

ever, until recently has been little known. Upon the maps it is seen but seldom—Thompson River, Thompson's Prairie, Thompson Falls. Here and there monuments have lately appeared; his grave in Montreal was marked in 1926. Although a great deal of Thompson's exploration was in the present state of Washington, there is not within its borders, so far as the speaker is aware, a single geographical feature bearing his name or a monument commemorating his accomplishments. Nine miles from the meeting place of this Association is the unmarked site of Spokane House, its history unknown to the passing thousands. What more fitting memorial could be erected by the Northwest Scientific Association than a monument to David Thompson on that site which he visited so often, calling to the attention of posterity the achievements of this early Northwest Scientist?

The waters of the Columbia River

now being held in check by the Coulee Dam will soon form an extensive lake, covering a part of the area first surveyed by Thompson. The interesting suggestion has been offered that the pioneer work of this explorer and geographer be further acknowledged by naming the new body of water Thompson Lake.

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## The Affinity Between Cattle and Creek Bottoms on Mountain Ranges, and Some Effects Thereof

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My subject is elementary in character, and its significance obvious. So much so that its presentation to a group of trained observers and men whose services are marshaled to the cause of preventing destructive land-use methods and the healing of land sores, in fact is a bit embarrassing to me. To do so is somewhat akin to a pupil telling his teacher that a boy sneaked a poke at his pal in school; bad behavior—preventable by throwing both boys out of school.

However, since the request was made there must be at least one good reason behind it to justify taking your time for the minutes that I shall stand before you.

Believing that this is the case, here comes my story:

Most members of the Bovidae family by nature are valley-loving creatures—flat, near flat and rolling land, by preference, their habitat. True, there are exceptions—wild sheep, goats and ibex, as examples; however, the easy topographic choice holds good for all heavier members of the genus, although some breeds have developed greater mountain climbing tendencies than others.

Out of the instinct of cattle as a class to gain their livelihood with the least expenditure of physical effort and to rest in greatest comfort, springs one of the critical issues and most diffi-

cult problems incident to foraging of cattle on typical mountain ranges of the West.

Other factors complicate the problem—one, the more common presence of readily usable water in the bottoms than on the slopes. Still another is the habit of cattle between feeding periods to bed near their drinking places and to seek the shelter of brush or timber in creek bottoms for protection against the activities of predatory insects.

Accordingly, few mountain ranges characterized by long, abrupt slopes bisected by low-lying, relatively flat creek bottoms, small valleys and even steeper lateral water courses are without bottom land sores of varying degrees of cover and soil degradation.

Commonly, the sores are of long standing; a few are slowly healing under intelligent treatment; but many continue to suffer loss of cover and sluff precious soil into the water courses during the seasons of rapid run-off of precipitation.

Somewhat similar conditions are common on ranges of whatsoever topography where open parks intermingled with timber comprise a minor portion of given areas over which cattle graze.

I list some of the more obvious of the items of damage:

- (1) Destruction of perennial plants of high forage value whose long, thick, deeply penetrating, soil-binding roots lead water into the earth, and their replacement, if any, by shallow-rooted annuals of low or no forage value; also, annuals are far less effective in minimizing rapid run-off of water and as soil-binders.
- (2) Killing of browse—aspens—birch—willows—poplar—other brush and tree species common to deeper soils in given localities, with the consequent loss of the soil-

binding and water-leading properties of the roots of such major plants.

- (3) Breaking up of the sod, followed by sheet erosion and formation of small gullies, both of which lead to deeper lateral gullies, and viciously gutted main stream courses—many of which take the form of miniature Grand Canyons.
- (4) Swampy land, grass-covered in its natural state, trampled into unsightly mud puddles, or "cow biscuits."
- (5) Water-retaining capacity of bottom land—natural underground reservoirs greatly decreased, and in many instances completely eliminated; accordingly, their natural restraining influence against rapid run-off is replaced by water wastage and silt flowage.
- (6) Ever-enlarging destruction of high-class vegetative cover extending up the slopes from the damaged bottoms, accompanied by all the evil influences incident to this form of resource degradation.
- (7) Impairment of aesthetic values, and in many instances elimination of recreational values.

The extent to which the course of such damage has been run, to be sure, is not uniform in all places. The general pattern, however, does not vary. At the outset, damage is slight. Even some paid observers fail to see what they look at in this respect, and nothing is done about it. From such beginnings the depletion spans the entire gap between the incipient wounds where the degree of stocking has been light under reasonably good management, to complete wreckage on the longer and more heavily used areas.

I have seen in all western states

broad upland one-time meadows laid barren and reduced to gully-ribbed dust beds by the mouths and feet of cattle. I have seen smaller valleys converted to boulder-strewn flats by the same agencies of destruction. I have seen lesser grassy glades bordering mountain streams washed away until only their sloping foundations remained to form a part of the continuing incline from the hilltop to the bottom of the now stony stream beds, dry in summer.

I have seen sites where cows have completely eliminated aspen, willow, cottonwood and associated browse species by persistent feeding on seedlings and root shoots, and cropping of and rubbing against the parent stand. As a result, I have seen beaver—one of the most useful and interesting of animals—starved out and forced out. A more complete upsetting of natural ecological conditions is exceeded only by the smelter-fume poison which laid bare the Ducktown Basin of eastern Tennessee.

If all this is true, then why tolerate cattle grazing on areas where such form of destruction is likely to start, or is under way. I shall try to make a case for it. Here is one answer:

In the first place, the risk of such major damage continuing can be averted if proper control measures are applied. Secondly, use of mountain ranges by cattle has a place in the basic economy of many parts of the West, provided it can be conducted on a long-time basis without material injury to cover and soils. Thirdly, some small sacrifice of values in bottoms may be justified in order that the resources of a greater area can be made available for the benefit of mankind. It is a matter of balance-striking. Tricky—yes; and, in fact, in the past, doubts have been resolved too often in favor of the day-to-day benefits of the current year to cur-

rent users without thought about the long-time implications of such practices.

Be that as it may, it is to be borne in mind that land has for humans only one purpose; that is to serve mankind most richly, and enduringly so.

To that end, what can be done to secure utilization of sidehill forage and at the same time heal the creek-bottom sores and make them again productive?

Each area has its particular problem or problems. Remedies should be selectively applied, and the selections ought to be medicines giving greatest promise of arresting spread and curing the running of given sores. Even carefully selected measures, skillfully applied, cannot be expected to develop absolute prevention of damage, but they can be made to operate as effective prophylaxis. Here are some suggested practices from which selections for given situations might be made:

- (1) Determine a stocking limit which takes into proper account the natural impulse of the average range cow to live on the low lands, and the extent to which such inherent habits might be broken up if the animals are led away from bottoms by salting them well up along and on the crests of slopes. Put such determination into effect.
- (2) Where prospects of its presence are good, develop drinking water for stock high up on the slopes and at the heads of water courses.
- (3) Require daily herding of cattle to insure their proper distribution—a feature containing generous promise in fiction but far less in fact.
- (4) Exclude stock from bottoms by fencing, permitting access to water at places where probability of damage by trampling is the least.

- (5) Fencing of traveled lanes leading from the slopes to bottoms (cattle are prone to follow well-defined trails) with deflecting wings on the ends of the fences.
- (6) Alternating use of given sections of range—that is, resting areas—and grazing them at intervals of one year.
- (7) Killing off old cows—the dyed-in-the-hide creek-bottom habitues—around which younger stock gravitate, and which early absorb the bad habits of their leaders. The disposal of old "hardheads" lends more promise to the effectiveness of herding.
- (8) Changing breeds of stock; for instance, the Black Angus breed is characteristically a better climber and rustler than the Shorthorn, or even more energetic than the short-legged, heavily-bodied Hereford—reputedly a hill-climber having great ambition for high places. However, with the breeding out of the longhorn blood, the modern vintage of this popular breed has become progressively more logy and often degenerates to the shabby genteel, creek-bottom scavenger.
- (9) Changing classes of stock; that is, from cattle to sheep. Sheep can be placed where man wills for such length of time as he wills and in such formation as he wills. They can thrive without loss of weight for days—running into a week or more—without water, the length of time between necessary drinks depending upon the succulence of the forage.

In passing, I cannot resist recording

that certain areas have been used by cattle, and by sheep also, the soils of which by their very nature have such low "wearing" qualities as to render them entirely without use endurance for grass production under the pulling force of the jaws of the four-footed crop harvesters and the pushing, sliding force of the feet of such animals. In the first place, stock never should have been placed on soil so young and mobile; and secondly, if cover is to be maintained at all on such land and its soil is to be kept in place, stock needs must be removed entirely.

Returning to my subject—the stream-bottom problem: Where stream-course lands have been injured, their reparation enters the field of soil conservation activities. The means and the techniques appropriate to particular situations as practiced by the Soil Conservation Service and other agencies are applicable. I need not take time to enumerate before this group either the means or the techniques.

In the final analysis, use of typical mountain ranges by domestic stock can endure over the long swings only under the most skilled management, which takes into account not only the nature of the beasts using the range, but the nature of the soils upon which the feed grows, and the basic laws underlying the life's history of the plants.

The neglect of any one of these factors will lead in all instances, as it has in many in the past, to resource depreciation; and, if it goes on long enough, to plant destruction. With plant destruction follows rapid run-off, and, with that, comes an unraveling world, carrying along with it economic decline and impairment of civilization.