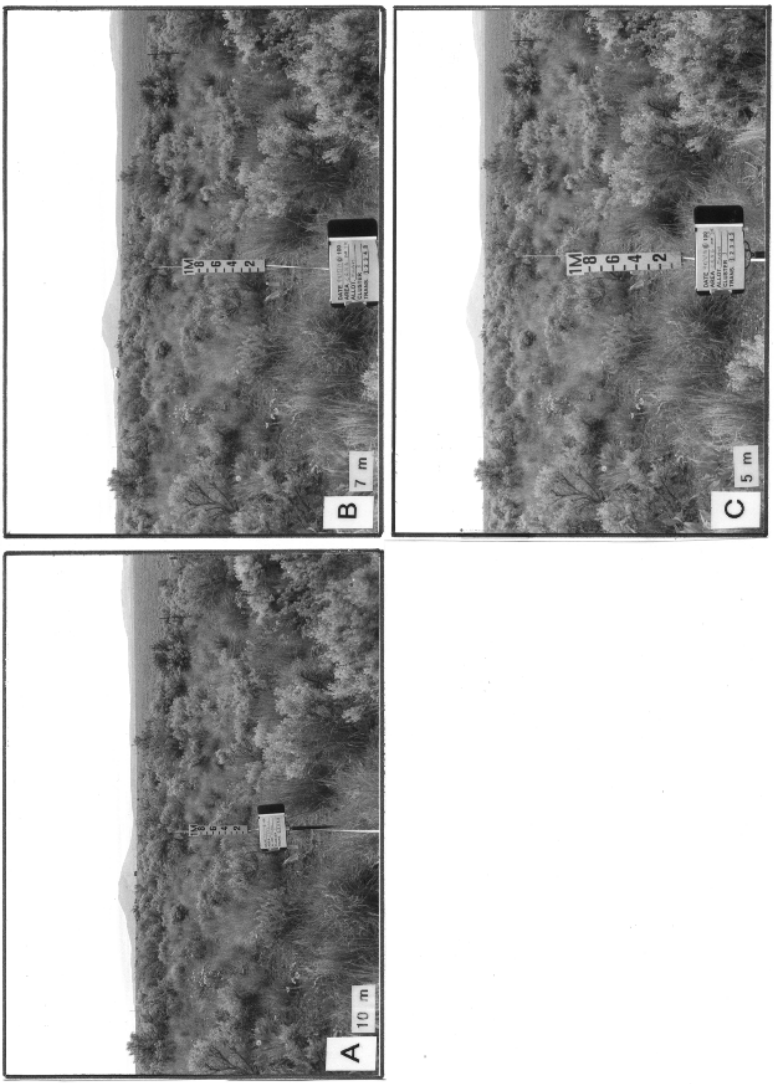


Figure 16—Evaluation of a 35mm lens on a 35mm camera for placement of a meter board to emphasize a topic. This is a transect on the Crooked River National Grassland in eastern Oregon. (**A**) Placement of the meter board 33 feet (10 m) from the camera. It is essentially the same as 46 feet (14 m) distance with a 50mm lens. (**B**) Distance of 23 feet (7 m), essentially similar to 33 feet using a 50mm lens (fig. 31, part B). (**C**) Sixteen feet (5 m) distant, equivalent to 23 feet with a 50mm lens. A consistent distance between camera location and photo point for all photographs is not required. Chose a distance that best documents what you want to show. But, after your choose it, it must remain the same.

Equipment
The following equipment is required for topic photography:

1. Camera or cameras with both color and black and white film or a digital camera.
2. Form “Camera-Photo” from part B, appendix A, printed on medium blue paper.
3. Forms for site identification and photo points from part B, appendix A: “Photographic Site Description and Location” and “Camera Location and Photo Points”
4. Meter board (part B, app. B).
5. Clipboard with its support to hold the photo identification forms (part B, appendix B).
6. Fenceposts and steel stakes sufficient for the number of camera locations and photo points desired. Include a pounder.
7. Compass and 100-foot (30 m) tape for measuring distance.
8. Metal detector for locating stakes.

Technique
Several steps are needed to establish topic photo monitoring. Pole Camp (fig. 2) is used as an example.

Define the topics of interest. At Pole Camp, primary topics were effects of livestock grazing on streambank stability, differential utilization on dry and wet meadows, and impacts on willow shrubs.

Next, define what coverage is desired in the monitoring area. How many streambank sites are desired? How many dry and wet meadows and where? How many shrubs should be monitored and where are they located (see “Shrub Profile Photo Monitoring”)? Notice the distribution of willow shrubs in figure 2A and the pattern of dry to moist to wet meadow in 2B.

Photo points and camera locations—Based on the desired objectives, locate photo points (meter boards) to best document change. Then establish camera locations for optimum coverage of the photo point topic. Coverage might require multiple photo

points from the same camera location or multiple camera locations focusing on the same photo point. Figure 6 maps two photo points (“D” and “W”—dry and wet meadow) from camera location 1 and two camera locations (2 and 3) focusing on photo point “S” (streambank). Figure 2 shows these camera locations and photo points. Advantages are twofold: First, relocation tends to be easier when only one point must be located that will serve two or more views, and second, one point showing several views tends to tie the sampling area together.

Riparian considerations—Riverine riparian settings have two unique photo monitoring characteristics not found in dryland situations: floods and beavers. These characteristics require some special considerations in locating both camera locations and photo points.

Camera locations should not be placed at the stream edge because they cannot be relocated if the edge erodes. Place them 3 to 5 feet (1 to 1.5 m) away from the edge and, if deemed necessary, triangulate their location (fig. 17). They should not be placed in the stream unless exact relocation for both height above the original streambed and position in the stream is assured. At times, camera locations documenting photo points in or at a stream edge may be difficult to establish.

Photo points at the stream edge may be highly desirable (figs. 3 and 17). Consider the following: (1) Use a fencepost to mark the meter board and pound it down to exactly the meter board height. This will help document erosion or deposition (fig. 3) at the base of the fencepost. When the meter board is placed for a repeat photo, measure the distance from the top of the fencepost to the top of the meter board to document the amount of change. (2) Triangulate location of the streambank fencepost (fig. 17) to assure its exact relocation should a flood remove it. If it is removed, replace the fencepost to the current meter board height. Amount of change in the meter board can be documented from an unchanged camera location only by comparing the meter board with adjacent items, such as the streambank.

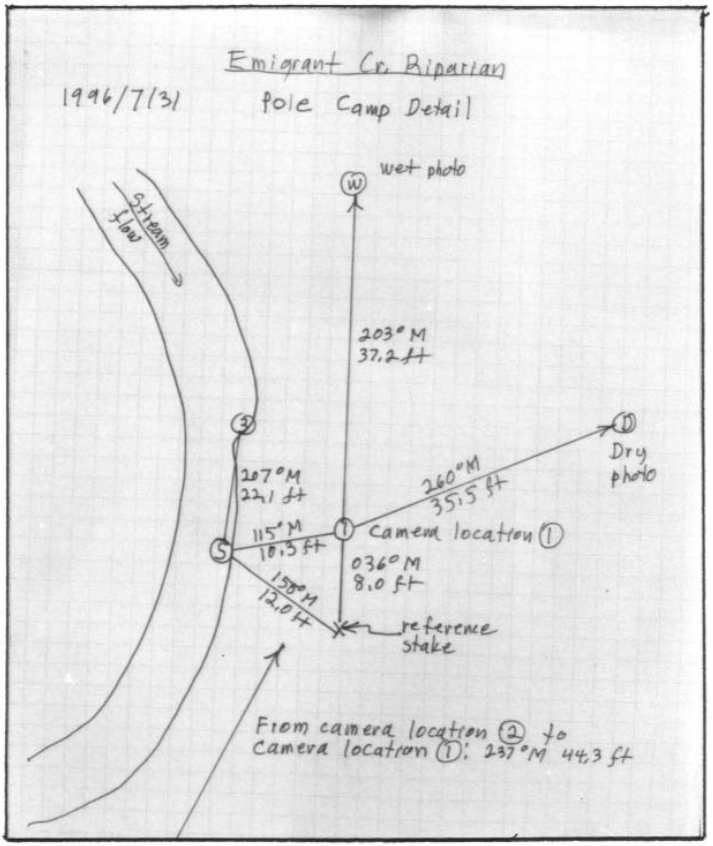


Figure 17—Triangulation location of the meter board in figure 3 to document streambank erosion at Pole Camp. This map is the boxed area shown in figure 6. Any photo point or camera location in a tenuous spot should be referenced by two or more locator stakes.

Camera orientation and focus—Consistent repeat photography requires a reference point to orient subsequent views. The objective is to have the view remain constant as items within the view change. A meter board serves this purpose. Figure 18 shows three repeat photographs of a ponderosa pine/elk sedge community that was selectively cut. Figure 18A illustrates how the camera focus ring is placed over the “1M,” which accomplishes two things: (1) it provides a common orientation point for the first and subsequent photographs, and (2) it provides a

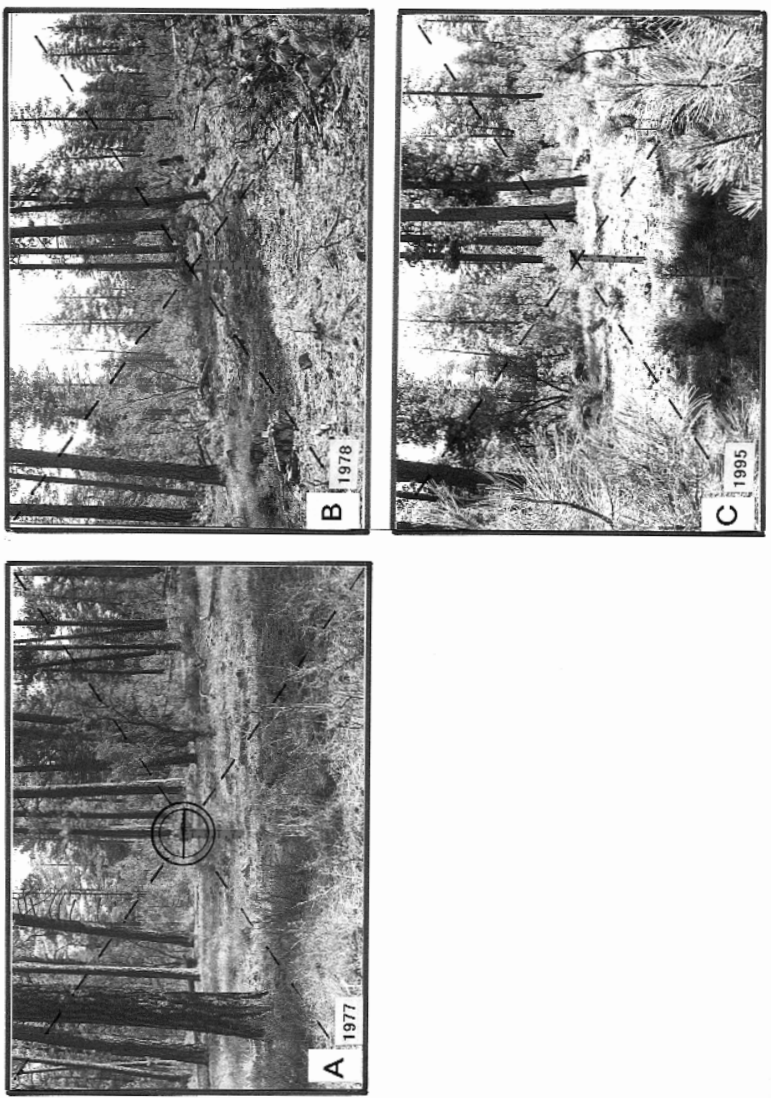


Figure 18—A meter board is used to aim the camera for consistent repeat photography. (**A**) Placement of the camera focus ring on the 1M," which puts the "1M" in the center of the picture (dashed lines). This orientation produces exact replication of repeat photographs as shown in (**B**) and (**C**). Focusing the camera on "1M" provides optimum sharpness and depth of field at the meter board. With an f-stop of 8, everything in the picture will be in focus. This series is part of a study following logging effects on ground vegetation and stand structure (fig. 11). (**A**) 1977 just before a selection cut, (**B**) the summer after the cut (a two-turn skid trail crossed the meter board location), and (**C**) 1995, 18 years later.

locus for focusing the camera for maximum depth of field. With the meter board placed at the topic of interest, the topic should always be in sharp focus.

Other options may be considered with topic photography: close-up pictures of the meter board and overhead photos of tree canopy.

Closeup photos—In many cases, details might be desired that are not accommodated by a meter board 20 to 35 feet (7 to 10 m) distant. Closeup photos, one from each side of the meter board, are recommended (fig. 19). After the general photo is taken, walk up to the meter board and photograph it on each side. With a 50mm lens, stand 7 feet (2 m) away or with a 35mm lens, stand 5 feet (1.5 m) away. Figure 19 illustrates a 50mm lens.

A critical element is to always place the top of the meter board all the way up in a corner of the view (fig. 20). Details on the ground are shown in about a 5- by 5-foot (1.5- by 1.5-m) area on each side of the meter board (figs. 19 and 20). Always take a general photo and two closeup photos to document change (fig. 11).

Figure 11 illustrates use of filing system form “Photo Points and Close Photos” (part B, app. A) for mounting and filing topic photographs. It is the 1977 view of ponderosa pine shown in figure 18.

Overhead canopy—Pictures of the overhead tree canopy may be useful when documenting changes in tree canopy cover. The technique is discussed in “Tree Cover Sampling.” A word of **caution:** camera focal length **must be the same** for all subsequent pictures because there is no size control board by which to adjust different focal length photos to the same size.

An investigator may elect to do all three kinds of photography: topic view, closeups on each side of the meter board, and an overhead view for maximum documentation of treatment effects.

Text continues on page 33.

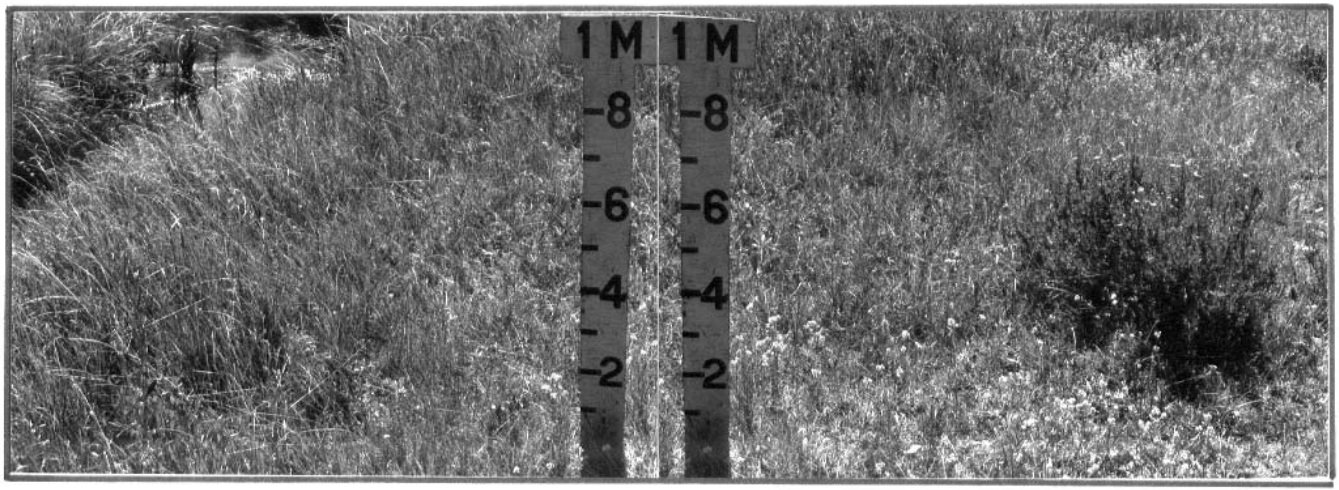
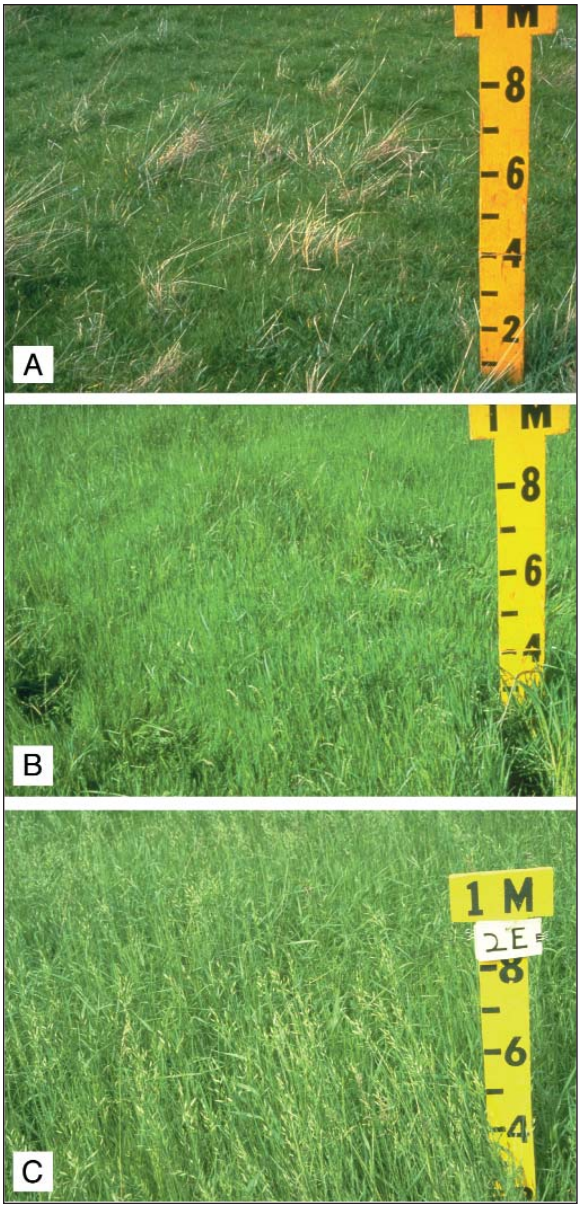


Figure 19—Technique for documenting ground vegetation by using the meter board. Take one picture to the left and one to the right with the meter board at the corresponding edges of the photographs. Stand 7 feet (2 m) away from the board. Tilt the camera slightly off horizontal to make the meter board parallel with the side of the photograph. Place the “1M” of the board in the upper corner of the view. The 7-foot distance, along with a 50mm lens on a 35mm camera, will place the bottom of the board in the lower corner of the picture (fig. 20). Set the camera to 3 meters (9 ft), which allows the vegetation to be in focus from bottom of the meter board to at least 7 feet (2 m) beyond the board. These are closeup views of figure 4, June 15. If pictures are mounted in this fashion, I overlap the meter boards so that only one is showing.


A
1 M
8
6
4
2
B
1 M
8
6
4
C
1 M
2E
8
6
4

Analysis of Change

The meter board also is used as a constant size reference point for analyzing changes. The recommended system is grid analysis (discussed in part B). In a nutshell, a clear plastic form with site identification information is taped to the photo and topics of interest outlined. Then an analysis grid is adjusted to exactly match the size of the meter board in the outline and is printed on white paper. The outline form is taped to the grid, and grid intersects within the outlines are counted and recorded. Amount of change between photos can then be determined.

Topic Description

Describe the setting and topic to be photographed each time photos are taken**.** Figures 13 to 15 show mountain pine beetle effects on lodgepole pine. New conditions are recorded for each repeat photograph. Figure 11 illustrates a general photo and two closeup pictures of ground conditions. Plant species and their estimated canopy cover are recorded for the closeup pictures each time they are taken. The "Photo Points and Close Photos" form provides space for these notes.

◀ Figure 20—Orientation for closeup photos of a meter board in dense vegetation. In photograph (**A**) with 4 inches (1 dm) of stubble height, the meter board bottom can be visually estimated. In (**B**) and (**C**) it cannot. Exact reorientation of the photograph is essential: (1) the "1M" must be in the top corner of the view, (2) the bottom of the board must be in the lower corner, (3) the photograph must be taken from 7 feet (2 m) away with a 50mm lens on a 35mm camera, and (4) the camera must be tilted slightly off horizontal to make the board parallel with the side of the view frame. In photograph (**B**), just 3 months later, grass is over 16 inches (4 dm) tall effectively hiding the bottom of the meter board. Problems with tall vegetation and exact photograph reorientation are shown in (**C**). The "1M" was not placed in the top corner of the view frame. Instead it is about 8 inches (2 dm) below the corner meaning the bottom of the board is about 8 inches (2 dm) below the bottom of the picture, an unacceptable repeat photograph. Photo (**C**) also demonstrates a problem photographing plot frames because a frame would not be visible.

Shrub Profile Photo Monitoring

Change in shrub profile area can mean either shrub use or shrub growth. It may be documented through repeat photography with grid analysis and horizontal camera orientation. Permanent camera locations and photo points, marked by steel fenceposts or stakes, are required. Season of photography is a key factor in documenting change and causes of change in shrub profiles.

Concept

The concept of documenting change in shrub profile area is to photograph a shrub on two sides with the camera location moved for a 90-degree difference between views (Reynolds 1999). This photographs all profiles of a shrub. Camera locations and photo points must be marked with steel fenceposts or stakes to assure the same distance from camera to meter board for all future photographs. The same distance need not be used, however, for all camera locations. Adjust distance to suit the topic being photographed. Tall shrubs, where double meter boards are used (fig. 21), require a much greater distance than short shrubs (fig. 25, below).

Once photographs have been taken, use the photo grid analysis procedure (in part B) to document changes in shrub profile area and shape.

Guidelines

All basic photo monitoring requirements for relocating the monitoring area and for maintaining the same distance from camera to meter board must be met. Some guidelines follow.

The primary objective in monitoring change in shrub profile area or shape is to document usage (reduction in area, Reynolds 1999) or growth (increase in area). Thus, season of photography is of critical concern. If effect of animal browsing is the topic of interest, photography both before and after this use may be necessary. This requires selection of two seasons to photograph, such as just before livestock grazing and immediately after. If livestock graze at different seasons in the same pasture over a period of years (such as rest-rotation systems), three dates may

Figure 21—Use of a folding 2-meter board to document height and growth of tall shrubs. This board is hinged in the middle and held upright by a barrel bolt. When folded together (fig. 54, part B), it is a 1-meter board and unfolded it is 2 meters.

be required to document grazing effects over several years. Other dates, established by local knowledge, probably will be required for wild animals.

If growth in shrub profile area is the topic of interest, then photography after termination of growth would be desirable. Dryland shrubs usually have a definite termination of growth and are called determinate shrubs. Some riparian shrubs, such as many willows, continue to grow until environmental conditions, such as frost, cause growth to stop. These are indeterminate shrubs. Season to photograph must thus be based on the physiological development of the shrub species under study.

Procedures

1. Establish a monitoring objective at the same time as the area and species of shrub to evaluate are selected. Determine photography date(s).

2. Make a map to find the monitoring area (fig. 5) and a map of the transect layout (figs. 22 and 23). The transect layout must include direction and distance from the witness mark to the first shrub photo point and then its two camera locations, and from there the direction and distance to the next shrub photo point and its camera locations (fig. 23). All shrub photo points must be tied together for ease in future location. The transect layout need not, probably will not, be a straight line (fig. 23).

3. Placement of the meter board is critical because it will be used to document changes in shrub profile. There are three concerns**:** (1) Placing the meter board far enough to the side of the shrub to allow the shrub to grow in crown diameter (figs. 24 and 25). Consider a distance that is half the current shrub crown diameter (fig. 24). (2) Placing the bottom of the meter board far enough toward the camera to assure the lowest line of the grid will be **below** the bottom of the shrub if it grows. Consider placing the 2-decimeter line opposite the current bottom of the shrub (fig. 25). (3) Placing the board in one location and moving the camera for a 90-degree change in view (figs. 24 and 25).

4. Select a camera-to-photo-point distance that will permit the shrub to grow in both height and diameter. Consider a distance where the current shrub is about 50 percent of the camera view height and 70 percent of the camera view width (fig. 25, A and B).

5. Try to select a single shrub or several shrubs separated from other shrubs in the camera view. If shrubs increase in area of profile, their outer crown periphery may become difficult to separate from adjacent shrubs (fig. 25). Color photographs greatly aid in shrub profile delineation.

6. Aim the camera so that the meter board is at the extreme left or right of the view (fig. 25). The “Shrub Analysis Grid” (part B, app. A) shows the meter board at the sides (fig. 25). Next,

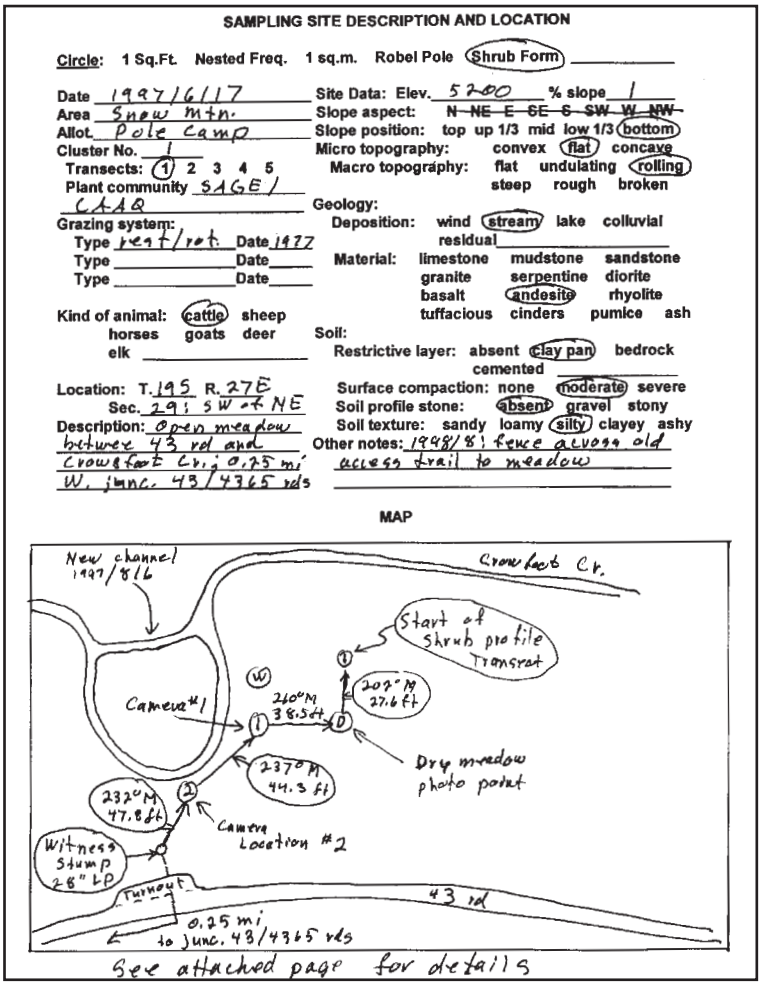


Figure 22—The filing system form “Sampling Site Description and Location” identifies the Pole Camp shrub profile monitoring system. On the first line of the form, circle the monitoring system used, in this case “Shrub Form.” Information about the area is entered, and a map is drawn to locate the monitoring system. This shrub profile transect is one of several photo monitoring installations at Pole Camp; figure 6 diagrams five camera locations and four photo points. A note at the bottom of this map says that an attached page has details. This is shown in figure 23.

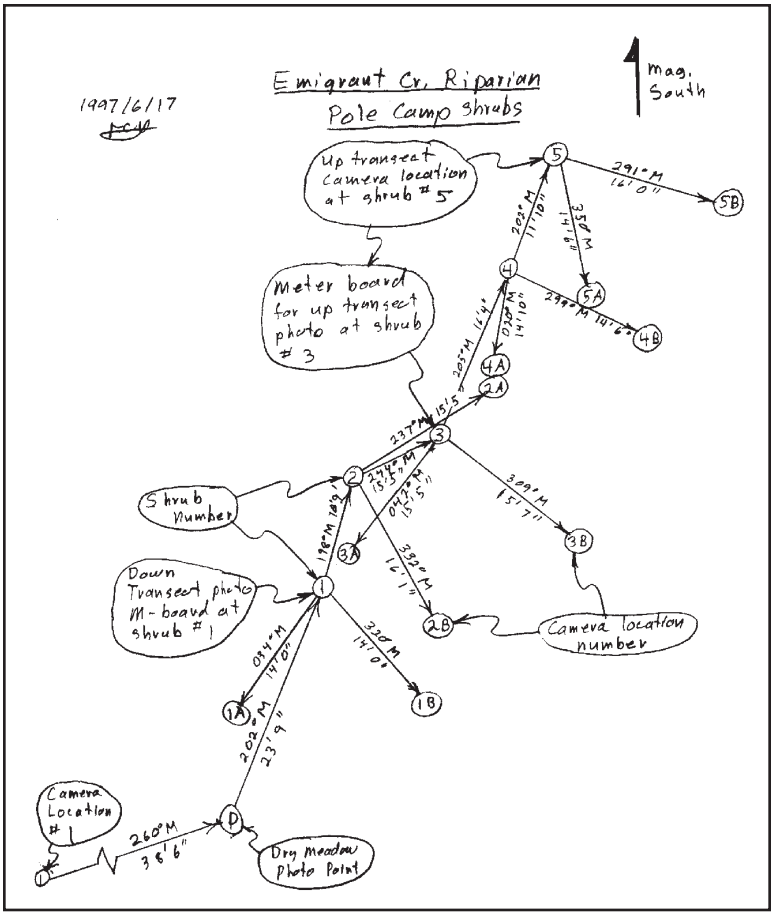


Figure 23—Details of the Pole Camp shrub profile transect (an attachment to the form shown in fig. 22). Instructions begin at camera location 1. The dry meadow photo point has been used as a camera location for a view down the transect (see fig. 25). Directions to five shrubs are shown in magnetic degrees and distance. Because a shrub is the point of reference, the two camera locations take direction and measured distance **from** the shrub to facilitate relocation.

orient the camera so that the bottom of the meter board is just **above** the bottom of the camera view (fig. 25). Thus, a maximum amount of photo is allocated to current and future crown area development of the shrub.

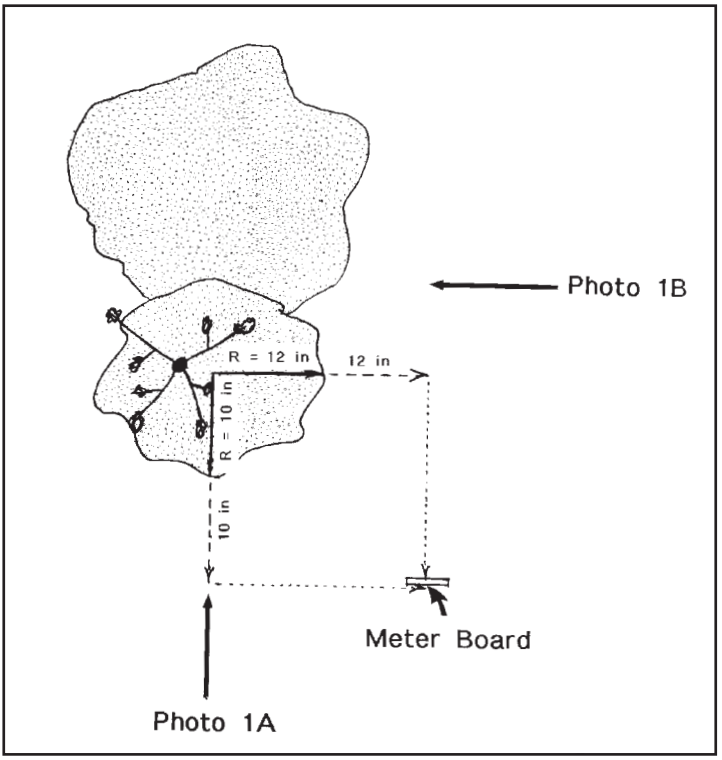


Figure 24—System for locating a meter board when photographing shrub profiles. Measure the shrub radius in two directions, at 90 degrees from each other to correspond to the direction of photographs (12 inches [30 cm] and 10 inches [25 cm]). Move out from the shrub the same distances (12 inches and 10 inches), and locate the meter board at the intersection of the distances. This will place the meter board far enough to the side and front of the shrub so that the shrub can grow and still be covered by a grid. These two views correspond to figure 25, 1A and 1B.

Note the relation between placement of the meter board bottom about 8 inches (2 dm) below the bottom of the shrub and orientation of the camera at the bottom of the meter board. The objective is to document change in shrub profile both upward and outward.

When tall shrubs require double meter boards, such as in figure 21, the boards may be placed in front and the “Analysis Grid-2-Meter” form (part B, app. A) used.

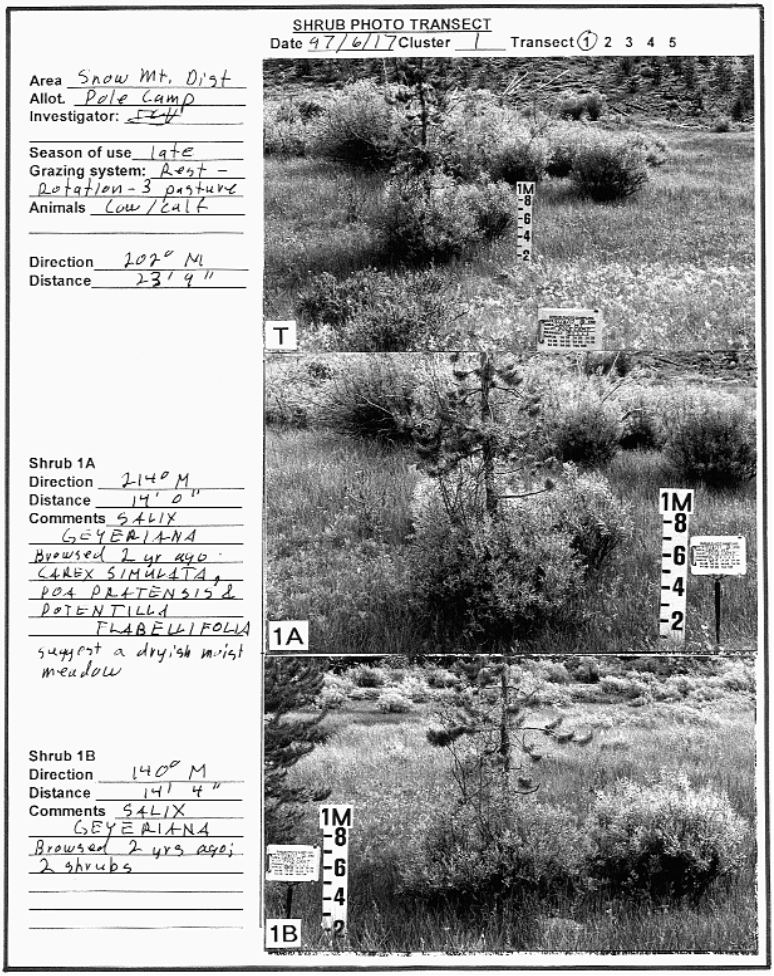


Figure 25—The filing system form “Shrub Photo Transect” (part B, app. A) shows Pole Camp willow transect 1 and both views of shrub number 1. Notes about the vegetation and item photographed are made opposite each photograph. Direction shown is from the **camera** location to the shrub—a reciprocal of the map direction. The form provides for two views each of 10 shrubs with views down the transect from each end. The top photograph (T = transect) is down the transect under which are photo points 1A and 1B. Species are *Salix geyeriana* Anderss., *Carex simulata* Mackenzie, *Poa pratensis* L., and *Potentilla flabellifolia* Hook. ex Torr. & Gray.

Equipment
The following equipment is required for shrub profile sampling:

1. Camera or cameras with both color and black-and-white film, or a digital camera.
2. Forms from part B, appendix A: for transect and shrub identification, “Shrub Photo Sampling” printed on medium blue paper, and data/photo mounting form “Shrub Photo Transect” printed on medium yellow paper.
3. Meter board (part B, app. B).
4. Clipboard with its support for holding the photo identification forms (part B, app. B).
5. Fenceposts and iron stakes sufficient for the number of shrubs desired: 1 fencepost and 2 iron stakes per shrub. Include a pounder.
6. Compass and 100-foot (30-m) tape.
7. Metal detector for locating transect stakes.

Technique
The technique for shrub profile monitoring combines a transect system with principles discussed in “Topic Photography,” above, and in part B, “Photo Grid Analysis.” A primary objective is to monitor **change** in shrub profile area and not to measure canopy cover of shrubs or shrub profile area per acre (hectare). Shrubs, therefore, are objectively selected for photography. The following technique emphasizes this objectivity.

1. Locate the area of consideration. Walk the area to select shrubs to be monitored. In many cases, shrub distribution does not lend itself to straight line transects, particularly in riparian areas with winding streams. Ask, “Why am I concerned with change in shrub profile area? Is it to appraise usage, assess vigor, or document change in profile area? Is the location of shrubs important, such as creating shade along streams? Each shrub is a topic and becomes the key mapping and photo orientation object.

2. Mark each shrub to be photographed with steel fenceposts or a combination of posts and stakes: a fencepost to mark the meter board and two more posts or stakes to mark camera locations that view the shrub at 90 degrees (two different sides). Whenever possible, select a single meter board position that will accommodate the two camera locations (figs. 24 and 25).

3. After marking all the desired shrubs, diagram the transect layout (fig. 23). Take a direction and measured distance from the witness marker to the meter board position for the first shrub. Diagram the two camera locations with direction and distance **from** the shrub. This aids repeat photography. Find the shrub fencepost or stake, take direction, and measure distance to the camera locations. Fenceposts are easy to find. Stakes require a metal detector, which is greatly facilitated by this location system. The distance and direction should locate a 0.5-meter diameter area in which to find the stake.

   Then take direction and measured distance from the meter board for the first shrub to the second shrub, again documenting direction and distance to the camera locations. Continue to the end of the transect (fig. 23). Remember to indicate magnetic or true direction.

4. When ready to photograph, fill out the filing system form "Shrub Photo Sampling" for photograph identification as seen in the three parts of figure 25.

5. Take a general picture of the transect by setting the meter board at shrub number one as shown in figure 25T. Stand 20 to 30 feet (7 to 10 m) from the board and put the "Shrub Photo Sampling" form in view (fig. 25T). Stake the camera location and add the location to the sampling layout diagram.

6. For each shrub, place the "Shrub Photo Sampling" photograph identification form next to the meter board (fig. 25, 1A and 1B). The form has a shrub number and letter for camera

locations for 10 shrubs. Match the shrub number and letter on the form with the transect diagram and circle the number, in figure 25-1A, 1A is circled for camera location “A.” To photograph the shrub, focus the camera on the meter board to assure greatest depth of field for the shrub. Then swing the camera either left or right to place the meter board at the side of the frame.

Move to the second camera location (1B), turn the meter board and the photo identification form to face the camera, cross out the last shrub number on the form and circle the current one. In figure 25-1B, 1A is crossed out and 1B is circled representing shrub 1, camera location “B.”

Make notes of what is in each photo on the “Shrub Photo Transect” form printed on yellow paper (fig. 25) from part B, appendix A. Identify the shrub, list herbaceous vegetation, and note anything of interest such as browsing and by what.

7. Move to the next shrub and repeat the process until completed.

8. Mount the photographs, as shown in figure 25. The filing system form “Shrub Photo Transect” is designed for 3- by 4½-inch (7.5- by 11.2-cm) photos.

9. Conduct grid analysis of the pictures as discussed in part B (fig. 26).

Tree Cover Sampling

Forest stand density, represented by canopy cover, has direct influences on ground vegetation species through root competition and by casting shade. Trend in density and composition of ground vegetation is often as much influenced by this competition as by grazing or light disturbance. Any photo point placed in a forested setting should consider tree cover photography.

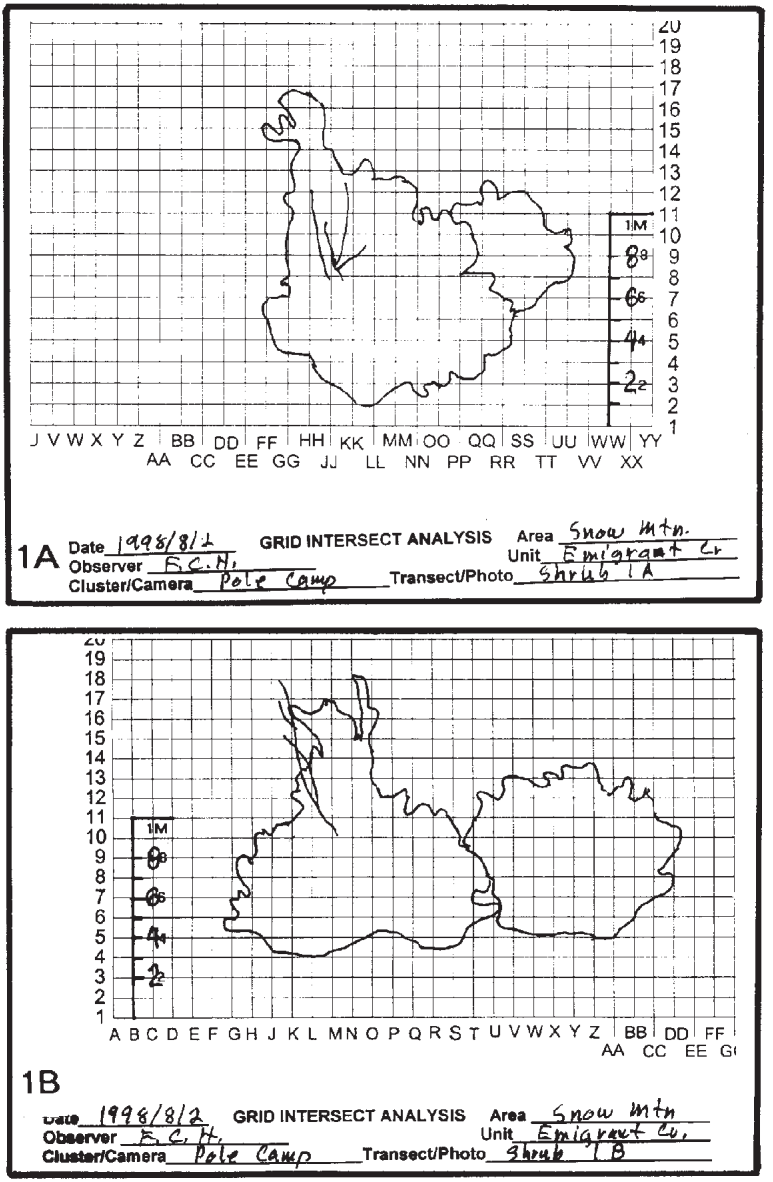


Figure 26—Grid outlines for shrub 1, views (**1A**) and (**1B**) on the Pole Camp shrub profile transect. Grids have been adjusted for size by the outlined meter board. Outlines are then taped to the grid. Count grid intersects and record on the filing system form “Photo Grid Summary” (fig. 49, part B).

Figure 27–System to photograph tree canopy cover. The photo point meter board will be crosswise of the view. Place the camera level board on top of the meter board and the camera on the level board. First, center the cross-view level by moving the meter board sideways. Then tilt the camera level board so that the down-the-view level is centered, move your head out of the camera view, and photograph.

Concept

Tree canopies are photographed perpendicular to the ground by using a camera leveling board to assure vertical orientation of the camera. Figure 27 illustrates a 35mm camera with 50mm lens in the correct position.

Whatever focal length is used to begin, the **same focal length** must be used for subsequent photos. There is no measured distance to a meter board or other size control used in the over-head view, therefore pictures **cannot** be adjusted to a common camera focal length to compare canopy cover.

Equipment

The following equipment is required for tree cover sampling:

1. Camera or cameras with both color and black-and-white film, or a digital camera.

2. A camera leveling board (part B, app. B).
3. Form from part B, appendix A, for data and photo mounting, “Photo Points with Overhead Views” (fig. 28)
4. Meter board (part B, app. B) on which to set the leveling board and camera and thus maintain a constant camera height.
5. A compass and 100-foot (30-m) tape.
6. Fenceposts or steel stakes with pounder.
7. Metal detector for locating stakes.

Technique
Position the meter board at the topic of interest following guidelines in “Topic Photography” (above). Hold the camera leveling board on top of the meter board, set the camera on the leveling board with the long axis crosswise to the scene (landscape orientation) and the viewfinder toward the camera location (fig. 27). The easy way to remember this is to view the photo point with the camera in landscape orientation (fig. 28, top view), then move to the meter board and rotate the camera to look up at the canopy (fig. 28, bottom view).

Move the meter board sideways to level the camera board across the view. Then level the camera board down the view, bend down to take your head out of the picture, and photograph (fig. 28, bottom view).

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

1. The same focal length lens must be used for all subsequent photographs so that images can be compared.

2. The camera must be the same height aboveground. Use the meter board for consistent heights. Figures 31 and 32 in part B illustrate the effect of change in distance on size and location of objects.

PHOTO POINTS WITH OVERHEAD VIEWS

Date 96/8/5 Camera Wide Thin #3
Area Prairie City Dist Number of Photo points: 1
Unit Cold Cr. Observer F.C. Ball
Comments 25 yrs since pct; clearcut about 1950

Slope 5 Aspect W Slope position mid Topography undulating

Photo Point A
Compass bearing: 178° M
Distance 32.0 ft
Photo comments:
No cow use, trees now growing at 2.2" per dec.

Overhead of Photo Point A
Photo comments:
Ponderosa pine in fairly good vigor. 100 ft line transect showed 47% covey

Figure 28—Filing system form “Photo Points with Overhead Views” documenting current tree canopy cover. The form is in part B, appendix A. Remember to make notes on what is in each photo.

3. Make sure that the camera is oriented crosswise to the view with the viewfinder toward the camera location (fig. 27). Remember this by viewing the photo point through the camera, then rotating it 90 degrees upward to view the canopy.

Canopy cover also may be determined by using the photo grid analysis technique discussed in part B.

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