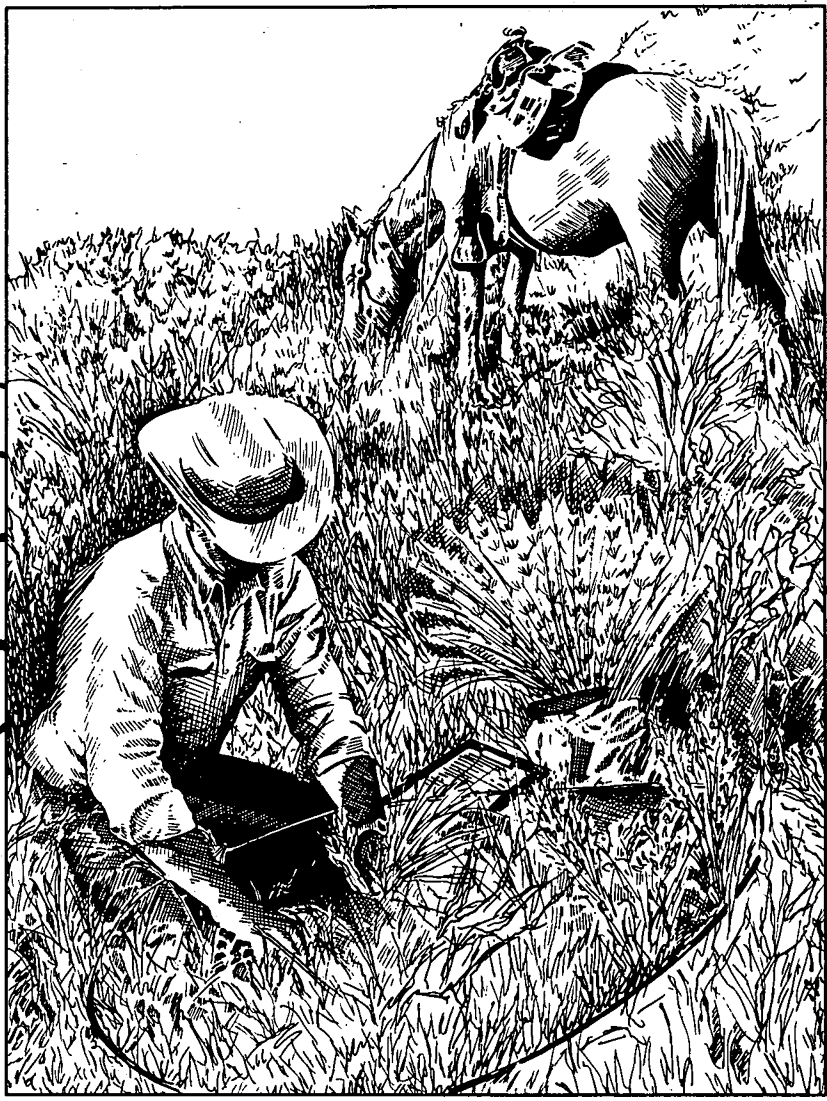
RANGELAND INVENTORY & MONITORING



Supplemental Studies

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INTRODUCTION

This Technical Reference contains the rangeland inventory and monitoring techniques historically used in the Bureau since the formation of the Grazing Service. It does not include local or regional techniques. Where manuals could not be located, the best available documentation was used.

Every effort has been made to accurately transcribe the original manuals. Editing was limited to the introductory Editor's Notes in Sections I - XII and XVII - XIX to preserve the original wording intact. However, Sections XIII - XVI were rewritten for clarity, since there was no need to be concerned about preserving an original manuscript.

This technical reference is designed to be a reference document. It is not intended as an endorsement of these methods as Bureau-approved procedures.

Many existing case files (allotment and operator files) and district files contain resource information gathered using procedures that are no longer approved methods. Some of this data is still being used to determine the grazing preference on public land and the carrying capacity on nonfederal lands. The procedures employed by some of these methods are now obscure. Since this resource information is still being used, this document will help to explain how the data was collected. It also provides instructions on how to collect data for future comparison.

Historical inventory and monitoring data are often useful for making long-term analyses of trends and ecological change. Although some historical techniques may be considered to be technically inadequate, the data may still be useful in making general interpretations. Knowledge of the intent or purpose of historical methods aids in understanding why previous range managers managed the range the way they did, and in determining if certain reports, e.g., range condition, can be compared to the concepts and reports used today.

It is very important for future reference that any old monitoring and inventory data not be disposed of.

If a description in this document does not accurately portray a historical technique, comments and supporting documentation should be sent to the National Applied Resource Sciences Center (RS-140).

I. RANGE SURVEY

Editor's Note: The Range Survey procedures were transcribed from the original text from the Inter-agency Range Survey Committee. The only changes involved the text format.

The following narrative reflects a writing style and choice of language different from many of today's commonly accepted standards. To preserve the integrity of the original document, the wording has been left untouched.

INSTRUCTIONS
FOR
RANGE SURVEYS

As formulated by the Inter-agency Range Survey Committee

and adopted by the

Western Range Survey Conference

April 34, 1937

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INTERAGENCY INSTRUCTIONS FOR RANGE SURVEYS

A. Foreword

The purpose of these instructions is to outline the present policy for the conduct of range surveys, and to standardize the methods used to the extent necessary to obtain the desired accuracy and uniformity in results.

Former instructions are herein revised to include modern procedure and acceptable new methods that have proved desirable and generally satisfactory. Promising new field practices are described in detail.

The instructions provide for the continued use of the reconnaissance method with minor changes, but also describe the so-called "square-foot density or point observation plot" method of determining density and composition, fully recognizing it as an acceptable and optional variation of the reconnaissance method.

Recognition of the square-foot density method for determining density necessitates a few other changes in procedure since that method measures density to as nearly as possible true ground cover whereas the reconnaissance method in actual practice results in much higher density estimates.

It may be generally assumed that these differences in density estimates are later compensated in final grazing capacity determinations by the use of proportionately different forage acre requirement standards. For this and similar reasons it becomes desirable in future projects to drop the "forage acre" as a common unit of measure, except as it is used in computation, and to summarize project results directly in terms of grazing capacity in future tabulations and graphic presentations.

It is recognized that each agency may wish to issue supplementary written instructions to its field officers, based upon the principles herein outlined, regarding methods not lending themselves to standardization or requiring the collection of specific data, not provided for in these instructions, in accordance with the unified procedure.

B. Object

There is an ever present need for the fullest and most accurate, up-to-date information practical to secure, in connection with the use and administration of the range and related resources for such purposes as livestock production, watershed protection, game conservation, recreation, and other legitimate demands. The closest integration and coordination of these uses are essential if serious conflicts are to be avoided. As the demands for the various uses increase conflicts develop, the settlement of which requires accurate information regarding all the factors involved. It is for the purpose of obtaining these basic facts, analyzing the various problems and from them developing a comprehensive plan for managing the resource, the range surveys are conducted. A completed plan of range management should show what the range resource is, its physical condition, its relation to other resources, and how it may be best utilized, developed, and improved.

The collection of field data and the preparation of management plans, while essential, are of no greater importance than the training of the men who take part in the work. This activity is essentially field laboratory work in range management. It involves every phase of invoicing range resources, studying and analyzing problems, working out solutions, and providing for the application of thorough-going plans. In view of the recognized need for thoroughly trained range technicians and administrators, it is essential that training in the conduct of survey projects be stimulated in every way and adequately provided for.

C. Responsibility

The instructions that follow are set up as minimum standards of requirement. Each agency may issue such additional instructions as they may find necessary in connection with specialized work or projects, provided, however, that such instructions do not alter the minimum requirements herein described or conflict with the principles herein approved. Each agency assumes full administrative responsibility for the adequacy and accuracy of the results obtained.

D. Preliminary Considerations

1. Preparation for Field Work

Before the beginning of field work the responsible surveys man will obtain the necessary equipment and assemble and review all maps and other available data that will be needed, including the following:

a. Sufficient number of sets of topographic maps preferably on a scale of 2 inches to the mile, or aerial contact prints. Aerial photographic maps are preferable when obtainable. If aerial maps cannot be procured and the available base map is not on the desired scale, photographic enlargements or reductions may be made. Unmounted copies may be used by the examiners for typing in the field. Where maps of satisfactory accuracy are not available, accurate field maps on a 1- or 2-inch scale must be prepared, either prior to or in connection with the range survey work. Minimum control requirements as described on page 8 must be followed in connection with the field mapping and typing work.

b. Status of land. Where covered by G.L.O. surveys, proper township assemblage of Land Office surveys for the area to be covered.

c. Location of known section corners and of as many as possible of such cultural features as buildings, fences, corrals, roads, trails, driveways, improved water developments, telephone lines, etc., including locations by special surveys.

d. Names and class of range users, numbers and classes of stock grazed, and allotments or units used.

e. Table of forage palatability ratings for each class of stock and all important forage plants, expressed in percentages. Agencies working in the same general localities should jointly develop and agree on the palatability ratings used.

f. In connection with the correlation of grazing and other uses of forested lands, the following information and data should also be obtained to the extent that it is available:

   (1) Under timber use, the cut-over lands, lands being cut, and lands proposed to be cut within 5 years, planted areas and proposed plantations, as well as a timber type map for field use if available.

   (2) The value of each watershed, as for municipal water supply, irrigation, or power; and areas closed to grazing or on which grazing is restricted for the purpose of watershed protection.

   (3) Population estimates of important big game species; approximate range; seasonal use of areas; areas of introduced game; plans for handling, developing and utilizing; boundaries of refuges, present and proposed; and any restrictions on grazing to provide for game. In addition careful notes should be made of the occurrence of smaller fur-bearing animals, upland bird species, etc., and of the means by which grazing can be better correlated with the management and protection of these forms of wildlife.

   (4) The general recreation plans, public camping grounds, summer home sites, and other recreational features which might have a bearing on future grazing plans.

   (5) On forested lands where fire protection is unusually important, it may be advisable to determine the areas of greatest fire hazard, general fire-trail plan, and possibly the fire-control plan.

   (6) Data regarding any areas used for experimental purposes.

The above data will be secured from administrative records or from any other reliable source. As much of the data as possible should be entered on maps for reference in the field.

Before the party goes into the field, the chief of party should familiarize himself with the area to be covered, in order that he may be able, upon consultation with his superior officers, to decide upon the place to start work, the route for covering the area, the location of camp sites, general conditions, and general phases of present management.

2. Field Season

Within practical limits the survey should not begin until the season is sufficiently advanced that there will be a representative growth of forage on the ground. The work should continue in the fall until grazing or weather conditions prevent accurate classification.

3. Control for Range Classification

a. ***Base Maps.*** A reliable base map is essential. Aerial photographs or recent U.S. Geological Survey topographic maps are preferable. Timber survey maps or those prepared by other organizations may serve as a base where they conform to satisfactory accuracy standards.

b. ***Control.*** In connection with the accurate mapping of vegetation types, it is necessary to have definitely located points on the area being covered in order to properly tie in the work. Every three sections, and preferably every two, should have an accurate tie point. If satisfactory Land Office surveys have not been obliterated, they will serve admirably, provided they have been reconciled to the primary control and the topographic map. This reconciliation and the establishment of control where necessary should be done by personnel fully qualified for technical work of that nature. The project man responsible will decide upon the adequacy of or additional control needed in each case.

Where mapping or typing is done by triangulation, using U.S.G.S. or C.&G.S. primary control, it is essential to correlate the triangulation control with G.L.O. corners at a frequency of one to three corners per township. Approximately nine secondary control points in each township should be accurately located and marked. A minimum of five secondary control points per township is considered essential for intensive work. When recent G.L.O. surveys are being used for control in mapping and typing, the minimum tie requirement should be one corner per section.

E. Procedure in the Field

1. General Statement

It is impracticable to set up one arbitrary standard to which the field work in every project should conform. The general character of information obtained should not vary materially as between projects - it should be consistently accurate and reliable, but the intensity of the field examination and the amount of detail in the data may vary according to the importance and complexity of the grazing and related problems. The Chief of Party or responsible project man will decide when the proficiency of the men has reached a point that will assure the examination work being carried on in accordance with minimum standards of requirement set up.

2. Size, Organization, and Qualifications of Party

Experience has shown that under national forest conditions a party made up of a chief, three or four temporary or permanent assistants, and one combination cook and camp mover constitutes the most efficient, economical, and practical organization where the field work is done intensively. A larger party requires too frequent moving of camp and too much camp equipment. On the other hand, a crew of less than four field men cannot be handled with much less outlay for cook and moving equipment than is required for a party of four or five men. When aerial photographic maps are used, whereby the detailed typing work is materially speeded up in the field, smaller crews and horseback work may prove more satisfactory. In level or undulating country many agencies find the use of a car saves much valuable time in traveling between sampling plots or reaching advantageous starting points. The accessibility of the country to be covered, the number of qualified men available, etc., should be considered in determining the size and make-up of the crew.

Individual examiners not working under the direction of a chief of party should have sufficient training under a qualified man as to enable them to carry on the examination work in accordance with the standards herein provided for.

3. Chief of Party

Where projects are conducted on a party basis, the importance of selecting the best qualified man available to serve as chief of party deserves repeated emphasis. The uniformity and quality of the party work often importantly depends upon his judgment and training ability. The position is looked upon as important enough to justify using men up to the $3200 grade where qualified men in that grade are obtainable.

The chief of party should be a man of good judgment, thoroughly trained in the technical work, and with considerable administrative experience. He must be able to handle and direct his men and cooperate with local officers and stockmen. He should be experienced in range survey field practices. He will be directly responsible for the conduct of the work on the ground, and will be expected to lay out the work of the men in the field, see that the project plan and field methods are thoroughly understood and followed by the men, train them to observe and analyze conditions, take measures to secure uniform results, exercise discipline, keep the data in proper form so that if necessary it may be turned over in understandable shape to a successor, order supplies when good business so directs, and maintain a check on expenditures. He should make a thorough study of range conditions, utilization and management needs on the area as a whole, in order to be able to participate in the preparation of a comprehensive management plan at the completion of the project. At the close of the field season he should direct and aid in the assemblage and compilation of all data for the management plan and help prepare the final plans for the range unit, or parts of the unit covered.

4. Other Members of Party

Men with a natural inclination toward the work, with suitable training or experience, and with promise of developing so as to assume greater responsibility in the future, will be selected for the regular party work or chosen as temporary assistants. Because of the strenuous character of the work, especially when done on foot, men must be in good physical condition.

Either technical or non-technical administrative men already in the agency will be encouraged to serve on the party for one or more years where such assignments are considered in the best interests of the work and the men.

By every means possible the whole party should be given insight into the broader phases of the work, its purpose, and the use of results. This is of utmost importance in arousing a personal interest, which is essential to a high degree of accuracy and efficiency. When interested students or other promising field men are obtained under local emergency employment programs for this type of work, the need for greatly increased field and office supervision becomes increasingly important and may involve the necessity of providing one or more assistants to the chief of party in order to maintain the work standards. If any members of the party do not take a proper interest in the work, it is advisable that they be replaced by men who will.

The cook and teamster-packer fills a position of no mean importance in the field party. On him depends to a large extent the welfare and morale of the other members of the crew. He should be able to do good plain cooking in a sanitary and economical way, be willing to serve meals at whatever time the men get into camp, and possess an agreeable disposition. He should assume charge and take care of all equipment in camp during the absence of the other men. He should know how to handle horses and take over the responsibility of their care. If conditions justify a separate teamster or packer, he should be chosen because of his proficiency in such duties and his familiarity with the region.

F. Field Methods

In order that new men may early in the work gain a definite conception of the use to be made of the various data collected, all the steps connected with the field work and the preparation of a complete management plan should be covered for a sample unit. For this purpose a suitable allotment should be selected as soon as the men become familiar with the mechanics of the field work.

Typing and note-taking in the field will be done ordinarily by each man working individually. The chief of party will designate the units or areas to be covered by each examiner from each camp.

Legal subdivision or ownership will be used as the unit for the correlation of notes and type descriptions except in cases of large blocks of land under one jurisdiction where the topographic unit would be more satisfactory.

In rough country, consideration should always be given to the topographic unit in deciding the area to be assigned each examiner so that there will be no undue crossing of steep canyons or high ridges in covering the area unless the type classifications would suffer through the adoption of such a course.

Typing and Mapping in the Field. The intensity with which types should be examined will vary considerably. The minimum requirement is that the examiner should see enough of each type to obtain a reliable estimate of its density and composition and to determine the various conditions that would affect the practical use of the type. Where previously compiled type maps or aerial photos are used, each day's work should be so planned that the examiner will pass through the largest portion of each type without back-tracking or recrossing the general line of travel.

Where topographic maps are used, and if the types are governed, largely by topography, the types and other data can be located and mapped with reference to topographic features or by pacing a sufficient distance from known points to make the work reliable.

Where the planetable method of mapping is employed types are accurately mapped by point intersection and the forage estimates are made by going through representative portions of each type while travelling between vantage points or control stations. Each type or sub-type must be examined but type boundaries are located in connection with the mapping work.

Very much the same principle applies to the use of aerial maps or photos. Where these are used, type and sub-type boundaries will be indicated by the examiner. Care must be taken that each type and sub-type is satisfactorily examined and given a key number or other symbol to provide a reference from the photo to the write-up sheet.

Where the "strip" system is used, the examiner will cross the area in a systematic manner by compass and pacing from established points, with checks on as many points as it is possible and practicable to make. On areas surveyed by the G.L.O., section and quarter corners will be used as control points, and section lines and centers of sections will generally be followed. If there are no Land Office surveys, or if survey corners have been largely destroyed, other control points, either those located expressly for this purpose or monuments left from earlier topographic mapping, will be necessary. The areas should be covered on a basis equivalent to passing twice through each section and mapping at least 20 chains on each side of the line traversed, with sufficient offsets to obtain the necessary information for all the types, and properly map their boundaries.

Where the types are large and uniform, crossing the area the equivalent of once through each section may be sufficient. The chief of party or responsible examiner will decide when a basis of less than twice through a section is sufficient to maintain the required standards of results. In very rugged or barren country, or where the forest cover is too dense to permit grazing, the types need examination only to the extent necessary to be assured that no usable feed areas are overlooked.

On special projects requiring greater or lesser intensity of examination, the intensity standard to be used should be clearly specified by the responsible administrative agency in issuing supplemental instructions applicable to the specific project.

The following data should be obtained by the examiner and shown on his field map.

1. Forage Types

The area should be classified into types and sub-types and mapped in accordance with the outline given under the section on "Classification of Forage Types." Typing of areas of less than 10 acres may be desirable at the discretion of the agency conducting the project. Such important areas as parks in dense timber, clumps of timber in parks, and other similar type changes down to 10 acres in size, if they are important landmarks may be mapped. Ordinarily, unless some marked contrast of this character exists, or specific instructions given, a change in type of less than 20 acres need not be mapped. Special attention must be paid to the mapping of inaccessible areas which come under Type 7. Areas which are inaccessible because of lack of development, lack of water, steepness, etc., should not be mapped as Type 7, but they should be typed and their degree of inaccessibility noted on the write-up sheet and map as a utilization cut. If definite determination as to accessibility cannot be made by the examiner, a note should be made of the areas, and the case should be referred to the chief of party for final decision. Types should be designated by number on the map. At the discretion of the agency, the density and composition of all plants used by game should be recorded in such form as may be compiled when needed for game management plans.

2. Soil Erosion

Because of a depletion of native vegetation, accelerated erosion has attained such importance on range lands that it is necessary to take it into account in range management. It is equally evident that the character of the soil and the degree of slope are important considerations from the standpoint of range management and improvement.

A summary of erosion conditions will be written for each management unit, recognizing the general erosional, slope and soil conditions.

3. Topography

The topographic map should be checked in the field during the course of the work. All topographic features which have local names should have such names included on the map or aerial photos whenever possible to do so.

4. Drainage and Watering Places

All drainage lines and watering places should be shown. Special attention should be given to the mapping of water facilities for stock, as they often are a controlling factor in range management. The examiner should check all the water on the original map and add the minor watering places which usually are omitted. On aerial photos it is important that running water in small streams be shown and the limits of such streams indicated.

5. Culture

Buildings, fences, corrals, roads, trails, telephone lines, and other cultural features should be located, and those already shown on the map should be checked for location. Fences, where they are important to range management, should be accurately located. On aerial photos such features should be inked with India ink. The standard symbols as adopted by the board of surveys and maps of the United States and published by the U.S.G.S. should be adhered to for range survey work so far as symbols are available. When additional symbols are needed it is recommended that all agencies make an effort to get them standardized and approved by the board of surveys.

6. Alienated Lands

Time need not be spent in the field in accurately checking the boundaries of lands shown in the status record, as it is assumed that the survey of such lands is correct. If private lands are or may be used in connection with the range unit they should be gone over and classified as a part of that unit.

7. Field Notes

Each type and sub-type will be written up on Form 764a or 764b in the manner called for thereon (Illustrations 1 and 2).

Unit descriptions. Each examiner should summarize the important management features for each section, ownership tract or other unit if such a system is called for by the particular survey. It will be noted that many points are duplicated under the information to be gathered by the chief of party, however, it will be standard practice for individual examiners to cover all of the following subjects for each sub-division or natural topographic unit as a check for the chief of party on the information collected by him personally. On special projects this procedure may be modified so that it will be obtained as accurately and expeditiously as possible without undue duplication.

a. Elevation, topography, and drainage as these affect the accessibility of range to stock; drainage systems whether flat, rolling, or rugged; depth of canyons, steepness of slope, rock, exposure, slides, boulders, cliffs, general accessibility.

b. Character of watering places (stream, lake, pond, spring, seep, well, tank, reservoir). Permanent or temporary (if temporary state usable period). State of development and need for improvement or maintenance; nearest permanent water; character of country, particularly the slopes; relative amount of water available as compared to carrying capacity of the range.

c. Numbers of stock now using the range, either estimated or known, current utilization, condition of the range and the forage, with recommendations for proper numbers of stock on basis of past use and condition.

d. Class of stock now using the range and recommended class based on above factors.

e. Proper seasonal use. Present date when stock enter or reach each portion of the range. Recommendation for changes within the limits of practicability, and based on the needs of the forage, when forage or water is available, etc.

f. Proper distribution of stock. Over or under-grazed areas, with recommendations for improved handling.

g. Handling of stock. The manner in which stock is being handled, including herding of cattle or sheep, bedding of sheep, conditions of bedgrounds, excessive trailing and other phases of management with recommendations of needed changes and reasons therefor.

h. Recommendations for needed changes in present salting and reasons therefore.

i. Range destroying rodents, species, location, area and damage.

j. Poisonous plants. Species, abundance, area and location, losses, and recommendations for methods of avoiding future loss.

k. Other pests such as grasshoppers, crickets, etc. Estimated damage.

l. Game. Indications of game on the area, seasonal use by game and other important matters relating to game welfare.

m. Predatory animals. Important species, approximate ranges, depredations.

n. Extent to which other uses enter into or conflict with the use of the area and adjustments to be made. Timber production, watershed and soil protection, recreation or any other legitimate demands.

o. Range improvements needed; water development, division or boundary fences, corrals, bridges, trails, driveways, reseeding and deferred grazing areas; others.

G. Palatability

Palatability, as used in range surveys, is the percent of the total current year's growth, within reach of stock, to which a species is grazed when the range unit is properly utilized under the best practical range management. The class of stock, the composition of the vegetation, and the proper time of using the range as a whole, etc., must be considered when rating the palatability of individual species. This percentage should not be in excess of what may be grazed under proper use and still allow the plant to maintain its stand and vigor, year after year. As a basis for individual palatability figures, a palatability list should be prepared cooperatively where local associations are organized, by all the agencies concerned for each major vegetation region or smaller ecologic unit if desired. The ratings may be revised, if necessary, to fit local conditions or needs, upon recommendation of any agency, if agreed to by the local interagency committee.

It is very important that members of the survey party learn the relative palatability of the principal range plants. Plants are eaten more readily under certain conditions than under others. Affecting palatability are such conditions as the combinations in which plants occur in the type, intensity of grazing, season in which they are grazed, mechanical features (awns, etc.), and, to some extent, the familiarity of the stock with the classes of vegetation. The palatability estimate must take all these factors into consideration and be based on the proper degree of utilization under the best practicable management.

H. Density and Composition

1. Reconnaissance Method

a. ***Density.*** In estimating density the spread of vegetation above the ground must be carefully considered. The density of more or less upright weeds should be based on the amount of ground that appears covered when the vegetation is viewed from directly above. In estimating the density of spreading weeds or browse or open clumps of grass this forage should be pressed together or raised at an angle so that all of the normal interstices between the leaves are completely filled without compressing or unduly crowding the vegetation. The forage is then so compacted that it will represent a 10/10 density. All density should be judged on the basis of growth during a normal year. The density of browse should be determined by the portion of the ground covered by that part of the browse that is accessible to stock. This may exclude from the estimate the interior of dense clumps. Any oak or other brush that forms an upper story beyond the reach of stock does not enter into the density estimate. Where a double story of available vegetation exists, such as browse over grass, judge the density of each story separately. Both stories are included in the density estimates. Care must be exercised that the density estimate represents a true average for the type as a whole. Especially is this important in composite types which cannot be divided into separate types.

In passing through the type the examiner will mentally calculate and carry with him a moving average of plant density and composition. In large types the examiner should jot down notes on density and composition changes in order to better analyze type averages and aid his mental calculations.

b. ***Composition.*** Type composition estimates are based on the relative density abundance of each available vegetation species in the type. The examiner should not write up his type until he has seen a fair sample of the total type area. Preferably he should complete his write-up while still in a representative part of the type. Type composition is itemized on Form 764a expressed in terms of percentage. The sum of the percentage ratings for individual species should always total 100%. In determining composition the examiner should rate each species in accordance with his best judgment as to its individual abundance with relation to the total cover.

In the interests of obtaining uniformity between examiners it is generally desirable to estimate composition by rating the species in accordance with their relative abundance in the type, starting with the most abundant species and rating each lesser species in turn. Such a rating scheme results in a definite expression of relative abundance. Afterward the individual initial ratings may all be slightly adjusted to total 100% without destroying the established ratio.

c. ***Field Computation.*** After the composition rating for each individual species has been recorded, that rating is multiplied by the accepted palatability rating for the species, and the sum of all the individual products yields the weighted average palatability of the type. This last figure multiplied by the estimated density yields the forage factor or palatable density of the type. The forage factor is carried onto the camp map for type "jibing" purposes and otherwise used in compilation of the data but should no longer be placed on the final map or used in grazing capacity summaries.

2. Square Foot Density Method

a. ***Definition of Method.*** The square foot density method is a system of sampling vegetation by randomized and replicated plots. It differs from the reconnaissance method in the manner of estimating density and of obtaining average species composition and density on plant types of varying acreage. The procedure for computing grazing capacity following the determination of the forage factor is identical for the two methods.

b. ***Procedure:***

(1) *How to lay out a plot:* The plot used in this method is a circle 100 square feet in area, with a radius of 5.64 feet (or 5 feet 7.8 inches). Two systems of describing the boundary of this circle have been found to be most convenient.

(a) Compass system. - Two stakes connected by a light chain equal to the radius (5.64') of the circle constitute the apparatus. In laying out the plot one stake is struck in the center of the sample plot and the other stake is used as a compass to circumscribe the plot. Care must be exercised to keep both stakes erect and the chain tight and horizontal.

(b) Radius rod system. - The apparatus consists of a stick equal to the radius (5.64') of the circle. By holding one end of the rod at the center of the plot, and using the other end as a marker, the boundary of the circular plot may be scratched in the soil. In marking out the circle, hold the rod horizontal, close to the ground and scratch short segments at intervals to indicate the plot boundary.

Care must be exercised in marking the plot boundary. For example, a 6-inch mistake on the radius of a 100 sq. ft. circle introduces an error of 13.4 sq. feet in the area of the circle. Any method of describing the circle accurately and quickly is acceptable and should be left largely to the discretion of the estimator as influenced by the character of the vegetation to be sampled.

(2) *How to estimate density:* In the square foot method the density of each species occurring on a particular plot is estimated individually. No attempt is made to estimate the percentage each species comprises of the total plot density.

A square foot of ground completely covered by vegetation when viewed from above is standard for estimation of density. The vegetation is never viewed obliquely because this tends to increase the estimate by allowing plant height to hide the ground surface. It is essential that the estimator have a clear conception of a square foot area in his mind and that he constantly refresh his memory by means of a wire frame one foot square, divided into quarters, which he should carry out at all times.

In estimating weeds or grasses, if the herbage is spread or prostrate, it should mentally be compacted so that all the normal interstices are completely filled without compressing or unduly crowding the vegetation. Density of upright woods or grass should be based on the amount of ground that appears covered when the vegetation is viewed from directly above. Density estimates of shrubby species should consist only of the current year's twig growth and the leafage present on the plant; trunks, or heavy branches being excluded. In estimating for different classes of livestock, shrubby material within 30 inches from the ground should be taken as available for sheep and within 60 inches for cattle. Any vegetation unavailable to livestock owing to height or to other factors should be excluded from the density estimate.

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

In considering a double story of vegetation the density of each layer should be estimated.

Using the square foot as a unit of measure with the foregoing principles in mind, mentally amass individual plants of a species into square-foot units of total density and do this progressively until the total number of square-foot units of that species has been counted for the plot. As an aid to counting square feet, the unit of estimation may be 1/4, 1/2 or 1 square foot depending on the density, abundance and growth character of the species. This procedure should be continued by species.

The number of square foot to 10/10 density recorded for a given species represents the percentage of total ground area covered by that species because a square foot is one percent of the total plot area.

Individuals should check their density concept at least once a day by picking the plants on a plot and placing them within the wire frame or on a square foot area that has been marked out on the ground. Plants should be so placed within the square-foot area that they constitute a 10/10 density without crushing plant parts together. This check preferably should be made by all members of the field party on the same plots to afford uniformity of results and also to evaluate the personal error of estimate. Each new species should be checked when encountered. The accuracy of this method depends to a great extent on the density estimate. Therefore, utmost care is essential in making this simple measurement.

(3) *How to record estimates*

(a) On the form to be used for recording density estimates, list all species occurring in density on the plot, either by name or by standard plant symbol.

Species should be listed by the three common vegetative groups: grasses, weeds, and browse.

(b) Density of species should be recorded directly in square foot or fractions thereof.

(c) Before leaving each plot, make an estimate of total density and check the sum of the species estimates to see that it equals the total density of the plot. This is necessary to avoid the omission of important species.

(d) All plots within a particular type or sub-type should be recorded on the same sheet or sheets. No plots in other types should be included. If the survey is by land lines set up a new set of sheets for each section. In any case, whether the survey is by land lines, topographic units or types it is essential to record on each and every sheet (1) the section, township and range or reference to aerial photograph where these are used in lieu of a base map; (2) examiner's name; (3) date; (4) plot numbers; (5) type and sub-type; (6) number of the plot series (transect or type number).

(e) Locate each plot of a series or transect within each type by a dot on the field map. In every case show route of travel by progressive plot numbers or directional arrow. Also identify each transect on the map by its number.

(4) *Field Application:* The square foot method is based on the premise that average values obtained from several definitely defined and impersonally selected small plots is more accurate, uniform, and representative of the type to be sampled than is a general opinion formulated in the estimator's mind as he walks through the type. By varying the procedure in sampling, increasing or decreasing the number of plots, or by a combination of the two, the method is sufficiently flexible to meet all ordinary field conditions.

Six general conditions may be encountered in the field. These are: (1) a mixture of small vegetative types and sub-types with widely different grazing capacities; (2) a mixture of large types; (3) a mixture of small type with similar grazing capacities; (4) one or more large types with high grazing capacity, interspersed with small types of low grazing capacity; (5) a single, large , homogenous type, and (6) a mixture of large types relatively low in grazing capacity, interspersed with small distinct types of high grazing capacity. The procedure in sampling these conditions should be varied to obtain uniformly dependable data most economically.

Three variations in sampling procedure are: (a) sampling within types (b) stripping or gridironing, and (c) a combination of the two whereby the major sample is obtained by the strip or gridiron method but is augmented by additional sampling where needed within specific types. A fourth procedure of sampling, whereby a so-called "typical" area is selected and sampled as being representative of a larger surrounding area, is not recommended because a reliable average is not always obtained and because such data may not be applicable to the development of management plans.

Procedure A should be used under condition 1 described above. It consists of first determining the location and extent of the type; secondly, of an estimation of the approximate acreage and the number of plots necessary to sample the type. The center of the first plot should be determined at random by throwing a stone into the type. The estimator ordinarily should proceed along the longitudinal axis of the type estimating plots at a pre-determined sampling interval until the necessary number of plots has been completed. All of the series should be well within the type boundaries. The minimum number of plots to sample various acreages is as follows:

10 - 20 acres	3 plots
20 - 80 acres	5 plots
80 - 640 acres	10 plots

It is not contended that 3 plots will give an adequate sample of a small type from a statistical viewpoint. However, in any management unit, the same type may occur many times. Therefore, it is believed that with the minimum per-acre set up, a dependable estimate of plant cover may be obtained.

Procedure B should be used under conditions 2, 3, 4, and 5. It consists of a uniform spacing of plots on a line or lines within a section, township or other arbitrarily bounded area. It may also be used within a definite topographic unit if conditions 2, 3, 4, or 5 are present. If the minimum sample is to be used, one line of 10 plots spaced at 8 chain intervals through the middle of each section is preferable. If greater intensity is desired in the survey two parallel lines of 10 plots each one half mile apart may be used. If still greater intensity is desired, 25, 36, etc., equidistant plots within the section necessitating 5, 6, etc., lines through each section should be used. In either the strip or grid system the type lines are indicated when crossed by or seen from the survey line and the estimated plots are segregated both according to the type in which they fall and by the section being surveyed. The estimator should leave his line of plots whenever necessary to close a type boundary or to indicate its extension to the next line of survey.

Procedure C should be used when condition number 6 exists. This procedure is a combination of A and B, and consists of sampling the large low value type in a similar manner and with the minimum requirements stated under procedure B, and digressing from the survey line to sample the small important types as outlined in procedure A.

With the foregoing suggestions as a guide it is left to the discretion of the chief of party to use the three procedures in a manner best suited to meet local needs and conditions. If, for example, rugged topography makes procedure B exceedingly laborious, procedure A may be used.

(5) *Supplemental Instructions*

(a) Reconstruction of vegetation: The density of vegetation should be based on the spread of the plants as they would appear when they have attained their full growth in a normal year in an ungrazed condition.

(b) Elimination of unimportant species: Non-poisonous species of zero palatability when not important from a soil-conservation standpoint may be omitted from the density estimate, unless a full plant inventory is desired.

(c) Minimum limit of estimation: In general, densities should not be counted that will not make 1/2 square foot unless in sparse vegetation it seems advisable to reduce the limit of estimation to 1/4 square foot. If a complete record of plant occurrence is desired, species present on the plot but not abundant enough to reach the lower limit of density should be recorded as a trace (T).

(d) If species unimportant to grazing and individually not estimated are present, an estimate of total plant cover may be made if desired for erosion studies.

(e) In addition to the forage inventory, the examiner should make field notes by types or topographic units which will enable him to prepare the unit description called for on page 13 Section I.F.7. of these instructions.

(6) *Field Computation:* In the determination of the forage factor, the following order of computation should be observed:

(a) Add the species densities for each plot and record the total estimated density in the space provided on the field sheet (764b).

(b) Add the densities for each species horizontally across the form for all plots within the type and record the sum in the total density column.

(c) Add the total densities of species. This sum should equal the total of the plot densities.

(d) Divide each total species density by the number of plots in the type and record the quotients in the average density column.

(e) Sum the average densities. This sum should equal the average total density.

(f) Multiply the average density of each species by its percentage palatability.

(g) Add the products thus obtained to secure the forage factor. This is expressed as forage acres per hundred surface acres and two decimal places should be pointed off to the left to obtain values expressed in terms of one surface acre.

I. Grazing Capacity Computations (Either Method)-Forage Acre Requirement

Determination of the forage acre requirement base by means of which the forage acre data are converted to terms of grazing capacity is as important as any phase of the range survey work.

Ordinarily the most satisfactory method of determining this base is to select for forage acre requirement studies those allotments, pastures or ranges that have every appearance of having been properly used for a period of years and that have been surveyed in the course of the season's work. These areas should be as representative of large portions of the range as it is possible to find. Figures for controlled ranges, whenever obtainable, should be used. At the close of the season the chief of party will make utilization and range condition studies of these ranges and will obtain the most accurate and detailed information possible on the rate of stocking and seasonal use that has been obtained on such areas for the past several years. Supplied with this information he is able to determine, as soon as compilation of the current survey data is complete, the number of forage acres per animal unit that have been used in the past, following up this determination with slight adjustments to correlate actual use with previously determined range conditions on the selected areas should yield a satisfactory base from which to determine approximate grazing capacity. Preferably these figures should be based on a slightly below indicated requirement pending actual trial of the recommended stocking. If actual use on the basis of recommended stocking indicates that the forage acre requirement determined is uniformly high or low, it should be adjusted to permit increased or reduced stocking.

When the forage acre requirement proves unsatisfactory under general application, owing to important differences in forage composition or range conditions, there should be no hesitation in making additional studies to determine the appropriate requirement for different localities. There is a distinct danger in applying a predetermined forage acre requirement to a new project or to a new series of types without determining first, that the two ranges are similar in the main characteristics, and, second, that the bases for estimating density, composition, palatability and utilization are directly comparable. In the absence of these requisites a new test to determine the requirement should be made.

The forage acre has erroneously been accepted as a constant. Actually it is a variable. This is evident because of the continual need of applying different forage acre requirements to obtain grazing capacity in different localities or in the same locality with different methods of estimation. Consequently, the forage acre has been misleading to stockmen, to economists who have attempted to capitalize it, and to agencies who have attempted to correlate grazing capacity on different ranges.

In the future, forage acres will be omitted on all range maps and Graphic plans and grazing capacity in terms of animal months substituted therefor. This will bring all maps and plans to the same basis.

To compute the grazing capacity, multiply the surface acreage of a type by its forage factor, and divide the result by the proper forage acre requirement. The forage acre requirement may be in terms of sheep or cow months, or years, according to the forage acre requirement used.

Thus, the final maps will always show for each type the following:

- Surface acreage
- Grazing capacity (in sheep or cow months or years)

Other converting factors or pertinent information may be added if desired.

J. Estimating Grazing Capacity of Annuals

In judging the value of ranges where the production of "annuals" importantly affects the grazing capacity it is first of all essential that sound range management objectives be clearly defined for the area or region. For example: Depleted ranges producing dependable crops of annuals may be managed with a view to getting fullest possible use of the annuals from a livestock economy standpoint or to making but very moderate use of the "annuals" from a broader viewpoint of eventually restoring the former perennial plant composition and density.

As a general rule it is assumed that the objective will be to hasten recovery of the valuable perennial species. In such cases the value of annuals should be kept sufficiently low to allow for their extreme fluctuations with relation to climate and to insure against overutilization of associated perennial. At the discretion of the administrative agency, the density of annuals may be ignored in the type writeup and their value calculated in other terms such as a direct estimate of safe grazing capacity based on the actual season of dependable use.

In unusual cases, where natural revegetation is out of the question, annuals may be considered under the same surveys procedure as for perennial but conservative forage acre requirement ratings should be assigned to compensate for extreme fluctuation in forage production and to provide a safety factor in soil conservation.

K. Progress Report

At the end of the field season, the chief of party will prepare a progress report of the work done during the season. This report will include the following: Acreage and part of unit covered, organization and qualifications of the crew, training given men in the field, methods used, recommendations for future work, and a statement of costs. The cost report will show in detail the various expenditures — total cost of various operations in the field; cost per acre of surveying, field examination, office, herbarium, moving, noneffective days other than moving; average cost per acre; and average acreage covered in the field per day.

L. Classification of Forage Types

1. Type Designations

Types will be indicated by the proper type number followed by standard symbols to indicate the dominant species. Types containing a timber overstory will carry the principal timber species symbol after the type numbers. The governing rule should be that the number and symbols will give an accurate picture of the principal species.

Types will be designated according to aspect. For instance, if the type is predominantly a grass type with scattering timber, it will be shown as a l type, followed by the timber symbol. The conspicuous or most important species or genus symbol will be shown first, followed by minor species. Ordinarily, unless exceptional conditions prevail not more than three symbols will be shown in a designation. If less than three species are prominent the number of symbols should be reduced accordingly.

2. Symbols

Symbol lists for trees, shrubs, and herbaceous vegetation should be devised and standardized for regions. Standardization of symbols for all common and widely distributed genera and species should preferably be standardized for the entire range area.

The governing principle will be a three letter symbol; all capitals for the genus symbol and one capital and two lower-case letters for species. The genus symbol should, except for trees, consist of the first three letters of the genus name. In case of conflict the least common genus will carry the second or third letter changed to remove the conflict.

Species symbols will consist of the first letter of the latin generic name, followed by the first two letters of the specific name. In case of conflicts, the same rule will be applied as for removing conflicts in genus symbols. Where the species determination is unimportant and where the species cannot be readily identified the genus symbol may be used. When there is a difference in forage value or general characteristics between species in the same genus, the species symbol should always be used.

3. Color Legend

Standard colors are shown for each type by crayon numbers.

The use of crayons contemplates a medium - light application of crayon, smoothed out through the use of a stomp dipped in gasoline.

M. Type Descriptions

The descriptions of each type are found on Illustration 3.

Form 764a (front)
(Revised Apr. 24, 1937)

RANGE SURVEY WRITE-UP SHEET

No.________

Project ________ Date ________

Examiner ________ Location ________

(Twp. & Range-Aerial Photo No.)

Type ________

Total Density ________ Timber ________

(Composition) (Condition)

Forage Density ________ & Pal. ________

F. A. Factor ________ For ________

C & H or S &G

(Reproduction) (Density) (Age)

(Injury) (Cause)

Utilization Cuts ____ Slope ____ %, Timber ____ %, Rocks ____ %, Lack of Water ____ %,

Erosion ____ %, Unstable Soils ____ % Total Cut ________

Principal Forage Species

Weeds %	%	x Pal	Grasses %	%	x Pal	Shrubs %	%	x Pal

Form 764a (back)

Type Comments

Current Forage Utilization: (check one) over-proper-Under

Plant Vigor (check one) poor-fair-good

Range Condition: (check one) poor-fair-good

Relative Productiveness of Site (cheok one)low-Av.-High

Watering Places ____________________

(Kind-Lake,spring,tank,etc.) (Distance) (Adequacy) (Permanent-Temp.)

Poisonous Plants ____________________

(Kinds) (Recommendations)

Kind of stock best suited to range: (check one or more) Cattle-horses-sheep-goats.

Proper Grazing Period: (check one or more): Spring-Summer-Fall-Winter-Year Long.

Wildlife ____________________

(Game, Predators, Rodents - Species and abundance)

Soil Erosion (check one or more)

Sheet Erosion Eivdent
*Gully Erosion
Occasional gullies-shallow
Occasional gullies-deep
Frequent gullies-shallow
Frequent gullies-deep

Soil Texture (to six inches deep)
Check in appropriate blocks.

		Gravelly	Stony
Light			
Medium			
Heavy			

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 is 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.

Form 764 (b)
(Revised Mar., 1937)

Suggested Face of 764 (b)
Adapted to Square Foot Density Method.

United States Department of Agriculture
Forest Service

Range Survey - Note Sheet

Examiner John Doe Date 6/1/37 Type 4 PP Sub-Type Mmo

Sec. 36 T 12 N R. 42E N.M.P.M. Aerial Photo No. -- Transect No. 1

SPECIES DENSITY

Plot Number	1	2	3	4	5	6	7	8	9	10	Total Density	Average Density	x Pal
Density	18	11	23	22	10	36	24	7	19	12	182		
Species													
Mmo	4	2	8	3	2½	10	8½	1½	2	5½	47	4.7	2.35
Far	1	½		2		3½			4	1	12	1.2	0.48
Ker	½	½	1	½	1	2½	1	1½	½	1	10	1.0	0.60
Lwr	½		1	1	½		1		3	1	8	0.8	0.48
Lup		2		½		1		3		½	7	0.7	0.35
Bdi	1		4				3½	1	4½		14	1.4	0.14
Aga	10	5½	9	14	3½	17	10		4	1	74	7.4	1.82
Sor	1	½		1	2½	2			1	2	10	1.0	.20
												F A F	0642

Front of Form
Printed Form will be half Letter size

FORAGE TYPE DESCRIPTION

Type No.	Standard Color	Type Description
		Grassland
1. (s)	Short Grass Light yellow Mongol 817	Includes grassland other than meadow and secondary meadow. Perennial grasses predominate and determine the aspect, although weeds and browse may be present.
(t)	Tall grass Dark Yellow	Examples of types are: (s) grama-buffalo grass; (t) bunch grass, wheatgrass-sedge, alpine grassland, blue stem.
		Meadow
2.	Cadmium Orange Mongol 862 Dixon Thinex 372	Includes areas where sedges, rushes and moisture-enduring grasses predominate. Two classes of meadows are recognized: wet meadows and dry meadows. Wet meadows are characterized principally by sedges and remain wet or moist throughout the summer. These shall be designated as 2W-Wet Meadow or Marsh. Dry meadows are dominated by grasses rather than sedges and occur as moist meadowlike areas in open timber or intermittent meadows, both of which become moderately dry by midsummer. These shall be designated as 2-D - Dry Meadow or Flood Plain.
		Perennial Forbs (Weeds) (Not Desert Weeds)
3.	Lake Red Dixon's best 321 1/2 or Dixon Thinex 369	Includes all untimbered areas where perennial weeds predominate over other classes of vegetation. There is very little true weed type, as a weed cover is usually more or less temporary in character and is soon replaced by a more permanent type if the disturbing factor is removed. If there is no great predominance of the weeds over the grass or brush vegetation, and if it is possible to judge that the weed predominance is due to some unnatural factor, the weeds should be disregarded in designating the type and the more stable vegetation should be used as an index. The weeds will then be cared for in the sub-type.
		Sagebrush
4.	Stone Brown Mongol 863 Dixon Thinex 378	This type includes all untimbered lands where sagebrush or shrubby species of similar appearance predominate. The sagebrush lands are usually of different range values and different in season of grazing from the areas which are listed below under browse. Areas dominated by shrubby species of sagebrush, including big sagebrush (Artemisia tridentate), shall be classed as sub-types, as: Artemisia filifolia, A. cana, and A. tripartitia. Other shrubby species such as

<u>Chrysothamnus</u> should be designated as sub-types when they become dominant in sagebrush areas.

This and the browse type which follows are sometimes difficult to distinguish from the grass and weed types if aspect rather than the dominant class of forage is used as the distinguishing characteristic. Sagebrush may form only 15 percent of the total vegetation of a type and still its aspect may be that of a sagebrush type.

It may prove desirable, in a given region, to decide on a certain percentage of all the vegetation in the type, say 20 percent, as the minimum proportion of sagebrush that may be present if the area is still to be classified as a 4 type, providing, of course, it does not already have the aspect of some other type. The same will hold true of the browse type.

Browse Shrub

5. Olive Green Mongol 888 Dixon thinex 391

This type includes all untimbered lands where browse, except sagebrush or its sub-types, gives the main aspect to the type or is the predominant vegetation. Characteristically it occupies the transition zone of the lower mountain slopes, foothill, and plateau areas. Examples of sub-types are mountain mahogany, bitter brush, willows, Cennothus-Manzanita, California Chaparral, etc.

Conifer

6. Dark Green Mongol 858 Dixon Thinex 375

This type includes all range in coniferous timber supporting grasses, weeds, browse, either singly or in combination, except as provided under Type 7 and 9. The forage may vary from a pure stand of weeds or browse. It usually, however, consists of grasses, weeds, and browse, and the proportion of each species varies so widely that it is not thought advisable to attempt a division into types with distinct colors. These variations can best be represented by sub-types.

Waste

7. Blue Green Mongol 898

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, owing either to denseness of standing or down timber or sparseness of forage growth. Large areas of very sparse forage, unless within easy reach of a better type, shall be classified as waste because of the impracticability of running stock over so large an area to get such a small amount of feed.

This type also includes other waste areas not strictly in timber or brush and not barren which are so rough or inaccessible as to make their future use improbable. The sub-type designations generally encountered in this type are as follows: 7T-Waste in Dense Timber; 7D Waste in Down Timber; 7B - Waste in Brush; 7R -Waste Areas where Rocky Character Prevents use; and 71 - Permanently Inaccessible Areas. Principal species of timber should be shown by symbols.

Barren

8. (Blank)

This type includes all areas on which there is naturally no vegetation, or practically none, including intermittent lake beds, saline flats, active sand dunes, shale, rock slides, lava flows, etc. Areas which have been denuded by overgrazing should not be confused with areas naturally barren, nor should areas containing only annuals for a part of the year be shown under 8, although these may be without vegetation for the remainder of the year.

Pinon-Juniper

9. Light Green Mongol 848 Dixon Thinex 389

This type includes pinon, juniper, pinon-juniper, and digger pine. The character of the range in this type as regards location, grazing capacity, and management is sufficiently distinct from the conifer type to justify a separate color. The forage may vary from a pure stand of grasses, weeds, or browse to a combination of any two or all. This variation can best be shown by sub-type designations.

Broad leaf Trees

10. Pink Mongol 846 Dixon Thinex 381

This type includes all range in deciduous timber. The combination of grasses, weeds, and browse, and the proportion of individual species, will vary as in other types.

The principal sub-types which will be encountered are: aspen, cottonwood, oak, birch, alder, ash-elm, etc., when they occur in tree form.

Creosote

11. Bottle Green Mongol 855

This type includes areas where creosote bush (Covillen) constitutes the predominant vegetation.

Mesquite

12. Yellow Earth Mongol 853

This type includes areas where various species of the Mesquite (Prosopis) give the characteristic aspect or constitute the predominant vegetation.

Saltbush

13. Slate Mongol 819 Dixon Thinex 399

This type includes areas where the various salt desert shrubs of the Atriplex family form the predominant vegetation, or give the characteristic aspect. There is sufficient significant difference in the range value and the use of salt bush areas to justify their separation from other desert or semidesert shrub types.

Greasewood

14. Royal Purple
Mongol 864
Dixon Best
323½

This type includes areas where greasewood (Sarcobatus) is the predominant vegetation or gives a characteristic aspect. Characteristically this type occupies valley floors subject to overflow during flood periods or areas underlain with ground-water at shallow depths where the soil is more or less saline. It is sufficiently differentiated from other desert shrubs to justify an exclusive type.

Winterfat

15. Light Tan
Dixon Best
324½
Dixon Thinex
388

This type includes areas where winterfat (Eurotia) gives a characteristic aspect or constitutes the predominant vegetation. Though commonly associated with other semi-desert shrubs, the occurrence of this plant in Utah and Nevada as a type character is of sufficient extent to justify a separate type.

Desert Shrub

16. Flesh Tint
Mongol 867

This is a general type which includes areas where other desert shrubs aside from those separated into individual types, constitute the predominant vegetation or give the characteristic aspect. This type includes several genera which are quite distinctive in type habitat such as black brush (Coleogyne), coffee berry (Simmondsia), Catclaw (Acacia Mimosa), gray molly (Kochia), hopsage (Grayia spinosa), spiny horsebrush (Tetradymia spinescens), and little rabbitbrush (Chrysothamnus stenophyllus) but pure types of each are so limited in extent as to not justify separate type. The plant symbols used will be sufficient to indicate the predominant species present.

Half Shrub

17. Wisteria
Mongol 844
Dixon Thinex
377

This type includes areas where half shrubs constitute the dominant vegetation or give the characteristic aspect. Half shrubs are semi-woody perennial of low stature such as Aplopappus, Gutierrezia, Artemisia frigida, Eriogonum wrightii, etc. They commonly consist of a woody caudex from which herbaceous stems are produced that die back annually. These genera are sufficiently distinctive in habitat and of wide enough extent in certain localities to justify a separate type designation.

Annuals(Weeds or Grasses)

18. Red Terra
Cotta
Mongol 876
Dixon Best
351

This type includes areas in which annual weeds or annual grasses constitute the dominant vegetation. Both transitory stages and semi-permanent conditions should be included in this type as for example: Russian thistle, downy chess (Bromus tectorum) desert weeds. The plant symbols used will be sufficient to indicate the predominant species present.

Abandoned Lands

Abandoned lands should be classified according to aspect. In mapping, the boundaries should be hatched.

II. PARKER 3-STEP METHOD

Editor's Note: The Parker 3-Step procedures were transcribed from the original text in the old BLM Manual, Volume IX, Range Release No. 38, dated September 12, 1960.

A. Parker 3-Step Method

The following instructions for establishing intensive range studies are largely derived from the Parker 3-step method and subsequent modifications approved by the Bureau.* The three steps used in this method are:

1. The establishment of permanent line transects.

2. A photographic record of each transect.

3. A record of range condition and eventually of range trend at and adjacent to the transect site.

*Note: For additional details about this method, consult A Method for Measuring Trend in Range Condition on National Forest Ranges, dated October 17, 1951, and supplement of March 31, 1953 by Kenneth W. Parker.

New Equipment for the 3-Step Method by L. R. Short, Northern Rocky Mountain Experiment Station, Research Note, August 1952.

Suggested Procedure for Use with the Loop-Transect Method by L. A. Sharp, University of Idaho, Research Notes, May 1955.

B. Factors in Establishing Permanent Transects

Essentially, line transects will accurately portray trend of condition on the transect site and will serve as benchmarks from which factors for judgment of surrounding range lands may be derived. Several important factors must be given consideration in the establishment of permanent transects:

1. The selection of average or representative sites within the range types being studied is very important. Transects should not be located in areas of livestock concentration such as near watering places or on driveways, nor should they be placed in unusable or extremely remote range areas. They should be placed so as nearly as possible to sample conditions in areas which carry the major grazing load of an allotment or unit.

2. Completion of the field work during the time of year when the important plant species are most easily identified is also important. (This applies to all methods of study.)

3. It is necessary to accurately record the cluster location (a cluster is one or more permanent line transects at one site) with reference to a permanent identification marker, and clearly describe the location of each transect within the cluster.

4. The delineation of tentative range condition classes on a map prior to establishment of transects will simplify and speed up the job. In this way intensive study can generally be limited to those types which may be expected to reflect changes in use and management.

5. In instances when moderately intensive survey coverage has delineated range condition class zones prior to the installation of transects for more exact determinations of trends, the acreage of the key areas represented by the intensive study should be reported under Phase 1 in statistical reports and deducted from the acreage previously reported as coverage under Phase 2.

C. Recording the Cluster Location

The making of "repeat" records in future years will depend upon the examiner being able to relocate the initial and terminal transect stakes from information shown on the original record. For best results, successive readings should always be taken at the same season of the year.

1. Where the cluster site cannot be readily located with relation to a known section corner, the site should be identified by regular range improvement project marker or any other permanent location tie set far enough away to avoid interference with the transects.

2. A sketch map should be drawn on the back of the line transect record form showing roads, fences, close identifying landmarks, bearings and distances, or other pertinent data which will facilitate relocating the site for repeat recordings. Aerial photographs and the general transect photograph (Section II. E) are useful for this purpose.

3. Each cluster established will be identified by number, and each district will maintain its own numbering series, starting with number one and continuing in consecutive order. Each separate transect should also be identified by number or letter and by exact bearing of the transect line.

D. Step One - Establishing a Line Transect

From one to three 100' transects (depending on the density and uniformity of the vegetation) will provide an adequate record at each cluster site. In moderately dense homogeneous vegetal types one transect will be sufficient. If the type is quite variable in composition or of relatively low density, a two transect cluster will provide more reliable data. In areas of very sparse vegetal cover, three or more transects per cluster may be required. The examiner will have to exercise his best judgment in deciding upon the number of transects per cluster to be installed.

A completed sample form used for recording data (Form 4-1420, Record of Permanent Line Transect) is included as Illustration 4.

1. Reading the Tape

Readings are taken and recorded at one-foot intervals along a steel tape stretched taut between two permanent iron stakes. The stake at the zero end of the tape is referred to as the "initial stake", and the other located a few inches beyond the 100' mark (far enough so that the 100' reading is not disturbed) is called the "terminal stake". A third or "middle" permanent iron stake may be placed directly under the tape at approximately 50 feet 6 inches. This third stake will aid materially in lessening tape movement by the wind and relocating the transect for repeat recordings in areas of heavy vegetation. Its exact location on the tape should be noted on the margin or reverse side of the transect record form. Normally the permanent stakes should not extend more than 6 inches above the ground level.

a. In tall growing browse types, the stakes must of necessity be longer and extend higher above ground level in order for the tape to be properly placed. If the tape is stretched at a height of one foot or more above ground level it will usually be preferable to use a plumb bob suspended by a string in lieu of a wire loop to mark the points directly below the one foot measurement stations on the tape. In this instance the point of the plumb bob hit is visualized as the center of a 3/4 inch circle. Readings on vegetation are taken at any height up to 60 inches above ground level. (Plant growth above 5 feet is generally considered to be unavailable for use.)

b. Of first importance is that measurement and recordation of data be done in as systematic and as nearly standardized manner as possible in order that remeasurement may be done with a minimum of error and inconvenience. For the sake of consistency when the tape is read either with a wire loop or with a plumb bob, readings should be made along the right side of the tape proceeding from the 0 to the 100 foot mark. If a straight shank loop is used it is also important that the loop itself be consistently held in the same position with relation to the tape. The practice to be followed will be to turn the loop out at right angles to the direction of the tape. If the loop is mounted on an offset handle as described by Short's Note of August 1952, less difficulty will be had in resetting the loop in an exact position. The use of a leveling bulb mounted on the loop handle will help to assure a vertical projection of the loop below the measurement point on the tape (Sharp's Note of May 1955). Any variation in procedure used in reading the tape should be carefully described and recorded on the transect record form for reference when a repeat measurement is made.

c. Brass cap survey corners provide an excellent location tie for the establishment of transects but normally should not be used as an initial stake with the transect itself. Quarter corners, being less conspicuous, may provide a satisfactory reference stake or hub for a transect cluster provided they are not surrounded by a mound of rocks and the vegetation has not otherwise been subjected to disturbance.

2. Recording Transect Information.

To complete the line transect record (Illustration 4), readings are taken along the tape starting at the one-foot mark, and thereafter at one-foot intervals.

a. Show in the proper spaces under Block (A) of the form the situation under each one-foot station on the tape as encompassed within a 3/4 inch circle. Use the lower half of each numbered block for recording readings of the plant understory, and the top half for recording the taller shrubs up to 5 feet in height (overstory).

b. To be recorded as "hits" the root crowns or portions thereof of grasses and forbs must fall within the 3/4 inch circle. On browse species hits are recorded whenever the loop falls within the circumference of the perennial portions of the crown.

c. Occasionally it may be impossible to establish a full 100 foot transect line at the selected site. In this case a 50-foot transect will suffice and 100 readings may be taken at 6 inch intervals on the tape.

d. Block (B) is a summary of the data recorded in Block (A).

e. In Block (C) list all perennial vegetation recorded in Block (A) by name, symbol, and number of "hits" (number of times it is recorded on the transect). Indicate by check mark (√) the species which are carrying the grazing load (Index plants). Note: In the bottom part of Block (B) the number of "hits" on these index plants are totaled.

f. Block (D) is provided to record vigor measurements. Select two or three of the most desirable plant species along the transect and determine the average measurements for vigor.

g. The remainder of the form provides supplemental information. Under the heading "Photographic Data", include information about additional pictures taken, type of film, camera used, etc.

3. Equipment

All transect directions should be determined by compass from the initial landmark stake or hub. A (K & E) Stevens Wyteface "A" 100 foot tape has proved to be ideal for laying out transects. Reinforcing steel, (3/8 inch or 1/2 inch) cut in the desired lengths, is suitable for the transect stakes. The tape can be held in a taut position between the two permanent stakes by means of clamps and temporary stakes or tape stretchers as suggested by Short, or by use of steel springs and a turn buckle arrangement devised by Sharp.

4. Optional

As an alternative procedure in areas of sparse vegetation, use of a 10-foot board notched or marked at 1-foot intervals may be substituted for the 100 foot tape in establishing transect lines. This procedure, developed in the Southwest, requires the placing of permanent stakes at 10-foot intervals along a predetermined line. A minimum of 100 feet of recorded line is required.

5. Paced Transect

To supplement data on plant density and composition, a paced transect system may be used. One or more straight lines may be paced at random through the area, recording the condition immediately in front of the right foot at the end of each pace. Readings may be recorded by a simple dot tally and summarized for comparison with the transect data.

6. Coverage

The number of transect clusters required in a given area must be left to the judgment of the individual making the study as the topography, uniformity of range types, time available for collecting data, and many other factors must be taken into consideration. Generally speaking, an attempt should be made to secure adequate samples of the major range areas producing the bulk of the forage within any given unit. It is especially important that one or more transect clusters be established in all key range areas which because of their character, location, availability, or for other reasons, have unusual significance to livestock or game populations and management.

E. Step Two - Photographic Record

A minimum of two pictures will be taken at each transect site (with the tape in place), one a close-up, another giving a general view along the transect line. Although this is listed as Step 2, it is preferable to photograph the area immediately after the tape is stretched in order to more accurately portray undisturbed conditions.

1. Photographs will be made in general conformance with the instructions given in the BLM publication, <u>An Improved Method of Making a Photographic Record of Range Conditions</u>, by French & Shunk, July 1952. This publication provides instructions for photographic identification, filing, recommended photographic equipment, etc., which may be modified as necessary.

2. Taking pictures with 35 MM cameras is permissible as a temporary measure <u>if more suitable equipment is not available</u>. However, this should be done only with black and white film in order that suitable enlarged prints, not less than 4 x 5 inches, may be made and filed with the transect record. Use of a tripod is essential. Range photographs will be identified by use of a printed card. This form is included as Illustration 5. The importance of obtaining a good photographic record cannot be overemphasized. Good before and after photographs of an identical range area provide one of the best and most easily understood selling points on the value of good range management practices.

3. Additional permanent photographic stations should be established to provide a more complete record of change in vegetation or soil condition. A periodically continuing picture record at such sites will be a valuable supplement to study data obtained by other methods and at other sites. In order for the record to be fully usable, careful notation of the location, season of year, general growing conditions, etc., should be made for each photograph at the time it is taken.

F. Step Three - Score Card

The score card (Illustration 6, Form 4-1419) is designed to rate current range condition and aid in estimating range trend. The examiner determines from analysis of transect data and by observation of the surrounding area which of the various rating descriptions best fit the conditions he observes. One of the figures assigned to that description is entered on the right hand margin as his score. A "spread in value" is given which allows the examiner to use any figure between the minimum and maximum values listed. Although the area of observation is limited to the transect immediate vicinity, the condition rating will apply to adjacent and surrounding range lands of similar use pattern, type, and character.

In the use of the score card and transect record, it is most important that <u>all</u> data be <u>filled</u> <u>in</u> on the forms while the examiner is on the ground. Though condition standards and score card values may change as a result of new research findings, the history of the site as measured in Step 1 will always be available for future reanalysis.

Each district office must develop a list showing the ratings of the plant species to be listed in Section B "Composition", and decide whether "Vigor" will be based chiefly on perennial grasses, shrubs, or forbs or some combination of the three. In developing these ratings the District should stay within or near the general numerical values assigned in Illustration 6.

1. Density

Density should be rated directly from the number of hits on vegetation per 100 readings on the tape. This assumes that plant frequency along the transect line is in direct proportion to percentage of total vegetative cover present. Note: Hits on either shrub overstory or plant understory contribute to total plant density but a hit on both at any given transect point should, for the purpose of rating density, be counted as a single hit.

2. Composition

Careful consideration of vegetal composition is very important, especially as it pertains to range trend. To prepare the score card for local use, refer to the district plant classification list (Illustration 7, page 1) as a basis for listing plant species in category B(1) on Form 4-1419 (Illustration 6). The key plant species, indigenous to the vicinity, which indicate poor, fair, good or excellent stand composition, should be listed, in the proper sequence and appropriate statements made on reproduction and age class distribution. Probably in most cases plant composition criteria will differ somewhat for each major plant association within a district. However, once developed, frequent changes in standards should be avoided.

3. Vigor and Condition

Vigor and condition criteria for all classes of vegetation are combined within this section rather than having a separate section for browse. If desirable browse or other classes of plants are missing or occur only in very minor amounts, the examiner should disregard them when rating vigor, major attention must go to the species of plant or plants which carry most of the grazing load for the type.

4. Soil and Erosion

Soil and erosion factors are judged on the basis of:

a. The natural erosion hazard as determined from the percent of bare ground measured on the transect line, and

b. Current soil erosion conditions noted along and in the vicinity of the transect line. The rating criteria listed on the score card are believed to be self-explanatory.

5. Supplemental Information

It is important that the examiner take time to record any pertinent supplemental data under the heading, "Current Situation." This information will do much to explain variation with subsequent readings, on such things as plant vigor, seed production, etc.

G. Summary Records

The summary record for intensive studies, formerly listed as illustration 3 in the Manual, has been discontinued because it fails to provide much usable information for the districts. However, this does not remove the necessity for keeping a cumulative record of soil and vegetal changes which takes place on any given study plot or transect site. But the range management plan for an allotment or unit will require a written summary of range condition and trend based upon the data from range study records.

H. Records

All field records pertaining to range studies will be retained in the district offices. Since considerable material eventually will be accumulated for each allotment or unit being studied, separate files should be maintained. Double or triple compartment manila binders are well suited for the filing of these data.

Form 4—1420
(July 1959)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RECORD OF PERMANENT LINE TRANSECT

Allotment or Unit	District	Date
Cluster Number	Location[1]	
Transect Number	Location[2]	
Examiner		

A.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

Note: List overstory species in upper blocks. Show plants by interagency symbols and circle symbol when dead. L – Litter; R – Rock; S – Soil; A – Unidentified annual; E.P. – Erosion Pavement.

B. SUMMARY OF PART A

		NO. OF "HITS"
	BARE SOIL	
	(Annuals) Plant	
Ground	(Perennials) Density Index[3]	
Cover	(Litter	
Index	(Rock	
	(Erosion Pavement	
	(Other *(list)*	
	TOTAL	100
	Overstory	
	Understory	
	Desirable Plant Index[4]	

C. LIST OF PLANT SPECIES*

PLANT NAME	SYMBOL	NO. OF "HITS"	KEY FORAGE PLANTS

*Include important species not recorded as hits on the transect

D. VIGOR *(Record any actual measurements made of key forage species)*

PLANT SPECIES	MEASUREMENT
1.	
2.	
3.	
4.	
5.	

E. PHOTOGRAPHIC DATA[5]

1 Permanent Reference Point, such as GLO survey corner or tie to corner.

2 Initial transect stake by bearing and distance from GLO corner or reference point.

3 Record no more than 1 hit per measurement point. If both annual and perennial on same point, record the perennial. P.D.I. = *total hits on vegetation.*

4 Consult Plant list (Illustration No. 9).

5 Note any deviation from standard procedures, extra photos taken, etc.
General View – Set up camera 35 feet back of initial stake and focus to show full length of line and horizon. (With tape in place.)
Close up – Set up camera over initial stake, focus on point 6 feet out on transect line. (With tape in place.)

6 Additional Information:
(a) Describe permanent reference point and note by sketch map, additional directions for reaching and identifying the transect site:

(b) Briefly describe the type of equipment and method used to read tape in order that repeat readings will exactly duplicate the procedures used for the initial reading, i.e., describe type of loop used, how readings were taken with reference to position of the tape, etc.

TRANSECT PHOTOGRAPH IDENTIFICATION CARD

DATE________

C______T____

S__T____R____

UNIT__________

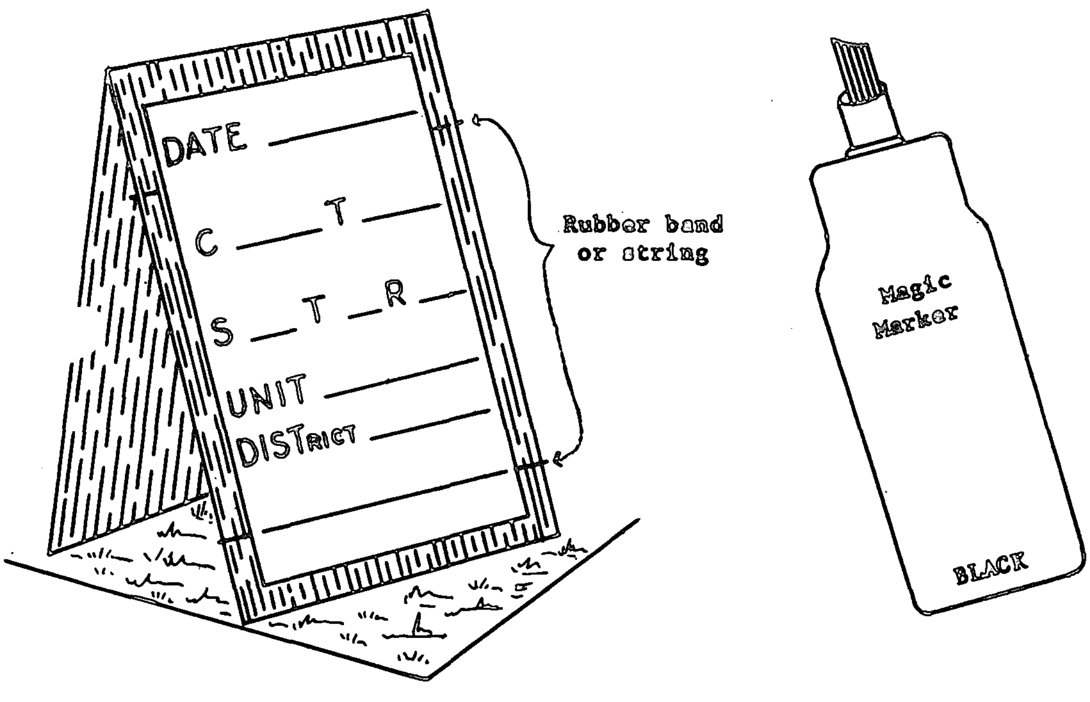
DISTRICT________

Instructions for Preparation of Transect Photograph Identification

This form will be used to identify all photographs taken during the installation and remeasurement of Three-step transects.

The printed form (sample attached) is intended to be disposable. The information needed to complete the transect identifications will be added using black "Magic Marker" ink.

The tatum holder normally used in collecting field data and for carrying blank forms will furnish backing for the placard during photography. Two rubber bands or string loops may be used on the lid of the tatum holder to keep the placard in place. The tatum may be placed on the ground or, if elevation is necessary as in browse types, astride a stick or twig.



Form 4–1419
(July 1959)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RANGE CONDITION TRANSECT SCORE CARD

Date

Examiner

Cluster Number

District

Location

Allotment or Unit

Range Type

I. VEGETATION

A. DENSITY OF PLANT COVER *	SCORE
40% or more = 10 30–40% = 8 20–30% = 6 10–20% = 4 Less than 10% = 2 Check if data were obtained from more than one transect and are average number of hits per 100 readings ☐	
*Determine directly from Part A and B of line transect record. Record no more than 1 hit per measurement point even though both understory and overstory hits listed.	

B. COMPOSITION AND AGE CLASS

(Based upon transect data plus ocular estimate of adjoining area)

With reference to the site potential, list vegetation present or which should be present under the following categories: *

(1) Desirable perennials:

(2) Perennials of medium value or high quality annuals:

(3) Annuals and undesirable or worthless perennials:

* Refer to district plant list *(Illustration No. 9)*.

1. Plants in (1) above making up more than 50% of the type total;
   Plants in (2) above generally present and may be moderately abundant but not in excess of 40% of type total;
   Plants in (3) above rare or absent and never in excess of 10% of type total. (16–20)

Illustration 6 Page 2

B. COMPOSITION AND AGE CLASS *(Based upon trasect data plus ocular estimate of adjoining area) – Continued*	SCORE
2. Perennials in (1) above present in decreased amount usually 30 to 50% of type makeup; plants in (2) above usually equaling or exceeding the percentage of those in group (1); less desirable plants such as those in (3) above in greater amounts but not exceeding 30% of total type composition. Young plants present and some reproduction of desirable perennials taking place. (11–15)	
3. Desirable perennials in groups (1) and (2) much reduced, together making up from 20 to 60% of type total; annuals and undesirable perennials present in greatly increased amounts, usually making up 40 to 80% of total vegetation; pure stands of palatable annuals may occur. May be young plants but little or no reproduction of desirable species. (6–10)	
4. Low value and noxious plants predominate, only remnants of desirable forage species remain. No reproduction of desirable species. (0–5)	
C. VIGOR AND CONDITION OF MAJOR FORAGE PLANTS	
1. Grasses and palatable forbs robust, numerous leaves, seed stalks tall and abundant. Sod and bunch grasses firm. Browse, flowers or fruits and current leaf growth abundant; plants show no grazing effect. Young plants of varying age usually occur throughout the type. (9–10)	
2. Grasses and palatable forbs strong with moderate amount of seed stalks and leafage. Sod and bunch grasses firm. Browse current leaf growth, flowers, or fruits plentiful; slight effect from grazing use; low shrubs erect, no evidence of hedging or browse line. (7–8)	
3. Grasses and palatable forbs apparently healthy but forage production poor, evidence of thinning, some bunch grasses loose (slight pedestaling of plants generally characteristic of this class). Browse, current growth, flowers, or fruits scarce; tall shrubs with browse line forming; low shrubs hedged. (5–6)	
4. Grasses and palatable forbs weak, forage production poor, seed stalks few and short, plants pull up easily, sod grasses definitely breaking up (distinct pedestaling and abnormal death loss often characteristic of this class). Browse, current growth slight to none, tall shrubs with distinct browse line, low shrubs prostrate or stubby. (3–4)	
5. Grasses extremely weak and dwarfed, leaves and seed stalks few to none; excessive thinning of sod and deterioration of bunch grass root crowns; survival of much of grass cover doubtful. Palatable forbs generally absent (root exposure due to erosion of pedestals and high death loss generally characteristic of this class). Browse, no current growth; inferior species heavily grazed, many branches dead, some plants killed outright. (0–2)	
TOTAL SCORE FOR VEGETATION	

CURRENT SITUATION *(Check appropriate block)*

Precipitation: ☐ Above normal ☐ Normal ☐ Below normal ☐ Dought conditions prevail

Current plant development is: ☐ Early ☐ Late ☐ Above average ☐ Average ☐ Below average

Utilization of current growth is: ☐ Light ☐ Moderate ☐ Heavy ☐ Excessive

Unusual site influences:

Record current stocking rate and condition of livestock from best information source available:

Additional remarks, if needed:

II. SOIL AND EROSION	SCORE
A. EROSION HAZARD INDEX *(Rate on basis of ground cover index on transect line)*	
80 to 100 hits = 13–15; 40 to 60 hits = 7–9; 60 to 80 hits = 10–12; 20 to 40 hits = 4–6; 0 to 20 hits = 0–3	
B. CURRENT EROSION	
1. Erosion none; all soil layers intact and stabilized. (15)	
2. Erosion slight; might be detected by litter or small amounts of sediment or top soil deposited on or against grasses or low shrubs; gullies or draws absent or completely healed. (11–14)	
3. Erosion moderate; occasional bare spots giving patchy appearance; few plants pedestaled; gully or channel sides not raw, but complete stabilization doubtful; litter scarce; soil compaction noticeable but not excessive; concentration of runoff into minute channels often apparent; cat steps and terraces noticeable on slopes. (7–10)	
4. Erosion severe; numerous bare spots, sheet erosion and soil compaction on light soils definitely apparent; erosion pavement evident on stony or gravelly soils; pronounced drift on sandy soils; channels or gullies, if present, with raw sides; majority of plants pedestaled with some roots exposed. (3–6)	
5. Erosion very severe or critical; sheet erosion widespread; subsoil exposed in many places; shoe-string gullies with raw sides generally common; large gullies with active side and head cutting often present; complete erosion pavement on stony soils; "blowouts" and excessive drifts on sandy soil, rapid depletion of plant cover evident. (0–2)	
TOTAL SCORE FOR SOILS	

INTERPRETATION OF SCORE
(Circle appropriate scores)

CLASSIFICATION	I. VEGETATION	II. SOILS	III. COMBINED RATING
Excellent	32 or more	24 or more	56 to 70
Good	24 to 31	18 to 23	42 to 55
Fair	16 to 23	12 to 17	28 to 41
Poor	9 to 15	7 to 11	16 to 27
Very Poor	0 to 8	0 to 6	0 to 15

Plant Species	Common Name	Plant Symbol	Spring Desirable Hi	Spring Desirable Med	Spring Undesirable Lo	Spring Undesirable Wor	Summer Desirable Hi	Summer Desirable Med	Summer Undesirable Lo	Summer Undesirable Wor	Fall Desirable Hi	Fall Desirable Med	Fall Undesirable Lo	Fall Undesirable Wor	Winter Desirable Hi	Winter Desirable Med	Winter Undesirable Lo	Winter Undesirable Wor
Achillea lanulosa	Yarrow	Ala		SW	C			W	CS				CSW					
Agoseris spp.	False Dandelion	AGO	S	CW			S	W	C			SW	C					
Allium acuminatum	Wild onion	Aac	CS	W					W									
Amsinckia spp.	Fiddleneck	AMS				CSW				CSW				CSW				
Aster spp.	Aster	ASS		W		CS		W	CS				CSW				W	CS
Astragalus stenophyllus	Astragalus	Ast		CS	W				CSW				CSW				W	
Balsamorrhiza sagittata	Balsamroot	Bsa		CSW			W	S	C				CSW				W	
Brassica spp.	Mustard	BRA		S	WC				CSW				CSW					
Castilleja spp.	Paintbrush	CAS		SW	C			W	CS			W					W	
Chenopodium spp.	Goosefoot	CHE		SW	C			W	CS			S	WC			S	WC	
Circium spp.	Thistle	CIR			W	CS			CSW				CS	W			CS	W
Delphinium spp.	Larkspur	DEL		S	W	C-(P)		SW		C-(P)		S	W	C-(P)				
Erigeron spp.	Fleabane	ERI		W	CS			W	CS			W	CS					
Eriogonum wrightii	Mt. buckwheat	Ewr		W	CS			W	CS				CSW			W		
Erodium cicutarium	Alfileria	Eci	CSW						CSW						W			
Geranium spp.	Geranium	GER	W	CS				SW	C				W					
Halogeton glomeratus	Halogeton	Hgl				CSW-(P)				CSW-(P)				CSW-(P)				CSW-(P)
Helianthus annuus	Sunflower	Han			W	CS		W		CS			W	CS				CSW

KEY: C - cattle
S - sheep
W - wildlife *
P - poisonous

Hi - high
Med - medium
Lo - low
Wor - worthless

Illustration 7 Page 2

D - Deer
A - Antelope
E - Elk

LIST OF COMMON FORAGE
PLANTS AND THEIR USE BY BIG GAME ANIMALS

Hi - High
Med - Medium
LO - Low
Wor-Worthless

NORTHERN STATES

A. **GRASS & GRASSLIKE PLANTS**

Plant Species	Common Name	Spring Hi	Spring Med	Spring Lo	Spring Wor	Summer Hi	Summer Med	Summer Lo	Summer Wor	Fall Hi	Fall Med	Fall Lo	Fall Wor	Winter Hi	Winter Med	Winter Lo	Winter Wor
Agropyron spp.	Wheatgrass		D E				E					E			E	D	
Ag. cristatum	Crested wheatgrass		D						D								
Aristida	Three-awn			A	D												
Bouteloua	Grama grass											A				A	
Bromus spp.	Brome grass		D E				E		D		E				E		
B. tectorum	Cheatgrass		A D						AD			A					AD
Distichlis	Saltgrass			D					D				D				D
Festuca	Fescue	E	D				E	D			E	D			E	D	
Koeleria	Junegrass	E	D				E								E		
Oryzopsis	Ricegrass	E	D				E				E	A		E		A	
Poa	Bluegrass		E				E	E			E	E			E	D	
Sitanion	Squirreltail			A	D				A				A			AD	
Stipa	Needlegrass			D				D							E		
Carex (dryland)	Sedge			A					D							AD	
Carex geyerii	Elk sedge					E				E				E			

SOUTHWEST

Plant Species	Common Name	Spring Hi	Spring Med	Spring Lo	Spring Wor	Summer Hi	Summer Med	Summer Lo	Summer Wor	Fall Hi	Fall Med	Fall Lo	Fall Wor	Winter Hi	Winter Med	Winter Lo	Winter Wor
Andropogon	Feather grass				D				D				D				D
Aristida	Three-awn				D				D				D				D
Bouteloua curtipendula	Side-oats grama	D				D							D				D
Bromus carthartieus	Rescue grass		D										D				D
Festuca arizonica	Arizona fescue		D				D						D				D
Muhlenbergia montana	Mountain muhly						D						D				D
Paspalum	Knotgrass	D				D						D				D	
Poa fendleriana	Bluegrass		D				D						D				D
Sitanion hysterix	Squirreltail		D				D						D				D
Triodia mutica	Slim triodia	D				D						D				D	
Triodia pulchella	Burrograss				D				D				D				D
Carex	Sedge				D				D				D				D
Juncus arizonicus	Wiregrass							D				D					

III. DEMING TWO-PHASE

Editor's Note: The Deming Two-Phase procedures were transcribed from the original text from the old BLM Manual, Volume IX, Range Release No. 38, dated September 12, 1960.

A. Procedures for Using Two-Phase Method

The following procedural statements describe certain details of practice in surveys made by the Two-Phase method. Further amplification of these procedural hints is to be found in "Supplemental Instructions for Field Use" - March 1957, by Milo H. Deming (Illustration 8).

1. Observations

Observations are made in the field at random but at such intervals as seem necessary to sample sufficiently all the important vegetational types and broadly generalized sites. Only a single observation record need be taken for any size of area where similar conditions of site, vegetal cover, and use intensity patterns prevail. Substantial change in any of these features will require another observation writeup record, and map entry.

2. Local Plant Classification List

On the particular management unit or allotment under study the prevailing or anticipated circumstances of season of use and kind of grazing animal fix the appropriate basis for using the local plant classification list with reference to the Range Condition Index.

3. Range Condition Survey Field Record

The data for field observations on range condition is recorded on a Two-Phase Range Condition Survey Field Record Form 4-1529 (Illustration 9). This form provides for a brief description of each type and site at each observation location for which a writeup and rating are made. The vegetal type is designated by the appropriate number and/or name (Section I, Illustration 3) and the most important species present are listed. The site is described with concise terms as to land form (as valley floor, mountain slope, etc.); topography (as broken, steep, etc.); exposure (by directional quadrants, as SE, multiple, etc.); soil characteristics (as sandy loam, clay from tertiary shales, etc.); and moisture characteristics (approximate annual rainfall in inches and snow lay, as 8", snow cover intermittent, etc.). Space is provided for a location tie entry for each observation station, by section, township and range, if possible, otherwise by land feature names.

4. Numerical Ratings

Numerical ratings are assigned on the writeup form to each of the four items listed under each phase of Forage Stand and Site-Soil Mantle headings. Each item is judged appropriately by reference to the standard key descriptions contained in the Range Condition Index. These item ratings are entered on the field sheets and totaled separately for each phase. These totals are written thus (40/60) as "combined ratings" in which the first figure always refers to the Forage Stand Phase total and the figure behind the slash mark always refers to the Site-Soil mantle total.

5. Unit or Allotment Summary

Each field sheet has spaces provided for ten complete observation location records. This number is usually sufficient to describe an allotment or a small management unit adequately if the kind of livestock or big game and season of use therein are the same universally. After acreage of each condition class is computed from the zoned map the data is entered in the Unit or Allotment Summary spaces on the field sheet form.

6. Condition Classes

The sum of the total rating obtained for both phases (i.e., both figures of the combined rating) determines the range condition class for that writeup and location. These condition classes are five in number: Excellent, Good, Fair, Poor and Bad. The appropriate condition class in which each combination rating total falls is determined with reference to the following scale index points:

0 - 25	Equals	Waste or Unusable Range
25 - 60	Equals	Bad
60 - 95	Equals	Poor
95 - 130	Equals	Fair
130 - 165	Equals	Good
160 - 200	Equals	Excellent

7. Observation Noted on Map

The approximate location of each observation place is shown on the map by entering the Two-Phase formula figures for the Forage Stand and Site-Soil Mantle conditions observed in that place. This is the "combined rating" for both phases and is entered thus 60/80. The extent of the reference area of each observation location is not delineated on the map.

8. Zones by Condition Class

After all the ratings for the respective observation locations are plotted on a map, zonation of the area of each condition class is obtained by drawing exterior boundaries which contain all the locations at which the combination ratings fall within the prescribed arithmetic limits for each respective class. Any combined rating total of less than 25 is considered as waste and unusable and the area so rated is cross-hatched on the map. Acreage for each condition class zone or for unusable range is computed from the map by planimeter or other measuring device.

9. Using Type and Topographic Maps

The dividing lines or boundaries between the respective zones usually follow topographic relief and vegetational type lines. If type maps or topographic maps are available for field use they help to fix where the boundaries between such zones should be drawn. Otherwise the boundaries are approximated or sketched in the field, using whatever controls are available from knowledge of the area.

10. Range Condition Criteria Index

The Range Condition Criteria Index quoted hereafter (Sections III.B and III.C) constitutes the universal reference guides for judgment of the field examiner in assigning appropriate numerical ratings item by item for the conditions discovered in field surveys. Since this index is constantly used for reference in field work, it was published separately (Illustration 8).

B. Phase 1 - Range Forage Condition Index Ratings

For consideration of the forage stand, the four items of Quality, Quantity, Vigor, and Reproduction are subject to independent rating and judgment. The sum of the ratings assigned each item produces the total Forage Stand phase rating.

Forage Stands - Phase 1

1. Rating Plant Stands for Quality

Judge proportionately the relationship of plants composing the stand which are of high forage value, of intermediate forage value, of low forage value and worthless for forage. Lists of local plants so classified are essential. Ratings will be applied as follows:

25 - Outstanding predominance of high quality perennial forage plants in the stand. Remainder of the stand is principally of medium value or worthless plants negligible.

20 - At least half of the stand is composed of high quality perennial forage plants. Remainder of the stand may be mostly medium value plants with only minor percentages of low value and few worthless plants. (High quality annual plants may be considered here if they persist and are available for use throughout the grazing season.)

15 - At least one-third of the perennial forage plants are of high quality. Medium value plants may be greatly predominant, but low quality and/or worthless plants may not exceed one-third of the stand. (Annual plants of high and medium quality but limited usefulness are considered here. Stands composed almost exclusively of medium value plants, either desirable annuals or perennial, also fall in this category.)

10 - High quality perennial forage plants are few. A major proportion of the forage plants are of medium and low value. Worthless plants comprise a very significant percentage of the stand. (Annual plants of low value and short life or usefulness are considered here.)

5 - Outstanding preponderance of low value and/or worthless forage plants in the stand. (These may be either annuals or perennials.) Remaining percentage of stand may be composed principally of medium value plants. High quality plants are negligible or relics.

0 - An extreme situation where only low value or worthless plants for forage comprise the stand.

2. Rating Density and Occupancy by Desirable Forage Plants

Considering the site and environmental potentials for production of vegetation, judge the relative density of stand and degree of occupancy of available space by <u>valuable and desirable</u> forage plants, (i.e., those of high and medium values on local plant lists).

25 - There is a very dense stand of valuable and desirable forage plants. Such plants occupy the available space almost exclusively.

20 - There is a thick stand in density of valuable and desirable forage plants. There may be minor amounts of space occupied by undesirable and worthless forage plants.

15 - There is a medium stand in density of valuable and desirable plants. Low value plants and/or those worthless for forage may be equally dense in patches or may occupy equal space with the desirable plants.

10 - There is a thin, open, or patchy stand of valuable and desirable plants. Low value and/or Worthless plants may be denser or occupy a major portion of the available space.

5 - There is a scanty and widely-spaced stand of valuable and desirable plants. There may be dense stands of low value and worthless plants.

0 - An extreme situation where there is no appreciable density of valuable and desirable plants. Space occupancy may be almost entirely by worthless plants.

3. Rating Vigor of Desirable Plants

Judge the relative degree of health and thrift of the <u>valuable</u> and <u>desirable</u> forage plants which are available for grazing. This is evidenced by their size, height, shape, color, firmness of rooting, amount of leafage or shoot production and flower or seed stalk abundance. Consider relatively high vigor of competing undesirable plants as an adverse influence. Note any evidence of recent death loss of desirable plants.

25 - Valuable and desirable plants are robust, of maximum height and excellent color, well formed and producing abundant leafage, seed stalks and shoots. They are firmly rooted and show no sign of weakness or malformation.

20 - Valuable and desirable plants are thrifty and of good height, shape and color. Grass clumps or sods are intact and well filled. Shrubs are sturdy, with good form and have moderate numbers and length of shoots.

15 - Valuable and desirable plants are of medium size, fair height, and with a medium volume of leafage and shoot production. Grass clumps may be small or sods patchy. Shrubs may have relatively fewer and shorter shoots or may be somewhat distorted in form.

10 - Valuable and desirable plants are low or short, poorly formed and unthrifty. Grass clumps may have dead centers, sod formations may be broken and irregular. Desirable shrubs are malformed or scrawny, or have some dead branches.

5 - Valuable and desirable plants are critically weak and decadent with poor color, stunted form and with very limited leafage or shoot production. Grass tufts or shrubs often are infirmly rooted or pedestalled, and some recent death loss may be found. Undesirable plants may be thrifty

0 - Extreme situation where valuable and desirable plants are barely existing relics, or have recently died in substantial amounts.

4. Rating Reproduction Abundance and Survival of Desirable Plants

Judge the comparative abundance and evidence of survival of seedlings, shoots, and younger age classes of the valuable and desirable forage plants. Usually these are in competition with undesirable plants for future increases and replacements in the stand. Consider which plants are gaining materially in replacement for death loss of their own kind.

25 - Reproduction of valuable and desirable plants is abundant. It is outstandingly predominant in all younger age classes and seedlings. This indicates the continual presence of sufficient reproduction to build or maintain dominance of the better forage plants.

20 - Reproduction of valuable and desirable plants is frequent and in the majority with respect to most new seedlings and younger age classes. Some low value or worthless plant reproduction may be present in minor amounts or in the older age classes of reproduction.

15 - Reproduction of valuable and desirable plants is moderate. It may occur in nearly equal amounts and frequency with that of low value or worthless plants.

10 - Reproduction of valuable and desirable plants is scanty. It is in the minority in most younger age classes and is usually outnumbered by that of low value and worthless plants.

5 - Reproduction of valuable and desirable plants is rare or negligible in amount. That of low value or worthless plants is usually predominant in all younger age classes. This indicates that the undesirable plants are gaining dominance or definitely have control of the stand.

0 - Extreme situation where there is no evidence that valuable and desirable plants are reproducing and surviving in the stand in any appreciable amount.

C. Phase 2 - Site and Soil Mantle

The second phase of this method refers to the Site-Soil Mantle condition. Here the physical influences of all plants both above and below the ground surface are of paramount importance. Four items of Protective Cover, Natural Vulnerability, Surface Runoff Resistance, and Soil Stability are judged and rated independently. The sum of these ratings produces the total rating for Phase 2.

Site and Soil Mantle - Phase 2

1. Rating the Protective Cover and Its Efficiency

Judge the relative density and mass effectiveness of the cover formed by all kinds of vegetation, including trees, shrubs, and litter, which shields the soil mantle from disturbance by water and wind. Note the size and pattern of bare spaces.

25 - Dense cover making a full and continuous canopy over the surface of the ground. It affords maximum protection against erosion by water or wind.

20 - A thick cover in which there may be some small and widely spaced openings. Usually it affords good protection against erosive forces, but the nature of cover and dispersion of plants or litter leaves some marginal openings bare.

15 - A medium cover of vegetation, or a thick cover with large and patchy openings; or thick stands of "annuals" or "perennials" which persist to maintain cover. These are moderately or partially effective as protection against erosive forces.

10 - A thin cover of vegetation, or ephemeral and shortlived annual plants, or scattered clumps and islands of vegetation in large bare openings. These are only slightly or partially effective against erosive forces at certain times.

5 - Widely dispersed and scanty cover of vegetation, or annual vegetation that vanishes quickly or appears only in some years. Ineffective against erosive forces as most of the ground surface is uncovered most of the time.

0 - Extreme cases where the soil surface is barren of cover or nearly so, with no protection afforded.

2. Rating the Natural Vulnerability of the Site

Judge comparatively the natural features of terrain and environment which tend either to accelerate or reduce the force and effectiveness of wind and water as erosion agents. Such features include position and land form, topographic relief, slope and exposure, the nature and properties of the soil, surface stoniness or rock outcrop, and characteristic extremes of local weather. Consider these factors under presently prevailing conditions of cover and climate. The rating should reflect vulnerability to whichever erosion agent is most active locally.

25 - Minimum erosion hazard from either water or wind because of natural feature. For water this usually means valleys, plains or terraces, gentle slope gradients, smooth terrain, and stable and absorptive soils. For wind action this usually means broken or rugged terrain and very stable soils amply sheltered.

20 - Slight erosion hazard from either water or wind because of natural features. For water this usually means some hilly or rolling terrain with moderate slopes, and fairly stable and absorptive soils. For wind this usually means undulating or rough topography with few level areas subject to wind sweep.

15 - Moderate erosion hazard from all erosive forces because of natural features. Intermediate conditions of terrain relief and steepness of slope usually occur; also moderately stable and absorptive soils, but with only partial shelter.

10 - High erosion hazard from either water or wind because of natural features. For water this usually means relatively steep slopes, dissected terrain, rather unstable soils, and sharply cut water courses. For wind this usually means much smooth topography which offers little protection from wind sweep; and loose or light soils.

5 - Critical erosion hazard from either water or wind because of natural features. For water this usually means precipitous slopes or badland areas with some shale or bare rock exposure; and disintegrating types of soils. For wind this usually means flat smooth terrain with little obstruction to wind sweep, and light or loose soils easily subject to blowing.

0 - Extreme situation such as bare rock, raw shale beds, exposed subsoil layers, or active dunes.

3. Rating Surface Runoff Resistance

Judge comparatively the rapidity with which water from snowmelt or rainfall enters the soil or runs off over the soil surface and in drainageways or stream courses. Consider the nature, amount and time of occurrence of all forms of precipitation. Consider channel form and drainage patterns of major and minor watercourses.

25 - No or very slight indication of surface runoff occurrence. Most of the water from snow or rain is apparently absorbed or moves so gradually that litter and soil are practically undisturbed. Drainageways and stream courses are smoothly rounded and apparently well stabilized.

20 - Some evidence that a small amount of surface runoff occurs. There is some disturbance of litter, fine soil, and small debris, but these are carried only short distances and moved in zigzag patterns. Water courses and drainageways are fairly stable though well-defined.

15 - There are marks of moderate amounts of over-surface flow occurring, indicating lessened absorption and percolation. Litter movement and soil or debris lodgment behind obstacles is common but in irregular patterns. Drainageways show evidence of high water flow and debris deposits and some minor or discontinuous cutting of streambanks is evident.

10 - Many indications of rapid runoff, low absorption, and a large volume of over-surface flow. Straight rill gully patterns may show on exposed slopes, drainages will show evidence of instability and active bank cutting or deepening. Litter accumulation is sparse. Stream courses show silt, debris and rubble deposits intermittently, or at high water stage levels of overflow plains.

5 - Much evidence of occurrence of quick runoff and torrential or flood flows of waters. There is no litter accumulation in place. Flood debris and rubble deposits occur along watercourse banks and as fans at stream junctions. Watercourse channels are commonly straight walled and deeply sunk in valley floors.

0 - Extreme situation showing evidence of floods of great volume carried in thoroughly scoured channels.

4. Rating Soil Stability

Judge comparatively the present rate of erosional activity by the degree of soil movement or disturbance. Results of either wind or water action or both should be considered.

25 - Soil mantle is intact with no evidence of soil movement. The soil is developing in place with no sign of transportation. Surface litter is usually accumulating in place.

20 - Slight evidence of some recent soil movement. There may be a limited movement of fine soil from bare ground or on certain exposures, but generally stable surface conditions prevail.

15 - Moderate movement of soil is plainly apparent and recent. There may be some terracing, or occasional plants on pedestals, or a few small rill gullies in exposed places. Some sediment deposits occur intermittently in runoff channels or against small obstructions elsewhere. Some gravel is exposed in bare spots where fine soil has been removed.

10 - Well advanced and active soil erosion is evident. Usually there are active gullies to aid soil carriage and plants are on pedestals of soil. Drifted soil or debris deposits are very noticeable against minor surface obstructions. Drainageways show silty deposits or sandy material along channels or in fans. Erosion pavement is well formed on gravelly or stony soil, but the pattern is open. Transported soil appears mounded about shrub clumps.

5 - Severe soil erosion of recent occurrence. There is exposed subsoil or closed erosion pavement on stony soils: frequently many active gullies, sharply incised drainage channels, large fan deposits of soil and debris which includes gravel and rocks. There are wind scoured depressions and active hummocking or embryonic dunes in sandy situations.

0 - Extreme situation such as on barren lands, raw shalebeds, or shifting sand dunes.

D. Preparation of Maps

Maps are an indispensable part of the range condition survey record. Combination ratings (See Section III.A.4) at respective observation locations are plotted on them. From these reference points the extent and limits of zones for each condition class are drawn and respective acreage are computed. Range condition survey maps used in district reports or for other permanent records will be on scales of either 1/4 or 1/2 inch per mile. Unit reports or field work maps may be on any convenient scale.

1. Map Zone Legends

All maps which serve cumulative or permanent record purposes should be colored by condition class zones according to the following standard legend; Excellent Condition, blue; Good condition, green; fair condition, yellow; Poor condition, orange; bad condition, red; waste or unusable areas, cross hatching in red. The combination ratings, written thus (60/80), should also be entered at the appropriate locations. (Section III.A.7) Field or work maps should be colored similarly for contrast to aid in the mechanics of determining acreage and percentage relationships for each zone.

2. Map Reference Dates

All field work and permanent record maps should carry the proper reference year dates. The permanent record maps will identify the years in which respective units or sectors of the district were surveyed. In addition a district diagram progress map may be kept to show the sector survey dates and other pertinent information such as delineation of sectors covered by different intensities of study, location of key area transects, location of exclosure plots, photo stations, etc.

3. Special Separate Phase Maps

Separate maps or transparent overlays to illustrate the area and percentage relationships of either the Forage Stand Phase, or the Site-Soil Mantle Phase alone may be developed for such special purposes as particular problem analysis or for exclusive demonstration purposes. These may be prepared by entering only the rating figures for the particular phase concerned at each observation location; then zoning the area by 20 index point stage differentials in a manner similar to that followed when using the combination ratings.

4. Resurvey Work Maps

Field work maps prepared in advance of resurveys of the Two-Phase method should have the location of each observation station indicated in place by a reference point symbol. (thus = [•].) The combination Two-Phase rating should not be used for this purpose because it might tend to influence the resurvey rating. The type number or name may be entered on the map to aid more positive identification of the place and type involved.

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT

TWO-PHASE RANGE CONDITION SURVEYS SUPPLEMENTAL INSTRUCTIONS FOR FIELD USE

By MILO H. DEMING - REVISED MARCH 1957

The Two-Phase Method for making comprehensive range condition surveys is described fully in Volume IX Range, Part 10 Studies, Chapter 10.3 Condition Surveys of the Bureau of Land Management Manual, and amendments. These supplemental instructions are prepared for ready reference in the conduct of field work. They afford some additional hints and explanation of the local application and adaptation of general principles referred to in the accompanying Range Condition Criteria Index (Revised March 1957)

The essentials for Two-Phase Method Surveys are:

(1) A plant classification list—prepared locally in advance of field work.
(2) A Range Condition Criteria Index—4 pages, processed separately.
(3) A supply of forms No. BLM 2-407 or similar—for field observation write-ups.
(4) A map of the area to be surveyed—any convenient scale for field use.

This method gives equivalent but separate ratings to the two most significant phases of the range resource complex; i.e. the forage stand and site and soil mantle of the habitat. The ratings for these two phases are further considered in combination for comprehensive classification of range condition by relative terms commonly used by range managing agencies. The recording system used on field sheets and maps maintains separate ratings for each phase at each observation station so that arithmetic computation of changes in each can be made locality by locality at the time of subsequent resurveys.

Forage Stand Consideration—Phase I

This phase deals with plants on the basis of their relative contribution to the crop of forage being produced on any particular site for the animals expected to use the range at a specific season of the year. The four items of Quality, Quantity, Vigor, and Reproduction are rated with particular reference to how well the valuable and desirable plants are faring in competition with undesirable plants under current circumstances of growth and grazing use. With 100 points as a maximum possibility, the aggregate numerical rating derived for the four forage stand items represents how closely the conditions obtaining approach what is consider to be the full potential capacity of the particular site for forage production.

Site and soil Mantle Consideration—Phase II

This phase deals with the physical features and environmental characteristics of the habitat which govern and limit the kind and abundance of native plants which can grow on any particular site. It considers all forms of vegetation and litter with reference to the protective cover it forms and the influence exerted on soil and water movement under prevailing climatic conditions. The four items of Protective Cover, Natural Vulnerability, Surface Runoff, and Soil Stability are rated independently. The aggregate numerical rating for these four items represents how near the situation as found approaches 100 points, or the ideal habitat conservation conditions for any particular site.

Some Basic Principles

(1) For range condition survey purposes the land areas to be surveyed are judged primarily from the viewpoint of usefulness for grazing purposes. Watershed, forest and other natural resource values present are not evaluated as such but are considered as environmental influences affecting the use and management of the area for range.

(2) Range condition is judged relatively with reference to resource conservation goals which can be attained by proper management under specified circumstances of grazing use rather than with reference to a possible ecological climax attainable under undisturbed natural competition.

(3) Where ranges are used jointly by livestock and big game animals the predominant use and the management objectives will govern which plant classification ratings are to be applied.

(4) Resurveys of range condition after intervals of several years will reveal the direction of trend and magnitude of the changes which have occurred by numerical comparisons of the respective survey ratings.

(5) The frequency of making field observation write-ups is governed by the necessity for sampling any significant changes in vegetational types, range sites, or use patterns. So long as these remain reasonably similar a single write-up will apply. Greater intensity of sampling makes the definition of condition class zone boundaries more exact.

Comparison Areas

Better understanding of the production potentials of various range sites may be had if ungrazed or lightly grazed areas are visited first and carefully rated. This helps to establish some definite criteria for making relative comparisons with findings on similar sites and in similar types. Local relict areas should be sought for observations on species composition, vigor and form of plants.

Local Plant Classification Lists

Lists of all the important plant species found in the local native plant association are prepared in advance of field work. These lists show a relative desirability classification (as high, medium, low, or worthless) for each species at each season of the year for each particular kind of grazing animal. These local plant lists become the foundation for judging the local relationships of desirable and undesirable plants as described for rating purposes in the Range Condition Index. The relative desirability classification for each plant is decided primarily on its forage value, but the placing may be discounted if the plant is objectionable for other reasons.

Combination Ratings and Map Color Legend

Two-Phase combination ratings are written thus: (60/80), the first figure always representing the aggregate forage stand index rating and the second figure always representing the aggregate Site-Soil Mantle index Rating. Entry of this combination rating symbol on the field and record maps identifies the approximate location at which the corresponding field write-up was made.

The sum of the two figures which comprise the combination rating determines the appropriate rang condition class according to where it falls within the following scale of numerical values for each condition class.

From	to	Range Condition Class	Map Zone Color
0	25	Waste-unusable	Red Hatchure
*************** For Usable Range Only ***************			
25	60	Bad	Red
60	95	Poor	Orange
95	130	Fair	Yellow
130	165	Good	Green
165	200	Excellent	Blue

Maps

Maps are an indispensable part of range condition survey records. Entry of the Two-Phase symbol on the map identifies the approximate location where the corresponding field write-up was made but the exact area of reference for each observation station is not bounded on the map. All observation stations for which the combination ratings fall within the numerical limits prescribed for each condition class are circumscribed by a zone boundary line. The zone or area occupied by each condition class is thus distinguished on the map for coloring and separate acreage computations.

Field maps may be of any convenient scale available. Large scale maps often contain topographic detail or vegetation type lines which facilitate the location of condition class boundaries. For permanent district record purposes the field information obtained should be transferred to district maps no larger in scale than 1/4 or 1/2 inches per miles. The area covered by surveys each year should be identified by dating with the year of survey in order to plan the cycle for periodic resurveys of particular units.

Trend and Trend Symbols

Trends describe the progressive pattern of changes in range condition which develop over a period of at least several years times. These should be distinguished from the short term fluctuations which occur from year to year with more or less erratic patters usually associated with climatic variation.

When former acquaintance of the examiner with any range area or when periodic resurveys permit a reliable observation of trend, the following symbols will be used to indicate trends appropriately on the field write-up form, No. II-407, and on maps prepared to show trends.

Symbol	Name	Interpretation
++	Double plus	Very marked upward trend, and/or great increase
+	Single plus	Definite and significant upward trend, and/or small increase
ϕ	Balance	Stable or indefinite position. Change is too small for positive determination of trend in either direction.
-	Single minus	Definite and significant downward trend, and/or small decrease.
=	Double minus	Very marked downward trend, and/or great decrease.

Correlation with Other Records

Range condition surveys picture cumulative results but do not disclose definite reasons for the prevailing conditions. The reasons must be developed through correlated analysis of other historical and contemporary records which afford local details about the circumstances of forage production and its use. The cumulative influences most responsible for range condition and trends are seasonal and yearly variation in grazing pressure and weather. Consequently, timely records of actual stocking, utilization results, improvement installations, forage production circumstances, and weather influence must be kept or consulted to assign valid reasons for the existing situation. Correlation of such records with survey findings will indicate the nature and some measure of adjustment required to correct unsatisfactory or maintain satisfactory conditions.

RANGE CONDITION CRITERIA FOR TWO PHASE METHOD SURVEYS PHASE I - FORAGE STAND INDEX RATINGS (Revised March 1957)

QUALITY: Judge proportionate relationship of plants composing the stand which are respectively of high forage value, of intermediate forage value, of low forage value and worthless for forage. Local lists of plants so classified are essential.

25 - Outstanding predominance in the proportion of high quality perennial forage plants in the stand. Remainder of the stand is composed principally of medium value, with the percentage of either low value or worthless plants negligible.

20 - At least half of the stand is composed of high quality perennial forage plants. Remainder of the stand is mostly medium value plants, with minor percentages of low value and few worthless plants. (High quality annual plants may be considered here if they persist and are available for use throughout the grazing season.)

15 - At least one-third of the perennial forage plants are of high quality. Medium value plants may be predominant. Low quality and/or worthless plants may not exceed one-third of the stand. (Annual plants of high and medium quality but short-lived usefulness are considered here.)

10 - High quality perennial forage plants are few. A major proportion of the forage plants are of medium and low value. Worthless plants comprise a significant percentage of the stand. (Annual plants of medium and low value and with short life are considered here.)

5 - Outstanding preponderance in proportion of low value and/or worthless forage plants in the stand. (These may be either annuals or perennials.) Remaining percentage of stand is principally composed of inferior or medium value plants. High quality plants are negligible or relics.

****

0 - An extreme situation where only low value or worthless plants for forage comprise the stand.

QUANTITY: Considering the site and environmental potentials for production of vegetation, judge the relative density of stand and degree of occupancy of available space by **valuable and desirable** forage plants, (i.e. high and medium values on lists).

25 - There is a very dense stand of valuable and desirable forage plants. Such plants occupy the available space almost exclusively.

20 - There is a thick stand in density of valuable and desirable forage plants. There may be minor amounts of space occupied by undesirable and worthless forage plants.

15 - There is a medium stand in density of valuable and desirable plants. Low value plants and/or those worthless for forage may be equally dense or occupy equal space with the desirable plants.

10 - There is a thin, open, or patchy stand of valuable and desirable plants. Low value and/or Worthless plants may be denser or occupy a major portion of the available space.

5 - There is a scanty and widely-spaced stand of valuable and desirable plants. There may be dense stands of low value and worthless plants.

****

0 - An extreme situation - there is no appreciable density of valuable and desirable plants. Space occupancy is almost entirely by worthless plants.

VIGOR: Judge the relative degree of health and thrift of the **valuable and desirable forage plants.** This is evidenced by their size, height, shape, color, firmness of rooting, amount of leafage or shoot production and flower or seed stalk abundance. Consider adversely comparative vigor of competing undesirable plants.

25 - Valuable and desirable plants are robust, of maximum height and excellent color, well formed and producing abundant leafage, seed stalks and shoots. They are firmly rooted and show no sign of weakness or malformation.

20 - Valuable and desirable plants are thrifty and of good height, shape and color. Grass clumps or sods are intact and well filled. Shrubs are sturdy, with good form and moderate numbers and length of shoots.

15 - Valuable and desirable plants are of medium size, fair height, and with a medium volume of leafage and shoot production. Grass clumps may be small or sods patchy. Shrubs may have relatively fewer and shorter shoots or may be somewhat distorted in form.

10 - Valuable and desirable plants are low or short poorly formed and unthrifty. Leafage and shoot production is limited. Grass clumps may have dead centers, sod formations may be broken and irregular. Shrubs are malformed or scrawny.

5 - Valuable and desirable plants are critically weak and decadent with poor color, stunted form, and with very limited leafage or shoot production. Grass tufts or shrubs often are infirmly rooted or pedestaled.

****

0 - Extreme situation - valuable and desirable plants are barely existing relics, or dying.

REPRODUCTION: Judge the comparative abundance and evidence of survival of seedlings, and younger age classes of the **valuable and desirable forage plants.** Usually these are in competition with low value and worthless plants for future increases and replacements in the stand.

25 - Reproduction of valuable and desirable plants is abundant. It is outstandingly predominant in all younger age classes and seedlings. This indicates the constant presence of sufficient reproduction to build or maintain dominance of the better forage plants.

20 - Reproduction of valuable and desirable plants is frequent and in the majority with respect to most new seedlings and younger age classes. Some low value or worthless plant reproduction is present in minor amounts or in the older age classes of reproduction.

15 - Reproduction of valuable and desirable plants occurs in near equal amounts and frequency with that of low value or worthless plants.

10 - Reproduction of valuable and desirable plants is scanty. It is in the minority in most younger age classes and may be overshadowed by of low value and worthless plants.

5 - Reproduction of valuable and desirable plants is rare or negligible in amount. That of low value or worthless plants is usually predominant in all younger age classes. This indicates that the undesirable plants are definitely and dominantly in control of the stand.

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0 - Extreme situation - no evidence that valuable and desirable plants are reproducing and surviving in the stand.

Phase II - SITE AND SOIL MANTLE INDEX RATING

PROTECTIVE COVER: Judge the relative density and mass effectiveness of the cover formed by all kinds of vegetation, including litter, shrubs, and trees, which shields the soil mantle from disturbance by water and wind. Note the size and pattern of bare spaces.

25 - Dense cover making a full and continuous canopy over the surface of the ground. It affords maximum protection against erosion by water or wind.

20 - A thick cover in which there may be some small and widely spaced openings. Usually it affords good protection against erosive forces, but the nature of cover and dispersion of plants or litter leaves some marginal openings bare.

15 - A medium cover of vegetation, or a thick cover with large and patchy openings; or open stands of "annuals" or "perennials" which persist to maintain cover. These are moderately or partially effective as protection against erosive forces.

10 - A thin cover of vegetation, or litter, or ephemeral and short-lived annual plants, or scattered clumps and islands of vegetation in large bare openings. These are only slightly effective against erosive forces.

5 - Widely dispersed and scanty cover of vegetation and litter, or annual vegetation that vanishes quickly or appears only in some years. Ineffective against erosive forces as most of the ground surface is uncovered most of the time.

****

0 - Extreme cases - barren of cover or nearly so.

NATURAL VULNERABILITY: Judge comparatively the natural features of terrain and environment which tend either to accelerate or reduce the force and effectiveness of wind and water as erosion agents. Such features would include position and land form and position, topographic relief, slope and exposure; the nature and properties of the soils; surface stoniness or outcrops, and characteristic extremes of local weather. Consider these under presently prevailing conditions of cover and climate. The rating should reflect vulnerability to whichever erosion agent is most active locally.

25 - Minimum erosion hazard from either water or wind because of natural feature. For water this usually means valleys, plains or terraces, gentle gradients, smooth terrain, and stable and absorptive soils. For wind action this usually means broken or rugged terrain and stable soils.

20 - Slight erosion hazard from either water or wind because of natural features. For water this usually means some hilly or rolling terrain with moderate slopes, and fairly stable and absorptive soils. For wind this usually means undulating or rough topography with few level areas subject to wind sweep.

15 - Moderate erosion hazard from all erosive forces because of natural features. Intermediate conditions of terrain relief and steepness of slope. Moderately stable and absorptive soils.

10 - High erosion hazard from either water or wind because of natural features. For water this usually means relatively steep slopes, dissected terrain, rather unstable soils, and sharply cut water courses. For wind this means much smooth topography which offers little protection from wind sweep, and loose or light soils.

5 - Critical erosion hazard from either water or wind because of natural features. For water this usually means precipitous slopes, badland areas of shale or bare rock exposure, and disintegrating types of soils. For wind this usually means flat smooth terrain with little obstruction to wind sweep, and light or loose soils easily subject to blowing.

****

0 - Extreme situation as bare rock, exposed subsoil layers, or active dunes.

SURFACE RUNOFF: Judge comparatively the rapidity with which water from snowmelt or rainfall enters the soil or runs off over the soil surface and in drainageways or stream courses. Consider the nature, amount and time of occurrence of all forms of precipitation.

25 - No or very slight indication of surface runoff occurrence. Most of the water from snow or rain is apparently absorbed or moves so gradually that litter and soil are practically undisturbed. Drainageways and stream courses are smoothly rounded and apparently well stabilized.

20 - Some evidence that a small amount of surface runoff occurs. There is some disturbance of litter, fine soil, and small debris but these are carried only short distances and moved in zigzag patterns. Water courses and drainageways are fairly stable though well defined.

15 - There are marks of moderate amounts of over-surface flow occurring, indicating lessened absorption and percolation. Litter movement and soil or debris lodgment behind obstacles is common but in irregular patterns. Drainageways show evidence of high water flow and debris deposits and some cutting of streambanks is evident.

10 - Many indications of rapid runoff, low absorption, and a large volume of over-surface flow. Straight rill gully patterns may show on exposed slopes, drainages will show evidence of instability and active bank cutting or deepening. Litter accumulation is sparse. Stream courses show silt, and debris deposits intermittently or at high water stage levels of overflow plains.

5 - Much evidence of occurrence of quick runoff and torrential or flood flows of waters. There is no litter accumulation in place. Gully patterns are incised on slops. Flood debris and coarse rubble deposits occur along watercourse banks and as fans at stream junctions. Watercourse channels are commonly straight walled and deeply sunk in valley floors.

****

0 - Extreme situation - evidence of floods of great volume carried in thoroughly scoured channels.

SOIL STABILITY: Judge comparatively the present rate of erosional activity by the degree of soil disturbance or movement. Results of either wind or water action or both should be considered.

25 - Soil mantle is intact with no evidence of soil movement. The soil is accumulating in place with no sign of transportation. Surface litter is usually accumulating in place.

20 - Slight evidence of some recent soil movement. There may be limited movement of fine soil from bare ground or on certain exposures, but generally stable surface conditions prevail.

15 - Moderate movement of soil is plainly apparent and recent. There may be some terracing, or occasional plants on pedestals, or a few small rill gullies in exposed places. Some sediment deposits occur intermittently in runoff channels or against small obstructions elsewhere. Some gravel is exposed in bare spots where fine soil has been removed.

10 - Well advanced and active soil erosion is evident. Usually there are active gullies to aid soil carriage and plants are on pedestals of soil. Drifted soil or debris deposits are very noticeable against minor surface obstructions. Drainageways show silty deposits or sandy material along channels or in fans. Erosion pavement is well formed on gravelly or stony soil, but the pattern is open. Transported soil appears about shrub clumps.

5 - Severe soil erosion: There is exposed subsoil, closed erosion pavement on stony soils, many active and frequent gullies, sharply incised drainage channels, large fan deposits of soil and debris which includes gravel and rocks. There are wind scoured depressions and active wind cutting or embryonic dunes in sandy situations.

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0 - Extreme situation - as on barren badlands, or shifting sand dunes.

Form 4–1529
(July 1960)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TWO–PHASE RANGE CONDITION FIELD RECORD

	State & District
	Unit or Allotment
Examiner	Date

PRESENT USE BY Kind of Livestock	Numbers	Season From	Season To	Stocking Rate (AUMs)
				( )

TRAVERSE ROUTE

PRESENT RANGE RESOURCE CONDITION INDEX

	1	2	3	4	5
LOCATION TIE *					
DESCRIPTION OF TYPE Name–Number List of Principal Species					
DESCRIPTION OF SITE Land Form Topography Exposure Soil Moisture					
FORAGE STAND Total & (Trend)	( )	( )	( )	( )	( )
Quality Quantity Vigor Reproduction					
SITE–SOIL MANTLE Total & (Trend)	( )	( )	( )	( )	( )
Protective Cover Vulnerability Runoff Resistance Soil Stability					
TWO-PHASE RATING					

* Identify each writeup station by Section, Township, Range, or by landmark features

SUPPLEMENTAL INFORMATION

PRESENT RANGE RESOURCE CONDITION INDEX					
LOCATION TIE*					
DESCRIPTION OF TYPE Name—Number List of Principal Species	(6)	(7)	(8)	(9)	(10)
DESCRIPTION OF SITE Land Form Topography Exposure Soil Moisture					
FORAGE STAND Total & (Trend)	( )	( )	( )	( )	( )
Quality Quantity Vigor Reproduction					
SITE–SOIL MANTLE Total & (Trend)	( )	( )	( )	( )	( )
Protective Cover Vulnerability Runoff Resistance Soil Stability					
TWO-PHASE RATING					

UNIT OR ALLOTMENT SUMMARY

Area: *(Acres)* Gross ________ Alienated ________ Federal Range ________

Federal Range Unusable ________ Game Use Only ________ Usable by livestock ________

Condition Classification *(Usable Federal Range):* ________ Acres

(Acres) Excellent ________ Good ________ Fair ________ Poor ________ Bad ________

Percent, Each Class: ________ ________ ________ ________ ________

Trend: Improving ________ Static or Indefinite ________ Declining ________

Percent ________ ________ ________

IV. TREND SCORE CARD

Editor's Note: The Trend Score Card procedures were transcribed from the original text in the old BLM Manual, Volume IX, Range Release No. 38, dated September 12, 1960.

A. Changes in density and composition of perennial vegetation are measurable to a large degree and it should be possible to obtain direct trend values from study plots. Plant vigor and soil erosion are less easily measured and will depend chiefly upon careful descriptive evaluations of change. Form 4-1422 "Range Trend Score Card" (Illustration 10) has been devised to aid in rating trend from information gathered by remeasurement of permanent study plots.

The criteria are presented for sake of illustration and are based upon positive or negative values assigned to the different elements listed. The indicated changes in both soil and vegetal conditions are weighted to give plus or minus values and added algebraically to reflect site condition changes if any. An excess of plus values indicates improving conditions; an excess of minus values the reverse. When the two are approximately balanced the range is judged to be in a relatively static or unchanging condition.

The numerical values assigned to this form were arrived at on a more or less arbitrary basis. Therefore, experience in use may dictate a change in the weights given to trend elements and in the number of transect hits required to meet the criterion of a moderate or great change in soil or vegetal condition. For example, let us consider "Density" under paragraph A of the form. In a sparsely vegetated desert type, an increase of 3 to 5 transect hits on vegetation might be equivalent to a 100 percent increase in plant density. The same increase in transect hits on an average Western range type might approximate a 10 percent to 15 percent increase in plant density. Thus, in the Southwest it seems certain that the scale of relative value accorded to hits on vegetation will have to be altered. This is permissible in any case, but in order to maintain uniformity of approach it is recommended that all such necessary changes be developed at the State or Area level, and that they not be allowed to vary appreciably within or between grazing districts.

B. In measuring trend, comparison is made with the data obtained from at least one prior measurement of the transect. As pointed out by Parker, the criteria for judging trend of vegetal condition may differ in accordance with the initial condition rating given the type. For example, a sagebrush type initially judged as Poor might completely lack a perennial grass understory, in which case the later establishment of a low palatability perennial grass would probably indicate improvement. A similar type judged as Good would be almost certainly have had a fair understory of palatable perennial grasses. A subsequent invasion by the same low palatability grass would in this instance suggest range regression to be taking place.

C. When considering the elements of composition and vigor as applied to major forage species in the type, the situation may arise where one class of desirable plants is deteriorating through overuse and another is improving and moving in as a replacement. This is most readily illustrated by winter game areas where palatable browse species may be decreasing in vigor, condition, and area occupied, while perennial grasses are on the increase. In such an event, major use of the type must be carefully considered and greatest weight given to the condition of the plant species carrying most of the grazing use load. In instances of this kind full documentation of the situation should be made by explanation under the space for "Additional Remarks."

1. To supplement the foregoing, the examiner should refer to the local plant classification lists (Section II, Illustration 7, Page 1) which are prepared as a foundation procedure of the Two-Phase study method and which provided the basic data for the preparation of the Intensive Study Score Cards.

2. As an aid to recognition of plant species having value to wildlife, a supplemental list of common range plants is included as Illustration 7, Page 2. Districts may add to this list or assign different plant values as determined by local conditions.

3. The plant classification lists will be of greatest value as they relate to measurement of changes in composition of a vegetative type. However, the presence or absence of desirable or undesirable plants may themselves under certain conditions be an indication of trend.

Form 4–1422
(July 1960)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RANGE TREND SCORE CARD

Date		
Examiner		
Cluster Number		Transect Number
District	Location	
Allotment or Unit	Range Type	

I. VEGETATION	IMPROVING	STATIC	DECLINING
	Circle appropriate scores		
A. DENSITY *(as compared to prior transect measurements)*			
1. Density of all perennial plants has increased			
a. Greatly *(more than 10 bits on transect)*	+2		
b. Moderately *(3 to 10 bits on transect)*	+1		
2. Relatively unchanged *(0 to 2 bits increase or decrease)*		0	
3. Density of perennial plants has decreased			
a. Moderately *(3 to 10 bits on transect)*			–1
b. Greatly *(more than 10 bits on transect)*			–2
B. COMPOSITION *(as compared to prior transect measurements)*			
1. Desirable perennial forage plants have increased in number; better species may be reestablishing *(refer to district plant list)*; reproduction and young age groups of preferred species are present			
a. Change is moderate to great *(more than 10 bits on transect)*	+4		
b. Change is slight to moderate *(3 to 10 bits on transect)*	+2		
2. Relatively unchanged *(0 to 2 bits increase or decrease)*		0	
3. Desirable perennial forage plants have decreased in number; some species may have disappeared; reproduction of desirable plants is very scarce or absent; annuals or undesirables may have invaded the type			
a. Change is slight to moderate *(3 to 10 bits on transect)*			–2
b. Change is moderate to great *(more than 10 bits on transect)*			–4
*4. Summary of composition change as compared to prior transect measurement *(list species and plus or minus bits)*			
a. Perennial plants increasing:			
b. Perennial plants decreasing:			
c. Invading species:			

* For informational purposes only. Data does not enter into numerical rating of composition.

	IM-PROVING	STATIC	DE-CLINING
C. VIGOR *(Judge any change in plant vigor and general condition relative to descriptive terms and scores or actual measurements listed on prior writeups)*			
1. Vigor of perennial plant species is good to excellent; all forage plants appear strong and robust; no dead or dying plants and previously overused or unhealthy species recovering; invasion of bare areas taking place			
a. Improvement in vigor and condition judged to be exceptional	+2		
b. Improvement is definite but only moderately so	+1		
2. Vigor of major forage species relatively unchanged from earlier writeups		0	
3. Vigor and condition are weakening; better forage species unhealthy, partially dead or dying; no reestablishment of desirable plants and range generally is an unhealthy condition			
a. Condition of major species has deteriorated from previous check but downward trend is moderate			–1
b. Condition of major forage species has deteriorated noticeably and at a rapid rate; no signs of slowing up			–2
TOTAL OF VEGETAL FACTORS (+ OR –)			
Indicated trend of vegetative condition is ☐ Upward ☐ Static ☐ Downward			
II. SOILS AND EROSION			
A. EROSION HAZARD INDEX *(Measure changing conditions directly from ground cover index on "Record of Permanent Line Transect")*			
1. Measurable increase in Ground Cover Index			
a. Great improvement; significant increase in ground cover *(decrease of more than 10 bits on bare soil)*	+2		
b. Moderate improvement; fair increase in ground cover *(decrease 3 to 10 bits on bare soil)*	+1		
2. Ground cover index relatively unchanged *(0 to 2 bits decrease or increase)*		0	
3. Measurable decrease in Ground Cover Index			
a. Decrease in ground cover is moderate *(increase of 3 to 10 bits on bare soil)*			–1
b. Decrease in ground cover is serious *(increase of more than 10 bits on bare soil)*			–2

	IM-PROVING	STATIC	DE-CLINING
B. SOIL CONDITION *(Judge change in amount of plant litter, relative stability of residual soil, degrees of depletion or accretion of transported soil layers and healing of eroded areas)* *			
1. Plant litter is accumulating and excellent layer is in place; little, if any, evidence of erosion and any formerly eroded areas completely healing; nc evidence of plant pedestaling or wind movement of soils			
a. Degree of improvement from prior measurement is very high	+4		
b. Improvement is noticeable but only in a moderate amount	+2		
2. Improvement, if any, is minor and is compensated for by some slight deterioration		0	
3. Plant litter has diminished and little evidence of replacement; gully and sheet erosion are continuing and may have accelerated; little if any healing taking place; definite evidence of soil movement by loss or accumulation of transported soil			
a. Deterioration is noticeable but at a moderate rate			−2
b. Deterioration has been rapid and no signs of lessened erosion activity or improvement			−4
* Judgment may also consider increase or decrease of trampling activity by livestock and any significant change in rodent activity in the area			
TOTAL OF SOIL AND EROSION FACTORS (+ or −)			

Indicated trend of soil condition is ☐ Upward ☐ Static ☐ Downward

INTERPRETATION OF OVERALL SCORE *

CLASSIFICATION	I. VEGETATION	II. SOILS	III. COMBINED
Improving *(rapidly)*	+5 to +8	+4 to +6	+9 to +14
Improving *(slowly)*	+1 to +4	+1 to +3	+3 to + 8
Unchanged	0	0	0 to ± 2
Deteriorating *(slowly)*	−1 to −4	−1 to −3	−3 to − 8
Deteriorating *(rapidly)*	−5 to −8	−4 to −6	−9 to −14

III. ADDITIONAL DATA

A. PRECIPITATION *(Check condition observed)*

1. Current conditions ☐ Above normal ☐ Below normal ☐ Normal ☐ Drought conditions prevail

2. Estimate of average moisture condition during preceding 3 to 5 year period:
☐ Above normal ☐ Normal ☐ Below normal

* *Circle the appropriate rating*

B. UTILIZATION OF FORAGE PLANTS BY CLASS OF ANIMAL °

1. Current utilization:

   Slight _______ Moderate _______ Proper _______ Close _______ Extreme _______

2. Estimate of average utilization for preceding 3 to 5 year period:

   Slight _______ Moderate _______ Proper _______ Close _______ Extreme _______

C. UNUSUAL SITE INFLUENCES which may have affected the trend ratings: List such factors as prolonged drought, fire, insect infestation, etc., and explain effect upon study site.

D. ADDITIONAL REMARKS: Use this space to document any additional evidence of changing trend in plant or soil condition which is not shown above.

° *Enter Symbol directly in blank as C for cattle, D for deer, S for sheep, etc.*

V. GUIDES FOR ESTIMATING TREND

Editor's Note: The Guides for Estimating Trend procedures were transcribed from the original text in the old BLM Manual, Volume IX, Range Release No. 38, dated September 12, 1960.

The following factors or indicators of trend may be used as a guide in estimating current range trend. This listing is not complete and its application must be accompanied by the examiner's best judgment of conditions existing at each particular site. No one set of factors will give a positive determination and observations should be made of as many of these criteria as possible.

A. From the standpoint of vegetal condition:

Evidence of Upward Trend	Evidence of Static Condition	Evidence of Downward Trend
Good perennial forage plants are represented in all age classes from seedlings through mature plants.	The age class distribution of existing species is adequate to maintain the stand. As a rule of thumb this should approximate: Seedlings and young plants 10 to 50 percent. Mature plants - 40 percent or more. Old plants 10 percent or more	Evidence of decreasing perennial forage plants or unnatural age class distribution such as absence or scarcity of seedlings or young plants.
Undesirable species decreasing or present only as relics.	Closed stand of mature plants which maintain dominance.	Undesirable species increasing in stand with a heavy percentage of young plants.
A definite increase in density and vigor of good forage plants as based upon past observations or comparisons with comparable adjacent areas.	Desirable browse plants showing one year or more of twig regrowth present. Few dead branches. Generally of healthy appearance and vigor. No serious evidence of replacement of palatable browse species by less desirable plants.	Desirable browse plants heavily hedged. Current growth heavily utilized (over 60 percent of annual growth). Larger plants high-lined. Many plants may be dead or partially dying out. Inferior species may be replacing palatable ones. Grass stands being invaded by inferior browse species.

B. From the standpoint of Soil and Erosion:

Evidence of Upward Trend	Evidence of Static Condition	Evidence of Downward Trend
Good accumulation of plant litter. Litter and duff relatively undisturbed and in well defined zones.	Fair accumulation of litter, and little evidence of movement taking place.	Litter, if any, being depleted. Top layers may be mixed with or covered by soil particles.
Little or no evidence of wind erosion taking place. Any existing bare or dune areas being taken over by plants, most of which are desirable perennials. The above is especially indicative if establishment is by seed from palatable perennials.	Any bare or dune areas are not increasing in size. Little or no evidence of change in marginal areas of vegetation.	Bare areas or sand blowouts or dunes, if present, appear to be deepening or increasing in size. No evidence of successful invasion of plant life.
No evidence of soil deposition or buildup around base of plants.	The deposition of soil is very slight and nonrecurring. Not noticeable on young plants. Old alluvial deposits largely vegetated.	There is noticeable soil deposition around base of plants, including young age groups. Plants will often be pedestalled. If roots are exposed this is evidence of very recent soil removal.
Any eroded gullies healed or healing. Sides as well as bottoms becoming covered with protective vegetation. Erosion pavement areas fully vegetated within limits of the site potential.	Gullies mostly healed. Not deepening and no apparent increase in head cutting; gully walls will be at least partly vegetated and nearing angle of repose. Erosion pavement, if present, is not increasing.	Gullies present and unhealed, active headcutting, gullies steep sloped and may be deepening. Rill channeling observable. Erosion pave ment forming.

VI. EXCLOSURES

Editor's Note: Procedures for using exclosures to determine range condition were transcribed from the original text in the old BLM Manual, Volume IX, Range Release No. 38, dated September 12, 1960, and from a reference in the Journal of Range Management, July 1958, "Exclosures in Big Game Management in Utah" by Stanford Young.

It has been a practice of long standing to construct range exclosures as a means of providing an index of the effect of grazing use by different classes of animals and to give a record of changing range condition.

A. Exclosure will often be set up in cooperation with State or other Federal agencies with a joint analysis being made of the use data obtained.

B. Where common use of the range takes place, one section of the exclosure should exclude only livestock and another should be game-proof. If there is an indication of even moderate rodent or rabbit population in the area a third and smaller division should be fenced against these animals. Even experienced observers cannot always distinguish between deer and rodent use. In addition, it is always desirable to have one small portion of an exclosure completely protected against use by all animal life to serve as a check on other environmental factors affecting plant growth such as fluctuations of climate, disease, insect infestations, etc. A fourth section of the study area should be marked but left open to unrestricted normal use.

C. State game departments are doing a considerable amount of this work and may be consulted for fencing specifications if exclosures are to be constructed other than on a cooperative basis. However, if such plots are to be constructed with the study of game use as a major objective, it is strongly recommended that it be made a cooperative venture if this is possible.

D. Selection of exclosure sites should be given as careful consideration as in the selection of any other area for study, taking all pertinent factors into consideration. It should be noted that exclosures are a valuable tool of management regardless of the type of range they are placed upon.

E. Permanent transect studies and photographic stations should be established as a means of recording the change in range and soil condition which may result at the exclosure site. Pellet count records within the different exclosure sections will also provide data for establishing the ratio of game vs. livestock use of the areas (Section VII). (An excellent reference is found in the Journal of Range Management, July 1958 - "Exclosures in Big Game Management in Utah" by Stanford Young.)

Editor's Note: The following information was summerized from the Journal of Range Management cited above and has been edited.

F. Construction of Exclosures should be guided by the following points:

1. Exclosures should be located on representative parts of range, physiographically as well as vegetatively, and they should enclose ecological units of range that can develop naturally and independently of the surrounding range. The more heterogenous the conditions, the larger the exclosure should be. Total-protected, game-only, and open-range areas should be carefully selected to have equivalent conditions, thereby allowing for accurate comparisons. Experienced range ecologists should be delegated the responsibility of location and design.

2. Exclosures should be permanent installations, with no more being constructed than can be properly maintained by the agency which built them. Once their upkeep is neglected and animals enter, much of the accrued development is destroyed.

3. Exclosures should be located on the important vegetation types to sample use by the different kinds of range animals.

4. Fencing should be of the most open design practical to minimize its effects on the range environment. However, log and block fencing, because of its durability, would possibly be necessary where deep snows prevail. Fencing that excludes deer should stand at least 8 feet high. Fencing excluding livestock while allowing deer to enter freely should stand 3 to $3^1/_2$ feet high and be railed.

5. Where rabbits are abundant, part of the total-protected area should be made rabbit-proof. This can be done with 1-inch by 1-inch mesh welded wire, supported against sagging, the lower edge of which should be buried 6 inches and pegged securely into the ground.

6. A sign should be installed at a prominent location giving the name, date built, building agency, and purpose. The sign should also identify the structures and discourage their use as corrals. Stiles or ladders should permit access to the totally protected portion, since gates or doors may be left open.

7. Included in the compiled records should be permanently located photo-hubs, along with aspect and fenceline photographs. Also recorded should be climate and animal use, including classes, seasons, and intensities. In addition, carefully designed studies sampling the different components of the range, ground cover, and browse should be established on the exclosures and surrounding range. These studies, standardized and regularly repeated, would chronicle the long-range effects of differential animal use on the range.

VII. PELLET STUDIES

Editor's Note: The Pellet Studies procedures were transcribed from the original text in the old BLM Manual, Volume IX, Range Release No. 38, dated September 12, 1960.

The counting of deer pellet (dung) groups as a method of determining the number of game-use days per acre, the approximate big game population of an area; and the trend in use from year to year, was described by McCain, et al., in 1940 and 1948 (A Method for Measuring Deer Range Use, 13th trans, North American Wildlife Conference). Studies by Rassmussen, Doman, and Smith (1943) indicated that the defecation rate for mule deer averages approximately 13 pellet groups per day. Recently workers in California (Dasmann and Taber, 1955) have found evidence that pellet deposition rates may vary with a change in diet. Robinette, et al., discussion at the 23rd Trans. North American Wildlife Conference in 1958 found at the Little Hills Experiment Station in Colorado, an average rate of 15 pellet-groups per day were deposited by mule deer using moderately stocked sagebrush - juniper type winter range which is in good condition, or thirteen groups per day if the deer were utilizing depleted winter ranges.

A. It is not contemplated that Bureau technicians will initiate studies of this kind except in rare instances. This brief statement is for the purpose of explaining the procedures used, since it is likely that the Bureau may cooperate with State agencies in checks of game use on BLM ranges.

B. By recording the pellet groups found in certain prescribed units of range such as 1/100-acre or 1/10-acre plots, it is possible to obtain the number of game days use per acre or actual grazing use which has taken place. If the period (months or days) of use of the area is known it is possible within reasonable limits to determine the game population numbers by dividing the total deer days use by the length of stay in the area.

C. Trend of use can be determined by noting the change in total deer days use from one year to the next. Then too, the game days use per acre can be correlated with the browse production and utilization information gathered in the regular study program. No further instruction in conducting this type of study is believed to be necessary for the reasons stated. Should there develop a need, detailed procedures can be set up when required.

VIII. WEIGHT ESTIMATE AND OCULAR RECONNAISSANCE

Editor's Note: Because of the similarities in procedures, the Weight Estimate and the Ocular Reconnaissance methods of vegetation survey have been combined to reduce space. The procedures discussed here apply to both methods unless otherwise stated.

The procedures for collecting data using these methods were transcribed from old BLM Manual 4412.11B, "Weight Estimate Forage Survey Handbook," Release 4-4, dated 4/30/63, and BLM Manual 4412.11A, "Ocular Reconnaissance Forage Survey Handbook," Release 4-3, dated 3/30/63.

A. Introduction

Bureau of Land Management forage survey techniques are based on research findings of correlations between vegetation and soil conditions and environmental influences, including intensity of grazing. Surveys and studies are designed to rate ranges for maximum sustained use by livestock and game and to improve or to maintain ranges in a good productive condition. The ultimate test of surveys, and grazing capacities based on them, is trend in range condition. Capacity estimates are properly used only as a starting point in management. Permissible grazing rates will vary with changes in range condition due to changes in weather or intensity of use. Continuous studies which may include actual use, climate analysis, condition and trend, utilization and production studies are necessary to follow up a survey and adjust initially established grazing capacities.

B. Forage Survey Methods

They will be used primarily for initial adjustments in stocking rates on ranges which have not before been subjected to reliable forage production or grazing capacity studies, and for equitable allottings to users and proper distribution of grazing use. The choice between these and other methods will be based on the apparent advantages that each offers for the particular range under consideration, and on any special study requirements. Prescribed methods include ocular reconnaissance and weight estimate plot procedures. Each has unique characteristics which make it more or less adaptable to specific ranges and special requirements. Some important considerations in objectively determining an appropriate method include the nature and amount of vegetative cover, the extent of fluctuations in annual forage production, the practical intensity of the survey, and the qualifications of survey personnel.

C. Objective

The primary objective of a forage survey is to determine the amount of forage which is currently available to livestock and game under proper range use. Under this concept a forage survey is a forage production study.

D. Technical Considerations

WEIGHT ESTIMATE: The weight estimate forage survey method is a system of inventorying vegetation by estimating total green forage weight and converting to dry weight, by species, in a range type.

OCULAR RECONNAISSANCE: The ocular reconnaissance forage survey is a system of inventorying vegetation by estimating total forage density and percentage composition, by species, in a range type.

The more important technical elements involved in these procedure are described below.

1. Range Types

A range type is the mapping unit used in forage surveys and other range studies. It is a relatively homogeneous classification unit of appropriate minimum size consisting of a portion or sometimes all of a vegetative type as determined by general aspect.

Derivation of Range Types. The 18 standard aspect vegetative types are first delineated and then subdivided as needed on the basis of several mapping criteria in deriving range types of desirable evaluation size. The segmenting criteria listed in the order of usual application are:

(1) Abundance of vegetation
(2) Species composition
(3) Slope
(4) Exposure
(5) Kind of soil
(6) Erosion

Usually the practical minimum type size will be reached before all of these criteria are given specific consideration. The most important ones are first considered, and are commonly as listed above.

2. Weight and Density

a. *WEIGHT ESTIMATE:* Under the weight estimate method, current green weight production by plant species is estimated on plots. These green weights are then converted to air dry values after determination of moisture content. Species weights in grams are determined and recorded on Form 4-1276 (Illustration 11). The grams per plot are then converted to pounds per acre. Weights are recorded to the nearest five grams per plot except that any species having less than 2 grams is recorded as 1 gram.

(1) *Stubble Height.* Estimates and clippings will include all accessible herbage produced during the current year within appropriate limits of grazing use. Herbaceous plants are clipped to the root crown.

(2) *Height of Grazing.* Weight estimates will include all current year's growth of each plant species that is available for use up to the grazing height of animals concerned. The standard heights of grazing for the different kinds of animals are: cattle - 5 feet; sheep - 3½ feet; deer - 4½ feet; elk and moose - 7 feet; and antelope and mountain sheep - 3½ feet. The value used for a particular species will be the height for the animal making substantial use. If two or more animals make use, a proportionate height will be used.

(3) *Allowance for Utilization and Growth Stage.* It will be necessary to make appropriate allowances in estimates for any grazing utilization that may have already occurred on current growth prior to the time of examination, and for the growth stage of each species at that time. The estimates should reflect as nearly as feasible the full current year's development of each species.

(4) *Old Plant Growth.* Care must be exercised when clipping and weighing plot vegetation to remove all old growth of previous years.

(5) *Conversion to Dry Weight.* The conversion of green plant weights to air dry values is of utmost importance and should be done as accurately as possible. Moisture contents vary considerably, not only between species but between seasons and with time of day and site conditions. Because of these complexities, moisture contents of different species should be determined at frequent intervals throughout the field seasons. Green samples of each species are clipped within grazing height limits so as to represent average site conditions and diurnal fluctuations. The clippings are placed preferably in light weight, loose woven cloth bags and air dried until a constant weight is reached. Dry matter percentages are computed from sample weight differences and entered on the writeup form (Illustration 11). Pounds of dry weight per acre are derived by applying these percentage factors to estimated pounds of green weight per acre. Moisture content of plants generally becomes less and is more constant toward the latter part of the field season.

(6) *Training for Weight Estimation.* The efficiency and accuracy of the work of the members of the survey party depend a great deal upon the initial training given them. The entire crew should work together for at least a week, or until estimates of weight are uniform among them. Following the training period, the Chief of Party will work individually with each of the men requiring further improvement of his work and to check his progress. During the course of the survey, the crew should work together for a portion of a day each week in order to correlate estimates and to resolve problems in field procedure that may arise.

b. ***OCULAR RECONNAISSANCE:*** Under the ocular reconnaissance method, density will consist of general estimates of overhead (vertical) ground cover for the current year's growth of all usable vegetation on each range type. Density will be recorded as the decimal proportion of the ground that is covered as viewed from directly above. Values for each species are obtained through composition estimates of the percentage of the total density attributable to each. These two estimates are made concurrently as the examiner traverses the type. Brief notes are advisable for different parts of the type to aid the examiner in properly weighing the variations encountered in his final write-up. It would be well to complete Form 4412-1 (Illustration 12) when within an apparently average part of the type, and make needed adjustments as the type examination ensues. (Average density is recorded at the bottom of the form, and percent composition is listed for each species.)

(1) *Height of Grazing.* Density estimates will include all current year's growth of each plant species that is available for use up to the grazing height of animals concerned. The standard heights of grazing for the different kinds of animals are: cattle - 5 feet; sheep - 3½ feet; deer - 4½ feet; elk and moose - 7 feet, and antelope and mountain sheep - 3½ feet. The value used for a particular species will be the height for the animal making substantial use. If two or more animals make use, a proportionate height will be used.

(2) *Vegetative Layers.* In making density estimates where distinct and overlapping layers of vegetation are involved, each layer will be given separate consideration.

(3) *Allowance for Utilization and Growth Stages.* It will be necessary to make appropriate allowances in estimates for any grazing utilization that may have already occurred on current growth prior to the time of examination, and for the growth stage of each species at that time. The estimates should reflect as nearly as feasible the full current year's development of each species.

(4) *Training for Density Estimation.* As an aid in gaining a concept of density and in training for density estimation, a square-foot wire frame divided by cross wires into fourths may be used. This frame is helpful to the examiner in determining the area from which the current growth of each species must be taken to make a square-foot of cover. The vegetation may be sufficiently bunched, either from its natural position or after clipping, to present a full cover within the frame. Undue compression and overlapping of herbage should be avoided in developing a concept of the amount of naturally distributed herbage of different species required to form a square-foot of density. Other aids that may be used in estimation training or in checking overhead density estimates include line intercept transects, line point transects, or pace point transects. Perhaps the most readily used of these is the latter wherein hits at the point of the toe on each pace along a predetermined transect line are taken as the basis for density determination by species. Line intercepts and point readings have been used to some extent, but are more time consuming.

(5) *Vegetation Composition.* Composition ratings are based on the proportion of the total vegetative density provided by each species. The sum of the ratings is 100 percent. This sum is first proportioned, in the estimation process, between the three main categories (life forms) of plants, and then these respective group values are divided among the component species in accord with their relative amounts.

3. Animal Unit Ratios

In computing the approximate AUM's of use for the various kinds of grazing animals, their respective animal unit equivalents must be specified. These ratios as used in the past have varied to some extent for specific animals. The average head of cattle run on a particular range will be considered an animal unit by the Bureau. Animal unit equivalents for other kinds of animals have often been set somewhere within the following limits: 5 to 6 sheep, 5 to 7 goats, 5 to 7 antelope, 4 to 5.5 mule deer, 4.5 to 7 white-tailed deer, 5 to 6 black-tailed deer, and 1.25 to 1.75 elk. All of these ratios refer to only those animals over 6 months old. Younger animals, constituting the natural increase of the herd, are not considered in setting numbers of animal units or computing AUM's of use.

4. Plant Symbol Lists

As complete a list as possible of the plants of the survey area will be prepared for use of the party members. Plants will be listed alphabetically in the three groups—grasses (including grass-like plants), forbs, and shrubs (including trees)—using their scientific binomials. Common names may be added in another column after the binomials, if it is thought any useful purpose may be served thereby. Ordinarily, this plant and plant symbol list is prepared in conjunction with a listing of proper use factors for each species.

A four-letter symbol will be listed for each plant in a column preceding the binomials. These symbols will be used on type writeup sheets. They consist of the first two letters of each of the generic and specific names. Only the first letter of a species symbol is capitalized. In the case of unidentified or grouped species of a genus, the first four letters of the generic name are used, and all are capitalized. The use of four-letter rather than three-letter symbols minimizes their duplication among plants of an area. Where the few duplications do occur, the conventional symbol is modified by adding a number beginning with "1" at the end. Numbers are assigned in order of importance of the plants involved. Thus, "2" is added to the symbol of the second most important plant.

5. Proper Use Factors

a. ***WEIGHT ESTIMATE:*** Lists of proper use factors will be prepared by plant species for the animal use complex on each significant use area of the survey. These factors will be based upon percent of weight taken upon proper use of the range.

   Factors for Each Use Complex. Whenever any of the range use segments of a survey area support a substantial amount of use by a particular game animal in addition to livestock use, proper use factors will be derived for the use complex.

   (1) *Kinds of Animals and Seasons of Use.* These factors will be established by plant species for all kinds of grazing animals for all pertinent seasons of use combined, and will be listed in a table which includes the plant and plant symbol list.

(2) *Proper Use Determination.* "Proper use" for a particular plant is the degree to which its current growth will be utilized by grazing animals when the range is properly used. Such percentage use factors are derived by determining the differences between total current production in a normal growth year and the amount left after proper use. They indicate all removal in the process of grazing including wastage by trampling. Any foliage removal or damage by rodents, insects, or disease is provided for under utilization deductions, and is therefore not considered in establishing proper use factors.

(a) Local Derivation of Factors. Any existing proper use factor tables which have been standardized for ranges similar to the survey area may be used as a guide in formulating factors for use on a survey. However, specific factors will be established on the basis of local use conditions. Grazing use of particular plants by each kind of animal varies considerably from one locality to another. Proper use varies with a number of criteria such as preference of different kinds of animals, season of use, vegetation composition, weather conditions as expressed in volume of growth and texture of forage and topography.

(b) Bases for Determinations. Proper use factors should be based on all pertinent information available, paying special attention to utilization studies and observations within or near the survey area. The results of any applicable research studies should receive careful attention. Such studies have recently modified the concepts of physiological requirements of forage plants in regard to grazing use. Results indicate that the maximum allowable use for most key forage plants is normally somewhere near 50% of the current growth. About that proportion of most important perennials must be left after grazing to assure their perpetuation and that optimum quantities of forage are produced. Studies of some browse plants have indicated that use up to 60% of current growth may be allowed, and still permit the plants to thrive; but this seems to be the upper limit. These percentages refer to total removal including that by rodents and insects. Therefore, it will be found that most key plant use factors will be below these values.

(c) Average Values Used. As a practical matter, all of the small variations in use of given plant species within the different range types of a survey area cannot be given separate consideration. Average values for these local range complexes must be used. The use differences for specific plants will normally be much greater between widely separated ranges than within more restricted localities.

b. *OCULAR RECONNAISSANCE:* Lists of proper use factors will be prepared by plant species for each kind of grazing animal alone and for the animal use complex on each significant use area of the survey. These factors will be based upon percent of weight taken upon proper use of the range.

Factors for Each Kind of Animal. Whenever any of the range use segments of a survey area supports a substantial amount of use by a particular game animal in addition to livestock use, proper use factors will be derived for the game species as well as for each kind of livestock. Ratings for these animals will be needed in arriving at total allowable proper use factors.

(1) *Kinds of Animals and Seasons of Use.* These factors will be established by plant species for each kind of grazing animal for each pertinent season of use, and will be listed in a table which includes the plant and plant symbol list. After the plant listings, columns of the table will be provided for grazing animals in the following order as needed: cattle, sheep, deer, antelope, and elk. Under each of these kinds of animals, seasonal use columns will be established in the following sequence as required: spring, summer, fall, winter, spring-fall, and yearlong. Occasionally, values for other seasonal combination periods are needed.

(2) *Proper Use Determination.* "Proper use" for a particular plant is the degree to which its current growth will be utilized by a kind of grazing animal when the range is properly used. Such percentage use factors are derived by determining the differences between total current production in a normal growth year and the amount left after proper use. They indicate all removal in the process of grazing including wastage by trampling. Any foliage removal or damage by rodents, insects, or disease is provided for under utilization deductions, and is therefore not considered in establishing proper use factors. If a plant provides no forage for a kind of grazing animal during a particular season it is rated zero for that combination although it may be present on the range and supply forage at other seasons. This may especially be the case for winter ranges where some plants are evident during the growing season but are unable to provide forage during the dormant period.

(a) Local Derivation of Factors. Any existing proper use factor tables which have been standardized for ranges similar to the survey area may be used as a guide in formulating factors for use on a survey. However, specific factors will be established on the basis of local use conditions. Grazing use of particular plants by each kind of animal varies considerably from one locality to another. Proper use varies with a number of criteria such as preference of different kinds of animals, season of use, vegetation composition, weather conditions as expressed in volume of growth and texture of forage, and topography.

(b) Bases for Determinations. Proper use factors should be based on all pertinent information available, paying special attention to utilization studies and observations within or near the survey area. The results of any applicable research studies should receive careful attention. Such studies have recently modified the concepts of physiological requirements of forage plants in regard to grazing use. Results indicate that the maximum allowable use for most key forage plants is normally somewhere near 50% of the current growth. About that proportion of most important perennials must be left after grazing to assure their perpetuation and that optimum quantities of forage are produced. Studies of some browse plants have indicated that use up to 60% of current growth may be allowed, and still permit the plants to thrive; but this seems to be the upper limit. These percentages refer to total removal including that by rodents and insects. Therefore, it will be found that most key plant use factors will be below these values.

(c) Average Values Used. As a practical matter, all of the small variations in use of given plant species within the different range types of a survey area cannot be given separate consideration. Average values for these local range complexes must be used. The use differences for specific plants will normally be much greater between widely separated ranges than within more restricted localities.

6. Proper Use Objective

For most range areas, it is the management objective of the Bureau to maintain or recover the valuable perennial forage plants as the chief constituents of the vegetation. If this is to be realized, the less valuable perennials and annuals must be assigned use ratings sufficiently low to assure that no more than the allowable use is made of the desired species regardless of their current abundance.

The annual plant ranges to the west of the Sierras in California and on a few adjoining areas constitute an exception to the general Bureau management objective with respect to type of forage cover. Management of these annual ranges will perhaps be based indefinitely on the annual cover, and proper use factors will be assigned to adequately safeguard and perpetuate this type of forage in a desirable condition.

7. Game Factor Considerations

In the derivation of use complex factors, the advice and help of State Game Department and other agency technicians should be obtained. Such ratings should be considered with these persons at the same time that game population, game population trends, and other game values are being estimated. The Ocular Reconnaissance methods takes into consideration specific game proper use values.

8. Derivation of Proper Use Factors

The weight estimate method refers to a "use complex proper use factor" where as the ocular reconnaissance method refers to a "total allowable proper use factor". The following proper use factors will be derived and used in grazing capacity computations.

a. *WEIGHT ESTIMATE:*

(1) *Use Complex Proper Use Factor.* Wherever more than one kind of grazing animal makes substantial use of a range use area, use complex proper use factors will be derived. These factors will consider the one or more kinds of livestock using the area plus the competitive use of the plant species by game, and further consider the judgment determination criteria explained below. When only one

kind of livestock is using the range and no appreciable use is made by game animals, it will not be necessary to derive a use complex proper use factor. In such a situation, a proper use factor will be derived for the one kind of livestock. If two kinds make use with no appreciable game use, use complex factors will be derived for the livestock complex.

(2) *Noncompetitive Game Proper Use Factor.* Wherever game makes proper use of a plant in addition to the competitive use, a non-competitive game proper use factor will be assigned that particular plant species. This assignment will consider the judgment determination criteria explained below (Section VIII.D.8.c).

b. ***OCULAR RECONNAISSANCE:*** *Total Allowable Proper Use Factors.* Wherever more than one kind of animal makes substantial use of a range use area, total allowable proper use factors will be derived and used in grazing capacity computations for that area. These factors will represent the maximum limit of the combined use to be made of any species for a particular range and season, and will be the result of judgment weightings of the factors for each kind of animal, considering a number of critical influences concerning the use complex and the nature of the range. Usually the total allowable proper use factor will not be greater than that normally allowed the kind of animal having a preference for the species.

c. ***Judgment Determination Criteria.*** Judgment decisions for the use complex and total proper use factors assigned each plant species will be developed. Obvious items that need definite consideration are:

The indicated ratio of use in AUM's between the various kinds of animals.

The season or sequence of use for each kind of animal and the relationship of this use with respect to ecological conditions.

The abundance of key forage plants for each kind of animal.

The relative accessibility and utilizability of the range for each animal.

The relative preference for the various plants of each kind of animal.

There appears to be no possibility of using a precise mathematical formula for this weighting; therefore, assignments are largely a judgment determination. Key forage plants for domestic livestock and game animals will need critical attention. Great care must be taken not to assign too high a use complex or total allowable proper use factor to any one forage plant even though such assignment might be within the physiological limits of that plant for grazing utilization. Keep in mind that the assignment of the total physiological utilization level for a forage plant in relatively large abundance may inflate the ultimate grazing capacity computation to the point that another forage plant in less abundance might be overutilized. This development might occur due to the grazing habits of the same kinds of animals or from the competitive grazing use of forage plants by different kinds of animals. To the fullest extent possible, the highly palatable but less abundant plants should not be sacrificed in order to obtain the indicated optimum degree of use within the survey area; however, occasionally this will occur when the choicer plants undergoing competitive or single animal usage are comparatively scarce in relation to other more abundant forage plant supporting a substantial amount of the grazing use.

(1) *Relative Ratings. WEIGHT ESTIMATE:* Use complex and noncompetitive game factors should be set so as to reflect the approximate extent of use that will prevail with the particular ratio and seasons of use by the kinds of animals that will graze each use complex area. No instruction can specifically detail precise guides to judgments of this kind. Therefore, the most experienced technicians in the district office, working in conjunction with the technical staff personnel in the State Offices, will need to be involved in the preparation of proper use tables.

Superabundant Species. Big sagebrush and possibly other species are an exception to assigning noncompetitive game factors. These species, when superabundant and having some forage value for game but none for livestock, are not given a game factor. The tremendous volume of big sagebrush frequently available would yield highly erroneous data if it was considered along with other forage species. In this case, the procedure is to determine what part of the animal's diet consists of sagebrush. This percentage is then applied to the game demand in animal unit months and then added to the additional forage available for game use only.

(2) *Relative Ratings. OCULAR RECONNAISSANCE:* Where a species is a key plant for each kind of animal involved, or at least has a high proper use factor for each, the total allowable proper use factor may be the same as the highest of those assigned for the different animals. But this is not always necessarily so - subject to the discussion and qualifications cited above. Also, where the use factor happens to be the same for the different animals, this value may be used as the total allowable proper use factor. On the other hand, the value may lie somewhere between differential factors for the animals. It should be set so as to reflect the approximate extent of use that will prevail with the particular ratio and seasons of use by the kinds of animals that will graze each use complex area. No instruction can specifically detail precise guides to judgments of this kind. Therefore, the most experienced technicians in the district office, working in conjunction with the technical staff personnel in the State Offices, will need to be involved in the preparation of total allowable proper use tables.

d. ***Use on Type Writeups.*** Illustration 11, Form 4-1276, and Illustration 12, Form 4412-1, are examples of writeups utilizing use complex, noncompetitive game and total allowable proper use factors for plant species on a hypothetical range type.

e. ***Pounds of Usable Forage.*** *WEIGHT ESTIMATE METHOD ONLY:* The pounds of dry weight of forage per acre is multiplied by the use complex proper use factor to obtain the pounds of usable forage per acre for the use complex for each species of plant. The pounds of dry weight of forage per acre is multiplied by the noncompetitive game factor to obtain the pounds of usable forage per acre for noncompetitive game for each species exclusive of superabundant species. Any necessary utilization deductions will be applied to the total pounds of usable forage per acre to obtain the net pounds per acre for both the use complex and noncompetitive game categories.

f. ***Relation to Physiological Limits of Use. OCULAR RECONNAISSANCE METHOD ONLY:*** There is one specific problem within the total allowable proper use factor relationship that needs special attention. As previously stated, if only one kind of grazing animal is utilizing a range area, it would be permissible to assign a proper use factor at the physiological limit for some key plant species unless management considerations dictate otherwise. A specific example of the exception probably would come about on critical big sagebrush deer winter ranges. Assignment of sagebrush total allowable proper use factor values for deer in this situation might be 15-25% under a moderate to heavy deer winter concentration; probably a maximum of 30-40% sagebrush total allowable proper use for deer would be the limit in the most intensively used sagebrush winter deer ranges.

g. ***Assignment of Proper Use Factor Ratings to Different Kinds of Animals on the Type Writeup Forms. OCULAR RECONNAISSANCE METHOD ONLY:*** The type writeup form provides for a proration of the total allowable proper use factor among the various kinds of animals. Again, much the same judgment criteria must be utilized in assigning these values to the kinds of animals per plant species. In reiteration, the indicated ratio of use in AUMs, seasonal or sequential use of the total forage complex range areas, range ecological relationships, availability, and relative preferences by kinds of animals for certain plants, must be taken into consideration. Also of prime importance will be the extent of knowledge of the particular range area concerning the amount of utilization and when it occurs on plants under competitive use by different kinds of animals. Many range areas in the West furnishing forage for different kinds of animals under different intensities of use are being studied by the State Game Departments, the Bureau, or other agencies. Results from such studies will be utilized. To illustrate a situation, the overall animal use ratio between cattle and deer might be 3 to 1 for a given area. Yet it might be best judgment to indicate by the individual animal proper use factor assignments a 30%-30% (half and half) proration of the forage production. Such judgments would need justifications including the known utilization of particular plant species by kind of animal and the seasonal utilization of forage species. Examples of such plants where such close study would be needed are bitterbrush, birch leaf mahogany, chokecherry, and serviceberry. The primary objective is to have the type writeup show the source of the forage for the different kinds of animals in relation to any competing or compatible uses within the total range type being surveyed.

h. ***Animal Use Ratio Comparison. OCULAR RECONNAISSANCE METHOD ONLY:*** The ultimate compilation of grazing capacity information by kind of animal will compare with the initial ratio of animal use. This comparison will provide a check of use factor prorations among the kinds of animals, and will be a source of feed-back information for analytical study of inherent range use problems. Such study will provide not only grazing privilege and adjudication information with respect to domestic livestock use, but will provide basic information for discussions of any needed game animal adjustments with the proper agencies.

i. *Forage Acre Factors. OCULAR RECONNAISSANCE METHOD ONLY:* The net forage acre factor is a figure representing the portion of a surface area which is completely covered with completely usable forage. This factor is expressed as a decimal figure; e.g., .05, .10, etc. Surface acres multiplied by the net forage acre factor gives forage acres.

9. Utilization Deductions

Type estimates of amount of vegetation are made for the average of that part of the type that is accessible to grazing animals. Utilization deductions are for any portion of the type that may not be available for some reason to any of the animals making use. Also, deductions are established for other type conditions that either require use compensation or reduced use for correction of the condition.

a. *Use Adjustment Criteria.* These essential usability estimates are made separately for each grazing animal in proportion to the ability of each to cover the range involved. They are assigned to the nearest multiple of 5 percent for each range feature requiring an adjustment. The main use criteria for which reductions may be needed are slope, rocks or stones, timber, lack of water, unstable soils, erosion, rodents, insects, and plant disease. Ratings for these are recorded on the back of the type writeup forms.

   Interaction of Criteria. Definite emphasis must be given to making appropriate utilization adjustments. Every feature of the range which limits animal access or requires special protection should be given due consideration and the best possible judgment adjustments should be made. It should be recognized, however, that an adjustment for one criterion may at least partially care for the needs of other features. All deduction elements should be considered together, and the total needed adjustment proportioned equitably among them. Where waste (7) types are used by game, the various range survey evaluations, including utilization deductions, will be made for these animals.

b. *Assuring Accurate Determinations.* The chief of party will pay special attention to utilization deduction estimates made by the examiners to assure reliable and uniform determinations.

10. Forage Requirements

Generally, it will be desirable to assemble a part or all of the basic use data needed to complete adequate forage requirement studies before the survey field work begins. This could be done by the chief of party during the course of the survey, but it will be well to have at least selected the study areas before the field season to insure their coverage as an integral part of the survey. Grazing use data could perhaps be advantageously entered on standard forms used to record estimates of actual use. If it is not feasible to obtain forage requirements from actual use studies, standard requirements may be used.

a. ***Local Derivation and Forage Consumption Criteria.*** Local derivation of specific forage requirements is desirable. Forage requirements are available which may change with any of the criteria that cause different daily rates of forage ingestion by grazing animals. Variations may occur in daily forage consumption with differences in type of forage, abundance and availability of forage, season of use, topography, and type of livestock management. The small amount of available data on actual daily forage intake on ranges with different characteristics shows considerable variation.

b. ***Forage Requirement Studies.*** Forage requirement studies are best made on representative allotments or pastures which are considered to have been grazed at or near a proper rate, and for which a reliable use history may be assembled. Such typical areas should be within or near the survey area and must be covered by the survey. Ownership of these tracts is unimportant. However, they must adequately represent the survey area; the required use information must be available; and there must be opportunity for field inspection.

(1) *Study Area Variations.* Preferably the study areas would be fenced or otherwise well controlled, with accurate use records extending back 4, 5, or more years. However, such favorable situations may be relatively few, and dependence may have to be placed on other use areas with somewhat less ideal attributes for part of the study data. A grazing use study preferably involves more than one controlled use area for each general seasonal range covered by the survey.

(2) *Actual Use Pastures.* In some places, actual use pastures have been established and data collected which are ideal for requirement derivation. Grazing use data will usually be obtained from records maintained by the livestock operator, although other sources of information may be available. These use data will be modified by estimates of the operator and district personnel for any trespass use that may have taken place. Allowance should also be made for any supplemental feeding that was done during the period of the study. Seldom will an allotment or pasture be available for deriving a forage requirement which may be considered to have been used to exactly the proper degree. Therefore, some adjustment of the indicated actual grazing use may be appropriate. The basis for such modification would be a range condition determination and perhaps a utilization check which should be documented as part of the record.

(3) *Abnormal Growing Conditions.* Completing forage requirement studies for each specific survey area covered in a particular year makes the established requirements directly applicable to the survey area without the need of adjustments for any abnormal growing conditions that may have prevailed. Of course, any study area used in a given year may be subsequently used again for other surveys on similar range in the same general vicinity by bringing the use record up to date and again covering the area with the new surveys.

c. ***Standard Requirements.*** Occasionally, a condition may exist where adequate controlled use areas cannot be located upon which to base a forage requirement study for a survey, and the decision is made to use a standard requirement established for some comparable range or ranges considered to have had normal current forage production. With any such use of standard requirements, it will be necessary to adjust forage estimates for any deviation from normal production.

(1) *Precipitation Correlation Factors. WEIGHT ESTIMATE ONLY:* For the weight estimate method of survey, the normalizing of current actual production estimated during the survey has often been effected by the preparation and application of weather conversion factors. This process entails the establishment of regression correlations between forage production and the important climatic factors—especially precipitation. Sometimes, values for the weather factors covering just a part of the year are more closely correlated with production than those for the full year. Careful consideration should be given to determining and using the most significant combination of monthly values.

(2) *Normality of Production. OCULAR RECONNAISSANCE ONLY:* Adjustments to compensate for normality of current production in connection with the use of standard forage requirements are customarily made as a part of the process of density estimation. These conversions could perhaps be advantageously made, where weather-production correlations are available, by estimating actual current density and applying the indicated conversion factors to such results, rather than by making a straight judgment conversion to normal conditions.

(3) *Use Studies Preferable. OCULAR RECONNAISSANCE ONLY:* Adjusting processes required to normalize survey estimates when standard requirements are employed are to some extent indirect and theoretical, and therefore constitute a significant source of error in survey evaluations. Since the principal aim of range surveys is to reflect grazing use that will provide maximum forage harvest and still maintain good range conditions, the ultimate test of survey results is its correlation with actual proper use. Forage requirement studies provide this correlation. Actual use data used could apparently contain considerable inaccuracy and still give results as dependable or more so than could be realized by using standard requirements and converting estimates to normalized values. Therefore, every effort should be made to complete adequate requirement studies before reliance is placed on normalizing weather factor conversions.

d. ***Relation to Range Condition.*** It should be remembered that ideally derived forage requirements are based on a properly used range in good condition and may therefore be somewhat too low to adequately cope with a poor range condition.

E. Forage Survey Procedures

Preliminary requirements and actual field survey work are considered in this section.

1. Presurvey Considerations

Proper preparation is extremely important to a successful forage survey. Many factors must be considered and many preparatory details must be attended to in order to insure the efficient conduct and conclusion of field work.

a. ***Preliminary Planning.*** The chief of party and the range manager in charge of the range administration program for the district should thoroughly inspect the area to be surveyed in order to become familiar with problems involved and objectives to be reached. As a result of such an inspection and subsequent field examinations, the chief of party will formulate a plan of operation and determine where to begin the field work and how to distribute crew members for the best coverage of the area.

(1) *Time of Year.* The chief of party and the range manager will determine the time of year the survey will be conducted. Within practical limits the survey should not begin until the season is sufficiently advanced to insure that there will be a representative growth of forage on the ground. Work may continue into the fall until grazing or weather conditions prevent accurate classification.

(2) *Assembling Materials.* The chief of party with the assistance of and under the direction of the range manager will assemble all of the forms, equipment, base maps, status maps, aerial pictures, proper use tables, and other data necessary for the conduct of the survey.

(3) *Grazing Use Areas.* Surveys shall be conducted within grazing use areas designated by the district manager.

b. ***Base Maps***

(1) *Cadastral Survey Plats.* The survey crew should have a copy of all cadastral survey plats covering each township in the survey area. These plats are necessary in locating cadastral survey corners for control purposes.

(2) *Aerial Photographs.* Aerial photographs should be used for field mapping. Ordinarily, only alternate prints will be used for field work. There is enough overlap from one photograph to the next on alternate prints to provide two complete sets of pictures for the area. One set can be used for forage survey mapping, and the other set will remain in the district office for other purposes. In particularly rough and mountainous areas it may be advisable to use every print, since photographic distortion is much greater in this type of country, and base maps are difficult to draft using only alternate prints. It may also be desirable to use every print to provide stereoscopic coverage in areas where topographic detail is not sharp enough to permit accurate location of ground control on the print without the use of stereoscope.

(a) Match Lines. Match lines will be placed on the aerial photographs prior to use in the field. This is done by delineating the center of each photograph, which has the least distortion, and matching it with adjoining photographs on all four sides.

(b) Distortion. Each examiner will work only within the match lines on the pictures assigned to him. This prevents duplication of work among examiners and enables the use of the most distortion-free portion of each photograph. Match lines may be placed on photographs with a soft lead or wax pencil.

(c) Index Map. An index map of 1/4" or 1/2" scale may be helpful in showing the areas covered by the numbered photographs.

(3) *Topographic and Planimetric Maps.* Any high quality maps showing with accuracy the relative position and nature of survey area features should be made available. Among the most usable of these would be the Geological Survey topographic quadrangles. Other topographic or planimetric maps may also be of considerable assistance. If satisfactory aerial pictures are not available and it is determined that the survey must be made before aerial photography can be obtained, the best of such maps as these could serve quite well as bases for field mapping.

(4) *Administrative Maps.* Copies of management units, grazing allotment, range improvement and status maps should be provided as reference for the party members during the survey. Surveys should begin and terminate on or near the boundaries of management use areas. The range improvement maps will act as prompters for the examiners to map at least all improvements of record. It may be desirable to transpose these recorded improvements onto the field pictures or maps in their approximate locations before field work begins, or this may be done by the crew members as the work progresses.

c. ***Survey Party.*** The selection and training of members of the survey party is extremely important to a survey program.

(1) *Chief of Party.* A great deal of emphasis must be placed on the selection of the chief of party for the survey. A permanent member of the district staff should be selected for the position. He should be trained in all phases of forage survey work and should be well acquainted with all of the programs of the Bureau and interrelated problems. He should be a man of good judgment for whom the crew members will give their best performance willingly. He will be responsible for correlating field data, making work assignments, keeping the equipment in good operating order, checking expenses, providing for the welfare of the crew, and reporting the progress of the survey. It is also the responsibility of the chief of party to collect the information for and prepare the narrative report at the conclusion of the survey.

(2) *Party Members.* Qualified college men from range management, forestry, or agricultural schools (either graduates or upper classmen) and permanent personnel from within the Bureau should make up the party. Every field member of the district staff who has not had range survey experience should if possible be given the opportunity to participate as a member of a survey party. Each man must have a working knowledge of plant taxonomy, plant ecology and animal habits. Very often the Bureau is able to select outstanding temporary personnel for permanent appointments after one or two seasons of survey work.

(3) *Size of Party.* A four-man crew is generally the optimum size for any one chief of party. A survey party of this size will require nearly all of the time of the chief of party in assigning and coordinating the work.

(4) *Party Training.* The efficiency and accuracy of the work of the members of the survey party depend a great deal upon the initial training given them by the chief of party.

(a) Survey Area Acquaintance. Enough time should be spent in general coverage of the survey area to acquaint each man with the main roads and landmarks for general reference.

(b) Uniformity of Estimates. The entire crew should work together for a sufficient period of time to assure uniformity of estimates.

(c) Individual Training. Following the training period, the chief of party will work individually with each of the men in order to further improve and assure uniformity of work and check his progress.

(d) Correlation of Estimates. During the course of the survey, the crew should work together for a portion of a day each week in order to correlate estimates and to resolve problems in field procedure that may arise.

2. Field Procedures

The following described procedures provide for minimum standards of accuracy and reliability of data collected.

a. ***Field Assignments.*** The chief of party will be responsible for crew member assignments. The size of the area assigned each man will depend on the topography, complexity of forage types, culture, mapping, sampling problems, etc.

b. ***Type Traverse. WEIGHT ESTIMATE:*** Each type will be traversed by the examiner in a manner to adequately sample it. This requires that representative portions be covered.

Plot Sampling. The weight estimate method of range survey requires the establishment of transects of plots through each type. Typically, these will be placed longitudinally through the middle of the type, if this will represent about an average condition. Otherwise, the transect line will be irregularly placed so as to give a representative sampling. In larger types, the transect may cross the sampling area two or more times in order to give a satisfactory distribution of plots.

(1) *Plot Location.* Plots will be spaced at more or less equal intervals along the predetermined transect lines. This will usually be accomplished by pacing. Tally registers are helpful in pace counting. Plot centers could well be determined by placing them at the point of the toe on the appropriate pace. Care must be exercised to let the paces near the end of the plot interval fall in natural lengths while traveling exactly in the established direction of the transect. Obstacles must not be permitted to interfere with the placement of the foot on the final pace which determines the plot center. Plots will usually be spaced a specific number of paces apart so as to spread them through a representative portion of the type. This will inject an element of randomness into this systematic sampling system.

(2) *Transect Line Offsets.* Where obstructions prevent the examiner from pacing directly along the established transect line, it will be necessary to offset his line of travel; but the plots will be located back on the transect line in their predetermined positions as well as this can be judged. Every effort must be made to remove a maximum of bias from the process of plot location.

(3) *Use of Vehicles.* When it is possible to run transect lines with a jeep or other vehicle and this means is adopted, the distance meter will be used in spacing the plots. Each plot center will be established by pacing a given number of paces in a specific direction from the vehicle at each stop. Offsetting may likewise be necessary here in both the line of travel of the vehicle and the pacing.

(4) *Randomizing Location.* The throwing of an object at the end of each transect interval as a means of randomly locating plot centers is good practice, provided the trajectory of the object is not interfered with until it contacts the ground. If a throwing procedure is used, care should be exercised to use techniques that assure against biased locations with respect to openings in the vegetation or otherwise.

(5) *Size of Plots.* The circular plot used will be 9.6 square feet in size. The radius for the 9.6 square-foot plot is 1.75 feet.

(6) *Converting Grams to Pounds.* The 9.6 square-foot size is appropriate for the weight procedures, since plot estimates are made in grams of vegetation. The number of grams on a 9.6 square-foot plot times 10 is equivalent to the number of pounds per acre.

(7) *Recording Green Gram Weight.* The green gram weight of each plant species on each transect plot is recorded on the type writeup form (Illustration 11, Form 4-1276). Each writeup sheet provides for 10 plots. If more than this are included in a type transect, two or more sheets will be used as required to record the plot data and a summary sheet will be completed on the same writeup form

as the plot record sheets. The sheet summary will show green weight totals transferred from the plot record sheets which are numbered in order for each transect beginning with "1." This sheet number is placed in the space provided at the head of the form. For sheet summaries, this number space will be used to indicate that it is a "Summary."

(8) *Summary Computations.* When a summary sheet is required, it will be the only transect form completed for data beyond the plot weight figures, including the computations of grazing capacity. The pounds of green weight per acre for each species is derived from averages of the plot weight data. A transect of ten 9.6 square-foot plots will have a pound per acre rating equal to the sum of the gram weights for the 10 plots. If more or less than 10 plots are included in a transect, an average gram weight per plot would be computed and multiplied by 10 in arriving at pounds per acre.

(9) *Establishment of Plots.* Plots are usually circumscribed on the ground by use of wire hoop or two metal stakes connected by a light radius chain. A hoop is perhaps most readily used with 9.6 square-foot plots. In using the stakes and chain, one stake is implanted at the plot center and the other used in compass fashion to circumscribe the plot.

(10) *Plot Mapping.* The first plot of a type transect will be positioned well within the type and located along the transect line at the determined plot interval from a selected initial point. The last plot will also be well within the type. The approximate location of each plot will be shown on the aerial picture or other field map, and the first and last will be numbered. If the sequence of plots throughout the transect is not obvious from this amount of location and identification data, additional plots along the transect will be appropriately numbered on the photo or map as needed.

(11) *Number of Plots.* The number of plots needed in a range type transect for an adequate forage sampling will depend upon the complexity of the type vegetation, and to some extent upon the size of the type. It has been estimated from research and other studies that for most range types mapped to an average size of about a section, from 20 to 30 plots will be required to keep the sampling error within acceptable limits. Needed sampling intensity will vary primarily with the heterogeneity of the forage stand. Size of type has some influence on the number of plots, but mainly because of increased variation introduced with larger areas. The productivity of the range may have little to do with the intensity of sampling needed, since a low producing type with a sparse cover may display as much variability as a more productive type.

c. ***Type Traverse. OCULAR RECONNAISSANCE:*** Most types will be traversed in an irregular fashion in order to more adequately accommodate the need for feature mapping, including that of type boundaries. The equivalent of once through a type will usually be sufficient except for the larger and more complex types. With this procedure, direct attention can be given to the mapping needs and still obtain an entirely satisfactory sampling of the vegetation stand. However, care should be exercised to observe a fully representative part of each type. For some types, brief notes should be maintained as an aid to the examiner in making the final average estimates for the types. It may prove advantageous to complete the writeup forms when located in what appears to be an average or typical part of the type, and to adjust the estimates for any average differences detected thereafter.

d. ***Field Mapping.*** Field mapping will be accomplished in accordance with procedures described hereafter.

(1) *Aerial Photographs.* If planametric control has not been established, it will be necessary for the examiner to accurately locate enough section corners on the photographs to make possible removal of some of the distortion found in all aerial pictures. Photo identified U.S.G.S. primary control (triangulation) stations are very helpful and should be located wherever possible. In order to prepare accurate maps from aerial pictures, at least two corners per township should be located. These should be well spaced. When identified corners are located they should be accurately placed on the photographs and pricked through with a fine needle. A cross will be placed over the hole on the reverse side of the picture with the sections to which the corner is common, written into the angles of the cross. The township, range, date, and examiner's initials should also appear on the back of the photograph. Assumed corners not positively identified should be similarly marked and the words "probable corner" written on the back of the photograph near the description.

(a) Recordation on Photographs. Field mapping on aerial pictures should be done with sharp, soft pencils, not harder than 2H, to prevent injury to the prints. Since soft pencil marks are easily rubbed off, it will be necessary to ink all the data at least weekly after it has been matched with adjacent photographs. Inking should be done with a fine pen in order that culture shown on the print will not be unnecessarily obscured.

(b) Feature Mapping. All permanent cultural or topographic features and existing range improvements such as fences, roads, water developments, etc., will be indicated on the aerial pictures.

(2) *Other Maps.* If aerial pictures are not available, topographic or other maps will be used. The same general mapping procedures as outlined for aerial photographs will be used.

(3) *Mapping Symbols.* The standard map symbol list of the Bureau (9161-BLM Map Symbol Handbook) covers all of the more important natural, cultural, and control feature symbols used in forage survey field mapping. This list will be used by survey parties in conjunction with the instructions in forage survey handbooks.

(4) *Range Type Mapping.* A range type is a relatively homogeneous classification and mapping unit of appropriate minimum size which usually consists of a part,

but may be all, of a vegetative type as determined by current aspect. Typically, these units will not be mapped to smaller than about 160 acres in size, although some very high production areas such as meadows and seedings may be delineated down to smaller sizes. Other relatively high producing areas will be mapped proportionately down to intermediate sizes. The maximum size of range types is indefinite except as each particular situation may be limited by the prescribed criteria for establishing types.

(a) Type Mapping Criteria. Range types will be derived by first mapping according to current vegetation aspect into the 18 standard vegetative types (Section I, Illustration 3). These general types will be subdivided or stratified to the extent feasible on the basis of differentials in several vegetative, topographic, and edaphic criteria, considered approximately in the following order: abundance of vegetation, species composition, slope, exposure, kind of soil, and erosion. Only the most significant and general changes for each of these criteria within an aspect type can be considered, otherwise the range types mapped would become unreasonably small. It is to be remembered that the 160 acres is minimum for ordinary range types, and the average of such types would be somewhat in excess of a section in size. However, the mapping detail will vary with range productivity and complexity.

(b) Order of Consideration. If any of the above listed mapping criteria is more important in distinguishing kinds of range in one area than another, it may be given preference for consideration; but usually the order of consideration will be as listed.

(c) Grazing Animal Barriers. In many instances, fence lines and natural features that form effective livestock or game barriers will be considered divisions between range types. Under these conditions, a use differential will almost always exist which may have created significant variations in some of the type mapping criteria.

(d) Area Mapped. The entire range survey area will be type mapped. Some of the lands in grazing allotments or use areas may be in alienated ownerships, but these will be mapped coincidentally with the Federal lands.

(e) Type Writeup Numbers. Type writeup numbers and type designations are given to each range type, and these are recorded on the writeup forms. Only the type writeup numbers are shown on the aerial pictures or maps. Type writeup numbers consist of the initial of the examiner's surname and a number beginning with "1" for the first type examined, "2" for the second, etc. In case surname initials are duplicated among party members, the initial of the first name may be added to the front of the type number. Examples of type numbers would be S1 and S2, or AS1 and AS2.

(f) Type Designations. The type designation is composed of the number for the aspect vegetative type to which is added the symbols of the most dominant and important plant species in the type. The first plant symbol given is usually that of the species responsible for the aspect or general appearance of the type. The second symbol is frequently that of the most important forage species. However, if the forage species is the same as the aspect species, a second most important plant is next indicated. Usually, three plant symbols are used in designation. This number may sometimes be two, and rarely four. Examples of type designation are 4 Artr Brte Pose and 1 Boer Hibe Gusa.

i. Mixed Types. Frequently, types of mixed aspect occur; in this case two aspect type numbers are used. The number for the more dominant type is indicated first with the other following in parentheses. Usually, symbols for both aspect species will appear somewhere in the designation. Examples for mixed types are 4(9) Artr Juut Agsp and 13(4) Atco Arno.

ii. Waste Type. The waste (7) type is so designated because of its unusability by livestock. Whenever this type is used by game animals, it will be rated for such use. The designation will be similar to those for mixed types with the aspect vegetation type number in parentheses following the number "7" or the symbol for one of waste subtypes. Symbols for prominent plant species will follow the numbers as for other types. An example is 7I(5) Cele Agtr Putr.

(g) Pretyping. Most of the vegetative aspect divisions are discernible on aerial pictures without field inspection. Also, a large portion of range type lines based on the other mapping criteria are almost equally distinct. These more obvious breaks between types can be penciled on the photographs before going into the field. This will help considerably in laying plans for traversing the range in order to efficiently complete an adequate mapping and examination job. Verification of type lines already drawn will be accomplished under field inspection, and any needed additional segmentation will be completed according to the typing criteria.

(h) Matching Type Lines. Even though the use of aerial pictures makes type mapping a much less variable undertaking than when done on other maps, there will still be some difference between examiners which will have to be reconciled between the contact prints. This matching of type lines will be accomplished before the type data are linked. A considerable adjustment is usually necessary when the mapping base is other than aerial pictures.

(i) Vegetative Types. The aspect vegetative types which are first used in mapping an area into range types are the same as the 18 standard types established some years ago. There appears little reason to change these materially for future use in forage surveys; therefore, only minor modifications have been made. Descriptions are given hereafter along with type number, type name, and standard mapping color on Illustration 3.

e. ***Type Writeup Recordation.*** For each range type mapped, a type writeup will be made on a standard Form 4-1276 and 4412-1 (Illustrations 11 and 12) which will describe the forage resource and record certain evaluations for the vegetation and forage stand.

(1) *Writeup Content.* Of the items in the heading of each writeup form, the writeup number and the type designation were before described under range type mapping. Name of examiner, date of writeup, kind of grazing animals currently making substantial use of the area and the usual season of use, aerial photograph number, and cadastral location need no further explanation. If an area is unsurveyed, note this fact and describe the location in the space for cadastral location. The other items entered on the form include plant symbols, plant composition, proper use factors, utilization deductions, and forage requirements. The grazing capacities are computation products derived from the other data on the form. In the footnote at the bottom of the form are listed game species making insufficient use of the forage resource to be considered in the capacity determinations.

(2) *Writeup Computations*

(a) WEIGHT ESTIMATE: Pounds of dry weight per acre (lbs DW/Ac) is multiplied by appropriate proper use factors (PUF's) for each species to obtain pounds of usable forage per acre (Lbs UF/Ac). The PUF's used are for the use complex and for noncompetitive game forage. The total Lbs UF/Ac in each case is multiplied by the average percent utilizable in the formulae at the bottom of the writeup form (Illustration 11) to obtain net Lbs UF/Ac. In the other formulae on the writeups, the forage requirement (Lbs/AUM) is divided by the net Lbs UF/Ac in arriving at the estimated grazing capacity (Ac/AUM) for the use complex and for noncompetitive game forage.

(b) OCULAR RECONNAISSANCE: For the ocular reconnaissance method, the percent composition is multiplied by the appropriate proper use factor (PUF) for each plant species by kind of animal to obtain a product which when summed for all species gives the average PUF for all vegetation (Illustration 12). This average PUF is entered in the formula at the bottom of the writeup form for each kind of animal as a decimal and multiplied by the average density for the type to obtain a forage acre factor (FAF). The FAF is multiplied in the formula by the average percent utilizable to obtain a net FAF which is then used to divide an appropriately derived forage acre requirement (FAR) to give the grazing capacity (Ac/AUM). The net FAF is the percentage of the ground covered by completely usable forage.

(3) *Computation Accuracy.* Before these grazing capacity computations can be made, all pertinent additions must be completed on the writeup forms. These and all other computations must be made accurately.

(4) *Completion of Computations*

(a) WEIGHT ESTIMATE: The writeup computations for the weight estimate method must await dry weight computations. In any event writeup computations will be completed as soon as possible so that resultant capacities can be given review.

(b) OCULAR RECONNAISSANCE: It would be highly desirable for each examiner to complete all computations needed to derive the type grazing capacity estimate while still on the type, or as near thereafter as possible. Such procedure would enable the examiner to gain a more definite conceptual correlation between observed conditions and grazing capacities of range types. In any event, writeup computations will be completed as currently as possible so that resultant grazing capacities can be given adequate review during the progress of the survey.

(5) *Review of Computations.* Derived grazing capacities must appear entirely reasonable in view of the character of the range type in relation to the use complex, other rated types, and the descriptive data assembled for it. Type writeup should be reviewed for apparent discrepancies, and any found should be carefully checked to determine if actual errors have occurred. All computations must be accurately completed.

(6) *Writeup Filing.* The type writeups are maintained numerically in series for each examiner, along with the aerial photographs used in field mapping.

F. Final Maps

Several maps will be prepared for each survey area as soon as field work is accomplished. These are base and data maps, described hereafter, for use in the management program.

1. Unit Base Maps

At the completion of the survey, or of appropriate sizable segments thereof, administrative unit base maps will be prepared on a one-inch per mile scale (1:63,360) using the field survey maps (aerial photographs) and other basic maps and plats. These base maps will show the main natural features, all existing cultural features having any management significance in addition to the cadastral grid and other basic control, and the boundaries of all grazing allotments.

2. Resource Township Plats

Besides the unit base maps, the Bureau mapping procedures prescribe the use of a set of two-inch per mile scale (1:31,680) township plats for recording and compiling forage survey data. These plats will show range type boundaries and evaluation data, land status, and allotment boundaries. Surface acres and grazing capacities will be shown for each section by type and by ownership.

3. Special Status and Survey Maps

Special land status and survey data maps may be prepared where desired on autopositives or on overlays of the unit base maps. These maps would show land ownership, range types, and grazing capacity data in addition to the basic map features.

G. Compilations

During the course of the survey, all type writeups and other survey records and maps are fully completed and carefully checked for legibility and accuracy. The grazing capacity computations are completed while the examiner is on the type or as soon thereafter as possible, and later checked for accuracy. Writeup forms are kept in numerical series for each examiner. Field maps (aerial pictures) will also be assembled in appropriate series and filed for the various areas covered in the survey. Such procedures are necessary for efficiency in subsequent compilation of the survey data.

Allotment Tabulation: Forage survey data will be compiled and summarized on an allotment basis.

1. Work Map (Resource Township Plat) Data

The two-inch per mile scale township plats showing land status and range types are used as work maps for this compilation and summarization of acreage and current grazing capacity in AUMs for each allotment. In this process, the section acreage as obtained from cadastral survey plats to the nearest whole acre is placed near the center of the section on the work map. For sections bisected by allotment boundaries, only the part of the section acreage within the allotment will be shown, and also near the center of the part in the allotment. The acreage in each type within each section for each ownership is placed on the work map near the center of that segment. These segment acreages are determined by use of some counting device. Perhaps that which is most easily used and which gives entirely reliable results for careful compilers is a gridded, transparent ruler of appropriate scale. The sum of the partial acreages must equal that for the section. Where all of a section is within a type and of one ownership, the AUM values will be placed under the total acreage figure near the center of the section. When this total section acreage figure has no AUM values under it, a division of the section between two or more types or ownerships is indicated.

a. ***WEIGHT ESTIMATE:*** Under each segment acreage figure, the computed AUMs for each kind of grazing animal making appreciable use for the use complex and noncompetitive game forage for that type area within the section by ownership will be shown with a horizontal line between the figures as follow:

$$\frac{273}{\text{UC46-NG15}}$$

b. ***OCULAR RECONNAISSANCE:*** Under each segment acreage figure, the computed AUMs for each kind of grazing animal making appreciable use for that type area within the section by ownership will be shown with a horizontal line between the figures as follow:

$$\frac{273}{\text{C46-D15}}$$

2. Acreage and Grazing Capacity Compilations

The acreage and current grazing capacity (AUM) values recorded on the work map as provided above are compiled on "Allotment Grazing Capacity Tabulation and Summary" Forms (Illustrations 13, 14, 15 and 16, Forms 4412-5 4412-2, 4412-6 and 4412-3). Copies of these forms are attached on which illustrative data have been placed for a small hypothetical allotment.

a. ***Allotment Tabulation Form.*** Illustrations 13 and 14 are used to list surface acres and AUMs by section and land ownership and control for each kind of grazing animal. At the top of the form, district and allotment names or designations, the kind of grazing animals and season of use for each, ratios of animal use, and the date are provided. Township, range, and section are indicated. Acres and AUMs are listed for each section involved for each kind of ownership and control and these values are totaled for the allotment. This listing will usually take a number of pages of the form for most allotments.

b. ***Allotment Summary Form***

(1) *WEIGHT ESTIMATE:* Illustration 15 is used to record summary acreage and grazing capacity values for each kind of ownership or control in the allotment. The data in the heading is the same as for Illustration 13. The surface acres, AUMs, and Ac/AUM are listed by kind of ownership or control, and the grazing capacity data are shown for the use complex and for noncompetitive game forage.

(2) *OCULAR RECONNAISSANCE:* Illustration 16 is used to record summary acreage and grazing capacity values for each kind of ownership or control in the allotment. The data in the heading is the same as for Illustration 14. The surface acres, AUMs, and Ac/AUM are listed by kind of ownership or control, and the grazing capacity data is for each kind of animal in the total.

c. ***Correlation of Form Totals.*** Totals for Illustrations 13 and 14 must equal the subtotals on Illustrations 15 and 16 for each category of ownership and control.

d. ***Accuracy of Form Data.*** As with all other survey records, these summary forms must be completed accurately, neatly, and legibly. Sufficient checking will be done to assure the accuracy of all compilations and calculations.

3. Allowance for Superabundant Species

WEIGHT ESTIMATE ONLY: An allowance will be made for superabundant plants as described under derivation of proper use factors (Section VIII.D.5.a). This allowance is added to the additional forage available for game only.

H. Narrative Report

This will be a concise, clearly written report covering a number of essential items concerning the survey area. It must supply all information, in addition to that on type writeups and survey maps, needed by the district manager from the survey in making range management decisions. The Chief of Party, having the obligation of preparing this report, will make adequate field inspections and analyze weather, use, and other records as needed for this undertaking. During the field season he will have to obtain general data for the survey area on range condition, degree and distribution of grazing use, rodent and insect damage, infestations of undesirable weeds and brush, timber and woodland stands, soil and topographic descriptions including accelerated erosion, forage production potentials, and possibilities for range development. Photographs depicting characteristics of the survey area are usually desirable.

Outline for Report. The survey report may be completed using the following outline:

1. **Description of Survey Area**
    a. Location
    b. Area and Land Status
    c. Vegetation, Soils, Topography, and Climate
    d. Natural and Cultural Features

2. **Forage Survey**
    a. Field Season
    b. Survey Party
    c. Procedures

3. **Past Grazing Use**
    a. Kinds of Animals (Livestock and Game)
    b. Seasons
    c. Intensity
    d. Management Practices
    e. Distribution

4. **Rodents and Insects**
    a. Kinds and Abundance
    b. Damage

5. **Predators**
    a. Kinds
    b. Problems

6. **Current Range Condition**
    a. Trend

7. **Potential Range Condition**
   a. Comparison (Relict) Areas

8. **Accelerated Erosion**
   a. Kind and Degree
   b. Trend

9. **Poisonous and Noxious Weeds and Brush**
   a. Need for Control

10. **Current Grazing Capacity**

11. **Recommended Grazing Use**
    a. Kinds of Animals (Livestock and Game)
    b. Seasons
    c. Intensity
    d. Systems of Grazing

12. **Game Management**
    a. Herd-units
    b. Migration Routes
    c. Hunts and Other Controls

13. **Needed Range Improvements**
    a. Water Distribution
    b. Land Treatments
    c. Structures

14. **Other Resource Uses**
    a. Coordination with Grazing

15. **Photographs**

I. Survey Cost Report

To provide information for future planning of programs, a record of approximate survey costs will be made and incorporated into a cost report for the survey. The cost items will be separated into three survey phases — preliminary preparations, field survey, and data summarization.

1. Preliminary Work

The preliminary work will be mainly that completed by the Chief of Party, but will include any efforts of other personnel. All prominent and separable cost items will be considered, including personnel salaries, travel expenses, and costs of maps, aerial pictures, other supplies and equipment.

2. Field Survey

All costs incurred during the actual field survey work will be segregated similarly. These will include salaries of the Party Chief and members and any other personnel, travel expenses for whatever means is used, and survey supplies and equipment costs.

3. Survey Summarization

The survey summarization costs will include expenses of drafting maps, as well as personnel time involved in compilation and preparation of reports, and costs of materials and supplies.

4. Relative Difficultness and Cost of Survey

The cost report will present a very brief description of survey area features reflecting the relative difficulty encountered in completing the survey. Acreages covered will be shown with acreage-cost ratios for the three phases and for the total.

Form 4-1276, Forage Survey Type Writeup (Weight Estimate Method)

FORAGE SURVEY TYPE WRITE UP
(WEIGHT ESTIMATE METHOD)

Write up No. 810 | Sheet No. | Date 6/15/62 | Aerial Photo No. 2B-72

Examiner	KIND OF ANIMAL*	SEASON OF USE	SECTIONS	TWP.	RNGE	MER.
A. B. Smith	Cattle	Sp-F	7,8+18	17S	21W	6th P
Type: 4 Artr Brte Pose	Deer	W				

	SPECIES	PLOT RECORD OR SHEET SUMMARY OF GREEN WEIGHT 1	2	3	4	5	6	7	8	9	10	TOTAL	LBS. GW/Ac	% DRY WT.	LBS. DW/Ac	PUF USE COMPLEX	PUF NON-COMP. GAME	LBS. UF/Ac USE COMPLEX	LBS. UF/Ac NON-COMP. GAME
Grasses	Brte	20	10	45	15	35	15	65	25	15	45	290	290	40	116	20	0	23	0
	Pose	10		20	20	15	5	10	20	10	30	140	140	60	84	25	0	21	0
	Agsp	1	35			5			40			81	81	50	41	45	0	18	0
	Feid		10		1		5			5		21	21	45	9	10	0	1	0
	Sihy		5	5			10	20		10		50	50	45	23	35	0	8	0
Forbs	PHPS	5	1	15		5		35	10			71	71	35	25	20	0	5	0
	Basa	1	10	5			10	10			15	51	51	30	15	40	0	6	0
	AMSS	5		1	5				5	10		26	26	40	10	0	0	0	0
	Saki	5	5		10	5			15	10		50	50	30	15	20	5	3	1
	SOPH		1			5	1		5	5	5	22	22	40	9	5	0	0	0
	ARFE		5	10		10		5			10	40	40	40	16	5	0	1	0
Shrubs	Artr	25	35	60		40	45	35	55	50	20	365	365	50	183	5	–	9	–
	Chvi	5	5	5	15			10	10		20	70	70	30	21	30	10	6	2
	Putr		10			10		20	5			45	45	45	20	50	10	10	2
	Arno	5			20							25	25	50	13	20	10	3	1
	Coat		5				10					15	15	45	7	40	5	3	0
TOTALS		81	137	166	86	130	101	210	190	115	145	1361	1361	(45)	607	(19)	(1)	117	6

Use Complex: 117 lbs. UF/Ac (tot.) × 85 % Utilizable = 99 lbs. UF/Ac (Net); 770 lbs./AUM (forage req.) ÷ 99 lbs. UF/Ac (Net) = 7.8 Ac/AUM

Noncompetitive Game: 6 lbs. UF/Ac (tot.) × 96 % Utilizable = 6 lbs. UF/Ac (Net); 770 lbs./AUM (forage req.) ÷ 6 lbs. UF/Ac (Net) = 128.3 Ac/AUM

Form 4-1276 (May 1963) USDI – BLM

*Livestock and major game species (other game species making inappreciable use are: Antelope)

UTILIZATION DEDUCTIONS IN PERCENT		
USE CRITERIA	USE COMPLEX	GAME
Slope		
Rocks or stones		
Timber		
Lack of Water	10	
Unstable soils		
Erosion		
Rodents	5	5
Insects		
Other (specify)		
TOTAL DEDUCTION	15	5
PERCENT UTILIZABLE	85	95

FORAGE SURVEY TYPE WRITE UP

(OCULAR RECONNAISSANCE METHOD)

Form 4412-1
(June 1964)
(formerly 4-1278)

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORAGE SURVEY TYPE WRITE UP
(OCULAR RECONNAISSANCE METHOD)

Write up No. S 10
Date 6-15-66
Aerial Photo No. 20-72

Examiner A. B. Smith	KIND OF GRAZING ANIMAL *	SEASON OF USE	SECTIONS	TWP.	RGE.	MER.
Type 4-Artr-Brte-Pose	Cattle	Sp-F	7, 8, & 18	17 S.	21 W.	6th P.
Ac/AUM 5.4	Deer	W				

	SPECIES	TOTAL ALLOWABLE PUF	% COMPOSITION	CATTLE PUF	COMP. x C PUF	SHEEP PUF	COMP. x S PUF	DEER PUF	COMP. x D PUF	PUF	COMP. x __ PUF
GRASSES	Brte	20	21	20	4.2			0	0		
	Pose	25	10	25	2.5			0	0		
	Agsp	45	6	40	2.4			5	.3		
	Hoju	10	2	10	.2			0	0		
	Sihy	35	4	35	1.4			0	0		
	SUBTOTAL		43								
FORBS	Tupr	20	5	15	.8			5	.3		
	Busa	40	4	35	1.4			5	.2		
	Cimu	0	2	0	0			0	0		
	Sake	25	4	20	.8			5	.2		
	SOPH	5	2	5	.1			0	0		
	ANTE	5	3	5	.2			0	0		
	SUBTOTAL		20								
SHRUBS	Artr	20	26	5	1.3						
	Chvi	40	5	25	1.3						
	Puti	60	3	45	1.4						
	Arno	30	2	20	.4						
	Cest	45	1	30	.3						
	SUBTOTAL		37								
	TOTALS		100		18.7				6.8		

Av C PUF 18.7 × Av Den .25 = FAF .047 × 85 % Util = Net FAF .040; FAR .3 ÷ Net FAF .040 = 7.5 Ac/AUM

Av S PUF ____ × Av Den ____ = FAF ____ × ____ % Util = Net FAF ____; FAR ____ ÷ Net FAF ____ = ____ Ac/AUM

Av D PUF .068 × Av Den .25 = FAF .017 × 95 % Util = Net FAF .016; FAR .3 ÷ Net FAF .016 = 18.8 Ac/AUM

Av PUF ____ × Av Den ____ = FAF ____ × ____ % Util = Net FAF ____; FAR ____ ÷ Net FAF ____ = ____ Ac/AUM

Total Net FAF .056; FAR .3 ÷ Net FAF .056 = 5.4 Ac/AUM

* Livestock and major game species. *(Other game species making inappreciable use are:* Antelope.

UTILIZATION DEDUCTIONS IN PERCENT					
USE CRITERIA	CATTLE	SHEEP	DEER		
Slope					
Rocks or Stones					
Timber					
Lack of Water	10				
Unstable Soils					
Erosion					
Rodents	5		5		
Insects					
Other *(specify)*:					
TOTAL DEDUCTION	15		5		
PERCENT UTILIZABLE	85		95		

GPO 842-719

ALLOTMENT GRAZING CAPACITY TABULATION

(WEIGHT ESTIMATE METHOD)

Form 4412-5
(March 1966)
(formerly 4-1707)

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ALLOTMENT GRAZING CAPACITY TABULATION
(WEIGHT ESTIMATE METHOD)

Page 1 of 1 pages
Compiled by H. B. Smith
Date 11-10-66

District	Allotment	KIND OF ANIMAL	SEASON OF USE	Ratios of Livestock and Major Game AUM Use:
Idaho 7	Jones-Young	Cattle	Sp-F	C 25 : S ___ : D 60 :
		Deer	W	___ : ___

LOCATION			PUBLIC DOMAIN			OTHER FEDERAL LAND*			RANGE CONTROLLED BY USER**			RANGE NOT CONTROLLED BY USER***		
				AUM's			AUM's			AUM's			AUM's	
TWP.	RGE.	SEC.	SURFACE ACRES	USE COMPLEX	NON-COMP GAME	SURFACE ACRES	USE COMPLEX	NON-COMP GAME	SURFACE ACRES	USE COMPLEX	NON-COMP GAME	SURFACE ACRES	USE COMPLEX	NON-COMP GAME
16S	21W	31	180	24	1									
		32							S-C.D. Jones:					
									480	68	4			
17S	21W	5	354	48	3	PSW:			P-C.D. Jones:					
						80	11	1	80	12	1			
		6	348	43	2	PSW:			P-C.D. Jones:					
						40	6	0	200	34	2			
						RW-G.H. Olson:								
						40	7	0						
		7	160	23	1	RW-G.H. Olson:			P-E.F. Young:			P:		
						120	21	1	200	32	2	160	27	1
		8	240	34	2				S-E.F. Young:					
									160	24	1			
		17	20	3	1									
		18	160	23	5									
17S	22W	1	360	38	8									
		12	400	50	11	RW-G.H. Olson:						P:		
						160	24	1				80	14	1
		13	240	34	2									
PAGE TOTALS			2462	347	36	440	64	3	1120	170	10	240	41	2

* Indicate type of Federal land and legal user (allottee) in listing.
** Indicate ownership (State or private) and legal user (allottee) in listing.
*** Indicate ownership (State or private) in listing.

GPO 887-301

Illustration 14

ALLOTMENT GRAZING CAPACITY TABULATION

(OCULAR RECONNAISSANCE METHOD)

Form 4412–2
(July 1965)
(formerly 4—1701)

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALLOTMENT GRAZING CAPACITY TABULATION
(OCULAR RECONNAISSANCE METHOD)

Page 1 of 1 pages
Compiled by A. B. Smith
Date 11/10/66

District: Idaho 7
Allotment: Jones - Young
Kind of Animal: Cattle; Deer
Season of Use: Sp - F; W
Ratios of Livestock and Major Game AUM Use: C 3.5 : S ___ : D 1.0 : ___ : ___

LOCATION			PUBLIC DOMAIN					OTHER FEDERAL LAND*					RANGE CONTROLLED BY USER**					RANGE NOT CONTROLLED BY USER***				
TWP.	RGE.	SEC.	SURFACE ACRES	AUM's C	S	D		SURFACE ACRES	AUM's C	S	D		SURFACE ACRES	AUM's C	S	D		SURFACE ACRES	AUM's C	S	D	
16S	21W	31	180	20		5							S - E.D. Jones:									
		32											480	60		12						
17S	21W	5	354	43		8		PSW:					P - C.D. Jones:									
								80	10		2		80	11		2						
		6	348	38		7		PSW:					P - C.D. Jones:									
								40	5		1		200	30		6						
								RW - G.H. Olson:														
								40	6		1											
		7	160	20		4		RW - G.H. Olson:					P - E.F. Young:					P:				
								120	18		4		200	28		6		160	23		5	
		8	240	34		7							S - E.F. Young:									
													160	21		4						
		17	20	3		1																
		18	160	23		5																
17S	22W	1	360	38		8																
		12	400	50		11		RW - G.H. Olson:										P:				
								160	20		5							80	12		3	
		13	240	34		7																
PAGE TOTALS			2462	303		63		440	59		13		1120	150		30		240	35		8	
ALLOTMENT TOTALS			2462	303		63		440	59		13		1120	150		30		240	35		8	

*Indicate type of Federal land and legal user (allottee) in listing
**Indicate ownership (State or private) and legal user (allottee) in listing
***Indicate ownership (State or private) in listing

GPO 851-134

ALLOTMENT GRAZING CAPACITY SUMMARY

(WEIGHT ESTIMATE METHOD)

Form 4412–6
(March 1966)
(formerly 4–1708)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALLOTMENT GRAZING CAPACITY SUMMARY
(WEIGHT ESTIMATE METHOD)

Compiled by: A. B. Smith

Date: 11-10-66

District	Allotment	KIND OF ANIMAL	SEASON OF USE	Ratios of Livestock and Major Game AUM Use:
Idaho 7	Jones - Young	Cattle	Sp-F	C 35 : S ___ : D 60
		Deer	W	___ : ___

RANGE CONTROL	TYPE OF FED. LAND OR OWNERSHIP	LEGAL USER (Allottee)	SURFACE ACRES	GRAZING CAPACITY: AUM's USE COMPLEX	AUM's NONCOMP. GAME	Ac/AUM USE COMPLEX	Ac/AUM NONCOMP. GAME
Public Domain			2462	347	36	7.1	129.6
Other Federal Land	PSW	—	120	17	1		
	RW	G. H. Olson	320	52	2		
SUBTOTALS			440	69	3	6.4	146.7
Controlled by User	S	C. D. Jones	480	68	4		
		E. F. Young	160	24	1		
	P	C. D. Jones	280	46	3		
		E. F. Young	200	32	2		
SUBTOTALS			1120	170	10	6.6	112.0
Not Controlled by User	P		240	41	2		
SUBTOTALS			240	41	2	5.9	120.0
ALLOT. TOTALS			4262	627	51	6.8	125.4

GPO 887-302

Illustration 16

ALLOTMENT GRAZING CAPACITY SUMMARY

(OCULAR RECONNAISSANCE METHOD)

Form 4412-3
(March 1966)
(formerly 4-1702)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALLOTMENT GRAZING CAPACITY SUMMARY
(OCULAR RECONNAISSANCE METHOD)

Date: 11-10-66

Compiled by: A. B. Smith

District	Allotment	KIND OF ANIMAL	SEASON OF USE	Ratios of Livestock and Major Game AUM Use:
Idaho 7	Jones-Young	Cattle	Sp-F	C 3.5 : S ___ : D 40 :
		Deer	W	___ : ___

RANGE CONTROL	TYPE OF FED. LAND OR OWNERSHIP	LEGAL USER (Allottee)	SURFACE ACRES	GRAZING CAPACITY AUM's C	S	D		TOTAL	GRAZING CAPACITY Ac/AUM C	S	D		TOTAL
Public Domain			2462	303		63		366	8.1		39.1		6.7
Other Federal Land	PSW	—	120	15		3		18					
	RW	H. H. Olson	320	44		10		54					
SUBTOTALS			440	59		13		72	7.5		33.8		6.1
Controlled by User	S.	C. D. Jones	480	60		12		72					
		E. F. Young	160	21		4		25					
	P.	C. D. Jones	280	41		8		49					
		E. F. Young	200	28		6		34					
SUBTOTALS			1120	150		30		180	7.5		37.3		6.2
Not Controlled by User	P		240	35		8		43					
SUBTOTALS			240	35		8		43	6.9		30.0		5.6
ALLOT. TOTALS			4262	547		114		661	7.8		37.4		6.4

GPO 887-300

IX. OCULAR ESTIMATE METHOD

Editor's Note: This procedure was transcribed from a Bureau document entitled "4440 - SUPPLEMENTAL STUDIES."

Under the Ocular Estimate Method the present percent composition by species by weight on range sites is acquired either by estimating, and/or clipping and weighing, production and then calculating present percent composition by weight. The present percent composition is compared against the climax percent composition by species by weight as described in the range site descriptions. The estimated percentage of the present plant community that is climax (natural vegetation) for the range site is calculated to determine the present condition class (seral stage). (Also see Section IX.D.)

A. Equipment and Supplies

1. Condition (Seral Stage) Worksheet, Form C-1 (Illustration 17).
2. 9.6 Square foot circular plot frame (hoop).
3. No. 12 paper bags for clipping samples.
4. Dial Scale (2 gram increments).
3. Clip board.
4. Range site descriptions.

B. Training

Under this method, the examiners must be able to identify the plant species, estimate weight by species, and recognize and map areas by condition class (seral stage). Adequate training and checks for efficiency and accuracy during data collection are extremely important.

1. Weight Units

Because the relationship of weight to volume is not consistent, production and composition determinations are based on weight estimates, not on comparison of relative volumes. The weight unit method is an efficient means of estimating production and composition and lends itself readily to self-training. This method is based on the following:

a. A weight units is established for each plant species occurring on the area being examined, and can consist of part of a plant, an entire plant, or a group of plants.

b. The size and weight of a unit varies according to the kind of plant. For example, a unit of 5 to 10 grams is suitable for small grass of forb species. Weight units for large plants may be several kilograms.

c. Other considerations include: length, width, thickness, and number of stems and leaves; ratio of leaves to stems; and growth or relative compactness of species.

2. Establishing Weight Unit for Species

a. Decide on a weight unit (in grams or kilograms) that is appropriate for the species.

b. Select part of a plant, an entire plant, or a group of plants likely to equal this weight.

c. Clip and weigh the plant material to determine actual weight.

d. Repeat this process until the desired weight unit can be consistently estimated within 10 percent of the actual weight.

e. Maintain proficiency in estimating by periodically clipping and weighing to check estimates or production.

3. Estimating Present Percent Composition by Weight

After examiners become proficient in estimating weight by species and are thoroughly familiar with the plant species, plant communities, and range sites, they <u>may</u> be able to estimate the present percent composition by weight by species without having to estimate, and/or clip and weigh, production by species. This takes considerable experience. The examiners must check their composition estimates by periodically clipping and weighing to maintain reasonable accuracy.

C. Sampling Process

Each delineated range site is placed in a condition class (seral stage) or further divided if more than one class (stage) exists within a given range site. The plant composition data upon which the class (stage) designation is based is collected and documented on the Condition (Seral Stage) Worksheet, Form C-1 (Illustration 17).

1. Location Plots

Select the plot, or plots, within a range site, or portion of a range site, by throwing the 9.6 square foot hoop within a representative portion of the area being sampled. The plots are not permanent, however, they may be plotted on a detailed allotment map or on an aerial photo, or both, for future reference. If an aerial photo is used, record the photo number on the Condition (Seral Stage) Worksheet, Form C-1 (Illustration 17). Depending on vegetation changes between studies, followup studies may be conducted within the same general area of the initial plot locations. The examiners determine and delineate on a map or photo the area which is represented by the plot, or plots.

2. Listing Plant Species

The plant species presently growing on the plot, or plots, are listed by plant group on the worksheet.

3. Estimating Weight - Calculating Composition

The present percent composition by species by weight may be determined by first estimating, and/or clipping and weighing, production (grams) by species. One to three plots may be used at the discretion of the authorized officer. If only one plot is used enter the grams in the $\bar{x}$ column under weight on the worksheet. If more than one plot is used, enter the weights in columns 1 through 3, average the weights from these plots, and place the mean in the $\bar{x}$ column. The present percent composition is then calculated by dividing the weight for species by the total weight for all species. This percentage is entered in the present composition column.

4. Estimating Composition

The present percent composition by species by weight may be estimated from a plot and entered directly on the worksheet in the present composition column.

5. Entering Climax Composition

Enter the climax percent composition by species from the appropriate range site description in the climax composition column on the worksheet. If a percentage range is shown for a species in the climax plant community, enter the average percentage on the worksheet. If a species listed does not occur in the climax plant community, enter 0.

D. Determining Condition (Seral Stage) Class

The lowest of either the present or climax percent composition values by species is entered in the allowable column on the worksheet. The values in the allowable column are totaled to determine the percentage of the present plant community that is climax (natural vegetation) for that range site, or portion of a range site. Based on this percentage the site is placed in a condition class.

Condition Classes

Seral Stage	Condition Class	Estimate Percentages of Present Plant Community that is climax (natural vegetation) for the Range Sites
Climax	Excellent	76 - 100
High	Good	51 - 75
Medium	Fair	26 - 50
Low	Poor	0 - 25

Illustration 17

CONDITION (SERAL STAGE) WORKSHEET

Plant Groups	Plant Species	Weight (grams) Plots 1	2	3	$\bar{X}$	Composition (% by weight) Present Comp.	Climax Comp.	Allow-able
Grass and Grasslike Plants								
Subtotal								
Forbs								
Subtotal								
Shrubs and Trees								
Subtotal								
TOTAL					gms	100%		%

(check the appropriate box)

SERAL STAGE - CONDITION CLASS				SERAL STAGE - CONDITION CLASS			
Climax	Excellent	76-100%		Medium	Fair	26-50%	
High	Good	51- 75%		Low	Poor	0-25%	

Form # C-1

X. APPARENT TREND

Editor's Note: This procedure was transcribed from a Bureau document entitled "4440 - SUPPLEMENTAL STUDIES."

The trend in rangeland condition can only be determined by measuring changes over time. Generally the longer the time the greater the confidence in trend determinations. However, in some cases, it may be necessary to establish what the existing trend is before long term trend data is available. The apparent trend study is used to determine the direction of change with a single observation. Apparent trend is an ESTIMATE of current trend based on indicators of current changes occurring in the vegetation and soil condition. The five factors involved are vegetation (either seeded or native), vigor, seedlings, surface litter, and soil movement. A numerical rating is assigned for each factor and a composite rating is determined. The Observed Apparent Trend Worksheet, Form AT-1 (Illustration 18) is used to record this data.

Illustration 18

Form AT-1

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OBSERVED APPARENT TREND
WORKSHEET

Planning Unit ____________
Allotment ____________
Location ____________
Examiner ____________
Vegetative Type ____________
Date ____________

No. ____________

		Possible Points	Rating
° 1.A. VEGETATION SEEDED	More than 50 percent of the total vegetation is composed of the seeded species. If shrubs are present, the seeded species occur mainly in open spaces between shrubs. Undesirable annual vegetation is absent or nearly so.	6	
	25 to 50 percent of the vegetation is composed of the seeded species. If shrubs are present, some seeded species occur in open unprotected areas. Limited amounts of undesirable annual vegetation are present.	4	
	Less than 25 percent of the vegetation is composed of the seeded species. Seeded species are generally protected by shrubs or rocks. There is an over abundance of undesirable annuals and/or shrubs.	2	
° 1.B. VEGETATION NATIVE	More than 50 percent of the total vegetation is composed of the potential natural vegetation. An evenly distributed mixture of grasses, forbs, and shrubs are present. Major native forage grasses occur in open, unprotected areas. Undesirable annual vegetation is absent or nearly so. Browse species showing no hedging.	6	
	25 to 50 percent of the vegetation is composed of the potential natural vegetation. Moderate variations of grasses, forbs, and shrubs exist. Some major native forage grasses occur in open, unprotected areas. Limited amounts of undesirable annual vegetation are present. Browse species showing moderate hedging.	4	
	Less than 25 percent of the vegetation is composed of the potential natural vegetation. Poor variation exists among grasses, forbs, and shrubs, with an over abundance of undesirable annuals or shrubs. Major native forage species are generally protected by shrubs or rocks. Browse species showing heavy hedging.	2	
2. VIGOR	Desirable grasses, forbs and shrubs are vigorous showing good health. These plants should have good size, color, and produce abundant herbage.	10	
	Desirable grasses, forbs, and shrubs have moderate vigor. They are medium size with fair color and producing moderate amounts of herbage, some seed stalks and seedheads are present.	6	
	Desirable grasses, forbs and shrubs have low vigor. They appear unhealthy with small size and poor color. Portions of clumps or entire plants are dead or dying. Seed stalks and seedheads almost non-existent except in protected areas.	2	
3. SEEDLINGS	There is seedling establishment of desirable grasses, forbs, and shrubs. Seedlings are present in open spaces between plants and along edges of soil pedestals. Few seedlings of invader or undesirable plants are present.	10	
	Some seedlings of desirable grasses, forbs and shrubs may or may not be present in open spaces between plants. Some seedlings of invader or undesirable plant species may or may not be present.	6	
	Few if any seedlings of desirable grasses, forbs and shrubs are being established. Seedlings of invader or undesirable plants are present in open spaces between plants.	2	
4. SURFACE LITTER	Surface litter is accumulating in place.	5	
	Moderate movement of surface litter is apparent and deposited against obstacles.	4	
	Very little surface litter is remaining.	3	
5. SOIL MOVEMENT	None or slight visual evidence of soil movement. No exposed roots.	5	
	Moderate movement of soil particles visible. Some plants have roots exposed.	3	
	Movement occurs with each event. Soil and debris deposited against minor obstructions. Terracing may be present. Many plants have roots exposed.	1	
	°Record vegetation as *either* seeded or native, *not for both*.	Total	

7-16 Downward
17-26 Static (not apparent)
27-36 Upward

General Remarks:

XI. SOIL-VEGETATION INVENTORY METHOD

Editor's Note: The procedures for collecting data using this method were transcribed from old BLM Manual 4412.14, "Soil-Vegetation Inventory Method," Release 4-58, dated 8/10/79.

The Soil-Vegetation Inventory Method (SVIM) is the Bureau of Land Management's (BLM's) method for conducting basic soil and vegetation inventories (consistent with BLM Manual Sections 5200, 6602, 6672, 7161, and 7312). The procedures provide a uniform, systematic method for inventorying soil and vegetation resources and collecting data for use in Unit Resource Analysis (URA), Management Framework Plans (MFP), Activity Plans, and environmental assessments. It is designed to be used in conjunction with BLM Manual section 6602, Integrated Habitat Inventory and Classification System (IHICS). The method does not preclude site specific studies (for special purposes), other approved inventories (various forest inventories, forage surveys, etc.), or more detailed inventories based upon it. Although SVIM does not inventory all renewable resources, it provides a sampling frame for wildlife species occurrence inventories and gathers basic data used by other resources (recreation, watershed, etc.). It is an integrated inventory system in that other renewable resource inventories are based upon, or directly related to, its procedures. To gather more detailed data, it may be necessary to conduct intensive studies on specific areas of concern. Continuous studies are also essential to monitor changes in base inventory data for necessary adjustments in management as resource conditions change. Such studies must include, but are not limited to: actual grazing use, wild animal occurrence, rangeland condition and trend studies, vegetation production and utilization, climatic variation, shrub transects or vegetation plots, ground cover determinations, and watershed transects.

A. Pre-Planning Analysis

All inventory and planning efforts must be preceded by a pre-planning analysis in accordance with BLM Manual section 1601. The pre-planning analysis identifies the issues and problems that impact the planning area and determines planning requirements, including the level of soil and vegetation inventory necessary for the area. The results of the preplanning analysis are documented in written guidance to the inventory planning team (Section XI.A.1). This guidance clearly defines the level of detail that must be met during data collection efforts to adequately address the issues and problems identified.

1. Inventory Plan

An inventory plan, based on guidance from the pre-planning analysis, must be developed prior to conducting the inventory. An interdisciplinary team must be appointed by the District in the pre-planning analysis, the team must set forth in writing the extent and intensity of the inventory. The inventory plan should be attached to and become a part of the pre-planning analysis. The inventory plan is approved by the District Manager and reviewed by the State Director prior to initiation of the inventory. A suggested outline for the inventory plan is as follows:

a. Purpose.

b. Objectives.

c. Description of inventory area.

d. Information required based on issues.

e. Inventory design.

f. Personnel and funding requirements and/or constraints.

g. Logistics.

h. Field measurements and procedures.

i. Compilation procedures.

j. Reporting (progress and results) requirements.

k. Approval process.

l. Files maintenance.

2. Progress Reviews

The inventory plan must set forth when and how progress reviews will be conducted. The District Manager must appoint a progress review team consisting of resource specialists from the District staff, with assistance from State or other BLM office specialists if desired. Reviews consist of assuring adequate quality and quantity of inventory progress and resolving any problems incurred.

3. Pre-Inventory Preparation

Pre-inventory preparation is extremely important if the inventory is to be successful. Many factors must be considered and many preparatory details organized efficiently and sequentially in order to insure systematic conduct and completion of field work.

4. Inventory Party

The inventory party normally consists of a party chief, a soil survey team, and a vegetation inventory (transecting) team. If specified in the inventory plan, the soil survey and mapping team may be combined into a single team to complete the mapping of the inventory area. The soil survey team may be Soil Conservation Service (SCS), BLM, combined SCS-BLM, or contract personnel. The inventory party must be carefully selected. Members' knowledge, experience, education, and training is extremely important.

a. ***Chief of Party***. The chief of party, who should be a permanent BLM employee, must be selected with a great deal of emphasis placed on experience, integrity, character, attitude, ethics, knowledge, and competence. He/she should be knowledgeable and experienced in objectives and procedures of soil-vegetation inventories and acquainted with Bureau interrelated programs. He/she should be a person of good judgment and have had supervisory experience. He/she is responsible for organizing and directing the inventory, coordinating field data collection, making work assignments, keeping equipment in good operating order, providing for the welfare of the party members, and reporting progress of the inventory. Whether the soil survey is being conducted by the SCS, jointly by SCS and BLM, or by contract, the party chief is responsible for coordinating the vegetation and wildlife inventories with the soil survey.

b. ***Party Members.*** The soil survey mapping, and vegetation inventory teams must consist of qualified specialist, including range specialists, foresters, soil scientists, and wildlife biologists. All specialists on the inventory party must work closely together throughout the inventory.

(1) *Soil Survey Team.* The soil survey is responsible for soil mapping the area and must consist of qualified soil scientists organized to conduct the soil survey in accordance with standard soil survey procedures. The soil survey team may be SCS, BLM, a combination of SCS-BLM employees, or the soil survey may be contracted. Soil survey team members must work very closely with range specialists in designing mapping units. The SCS has final responsibility for correlating all soil surveys.

(2) *Mapping Team.* The mapping team is responsible for delineation of ecological sites, seral stages (condition classes), and present vegetation communities and must consist of experienced range specialists, foresters, wildlife biologists, and soil scientists who are familiar with the plant and animal communities of the inventory area.

(3) *Vegetation Inventory (Transecting) Team.* The vegetation inventory team collects site specific vegetation data and must consist of qualified resources specialists who are organized and trained to collect the data described in Section XI.D.

(4) *Phenological Data Collection Team.* It may be desirable to assign the responsibility of collecting the data for phenological adjustment factors as set forth in Section XI.D.6 to one or two individuals. This will assure accurate data collection in a timely manner for this important phase of the inventory. This team also may collect samples for air-dry weight conversion data (Section XI.D.7).

5. Preparing for the Inventory

The chief of party formulates a plan of operation, assembles material, makes necessary arrangements, and coordinates with appropriate District staff members. He/she must assemble all forms, maps, photos, and other equipment, and supplies necessary for conducting the inventory. See Illustration 19 for an equipment list.

a. *Base Maps*

(1) *Aerial Photographs.* It is essential to have a complete set of aerial photographs solely for inventory purposes. These should be acquired well in advance of the inventory. To facilitate the inventory, recent aerial photography (less than 10 years old) is desirable. Aerial photographs at the scale of 1:24,000 are best suited to the inventory requirements and ease of data transfer to orthophoto quads. Aerial photographs are used for field mapping and the mapped information is then transferred in the office to orthophoto quads or other base maps.

(2) *Orthophoto Quads.* Orthophoto quads (1:24,000) are a desirable mapping base and, if used, should be acquired well in advance of the field inventory. If not available, each State should try to obtain coverage. A 2- to 3-year lead time is needed to obtain adequate coverage.

(3) *Topographic and Planimetric Maps.* Use topographic and planimetric maps or any high quality maps accurately showing the relative position and nature of the inventory area features. Among the most usable would be GS topographic quadrangles, although other topographic or planimetric maps also may be of considerable assistance.

(4) *Administrative Maps.* Provide administrative maps which include management unit, grazing allotments, range improvements, timber harvest, fish and wildlife habitat, and land status as references for party members during inventory.

b. *Reference Material.* Review existing information for the inventory area and assemble pertinent information for use and orientation of inventory party members. This includes:

(1) *Inventories.* Past inventories (range, watershed, wildlife habitat, visual resources, recreation, timber, etc.) including current URA's.

(2) *Literature.* Literature concerning area soils, geology, vegetation, fish and wildlife species, archeology, presence of threatened or endangered species, etc. (Consult universities, local SCS offices, etc.)

(3) *National List of Scientific Plant Names.* Standard symbols from the National List of Scientific Plant Names, published by the SCS, and used on all vegetation inventory forms. This is the most complete list available on a national basis. It may be desirable (for field use) to compile a list of plant species found in the inventory area from the National List.

(a) Plant List Rules. To provide for uniformity and avoid duplication, the following rules were followed in developing the National List of Scientific Plant Names:

i. Alphanumeric Codes. Automatic data processing requires short plant name symbols. Four- to eight-letter alphanumeric plant name symbols must be used.

ii. Genus. A basic five-letter symbol, consisting of first five genus letters, is used for the genus name. If the name has less than five letters, "+" signs are added to make a five-letter symbol. For example, the genus for fir trees, Abies, has the five-letter symbol ABIES: for wheatgrasses, Agropyron, the symbol is AGROP; for bluegrasses, Poa, the symbol is POA++; and for maples, Acer, the symbol is ACER+. If needed, tie-breakers are added to the basic five-letter symbol. For example, CHRYS is the first five letters of several genera— Chrysopsis, Chrysopogon, Chrysothamnus, and Chrysanthemum. Alphabetically, the genus symbol for the first one is CHRYS and for the others CHRYS2, CHRYS3, etc.

iii. Species. The basic plant name (species) symbol consists of the first two letters of the genus name and the first two of the species name. For example, the symbol for Kentucky bluegrass, POA pratensis, is POPR. In alphabetic order, all other plants having the same four-letter symbol must have tie-breakers in numeric sequence starting with 2. Examples: POPR2, POPR3, etc.

iv. Variety. The first letter of the variety name, either natural or cultivar, is added to the basic four-letter plant name symbol. Examples: Pinus ponderosa variety arizonica has the five-letter symbol PIPOA. Symbols for cultivars must be developed when the cultivar list is generated.

(b) Species Not Listed. When species which have not been assigned a code in the National List are encountered, use the following procedure:

i. Form Entry. On all vegetation inventory forms, enter the first two letters of the genus name and the first two of the species name. In addition, add an asterisk to denote the absence of an assigned code.

ii. Notification of Absence from List. Upon identifying a species which is not included in the National List, the person noting the absence must forward the information to the Service Center Director (D-460). This staff must coordinate with the SCS to obtain a code for each such species encountered.

(4) *Location of Fish and Wildlife Species.* Review information on probable location of fish and wildlife species with particular emphasis on endangered, threatened, or sensitive species, big game ranges, concentration areas, and important biological areas. Document new information in URA.

(5) *Location of Threatened or Endangered Plants.* Review and assemble information for URA on probable location of threatened or endangered plant species, including descriptions and pictures.

c. ***Comparison Area Information.*** Identify existing and probable comparison areas (Section XI.D.8.a) and document data on Form 4412-41, Documentation of Comparison Areas, (Illustration 20), for determining site potential, seral stage (condition class), and apparent trend. Comparison areas are especially useful for evaluating riparian vegetation. It may be necessary to construct exclosures along stream segments and measure successional changes to determine potential vegetation in the riparian zones.

d. ***Inventory Schedule.*** Plan and schedule the inventory well in advance with appropriate priorities and Annual Work Plan procedures. The time of year the inventory will be conducted must be determined by the chief of party in consultation with appropriate District staff members. Soil inventories and soil and ecological site mapping can be conducted any time weather permits. Within practical limits, the vegetation data collection should not begin until the growing season is sufficiently advanced to insure a representative growth of vegetation. Work may continue into the fall until conditions prevent accurate classification and production estimates. It may be desirable to strategically place utilization cages in representative portions of the inventory area prior to the inventory. This is helpful in reconstructing utilized plants as well as adjusting for full plant growth in the summary and interpretative phases.

6. Training

Training inventory party members is the responsibility of the chief of party and other qualified resource specialists. This includes scheduling and preparing training in procedures. e.g., mapping units, data collection, plant identification, aerial photo interpretation, etc.

a. ***Prior to the Inventory.*** The inventory party must be trained in all facets of the SVIM. District and State resource specialists should inform the inventory party about items to look for and explain how all information will be gathered and documented consistent with the inventory plan.

b. ***During Inventory.*** The efficiency and accuracy of the inventory crew members depend upon their initial training. During this initial period, coordination with the District staff is extremely important. Spend enough time to acquaint each party member with the inventory area, main roads, landmarks, fish and wildlife crucial areas, and important biological areas.

(1) *Uniformity.* Uniformity in following the inventory procedures is essential. All vegetation inventory team members must work together for a sufficient period of time to assure uniformity in following inventory procedures.

(2) *Individual Training*. The chief of party must work individually with each member of the vegetation inventory team to further improve and assure uniformity and accuracy of work and to check progress.

(3) *Coordination*. Procedures must be continually coördinated throughout the inventory. Vegetation inventory team members must work together for at least a portion of a day each week to correlate estimates and to resolve problems that may arise in field procedures.

(4) *Progress Reviews*. Progress reviews, including field checks of inventory crew work, should occur as set forth in the inventory plan (Section XI.A.2).

B. Field Inventory Mapping

Mapping must be done by trained range specialists, wildlife biologists, foresters, and soil scientists, working closely together. Field mapping consists of delineating site writeup areas (SWAs) (Section XI.B.3) based on present plant communities within boundaries of potential plant communities—range sites, woodland sites (suitability groups), or forest types (Illustration 21). Field mapping must be completed for the inventory area prior to stratification and collection of vegetation data. It is desirable to complete mapping a year in advance of collecting vegetation data. All mapping must be in accordance with Office of Management and Budget National Mapping Standards, Circular A-16.

1. Sources and Criteria for Mapping

a. ***Sources of Potential Plant Community Information.*** The following sources should be reviewed for information concerning the potential plant community:

(1) Range site descriptions.

(2) Woodland site descriptions.

(3) Potential forest type descriptions (habitat types).

(4) Comparison area data.

b. ***Criteria for Mapping Present Vegetation.*** Significant changes in the following factors must be considered in delineating present vegetation communities:

(1) Vegetation species composition (kinds, proportions, and amounts of present vegetation).

(2) Vegetation ground cover.

(3) Vegetation height.

(4) Vegetation age class (especially in forested areas).

(5) Topography.

(6) Other factors identified in the inventory plan.

2. Potential Plant Community Mapping

a. ***Guidance on Potential Plant Communities.*** The SCS National Range Handbook (NRH-1, July 13, 1976) should be consulted for information on range and woodland sites (suitability groups). The SCS has described range sites covering much of the public land. In some cases woodland sites descriptions may also be available. Early contact and coordination with local SCS offices is essential. Information which should be obtained from the SCS includes: soil surveys, copies of soil survey field sheets, technical range and woodland site descriptions and guides, and information from the SCS Range Data System. Information on forest types may be obtained from applicable published reports by Forest Service Experimental Stations, universities, etc.

b. ***Mapping Process with a Completed Soil Survey.*** In areas where soil survey and range site descriptions are complete, a range site-soil series correlation should be available in the final soil survey report. The survey report may also identify soil series that support woodland sites or forest types (habitat types) where the potential plant communities have been defined. From these data a legend can be developed to correlate the soil maps with the appropriate range site, woodland site, or forest type. This legend should be provided to the mapping team for field use.

Preliminary Interpretations: Prior to going to the field, the mapping team can make some preliminary interpretations based on the soil maps and site legend and aerial photographs. Each preliminary delineation must be checked on the ground to accurately determine the range site, woodland site, or forest type. On most soil surveys, a number of the soil mapping units may be either associations or complexes. The mapping team has to determine the percentage of each of the components when they determine the range site, woodland site, or forest type.

c. ***Mapping Without a Completed Soil Survey.*** In areas where soil surveys are not completed, the SCS must be contacted to obtain any available soil or ecological site data. The SCS may be able to assist in training and in establishing the mapping legend. The mapping team must work together in the field to achieve consistency in SWA delineation based upon range sites, woodland sites, or forest types. The soil scientist must insure that soils are considered in delineations. If at all possible, a soil survey should be completed prior to or concurrently with delineation of ecological sites. When it is necessary to delineate range sites, woodland sites, or forest types without a soil survey, Form 4412-38, Soil Description Field Data, (Illustration 22), is used to record soil data. The soil scientist completes one for each established phase of series and three for unnamed phases of series.

3. Present Plant Community Mapping

Potential plant communities (range and woodland sites and forest types) are further subdivided into the present vegetation communities, using criteria listed in Section XI.B.1.b. Each identified range site is divided into seral stage (condition classes) and/or present vegetation communities by the mapping team. Woodland sites and forest types are divided only into present vegetation communities, unless site guides for seral stage (condition class) determinations are available.

Site Writeup Area (SWA) Delineation: The smallest delineation geographical unit to be used as a base for collecting vegetation data is the SWA. It may consist of an entire ecological unit (range site, woodland site, or forest (habitat) type), or a portion of a unit if more than one seral stage (condition class) or present vegetation community exists. It may contain more than one present and/or potential plant community where soil-vegetation complexes occur and are intermingled to the extent they cannot be individually delineated. It must not cross allotment boundaries. This is essential in order to compile data by grazing allotment. SWAs may be mapped down to a minimum of 6 acres. SWAs may also be delineated on soil mapping units or pastures boundaries if specified in the inventory plan.

a. ***Range Sites.*** The mapping team must divide each mapped range site into seral stage(s) (condition class[es]) and present vegetation communities (Illustration 20). Detailed procedures for mapping range sites and condition classes are found in the SCS National Range Handbook (See Section XI.B.2).

(1) *Seral Stage (Condition Class) Classification.* Each delineated range site must be placed in a seral stage (condition class), or further divided into seral stages if more than one stage (class) exists within a given range site. Classifying range sites into seral stages is done initially by making visual estimates of plant composition. Determine the initial stage (class) of areas within a range site by comparing the present plant community with that of the climax community, as indicated by the range condition guide. For the existing plant community, count as climax no more than the maximum weight (or percentage of total production) shown on the guide for any species in the climax community. Total the amount of all climax species, not in excess of that shown on the guide, to indicate the relative ecological rating. The rating must be between 0 and 100, depending on how closely the existing plant community resembles the potential plant community for the range site. (See the SCS National Range Handbook for discussion of range condition determinations.) The mapping team may want to develop a field worksheet to record these initial condition determinations.

(2) *Seral Stages (Condition Classes).* Use the following seral stages (condition classes) to express the degree to which the composition of the present plant community reflects that of the potential. It is <u>not necessary</u> to use both seral stage and condition class terminology in referring to the specific ecological plant communities. Both terms are shown here merely to illustrate the relationship of the seral stages (new terminology) to the established condition class terminology.

Present Seral Stage	Condition Class	Estimated Percentage of Plant Community that is Potential for the Range Site
Climax	Excellent	76 - 100
High	Good	51 - 75
Medium	Fair	26 - 50
Low	Poor	0 - 25

(3) *Present Vegetation.* After range sites have been initially classified into seral stages (condition classes), it may be necessary to further divide these stages based on the present vegetation communities. For example, a range site may be in a low stage (poor condition) with heavy sagebrush on part of the site and cheatgrass on the remainder. These two diverse vegetation communities must be delineated. Significant changes in vegetation composition and ground cover should be consistent in mapping the present vegetation community. The smallest unit delineated within a range site is the Site Writeup Area (SWA). The mapping team must assign a SWA number to each SWA delineated and also complete certain sections of Form 4412-26, Transect Data Sheet, (Illustration 23), and Form 4412-30, Stratification Data and General Characteristics, (Illustration 24). Automatic Data Processing Codes for Vegetation Types and Subtypes, Form 4412-30a, (Illustration 25), and Standard Land-Form Coding and Descriptions, Form 4412-30B, (Illustration 26), are used in completing Form 4412-30 and 4412-38.

b. ***Woodland Sites.*** Each delineated woodland site must be divided by stage (condition) if guides are available, or by present vegetation communities. The smallest unit delineated within a woodland site is the SWA. The mapping team must assign a SWA number to each SWA delineated, and also complete certain sections of Form 4412-26 (Illustration 23) and Form 4412-30 (Illustration 24).

c. ***Forest Types.*** Forest types are divided into stands—uniform plant communities of trees as to timber type, age class, vigor, height, ground cover, and stocking. The smallest delineated unit within a forest type is the site writeup area (SWA), or stand. The mapping team must assign a SWA number to each delineated SWA, and also complete certain sections of Form 4412-26 (Illustration 23) and Form 4412-30 (Illustration 24).

4. Feature Mapping

Feature mapping must be accomplished primarily by the mapping team. If the vegetation inventory team observes any features missed by the mapping team, they should record them. Any permanent cultural or topographic features and/or biological features (Section XI.F.2 for special feature areas, and BLM Manual Section 6602) and existing improvements, such as fences, roads, water developments, etc., not shown on existing maps must be indicated on aerial photographs and transferred to topographic maps or orthophoto quads, using standard mapping symbol. The Bureau's standard map symbol list (Manual Section 9161, BLM Map Symbol Handbook) covers the more important natural, cultural, and control feature symbols used in inventory field mapping. Barriers to livestock and/or wildlife and wild horse and burros must be noted.

5. Water Resources

Show all water resources, such as marshes, reservoirs, springs, seeps, streams, etc., on the map. To the maximum extent possible, aquatic and riparian vegetation information must be integrated into the SVIM procedures.

6. Planimetric Control

If planimetric control is not adequate, it is necessary to locate all known section corners. Photo identified USGS primary control (triangulation) stations are very helpful and should be located wherever possible. In order to prepare accurate maps from aerial photographs, locate at least two corners per township. These should be well spaced. When corners are found, indicate the precise location on the photographs with a needle prick. Mark a cross over the hole on the reverse side of the picture with the sections to which the corner is common written into the angles of the cross. Record the township, range, date, and the identifying individual's initials on the back of the photograph. Mark assumed corners not positively identified similarly and write the words "probable corner" on the back near the description.

C. Soil Considerations

The basic soil taxon is the soil series. Taxa other than the soil series may constitute only a very minor portion of any legend. Thus, almost all soil mapping units are composed of phases of soil series, either mono- or multi-taxa with some families or subgroups and miscellaneous areas as indicated by soil characteristics and geomorphic conditions. Size of delineations are dominately controlled by the scale of map and mapping unit composition.

Soil Inventory Standard. It is Bureau policy to make soil inventories that meet the standards of the National Cooperative Soil Survey as stated in the SCS National Soils Handbook, Soil Survey Manual, Soil Taxonomy, and BLM Section 7312 - Soils. The soil survey is published as an interim or special soil survey report of areas for in-service use.

1. Mapping Intensity

As a minimum, the intensity of soil inventories within the Bureau is a third-order survey at a scale of 1:24,000 and phases of series. At this intensity, soil mapping units consist primarily of associations with some consociations, complexes, undifferentiated groups that are defined primarily in terms of phases of soil series. There is a need to consider phases of families/familia, subgroups, and miscellaneous areas as indicated by soil and geomorphic conditions. This <u>does</u> <u>not</u> mean families and phases of families are the primary taxa for the inventory area, but are legitimate components when used to define the potentials or limitation of unique areas. This major goal is to identify soil mapping units that can be correlated into range sites, woodland sites, forest land types, and, in some instances, important resource values identified in the pre-planning analysis. The constraints that control the intensity of mapping unit must be defined in the inventory plan.

2. Map Scales

The Bureau's standard map scale is 1:24,00 (Section XI.A.5.a). The minimum size delineation for soil and vegetation inventories is about 6 acres for distinctly suitable areas for wildlife habitat such as riparian areas for food and cover, and cliffs or promontories for raptors (Section XI.F.2 for instructions on handling special habitat features). Districts now having 1:20,000 or 1:31,680 scale photography may use these scales for the inventories. It is suggested that smaller scale photography up to 1:63,360 be enlarged to a scale of 1:31,680 or 1:24,000. Minimum size delineations are as follows:

Scale	Acres	Inches/Miles
1:20,000	4.0	3.16
1:24,000	6.0	2.64
1:31,680	10.0	2.0

3. Soil Symbols and Recording

Symbols to be used to identify soil series are defined in BLM manual section 7312 - Soils. Each phase of a soil series, miscellaneous land type, etc., is given a symbol and defined locally. All mapping units and symbols must be identified in the soil identification legend. All mapping units within an inventory area must be assigned a symbol and recorded in the legend for the soil survey area.

D. Vegetation Field Inventory

The following vegetation sampling procedures are recommended for use in delineated site writeup areas (SWA's). Alternative procedures, such as those outlined in Section 600 of the SCS National Range Handbook may be used, provided the alternative procedures supply comparable data for computer processing by the Service Center and all the standard forms are used in recording field data. Procedures are set forth in the sequence in which they are conducted. These are minimum standards. Additional transects or more intense sampling may occur, if so indicated in the inventory plan.

1. Stratification

Similar SWA's are grouped together for sampling purposes. If a SWA contains a complex of soil-vegetation units, individual components are placed in stratum composed of similar soil-vegetation units. The size of the geographical area to be stratified is determined and documented in the inventory plan. The complexity of the ecological situation, as well as local needs, determines whether stratification is made by allotment, group of allotments, environmental impact statement (EIS) area, planning unit, resource area, or District. The inventory plan sets forth the criteria for stratification.

a. ***Stratum.*** A stratum consists of a grouping of SWA's or similar soil-vegetation components (percent of SWA) having the same range site, woodland site, or forest type in the same seral stage (condition class) and/or present vegetation community. If an area is critical wildlife habitat, this may serve as additional criteria for stratification.

b. ***Documentation.*** All strata are assigned a number and listed on Form 4412-30, Stratification Data and General Characteristics (Illustration 24). The SWA's within a stratum are also listed on Form 4412-30.

c. ***Sampling.*** Mapping should be completed prior to sampling for the entire geographical area to be sampled. SWA's to be sampled must be randomly selected from each stratum. For example, if it is determined there are 40 SWA's within a stratum, each of the 40 SWA's must have an equal chance of being selected for sampling.

Number of Transects. The goal is to select the minimum number of transects needed to adequately (as defined in the inventory plan) characterize existing vegetation. The precise number of transects allocated per stratum, or the number of SWA's to be sampled, will depend upon inventory objectives, budget constraints, and vegetation variability. Exactly how the number of transects selected is determined must be documented in the inventory plan.

2. Step-Point Transect

Record a minimum of one 200-point transect in each site writeup area (SWA) to be sampled. Transects must traverse the SWA in a manner which obtains a representative sample. Terrestrial transects generally run across the long axis of a SWA, although other layouts may be used. Transects in riparian SWA's are situated at a 90-degree angle from the stream or river axis. Additional transects are placed along the stream axis whenever changes in vegetation composition are apparent. If more than one range site and associated vegetation occurs within a SWA, determine the percentage of each site and/or vegetation community within the SWA and establish a transect to sample each separately. If a distinctive strip pattern exists, establish a transect in each community. If an indistinct mottled pattern exists, establish one transect and record each community on separate forms. Data collected from this transect include ground cover, both basal and canopy.

a. ***Transect layout.*** The mapping team must determine how the transect is to be laid out on the SWA's to be sampled and depict the transect location on the aerial photograph or overlay. (See Illustration 27, Transect layout, for procedure in determining points to be read and options in laying out transects.) At the beginning point of the transect take a photograph in the direction of the transect line to show a general view of the SWA. File the photographs with the inventory records in the District Office.

b. ***Obstructions.*** When obstructions such as juniper trees, cholla cactus, or ledge rocks, etc., are encountered, the transect can be projected by a rod or stick with the length of the pace (e.g., 6') marked (Illustration 28, Projected Hits with Obstructions). Record the ground cover by observing the hit along the original transect line. Return to pace transect line as soon as possible and resume pacing. Normally "hits" along that portion of transects that intersect unnaturally disturbed areas, such as roads and trails, are not recorded. However, if unnatural e.g. disturbed areas, make up a significant portion of the SWA (e.g. heavily roaded by past mining activity or off-road-vehicle use) record the hits or use other techniques such as recent aerial photographs to estimate the percentage of disturbed area within the SWA. When disturbed areas are encountered, proceed three paces past disturbance and continue recording along the same transect line.

c. ***Recording.*** At each point to be read, record the following (Diagrammatic Sketch of Step-Point Data and Recording Procedures, Illustration 29, and Form 4412-26, Transect Data Sheet, Illustration 23):

(1) *Basal Hits.* Identify ground cover and record as either basal hits or live vegetation (including mosses and lichens), litter (persistent or nonpersistent), gravel, cobbles or stones, bare ground, or bedrock. Live vegetation must always be identified by plant symbols (see SCS National List of Scientific Plant Names).

(a) Identify "hits" by a 1/8 inch mark, preferably a 1/8 inch wide and 1/16 inch deep, on the toe of the sole of boot. Wider notches affect the decision as what to record.

(b) If two or more items such as bare ground and litter appear in the notch, record the item which occupies the majority of the notch.

(c) Identity of the cover must be expressed as a single category; therefore, where two or more apparently equal categories are identified, the preferred identity is: first, vegetation; second, litter; third, gravel; forth, cobble, fifth, stone; sixth, bare ground.

(d) Identify the cover category or "hit" directly beneath the notch, unless the vegetation and/or litter is pushed out of its natural canopy. Record the cover category that appears under the disturbed material at the ground surface.

(2) *Canopy.* Identify and record the overstory (canopy) above the mark or notch within the line of sight. (See Illustration 29 for examples of various situations.)

3. Vegetation Production and Characterization Plots

These plots are used to record production and certain plant characteristics.

a. ***Types of Plots.***

(1) *Weight-Estimate Plots.* The weight estimate may be any multiple of .96 square feet (.96, 1.92, 4.8, 9.6, 19.2, 48.0, etc.). The 9.6 square-foot plot is usually best suited for use in areas of sparse vegetation. Given the greater productivity of riparian versus upland vegetation, weight-estimate plots in riparian SWAs may have to be reduced in size (i.e., .96 sq.ft.). The weight-estimate plot may be delineated by a circular hoop or a palo for linear rectangular plots (See Illustration 30, Vegetation Characterization Plot Layout—Circular Plots). The same size and type of plot should be used for the entire transect.

(2) *Shrub and Tree Characterization Plots.* The shrub and tree characterization plot may be a 1/100-acre or 1/200-acre plot. The 1/100-acre plot is used in sparse stands of shrubs while the 1/200-acre plot may be used in dense stands of

shrubs. The same size of plot should be used for the entire transect. The center point of this plot is the center of the weight-estimate plot. The 1/100-acre plot is delineated by an 11.7-foot fine cable or chain as a radius, and the 1/200-acre plot is delineated by an 8.3-foot fine cable or chain as a radius (Illustration 30).

(3) *Forest Land Plots.* If it is determined in the inventory plan that more intense data is required on forest lands, establish a forest plot using the center of the weight estimate plot. The forest plot consists of two concentric circular plots having a radius of 11.7-feet (1/100 acre plot) and 37.2-feet (1/10 acre).

b. ***Plot Layout.*** Establish plots at every 20th point of the step point transect. Place the rear edge of the weight estimate plot at the toe of the boot where the hit was recorded (Illustration 30). Each transect will have a minimum of 10 weight-estimate plots. Plots may be established in clusters if so determined in the inventory plan. The shrub and tree characterization plot and the forest lands plot must be established, using the center of the weight-estimate plot as the center for these plots.

c. ***Recordings***

(1) *Weight-Estimate Plot.* The following vegetation records are made from this plot in the order listed.

(a) Vegetation Characterization

i. Average availability, phenology, and utilization for each plant species for each weight estimate plot is recorded on Form 4412-27, Weight Estimate and Vegetation Characterization (Illustration 31).

ii. Form and age class for each plant of grasses and forbs and average height by grass and forb species with totals for each category is recorded on Form 4412-27 (Illustration 31). Record this data on a minimum of 3 of the 10 weight-estimate plots. More plots may be recorded if more intensive sampling is required.

(b) Weight Estimate of Vegetation Production. Record weight-estimate data on Form 4412-27. (See Illustration 31, page 2, for form entry instructions and Illustration 32 for a schematic sketch of the weight-estimate plot layout.) Make records for each of the 10 plots. At least 2 of the 10 plots are clipped and weighed. Make estimates before the plants are clipped and weighed, as follows: Pre-select 2 of the 10 plots which are to be clipped; make weight-estimates prior to clipping; clip and weigh; record both the estimated and the actual weights on Form 4412-27. Circle the actual weight entries on the form.

i. Recording Actual Weights. Record actual green weights for each species as weighed and/or estimated on each plot.

Height Classes. Include height estimates of all current year's growth of each plant species by the following height classes: 0' to 3', 3' to $4^1/_2$', $4^1/_2$' to 7', and 7' up (Illustration 32).

Accuracy. During training periods and before individuals can proceed, the chief of the party assures that each member is consistently estimating weights within 10 percent of actual weights.

ii. Weight Units. Because the relationship of weight to volume is not consistent, base production and composition determinations on weight estimates, not on comparison of relative volumes. The weight unit method is an efficient means of estimating production and lends itself readily to self-training. This method is based on the following:

A weight unit is established for each plant species occurring on the area being examined, and can consist of part of a plant, an entire plant, or a group of plants.

The size and weight of a unit varies according to the kind of plant. For example, a unit of 5 to 10 grams is suitable for small grass or forb species. Weight units for large plants may be several kilograms.

Other considerations include: length, width, thickness, and number of stems and leaves; ratio of leaves to stems; and growth or relative compactness of species.

iii. Establishing Weight Unit for Species.

Decide on a weight unit (in grams or kilograms) that is appropriate for the species.

Select part of a plant, an entire plant, or a group of plants likely to equal this weight.

Harvest and weigh the plant material to determine actual weight.

Repeat this process until the desired weight unit can be estimated with reasonable accuracy.

Maintain proficiency in estimating by periodically harvesting and weighing to check estimates or production.

iv. Number of Plots. A minimum of 10 weight estimate plots must be established per transect. If it is decided that more precise sampling with statistical reliability is needed, make an analysis in accordance with Illustration 33, Sampling Precision and Probability, to determine the number of additional plots necessary to achieve the reliability desired. Statistically reliable sampling is especially important if serious resource problems exist or major land-use adjustments are anticipated within a given allotment or inventory area.

(2) *Shrub and Tree Characterization Plot.* A minimum of 3 shrub and tree characterization plots must be established along each transect. The following data is recorded for shrubs and trees from the 1/100 acre or 1/200 acre plot (Illustration 30):

(a) Form and age class for 5 shrubs and trees of each species;

(b) Average height, and crown diameter by species; and

(c) Total number of plants by species.

(3) *Forest Land Plots.* Forest land plots are established if it is determined in the inventory plan that tree data in addition to that collected off the shrub and tree characterization plot is required.

4. Vegetation Species Occurrence

Record on Form 4412-26, Transect Data Sheet, (Illustration 23) any plant species observed in the site writeup area which is not recorded on step-point transect or plot record.

5. Endangered, Threatened, or Locally Endemic Plants

Each inventory party member must be provided with pertinent information on endangered, threatened, or locally endemic plant species likely to occur within the inventory area. Such information must include descriptions of plants, pictures, and unique plant habitats. Areas of high potential for supporting threatened, endangered,or locally endemic species must be described and identified in field maps to assist inventory members. Record observed plants on the species list, Form 4412-26 (Illustration 23). Take color photographs of observed plants.

6. Data Collection for Phenology Adjustment Factor

Data are required to develop factors to adjust vegetation production recorded at the time of inventory to maximum production for the season. To generate this data, it is necessary to clip and weigh all major species in the inventory area and also record the dimensions of study plants on Form 4412-28, Dry/Green Weight Conversion Factor Data, (Illustration 34). Specific study sites are selected for collection of phenology adjustment factor data. Data should be collected for all phenology stages by plant species. It may be desirable to collect data every 2 weeks. A minimum of 10 plants of each species should be recorded. A special team may be assigned the responsibility of collecting this data (Section XI.A.4.b.(4)).

7. Obtaining Air-Dry Weight Conversion Data

Converting green weight to air-dry weight is necessary in the compilation and interpretation phase. In order to make this conversion, vegetation samples must be collected at the same time the phenology adjustment factor data is collected (described in Section XI.D.6 above). Store samples in paper bags in a dry place and weigh them periodically until a consistently low weight is obtained. Collect these samples by species at each phenology stage for all major plant species in the inventory area. Recordation can be expedited by marking the following items on the paper bag with a rubber stamp prior to going to the field: plant species, date collected, elevation, phenology stage, green weight, and dry weight. Record this date on Form 4412-28 (Illustration 34).

8. Comparison Area Data

To determine potential vegetation communities and production, it is necessary to identify and study comparison areas. This is also important for several other interpretations.

a. *Site Potential Comparison Area.* For many range sites the SCS has identified natural plant communities (relic areas) which can be used to determine potential. To substantiate existing data and to provide potential natural plant community data for sites not already covered, additional comparison areas need to be identified. Locate relatively natural, undisturbed comparison areas in order to develop potential plant communities for the various sites in the inventory area. The natural plant community of a site, in the absence of abnormal disturbances and physical site deterioration, will be approaching the climax community for that site. It is the total plant community that is best adapted to the unique combination of environmental factors. It should be the plant community that is in dynamic equilibrium with the environment. Such natural disturbances as drought, wild fires, native fauna grazing, and insects are inherent in the development of any native plant community. Plant communities protected from these natural influences for long periods do not always typify the goal for a desirable plant community. (See Rangeland Reference Areas, Society for Range Management, Range Science Series Number 3, March 1975).

(1) *Selection.* A site is recognized and described on the basis of soils and the climax plant community which it is capable of supporting. However, management's goal is not necessarily to restore or maintain such a plant community. The goal may be to establish a somewhat altered plant community which provides adequate soil and moisture conservation yet produces benefits more useful to the objectives of the decisionmaker than the climax vegetation.

(2) *Locating Comparison Areas.* District personnel should be on a constant lookout for riparian and terrestrial comparison areas. These areas should be identified, their locations recorded on Form 4412-41, Documentation of Comparison Areas, (Illustration 20), and studies as outlined below initiated or continued even though inventories are scheduled some time in the future. Repeat studies to substantiate data.

(3) *Determining Comparison Areas.* Use the following methods in determining the natural plant community of a site:

(a) Evaluate vegetation and associated soils on areas that have been subjected to minimal abnormal disturbances.

(b) Evaluate and interpret research data dealing with ecology, management, and soils of plant communities.

(c) Review early historical accounts and botanical literature of the area.

(d) Check the SCS Range Data Systems (RDS), which provides much data useful in identifying potential communities in many areas.

(e) Check potential sites for use as comparison areas which includes:

i. Fenced exclosures.

ii. Fenced rights-of-way which have not been recently disturbed. Do not use areas which receive additional moisture through runoff from highway, or other unnatural areas.

iii. Portions of grazing allotments currently not used by livestock due to lack of water, natural barriers, etc.

iv. Protected reserves, e.g., military reservations.

v. Old cemeteries.

(4) *Studying Comparison Areas.* Characteristics of a plant community obtained from a single source are not likely to be conclusive. In evaluating plant information, consideration must be given of such factors as drought versus unusually favorable years, effects of recent fire, excessive rodent concentrations, insect damage, plant disease, and excessive soil removal or deposition by wind or water. Every effort must be made to examine plant communities throughout the area of occurrence on the site and at different seasons and during different years. The initial description of a natural plant community should be considered as an approximation subject to modification as additional knowledge is gained.

(a) Conduct all the inventory studies described above on the comparison area, using the prescribed procedures.

(b) Take pictures of soil profiles and vegetation at each comparison area.

(c) Repeat studies, using the SVIM procedures, from year-to-year to refine and substantiate data. Collect primarily ground cover and production data in these repeat studies.

(5) *Protecting Comparison Areas.* Make every effort to protect identified comparison areas from future disturbances such as livestock grazing, mining, or other surface disturbing activities. The protection of these areas is necessary for continuing studies. It may be appropriate to place a BLM protective withdrawal on identified comparison areas. This can be accomplished under regulation 43 CFR Subpart 6225, Withdrawal of Natural Areas. Document comparison areas by completing Form 4412-41, Documentation of Comparison Areas, (Illustration 20). Assign a number to each comparison area. The number must consist of the following: State, District, township, range, consecutive number within the township and range.

b. ***Watershed Comparison Areas.*** Data gathered during the course of the inventory can be used to provided guidance in determining changes in erosion condition rating (Soil Surface Factor [SSF] Rating) and ground cover. (See BLM Manual Section 7322.11B7 for additional guidance on selecting watershed comparison areas.)

Type of Areas. Data obtained in the following types of areas can be used for watershed comparison area purposes: degraded areas adjacent to water, trails, etc.; mechanically treated areas, e.g., chaining, plowing, railing, etc., and chemically treated areas.

9. Determining Erosion Condition Class

Soil Surface Factor (SSF) information must be completed for each site writeup area sampled and recorded on the space provided on Form 4412-26, Transect Data Sheet, (Illustration 23). Complete an SSF writeup for each SWA sampled, assessing the erosion ratings of the surrounding area. (See Section XVI, Soil Surface Factor.) The determination of SSF is made after the transect has been completed. In determining SSF, it is necessary to evaluate the entire SWA and not localize the evaluation.

E. Forest Lands Inventory

Determine in the inventory plan if forestry data will be collected. Forest land mapping and the completion of Form 4412-37, Photo Sample Record, (Illustration 35), should occur during the mapping phase (Section XI.B). This form may be completed for all the inventory area, if so desired.

1. Conducting Inventory

The minimum mapping size of forest types is usually 40 acres or larger. For purposes of this inventory, a tree is defined as a woody plant having at least one well defined stem and a more or less well-formed crown, capable of attaining a height of at least 8 feet.

2. Recording

The initial forestry data is recorded on Form 4412-37, Photo Sample Record, (Illustration 35). This allows entry of stand or SWA information on trees, shrubs, grasses, and forbs. The use of this form for initial forestry input does not mean that other, more detailed forms may not be used along with intensive forest and rangeland surveys. The identified vegetation types may be used for preliminary typing, stratification, and mapping.

F. Wildlife Resources Field Inventory

Illustration 36 depicts the interrelationships between SVIM and wildlife resources inventories (Integrated Habitat Inventory and Classification System, BLM Manual Section 6602; Big Game Studies, and BLM Manual Section 6630; and Aquatic studies BLM Manual Section 6670).

1. Opportunistic Animal Sightings

Any wildlife observed during the inventory must be recorded on Form 4412-39, Wildlife-Recreation Observation Report, (Illustration 37), for each SWA sampled. The Wildlife-Recreation Observation Report is given to the District wildlife biologist for any followup action deemed appropriate. (More intensive sampling may be conducted later, using Form 6602-1, Animal Species Occurrence by Habitat Type, Illustration 38 [BLM Manual Section 6602].)

2. Special Habitat Features

During the inventory of a SWA, note special wildlife habitat features on aerial photographs and quads and record them on Form 6602-2, Special Habitat Feature, (Illustration 39, and refer to BLM Manual Section 6602). Features to be mapped will have been determined during the pre-planning analysis and stated in the inventory plan. This will identify areas which the wildlife biologist may want to investigate in detail at a later date. Special habitat features may include soil or vegetation units smaller than 6 acres (Section XI.B.4).

3. Riparian Areas

Riparian areas are extremely important and, therefore, require special attention in the SVIM procedures. Map and sample all riparian areas (existing and potential).

Recordings

a. ***Vegetation Condition*** (shrub and tree characterization plot) of the riparian habitat must be obtained by using the SVIM.

b. ***Tree Species*** within the riparian site must be recorded on Form 4412-27, Weight Estimate and Vegetation Characterization (Section XI.D.3.c.(2) and Illustration 31).

4. Optional Data - Identifying Sagebrush Species

Various sagebrush species have different palatability. Because of problems in identifying different species, a key has been developed for sagebrush species. (This key is available from the Service Center D-460.) Use portable black light (flashlight type) to assist in sagebrush species identification.

G. Recreation Field Inventory

For each SWA sampled, use Form 4412-39, Wildlife-Recreation Observation Report, (Illustration 37). Note the occurrence of recreation visitor use, incident, cultural features, or significant natural history feature observed. Give this observation report to the District recreation specialist for any followup action deemed appropriate.

H. Inventory Narrative Report

Upon completion of the field portion of the inventory, the party chief prepares a narrative report. This must be a concise report covering the important items concerning the inventory. One copy of the report is submitted to the State Director, and another retained in the permanent District files for future reference purposes. The following items should be included:

1. Description of inventory:
   a. Field season,
   b. Inventory party; and
   c. Procedures.
2. Inventory activities:
   a. Problems encountered and solutions,
   b. Variations and modifications to inventory plan; and
   c. Data gaps or problems
3. Recommendations:
   a. Additional data needed; and
   b. Changes for future inventories.
4. Approval of inventory:
   a. Party Chief;
   b. Area Manager; and
   c. District Manager.

I. Additional Required Data

In order to compile the soil-vegetation data, certain other data must be compiled and submitted with the inventory to the Service Center Director (D212) for computer compilation. These include:

1. Site Writeup Area Acres (by legal description), Form 4412-29 (Illustration 40).
2. Forage Requirement Data, Form 4412-31 (Illustration 41).
3. Livestock Use Data, Form 4412-32 (Illustration 42).
4. Phenology Adjustment Data, Form 4412-33 (Illustration 43). This is completed if the District computes its own phenology adjustment factors.
5. Ecological Site Description, Form 4412-34 (Illustration 44).

6. Diet/Use Factor by Animal and Season, Form 4412-35 (Illustration 45).

7. Wildlife Use Data, Form 4412-36 (Illustration 46).

8. Suitability for Livestock Grazing, Form 4412-40 (Illustration 47). This is completed after inventory data is compiled, and submitted to the Service Center (D212) prior to vegetation allocation.

Equipment For Soil-Vegetation Inventory Method

Vegetation

1. Hoops for use in defining circular plots of desired size:

   .96 sq. ft. = 41.7 inches circumference
      1/10th guide or .096 sq. ft. = 13.2 inches circumference
   1.92 sq. ft. = 59.0 inches circumference
      1/10th guide or .192 sq. ft. = 18.64 inches circumference
   4.8 sq. ft. = 93.2 inches circumference
      1/10th guide or .48 sq. ft. = 29.5 inches circumference
   9.6 sq. ft. = 131.8 inches circumference

      Palo which extends to a length of 9.6 ft. with calibrations for .96, 1.92, 4.8 ft.

2. Accurate spring balances with 1 or 2 gram calibrations.
3. A 6 by 10-inch cloth sack or plastic bag.
4. Letter-size tatum holder, clipboard, or aluminum holder.
5. Supply of field forms.
6. An 11.7-foot fine cable or chain with a spike tied on one end for measuring 1/100-acre plots.
7. Clippers for clipping vegetation.
8. An 8-foot tape measure delineated in tenth's.
9. Pocket stereoscope.
10. Orthophoto quads, aerial photos, USGS quads, and maps.
11. Abney level or Clinometer.
12. Rapidograph pen.
13. India ink.
14. Photo pricker.
15. Tally register.
16. Hand stapler.
17. Tentative plant species list and appropriate vegetation keys.
18. Plastic bags for plant collection.
19. Compass.
20. Cruiser vest for carrying equipment.

Soil Inventory

1. Aerial photo 1:24,000 to 1:12,000 topographic may (7-1/2 or 15') —if aerial photos not available.
2. Tiling spade (sharpshooter).
3. Soil auger - 2 3/4" diameter with extension handle and two auger heads (sand and standard).
4. Geologist's rock hammer.
5. Chisel-painted bar.
6. Pick
7. Acidity - Alkalinity (ph) kit - P.H. kit.
8. Hydrochloric acid solution - 10 percent solution.
9. 10X hand lens.
10. Clinometer or Abney level.
11. Measuring tape - both metric and English units.
12. Knife - 4- to 5-inch blade.
13. Munsel soil color charts.
14. Plastic bottle - 1/2 pint to 1 quart size.
15. Marking pencils - for photo. Photography equipment for field photography.
16. Office equipment - drafting tools (pens, lettering set, drafting and overlay paper, rulers and french curves, and scales for measuring distance).
17. Vehicles - 4-wheel drive for field inventory mounted with power probe; helicopter for pre-inventory, tractor w/back-hoe.

Documentation of Comparison Areas

Form 4412-41
(July 1979)

Bureau of Land Management
Standard Unit Record
For
Site Control Data
Documentation of Comparison Areas

Record Type		V	4
State		U	T
District		0	2
Township	0	9	N
Range	2	0	W
Comparison Area No.	0	0	1

DOCUMENTATION OF COMPARISON AREAS

1. Name of area BLØDGETT CREEK
2. Location T9N, R20W, SW¼, NE¼ Sec 21
   (Legal Description)
3. Ownership of land BLM
4. Size and dimensions of comparison area 20 acres
5. Vegetation community ARTR2, AGSP
6. SCS Range Site Name (if named), and number SANDY UPLAND D34X0214
7. Soils Taxanomic Unit 4001
   a. Soil profile ________
8. Major plant species ARTR2, AGSP, FEID, SIHY
9. Management or use past 50 years (if known) FENCED AREA WHICH HAS RECEIVED NO LIVESTOCK GRAZING
10. Type of area (exclosure, right of way, etc.) EXCLOSURE
11. Evidence of possible influences (e.g., rodents, insects, disease, etc.) NONE
12. Altitude 5500 Exposure NW Slope 10%
13. General description of area LOCATED UP BLØDGETT CREEK Road 1.3 miles from US 191

Illustration 20 Page 2

Documentation of Comparison Areas

14. Date established (if previously established) ____________

15. Vegetation sampling: yes

a. Has vegetation been sampled? yes

b. When and by what methods? 5 VIM, June, 1979

c. Where are records retained? BLODGETT DISTRICT OFFICE

16. Photographs:

a. When? ____________

b. Type of photo's? 35 mm color

c. Where retained? BLODGETT D.O.

17. Geologic formation ____________

18. Is area protected from future disturbance? yes

a. If not, what needs to be done to protect the area, both legally and physically? ____________

Report by Clyde Dudley Date 6/15/79

(Please fill in as many blanks as possible and include a map showing location of area.)

Illustration 21

Ecological Site, Seral Stage (Condition Class), and Site Writeup Area Mapping

1. Delineate ecological sites (range sites, woodland sites, or forest types).

2. Divide range sites into seral stages, (condition classes) if more than one seral stage (condition class) exists within a range site.

3. Further divide seral stages (condition classes) into present vegetation communities if more than one vegetation community exists within the stage (class).

4. The smallest delineation becomes a site writeup area (SWA). Place a SWA number within the SWA.

   All SWA's that are in the same range site, woodland site, or forest type and present vegetation community are placed in the same stratum for sampling.

5. The mapping team must determine how the vegetation transect is to be laid out on the representative SWA's which are to be sampled. On the areal photograph depict the location of the transect.

6. The mapping team must complete the pertinent site control data items on Form 4412-26, Transect Data Sheet. (See Illustration 34.)

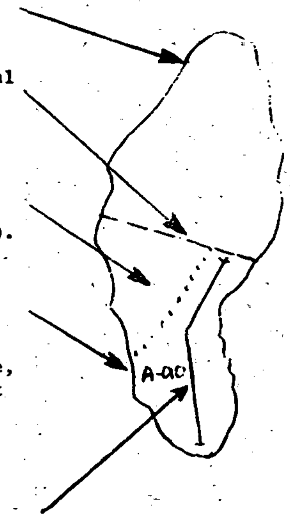


Illustration 22

Soil Description Field Data

Form 4412–38 (July 1979)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SOIL DESCRIPTION FIELD DATA

RECORD TYPE		S	1
STATE	(1)	U	T
DISTRICT		0	2
PLANNING UNIT		0	2
SOIL NUMBER	(2) 4 0 0.		1
SOIL STATUS	(3)		E
ACTION (A=ADD, D=DELETE)	(4)		A

Soil Type (5) ALPHA FINE SANDY LOAM — Date (6) 77-4-13 — Collector (7) CHUCC

Classification (0) LOAMY-SKELETAL, MIXED MESIC, XEROLLIC CALCORTHIDS

Location (9) 100 Ft. WEST, 150 Ft. NORTH OF SW COR. SEC.7, T1N, R3W

N. Veg. (10) ARTR, ORHY — Climate (11) 13" 54°F 61°F

Parent Material (12) ALLUVIUM FROM BASIC IGNEOUS AND SEDIMENTARY ROCK

Land Form (13) ALLUVIAL FAN

Relief (14) CONVEX — Drainage (15) WELL — (16) Salt or Alkali STRONGLY

Elevation (17) 5400 — Gr. Water (18) DEEP — Stoniness (19) NONE

Slope (20) 8% — Moisture (21) MOIST TO 9 INCHES

Aspect (22) N 10° — Root Distrib. (23) 34 INCHES — % Clay

Erosion (25) SLIGHT — % Coarse Fragments (24) — % Coarser than V.F.S.

Permeability (26) MODERATE

(24) Control section average

Horizon (27)	Depth (27)	Color Dry (27)	Color Moist (27)	Texture (27)	Structure (27)	Consistence Dry (27)	Consistence Moist (27)	Consistence Wet (27)	Reaction (27)	Boundary (27)	(28) Roots	Pores
A1	0-2	10YR6/2	10YR3/3	CoB, fsb	1tpl	sh	fr	ss p	8.4	as	1f	vcs 2f
B2	2-9	10YR6/3	10YR3/4	l	1mpr Kebl.c	sh	fr	ss p	8.2	as	2f 1c	1f Tub
C1Ca	9-20	10YR7/2	10YR5/2	gL	m	h	fr	ss sp	8.5	as	2f 1m	2f Tub
C2Ca	20-34	10YR6/3	10YR5/3	gsL	m	h	vfr	ss po	8.6	as	2f 1m	2f Tub
IIC3	34-60	10YR5/1	10YR4/1	vg lcs	sg	l	l	so po	8.4		v.f	

Additional notes

(13) See glossary of terms for land form descriptions.

(14) Concave, convex, single or complex.

(15) Describe in terms of very poorly drained, poorly drained, somewhat poorly drained, moderately well drained, well drained, etc., as described in Soil Survey Manual — Agriculture Handbook 18, Pages 170–172.

(16) Class of salinity or alkalinity in terms of slight, moderate or strong, if applicable.

(17) Best estimate if topographic maps are not available.

(18) Depth at which a water table is observed.

(19) Defined in terms of classes. See Soil Taxonomy — Agriculture Handbook 436, Pages 472–475.

(20) Percent slope at site of description.

(21) Indicate whether soil is dry, slightly moist, moist or wet when examined, and approximate depth.

(22) Direction the slope faces and its bearing.

(23) Depth of the majority of root penetration, (a few fine roots at depth does not qualify).

(24) To be used only in the classification of soil. VFS=Very Fine Soil.

(25) Class of eroded soils in terms of none, slightly, moderately, severely or very severely eroded.

(26) Class in terms of very slow, slow, moderately slow, moderate, moderately rapid, rapid, or very rapid.

(27) Enter terms as defined in Soil Taxonomy — Agriculture Handbook 436, Pages 459–481, and other definitions and abbreviations for soil descriptions that are appropriate for your State.

(28) Additional data applicable for the soil profile, such as pores, calcium carbonate, clay films, roots, etc.

INSTRUCTIONS

(1) Standard two-digit code from BLM Manual Section 1265.

(2) Soil number assigned to the series.

(3) Status of the soil series name – proposed (P), tentative (T) or established (E).

(4) "A" when new data is entered; "D" when series data is changed.

(5) Soil series name, type, and phase.

(6) Year, month, and day.

(7) Collectors last name.

(8) Classification at the family level.

(9) Measured distance from a known or assumed section corner, range, and township.

(10) Major overstory and understory plants.

(11) Mean annual precipitation, soil temperature at 20 meters and mean summer soil temperature.

(12) General characteristics in terms of alluvium, residuum, colluvium, etc., and the kinds of rocks the soil is forming within.

Transect Data Sheet

Form 4412-26
(June 1979)

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

TRANSECT DATA SHEET

RECORD TYPE . . . . (1) V 1
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) :4:T:0:2:4:8:0:2:
ALLOTMENT . . . . (4) :4:0:1:1:
PASTURE . . . . (5) :0:2:
SITE WRITEUP AREA (SWA) . . . (6) :B:0:0:1:
TRANSECT NUMBER . . . . (7) :0:1:
COMPARISON AREA . . . . (8) :C:
DATE (YYMMDD) . . . . (9) :7:9:0:6:1:5:
ACTION CODE (A,D) . . . . . . (10) :A:

(11) AERIAL PHOTO :ARS-14-102:

(12) RECORDER :JNB:

(13) GROUND COVER DATA — BASAL	DOT COUNT	(14) HITS	(15) PLANT LIST — SYMBOL	SYMBOL	SYMBOL	SOIL FACTOR ITEMS	(16) RATING
BARE GROUND	⊠ ⊠ ⊠ ⊠ ⊠ ⊠	60	SIHY			SOIL MOVEMENT	5
PERISTENT LITTER	⊠ ∷	14	STCφ3			SURFACE LITTER	3
NON-PERSISTENT LITTER	⊠ ⊠ ⊠ ··	32	PφSE			SURFACE ROCK	4
GRAVEL (2mm - 3")	⊠ ··	12	BRTE			PEDESTALLING	4
COBBLE (3" - 10")	··	2	SAKA			FLOW PATTERNS	5
STONE (> 10")	·	1				RILLS	2
BEDROCK						GULLIES	2
						(17) SOIL SURFACE FACTOR TOTAL	25

(18) LEVEL OF TRANSECT HIT — BASAL	CANOPY 1	CANOPY 2	CANOPY 3	DOT COUNT	(19) HITS	(18) LEVEL OF TRANSECT HIT — BASAL	CANOPY 1	CANOPY 2	CANOPY 3	DOT COUNT	(19) HITS
SPCφ				··	2						
ARTR2				□	8						
B	N			·:·	3						
B	SPCφ			⊠	9						
AGSP	ARTR2	PIED		··	2						
N	φRHY			··	2						
B	P			∷	4						
B	IV			□	8						
B	AGSP			··	2						
GEMA				⊠ ∷	14						
AGSM				·:·	3						
B	ARAR8			⊠ ·	11						
P	ARTR2			⊠ ·	11						

(Continued on reverse)

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0

Transect Data Sheet

(Continued from front)

(18) LEVEL OF TRANSECT HIT					(19)
BASAL	CANOPY 1	CANOPY 2	CANOPY 3	DOT COUNT	HITS

INSTRUCTIONS FOR RECORD TYPE V1

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 0968	ALLOTMENT: Enter designated RMAS four-character number.
(5)	DE 3905	PASTURE: Enter pasture number; blank if none. (Must be unique within Allotment.)
(6)	DE 3507	SITE WRITUP AREA: Enter SWA number.
(7)	DE 3508	TRANSECT: Enter Transect number.
(8)	DE 3572	COMPARISON AREA: If data is from Comparison Area, enter "C"; otherwise leave blank.
(9)	DE 6618	DATE: Enter Date of data collection (Yr,Mo,Day).
(10)	DE 7350	ACTION CODE: Enter "A" to add new data: "D" to delete existing data.
(11)	DE 6525	RECORDER: Enter Recorder's initials.
(12)	DE 5713	AERIAL PHOTO: Enter Photo-ID or Map Identifier.
(13)	DE 3526	GROUND COVER DATA: Record Dot Counts by Basal Categories.
(14)	DE 3527	HITS: Record total number of hits for each basal category (use section to left for dot count tally). (See BLM Manual Section 4412.14, Illustration 38, for diagramatic sketches of step point data and recording procedures.) When a hit is duplicated on a transect it can be dot-counted rather than making a new entry.
(15)	DE 2646	PLANT LIST: Record other plant species observed but not encountered on pace transect.
(16)	DE 4817	SOIL FACTOR ITEMS: Enter a value for each item as determined for Site Writeup Area. This is the recorded rating from the required soil surface factor form. (See BLM Manual Section 7322.11B.)
(17)	DE 4818	SOIL SURFACE FACTOR TOTAL: Record SSF total. This is an optional entry item.
(18)	DE 3526	LEVEL OF TRANSECT HITS: Enter appropriate ground cover and/or plant symbol encountered at each level. (See BLM Manual Section 4412.14, Illustration 38, for diagramatic information.)
(19)	DE 3527	HITS: Record total number of Hits. Use column to left for Dot-Count tally.

WORK AREA/REMARKS

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z   1 2 3 4 5 6 7 8 9 0

Stratification Data And General Characteristics

Form 4412-30
(June 1979)

Page ___ of ___

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V B
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) U:T:0:2:4:8:0:2
CLIMATIC ADJUSTMENT FACTOR . (4) _:1:1:1:3
DATE (YYMMDD) . . . . (5) 7:9:0:6:1:5
ACTION CODE (A,D) . . . . . . (6) A

STRATIFICATION DATA AND GENERAL CHARACTERISTICS

(7) SWA NUMBER	(8) TRAN SECT	(9) % OF SWA	(10) RANGE SITE	(11) STRATUM	(12) ALLOT	(13) PASTURE	(14) VEGETAL SUB-TYPE	(15) COND. CLASS	(16) % SLOPE	(17) SLOPE ASPECT	(18) LAND FORM	(19) PHASES OF SOIL SERIES
B001	01	60	034X001U	0001	4001	01	1002	F	10	N	MSA	4001
B001	02	40	034X002U	0002			4041	P	10	N		4023
B002	01	100	034X001U	0001			1002	F	15	NW		4001
B003		70	034X003U	0003			4041	G	15	SE	RDG	4015
B003		30	034X004U	0004			4042	F	15	SE	RDG	4026
B004		100	034X003U	0003			4041	G	20	W	VAL	4015
B005	01	100	034X001U	0001			1002	F	10	S	MSA	4001
B006	01	50	034X003U	0003			4041	G	25	SW	RDG	4015
B006	02	50	034X004U	0004			4042	F	25	SW		4026
B007		100	034X003U	0003			4041	G	10	E		4015

ABCDEFGHIJKLMNØPQRSTUVWXYZ 1234567890

Stratification Data And General Characteristics

I N S T R U C T I O N S   F O R   R E C O R D   T Y P E   V B

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 3547	CLIMATIC ADJUSTMENT FACTOR: Enter climatic adjustment factor to be used to adjust production data to an average year. If no factor is entered, it will be assumed that no climatic adjustment is needed.
(5)	DE 6618	DATE: Enter Date of data collection (Yr,Mo,Day).
(6)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(7)	DE 3507	Site Writeup Area: Enter SWA number.
(8)	DE 3508	TRANSECT: Enter transect number.
(9)	DE 3516	% OF SWA: Enter percent of SWA which is within the stratum. If the entire SWA is in the stratum enter "100". (Fractions of a percent are not allowed)
(10)	DE 3528	ECOLOGICAL SITE: Enter range or woodland site number according to the following example: D 3 4 A 0 0 1 A N U C where D = Major Land Resource Region 34 = Major Land Resource Area A = Subarea (If no subarea enter "X") 001 = Consecutive Site Number and ANUC = States in which range site is correlated, e.g. Arizona, New Mexico, Utah, and Colorado.
(11)	DE 3906	STRATUM: Record a stratum number for each entry.
(12)	DE 0968	ALLOTMENT: Enter designated RMAS four-character number.
(13)	DE 3905	PASTURE: Enter pasture number; blank if none (Must be unique within allotment.)
(14)	DE 2706	VEGETATION SUB-TYPE: Enter standard vegetation sub-type code. (See Form 4412-30a for proper codes.)
(15)	DE 2625	CONDITION CLASS (Seral Stage): Enter initial condition class assigned by mapping team. Code as follows: E - Excellent (Climax) 76 to 100 % of potential G - Good (High) 51 to 75 % of potential F - Fair (Medium) 26 to 50 % of potential P - Poor (Low) 0 to 25 % of potential
(16)	DE 3874	% SLOPE: Enter average slope for the SWA in nearest whole percent.
(17)	DE 6523	SLOPE ASPECT: Enter average slope aspect for SWA as follows: N - North NW - Northwest W - West SW - Southwest S - South SE - Southeast E - East NE - Northeast F - Flat
(18)	DE 5132	LANDFORM: Enter landform code for SWA. (See Form 4412-30a for proper codes.)
(19)	DE 4649	PHASES OF SOIL SERIES: Enter the phases of soil series from the State Soil Inventory legend.

Automatic Data Processing (ADP) Codes for Vegetation Types and Sub-Types

Form 4412-30a
(July 1979

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Automatic Data Processing (ADP) Codes for
Vegetation Types and Sub-Types

TYPE	CODE NUMBERS	SUB-TYPE
1. GRASS	1001	SHORT GRASS
	1002	MID GRASS
	1003	TALL GRASS
2. GRASSLIKE	2001	SEDGE
	2002	RUSH
3. PERENNIAL FORBS	3001	PERENNIAL FORB
4. SHRUBS	4001	BLACK GREASEWOOD
	4002	BAILEY'S GREASEWOOD
	4011	CREOSOTO BUSH
	4012	TARBUSH
	4013	BROOM DALEA
	4015	WINTERFAT
	4021	MESQUITE
	4031	SHADSCALE
	4032	NUTTAL SALTBRUSH
	4033	MAT SALTBUSH
	4034	FOURWING SALTBUSH
	4035	OTHER SALTBUSHES
	4036	DESERT SALTBUSH ATPO
	4037	MIXED DESERT SHRUB
	4041	BIG SAGEBRUSH
	4042	LOW SAGEBRUSH
	4043	BLACK SAGEBRUSH
	4044	OTHER SAGEBRUSHES
	4045	RABBITBRUSH
	4046	SAND SAGE
	4051	CHAMISE
	4052	MANZANITA
	4053	CEANOTHUS
	4054	SHINNERY OAK
	4055	CHAPARRAL
	4056	MOUNTAIN MAHOGANY
	4057	BITTERBRUSH
	4058	OAKBRUSH
	4059	SERVICEBERRY

Automatic Data Processing (ADP) Codes for Vegetation Types and Sub-Types

TYPE	CODE NUMBERS	SUB-TYPE
4. SHRUBS (CON.)	4060	MIXED MOUNTAIN SHRUB
	4061	BLACKBRUSH
	4062	CACTUS
	4063	JOSHUA TREE
	4064	YUCCA
	4065	WHITE THORN
	4066	PALOVERDE CERCI
	4067	BURSAGE FRDE-FRDU
	4068	CATCLAW
	4069	SOTOL
	4070	MARIOLA
	4071	SNAKEWEED
	4072	FRINGED SAGEBRUSH
	4073	CLUBMOSS
	4074	WILLOW
	4075	TURPENTINE BRUSH HALA
	4076	BURROWEED HATE
	4077	MORMAN TEA
	4078	SKUNK BUSH
	4079	OCOTILLA
	4080	SACAHUISTE
	4081	ALDER
	4999	OTHER SHRUBS
5. BROADLEAF TREES	5074	WILLOW
	5075	DESERT WILLOW
	5077	BIRCH-ALASKA
	5079	BALSAM POPLAR-COTTONSEED
	5081	RED ALDER
	5082	POPLAR-BIRCH
	5083	ASPEN
	5084	CALIFORNIA BLACK OAK
	5085	COTTONWOOD
	5086	MAPLE
	5087	ORGON WHITE OAK
	5088	MADRONE
	5089	TAN OAK
	5999	OTHER BROADLEAF TREES
6. CONIFER	6001	DOUGLAS FIR
	6002	DOUGLAS FIR-WESTERN HEMLOCK
	6003	PORT ORFORD CEDAR
	6004	DOUGLAS FIR-WHITE FIR
	6011	PONDEROSA PINE

Automatic Data Processing (ADP) Codes for Vegetation Types and Sub-Types

TYPE	CODE NUMBERS	SUB-TYPE
6. CONIFER (CON.)	6012	JEFFREY PINE
	6013	PONDEROSA PINE-SUGAR PINE-FIR
	6014	SUGAR PINE
	6015	INCENSE CEDAR
	6021	WESTERN WHITE PINE
	6031	WHITE FIR
	6032	RED FIR
	6033	GRAND FIR
	6034	PACIFIC SILVER FIR
	6035	ENGLISHMANN SPRUCE
	6036	ENGLISHMANN SPRUCE-SUBALPINE FIR
	6037	WHITE SPRUCE
	6038	BLUE SPRUCE
	6039	NOBLE FIR
	6041	WESTERN RED CEDAR
	6042	SITKA SPRUCE
	6043	BLACK SPRUCE
	6047	MOUNTAIN HEMLOCK
	6048	WESTERN HEMLOCK
	6055	WESTERN LARCH
	6056	GRAND FIR-LARCH-DOUGLAS FIR
	6057	PONDEROSA PINE-LARCH-DOUGLAS FIR
	6058	LARCH TAMARACK-ALSKA
	6061	LODGEPOLE PINE
	6071	REDWOOD
	6091	COULTER PINE
	6092	DIGGER PINE-OAK
	6093	PINYON-JUNIPER
	6094	KNOBCONE PINE
	6095	BRISTLECONE PINE
	6096	WHITEBARK PINE-LIMBER PINE
	6097	PINYON
	6088	JUNIPER
	6999	OTHER CONIFER
7. CRYTOGAMS	7001	LICHEN-MOSS
	7002	MOSS
	7003	LICHEN
	7004	FERN
	7999	OTHER

Automatic Data Processing (ADP) Codes for Vegetation Types and Sub-Types

TYPE	CODE NUMBERS	SUB-TYPE
8. BARREN	8001	BADLAND
	8002	BEACHES
	8003	BLOWN-OUT LAND
	8004	CINDER LAND
	8005	DRY LAKE BED
	8006	DUMPS
	8007	DUNE LAND
	8008	GULLIED LAND
	8009	GYPSUM LAND
	8010	LAVA FLOWS
	8011	OIL-WASTE LAND
	8012	PITS
	8013	PLAYAS
	8014	QUARRIES
	8015	RIVERWASH
	8016	ROCK OUTCROP
	8017	RUBBLE LAND
	8018	SALT FLATS
	8019	SCORIA LAND
	8020	SLICKENS
	8021	SLICK SPOTS
	8999	OTHER
9. ANNUAL GRASSES	9001	CHEATGRASS
	9002	MEDUSAHEAD RYE
	9003	RED BROME
	9005	THREE-AWN
	9006	SIX-WEEKS GRAMA
	9999	OTHER
10. ANNUAL FORBS	0001	FILAGREE
	0002	HALOGETON
	0999	OTHER

Standard Land-Form Coding and Descriptions

FORM 4412-30B
(JULY 1979)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

STANDARD LAND-FORM CODING AND DESCRIPTIONS
(FOR USE IN COMPLETING FORMS 4412-30 AND 4412-38)

ALF Alluvial Fan: the fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream. (Webster)

ALP Alluvial Plain:

1. A level or gently sloping flat or a slightly undulating land surface resulting from extensive deposition of alluvial materials by running water. (Webster)

2. A plain formed by lateral coalescence of alluvial fans (a piedmont alluvial plain). (Webster)

BAL Badland(s): a region characterized by the intricate and sharp erosional sculpture of generally weak rocks usually forming nearly horizontal beds, generally developing in decomposed granite, loess, or other soft material, lacking or having only scanty vegetation, and consisting of steep, burrowed, or fantastically formed hills, labryinthine drainage, and normally dry watercourses or arroyos. (Webster)

BFE Basin Floor External: a basin floor which drains into another area.

BFI Basin Floor Internal: a basin from which there is no outward drainage.

BMR Bog Marsh Riparian

BTT Butte: an isolated hill or a small mountain with steep or precipitous sides and a top variously flat, rounded, or pointed that may be residual mass isolated by erosion, a volcanic cone, or an exposed volcanic neck, and that usually has a smaller summit area than a mesa. (Webster)

CAL Caldera(s): a crater whose diameter is many times that of the volcanic vent because of the collapse or subsidence of the central part of a volcano or because of explosions of extraordinary violence. (Webster)

CAN Canyon: a deep narrow valley with precipitous sides characteristic of regions where downward cutting of the streams greatly exceeds weathering; Gorge. (Webster)

CES Cuesta: southwest; a sloping plain especially with the upper end at the crest of a cliff; a hill or ridge with a steep face on one side and gentle slope on the other. (Webster)

DOM Dome: a rounded mountaintop or vast mound of ice. (Webster)

Standard Land-Form Coding and Descriptions (continued)

FPL Flood Plain:

1. A flat or nearly flat surface that may be submerged by floodwaters. (Webster)

2. A plain built up or in the process of being built up by stream deposition. (Webster)

GCR Glacial Cirque

GMR Glacial Morraine: the ridge-like accumulation of sediments deposited by a glacier.

GOW Glacial Outwash: the stratified material deposited by streams of melt-water as it flows away from a glacier.

GTO Glacial Trough

GUL Gully: a miniature valley or gorge worn in the earth originally by running water through which water usually runs only after rains. (Webster)

HBK Hogback: a ridge of land formed by the outcropping edges of tilted strata; broadly, a ridge with a sharp summit and steeply sloping sides. (Webster)

HIL Hill: a natural elevation of land of local area and well-defined outline; a more or less rounded elevation as contrasted with a peaked or precipitous one. (Webster)

IPR Intermittent Playa Riparian:

KRS Karst

LCP Lacustrine Plain: a flat or nearly flat surface.

MSA Mesa: a usually isolated hill or mountain having abrupt or steeply sloping sides and a level top that is composed of a resistant, nearly horizontal stratum of rock and is usually greater in area than that of a butte; a small isolated plateau. (Webster)

MTN Mountain and Deeply Dissected Plateaus: a steep elevation with a restricted summit area projecting 1000 feet or more above the surrounding land surface. (Webster)

OLR Lake Riparian

ORR Reservoir Riparian

OSR Stream Riparian

Standard Land-Form Coding and Descriptions (concluded)

PED Pediment: a broad, gently sloping bedrock surface with low relief that is situated at the foot of a much steeper mountain slope in an arid or semi-arid region; is usually covered with a thin veneer of alluvial gravel and sand and is an erosional surface in contrast to a depositional piedmont plain. (Webster)

PEP Peneplain or Plateau: an erosion surface of considerable area and slight relief - also called endrumpt. (Webster)

PMT Piedmont: lying or formed at the base of mountain. (Webster)

PYA Playa: an undrained desert basin that becomes at times a shallow lake on which evaporation may leave a deposit of slat or gypsum. (Webster)

RDG Ridge: a range of hills or mountains or the upper part of such a range; an extended elevation between valleys. (Webster)

SBS Subsidence: an area with subsidence from subsurface mining.

SDL Saddle: a ridge connecting two higher elevation, a low point in the crest line of a ridge. (Webster)

SDN Sand Dune: a hill or ridge of sand piled up by the wind commonly found along shores, along some river valleys, and generally where there is dry surface sand during some part of the year. (Webster)

SNK Sinkhole

SRP Scarp: a line of cliffs produced by faulting or erosions. Fault Scarp - cliff or escarpment directly resulting from an uplift along one side of a fault. (Webster)

SUR Sub-Riparian

TRC Terrace; a level and ordinarily rather narrow plain, usually with a steep front bordering a river, a lake, or the sea; a topographic bench. (Webster)

VAL Valley:

1. An elongate depression of the earth's surface commonly situated between ranges of hills or mountains and often comprising a drainage area.

2. An area of generally flat land extending many miles inland and drained or watered by a large river and its tributary streams. (Webster)

WMR Web Meadow Riparian

Transect Layout

THE MAPPERS MUST DECIDE HOW THE TRANSECT CAN BEST BE LAID OUT TO OBTAIN A RELIABLE SAMPLE. SEVERAL OPTIONS ARE AVAILABLE AND THE TRANSECT DESIGN MUST BE DETERMINED ON A CASE-BY-CASE BASIS. IT IS RECOMMENDED THAT, WHERE FEASIBLE, THE TRANSECT BE LAID OUT ACROSS THE LONGEST AXIS AS DESCRIBED IN OPTION I BELOW.

I. LAYING OUT TRANSECT ACROSS THE LONGEST AXIS OF SWA

STEP 1. MEASURE THE DISTANCE ACROSS THE LONGEST AXIS OF SITE WRITEUP AREA IN FEET WITH A USGS 1:24,000 SCALE (ORTHOPHOTO QUADS) (SEE APPENDIX 10, GUIDE TO MAP SCALES)

STEP 2. DIVIDE THE DISTANCE MEASURED BY 200 (THE NUMBER OF POINTS IN THE STEP-POINT TRANSECT).

STEP 3. DIVIDE THE DISTANCE BETWEEN POINTS BY THE LENGTH OF YOUR PACE (A PACE IS TWO STEPS) TO GET THE NUMBER OF PACES BETWEEN POINTS.

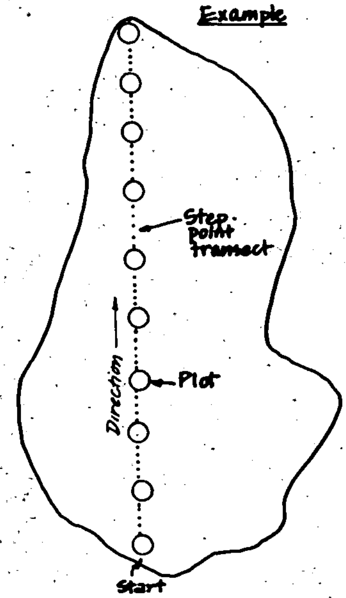
STEP 4. MEASURE THE COMPASS BEARING OF THE LINE BY PROTRACTION OFF THE ORTHOPHOTO QUAD OR AERIAL PHOTO

STEP 5. PROCEED TO STARTING POINT.

STEP 6. TAKE PHOTOGRAPH OF THE SITE WRITEUP AREA ALONG THE TRANSECT LINE.

STEP 7. THE FIRST POINT IS HALF THE NUMBER OF PACES CALCULATED IN STEP 3. PACE TO THIS POINT TO BEGIN RECORDING.

Example



Step 1 - 9000 ft.

Step 2 - $\frac{9000 \text{ ft.}}{200 \text{ pts}}$ = 45 ft. between points

Step 3 - $\frac{45 \text{ ft}}{6 \text{ ft. pace}}$ = 7.5 paces (rounded down to 7)

Step 4 - Bearing measured is 76°

Step 7 - $\frac{7 \text{ paces}}{2}$ = 3.5 paces (rounded down to 3) to first point

Transect Layout

STEP 8. COMPLETE 20 POINTS OF THE STEP-POINT TRANSECT

Example

Step 8 - RUN TRANSECT ON COMPASS BEARING OF 76°

STEP 9. PLACE THE WEIGHT-ESTIMATE/ CHARACTERIZATION HOOP OR PALO AT THE 20th POINT. CONDUCT CHARACTERIZATIONS OF GRASSES AND FORBS AND RECORD WEIGHTS OF ALL SPECIES.

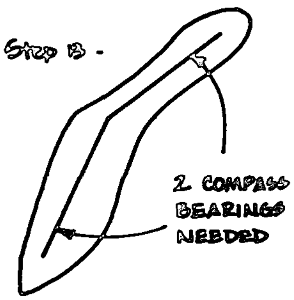
STEP 10. DETERMINE THE CENTER POINT OF THE 1/100th ACRE OR 1/200th ACRE PLOT AND CONDUCT SHRUB CHARACTERIZATIONS AND COUNTS.

STEP 11. REPEAT STEPS 8, 9, and 10 TO COMPLETE 200 POINTS FOR THE STEP-POINT TRANSECT AND 10 WEIGHT-ESTIMATE CHARACTERIZATION AND 1/100th OR 1/200th ACRE PLOTS.

STEP 12. COMPLETE SPECIES LIST.

STEP 13. CONTINGENCY ACTIONS ON LONG STRINGERS WITH DOG LEGS. MEASURE UP THE CENTER OF THE STRINGER FOR THE TOTAL DISTANCE. THE ONLY DIFFERENCE WILL BE THE MEASUREMENT OF 2 COMPASS BEARINGS.

Step 13 -



Transect Layout

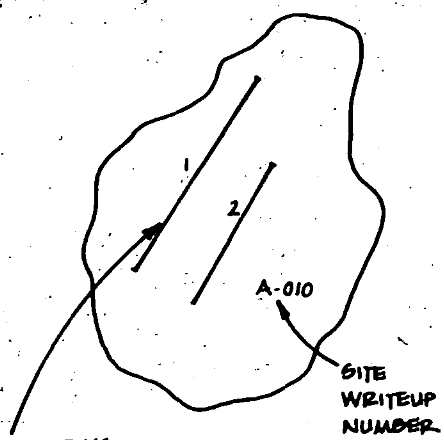
II MORE THAN ONE VEGETATION-SOIL UNIT PER SITE WRITEUP AREA

WHERE MAPPERS HAVE DETERMINED THERE IS MORE THAN ONE VEGETATION-SOIL UNIT WITHIN A SITE WRITEUP AREA THE VEGETATION INVENTORY PROCEEDS AS FOLLOWS:

Example

A DISTINCTIVE STRIP PATTERN

WHERE STRIPS ARE EASILY DISCERNIBLE AT LEAST ONE TRANSECT SHOULD BE PLACED WITHIN EACH OF THE VEGETATION-SOIL UNITS. SUCH TRANSECTS MUST BE MECHANICALLY LOCATED AND NOT RANDOMLY LOCATED AS DESCRIBED IN I ABOVE. THE MAPPING TEAM SHOULD LAY OUT HOW THE TRANSECTS SHOULD BE RUN.

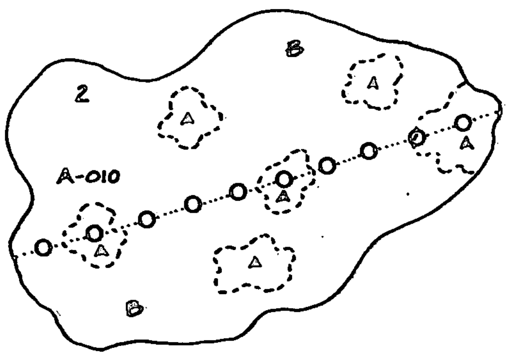


TRANSECT 1. SAMPLES ONE VEGETATION-SOIL UNIT AND TRANSECT 2. SAMPLES THE OTHER VEGETATION-SOIL UNIT. BOTH ARE WITHIN SITE WRITEUP AREA A-010
THE PERCENTAGE OF THE SITE WRITEUP AREA MUST BE DETERMINED FOR EACH TRANSECT.

Transect Layout

B. INDISTINCT MOTTLED PATTERN

WHERE VEGETATION - SOIL UNITS ARE NOT EASILY DISCERNIBLE ON AERIAL PHOTOGRAPHS TRANSECT LAYOUT MUST BE AS DESCRIBED IN I ABOVE. RECORDS MUST BE MADE OF STEP-POINT AND WEIGHT - ESTIMATE/CHARACTERIZATION DATA SEPARATELY BY VEGETATION - SOIL UNITS AS THEY ARE ENCOUNTERED. THIS PROCEDURE IS SHOWN IN THE FOLLOWING EXAMPLE:



RECORDS BY VEGETATION - SOIL UNITS

A (TRANSECT 2)		B (TRANSECT 1)	
STEP - POINT	PLOT	STEP - POINT	PLOT
		1 - 31	1
32 - 62	2		
		63 - 115	3,4
116 - 124	5,6		
		125 - 170	7,8
171 - 200	9,10		

THE PERCENTAGE OF THE SITE WRITEUP AREA MUST BE DETERMINED FOR EACH OF THE VEGETATION - SOIL UNITS.

III OTHER OPTIONS FOR TRANSECT LAYOUT

USE THE SAME PROCEDURES AS SET FORTH IN OPTION I EXCEPT THE DISTANCE AND COMPASS BEARING OF EACH TRANSECT LEG WILL HAVE TO BE CALCULATED.

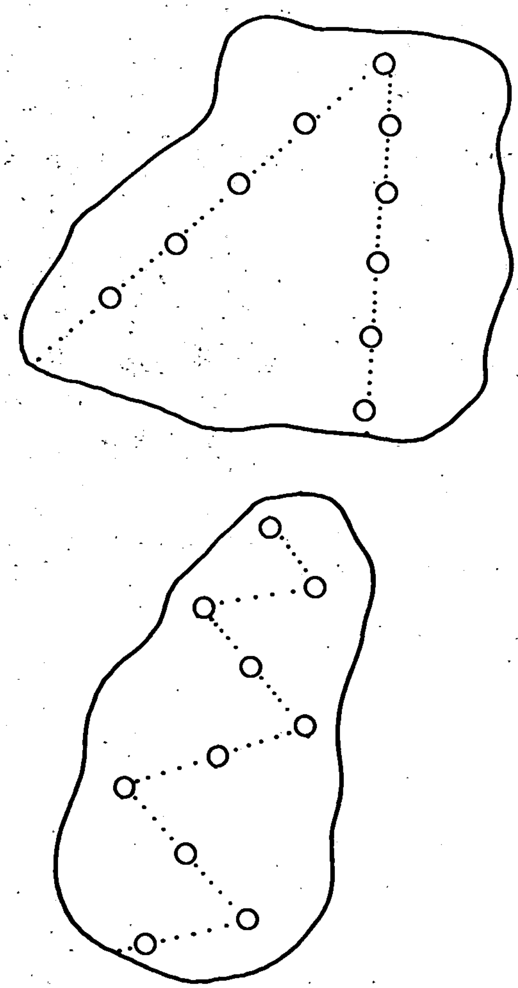
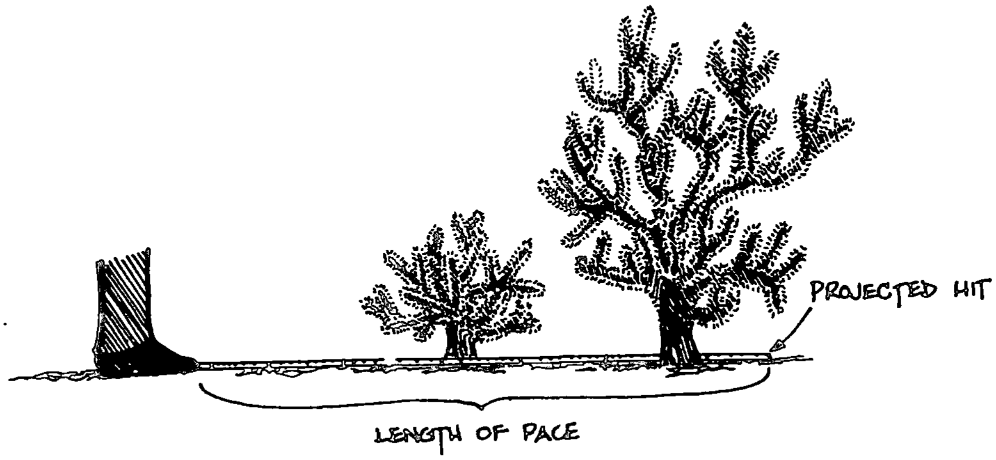


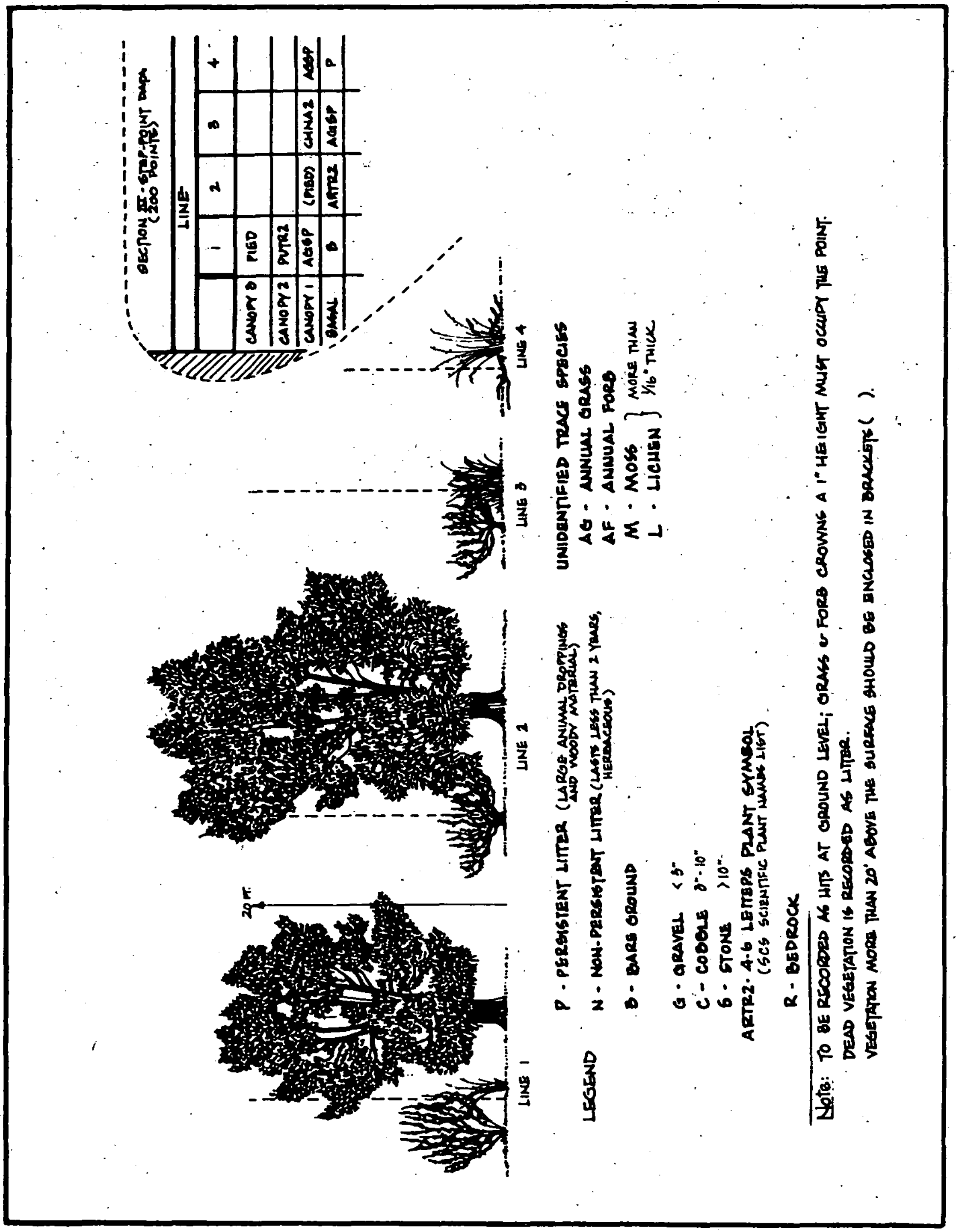
Illustration 28

Projected Hits With Obstructions

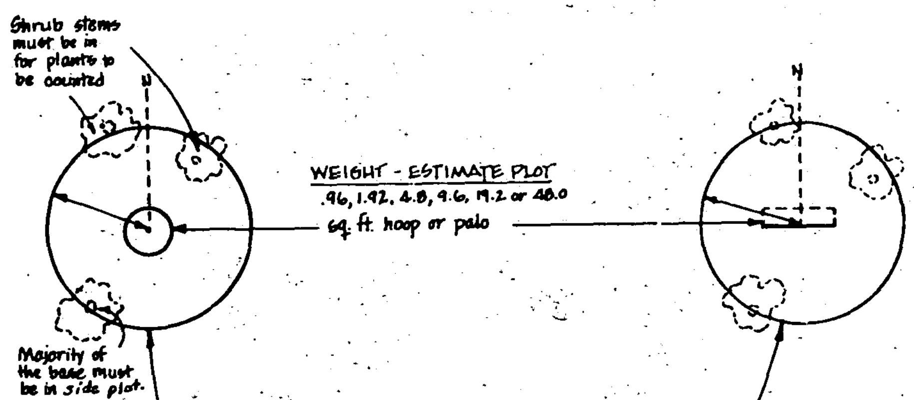


Diagrammatic Sketches of Step-Point

Data and Recording Procedures



Vegetation Characterization Plot Layout - Circular Plots



1. Data on average availability, phenology and utilization are obtained for each plant species occurring within the weight-estimate plot.

CIRCULAR PLOTS

1/100 acre plot (11.7 ft. radius) OR 1/200 acre plot (8.3 ft. radius)

2. Data on age and form class are obtained for each grass and forb plant of each species and average height for each plant species.

3. Data on age and form class for each plant of each plant species, the average height and crown diameter by plant species are obtained for the first five plants of each shrub and tree species occurring within the shrub and tree characterization plot. The first five plants of each species are determined from a predetermined line including those in the weight estimate plot. Counts are made of all remaining shrubs and trees by species.

Illustration 30 Page 2

Vegetation Characterization Plot Layout - Circular Plots

PHENOLOGY STAGES: GRASSES, FORBS, SHRUBS, AND TREES

CODE NO.	DESCRIPTION
1	Begin Growth
2	Vegetative Stage
3	Boot Stage
4	Peak Flowering
5	Seed Ripe
6	Mature
7	Dormant
8	Regrowth

FORM CLASSES

CODE NO.	Grasses	Forbs	Shrubs and Trees
1	Normal & Vigorous	Normal & Vigorous	Normal & Vigorous
2	Dying Center	////////////////	////////////////
3	Hollow Center	Portion Dead or Dying	Portion Dead or Dying
4	Clump Edge	////////////////	////////////////
5	Dead	Dead	Dead

AGE CLASSES

CODE NO.	Grasses	Forbs	Trees	Shrubs
S - Seedling	Base less than 1/4" dia.	X	X	Established new plants not more than 2 or 3 years old
P - Pole Sapling	//////////////////////	///	X	//////////////////////////
Y - Young	Base 1/4" to 1" dia.	X	X	Intermediate age classed between seedling and mature
M - Mature	Base greater than 1" dia.	X	X	Seed producing age but not decadent
O - Old	//////////////////////	///	X	//////////////////////////
D - Decadent	Over 25% of plant dead	X	X	X
R - Resprout	//////////////////////	///	///	Established plants having regrowth following crown kill usually caused by fire. Fully recovered resprouts are classified in appropriate age class.

AVAILABILITY CLASSES: GRASSES, FORBS, SHRUBS, AND TREES
(Annual Growth Only)

CODE NO.	DESCRIPTION
A - Available	100 percent available
P - Partially Available	75 percent available
H - Half Available	50 percent available
L - Limited Availability	25 percent available
U - Unavailable	0 percent available

UTILIZATION CLASSES: GRASSES, FORBS, SHRUBS, AND TREES

CODE NO.		DESCRIPTION
0	0	Utilization of Current Years Growth
1	1 to 20%	"
2	21 - 40%	"
3	41 - 60%	"
4	61 - 80%	"
5	81 -100%	"

Weight Estimate and Vegetation Characterization

Form 4412-27
(June 1979)

Page ____ of ____

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

WEIGHT ESTIMATE
AND
VEGETATION CHARACTERIZATION

RECORD TYPE . . . . (1) V 2
FORMAT CODE . . . . (2) 0
BLM ADMIN UNIT (ST/DI/RA/PU). (3) U:I:0:2:4:8:0:2
ALLOTMENT . . . . (4) 4:0:1:1
PASTURE . . . . (5) 0:2
SITE WRITEUP AREA (SWA) . . . (6) B:0:0:1
TRANSECT NUMBER . . . . (7) 0:1
DATE (YYMMDD) . . . . (8) 7:7:0:6:1:5
ACTION CODE (A,D) . . . . . . (9) A

PLOT SIZES:

TREES & SHRUBS (10) X 1/100 ☐ 1/200

GRASSES & FORBS (11) ☐ .96 ☐ 1.92 ☐ 4.80 X 9.60 ☐ 19.20 ☐ 48.00 ☐ OTHER________ Specify

PLOTS TO BE CLIPPED AND CHARACTERIZED (12)

CLIP: 1 2 3 4 5 6 7 8 9 10

CHAR: 1 2 3 4 5 6 7 8 9 10

WEIGHT ESTIMATE DATA									VEGETATION CHARACTERIZATION						
(13) PLOT NO.	(14) PLANT SYMBOL	(15) AVE AVAIL	(16) AVE PHEN	(17) AVE UTIL	(18) ESTIMATED WEIGHT IN GRAMS HT1	HT2	HT3	HT4	(19) AVE HEIGHT	(20) AVE CROWN DIAM.	(21) AGE CLASS	(22) FORM CLASS	DOT COUNT	(23) NUMBER CHAR'D	(24) NOT CHAR'D
1	AGSP	A	3	0	20										
	FEID	A	2	1	10										
	ØRHY	P	3	1	5										
	BASA	A	3	0	5										
	ARTR2	A	2	0	30										
	PUTR	A	2	0	20	10									
2	AGSP	A	3	1	15				.8		M	1		4	
	ØRHY	B	3	0	16				.7		M	1		3	
	BASA	A	3	0	5				.5		M	1		2	
	ARTR2	A	2	0	35				.2		M	1		5	4
	PUTR	A	2	0	10	10			1.2	1.0	M	1		3	3
	PUTR								4.1	2.0	Y	1		2	
3	AGSP	A	3	0	10 12										
	ORHY	A	2	2	5 5										
	BASA	A	3	0	3 2										
	ARTR2	A	2	0	33 35										
4	AGSP	A	3	0	12										
	FEID	A	3	1	5										
	ORHY	A	2	2	7										
	BASA	A	2	0	2										
	ARTR	A	2	0	31										
	CHVI8	A	2	0	27										
	ARAR8	A	2	1	15										

(Continued on reverse)

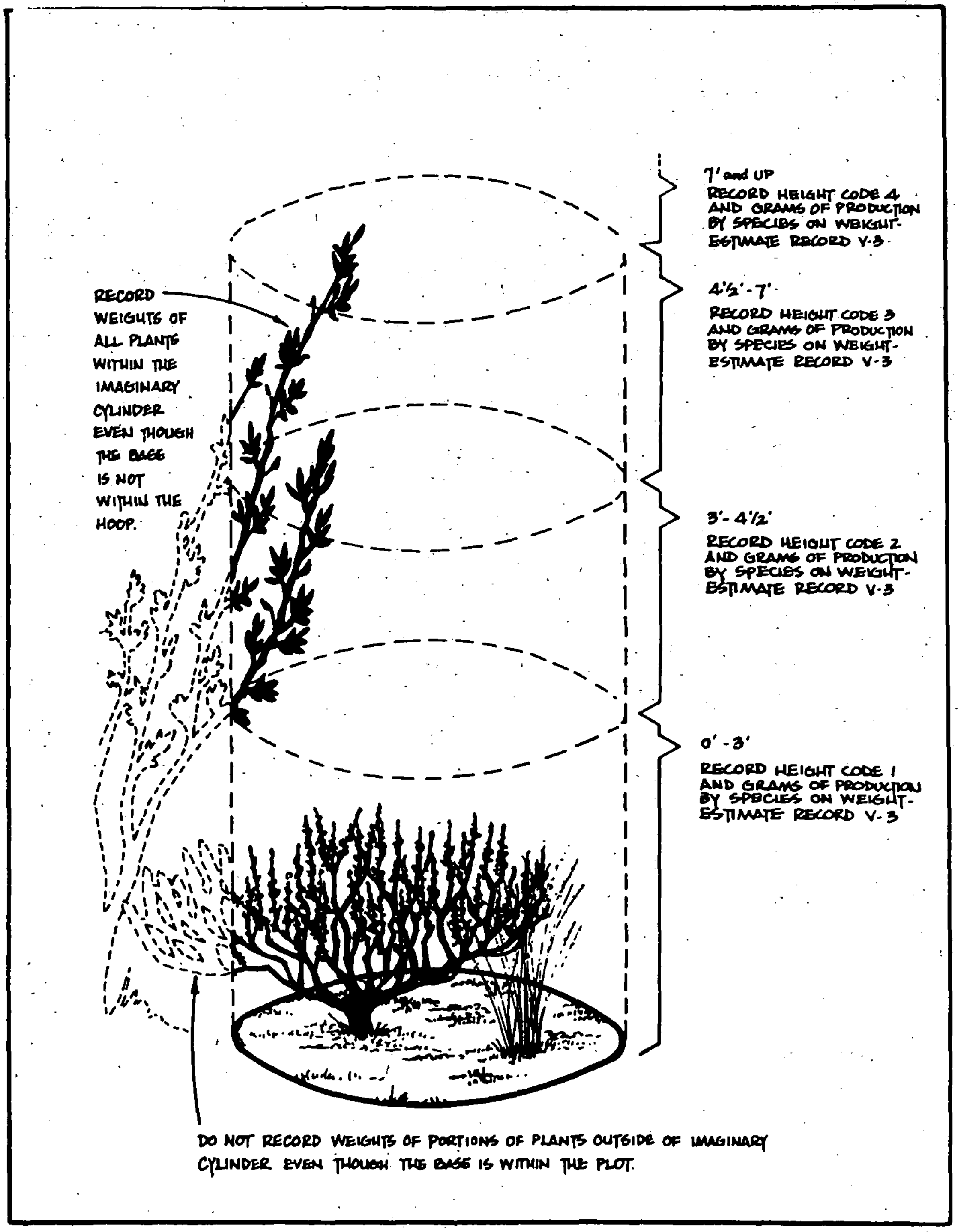
ABCDEFGHIJKLMNØPQRSTUVWXYZ 1234567890

Weight Estimate and Vegetation Characterization

INSTRUCTIONS FOR RECORD TYPE V2

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 0968	ALLOTMENT: Enter designated RMAS four-character number.
(5)	DE 3905	PASTURE: Enter pasture number; blank if none. (Must be unique within allotment)
(6)	DE 3507	SITE WRITUP AREA: Enter SWA number.
(7)	DE 3508	TRANSECT: Enter Transect number.
(8)	DE 6618	DATE: Enter Date of data collection (Yr,Mo,Day).
(9)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(10)	DE 3514	TREES and SHRUBS: Check plot size for trees and shrubs (1/100 acre or 1/200 acre).
(11)	DE 3510	GRASSES and FORBS: Check plot size (sq. ft.) for grasses and forbs.
(12)		PLOTS TO BE CLIPPED AND CHARACTERIZED: Circle plots to be clipped and characterized (for field use only).
(13)	DE 3512	PLOT NO.: Enter plot number from which weight estimate and characterization data is being collected.
(14)	DE 2646	PLANT SYMBOL: Enter SCS standard plant symbol.
(15)	DE 3830	AVAILABILITY: Enter average availability by plant species occuring in the plot. Code as follows: A - Available 100 % P - Partially Available 75 % H - Half Available 50 % L - Limited Availability 25 % U - Unavailable 0 %
(16)	DE 3712	PHENOLOGY: Enter average phenology by plant species occuring in the plot. Code as follows: 1 - Begin Growth 2 - Vegetative Stage 3 - Boot Stage 4 - Peak Flowering 5 - Seed Ripe 6 - Mature 7 - Dormant 8 - Regrowth
(17)	DE 3832	UTILIZATION: Enter average utilization by plant species occuring in the plot. Code as follows: 0 = 0 % 1 = 01 to 20 % 2 = 21 to 40 % 3 = 41 to 60 % 4 = 61 to 80 % 5 = 81 to 100 %
(18)	DE 3532	GRAMS PER PLOT: Record weight in grams per plant species for each height category as follows: HT1 - 0 to 3' HT2 - 3 to 4 1/2' HT3 - 4 1/2 to 7' HT4 - OVER 7' A minimum of two plots per transect must be clipped and weighed. Enter the estimated weight for all plots. Enter and circle actual clipped weight on the clipped plots.
(19)	DE 3504	HEIGHT: Record average height in feet and tenths of feet for each species encountered in plot.
(20)	DE 3522	CROWN DIAMETER: Record the average crown diameter in feet and tenths of feet for each species encountered in plot.
(21)	DE 3502	AGE CLASS: For each plant species record each age class encountered on plot. Use separate lines for each age class. Codes are as follows: S - Seedling Y - Young M - Mature D - Decadent O - Old (trees only) P - Pole Sapling (trees only) R - Resprout (shrubs only) (See BLM Manual Section 4412, Illustration 39, Page 2, for detailed explanation.)
(22)	DE 3503	FORM CLASS: Record form class encountered on plot for each species. Use separate lines for each form class. Codes are as follows: 1 - Normal and Vigorous 2 - Dying Center (grasses only) 3 - Hollow Center (grasses) ? Dead or dying (forbs, shrubs, trees) 4 - Clump Edge (grasses only) 5 - Dead
(23)	DE 3919	NUMBER CHARACTERIZED: Enter total number of plants characterized. Characterize all grasses and forbs, and a minimum of five shrubs and trees per species. The balance of the shrubs and trees within the plot are counted and recorded under item (24). Dot count column to left may be used to tally plant species characterized.
(24)	DE [illegible]	NUMBER NOT CHARACTERIZED: Enter the number of shrubs and trees not characterized in excess of the five characterized.

Weight-Estimate Plot Layout



Sampling Precision and Probability

The number of plots required for a sufficient sample depends upon variation among plots, confidence or probability level we wish to have in our data, and the precision with which we wish to sample. Sampling with high precision with supreme confidence in the data requires a different number of sample plots than when we re satisfied with either a lower precision or less confidence, or both.

The formula for calculating number of plots necessary to sample with a desired precision and level of probability (confidence) is as follows:

$$N = \left(\frac{ts}{px}\right)^2$$

Where: N = number of plots necessary to sample within certain prescribed precision and confidence;

t = value which establishes the level of probability (confidence);

s = standard deviation, a measure of variability;

p = sampling precision (this value is expressed as a percentage and varies depending upon the sampling precision desired);

x = the mean or average of a group of values.

The value for "t" varies with the probability of confidence level chosen. The value of "t" for different confidence levels or probability is as follows based on a sample of ten and twenty plots:

Probability:	50%	60%	70%	80%	90%	95%	98%	99%
"t" value: (10 plots)	0.70	0.88	1.10	1.38	1.83	2.26	2.82	3.25
"t" value (20 plots)	0.69	0.86	1.07	1.33	1.73	2.09	2.54	2.86

For example, choosing a probability or confidence level of 99 percent means we can be certain that 99 times out of a 100 our sample size will provide the precision required; at a confidence level of 95 percent, the odds are 19 to 1; at 80 percent, the odds are 8 out of 10; etc.

The values for "s" and "x" are calculated from the sample of 10 plots which have been clipped or estimated.

The value for "p" may be 5, 10, 20, 25, etc. percent or some other percentage chosen. It is the precision with which we wish to sample.

In a formula expressed thus:

$$N = \left(\frac{2.26s}{.10\bar{x}}\right)^2$$

We will sample with ±10 percent of the population mean or average with 95 percent confidence that the number of plots (N) sampled will provide this precision.

The calculation of "s" (standard deviation) is somewhat complex even with a good calculator and seated at your desk in the office. It is even more difficult in the field. An estimate of the value "s" can be derived from the following table [1/].

[1/] Source: Snedecor, George W. and William C. Cochran, 1974. Statistical Methods. Iowa State University Press, Ames, Iowa 573 p.

If N is near this number	Then S is roughly estimated by dividing the range in values by
5	2
10	3
25	4
100	5

Examples of using the above formula for different confidence levels and precision follow. Assume 10 individual plots have been randomly selected along the transect line and total yield of current years growth is clipped or estimated and recorded as follows:

Plot(N)		Current Yield, gms.
1		57
2		43
3		64
4		51
5		49
6		60
7		71
8		48
9		66
10		54
	Total	563 grams

$$\text{Mean } (\bar{x}) = \frac{563}{10} = 56.3 \text{ grams}$$

$$s = \frac{71-43}{3} = \frac{28}{3} = 9.3$$

(from table above for N=10)

Example 1: Sample within ± 10 percent of the mean with 95 percent confidence.

$$N = \left(\frac{2.26 \times 9.3}{.10 \times 56.3}\right)^2 = \left(\frac{21.0}{5.63}\right)^2 = (3.73)2 = 14 \text{ plots}$$

Four additional plots are needed in addition to the 10 already clipped or estimated to sample with the precision and confidence desired.

Example 2: Sample ± 5 percent of the mean with 99 percent confidence:

$$N = \left(\frac{3.25 \times 9.3}{.05 \times 56.3}\right)^2 = \left(\frac{30.2}{2.82}\right)^2 = (10.71)2 = 115 \text{ plots}$$

Considering money and manpower, it is probably impossible to sample with this precision and confidence in most biological communities.

Example 3: Sample within ± 10 percent of the mean with 90 percent confidence:

$$N = \left(\frac{1.83 \times 9.3}{.10 \times 56.3}\right)^2 = \left(\frac{17.0}{5.63}\right)^2 = (3.02)2 = 9 \text{ plots}$$

The original 10-plot sample was adequate to sample with this precision and probability.

After sampling the estimated precision obtained can be calculated by solving for "p" in the original formula as follows:

$$P = \frac{t\,s}{\sqrt{n}\,x}$$

Using a hypothetical example, assume the following yields were recorded from 10 plots:

Plot(N)	Current Yield, gms.
1	12
2	89
3	43
4	19
5	70
6	52
7	38
8	44
9	29
10	61
Total	457 grams

$$\text{Mean } (\bar{x}) = \frac{457}{10} = 45.7 \text{ grams}$$

$$S = \frac{89-12}{3} = \frac{77}{3} = 25.7 \text{ grams}$$

To sample this site within ± 10 percent of the mean with 95 percent confidence requires the following number of plots:

$$N = \left(\frac{2.26 \times 25.7}{.10 \times 45.7}\right)^2 = \left(\frac{58.1}{4.57}\right)^2 = (12.7)^2 \quad x = 161 \text{ plots}$$

It is determined that it is impractical to collect data from this many more plots. Ten additional plots are sampled. The sampling precision for the total 20 plots is calculated as follows:

1st Sample		2nd Sample	
Plot	(N) Yield, gms.	Plot	Yield,gms.
1	12	11	59
2	89	12	32
3	43	13	27
4	19	14	66
5	70	15	41
6	52	16	54
7	38	17	77
8	44	18	20
9	29	19	55
10	61	20	47
		Total	935 grams

Mean ($\bar{x}$) 46.8 grams

$$S = \frac{89-12}{4} = \frac{77}{4} = 19.2 \text{ grams}$$

"t" value for 20 plots = 2.09 at 95 percent probability level.
Therefore:

$$P = \frac{2.09 \times 19.2}{\sqrt{20} \times 46.8} = \frac{2.09 \times 19.2}{4.47 \times 46.8} = \frac{40.1}{209.2} = 0.19 \text{ precision}$$

The 20-plot sample actually provided an estimate within ± 19 percent of the true mean with 95 percent confidence.

An example calculation based upon a certain confidence level could be as follows:

Situation:

The preplanning analysis for the area has indicated serious resource problems in the area. The decision maker has accepted the minimum sampling level as ± 20 percent of the average vegetation production with 80 percent confidence level. Therefore, the number of plots necessary to meet this minimum level is calculated as follows:

Calculations:

$$N = \left(\frac{1.38\ s}{.20\ \bar{x}}\right)^2$$

An example follows based on data from 10 plots:

	Plot Yield, gms
	74
	16
	127
	43
	84
	36
	52
	25
	61
	19
Total	537

Mean ($\bar{x}$) = 53.7

$$s = \frac{127-16}{3} = \frac{111}{3} = 37.0$$

$$N = \left(\frac{1.38 \times 37.0}{.20 \times 53.7}\right)^2 = \left(\frac{51.1}{10.74}\right)^2 = (4.76)^2 = 23 \text{ plots}$$

Weight production must be determined from an additional 13 plots to obtain the minimum sampling intensity.

Table of "T" Values and Determination of "S"

Number of Plots	To Find "S" Divide Range of Values By:	Probability (Confidence Level) 80 Percent	75 Percent
2	1.0	3.078	2.521
3	1.5	1.886	1.636
4	1.7	1.638	1.444
5	2.0	1.533	1.362
6	2.2	1.476	1.316
7	2.4	1.440	1.287
8	2.6	1.415	1.267
9	2.8	1.397	1.252
10	3.0	1.383	1.241
11	3.1	1.372	1.233
12	3.1	1.363	1.226
13	3.2	1.346	1.219
14	3.2	1.350	1.214
15	3.3	1.345	1.210
16	3.4	1.341	1.207
17	3.5	1.337	1.204
18	3.5	1.333	1.201
19	3.6	1.330	1.198
20	3.6	1.328	1.197
21	3.7	1.325	1.194
22	3.8	1.235	1.193
23	3.9	1.321	1.191
24	4.0	1.319	1.190
25	4.0	1.218	1.189
26	4.1	1.316	1.187
27	4.1	1.315	1.186
28	4.1	1.314	1.185
29	4.2	1.313	1.184
30	4.2	1.311	1.183
31	4.2	1.310	1.182
	5.0	1.282	1.159

Dry/Green Weight Conversion Factor Data

Form 4412-28
(June 1979)

Page ___ of ___

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V6
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU) . (3) UT021402
DATE (YYMMDD) . . . . (4) 790615
ACTION CODE (A,D) . . . . . . (5) A

DRY/GREEN WEIGHT CONVERSION FACTOR DATA

(6) PLANT SYMBOL	(7) PHENOLOGY	(8) GREEN WEIGHT	(9) % AIR-DRY WEIGHT	(10) DRY WEIGHT	(11) GRASSES BASAL DIMENSIONS MINIMUM	(11) MAXIMUM	(12) FORBS, SHRUBS, TREES CROWN DIMENSIONS MINIMUM	(12) MAXIMUM	(13) SPECIES AVERAGE HEIGHT	(14) AVERAGE LEADER LENGTH
AGSP	3	20			25	30			9	
		30			20	27			8	
		17			10	30			7	
		22			15	18			8	
		14			12	15			7	
		12			15	20			9	
		19			15	30			8	
		18			20	30			7	
		16			25	30			7	
		17			15	15			8	
AGSP	3	85	82	70	AIR	DRY	SAMPLE			
ARTR2	2	100					12	13	10	
		60					10	15	12	
		75					17	18	13	
		85					12	12	12	
		60					10	20	20	
		90					15	15	11	
		120					16	17	13	
		65					13	14	12	
		70					14	17	11	
ARTR2	2	200	83	165	AIR	DRY	SAMPLE			

ABCDEFGHIJKLMNØPQRSTUVWXYZ 1234567890

Dry/Green Weight Conversion Factor Data

I N S T R U C T I O N S   F O R   R E C O R D   T Y P E   V 6

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(5)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(6)	DE 2646	PLANT SYMBOL: Enter SCS standard plant symbol.
(7)	DE 3712	PHENOLOGY: Enter standard phenology by plant species. Code as follows: 1 - Begin Growth 2 - Vegetative Stage 3 - Boot Stage 4 - Peak Flowering 5 - Seed Ripe 6 - Mature 7 - Dormant 8 - Regrowth
(8)	DE 3941	GREEN WEIGHT: Enter grams weighed at time plant clipped.
(9)	DE 3546	% AIR-DRY WEIGHT: Enter the percent air-dry weight is of green weight.
(10)	DE 3942	DRY WEIGHT: Enter air-dry weight in grams of clipped material.
(11)	DE 3533	BASAL DIMENSIONS: Enter basal dimensions in feet and hundredths of feet for grasses.
(12)	DE 3534	CROWN DIMENSIONS: Enter crown dimensions in feet and tenths of feet for forbs, shrubs, and trees.
(13)	DE 3504	SPECIES AVERAGE HEIGHT: Enter height in feet and tenths of feet for each species.
(14)	DE 7313	AVERAGE LEADER LENGTH: Enter average leader length in feet and tenths of feet (shrubs and trees).

Photo Sample Record

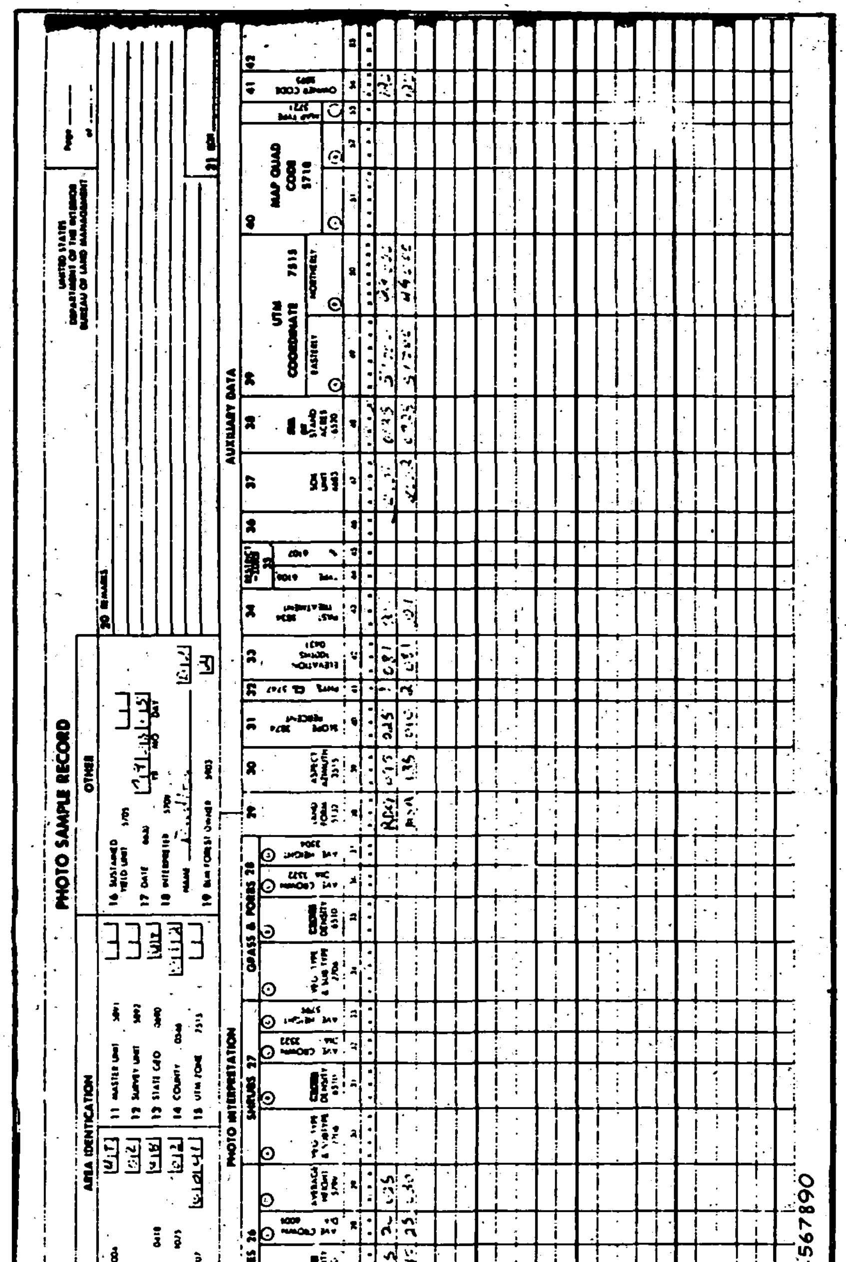
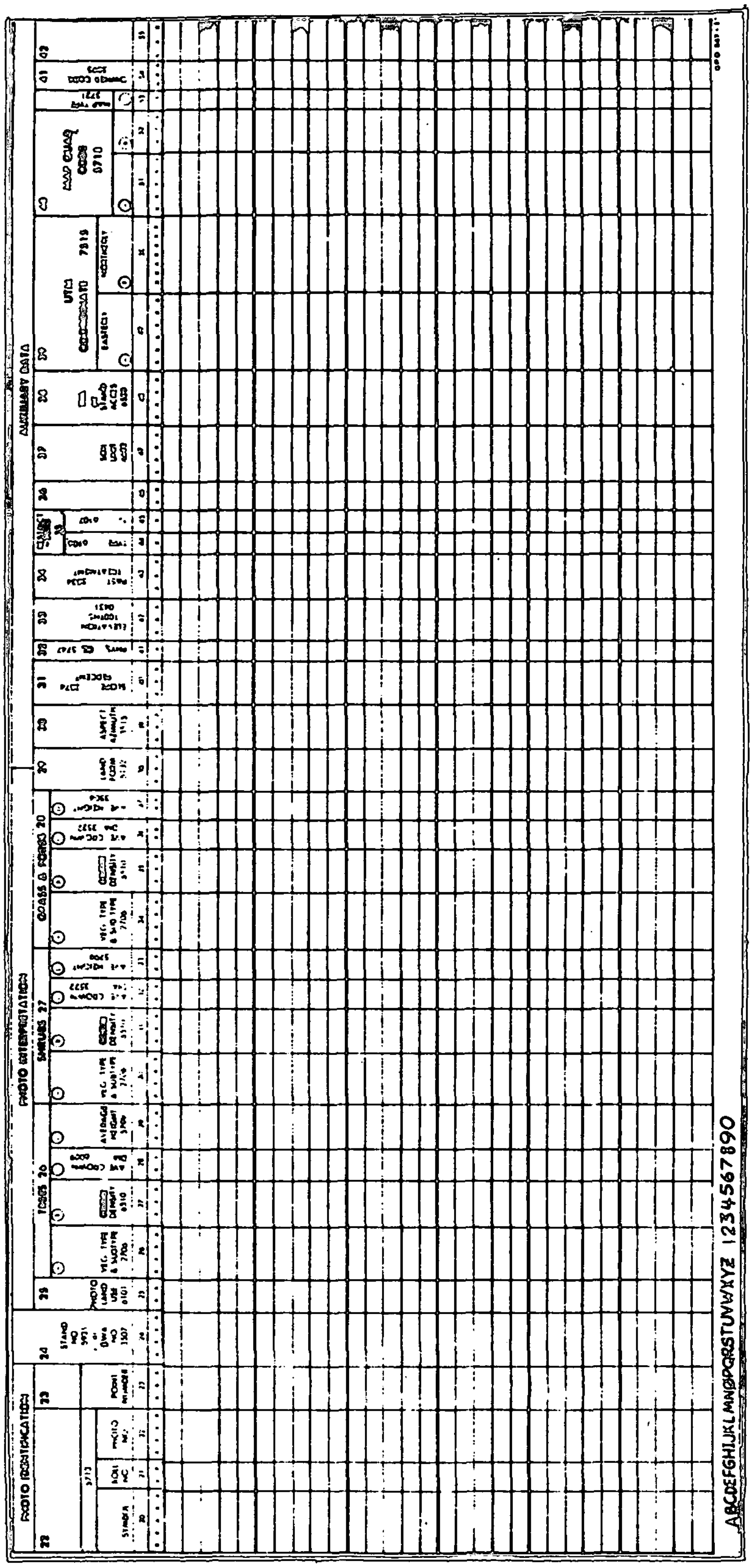


Illustration 35 Page 2

Photo Sample Record



All of the required codes are found in the Forest Data Element Dictionary.

The large dark number to the left or above the data element name is the item number, the four-digit number following is the data element number which is the reference number in the data element dictionary. The "X" or spaces following or below the data items indicate the number of characters that must be filled in if data is recorded for that data element.

Item 1. **Transaction Code** (6196) - Indicates what action is being taken with the current entry, i.e., new data, change, or correlation of old data, etc.

Item 2. **Type of Photo Record** (5714) - For SVIM this is always the stand (or site write-up area) record.

Item 3. **Series** (5711) - The three-digit number is used to control area data and for editing. The numbers run consecutively from 001 to 999. They are assigned by the interpreter who maintains a log of the numbers. The series number must change any time there is a change in the following items: STATE, DISTRICT, RESOURCE AREA, PLANNING UNIT, SURVEY UNIT, COUNTY, and PHOTO MISSION. They may change when there is a change in a SUBUNIT or PHOTO BLOCK. These numbers are unique within an inventory unit.

Item 4. **Inventory Unit** (5708) - Record the three-digit number which identifies the inventory unit. This may be a whole State, District, or parts of Districts. This number is unique within a State.

Item 5. **No. of Lines** (5712) - Record the total number of points interpreted within each series. This number must equal the number of lines filled out in the body of the record.

Item 6. **State Administration** (0004) - Record the two-character alpha code for the State that administers the inventory unit.

Item 7. **District** (0543) - Record the two-digit code. See data element number 0543 in the Data Dictionary. Record only the numeric portion of the code.

Item 8. **Resource Area** (0418) - Record the last two digits of the code shown in the Data Element Dictionary.

Item 9. **Planning Unit** (1075) - Record the last two digits of the code shown in the Data Element Dictionary.

Item 10. **Subunit** (5707) - If subunits or compartments (or block) record the four-digit identification number; otherwise leave blank.

Item 11. **Master Unit** (5891) - Record the two-digit code for identification of master units in western Oregon. Other States leave blank.

Item 12. **Survey Unit** (5892) - Record the two-digit code. This code is used to identify United States Forest Service survey units to coordinate the flow inventory information between the Bureau and the Forest Service.

Item 13. **State, Geographic** (0690) - Record the two-character alpha code. The geographic State in which the data is being recorded, as opposed to the administrative State. For example, data on a SWA or stand located in eastern Washington State which falls in the geographic State of Washington and administrative State of Oregon.

Item 14. **County** (0546) - Enter the three-digit code for the county, borough, parish, etc. (See the Data Element Dictionary.)

Item 15. **Universal Transverse Merecator (UTM) Zone** (7515) - Record the two-digit code which is found in the lower left corner of the 7-1/2 min. quad maps.

Item 16. **Sustained Yield Unit** (5705) - Record two-digit code (all new codes are assigned by the Denver Service Center). This code is used to tie the extensive forest inventories to other inventories. Leave blank if the area is not in a sustained yield unit.

Item 17. **Date** (6630) - Record a six-digit number of which the first two are the last two digits of the year, the next two are the month, and the last two are the day the data was recorded.

Item 18. **Interpreter** (5709) - Record the first initial and last name and code of the photo interpreter who does the photo interpretation. The field uses the codes assigned to each interpreter. This number is unique within an inventory unit.

Item 19. **BLM Forest Owner** (5903) - Record the one-digit code that indicates the type of BLM ownership. <u>An entry required only</u> in Oregon. Other States may leave blank.

Item 20. **Remarks** - Record any pertinent information such as problems, etc. Page____of____. Enter page number of series and the total number of pages in that series.

Item 21. **Edit** - Enter initials of supervisor giving final edit to the Photo Sample Record.

Item 22. **Photo Identification** (5713)

Photo Symbol: xxxxx

Record the appropriate contract symbol (five-digit code) as designated in the photo contract. This symbol may be found in the upper right-hand or left-hand corner of the photograph and may be alphanumeric. Right justify coding if necessary. If all photos within the same unit contain the same symbol, this item may be written down only once per sheet. Draw arrow down column.

Roll Number: xx

Record the roll number as defined in the photo contract - this may be alphanumeric. Note: Some BLM and other photography do not have roll numbers but have flight line numbers instead.

Example: 1 EMK 73-3-81. The "3" is the roll number. This number will be recorded as a two digit code, 03.

2 COL 78-21-08. The "21" is a flight line number; treat it the same way as roll number, i.e., 21.

Photo Number: xxxx

Each photo has its own separate photo number or identification. This is the third set of numbers or letters in the top right-hand corner. They are coded as a four-digit codes. Example: EMK 74-3-81, coded 0081.

Item 23. **Point Number:** xx

The numbering system is based on the photo grid. Number the grid from top to bottom or from left to right, as shown in the examples below:

ID	1:15840		
:01.	04.	07.	10.:
:02.	05.	08.	11.:
:03.	06.	09.	12.:

ID		1:20000		
:01.	02.	03.	04.	05.:
:06.	07.	08.	09.	10.:
:11.	12.	13.	14.	15.:
:16.	17.	18.	19.	20.:

In using this system, points falling on BLM land must be numbered on the photo and then transferred to the master set of maps. They must be numbered identically on the map. This item may be left blank on SVIM and stand surveys.

Item 24. **Stand Number** (5921) or **SWA Number** (3507) - Each stand or site write-up area is assigned a unique four-character number. This number is held unique within a planning unit. The area is a plant community possessing sufficient uniformity in relation to composition, special arrangement, and/or condition to be distinguishable from adjacent communities. Site write-up areas are mapped within a range site or areas which are similar in growth potential. A log must be maintained for stand or site write-up area numbers. These numbers must not be duplicated within a planning unit.

Photo Interpretation

Item 25. **Photo Land Use** (6101) - Record a two-digit code. This is the first interpretation step to determine the primary land-use class. The major categories are Forest Land and Nonforest Land. These classes are subdivided into major type classes as determined by administrative and biological needs.

The categories are:

Forest Land

codes

20-29 Even age stands

30-39 Two-story stands

40-49 Nonproductive forest land

Nonforest Land

60-69 Nonforest land

91-92 Water

Forest Land - Land at least 16.7 percent stocked (or 10 percent crown closure) by forest trees of any size, or formerly having such tree cover, and not currently developed for nonforest use. Includes chaparral areas in the west and afforested areas. The minimum are for classification of forest land or subclasses of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width at least 120 feet wide to qualify as forest land. (Crown width is defined as distance from one crown edge to another and differs for stringers and openings.)

Unimproved roads[1/] and intermittent water (fluctuating stock dams and reservoirs) trails, streams, and clearings in forest areas must be classed as forest if less than 120 feet in width of 1 acre in size.

[1/] Improved roads are those maintained for continuing use and with at least a 30 foot right-of-way. Also, includes entire right-of-way of operating railroads—classed nonforest.

Forest land is divided into productive and nonproductive strata.

Productive Forest Land (PFL) (Code 20 and 30 series) Forest land (1 acre in size or greater) which is producing, or is capable of producing, crops of industrial wood. This includes areas suitable for management to grow crops of industrial wood, generally of a site quality capable of producing in excess of 20 cubic feet/acre of annual growth or in excess of 3000 board feet (scribner net) volume/acre. This includes volume from saw logs and pulpwood (but excludes fuelwood) and also includes both accessible and inaccessible areas and both operable and currently inoperable stands. Generalization - any stand over 40 feet height is occupying PFL. Data obtained from photo measurements of height, crown diameter, crown density, and/or volume will be the primary means of subdividing productive forest lands into sampling strata. Nonproductive cover type occupying productive forest land takes the acre PFL strata and climax forest type.

Nonproductive Forest Land (NPFL) (Code 40 series) Forest land incapable of yielding 20 cubic feet per acre per year or 2000 cubic feet in 100 years because of adverse site conditions, or land unsuitable for management because of steepness and rockiness, or because of adverse location or critical watershed aspects of the site. This includes: sterile or poorly drained forest land which produces stunted and deformed trees; subalpine forests at the upper limits of tree growth; steep rocky areas with cliffs, ledges, and talus slopes and forest land capable of producing only noncommercial tree species.

Nonforest (N.F.) (Code 60 series) This is land that has never supported forests and lands formerly forested where forest use is precluded by development for "nonforest" uses, such as crops, improved pasture, residential areas, and city peaks. This also includes improved roads adjoining right-of-ways, powerline clearings, and certain areas of water classified by the Bureau of Census as Land. Unimproved roads, streams canals, and nonforest strips in forest areas must be more than 120 feet wide (crown width) and clearings in forest areas, beaver dams, and stock ponds must be more than 1 acre in size to qualify as nonforest land. Areas of water less than 40 acres in size or less than 1/8 mile in width must also be classified as nonforest. Areas of water larger than these are excluded from the gross area of the inventory unit (code 90 series). The area surrounding and including each point must be studied to determine which land-use class it best fits. If the point falls into a nonforest or nonproductive type i.e., an acre in size or greater, it must be classed as that type. If the point falls in an area smaller than 1 acre in size, it must be classed as the type immediately surrounding the point. To classify as productive, the type within which the plot falls must be at least 1 acre in size. Use the examples below to determine which class the point falls in.

Items 26, 27, 28.

1. If photo land-use (Item 25) is coded as barren, then enter the type of barren under the vegetation type and subtype 26A. Leave 26B-D, 27, and 28 blank.

2. If photo land-use (Item 25) is coded as forest land, then Item 26 must be completely filled out. If the forest crown density is less than 85 percent, then entries may be made in Items 27 and/or 28 if these types of vegetation are present.[1/]

3. If photo land-use (Item 25) is coded as shrubs, record all of Item 25. There may be entries under Trees if areas with less than 10 percent crown density are important or if grasses and forbs are present in sufficient quantity to be recorded.[1/]

4. If photo land-use (Item 25) is coded as grasslands, cryptogams or forks, then Items 26 (Trees) and 27 (Shrubs) may be left blank if trees or shrubs are not present in sufficient quantity.[1/]

1/ The quantity of vegetation needed for a required entry must be listed during the pre-planning analysis.

Item 26. Trees

A. Vegetation Type and Subtype (2706) - If photo land-use is Forest Land (20, 30, or 40 series), then a vegetation type and subtype must be entered from the five or six thousand series (Forest Type).

If photo land-use is in the 30-39 group, then Density (B), Average Crown Diameter (C) and Average Height (D) must be recorded on the part of the two-story stand to be featured when the stand is put under intensive management. Recognition of the principle story requires considerable field experience and the interpreter will have to use his own judgment and experience to interpret multi-storied stand. In general, the overstory should be recognized as the dominant feature if it contains 40 percent or more crown density regardless of the density of the understory. (Understory trees are generally destroyed during harvesting operations when the overstory is medium-stocked or better.) Feature the understory in two-storied stands which have a very poorly stocked (5 to 20 percent) overstory.

B. Crown Density (6510) - Record the percent of crown cover on the plot, stand, or SWA. This may be recorded in 1 percent increments. If the area is in nonstocked forest land, record 00. In the case of two-story stands, record the density of the stand to be managed.

C. Average Crown Diameter (6009) - Record the average crown diameter to nearest foot. In two-story or all-age stands, record the crown diameter of the stand to be featured when the stand is put under intensive management.

D. Average Height (5799) - Record the average height of the dominant trees in whole feet of the stand to be featured in management.

Item 27. Shrubs

A. Vegetation Type and Subtype (2706) - Record the dominant shrub type and subtype. If the species group is not listed in the data element dictionary, record the code for other shrubs. If the species cannot be identified, record 4000. If photo land-use is entered as brushland, then there must be an entry on this item.

B. Crown Density (6510) - Record the crown cover of the shrubs. The density may be recorded in 1 increment.

C. **Average Crown Diameter** (3522) - Record the average crown diameter of subtype listed under "A" to the nearest foot.

D. **Average Height** (5799) - Record the average height of the dominant shrubs.

Item 28. **Grass and Forbs**

A. **Vegetation Type and Subtype** (2706) - Record the predominant type or subtype from the perennial forbs, grass, annual forbs, annual grasses, grasslike, or cryptogams. If photo land-use is recorded as grassland, there must be an entry.

B. **Crown Density** (6510) - Record the percent of crown cover in the plot, stand, or site write-up area. This may be recorded in 1 percent increments.

C. **Average Crown Diameter** (3522) - The crown diameter of bunch grasses can be recorded. Many other species have no crown visible. In this case leave the field blank.

D. **Average Height** (3504) - Record the average height of the predominant vegetative type and subtype recorded in "A" above. This may be recorded in tenths of feet. The tallest may be 9.9 feet.

Item 29. **Landform** (5132) - This is a description of a physical feature on the earth's surface which would best describe the location of the stand or site write-up area. (See Form 4412-30a)

Item 30. **Aspect - Azimuth** (3515) - Record the azimuth to the nearest degree. On a stand or site write-up area, the aspect is along a line through the stand center on the longest axis of the slope.

Item 31. **Slope Percentage** (3874) - The slope estimation is based upon a line through the stand or site write-up area center on the longest axis of the SLOPE.

If the stand is located at a slope break, an average slope estimation is determined for the two slopes.

Slope percentages are obtained from computing the distance and elevational rise as indicated in large scale topographic maps, or by the use of a parallax wedge on aerial photos.

Item 32. **Physiographic Class** (5747) - This is the position on the landscape which the majority of stand or site write-up area occupies.

Item 33. **Elevation** (0431) - Record the average elevation of the stand or point from the contour lines on USGS topographic maps. Use a three-digit code indicating elevation to the nearest 100 feet. Example: Stand falls on 5340 contour - Record 053. Enter for all stands.

Item 34. **Past Treatment** (5834) - Record the most recent event on the stand or sample point. This data may be recorded from photos, timber or range atlas, or fire maps.

Item 35. **Restrictions** (6106 and 6107) - Record for all land classes. Land-use restrictions must be compiled from two sources by the Districts: (1) administrative restrictions currently in effect and, (2) multiple use restrictions as determined by following the processes described in BLM Manual Section 1605, Unit Resource Analysis, and 1608, Management Framework Plans. Cutoff date for restrictions is December 31 of the year immediately preceding the commencement of the photo interpretation phase of the inventory.

Land-use restrictions are coded as a two-digit code, the first digit representing the type of restriction (6106), and the second digit the amount of restriction (6107). If there are no restrictions, leave columns blank.

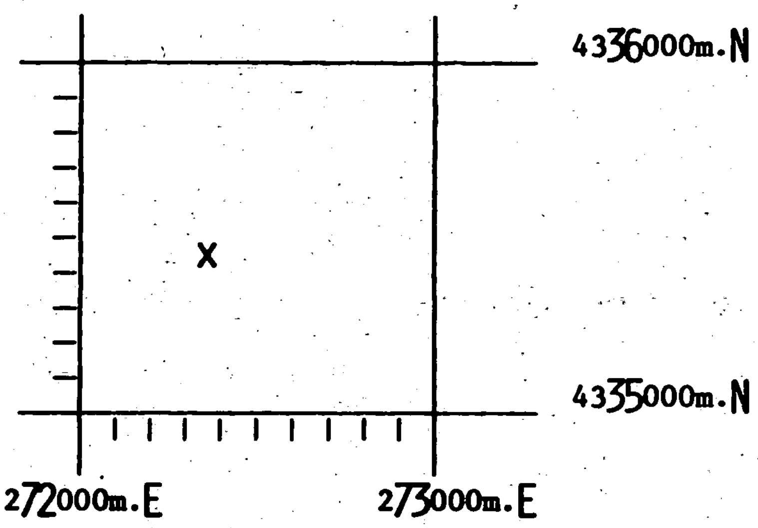
Item 36. **(Reserved)**

Item 37. **Soil Unit** (4683) - Record the four-digit code representing the soil series (see BLM Manual Section 7312.13E on how to develop codes). All codes must be cleared through the Service Center Director (D-460).

Item 38. **SWA or Stand Acres** (6520) - Record the acreage of all stands to the nearest acre. Stands or site write-up area as small as a 1 acre may be recorded.

Item 39. **Universal Transverse Mercator (UTM) Coordinate** (7515) - Record the point location or center of the stand or site write-up area to the nearest 10 meters. The designation of a point always follow the rule, read <u>**RIGHT**</u> and <u>**UP**</u>.

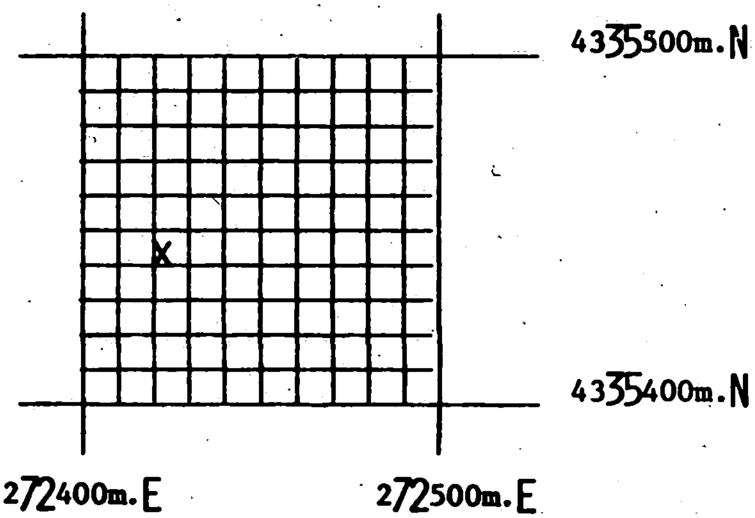
Example:



Point X is located in the grid square 272,400m.E. and 4,335,500m.N. Location is to the nearest 100 meters.

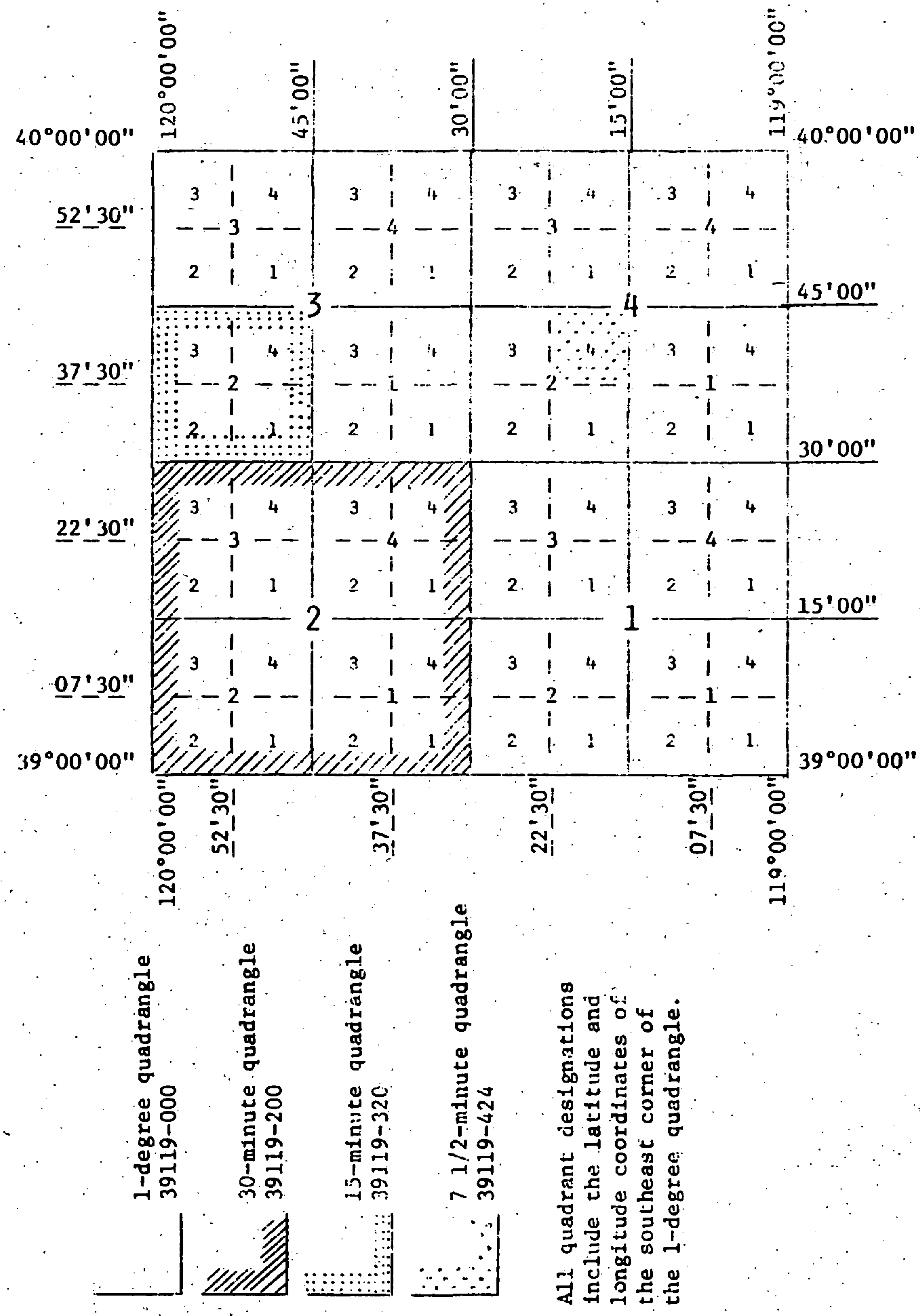
To get to the nearest 10 meters, the 10-meter square is further subdivided and point X is located 272,430m.E. and 433,554m.M. This would be recorded on the form as 272,430 under Item 39A Easterly and 4,335,540 unit item 39B Northerly.

Enlargement of 100-meter grid square:



Item 40. Map Quad Code (5718) - The modified Texas Code Index Number is assigned by utilizing the whole degree designation of first the latitude and then the longitude of the southeast corner of the 1-degree area in which any may lie. The 1-degree quadrangle is then sectioned into four 30-minute quadrangles that are numbered in a clockwise fashion, from 1 to 4, beginning with the southeast quadrant. The 30-minute quadrangles are then quartered to form four 15-minutes which are likewise numbered in a clockwise fashion, beginning in the southeast quadrant. Lastly, the 15-minute quadrangles are then divided into 7-1/2-minute quadrangles, designated in the same clockwise fashion beginning with number 1 for the southeast quadrangle. A 1-degree quadrangle is thus subdivided into 64 parts which are easily and quickly identified by assigning the numbers as described 40A. Thus, for the 1-degree quadrangle whose southeast corner lies at latitude 39°00'00" and longitude 11900'00", the first five digits of the Code Number (A) would be 39119. After recording the latitude and longitude coordinates as the first five digits of a Code Index Number, the number designating the 30-minute, 15-minute, and 7-1/2-minute quadrangle in which a particular map is located is then shown. For maps covering a 15-minute quadrangle, a 0 (zero) is assigned to the last digit (representing the 7-1/2-minute quadrangle designation). Likewise, if a map covers a 30-minute quadrangle, two 0"s (zeros) are assigned (one each for the 15-minute and 7-1/2-minute quadrangles thereby identified).

Referring to Figure 1 and carefully reading this explanation will enable the reader to understand and use the Modified Texas Code Index Number for any standard topographic map.



All quadrant designations include the latitude and longitude coordinates of the southeast corner of the 1-degree quadrangle.

Map Type (5721) - Enter a one character code for the type of map.

CODE

O ORTHOPHOTO MAP is a corrected areal photograph which may have physical or topographic features drafted on.

P PLANIMETRIC MAP is a map that presents the horizontal positions only for the natural or cultural features represented. (American Geological Institute.)

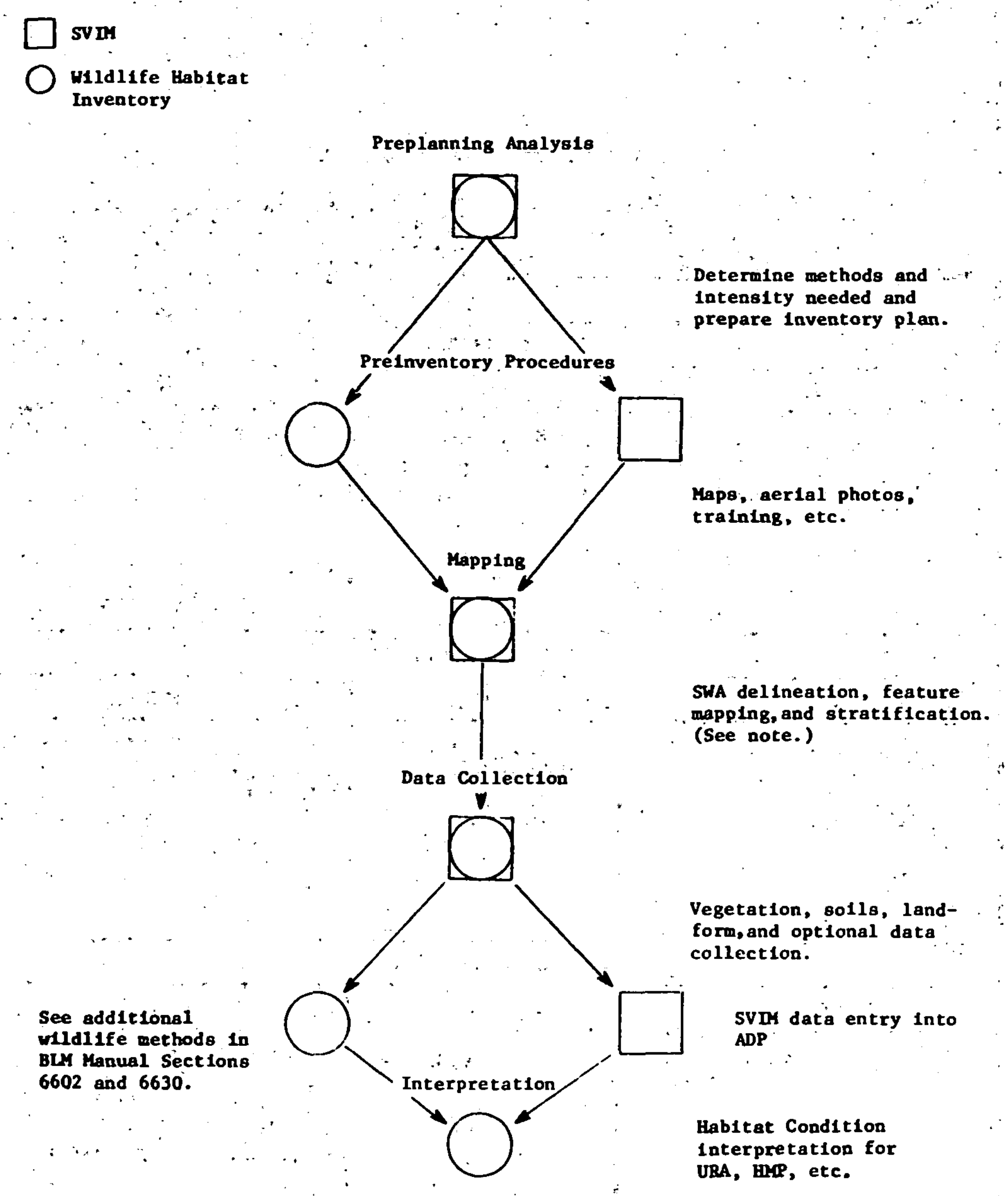
Q ORTHOPHOTO QUAD is a photo map without contours or other features drafted on the map.

T TOPOGRAPHIC MAP is a representation on paper that is designed to portray certain selected features of a section of the earth's surface plotted on some form of projection and to a certain scale, that primarily depicts the relief of the county mapped but shows also its drainage and cultural features, and that delineates all features in true latitude and longitude and then fixes all parts in a rigidly correct relative position (Beaman).

Item 41. Owner Code (5895) - Enter the three-digit code for the owner of the land.

Item 42. (Reserved)

Relationship Between Soil-Vegetation Inventory Method and Wildlife Habitat Inventory



Note: Site Writeup Area = Habitat Site (same site writeup number)
Strata $\leq$ Standard Habitat Site

Illustration 37

Wildlife-Recreation Observation Report

FORM 6612-39
(July 1979)

WILDLIFE-RECREATION OBSERVATION REPORT

ALLOTMENT NO. 4011
SWA NUMBER A-010
DATE 79-06-12
TIME 10:00 AM

RECORDER JFK
AERIAL PHOTO NO. ARS-1-97
VEGETATION SUB-TYPE 0441

WILDLIFE OBSERVATION

SPECIES	USE	COMMENTS
MULE DEER	FEEDING	OBSERVED 13 HEAD
COYOTE	STALKING DEER	

RECREATION OBSERVATION

TYPE	USE	COMMENTS
ORV	MOTORCYCLE TRAILS	CONCENTRATED USE ON TWO HILLS SOME RESOURCE DAMAGE
HUNTING	SMALL GAME	TWO RABBIT HUNTERS WITH DOG

CULTURAL OBSERVATION

TYPE	USE	COMMENTS
INDIAN RUINS	ONE DWELLING ONE FIRE PIT	REMAINS OF ROCK DWELLING. ONE WALL ALMOST INTACT. FIRE PIT VERY DISTINCT BLACKENED SOIL

Animal Species Occurrence

Form 6602-1
(January 1982)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANIMAL SPECIES OCCURRENCE
(Integrated Habitat Inventory and Classification System)

Page 1 of 1

(1) Record Type	W 1
(2) Format Code (1, 2, or 3)	1
(3) BLM Admin Unit (ST/DI/RA/PU)	N M 0 3 7 8 0 5
(4) Standard Habitat Site Code	N M 0 0 4
(5) SWA Number	J 0 2 1
(6) Action Code (A, C, or _)	A

SHS Name MIXED SHRUB MOUNTAIN — Recorded by JOHN DOE — Date 79/03/01

SECTION I. HABITAT SITE (SWA) DATA

HABITAT SITE IDENTIFICATION	SWA CHARACTERISTICS		HABITAT CLASSIFICATION/ CROSS REFERENCES
(7) Year Inventory Begun 19 77 Completed 19 78	(11) Structural Height MB	(12) Acres 5577	(17) Physiographic region 07
HABITAT SITE NAME	(13) Slope 30	(14) Aspect W	(18) Subphysiographic Region ___
(8) Dominant Spp QUTU2__	(15) Elevation 60		(19) Assoc. 023 (20) Biome D
(9) Sub-Dominant Spp CEMO2__	(16) Special Habitat Features in Habitat Site (SWA) (5 Maximum)		(21) USFS Ecoregion 3211
(10) Landform MTN	B35 A13 ___ ___ ___		(22) Standard Hab Type ___

SECTION II. ANIMAL OCCURRENCE DATA

ANIMAL SPECIES COMMON NAME	CODE (33)	ORP. (34)	STATUS (25)	USE GENERAL (26)	USE SPECIFIC (27)	CRUCIAL (28) WI	SP	SU	FA	METHOD (29)	OCCURRENCE (30) WI	SP	SU	FA	COMMENTS (Limit 40 characters) (31)
DESERT SHREW	NOCR	M	OT	YLEA	YLEA						H	H	H	H	PREFERS LOWLANDS
HOARY BAT	LACI	M	OT	SSMA	SSRO					L	S	O	O	S	RARE MIGRANT
TX ANTL. GRN. SQ	AMIN	M	OT	SSBR	SSDE					C		C	C		
			OT	FAMA	FAMA					C					
			OT	WIMA	WIHI					L	U				
MULE DEER	ODHE	M	OT	YLEA	YLEA	C				S	C	C	C	C	
COLLARED LIZARD	CRCO	H	OT	YLEA	YLEA					C	C	C	C	C	
E. FENCE LIZARD	SCUN	H	OT	YLEA	YLEA					C	C	C	C	C	
TURKEY VULTURE	CAAU	B	OT	SSBR	SSNE					S	S	C	C		
			OT	FAMF	FASM					S				C	
COOPERS HAWK	ACCO	R	OT	YLEA	YLEA					S	U	U	U	U	

(instructions on reverse)

Form 6602-1
(January 1982)

Page _1_ of _1_

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANIMAL SPECIES OCCURRENCE
(Integrated Habitat Inventory and Classification System)

(1) Record Type	U	1						
(2) Format Code *(1, 2, or 3)*	2							
(3) BLM Admin Unit *(ST/DI/RA/PU)*	N	M	Ø	3	7	8	0	5
(4) Standard Habitat Site Code	N	M	0	0	4			
(5) SWA Number	J	0	2	4				
(6) Action Code *(A, C, or I)*	A							

SHS Name MIXED SHRUB MOUNTAIN | Recorded by JOHN DOE | Date 79/03/01

SECTION I. HABITAT SITE (SWA) DATA

HABITAT SITE IDENTIFICATION	SWA CHARACTERISTICS		HABITAT CLASSIFICATION/ CROSS REFERENCES	
(7) Year Inventory Begun 19 78 Completed 19 79	(11) Structural Height M8	(12) Acres 5517	(17) Physiographic region 07	
HABITAT SITE NAME	(13) Slope 30	(14) Aspect W	(18) Subphysiographic Region ___	
(8) Dominant Spp QUTU2 __	(15) Elevation 60		(19) Assoc. 023	(20) Biome D
(9) Sub-Dominant Spp CEMØ2 __	(16) Special Habitat Features in Habitat Site (SWA) *(5 Maximum)*		(21) USFS Ecoregion 32LL	
(10) Landform MTN	B35 A13 ___ ___ ___		(22) Standard Hab Type ___	

SECTION II. ANIMAL OCCURRENCE DATA

ANIMAL SPECIES: COMMON NAME	CODE (23)	GRP. (24)	STATUS (25)	USE: GENERAL (26)	USE: SPECIFIC (27)	CRUCIAL (28): UI	SP	SU	PA	METHOD (29)	OCCURRENCE (30): UI	SP	SU	PA	COMMENTS *(Limit 40 characters)* (31)

(Instructions on reverse)

Special Habitat Feature

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SPECIAL HABITAT FEATURE

(1) Record site	W 2
(2) State	C O
(3) District	0 4
(4) Planning unit	0 1
(5) Site writeup number	B 1 2 7

SECTION I – GENERAL

(6) Date 771004 (7) Habitat site name PIPO--DOGR2-BTI (8) Acreage 0015

(9) Special habitat feature code 4C5 (10) Location: T84W R12S S32 ¼NE ¼NE (11) Relationship to other habitat sites W

(12) Other habitat sites involved B216B215B218

(13) Map or overlay reference 10193E1603 1091274

(14) General description of feature BUTT150X500ET90FTHIGHLIMESTON

SECTION II – ANIMAL SPECIES BENEFITED			SECTION III – ANIMAL SPECIES ADVERSELY AFFECTED			SECTION IV – PLANT SPECIES AFFECTED	
SPECIES	USE ENCOURAGED BY FEATURE		SPECIES	USE DISCOURAGED BY FEATURE		SPECIES	EFFECT
	GENERAL	SPECIFIC		GENERAL	SPECIFIC		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
FAPE	SSB	AN	CEEL	MI	WA		

(Instructions on reverse)

Form 6602–2 (April 1978)

Special Habitat Feature

GENERAL INSTRUCTIONS

1. *Wildlife biologist completes all entries while in the field.*
2. Consolidate all completed forms (6602–1, 1a, and 2) and file in appropriate District Office along with other related information or completed formats.

SPECIFIC INSTRUCTIONS
(Items not listed are self-explanatory)

Items

(2), (3), (4) Enter standard two-digit codes from BLM Manual Section 1265.

(5) *Site Writeup Number* – Enter first letter of the last name of recorder and three numbers indicating, consecutively, the number of habitat sites in the planning unit.

(6) *Date* – Enter date inventory is conducted; record as year, month, day.

(7) *Habitat Site Name* – Enter code for habitat site affected by special feature, consisting of abbreviation for dominant and subdominant plant species *(six spaces each)*, and three-letter land form code. Refer to BLM Manual Section 4411 for plant symbols and BLM Manual Section 6602 for land form codes.

(9) *Special Habitat Feature Code* – Enter code from the following list:

A. Natural Special Features

A01 – Avalanche-Slide Area
A02 – Cave
A03 – Cave, Ice
A04 – Cave, Lava
A05 – Cliff
A06 – Cone, Volcanic
A07 – Dike, Volcanic
A08 – Dune, Sand
A09 – Insect Mounds
A10 – Overhang
A11 – Salting Area
A12 – Seep
A13 – Cold Springs
A14 – Sink Hole
A15 – Snag or Group of Snags
A16 – Talus, Slope
A17 – Talus, Field
A18 – Wallow, Elk
A19 – Waterfall
A20 – Waste Land
A21 – Island *(too small for habitat type)*
A22 – Log Jam
A23 – Down Timber
A24 – Bluff
A25 – Beaver Dam
A26 – Muskrat House
A27 – Cataracts *(stream)*
A28 – Barren Lands
A29 – Hot Springs
A30 – Blowouts
A31 – Mudflow
A32 – Temporary Pond
A33 – Small Natural Ponds
A34 – A99 *(Reserved)*

B. Man-Made Special Features

B01 – Bridge
B02 – Fence
B03 – Underpass
B04 – Salting Area
B05 – Goose Nesting Platforms
B06 – Artificial Nesting Boxes
B07 – Small Seedings
B08 – Buffer Strip
B09 – Building
B10 – Bird Ramp
B11 – Berm
B12 – Culvert
B13 – Dock
B14 – Dredged Area
B15 – Exclosure, Study Area
B16 – Fish Migration Barrier *(Man-Caused)*
B17 – Gauging Station, Water
B18 – Mining Activity
B19 – Poles *(Electrical and Telephone)*
B20 – Perches
B21 – Road
B22 – Trail
B23 – Stream Improvement Structure
B24 – Railroad
B25 – Stream Crossing
B26 – Shelter *(Overnight)*
B27 – Recreation Area
B28 – Feeding Station
B29 – Fire Break
B30 – Seismographic Trail
B31 – Oil Sump Pit
B32 – Windmill
B33 – Irrigation Diversion and Ditch
B34 – Water Gap
B35 – Stock Water Tanks and Ponds
B36 – Corral and Loading Chute
B37 – Artificial Wildlife Waters
B38 – B99 *(Reserved)*

(10)–(14) *(See BLM Manual Section 6602.)*

Columns

(a), (d), (g) *Species* – Enter code, consisting of first two letters of generic and species names.

(b), (c), (e), (f) Use the following two-letter season of use codes to preceed the codes for general and specific use:

SP	Spring	SF	Summer/Fall
SU	Summer	FW	Fall/Winter
FA	Fall	WS	Winter/Spring
WI	Winter	YL	Year-Long
SS	Spring/Summer		

(b), (e) *General Use* – Enter four-letter codes, recording the first two letters for season of use, then the last two from the following:

BD Breeding *(mainly courtship, e.g., booming, strutting, rutting, etc.)*
BY Bearing Young *(nesting, egg laying, and hatching; denning, fawning, and calving, etc.)*
RY Rearing Young *(post-fledging care, postnatal care, etc.)*
BB Breeding and Bearing Young
BR Bearing and Rearing Young
BA Breeding, Bearing Young, and Rearing Young
MI Migration
WM Winter Maintenance
EC Entire Annual Cycle

(c), (f) *Specific Use* – Enter four-letter codes, recording the first two letters for season of use, then the last two from the following:

FE	Feeding Area	NE	Nest Site *(known)*
WA	Watering Area	AN	Active Nest
EC	Escape Cover	SA	Salting Area
RE	Resting Area	RO	Roost Area

ST Staging Area for Migration
BC Booming or Strutting Ground *(Traditional)*
MR Migration Route *(Traditional)*
CA Calving or Fawning Area *(Traditional)*

(h) *Effect* – For endangered or threatened plants *only*. Enter "E" if plant species is encouraged, and "D" if discouraged.

Site Writeup Area Acres

(By Legal Description)

Form 4412-29
(June 1979)

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

Page ____ of ____

SITE WRITEUP AREA ACRES
(By Legal Description)

RECORD TYPE . . . . (1) V A
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) U T 0 2 4 8 0 2
ALLOTMENT . . . . (4) 4 0 1 1
PASTURE . . . . (5) 0 1
DATE (YYMMDD) . . . . (6) 7 9 0 6 1 5
ACTION CODE (A,D) . . . . (7) A

(8) MAP SOURCE: ØR
(9) MERIDIAN: 26

(10) TOWNSHIP	(11) RANGE	(12) SECTION	(13) SWA NUMBER	(14) NE1/4 NE NW SW SE	(14) NW1/4 NE NW SW SE	(14) SW1/4 NE NW SW SE	(14) SE1/4 NE NW SW SE	(15) ACRES	(16) SURFACE OWNER	(17) FEDERAL SURFACE ONLY JURIS.	(18) FEDERAL SURFACE ONLY ADMIN.	(19) FEDERAL SURFACE ONLY TYPE LAND
7 N	98 W	2	B121				X	28	FP	BLM	BLM	PL3
7 N	98 W	2	B121			X		12	NP			
7 N	98 W	3	B122		XXX	XXX		175	FP	DØD	BLM	PL3

ABCDEFGHIJKLMNØPQRSTUVWXYZ 1234567890

Site Writeup Area Acres

(By Legal Description)

GENERAL INSTRUCTIONS FOR VA

(1) DE 3529 RECORD TYPE - Preprinted on form.
(2) DE 3579 FORMAT CODE - Preprinted on form.
(3) DE 0003 BLM ADMINISTRATIVE UNIT - Enter Administrative State Code(alpha) and the District, Resource Area, and Planning Unit numbers.
(4) DE 6618 DATE - Enter date of data collection (Yr.Mo.Day).
(5) DE 7350 ACTION CODE - Enter "A" to add new data; "D" to delete existing data.
(6) DE 3540 MAP SOURCE - Enter the map type used for computing acreage figures as follows:
- MTP - MTP Plats
- SP - Survey Plats
- QS - USGS Quad Sheet
- PM - Planimetric Map
- OR - Ortho Photo Quad
- MISC - Other map type (Specify on front of form)

(7) DE 1703 MERIDIAN - Enter principle meridian code as follows:
- 14 - Gila-Salt River ——— Arizona
- 22 - Navajo
- 15 - Humboldt ——————— California
- 21 - Mt. Diablo
- 27 - San Bernardino
- 06 - 6th Principle ———— Colorado
- 23 - New Mexico PM
- 31 - Ute
- 08 - Boise ————————— Idaho
- 20 - Montana PM —————— Montana
- 21 - Mt. Diablo —————— Nevada
- 23 - New Mexico PM ———— New Mexico
- 33 - Willamette ——————— Oregon/Washington
- 26 - Salt Lake ——————— Utah
- 30 - Uintah
- 06 - 6th Principle ———— Wyoming
- 34 - Wind River

NOTE: For other states see DE Dictionary.

(8) DE 1695 TOWNSHIP - Enter township description (NNN.FD) where
- NNN = twp number
- F = fraction (1 - 1/4, 2 - 1/2, 3 - 3/4)
- D = direction (N - north, S - south)

(9) DE 1699 RANGE - Enter range description (NNN.FD) as above except
- D = direction (E - east, W - west)

(10) DE 2506 SECTION - Enter section number.
(11) DE 3507 SITE WRITUP AREA - Enter SWA number.
(12) DE 2904 ALIQUOT PART - Place an "X" under all nominal 40 acre aliquot parts in which the SWA is located. A single 40-acre subdivision of a section may contain parts of more than one SWA.
(13) DE 6520 ACRES - Enter ownership acres for this line item entry.
(14) DE 2531 SURFACE OWNER - Enter ownership code as follows:
- FA - Federal-Acquired
- FP - Federal-Public
- NC - Non-Federal County
- NP - Non-Federal Private
- NQ - Non-Federal Quasi-Government
- NS - Non-Federal State
- NT - Non-Federal Towns
- P___ - Non-Federal Private, assign by planning unit where "___" is a sequential no. assigned to an individual.

(15) DE 2572 JURISDICTION -
(16) DE 2570 ADMINISTRATION - Enter Jurisdiction and Administration codes as follows:
- AF - U.S. Air Force
- ARMY - U.S. Army
- BIA - Bureau of Indian Affairs
- BLM - Bureau of Land Management
- BOM - Bureau of Mines
- BPA - Bonneville Power Administration
- BSFW - Bureau of Sports Fish & Wildlife
- COE - Corps of Engineers
- DOD - Dept of Defense
- DOE - Dept of Energy
- FS - Forest Service
- FWS - Fish & Wildlife Service
- GS - Geological Survey
- MC - Marine Corps
- NAVY - U.S. Navy
- NPS - National Park Service

NOTE: For other agency codes, refer to DE 2576 in dictionary.

(17) DE 3801 TYPE LAND - Enter one of the following codes:
- PL3 - Public Lands-Section 3
- PL5 - Public Lands-Section 15
- PL3R - Public Lands-Section 3, reserved
- PL5R - Public Lands-Section 15, reserved
- LU3 - Land Utilization-Section 3
- LU5 - Land Utilization-Section 15
- O&C - Oregon and California Grant Lands
- CBWR - Coos Bay Wagon Roads
- PA - Pierce Act
- MISC - Miscellaneous Lands

Forage Requirement Data

Form 4412-31
(June 1979)

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

FORAGE REQUIREMENT DATA

RECORD TYPE . . . . (1) V F
FORMAT CODE . . . . (2) D
BLM ADMINISTRATIVE STATE . . (3) U T
BLM DISTRICT . . . . (4) 0 2
DATE (YYMMDD) . . . . (5) 7 9 0 6 1 5
ACTION CODE (A,D) . . . . . . (6) A

(7) ANIMAL SPECIES NAME	CODE	(8) MONTHLY FORAGE REQUIREMENT (lbs)	(9) HEIGHT CLASS AVAILABLE TO ANIMAL (Circle one) 0'-3'	3'-4.5'	4.5'-7'	7' PLUS
Antelope	AN	160	1	2	3	4
Bison, American	BA		1	2	3	4
Burros	BU		1	2	3	4
Cattle	CA	850	1	2	3	4
Caribou	CR		1	2	3	4
Deer, Black-tailed	DB		1	2	3	4
Deer, Mule	DM	200	1	2	3	4
Deer, Whitetail	DW	160	1	2	3	4
Deer, Sitka	DS		1	2	3	4
Elk, Rocky Mt.	ER	668	1	2	3	4
Elk, Roosevelt	EO		1	2	3	4
Elk, Tule	ET		1	2	3	4
Goats	GO		1	2	3	4
Goats, Mountain	GM		1	2	3	4
Horses	HO	1000	1	2	3	4
Ibex	IB		1	2	3	4
Javelina	JA		1	2	3	4
Moose	MO		1	2	3	4
Sheep	SH	150	1	2	3	4
Sheep, Barbary	SB		1	2	3	4
Sheep, California Bighorn	SC		1	2	3	4
Sheep, Dall	SD		1	2	3	4
Sheep, Desert Bighorn	SE		1	2	3	4
Sheep, Peninsula Bighorn	SP		1	2	3	4
Sheep, Rocky Mt. Bighorn	SR		1	2	3	4
			1	2	3	4

ABCDEFGHIJKLMNØPQRSTUVWXYZ 1234567890

Forage Requirement Data

INSTRUCTIONS FOR RECORD TYPE VF

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE STATE: Enter Administrative State Code (alpha).
(4)	DE 0003	BLM DISTRICT: Enter BLM District code.
(5)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(6)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(7)	DE 3929	ANIMAL SPECIES: The code for each animal is preprinted on form. No entry is required.
(8)	DE 3551	MONTHLY FORAGE REQUIREMENT: Enter the monthly forage requirement in pounds dry matter for an average month for each animal occurring on the District.
(9)	DE 3548	HEIGHT CLASS AVAILABLE TO ANIMAL: Circle the height code representing the highest forage available to the grazing animal.

Livestock Use Data

Form 4412-32
(June 1979)

Page ___ of ___

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V L
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) U T 0 2 4 8 0 2
DATE (YYMMDD) . . . . (4) 7 9 0 6 1 5
ACTION CODE (A,D) . . . . . . (5) A

L I V E S T O C K   U S E   D A T A

(6) ALLOTMENT	(7) PASTURE	(8) ANIMAL SPECIES	(9) AUTHORIZED NUMBER OF LIVESTOCK	(10) PERIOD OF USE FROM MONTH DAY - TO MONTH DAY
4011	01	CA	200	06/01 - 07/15
4011	02	CA	200	07/16 - 08/30
4011	03	CA	200	09/01 - 09/30
4012		CA	350	06/01 - 10/30
4013		SH	1200	10/01 - 03/31
4013		HØ	5	10/01 - 03/31

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z   1 2 3 4 5 6 7 8 9 0

Livestock Use Data

I N S T R U C T I O N S   F O R   R E C O R D   T Y P E   V L

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(5)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(6)	DE 0968	ALLOTMENT: Enter designated RMAS four-character number.
(7)	DE 3905	PASTURE: Enter pasture number; blank if none. (Must be unique within allotment.)
(8)	DE 3929	ANIMAL SPECIES: Enter code for each authorized animal which occurs on the allotment. Code as follows: BA - Bison, American BU - Burros CA - Cattle GO - Goats HO - Horses SH - Sheep
(9)	DE 3926	AUTHORIZED NUMBER OF LIVESTOCK: Enter authorized numbers of livestock for all species entered in Item (8).
(10)	DE 3845	PERIOD OF USE: Enter periods of use (month and day) for livestock entered in Item (8). If more than one use period occurs during the year, make additional line entries.

Phenology Adjustment Data

Form 4412-33
(June 1979)

Page ___ of ___

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V P
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) U T 0 2 4 8 0 2
DATE (YYMMDD) . . . . (4) 7 9 0 6 1 5
ACTION CODE (A,D) . . . . . . (5) A

PHENOLOGY ADJUSTMENT DATA

(6) PLANT SYMBOL	(7) PERCENT OF MAXIMUM PRODUCTION BY PHENOLOGY STAGE: BEGINNING GROWTH 1	VEGETATIVE STAGE 2	BOOT STAGE 3	PEAK FLOWERING 4	SEED RIPE 5	MATURE 6	DORMANT 7	REGROWTH 8
AGSP	20	35	55	80	100	95	90	
POSE	30	40	65	85	100	95	85	
FEID	20	35	60	85	100	95	85	
ARTR2	65	85	95	100	100	100	100	

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Phenology Adjustment Data

INSTRUCTIONS FOR RECORD TYPE VP

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(5)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(6)	DE 2646	PLANT SYMBOL: Enter SCS standard plant symbol.
(7)	DE 3545	PHENOLOGY ADJUSTMENT FACTOR: For each species recorded in the planning unit, enter air-dry weight adjustment factors by phenology stage as a percent of maximum production. If no adjustment factor data were collected for certain species, assign factors from species with similar phenological characteristics.

Ecological Site Description

Form 4412-34
(June 1979)

Page ___ of ___

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V R
FORMAT CODE . . . . (2) D
BLM ADMINISTRATIVE STATE . . (3) :U:T:
DATE (YYMMDD) . . . . (4) :7:9:0:6:1:5:
ACTION CODE (A,D) . . . . . . (5) :A:

E C O L O G I C A L   S I T E   D E S C R I P T I O N

(6) RANGE SITE NUMBER	(7) RANGE SITE NAME	(8) PRECIP. ZONE LOW	TO	(8) HIGH	(9) SOIL SURFACE FACTOR	(10) POUNDS OF PRODUCTION PER ACRE AVERAGE YEAR	FAVORABLE YEAR	UNFAVORABLE YEAR
D37X020U	SANDY LM	12	TO	16	26	725	900	600

P L A N T   S P E C I E S   L I S T

(11) PLANT SYMBOL	(12) % COMPOSITION	(11) PLANT SYMBOL	(12) % COMPOSITION	(11) PLANT SYMBOL	(12) % COMPOSITION	(11) PLANT SYMBOL	(12) % COMPOSITION
AGSP	20						
POSE	10						
FEID	10						
ARTR 2	40						
CHVI8	20						
PUTR	10						

S O I L   P H A S E S   A N D   N A M E S

(13) PHASE OF SOIL SERIES	(14) SOIL NAME	(13) PHASE OF SOIL SERIES	(14) SOIL NAME
4011	ALPHA FINE SANDY LOAM		

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z   1 2 3 4 5 6 7 8 9 0

Ecological Site Description

I N S T R U C T I O N S   F O R   R E C O R D   T Y P E   V R

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3329	RECORD TYPE: Preprinted on form.
(2)	DE 3379	FORMAT CODE: Preprinted on form.
(3)	DE 0004	BLM ADMINISTRATIVE STATE: Enter Administrative State Code (alpha).
(4)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(5)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(6)	DE 3528	ECOLOGICAL SITE NUMBER: Enter range or woodland site number according to the following example: D 3 4 A 0 0 1 A N U C where D = Major Land Resource Region 34 = Major Land Resource Area A = Subarea (If no subarea enter "X") 001 = Consecutive Site Number and ANUC = States in which range site is correlated, e.g. Arizona, New Mexico, Utah, and Colorado.
(7)	DE 3914	ECOLOGICAL (Range) SITE NAME: Enter first eight digits of site name.
(8)	DE 3909	PRECIPITATION ZONE: Enter average annual precipitation low and high for the site.
(9)	DE 4818	SOIL SURFACE FACTOR: Enter SSF for the site. This should be future SSF with management.
(10)	DE 3930	POUNDS OF PRODUCTION PER ACRE: Enter potential production in pounds per acre for the average, favorable, and unfavorable years.
(11)	DE 2646	PLANT SYMBOL: Enter SCS standard plant symbol.
(12)	DE 3535	PERCENT COMPOSITION: Enter percent composition by species as shown on the SCS description or otherwise derived. Enter percents in whole numbers. When a range in percent is specified always enter the higher number (i.e. 20 to 25 %, enter 25 %).
(13)	DE 4649	PHASES OF SOIL SERIES: Enter the phases of soil series from the State Soil Inventory legend.
(14)	DE 4648	SOIL NAME: Enter soil name for the associated phase of soil series. No more than 24 positions may be entered.

Diet and Use Factors by Animal and Season

Form 4412-35
(June 1979)

Page ____ of ____

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V U
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) MT024802
DATE (YYMMDD) . . . . (4) 790615
ACTION CODE (A,D) . . . . . . (5) A

DIET AND USE FACTORS BY ANIMAL AND SEASON

(6) PLANT SYMBOL	(7) ALLOWABLE USE FACTOR (PERCENT OF PLANT UTILIZED) SPRING	SUMMER	FALL	WINTER	YEARLONG	(8) ANIMAL SPECIES	(9) P PROPER USE FACTOR / (10) D DIETARY PREFERENCE VALUE (circle one) SPRING	SUMMER	FALL	WINTER	YEARLONG
ABFR2	30	50	50	60		CA	0	0	0	0	
AMUT	40	50	50	50		CA	30	20	20	20	
						AN	40	40	25	05	
						SH	40	40	25	10	
						HO	20	15	15	10	
						DM	40	50	30	10	
AGCR	40	50	50	50		CA	50	50	30	10	
						AN	5	5	10	10	
						SH	50	50	30	10	
						HO	50	50	30	10	
						DM	10	5	5	5	

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0

Diet and Use Factors by Animal and Season

INSTRUCTIONS FOR RECORD TYPE VII

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 6618	DATE: Enter Date of data collection (Yr,Mo,Day).
(5)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(6)	DE 2646	PLANT SYMBOL: Enter SCS standard plant symbol.
(7)	DE 3928	ALLOWABLE USE FACTOR: Enter percent of annual production which can be utilized by season* and still allow the plant to maintain itself.
(8)	DE 3929	WILDLIFE ANIMAL SPECIES: Enter the code for the common name of each animal species occurring in the allotment. Code as follows: AN - Antelope BA - Bison, American BU - Burros CA - Cattle CR - Caribou DB - Deer, Black-tailed DM - Deer, Mule DW - Deer, Whitetailed DS - Deer, Sitka ER - Elk, Rocky mt. EO - Elk, Roosevelt ET - Elk, Tule GO - Goats GM - Goats, Mountain HO - Horses IB - Ibex JA - Javelina MO - Moose SH - Sheep SB - Sheep, Barbary SC - Sheep, California Bighorn SD - Sheep, Dall SE - Sheep, Desert Bighorn SP - Sheep, Peninsula Bighorn SR - Sheep, Rocky Mt. Bighorn
(9)	DE 3511	PROPER USE FACTOR: Circle "P" if proper use factors are being entered. Enter PUF'S by season* for each animal and plant species.
(10)	DE 4114	DIETARY PREFERENCE VALUE: Circle "D" if dietary preference values are being entered. Enter dietary percent by season* for each animal and plant species.

* Standard Seasons of Use Dates (based on North American Solstice Dates):

Spring	3/21	-	6/20
Summer	6/21	-	9/20
Fall	9/21	-	12/20
Winter	12/21	-	3/20
Yearlong	3/21	-	3/20

Wildlife Use Data

Form 4412-36
(June 1979)

Page ____ of ____

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

RECORD TYPE . . . . (1) V W
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) U T 0 2 4 8 0 2
DATE (YYMMDD) . . . . (4) 7 9 0 6 1 5
ACTION CODE (A,D) . . . . . . (5) A

WILDLIFE USE DATA

(6) HERD UNIT	(7) ALLOTMENT	(8) PERCENT OF HERD	(9) WILDLIFE ANIMAL SPECIES	(10) ESTIMATED NUMBER OF ANIMALS	(11) PERIOD OF USE FROM MONTH DAY – TO MONTH DAY	(12) LISTING OF SWA'S USED BY WILDLIFE SPECIES: SWA #	SWA #	SWA #	SWA #	SWA #
16A	4011	20	AN	300	10/01 - 4/30	B001	B002	B003	B004	B005
16A					/ - /	B006	B007	B008		
16D	4011	100	DM	150	/ - /	9999				

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0

Wildlife Use Data

I N S T R U C T I O N S   F O R   R E C O R D   T Y P E   V W

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(5)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(6)	DE 6598	HERD UNIT: Enter herd unit number for each wildlife species.
(7)	DE 0968	ALLOTMENT: Enter designated RMAS four-character number.
(8)	DE 3927	PERCENT OF HERD: Enter percent of total herd that uses the allotment.
(9)	DE 3929	WILDLIFE ANIMAL SPECIES: Enter the code for the common name of each animal species occurring in the allotment. Code as follows: AN - Antelope BA - Bison, American BU - Burros (wild) CR - Caribou DB - Deer, Black-tailed DM - Deer, Mule DW - Deer, Whitetailed DS - Deer, Sitka ER - Elk, Rocky mt. EO - Elk, Roosevelt ET - Elk, Tule GM - Goats, Mountain HO - Horses (wild) IB - Ibex JA - Javelina MO - Moose SB - Sheep, Barbary SC - Sheep, California Bighorn SD - Sheep, Dall SE - Sheep, Desert Bighorn SP - Sheep, Peninsula Bighorn SR - Sheep, Rocky Mt. Bighorn
(10)	DE 3926	ESTIMATED NUMBER OF ANIMALS: Enter estimated number of animals that graze within allotment boundaries.
(11)	DE 3845	PERIOD OF USE: Enter periods of use (month and day) for wildlife entered. If more than one period during year, make additional line entries.
(12)	DE 3507	LISTING OF SWA'S USED BY WILDLIFE SPECIES: Enter SWA numbers for all SWA'S the wildlife species uses on the allotment. Enter "9999" if all SWA'S within the allotment are used by the animal.

Suitability For Livestock Grazing

Form 4412-40
(June 1979)

Page ___ of ___

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SOIL-VEGETATION INVENTORY METHOD

SUITABILITY FOR
LIVESTOCK GRAZING

RECORD TYPE . . . . (1) V I
FORMAT CODE . . . . (2) D
BLM ADMIN UNIT (ST/DI/RA/PU). (3) :U:T:0:2:4:8:0:2:
ALLOTMENT . . . . (4) :4:0:1:1:
PASTURE . . . . (5) :0:1:
DATE (YYMMDD) . . . . (6) :7:9:0:6:1:5:
ACTION CODE (A,D) . . . . . . (7) :A:

(8) SITE WRITEUP AREA	(9) PERCENT OF SWA BY SUITABILITY CLASS				(8) SITE WRITEUP AREA	(9) PERCENT OF SWA BY SUITABILITY CLASS			
	SUITABLE	POTENTIALLY SUITABLE	LIMITED SUITABILITY	UNSUITABLE		SUITABLE	POTENTIALLY SUITABLE	LIMITED SUITABILITY	UNSUITABLE
B001	100								
B002	50	50							
B003				100					
B004		100							
B005	70	30							
B006				100					
B007	100								
B008	100								

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0

Suitability For Livestock Grazing

INSTRUCTIONS FOR RECORD TYPE VI

ITEM	DATA ELEMENT	INSTRUCTIONS
(1)	DE 3529	RECORD TYPE: Preprinted on form.
(2)	DE 3579	FORMAT CODE: Preprinted on form.
(3)	DE 0003	BLM ADMINISTRATIVE UNIT: Enter Administrative State Code (alpha) and the District, Resource Area, and Planning Unit numbers.
(4)	DE 0968	ALLOTMENT: Enter designated RMAS four-character number.
(5)	DE 3905	PASTURE: Enter pasture number; blank if none. (Must be unique within allotment.)
(6)	DE 6618	DATE: Enter date of data collection (Yr,Mo,Day).
(7)	DE 7350	ACTION CODE: Enter "A" to add new data; "D" to delete existing data.
(8)	DE 3507	SITE WRITEUP AREA: Enter SWA number.
(9)	DE 3925	PERCENT OF SWA BY SUITABILITY CLASS: Enter percent of SWA by suitability class in one or more of the four classes. The sum must equal 100 %. Definitions are as follows:

SUITABLE - entirely suitable for livestock grazing.

POTENTIALLY SUITABLE - would be suitable if production is increased, watershed conditions improved, or water developed.

LIMITED SUITABILITY - livestock grazing due to seasonal water availability or ephemeral range.

UNSUITABLE - totally unsuitable for livestock grazing due to excessive slopes, poor watershed conditions, or low production.

XII. FECAL ANALYSIS

Editor's Note: This procedure was transcribed from a Bureau document entitled "4412 - PHYSICAL RESOURCES STUDIES."

A. Introduction

Fecal analysis studies provide information which can be used to aid in the evaluation of present management practices or establishment of future management direction. These studies provide information on the relative percentages of plant species currently being consumed by various herbivores on a particular area of land.

B. Procedures

1. Sampling Area

The area to be sampled is selected on the basis of the use expected to be made of the data. For example, if it is desirable to determine the foraging habits and degree of competition between cattle and mule deer on habitats which only partially overlap each other, it will be necessary to include the total habitat of cattle and the total habitat of mule deer in the sampling area. On the other hand, if it is only necessary to determine the degree of competition between cattle and deer on their overlapping habitats, the sampling area can be reduced to include only that area where the habitats are overlapping.

2. Sampling Procedures

a. ***Method of Sampling***

(1) The sampling area should be traversed in a systematic manner, e.g. paced back and forth on transect lines, and subsamples collected as fecal material is encountered along each transect line. In large sampling areas, it may be desirable to utilize more transects of shorter distances, scattered throughout the sampling area. Non-permanent transects may be necessary in certain areas due to normal distribution patterns of the animals. Other sampling methods are acceptable, providing the area, dates, or animals sampled do not provide a biased sample.

(2) From each pile of fecal material, extract a 2-3 gram subsample ("pinch") and place with other subsamples collected from a particular animal species into a single container. It is recommended that at least 50 defecations from each herbivore be sampled. The result will be a "composite sample" representing a particular class of herbivore in the sampling area.

(3) Composite samples may be comprised of subsamples collected from individual transects or subsample from several transects combined. Composite samples representing individual transects will allow computation of mean and standard

deviation which will provide statistical comparison between areas. However, such samples will also result in greater costs due to the fact that additional microscopic analysis will be required.

b. *Yearling Habitat.* When animals remain in essentially the same location, composite samples may be collected on a seasonal basis to reflect seasonal diet preference or on a one-time basis to reflect a general overview of the diet for an entire year. If it is desirable to determine seasonal diets, it is absolutely necessary that only fresh fecal subsamples be collected. If it is desirable to determine an overview of the yearlong diet, it is necessary to collect subsamples from a variety of fecal age classes (from old to fresh fecal material) to assure that all seasons are represented in the composite sample. In this case, the maximum age of fecal subsamples should not exceed 2-3 years. If any green color still occurs inside the dung, it is probably satisfactory for fecal analysis.

c. *Seasonal Habitat.* When animals migrate from one habitat type to another, as part of their seasonal movement patterns, composite samples may be collected to determine: 1) seasonal diet by habitat type, or 2) overview diet for the entire yearlong habitat. If it is desirable to determine seasonal diets by habitat type, it may be necessary to collect only fresh fecal subsamples to prevent the diets of small resident populations from biasing the data. If it is desirable to obtain an overview diet for the entire habitat, it is necessary to assure that adequate fecal subsamples are collected from each habitat type.

d. *Comparison of diet.* If it is desirable to compare the diet of one class of herbivore with the diet of other herbivores, fecal subsamples must be collected from all animal species being considered. If possible, fecal subsamples from different herbivores should be collected along the same transect line and in equal proportions. Fecal subsamples from each herbivore should be placed in separate containers to form a composite sample for each animal involved.

3. Sample Identification

A suitable means of identifying composite samples must be provided. As a minimum, the date of collection, location, species and/or class of animal should be firmly affixed to each composite sample container. Other useful identifying criteria for a particular sampling area should be used as appropriate, e.g. season represented by the composite sample, name of collector, age of fecal material, or number of subsamples included in the composite sample.

4. Sample Preservation

In order to arrest bacterial activity, composite samples should be oven dried at temperatures below 70 degrees centigrade. If this is not possible, the samples should be air dried until all moisture has been removed. Samples of fresh dung may also be preserved by adding common table salt (1:1 volumetric ratio), alcohol or formaldehyde.

5. Sampling Analysis

a. ***Shipment of Samples.*** Composite samples should be mailed to an appropriate fecal analysis laboratory in suitable containers (plastic or paper bags, plastic bottles, boxes, vials, etc.). Samples should not be sent in glass containers due to possible breakage. Samples preserved with a liquid should have excess liquid drained off before shipment to reduce volume and weight. Do not send samples which have not been dried or fixed with a preservative. Duplicate samples should be retained in the district office in case of questions.

b. ***Microscopic Analysis***

(1) Fecal analysis laboratories will generally have comprehensive libraries of microscopic slides of plant parts, tissues, cells etc. Fecal samples are compared to these microscopic slides, and the ingested plants are identified.

(2) The laboratories will generally prepare 20 slides from each composite fecal sample. Each slide will be examined through a binocular microscope at the rate of approximately 20 fields of view per slide. Botanical composition of the diet may then be determined by dividing the number of plant fragments recognized for a particular plant species by the total number of fragments of all species.

(3) It is necessary that a list of plants, which are present in the area from which fecal samples are collected, be prepared and sent to the fecal analysis laboratory. The abundance of plants in the sampling area should be identified as abundant, common, or infrequent. The plant list will aid the laboratory in identifying plant fragments in the fecal samples and reduce the time required to search through a large number of reference slides.

(4) Even though fecal analysis laboratories have rather complete libraries of the major forage species, frequently the plant material is not on file. If the plant material is not on file, it will be necessary to collect the plant species involved and send them to the laboratory for preparation of reference slides. As a general rule, plant material should be collected during the same season and in close proximity to the area where animal use occurs.

(5) After microscopic examination of fecal material, the laboratory will develop a table showing the percentages of forage categories found in the diets (Illustration 48). This table will be made available to the appropriate district office.

6. Sampling Plan

To insure continuity in sampling procedures, a sampling plan (Illustration 49) will be prepared for all fecal analysis studies which meet one or more of the following criteria:

a. More than one year of data is to be collected.

b. More than one species of herbivore will be involved.

c. More than one habitat will be considered.

d. More than one season of use will be involved.

As a minimum, sampling plans will contain the following sections:

- Section I Background Information and Purpose of Study
- Section II Objective of Study
- Section III Area(s) of Sampling
- Section IV Methods of Sampling
- Section V Identification of Samples
- Section VI Preservation of Samples
- Section VII Sample Collection Schedule

7. **Vegetation Composition**

a. In order to make maximum use of fecal analysis data, it is frequently necessary to compare what is eaten with what is available. As a result, it may be necessary to collect data relative to percent composition of the plant species in the sampling area.

b. Accurate vegetation composition data can best be obtained by using the Soil Vegetation Inventory Method (Section XI). Care should be taken when using vegetation composition information to assure that the data is representative of the sampling area and corresponds to any portions of the sampling area which may be seasonal habitat.

c. In situations where the sampling area overlaps two or more site writeup areas and/or vegetation types, it will be necessary to compute a weighted average of vegetation composition for the entire sampling area. (See Illustration 50 for an example of weighted average computation.) The following formulae should be used when making this computation:

$$\text{Formula:} \quad X = \frac{(P1)(Pa) + (P2)(Pb)}{100}, \text{ where}$$

P1 = Percent Composition by Species in Vegetation Type No. 1

Pa = Percent of Total Area Represented by Vegetation Type No. 1

P2 = Percent Composition by Species in Vegetation Type No. 2

Pb = Percent of Total Area Represented by Vegetation Type No. 2

X = Percent Composition of Vegetation Types 1 and 2 combined (weight average)

C. Use of Data

The percentage of forage categories found in the diets of herbivores can be used in several ways to provide information useful in making management decisions. In most instances, mathematical computations are required for development of useable data.

1. Diet Similarity

Diet similarity is the percentage to which two diets are similar to one another. The similarity of diets can be computed for different classes of herbivores on the same habitat, for different habitats used by one class of herbivore, or for different seasons of use by one herbivore on the same habitat. Such computations will aid in the identification of competition or conflicts which may be occurring in a particular area.

a. ***Diet Similarity Between Herbivores.*** To compute the similarity between diets of two herbivores on the same habitat, the following should be used.

$$DS = \frac{\sum(2w)}{\sum(a+b)}$$

w = the smaller of two shared items
a = percent in diet of herbivore No. 1
b = percent in diet of herbivore No. 2

EXAMPLE

Plant Species	Percent in Diet of Antelope (a)	Percent in Diet of Sheep (b)	2W
Bogr	20	50	40
Spco	10	2	4
OPUN	20	5	10
Chna	40	20	40
Artr	10	23	20
	Σ =100	Σ =100	Σ =114

$DS = \frac{114}{200} = .57$ or The diets of antelope and sheep are 57% similar to each other.

b. ***Diets Similarity Between Habitats.*** The same formula can be used to compute the similarity between diets of a particular class of herbivore on two separate habitats.

Where,

w = the smaller of two shared items
a = percent in diet of habitat No. 1
b = percent in diet of Habitat No. 2

EXAMPLE — Wild Horse Herd 1 — Wild Horse Herd 2

Plant Species	Percent in Diet (a)	Percent in Diet (b)	2W
Brome	10	30	20
Wheatgrass	25	40	50
Fescue	—	10	0
Ricegrass	45	—	0
Sage	—	5	0
Winterfat	—	10	0
Rabbitbrush	5	2	4
Legumes	10	1	2
Other Forbs	5	2	4
	$\Sigma = 100$	$\Sigma = 100$	$\Sigma = 80$

$DS = \frac{80}{200} = .40$ or The diets of wild horse range 1 and 2 are 40% similar to each other.

(Note: This calculation would primarily be useful in instances where it is necessary to prove that the diets of one class of herbivore on two different areas are not identical.)

c. ***Diet Similarity between Seasons.*** The same formula can also be used to compute the similarity of diet for one class of herbivore on the same habitat during different seasons.

$$DS = \frac{\Sigma(2w)}{\Sigma(a+b)}$$

Where,

w = the smaller of two shared items
a = percent in diet during season No. 1
b = percent in diet during season No. 2

EXAMPLE

Plant Species	Percent in Cattle Diet Mid-Winter	Percent in Cattle Diet Mid-Summer	2W
Wheat grass	25	7	14
Fescue	—	25	—
Needlegrass	10	3	6
Other Grasses	5	10	10
Alfalfa	30	20	40
Kochia	—	25	—
Other Forbs	—	10	—
Prickly Pear	5	—	—
Sagebrush	20	—	—
Other Shrubs	5	—	—
	Σ =100	Σ =100	Σ = 70

$DS = \frac{70}{200} = .35$ or The Mid-summer diets and mid-winter diets of cattle are 35% similar to each other.

2. Stocking Exchange Rates

Stocking exchange rates are computed to estimate the day's use of forage consumption by one class of herbivore which will need to be removed in order to make a specified number of day's use of forage available for another class of herbivore. Such computations aid in quantifying the trade-offs needed to accommodate various types of range use. Stocking exchange rates are not used to establish carrying capacities or stocking rates. The following example depicts the procedure for computing stocking exchange rates between antelope and sheep when both make use of the same habitat:

$$\text{Formula: } DU = d \times \frac{a}{(c)(b)}, \text{ where}$$

DU = The number of sheep days of use which need to be removed in order to make additional forage available for antelope.

a = Average daily forage intake for antelope (1.84 pounds per day)

b = Average daily forage intake for sheep (1.63 pounds per day)

c = Similarity of antelope and sheep diets (21%)

d = The number of antelope days of use of forage which is desired to be made available (20 antelope days of use)

$$\text{Computation: } DU = 20 \times \frac{1.84}{(0.21)(1.63)} = 107.6 \text{ or}$$

107.6 sheep days of use will need to be removed to make 20 antelope days use available.

3. Habitat Suitability

Habitat Suitability is a comparison between percent composition of vegetation species in the diet and percent composition of vegetation species in the habitat. Habitat suitability will indicate the percent suitability or comparability of the plant composition in the diet to the botanical composition of the feeding habitat, i.e., which animal is more efficiently adapted to a particular habitat. Habitat suitability can be computed by use of the following formula:

$$DS = \frac{\Sigma(2w)}{\Sigma(a+b)}$$

w = the smaller of two shared items
a = percent composition of vegetation in the diet
b = percent composition of vegetation in the habitat

EXAMPLE

Elk Range No. 1

Plant Species	Percent in Diet (a)	Percent Composition (b)	2W
Brome	8	4	8
Wheatgrass	3	1	2
Fescue	—	—	—
Ricegrass	10	2	4
Sage	10	4	8
Pinon	2	44	4
Mahogany	5	4	8
Juniper	48	34	68
Aspen	—	1	—
Spruce-fir	—	—	—
legumes	6	2	4
Other Forbs	8	4	8
	Σ =100	Σ =100	Σ =114

Elk Range No. 2

Plant Species	Percent in Diet (a)	Percent Composition (b)	2W
Brome	6	2	4
Wheatgrass	12	3	6
Fescue	19	5	10
Ricegrass	—	—	—
Sage	—	—	—
Pinon	—	—	—
Mahogany	6	1	2
Juniper	—	2	—
Aspen	8	33	16
Spruce-fir	13	33	26
legumes	16	5	10
Other Forbs	20	16	32
	$\Sigma = 100$	$\Sigma = 100$	$\Sigma = 106$

Computation:

Elk Range No. 1 $HS = \frac{114}{200} = .57$

Elk Range No. 2 $HS = \frac{106}{200} = .53$

NOTE: Elk Range No. 1 provides the best habitat for elk, i.e., elk diet was more similar to the habitat on Range 1 than on Range 2.

4. Dietary Preference

a. ***Preference Index*** Indices of dietary preference are used to indicate the vegetative species which are highly preferred as food by herbivores. Preference indices are computed by one of the following formula:

$$P = \frac{a}{b}$$ where a = percent composition of vegetation in the diet
b = percent composition of vegetation in the habitat

EXAMPLE

Plant Species	Percent in Diet (a)	Percent Composition (b)	Preference Index
Blue grama	20	50	.4
Globe mallow	10	4	2.5
Prickly pear	20	6	3.3
Rabbitbrush	40	20	2.0
Sagebrush	10	20	.5

NOTE: Increasing values of preference indices indicate greater desirability of a plant species as a source of food.

b. ***Mean Preference Index.*** Mean indices of dietary preference may be used to indicate the relative amount of energy expended by an animal when searching for the foods in its diet. The following example computes the mean preference indices for antelope and sheep on a hypothetical range:

Plant Species	Percent in Diet Antelope	Percent in Diet Sheep	Percent Composition	Antelope Pref. Index	Sheep Pref. Index
Blue grama	20	50	60	.3	.8
Globe mallow	10	2	2	5.0	1.0
Prickly pear	20	5	10	2.0	.5
Rabbitbrush	40	20	8	5.0	2.5
Sagebrush	10	23	20	.5	1.2
				= 12.8	= 6.0

Mean preference index for antelope $= \frac{12.8}{5} = 2.6$*

Mean preference index for sheep $= \frac{6.0}{5} = 1.2$*

*NOTE: As the mean preference index increases above one (1), increasing amounts of energy are used is searching for food. In the above example, antelope would spend more time and energy moving around in search of food.

Illustration 48

Percentages of forage categories in the diets of wild horses, cattle, sheep and pronghorns determined by the microhistological analysis of feces technique (400 fields at 100X were examined per sample) Ely District Nevada

	Horses					Cattle		Sheep		Antelope				
	Spring	Summer	Fall	Winter	Composite	Summer	Composite	Fall	Winter	Spring	Summer	Fall	Winter	Composite
Three awn (Aristida)						.34								
Blue grama (Bouteloua gracilis)		1.38	.06		1.89	.17	2.87							
Cheatgrass Bromus tectorum)	2.03					.08		.13						
Sedge (Carex)	1.12	.16			.24		.15							
Wild rye (Elymus)	9.16	.51	.28		.40	.68	.77							
Galleta (Hilaria Jamesii)	2.88	41.40	5.26	8.55	22.18	63.67	62.06	.03	2.10		.23		.06	
Indian ricegrass (Oryzops hymenoides)	14.30	10.52	1.76	2.64	10.96	2.80	3.37	.23	.21	.20	1.92			
Squirrel tail (Sitanion hystrix)	12.26	1.04	1.24	.87	1.14	.85	3.29	.20	.47		.31			
Dropseed (Sporobolus)	.58	1.68	.89	.74	7.34	9.77	5.85		.05					
Needlegrass (Stipa)	47.65	5.36	2.46	5.99	30.75	6.35	.93	.20	2.67		2.16			
Unknown grass	.16			.49	.49		.08			.03				.04
Wheatgrass Agropyron)								.17						
Sagebrush (Artemisia)	.24							3.25	1.99	16.05	47.24	96.34	11.53	49.22
Saltbrush (Atriplex)		.31	1.73	7.69	1.64	3.72	3.04	2.21	22.83	1.71	3.18	.03	1.79	1.30
Balsam root (Balsamorhiza)								.07						
Rubber rabbitbrush (Chrysothamnus nauseosus)						.08								
Douglas rabbitbrush (Chrysothamnus viscidiflorus)											.08		.03	
Tansy Mustard (Descurania)	.32			.49		.51	3.46		.15	81.07	7.59	.03	86.35	49.22
Mormon tea (Ephedra)						.51			.05					
Wall flower (Erysimum)				.12										
Wright buckwheat (Eriogonum wrightii)														
Winterfat (Eurotia lanata)	8.03	7.29	86.90	70.45	22.82	7.81	9.57	91.83	68.55	.03	.15			
Halogeton (Halogeton glomeratus)	.32					1.99	1.16	.07	.21					
Spiny Hopsage (Grayia spinosa)								.07		.03				
Juniper (Juniperus Utahensis)							.46							
Opuntia										.44	1.10	3.11	.15	.16
Phlox (Phlox hoodii)	.39			.25	.24			.27			.08			
Greasewood (Sarcobatus vermiculatus)	.16													
Russian thistle (Salsola Kali)				.12										
Nightshade (Solanum)						.08	.15							
Globe Mallow (Spaeralcea coccinia)						.25	1.23		.31	.14	35.03	.49	.03	.04
Seed					.08						.15			
Unknown Chenopod		.08			.16									
Unknown Composite (Artemisia type)								1.27		.12				
Unknown Composite	.32									.09				
Unknown Forb		.27	.22	1.24	.08				.05	.06	.39		.06	
Unknown Legume	.08			.37		.34	1.56		.36		.39			.02
Moss										.03				

Wild Horse Fecal Analysis Study
Sampling Plan
Ely District

1. Background Information

Approximately 3,000 wild horses inhabit national resource lands in the Ely District. These horses are scattered across most areas within the district boundaries. The habitat of these animals includes both yearlong and seasonal ranges.

Depending on the location, wild horses graze side by side with a variety of animal species. The major species include mule deer, antelope, domestic cattle and domestic sheep. It is desirable that data relative to the diets of these animals be obtained to facilitate MFP and activity planning.

2. Objectives

a. Determine dietary components of wild horses by season on yearlong and seasonal ranges which are typical of wild horse habitat in the Ely District.

b. Determine possible competition for forage with other herbivores on yearlong and seasonal wild horse habitat.

3. Methods

In order to accomplish the above objectives, the following actions will be taken:

a. Sampling Area

The sampling areas will be established. These will be located on one yearlong wild horse habitat and one (1) seasonal wild horse habitat, respectively.

The yearlong habitat is located in the Little Smokey and Sand Springs Valleys of the Duckwater Planning Unit and is grazed by sheep during the winter months and cattle during the summer months. This area also contains yearlong habitat for a small number of antelope.

The seasonal habitat is located on Buck Mountain and in Long Valley of the Newark Planning Unit. Higher elevations of this area contain crucial winter habitat for mule deer and are grazed by cattle during the summer months. Lower elevations are grazed by sheep and cattle during the winter months.

Both wild horse habitats (yearlong and seasonal) include a variety of vegetation types and plant species.

b. Sampling Procedures

The collection of fecal subsamples will be accomplished by use of non-permanent straight-line transects. Transects will be a minimum of one-quarter mile in length and will be repeated until the desired number of fecal subsamples are obtained. Fecal subsamples will be collected from both sides of the transect line within that area observable by the collector. Additional sampling procedures for the two sampling areas are as follows:

(1) Yearlong Habitat

An attempt to collect fecal material from four (4) geographic areas within the confines of the yearlong habitat will be made. At least one non-permanent transect will be used in each of the four geographic areas. These geographic areas dissect a variety of vegetation types and use areas of wild horses, antelope, cattle, and sheep. Subsamples will be collected four (4) times each year - during the summer, fall, winter, and spring periods - to obtain data on forage preference by season. Since the area is yearlong habitat, only fresh fecal material will be collected.

A total of 50 wild horse fecal material subsamples (2-3 grams subsamples) will be collected from each of the four geographic areas within the yearlong habitat in response to many environmental factors, it will always be necessary to collect subsamples from areas where the animals are located to insure that only fresh fecal material is collected.

Fecal material from cattle and sheep will be collected each time wild horse subsamples are collected. Due to the fact that cattle utilize only a portion of the area during the summer months and sheep utilize only a portion of the area during the winter months, it is expected that fecal material from these animals will be comparatively scarce. Therefore, it is necessary to collect subsamples from these animals whenever fecal material is collected for wild horses to insure that an adequate number of cattle and sheep subsamples are provided.

Because the season on which cattle and sheep utilize the area is fixed by a grazing license, there should be on problem determining seasonal forage preference of cattle and sheep from fecal material collected during all seasons of the year. However, it will always be important not to collect cattle and sheep subsamples in excess of three years of age.

If possible, fecal material from antelope will be collected during each season wild horse subsamples are collected. Because there are very few antelope in this area, it will be necessary to collect subsamples from areas in which antelope concentrate. It is suggested that if antelope droppings are not readily available, the collector should search for droppings along roads or trails. This suggestion is made because antelope are known to deposit droppings when crossing roads.

Since antelope use the sampling area on a yearlong basis, it is necessary to collect only fresh subsamples so that seasonal diets can be compared with those of wild horses.

(2) Seasonal Habitat

An attempt will be made to collect fecal material from three (3) geographic areas within the confines of the seasonal habitat. At least one non-permanent transect will be used in each of the three geographic areas. These geographic areas dissect a variety of vegetation types and use areas of a variety of animal species within the sampling area.

The spring, summer, and fall portions of the seasonal wild horse habitat are located on the higher elevation of Buck Mountain. This area serves as spring, summer, and fall range for wild horses and cattle. It also serves as important winter range for mule deer.

A total of 100 wild horse fecal material subsamples will be collected from this area. This fecal material will be collected three times each year during the spring, summer, and fall seasons to determine forage preferences by season. Only fresh fecal material will be collected.

Fecal material from mule deer will be collected also. However, because it is not possible to gain access on Buck Mountain during the winter season, no attempt to collect mule deer fecal material during the winter months will be made. Therefore, in order to obtain data on forage preferences for mule deer during the winter period, it will be necessary to collect mule deer subsamples during the spring. Mule deer fecal material will be collected only once each year, in the early spring, and only fresh subsamples will be collected.

The winter portion of the seasonal wild horse habitat is located on the west side on Long Valley. This area dissects a variety of vegetation types and use area of wild horses, cattle, and sheep. Subsamples will be collected in the Dry Mountain Allotment (sheep use) and the Warm Springs Allotment (cattle use). A total of 50 wild horse fecal material subsamples will be collected from each allotment for a total of 100 subsamples. Subsamples will be collected once each year during the winter season to determine forage preferences during the winter.

Fecal material from cattle will be collected in the Warm Spring Allotment whenever wild horse subsamples are collected. If possible, 50 subsamples will be obtained.

Fecal material from sheep will be collected in the Dry Mountain Allotment whenever the wild horse subsamples are collected. If possible, 50 subsamples will be collected.

The Dry Mountain and Warm Springs Allotment are located in a winter use area for wild horses, cattle, and sheep. As a result, it will not be necessary to collect fresh fecal material from these animals. However, it is important not to collect subsamples older than three years old.

4. Sample identification

Samples collected in accordance with labels which include the following information:

a. District

b. Sampling Area:yearlong or seasonal habitat

If seasonal habitat: spring, summer,
fall, or winter portion

c. Date of Collection

d. Season Represented by Sample

e. Class of Animal

5. Sample preservation

Samples will be air dried for a period of not less than 30 days prior to analysis.

6. Collection Schedule

The following schedule will be utilized in collection of subsamples:

YEARLONG HABITAT

	Wild Horses	Cattle	Sheep	Antelope
Number of Subsamples to Collect by Season	200	As many as possible up to 100	As many as possible up to 100	As many as possible up to 100
Season Subsample Will be Collected	Winter Spring Summer Fall	Spring Summer Fall	Winter Spring Fall	Winter Spring Summer Fall
Age of Subsamples to Collect	fresh only	3 years old	3 years old	fresh only

SEASON HABITAT (Spring, Summer, Fall Portion)

	Wild Horses	Cattle	Deer
Number of Subsamples to Collect by Season	100	100	100
Season Subsample Will be Collected	Spring Summer Fall	Spring Summer Fall	Spring
Age of Subsamples to Collect	fresh only	fresh only	fresh only

	Wild Horses	Cattle	Sheep
Number of Subsamples to Collect by Season	50	50	50
Season Subsample Will be Collected	Winter	Winter	Winter
Age of Subsamples to Collect	3 years or less	3 years or less	3 years or less

Table 1
List of Plant Species in
Yearlong Wild Horse Habitat
Duckwater Planning Unit

Plant Species	Plant Abundance
Artemisia tridentata	abundant
Artemisia nova	abundant
Artemisia spinescens	infrequent
Atriplex confertifola	abundant
Atriplex canescens	infrequent
Greyia spinosa	common
Tetradymia canescens	infrequent
Halogeton glomeratus	common
Salsola kali	common
Purshia tridentata	infrequent
Cowania mexicana	infrequent
Rhus trilobata	infrequent
Lupinus spp.	infrequent
Juniperus utahensis	infrequent
Pinus monophyla	infrequent
Phlox spp.	infrequent
Chrysothamnus nauseosus	common
Chrysothamnus viscidiflorus	abundant
Chrysothamnus lanceolatus	infrequent
Ephedra spp.	infrequent
Sarcobatus vermiculatus	common
Eurotia lanata	common

Plant Species	Plant Abundance
Sphaeralcea tenuiflora	common
Carex spp.	infrequent
Hilaria jamesii	abundant
Oryzopsis hymenoides	common
Elymus salinus	infrequent
Sitanion hystrix	common
Stipa comata	infrequent
Stipa spp.	infrequent
Sporobolus airoides	infrequent
Bouteloua gracilis	infrequent
Elymus cinereus	infrequent

Table 2
List of Plant Species in
Seasonal Wild Horse Habitat
Newark Planning Unit

Plant Species	Plant Abundance
Artemisia tridentata	abundant
Artemisia nova	common
Artemisia spinescens	infrequent
Atriplex confertifola	common
Atriplex canescens	infrequent
Greyia spinosa	infrequent
Tetradymia canescens	infrequent
Halogeton glomeratus	common
Salsola kali	infrequent
Purshia tridentata	common
Cowania mexicana	infrequent
Rhus trilobata	infrequent
Lupinus spp.	infrequent
Juniperus utahensis	common
Pinus monophyla	common
Phlox spp.	infrequent
Chrysothamnus nauseosus	common
Chrysothamnus viscidiflorus	common
Chrysothamnus lanceolatus	infrequent
Ephedra spp.	infrequent
Eurotia lanata	common

Plant Species	Plant Abundance
Sphaeralcea tenuiflora	common
Carex spp.	infrequent
Oryzopsis hymenoides	common
Sitanion hystrix	common
Stipa comata	common
Stipa spp.	infrequent
Elymus cinereus	infrequent

Example - Weighted Average Computation for Two Vegetation Types

Vegetation Type No. 1 Pinon/Juniper - 30% of Sampling Area			Vegetation Type No. 2 Sagebrush - 70% of Sampling Area			**Weighted Average** or percent composition of vegetation **Types 1 and 2 Combined**
(a) Plant Species	(b) Percent Composition	(c) (Column b x 30%)	(d) Plant Species	(e) Percent Composition	(f) (Column e x 70%)	(g) Sum of Columns c plus f x 100
Pied	15	.045	Pied	—	0	4.5
Juos	20	.060	Juos	—	0	6.0
Artr	40	.120	Artr	70	.490	61.0
Arno	5	.015	Arno	10	.070	8.5
Putr	10	.030	Putr	5	.035	6.5
Eula	—	0	Eula	2	.014	1.4
Agsp	3	.009	Agsp	5	.035	4.4
Stco	5	.015	Stco	3	.021	3.6
Sihy	2	.006	Sihy	3	.021	2.7
Hija	—	0	Hija	1	.007	.0
Bogr	—	0	Bogr	1	.007	.7
	100			100		100.0

XIII. MEDITERRANEAN ANNUAL STUDY METHOD

Editor's Note: The Photographic Utilization Method described below was taken from original BLM Manual Release 4-36, Part 4412.24, dated 05/26/70. The material was reorganized and edited to clarify the procedure.

A. Introduction

The purpose of this procedure is to analyze the productive condition and species composition in relation to mulch residue in the Mediterranean annual type. This helps in determining the amounts of mulch needed for sustained production and evaluating the adjustments needed in stocking rates. Procedures apply only to Mediterranean ranges in the state of California.

B. Plot Location

1. Photo Plots

Photo plots will be established in Key areas in accordance with the procedures for the Photo Plot Method described in Technical Reference 4400-4 for range trend studies.

2. Mulch Residue Plots

Two plots will be established using a 9.6 sq. ft. frame (round or square frames) located a minimum of 10 feet from the photographic plot. Plots will be moved each year, starting in the NW quarter from the photographic plots and then moving in a clockwise direction to the NE, SE, SW, and back to the NW. If a circular plot is used, a steel stake marker should be placed in the center of the plot. If a square plot is used, then angle iron stakes should be placed at opposite corners.

C. Collection of Data

Data collection for evaluation of the annual type requires six steps: photographs, estimates of composition, observed apparent trend, mulch residue determination, climate, and actual use.

1. Photographs

Photographs will be taken at the photo plots at approximately the same time each year. Photos will include both a closeup shot and a general view.

2. Composition

Composition based on ocular weight estimates is determined on the photographic plot and also on the mulch plots clipped the previous fall. Composition estimates are recorded on Form 4412-23 (Illustration 51) for individual species considered most important to management objectives for the specific allotment; all other species are recorded as other. The species selected may have bad as well as good qualities, but they must be valuable as indicators. Even though the selected species are not present each year, estimates in subsequent years will include only the original species chosen. Composition is estimated in the spring when plants are easily identifiable. After composition is estimated, the mulch plot stakes are removed (and reset for mulch plots to be clipped in the fall (See Section XIII.C.3). Care should be taken not to reuse an old plot after each cycle.

3. Mulch Residue Determination

At each mulch plot, all standing vegetation is clipped to ground level and all undecomposed plant material that was produced on the plots is removed. Use caution not to include any soil or other foreign materials. This plant material will be kept in paper sacks until air dry weight can be measured. These plots will not be clipped again but will be used the next spring for composition estimates. Dry weights are recorded in grams for each clipped plot on Form 4412-22 (Illustration 52). Total weight (b) is that for all of the plot weights in grams. Average weight (c) is the average production in pounds per acre (total production/number of plots x 10= pounds per acre). Column (d) indicates composition plot direction and distance from the photographic plot.

Clipping vegetation and removing mulch destroys the effects of mulch accumulation. Therefore, the mulch plots will have to be moved each year after composition is determined in the spring.

4. Observed Apparent Trend

This is recorded on Form 4412-23 (Illustration 51) with a short narrative statement on soil stability that describes present erosion conditions and any indications of active erosion. Evidence of grazing is described by livestock use patterns that might be recognized or known. A short narrative statement is made by the examiner based on an overall observation of the apparent trend at the time of examination.

5. Climate

The basic factors to be considered are temperature and precipitation, which are significant because of their influence over growth processes. Summarize climatic data on Allotment Evaluation Summary Form 4413-1 (Illustration 53).

6. Actual Use

Records will be kept in accordance with the Actual Use Studies Technical Reference 4400-2.

D. Training

Training required is minimal. The key area and plot location must be made by the resource manager, but the clipping and weighing can be performed by students or sub-professionals.

E. Production

If current production is desired, a caged plot could be added for each of the two mulch plots used, as is done in the paired plot method described in TR4400-3, Utilization Studies.

Composition Studies Mediterranean Annual Ranges

Form 4412–23
(January 1970)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COMPOSITION STUDIES MEDITERRANEAN ANNUAL RANGES

INSTRUCTIONS
DISTRICT OFFICE PREPARES ONE (1) COPY AS NEEDED. FILE WITH AMP STUDIES DATA.

District	Examiner (name)	Date
Ukiah	W. E. Stencil	3-5-70

Planning Unit	Allotment (name)	Pasture (number or name)	Vegetative Type
Bear Creek	Cubson	West	Med. Annual

Class of Stock	Season of Use	Grazing Management System
Cows and Calves	11-16 to 6-30	Season Long

PHOTOGRAPHIC PLOT (Species)	COMPOSITION (percent)	CLIPPED PLOTS* (Species)	COMPOSITION (percent) PLOT NUMBER 1	2	3	4
Brmo	25	Brmo	10	15		
Brri	10	Brri	20	15		
Erbo	20	Erbo	20	20		
Mehi	10	Mehi	10	5		
Gave	5	Gave	5	10		
Orer	5	Orer	15	10		
Other	25	Other	20	25		
TOTAL	100	TOTAL	100	100	100	100
Above is photo plot number 6		Location in relation to photographic plot	10' NW	20' NW		

Remarks

Light erosion conditions – soil movement is evident on the slopes. The range generally looks smooth – about the same amount of vegetation left in swales and on slopes. Apparent trend appears to be down.

*Composition is estimated the spring following clipping of mulch plots

Illustration 52

Determining Utilization of Mediterranean Annual Ranges

Mulch Method

Form 4412–22
(January 1970)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

DETERMINING UTILIZATION OF MEDITERRANEAN ANNUAL RANGES
MULCH METHOD

INSTRUCTIONS
DISTRICT OFFICE PREPARES
ONE (1) COPY AS NEEDED.
FILE WITH AMP STUDIES DATA.
RECORD NEW INFORMATION AS GATHERED.

District: Redding	Examiner (name): Forest Palmer		Date: 9-2-70
Planning Unit: Foothill	Allotment (name): Three Oaks	Pasture (number or name): 4	Vegetative Type: Med. Annual
Class of Stock: Steers	Season of Use: 11-1 to 8-15	Grazing Management System: Season Long	

	PLOT WEIGHT (Grams) (a)										WEIGHT: GRAMS (b)	POUNDS PER ACRE (c)	DISTANCE AND DIRECTION FROM PHOTO PLOT (d)									
YEAR	1	2	3	4	5	6	7	8	9	10	TOTAL	AVERAGE	1	2	3	4	5	6	7	8	9	10
1970	140	173	152	136	148	160					909	1510	10' NW	20' NW	10' NW	20' NW	10' NW	20' NW				
1971	174	202	196	224	187	212					1195	1990	10' NE	20' NE	10' NE	20' NE	10' NE	20' NE				
1972	193	169	182	195	171	184					1094	1820	10' SE	20' SE	10' SE	20' SE	10' SE	20' SE				
1973	172	105	95	110	85	92					659	1090	10' SW	20' SW	10' SW	20' SW	10' SW	20' SW				
1974	136	160	142	136	151	146					870	1450	15' NW	25' NW	15' NW	25' NW	15' NW	25' NW				

(e) LOCATION

Plots 1 and 2 See aerial photo #GGB 23-140. Plots marked in upper left portion of photo. Steel fence post is .3 west from road at Johnson Creek junction. Plots are south of post from 100 to 250 feet. Plots 3 and 4 See aerial (over)

ALLOTMENT EVALUATION SUMMARY

Form 4413–1
(July 1968)

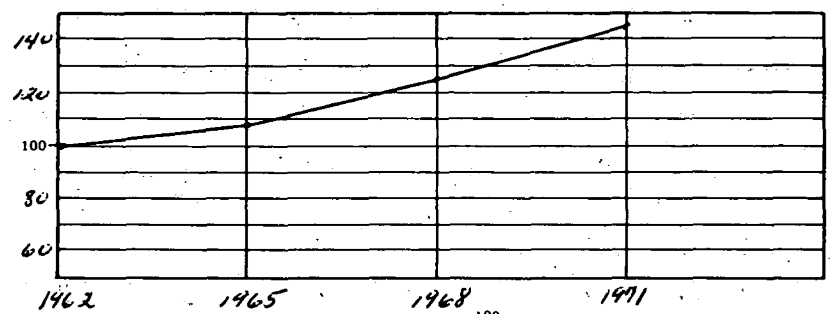
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

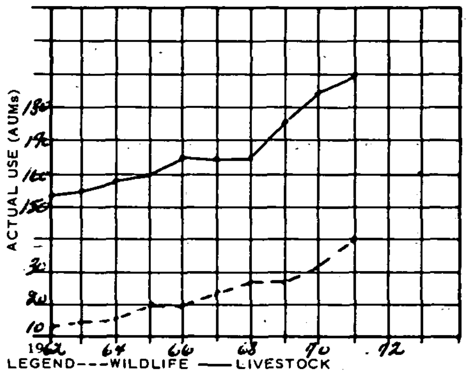
ALLOTMENT EVALUATION SUMMARY

District	Planning Unit	Date
Salmon	LAVA	7-1-72

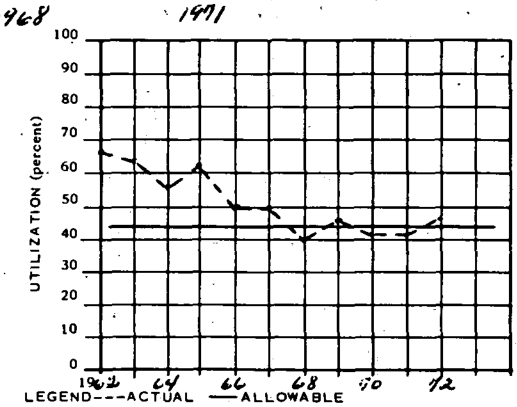
Allotment	Type of Management
Pebble (N. Pasture Strata)	Deferred Rotation

TREND INDEX





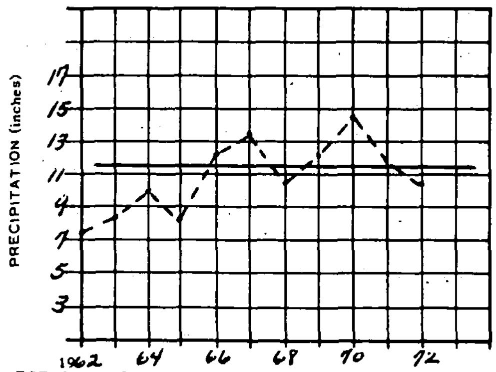
LEGEND---WILDLIFE ——LIVESTOCK



LEGEND---ACTUAL ——ALLOWABLE

LEGEND---ACTUAL ——NORMAL

Growing Season (4-15 to Sept. 30)



LEGEND---ACTUAL ——NORMAL

Growing Season Precip. (4/15 - 9/30)

PRODUCTION			RANGE SUITABILITY		
			PERCENT		
			SUITABLE	POTENTIALLY SUITABLE	UNSUITABLE
Current	190	AUMs			
Potential	252	AUMs	90	0	10

NARRATIVE

Brief concise evaluation, alternative possibilities for improvement, recommendations for management changes, etc.
(Attach additional sheets, if necessary)

Prior to 1968, growing season temperature has been above normal and precipitation below normal, resulting in hot, dry weather. During this time, (actual) use increased only slightly and utilization has largely been above desired use. However, the trend also has been continually upward.

The cooperator has been making stocking adjustments in accordance with the flexibility detailed in the management plan. Because of poor market conditions, some cattle have been held over resulting in the increased actual use and utilization during this period.

With the return of normal growing season climatic conditions, actual use has increased more rapidly by delaying gathering date. This has resulted in stabilizing utilization at the desired level.

It is concluded now that no further modifications in the plan are necessary. Vegetative cover and composition have improved considerably (see data sheets in allotment file) since the management plan was initiated in 1962.

Collect trend studies data every 5 years in the future.

GPO 844-502

XIV. MISSOURI RIVER BASIN STUDIES

Editor's Note: The Missouri River Basin Studies procedures described below have been summarized from the Handbook for the Resource Inventory of Lands for Field Personnel Engaged in Missouri River Basin Studies, published by the U.S. Department of the Interior, Bureau of Land Management, Denver, Colorado, revised May 1963.

A. Introduction

These studies involved Range Site inventories in portions of Montana and Wyoming within the Missouri River Basin. The method identified range sites based on the productive capabilities of the sites. Each site was assigned a condition class based on a comparison of the existing plant community with the original (or potential) plant community. Range Condition represented the degree to which the present plant composition (an ocular estimate to the nearest 5 percent of annual growth, by weight, of the species making up the plant community) departed from that of the native potential plant community.

B. Species Categories

Plant species were segregated by their response to grazing use into three categories: Decreaser, Increaser, and Invader plants.

1. Decreasers

Decreasers were those plants of the potential plant community that dwindle in relative abundance with continued moderately heavy to heavy grazing use, drought, wrong season of use, wrong class of livestock, poor water distribution, etc. The total percent composition of all of these species is tallied in determining the range condition class.

2. Increasers

Increasers were those plants of the original plant community that occupy more space and hence increase as the decreaser plants drop out. Increaser plants are handled by the percent composition in which they normally occurred in the original plant community. Their present abundance up to, but not exceeding, this maximum was added to the total already derived from all of the decreasers.

3. Invaders

Invaders were those plants not part of the potential plant community. No invader was counted in determining the range condition class.

C. Range Condition

The percent composition (dry weight) for each species was determined by ocular estimate and recorded on the Range Site & Condition Write-up Form (Illustration 54). This same worksheet could then be used to determine the present Range Condition by comparing the degree of similarity between the existing vegetation with the potential plant community. The potential plant community for each range site could then be found on a series of guides for determining range condition. These Technicians' Guides (Illustration 55) list the increaser species and the percent composition (air dry weight) that each decreaser species contributes to the potential (climax) plant community for each range site .

On this basis, there are four range condition classes.

Condition Class	Percent of Present Composition that is Potential for the Site
Excellent	75-100
Good	50-75
Fair	25-50
Poor	0-25

D. Stocking Rate

The Technicians' Guides also have recommended stocking rates for various parts of the region and different precipitation zones. These guides listed the key vegetation species and percent dry weight (composition) in the climax community for each range site.

For further details of this survey method, refer to Handbook for the Resource Inventory of Lands for Field Personnel Engaged in Missouri River Basin Studies, as published by the U.S. Department of the Interior, Bureau of Land Management, Denver, Colorado, revised May 1963; also refer to "Condition and Management of Range Land Based on Quantitative Ecology" by E.J. Dyksterhuis, Journal of Range Management, , Vol. 3, No. 3, July 1949.

Range Site & Condition Write-up (Ecological Site Method)

Date________________

Plot No.__________ Examiner______________

T_______ R_______ Sec____________ P.M._____

____

Present Composition		Climax
Species	%	% Usable
Plants are listed by symbol (See Sec IX - Plant List) as they are encountered. Relative abundance is estimated by increments of 5%.	Relative abundance by percent.	Percentage of each plant species as it would be encountered in the original vegetation (See Guide Appendix A)
Total	100%	% Condition

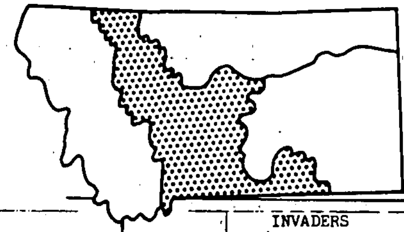
GPO 840381

________AUM's/Acre

Field Writeup Sheet

Based on information from
U. S. Department of Agriculture
Soil Conservation Service
(Rev) April, 1962

TECHNICIANS' GUIDE TO
RANGE SITES, CONDITION CLASSES AND RECOMMENDED STOCKING RATES
IN
THE FOOTHILLS AREA OF CENTRAL MONTANA 10-14" PRECIPITATION ZONE



PART I: KEY SPECIES AND THEIR RESPONSE TO GRAZING

DECREASERS		INCREASERS (By Range Site*)	Maximum Percent Dry Weight Produced Annually in Climax																									INVADERS (Less than 2½% in Climax)
			WL	Sb	SS	Ov	SO	Sa	Sv	Sy	Si	Cy	TSy	TSi	TCy	SwC	SwG	SwL	SwN	Ps	DC	TB	Gr	VS	SU	Sh	Bl	
Elci	Bocu	Agsm	-	5	d	30	d	5	15	10	25	35	10	25	30	d	d	30	30	d	30	20	d	d	d	d	d	Annual Plants
Spgr	Poca	Feid	-	-	-	-	-	-	d	d	30	d	d	d	d	d	d	d	d	-	-	d	d	d	d	d	-	Popr
Deca	PUCC	Stco (1)	-	-	-	5	-	30	20	35	25	-	40	30	-	-	d	25	25	d	-	d	d	d	-	-	d	Poco
Caca	Cahe	Spcr	-	-	-	-	-	5	-	5	-	-	5	-	-	-	5	-	-	-	-	5	10	d	-	-	-	Hoju
Fesc	Forb decr.	Kocr	-	-	-	-	-	5	5	5	5	-	5	10	5	5	15	10	10	10	-	10	d	d	-	-		Scpa
Elca	Woody decr.	Camo	-	-	-	-	-	-	5	5	5	10	5	5	10	10	d	d	d	15	15	d	d	d	-	d	-	Arlo
Brma		Mucu	-	-	-	-	-	-	-	-	-	-	10	15	5	5	15	-	-	-	-	10	10	15	-	d	d	Cael
Poam		Bogr	-	-	-	-	-	-	5	5	10	5	10	10	5	5	10	10	-	10	-	10	15	15	-	d	25	Grsq
Calo		Pose	-	-	-	-	-	-	-	-	5	5	-	5	10	10	10	10	10	10	5	10	10	10	-	10	10	Gusa
Heki		SITA	-	-	-	-	10	-	-	-	-	-	-	-	5	5	5	5	-	5	-	-	-	-	d	d	-	Taof
Spai		Sedge incr.	25	15	10	5	5	-	-	5	5	-	5	5	5	5	5	5	5	5	-	10	d	d	-	-	-	Cila
Poju		Musq	-	5	10	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			Ciar
Stvi		ATRI	-	-	15	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	d	-	Eues
Agsp		Forb incr.	10	10	-	5	-	5	5	5	5	5	5	5	5	5	5	5	5	-	-	5	10	15	-	15	5	Cere
Dapa		Eula	-	-	-	-	-	-	-	-	10	5	-	d	d	d	-	-	-	d	d	d	d	d	d	d	d	CHRY
Agtr		Artr	-	-	-	-	-	-	-	-	5	5	-	5	-	5	-	-	-	-	-	5	-	-	-	-	-	
Stcl		Arca	-	-	-	5	-	-	-	5	5	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	
Trsp		SAVE	-	-	5	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	10	-	
Orhy		Conifers	-	5	-	-	-	-	10	-	-	-	-	-	-	5	5	5	-	-	-	10	-	5	-	-	-	
Ansc		Other woody plants	10	15	-	10	5	5	5	5	5	5	5	5	5	5	5	5	5	-	-	5	5	5	-	5	5	

* The symbol "-" means the species has less than 2½% coverage or is not present in the original vegetation of this site. The symbol "d" means the species is a decreaser on this site. Range soil groups are described with determinant features in the Technical Guide. WL - WET LAND; Sb - SUBIRRIGATED; SS - SALINE SUBIRRIGATED; Ov - OVERFLOW; SO - SALINE OVERFLOW; Sa - SANDS; Sv - SAVANNAH; Sy - SANDY; Si - SILTY; Cy - CLAYEY; TSy - THIN SANDY; TSi - THIN SILTY; TCy - THIN CLAYEY; SwC - SHALLOW CLAY; SwG - SHALLOW TO GRAVEL; SwL - SHALLOW LIMY; SwN - SHALLOW NONLIMY; Ps - PANSPOTS; DC - DENSE CLAY; TB - THIN BREAKS; Gr - GRAVEL; VS - VERY SHALLOW; SU - SALINE UPLAND; Sh - SHALE; Bl - BADLANDS.

PART II: GUIDE FOR MAKING RECOMMENDATIONS ON STOCKING

A. Guide to Departures from Basic Table by Soil Groups**

For WET LAND sites use three times the values for 20-24" precipitation zone. For SUBIRRIGATED use two times the values for 20-24" p.z. For SALINE SUBIRRIGATED and OVERFLOW, use values of next higher p.z. For SALINE OVERFLOW use values one-half step above p.z. For SANDS, SAVANNAH, SANDY, SILTY and CLAYEY sites use values given for the p.z. For THIN SANDY, THIN SILTY, THIN CLAYEY, SHALLOW CLAY, SHALLOW TO GRAVEL, SHALLOW LIMY, SHALLOW NONLIMY, PANSPOTS and DENSE CLAY sites use values one-half to one zone lower than the p.z. where located. For THIN BREAKS use values one to one and one-half zones lower. For GRAVEL, VERY SHALLOW, and SALINE UPLANDS use values one and one-half to two zones lower than those for the p.z. but not less than one-half the values for the 5-9" p.z. For SHALE and BADLANDS use values two to three zones lower but not less than one-half the values for the 5-9" precipitation zone.

B. Basic Table for Normal Sites of each Precipitation Zone

Average Annual Precipitation Zone	Range Condition Percentage & Classes			
	100 - EC - 75	- GC - 50	- FC - 25	- PC
(Inches)	(Animal Unit Months per Acre***)			
25-29	1.0	.75	.5	.25
20-24	.8	.6	.4	.2
15-19	.6	.45	.3	.15
10-14	.4	.3	.2	.1
5-9	.2	.15	.1	.05

** Departures do not include utilization cuts because of inaccessibility. Apply any necessary utilization cut to grazing unit after AUM's are totaled.

*** All rates are much higher if grazing is limited to season of complete dormancy.

RECOMMENDED STOCKING RATE
AUM'S PER ACRE

Range Condition Percentage	Precipitation Belt (Inches) 25-29	20-24	15-19	10-14	5-9
0	0	0	0	0	0
5	.05	.04	.03	.02	.01
10	.10	.08	.06	.04	.02
15	.15	.12	.09	.06	.03
20	.20	.16	.12	.08	.04
25	.25	.20	.15	.10	.05
30	.30	.24	.18	.12	.06
35	.35	.28	.21	.14	.07
40	.40	.32	.24	.16	.08
45	.45	.36	.27	.18	.09
50	.50	.40	.30	.20	.10
55	.55	.44	.33	.22	.11
60	.60	.48	.36	.24	.12
65	.65	.52	.39	.26	.13
70	.70	.56	.42	.28	.14
75	.75	.60	.45	.30	.15
80	.80	.64	.48	.32	.16
85	.85	.68	.51	.34	.17
90	.90	.72	.54	.36	.18
95	.95	.76	.57	.38	.19
100	1.00	.80	.60	.40	.20

CONVERSION FROM AUM'S PER ACRE

Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres Aum
.01	100	.21	4.8	.41	2.4	.61	1.6	.81	1.2
.02	50	.22	4.5	.42	2.4	.62	1.6	.82	1.2
.03	33	.23	4.3	.43	2.3	.63	1.6	.83	1.2
.04	25	.24	4.2	.44	2.3	.64	1.6	.84	1.2
.05	20	.25	4.0	.45	2.2	.65	1.5	.85	1.2
.06	17	.26	3.8	.46	2.2	.66	1.5	.86	1.2
.07	14	.27	3.7	.47	2.1	.67	1.5	.87	1.1
.08	13	.28	3.6	.48	2.1	.68	1.5	.88	1.1
.09	11	.29	3.4	.49	2.0	.69	1.4	.89	1.1
.10	10	.30	3.3	.50	2.0	.70	1.4	.90	1.1
.11	9	.31	3.2	.51	2.0	.71	1.4	.91	1.1
.12	8.3	.32	3.1	.52	1.9	.72	1.4	.92	1.1
.13	7.7	.33	3.0	.53	1.9	.73	1.4	.93	1.1
.14	7.1	.34	2.9	.54	1.9	.74	1.4	.94	1.1
.15	6.7	.35	2.9	.55	1.8	.75	1.3	.95	1.1
.16	6.3	.36	2.8	.56	1.8	.76	1.3	.96	1.0
.17	5.9	.37	2.7	.57	1.8	.77	1.3	.97	1.0
.18	5.6	.38	2.6	.58	1.7	.78	1.3	.98	1.0
.19	5.3	.39	2.6	.59	1.7	.79	1.3	.99	1.0
.20	5.0	.40	2.5	.60	1.7	.80	1.3	1.00	1.0
								1.20	.8
								2.00	.5
								5.00	.2

INSTRUCTIONS TO TECHNICIANS: The use of the above guide will give you an indication of carrying capacity. However, other factors must be of record. On the back of each range writeup include the following as notes. However, all will not be within each type and will have to be noted. Record:

1. Site Inclusion: Inclusion of other Sites as minor constituents to the dominant Site with percent (%) of each.

2. Variance: Inclusion of areas of carrying capacity varying markedly from the site norm; such as, rocky outcrops, barren lakebeds or small productive meadows.

3. Soils: Explain if there are variations in soils which disagree markedly with the norm for the site--an area with severe erosion, for example.

4. Utilization Cut: Always record any cut which is made according to manual instructions in which feed is unavailable to stock because of rocks, distance of water, steep slope, down timber, unstable soil, etc.

5. Site Cut or Raise: Always record (if the site calls for another rainfall belt) how much of a deduction or addition has been made and for what reason, i.e. "cut one belt for Shallow". Sometimes carrying capacity is reduced because a less productive Site is included within the dominant more productive Site. Make the writeup according to percent of each (see 1 and 2).

6. Poisonous Plants: Are poisonous plants present? Are they significant; that is, do they constitute a menace and should they be eradicated?

7. Rodents: Are there destructive animals, such as prairie dogs or kangaroo rats or rabbits, in such numbers they need to be controlled?

8. Reaction to Site: It is especially important to give your impression of the Site; therefore, comment on the general aspect, if there is such a thing as scattered trees throughout the area, or perhaps a few included ridges on which limber pine may make this area different from the rest.

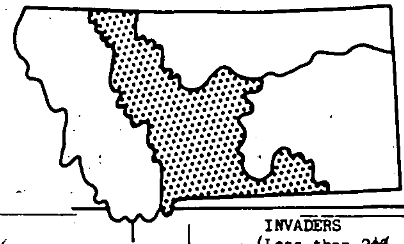
9. Recreation and Access: Record anything regarding recreational use, such as scenic beauty, hunting, fishing, or access to area which does provide such.

10. Inter-Agency Interest: Always mention archaelogical, paleontological or historical sites, or relict areas. They should be included on the map. Another factor which is sometimes overlooked are items of historical interest.

11. Potential Improvement: Is the area short of water? Is there permanent water or is there temporary water and how far distant? Is the forage underused because of lack of water? Is it overused because it is too close to water? Would it be possible to avoid overuse by better distribution of livestock; waterspreaders or reseeding?

Based on information from
U. S. Department of Agriculture
Soil Conservation Service
(Rev) April, 1962

TECHNICIANS' GUIDE TO
RANGE SITES, CONDITION CLASSES AND RECOMMENDED STOCKING RATES
IN
THE FOOTHILLS AREA OF CENTRAL MONTANA 15-19" PRECIPITATION ZONE



PART I: KEY SPECIES AND THEIR RESPONSE TO GRAZING

DECREASERS		INCREASERS (By Range Site*)	WL	Sb	SS	Ov	SO	Sa	Sv	Sy	Si	Cy	TSy	TSi	TCy	SwC	SwG	SwL	SwN	Ps	DC	TB	Gr	VS	SU	Sh	INVADERS (Less than 2½% in Climax)
			Maximum Percent Dry Weight Produced Annually in Climax																								
Elci	Trsp	Agsm	-	5	d	20	d	-	10	5	15	25	5	20	30	d	d	20	20	d	30	20	d	d	d	d	Annual Plants
Spgr	Orhy	Feid	-	-	-	-	-	-	20	15	20	20	20	25	25	25	30	30	30	-	-	d	d	d	-	-	Phpr
Deca	Ansc	Stco (1)	-	-	-	-	-	20	15	20	15	-	30	25	-	-	20	20	20	d	-	25	d	d	-	-	Popr
Caca	Bocu	Spcr	-	-	-	-	-	5	-	5	-	-	5	-	-	-	5	-	-	-	-	5	10	d	-	-	Poco
Fesc	Poca	Dain	-	-	-	-	-	5	5	5	5	5	5	5	5	5	5	5	10	-	-	5	d	d	-		Hoju
Elca	PUCC	Kocr	-	-	-	-	-	-	-	-	-	-	5	5	5	5	10	10	10	5	-	5	5	5	-	-	Sepa
Brma	Cahe	Camo	-	-	-	-	-	-	-	-	-	5	-	-	5	5	-	5	-	10	15	10	d	d	-	d	Arlo
Poam	Forb decr.	Bogr	-	-	-	-	-	-	-	-	-	-	5	5	5	5	5	5	5	5	-	5	10	10	-	d	Cael
Calo	Woody decr	Pose	-	-	-	-	-	-	-	-	-	-	-	5	5	5	5	5	5	5	5	5	5	5	-	10	Grsq
Heki		Sedge incr.	25	15	10	10	10	-	-	-	-	-	5	5	-	-	5	5	5	-	-	5	5	10	-	-	Gusa
Spai		Musq	-	5	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Taof
Poju		ATRI	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	d	Cila
Stvi		Forb incr.	15	15	-	10	5	10	10	10	10	5	10	10	5	5	5	5	5	-	-	10	15	5	-	10	Ciar
Agsp		Eula	-	-	-	-	-	-	-	-	-	5	-	-	-	5	-	-	-	d	-	d	-	-	-	d	Eues
Dapa		Artr	-	-	-	-	-	-	-	-	5	-	-	5	-	-	-	-	-	-	-	5	-	-	-	-	Cere
Agsu		SAVE	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	CHRY
Agpa		Conifers	-	5	-	-	-	-	15	-	-	-	-	-	-	5	5	5	5	-	-	15	10	10	5		
Stcl		Other woody plants	10	15	-	15	-	5	5	5	5	5	5	5	5	5	5	5	5	-	-	10	10	5		5	

* The symbol "-" means the species has less than 2½% coverage or is not present in the original vegetation of this site. The symbol "d" means the species is a decreaser on this site. Range soil groups are described with determinant features in the Technical Guide. WL - WET LAND; Sb - SUBIRRIGATED; SS - SALINE SUBIRRIGATED; Ov - OVERFLOW; SO - SALINE OVERFLOW; Sa - SANDS; Sv - SAVANNAH; Sy - SANDY; Si - SILTY; Cy - CLAYEY; TSy - THIN SANDY; TSi - THIN SILTY; TCy - THIN CLAYEY; SwC - SHALLOW CLAY; SwG - SHALLOW TO GRAVEL; SwL - SHALLOW LIMY; SwN - SHALLOW NONLIMY; Ps - PANSPOTS; DC - DENSE CLAY; TB - THIN BREAKS; Gr - GRAVEL; VS - VERY SHALLOW; SU - SALINE UPLAND; Sh - SHALE.

PART II: GUIDE FOR MAKING RECOMMENDATIONS ON STOCKING

A. Guide to departures from Basic Table by Soil Groups**

For WET LAND sites use three times the values for 20-24" precipitation zone. For SUBIRRIGATED use two times the values for 20-24" p.z. For SALINE SUBIRRIGATED and OVERFLOW, use values of next higher p.z. For SALINE OVERFLOW use values one-half step above p.z. For SANDS, SAVANNAH, SANDY, SILTY and CLAYEY sites use values given for the p.z. For THIN SANDY, THIN SILTY, THIN CLAYEY, SHALLOW CLAY, SHALLOW TO GRAVEL, SHALLOW LIMY, SHALLOW NONLIMY, PANSPOTS and DENSE CLAY sites use values one-half to one zone lower than the p.z. where located. For THIN BREAKS use values one to one and one-half zones lower. For GRAVEL, VERY SHALLOW and SALINE UPLANDS use values one and one-half to two zones lower than those for the p.z. but not less than one-half the values for the 5-9" p.z. For SHALE use values two to three zones lower but not less than one-half the values for the 5-9" precipitation zone.

B. Basic Table for Normal Sites of each Precipitation Zone.

Average Annual Precipitation Zone	Range Condition Percentage and Classes			
	100 - EC - 75	- GC -	50 - FC -	25 - PC
(Inches)	(Animal Unit Months per Acre***)			
25-29	1.0	.75	.5	.25
20-24	.8	.6	.4	.2
15-19	.6	.45	.3	.15
10-14	.4	.3	.2	.1
5-9	.2	.1	.1	.05

** Departures do not include utilization cuts because of inaccessibility. Apply any necessary utilization cut to grazing unit after AUM's are totaled.

*** All rates are much higher if grazing is limited to season of complete dormancy.

RECOMMENDED STOCKING RATE
AUM'S PER ACRE

Range Condition Percentage	Precipitation Belt (Inches) 25-29	20-24	15-19	10-14	5-9
0	0	0	0	0	0
5	.05	.04	.03	.02	.01
10	.10	.08	.06	.04	.02
15	.15	.12	.09	.06	.03
20	.20	.16	.12	.08	.04
25	.25	.20	.15	.10	.05
30	.30	.24	.18	.12	.06
35	.35	.28	.21	.14	.07
40	.40	.32	.24	.16	.08
45	.45	.36	.27	.18	.09
50	.50	.40	.30	.20	.10
55	.55	.44	.33	.22	.11
60	.60	.48	.36	.24	.12
65	.65	.52	.39	.26	.13
70	.70	.56	.42	.28	.14
75	.75	.60	.45	.30	.15
80	.80	.64	.48	.32	.16
85	.85	.68	.51	.34	.17
90	.90	.72	.54	.36	.18
95	.95	.76	.57	.38	.19
100	1.00	.80	.60	.40	.20

CONVERSION FROM AUM'S PER ACRE

Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres Aum
.01	100	.21	4.8	.41	2.4	.61	1.6	.81	1.2
.02	50	.22	4.5	.42	2.4	.62	1.6	.82	1.2
.03	33	.23	4.3	.43	2.3	.63	1.6	.83	1.2
.04	25	.24	4.2	.44	2.3	.64	1.6	.84	1.2
.05	20	.25	4.0	.45	2.2	.65	1.5	.85	1.2
.06	17	.26	3.8	.46	2.2	.66	1.5	.86	1.2
.07	14	.27	3.7	.47	2.1	.67	1.5	.87	1.1
.08	13	.28	3.6	.48	2.1	.68	1.5	.88	1.1
.09	11	.29	3.4	.49	2.0	.69	1.4	.89	1.1
.10	10	.30	3.3	.50	2.0	.70	1.4	.90	1.1
.11	9	.31	3.2	.51	2.0	.71	1.4	.91	1.1
.12	8.3	.32	3.1	.52	1.9	.72	1.4	.92	1.1
.13	7.7	.33	3.0	.53	1.9	.73	1.4	.93	1.1
.14	7.1	.34	2.9	.54	1.9	.74	1.4	.94	1.1
.15	6.7	.35	2.9	.55	1.8	.75	1.3	.95	1.1
.16	6.3	.36	2.8	.56	1.8	.76	1.3	.96	1.0
.17	5.9	.37	2.7	.57	1.8	.77	1.3	.97	1.0
.18	5.6	.38	2.6	.58	1.7	.78	1.3	.98	1.0
.19	5.3	.39	2.6	.59	1.7	.79	1.3	.99	1.0
.20	5.0	.40	2.5	.60	1.7	.80	1.3	1.00	1.0
								1.20	.8
								2.00	.5
								5.00	.2

INSTRUCTIONS TO TECHNICIANS: The use of the above guide will give you an indication of carrying capacity. However, other factors must be of record. On the back of each range writeup include the following as notes. However, all will not be within each type and will have to be noted. Record:

1. Site Inclusion: Inclusion of other Sites as minor constituents to the dominant Site with percent (%) of each.

2. Variance: Inclusion of areas of carrying capacity varying markedly from the site norm; such as, rocky outcrops, barren lakebeds or small productive meadows.

3. Soils: Explain if there are variations in soils which disagree markedly with the norm for the site--an area with severe erosion, for example.

4. Utilization Cut: Always record any cut which is made according to manual instructions in which feed is unavailable to stock because of rocks, distance of water, steep slope, down timber, unstable soil, etc.

5. Site Cut or Raise: Always record (if the site calls for another rainfall belt) how much of a deduction or addition has been made and for what reason, i.e. "cut one belt for Shallow". Sometimes carrying capacity is reduced because a less productive Site is included within the dominant more productive Site. Make the writeup according to percent of each (see 1 and 2).

6. Poisonous Plants: Are poisonous plants present? Are they significant; that is, do they constitute a menace and should they be eradicated?

7. Rodents: Are there destructive animals, such as prairie dogs or kangaroo rats or rabbits, in such numbers they need to be controlled?

8. Reaction to Site: It is especially important to give your impression of the Site; therefore, comment on the general aspect, if there is such a thing as scattered trees throughout the area, or perhaps a few included ridges on which limber pine may make this area different from the rest.

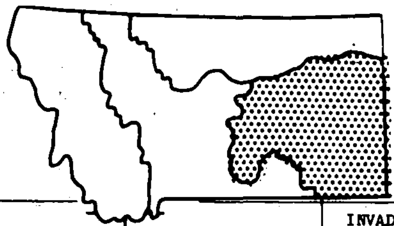
9. Recreation and Access: Record anything regarding recreational use, such as scenic beauty, hunting, fishing, or access to area which does provide such.

10. Inter-Agency Interest: Always mention archaelogical, paleontological or historical sites, or relict areas. They should be included on the map. Another factor which is sometimes overlooked are items of historical interest.

11. Potential Improvement: Is the area short of water? Is there permanent water or is there temporary water and how far distant? Is the forage underused because of lack of water? Is it overused because it is too close to water? Would it be possible to avoid overuse by better distribution of livestock; waterspreaders or reseeding?

Based on Information from
U. S. Department of Agriculture
Soil Conservation Service
(Rev) June, 1962

TECHNICIANS' GUIDE TO
RANGE SITES, CONDITION CLASSES AND RECOMMENDED STOCKING RATES
IN
THE SEDIMENTARY PLAINS OF MONTANA 10-14" PRECIPITATION ZONE



PART I: KEY SPECIES AND THEIR RESPONSE TO GRAZING

DECREASERS		INCREASERS (By Range Sites*)	WL	Sb	SS	Ov	SO	Sa	Sv	Sy	Si	Cy	TSy	TSi	TCy	SwC	SwG	SwL	SwN	Ps	DC	TB	Gr	Vs	SU	Sh	Bl	INVADERS (Less than 2½% in Climax)
			Maximum Percent by Dry Weight Produced Annually in Climax																									
Elci	Orhy	Agsm	-	20	d	50	d	5	30	30	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	Annual Plants
Spgr	Poca	Stco (1)	-	-	-	5	-	25	20	45	40	-	45	40	-	-	d	d	d	d	-	d	d	d	-	-	d	Phpr
Sppe	Puai	Spcr	-	-	-	-	-	10	5	10	5	-	10	5	-	-	15	10	5	5	-	d	d	d	-	-	d	Popr
Caca	Pudi	Kocr	-	-	-	-	-	5	5	5	5	5	5	10	10	5	5	5	5	10	-	10	d	d	-	d	d	Sepa
Cain	Sedge decr.	Camo	-	-	-	-	-	-	5	5	5	10	5	5	10	5	5	5	5	10	5	5	d	d	d	d	d	Musq
Elca	Forb decr	Mucu	-	-	-	-	-	-	-	-	-	-	5	10	10	5	10	10	10	5	-	d	d	d	-	d	d	Hoju
Brma		Bogr	-	-	-	5	-	10	5	15	15	10	20	20	15	15	20	20	20	20	-	10	10	25	-	d	d	Arlo
Bran		Buda	-	-	-	-	-	-	-	-	-	5	-	-	5	-	-	-	-	5	5	-	-	-	-	-	-	Cael
Atca		Pose	-	-	-	-	-	-	-	-	5	5	-	5	5	5	5	5	5	5	5	5	-	5	d	d	d	Grsq
Pavi		Sihy	-	-	-	-	5	-	-	-	-	-	-	-	5	5	5	5	-	5	5	5	5	-	d	d	d	Gusa
Spai		Sedge incr.	25	[illegible]	5	5	-	5	5	10	5	5	10	10	10	10	10	10	10	5	-	10	d	d	-	d	d	Taof
Poar		Dist	-	5	15	5	25	-	-	-	-	-	-	-	-	-	-	-	-	5	-	5	-	-	d	d	d	CIRS
Agsp		Forb incr.	10	10	-	5	-	5	5	5	5	5	5	5	5	5	5	5	5	-	-	5	5	10	-	15	5	Arco (2)
Agsu		Eula	-	-	-	-	-	-	5	5	5	5	5	5	5	-	d	d	d	d	d	d	d	d	d	d	d	Amar
Agin		Atnu	-	-	-	-	10	-	-	-	5	5	-	5	5	10	-	5	-	10	-	5	-	-	d	d	d	CHRY
Agtr		Artr	-	-	-	-	-	-	-	-	-	5	-	5	5	5	-	-	-	5	5	-	-	-	-	-	5	
Anha		Atca	-	-	-	5	-	5	-	-	5	-	-	5	-	-	-	-	-	-	-	5	-	-	-	-	5	
Ange		Save	-	-	10	-	25	-	-	-	-	5	-	-	-	5	-	-	-	5	5	5	-	-	10	10	d	
Ansc		Conifers	-	-	-	-	-	-	10	-	-	-	-	-	-	5	-	5	5	-	-	5	10	10	-	-	5	
Bocu		Other woody increasers	10	15	-	10	5	10	5	5	5	-	5	5	-	-	-	5	5	-	-	5	5	5	-	-	5	
Hemo		Musq	-	5	10	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

* The symbol "-" means the species has less than 2½% coverage or is not present in the original vegetation of this site. The symbol "d" means the species is a decreaser on this site. Range soil groups are described with the determinant features in the Technical Guide, WL - WETLANDS; Sb - SUBIRRIGATED; SS - SALINE SUBIRRIGATED; Ov - OVERFLOW; SO - SALINE OVERFLOW; Sa - SANDS; Sv - SAVANNAH; Sy - SANDY; Si - SILTY; Cy - CLAYEY; TSy - THIN SANDY; TSi - THIN SILTY; TCy - THIN CLAYEY; SwC - SHALLOW CLAY; SwG - SHALLOW TO GRAVEL ; SwL - SHALLOW LIMY; SwN - SHALLOW NONLIMY; Ps - PANSPOTS; DC - DENSE CLAY; TB - THIN BREAKS; Gr - GRAVEL; VS - VERY SHALLOW; SU - SALINE UPLAND; Sh - SHALE; Bl - BADLANDS.

PART II: GUIDE FOR MAKING RECOMMENDATIONS ON STOCKING

A. Guide to Departures From Basic Table by Soil Groups **

For WET LAND sites use three times the values for 20-24" precipitation zone. For SUBIRRIGATED use two times the values for 20-24" p.z. For SALINE SUBIRRIGATED and OVERFLOW, use values of next higher p.z. For SALINE OVERFLOW use values one-half step above p.a. For SANDS, SAVANNAH, SANDY, SILTY and CLAYEY sites use values given for the p.z. For THIN SANDY, THIN SILTY, THIN CLAYEY, SHALLOW CLAY, SHALLOW TO GRAVEL, SHALLOW LIMY, SHALLOW NONLIMY, PANSPOTS and DENSE CLAY sites use values one-half to one zone lower than the p.z. where located. For THIN BREAKS use values one to one and one-half zones lower. For GRAVEL, VERY SHALLOW and SALINE UPLANDS use values one and one-half to two zones lower than those for the p.z. but not less than one-half the values for the 5-9" p.z. For SHALE and BADLANDS use values two to three zones lower but not less than one-half the values for the 5-9" precipitation zone.

B. Basic Table for Normal Sites of Each Precipitation Zone.

Average Annual Precipitation Zone (Inches)	Range Condition Percentage & Classes: 100 - EC - 75	75 - GC - 50	50 - FC - 25	25 - PC
	(Animal Unit Months per Acre***)			
25 - 29	1.0	.75	.5	.25
20 - 24	.8	.6	.4	.2
15 - 19	.6	.45	.3	.15
10 - 14	.4	.3	.2	.1
5 - 9	.2	.15	.1	.05

** Departures do not include utilization cuts because of inaccessibility. Apply any necessary utilization cut to grazing unit after AUM's are totaled.

*** All rates are much higher if grazing is limited to season of complete dormancy.

Illustration 55 Page 5

RECOMMENDED STOCKING RATE
AUM'S PER ACRE

Range Condition Percentage	Precipitation Belt (Inches) 25-29	20-24	15-19	10-14	5-9
0	0	0	0	0	0
5	.05	.04	.03	.02	.01
10	.10	.08	.06	.04	.02
15	.15	.12	.09	.06	.03
20	.20	.16	.12	.08	.04
25	.25	.20	.15	.10	.05
30	.30	.24	.18	.12	.06
35	.35	.28	.21	.14	.07
40	.40	.32	.24	.16	.08
45	.45	.36	.27	.18	.09
50	.50	.40	.30	.20	.10
55	.55	.44	.33	.22	.11
60	.60	.48	.36	.24	.12
65	.65	.52	.39	.26	.13
70	.70	.56	.42	.28	.14
75	.75	.60	.45	.30	.15
80	.80	.64	.48	.32	.16
85	.85	.68	.51	.34	.17
90	.90	.72	.54	.36	.18
95	.95	.76	.57	.38	.19
100	1.00	.80	.60	.40	.20

CONVERSION FROM AUM'S PER ACRE

Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres Aum
.01	100	.21	4.8	.41	2.4	.61	1.6	.81	1.2
.02	50	.22	4.5	.42	2.4	.62	1.6	.82	1.2
.03	33	.23	4.3	.43	2.3	.63	1.6	.83	1.2
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.13	7.7	.33	3.0	.53	1.9	.73	1.4	.93	1.1
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.16	6.3	.36	2.8	.56	1.8	.76	1.3	.96	1.0
.17	5.9	.37	2.7	.57	1.8	.77	1.3	.97	1.0
.18	5.6	.38	2.6	.58	1.7	.78	1.3	.98	1.0
.19	5.3	.39	2.6	.59	1.7	.79	1.3	.99	1.0
.20	5.0	.40	2.5	.60	1.7	.80	1.3	1.00	1.0
								1.20	.8
								2.00	.5
								5.00	.2

INSTRUCTIONS TO TECHNICIANS: The use of the above guide will give you an indication of carrying capacity. However, other factors must be of record. On the back of each range writeup include the following as notes. However, all will not be within each type and will have to be noted. Record:

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6. Poisonous Plants: Are poisonous plants present? Are they significant; that is, do they constitute a menace and should they be eradicated?

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TECHNICIANS' GUIDE TO
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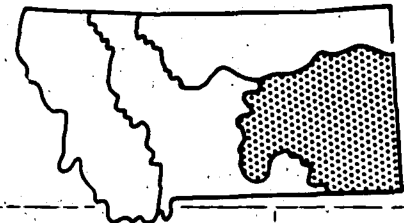
IN
THE SEDIMENTARY PLAINS OF MONTANA 15-19" PRECIPITATION ZONE



PART I: Key Species and Their Response to Grazing

DECREASERS		INCREASERS (By Range Site*)	WL	Sb	SS	Ov	SO	Sa	Sv	Sy	Si	Cy	TSy	TSi	TCy	SwC	SwG	SwL	SwN	Ps	DC	TB	Gr	VS	SU	Sh	Bl	INVADERS (Less than 2½% in Climax)
			Maximum Percent Dry Weight Produced Annually in Climax																									
Elci	Orhy	Agsm	-	10	d	30	d	5	20	20	40	50	20	45	55	d	d	d	d	d	d	d	d	d	d	d	d	Annual Plants
Spgr	Poca	Feid	-	-	-	-	-	-	20	10	10	10	15	15	15	10	20	d	d	-	-	d	d	d	-	-	-	Phpr
Sppe	Puai	Stco (1)	-	-	-	5	-	20	15	25	20	-	30	25	-	-	20	20	20	d	-	d	d	d	-	-	d	Popr
Caca	Pudi	Spor	-	-	-	-	-	5	-	5	5	-	10	10	-	-	5	-	-	-	-	5	10	d	-	-	-	Sepa
Cain	Sedge decr.	Dain	-	-	-	-	-	-	5	-	-	-	5	5	-	-	-	5	5	-	-	5	-	-	-	-	-	Musq
Elca	Forb decr.	Kocr	-	-	-	-	-	-	-	-	5	5	5	5	5	5	5	5	5	5	-	5	5	5	-	-	-	Hoju
Brma		Camo	-	-	-	-	-	-	-	-	-	-	-	-	5	5	5	5	5	5	-	5	-	-	-	d	-	Arlo
Bran		Mucu	-	-	-	-	-	-	-	-	-	-	5	10	10	5	10	10	10	-	-	10	10	d	-	d	d	Cael
Brca		Bogr	-	-	-	-	-	5	5	10	10	10	10	10	10	10	10	15	10	15	-	10	10	10	-	d	20	Grsq
Brpu		Buda	-	-	-	-	-	-	-	-	-	5	-	-	5	-	-	-	-	5	5	-	-	-		-	-	Gusa
Calo		Pose	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	5	5	5	5	5	5	5	-	10	10	Taof
Stvi		Sihy	-	-	-	-	5	-	-	-	-	-	-	-	5	5	-	-	-	5	5	-	-	-	5	5	-	CIRS
Agsp		Sedge incr.	25	15	10	5	5	-	5	-	5	-	10	10	5	5	10	5	5	-	-	10	10	10	-	-	-	Arco (2)
Agsu		Dist	-	-	20	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	d	-	Amar
Agin		Forb incr.	15	15	-	10	5	10	10	10	5	5	10	5	5	5	5	5	5	-	-	10	10	5	-	10	5	CHRY
Agtr		Eula	-	-	-	-	-	-	-	-	-	5	-	-	5	5	-	-	-	d	-	d	-	-	-	d	-	
Anha		Artr	-	-	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-	-	-	5	-	-	-	-	-	
Ange		Arca	-	-	-	5	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	
Ansc		Save	-	-	5	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	
Bocu		Conifers	-	-	-	-	-	-	15	-	-	-	5	5	-	5	5	5	5	-	-	10	-	10	-	5	-	
Hemo		Other woody increasers	10	15	-	15	-	10	5	5	5	5	5	5	5	-	-	5	5	-	-	5	5	5	-		5	

*The symbol "-" means the species has less than 2½% coverage or is not present in the original vegetation of this site The symbol "d" means the species is a decreaser on this site. Range soil groups are described with determinant features in the Technical Guide, WL - WET LAND; Sb - SUBIRRIGATED; SS - SALINE SUBIRRIGATED; Ov - OVERFLOW; SO - SALINE OVERFLOW; Sa - SANDS; Sv - SAVANNAH; Sy - SANDY; Si - SILTY; Cy - CLAYEY; TSy - THIN SANDY; TSi - THIN SILTY; TCy - THIN CLAYEY; SwC - SHALLOW CLAY; SwG - SHALLOW TO GRAVEL; Swl - SHALLOW LIMY; SwN - SHALLOW NONLIMY; Ps - PANSPOTS; DC - DENSE CLAY; TB - THIN BREAKS; Gr - GRAVEL; VS - VERY SHALLOW; SU - SALINE UPLANDS; Sh - SHALE ; Bl - BADLANDS.

PART II: GUIDE FOR MAKING RECOMMENDATIONS ON STOCKING

A. Guide to Departures From Basic Table by Soil Group**
For WET LAND sites use three times the values for 20-24" precipitation zone. For SUBIRRIGATED use two times the values for 20-24" p.z. For SALINE SUBIRRIGATED and OVERFLOW use values of next higher p.z. For SALINE OVERFLOW use values one-half step above p.z. For SANDS, SAVANNAH, SANDY, SILTY, and CLAYEY sites use values given for the p.z. For THIN SILTY, THIN CLAYEY, SHALLOW CLAY, SHALLOW TO GRAVEL, SHALLOW LIMY, SHALLOW NONLIMY, PANSPOTS and DENSE CLAY sites use values one-half to one zone lower than the p.z. where located. For THIN BREAKS use values one to one and one-half zones lower. For GRAVEL, VERY SHALLOW and SALINE UPLANDS use values one and one-halfto two zones lower than those for the p.z. but not less than one-half the values for the 5-9" p.z. For SHALE and BADLANDS use values two to three zones lower but not less than one-half the values for the 5-9"precipitation zone.

B. Basic Table for Normal Sites of Each Precipitation Zone.

Average Annual Precipitation Zone (Inches)	Range Condition Percentage & Classes 100 - EC - 75	- GC - 50	- FC - 25	- PC
	(Animal Unit Months per Acre ***)			
25-29	1.0	.75	.5	.25
20-24	.8	.6	.4	.2
15-19	.6	.45	.3	.15
10-14	.4	.3	.2	.1
5-9	.2	.15	.1	.05

** Departures do not include utilization cuts because of inaccessibility. Apply any necessary utilization cut to grazing unit after AUM's are totaled.

*** All rates are much higher if grazing is limited to season of complete dormancy.

RECOMMENDED STOCKING RATE
AUM'S PER ACRE

Range Condition Percentage	Precipitation Belt (Inches) 25-29	20-24	15-19	10-14	5-9
0	0	0	0	0	0
5	.05	.04	.03	.02	.01
10	.10	.08	.06	.04	.02
15	.15	.12	.09	.06	.03
20	.20	.16	.12	.08	.04
25	.25	.20	.15	.10	.05
30	.30	.24	.18	.12	.06
35	.35	.28	.21	.14	.07
40	.40	.32	.24	.16	.08
45	.45	.36	.27	.18	.09
50	.50	.40	.30	.20	.10
55	.55	.44	.33	.22	.11
60	.60	.48	.36	.24	.12
65	.65	.52	.39	.26	.13
70	.70	.56	.42	.28	.14
75	.75	.60	.45	.30	.15
80	.80	.64	.48	.32	.16
85	.85	.68	.51	.34	.17
90	.90	.72	.54	.36	.18
95	.95	.76	.57	.38	.19
100	1.00	.80	.60	.40	.20

CONVERSION FROM AUM'S PER ACRE

Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres/ Aum	Aum's Per Acre	Acres Aum
.01	100	.21	4.8	.41	2.4	.61	1.6	.81	1.2
.02	50	.22	4.5	.42	2.4	.62	1.6	.82	1.2
.03	33	.23	4.3	.43	2.3	.63	1.6	.83	1.2
.04	25	.24	4.2	.44	2.3	.64	1.6	.84	1.2
.05	20	.25	4.0	.45	2.2	.65	1.5	.85	1.2
.06	17	.26	3.8	.46	2.2	.66	1.5	.86	1.2
.07	14	.27	3.7	.47	2.1	.67	1.5	.87	1.1
.08	13	.28	3.6	.48	2.1	.68	1.5	.88	1.1
.09	11	.29	3.4	.49	2.0	.69	1.4	.89	1.1
.10	10	.30	3.3	.50	2.0	.70	1.4	.90	1.1
.11	9	.31	3.2	.51	2.0	.71	1.4	.91	1.1
.12	8.3	.32	3.1	.52	1.9	.72	1.4	.92	1.1
.13	7.7	.33	3.0	.53	1.9	.73	1.4	.93	1.1
.14	7.1	.34	2.9	.54	1.9	.74	1.4	.94	1.1
.15	6.7	.35	2.9	.55	1.8	.75	1.3	.95	1.1
.16	6.3	.36	2.8	.56	1.8	.76	1.3	.96	1.0
.17	5.9	.37	2.7	.57	1.8	.77	1.3	.97	1.0
.18	5.6	.38	2.6	.58	1.7	.78	1.3	.98	1.0
.19	5.3	.39	2.6	.59	1.7	.79	1.3	.99	1.0
.20	5.0	.40	2.5	.60	1.7	.80	1.3	1.00	1.0
								1.20	.8
								2.00	.5
								5.00	.2

INSTRUCTIONS TO TECHNICIANS: The use of the above guide will give you an indication of carrying capacity. However, other factors must be of record. On the back of each range writeup include the following as notes. However, all will not be within each type and will have to be noted. Record:

1. Site Inclusion: Inclusion of other Sites as minor constituents to the dominant Site with percent (%) of each.

2. Variance: Inclusion of areas of carrying capacity varying markedly from the site norm; such as, rocky outcrops, barren lakebeds or small productive meadows.

3. Soils: Explain if there are variations in soils which disagree markedly with the norm for the site--an area with severe erosion, for example.

4. Utilization Cut: Always record any cut which is made according to manual instructions in which feed is unavailable to stock because of rocks, distance of water, steep slope, down timber, unstable soil, etc.

5. Site Cut or Raise: Always record (if the site calls for another rainfall belt) how much of a deduction or addition has been made and for that reason, i.e. "cut one belt for Shallow". Sometimes carrying capacity is reduced because a less productive Site is included within the dominant more productive Site. Make the writeup according to percent of each (see 1 and 2).

6. Poisonous Plants: Are poisonous plants present? Are they significant; that is, do they constitute a menace and should they be eradicated?

7. Rodents: Are there destructive animals, such as prairie dogs or kangaroo rats or rabbits, in such numbers they need to be controlled?

8. Reaction to Site: It is especially important to give your impression of the Site; therefore, comment on the general aspect, if there is such a thing as scattered trees throughout the area, or perhaps a few included ridges on which limber pine may make this area different from the rest.

9. Recreation and Access: Record anything regarding recreational use, such as scenic beauty, hunting, fishing, or access to area which does provide such.

10. Inter-Agency Interest: Always mention archaelogical, paleontological or historical sites, or relict areas. They should be included on the map. Another factor which is sometimes overlooked are items of historical interest.

11. Potential Improvement: Is the area short of water? Is there permanent water or is there temporary water and how far distant? Is the forage underused because of lack of water? Is it overused because it is too close to water? Would it be possible to avoid overuse by better distribution of livestock; waterspreaders or reseeding?

XV. PHOTOGRAPHIC UTILIZATION METHOD

Editor's Note: The Photographic Utilization Method described below is based on original BLM Manual Release 4-31, Part 4412.22B7f, dated 12/12/68.

A. Introduction

The Photographic Utilization Method is a means for using comparison photographs to judge utilization on California Mediterranean annual.

B. Objective

The objective is to match the observed current utilization of the range against photographs depicting various degrees of use.

1. Density

Density, or the number of plants per unit area, will vary widely from area to area and will influence the judgement of the examiner.

2. Making Observations

The Examiner often will find that on-the-ground observations of a site do not match any particular picture because of differences in stand density and vigor, two factors which vary on every site. The amount of use (number of seedheads remaining, amount of residue, etc.), however, will be in proportion to the amount shown on one of the pictures, irrespective of density and vigor. For example, two sites may have densities of 20 and 80 plants per square foot; both have been utilized 50 percent. Each stand, regardless of the density, will have a proportionate amount of litter left on the ground, number of seedheads remaining, etc. The pictures are used to show these proportionate relationships; sites will seldom look exactly like the photograph.

3. Degree of Utilization

Judge the degree of utilization, not stand density and vigor.

C. California Mediterranean Annual Ranges

Standards for judging utilization are based on the current year's forage that remains on the ground at the end of the grazing period. Degrees of utilization from light to very close are depicted in photographs 1 through 6 (Illustration 56). Photographs 7 through 10 show contrasting use on swales, hillsides, and underbrush. Word descriptions accompany each photograph.

1. Area of Use

This is specific for California Mediterranean annual ranges. The California State Director may require more detailed and refined photographic standards for each climatic region within the state.

2. Advantages and Limitations

The method is easy to use and requires little training.

3. Equipment Needed

Photographic equipment and Form 4412-21 (Illustration 57).

4. Use of Standards

See Illustration 56 for descriptions and photographs of degree of forage utilization on California annual ranges.

a. Judge utilization of the range after grazing and prior to the beginning of the new growing season.

b. Stratify the allotment or pasture on the basis of topography or a broad soils grouping (such as gravelly, clay, alluvium, etc).

c. Prepare an allotment map showing boundaries of each stratum so that utilization ratings in subsequent years can be collected from the same strata. Utilization ratings by strata will assist in identification of distribution problems.

d. Compare each range unit or stratum with photographs 1 through 6 and decide which photograph most nearly depicts the proportionate relationships.

e. Examine the range more closely for specific indicators of degree of use (photographs 7 through 10) and, if necessary, adjust the first estimate.

f. Rate the use of each stratum and the range as a whole by using the photographs and accompanying descriptions. Record the rating on Form 4412-21 (Illustration 57).

Photograph No. 1 (Very light)

375653

Photograph No. 2 (Light)

Illustration 56 Page 2

Photograph No. 3 (Moderately light) 387986

Photograph No. 4 (Moderate) 387988

Photograph No. 5 (Close) 387978

Photograph No. 6 (Very close) 387961

Photograph No. 7 - Contrasting use in swales and on adjoining hillsides.

The forage has been grazed much less on the hillsides than in the swales, indicating moderate or proper use of the range as a whole. Compare with photographs #6 and #8. Livestock graze the forage in the swales more closely because it remains green longer than on the hillsides.

Photograph No. 8 - Close use on hillsides as well as in swales.

When no more forage is left ungrazed on the slopes than in the swales, the range has been too closely used.

Photograph No. 9 - Light use around and under shrubs.

Light or no use around and under shrubs as shown here is one indication that the range has not been grazed closely. Compare with photograph #10.

Photograph No. 10 - Close use in relatively inaccessible places.

When livestock graze closely under shrubs and around and between the limbs and tangled masses of smaller branches of dead trees and bushes lying on the ground, it is an indication that the range has been too heavily grazed.

Illustration 57

4412 - PHYSICAL RESOURCE STUDIES

RANGE UTILIZATION

PHOTOGRAPHIC METHODS

Form 4412-21
(September 1960)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RANGE UTILIZATION
PHOTOGRAPHIC METHODS

District Folsom	Date June 7, 1966
Planning Unit Gold Digger	Examiner J. B. Mosby
Allotment Gee Bee Mtn.	Class of stock Cows - Calves
Pasture #1	Season of use 2/1 to 6/1

Grazing Management System Deferred - Rotation

STRATUM	1966	1967	1968	1969	1970
	PHOTO NUMBER AND UTILIZATION INDEX				
Gravelly Bouldland	2	3	4	4	3
N. W. Hillside	3	3	3	4	4
Clay Bottomland	6	4	4	5	4
Ridgetop	2	3	4	4	3
Open Parkland	3	4	3	4	5
Upper South Slope	1	3	3	3	4
East Alluvial Flat	6	4	4	4	5
Average Utilization Index *(allotment)*	3.3	3.4	3.6	4.0	4.0

Remarks See allotment management plan for map showing strata.
1966 - Utilization too light and poorly distributed. Relocated salt.
1967 - Utilization still too light.
1968 - Weather has been average or below for past 4 years. Composition of perennials is improving. Annual actual rise by 10 percent.

UTILIZATION RATING SCALE

None	0	
Very light	1	
Light	2	Refer to photographs for description
Moderately light	3	
Moderate	4	
Close	5	
Very close	6	

XVI. SOIL SURFACE FACTOR

Editor's Note: The procedures for determining a Soil Surface Factor rating were summarized from BLM Manual 7322 - WATERSHED CONSERVATION AND DEVELOPMENT SYSTEM, release 7-47, dated 3/20/72.

A. Introduction

Procedures for collecting Soil Surface Factors (SSFs) were a small part of the Watershed Conservation and Development inventories conducted in the 1970s and the Soil-Vegetation Inventory Method in the late 70s and early 80s. The SSF values were also used to determine the erosion condition classes described in BLM Manual 7317.12.

The SSF procedures are no longer recognized as an approved resource data collection procedure.

B. Criteria

The SSF, as evaluated by completing Form 7310-12 (Illustration 58), is an expression of current erosion activity. Seven categories of surface features are considered by the field observer while examining the area represented by each transect. Both wind and water erosion are considered, as applicable, to each category. The seven surface feature categories are soil movement, surface litter, surface rock, pedestalling, rills, flowpatterns, and gullies. In the process of determining the SSF, the field observer must consider the features as they represent the total area of the vegetative subtype, not just the area near the transect or soil pit. SSF values may provide an indication of changes in erosion activity over time under various intensities of use.

DETERMINATION OF EROSION CONDITION CLASS

SOIL SURFACE FACTORS

Form 7310–12
(August 1970)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

DETERMINATION OF EROSION CONDITION CLASS
SOIL SURFACE FACTORS

By A. AKER | Date 9-6-68
Location 2704003 MAD CREEK
Treatment affecting the SSF

SOIL MOVEMENT	No visual evidence of movement 0 1 2 3	Some movement of soil particles $\boxed{4}$ 5	Moderate movement of soil is visible and recent. Slight terracing generally less than 1" in height. 6 7 8	Occurs with each runoff. Soil and debris deposited against minor obstructions. 9 10 11	Subsoil exposed over much of area, may have embryonic dunes and wind scoured depressions 12 13 14
SURFACE LITTER	Accumulating in place 0 1 2 $\boxed{3}$	May show slight movement 4 5 6	Moderate movement is apparent, deposited against obstacles 7 8	Extreme movement apparent, large and numerous deposits against obstacles 9 10 11	Very little in evidence 12 13 14
EROSION PAVEMENT	If present, pavement is well developed and evenly distributed 0 1 2	If present, pavement is well developed but with spotty distribution 3 4 $\boxed{5}$	Some pavement and/or large rock may be present but distribution pattern is poorly developed 6 7 8	Pavement may be partially developed but exhibits some movement 9 10 11	Pavement may be considerable but dissected by rills and gullies or already washed away 12 13 14
PEDESTALLING	No visual evidence of pedestalling 0 1 2 $\boxed{3}$	Slight pedestalling, in flow patterns 4 5 6	Small rock and plant pedestals occurring in flow patterns 7 8 9	Small rocks and plants on pedestals generally evident, plant roots exposed 10 11	Pedestalled rocks and plants are present 12 13 14
RILLS	No visual evidence of rills 0 1 $\boxed{2}$ 3	Some rills in evidence but less than ½" deep at infrequent intervals over 10' 4 5 6	Rills ½" to 6" deep occur in exposed places at approximately 10' intervals 7 8 9	Rills ½" to 6" deep occur in exposed area at intervals of 5 to 10' 10 11 12	May be present at 3" to 6" deep at intervals less than 5' 13 14
FLOW PATTERNS	No visual evidence of flow patterns 0 1 2 $\boxed{3}$	Deposition of particles may be in evidence 4 5 6	Well defined with intermittent sediment deposits 7 8 9	Flow patterns contain silt and sand deposits and alluvial fans 10 11 12	Flow patterns are numerous and readily noticeable. May have large barren fan deposits. 13 14 15
GULLIES	May be present in stable condition. Vegetation on channel bed and side slopes 0 1 $\boxed{2}$ 3	A few gullies in evidence which show little bed or slope erosion. Some vegetation is present on slopes. 4 5 6	Several well developed gullies having active erosion along less than 10 percent of their length 7 8 9	Gullies are numerous and 10 to 50 percent are actively eroding 10 11 12	Sharply incised gullies cover most of the area and over 50 percent are actively eroding 13 14 15

SITUATION	TOTAL				
PRESENT	42		$\frac{(22+20) \times 100}{100} = 42$		
FUTURE	22		$[(13+9) \div 100] \times 100 = 22$		

Erosion Condition Classes: Stable 0–20; Slight 21–40; Moderate 41–60; Critical 61–80; Severe 81–100

(Instructions on reverse)

EXAMPLES

ITEM	EXAMPLE ONE			EXAMPLE TWO			EXAMPLE THREE		
	POTENTIALLY PRESENT	IDENTIFIED FACTORS	POSSIBLE FACTOR	POTENTIALLY PRESENT	IDENTIFIED FACTORS	POSSIBLE FACTOR	POTENTIALLY PRESENT	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Yes	8	14	Yes	8	14	Yes	8	14
Surface Litter	Yes	9	14	Yes	9	14	Yes	9	14
Erosion Pavement	Yes	7	14	No	–	––	Yes	0	14
Pedestalling	Yes	10	14	Yes	10	14	Yes	10	14
Rills	Yes	8	14	Yes	8	14	Yes	8	14
Flow Patterns	Yes	10	15	Yes	10	15	Yes	10	15
Gullies	Yes	6	15	No	–	––	Yes	0	15
TOTAL		58	100		45	71		45	100
Total SSF	$\frac{58}{100} \times 100 = 58$			$\frac{45}{71} \times 100 = 63$			$\frac{45}{100} \times 100 = 45$		

GENERAL INSTRUCTIONS

District prepares one copy and files in district with particular study under consideration.

Wind and water are considered eroding agents when evaluating each item.

Do *not* include items in computations which are not potentially present.

Identify numerical factor that most nearly describes the conditions observed by circling the factor given for each logical item.

SPECIFIC INSTRUCTIONS

Total all factors at bottom of page. Divide total identified factors by total possible factors for items considered and multiply by 100 in order to compute the SSF.

Situation – Describe situations being evaluated such as present, geologic, with mechanical treatment in effect for 10 years, under a 5 pasture livestock management system for last 8 years, etc.

Total – Total computed SSF.

GPO 030-000

XVII. PHOTO PLOT METHOD

Editor's Note: The Photo Plot Method procedures were transcribed from the original text in BLM Technical Reference 4400-4; Rangeland Monitoring - Trend Studies, dated May 1985.

A. General Description

The Photo Plot Method includes taking a close-up photograph of either a 3- x 3-foot plot or a 5- x 5-foot plot and a general-view photograph of the study site. In addition, measurements and/or estimates are made to provide quantitative data concerning vegetation characteristics that may or may not be seen in the photographs. The following indicators of trend are monitored with this method:

1. Foliar and basal cover (including litter)

2. Composition (by cover)

3. Reproduction of key species

4. Density

B. Areas of Use

This method has wide applicability and is suited for use with grasses, forbs, and shrubs.

C. Advantages and Limitations

This method provides both a photographic record and a measurement or estimate of the vegetation cover and composition. Depending on the density of the vegetation, it may take considerable time to measure and estimate the vegetation on the plot. Limitations of this method are the extremely small area sampled, the difficulty in identifying seedlings, and the variation in the data collected among examiners.

D. Equipment

1. Study Location and Documentation Data form (see Illustration 59)
2. Trend Study Data - Photo Plot Method form (see Illustration 60)
3. Photo Identification Label (see Illustration 61)
4. Frame to delineate the 3- x 3-foot or 5- x 5-foot plots (see Illustrations 62 and 63)
5. Square-foot gridded frame with 16 equal divisions (see Illustration 62)
6. Stakes: 3/4- or 1-inch angle iron not less than 16 inches long
7. Hammer
8. Permanent yellow or orange spray paint
9. Camera: 35-mm with a 28-mm wide-angle lens
10. Exposure meter (if camera is not equipped with one)

11. Film
12. Tripod (optional)
13. Small step ladder (for 5- x 5-foot photo plots)
14. Black felt-tip pen
15. Measuring tape calibrated in tenths of inches
16. Steel post
17. Post driver
18. Compass

E. Training

Examiners must be able to identify plant species. They must know how measurements and estimates on the plots are collected and recorded. The accuracy of the data depends on how well examiners are trained and on their ability to measure or estimate cover.

F. Establishing Plots

Careful establishment of plots is a critical element in obtaining meaningful data.

1. Site Selection

Stratify the allotment, wildlife habitat area, herd management area, watershed area, or other designated management area; select the key area(s) and key species; and determine the number, size, and location of the plots.

2. Number of Plots

Establish one plot on each key area; establish more if needed.

3. Plot Size and Shape

Use a 3- x 3-foot plot in herbaceous vegetation and a 5- x 5-foot plot in shrub vegetation. If the herbaceous vegetation is sparse, the 5- x 5-foot plot may be used.

a. ***Plot Frame - 3- x 3-foot.*** Rods are used to divide the 3-x 3-foot frame into nine equal square-foot sections. A square-foot frame gridded into 16 equal units can be used to obtain more precise data. Each of these grid units represents 0.7 percent of the area of a 3- x 3-foot plot (see Illustration 62).

b. ***Plot Frame - 5- x 5-foot.*** The 5- x 5-foot frame is supported above the vegetation by six telescoping legs. A gridded overlay frame, 1 foot wide and 5 feet long, divides the plot frame into smaller units. The overlay frame is constructed of welding rod and is gridded into 1/16-square-foot units. The plot frame is marked at 1-foot intervals on two parallel sides so that the gridded overlay frame can be positioned at 1-foot intervals across the plot (see Illustration 63).

4. Plot Location

a. Permanently mark plots with angle-iron stakes driven into the ground at two diagonal corners of the plots (see Illustration 64).

b. Paint the stakes with bright-colored permanent spray paint (yellow or orange) to aid in relocation. Repaint these stakes when subsequent readings are made.

5. Reference Post or Point

Permanently mark the location of each plot by means of a reference post (steel post) placed about 100 feet from the plot. Record the bearing and distance from the post to the plot. An alternative is to select a reference point, such as a prominent natural or physical feature, and record the bearing and distance from that point to the plot. If a post is used, it should be tagged to indicate that it marks the location of a monitoring study established by the Bureau of Land Management and that it should not be disturbed.

6. Plot Identification

Number plots for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (see Illustration 65).

7. Plot Documentation

Document the location, size, and other pertinent information concerning the plot on the Study Location and Documentation Data Form (see Illustration 59). Plot the precise location of the photo plots on detailed maps and/or aerial photos.

G. Taking Photographs

Take close-up photographs of the plot, as well as the general-view photographs, before making any measurements or estimates.

H. Sampling Process

Count seedlings and mature plants by species and determine vegetation cover and composition by measurement and/or estimation. Record the data on the Trend Study Data - Photo Plot Method form (see Illustration 60). When repeat measurements or estimates are made, follow the same process used in making the initial measurements or estimates. In addition to collecting the specific studies data, general observations should be made of the study sites.

1. Number of Plants

Count and record on the form the number of seedlings and mature perennial plants, by species, within the plot. In dense vegetation, the plants may be counted on a randomly selected small portion of the plot and converted to the total for the plot. The form includes space for a plot diagram where the examiner can sketch in all the plants or just the key species.

2. Measuring Cover

Record basal and foliar cover in square inches on the form. Measurements are made where the growth form is a bunch type and clearly defined, such as occurs with bluebunch wheatgrass (Agropyron spicatum) or Indian ricegrass (Oryzopsis hymenoides). Measure vegetation in its natural state, not "bunched" or "compressed" (see Illustration 66). Most plant species grow in the form of an ellipse rather than a circle. Therefore, basal area measurements of bunchgrass and foliar cover measurements of forbs and shrubs will consist of two measurements—the long and short diameters. Area is calculated by using the formula, Area = πab, where a and b are lengths of major and minor radii. (Radii are obtained by taking half of the measured diameters.)

a. ***Grasses.*** Measure basal area of bunchgrasses to the nearest 1/10 inch at 1 inch above the soil surface. Measure any dead or vacant central portions of a grass clump and subtract this from the total if the portion is larger than 10 percent of the plant basal area.

b. ***Forbs and Shrubs.*** Measure foliar cover of forbs and shrubs, projected to the ground surface as viewed from directly above, if they are clearcut in outline. Subtract dead or vacant central portions exceeding 10 percent of the plant cover. For example, a shrub measures 14 x 20 inches but an area in the center, 5 x 8 inches, is "open." The area of the shrub is:

$$A = \pi ab - \pi a'b' = (3.14)(7)(10)-(3.14)(2.5)(4) = 188 \text{ square inches.}$$

3. Estimating Cover

Estimates are made on litter and plants that are difficult to measure, i.e., creeping or decumbent forms. Estimations are more rapid than measurements but not as sensitive because small changes in plant size may not be readily detected.

a. ***Making Estimates Using the 3- x 3-foot Plot.*** Place the square-foot gridded frame over each square foot of the plot (see Illustration 62). Observe the vegetation cover from directly above the grid and count the number of 1/16-square-foot units of basal or foliar cover by species. Do this for each species on the plot. Record the number of units of basal or foliar cover by species on the form. If the observed cover does not fill any specific 1/16-square-foot unit, estimate the percent of a unit that is filled. Estimate the amount of litter cover in the same manner.

b. ***Making Estimates Using the 5- x 5-foot Plot.*** Place the 1- x 5-foot gridded frame over a 1- x 5-foot section of the plot frame (see Illustration 63). Observe the vegetation cover and count the number of 1/16-square-foot units of basal or foliar cover by species in the same manner as described for making estimates using the 3- x 3-foot plot (see preceding section). Advance the gridded frame a foot at a time until the plot has been covered. Litter cover and cover by understory species can be estimated with the 1-square-foot gridded frame if desired.

c. ***Estimating Cover of Stoloniferous Grasses.*** Generally, the cover for stoloniferous grasses can be estimated because they form a dense closed sod cover. Determine basal ground cover, as viewed through the 1/16-square-foot units of the grid.

d. ***Estimating Cover of Forbs and Shrubs.*** Record the foliar cover of forbs and shrubs as viewed through the small grids. Do not count grids filled with dead portions of the plants.

4. Combining Measurements and Estimates

Measurements and estimates are used if both clearly defined and irregularly shaped plants occur in a plot. For example, a plot contains a very irregular-shaped shrub, two or three bunchgrasses, and a thin cover of rhizomatous grasses. Estimate the foliar cover of the shrub and the basal area of the rhizomatous grasses, but measure the basal area of the bunchgrasses.

a. ***Rhizomatous Grasses.*** Rhizomatous grasses are difficult to measure or estimate. Where only a few stems are present, count and record the number. Where the entire plot contains widely spaced stems, count the stems in randomly selected grids and then convert this to a total number for the plot. Count stems in at least 10 percent of the grids that contain the species. Convert these to basal area. Measure the area of 15 to 20 stems (or some other unit) and multiply by the total number. [Editor's note: To make calculations easy, measure the number of stems in one square inch and then divide the total number of stems in the plot by the number of stems in the 1-square-inch area to determine the number of square inches.] For example, if a plot contains 1,000 stems of western wheatgrass (Agropyron smithii) and 20 stems have an area of one square inch, the area of this species on the plot is 50 square inches.

b. ***Annual Grasses.*** For annual grasses, use the same procedure used for rhizomatous grasses (see preceding section). Estimate, as nearly as possible, the basal cover of the plants and not the foliar cover.

I. Calculations

Calculate the trend index by totalling the following factors and recording them on the Trend Study Data - Photo Plot Method Form (see Illustration 60).

1. Composition

The composition factor is the percentage that the key species make up of the total plant composition on the plot.

2. Vegetation Cover

The vegetation cover factor is the percent ground cover provided by all live vegetation (basal cover of grasses plus foliar cover of forbs and shrubs) on the plot.

3. Seedlings

The seedlings factor is the total number of seedlings of the key species on the plot.

4. Litter

The litter factor is the percentage of the plot area that is covered by litter.

Page ___ of ___

United States Department of the Interior
Bureau of Land Management
Study Location & Documentation Data

Study Method	Study Number
Allotment Name & Number	Pasture
District	Resource Area
Ecological Site	Plant Community

Date Established	Established by (Name)	Map Reference

Elevation	Slope	Exposure	Aerial Photo Reference

Location

Township Range Section 1/4 1/4 1/4

Scale: ___ inches equals one mile

Key Species

1 2 3

Distance and bearing between reference post or reference point and the transect location stake, beginning of transect, or plot

Distance and bearing between location stake and bearing stake

Transect Bearing	Vertical Distance Between Ground & Aligned Tape
Length of Transect	Plot/Frame Size
Sampling Interval	Total Number of Samples

Notes (Description of study location, diagram of transect/plot layout, description of photo points, etc. If more space is needed, use reverse side or another page.)

Note: Depending on the study method, fill in the blocks that apply when a study is established. This documentation enables the examiners to conduct follow-up studies in a consistant manner to provide comparable data for analysis, interpretation, and evaluation.

Page 1 of 1

United States Department of the Interior
Bureau of Land Management
Study Location & Documentation Data

Study Method: Daubenmire Trend

Study Number: 035-27W-08-03

Allotment Name & Number: Quaking Aspen - 11037

Pasture: Sheep Creek

District: Howe

Resource Area: Lost Mountain

Ecological Site: Clayey-15-19" Northern Plains

Plant Community: ARTR2 - AGSP - PONE3

Date Established: 7/24/84

Established by (Name): Charlie Wagon

Map Reference: Graystone 7½ min. topo.

Elevation: 4300

Slope: Flat

Exposure: East

Aerial Photo Reference: BLM-24CN-A277A - 4/22/78

Location	Township	Range	Section	1/4	1/4	1/4
	3S	27W	8	NW	SE	NW

Scale: 2 inches equals one mile

Key Species

1 AGSP 2 PONE3 3

	X		

Distance and bearing between reference post or reference point and the transect location stake, beginning of transect, or plot

The transect location stake is 100 ft. south (180°) of the reference post. Reference post is 3 miles west of Redtop Reservoir.

Distance and bearing between location stake and bearing stake: 102 feet at 135°

Transect Bearing:

Vertical Distance Between Ground & Aligned Tape: 3 inches

Length of Transect: 100 feet

Plot/Frame Size: 20x50 cm - 6 cover classes

Sampling Interval: Every 2 ft. beginning at the 1-foot mark on the tape. Place the rear left corner of the frame at every 2nd foot mark along the right side of the tape.

Total Number of Samples: 50

Notes (Description of study location, diagram of transect/plot layout, description of photo points, etc. If more space is needed, use reverse side or another page.)

The two photo plots are located at 37 and 53 feet along the tape. Close-up photos are taken from the northeast side of the photo plots.

Note: Depending on the study method, fill in the blocks that apply when a study is established. This documentation enables the examiners to conduct follow-up studies in a consistant manner to provide comparable data for analysis, interpretation, and evaluation.

Page____of____

United States Department of the Interior
Bureau of Land Management
Trend Study Data
Photo Plot Method

Study Number	Date	Examiner

Allotment Name & Number	Pasture

Part I—Plot data by square foot section

Species																		
Grass	Forb	Shrub	Mature Plants	Seedlings	1/16 Units	Total sq. inches	Mature Plants	Seedlings	1/16 Units	Total sq. inches	Mature Plants	Seedlings	1/16 Units	Total sq. inches	Mature Plants	Seedlings	1/16 Units	Total sq. inches
	(a)		(b)	(c)	(d)	(e)	(b)	(c)	(d)	(e)	(b)	(c)	(d)	(e)	(b)	(c)	(d)	(e)
	LITTER																	
	LITTER																	
	LITTER																	
	LITTER																	
	LITTER																	

Part II—Summary of Plot Data						
List by Species (a)	Number: Mature Plants (b)	Number: Seedlings (c)	1/16 Sq. Ft. Units (estimate) (d)	Total Sq. In. (measurement) (e)	Percent: Cover (f)	Percent: Composition (g)
Grasses (Basal Cover)						
Grass Totals						
Forbs (Foliar Cover)						
Forb Totals						
Shrubs (Foliar Cover)						
Shrub Totals						
Veg. Totals						
Litter						

Part III—Plot Diagram

Part IV—Trend Index Summary	
Composition, Key Species *(percent)*	
Cover, Live Vegetation *(percent)*	
Seedlings, Key Species *(number)*	
Litter, Plot Total *(percent)*	
TOTAL	

Specific Instructions

(Items not listed are self-explanatory)

Part I—Plot Data by Square Foot Section

Record data for each 1' x 1' section of the plot

Column (a) - Use the standard plant code (Scientific Symbol). Indicate which species are the key species.
Column (b) & (c) - Enter number
Column (d) - *Estimate* - 1/16 sq. feet units covered by species.
Column (e) - *Measure* - Total sq. inches covered by species.
Note: Use *either* estimate or measurement for *each* species. Do *not* use both.
Total - Total data for *each* species and enter in Part II.

Part II—Summary of Plot Data

Column (f) - To convert measurement data to percent cover - $\frac{\text{Measured sq. inches (Column (e))}}{\text{1296 (3' x 3' plot) or 3600 (5' x 5' plot)}} \times 100 = \text{percent cover}$

- To convert estimate data to percent cover - Multiply Column (d) by 0.7 (3' x 3' plot) or 0.25 (5' x 5' plot) = percent cover

Column (g) - To calculate composition - $\frac{\text{\% Cover } \textit{(Column (f))} \text{ of each species}}{\text{Total \% vegetation cover } \textit{(of plot in Column (f))}} \times 100 = \text{percent composition}$

Page 1 of 2

United States Department of the Interior
Bureau of Land Management
Trend Study Data
Photo Plot Method

Study Number	Date	Examiner
34S-02W-17-02	6/19/84	Al Zisk

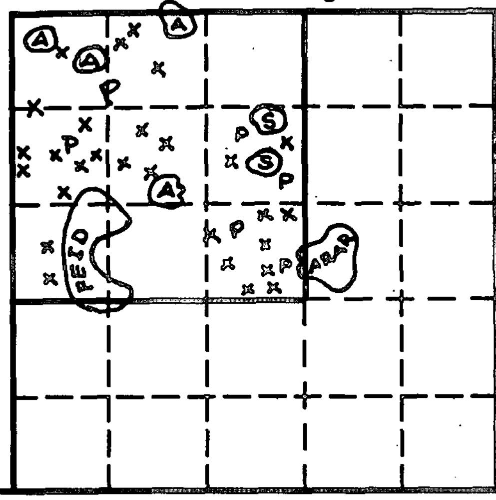
Allotment Name & Number	Pasture
Black Butte - 1234	Butte

Part I—Plot data by square foot section

Species: Grass	Species: Forb (a)	Species: Shrub	Mature Plants (b)	Seedlings (c)	1/16 Units (d)	Total sq. inches (e)	Mature Plants (b)	Seedlings (c)	1/16 Units (d)	Total sq. inches (e)	Mature Plants (b)	Seedlings (c)	1/16 Units (d)	Total sq. inches (e)	Mature Plants (b)	Seedlings (c)	1/16 Units (d)	Total sq. inches (e)	Mature Plants (b)	Seedlings (c)	1/16 Units (d)	Total sq. inches (e)
AGSP – Key Species			2		.4		1		.4						Angle Iron							
POSE			2		.2		3		.5						Stake							
	PHHO		1		.1		–		.1													
	LITTER				4.3				.8				.1									
POSE			7		.6		4		.5		2		.3									
SIHY											2		.5				N					
FEID – Key Species			–		.2																	
	PHHO		1		.2						2		.4									
AGSP							1		.1													
	LITTER				.7				.1				.8									
POSE			2		.2		–		T		8		.8									
FEID			3		4.1		–	1	.4													
	PHHO										2		.6									
		ARARB									1		.1									
AGSP							–		T													
	LITTER				4.9				.3				.6									
			Angle Iron																			
			Stake						Camera													
									Point													
	LITTER																					
	LITTER																					

Part II—Summary of Plot Data						
List by Species (a)	Number: Mature Plants (b)	Number: Seedlings (c)	1/16 Sq. Ft. Units (estimate) (d)	Total Sq. In. (measurement) (e)	Percent: Cover (f)	Percent: Composition (g)
Grasses (Basal Cover)						
AGSP (Key Sp.)	4		0.9		.63	8.4
POSE	28		3.1		2.17	29.0
SIHY	2		0.5		.35	4.7
FEID (Key Sp.)	3	1	4.7		3.29	43.9
Grass Totals	37	1	9.2		6.44	86.0
Forbs (Foliar Cover)						
PHHO	6		1.4		.98	13.1
Forb Totals	6		1.4		.98	13.1
Shrubs (Foliar Cover)						
ARAR 8	1		0.1		.07	.9
Shrub Totals	1		0.1		.07	.9
Veg. Totals					7.49	100.0
Litter			12.6		8.82	

Part III—Plot Diagram



Part IV—Trend Index Summary	
Composition, Key Species *(percent)*	52.3
Cover, Live Vegetation *(percent)*	7.49
Seedlings, Key Species *(number)*	1
Litter, Plot Total *(percent)*	8.82
TOTAL	69.61

P - PHHO
× - POSE
(S) - SIHY
(A) - AGSP
L - Angle Iron Stake

Specific Instructions

(Items not listed are self-explanatory)

Part I—Plot Data by Square Foot Section

Record data for each 1' x 1' section of the plot

Column (a) - Use the standard plant code (Scientific Symbol). Indicate which species are the key species.
Column (b) & (c) - Enter number
Column (d) - *Estimate* - 1/16 sq. feet units covered by species.
Column (e) - *Measure* - Total sq. inches covered by species.
Note: Use *either* estimate or measurement for *each* species. Do *not* use both.
Total - Total data for *each* species and enter in Part II.

Part II—Summary of Plot Data

Column (f) - To convert measurement data to percent cover - $\frac{\text{Measured sq. inches (Column (e))}}{\text{1296 (3' x 3' plot) or 3600 (5' x 5' plot)}}$ x 100 = percent cover

To convert estimate data to percent cover - Multiply Column (d) by 0.7 (3' x 3' plot) or 0.25 (5' x 5' plot) = percent cover

Column (g) - To calculate composition - $\frac{\text{\% Cover \textit{(Column (f))} of each species}}{\text{Total \% vegetation cover \textit{(of plot in Column (f))}}}$ x 100 = percent composition

DATE

NO.

R.A.

ALLOT.

PAST.

DATE 7/24/84

NO. 035-27W-08-03

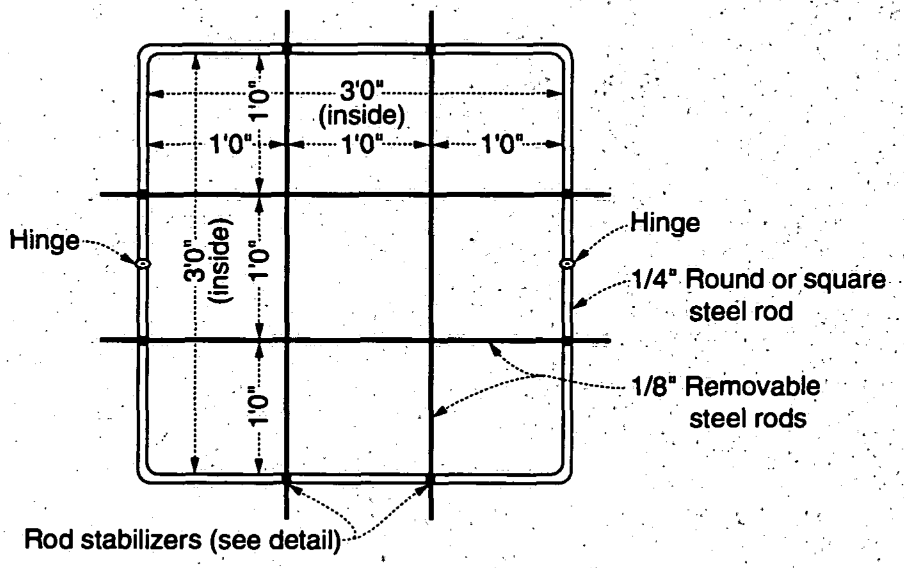
R.A. Lost Mountain

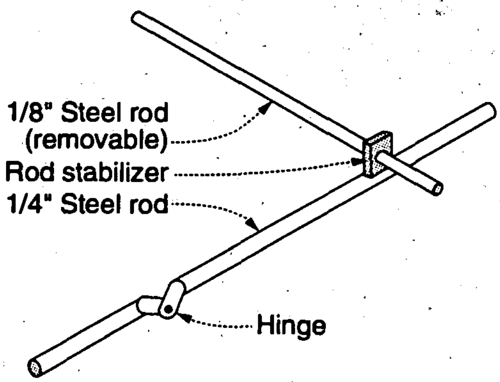
ALLOT. Quaking Aspen

PAST. Sheep Creek

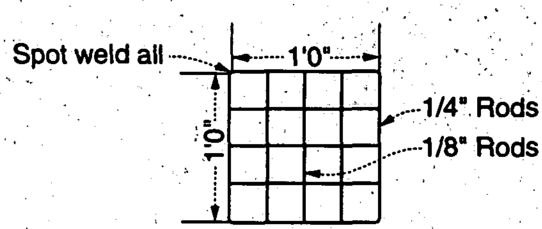
Rangeland Monitoring—Trend Studies

Photo Plot Frame - 3- x 3-foot





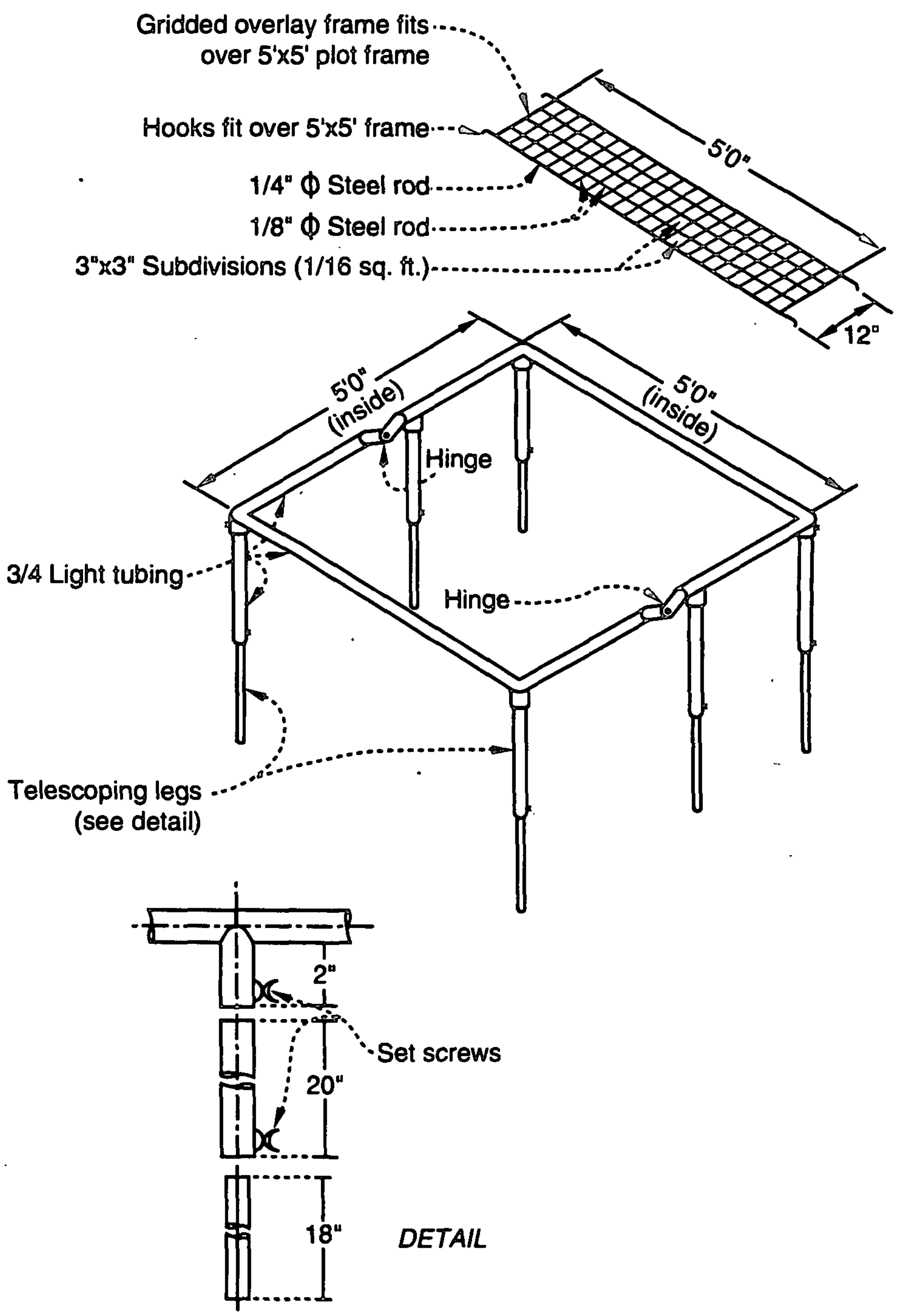
DETAIL



Gridded overlay frame for use with 3'x3' plot frame. Each grid 1/16 sq. ft. (3"x3")

Rangeland Monitoring—Trend Studies

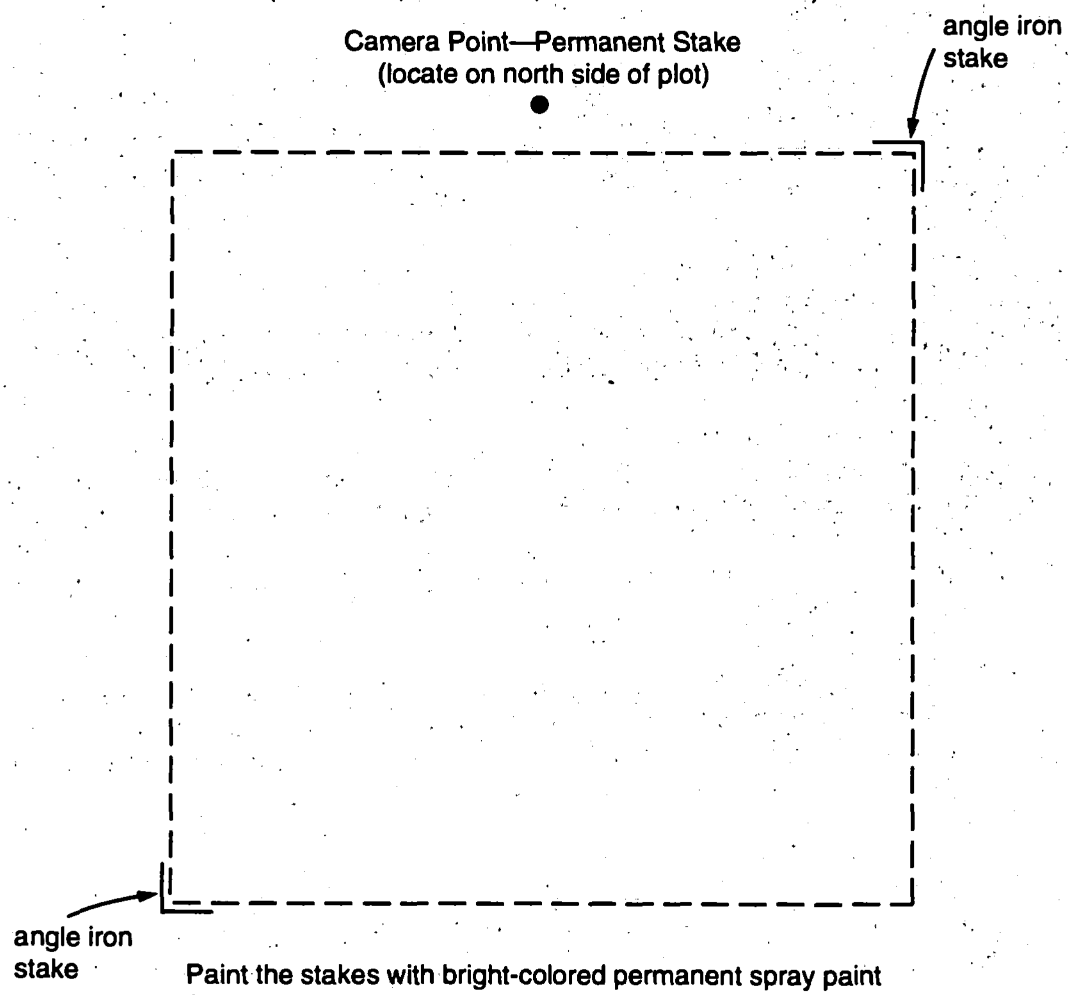
Photo Plot Frame—5- x 5-foot



Rangeland Monitoring

Permanent Photo Plot Location

(3- x 3-foot, 5- x 5-foot, or 1- x 1-meter outline)



Paint the stakes with bright-colored permanent spray paint (yellow or orange) to aid in relocation. Repaint these stakes when subsequent photographs are taken.

RANGELAND MONITORING/TREND STUDIES—STUDY AND PHOTOGRAPH IDENTIFICATION

A. Numbering Studies

Studies should be numbered to assure positive identification. These numbers can also be used to identify photographs. Following are three alternative schemes for numbering studies:

1. Numbering Scheme 1

Consecutive numbers may be assigned to studies within an allotment. For example, Mooncreek #1 and Mooncreek #2 would be studies Number 1 and 2 within the Mooncreek Allotment. A disadvantage to using the names of allotments in a numbering scheme is that these names can, and often do, change.

2. Numbering Scheme 2

Studies may be numbered based on their location within a township, range, and section. A 10-character number can be assigned in the following manner:

a. The first three characters are the township (03S), the second three are the range (27W), the next two are the section (08), and the last two are simply a series number (01) assigned to a study based on the number of studies located within a section.

b. The numbers for studies located in Section 8 would be 03S-27W-08-01, 03S-27W-08-02, and so forth.

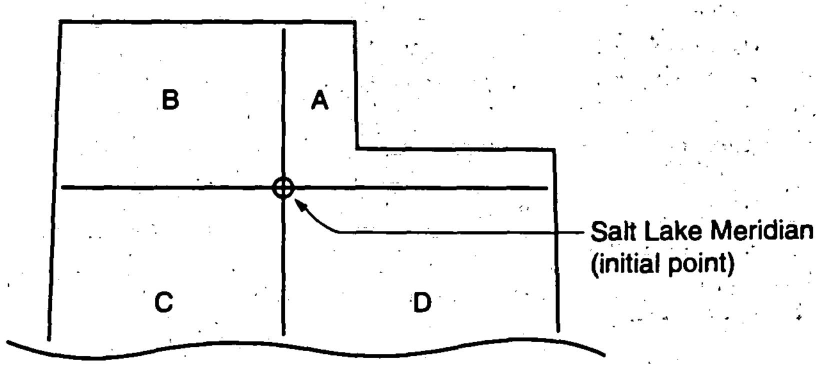
c. Depending on the local situation, this scheme can be modified by adding characters to the code where there are fractional townships or ranges, where there are more than 99 sections/tracts within a township, and/or where there is more than one public land survey principal meridian and baseline within the area of jurisdiction.

3. Numbering Scheme 3

Studies may be numbered based on their location relative to the initial point of survey (principal meridian and baseline governing public land survey).

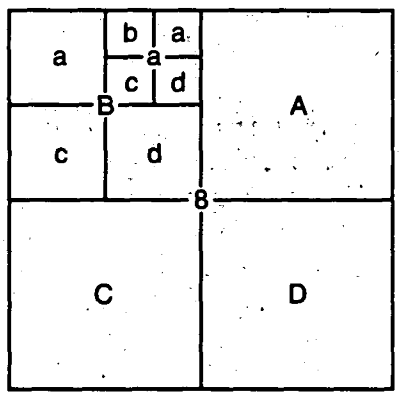
a. Under this scheme, the first character is a letter assigned to a principal meridian and baseline quadrant. Using the initial point of the survey as the center point, the northeast quadrant (townships located to the north and east of the initial point) is coded

"A". The northwest, southwest, and southeast quadrants are coded "B", "C", and "D", respectively. For example:



b. The next characters are the township number (3, 16, etc.) followed by the range number (7, 32, etc.) and the section number (8, 21, etc.).

c. The next three characters are used to identify the subdivisions within a section (down to 10 acres) in which a study is located. These subdivisions have letter designations as follows:



d. The last character(s) is (are) simply a series number (1, 2, 3, . . . 10, 11, etc.) assigned to a study based on the number of studies located within the smallest subdivision.

e. For example, Studies 1 and 2 located in the SE1/4NE1/4NW1/4 of Section 8, T3S, R21E would be numbered (D-3-21)8Bad-1 and (D-3-21)8Bad-2.

f. Depending on the local situation, this scheme can be modified by adding characters to the code where there are fractional townships or ranges, where there are more than 99 sections/tracts within a township, and/or where there is more than one public land survey principal meridian and baseline within the area of jurisdiction.

B. Identifying Photographs

In most cases, the number that has been assigned to a study is the number used to identify the photographs associated with that study. Following is a description of three labels that can be used to include the study number in the photographs:

1. **Label 1**

The Photo Identification Label included as Appendix C can be copied and used to identify photographs. This label provides space for documenting the date, number, and location (Resource Area, allotment, and pasture) of a study. A large black felt-tip marking pen should be used to print the information on the label.

2. **Label 2**

A slotted sign board with a black felt background and movable white plastic letters can be used as a photo identification label. Room permitting, the user may include any information desired on such a label. A 9- x 12-inch board with slots running lengthwise at a spacing of 1/4-inch and 1-1/2-inch white letters makes a highly visible label for most photographs.

3. **Label 3**

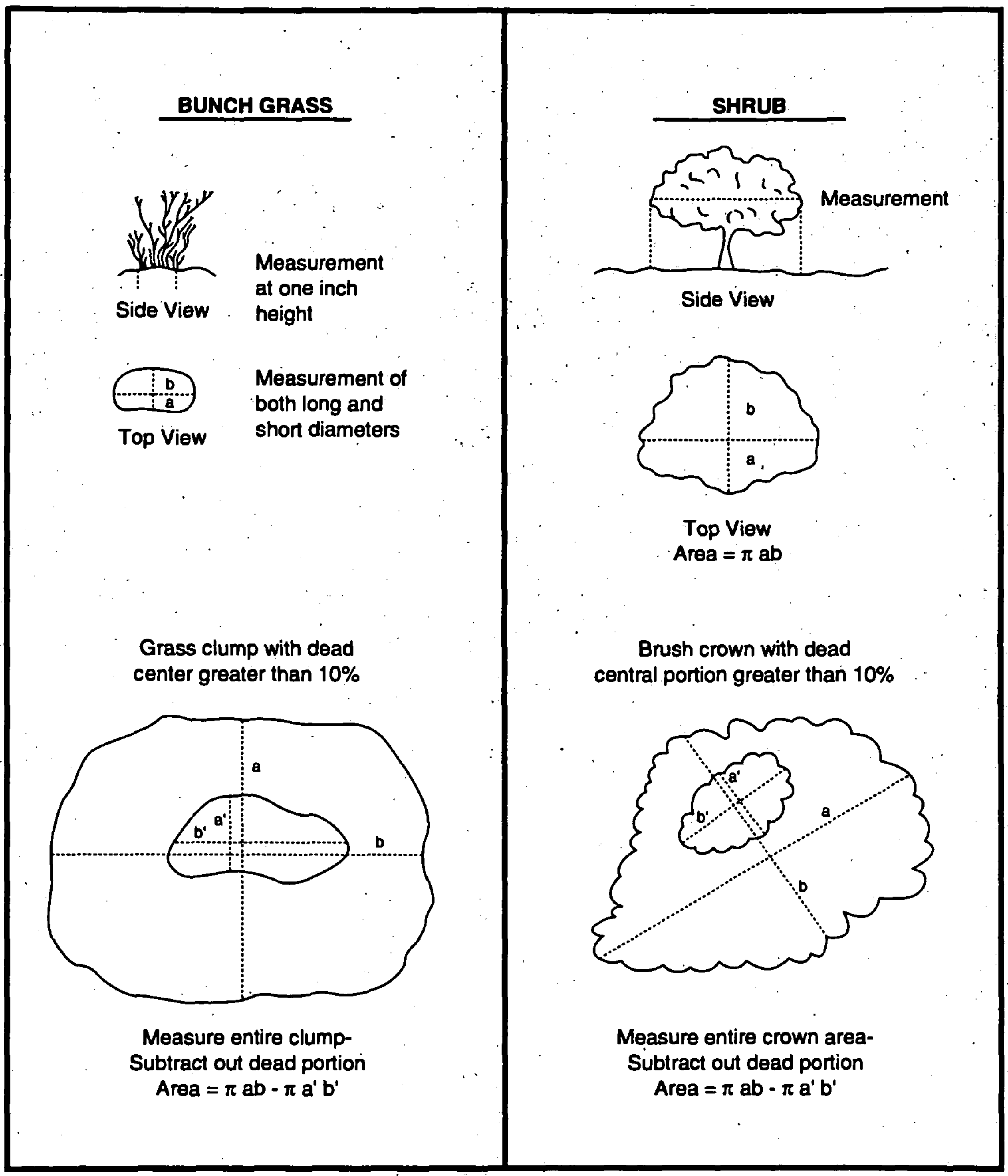
A placard on which identifying characteristics can be entered can be developed to meet local field needs. The placard can be constructed of heavy white cardboard on which such things as Date, "T" (township), "R" (range), Section Number, etc., are preprinted. A heavy mylar film can be placed over the preprinted placard. The specific identifying information can be handprinted on the mylar with a heavy grease pencil or other readily removable, highly visible, marking material. After taking the desired photographs, the mylar can be wiped clean and the placard reused for other photographs. A more permanent placard can be constructed of plywood and painted enamel white. The grease pencil markings can be wiped from the enameled surface and the placard reused for other photographs. Caution must be exercised in the placement of the placard to prevent glare from the mylar or enameled surface.

NOTE - Labels can be placed flat on the ground immediately adjacent to photo plots for close-up photographs.

- Labels can be placed in an upright position in the foreground of general view photographs.

Rangeland Monitoring—Trend Studies

Diagrammatic Sketches of Vegetation Growth Forms and Measurement Techniques



XVIII. COMMUNITY STRUCTURE ANALYSIS

Editor's Note: The Community Structure Analysis procedures were transcribed from the original text from BLM Technical Reference 4400-4, Rangeland Monitoring - Trend Studies, dated May 1985.

A. General Description

The Community Structure Analysis (CSA) Method assigns an "importance value" to each species to describe its status in the community. This value is based on relative cover, relative density, and relative frequency. A 100-point pace transect is run to collect the vegetation data. Close-up and general-view photographs should be used with this method. The following indicators of trend are monitored with this method:

1. Foliar cover (including litter)

2. Density

3. Frequency

4. Composition by foliar cover and density

B. Areas of Use

This method is recommended for grass-shrub vegetation types.

C. Advantages and Limitations

The method is easy to use and interpret. Because the importance is based on "relative" rather than " absolute" values, it is less affected by estimator bias. The relative position of a plant species in the community is essentially undisturbed by year-to-year differences in rainfall, as density and frequency tend to compensate for fluctuations in production.

D. Equipment

1. Study Location and Documentation Data form (see Illustration 59)
2. Trend Study Data - Community Structure Analysis Method-Foliar Cover Data form (see Illustration 67)
3. Trend Study Data - Community Structure Analysis Method-Density and Frequency Data form (see Illustration 68)
4. Trend Study Data - Community Structure Analysis Method-Summary form (see Illustration 69)
5. Photo Identification Label (see Illustration 61)

6. Frame to delineate the 3- x 3-foot photo plots
7. Stakes: 3/4- or 1-inch angle iron not less than 16 inches long
8. Hammer
9. Permanent yellow or orange spray paint
10. Camera: 35-mm with a 28-mm wide-angle lens
11. Exposure meter (if camera is not equipped with one)
12. Film
13. Tripod (optional)
14. Black felt-tip pen
15. Microplot frame: 5 x 10 centimeters divided into quarters
16. Circular plot frame: 9.6 square feet or smaller if vegetation is dense
17. Tally counter (optional)
18. Compass
19. Steel post
20. Post driver

E. Training

The accuracy of the data depends on the training and ability of the examiners.

1. Examiners must be able to identify the plant species.

2. Examiners must know how to collect foliar cover data.

3. Examiners should be consistent in determining the number of individual plants. For most plant species, individuals are readily distinguished. However, most communities contain some species that reproduce vegetatively. Determination of what constitutes a plant unit in such cases is somewhat arbitrary. For rhizomatous grasses such as western wheatgrass (Agropyron smithii), each culm group can be visualized as an actual or potential plant unit, as can rooted stoloniferous units of such species as vine mesquite (Panicum obtusum). Mat or sod-forming plants such as blue grama (Bouteloua gracilis) or alkali sacaton (Sporobolus airoides) usually start growth as small, distinct clumps but may spread to become plants that are a yard or more in diameter. As this occurs, they tend to fragment into more-or-less separate units, and it is these separate units that should be counted as actual or potential individuals.

4. Examiners must be familiar with the operation of the camera equipment.

F. Establishing Transects

Careful establishment of transects is a critical element in obtaining meaningful data.

1. Site Selection

Stratify the allotment, wildlife habitat area, herd management area, watershed area, or other designated management area; select the key area(s) and key species; and determine the number, length, and location of the transects.

2. Number of Transects

Establish one transect on each key area; establish more if needed.

3. Transect Layout

a. Drive an angle iron location stake into the ground to permanently mark the location of each transect (see Illustration 70).

b. At the location stake, determine the transect bearing and select a prominent distant landmark such as a peak, rocky point, etc., that can be used as the transect bearing point. Drive an angle iron stake into the ground at a point 6 feet from the location stake along the transect bearing (see Illustration 70).

c. Paint the transect location and transect bearing stakes with bright-colored permanent spray paint (yellow or orange) to aid in relocation. Repaint these stakes when subsequent readings are made.

4. Reference Post or Point

Permanently mark the location of each transect by means of a reference post (steel post) placed about 100 feet from the transect location stake. Record the bearing and distance from the post to the transect location stake. An alternative is to select a reference point, such as a prominent natural or physical feature, and record the bearing and distance from that point to the transect location stake. If a post is used, it should be tagged to indicate that it marks the location of a monitoring study established by the Bureau of Land Management and that it should not be disturbed.

5. Transect Identification

Number transacts for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (see Illustration 65).

6. Transect Documentation

Document the location, starting point, bearing, sampling interval, and other pertinent information concerning the transect on the Study Location and Documentation Data form (see Illustration 59). Plot the precise location of the transects on detailed maps and/or aerial photos.

G. Taking Photographs

Take close-up photographs of the photo plot, as well as the general-view photographs, before making any measurements or estimates.

H. Sampling Process

The studies data are collected by species along a 100-point pace transect. Microplots are read at each point and a 9.6-square-foot, or other size, circular plot is read at each tenth microplot. Data are recorded on the Trend Study Data - Community Structure Analysis Method—Foliar Cover Data form and the Trend Study Data - Community Structure Analysis Method—Density and Frequency Data form (see Illustrations 67 and 68). When the transacts are reread, follow the same process that was used when they were established. In addition to collecting the specific studies data, general observations should be made of the study sites.

1. Collecting Cover Data

a. Beginning at one pace from the transect bearing stake along the transect bearing, collect cover data with a 5- x 10-cm microplot frame at every pace (every alternate step), or at some other prescribed interval, along the transect for a total of 100 samples (see Illustration 70). Center the microplot frame in front of the toe.

b. With each placement of the microplot frame, estimate the foliar coverage of each perennial plant species. Record the dot count tally for each species by cover class on the Trend Study Data - Community Structure Analysis Method—Foliar Cover Data form (see Illustration 67). Foliar coverage data may also be collected for annual plant species. The cover classes are as follows:

Cover Class	Range of Coverage	Midpoint of Range
1	1-5%	2.5%
2	5-25%	15.0%
3	25-50%	37.5%
4	50-75%	62.5%
5	75-95%	85.0%
6	95-100%	97.5%

c. Alternative cover classes can be used with this method. When transacts are reread, use the same cover classes used when the studies were established. An example of a ten-cover-class system is as follows:

Cover Class	Range of Coverage	Midpoint of Range
1	1-5%	2.5%
2	5-12.5%	8.75%
3	12.5-25%	18.75%
4	25-37.5%	31.25%
5	37.5-50%	43.75%
6	50-62.5%	56.25%
7	62.5-75%	68.75%
8	75-87.5%	81.25%
9	87.5-95%	91.25%
10	95-100%	97.5%

d. Estimate the undisturbed foliar cover for grasses, forbs, and shrubs. Consider all individuals of a plant species in the microplot as a unit. All other kinds of plants are ignored as each plant species is considered. The plants do not have to be rooted in the plot.

e. The 5- x 10-cm microplot frame is divided into fourths to assist in estimation.

f. Overlapping foliar cover is included in the cover estimates by species; therefore, total cover may exceed 100 percent. Total cover may not reflect actual ground cover.

g. Estimate and record the cover for litter (loose plant material or standing dead material) and rock (1/2 inch in diameter and larger).

2. Collecting Density and Frequency Data

a. At each tenth microplot, collect density data with a 9.6-square-foot circular plot (see Illustration 70). Center the circular plot frame in front of the toe. A total of ten samples is collected. Depending on the density of the vegetation, a smaller size circular plot may be used. Record the number of plants by species for all perennial grasses, forbs, and shrubs on the Trend Study Data - Community Structure Analysis Method—Density and Frequency Data form (see Illustration 68). Density and frequency data may also be collected for annual plant species.

b. Count by species all plants rooted within the plot. The majority of the base of the plant must be in the plot to be counted.

I. Calculations

1. Cover

Calculate the percent cover by species as follows:

a. Convert the dot count for each species in each cover class to the number of plots that included that species in that cover class.

b. Multiply this value times the midpoint of the appropriate cover class.

c. Total the products for all cover classes by species.

d. Divide the sum by the total number of microplots sampled on the transect (usually 100).

e. Record the percent cover by species on the Trend Study Data - Community Structure Analysis Method—Foliar Cover Data form and on the Trend Study Data - Community Structure Analysis Method—Summary form (see Illustrations 67 and 69).

2. Density

Calculate the density for each plant species by adding the number of plants of the species counted in the 10 circular plots. Record the totals on the Trend Study Data - Community Structure Analysis Method—Density and Frequency Data form and on the Trend Study Data - Community Structure Analysis Method—Summary form (see Illustrations 68 and 69).

3. Frequency

Calculate the percent frequency for each plant species by dividing the number of circular plots in which the species occurred by the total number of circular plots sampled (usually 10) and multiplying the value by 100. Record the percent frequency on the Trend Study Data - Community Structure Analysis Method—Density and Frequency Data form and on the Trend Study Data - Community Structure Analysis Method—Summary form (see Illustrations 68 and 69).

4. Importance Value

The importance value of a species is a composite score of the relative cover, relative density, and relative frequency; it represents the relative importance of that species in the plant community. Calculate the relative values by dividing the individual species values for cover, density, and frequency, by the total values for these data categories for all species. Plant species can be ranked by importance value. The total community has an importance value of 3.00. The importance value is calculated and recorded on the Trend Study Data - Community Structure Analysis Method—Summary form. The percent plant cover, litter cover, rock cover, and bare ground are also recorded on this form (see Illustration 69).

United States Department of the Interior
Bureau of Land Management

Trend Study Data
Community Structure Analysis Method—Foliar Cover Data

Page ____ of ____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Cover Category and Plant Species	Cover Class 1 1-5 % (2.5)		Cover Class 2 5-25 % (15)		Cover Class 3 25-50 % (37.5)		Cover Class 4 50-75 % (62.5)		Cover Class 5 75-95 % (85)		Cover Class 6 95-100 % (97.5)		Percent Cover
	Dot Count	#	Dot Count	#	Dot Count	#	Dot Count	#	Dot Count	#	Dot Count	#	
Litter													
Rock ≥ 1/2 inch													

$$\text{Percent Cover by Species} = \sum \left[\frac{\text{(no. in)}}{\text{(Class 2)}} \frac{\text{(Midpoint)}}{\text{(Class 2)}} + \ldots + \frac{\text{(no. in)}}{\text{(Class 2)}} \frac{\text{(Midpoint)}}{\text{(Class 2)}} \right]$$

Notes (Use other side or another page)

United States Department of the Interior
Bureau of Land Management

Trend Study Data
Community Structure Analysis Method—Foliar Cover Data

Page 1 of 1

Study Number	Date	Examiner	Allotment Name & Number	Pasture
CUBA #1	9/15/84	Joe Blue	CUBA - 2431	South

Cover Category and Plant Species	Cover Class 1 1-5 % (2.5)		Cover Class 2 5-25 % (15)		Cover Class 3 25-50 % (37.5)		Cover Class 4 50-75 % (62.5)		Cover Class 5 75-95 % (85)		Cover Class 6 95-100 % (97.5)		Percent Cover
	Dot Count	#	Dot Count	#	Dot Count	#	Dot Count	#	Dot Count	#	Dot Count	#	
Litter		28		17		3							4
Rock ≥ 1/2 inch		9		2				1					1
HIJA		18		23		10		2					9
SPAI		6		5									1
SIHY		26		7		3							3
BOGR 2		12		17		3		1					5
ASTRA		3		6		1							1
SPDI3		1		4		2							1
EULA5		5		9		1							2
GUSA 2		9		2		3							2
OPCL		2		3				1					1
ATOB		4		8		5				1			4
											(100 Samples)		

Percent Cover by Species $= \sum \left[\frac{(\text{no. in})\,(\text{Midpoint})}{(\text{Class 2})\,(\text{Class 2})} + \ldots + \frac{(\text{no. in})\,(\text{Midpoint})}{(\text{Class 2})\,(\text{Class 2})} \right]$

Notes (Use other side or another page)

Page ___ of ___

United States Department of the Interior
Bureau of Land Management
Trend Study Data
Community Structure Analysis Method—Density and Frequency Data

Study Number	Date	Examiner

Allotment Name & Number	Pasture

Plant Species	Plot Number										Density (Total)	Frequency (%)
	1	2	3	4	5	6	7	8	9	10		

Density = Total number of plants by species recorded for all ten plots.

Notes (Use other side or another page)

$$\text{Frequency (\%)} = \frac{\text{No. of plots in which a species occurs}}{10} \times 100$$

Page 1 of 1

United States Department of the Interior
Bureau of Land Management
Trend Study Data
Community Structure Analysis Method—Density and Frequency Data

Study Number	Date	Examiner
CUBA #1	9/15/84	Joe Blue

Allotment Name & Number	Pasture
CUBA - 2431	South

Plant Species	Plot Number 1	2	3	4	5	6	7	8	9	10	Density (Total)	Frequency (%)
HIJA	4	3	-	7	2	5	7	-	2	6	36	80
SPAI	1	-	3	-	4	-	-	1	2	-	11	50
SIHY	-	2	4	1	3	2	5	-	-	3	20	70
BOGR2	3	2	5	2	4	4	-	-	3	4	27	80
ASTRA	-	1	-	-	-	-	-	1	-	-	2	20
SPDI3	1	-	-	1	-	1	-	-	1	-	4	40
EULA5	2	4	5	-	-	2	-	6	-	-	19	50
GUSA2	-	-	-	-	1	5	3	4	2	-	15	50
OPCL	-	1	-	-	1	-	-	-	-	-	2	20
ATOB	-	-	-	-	-	-	-	1	-	-	1	10

Density = Total number of plants by species recorded for all ten plots.

Notes (Use other side or another page)

$$\text{Frequency (\%)} = \frac{\text{No. of plots in which a species occurs}}{10} \times 100$$

United States Department of the Interior
Bureau of Land Management

Trend Study Data
Community Structure Analysis Method - Summary

Page____of____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Plant Species	Foliar Cover		Density		Frequency		Importance Value
	%	(Relative)	Number	(Relative)	%	(Relative)	
		1.00		1.00		1.00	3.00

Plant Cover	Litter	Rock	Bare Ground
%	%	%	%

CALCULATIONS

1. **Plant Cover** - Total percent cover for all species listed on the Foliar Cover Data Form. (This value may be $\geq$ 100%.)
2. **Litter** - Total percent litter cover recorded on the Foliar Cover Data Form.
3. **Rock** - Total percent rock cover recorded on the Foliar Cover Data Form.
4. **Bare Ground** - 100 percent minus plant cover, litter, and rock percentages equals percent bare ground. (Note: Percent bare ground calculated in this manner will be much lower than it actually is because overlapping canopies as well as litter and rock beneath plant canopies are subtracted from 100%.)
5. **Plant Species** - List all the species listed on the Foliar Cover Data and Density and Frequency Data Forms.
6. **Foliar Cover**

   % — Enter the percent cover for each species listed on the Foliar Cover Data Form.

   Relative — Divide each species' % cover by the total plant cover. The relative cover column will total 1.00.

8. **Frequency**

   % — Enter the % frequency for each species listed on the Density and Frequency Data Form.

   Relative — Divide the % frequency for each species by the total frequency for all species. The relative frequency column will total 1.00.

9. **Importance Value** - Relative Cover + Relative Density + Relative Frequency = Importance Value by species. The importance value column will total 3.00.

Notes (Use other side or another page)

United States Department of the Interior
Bureau of Land Management

Trend Study Data
Community Structure Analysis Method - Summary

Page 1 of 1

Study Number	Date	Examiner	Allotment Name & Number	Pasture
CUBA #1	9/15/84	Joe Blue	CUBA - 2431	South

Plant Cover	Litter	Rock	Bare Ground
29 %	4 %	1 %	66 %

Plant Species	Foliar Cover %	Foliar Cover (Relative)	Density Number	Density (Relative)	Frequency %	Frequency (Relative)	Importance Value
HIJA	9	.31	36	.26	80	.17	.74
SPAI	1	.03	11	.08	50	.11	.22
SIHY	3	.11	20	.15	70	.15	.41
BOGR 2	5	.18	27	.20	80	.17	.55
ASTRA	1	.03	2	.01	20	.04	.08
SPDI 3	1	.03	4	.03	40	.08	.14
EULA 5	2	.07	19	.14	50	.11	.32
GUSA 2	2	.07	15	.11	50	.11	.29
OPCL	1	.03	2	.01	20	.04	.08
ATOB	4	.14	1	.01	10	.02	.17
	29	1.00	137	1.00	470	1.00	3.00

CALCULATIONS

1. **Plant Cover** - Total percent cover for all species listed on the Foliar Cover Data Form. (This value may be ≥ 100%.)

2. **Litter** - Total percent litter cover recorded on the Foliar Cover Data Form.

3. **Rock** - Total percent rock cover recorded on the Foliar Cover Data Form.

4. **Bare Ground** - 100 percent minus plant cover, litter, and rock percentages equals percent bare ground. (Note: Percent bare ground calculated in this manner will be much lower than it actually is because overlapping canopies as well as litter and rock beneath plant canopies are subtracted from 100%.)

5. **Plant Species** - List all the species listed on the Foliar Cover Data and Density and Frequency Data Forms.

6. **Foliar Cover**

   % — Enter the percent cover for each species listed on the Foliar Cover Data Form.

   Relative — Divide each species' % cover by the total plant cover. The relative cover column will total 1.00.

8. **Frequency**

   % — Enter the % frequency for each species listed on the Density and Frequency Data Form.

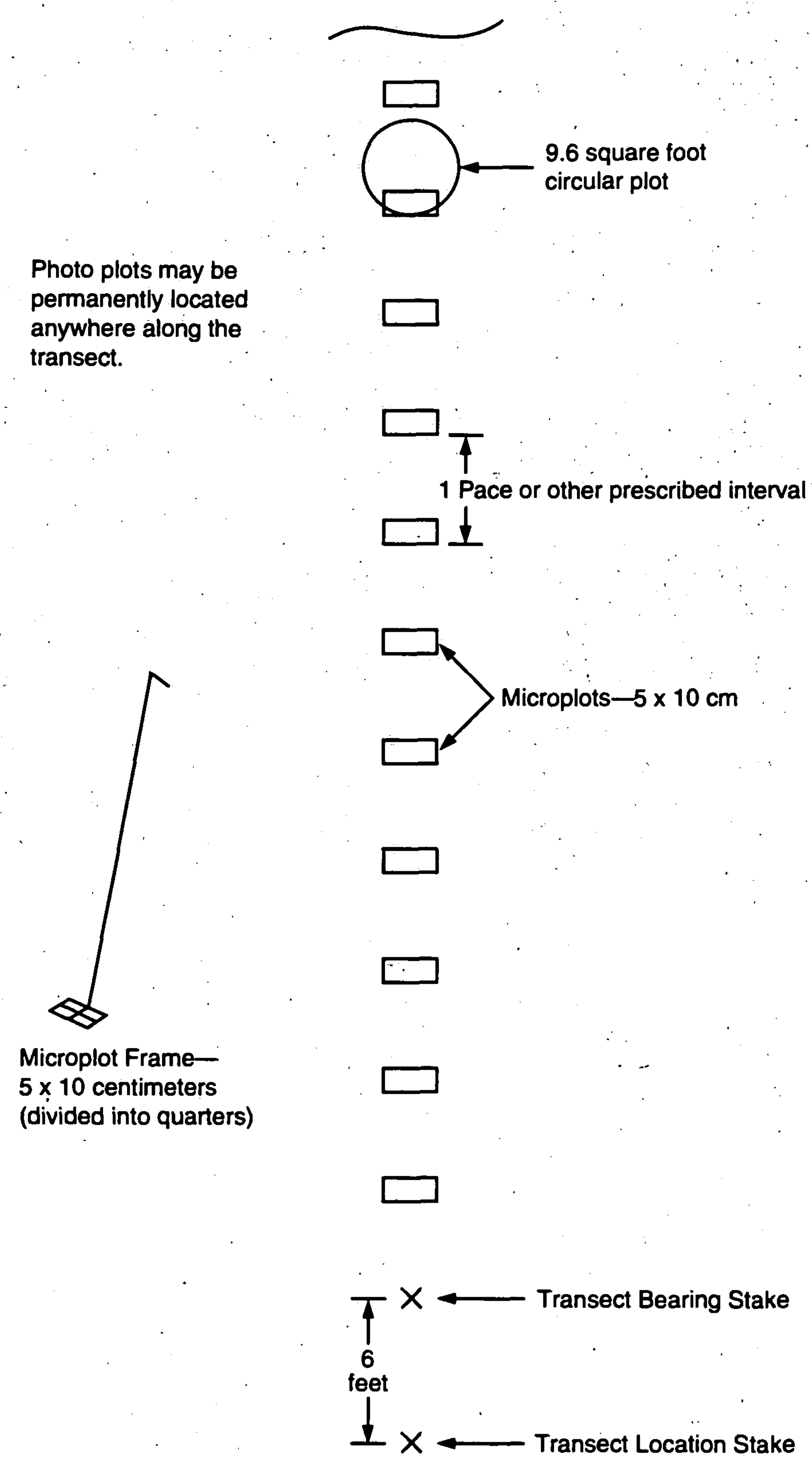
   Relative — Divide the % frequency for each species by the total frequency for all species. The relative frequency column will total 1.00.

9. **Importance Value** - Relative Cover + Relative Density + Relative Frequency = Importance Value by species. The importance value column will total 3.00.

Notes (Use other side or another page)

Rangeland Monitoring—Trend Studies

Community Structure Analysis Method Transect Layout



XIX. STEM COUNT METHOD

Editor's Note: The Stem Count Method procedures were transcribed from the original text in the BLM Technical Reference 4400-3, Rangeland Monitoring - Utilization Studies, dated September 1984.

The Stem Count Method involves counting grazed and ungrazed stems in plots along a transect. It is based on the theory that percent utilization is directly related to the total number of stems grazed.

A. Areas of Use

This method was developed for use on mixed grass prairie rangelands. It is recommended for rangelands where western wheatgrass (Agropyron smithii) or other single-stem rhizomatous grasses are the important forage species. If the key species is not present at the proper interval at least 50 percent of the time, a different method for determining utilization should be used.

B. Advantages and Limitations

The method is simple and comparatively free from personal or procedural error. Some problem may arise in determining what is a single plant when more than one stem appears from a rhizome. Count stems—not plants.

C. Equipment

1. Study Location and Documentation Data form (see Illustration 59)

2. Utilization Study Data - Stem Count Method form (see Illustration 71)

3. Frame to delineate plots (a 1-square-foot plot is suggested)

D. Training

Little training is required for this method. Examiners must be able to identify the plant species as they count and record the number of grazed and ungrazed stems of the grasses on the plots.

E. Establishing Studies

Select key area(s) and key species and determine the number, length, and location of the transects. Document the location and other pertinent information concerning a transect on the Study Location and Documentation Data form (see Illustration 59).

F. Sampling Process

After examiners are trained, proceed with the collection of utilization data.

1. At each interval along the transect, place the frame immediately in front of the toe or on the nearest site having the key species.

2. Count all grazed and ungrazed stems of the key species in each plot and record the numbers separately on the Utilization Study Data Stem Count Method form (see Illustration 71).

G. Calculating Percent Utilization

Calculate the percent utilization (percent of stems grazed) by dividing the total number of grazed stems by the total number of stems (grazed plus ungrazed) and multiplying the result by 100. Record the percent utilization on the Utilization Study Data Stem Count Method form (see Illustration 71).

Page ___ of ___

United States Department of the Interior
Bureau of Land Management
Utilization Study Data
Stem Count Method

Study Number	Date	Examiner

Allotment Name & Number	Pasture

Kind and/or Class of Animal	Period of Use

Key Species — Stem Count by Plot

Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Grazed																
Ungrazed																
Plot	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Totals
Grazed																
Ungrazed																
Plot	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	Totals
Grazed																
Ungrazed																

Notes (Use other side or another page if necessary)

Total GR Stems		Total GR + UNGR Stems	

$\frac{\text{Grazed Stems}}{\text{Total Stems}} \times 100 =$ % Utilization (Stems Grazed) ______ x 100

Page 1 of 1

United States Department of the Interior
Bureau of Land Management
Utilization Study Data
Stem Count Method

Study Number	Date	Examiner
13 N - 41 E - 27 - 04	9/30/84	Bob Jackstraw

Allotment Name & Number	Pasture
Blue Ridge - 0079	Chokecherry

Kind and/or Class of Animal	Period of Use
Horses	5/1 to 9/30

Key Species AGSM — Stem Count by Plot

Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Grazed	5	6	4	7	8	5	6	2	5	3	3	4	9	9	6	82
Ungrazed	3	8	9	0	6	10	8	9	5	6	8	1	5	3	2	83
Plot	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Totals
Grazed	5	8	7	9	6	8	5	9	9	7	7	4	5	7	4	100
Ungrazed	9	3	2	5	2	3	3	0	0	6	2	0	1	2	1	39
Plot	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	Totals
Grazed	5	2	3	7	7	5	7	4	6	10	4	5	3	6	2	76
Ungrazed	5	9	8	0	2	9	2	9	1	1	1	10	6	2	9	74

Total GR Stems: 258 — Total GR + UNGR Stems: 454

$\frac{\text{Grazed Stems}}{\text{Total Stems}} \times 100 =$ % Utilization (Stems Grazed): $\frac{258}{454} \times 100 = 57\%$

Notes (Use other side or another page if necessary)

These horses have trampled the area around the undeveloped chokecherry spring until it is nothing but a mud hole. The spring head should be fenced and the water piped to a trough.

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13. ABSTRACT *(Maximum 200 words)*

This Technical Reference contains the rangeland inventory and monitoring techniques historically used in the Bureau of Land Management (BLM) since formation of the Grazing Service. It is designed to be a reference document. BLM contains numerous files and documents containing historical vegetation and other resource data. Much of this data is being used today to determine grazing preference on public lands and the carrying capacity on nonfederal lands. However, the procedures employed to gather this data are now obscure. This document explains how data was collected in the past and provides instructions on how to collect data for future comparison. Historical procedures are described as they were originally published.

Historical inventory and monitoring data is often useful for making long-term analyses of trends and ecological change. Although some historical techniques may be considered technically inadequate by today's standards, older data may be useful in making general interpretations. Knowledge of the intent or purpose of historical methods aids in understanding why previous range managers managed the range the way they did, and in determining if certain reports, such as range condition, can be compared to the concepts and reports used today.

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