

Range Condition Underground

E. WILLIAM ANDERSON

Range Conservationist, Soil Conservation Service, Pendleton, Oregon

RANGE condition class monoliths, an adaptation of the recently developed technique of making plant monoliths (Woods, 1950), are useful visual aids. They can be used for permanent or portable displays, demonstrations, and class room work.

Range technicians working with ranchers will find them of particular value when explaining range condition classes, ecological relationships between plants and site, the effects of grazing management, and other correlations between the technical and everyday observations of grass management.

For example, consider the two monoliths illustrated (Fig. 1). They were taken from a moderate south slope (normal upland) site with fairly deep medium textured soil (Condon silt loam) in the Gilliam County Soil Conservation District of northeastern Oregon. Average annual precipitation for the area is 10 to 12 inches. On these monoliths an 18 inch depth is shown.

PAST MANAGEMENT REFLECTED BY RANGE CONDITION

The two monoliths were dug about 100 feet apart on land of two ownerships, separated by a fence (Fig. 2). One range rated *Excellent* condition while the other rated *Fair* condition on the basis of climax species in the composition. The difference between them is obviously the result of past use. Both were near a creek which runs water until early summer. On the *Excellent* condition side a perennial spring is less than a quarter mile away. The side in *Fair* condition had to be grazed when water was in the

creek, resulting in continuous grazing during most of the spring growing season each year. The result is what the monolith shows, a *Fair* condition where the site is producing less than 50 percent of its potential. The *Excellent* condition side had a season-long water supply and could be reserved for later summer forage. And as a result, the *Excellent* condition monolith shows a site fully occupied by climax forage species and producing more than 75 percent of its potential.

RANGE CONDITION AND FORAGE YIELD ILLUSTRATED

Range condition is a general rating expressing the state of health or productivity of both soil and forage on a given range, in terms of what it could or should be under normal climate and the best practical management. On bunchgrass ranges the relative forage production is in direct proportion to the percent of climax species in the total composition on the site. On the area from which the *Excellent* condition monolith was taken nearly all of the vegetation was climax species, including bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), also Sandberg bluegrass (*Poa secunda*), as shown in Table 1. Perennial herbs included lupine (*Lupinus* spp.), yarrow (*Achillea lanulosa*), phlox (*Phlox* spp.), pussytoes (*Antennaria* spp.), balsamroot (*Balsamorhiza sagittata*), etc.

Annual grasses and herbs were composed of such plants as: Cheatgrass (*Bromus tectorum*), Annual fescue (*Festuca octoflora*), Peppergrass (*Lepidium perfoliatum*), Fiddleneck (*Amsinckia* spp.), Kitchenweed (*Gayophytum* spp.), Tar-

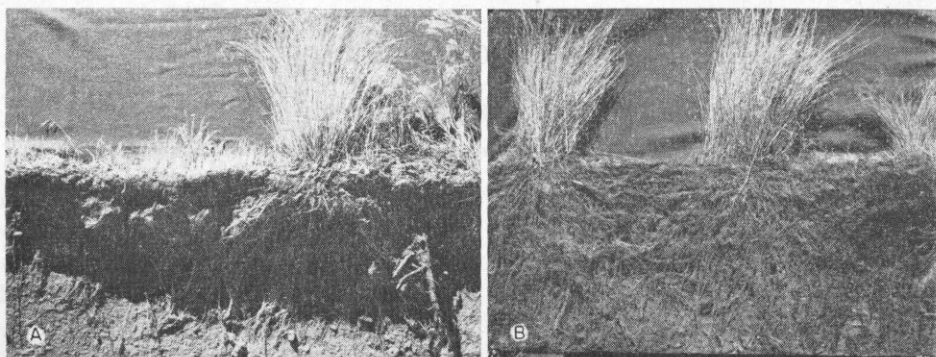


FIG. 1. Range condition monoliths taken from a moderate south exposure, normal upland bunchgrass site. A. Fair condition. B. Excellent condition.

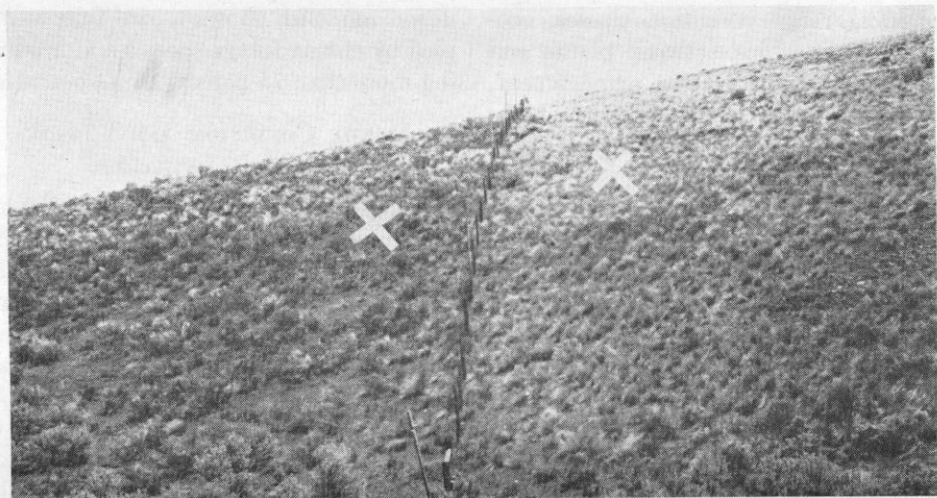


FIG. 2. Moderate south exposure on normal upland bunchgrass site from which range condition monoliths were taken, locations marked with X. Fair condition on left of fence, excellent condition on right.

weed (*Madia* spp.), Tumblemustard (*Sisymbrium altissimum*), etc. Spots of sagebrush (*Artemisia tridentata*), cheatgrass (*Bromus tectorum*), or peppergrass (*Lepidium perfoliatum*) occurred where badgers or squirrels had disturbed the soil. These spots constituted, however, only a trace in the entire composition. Across the fence on the *Fair* condition area only 35 percent of the composition was climax for the site, with sagebrush, rabbitbrush (*Chrysothamnus nauseosus*),

cheatgrass, and annual and perennial weeds invading. This means that this *Fair* condition range is producing about 35 percent of its potential production.

SOIL LOSSES

The uneven soil surface of the *Fair* condition monolith compared with the straight, even surface of the *Excellent* condition indicates soil losses that generally accompany range deterioration in in this area.

FORAGE YIELDS CHECKED

A check on the relative present production estimates was made by clipping samples, using the 96 square foot plot method which converts grams per 96 sq. ft. directly to pounds per acre, air dry weight (Frischknecht and Plummer, 1949). Sampling the immediate vicinity of the *Excellent* condition monolith gave a yield of 1276 pounds per acre available forage, air dry weight. In the vicinity of the *Fair* condition, only 359 pounds per

TABLE 1

Estimated species composition on the Excellent and Fair condition site from which monoliths were taken

SPECIES	EXCELLENT		FAIR	
	Compo- sition	Climax	Compo- sition	Climax
	percent		percent	
Bluebunch wheat- grass	70	70	10	10
Idaho fescue	10	10	0	
Sandberg blue- grass	15	15	45	20
Perennial herbs	5	5	15	5
Annual grasses and herbs	Trace	0	15	0
Rabbitbrush and sagebrush	Trace	0	15	0
		—		—
		100		35

acre were being produced, or about 30 percent of potential.

METHOD OF PREPARATION

The range condition monolith is prepared by using the same procedure as for a single plant monolith with some minor but important modifications. Following is a step-by-step procedure for preparing a range condition monolith.

1. Carefully select the section to be represented on the monolith. To help maintain alignment of the

species to appear on the mount a cord can be stretched over them.

2. Dig a pit along one side of the desired section large enough to work in and six inches deeper than the desired root section. Extend the pit about ten inches beyond each end of the desired monolith section.
3. Cut a trench at each end so that a steel rod can be set vertically at each end of the desired monolith section to act as guides in finishing the surface that adheres to the display board. Use a carpenter's level when setting the rods.
4. Using a sharp flat spade remove more soil from the monolith surface, working toward the center of the plant crowns. Use a straight-edge resting against the vertical guide rods when finishing the monolith surface. The final surface should be about 2 inches from the crown centers and as vertical and smooth as possible for close adhesion with the display board.
5. Using any hand pump that delivers a coarse spray, apply a thin solution of cellulose acetate over the monolith surface. This solution consists of low viscosity (thin) cellulose acetate diluted with acetone to the consistency of water. Continue spraying fresh solution on a small area of the surface to prevent formation of a film until it has penetrated $\frac{1}{4}$ to $\frac{1}{2}$ inch. This spraying fixes the soil and makes it possible to apply the thick solution of cellulose acetate. Allow to dry about 30 minutes or until the surface is no longer sticky.
6. Apply the high viscosity (thick) cellulose acetate to the entire monolith surface starting at the top. This solution should be about the consistency of honey. Use a

paint brush to spread it around and guide the flow as it comes from the brush. Do not try to brush it out as this may break the surface formed by the initial spray.

7. Mark the display board so that the desired root depth shows on each edge. Apply thick cellulose acetate to the area that will adhere to the soil. Align these marks at the ground level and force the board against the sticky monolith surface. Apply pressure to hold the board against the monolith surface by using a screw type jack and framing. Allow the cellulose acetate to harden for about 24 hours.
8. Using the sharp flat spade make the cuts that form the face of the monolith section at the desired thickness. The amount of roots in the monolith section will determine the thickness that can be held on the board. About 4 inches is maximum thickness with dense root growth. Complete the pit along the front side. Undercut the monolith section and remove from the ground.
9. Remove excess soil by placing the root section of the monolith in a trough of water to soften the soil. Then play a stream of water on this section to remove the soil. The roots will withstand considerable washing without breaking. Leave enough soil to support the plant crowns and for a background.
10. This final step is very important. To prevent loss of soil material, fibrous roots, and seed after the monolith has dried, spray the entire mount with a solution of approximately 8 percent "Vinylite" resin in a solvent mixture consisting of two thirds acetone and one third methyl isobutyl ketone. This

will fix the soil and plant material and leave no visible residue.

Clean the edges of the monolith and paint the exposed board. Tile red color sets off the mount well and does not soil easily. Store in a cool, dry, dark place so that the plants will retain as much of their natural color as possible. Detachable legs for the monolith aid in visibility and arrangement when used before rancher groups.

MATERIALS AND EQUIPMENT REQUIRED

The following materials and equipment are required for each range condition monolith:

- One mounting board, 3 x 4 feet size, of $\frac{3}{4}$ inch waterproof plywood.
- 1.5 gallon of high viscosity cellulose acetate (thick)
- 0.5 gallon of low viscosity cellulose acetate (thin)
- 1.0 gallon of acetone
- 0.5 gallon of solvent mixture (methyl isobutyl ketone with acetone)
- 0.5 pound of "Vinylite" resin
- Hand spray pump (coarse spray)
- Sharp flat spade
- Sharp butcher knife
- Old paint brush
- 2 steel rods or angle iron about 4 feet long
- 1 straight-edge of lumber or angle iron
- Hammer, saw, nails, carpenters level
- Screw jack
- 1 piece 2 x 4 lumber, 4 feet long
- Several shorter pieces 2 x 4 lumber

LITERATURE CITED

- WOODS, JACK E. 1950. Plant monoliths . . . a new visual aid. *Whats New in Crops and Soils* 3: 16, 22.
- FRISCHKNECHT, NEIL C. AND PLUMMER, A. PERRY. 1949. A Simplified Technique for Determining Herbage Production on Range and Pasture Land. *Agronomy Jour.* 41: 63-65.