veloping good native grass range—just kill the brush, and practice a little deferred grazing so the grasses can get healthier and produce seed. In all instances, we watch closely what we call the “Big Four”—big bluestem, little bluestem, Indiangrass and switchgrass. We try to maintain these grasses in good and excellent condition. Quite often this means that the number of livestock has to be reduced. We now have 182 mother cows and 20 yearling heifers. The cattle graze on the 2,900-acre mountain pasture and we use the 1,100-acre prairie for native grass hay and small grain. The calves are sold on the farm to operators in Kansas, Missouri and Iowa. The cattle are put on the mountain pasture about April 15 and stay until January when they are put back on the prairie pasture for working. Our calves have brought top prices for the past seven years. Over the past ten years the improvement in our cattle has kept pace with our range improvement. This has been brought about by purchasing tested bulls and through natural selection.

With the brush gone, we again have large areas that look like a sea of grass. It is customary to judge some things from the amount of money that they cost and what they bring. Our experience has certainly been one from brush to grass to dollars. With proper management and ability to recognize the characteristics and capacities of range soils and grasses, the grasses will continue to produce forage. Acquaintance with the grasses, soils and their properties is advantageous to everyone. We need to know and understand why money that they cost and what they bring. Our experience has certainly been one from brush to grass to dollars. With proper management and ability to recognize the characteristics and capacities of range soils and grasses, the grasses will continue to produce forage. Acquaintance with the grasses, soils and their properties is advantageous to everyone. We need to know and understand why

Some of the larger draws have made deltas where they disgorge their loads of silt at their junction with the river. Others follow a cut-back channel to river level.

On Mooney’s place are perhaps a thousand acres of river bottom, land which is nearly level but bone dry. Before cattle came into the country the river bottoms must have been meadows of stirrup-high wheatgrass, rippling like grain in the wind. With the river as the only source of water, cattle stayed on the bottoms all summer long grazing them out until the grass was killed and replaced by annual saltbush. Here and there along the river a choice bit of bottom had been homesteaded and fenced for hay, protecting it from the concentration of cattle.

A family named Burton had built the original ranch. They had homesteaded on the river at the mouth of Haydraw, a 40,000-acre drainage which spread its floodwater naturally over a flat, nearly a section in area. As the years passed, more of the watershed was plowed, the draw bottoms were grazed out and started to cut and

Floyd A. Mooney went into cattle ranching in 1947 in western South Dakota after a venture in farming in the Panhandle of Texas from 1930 to 1947. Mooney and his family now operate some 20,000 acres of deeded plus 8,000 acres of leased land, in a yearling operation with about 700 Hereford cows. Mooney is a director and vice-president of the Rapid City Production Credit Association and a member of The American Society of Range Management.
the silt load got bigger. At the mouth of the draw a delta built up, changing in size and shape with every flood. Burton built a ditch and floodgate in an attempt to get the water where he wanted it, but silt filled the gate and ditch and the draw started to cut a new channel to the river, leaving half the flat high and dry. A few years' mowing of that area discouraged the wheatgrass and it gave way to blue grama which was short enough to escape the mower.

**The Water Spreading System**

When Mooney took the place over he decided halfway measures would not do. "We'll let the water flow out of the draw, but on the bottom we will build a series of terraces or dikes on the level," he reasoned. "When the top one fills, water will have to spill around the ends and fill the next one below. We'll cover the whole flat with water and let it soak in; or if it stands too long we can open the dikes and drain the excess into the river."

His local soil conservation district helped him plan and lay out the dikes. After hiring a contractor to build the first ones, Mooney decided to invest in his own equipment. He bought a medium-sized crawler tractor with a bulldozer for dirt work and a tool bar for farming. After four seasons the wisdom of this move is evident. In addition to building 17 miles of dikes three to four feet high, the tractor has been used to build 15 stockwater dams averaging 5,000 yards; two miles of road from ranch headquarters to the county road; a mile of heavy canal to divert flood waters to the desired locations; many hours of plowing, chiseling and subsoiling on crop land; moving hay a stack at a time; and snow removal after winter storms.

Haydraw drains enough country so it has run some water every year since Mooney's took over the ranch. Following a year of average snowfall the draw runs for nearly a month. This flow is relatively small, being ordinarily less than 25 second feet. Mooney steers this water around "by hand," opening a dike here, closing one there, holding it on the ground for as much as three weeks. The 8-foot depth of heavy clay and shale beneath the surface absorbs water slowly. Western wheatgrass and alfalfa are not killed by being under water for so long a time in the cool weather of early spring.

During late spring and summer the system must be handled differently. The expected flows then will come from heavy rains or violent thunderstorms. Haydraw will change within minutes from a dry water source to a surging, turbid flood. In June of 1955 such a runoff occurred just after the first cutting of hay had been put up. According to Mooney so much water poured over the flat that the dikes were completely submerged, the only evidence of them being swells on the surface of the flood. The peak flow lasted less than a day, and had practically ceased after four days. Mooney expected the wild, unbridled fury of the flood to leave scarcely a trace of the dikes, and was overjoyed when he saw that the damage was so minor that it could be repaired in a matter of hours. Perhaps half of the dikes had a single hole cut through them—a gap of from 3 to 15 feet. The others had to be cut with the bulldozer to drain them, for the flooding occurred during hot weather when alfalfa can be killed by standing under water for 24 hours.

**Forage Benefits**

On the Haydraw bottom Mooney has moved 25,000 yards of earth to build 7 miles of dikes. The cost at 12 cents per yard would be $3,000, or $6.70 per acre for the 450 acres covered. Maintenance and operating costs to date have been less than 20 cents per acre per year. He is convinced that the system annually rewards him with 400 tons more hay than he could harvest without it, plus the alfalfa seed crops which are entirely dependent on the extra water.

After building the dikes Mooney drilled Cossack alfalfa into the existing grass with no seedbed preparation, planting four pounds per acre in the early spring. Within two years the alfalfa had made such a heavy stand that grass was
not evident in it at a casual glance. First-cutting alfalfa has yielded as much as two tons per acre. The second cutting is delayed until the prospects for a seed crop can be assayed. In the fall of 1954 Mooney marketed 50,000 pounds of No. 1 certified seed, and 40,000 pounds in 1955.

In discussing the system on Haydraw, Mooney made some interesting observations. Since the dikes were completed in 1952, floodwater has reached the river only once. All the other flows have been absorbed by the meadow. It is conceivable that well over 450 acre-feet of water can be stored in the soil of this particular bottom. A storage dam of equal capacity would be an expensive structure, and short-lived because of silt. The silt, rich in plant nutrients, may be deposited against some of the dikes as much as six inches in depth from a single runoff. The alfalfa is killed, but western wheatgrass will thrust itself through the silt and flourish. Mooney has re-established alfalfa on such areas by broadcasting seed on them as soon as the water is off, at any time during the growing season.

Mooney has started developing spreader systems on four more separate bottoms, and has plans to do the same on two others. He says, "Some folks may think I'm crazy, but wherever it's possible to get the water and the soil together, I aim to make the effort. There are so many opportunities here that in my lifetime there is no chance to develop them all. I do want to leave the place a little better than I found it, and I hope the boys will continue on with the same idea."

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**Brush Control and Reseeding for Range Improvement in Central California**

KEITH MANLEY, Eshom Valley, Tulare County, and CHARLES F. WALKER, Agronomy Department, University of California at Davis, California

Keith Ranches are located in the north central portion of Tulare County in California. This 6,700-acre ranch operation is on foothill land (600-1,000 feet elevation; 11 inches annual rainfall) and on land of intermediate elevations (3,000-3,500 feet, average annual rainfall of 35 inches) along the west side of the Sierra Nevada mountain range. The ranch headquarters of the mountain range is located in Eshom Valley and is surrounded by 300 acres of arable land. One hundred and twenty acres are irrigated tall fescue-Ladino clover pasture and the remaining 180 acres appear as a natural meadow of tall fescue-perennial ryegrass and resident annual clovers.

**Woodland—Annual Grass Range**

At the present time, the ranches are grazing a herd of 220 cows and calves, 204 yearling steers and heifers, and 15 bulls. Future plans are to increase to a 300-cow breeding herd when additional range improvements are accomplished. So far the principal efforts to increase carrying capacities have been concentrated on formerly dense brushland of the mountain ranch. Brush to grass is the goal. Before range improvements, this summer range required 45 acres to the animal unit on a yearlong basis. Controlling the brush and seeding perennial grasses increases the grazing capacity to 12 acres to the animal unit.

From September to May, the cattle are kept on the foothill range, a typical oak woodland-annual grass type. It will carry one animal unit to ten acres the year around. The principal forage is soft chess, wild oats, ripgut, bur clover, and alfilaria. Mild winters afford an excellent area for calving. Bulls are turned in with the cows on February 1. The cows start to calve by the middle of October and are through in December. The calf crop is consistently above 90 percent.

Calves are marked and branded before the 22-mile trek to the mountains. The herd is vaccinated for blackleg and the heifers are inoculated for Bang's disease. By using a calf squeeze there have never been any losses at branding time.

The weaners are winter-fed a free-choice salt mix of cottonseed meal and ground alfalfa. Some alfalfa hay and barley is also fed. The cows receive alfalfa hay until the green grass starts to grow.

The move to the mountains begins in May. Yearlings are trucked and cows and calves are trail driven. They are all returned to the lower ranch by the middle of September. Thus the 3,300-acre foothill range carries the herd seven months and the 3,400-acre mountain range five months.

**Brush Improvement**

Brush range improvement in our country means control-burning the existing brush, reseeding with