4	60	.0024
Asp	0.5		2.0						2.5	0.2	70	.0014
Ala	1.0		7.0						8.0	0.7	20	.0014
Eck	0.5		9.5						10.0	0.9	60	.0054
ERO	0.5		2.5						3.0	0.3	00	.0000
LUP-G			4.5						4.5	0.4	20	.0008
CHR	1.0		4.5						5.5	0.5	00	.0000
Ptr	1.0		---						1.0	0.1	40	.0004
Atr			2.0						2.0	0.2	00	.0000
												.0207

FORM 764B (BACK)

TYPE COMMENTS

CURRENT FORAGE UTILIZATION: OVER-PROPER-UNDER   PLANT VIGOR: POOR-FAIR-GOOD
                           (CHECK ONE)   (CHECK ONE)

RANGE CONDITION: POOR-FAIR-GOOD   RELATIVE PRODUCTIVENESS OF SITE: LOW-AV.-HIGH
                 (CHECK ONE)   (CHECK ONE)

WATERING PLACES *Seasonal stream. ½Mi. Inadequate*
                (KIND - LAKE, SPRING, ETC.) (DISTANCE) (ADEQUACY)   (PERM. - TEMP.)

POISONOUS PLANTS _____ *Not important* _____
                       (KINDS)   (RECOMMENDATIONS)

KIND OF STOCK BEST SUITED TO RANGE: CATTLE-HORSES-SHEEP-GOATS
                                    (CHECK ONE OR MORE)

PROPER GRAZING PERIOD: SPRING-SUMMER-FALL-WINTER-YEAR LONG
                       (CHECK ONE OR MORE)

WILDLIFE _____ *Deer, coyotes, and Sagehens.* _____
              (GAME, PREDATORS, RODENTS - SPECIES AND ABUNDANCE)

SOIL EROSION (CHECK ONE OR MORE)   SOIL TEXTURE (TO SIX INCHES DEEP)

                                              CHECK IN APPROPRIATE BLOCKS

   SHEET EROSION EVIDENT

		GRAVELLY	STONY
LIGHT			
MEDIUM			✓
HEAVY			

  °GULLY EROSION
     OCCASIONAL GULLIES - SHALLOW ✓
     OCCASIONAL GULLIES - DEEP
     FREQUENT GULLIES - SHALLOW   ALKALI (CHECK IF EVIDENT)
     FREQUENT GULLIES - DEEP
   WIND EROSION
     DEPOSITION EVIDENT
     REMOVAL EVIDENT

SLOPE IN PERCENT (CIRCLE APPROPRIATE CLASSIFICATION) 0 TO 5, 6 TO 10, (11 TO 20,) 21 TO 40,
                                                     41 TO 60, 61 TO 80, 81+

°EXPLANATION OF GULLY TERMS: OCCASIONAL GULLIES ARE GULLIES MORE THAN 100 FEET APART. FREQUENT
  GULLIES ARE GULLIES LESS THAN 100 FEET APART. SHALLOW GULLIES ARE THOSE EASILY CROSSABLE BY
  STOCK. DEEP GULLIES ARE THOSE DEEP ENOUGH TO INTERFERE WITH STOCK MOVEMENTS.

ADDITIONAL TYPE COMMENTS _____
_____
_____
_____
_____
_____
_____
_____
_____

NOTE:
   THE INFORMATION CONTAINED ON THIS SHEET IS PRIMARILY A FORAGE INVENTORY. WHEN AND IF FURTHER
DATA ARE SECURED ON TIMBER, WATER, SOILS, EROSION, WILD LIFE, ETC., BY EXPERTS ALONG THESE LINES,
SUCH INFORMATION SHOULD BE FURTHER CORRELATED TO BEST SERVE RANGE MANAGEMENT.

Figure 6.

RANGE SURVEY WRITE-UP SHEET
ADAPTED TO SQUARE FOOT DENSITY METHOD

TYPE OR
TRANSECT NO. ②

PROJECT   John Doe
EXAMINER   H. Hessig
TYPE   18-Bte
TOTAL DENSITY _____
FORAGE DENSITY _____ % PAL. _____
F.A. FACTOR _____ FOR   C & H
                              C & H OR S & G

DATE   Aug. 24, 1937
LOCATION   S. 4 & 3; T. 5S; R. 26E.
            S., T. & R. — AERIAL PHOTO NO.
TIMBER _____
            (COMP.)   (COND.)

_____
(REPROD.)   (DENS.)   (AGE)

_____
        (INJURY)   (CAUSE)

UTILIZATION CUTS:—   SLOPE ____ % TIMBER ____ % ROCKS ____ % LACK OF WATER ____ % EROSION ____ %
                     UNSTABLE SOILS ____ %   TOTAL CUT _____

SPECIES DENSITY

PLOT NUMBER	1	2	3	4	5	6	7	8	9	10	TOTAL DENSITY	AVERAGE DENSITY	PAL.	F.F.
DENSITY	11.0	8.0	8.5	8.5	9.0	5.5	4.5	6.0	9.0	12.5	82.5			
SPECIES														
Bte	4.0	1.0	3.0	5.0	6.0	3.0	2.0	4.0	7.0	10.0	45.0			
Bbr	1.0	0.5	1.0	---	---	---	---	---	---	---	2.5			
Pse	0.5	0.5	1.0	0.5	---	---	0.5	---	---	---	3.0			
Asp	1.0	---	0.5	---	---	---	---	---	0.5	---	2.0			
Ala	1.0	0.5	0.5	1.0	---	1.5	0.5	0.5	0.5	1.0	7.0			
Eck	0.5	3.0	0.5	1.0	1.5	1.0	1.0	0.5	---	0.5	9.5			
LUP-G	1.5	1.0	---	---	1.0	---	---	---	1.0	---	4.5			
ERO	---	---	1.0	---	0.5	---	---	1.0	---	---	2.5			
Atr	1.0	0.5	---	0.5	---	---	---	---	---	---	2.0			
CHR	0.5	1.0	1.0	0.5	---	---	0.5	---	---	1.0	4.5			

TYPE COMMENTS

CURRENT FORAGE UTILIZATION: <u>OVER—PROPER—UNDER</u>
(CHECK ONE)

PLANT VIGOR: <u>POOR—FAIR—GOOD</u>
(CHECK ONE)

RANGE CONDITION: <u>POOR—FAIR—GOOD</u>
(CHECK ONE)

RELATIVE PRODUCTIVENESS OF SITE: <u>LOW—AV.—HIGH</u>
(CHECK ONE)

WATERING PLACES _____
(KIND — LAKE, SPRING, ETC.) (DISTANCE) (ADEQUACY) (PERM. — TEMP.)

POISONOUS PLANTS _____
(KINDS)   (RECOMMENDATIONS)

KIND OF STOCK BEST SUITED TO RANGE: <u>CATTLE—HORSES—SHEEP—GOATS</u>
(CHECK ONE OR MORE)

PROPER GRAZING PERIOD: <u>SPRING—SUMMER—FALL—WINTER—YEAR LONG</u>
(CHECK ONE OR MORE)

WILDLIFE _____
(GAME, PREDATORS, RODENTS — SPECIES AND ABUNDANCE)

SOIL EROSION (CHECK ONE OR MORE)

SOIL TEXTURE (TO SIX INCHES DEEP)
CHECK IN APPROPRIATE BLOCKS

SHEET EROSION EVIDENT

		GRAVELLY	STONY
LIGHT			
MEDIUM			
HEAVY			

°GULLY EROSION
    OCCASIONAL GULLIES — SHALLOW
    OCCASIONAL GULLIES — DEEP
    FREQUENT GULLIES — SHALLOW
    FREQUENT GULLIES — DEEP

ALKALI (CHECK IF EVIDENT)

WIND EROSION
    DEPOSITION EVIDENT
    REMOVAL EVIDENT

SLOPE IN PERCENT (CIRCLE APPROPRIATE CLASSIFICATION) 0 TO 5, 6 TO 10, 11 TO 20, 21 TO 40,
41 TO 60, 61 TO 80, 81+

°EXPLANATION OF GULLY TERMS: OCCASIONAL GULLIES ARE GULLIES MORE THAN 100 FEET APART. FREQUENT GULLIES ARE GULLIES LESS THAN 100 FEET APART. SHALLOW GULLIES ARE THOSE EASILY CROSSABLE BY STOCK. DEEP GULLIES ARE THOSE DEEP ENOUGH TO INTERFERE WITH STOCK MOVEMENTS.

ADDITIONAL TYPE COMMENTS _____
_____
_____
_____
_____
_____
_____
_____
_____

NOTE:
THE INFORMATION CONTAINED ON THIS SHEET IS PRIMARILY A FORAGE INVENTORY. WHEN AND IF FURTHER DATA ARE SECURED ON TIMBER, WATER, SOILS, EROSION, WILD LIFE, ETC., BY EXPERTS ALONG THESE LINES, SUCH INFORMATION SHOULD BE FURTHER CORRELATED TO BEST SERVE RANGE MANAGEMENT.
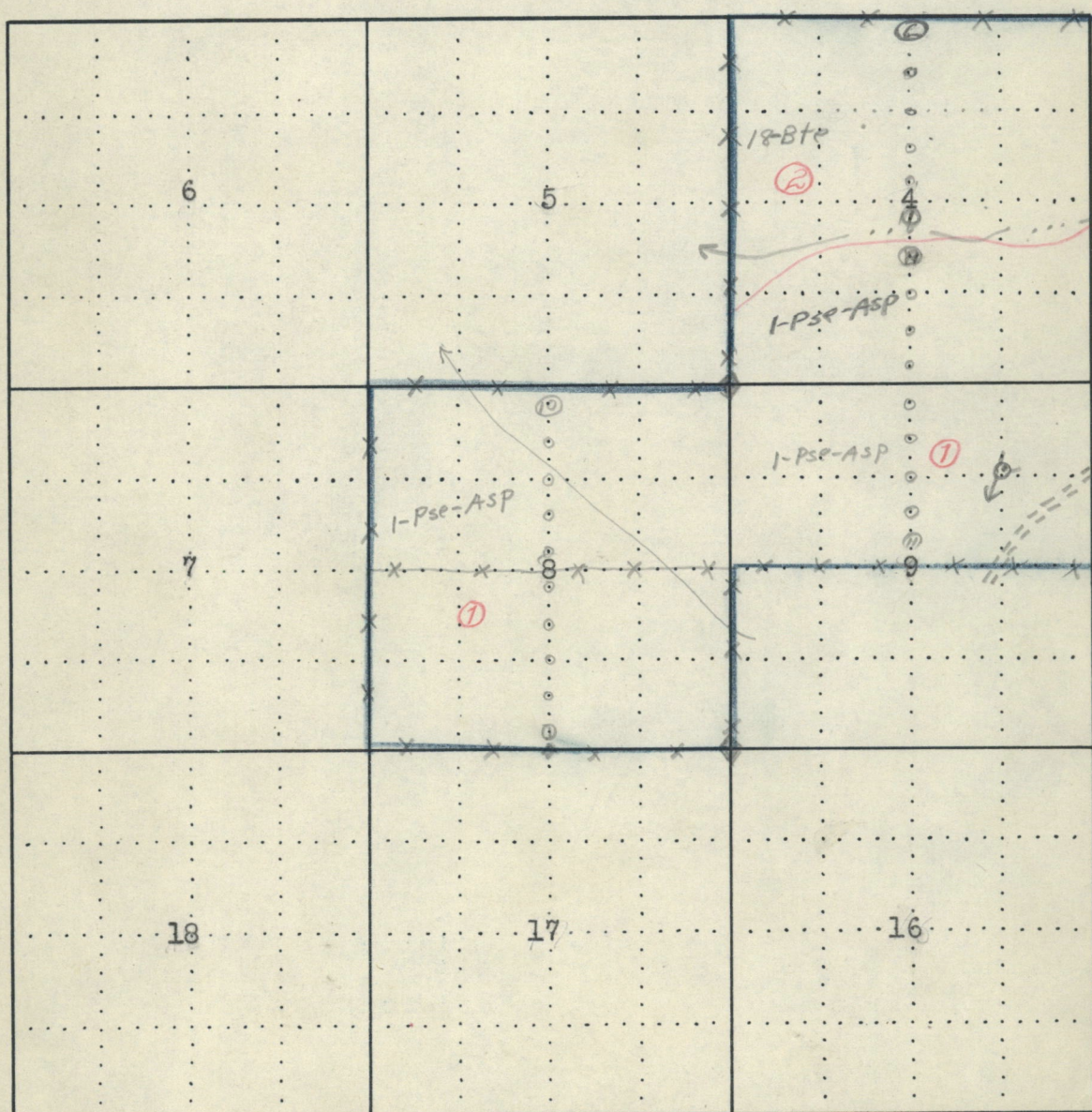
Figure 7. 22

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

RECONNAISSANCE MAP SHEET

NW ¼   T. 5 S   R. 26 E   STATE Oregon   COUNTY Morrow

SERIAL NO. XYZ

MAPPED BY H. Hessig   Aug. 24   1937

SCALE   2 INCHES = 1 MILE

① = 1185 Acres
② = 415 "
Total = 1600 Acres

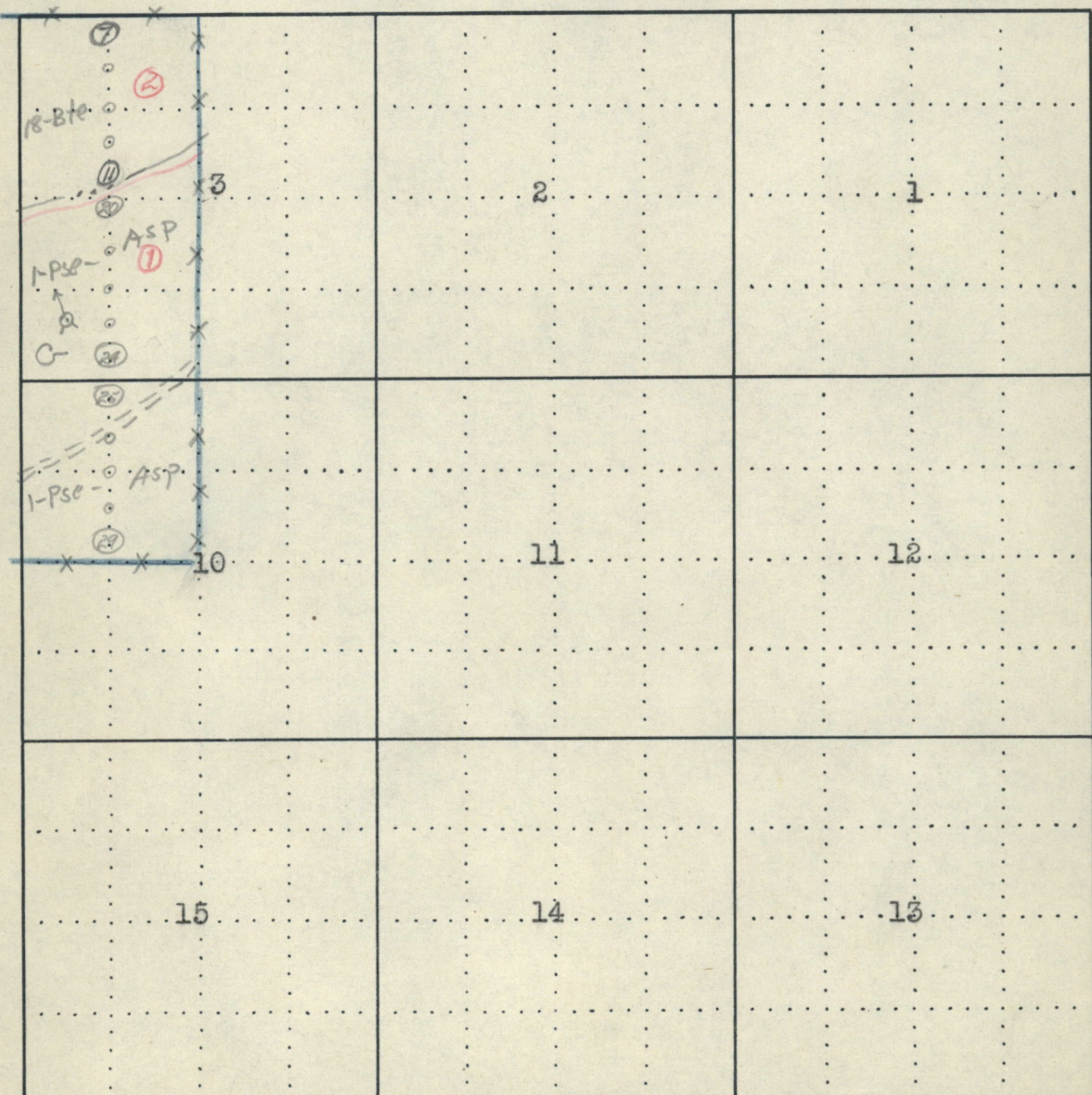## Figure 8.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

RECONNAISSANCE MAP SHEET

NE 1/4   T. 5 S   R. 26 E   STATE Oregon   COUNTY Morrow

SERIAL NO. XYZ

MAPPED BY H. Hessig _____ _____ Aug. 24, _____ 1937

SCALE   2 INCHES = 1 MILE

② = 155 Acres
① = 325 "
Total   480 Acres

Figure 9

Grand summary of sample survey

Type or Transect No.	:	Surface Acres Per type	:	Forage Acres Per type	:
1	:	1510	:	69.46	:
2	:	570	:	11.80	:
TOTAL	:	2080	:	81.26	:

$$\frac{81.26}{1.68} = \underline{\underline{48.3}} \quad \text{Animal Units}$$

Table I

A comparison of total acres examined, total grazing capacity (examined), and acres per animal unit (acres examined) for the three states of Oregon, Washington, and California. Figures were obtained from the report on participation in 1937 Range Conservation Program for the period ending October 31, 1937.

State	Total acres examined	Total grazing capacity (examined)	Acres per A. U. (acres examined)
Oregon	5,338,914	159.205	34
Washington	2,071,470	53,262	39
California	7,902,896	411,914	17

Table II

RANGE CONSERVATION PROGRAM, EASTERN OREGON, 1937

County	Total Pasture Area Woodland and Other	C.P.P. Estimates Acres Per A. U. for 12 Months	Total Area Covered By Applications R.C.P. 1937	(Survey Method) (only) Area Examined as of November 30	Carrying Capacity in A. U. for 12 Months	R.C.P. 1937 A. Per A.U. for 12 Mo.	% Area (col. 1) Covered by Applns.	% Area (col. 1) Surveyed to November 30	% Area Appl'ns. Actually Examined
Baker	599,005	37	623,551	138,474	3,729	37.1	104.0	23.1	22.2
Grant	885,000	50	565,905	125,989	4,060	31.0	63.9	14.2	22.2
Union	278,668	*35	181,326	89,033	2,729	32.6	65.0	31.9	49.1
Wallowa	425,560	38	377,024	94,516	3,938	24.0	88.5	22.2	25.0
TOTAL	2,188,233	42.1	1,747,806	448,012	14,456	30.9	79.8	20.4	25.6
Umatilla	768,772	*60	666,128	384,763	15,067	25.5	86.6	50.0	57.7
Morrow	721,893	66	444,105	357,073	9,708	36.7	61.5	49.4	80.4
Gilliam	409,793	60	273,063	92,394	2,705	34.1	66.6	22.5	33.8
Sherman	154,000	*60	59,659	35,394	1,046	33.8	38.7	22.9	59.3
Wasco	672,204	.55	334,361	120,286	3,472	34.6	49.7	17.8	35.9
TOTAL	2,726,662	60.3	1,777,316	989,910	31,998	30.9	65.1	36.3	55.6
Crook	694,655	43	538,415	275,605	6,799	40.5	77.5	39.6	51.1
Deschutes	103,856	43	45,214	30,686	506	60.6	43.5	29.5	67.8
Jefferson	368,335	35	367,291	294,287	8,597	34.2	99.7	79.8	80.1
Wheeler	724,000	**39	591,802	317,728	9,176	34.6	81.7	43.8	53.6
TOTAL	1,890,846	39.9	1,542,722	918,306	25,078	36.6	81.5	48.5	59.5
Harney	1,108,813	*43	589,982	349,456	5,580	62.6	53.2	31.5	59.2
Klamath	357,613	*73	265,048	208,671	2,408	86.6	74.1	58.3	78.7
Lake	540,384	88	162,800	91,929	1,434	64.1	30.1	17.0	56.4
Malheur	651,249	66	481,190	69,101	2,281	30.2	73.8	10.6	14.3
TOTAL	2,658,059	61.8	1,499,020	719,157	11,703	61.4	56.3	27.0	47.9
TOTALS AND AVERAGES	9,463,800	52.4	6,566,864	3,075,385	83,235	36.9	69.3	32.4	46.8

* Revised
** Error Corrected

Weight Estimate Method

A comparison of weight estimates versus estimates of
density for indicating the amount of forage on an area.

For any one plant species, weight estimates in in-
dicating differences in herbage productivity on different
areas. For plant species differing in growth habit and
stature, weight estimates are definitely superior to density
estimates in indicating herbage production. Weight estimates
are slightly more subject to personal error than density
estimates. Weight estimates fluctuate equally as much as
the actual values but density estimates do not.

It is essential to the primary calculation of grazing
capacity that forage inventory, palatability, and percentage
utilization be expressed in the same basic terms, preferably
units of volume. By use of the weight basis, the amount of
feed and forage preference per animal unit can be calculated.

With density estimates, abundant replication is faci-
litated by the rapidity with which weight estimates can be
made. In the sagebrush-wheatgrass range type herbage,
weight can be estimated by species on from 30 to 50 plots
per man-day.

The weight estimate method for field use.

Estimates of productivity by the weight estimate method
are made on plots located in a gridiron or patternized ar-
rangement or on purely randomized plots. Yield and flor-
istic composition of the total current growth of the entire
aerial portion of the plant are recorded in units of green

or dry weight.

Plots.

The most suitable number, size, shape and manner of location of plots are dependent upon the type of vegetation to be studied and should be determined by trial before the study is initiated. Weight estimates can be used on any size or shape of plots.

Equipment required.

A set of spring scales sensitive to the nearest 10 grams and small enough to be placed in a pocket, a pair of scissors with a 4 to 6 inch blade, a cloth or paper sack, and the ordinary equipment needed for marking out the circular plots, recording data, and keeping direction as used in the Point Observation Plot Method.

Preliminary to field work.

Each estimator should spend several days checking estimates on the same type of vegetation upon which future work is to be done. Length of training prior to field work should be a week for entirely untrained individuals. Training individually or collectively doesn't make any material difference.

How to estimate. First estimate the weight of either one or several plants of a single species in grams. Then clip the herbage and determine the error of weight estimate by actually weighing. After each estimate the estimator should try to alter his estimate to conform with the actual weight. The estimators should train on one species at a time.

Actual field work.

Carry the same equipment in the field as was used during the training period. During the inventory of an area, each day all individuals should make estimates of herbage on the same temporary plots. From 10 to 20% as many plots should be estimated in this manner as are estimated by each individual per day. These plots are then clipped and a permanent record made of each individual's estimates and of the actual green weights. From these data can be calculated a regression by species for determining actual weights from estimated weight for any individual at any date or on any area. These regressions can be used to make adjustments for such differences that may be in excess of the percentage of accuracy desired by the survey.

Differences found in the adaptability of the weight estimate method: Herbage moisture content and the inaccuracies due to grazing of some of the herbage prior to the time of the estimate. Methods designed to overcome these differences are:

Herbage moisture content may be evaluated for all species by recording the green weight of herbage samples taken at the time of daily checking and the weights after the samples have been oven-dried. Use of air-dry weights may be substituted if an oven is not available. From these data the percentage moisture content of the herbage during the period of estimation can be calculated and the difference in estimated weights due to differences in moisture content can be adjusted between season, location or year.

On grazed areas two methods may be followed: (1)
Estimate the herbage actually remaining on the ground and
percentage utilization by weight. Adjustments in the for-
age inventory can then be made by the following formula:
Weight herbage remaining times 100 divided by 100 minus
percentage utilization by weight equals yield on the area
if herbage was ungrazed. (2) Where work is extensive and
it is deemed imperative that all possible accuracy be at-
tained, it may be desirable to reconstruct ocularly the
grazed portions and estimate as on ungrazed areas. Esti-
mates on this type are not subject to absolute check, so
they are more undesirable than the first mentioned method.
However, they do speed up field work and lessen office
compilation.

Summary.

The weight estimate method was tested in conjunction
with square foot density estimates on grass and weed types
of vegetation in the Upper Snake River plains of Idaho.
Under test, estimates by the weight method proved definitely
superior to estimates of square foot density in accuracy
of indicating actual yield of different species or of dif-
ferent types of the same species.

Weight estimates are accurate, indicative of yield,
subject to actual mechanical check, rapid, and thus suited
for use with replicated randomly or mechanically located
plots, and the technique is easily learned with a minimum
of instruction.

Because data obtained by this method are comparable regardless of location, type of vegetation, or species, they will furnish a sound basis for stocking or management plans of any area.

Forage inventory, percentage utilization and palatability, the three standards in range investigation, are on an identical basis affording close correlation and integration vital in estimating grazing capacity.

The weight estimate method on plots of any limited size or shape located in patternized mechanical arrangements or purely randomized may provide an excellent instrument for use in vegetative studies. It should be considered for use where records of vegetative changes, due to climate or grazing, are being maintained or where carrying capacity studies are being made.

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