Transect Photo Sampling

The historical purpose for transect sampling was to document change in vegetation and soil caused by livestock grazing, commonly called range trend analysis (Parker 1954, Parker and Harris 1959). The Parker three-step method (Parker 1954) was designed for this purpose. It used a 0.75-in diameter loop dropped at each foot along a 100-ft line. The system was supplemented by photographs taken of the transect from the 0- and 100-ft ends with additional closeup pictures of a 3- by 3-ft square at each end.

By 1970, the system had been installed at 16,500 locations and reviewed by the Rocky Mountain Forest and Range Experiment Station (Reppert and Francis 1973). The findings suggested that photographs are the most valuable part of the system. Photos (1) documented transects across two or more sites, (2) helped to evaluate species identification, and (3) were used to validate interpretation of measured data through a four-step process.

Based on these findings, Hall (1976) developed a photo monitoring method, which has been updated for presentation here.

Five kinds of photo transects will be discussed and illustrated: (1) 1-ft^2 frequency photographed with a stereo attachment on the camera (or photographed without the stereo), (2) nested frequency using four plot sizes in a 0.5- by 0.5-m frame, (3) 1-m^2 plot frame photographed at an angle, (4) vertical photographs of tree canopy cover, and (5) measurement of herbaceous stubble height using the Robel pole system. All five may be applied on top of any three-step transect or they may be installed in new areas for any documentation of ground vegetation and soil surface monitoring. The following factors apply to any transect system.

Locating a Sample Area

The introduction to this appendix discussed selection of an area and when to photograph. Probably the most important of these suggestions was to **define a purpose** for monitoring. In addition, several other elements might be considered: livestock grazing, wildlife distribution, and planned and unplanned disturbance because the investigator must be guided by factors not under their control. Transect photo monitoring is not limited to livestock effects analysis.

Livestock considerations—The three-step sampling system (Parker 1954) was designed to evaluate livestock grazing impacts on vegetation and soil. Instructions called for one to three transects. The objective was to attain 60 or more hits on vegetation with a 0.75-in loop. If more than 60 hits were not recorded on the first transect, then a second or third transect was installed until either 60 hits were obtained or three transects were established. Each set of transects was called a cluster. Nested frequency, also an appraisal tool for livestock impacts, requires five transects.

Location of transects has three primary requirements:

1. The site under each transect must be homogeneous. If an entire cluster of two to five transects is to represent a single site, vegetation and soil surface conditions under each of the transects must be homogeneous and similar to each other.

2. The kind of site selected should be one sensitive to livestock use. For example, in a complex meadow where dry meadow around the edge grades into moist meadow, which finally grades into wet meadow, the most desirable sampling location would be in the dry meadow because it is most sensitive to livestock use.

3. Locate the sample in an area best representing current livestock utilization.

These three criteria generally will satisfy the objectives of monitoring management effectiveness by photographic documentation of conditions; evaluation of sensitive areas which, when indicating an upward trend, imply that less sensitive areas are in a faster upward trend (or are in better condition); and distributing sampling locations on a least-cost or cost-effective basis.

The most difficult aspect of sample location deals with suitable representation of current livestock activity. Samples on a range area (allotment) grazed season long may not be adequately located or sufficient in number for the same area under rest-rotation grazing. Furthermore, locating a transect may be difficult in an allotment that has had a major change in management—for instance, from season long to rest-rotation—until livestock distribution over an entire grazing sequence has been evaluated. Selection of a site sensitive to livestock use in a unit under spring grazing might be quite different from that selected in the same unit under fall grazing.

Locating a sampling site requires a great deal of professional expertise liberally mixed with artistic finesse. Investigators must understand seasonal and topographic effects on livestock distribution, seasonal effects on plant community, and soil sensitivity to grazing, and they must have a critical eye for site homogeneity.

Wildlife considerations—Locating transects or clusters suitable for monitoring impacts of wildlife, including big game, on vegetation and soil requires knowledge of animal distribution and most critical season of use. Wild animals may be year-round residents or may be moved by snow or other weather conditions. The investigator must determine which season is most critical and where the animals are at that season for both transect or cluster location and season of sampling.

Planned disturbance—Planned disturbance sampling is where a treatment is prescribed and the area is sampled before and after implementation. Figure 21, a logged and precommercially thinned ponderosa pine stand, is an example of planned disturbance sampling. Two important factors to consider are (1) where to locate the sampling transects so they best represent effects of the treatment, and (2) use of camera location and photo point stakes pounded flush with the ground to resist mechanical displacement. These require use of a metal detector to relocate (White's Electronics, Inc. 1996). Use maps with directions and measured distances to aid in relocating stakes.

Fenceposts, flimsy or strong, used in any kind of disturbance other than prescribed fire, tend to do two things: (1) they bias operators of equipment to stay away from the posts, and (2) they may be removed completely from their location making exact replacement of camera locations and photo points nearly impossible. Prescribed fire

sampling, however, might well use fenceposts, particularly for photo point locations. Pound the fenceposts down to the exact height of the meter board. Then photograph the fire as it passes the fencepost to document fire intensity, flame length, and burn aftermath. Coordination with the fire boss on transect layout and direction given topography and fire behavior might be advisable.

Unplanned disturbance—Unplanned disturbance, such as fire, blowdown, or flood, generally preclude predisturbance transect or cluster installation. Care should be taken to select areas where change is most critical or where postdisturbance activity, such as salvage logging, most likely would occur. If activity is probable, consider use of steel stakes driven flush with the ground and a metal detector to find them

Maps—Each cluster should have two maps: one to find the monitoring area (fig. 72), and another of the cluster layout (fig. 73). A blank form for "Sampling Site Description and Location" is in appendix B.

To use the "Sampling Site Description and Location" form shown in figure 73, circle the type of sample in the (top line), in this case "1 sq. ft." Most items are self-explanatory such as entering the date installed, the name of the area, and the allotment. Grazing system should be entered, such as season long, enclosure, deferred-rotation, elk fall range, deer fawning area, etc., and the date when initiated or season of use. Circle the kind (or kinds) of animals using the sample area.

Describe location with both standard survey nomenclature and a description of where the sample is located in relation to land, vegetation, or road features. Describe it as if you were telling someone how to find it. Then diagram the sample layout in the map space (fig. 73). Note, location of identifiable features, compass headings as either true (T) or magnetic (M), measured distances, transect location and orientation, and the 0- and 100-ft ends. With transects laid end to end, continue the sample layout map on the back of the form (fig. 74).

The front side of the form is for a site description (fig. 73). Enter elevation and percentage of slope. Then circle the item best describing aspect, slope position, micro (within one acre) and macro (within one section) topography, kind of soil deposition, soil parent material, and kind of restriction to rooting depth (if there is a restriction within 5 ft of the soil surface). Enter depth to restriction and rooting depth. Circle items describing soil compaction, soil stone, and texture. A space is provided for comments not otherwise addressed.

Note: A single site description presumes all transects are on the same site. If they are not on the same site, fill out a new form for each different site.

Choice of film—Choice of film is a concern. Photo trend sampling is designed to measure change in vegetation and soil over time. Photographs taken 5, 10, or 15 years earlier are compared to current photographs. Film therefore must be selected that will retain its sharpness and clarity for a long time. Black and white film should be the first choice, but it can be supplemented by color film.

Text continues on page130.

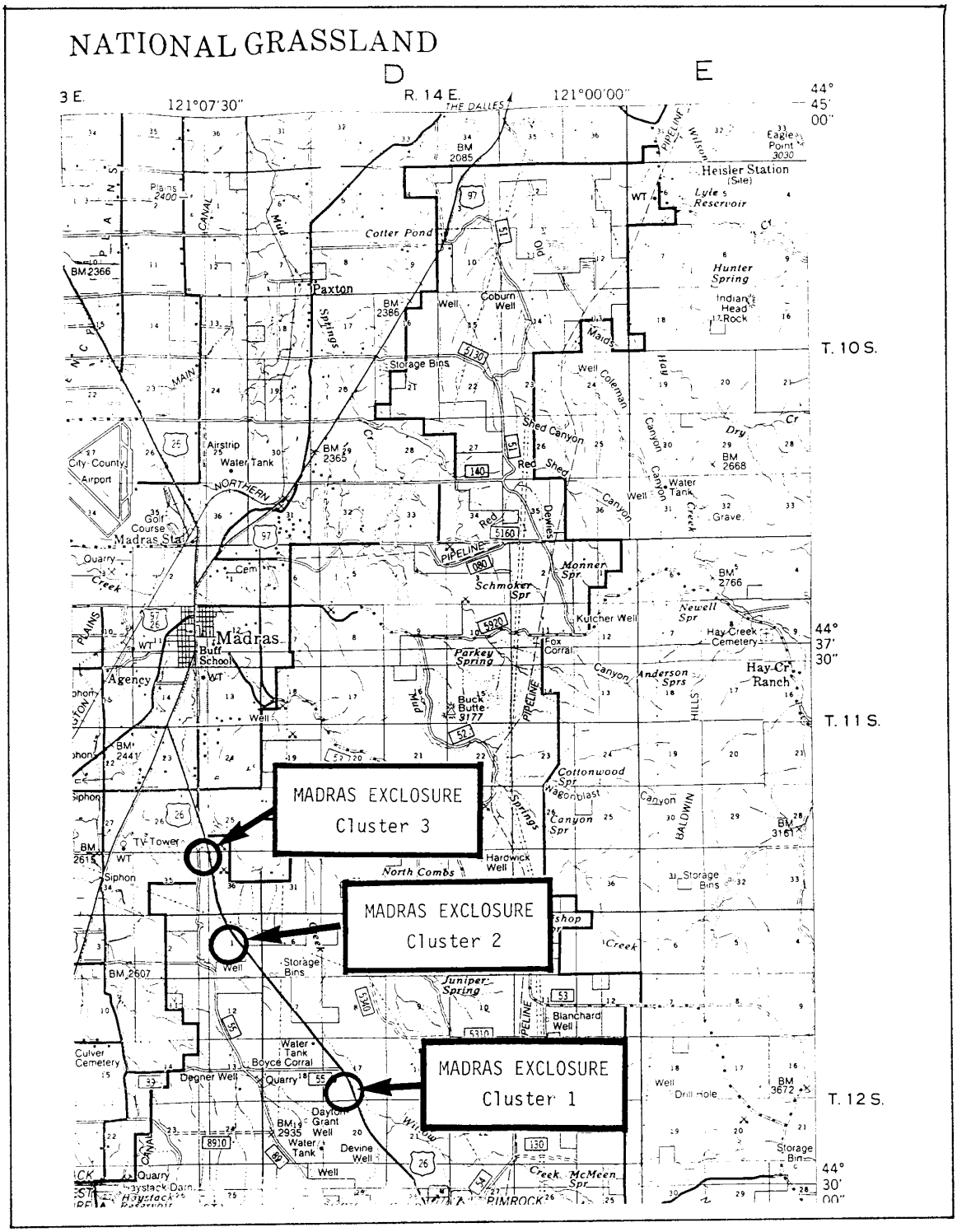


Figure 72—Ranger District map locating the Madras Exclosure and three range trend sampling clusters having three transects each in the Crooked River National Grassland. Cluster number 3, transect 1, will be used to illustrate photo sampling of square-foot frequency, nested frequency, and square-meter systems.

SAMPLING SITE DESCRIPTION AND LOCATION

Circle: (1 Sq.Ft) Nested Freq. 1 sq.m. Robel Pole Shrub Form _____

Date 1997/3/22
Area Crooked River N. G.
Allot. Madras
Cluster No. 3
Transects: 1 2 (3) 4 5
Plant community ARTR/ AGSP/POSA3

Grazing system:
Type Exclosure Date 1954
Type _____ Date _____
Type _____ Date _____

Kind of animal: cattle sheep horses goats (deer) elk jack rabbits

Location: T. 11S R. 13E
Sec. 36 NW of NW
Description: US hiway 20 at Crooked River N. G. sign; 2.1 mi. from junct. US 97 & US 26 S. of Madras.

Site Data: Elev. 2775 % slope 8
Slope aspect: N NE E SE S (SW) W NW
Slope position: top (up 1/3) mid low 1/3 bottom
Micro topography: (convex) flat concave
Macro topography: flat (undulating) rolling steep rough broken

Geology:
Deposition: (wind) stream lake colluvial (residual) _____
Material: limestone mudstone sandstone granite serpentine diorite (basalt) andesite rhyolite tuffacious cinders pumice ash

Soil:
Restrictive layer: absent clay pan (bedrock) cemented _____
Surface compaction: (none) moderate severe
Soil profile stone: absent (gravel) stony
Soil texture: sandy loamy (silty) clayey ashy
Other notes: Livestock excluded when hiway was fenced in 1954

MAP

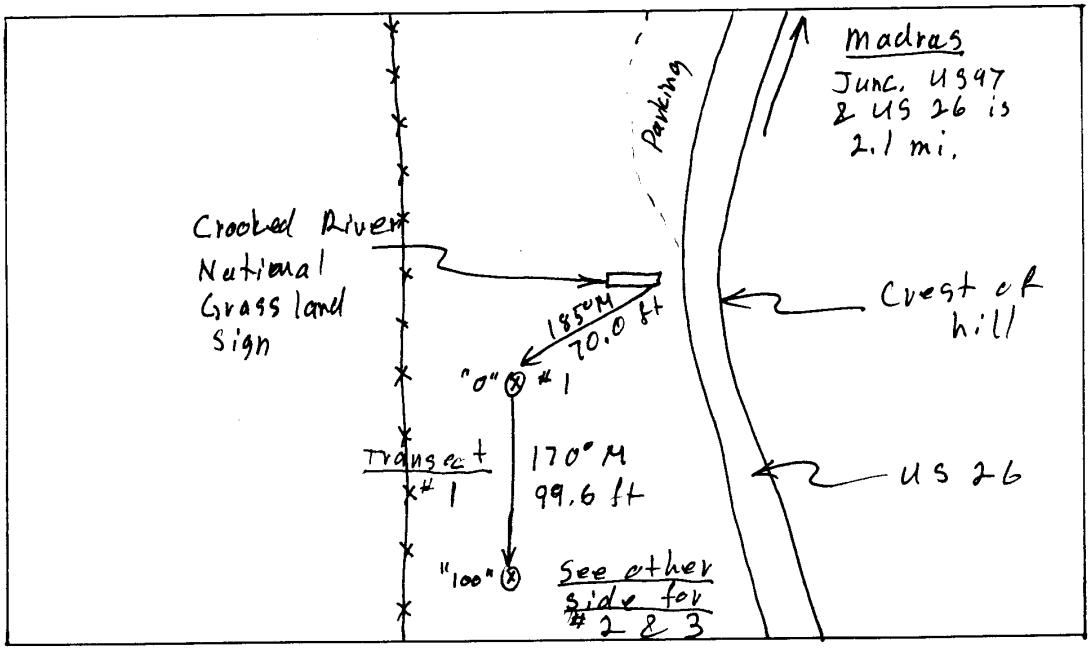


Figure 73—Filing system form "Sampling Site Description and Location" for finding the Madras Exclosure cluster 3. The first line lists a choice of sampling systems. Circle "1 sq. ft." Fill in the required information as shown. After laying out the photo sampling system, plot it in the map space provided. If several transects require more space, use the form back (see fig. 74). Take direction and measured distance between the witness point (Crooked River National Grassland sign) and the first transect (185 degrees magnetic, 70.0 ft). Next take direction and measured distance to the 100-ft end of the tape (170 degrees magnetic, 99.6 ft). The 100-ft end-stake is at foot mark 99.6. See figure 74 for continuation of the map.

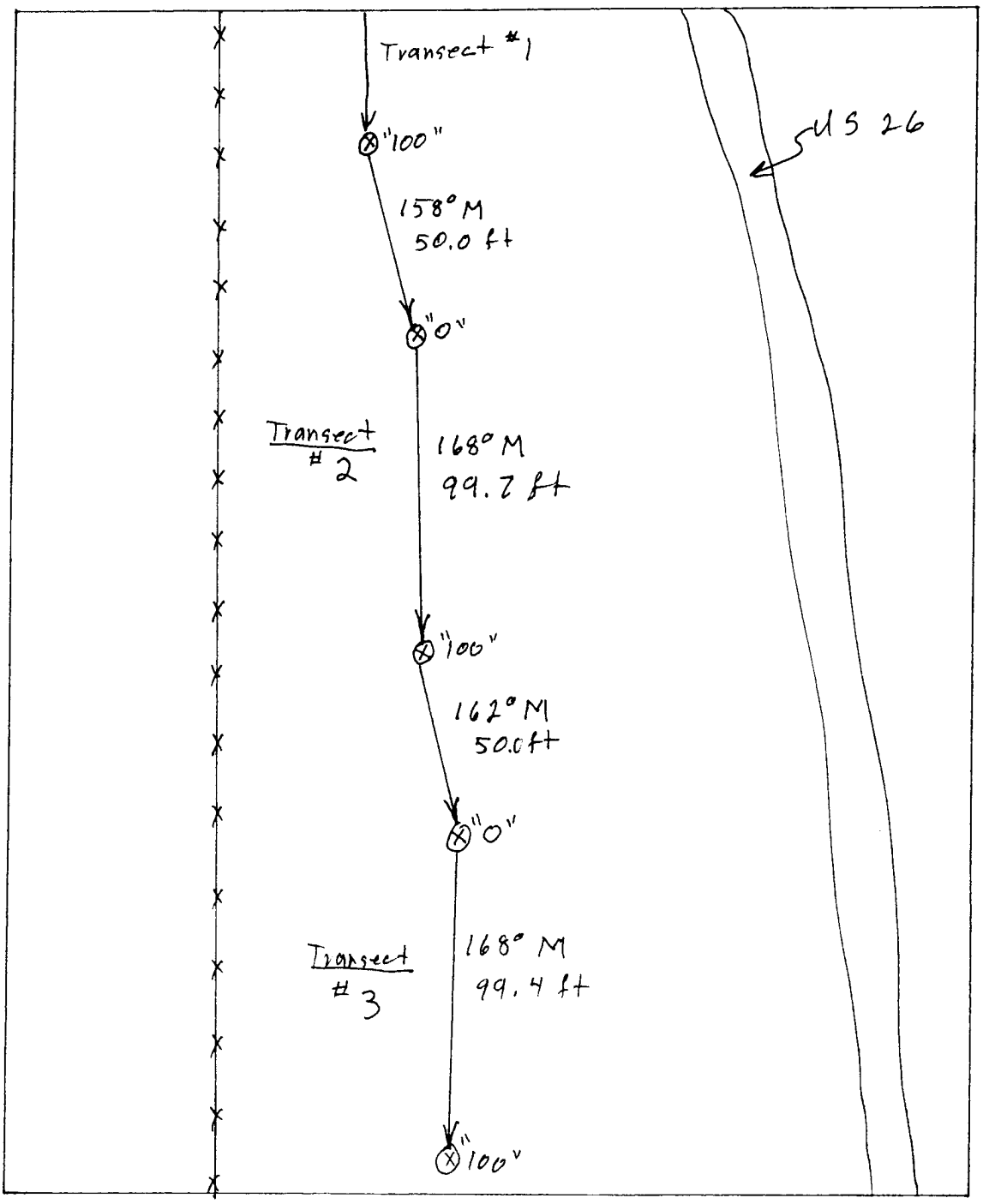


Figure 74—Map on back of figure 73 showing location of transects 2 and 3. When distances are measured, as shown here, use feet and tens of feet, for example, 50.0 ft between transect 1 at its 100-ft end and transect 2 at its 0-ft start. Then 99.7 ft between the 0-ft stake and the end stake located at foot mark 99.7 for transect 2. Continue for transect 3.

Film with an ISO rating of 100 or better should be used, particularly in forested conditions. A film of ISO 160 will have good contrast and fine grain. ISO ratings up through 400 may be considered. Higher ISO ratings mean smaller f-stops (higher f-number) and produce greater depth of field. Photos taken with films rated higher than ISO 400 will be grainy and nullify lens sharpness.

Digital cameras should have 2.1 megapixels or more. Graininess of images from cameras of 1.6 megapixels or less usually precludes accurate analysis of prints.

Season of year—Season of year for photography depends on objectives and past history. Reppert and Francis (1973) recommend repeat sampling within plus or minus 2 weeks of the original date. When placing the 1-ft^2, nested frequency, or 1-m^2 transects on top of existing three-step transects, date of sampling should be governed by the original readings. For newly established transects, date of installation should be governed by plant growth development (phenology) and season of critical concern. In general, a good time to sample is when plants are well into flowering or just completing their maximum seasonal growth.

Transect Installation

Document the direction and measured distance from a witness site to the 0-ft end of the first transect. Set a fencepost to mark the transect. Drive stakes to leave about 6 in aboveground onto which the 100-ft steel tape is clamped. Vice grips are very convenient. The 0-ft mark on the tape is aligned with the first angle iron stake and clamped in place. A mid-stake is located between foot marks 50 and 51, and the end-stake is located between the 99- and 100-ft marks and clamped in place. Make sure the zero end is labeled and that 0- and 100-ft ends are properly documented on the map (figs. 73 and 74). Mark both ends with fenceposts for easy relocation.

In disturbance sampling, presample the area with 6 in of stake aboveground for fastening the steel tape. After sampling, drive the stakes flush with the ground. For postsampling, plan on adding a stake nested inside the flush stake extending 6 in aboveground on which is clamped the 100-ft steel measuring tape. Relocation of the flush-pounded stakes will probably require a metal detector (White's Electronics, Inc. 1996).

From the 0-ft stake, record direction (note true or magnetic) and measured distance to the 100-ft steel stake (figs. 73 and 74) for each transect. Tie the transects together for easy relocation by direction and measured distance from one to another (fig. 74). Always record location of both the 0- and 100-ft ends.

Every transect should have a photograph taken from both the 0- and 100-ft ends (figs. 75, top, and 77). Each photograph down the transect should be identified with the cluster-transect form (app. B). Place the identification form at 15 ft, a size control board at 33 ft, hold camera at eye level, and photograph the transect with the camera focus system on the size control board's "1M" and the photo identification sheet at the bottom of the picture (fig. 75). Repeat this procedure at the 100-ft end of the tape by placing the identification sheet at foot mark 85 and the size control board at foot mark 67 (fig. 77).

Text continues on page134.

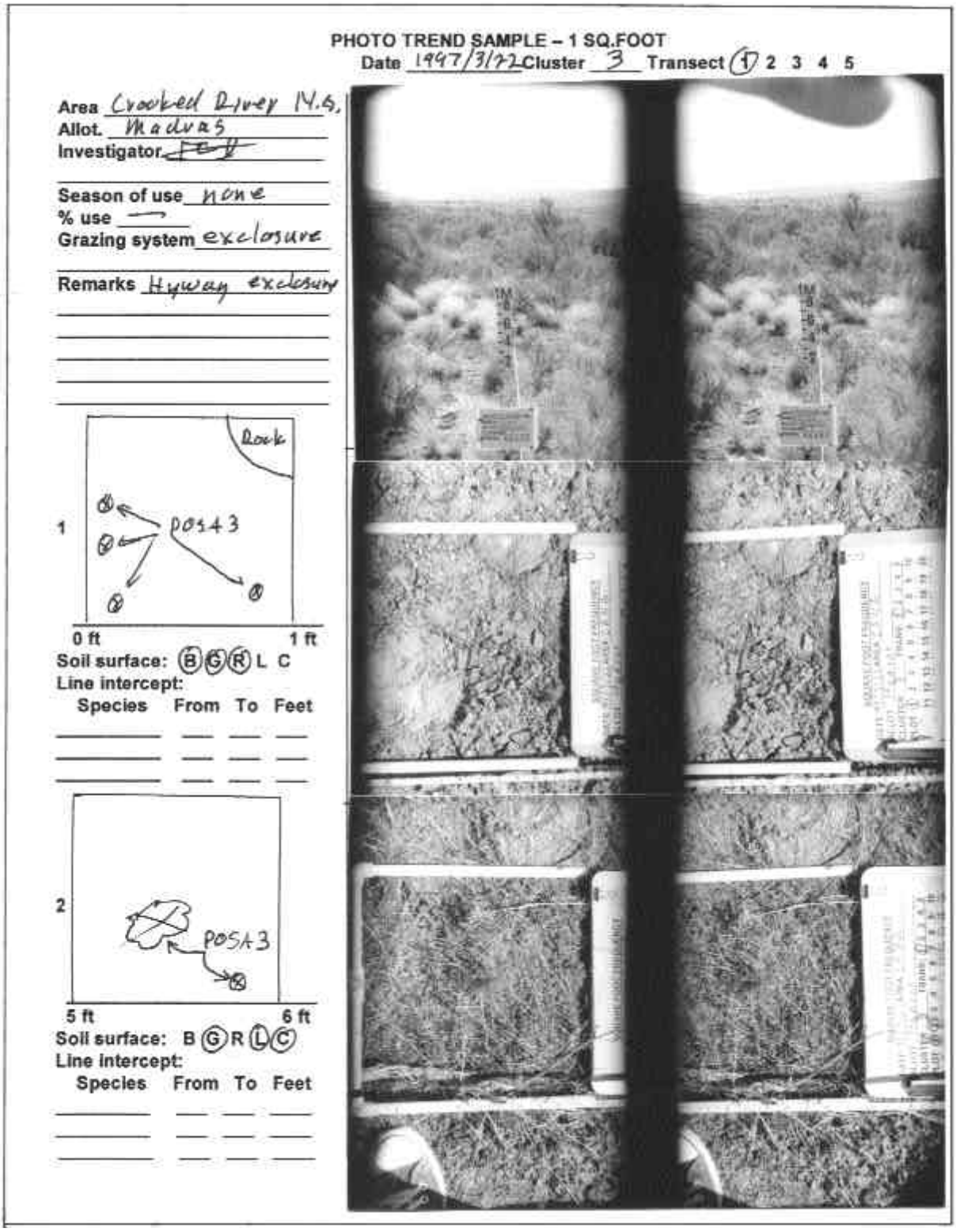


Figure 75—Filing system form “Photo Trend Sample - 1 sq. ft.” illustrating its use (continued in figs. 76 and 77). Two additional forms are shown: transect identification (top picture) and plot identification (lower two pictures). Fill out required information on each form: CRNG (Crooked River National Grassland), Madras Exclosure, cluster 3, transect 1, date, and notes. Photograph the transect from the 0-ft (top picture) and the 100-ft ends (fig. 77). Then place the square-foot plot at the specified foot mark (plot 1 from 0 to 1 ft). Fill out the plot identification form, circle plot 1, and place in view. Soil surface items are B = bare ground, G = gravel, R = rock, L= litter, and C = cryptogamic crust. Circle each item occurring in the plot.

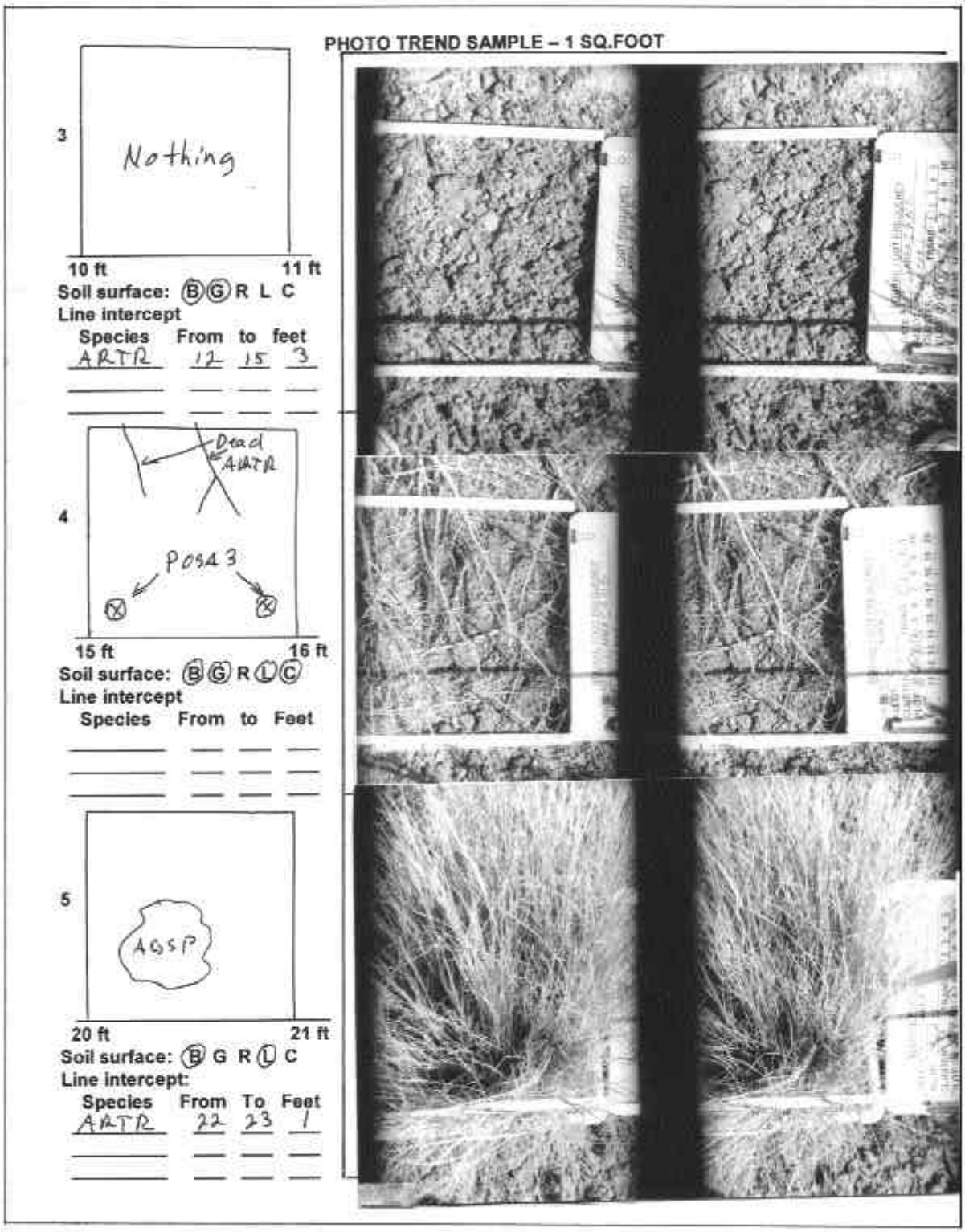


Figure 76—Second page of the "Photo Trend Sample - 1 sq. ft." form with provision for three more sample plots. Notice under plot 3 that ARTR (*Artemisia tridentata* Nutt., big sagebrush) intersected the tape between foot marks 12 and 15 for 3 ft of line intercept. Intersect is counted between the first foot mark from one plot to the next; in this case, from foot 10 to 15. ARTR also intercepted the line as shown under plot 5. Additional pages provide for all 20 ft^2 plots. Other species are AGSP (*Agropyron spicatum* vis. *Pseudoroegneria spicata* (Pursh) A. Love., bluebunch wheatgrass), and POSA3, (*Poa secunda* J. Presl., Sandberg's bluegrass).

PHOTO TREND SAMPLE – 1 SQ FOOT

SUMMARY

Species	Frequ.	Interc.
POSA3	17	
AGSP	5	
LOMAT.	2	
PHLOX		
BASA		
SIHY	1	
STOC		
ARTR		6
PUTR		1
CHNA		

Bare soil	18
Gravel pavement	15
Rock	2
Litter	15
Cryptogams	8

Estimated Utilization

Species	% Use
—	—

ACTIVITIES

Logging —
Fire —
Revegetation —
Insects —
Wildlife deer, few pronghorn antelope
Other

CLIMATE compared to Average

	This Yr.	Last Yr.	Two Yrs.	Three Yrs	Four Yrs.
Temp	+ (0) -	+ (0) -	+ (0) -	+ 0 (-)	+ (0) -
Ppt.	(+) 0 -	(+) 0 -	+ (0) -	+ (0) -	+ 0 (-)

Apparent range condition Good
Apparent range trend Static

COMMENTS

Hyway exclosure

Figure 77—Last page of the form “Photo Trend Sample - 1 sq. ft.” with a view up the transect from the 100-ft end. This page is also the summary sheet where frequency of species and soil surface items are listed. Space is provided for observed utilization, activities, climate, condition, and comments. The sign in the upper right is the witness point for this cluster (fig. 73). Species are AGSP (*Agropyron spicatum* vis. *Pseudoroegneria spicata* (Pursh) A. Love, bluebunch wheatgrass), POSA3 (*Poa secunda* J. Presl, Sandberg’s bluegrass), SIHY (*Sitanion hystrix* (Nutt.) J.G. Sm., squirreltail), STOC (*Stipa occidentalis* Thurb. ex S. Wats., needlegrass), BISO (*Balsamorhiza sagittata* (Pursh) Nutt., arrowleaf balsamroot), LOMAT (*Lomatium* species), PHLOX (*Phlox* species), ARTR (*Artemisia tridentata* Nutt., big sagebrush, PUTR (*Purshia tridentata* (Pursh.) DC., bitterbrush), and CHNA (*Chrysothamnus nauseosus* (Pallas ex. Pursh) Britt.).

The cluster-transect identification form (app. B) is used for both the 0- and 100-ft ends of a transect. Print information in large letters similar in size to those on the form. This size can be read on the photographs (figs. 75 and 77). Circle “0” in upper right corner for the 0-ft end (fig. 75). After taking the picture, cross out the “0” and circle the “100” for the picture at the 100-ft end (fig. 77).

A size control board is required (specifications in app. C). The illustrations in figures 75 and 77 have a size control board marked with “1M” (indicating 1 m) and decimeters labeled as 2, 4, 6, and 8. Use of a size control board has several purposes: (1) depth of grass, height of shrubs, or other items can be estimated; (2) when the camera focus system is placed on the “1M,” pictures will be consistently oriented both horizontally and vertically for easy comparison; (3) focusing the camera on the “1M” assures sharp picture clarity and greatest depth of field at the meter board; and (4) grid analysis may be performed if desired.

General transect photographs from the 0- and 100-ft ends should be taken with the three-dimensional attachment (fig. 78) on 1-ft^2 transects (fig. 75 through 77) if available, otherwise with a 50-mm lens. For other sampling, use a 50- or 35-mm lens for nested frequency, 1-m^2, and canopy cover. A 50-mm lens should be used with Robel pole to adequately document pole divisions. In addition, a standard photograph (without 3-D) is highly recommended on 1-ft^2 transects to encompass a broader horizon of the plant community and, when color slides are produced, to use in slide talks dealing with range trend (fig. 77).

Transect data forms—Forms are provided in appendix B. The series of “Photo Trend Sample-...” forms double as both data forms and a filing system for the photographs. Another form identifies the cluster and transect photograph in letters large enough to be read on the negative. The plot identification form identifies each plot and labels it on the photo negative. Because these forms are used in the field, they should be printed on a paper color that is easy on the eyes and will not burn out in photography under direct sun. “Photo Trend Transect” forms should be printed on medium yellow paper, such as Champion Goldenrod© or Hammermill Copy Plus Goldenrod©, which have been found quite acceptable. Light yellow paper, common in the office environment, is less satisfactory. Transect and plot photograph identification forms will resist fading out under direct sun if printed on medium blue color paper. Tests have shown that Hammermill Brite Hue Blue© or Georgia Pacific Papers Hots Blue© are most useful.

One-Square-Foot Plot Transect

One-square-ft sampling employs a square-foot plot placed every 5 ft along a 100-ft transect for a total of 20 plots. It is designed to document changes in species, their density, and frequency as a means to estimate change in vegetation and soil surface conditions.

Concept

Each 1-ft^2 plot is photographed in stereo to provide a permanent, visual record of vegetation and soil surface conditions. At the same time, each plant species rooted in the plot is recorded and presence of bare soil, gravel (1/8- to 3/4-in diameter), rock, litter, and cryptogams are noted. At a later time, the same transect will be

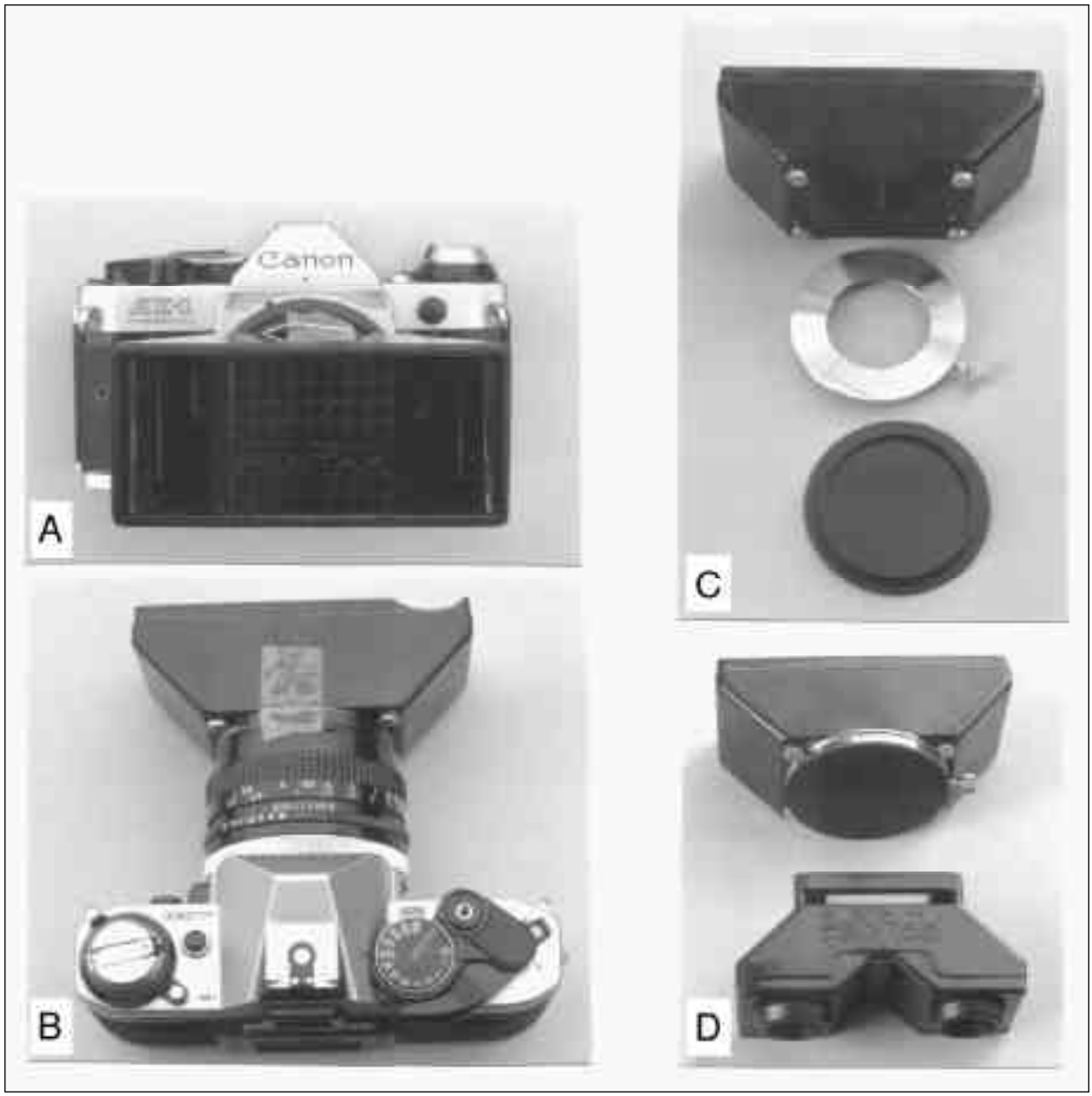


Figure 78—Camera using a 50-mm lens with stereo adapter mounted (**A** and **B**). This a Honeywell Pentax Stereo Adapter® with the connection plate removed because it will not fit on a Canon® camera. (**C**) The connection plate and its cover are shown removed. In B, the stereo system has been taped to the camera over a filter. It must be aligned horizontally with the camera (A). (**D**) The complete system includes the stereo adapter and slide viewer.

reread and rephotographed to provide a comparison set of pictures and data. Range trend is interpreted by comparing original and followup photos and data of each 1-ft^2 plot to appraise changes in species presence, density, basal area, frequency, shrub and tree line intercept, and soil surface characteristics.

Photographs are used to measure or estimate vegetation and soil parameters, aid in evaluating plant identification, facilitate illustration of range trend or lack of trend, and reduce observer variability in comparing transect readings taken at different times. Anybody can compare and measure the difference between photographs.

Stereo photographs greatly aid species identification and interpretation of vegetation and soil parameters. Try evaluation on one-half of a stereo pair—then view it with a stereoscope (fig. 75)!

Equipment

The following equipment is required for 1-ft^2 sampling:

1. Camera or cameras with color and black-and-white film and stereo adapter (fig. 78)
2. A 1-ft^2 plot frame (app. C)
3. Forms from appendix B: for photo identification “Cluster-Transect” and “Square Ft Frequency” printed on medium blue paper; and the data and photo-mounting form “Photo Trend Sample - 1 sq. ft.” printed on medium yellow paper
4. Meter board (app. C)
5. Clipboard and holder for the photo identification forms (app. C)
6. Compass and a 100-ft steel tape with clamps or vice grips to clamp onto angle iron stakes
7. Fenceposts and angle iron stakes sufficient for the number of transects desired: two fenceposts and three angle iron stakes per transect and a pounder
8. Metal detector for locating transect stakes

Technique

Map the location of the transect cluster (fig. 72). Establish the transects and map them on the filing system form “Sampling Site Description and Location” (fig. 73). If slope exceeds 10 percent, orient transects on the contour so that uphill is left of the transects when viewed toward the 100-ft end. Placing plot frames and photographing uphill is easier than working downhill. Fill out information on the form and circle “1 sq. ft.” on the top line. If transects fall in a line, continue the map on the back of the form (fig. 74).

A three-dimensional adapter for 35-mm cameras with 50-mm lenses is desirable for both general and 1-ft^2-plot photographs (fig. 78). Such adapters may not be available, however. If not, use a 50-mm lens in preference to a 35-mm for best detail resolution. Take general pictures from the 0-ft (fig. 75, top) and 100-ft ends (fig. 77) to show vegetation prior to trampling from placing and photographing the 1-ft^2 plot (figs. 75 and 76).

The filing system form, “Photo Trend Sample – 1 sq. ft.” (app. B), is illustrated in figures 75 to 77. It should be printed on medium yellow paper such as Champion’s or Hammermill’s Goldenrod© to ease eyestrain. It is used to diagram plants and mount photographs of the 20 plots. Fill in date, area (Crooked River N.G.), allotment (Madras grazing unit), cluster number (3), transect number (1), and the investigator’s name. “Season of use” means when during the previous 12 months the area was used, such as season long, spring, summer, fall, or winter. The “% use” is the average utilization at the time of sampling. “Grazing system” means the kind currently being used, such as season long, rest-rotation, or alternate year. Any comments may be made under “Remarks” (fig. 75) or “Comments” (fig. 77).

Transect photos are identified by the filing system form “Cluster-Transect” (figs. 75 and 77). It should be printed on medium blue paper. Fill in the date (97/3/22), circle either “0” or “100” (fig. 75 is 0, and fig. 77 is 100) to indicate which end of the transect is being photographed, area (CRNG), allotment (Madras), cluster number (3),

and the transect number (1). For the downtransect photo, place the camera at the 0-ft stake, photo identification form at 15 ft, and the meter board at 33 ft; for uptransect photos, camera at 100 ft, photo identification form at 85 ft, and meter board at 67 ft.

Each square-foot plot and its photograph is labeled individually ("Square Foot Frequency") and positioned on the transect as noted on the form "Photo Trend Sample - 1 sq. ft." Place the 1-ft^2 plot at the first location, between 0 and 1 ft, with its identification card. Diagram the location of each plant species and label as shown in figures 75 and 76. Diagram basal area in bunchgrasses and area of rhizomatous or single-stemmed species when they occur within the square foot. The diagram is used for species identification and counting frequency, not for measurement of change. The stereo photograph is used to measure plant and soil change.

Under the plot diagram, circle soil surface items in the plot: "B" is bare ground (> 50 percent ground cover), "G" is gravel (> 50 percent ground cover of stones 1/8- to 3/4-in diameter), "R" is rock (> 3/4 in), "L" is litter (> 50 percent ground cover), and "C" is cryptogamic crust (> 50 percent ground cover).

Identify each square foot plot with the "Square Ft Frequency" form (app. B). It labels each 1-ft^2 plot and its photograph (figs. 75 and 76). One sheet is designed for use with all 20 plots on a transect. Try to print the necessary information in letters similar in size to those on the form. This will ensure readability in photographs. For plot 1, circle number 1, place form on ground next to the tape and adjacent to the square-foot plot. Place the plot frame at footmarks 1 and 2 as noted on the form. With a stereo adapter attached to the camera, hold the camera at eye level directly above the plot and expose for both the square-foot plot and the photo identification paper (fig. 75). For plot 2, cross out number 1 and circle number 2 (fig. 75). Place the plot frame at foot marks 5 and 6 as noted on the form. For plot 3, cross out number 2 and circle 3 (fig. 76) and place at foot marks 10 and 11. Repeat for all 20 plots. Use a new sheet for each transect.

Caution: Expose for both the photo identification paper and the plot. Generally, paper will reflect more light than vegetation and soil; the paper therefore should be slightly overexposed while soil and vegetation are slightly underexposed. Acceptable paper exposure is essential to read the printing in each plot photo. Medium blue paper, not office blue color, may be attained at most office supply stores.

In addition, from plot number 1, record shrub and tree (under 6 ft tall) canopy cover intercept by species above the transect tape between the start of one plot and the start of the next. Record beginning and ending foot marks and number of feet between intercepts. For example, in figure 76, plot 3 starting at 10 ft had a shrub intercept from 12 to 15 ft between it and plot 4, for a total of 3-ft crown intercept. Plot 5 starting at 20 ft had a shrub intercept from 22 to 23 ft between it and plot 6, for a total of 1 ft.

Another important source of supplemental information, particularly in the Pacific Northwest where many range types are forested, is the effect of tree cover. Cover must be sampled on all forested ranges. It is discussed as an additional transect sample in the "Tree Cover Sampling" section, below.

Summarize Data

After all 20 plots have been photographed and diagrammed, the transect is summarized on the last page of the “Photo Trend Sample - 1 sq. ft.” form (fig. 77). The left side documents frequency and line intercept by species as well as by soil surface items. List all species found on the transect. Sometimes a shrub or tree species will be rooted in a plot for frequency and also will be recorded for crown intercept. Record the shrub or tree species in both cases. For frequency, count the number of plots in which the species occurred and record. For intercept, total the number of feet for each species and record (fig. 77).

The same procedure is followed at the bottom of the species listing for bare ground, gravel pavement, rock, litter, and cryptogams. Determine the number of plots in which each of these items occurred (fig. 77). Bare soil occurred in 18 sample plots, gravel pavement in 15, rock in 2, litter in 15, and cryptogams in only 8 plots.

The rest of the “Photo Trend Sample - 1 sq. ft.” form is devoted to supplemental information (fig. 77). At the bottom left, record the two or three species sustaining the greatest utilization regardless of whether they are decreasers or not. The objective is to document how much utilization occurred for which species, not to estimate “proper use.”

On the lower right side of figure 77, briefly describe any activities that occurred since the last transect reading. Provision is made for logging disturbance, fire, revegetation, insects, wildlife effects, and other.

Evaluate recent climatic conditions (fig. 77). Circle whether temperature was hotter, about average, or colder for this growing season (when the sampling was done), last year, two years ago, three years ago, and four years ago. Do the same for precipitation falling between January 1 and July 1: Was it above average, about average, or below average? This information should be available from local weather stations. Precipitation in the mountains can differ considerably from local stations, and no attempt is made to quantify differences.

Estimate whether apparent range condition is good, fair, poor, or very poor. These are range management terms equivalent to ecological definitions of potential natural vegetation (PNV), late seral, mid seral and early seral. PNV is the stable, native plant community that will become established after succession following disturbance. In much of the Pacific Northwest, livestock forage rating guides can be used to determine range condition. For areas without livestock forage rating guides, estimate range condition to the best of your ability.

Next, estimate apparent range trend. If you have a strong feeling that range trend is down, say so; if you have a strong feeling the trend is up, say so; if you are not sure about trend, say that also.

Space is provided for other comments. Whenever possible, make these additional comments in the field while you are looking at the transect.

If the site is forested, add the “Tree Cover Sampling” transect to this file.

RANGE TREND REREADINGS

Circle the sampling system: (20 plots 1 sq.ft,) 100 plots Nest. Frequ. 5 Plots 9 sq.ft.(1 sq. m)
Area Crooked R, N. G. Allotment Madras Cluster 3 Transect (1) 2 3 4 5

Species	Averages by Year 1957	1982	1997
Tree Crown Cover (in percent)			
TOTAL			
Shrub intercept (in feet)			
ARTR	5	6	6
PUTR	—	—	1
CHNA			
TOTAL	5	6	7
Frequency: No. plots for (1 sq.ft.) & 9 sq.ft. (1 sq. m); nested frequ. value			
POSA3	12	15	17
AGSP	2	3	5
LOMAT	6	3	2
PHLOX	1		
BASA	1	1	
SIHY	1	1	1
STOC	1		
ARTR			

Figure 79—The filing system form “Range Trend Rereadings” is printed front and back (fig. 80 shows the back). Provision is made for 10 rereadings of each transect. Fill in the top section to identify the cluster and transect. Then enter the year of each reading and copy data from the last page of the “Photo Trend Sample - 1 sq. ft.” form (fig.77).

RANGE TREND REREADINGS (Continued)

Elements	Averages by Year		
	1957	1982	1997
Range Condition Guide/date Bunchgrass 1951	P		
ARTR 1983	F	F	G
Decreasers:	2	3	5
Palatable Increasers	14	16	18
Unpalatable Increasers	7	3	2
Invaders	—	—	—
Vegetation - (root crown)	16	17	17
Bare Soil	20	20	18
Gravel (1/8 to ¾ inch)	16	14	15
Rock (> ¾ inch)	2	2	2
Litter	8	12	15
Cryptogams	4	6	8
% Utilization by species			
none	—	—	—
Season of Use	—	—	—
Climate			
Temp: Current	+	0	0
Last year	0	0	0
2 yrs. Ago	0	+	0
3 yrs. Ago	0	0	—
4 yrs. Ago	—	0	—
Ppt.: Current	0	+	+
Last year	0	+	+
2 yrs. Ago	0	0	0
3 yrs. Ago	—	0	0
4 yrs. Ago	+	0	—
Apparent range condition	F	F	G
Apparent range trend	S	U	S

Figure 80—Back of the "Range Trend Rereadings" form providing for data analysis by use of rating guides for livestock forage (range condition guides). The remaining transect summary data from figure 77 may also be added by date.

Range Trend Analysis

Data obtained by square-foot frequency are summarized for trend analysis in the filing system form “Range Trend Rereadings” (fig. 79). The form is designed for a series of up to 10 transect readings that may be compared side by side. The columns under “Averages by Year” require the year of reading to be entered at the top. The form in appendix B is printed front and back corresponding to figures 79 and 80.

Figure 79 is the front of the form. Circle which sampling system was used, “20 plots 1 sq. ft.” in this case. Enter the information on area, allotment, and cluster number and circle the transect number. Enter the date of reading at the top of the “Averages by Year” column. Figure 79 shows three hypothetical transect readings: 1957, 1982, and 1997. The data in figure 79 refer to the 1997 reading.

If tree cover was sampled (trees over 6 ft tall), enter the total number of feet of intersect by species and total. Then enter the total number of feet of intercept by shrub species and total. Shrub species intercept is summarized on the last page of the form “Photo Trend Sample - 1 sq. ft.” (fig. 77), a total of 7 ft.

The next data set (fig. 79) is for herbaceous species sampled by either 1-ft^2 or 1-m^2 or nested frequency. The data are summarized on the last page of the form “Photo Trend Sample - 1 sq. ft.” (fig. 77). Circle the sample plot used (“1 sq. ft.”). Enter the number of plots in which each species was rooted. Maximum number of plots for 1 ft^2 is 20 and 9 ft^2 or 1 m^2 has five plots. Nested frequency uses a different value. It is the total value of all five transects (100 plots) by species. See the “Nested Frequency Transect” section, below, for details.

Figure 80 shows the back of the form, which summarizes additional information and data. Enter data by date in the column “Averages by Year.” If a range condition guide (or livestock forage rating guide) is available, list it and its date. In this case, an old bunchgrass guide of 1951 was used for the 1957 reading, which rated P (poor condition). A 1983 guide for big sagebrush (ARTR, *Artemisia tridentata* Nutt.) was used to estimate range condition for all three years. The 1983 guide showed data for 1951 rated F (fair) condition instead of poor.

These range condition guides list species by their reaction to livestock grazing: *decreasers* decrease under heavy use; *palatable increasers* are less palatable and tend to increase with heavy use. However, if heavy use continues, these species also decrease. *Unpalatable increasers* are species that livestock do not like to eat, and they tend to increase. *Invaders* are species generally not found on rangeland in good condition.

Data are summarized by the above categories of plant species (fig. 80). Total the number of plots by species in each category and enter. For example, AGSP (*Agropyron spicatum* vis. *Pseudoroegneria spicata* (Pursh) A. Love, bluebunch wheatgrass) is the only decreaser, so its data are entered (5 plots). Palatable increasers are POSA3 (*Poa secunda* J. Presl, Sandberg’s bluegrass), SIHY (*Sitanion hystrix* (Nutt.) J.G. Sm., squirreltail), STOC (*Stipa occidentalis* Thurb. Ex S. Wats., needlegrass), and BASA (*Balsamorhiza sagittata* (Pursh) Nutt.,

arrowleaf balsamroot), so their data are summarized and entered in “palatable increasers” (18 plots). LOMAT (*Lomatium* species) and PHLOX (*Phlox* species) are considered unpalatable increasers and are entered as such (2 plots).

The next section of figure 80 deals with soil surface conditions. “Vegetation - (root crown)” is the number of plots in which a root crown of a bunchgrass is present. In 1997, 17 plots had a root crown and 3 had no vegetation rooted in them. Single stem plants, like many forbs, do not contribute directly to soil surface protection. This information is taken from the stereophotographs as is the frequency of bare ground, gravel, rock, litter, and cryptogams. The latter five items are summarized at the bottom left of the “Photo Trend Sample - 1 sq. ft.” form (fig. 77). The section on “% Utilization by species” provides space to enter stubble height or other means to estimate utilization by species as taken from the “Photo Trend Sample” form, lower left. In this exclosure, there was no utilization. If there was use, estimate the season of use, as spring (spr), summer (sum), fall (fall), or winter (wint).

Climate information is listed in the next section for the current and preceding three years, which has been summarized in the lower right of the form, “Photo Trend Sample - 1 sq. ft.” (fig. 77). Finally, copy the estimates of apparent range condition and trend from the “Photo Trend Sample.” Abbreviations are G = good, F = fair, P = poor, and VP = is very poor, a condition where decreasers are absent and livestock management is no longer a feasible means for attaining an upward trend to good condition. Trend abbreviations are U = upward trend, S = static or no trend, and D = downward trend.

Trend Interpretation

Interpretation of trend is accomplished by comparison of data in the columns. Data for 1997 were measured; those for 1982 and 1957 were constructed. A current, soundly developed livestock forage rating guide (range condition guide) is a major aid in trend interpretation. Statistical analysis is not possible on this kind of data. No trend, or stable status, is indicated by little change in either vegetation or soil surface data.

Upward trend, or successional change to good condition (potential natural vegetation: PNV), is generally indicated by increased decreasers, and often palatable increasers, accompanied by a decrease in unpalatable increasers. If earlier condition was below fair, there should be improvement of soil surface conditions, such as litter and cryptogamic crust, with less bare soil. Seldom will rock or gravel change in an upward trend. Consult the livestock forage rating guide (range condition guide) for data characterizing the PNC soil surface status

A downward trend, or successional change to poorer condition (earlier seral status), is characterized by reduction in decreasers, increase in palatable increasers initially in fair and good condition (late and PNV seral status), and then their decrease as seral status approaches very poor condition (early seral). Soil surface data also should change with decreases in vegetation, litter, and cryptogams and increases in bare soil and possibly gravel.

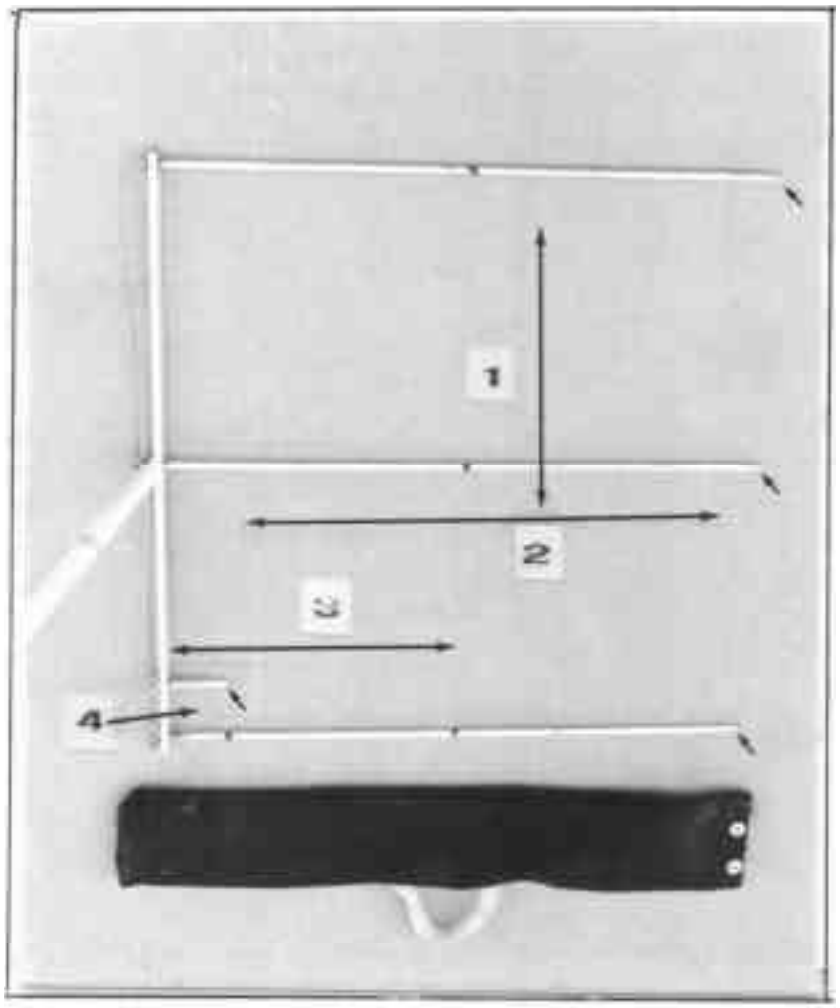


Figure 81—Nested frequency sampling frame with four plot sizes and its carrying case. Plot size 4 is 5 by 5 cm, size 3 is 25 by 25 cm, size 2 is 25 by 50 cm, and size 1 is 50 by 50 cm. Plant species rooted within each of the plot sizes are assigned the plot size value. The ends of each prong are sharpened for use as point samples of soil surface conditions (short arrows). The frame case has a strap for easy handling.

Poor and very poor condition classes (early and mid seral ecological status) pose two important questions: (1) Has vegetation passed a threshold whereby it may not be able to reattain its PNV composition and density of species? An example is a cheatgrass-dominated stand where decreasers are absent and only a few palatable increasers are present. Adjustment in livestock management is no longer feasible to attain an upward trend. (2) Has the soil been damaged sufficiently that it has passed a threshold and no longer can support the historic PNV community? Such threshold changes are indicated by erosion of the A-horizon, increase in gravel as a result of erosion, and severe compaction. A well-developed livestock forage rating guide contains parameters on PNV status of bare ground, gravel pavement, rock, and A-horizon characteristics that may be compared with current soil conditions. It should specify criteria when a soil threshold has been crossed.

Nested Frequency Transect

Nested frequency employs a sample frame with four nested plot sizes. It documents change in species frequency along five 100-ft transects of 20 plots each. Statistical analysis suggests significant change in frequency at the 80-percent level of probability.

Concept

Frequency is defined as the number of times a species occurs (is rooted) in a given number of plots and considers only whether species are present or absent. It is an objective and repeatable means of collecting data to evaluate change.

The nested frequency concept involves sampling vegetation with four various sized plots nested within a frame (fig. 81). The overall frame is 50 by 50 cm with smaller subplots of 25 by 50 cm (50 percent of the large plot area), 25 by 25 cm (25 percent of the large plot area), and 5 by 5 cm (1 percent of the large plot area). The assumption is made that a species rooted within the 5- by 5-cm subplot also occurs in the 25- by 25-cm subplot, the 25- by 50-cm subplot and in the 50- by 50-cm subplot. Similarly, a species rooted in the 25- by 25-cm subplot occurs in the larger subplots. Therefore, once a species is recorded in a subplot, it is **not** recorded if found in a larger subplot.

Samples are taken along five randomly selected transect lines confined to a single ecological type (range site). The data collected are a function of plot size, which is related to density and distribution of the vegetation. These data serve as a basis for determining trend and can be evaluated by applying statistical procedures. Statistical analysis requires use of 100 plot frames or 400 total plots. Twenty plot frames on each of five transects yield 100 plot frames.

Ground cover measurements are obtained by sampling soil surface items under pointed ends of four prongs of the nested frequency frame (fig. 81). Twenty sample frames on five transects will yield 400 sample points. Items recorded are vegetation (root crown), bare soil, gravel (1/8- to 3/4-in diameter), rock (>3/4-in), litter, and cryptogams.

When trees or shrubs occur on the transect, their canopy intercept above the transect is recorded.

It is recognized that the nested plot has apparent replication. A plant occurring in the 5- by 5-cm plot also occurs in the 25- by 25-cm plot, the 25- by 50-cm plot, and the 50- by 50-cm plot. As this is a question of statistical bias, two things overcome the possible sampling error. One is that each frame is not an independent sample; therefore, only one degree of freedom is used. Secondly, empirical analysis indicates that if a site is adequately sampled, in this case 400 nested plot samples (100 plot frames), the final result is highly similar whether all plots are randomly tested or if a nested plot (with apparent replication) is used.

Plants rooted within each of the four plots in the frame are recorded by plot size. The 5- by 5-cm plot is assigned the value of 4 (fig. 81), the 25- by 25-cm plot the value of 3, 25- by 50-cm plot a 2, and the 50- by 50-cm plot a 1. These values are then assigned by species and recorded on the filing system form, “Nested Frequency Transect Data” (fig. 86, discussed below).

Table 2—Table of random numbers

Row	Random Number				
1	23 25 75 48 59	01 83 72 59 93	76 24 97 08 96	95 32 03 67 44	05 54 55 50 43
2	10 53 74 35 08	90 61 18 37 44	10 96 22 12 43	14 87 16 03 50	32 40 43 63 23
3	50 05 10 03 22	11 54 38 08 34	38 97 67 49 51	94 05 17 58 53	78 80 59 01 94
4	32 42 87 16 95	97 31 26 17 18	99 75 53 08 79	94 25 12 58 41	54 88 21 05 13
5	11 74 26 93 81	44 33 93 08 72	32 79 73 31 18	22 64 70 68 50	43 36 12 88 59
6	11 01 64 56 23	93 00 90 04 99	43 64 07 40 36	93 80 62 04 78	38 26 80 44 91
7	55 75 11 89 32	38 47 55 25 71	49 54 01 31 81	08 42 98 41 87	69 53 82 96 61
8	77 73 80 95 27	36 76 87 26 33	37 94 82 15 69	41 95 96 86 70	45 27 48 38 80
9	07 09 25 23 92	24 62 71 26 07	06 55 84 53 44	67 33 84 53 20	43 31 00 10 81
10	44 86 38 03 07	52 55 51 61 48	89 74 29 46 47	61 57 00 63 60	06 17 36 37 75
11	63 14 89 51 23	35 01 74 59 93	31 35 28 37 99	10 77 91 89 41	31 57 97 64 48
12	62 58 48 69 19	57 04 88 65 26	27 79 59 36 82	90 52 95 65 46	35 06 53 22 54
13	09 24 34 42 00	68 72 10 71 37	30 72 97 57 56	09 29 82 76 50	97 95 63 50 18
14	40 89 48 83 29	52 23 08 25 21	22 53 26 15 87	93 73 25 95 70	43 78 19 88 85
15	56 67 16 68 26	95 99 64 45 69	72 62 11 12 25	00 92 26 82 64	35 66 65 94 34
16	71 68 75 18 67	61 02 07 44 18	45 37 12 07 94	95 91 73 78 66	99 53 61 93 78
17	97 83 98 54 74	33 05 59 17 18	45 47 35 41 44	22 03 42 30 00	89 16 09 71 92
18	22 23 29 06 37	35 05 54 54 89	88 43 81 63 61	25 96 68 82 20	62 87 17 92 65
19	02 82 35 28 62	84 91 95 48 83	81 44 33 17 19	05 04 95 48 06	74 69 00 75 67
20	65 01 71 65 45	11 32 25 49 31	42 36 23 42 86	08 62 49 76 67	42 24 52 32 45

Equipment

The following equipment is required for nested frequency sampling:

1. Camera or cameras with both color and black-and-white film, or digital camera
2. A nested frequency plot frame (app. C)
3. Forms from appendix B: “Cluster-Transect” for transect identification, and “Nested Frequency” for plot identification both printed on medium blue paper, and data and photo mounting form “Photo Trend Sample - Nested Frequency” and “Photo Trend Sample -Nested Frequency Summary” printed on medium yellow paper
4. Meter board (app. C)
5. Clipboard and support for holding the photo identification forms (app. C)
6. A compass and 100-ft steel tape with clamps or vice grips to clamp onto angle iron stakes
7. Fenceposts and angle iron stakes sufficient for the number of transects desired: 2 fenceposts and 3 angle iron stakes per transect and a pounder
8. Metal detector for locating transect stakes

Technique

Each of the five transects is defined as a randomly selected line along which data are collected. A minimum of five transects are established at five randomly selected compass directions radiating from a central point whenever site conditions are suitable.

Select compass headings in 10-degree increments between 0 and 35 from table 2. If site conditions require placement in a line, distances between transects should be randomly chosen. The example below illustrates transect placement around a central witness location by using the first five values in table 2 that are between 0 and 35 (from 0 degrees; that is, 360 degrees to 350 degrees). Chose numbers less than 36 (360 degrees) and add a “0” to the value for compass bearing. For example, in the first row, “23” would be a compass bearing of 230 degrees for transect 1. Transect 2 would be 250 degrees, transect 3 is 10 degrees, transect 4 is 240 degrees, and transect 5 is 80 degrees. Select a different row for each new cluster of five transects.

Placement of the transects requires a witness site with direction (indicate whether magnetic or true) and measured distance to the central marker for five radiating transects or to transect number 1 (fig. 82). For radiating transects, measure out 5 ft from the central marker (fencepost) and start the transect as discussed under “Transect Layout” in the “Transect Photo Sampling” section above. Record direction determined above (magnetic or true) and distance to the three angle iron stakes. If transects are in a line, record direction and measured distance between the 100- and 0-ft ends of each transect (fig. 74).

Diagram the transect layout on the filing system form (fig. 82), and fill out information on the form. Remember to circle “Nested Freq.” on the top line of the form. Note the transect numbers at their 0-ft ends.

Each transect photo is identified by the filing system form shown in figures 83 and 85. The photo identification form should be printed on medium blue paper for use in the photographs. Fill in the date (97/3/22), circle either “0” or “100” (fig. 83 is 0, fig. 85 is 100) to indicate which end of the transect is being photographed, note area (CRNG), allotment (Madras), and cluster number (3), and circle the transect number (1).

Place the nested frequency plot frame uphill on the left of the transect tape as viewed toward the 100-ft end. Locate the 5- by 5-cm plot against the tape, open end of the frame toward the 100-ft end. Figures 83 and 84 show, under the plot diagram, foot marks on the tape where each plot frame is placed. Print this form on medium yellow paper to reduce glare because it is used to record data.

Place the nested plot frame at the first location, between 0 and 1.6 ft. The form “Nested Frequency” (app. B) shown in figures 83 and 84 identifies each plot frame. It should be printed on medium blue paper to reduce overexposure in the Sun. For photo plot 1, circle number 1 and place on the ground at the open end of the plot. For plot 2, cross out number 1 and circle number 2 (fig. 83). Repeat for all 20 plots (fig. 84).

List all species in each frame and diagram their locations (figs. 83 and 84). A plant is considered rooted within the plot if any portion of the stem or root crown is contained therein. For mat-forming species, any portion of the crown extending into the plot will constitute presence of that plant.

Text continues on page 151.

SAMPLING SITE DESCRIPTION AND LOCATION

Circle: 1 Sq.Ft. (Nested Freq.) 1 sq.m. Robel Pole Shrub Form _____

Date 1997/3/22
Area Crooked River N.G.
Allot. Madras
Cluster No. 3
Transects: 1 2 (3) 4 5
Plant community ARTR/ AGSP/POSA

Site Data: Elev. 2775 % slope 8
Slope aspect: N NE E SE S (SW) W NW
Slope position: top (up 1/3) mid low 1/3 bottom
Micro topography: (convex) flat concave
Macro topography: flat (undulating) rolling steep rough broken

Geology:
Deposition: (wind) stream lake colluvial (residual)
Material: limestone mudstone sandstone granite serpentine diorite (basalt) andesite rhyolite tuffacious cinders pumice ash

Grazing system:
Type Exclosure Date 1954
Type _____ Date _____
Type _____ Date _____

Kind of animal: cattle sheep horses goats (deer) elk jack rabbits

Soil:
Restrictive layer: absent clay pan (bedrock) cemented _____
Surface compaction: (none) moderate severe
Soil profile stone: absent (gravel) stony
Soil texture: sandy loamy (silty) clayey ashy

Location: T. 11S R. 13E
Sec. 36 NW of NW
Description: US hiway 20 at Crooked River N.G. sign; 2.1 mi. from junct. US 97 & US 26 S. of Madras.

Other notes: Livestock excluded when hiway was fenced in 1954

MAP

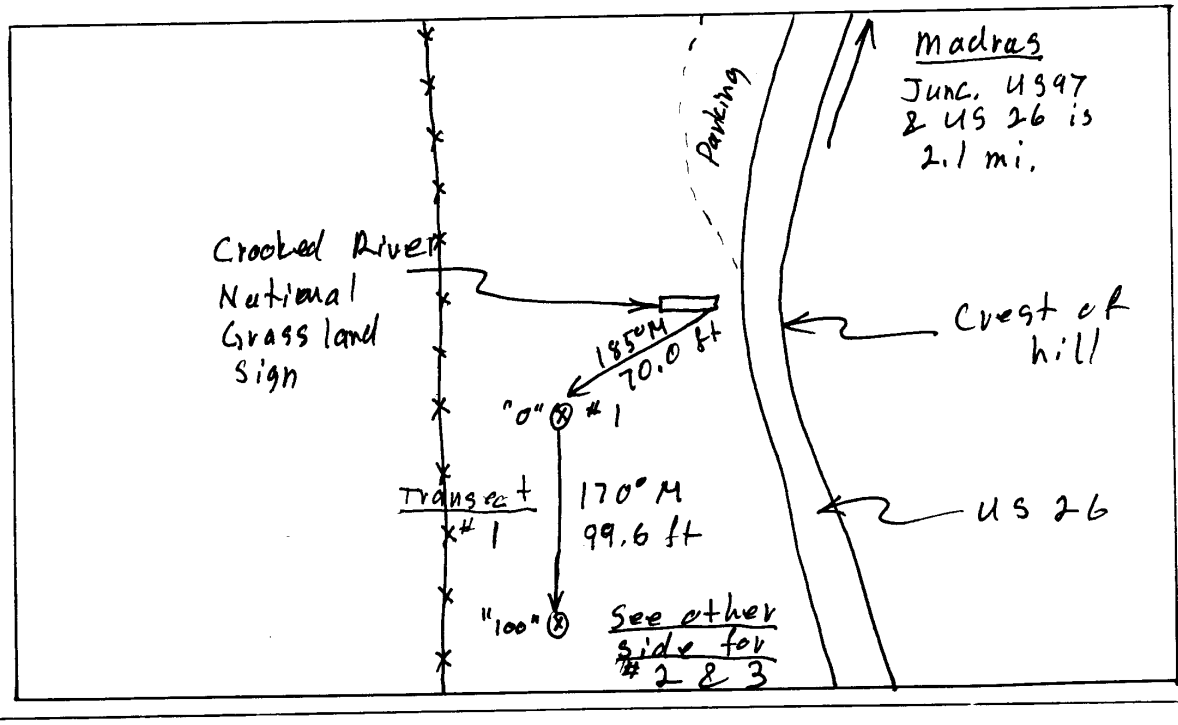


Figure 82—Filing system form "Sampling Site Description and Location" for this nested frequency discussion (same as fig. 73). First, circle "Nested Freq." on the top line, then fill in the information requested, and diagram the transect layout. Figures 73 and 74 are the complete documentation.

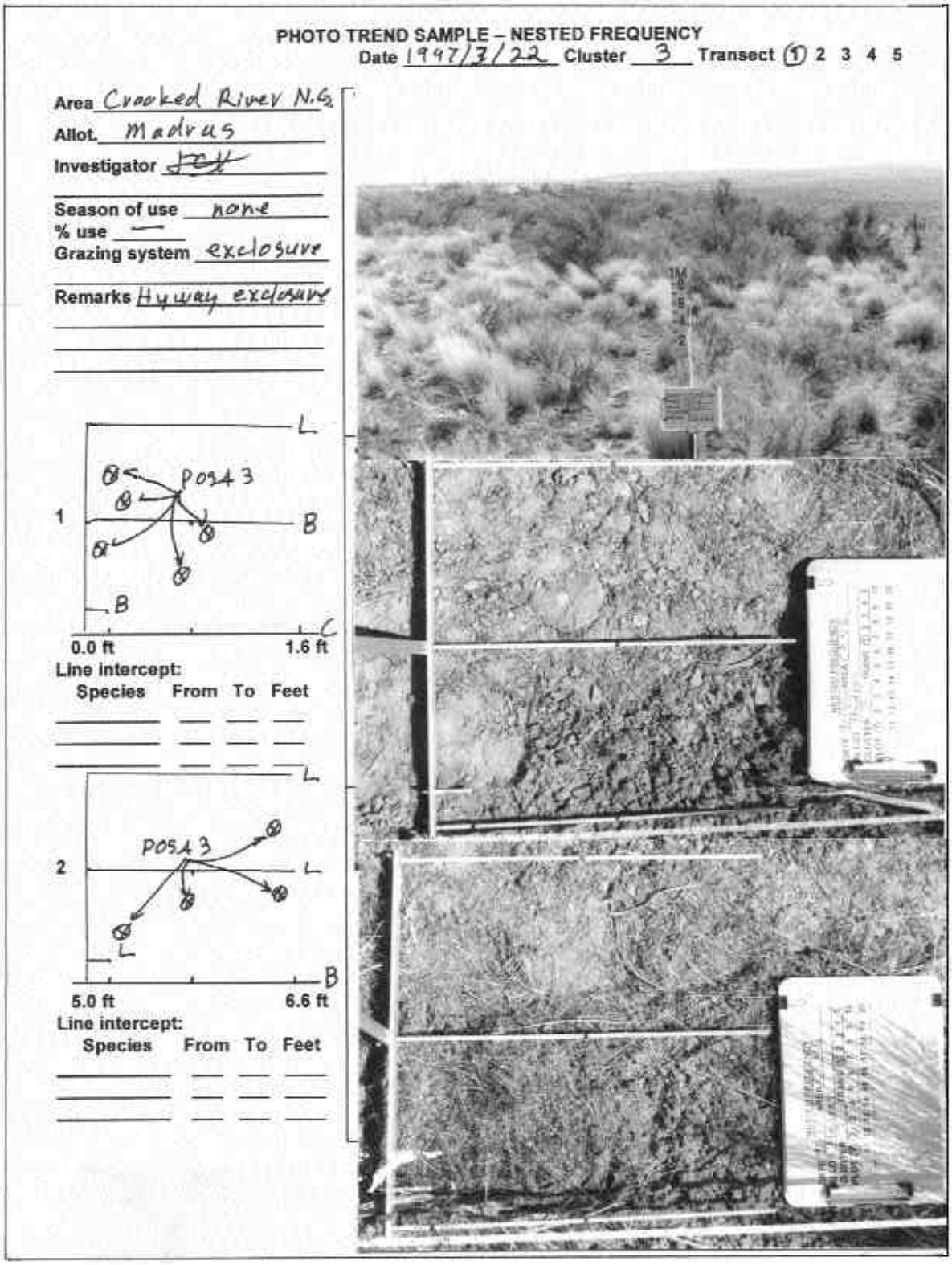


Figure 83—Filing system form “Photo Trend Sample - Nested Frequency” illustrating its use. Two additional forms are required: transect identification (top picture) and plot identification (lower two pictures). Fill out required information on each form: CRNG (Crooked River National Grassland), Madras Exclosure, cluster 3, transect 1, date, and notes. Photograph the transect from the 0-ft (top picture) and the 100-ft ends (fig. 85). This is the same transect shown in figure 75. Notice the soil surface items at the end of each prong: B = bare ground, G = gravel, R = rock, L = litter, and C = cryptogamic crust.

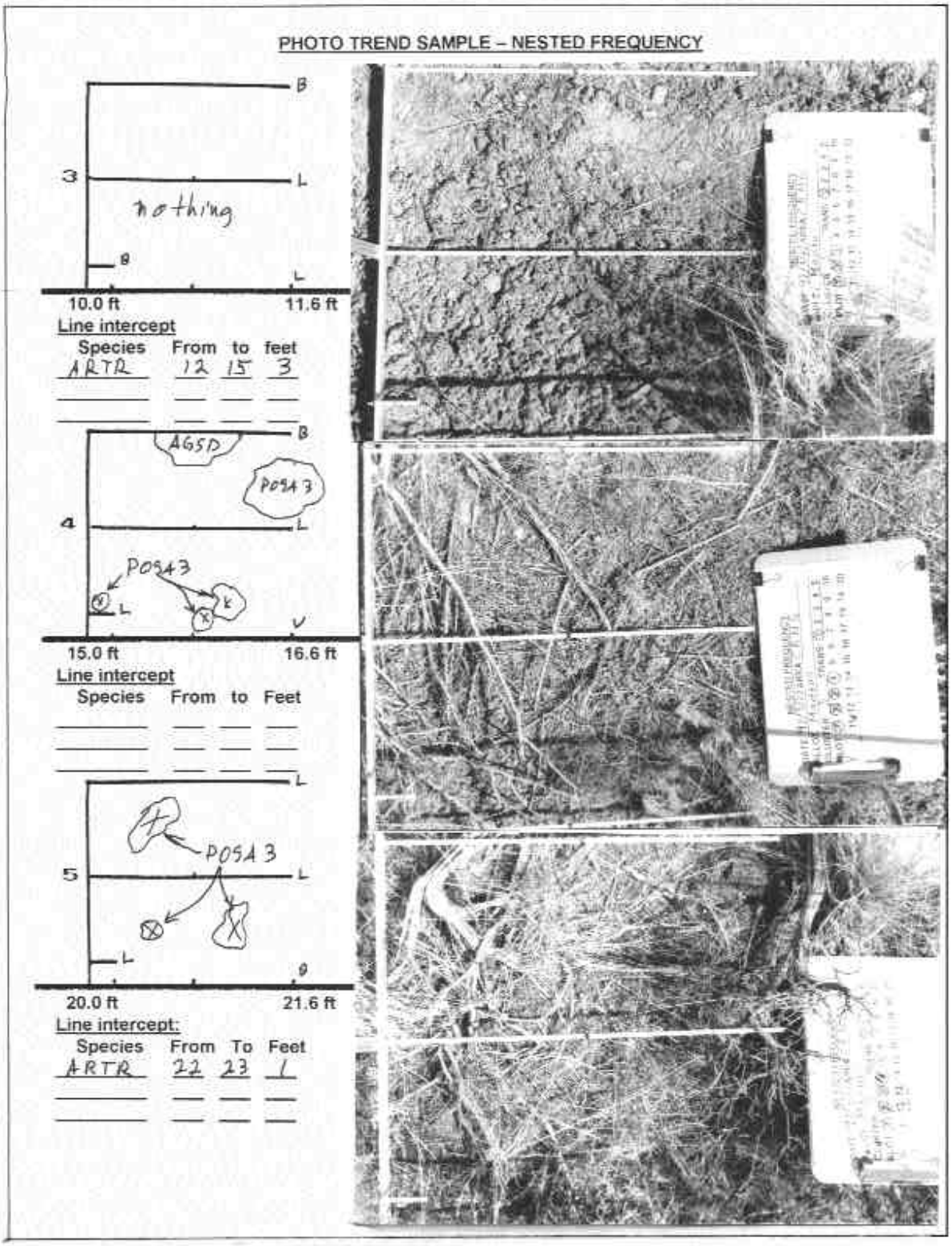


Figure 84—Nested frequency data sheet and photo-mounting form for plot frames 3 to 5. A space on the left is available for recording crown canopy intercept along the transect. Under plot frame 3, ARTR (*Artemisia tridentata* Nutt., big sagebrush) canopy intersected the transect at foot marks 12 to 15 for 3 ft of intercept. Record intercept between plot frames starting and ending with the beginning footmark for each plot. For plot frame 3, the intersect is from footmark 12 to 15. Plot 5 had ARTR intercept between footmarks 22 and 23 for 1 ft of intercept. Other species are AGSP (*Agropyron spicatum* vis. *Pseudoroegneria spicatum* (Pursh.) A. Love., bluebunch wheatgrass), and POSA3, (*Poa secunda* J. Presl., Sandberg's bluegrass).

PHOTO TREND SAMPLE – NESTED FREQUENCY

SUMMARY

NOTE: use the nested frequency data forms on the next two pages.

ACTIVITIES

Logging —
Fire —
Revegetation —
Insects —
Wildlife deer, rabbits
Other Exclosure

CLIMATE compared to Average

	This Yr.	Last Yr.	Two Yrs.	Three Yrs	Four Yrs.
Temp	+ (0) -	+ (0) -	+ (0) -	+ (0) -	+ (0) -
Ppt.	(+) 0 -	(+) 0 -	+ (0) -	+ (0) -	+ 0 (-)

Apparent range condition Good
Apparent range trend Static

COMMENTS

Hiway exclosure

Estimated Utilization

Species	% Use

Figure 85—Last page of the filing system form “Photo Trend Sample - Nested Frequency.” Notice that data are not summarized on this form. Instead, they are summarized for each transect on the filing system form, “Nested Frequency Transect Data” (figs. 86 and 87), and all five transects are summarized on another form, “Nested Frequency Cluster Summary” (figs. 88 and 89). Fill in activities, climate, and comments as appropriate.

Next, record point sampling by noting what is under the pointed end of the four prongs (figs. 83 and 84). Use the following abbreviations: V = vegetation (plant root crown), B = bare soil, G = gravel (stones 1/8- to 3/4-in diameter), R = rock (> 3/4 in), L = litter, and C = cryptogams. These are point samples.

After photographing and diagramming a plot, determine shrub or tree (under 6 ft) intercept along the line from the start of one plot to start of the next. For example, figure 84 between plot numbers 3 and 4 (between foot marks 10.0 ft and 15.0 ft), ARTR (big sagebrush) intersected the line from foot marks 12 to 15 for 3 ft of intercept.

Proceed down the transect with photographs and diagrams of each plot frame. Complete the last page of the form “Photo Trend Sample - Nested Frequency” (fig. 85).

Another important source of supplemental information is the effect of tree cover. Cover should be sampled on all forested ranges. It is discussed below in the “Tree Cover Sampling” section.

Summarize Data

Transect summary—Using diagrams for each sample on the form, “Photo Trend Sample - Nested Frequency” (figs. 83 and 84), summarize them on the filing system form, “Nested Frequency Transect Data” (figs. 86 and 87). Fill in information at the top for unit, area, cluster, and transect. This form is printed front and back. The table lists “Sample Number” across the top. These correspond to the sample numbers shown on figures 83 and 84. Species are listed down the left side.

Using “Nested Frequency Transect Data” (fig. 86), start with sample 1 of the transect (fig. 83) and evaluate the smallest subplot (rated 4 in fig. 81), record species rooted within it, and assign the frequency value of 4 (no species in sample 1). Next record species rooted within the next largest subplot (rated 3 in fig. 81) and assign a frequency value of 3. POSA3 is recorded at 3. Continue with the next largest plot (25 by 50 cm) rating species a 2 (none in sample 1). Do **not** record a species rooted within a smaller plot. Finally, record species only in the whole plot frame (50 by 50 cm) with a 1 (none in sample 1).

Continue to record the frequency value in each sample by species (fig. 86). Total the value for each species on the right. These totals will be entered in the form, “Nested Frequency Cluster Summary” (figs. 88 and 89). The maximum total would be 80 if the same species occurred in every 5- by 5-cm plot rating 4. Species that do not fall in a plot of the frame are not given a value; that is, ARTR and BASA in figure 86.

Next summarize point sampling at the bottom of figure 86. Dot tally the occurrence of each of the six items from abbreviations at the ends of the four frame prongs (figs. 83 and 84). Sum the dot tallies in the “Totals” space. Next add the totals row for a grand total, which must equal 80 because there are 80 points in the 20 samples.

Text continues on page 158.

NESTED FREQUENCY TRANSECT DATA

Area: Crooked R. N. G. **Allotment:** Madvas **Date:** 97/3/22
Investigator: FC & GPH **Cluster:** 3 **Transect:** (1) 2 3 4 5
Plant community: ARTR / AGSP / POSA3

Species	Sample Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total Value
POSA3	3	3	–	3	3	4	3	3	3	3	4	2	3	3	3	–	4	3	3	3	56
AGSP				1		1		3		1	2	4	1	3	3					1	19
ARTR																					
LOMAT							3			3											6
PHLOX									1												1
BASA																					
SIHY																		3			3

POINT SAMPLING

Ground cover	Veg.	Soil	Gravel	Rock	Litter	Crypt.	Total
Dot tally	–	⊠ ⊠	⊠ 1	' '	⊠ ⊠	⊠ ⊠	
Totals	–	20	15	2	20	23	80

NEXT SHEET FOR LINE INTERCEPT OF SHRUBS AND TREES

Figure 86—Filing system form "Nested Frequency Transect Data," where frequency values by species and point sampling on the plot frame prongs are recorded. Starting with plot frame 1 (sample number 1), list the frequency value for each species in the "Sample Number" column. POSA3 rated a "3" (fig. 83). Next, add up the 20 frequency values and enter in the "Total Value" column. POSA3 added to 56. Transfer these values to the "Nested Frequency Cluster Summary" form (fig. 88). Then, dot tally in "Point Sampling" the items at each of the four prong points. Plot 1 had one litter (L), two bare soil (B), and one cryptogam (C). Add the dot tallies in each column by item. The sum of these "Totals" tallies should be 80. The sum of each item is then transferred to the "Nested Frequency Cluster Summary (continued)" form (fig. 89).

NESTED FREQUENCY TRANSECT DATA (Continued)

Line intercept of trees and shrubs

Shrub species	Line Intercept								Total	Percent
ARTR	3	1	1	1					6	6
PUTR	1								1	0.5
								Totals	7	6.5

Tree species	Line Intercept								Total	Percent
								Totals		

Figure 87—Second page of the “Nested Frequency Transect Data (Continued)” form where line intersect data for shrubs and trees are summarized. ARTR added to 6 ft of line intercept for 6 percent canopy cover. Line intercept data are summarized in the “Nested Frequency Cluster Summary (Continued)” form (fig. 89).

NESTED FREQUENCY CLUSTER SUMMARY

Area: Crooked River N.G. Allotment: Madras Date: 97/3/22
Investigator: ECH & GPH Cluster: 3
Plant community: ARTR / AGSP / POSA3

Species	Transect Number 1	2	3	4	5	(To trend summary) Total Value
POSA3	56	43	68	49	58	274
AGSP	19	18	16	26	31	110
ARTR	—	1	3	—	1	5
LOMAT	6	12	2	—	9	29
PHLOX	1	4	—	3	—	8
BASA	—	—	1	—	1	2
SIHY	3	—	4	—	2	9
STOC		1			1	2

OVER FOR LINE INTERCEPT AND POINT SAMPLING

Figure 88—The filing system form “Nested Frequency Cluster Summary” where five transects of the nested frequency cluster are summarized. The frequency values for transect 1 (fig. 86) are entered in the “Transect Number” column 1. Add the frequency values by species and enter in the “Total Value” column. The maximum value is 400 if the same species occurred in all 5- by 5-cm plots rating a 4. These values are then transferred to the filing system form “Range Trend Rereadings” (fig. 90) according to date of the reread. The data summarized above are shown for 1997.

NESTED FREQUENCY CLUSTER SUMMARY (Continued)

LINE INTERCEPT

Shrub species	Transect Number 1	2	3	4	5	(To trend summary) Total	Percent
ARTR	6	9	4	5	11	35	7
PUTR	1	1		1		3	–
CHNA			1			1	–
Tree Species							

POINT SAMPLING

Ground Item	Transect Number 1	2	3	4	5	(To trend summary) Total Hits	Percent
Vegetation (root crown)	–	2	–	1	3	6	2
Bare soil	20	34	4	36	16	110	28
Gravel (1/8 to ¾ in.)	15	12	21	7	16	71	18
Rock (> ¾ in.)	2	2	4	–	–	8	2
Litter	20	18	20	17	19	94	24
Cryptogams	23	12	31	19	26	111	28
Totals:	**80**	**80**	**80**	**80**	**80**	**400**	**100**

Figure 89—Back page of the “Nested Frequency Cluster Summary (Continued)” form where line intercept and point sampling data are entered for each of the five transects. For line intercept, enter the feet by transect. Total the feet by species; for example, ARTR (35) and enter. Then divide the total feet by 500 (500 ft of transects) for the percentage of cover (7 percent). Transfer the “Total” by species to the “Range Trend Rereadings” form (fig. 90). In “Point Sampling,” enter each transect’s data and sum in two directions. Data for each transect column must total 80. Add across rows for “Total Hits” by item. Determine percentage of occurrence of each item by dividing by 400, the total maximum number of hits possible. Add the “Total Hits” column to ensure it is 400. Transfer data in the “Total Hits” column by item to the “Range Trend Rereadings (Continued)” form (fig. 91).

RANGE TREND REREADINGS

Circle the sampling system: 20 plots 1 sq,ft, (100 plots Nest. Frequ.) 5 Plots 9 sq.ft.(1 sq. m)
Area Crooked R.N.G. Allotment Madras Cluster 3 Transect (1 2 3 4 5)

Species	Averages by Year		
	1957	1982	1997
Tree Crown Cover (in percent)			
TOTAL			
Shrub intercept (in feet)			
ARTR	38	36	35
PUTR	6	3	2
CHNA			
TOTAL			
Frequency: No. plots for 1 sq.ft. & 9 sq.ft. (1 sq. m); (nested frequ. value)			
POSA3	261	288	274
AGSP	58	92	114
ARTR	4	5	5
LOMAT	43	36	29
PHLOX	7	10	8
BASA	12	8	2
SIHY	11	16	9
STOC	15	8	2

OVER FOR ADDITIONAL DATA

Figure 90—The filing system form “Range Trend Rereadings” where transect data are entered each time the cluster is read. Circle the sampling system on the first line (“100 plots Nest. Frequ.”). Enter the cluster identification information. Notice that “Transect 1 2 3 4 5” are all circled. Enter the line intercept for shrubs and trees from each “Nested Frequency Cluster Summary (Continued)” (fig. 89) by year. Circle “nested frequ. value” and enter the sum of frequency values by year from figure 88. These values, by species, will be tested for significant change by using table 3. See text for details.

RANGE TREND REREADINGS (Continued)

Elements	Averages by Year									
	1957	1982	1997							
Range Condition Guide/date none ARTA 1983	→	—								
	F	F	G							
Decreasers:	58	92	114							
Palatable Increasers	299	320	287							
Unpalatable Increasers	54	51	42							
Invaders	—	—	—							
Vegetation - (root crown)	3	4	6							
Bare Soil	139	121	110							
Gravel (1/8 to ¾ inch)	79	82	71							
Rock (> ¾ inch)	8	7	8							
Litter	81	88	94							
Cryptogams	90	98	111							
% Utilization by species										
none	—	—	—							
Season of Use	—	—	—							
Climate										
Temp: Current	+	0	0							
Last year	0	0	0							
2 yrs. Ago	0	+	0							
3 yrs. Ago	0	0	—							
4 yrs. Ago	—	—	0							
Ppt.: Current	0	+	+							
Last year	0	+	+							
2 yrs. Ago	0	0	0							
3 yrs. Ago	0	0	—							
4 yrs. Ago	—	—	0							
Apparent range condition	F	F	G							
Apparent range trend	Sat	Up	Sat							

Figure 91—Second page of the "Range Trend Rereadings (Continued)" form where data are interpreted for change in vegetation and soil surface characteristics. If a range condition guide (livestock forage rating guide) applies to the monitoring area, list it and its date. Then rate the condition of each rereading. Next list the frequency values for decreasers, palatable increasers, unpalatable increasers, and invaders. There is no maximum value because species are lumped together and may total more than 400. See text for details.

Table 3—Table of significant change for nested frequency[a]

Less than	Initial value	More than	Less than	Initial value	More than	Less than	Initial value	More than
17	25	31	137	155	171	257	280	301
21	30	37	142	160	176	261	285	307
25	35	43	147	165	181	266	290	312
30	40	48	151	170	176	271	295	317
35	45	55	156	175	192	276	300	322
39	50	59	161	180	197	281	305	327
43	55	65	166	185	202	285	310	333
48	60	70	170	190	208	290	315	338
53	65	75	175	195	213	295	320	343
57	70	81	180	200	218	300	325	348
62	75	86	185	205	223	307	330	353
67	80	91	189	210	229	309	335	359
71	85	97	194	215	234	314	340	364
76	90	102	199	220	239	319	345	369
81	95	107	204	225	244	324	350	374
85	100	113	209	230	249	329	355	379
90	105	118	213	235	255	334	360	384
95	110	123	218	240	360	339	365	389
99	115	129	223	245	265	343	370	395
104	120	134	228	250	270	348	375	*
109	125	139	233	255	275	353	380	*
113	130	145	237	260	281	358	385	*
118	135	150	242	265	286	363	390	*
123	140	155	247	270	291	368	395	*
128	145	160	252	275	296	372	400	*
132	150	166						

[a] Using 100 nested frequency plot frames, the table shows a significant change in frequency value at the 80-percent probability level. Enter the table at "Initial value" with the *previous* frequency value for the 5 transects(100 plot frames). Compare the *previous* value with the *current* value to determine whether a significant change has occurred. A change is significant if the *current* value is smaller than the "Less than" value or greater than the "More than" value.

Finally, if shrubs and trees were intercepted, record the number of feet of intercept on the form, "Nested Frequency Transect Data (Continued)" (fig. 87). Total the number of feet and determine the percentage cover. For ARTR, 6 ft of intercept in 100 ft of line is 6 percent. If a tree or shrub was not intersected, there will be no data for it.

Cluster summary—Once the transect has been summarized, transfer data to the filing system form, "Nested Frequency Cluster Summary" (fig. 88). Fill in the required information at the top. List species down the left side and enter their frequency values by transect. Add the species values for a "Total Value." These total values are transferred to the "Range Trend Rereadings" summary to test for significant change in species (fig. 90). The maximum value possible would be 400 if the same species occurred in all 5- by 5-cm plots on all transects.

Next, transfer the line intercept data for each transect to the “Nested Frequency Cluster Summary (Continued)” form and total (fig. 89). A total of 35 ft of ARTR was intersected in 500 ft of transect for 7 percent cover. Transfer the intercept in feet to the “Range Trend Rereadings” form (fig. 91).

Finally, transfer the point sampling data by transect to the “Nested Frequency Cluster Summary (Continued)” form (fig. 89). These data must be added in two directions. Each transect column must add up to 80. Then add each item by row for their total hits. Add the “Total Hits” column, which must add to 400. Finally, determine the percentage of each item (hits/400). Transfer total hits to the form, “Range Trend Rereadings (Continued)” (fig. 91).

If the site is forested, tree canopy cover must be determined, a topic discussed in the “Tree Cover Sampling” section, below

Trend Interpretation

Interpretation of trend in species frequency values is facilitated by table 3, used in conjunction with the “Range Trend Rereadings” summary form (fig. 90). Interpretation is illustrated with measured data for 1997 and constructed data for 1957 and 1982. For example, AGSP, a decreaser, is a key species used to indicate trend. In 1982, its total frequency value was 92 and in 1997 it was 114. The previous value of 92 is located in table 3 in the “Initial value” column, falling between 90 and 95. Then the current value of 114 is compared to the values in the “More than” column opposite 90 and 95. These table values are 102 and 107. Because 114 exceeds the values, there is an 80 percent probability that a significant upward trend in AGSP frequency has occurred.

Downward trend is a reverse of this procedure. The 1982 total frequency value for POSA3 of 288 was the initial value and the value for 1997 of 274 is the current value (fig. 90). In table 3 in the “Initial value” column, find 288 and read 266 as the “Less than” value. The current value of 274 is not less than 266 and the downward change in POSA frequency therefore is not significant.

LOMAT, an unpalatable increaser, on the other hand, did show a significant decrease between 1957 and 1997. The initial value of 43 (fig. 90) is found in the “Initial value” column with a “Less than” value of about 33. The 1997 frequency value of 29 is less than 33, thereby suggesting an 80-percent significant probability of a reduction in frequency.

One could conclude that an increase in AGSP, a decreaser, and a decrease in LOMAT, an unpalatable increaser, indicate an upward trend in range condition. There is no statistical test for line intercept or point sampling data. Interpretation would suggest little change in ARTR cover. A decrease in bare soil and an increase in cryptogams, from 1957 to 1997 (fig. 91), suggested by table 3, would tend to support an upward trend interpretation.

In the upper left of the “Range Trend Rereadings (Continued)” (fig. 91) form under the “Elements” column, provision is made for use of range condition guides (livestock forage rating guides). List the guide name and date if one is applicable to the ecological type. The guides group plant species into four categories. Decreasers are

species that are most palatable and decrease in frequency with heavy livestock use. Palatable increasers are species that are eaten but are less palatable than decreasers. They tend to increase in frequency or percentage of composition as decreasers decline. If heavy grazing continues, these species also decline. Unpalatable increasers are species that livestock do not care to eat but are present in good range condition (potential natural community ecological status). Invaders are those species that generally do not occur in good condition; they invade the site after serious heavy grazing.

Add the frequency values of those species falling into each category. For example, AGSP is the only decreaser so its frequency value for 1997 is 114. Palatable increasers are POSA3, BASA, SIHY, and STOC, whose frequency values (fig. 90) add up to 287 (274 + 2 + 9 + 2 = 287). Unpalatable increasers are ARTR, LOMAT, and PHLOX whose frequency values add up to 42. There is no statistical test for significant change in these items. They are presented to aid interpretation.

Nine-Square-Foot (1-Square-Meter) Plot Transect

Nine-square-foot transects are designed to enhance the three-step sampling system by increasing the number of ground view photographs from two to five. Reppert and Francis (1973), in their analysis of the three-step method, found photographs to be the most useful part of the method and could be used to test and validate the transect data.

Concept

The 9-ft^2 (1-m^2) plot system is derived directly from the three-step concept of a general transect photograph plus a photo of a 3-ft square at each end of the transect. This system adds three more 9-ft^2 (1-m^2) plots at the 25-, 50-, and 75-ft locations on the transect. Photographs are taken of the plot frame at an oblique angle from eye level. There are no plot measurements involved, but line intercept of woody species is provided. A grid may be imposed on the plot frame by physically connecting marks on the frame, but interpretation is difficult owing to the oblique angle.

The 9-ft^2 (1-m^2) plot is not a sample of frequency because five plots are too few and 9 ft^2 is too large. In many cases, two or more species will occur at 100-percent frequency. A person cannot determine whether plants were spaced at 2 ft 10 in in distance (which would mean 100-percent frequency) or at 10 in in distance (which also would result in 100-percent frequency). The difference between 10 in and 2 ft 10 in can be important in evaluating range trend. Five plots of 9-ft^2 do provide, however, a repeatable view of vegetation and soil surface conditions for comparison between photos taken over time, a subjective means for interpreting trend.

Equipment

The following equipment is required for 9-ft^2 (1-m^2) sampling:

1. Camera or cameras with both color and black-and-white film, or digital camera
2. A 9-ft^2 (1-m^2) plot frame (app. C)
3. Forms from appendix B are for transect identification, “Cluster – Transect,” and for plot identification “9 sq. feet - 1 sq. meter” printed on medium blue paper; and data and photo-mounting form, “Photo Trend Sample – 9 sq. ft. (1 sq. m),” printed on medium yellow paper
4. Meter board (app. C)

5. Clipboard and support for holding the photo identification forms (app. C)
6. Compass and a 100-ft steel tape with clamps or vice grips to clamp onto angle iron stakes
7. Fenceposts and angle iron stakes sufficient for the number of transects desired: 2 fence posts and 3 angle iron stakes per transect, and a pounder
8. Metal detector for locating transect stakes

Technique

Establish the transects and map them on the filing system form, “Sampling Site Description and Location” (fig. 92). Fill out information on the form and circle “1 sq. m” on the top line. If transects fall in a line, continue the map on the back of the form (fig. 74).

General photographs from the 0- and 100-ft ends of the tape are required (figs. 93 and 95). Remember to circle “0” for the front photo and cross it out and circle “100” for the end photo.

The 9-ft^2 (1-m^2) plot transect is different in several respects from the 1-ft^2 and nested frequency transects:

1. Plot photographs are taken from an oblique angle rather than overhead
2. The picture is taken down the transect line
3. The transect line bisects the center of the plot (figs. 93 and 94)
4. The photograph of the last plot is taken from a different direction. Photo plot 1 is taken with camera over the 0-ft stake and the plot at 3.5 to 6.5 ft, whereas the last plot at 96.5 to 93.5 ft is taken with the camera over the 100-ft end and aiming back down the transect to the plot

Place the plots, on center, down the transect. Figures 93 and 94 illustrate the foot marks on the transect where each plot is located. Place a 9-ft^2 (1-m^2) plot between the 3.5- and 6.5-ft marks (fig. 93). Roughly diagram the location of each species and label. Circle soil surface items listed under the plot diagram: B = bare soil (> 50 percent of ground cover), G = gravel (> 50 percent cover of stones 1/8 to 3/4 in), R = rock (> 3/4 in), L = litter (> 50 percent of ground cover), and C=cryptogams (> 50 percent of ground cover).

Fill in photo identification form “9 square feet-1 square meter,” circle photo 1 and place at a far edge of the plot (fig. 93). Handhold the camera over the 0-ft stake (see note in fig. 93 under the photograph), make sure the photo identification sheet is visible, and take the photo.

Move to the next plot location at 25 ft (fig. 94). Determine canopy intercept along the line for trees less than 6 ft tall and shrubs from the start of plot 1 (0.0 ft) to the start of plot 2 (25.0 ft). A single species may have more than one intercept if more than one individual crosses the transect between 0 and 25 ft (fig. 93).

At plot 2, repeat diagrams. Camera location is at foot mark 21.5 (3.5 ft away from the plot) as shown in figure 94 under the photograph. On photo identification form, “9 square feet - 1 square meter,” cross out “1,” circle “2,” and photograph.

Text continues on page 166.

SAMPLING SITE DESCRIPTION AND LOCATION

Circle: 1 Sq.Ft. Nested Freq. (1 sq.m.) Robel Pole Shrub Form _____

Date 1997/3/22
Area Crooked River N. G.
Allot. Madras
Cluster No. 3
Transects: 1 2 (3) 4 5
Plant community ARTR/AGSP/POSA

Grazing system:
Type Exclosure Date 1954
Type _____ Date _____
Type _____ Date _____

Kind of animal: cattle sheep horses goats (deer) elk jack rabbits

Location: T. 11S R. 13E
Sec. 36 NW of NW
Description: US hiway 20 at Crooked River N. G. sign; 2.1 mi. from junct. US 97 & US 26 S. of Madras.

Site Data: Elev. 2775 % slope 8
Slope aspect: N NE E SE S (SW) W NW
Slope position: top (up 1/3) mid low 1/3 bottom
Micro topography: (convex) flat concave
Macro topography: flat (undulating) rolling steep rough broken

Geology:
Deposition: (wind) stream lake colluvial (residual)
Material: limestone mudstone sandstone granite serpentine diorite (basalt) andesite rhyolite tuffacious cinders pumice ash

Soil:
Restrictive layer: absent clay pan (bedrock) cemented _____
Surface compaction: (none) moderate severe
Soil profile stone: absent (gravel) stony
Soil texture: sandy loamy (silty) clayey ashy
Other notes: Livestock excluded when hiway was fenced in 1954

MAP

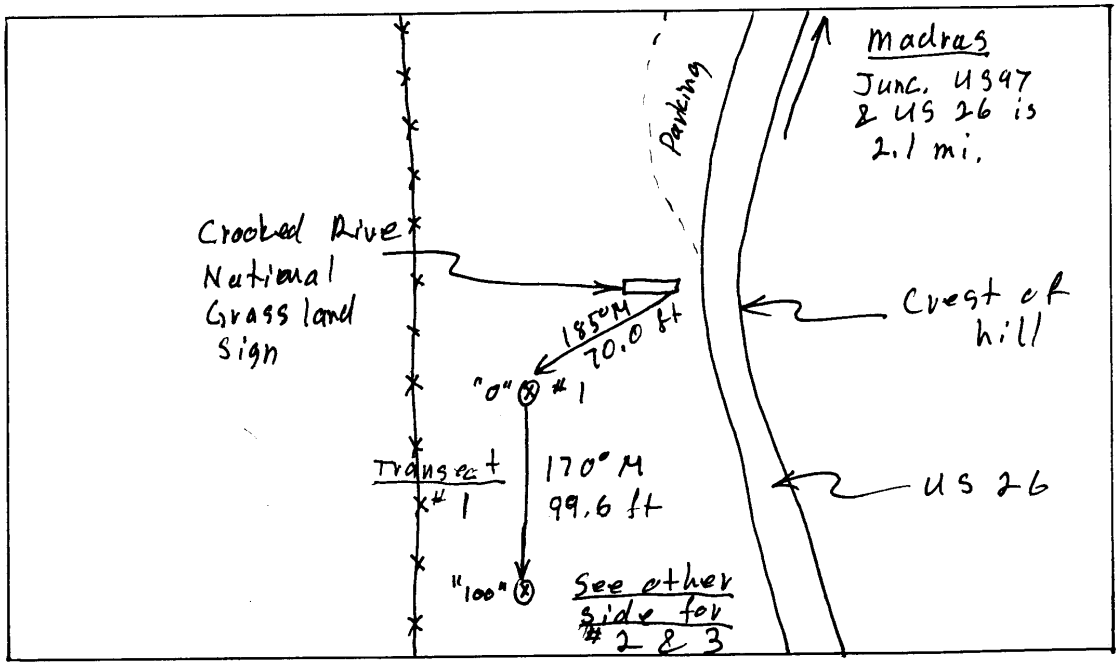


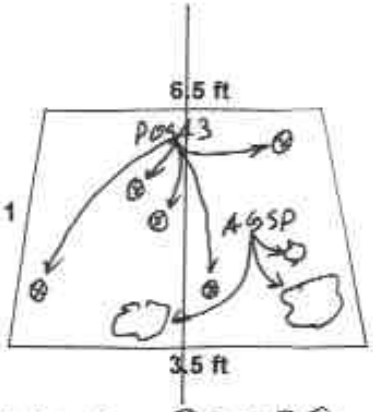
Figure 92—Filing system form "Sampling Site Description and Location" locating the 9-ft² (1-m²) transect system. It is the same location used for 1-ft² and nested frequency sampling. Circle "1 sq. m." on the top line. Fill in the rest of the information. Map the transect layout. Transects had to run end to end so the map continues on the back of the form (see fig. 74).

PHOTO TREND SAMPLE – 9 sq.ft. (1 sq. m)

Date 1997/3/22 Cluster 3 Transect (1) 2 3 4 5

Area Crooked River N. G.
Allot. Madras
Investigator [illegible]
Season of use none
% use —
Grazing system exclosure

Remarks Hyway exclosure



Soil surface: (B) G R (L) (C)

Line intercept:

Species	From	To	Feet
ARTR	12	15	3
ARTR	22	23	1

Camera at the 0 foot mark.

Figure 93—Filing system form “Photo Trend Sample - 9 sq. ft. (1 sq. m.)” illustrating its use. Two additional forms are required: transect identification (shown in the upper picture) and plot identification (lower picture). Fill out required information on each form: CRNG (Crooked River National Grassland), Madras Exclosure, cluster 3, transect 1, date, and notes. Photograph the transect from the 0-ft (upper picture) and the 100-ft ends (fig. 95). This is the same transect shown in figures 75 and 77. Soil surface items are B = bare ground, G = gravel, R = rock, L= litter, and C = cryptogamic crust. Circle each item occurring in the plot.

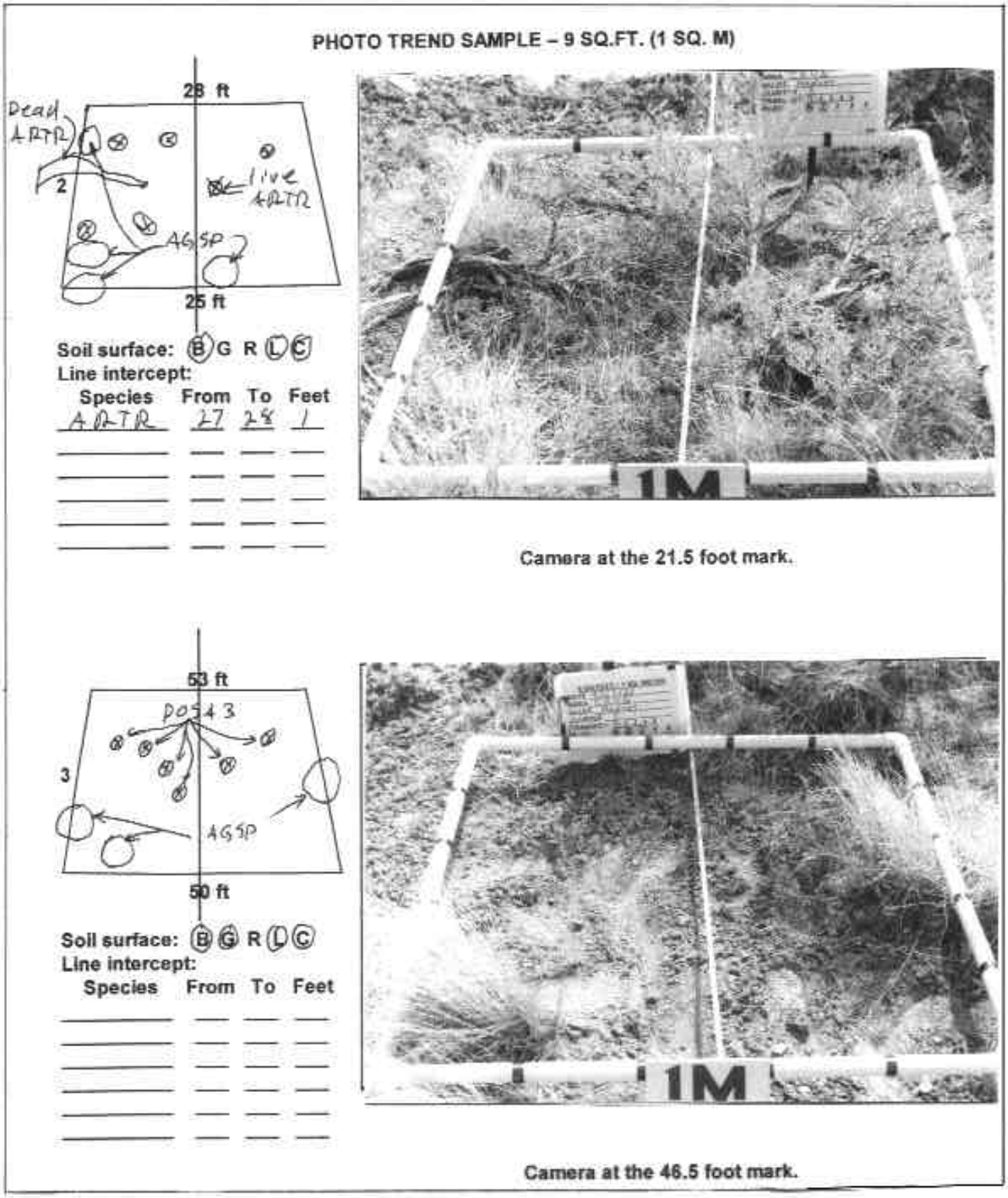


Figure 94—Second page of the "Photo Trend Sample - 9 sq. ft. (1 sq. m.)" form locating plots 2 and 3. Plot location foot marks are shown on the left. Camera location foot mark is shown under the photograph. Remember to circle the soil surface items within the plot. Cross out the previous plot number and circle the current one.

PHOTO TREND SAMPLE – 9 sq.ft. (1 sq. m)

SUMMARY

Species	Frequ.	Interc.
POSA3	5	
AGSP	4	
ARTR	1	6
LOMAT	2	
PHLOX	1	
BASA		
SIHY	2	
PUTR		1
Bare soil	5	
Gravel pavement	3	
Rock	2	
Litter	5	
Cryptogams	5	

Estimated Utilization

Species	% Use

ACTIVITIES

Logging —
Fire —
Revegetation —
Insects —
Wildlife Deer, rabbits
Other

CLIMATE compared to Average

	This Yr.	Last Yr.	Two Yrs.	Three Yrs	Four Yrs.
Temp	+ (0) -	+ (0) -	+ (0) -	+ 0 (0)	+ 0 (0)
Ppt.	(+) 0 -	(+) 0 -	+ (0) -	+ (0) -	+ 0 (0)

Apparent range condition Good
Apparent range trend Static

COMMENTS

A hiway exclosure

Figure 95—Summary sheet of the “Photo Trend Sample - 9 sq. ft. (1 sq. m)” form with the 100-ft transect photograph. Frequency of occurrence by species is on the left. Under that is frequency of soil surface items. Fill out appropriate information on the right.

Do the same for plots 3 and 4.

Plot 5 is different. It is photographed in the opposite direction from the others, back down the transect (see number 4, above).

Summarize Data

After sampling, fill in the summary on the last page of form, “Photo Trend Sample - 9 sq. ft. (1 sq. m)” (fig. 95). It is the same summary sheet used with the 1-ft^2 plots, and the procedure is identical. If the site is forested, tree crown cover must be sampled as discussed below.

Trend Interpretation

Transfer summary data from the last page of the form, “Photo Trend Sample – 9 sq. ft. (1 sq. m)” (fig. 95) to the “Range Trend Rereadings” form (figs. 96 and 97). Fill out the form information and circle “5 plots 9 sq. ft. (1 sq. m)” on the top line. Enter the transect intercept data by date of rereading. Then enter the frequency data by date of rereading (fig. 96). Data were measured for 1997 and constructed for 1957 and 1982.

On the second page (fig. 97), summarize by date and frequency by decreaser, palatable increaser, unpalatable increaser, and invader. Do not add up the frequency ratings from the first page (fig. 96) because frequency of these large plots is not additive. Instead, return to the data forms (figs. 93 and 94) and count the number of plots by species. Often two species in a category, such as unpalatable increasers, will occur in the same plot. The total frequency for unpalatable increasers from figure 96 is 4 but the frequency for the category had a frequency of only 3 (LOMAT, PHLOX, ARTR).

Transfer the soil surface items. Vegetation is any plant root crown, so a frequency of 5 for a species would be a 5 for vegetation. Transfer utilization and climate information. Finally, transfer the estimated range condition and trend information.

Interpretation of change is based on professional judgment and interpretation of photos.

Tree Cover Sample

Tree cover has direct influences on ground vegetation by casting shade. Trend in density and composition of species is often as much influenced by this shade as by grazing or light disturbance. Any transect placed in a forest setting should have tree cover sampled.

Concept

Tree canopy cover significantly influences density and composition of ground vegetation (shrubs and herbs). The effect is so important that documentation of tree cover on forest land transects is strongly recommended. Tree canopies are photographed by using a camera leveling board to assure vertical orientation of the camera (fig. 98).

On a 100-ft transect used for square-foot, nested-frequency, or 9-ft^2 (1-m^2) sampling, photograph tree cover at the 0-, 25-, 50-, 75-, and 100-ft locations. Overhead photos also may be taken with topic photography utilizing a single overhead photo (fig. 52). At 40-percent canopy cover using a 50-mm lens, trees taller than 70 ft will

Text continues on page 169.

RANGE TREND REREADINGS

Circle the sampling system: 20 plots 1 sq,ft, 100 plots Nest. Frequ. (5 Plots 9 sq.ft.(1 sq. m))
Area Crooked R. N.G. Allotment Madras Cluster 3 Transect (1) 2 3 4 5

Species	Averages by Year 1952	1982	1997
Tree Crown Cover (in percent)			
TOTAL			
Shrub intercept (in feet)			
ARTR	5	6	6
PUTR	—	—	1
CHNA	—	—	—
TOTAL			
Frequency: No. plots for 1 sq.ft. & (9 sq.ft. (1 sq. m)); nested frequ. value			
POSA3	5	5	5
AGSP	3	4	4
LOMAT	3	2	2
PHLOX	1	1	1
BASA			
SIHY	2	2	2
STOC	1		
ARTR	2	1	1

OVER FOR ADDITIONAL DATA

Figure 96—The filing system form “Range Trend Rereadings” where the transect data are compared to previous readings. Fill in the required information and circle “5 plots 9 sq. ft. (1 sq. m).” Transfer information from figure 95 to this form.

RANGE TREND REREADINGS (Continued)

Elements	Averages by Year		
	1957	1982	1997
Range Condition Guide/date none	—	—	—
Decreasers:	3	4	4
Palatable Increasers	5	5	5
Unpalatable Increasers	4	3	3
Invaders	—	—	—
Vegetation - (root crown)	5	5	5
Bare Soil	4	3	5
Gravel (1/8 to ¾ inch)	5	5	3
Rock (> ¾ inch)	2	2	2
Litter	5	5	5
Cryptogams	4	5	5
% Utilization by species			
None - exclosure			
Season of Use			
Climate			
Temp: Current	+	0	0
Last year	0	0	0
2 yrs. Ago	0	+	0
3 yrs. Ago	0	0	—
4 yrs. Ago	—	0	—
Ppt.: Current	0	+	+
Last year	0	+	+
2 yrs. Ago	0	0	0
3 yrs. Ago	—	0	0
4 yrs. Ago	+	0	—
Apparent range condition	P	P	F
Apparent range trend	S	S	S

Figure 97—Second page of the “Range Trend Rereadings” form where previous information is compared. See text for details.

appear in adjacent pictures providing a continuous 100-ft transect of tree cover. If a 35-mm lens is used, trees over 50 ft tall will provide a continuous strip. Whatever focal length is used to begin, the **same focal length** must be used for subsequent photos. Long axis of the camera should be across the transect.

Equipment

The following equipment is required for sampling tree cover:

1. Camera or cameras with both color and black-and-white film, or digital camera
2. A camera leveling board (app. C)
3. Form from appendix B for data and photo mounting: “Photo Trend Sampling - Tree Cover”
4. Meter board (app. C) to set the leveling board and camera on
5. A compass and 100-ft steel tape with clamps or vice grips to clamp onto angle iron stakes used for ground vegetation sampling
6. Fenceposts and angle iron stakes sufficient for the number of transects desired: 2 fenceposts and 3 angle iron stakes per transect and pounder (these are on the equipment list for ground vegetation sampling system)
7. Metal detector for locating transect stakes

Technique

On the 100-ft transect used for square feet, nested frequency, or 9-ft^2 sampling, photograph tree cover at the 0-, 25-, 50-, 75-, and 100-ft marks. Position the meter board at each of the foot marks, place the camera leveling board on top of the meter board, and set the camera on the leveling board with the long axis perpendicular to the transect and the viewfinder toward the 0-ft mark (fig. 98).

Move the meter board sideways to level the camera board cross-transect. Then level the camera board down-transect, bend down to take your head out of the picture, and photograph (fig. 98).

Important criteria—There is neither a size control (meter board) nor photo identification sheet in these pictures. Four procedures, therefore, **must** be followed:

1. The same focal length lens must be used for all subsequent photographs so images can be compared. Note the effects of focal length in figures 6 and 7.

2. The camera must be the same height aboveground. Use the meter board for consistent heights. Figures 2 and 3 illustrate the effect of change in distance using the **same focal length** lens.

3. Make sure the camera is oriented perpendicular to the transect with the viewfinder toward the 0-ft mark (fig. 98). Remember this by viewing the transect through the camera, and then rotating it 90 degrees upward to view the canopy. This camera orientation helps with placement of photos on the form. There is no “right side up” on these photos. Their orientation can be determined only by the exposure numbers at the bottom of the film.

4. Write down the film exposure number and the cluster and transect data so that negatives can be identified and picture orientation determined.

Figure 98—Tree canopy cover photography system. Ameter board is placed crosswise (perpendicular) to the transect at foot marks 0, 25, 50, 75, and 100. Hold camera level board on top of the meter board and place the camera on the level board. First center the crosstransect level by moving the meter board sideways. Then tilt the camera level board so the down-transect-level is centered, move your head out of the camera view, and photograph.

Summarize Data

Attach crown cover photos to the filing system form, “Photo Trend Sampling - Tree Cover” (figs. 99 and 100). Fill out information on the top two lines. Roughly diagram canopy outlines and label by species for identification. Then proceed as follows to determine canopy cover on each photo (figs. 99 and 100):

1. Print on clear plastic five copies of the grid analysis outline form (fig. 54), one for each photo. Tape along one edge over a photo and enter information for the photo (fig. 101). Outline the tree canopies carefully and identify by letter or number.

2. Print (without size adjustment on white paper) a copy of the analysis grid for shrub analysis (grid with meter boards at each edge) from appendix B. Remove the outline overlay from the photo and tape onto the grid. Orient the outline overlay on the bottom line of the grid and next to the left meter board but one grid line to the right (fig. 101). The top and right edges of the outline probably will fall between grid lines.

3. Determine the total number of grid intersects on the picture. Remember to count the left and bottom grid lines to determine total number. In figure 101, there are 26 grid lines across and 17 up for a total of 442 intersects.

Text continues on page 174.

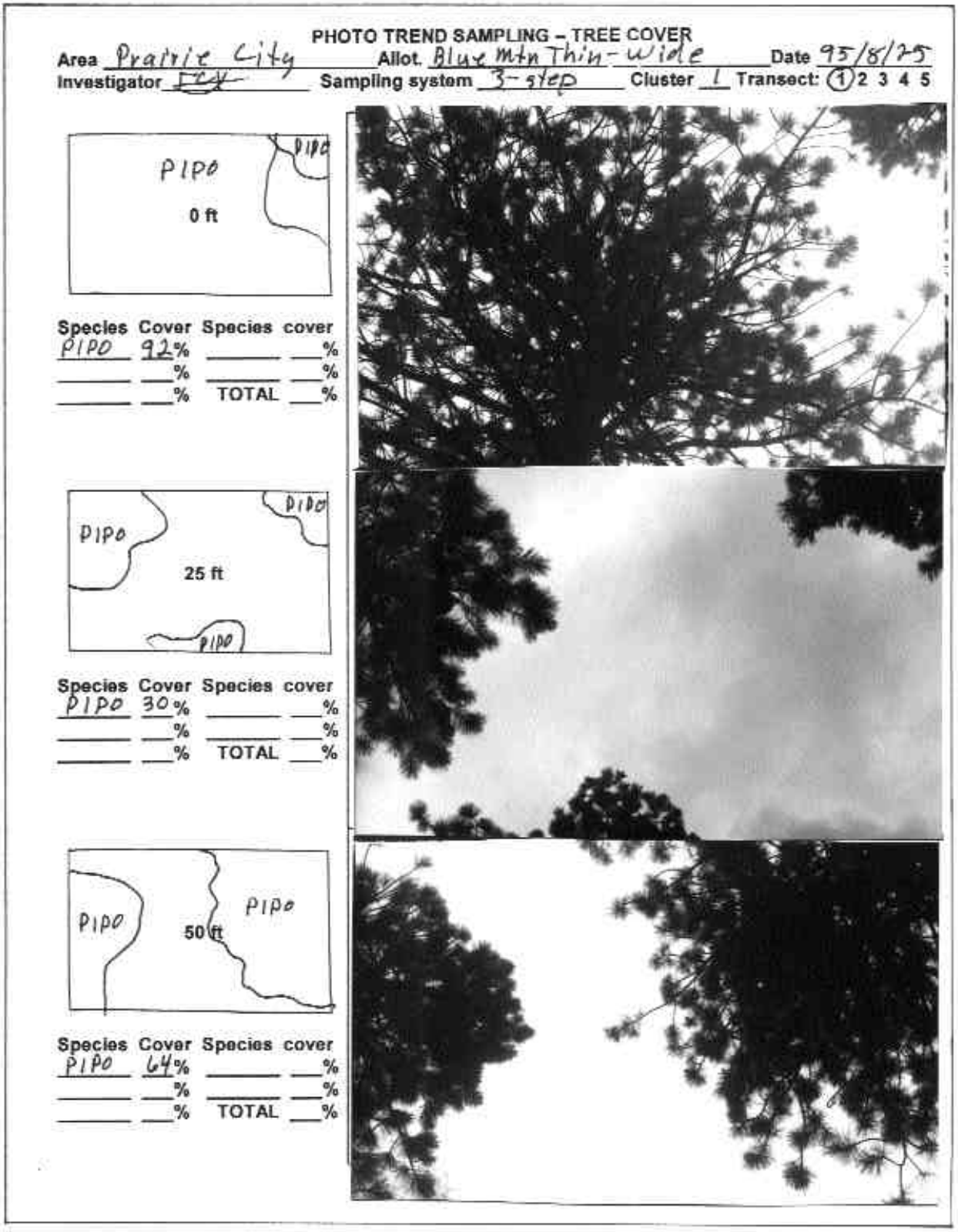
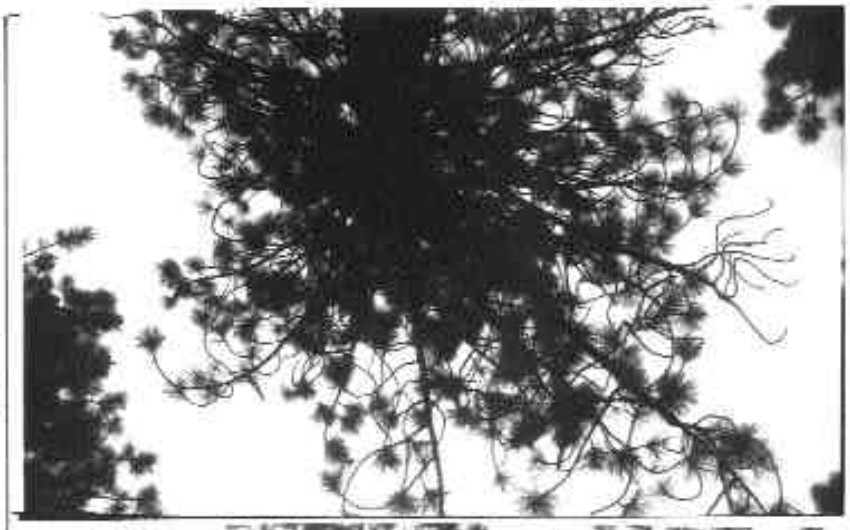
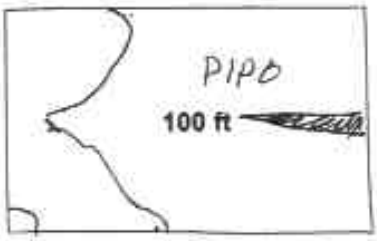


Figure 99—Filing system form “Photo Trend Sampling - Tree Cover” used to mount tree canopy cover photos and to estimate cover. Percentage of cover is determined by dot or intersect grid analysis (illustrated in fig. 101). Diagrams of cover are used to identify species, not to determine the percentage of cover (PIPO: *Pinus ponderosa* P. & C. Lawson, ponderosa pine).

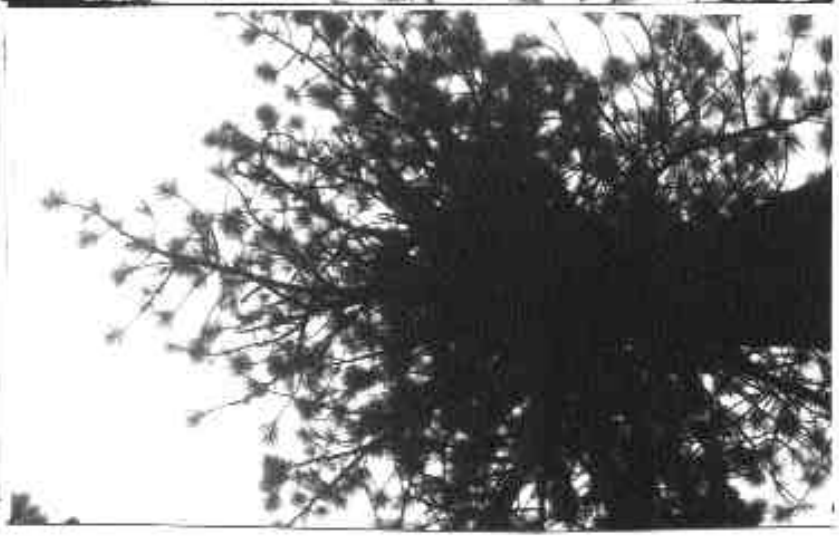
PHOTO TREND SAMPLING – TREE COVER

Species	Cover	Species	cover
PIPO	70 %		%
	%		%
	%	TOTAL	%





Species	Cover	Species	cover
PIPO	74 %		%
	%		%
	%	TOTAL	%



SUMMARY

Species	Ave. % cover
PIPO	66

SD = 22.67
SE = 10.18
CI_5 = 28.3

Figure 100—Second page of the “Photo Trend Sampling - Tree Cover” form with the cover summary. In this case, statistical analysis results were added: SD = standard deviation, SE = standard error, and CI_5 = the confidence interval at the 5-percent level of probability.

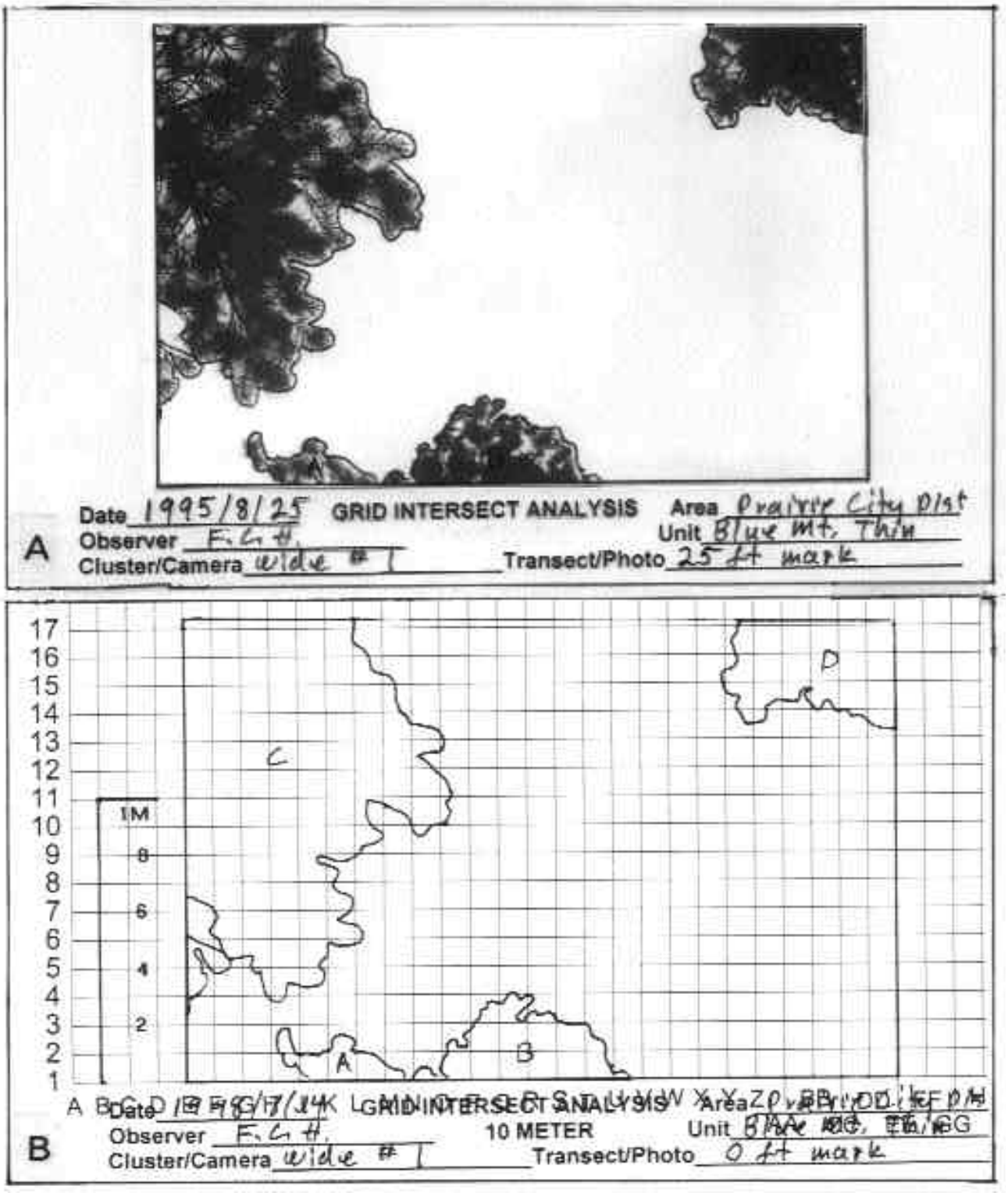


Figure 101—Determination of tree canopy cover using grid intersect. The grid intersect outline form printed on clear plastic is overlaid on photo **A** and tree canopies outlined, here for the 25-ft photo (fig. 99). Then in **B**, the outline is placed on the shrub analysis grid (with meter boards at each side) and printed on paper. Intersects within each tree canopy outline are counted (131) and divided by the total number of intersects within the photo (442, or 17 × 26) for 30-percent canopy cover.

4. Decide if tree canopy or open space will be counted. To ease counting, I prefer to count the item of least coverage: open space in the 0-ft picture of figure 99 and tree cover in the 25-ft picture (fig. 99). Count grid intersects on the left edge and bottom of the photograph. When counting open space, subtract the grid intersects from the total to determine canopy cover. In figure 101, the number of grid intersects falling on the tree canopy is 131. Percentage of cover is 131 ÷ 442 = 29.6, or 30-percent canopy cover.

5. For each photo, list canopy cover by species on the left of the filing system form, "Photo Trend Sampling Tree Cover," under the canopy diagram. Retain each outline as a permanent data form.

6. Add canopy cover for each photo, average, and enter in the summary shown in figure 100: a total of 330 divided by 5 is an average of 66-percent canopy cover.

Trend Interpretation

If there are five samples for statistical analysis of change, the mean of 66.0 will have a standard deviation of 22.7, a standard error of 10.2, and a confidence interval at the 0.05-percent probability level of 28.3 (fig. 100). The Student's T-test may be used to evaluate significant change in tree canopy cover between two data sets.

Usage Measured by Robel Pole

Stubble height of vegetation remaining after livestock grazing indicates animal preference for certain areas, may be used to adjust animal distribution, and suggests intensity of utilization. The Robel pole system documents this stubble height.

Concept

The basic concept is to measure stubble height, or ungrazed herbaceous height, by using a pole marked in inches and photographing it (a "visual observation") from a specific distance and height aboveground. Robel and others (1970) discuss the mathematics and test results. Guenther (1998) used the same concept to estimate annual grass herbage production in California. He uses two views: one from 20 ft and another from 10 ft. A 0.96-ft^2 hoop is placed at the base of the pole for visual reference.

The pole is 2.5 in in diameter and marked in alternate black bands by inches (fig. 102). A 4-m-long line is attached at 1-m height on the Robel pole and connected to the top of a 1-m-tall line pole (app. C). The Robel pole is set at the sample location (station) while the line is stretched and a photograph taken (visual observation) from the top of the line pole (fig. 103). Landscape orientation seems to be better than portrait for depicting utilization, because the former broadens the view at the Robel pole.

The location of the Robel pole is termed a "station" from which two visual observations are made: one in the direction of the transect and a second 180 degrees backwards to the start of the transect.

These consistently used measurements, 4-m distance and 1-m height of camera (4-to-1 ratio), provide repeatable angles for documenting stubble height (Robel and others 1970).

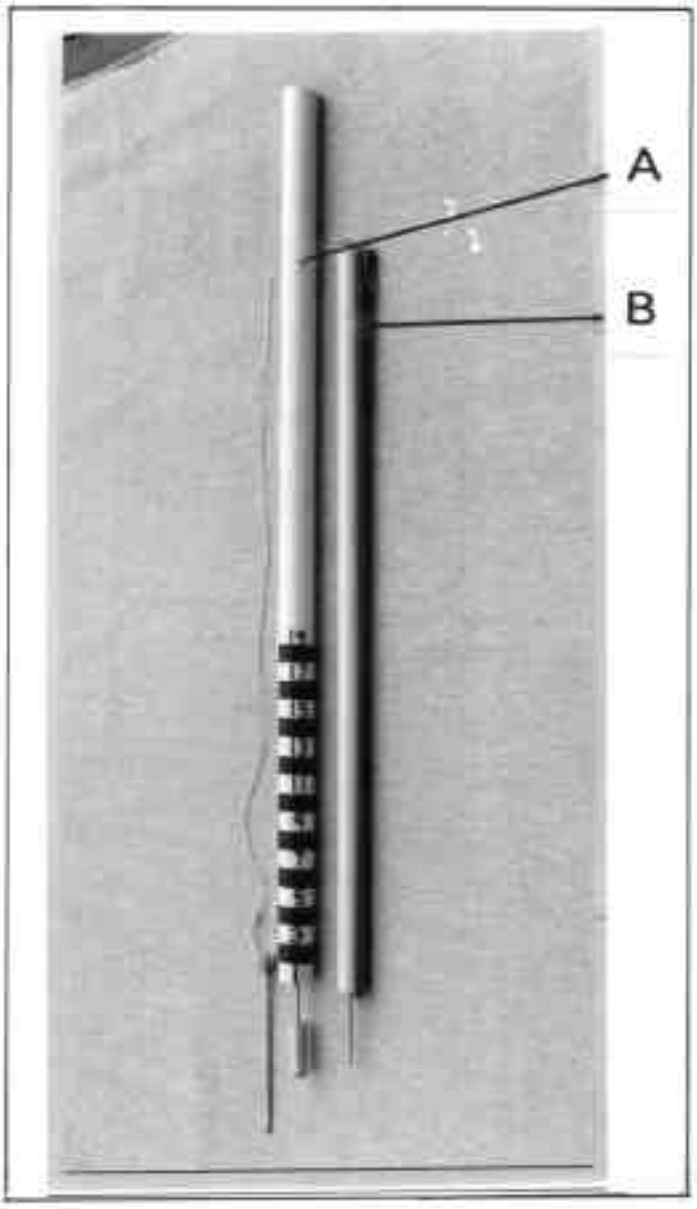


Figure 102—Robel pole has two main parts: the Robel (measuring) pole (**A**) and the camera height pole (**B**). The Robel pole is 2.5 in diameter and the camera height pole 1.5 in so the latter will fit inside the Robel pole. "A" points to an eye where a 4-m long line is attached. The line is shown wrapped around the camera height pole in B. A tent peg with 2 m of line may be used to hold the Robel pole when one person is sampling. See appendix D for details.

Transects generally are not permanently located with fenceposts and steel stakes. A fencepost marking a sampling station may significantly alter domestic livestock use owing to its physical presence. If permanent transects are desired, they should be located with fenceposts identifying the transect start and end. They may be set at visual observation camera locations with the station located by a steel stake driven flush with the ground. A metal detector is needed for relocation (White's Electronics, Inc. 1996).

Equipment

The following equipment is required for Robel pole transect sampling:

1. Camera or cameras with both color and black-and-white film, or digital camera
2. Robel pole with its 4-m line and a line pole (fig. 102, app. C)

Figure 103—Technique for photographing the Robel pole. In this case, the camera is held in the “portrait” or vertical position. I prefer the “landscape” or horizontal camera orientation (see fig. 106) because it covers a broader area of ground at the Robel pole. Spikes on the bottom of the Robel pole and line pole (fig. 102) are 1/4-in steel rod 6 in long, which are capable of holding both poles upright.

3. Forms from appendix B for transect identification, “Cluster – Transect,” and station identification, “Utilization - Robel Pole,” both printed on medium blue paper, and data and photo-mounting form, “Utilization - Robel Pole Sampling,” printed on medium yellow paper
4. Meter board (app. C)
5. Clipboard and support for holding photo identification sheet (app.C)

Technique

Site selection is a function of animal use and management objectives. For this illustration, a moist meadow in forested rangeland was selected because it is the most palatable kind of vegetation in the area and because it is adjacent to a water hole. Provide the usual two maps: one to locate the sampling area (fig. 104) and another to map the sampling transect (fig. 105). Draw a map on the filing system form, “Sampling Site Description and Location” and fill in necessary information.

1. Determine the number of transects and number of visual observation stations per transect. Then determine the direction of each transect and the interval between stations. All are influenced by two factors: homogeneity of vegetation and uniformity of animal use. Record and map transects on the filing system form, “Sampling Site Description and Location” (fig. 105). The filing system form, “Utilization - Robel Pole Sampling,” provides for 25 stations and 50 observations (fig. 106).

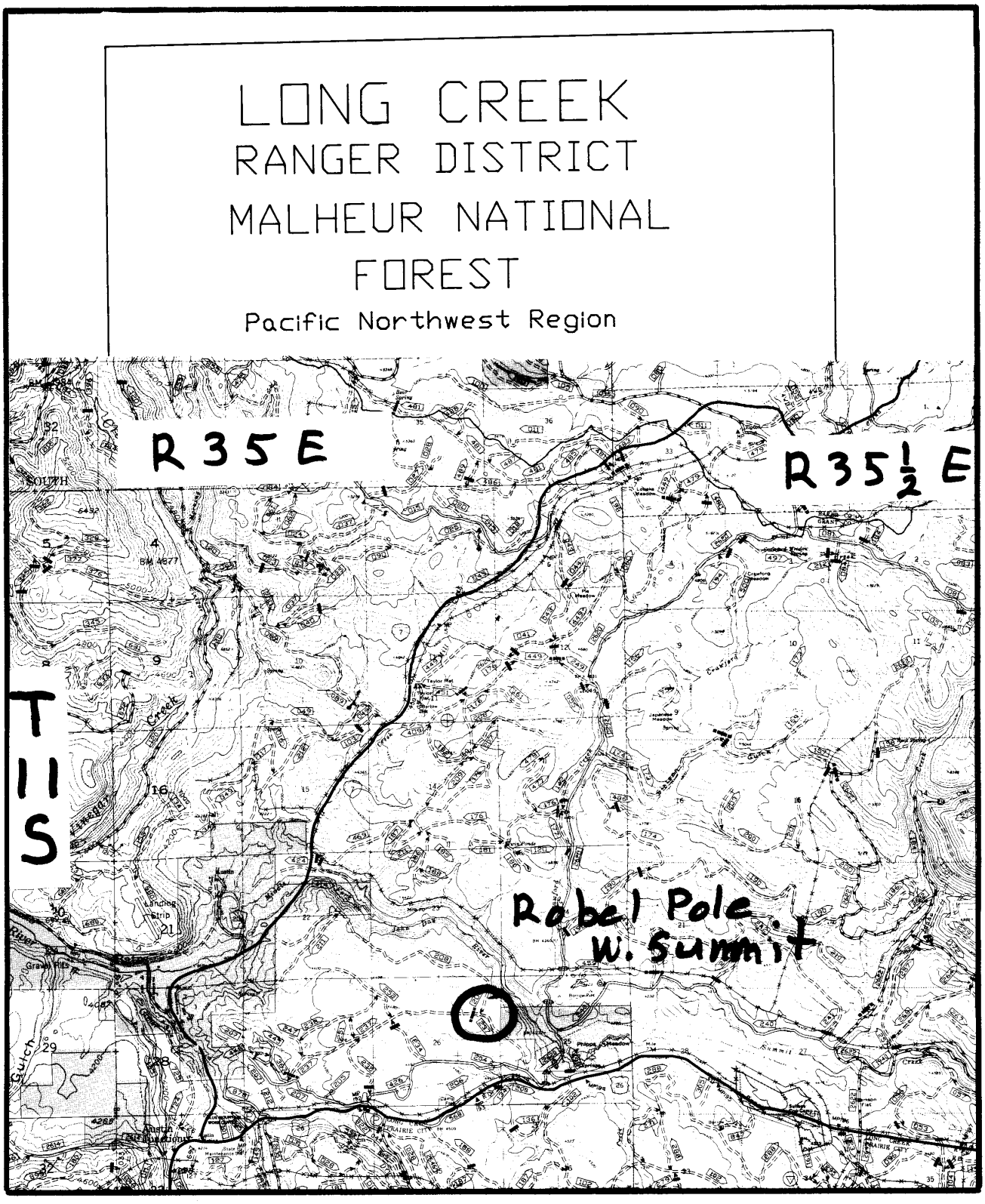


Figure 104—Ranger District map of the Robel pole utilization sampling site. It is on the West Summit Allotment at a road junction. Figure 105 shows the precise location.

SAMPLING SITE DESCRIPTION AND LOCATION

Circle: 1 Sq.Ft. Nested Freq. 1 sq.m. (Robel Pole) Shrub Form _____

Date 1997/7/7
Area Long Cr. Dist.
Allot. West Summit
Cluster No. 1
Transects: (1) 2 3 4 5
Plant community PO PR meadow

Grazing system:
Type RR Date____
Type _____ Date____
Type _____ Date____

Kind of animal: (cattle) sheep horses goats deer elk _____

Location: T. 11S R. 35E
Sec. 26 SE of NE
Description: Rd 237; 0.65 mi from junct rd 204; at water hole; PP at rd fork 24" DBH - tagged

Site Data: Elev. 4525 % slope 2%
Slope aspect: N NE E SE S SW W NW
Slope position: top up 1/3 mid low 1/3 (bottom)
Micro topography: convex flat (concave)
Macro topography: flat (undulating) rolling steep rough broken

Geology:
Deposition: wind (stream) lake colluvial residual _____
Material: limestone mudstone sandstone granite serpentine diorite basalt (andesite) rhyolite tuffacious cinders pumice ash

Soil:
Restrictive layer: absent (clay pan) bedrock cemented _____
Surface compaction: none moderate (severe)
Soil profile stone: absent gravel (stony)
Soil texture: sandy loamy (silty) clayey ashy

Other notes: Stations at 8 yd intervals

MAP

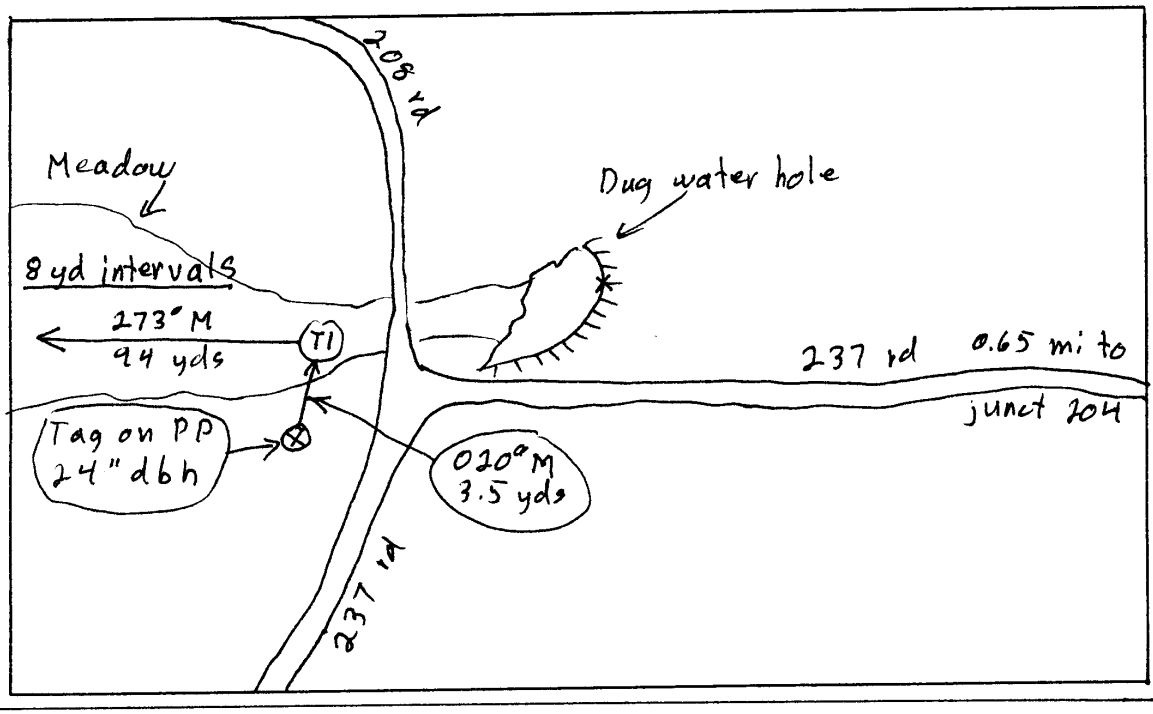


Figure 105—Filing system form "Sampling Site Description and Location" with information and transect location diagrammed. Remember to circle the sampling system, "Robel Pole," on the first line.

2. In this illustration, the meadow is small, oblong, and homogeneous. Only one transect is needed with 10 stations. The transect is oriented lengthwise and calls for a compass heading of 273 degrees magnetic and a total distance of 94 yd, which results in 8-yd intervals between stations (fig. 105).

3. Mark station 1 of the transect with the meter board. Place the camera location fencepost 10 m distant on the transect line. Fill out the transect photo identification form, circle the “0,” place it at 5 m, and photograph the transect (fig. 106 A).

4. At the first station, fill out the photo identification form, “Utilization - Robel Pole Sampling,” printed on medium blue paper; circle “1A,” and place next to the Robel pole at the station (fig. 106 B). Extend the line its full 4 m along the transect toward the fencepost that locates the transect. Set the line pole on the transect line, and photograph the Robel pole with the bottom of the pole in the center of the photo (fig. 106B). Focus on the pole to assure the sharpest image.

5. Using the filing system form, “Utilization - Robel Pole Sampling,” printed on medium yellow paper (fig. 106), fill in the first page. Then opposite “Visual Observation 1A” (station 1), record the stubble height, any comments, and the one to three species immediately in front of the pole that are being measured for stubble height. In this case, Kentucky bluegrass and analogue sedge are intermixed (fig. 106 B). Stubble is shown on the white “3” band with very little on the black “4” band. Record 3 for stubble height (3 in).

6. Next, move to the opposite side of station 1, 180 degrees, for visual observation 1B (fig. 106C). Pick up the line pole, turn the Robel pole and the photo identification paper around, cross out “1A” and circle “1B” on the identification paper, extend the line, and repeat the photography (fig. 106C). Record on the “Utilization - Robel Pole Sampling” form, in the “Visual Observation 1B” space, species being measured, the stubble height, and any comments. In this case, Kentucky bluegrass and California oatgrass are intermingled. Stubble is shown on the black “2” band and not on the white “3” band for a height of 2 in.

7. For the next station, determine direction and step off the required distance, in this case 8 yd. Forms in appendix B following the first page of “Utilization - Robel Pole Sampling” do not have visual observation (station) numbers, but a blank space instead (fig. 107). Print sufficient sheets for the number of stations. Then enter appropriate visual observation (station) numbers. Thus each station has its own page. Take photographs, data, and notes as discussed above (fig. 106).

8. Repeat for each station (figs. 107 and 108). At the end of the transect (fig. 108C), establish a fencepost 10 m beyond the last station. On the transect photo identification sheet, cross out the “0” and circle “100” to indicate the end of the transect. Photograph the transect looking toward the “0” end.

Text continues on page 184.

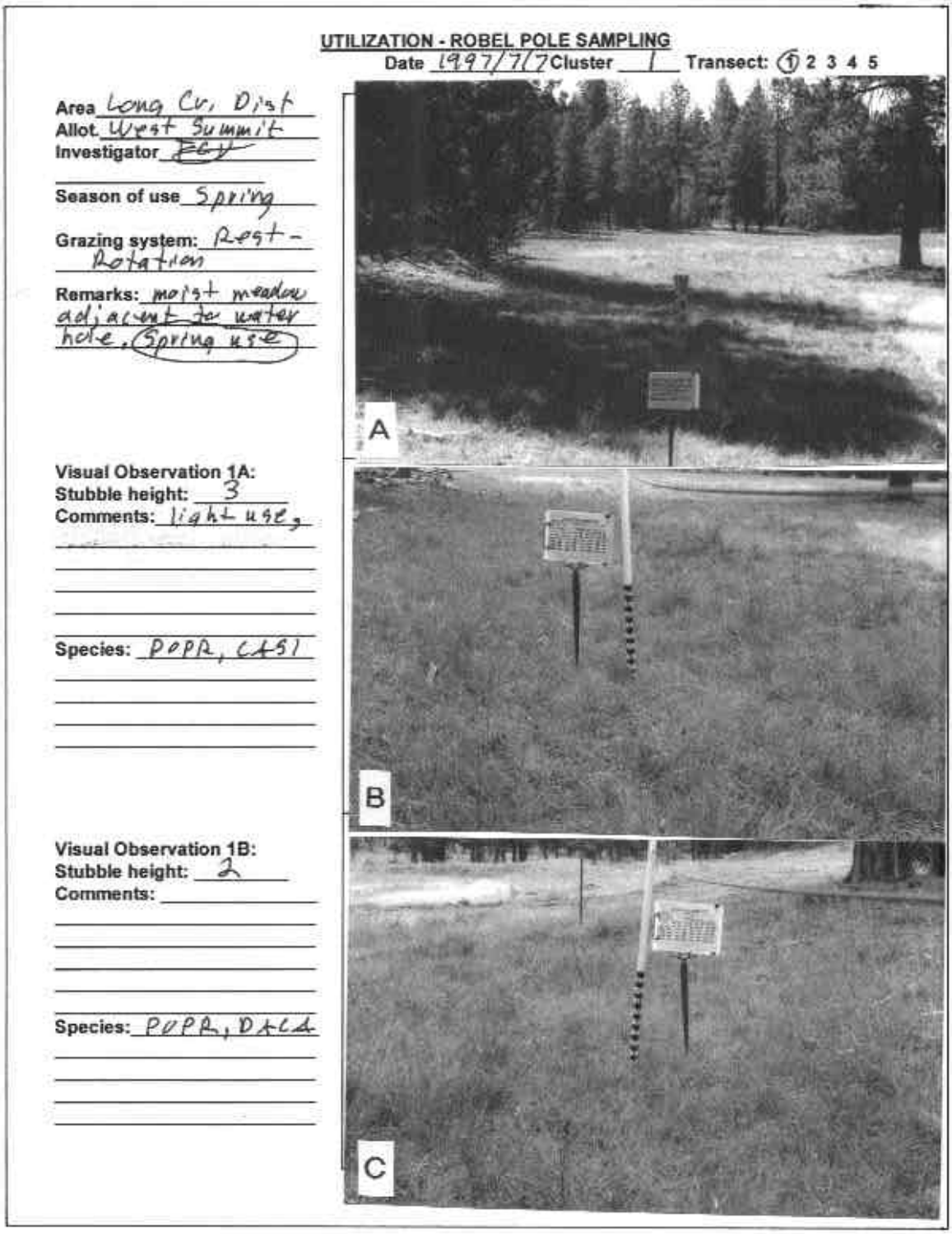


Figure 106—The filing system form “Utilization - Robel Pole Sampling” is used to mount pictures, record stubble height, and identify species at the Robel pole. Only those species immediately in front of the pole, whose stubble height is being photographed, are listed. (**A**) Looking down the transect with station 1 at the meter board. Both visual observations of station 1 are shown: (**B**) down the transect, and (**C**) 180 degrees reversed and looking up the transect. The fencepost marks the camera location and start of the transect. Species are POPR (*Poa pratensis* L., Kentucky bluegrass), CASI (*Carex simulata* Mackenzie, analogue sedge), and (DACA (*Danthonia californica* Boland, California oatgrass). Species in front of the Robel pole **must** be recorded. The line upper right in B and C is the 4-m-long line measuring distance from camera to pole.

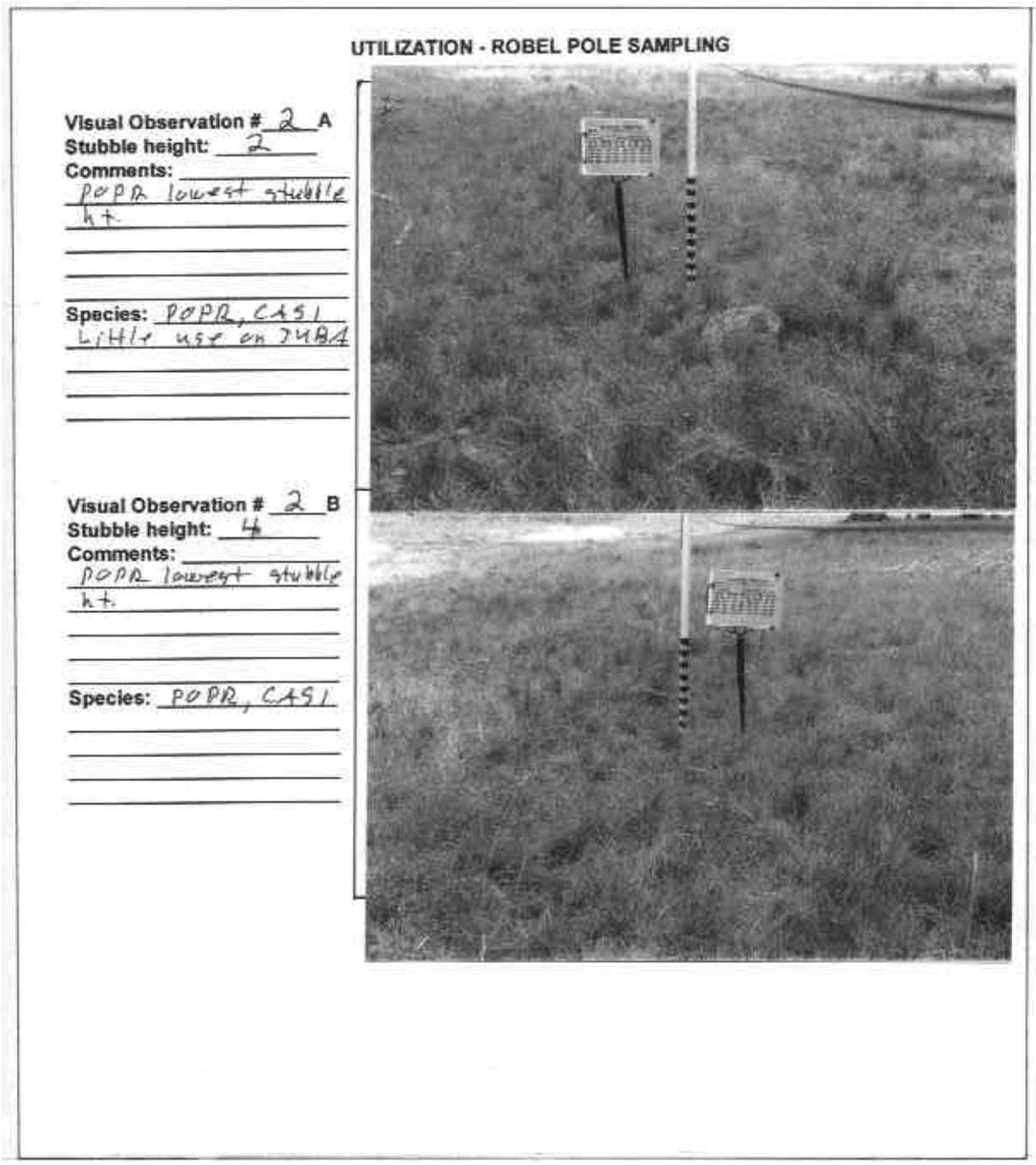


Figure 107—Second page of form “Utilization - Robel Pole Sampling” illustrating documentation and photographs of station 2. On this form at the top, enter the station number in the blank at “Visual Observation # ___ A”. Remember, on the photo identification form, to cross out “1B” and circle “2A” before photographing. Notes often are valuable in these situations.

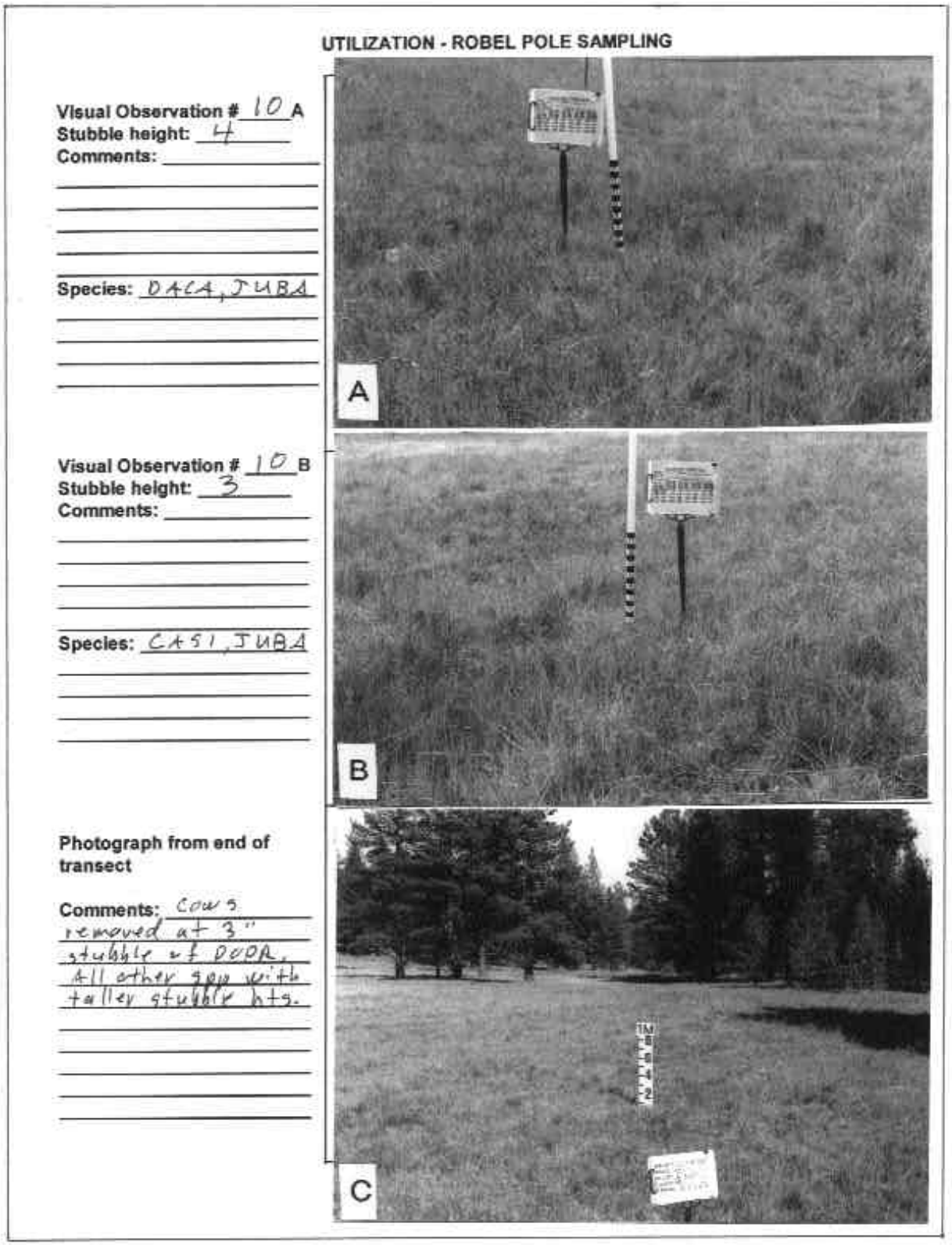


Figure 108—Last page of the form “Utilization - Robel Pole Sampling” with the last station, number 10 in **A** and **B**, and a transect view toward the 0-ft end (**C**). The camera is 10 m from the last station and the photo identification sheet is halfway between camera and meter board. JUBAis *Juncus balticus* Willd., baltic rush. Remember to cross out the “0” and circle “100.”

UTILIZATION - ROBEL POLE SUMMARY

Date 97/7/7 Examiner: ~~E.C.~~ Kell

Area Long Cr. Dist. Allotment West Summit

Cluster 1 Transect: (1) 2 3 4 5 Sampling interval 8 yrd

Station	VO "A"	VO "B"	Species "A" (Front)	Species "B" (Back)
1	3	2	POPR, CASI	POPR, DACA
2	2	4	" , "	" , "
3	2	3	" , DECE	" , DECE
4	3	3	" , "	" , "
5	6	6	" , "	" , DACE
6	4	5	DECE, DACA	DECE, JUBA
7	3	3	DACA, DECE	" , "
8	7	5	JUBA, DACA	DACA, DECE
9	3	4	DACA, JUBA	" , JUBA
10	4	3	" , "	CASI, "
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
Total	37	38		
Grand Total	75			
Average	3.75			

SD = 1.41
SE = 0.32
CI_5 = 0.66

Cluster Summary
Trans 1 3.75
Trans 2 _____
Trans 3 _____
Trans 4 _____
Trans 5 _____
AVE _____

Figure 109—Filing system form "Utilization - Robel Pole Summary" with location information, stubble heights, and species taken from the transect data and photo-mounting form. Add the stubble heights in each column (37 and 38), total the columns (75), and determine the average (75 ÷ 20 = 3.75). The average stubble height is 3.75 in. Variability in stubble height may be calculated by determining the standard deviation (SD), standard error (SE), and the confidence interval at the 5-percent confidence level (CI_5). These have been entered on the form. The stubble height is 3.75 ± 0.66 in, at the 5-percent confidence level.

Summarize Data

Add each of the stubble height columns: visual observation A ("VO A") is 37 and "B" is 38; then add the column totals: 37 + 38 = 75. Determine the average stubble height for 20 observations: 75 ÷ 20 = 3.75. In this example, the standard deviation (SD) was 1.41, standard error of the estimate (SE) was 0.32, and the 5-percent confidence interval (CL_5) was 0.66, which were recorded on the form. These data also may be used to determine significant differences among transects by using the Student's t-test. In this case, the stubble height was 3.75 in ± 0.66 in at the 5-percent probability level.

Literature Cited

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Hall, Frederick C. 1976. Range trend sampling by photographs. R6 Regional Guide 2-1. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 50 p.

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Parker, K.W.; Harris, R.W. 1959. The three-step method for measuring condition and trend of forest ranges: a resume of its history, development, and use. In: Techniques and methods of measuring understory vegetation: Proceedings of a symposium; 1958 October; Tifton, GA. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 55-69.

Reppert, Jack N.; Francis, Richard E. 1973. Interpretation of trend in range conditions from 3-step data. Res. Pap. RM-103. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 15 p.

Robel, R.J.; Briggs; J.N.; Dayton, A.D.; Hulbert, L.C. 1970. Relationships between visual obstruction measurements and weight of grassland vegetation. Journal of Range Management. 23: 295-297.

White's Electronics, Inc. 1996. Classic II SL™. Sweet Home, OR: White's Electronics, Inc. [1011 Pleasant Valley Road, 97368].

Appendix B: Blank Forms for Photo Monitoring

This appendix contains forms for photo monitoring. To be of the most use, they need to be copied onto three paper colors or overhead projection clear plastic, depending on their use. Office forms are printed on standard white paper. Field forms are printed on either of two colors: blue paper to place in photographs to identify each photo or yellow paper to ease eye strain for field forms. Outline forms for grid analysis are printed on clear plastic. Grids and summary forms are printed on white paper. Paper colors I've found suitable for each form are shown in **bold**.

White paper is used for summary forms and for grids adjusted to size of the outline overlays.

Blue paper is Hammermill Brite Hue Blue® or Georgia Pacific Papers Hots Blue®, or equivalent, used in the actual photographs for identification. This shade of blue has proven to be least sensitive to changes in sunlight, from full sun to shade, and has the least tendency to "bleach out" in full sun.

Yellow paper is Champion Goldenrod® or Hammermill Copy Plus GOLDENROD®, or equivalent, to be used for field forms. It has proven to be the least annoying in direct sunlight for field recording data, maps, diagrams, and other descriptions.

Clear plastic sheets for printing outline overlays are 3M® or Labelon® Overhead Transparency Film. These films are specifically designed for different printers such as laser, inkjet, or plain paper.

These forms are printed here at 90 percent of their original size. To reproduce at full size on 8½- by 11-inch paper, set the copy machine for a 110-percent enlargement.

Page and figure numbers for examples of their use are given in the following list.

Paper color found best for photo identification forms is this color blue.

It is **Hammermill Brite Hue Blue®**

or **Georgia Pacific Papers Hots Blue®**

This page is intentionally left blank.

Paper color that is easy on the eyes and used for transect data collection as well as photo mounting is this color.

It is **Champion Goldenrod®**

or **Hammermill Copy Plus GOLDENROD®**

/

This page is intentionally left blank.

DATE_____ 0 100

AREA _____

ALLOT._____

CLUSTER _____

TRANS. 1 2 3 4 5

DATE

AREA

UNIT

CAMERA: 1 2 3 4 5

PHOTO: A B C D

E F G H I J

DATE _____

AREA _____

UNIT _____

CAMERA: 6 7 8 9 10

PHOTO: A B C D

E F G H I J

SHRUB PHOTO SAMPLING

DATE _____ 0 END

AREA _____

ALLOT. _____

TRANSECT 1 2 3 4 5

SHRUB 1A 1B 2A 2B 3A 3B

4A 4B 5A 5B 6A 6B 7A 7B

8A 8B 9A 9B 10A 10B

SQUARE FOOT FREQUENCY

DATE _____ AREA _____

ALLOT. _____

CLUSTER _____ TRANS: 1 2 3 4 5

PLOT	1	2	3	4	5	6	7	8	9	10
FEET	0 - 1	5 - 6	10 - 11	15 - 16	20 - 21	25 - 26	30 - 31	35 - 36	40 - 41	45 - 46
	11	12	13	14	15	16	17	18	19	20
FEET	50 - 51	55 - 56	60 - 61	65 - 66	70 - 71	75 - 76	80 - 81	85 - 86	90 - 91	95 - 96

NESTED FREQUENCY

DATE _____ AREA _____

ALLOT. _____

CLUSTER _____ TRANS: 1 2 3 4 5

PLOT	1	2	3	4	5	6	7	8	9	10
FEET	0 - 1.6	5 - 6.6	10 - 11.6	15 - 16.6	20 - 21.6	25 - 26.6	30 - 31.6	35 - 36.6	40 - 41.6	45 - 46.6
	11	12	13	14	15	16	17	18	19	20
FEET	50.- 51.6	55 - 56.6.	60 - 61.6	65 - 66.6	70 - 71.6	75 - 76.6	80 - 81.6	85 - 86.6	90 - 91.6	95 - 96.6

9 SQ.FEET – 1 SQ. METER

DATE _____

AREA _____

ALLOT. _____

CLUSTER _____

TRANSECT: 1 2 3 4 5

PLOT:	1	2	3	4	5
FEET	3.5-6.5	25-28	50-53	75-78	96.5-93.5
METERS	1-2	7-8	15-16	22-23	29-28

UTILIZATION - ROBEL POLE

Date_____ Cluster____

Area_____

Allot._____

Transect: 1 2 3 4 5

1A 1B 2A 2B 3A 3B 4A 4B

5A 5B 6A 6B 7A 7B 8A 8B

9A 9B 10A 10B 11A 11B

12A 12B 13A 13B 14A 14B

UTILIZATION - ROBEL POLE

Date _____ Cluster____

Area _____

Allot._____

Transect: 1 2 3 4 5

15A 15B	16A 16B	17A 17B
18A 18B	19A 19B	20A 20B
21A 21B	22A 22B	23A 23B
24A 24B	25A 25B	

SAMPLING SITE DESCRIPTION AND LOCATION

Circle: 1 Sq.Ft. Nested Freq. 1 sq.m. Robel Pole Shrub Form _____

Date _____
Area _____
Allot._____
Cluster No. _____
Transects: 1 2 3 4 5
Plant community _____
_____
Grazing system:
Type _____Date_____
Type _____Date_____
Type _____Date_____

Kind of animal: cattle sheep
horses goats deer
elk _____

Location: T._____ R._____
Sec._____
Description:_____
_____
_____
_____

Site Data: Elev._____ % slope_____
Slope aspect: N NE E SE S SW W NW
Slope position: top up 1/3 mid low 1/3 bottom
Micro topography: convex flat concave
Macro topography: flat undulating rolling
steep rough broken

Geology:
Deposition: wind stream lake colluvial
residual_____
Material: limestone mudstone sandstone
granite serpentine diorite
basalt andesite rhyolite
tuffacious cinders pumice ash

Soil:
Restrictive layer: absent clay pan bedrock
cemented _____
Surface compaction: none moderate severe
Soil profile stone: absent gravel stony
Soil texture: sandy loamy silty clayey ashy
Other notes:_____
_____
_____

MAP

PHOTOGRAPHIC SITE DESCRIPTION AND LOCATION

Date _____ **Area**_____
Unit_____**Observer:**_____
No. of Camera locations: _____**No. of Photo points:**____ _____
Plant community_____
Location: T._____ **R.**_____ **Sec.**_____
Location description_____
_____
Photo purpose:_____
_____
Discussion:_____
_____
_____
_____

MAP

Use back of sheet for additional details.

CAMERA LOCATION AND PHOTO POINTS

Date_____ Camera Location_____
Area_____ Number of Photo points: _____
Unit_____Observer_____
Comments _____
_____
Slope_____ Aspect _____ Slope position_____

Photo point A:
Compass bearing: _____
Distance:_____

Photo Point A

Photo point B:
Compass bearing:_____
Distance:_____

Photo Point B

CAMERA LOCATION AND PHOTO POINTS

Photo point C_____
Compass bearing:_____
Distance:_____

Photo point C

Photo Point D: _____
Compass bearing:_____
Distance:_____

Photo point D

Photo Point E: _____
Compass bearing :_____
Distance:_____

Photo point E

CAMERA LOCATION AND PHOTO POINTS

Photo Point F: _____
Compass bearing:_____
Distance:_____

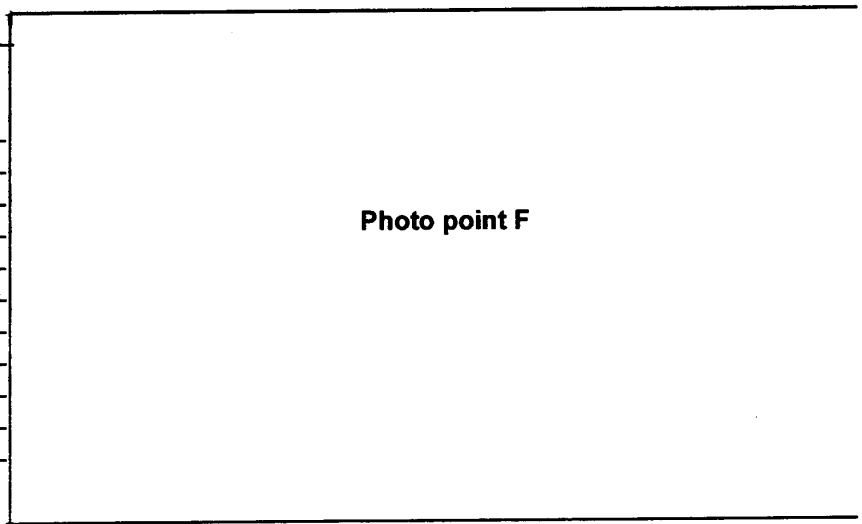


Photo Point G: ___ _____
Compass bearing:_____
Distance:_____

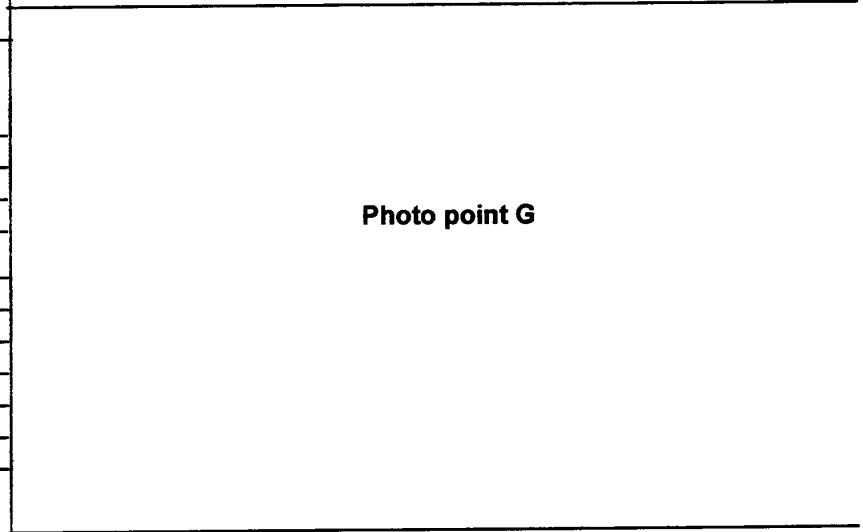
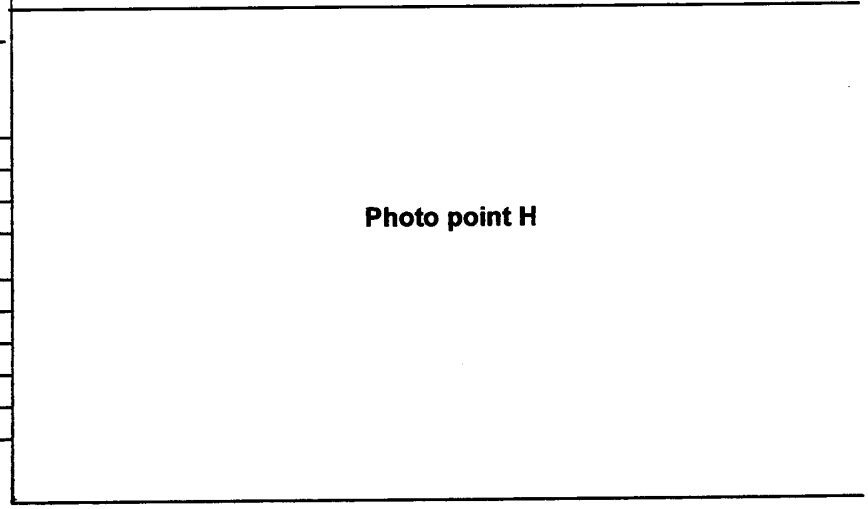


Photo Point H: _____
Compass Bearing:_____
Distance:_____



CAMERA LOCATION AND PHOTO POINTS

Photo Point I: _____
Compass bearing:_____
Distance:_____

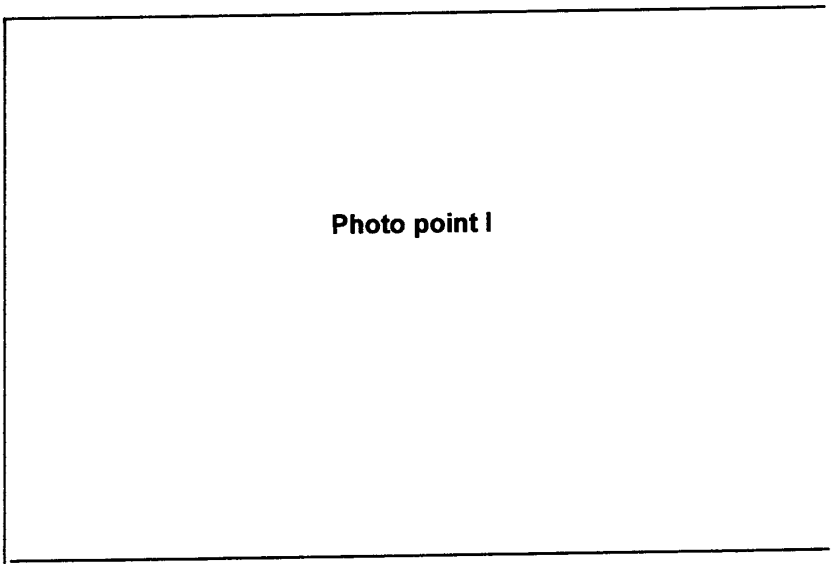


Photo Point J: _____
Compass bearing:_____
Distance:_____

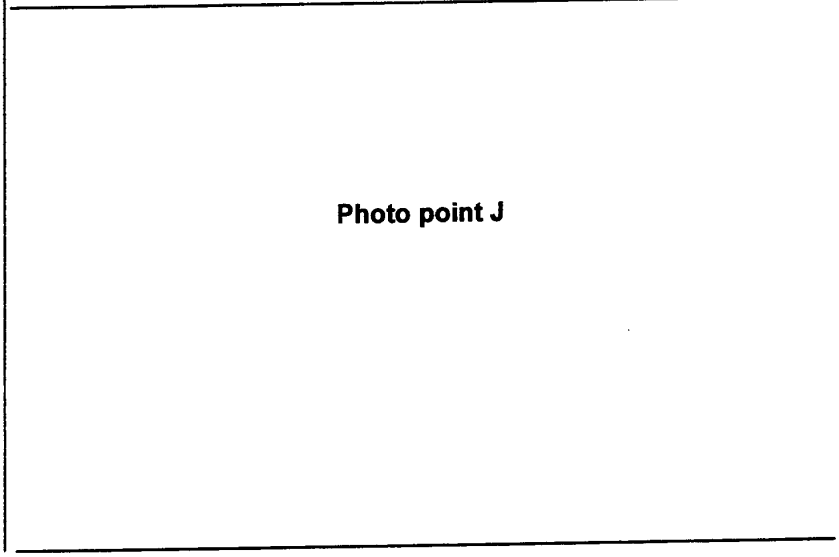


PHOTO POINTS AND CLOSE PHOTOS

Date _____ **Camera** _____

Area_____
Unit _____
Photo point: A
Observer_____
Remarks _____

General photograph of point A

Photo point A:
Left of meter board
Species/cover:_____

Comments:_____

Close photo to left of meter board

Photo point A:
Right of meter board
Species/cover: _____

Comments:_____

Close photo to right of meter board

PHOTO POINTS AND CLOSE PHOTOS

Date_____
Area_____
Unit _____
Camera _____
Photo point: B
Observer_____
Remarks _____

General photograph of point B

Photo point B
Left of meter board
Species/cover:_____

Comments:_____

Close photo to left of meter board

Photo point B
Right of meter board
Species/cover: _____

Comments:_____

Close photo to right of meter board

PHOTO POINTS AND CLOSE PHOTOS

Date_____
Area_____
Unit _____
Camera _____
Photo point: C
Observer_____
Remarks _____

General photograph of point C

Photo point C
Left of meter board
Species/cover:_____

Comments:_____

Close photo to left of meter board

Photo point C
Right of meter board
Species/cover: _____

Comments:_____

Close photo to right of meter board

PHOTO POINTS AND CLOSE PHOTOS

Date_____
Area_____
Unit _____
Camera _____
Photo point: D
Observer_____
Remarks _____

General photograph of point D

Photo point D
Left of meter board
Species/cover:_____

Comments:_____

Close photo to left of meter board

Photo point D
Right of meter board
Species/cover: _____

Comments:_____

Close photo to right of meter board

PHOTO POINTS AND CLOSE PHOTOS

Date_____
Area_____
Unit _____
Camera _____
Photo point: E
Observer_____
Remarks _____

General photograph of point E

Photo point E
Left of meter board
Species/cover:_____

Comments:_____

Close photo to left of meter board

Photo point E
Right of meter board
Species/cover: _____

Comments:_____

Close photo to right of meter board

PHOTO POINTS AND CLOSE PHOTOS

Date_____
Area_____
Unit _____
Camera _____
Photo point: ____
Observer_____
Remarks _____

General photograph of point _____

Photo point _____
Left of meter board
Species/cover:_____

Comments:_____

Close photo to left of meter board

Photo point _____
Right of meter board
Species/cover: _____

Comments:_____

Close photo to right of meter board

PHOTO POINTS WITH OVERHEAD VIEWS

Date_____ Camera _____
Area_____ Number of Photo points: _____
Unit_____Observer_____
Comments _____
_____
Slope_____ Aspect _____ Slope position_____ Topography _____

Photo Point A
Compass bearing: _____
Distance_____
Photo comments:_____
_____
_____
_____
_____
_____
_____
_____

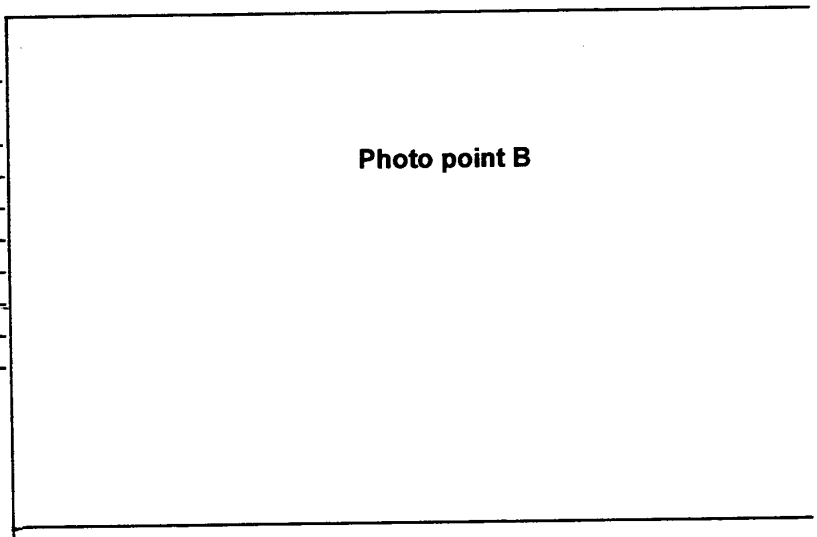
Photo point A

Overhead of Photo Point A
Photo comments:_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Overhead of photo point A

PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point B
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point B
Photo comments:_____

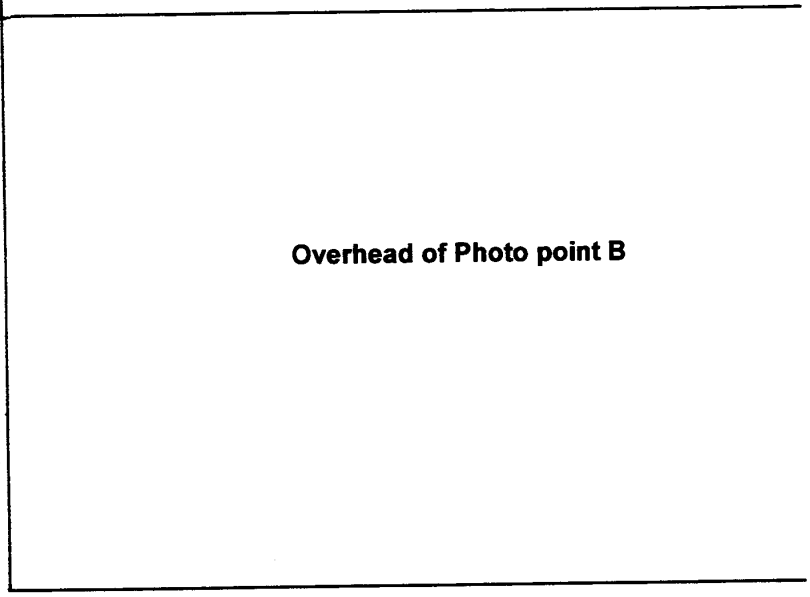


PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point C
Compass bearing: _____
Distance_____
Photo comments:_____

Photo point C

Overhead of Photo Point C
Photo comments:_____

Overhead of Photo point C

PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point D
Compass bearing: _____
Distance_____
Photo comments:_____

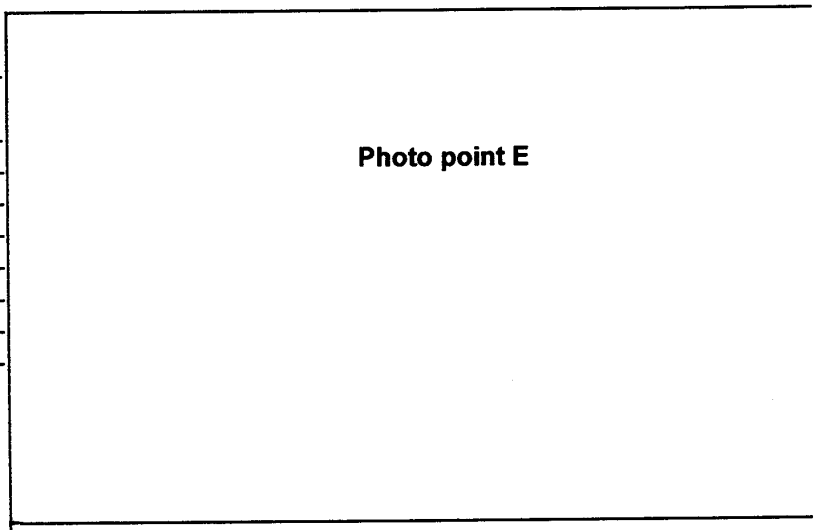
Photo point D

Overhead of Photo Point D
Photo comments:_____

Overhead of Photo point D

PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point E
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point E
Photo comments:_____

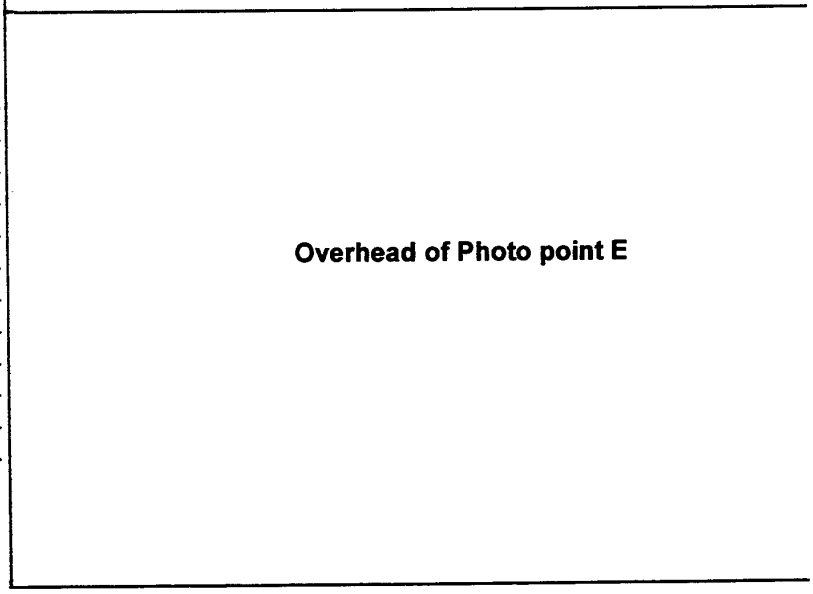
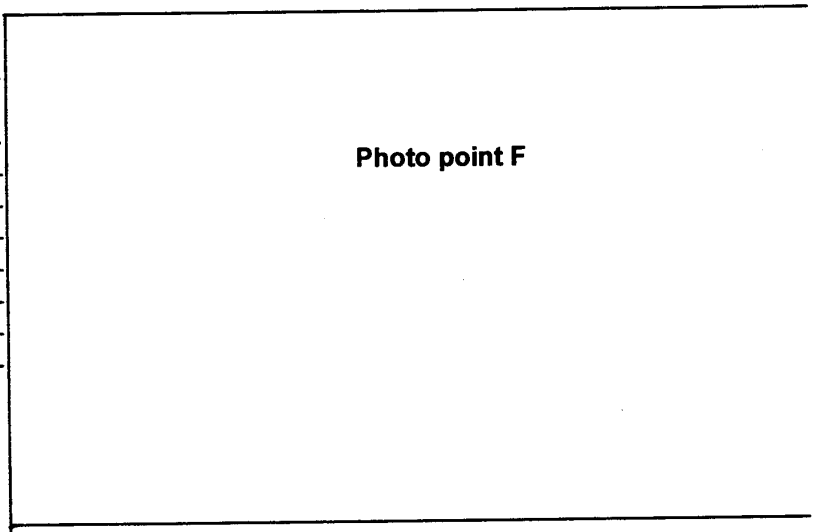


PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point F
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point F
Photo comments:_____

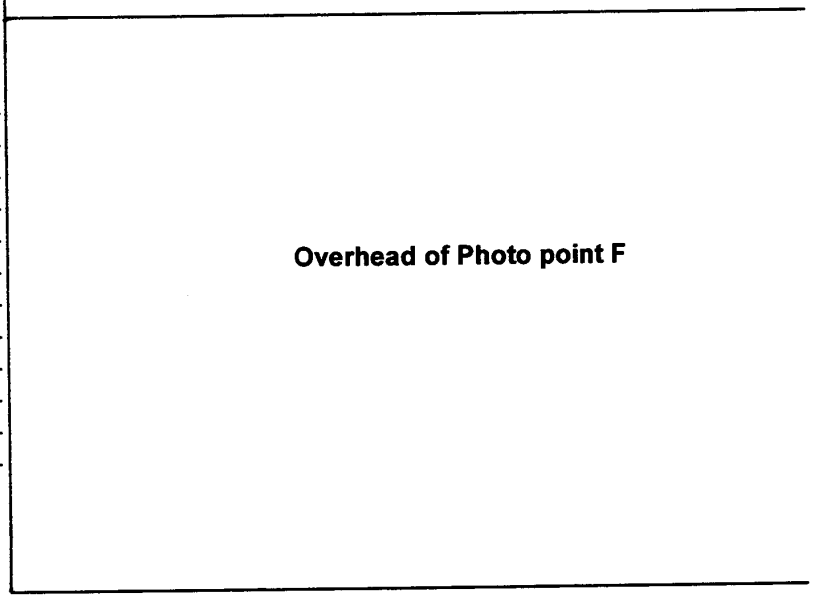
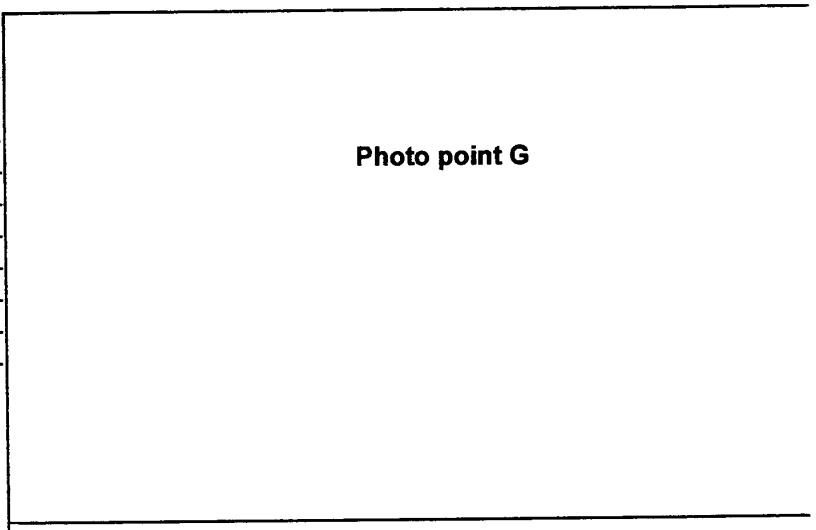


PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point G
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point G
Photo comments:_____

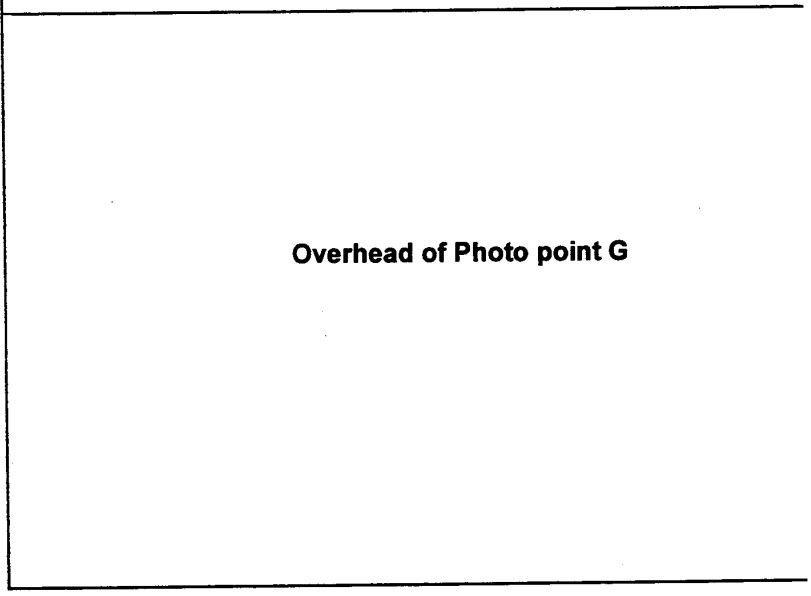
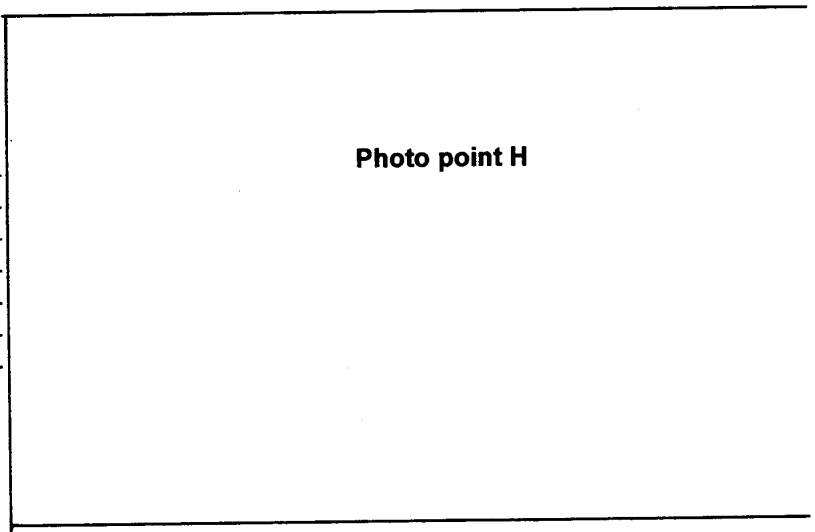


PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point H
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point H
Photo comments:_____

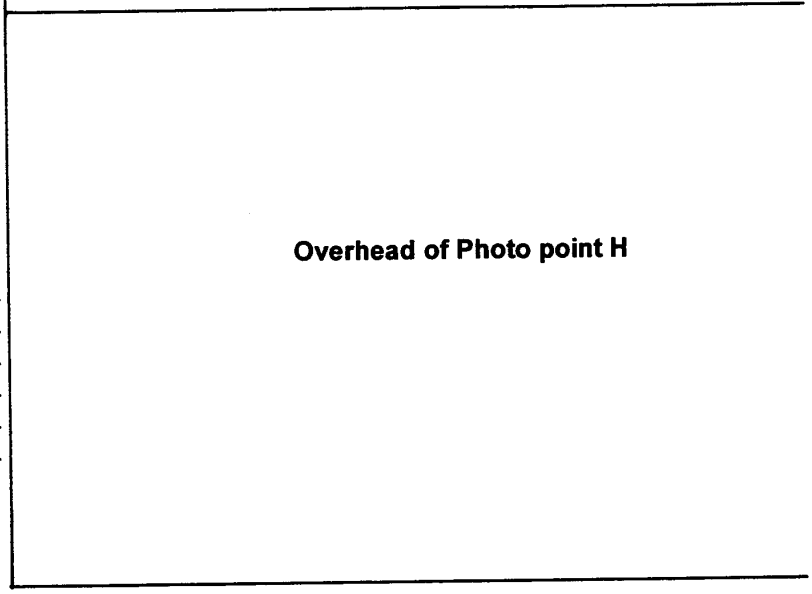
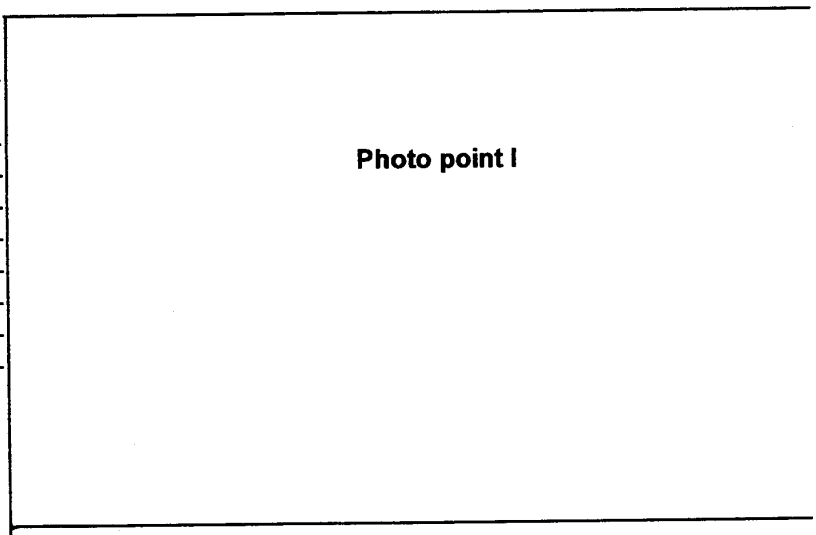


PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point I
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point I
Photo comments:_____

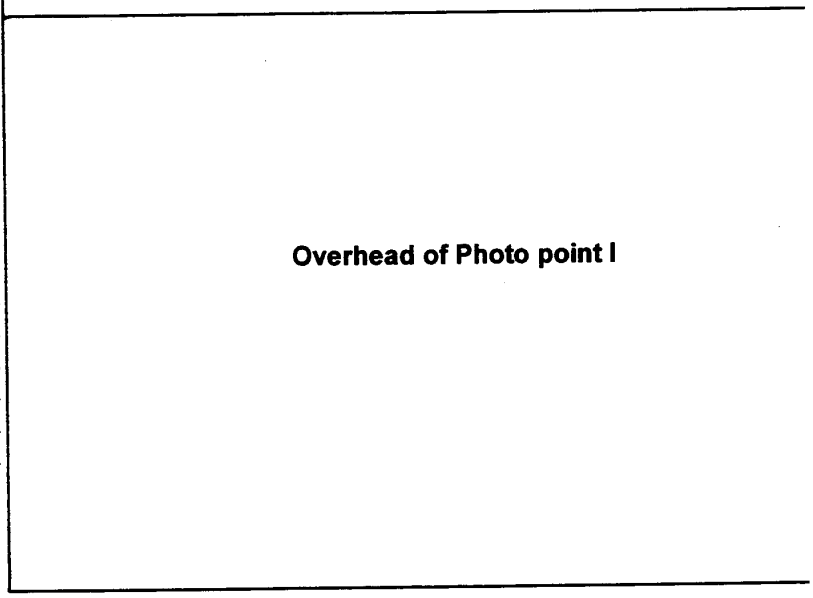
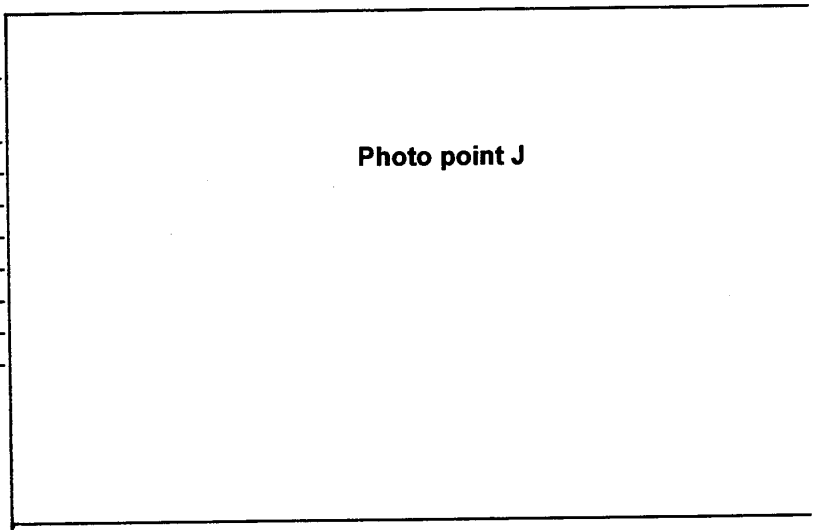
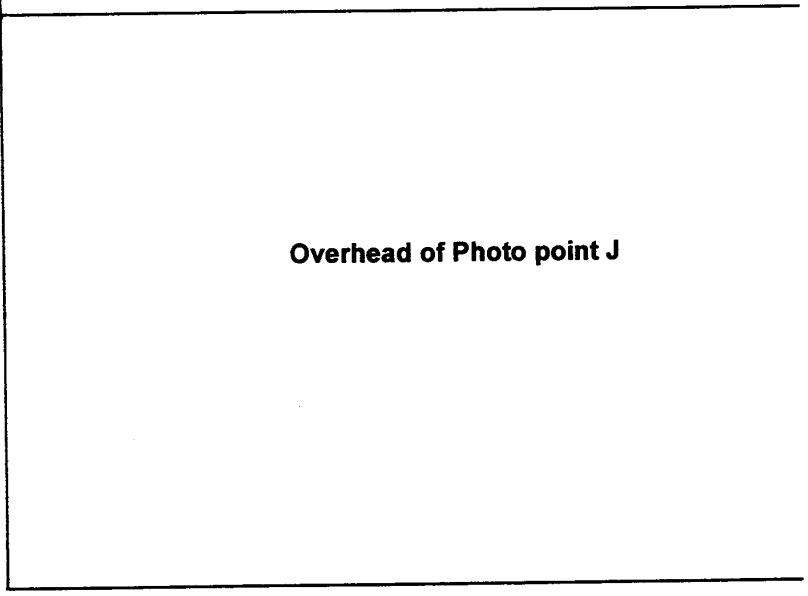


PHOTO POINTS WITH OVERHEAD VIEWS

Photo Point J
Compass bearing: _____
Distance_____
Photo comments:_____



Overhead of Photo Point J
Photo comments:_____



SHRUB PHOTO TRANSECT

Date _____ **Cluster** _____ **Transect 1 2 3 4 5**

Area _____
Allot. _____
Investigator: _____

Season of use _____
Grazing system: _____

Animals _____

Direction _____
Distance _____

General photograph down the transect

Shrub 1A
Direction _____
Distance _____
Comments _____

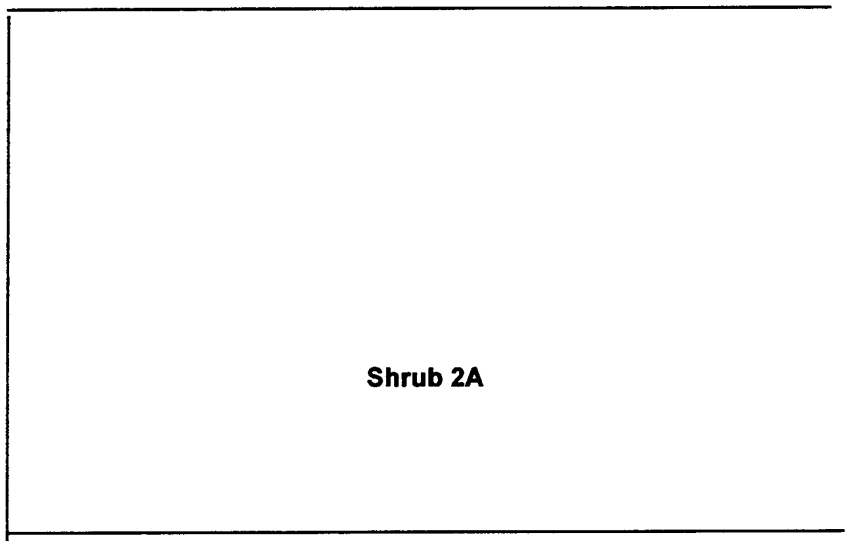
Shrub 1A

Shrub 1B
Direction _____
Distance _____
Comments _____

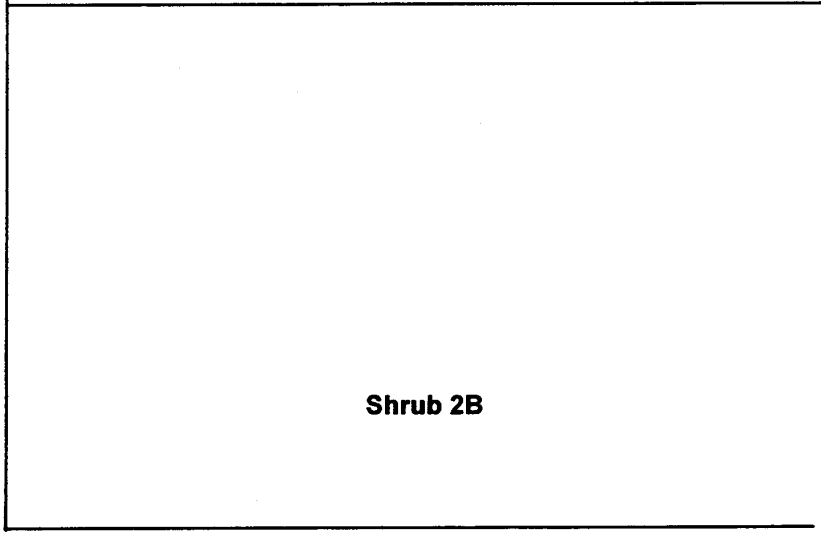
Shrub 1B

SHRUB PHOTO TRANSECT

Shrub 2A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

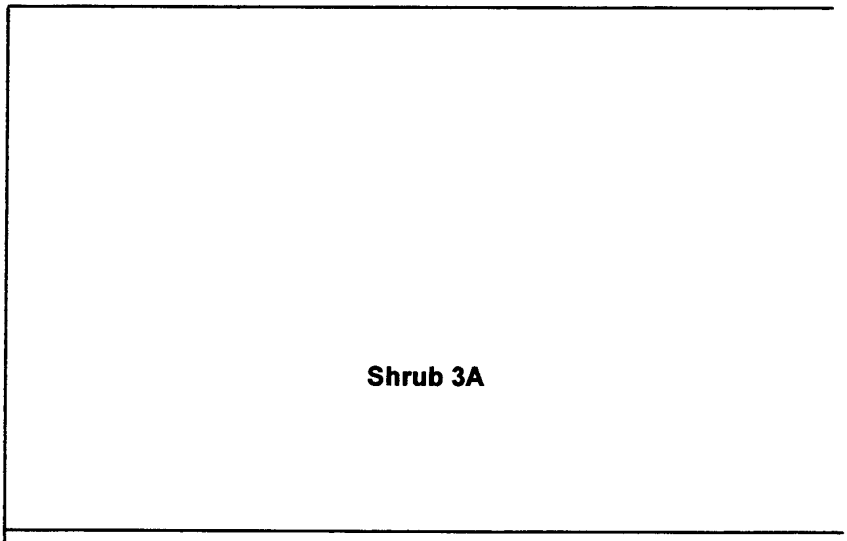


Shrub 2B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

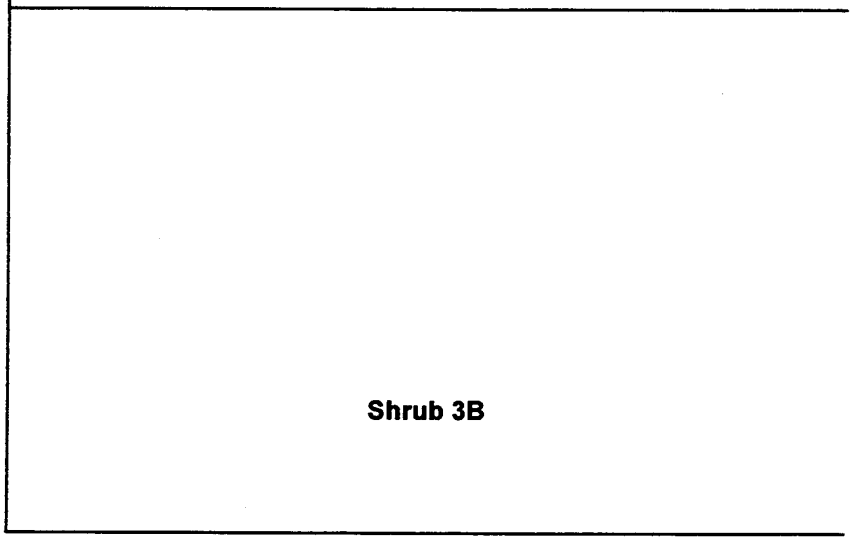


SHRUB PHOTO TRANSECT

Shrub 3A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

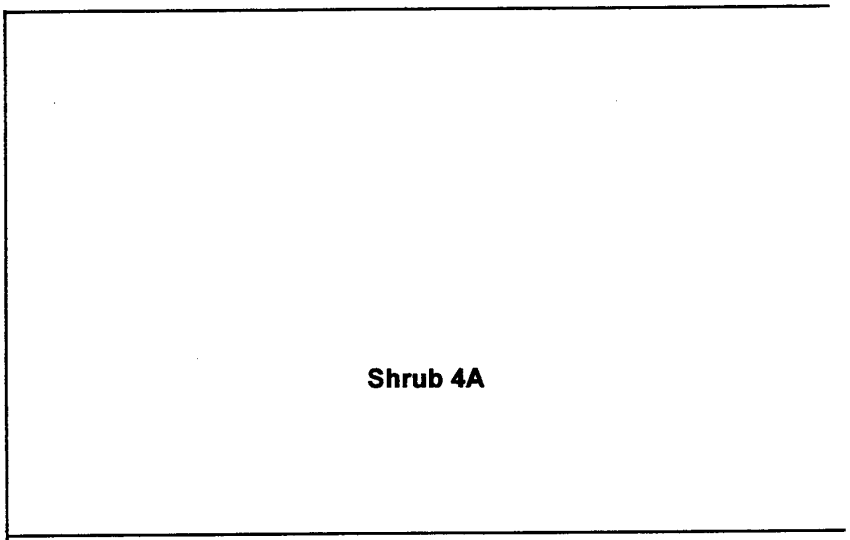


Shrub 3B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

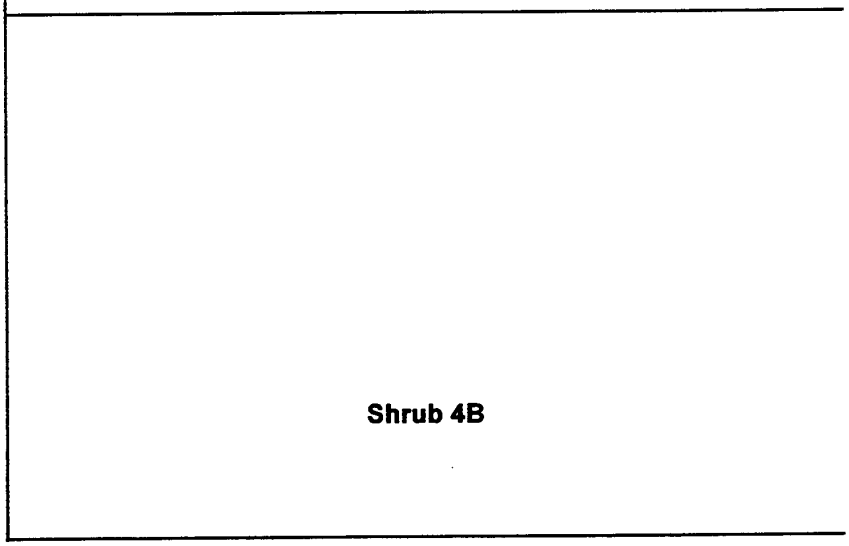


SHRUB PHOTO TRANSECT

Shrub 4A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

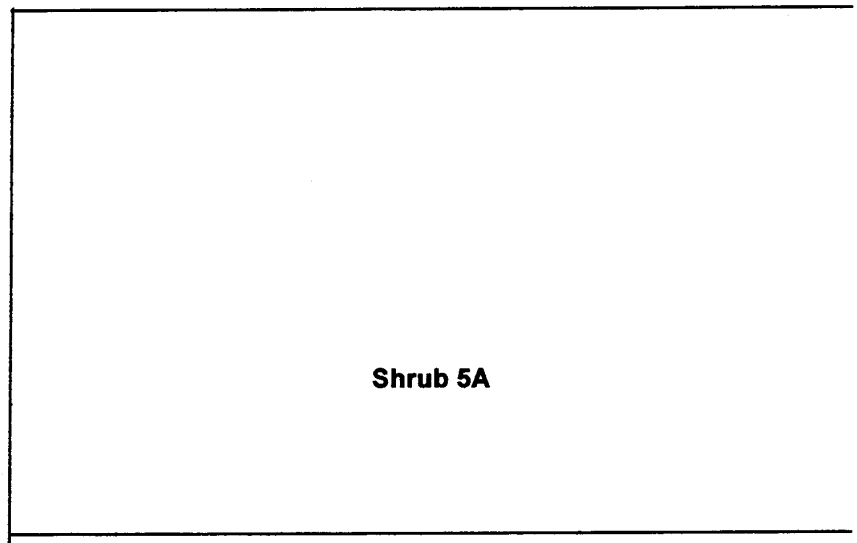


Shrub 4B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

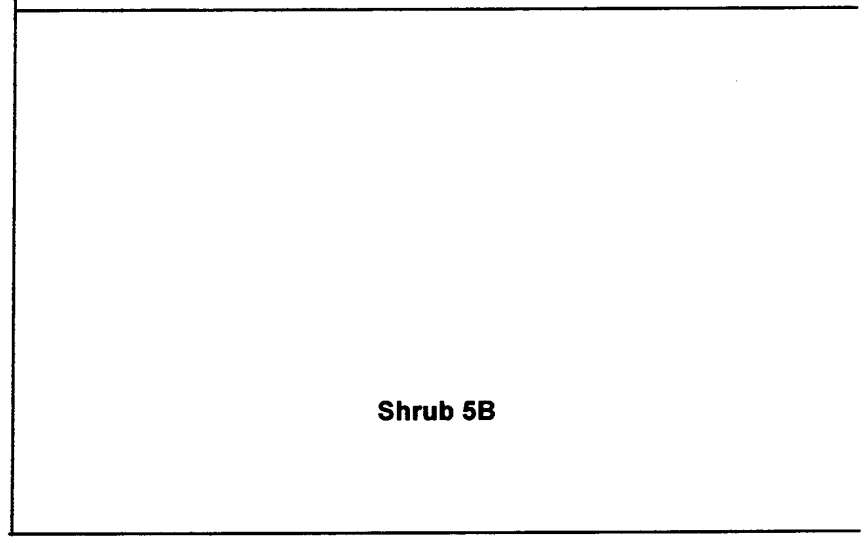


SHRUB PHOTO TRANSECT

Shrub 5A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

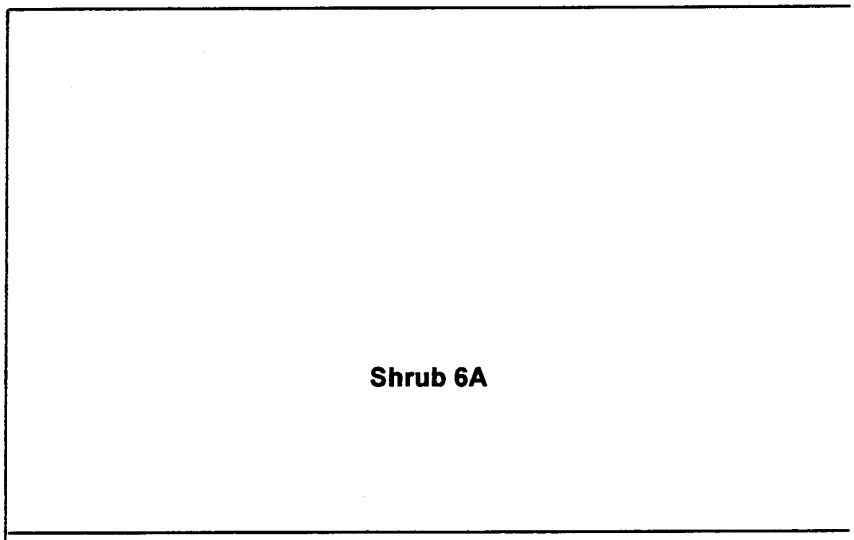


Shrub 5B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

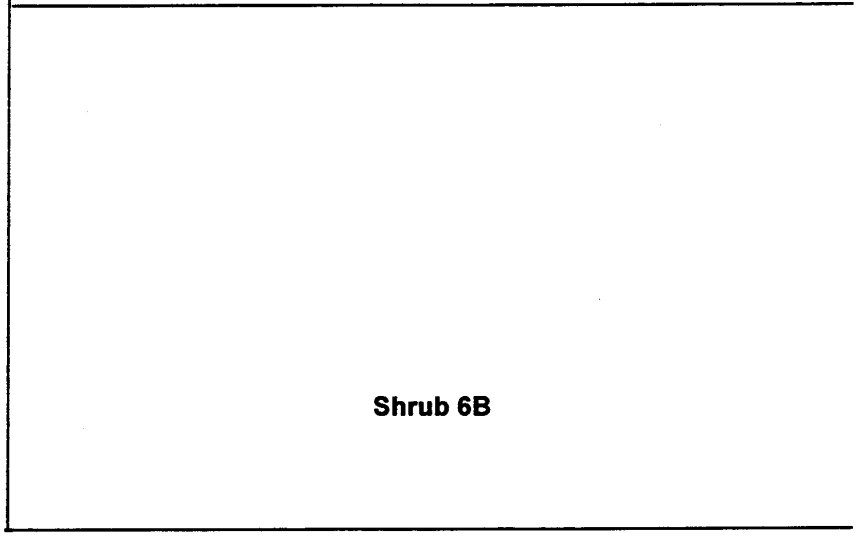


SHRUB PHOTO TRANSECT

Shrub 6A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

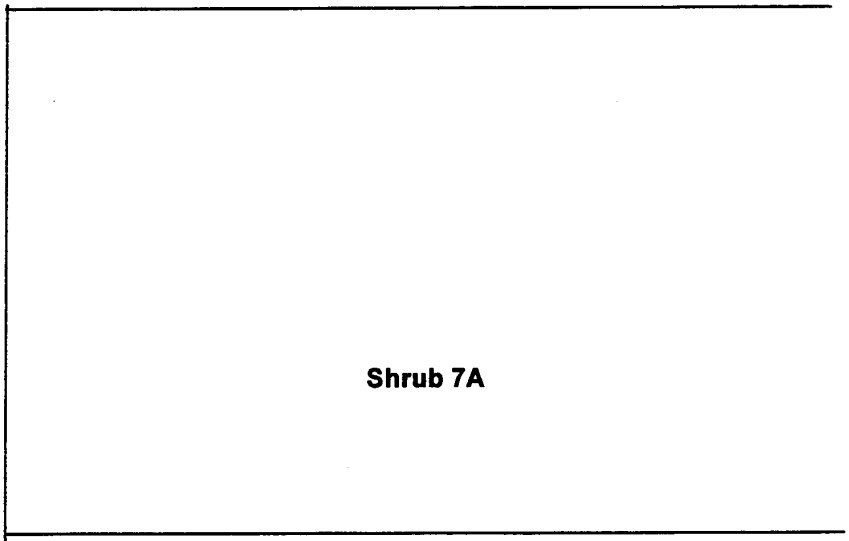


Shrub 6B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

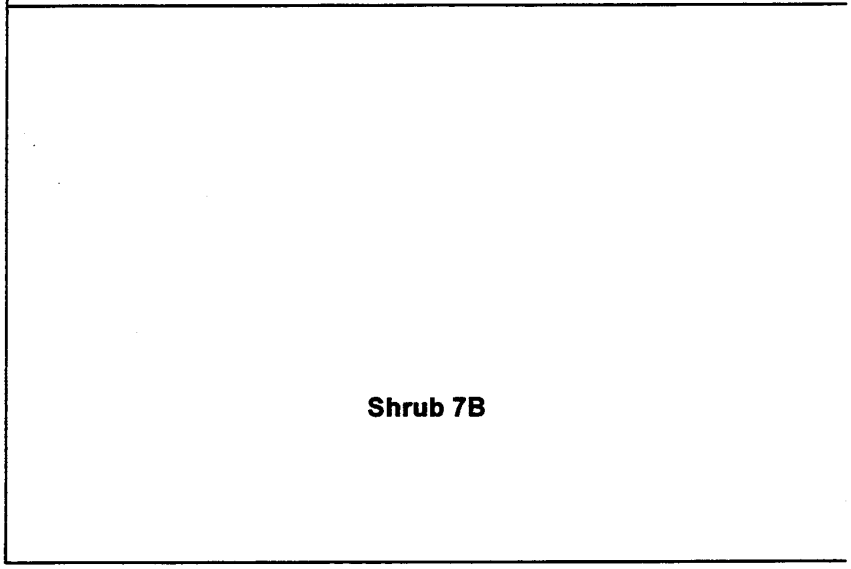


SHRUB PHOTO TRANSECT

Shrub 7A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

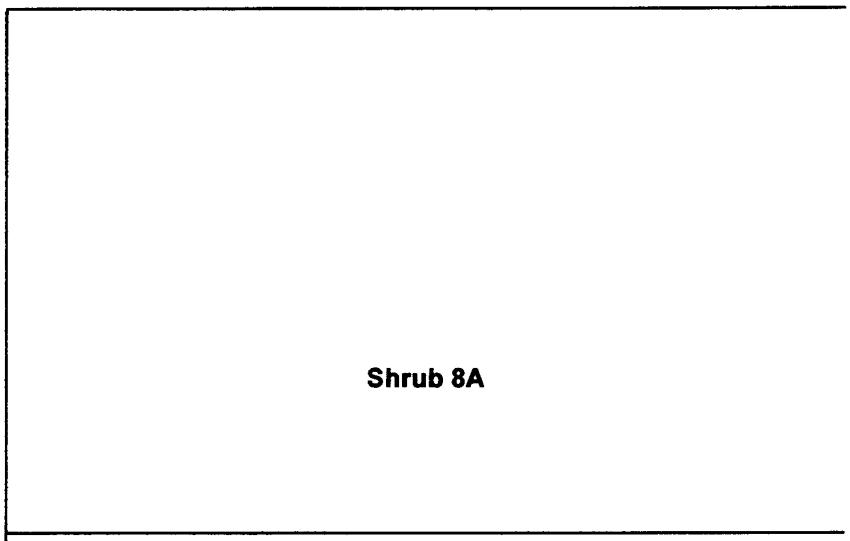


Shrub 7B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

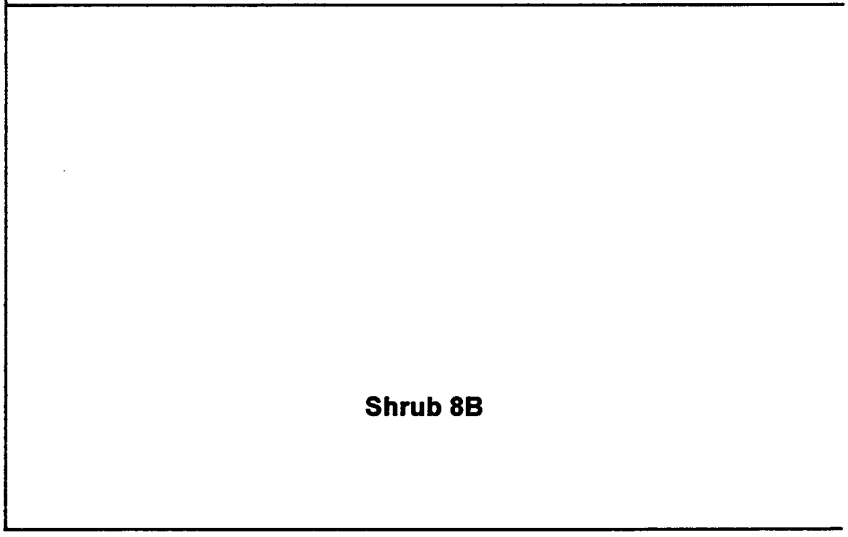


SHRUB PHOTO TRANSECT

Shrub 8A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

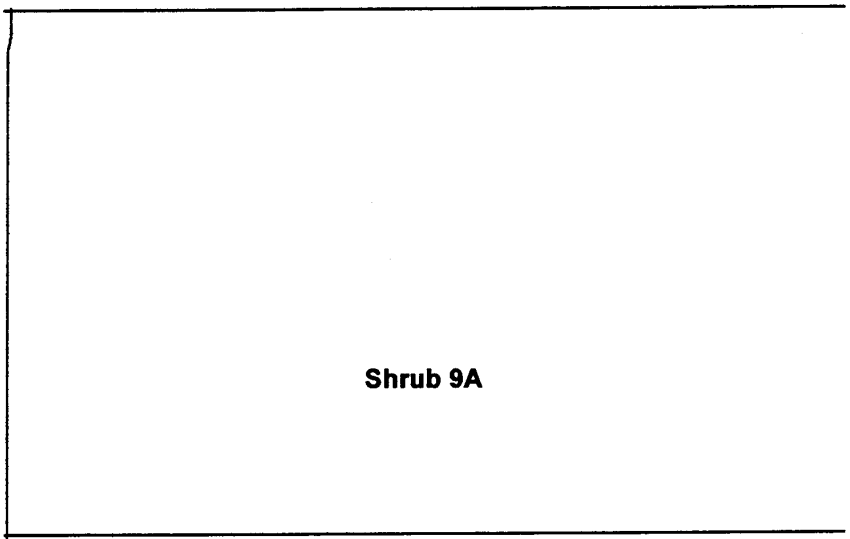


Shrub 8B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

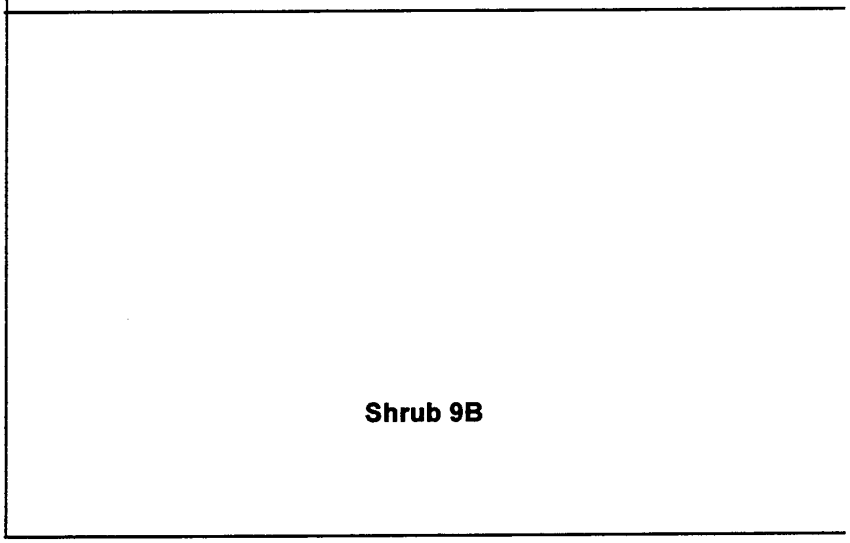


SHRUB PHOTO TRANSECT

Shrub 9A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____



Shrub 9B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____



SHRUB PHOTO TRANSECT

Shrub 10A
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

Shrub 10A

Shrub 10B
Direction _____
Distance _____
Comments_____
_____
_____
_____
_____
_____
_____

Shrub 10B

Up transect photograph:
Direction _____
Distance _____
Comments: _____
_____
_____
_____
_____
_____
_____

General photograph up the transect

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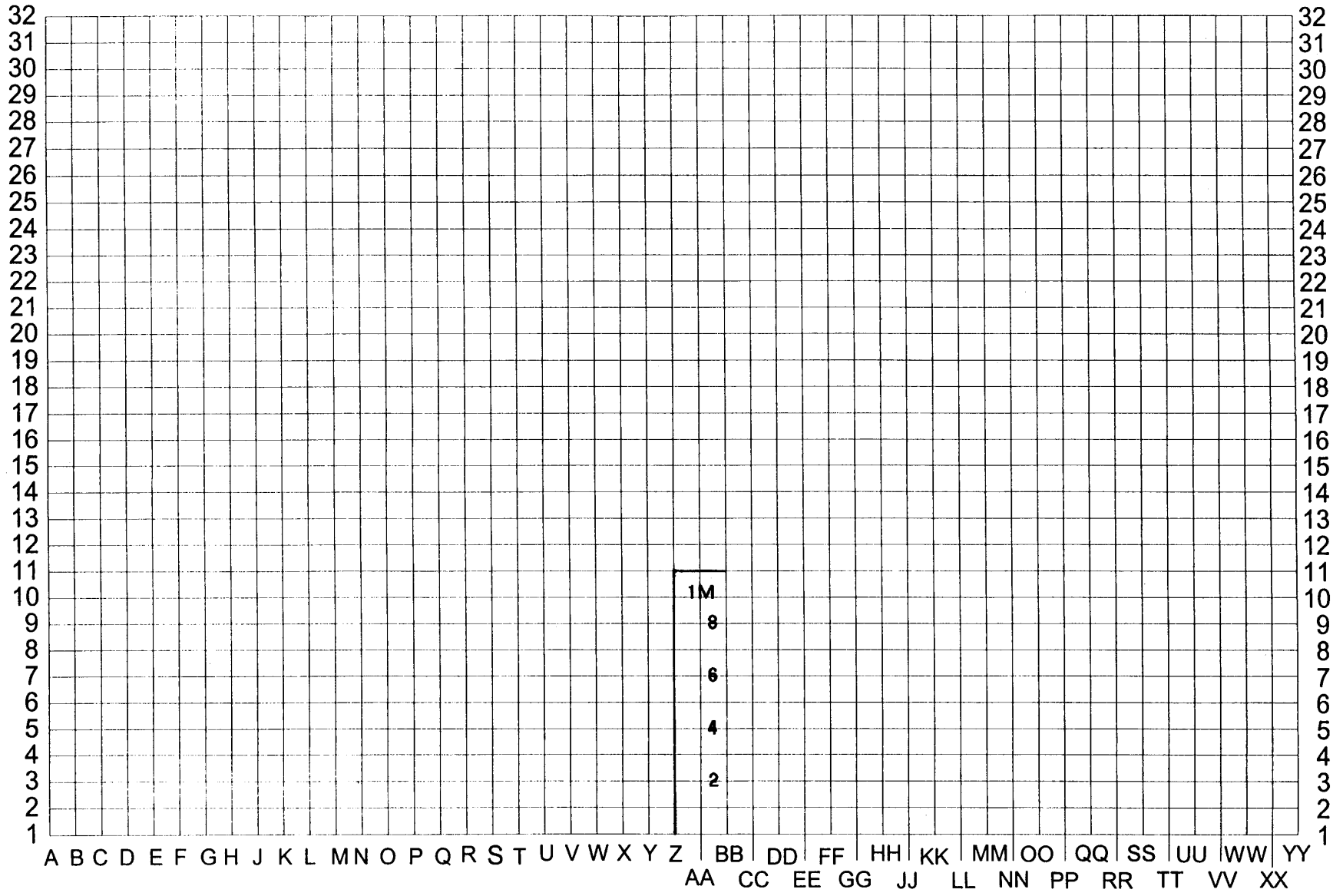
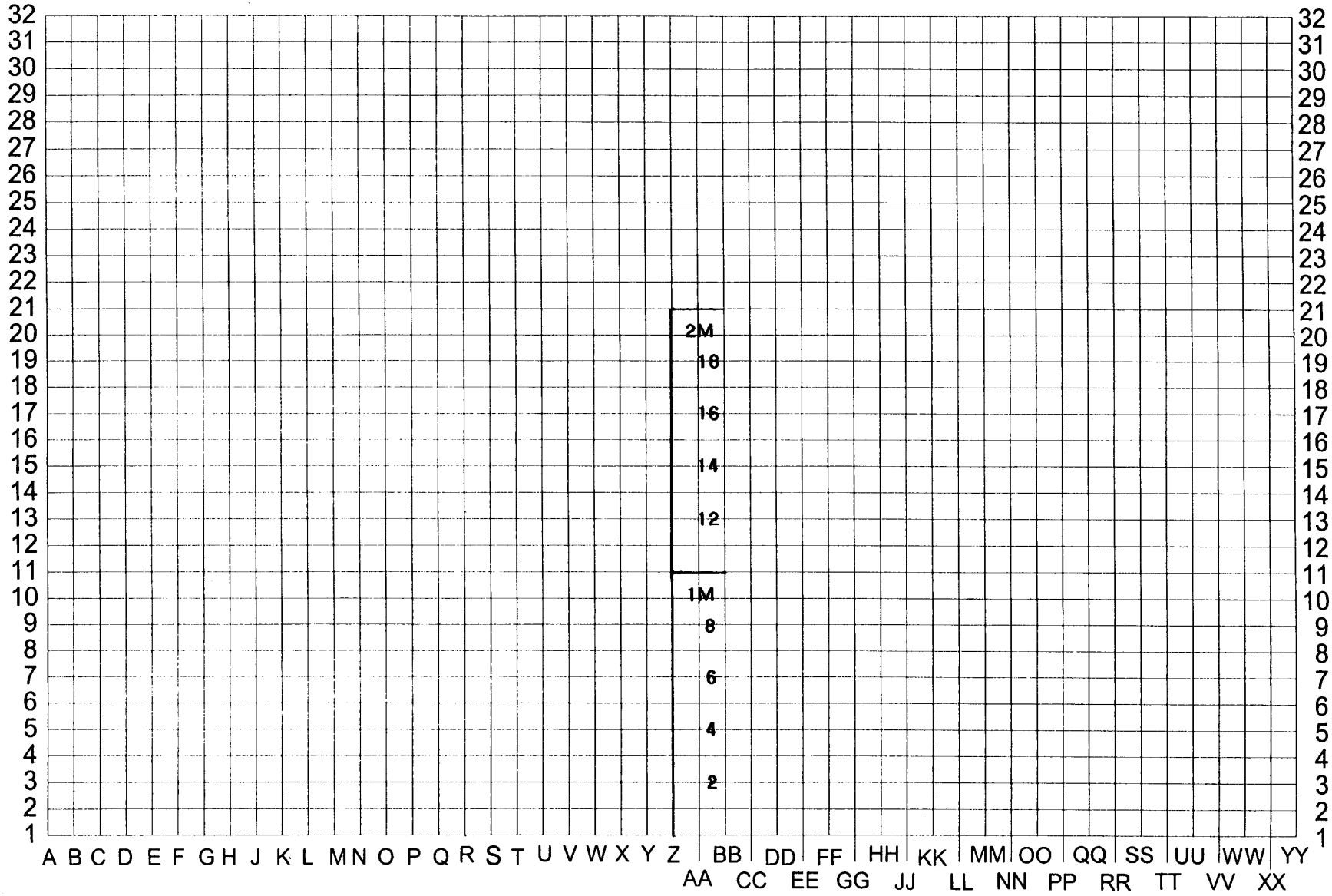
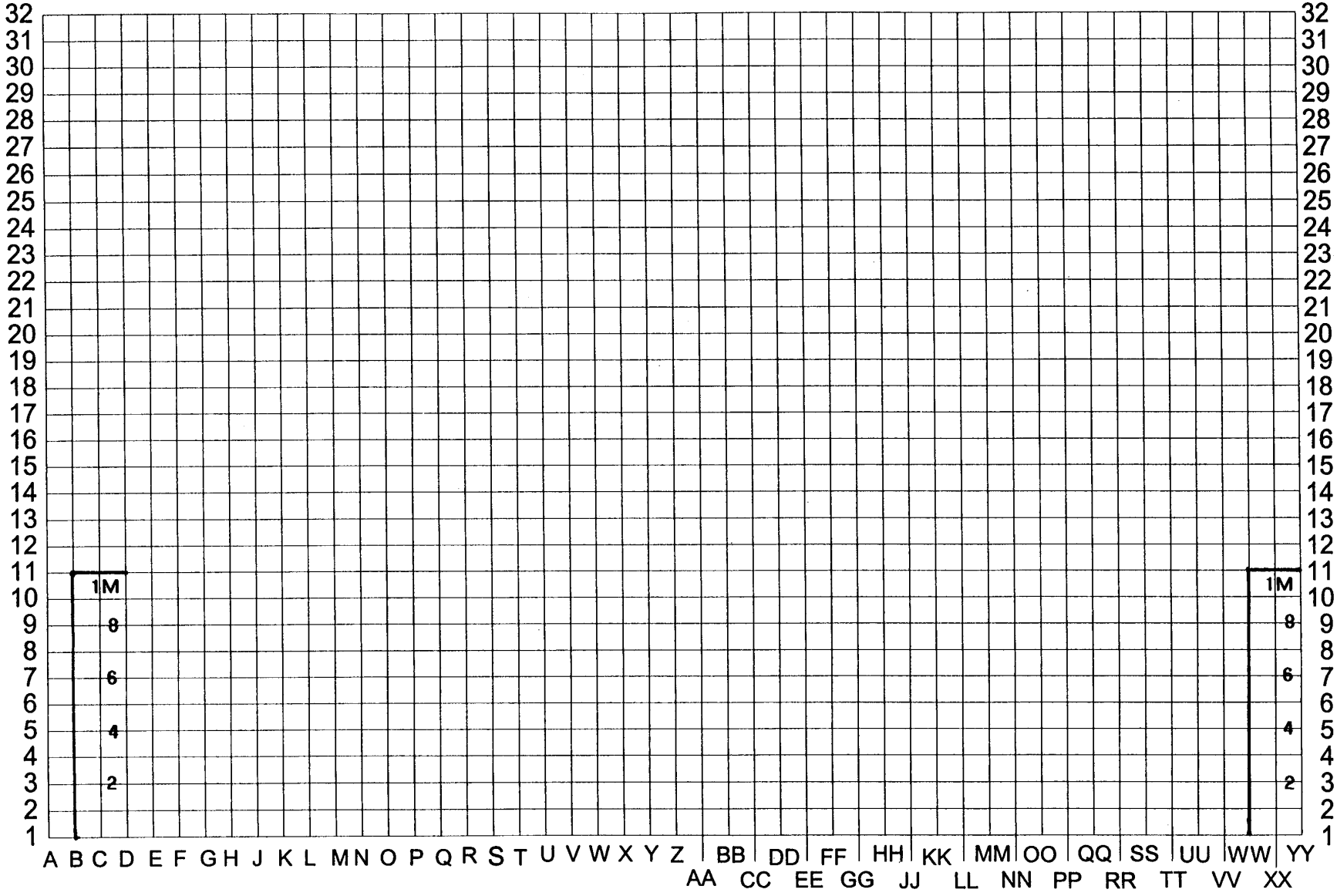
Date _____ **GRID ANALYSIS OUTLINE** **Area** _____

Observer _____ **Unit** _____

Cluster/Transect _____ **Transect/Photo** _____


32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
A B C D E F G H J K L M N O P Q R S T U V W X Y Z AA BB CC DD EE FF GG HH JJ KK LL MM NN OO PP QQ RR SS TT UU VV WW XX YY
1M
8
6
4
2


2M
18
16
14
12
1M
8
6
4
2
A B C D E F G H J K L M N O P Q R S T U V W X Y Z AA BB CC DD EE FF GG HH JJ KK LL MM NN OO PP QQ RR SS TT UU VV WW XX YY


32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
A B C D E F G H J K L M N O P Q R S T U V W X Y Z AA BB CC DD EE FF GG HH JJ KK LL MM NN OO PP QQ RR SS TT UU VV WW XX YY
1M
8
6
4
2

1999/2/19

PHOTO GRID SUMMARY

Date________________ Observer_______________________________________

Area__________________________________Unit______________________

Cluster/Camera ______________________ Transect/Photo____________________

Item #	Date	Item #	Date	Item #	Date

PHOTO TREND SAMPLE – 1 SQ.FOOT

Date _____Cluster _____ Transect 1 2 3 4 5

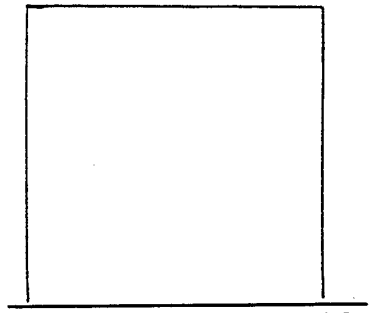
Area _____
Allot. _____
Investigator _____
_____
Season of use_____
% use _____
Grazing system_____
_____
Remarks _____
_____
_____
_____
_____
_____

General photograph down the 100 ft. (30 m)

tape from the 0 end

Size control board at 33 ft (10 m)
Photo identification paper at 15 ft (5 m)

1



0 ft 1 ft

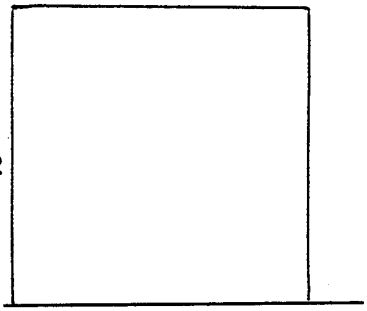
Soil surface: B G R L C

Line intercept:

Species	From	To	Feet
_____	___	___	___
_____	___	___	___
_____	___	___	___

Photograph of plot 1

2



5 ft 6 ft

Soil surface: B G R L C

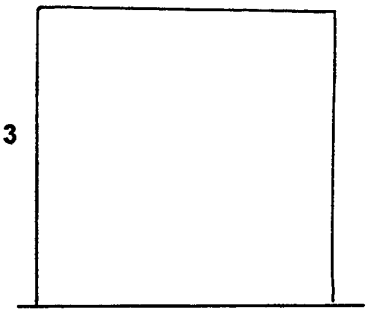
Line intercept:

Species	From	To	Feet
_____	___	___	___
_____	___	___	___
_____	___	___	___

Photograph of plot 2

PHOTO TREND SAMPLE – 1 SQ.FOOT

3



10 ft 11 ft

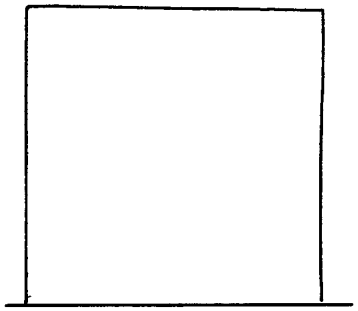
Soil surface: B G R L C

Line intercept

Species	From	to	feet

Photograph of plot 3

4



15 ft 16 ft

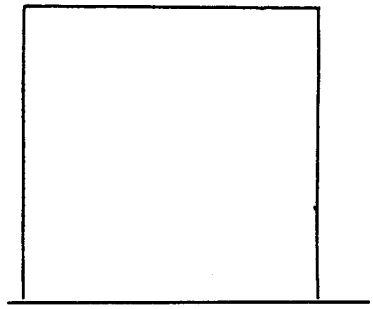
Soil surface: B G R L C

Line intercept

Species	From	to	Feet

Photograph of plot 4

5



20 ft 21 ft

Soil surface: B G R L C

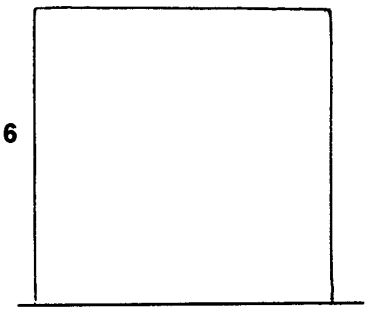
Line intercept:

Species	From	To	Feet

Photograph of plot 5

PHOTO TREND SAMPLE – 1 SQ.FOOT

6



25 ft 26 ft

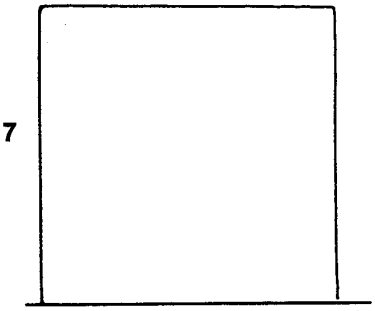
Soil surface: B G R L C

Line intercept

Species	From	to	feet

Photograph of plot 6

7



30 ft 31 ft

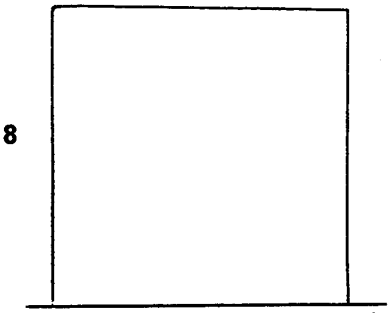
Soil surface: B G R L C

Line intercept

Species	From	to	Feet

Photograph of plot 7

8



35 ft 36 ft

Soil surface: B G R L C

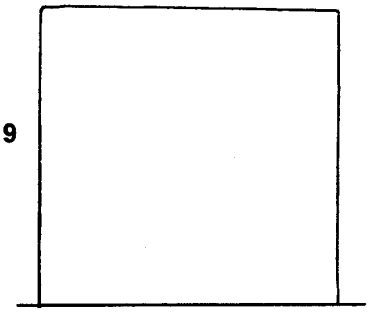
Line intercept:

Species	From	To	Feet

Photograph of plot 8

PHOTO TREND SAMPLE – 1 SQ.FOOT

9



40 ft 41 ft

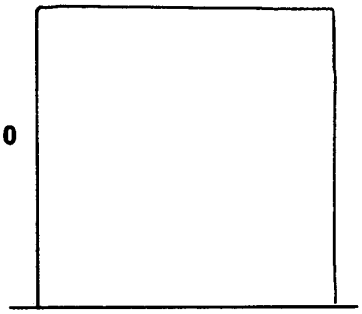
Soil surface: B G R L C

Line intercept

Species	From	to	feet

Photograph of plot 9

10



45 ft 46 ft

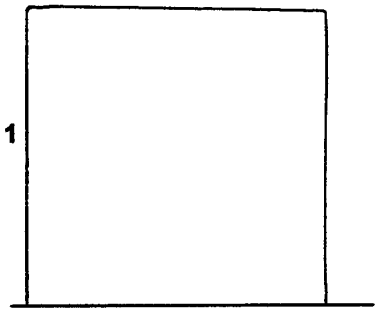
Soil surface: B G R L C

Line intercept

Species	From	to	Feet

Photograph of plot 10

11



50 ft 51 ft

Soil surface: B G R L C

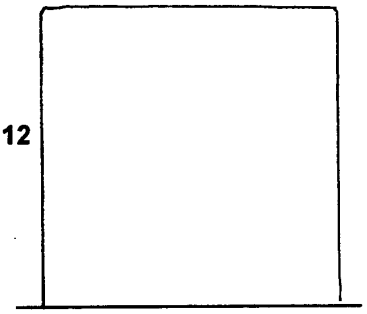
Line intercept:

Species	From	To	Feet

Photograph of plot 11

PHOTO TREND SAMPLE – 1 SQ.FOOT

12



55 ft 56 ft

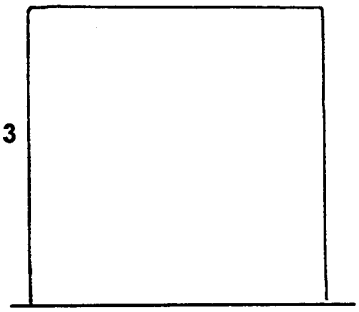
Soil surface: B G R L C

Line intercept

Species	From	to	feet

Photograph of plot 12

13



60 ft 61 ft

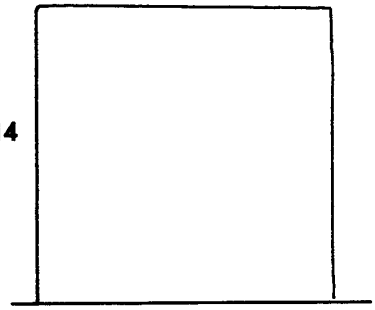
Soil surface: B G R L C

Line intercept

Species	From	to	Feet

Photograph of plot 13

14



65 ft 66 ft

Soil surface: B G R L C

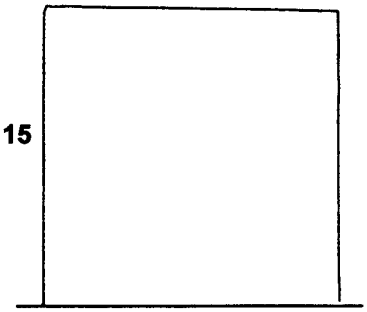
Line intercept:

Species	From	To	Feet

Photograph of plot 14

PHOTO TREND SAMPLE – 1 SQ.FOOT

15



70 ft 71 ft

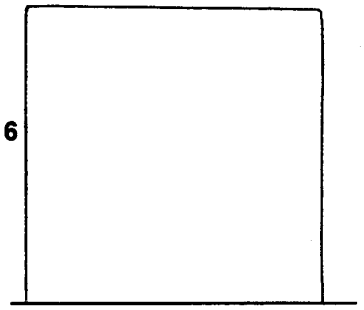
Soil surface: B G R L C

Line intercept

Species	From	to	feet

Photograph of plot 15

16



75 ft 71 ft

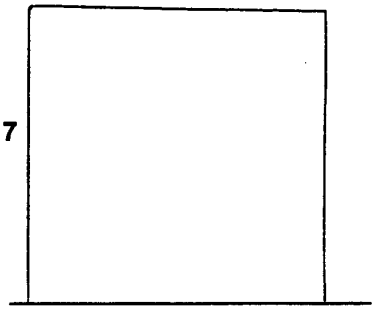
Soil surface: B G R L C

Line intercept

Species	From	to	Feet

Photograph of plot 16

17



80 ft 81 ft

Soil surface: B G R L C

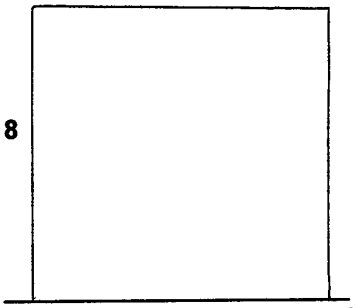
Line intercept:

Species	From	To	Feet

Photograph of plot 17

PHOTO TREND SAMPLE – 1 SQ.FOOT

18



85 ft 86 ft

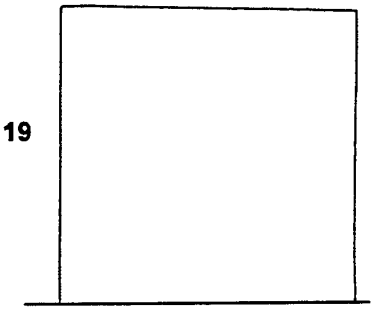
Soil surface: B G R L C

Line intercept

Species	From	to	feet

Photograph of plot 18

19



90 ft 91 ft

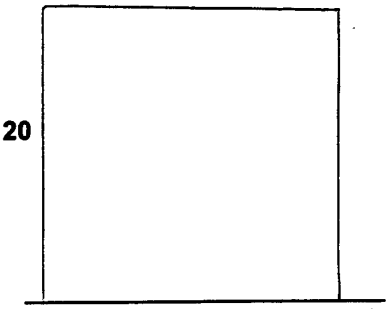
Soil surface: B G R L C

Line intercept

Species	From	to	Feet

Photograph of plot 19

20



95 ft 96 ft

Soil surface: B G R L C

Line intercept:

Species	From	To	Feet

Photograph of plot 20

PHOTO TREND SAMPLE – 1 SQ.FOOT

SUMMARY

Species	Frequ.	Interc.

Bare soil ______
Gravel pavement ______
Rock ______
Litter ______
Cryptogams ______

Estimated Utilization

Species	% Use

General photograph up the 100 ft (30 m)

tape from the 100 (30m) end

Size control board at 67 ft (20 m)
Photo identification paper at 85 ft (26 m)

ACTIVITIES

Logging ______
Fire ______
Revegetation ______
Insects ______
Wildlife ______

Other ______

CLIMATE compared to Average

	This Yr.	Last Yr.	Two Yrs.	Three Yrs	Four Yrs.
Temp	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -
Ppt.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -

Apparent range condition ______
Apparent range trend ______

COMMENTS

PHOTO TREND SAMPLE – NESTED FREQUENCY

Date _____ Cluster _____ Transect 1 2 3 4 5

Area_____

Allot._____

Investigator _____

_____

Season of use _____

% use _____

Grazing system _____

_____

Remarks _____

_____

_____

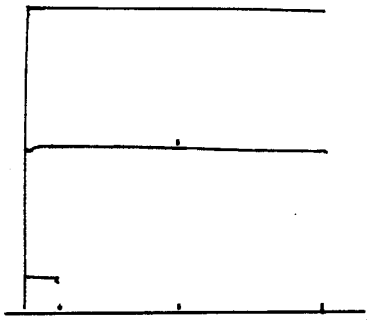
_____

General photograph down the 100 ft. (30 m)

tape from the 0 end

Size control board at 33 ft (10 m)
Photo identification paper at 15 ft. (5 m)

1



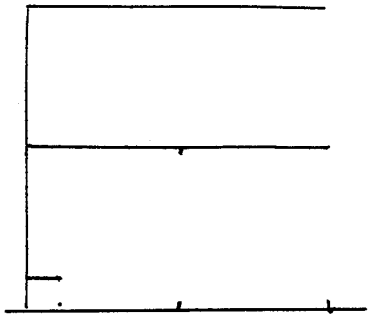
0.0 ft 1.6 ft

Line intercept:

Species	From	To	Feet

Photograph of plot 1

2



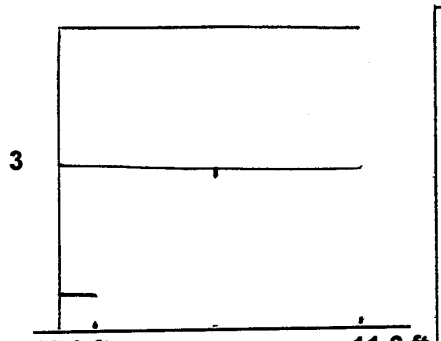
5.0 ft 6.6 ft

Line intercept:

Species	From	To	Feet

Photograph of plot 2

PHOTO TREND SAMPLE – NESTED FREQUENCY

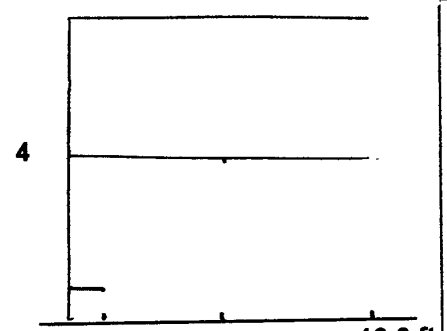


10.0 ft 11.6 ft

Line intercept

Species	From	to	feet

Photograph of plot 3

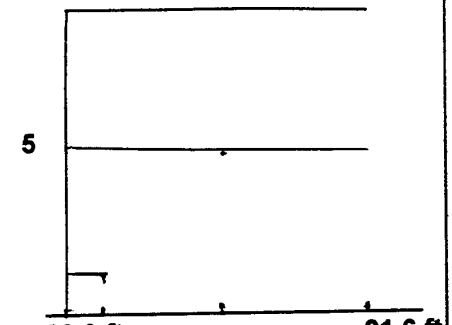


15.0 ft 16.6 ft

Line intercept

Species	From	to	Feet

Photograph of plot 4



20.0 ft 21.6 ft

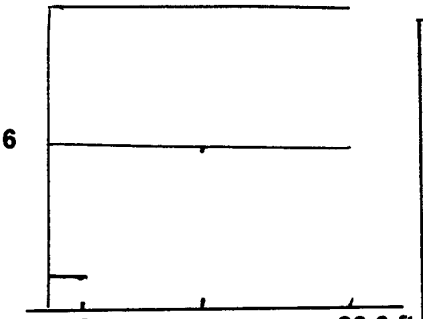
Line intercept:

Species	From	To	Feet

Photograph of plot 5

PHOTO TREND SAMPLE – NESTED FREQUENCY

6



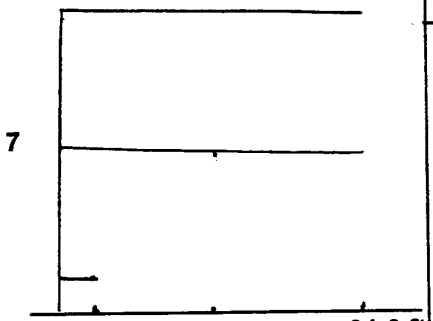
25.0 ft 26.6 ft

Line intercept

Species	From	to	feet

Photograph of plot 6

7



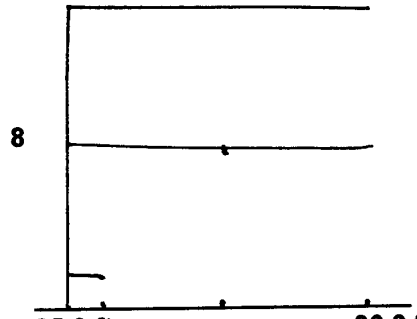
30.0 ft 31.6 ft

Line intercept

Species	From	to	Feet

Photograph of plot 7

8



35.0 ft 36.6 ft

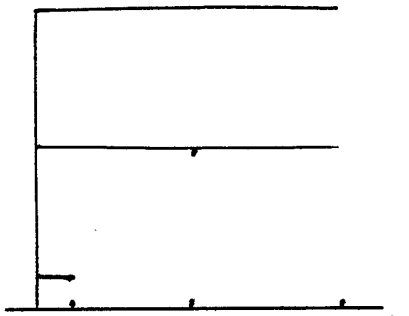
Line intercept:

Species	From	To	Feet

Photograph of plot 8

PHOTO TREND SAMPLE – NESTED FREQUENCY

9



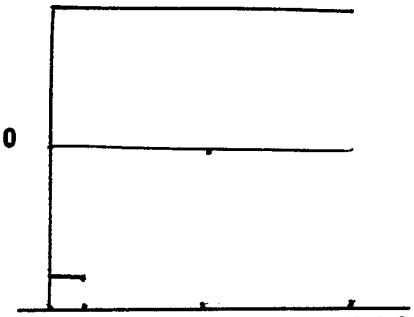
40.0 ft 41.6 ft

Line intercept

Species	From	to	feet

Photograph of plot 9

10



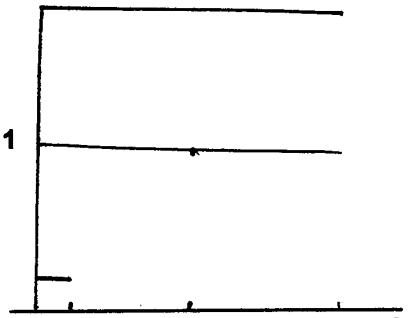
45.0 46.6 ft

Line intercept

Species	From	to	Feet

Photograph of plot 10

11



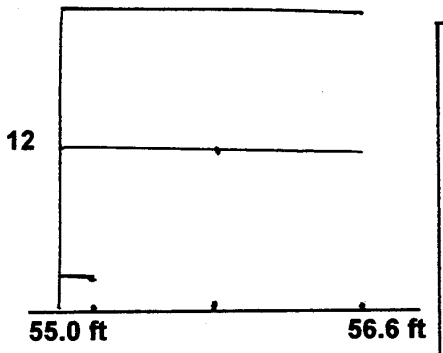
50.0 ft 51.6 ft

Line intercept:

Species	From	To	Feet

Photograph of plot 11

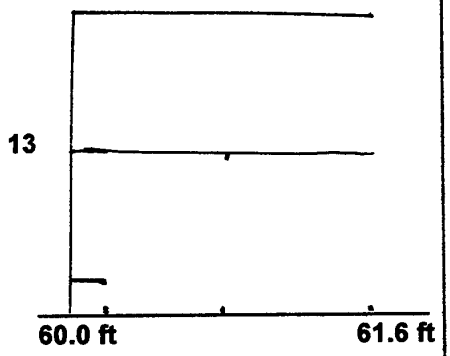
PHOTO TREND SAMPLE – NESTED FREQUENCY



Line intercept

Species	From	to	feet

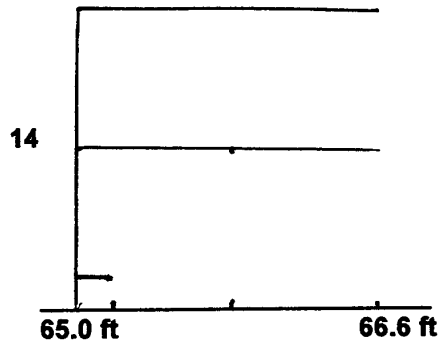
Photograph of plot 12



Line intercept

Species	From	to	Feet

Photograph of plot 13



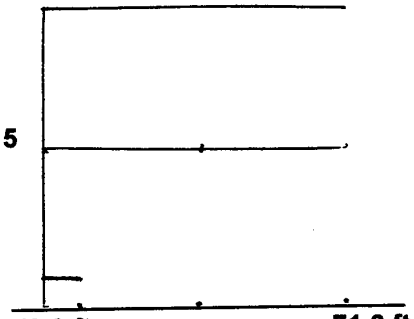
Line intercept:

Species	From	To	Feet

Photograph of plot 14

PHOTO TREND SAMPLE – NESTED FREQUENCY

15



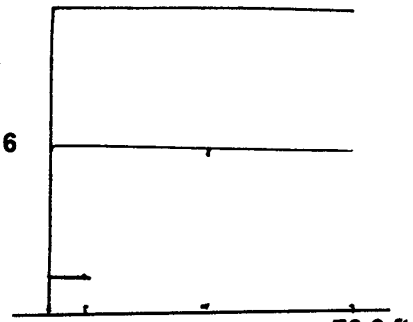
70.0 ft 71.6 ft

Line intercept

Species	From	to	feet

Photograph of plot 15

16



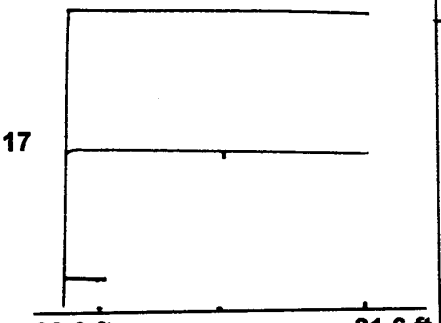
75.0 ft 76.6 ft

Line intercept

Species	From	to	Feet

Photograph of plot 16

17



80.0 ft 81.6 ft

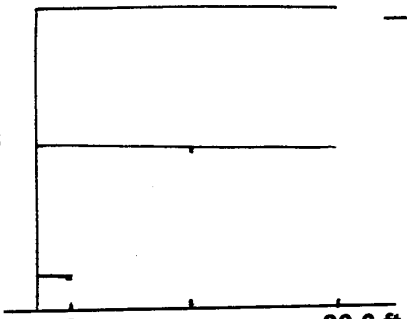
Line intercept:

Species	From	To	Feet

Photograph of plot 17

PHOTO TREND SAMPLE – NESTED FREQUENCY

18



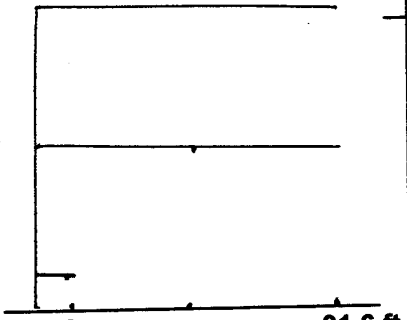
85.0 ft 86.6 ft

Line intercept

Species	From	to	feet

Photograph of plot 18

19



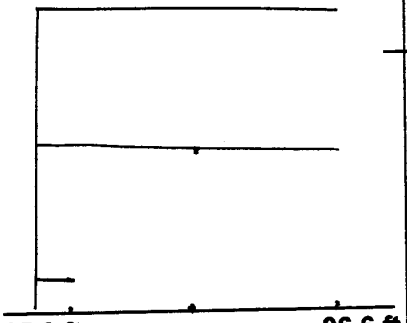
90.0 ft 91.6 ft

Line intercept

Species	From	to	Feet

Photograph of plot 19

20



95.0 ft 96.6 ft

Line intercept:

Species	From	To	Feet

Photograph of plot 20

PHOTO TREND SAMPLE – NESTED FREQUENCY SUMMARY

NOTE: use the nested frequency data forms on the next two pages.

General photograph up the 100 ft (30 m) tape from the 100 ft (30m) end

Size control board at 67 ft (20 m)
Photo identification paper at 85 ft (26 m)

ACTIVITIES

Logging_____
Fire_____
Revegetation_____
Insects_____
Wildlife_____
Other _____
_____
_____

CLIMATE compared to Average

	This Yr.	Last Yr.	Two Yrs.	Three Yrs	Four Yrs.
Temp	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -
Ppt.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -

Apparent range condition_____
Apparent range trend _____

COMMENTS

_____
_____
_____

Estimated Utilization

Species	% Use
_____	_____
_____	_____
_____	_____

NESTED FREQUENCY TRANSECT DATA

Area:_____ **Allotment:**_____ **Date:**_____
Investigator:_____ **Cluster:**_____ **Transect:** *1 2 3 4 5*
Plant community:_____

Species	Sample Number																				Total Value
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

POINT SAMPLING

Ground cover	Veg.	Soil	Gravel	Rock	Litter	Crypt.	Total
Dot tally							
Totals							80

NEXT SHEET FOR LINE INTERCEPT OF SHRUBS AND TREES

NESTED FREQUENCY TRANSECT DATA (Continued)

Line intercept of trees and shrubs

Shrub species	Line Intercept								Total	Percent
									Totals	

Tree species	Line Intercept								Total	Percent
									Totals	

NESTED FREQUENCY CLUSTER SUMMARY

Area: ______________________ **Allotment:** ___________________________ **Date:** ___________
Investigator: ______________________________________ **Cluster:** _________
Plant community: ____

Species	Transect Number 1	2	3	4	5	(To trend summary) Total Value

OVER FOR LINE INTERCEPT AND POINT SAMPLING

NESTED FREQUENCY CLUSTER SUMMARY (Continued)

LINE INTERCEPT

Shrub species	Transect Number 1	2	3	4	5	(To trend summary) Total	Percent
Tree Species							

POINT SAMPLING

Ground Item	Transect Number 1	2	3	4	5	(To trend summary) Total Hits	Percent
Vegetation (root crown)							
Bare soil							
Gravel (1/8 to ¾ in.)							
Rock (> ¾ in.)							
Litter							
Cryptogams							
Totals:	80	80	80	80	80	400	100

Table 5. Significant change table for nested frequency.

Using 100 nested frequency plot frames, the table below shows a significant change in frequency value at the 80% probability level. Enter the table at "Initial value' with the *previous* frequency value for the 5 transects (100 plot frames). Compare the *previous* value with the *current* value to determine if a significant change has occurred. A change is significant if the *current* value is smaller than the "Less than" value or greater than the "More than" value.

Less than	Initial value	More than
17	25	31
21	30	37
25	35	43
30	40	48
35	45	55
39	50	59
43	55	65
48	60	70
53	65	75
57	70	81
62	75	86
67	80	91
71	85	97
76	90	102
81	95	107
85	100	113
90	105	118
95	110	123
99	115	129
104	120	134
109	125	139
113	130	145
118	135	150
123	140	155
128	145	160
132	150	166
137	155	171
142	160	176
147	165	181
151	170	176
156	175	192
161	180	197
166	185	202
170	190	208
175	195	213
180	200	218
185	205	223
189	210	229
194	215	234
219	220	239
204	225	244
209	230	249
213	235	255
218	240	360
223	245	265
228	250	270
233	255	275
237	260	281
242	265	286
247	270	291
252	275	296
257	280	301
261	285	307
266	290	312
271	295	317
276	300	322
281	305	327
285	310	333
290	315	338
295	320	343
300	325	348
307	330	353
309	335	359
314	340	364
319	345	369
324	350	374
329	355	379
334	360	384
339	365	389
343	370	395
348	375	*
353	380	*
358	385	*
363	390	*
368	395	*
372	400	*

PHOTO TREND SAMPLE – 9 sq.ft. (1 sq. m)

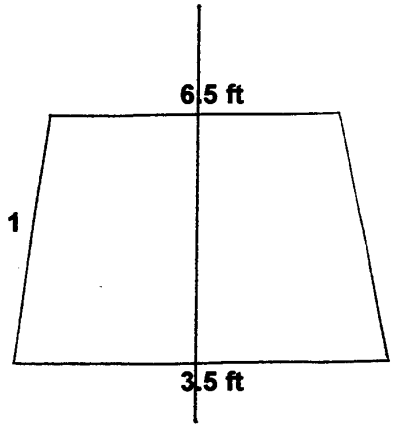
Date _____ Cluster _____ Transect 1 2 3 4 5

Area_____
Allot._____
Investigator _____
Season of use _____
% use _____
Grazing system _____
_____
Remarks _____
_____
_____
_____
_____
_____

General photograph down the 100 ft. (30 m)

tape from the 0 end

Size control board at 33 ft (10 m)
Photo identification paper at 15 ft (5 m)



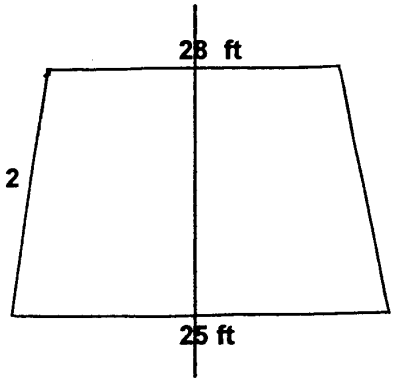
Soil surface: B G R L C
Line intercept:

Species	From	To	Feet
_____	___	___	___
_____	___	___	___
_____	___	___	___
_____	___	___	___
_____	___	___	___
_____	___	___	___
_____	___	___	___

Photograph of plot 1

Camera at the 0 foot mark.

PHOTO TREND SAMPLE – 9 SQ.FT. (1 SQ. M)

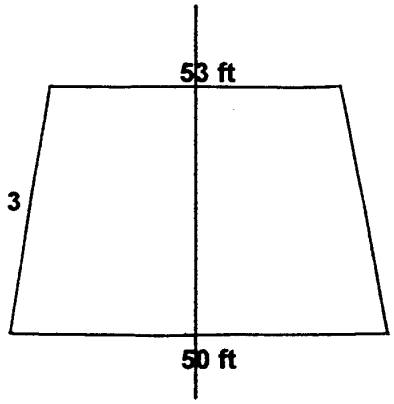


Soil surface: B G R L C
Line intercept:

Species	From	To	Feet

Photograph of plot 2

Camera at the 21.5 foot mark.



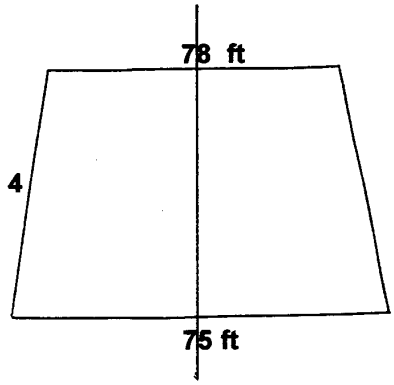
Soil surface: B G R L C
Line intercept:

Species	From	To	Feet

Photograph of plot 3

Camera at the 46.5 foot mark.

PHOTO TREND SAMPLE – 9 SQ.FT. (1 SQ. M)



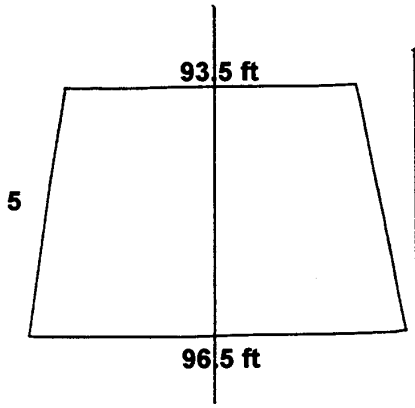
Soil surface: B G R L C

Line intercept:

Species	From	To	Feet

Photograph of plot 4

Camera at the 71.5 foot mark



Soil surface: B G R L C

Line intercept:

Species	From	To	Feet

Photograph of plot 5

STOP: Change camera direction - photo from the 100 ft end

Camera at the 100 foot mark.

PHOTO TREND SAMPLE – 9 sq.ft. (1 sq. m)
SUMMARY

Species	Frequ.	Interc.

General photograph up the 100 ft (30 m)

tape from the 100 (30m) end

Size control board at 67 ft (20 m)
Photo identification paper at 85 ft (26 m)

ACTIVITIES

Logging____________________
Fire____________________
Revegetation____________________
Insects____________________
Wildlife____________________
Other____________________

CLIMATE compared to Average

	This Yr.	Last Yr.	Two Yrs.	Three Yrs	Four Yrs.
Temp	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -
Ppt.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -

Bare soil ______
Gravel pavement ______
condition____________________
Rock ______
trend____________________
Litter ______
Cryptogams ______

Apparent range

Apparent range

COMMENTS

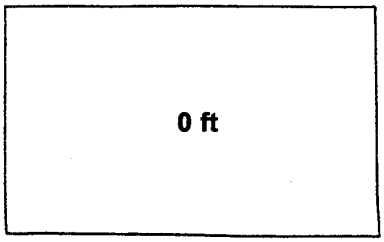
Estimated Utilization

Species	% Use	

PHOTO TREND SAMPLING – TREE COVER

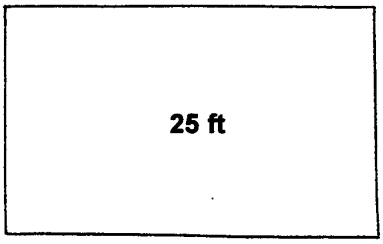
Area _____ Allot. _____ _____ Date _____

Investigator_____ Sampling system _____ Cluster ___ Transect: 1 2 3 4 5



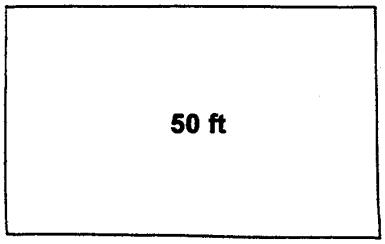
Vertical photo of tree cover above 0 foot mark

Species	Cover	Species	cover
_____	___%	_____	___%
_____	___%	_____	___%
_____	___%	TOTAL	___%



Vertical photo of tree cover above 25 foot mark

Species	Cover	Species	cover
_____	___%	_____	___%
_____	___%	_____	___%
_____	___%	TOTAL	___%



Vertical photo of tree cover above 50 foot mark

Species	Cover	Species	cover
_____	___%	_____	___%
_____	___%	_____	___%
_____	___%	TOTAL	___%

PHOTO TREND SAMPLING – TREE COVER

75 ft

Species	Cover	Species	cover
_____	___%	_____	___%
_____	___%	_____	___%
_____	___%	TOTAL	___%

Vertical photo of tree cover above 75 foot mark

100 ft

Species	Cover	Species	cover
_____	___%	_____	___%
_____	___%	_____	___%
_____	___%	TOTAL	___%

Vertical photo of tree cover above 100 foot mark

SUMMARY

Species	Ave. % cover
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

RANGE TREND REREADINGS

Circle the sampling system: 20 plots 1 sq,ft, 100 plots Nest. Frequ. 5 Plots 9 sq.ft.(1 sq. m)
Area_____ Allotment_____ Cluster_____ Transect *1 2 3 4 5*

Species	Averages by Year									
Tree Crown Cover (in percent)										
TOTAL										
Shrub intercept (in feet)										
TOTAL										
Frequency: No. plots for 1 sq.ft. & 9 sq.ft. (1 sq. m); nested frequ. value										

OVER FOR ADDITIONAL DATA

RANGE TREND REREADINGS (Continued)

Elements	Averages by Year									
Range Condition Guide/date										
Decreasers:										
Palatable Increasers										
Unpalatable Increasers										
Invaders										
Vegetation - (root crown)										
Bare Soil										
Gravel (1/8 to ¾ inch)										
Rock (> ¾ inch)										
Litter										
Cryptogams										
% Utilization by species										
Season of Use										
Climate										
Temp: Current										
Last year										
2 yrs. Ago										
3 yrs. Ago										
4 yrs. Ago										
Ppt.: Current										
Last year										
2 yrs. Ago										
3 yrs. Ago										
4 yrs. Ago										
Apparent range condition										
Apparent range trend										

UTILIZATION - ROBEL POLE SAMPLING

Date _____ Cluster _____ Transect: 1 2 3 4 5

Area_____
Allot._____
Investigator_____
_____
Season of use_____

Grazing system:_____
_____

Remarks:_____
_____
_____

General photograph down the transect from the start

Size control board at 33 ft (10 m)
Photo identification paper at 15 ft (5 m)

Visual Observation 1A:
Stubble height: _____
Comments:_____
_____
_____
_____
_____
_____
Species: _____
_____
_____
_____
_____

Photograph of observation 1A forward on contour

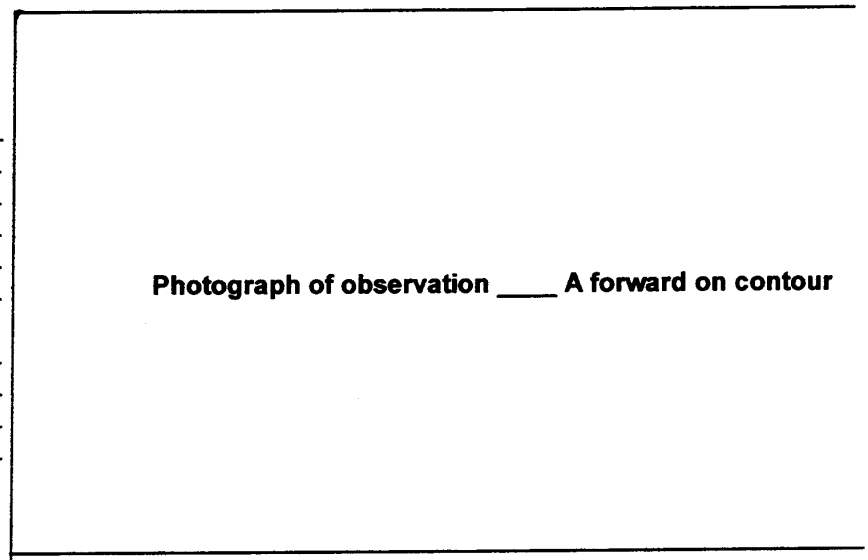
Visual Observation 1B:
Stubble height: _____
Comments: _____
_____
_____
_____
_____
_____
Species:_____
_____
_____
_____
_____

Photograph of observation 1B backward on contour

UTILIZATION - ROBEL POLE SAMPLING

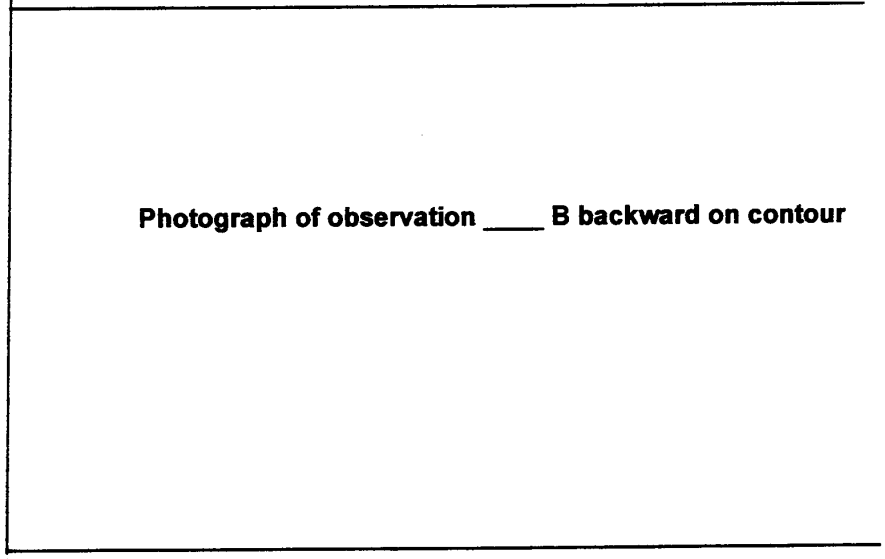
Visual Observation #_____A
Stubble height: _____
Comments: _____

Species: _____



Visual Observation # _____B
Stubble height: _____
Comments: _____

Species: _____



UTILIZATION - ROBEL POLE SAMPLING

Visual Observation #_____A
Stubble height: _____
Comments: _____

Species: _____

Photograph of observation ____ A forward on contour

Visual Observation # _____B
Stubble height: _____
Comments: _____

Species: _____

Photograph of observation ____ B backward on contour

Photograph from end of transect

Comments: _____

General photograph up the transect from the end

Six control board at 33 ft (10M)
Photo identification paper at 15 ft (5 m)

UTILIZATION - ROBEL POLE SUMMARY

Date _____ Examiner: _____
Area _____ Allotment _____
Cluster ____ Transect: 1 2 3 4 5 Sampling interval _____

Station	VO "A"	VO "B"	Species "A" (Front)	Species "B" (Back)
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				
Total				
Grand Total				
Average				

Cluster Summary
Trans 1 _____
Trans 2 _____
Trans 3 _____
Trans 4 _____
Trans 5 _____
AVE _____

CONTINUE