

## Rangeland Conservation Practices Soil and Water Effects

### 444. **Assessing the impact of overgrazing on soil erosion in arid regions at a range of spatial scales.**

Sharma, K. D.

In: Human impact on erosion and sedimentation/ Walling, D. E. and Probst, J. L.; Series: IAHS Publication 245.

Oxfordshire: IAHS Press, 1997; pp. 119-123.

*Notes:* ISBN: 0901502309; Conference: 5. Scientific Assembly of the International Association of Hydrological Sciences (IAHS), Rabat (Morocco), 23 Apr-3 May 1997

*Descriptors:* grazing/ soil erosion/ arid lands/ assessments/ erosion rates/ scaling/ spatial distribution/ livestock

*Abstract:* Increased livestock numbers in arid regions cause overgrazing which results in reduced infiltration and accelerated runoff and soil erosion. Results from a range of studies indicate that at the macro- and mesoscales soil erosion can increase dramatically due to overgrazing; causing increases of five to 41 times over the control at the mesoscale and three to 18 times at the macroscale.

However, the establishment of simple relationships across the range of scales is difficult due to spatial variation of soil erosion rates and patterns. Water authorities should be actively associated with range management activities for the protection of arid zone drainage basins.

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### 445. **Association of herd composition, stocking rate, and duration of calving season with fecal shedding of *Cryptosporidium parvum* oocysts in beef herds.**

Atwill, Edward R.; Johnson, Eileen M.; and Pereira, Maria Das Gracias C.

*Journal of the American Veterinary Medical Association* 215(12): 1833-1838. (1999)

*NAL Call #:* 41.8 Am3; *ISSN:* 0003-1488

*Descriptors:* calving season/ herd composition/ reproductive management/ rotational grazing practices/ stocking rate

*Abstract:* Objective: To evaluate the association of herd demographics, parturition variables, stocking rate, and rotational grazing practices with the probability of fecal shedding of *Cryptosporidium parvum* from beef cow-calf herds in California. Design: Cross-sectional study. Sample Population: 38 beef cow-calf operations. Procedure: Fecal specimens were collected and examined for *C parvum* oocysts, using immunofluorescent microscopy. Association between various demographic and management factors and the probability of shedding *C parvum* were statistically evaluated. Results: Adjusted for age and month of collection of a fecal sample, cattle from herds with a high number of young calves (ltoreq 2 months old) on the day of sample collection, a high stocking rate (No. of cattle/acre/mo), or a longer calving season were more likely to shed *C parvum* oocysts, compared with cattle from herds with fewer young calves, a lower stocking rate, or a shorter calving season. Cattle from herds with a higher number of older calves (> 2 months old) on the day of sample collection were less likely to shed *C parvum* oocysts, compared with cattle from herds with fewer older calves. Using our multivariate model, rotational grazing systems or season of onset of calving were not associated with shedding status for *C parvum* oocysts. Conclusions and Clinical Relevance: Reproductive management that would

result in a shorter calving season and use of a lower stocking rate for cattle may be associated with reduced risk of *C parvum* shedding. Intensive rotational grazing systems and time of year for onset of calving season apparently have little effect on reducing prevalence of oocyst shedding.

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### 446. **Bacterial water quality responses to four grazing strategies--comparisons with Oregon standards.**

Tiedemann, A. R.; Higgins, D. A.; Quigley, T. M.; Sanderson, H. R.; and Bohn, C. C.

*Journal of Environmental Quality* 17(3): 492-498. (1988)

*NAL Call #:* QH540.J6; *ISSN:* 0047-2425

*Descriptors:* range management/ water quality/ streams/ grazing/ watersheds/ Oregon

*Abstract:* Concentrations of fecal coliform (FC) and fecal streptococcus (FS) were measured weekly during summer 1984 in streamwater of 13 wildland watersheds managed under four range management strategies. The strategies were (A) no grazing; (B) grazing without management for livestock distribution; (C) grazing with management for livestock distribution; and (D) grazing with management for livestock distribution and with cultural practices to increase forage. Counts of FC were compared to Oregon water quality standards. Data for FS were used for determining the FC/FS ratio to assess origin of FC organisms. Counts of FC were significantly lower under strategies A and C than under strategy D, but no significant differences were apparent among other strategy comparisons. Two strategy D watersheds violated the Oregon water quality 30-d log<sub>10</sub> standard of no more than 2 X 10<sup>3</sup> FC L<sup>-1</sup> (200 FC X 100 mL<sup>-1</sup>). One watershed was in violation for most of the sampling period. Ratios of FC to FS indicated that wildlife was the major source of FC bacteria in strategies A, B, and C watersheds. Cattle were the primary source of FC bacteria on strategy D watersheds.

This citation is from AGRICOLA.

### 447. **Bladeploughing and enclosure influence soil properties in a semi-arid Australian woodland.**

Eldridge, D. J. and Robson, A. D.

*Journal of Range Management* 50(2): 191-198. (1997)

*NAL Call #:* 60.18 J82; *ISSN:* 0022-409X

[http://jrm.library.arizona.edu/data/1997/502/191-198\\_eldridge.pdf](http://jrm.library.arizona.edu/data/1997/502/191-198_eldridge.pdf)

*Descriptors:* range management/ shrubs/ soil erosion/ runoff/ grazing intensity/ hydrology/ sediment yield/ New South Wales

*Abstract:* Runoff and sediment yield were evaluated on a sandplain dominated by woody perennial shrubs in north-western NSW, Australia. The site was bladeploughed; and some plots were grazed by sheep and cattle and others enclosed from grazing. Two years after ploughing and enclosure, grazed plots had significantly lower levels of aggregate stability and organic carbon compared with ungrazed plots, but there was no effect of ploughing. Surface pH levels were significantly greater on unploughed plots compared with ploughed plots. Two years after treatment, runoff and sediment yield were greatest on plots with the least disturbance (unploughed and ungrazed) and

least on sites with the greatest disturbance (ploughed and grazed). We attribute differences in soil hydrology to the development of a thin physical soil crust on the unploughed-ungrazed plots, which restricted infiltration. On the ungrazed plots, increases in plant cover and biomass, and colonisation of the physical crust by biological elements, are hypothesised to lead to reduced runoff and sediment yield over time.

This citation is from AGRICOLA.

**448. Cattle grazing has varying impacts on stream-channel erosion in oak woodlands.**

George, M. R.; Larsen, R. E.; McDougald, N. K.; Tate, K. W.; Gerlach, J. D.; and Fulgham, K. O.

*California Agriculture* 58(3): 138-143. (2004)

NAL Call #: 100 C12Cag; ISSN: 0008-0845

*Descriptors:* grazing/ rangelands/ sediment/ stream erosion/ streams/ trails/ trampling/ woodlands

*Abstract:* We conducted a 5-year study on the impact of grazing on stream-channel bare ground and erosion, and a 3-year study of cattle-trail erosion on intermittent stream channels draining grazed oak (*Quercus*)-woodland watersheds. These studies were conducted on the San Joaquin Experimental Range in Madera County, California, USA. While the concentration of cattle along stream banks during the dry season resulted in a significant increase in bare ground, we were unable to detect stream bank erosion resulting from any of the grazing treatments applied. However, we did find that cattle trails are an important mode of sediment transport into stream channels. While cattle trails are common on grazed rangeland, excessive trailing often indicates that stock watering points are too far apart.

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**449. Consequences of livestock grazing on water quality and benthic algal biomass in a Canadian natural grassland plateau.**

Scrimgeour, G. J. and Kendall, S.

*Environmental Management* 29(6): 824-844. (2002)

NAL Call #: HC79.E5E5; ISSN: 0364-152X

*Descriptors:* phosphorus/ watersheds/ biomass/ concentration/ nitrogen/ nutrients/ grazing/ water quality/ grasslands/ communities/ livestock/ streams/ environmental impact/ algae/ agricultural pollution/ nutrient concentrations/ man-induced effects/ phytobenthos/ rivers/ riparian vegetation/ nutrients (mineral)/ environmental effects/ agricultural runoff/ environmental quality/ Canada, Alberta, Cypress Hills/ Canada, Alberta/ livestock grazing

*Abstract:* The effects of livestock grazing on selected riparian and stream attributes, water chemistry, and algal biomass were investigated over a two-year period using livestock enclosures and by completing stream surveys in the Cypress Hills grassland plateau, Alberta, Canada. Livestock enclosure experiments, partially replicated in three streams, comprised four treatments: (1) early season livestock grazing (June-August), (2) late season livestock grazing (August-September), (3) all season grazing (June-September), and (4) livestock absent controls. Livestock grazing significantly decreased streambank stability, biomass of riparian vegetation, and the extent to which aquatic vegetation covered the stream channels compared with livestock-absent controls. Water quality comparisons indicated significant differences among the four livestock grazing treatments in Battle and Graburn creeks but not in

Nine Mile Creek. In Graburn Creek, the concentration of total phosphorus in the all-season livestock grazing treatment was significantly higher than that in the livestock-absent control, and the early season and late season grazing treatments. Concentrations of soluble reactive phosphorus in the all-season livestock grazing treatment also exceeded that in livestock-absent control. In contrast, differences in water quality variables in the remaining 22 comparisons (i.e., 22 of the total 24 comparisons) were minor even when differences were statistically significant. Effects of livestock grazing on algal biomass were variable, and there was no consistent pattern among creeks. At the watershed scale, spatial variation in algal biomass was related ( $P < 0.05$ ) with concentrations of NO sub(2) super(m) + NO sub(3) super(m) and soluble reactive phosphorus in two of the four study creeks. Nutrient diffusing substrata experiments showed that algal communities were either nitrogen-limited or not limited by nutrients, depending on stream and season.

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**450. Correlations of stocking with the cryptogamic soil crust of a semi-arid rangeland in southwest Queensland.**

Hodgkins, I. W. and Rogers, R. W.

*Australian Journal of Ecology* 22(4): 425-431. (1997)

NAL Call #: QH540.A8; ISSN: 0307-692X

*Descriptors:* biodiversity/ community structure/ cryptogamic soil crust: community, condition/ dung density/ hoof impact/ semi arid rangeland: habitat/ water supply

*Abstract:* The soil crust community from a sub-tropical grassland in southwest Queensland was found to include 34 taxa with cyanobacteria, other algae, lichens, fungi, mosses and liverworts represented. Cyanobacteria and liverworts were the major components of the cryptogamic cover. This is a significant component of the biodiversity of the region. Changes in the structure of this community were significantly correlated with distance from a linear water supply (bore drain) and with dung density. It was concluded that hoof impact by grazing stock had measurably affected the cryptogamic community even under a moderate stocking policy. This research suggests that management for sustainable use of low-nutrient rangelands should include consideration of soil crust condition.

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**451. Debunking the myth of overgrazing and soil erosion.**

Rowntree, K.; Duma, M.; Kakembo, V.; and Thornes, J.

*Land Degradation and Development* 15(3): 203-214. (2004)

NAL Call #: S622.L26; ISSN: 1085-3278

*Descriptors:* carrying capacity/ communal rangeland/ ecology/ equilibrium and non equilibrium theory/ grazing impact/ land use change/ myth debunking/ overgrazing/ soil erosion

*Abstract:* What is overgrazing? Does it cause soil erosion? The recent debate from the ecological literature is reviewed as background to the debate on overgrazing and soil erosion. This debate stresses the need to view dryland grazing systems as dynamic ecosystems driven more by rainfall events than by livestock numbers. The case for soil erosion is then examined. Two case studies from communal rangelands in the Eastern Cape, South Africa, have cast doubts on the conventional wisdom that overgrazing leads to soil erosion. The first, a study of

historical land-use change and erosion in a communal area, showed that the most intense erosion, taking the form of steeply dissected badlands, was associated with cultivated land that had been abandoned and reverted to grazing from the 1960s onwards. Such severe erosion was generally absent from land that had been under grazing since the 1930s. The second study demonstrated that erosion rates from communal grazing lands ('overgrazed') were only slightly higher than those from land under 'optimal' grazing, that is grazing at a level considered not to exceed the carrying capacity of the land. These results support the ecologist's contention that communal grazing systems do not necessarily degrade the range condition relative to management systems based on a notional carrying capacity. Copyright 2004 John Wiley & Sons, Ltd.  
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**452. Discharge and suspended sediment patterns of an intermittent cold desert stream.**

Ellison, C. A.; Skinner, Q. D.; and Reddy, K. J.  
*Journal of the American Water Resources Association* 42(1): 55-68. (2006)  
NAL Call #: GB651.W315; ISSN: 1093-474X  
*Descriptors:* best management practices (bmps)/ channel storage/ runoff/ sediment transport/ time series analysis/ watersheds  
*Abstract:* Sage Creek in south-central Wyoming is listed as impaired by the U.S. Environmental Protection Agency (USEPA) due to its sediment contribution to the North Platte River. Despite the magnitude of sediment impacts on streams, little research has been conducted to characterize patterns of sediment transport or to model suspended sediment concentration in many arid western U.S. streams. This study examined the relationship between stream discharge and suspended sediment concentration near the Sage Creek and North Platte River confluence from 1998 through 2003. The objectives were to determine patterns of stream discharge and suspended sediment concentration, produce a sediment prediction model, and compare sediment concentrations for the six-year period. Stream discharge and suspended sediment transport responded rapidly to convective storms and spring runoff events. During the study period, events exceeding 0.23 m<sup>3</sup>/s accounted for 92 percent of the sediment load, which is believed to originate from erodible headwater uplands. Further analysis of these data indicates that time series modeling is superior to simple linear regression in predicting sediment concentration. Significant increases in suspended sediment concentration occurred in all years except 2003. This analysis suggests that a six-year monitoring record was insufficient to factor out impacts from climate, geology, and historical sediment storage. JAWRA Copyright © 2006.  
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**453. Effect of animal grazing on streamflow quality in the Pacific Northwest.**

Saxton, K. E.; Elliott, L. F.; Papendick, R. I.; and Jawson, M. D.  
*American Society of Agricultural Engineers Paper*(82-2616): 16 p. (1982)  
*Descriptors:* pollution/ water pollution/ erosion/ pastures/ water/ quality/ grazing

*Abstract:* Streamflow water quality was intensively studied for 3 yr on a grazed (21.5 ha) and an ungrazed check (0.9 ha) watershed in order to identify water quantity, erosion, and water quality from a typical summer grazed watershed. Emphasis was on sediment, nitrogen, phosphorous, and bacteriological quality.

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**454. Effect of animal grazing on water quality of nonpoint runoff in the Pacific Northwest.**

Saxton, K. E.; Elliott, L. F.; Papendick, R. I.; Jawson, M. D.; and Fortier, D. H.  
Ada, Okla.: United States Environmental Protection Agency Research & Development, 1983. 7 p.  
*Notes:* EPA 600/S2-83/071  
NAL Call #: TD223.7.E442 1983  
*Descriptors:* Pacific Northwest/ freshwater environment/ impact of agriculture/ cattle/ grazing/ erosion/ sedimentation/ water quality/ management/ manure/ indicator bacterial/ freshwater environment/ impact of forestry or agriculture/ policy, management, education or information  
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**455. Effect of canopy and grazing on soil bulk density.**

Tate, K. W.; Dudley, D. M.; McDougald, N. K.; and George, M. R.  
*Journal of Range Management* 57(4): 411-417. (2004)  
NAL Call #: 60.18 J82; ISSN: 0022-409X  
*Descriptors:* annual rangeland/ compaction/ RDM/ residual dry matter/ Sierra Nevada  
*Abstract:* This study compared soil surface bulk density between: 1) sites not grazed by cattle > 26 years; 2) sites not grazed for 6 years; 3) sites grazed for 15 years to October residual dry matter levels of > 1100 kg ha<sup>-1</sup>; 4) sites grazed for 15 years to October residual dry matter levels of 670 to 900 kg ha<sup>-1</sup>; 5) sites grazed for 15 years to October residual dry matter levels of < 450 kg ha<sup>-1</sup>; and 6) sites subject to concentrated cattle use (trails, corrals, and supplemental feed-water stations). Sites were collected from across the 1,772 ha San Joaquin Experimental Range (SJER) in Madera County, Calif. to represent canopy cover (open grassland, blue oak (*Quercus douglasii* Hook and Arn.), live oak (*Quercus wislizenii* A.DC.), foothill pine (*Pinus sabiniana* Douglas), wedgeleaf ceanothus (*Ceanothus cuneatus* (Hook) Nutt.), and ceanothus interspace) and topography (swale, uplands) typical of the rocky coarse sandy loam soils of the southern Sierra Nevada foothill oak savannah. Soil surface (0 to 7.62 cm) bulk density (g cm<sup>-3</sup>) was determined for 1489 soil cores collected across all available combinations of grazing management, canopy cover and topographic position at the SJER. Soil surface bulk density was 0.23 to 0.30 g cm<sup>-3</sup> lower under canopy compared to open grasslands. Bulk density was not different ( $P > 0.05$ ) between sites not grazed > 26 years and sites not grazed for 6 years. Grazing to residual dry matter levels of > 1100, 670 to 900, and < 450 kg ha<sup>-1</sup> created bulk densities which were 0.08, 0.18, and 0.21 g cm<sup>-3</sup> greater than non-grazed sites, respectively. Cattle concentration sites had bulk densities 0.37 to 0.47 g cm<sup>-3</sup> greater than areas not grazed > 6 or 26 years. For the purpose of maintaining soil surface bulk density current residual dry matter recommendations for sites with canopy cover > 50% appear appropriate, but

recommendations for open grasslands need additional review. In particular, residual dry matter level must be directly linked to soil surface infiltration capacity.

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**456. Effect of grazing and cultivation on some chemical properties of soils in the mixed prairie.**

Dormaar, J. F. and Willms, W. D.

*Journal of Range Management* 43(5): 456-460. (1990)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1990/435/19dorm.pdf>

*Descriptors:* Hesperostipa comata/ Bouteloua gracilis/ prairies/ pastures/ grassland soils/ tillage/ soil organic matter/ physicochemical properties/ monosaccharides/ organic acids and salts/ grazing/ soil quality/ Alberta  
This citation is from AGRICOLA.

**457. Effect of grazing on surface soil properties of interdune duplex soils in a chenopod shrubland.**

Greene, R. S. B. and Tongway, D. J.

In: Effects of management practices on soil physical properties. (Held 7 Sep 1987-10 Sep 1987 at Toowoomba, Queensland.) Coughlan, K. J. and Truong, P. N. (eds.) Brisbane: Queensland Department of Primary Industries; pp. 56-60; 1987.

NAL Call #: S599.7.A8E44 1987; ISBN: 0724224513

*Descriptors:* duplex soils/ animal husbandry/ grazing/ soil/ physical properties/ rangeland soils/ soil physics/ soil types ecological

*Abstract:* The effects of grazing on the soil resource base, and in particular, how stocking rate influences the physical and chemical properties of the duplex soils occurring in interdune areas, are discussed.

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**458. Effect of livestock grazing on physical properties of a cracking and self-mulching Vertisol.**

Taddese, G.; Saleem, M. A. Mohamed; and Ayalneh, W. *Australian Journal of Experimental Agriculture* 42(2): 129-133. (2002)

NAL Call #: 23 Au792; ISSN: 0816-1089

*Descriptors:* penetrometer measurements: field method/ vertisol: cracking, self mulching/ livestock trampling: grazing, soil resistance

*Abstract:* The impact of grazing on physical properties of Vertisol was studied from 1996 to 2000 in the Ethiopian highlands. The study was conducted at 2 sites with 0-4 and 4-8% slopes at Tero Jemjem watershed in Ginchi, 80 km west of Addis Ababa. The objective of the study was to compare selected soil physical properties at different grazing pressures and slopes. The stocking rate was moderate grazing 1.8 animal-unit months per hectare (1.8 AUM/ha), heavy grazing 3.0 AUM/ha and a control treatment with no grazing. The result showed that heavy grazing pressure removed grass cover, which consequently enhanced soil cracking. Effect of livestock trampling on soil resistance to penetration (indicated by penetrometer readings) was higher in the heavily grazed plots than in non-grazed plots. Penetrometer readings were influenced by soil moisture content. Low moisture content was observed in the heavily grazed plots at both sites. The infiltration of accumulated water to the soil matrix was lower in heavily grazed plots.

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**459. Effect of timing of grazing on soil-surface cryptogamic communities in a Great Basin low-shrub desert: A preliminary report.**

Marble, J. R. and Harper, K. T.

*Great Basin Naturalist* 49(1): 104-107. (1989)

NAL Call #: 410 G79; ISSN: 0017-3614

*Descriptors:* sheep/ vascular plant/ species diversity/ percent cover/ richness/ seasonality/ resource management/ soil stability/ Utah

*Abstract:* Cover and species richness of vascular and cryptogamic components of the plant community were inventoried in experimental grazing paddocks at the USDA/FS Desert Range Experimental Station, Millard County, Utah. The grazing treatments considered have been applied continuously for over 50 years. The effects of heavy (ca 17 sheep days/acre) grazing treatment applied in two different seasons (early winter versus a split between early and late winter) differed significantly between seasons. Cryptogamic over and cryptogamic species richness both showed larger decreases under early-late as opposed to early winter only grazing. Vascular plant cover (relative to controls) was also reduced by early-late winter grazing, but not to a significant degree. Late season grazing, likewise, had no significant effect on number of vascular species per transect.

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**460. Effect of various grazing systems on type and density of cattle trails.**

Walker, J. W. and Heitschmidt, R. K.

*Journal of Range Management* 39(5): 428-431. (1986)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1986/395/12walk.pdf>

*Descriptors:* rotational/ continuous/ deferred rotation/ soil erosion/ paddocks

*Abstract:* Number and kinds of cattle trails may have a dramatic impact on relative amount of bare soil and subsequently on amount and rate of soil erosion. The objective of this study was to quantify the effect of a cell-designed, rotational grazing treatment (RG) on density and kinds of cattle trails. Density of cattle trails in the RG treatment was compared to those in heavy continuous (HC), moderate continuous (MC), and deferred rotation (DR) treatments at 4 distances from water. There were no differences among the HC, MC, and DR treatments in density of trails. Trail densities ranged from 14/km near water sources to 9/km at the far end of the pastures. This compares to the RG treatment where trail densities ranged from 164/km near the cell center to 24/km at the far end of the paddock. The effect of increasing the RG treatment from 14 to 42 paddocks was also investigated. Subdivision of paddocks increased trail densities near the center from 32/km to 57/km with no increased noted at the far ends of the paddocks. It is concluded that implementation of a cell-designed, RG system will cause a significant increase in density and number of cattle trails particularly near the cell center.

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**461. Effect of watershed management operations on runoff and sediment release in Hazara Pakistan.**

Abbas, S. H. and Hanif, M.

*Pakistan Journal of Forestry* 37(2): 89-98. (1987)

NAL Call #: 99.8 P17; ISSN: 0030-9818

*Descriptors:* planting/ grazing/ closure



*Abstract:* To study the effect of watershed management practices (mainly planting) on runoff and sediment release an experiment was conducted at two sites in Hazara. The analysis of 6 years data collected, revealed that planting coupled with closure to grazing on the slopes proved to be extremely helpful in reducing the runoff and sediment release from 30% to 1% and 239 gms/plot to 10 gms per plot respectively.

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**462. Effects of intense, short-duration grazing on microtopography in a Chihuahuan Desert grassland.**

Nash, M. S.; Jackson, E.; and Whitford, W. G.

*Journal of Arid Environments* 56(3): 383-393. (2004)

NAL Call #: QH541.5.D4J6; ISSN: 0140-1963

*Descriptors:* cattle/ grazing/ hoof-action/ microdepressions/ micromounds/ microtopography index/ wind erosion

*Abstract:* We studied the effect of three consecutive years of short duration (< 48 h per year), and intense grazing (20-40 yearling cows per hectare) on soil surface microtopography in a Chihuahuan Desert grassland. We also studied the effects of shrub removal plus grazing on microtopography. Microtopography was measured in 18 plots (treatments). Treatments were a combination of two factors: (1) three levels of grazing (winter-grazed, summer-grazed, and not grazed), and (2) two levels of habitat structure (shrubs-removed and shrubs-intact). Mesquite (*Prosopis glandulosa*) shrubs were removed from half of the plots (nine out of 18 plots). The average height of the micromounds, the average depths of intermound depressions, and the number of micromounds were significantly reduced on the grazed plots. Shrub removal had no significant effect on the height of the micromounds or the depth of the intermound depressions of ungrazed plots. There were significant differences in average micromound heights and intermound microdepression depths attributable to the season of grazing.

Microtopography was significantly reduced on grazed plots from which shrubs were removed, compared to ungrazed plots, and grazed plots with shrubs present. Grass canopy reduction, and destruction of the micromound structure in a short duration, plus intense grazing results in erosion of micromounds and in-filling of intermound depressions. The loss of microtopography coupled with reduction in vegetation height and cover resulting from short-duration intense grazing by cattle exposed soils to an increased risk of soil erosion. Destruction of the micromound/microdepression topography by cattle changes the spatial patterns of water infiltration, and may homogenize nutrients in desert grasslands. © 2003 Published by Elsevier Science Ltd.

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**463. Effects of livestock grazing on infiltration and erosion rates measured on chained and unchained pinyon-juniper sites in southeastern Utah.**

Busby, F. E. and Gifford, G. F.

*Journal of Range Management* 34(5): 400-405. (1981)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1981/345/15busb.pdf>

*Descriptors:* Utah

This citation is from AGRICOLA.

**464. Effects of livestock grazing on nutrient retention in a headwater stream of the Rio Puerco Basin.**

Sewards, M. A. and Valett, H. M.

In: *Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together.* (Held 18 Sep 1995-22 Sep 1995 at Albuquerque, N. Mex.)

Shaw, Douglas W. and Finch, Deborah M. (eds.)

Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station, U.S. Dept. of Agriculture; pp.

135-142; 1996.

NAL Call #: aSD11.A42 no.272

*Descriptors:* streams/ grazing/ livestock/ nutrient retention/ hydrology/ biogeochemistry/ riparian buffers/ sediments/ New Mexico

This citation is from AGRICOLA.

**465. Effects of livestock grazing on sediment production, Edwards Plateau of Texas.**

Mccalla, G. R.; Blackburn, W. H.; and Merrill, L. B.

*Journal of Range Management* 37(4): 291-294. (1984)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1984/374/1mcca.pdf>

*Descriptors:* cattle/ sheep/ goats/ midgrass/ shortgrass/ community/ grazing duration/ stocking rate/ soil loss/ overgrazing/ erosion

*Abstract:* The influence of short duration grazing (SDG), moderate continuous grazing (MCG), heavy continuous grazing (HCG) and grazing exclusion on sediment production of midgrass and shortgrass-dominated communities was evaluated over a 20-mo. period on the Texas Agricultural Research Station located near Sonora in the Edwards Plateau, Texas. A combination of cattle, sheep and goats was used in each grazing treatment. Sediment production was consistently less from the midgrass (bunchgrass) than from the shortgrass (sodgrass) community. The HCG pasture was severely overgrazed and resulted in excessive soil loss. The midgrasses in this pasture were destroyed after 26 mo. of overgrazing. Sediment production from the SDG pasture stocked at double the recommended rate increased during the study period. The SDG pasture, by the end of the study, had lost more sediment from both the midgrass- and shortgrass-dominated communities than the MCG pasture. Sediment loss from the midgrass community in the MCG pasture was consistently low during the study; sediment production from the shortgrass community decreased in the MCG pasture. Sediment production from the midgrass community in the non-grazed pasture remained consistently low throughout the study, but the shortgrass community showed a strong decrease in sediment loss during the study.

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**466. Effects of long-term grazing on cryptogam crust cover in Navajo National Monument, Arizona.**

Brotherson, J. D.; Rushforth, S. R.; and Johansen, J. R.

*Journal of Range Management* 36(5): 579-581. (1983)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1983/365/9brot.pdf>

*Descriptors:* Arizona

This citation is from AGRICOLA.

**467. Effects of season and stage of rotation cycle on hydrologic condition of rangeland under intensive rotation grazing.**

Warren, S. D.; Blackburn, W. H.; and Taylor, C. A.  
*Journal of Range Management* 39(6): 486-491. (1986)  
 NAL Call #: 60.18 J82; ISSN: 0022-409X  
<http://jrm.library.arizona.edu/data/1986/396/2warr.pdf>

*Descriptors:* livestock/ sediment production/ growth damage

*Abstract:* Infiltration rate and sediment production were measured over a 2-year period on an intensive rotationally grazed pasture. Measurements were taken prior to the movement of livestock onto the pasture, soon after their removal, and approximately midway through the subsequent rest period of each rotation through the system. Midgrass-dominated interspaces were characterized by significantly higher infiltration rates and lower sediment production than shortgrass-dominated interspaces. Infiltration rate declined and sediment production increased following the short-term intense grazing periods inherent in the rotational system. The detrimental effect was significant during periods of drought or winter dormancy, but not during periods of active growth. Soil characteristics relating to higher hydrologic condition were significantly more stable during the growing season, providing greater resistance to and resilience from the damaging impact of livestock activity.

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**468. Efficacy of vegetated buffer strips for retaining *Cryptosporidium parvum*.**

Tate, K. W.; Pereira, M. das G. C.; and Atwill, E. R.  
*Journal of Environmental Quality* 33(6): 2243-2251. (Nov. 2004-Dec. 2004)

NAL Call #: QH540.J6; ISSN: 0047-2425

*Descriptors:* *Cryptosporidium parvum*/ intestinal microorganisms/ oocysts/ drinking water/ water pollution/ fecal contamination/ cattle/ grazing/ feces/ grasslands/ watersheds/ conservation buffers/ ground vegetation/ water flow/ slope/ sandy loam soils/ rainfall simulation/ rainfall duration/ California

*Abstract:* Overland and shallow subsurface hydrologic transport of pathogenic *Cryptosporidium parvum* oocysts from cattle feces into surface drinking water supplies is a major concern on annual grasslands in California's central and southern Sierra Nevada foothills. Soil boxes (0.5 m wide x 1.1 m long x 0.3 m deep) were used to evaluate the ability of grass vegetated buffer strips to retain  $2 \times 10^8$  spiked *C. parvum* oocysts in 200-g fecal deposits during simulated rainfall intensities of 30 to 47.5 mm/h over 2 h. Buffers were comprised of Ahwahnee sandy loam (coarse-loamy, mixed, active, thermic Mollic Haploxeralfs; 78:18:4 sand to silt to clay ratio; dry bulk density = 1.4 g/cm<sup>3</sup>) set at 5 to 20% land slope, and greater than or equal to 95% grass cover (grass stubble height = 10 cm; biomass = 900 kg/ha dry weight). Total number of oocysts discharged from each soil box (combined overland and subsurface flow) during the 120-min simulation ranged from  $1.5 \times 10^6$  to  $23.9 \times 10^6$  oocysts. Observed overall mean log<sub>10</sub> reduction of total *C. parvum* flux per meter of vegetated buffer was 1.44, 1.19, and 1.18 for buffers at 5, 12, and 20% land slope, respectively. Rainfall application rate (mm/h) was strongly associated with oocyst flux from these vegetated buffers, resulting in a decrease of 2 to 4% in the log<sub>10</sub> reduction per meter buffer for every additional mm/h

applied to the soil box. These results support the use of strategically placed vegetated buffers as one of several management strategies that can reduce the risk of waterborne *C. parvum* attributable to extensive cattle grazing on annual grassland watersheds. This citation is from AGRICOLA.

**469. Erosion studies from experimental watersheds impacted by livestock grazing.**

Daniel, J. A.

In: Soil erosion research for the 21st century: Proceedings of the International Symposium. (Held 3 Jan 2001-5 Jan 2001 at Honolulu, Hawaii, USA.); pp. 599-602; 2001.  
 NAL Call #: S622.2 .S656 2001

*Descriptors:* drought/ erosion/ grassland management/ grasslands/ grazing intensity/ livestock/ overland flow/ precipitation/ rain/ runoff/ sediment yield/ stocking density/ storms/ summer/ watersheds

*Abstract:* Three 1.6 ha experimental watersheds in Oklahoma, USA, equipped with stream gauge recorders, water samplers, and rain gauges, were used to determine the potential erosion by livestock grazing during simulated drought and wet periods. Surface runoff and sediment yield data was collated for each watershed for storm events between 1980 to 1991 during summer grazing. Grazing treatments included three stocking densities of 2.5, 5, and 7.5 head/ha by stocker calves. Since no grazing occurred during 1981, 1982, 1985, and 1986, these years were not included in the calculations, but were instead used as controls. Regression equations for each grazed treatment were calculated to determine the relation between precipitation, surface runoff and sediment yield per storm event. Precipitation of dry and wet years was estimated from a 40-year CLIGEN weather simulation utilizing local weather trend data. Results show that increasing stocking density on the watershed increased the erosion potential of the watersheds. Also the erosion potential increased in the wet years compared with the dry years. A 12% increase from light to heavy stocking density occurred for the dry years and a 25% increase occurred for the wet years. However, sediment movement off the watershed during rest periods was greater than when livestock was present. This suggests that for grazing under conservative management practices, the impact of livestock grazing on sediment movement is minimal.

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**470. Evapotranspiration from northern semiarid grasslands.**

Frank, A. B.

*Agronomy Journal* 95(6): 1504-1509. (2003)  
 NAL Call #: 4 AM34P; ISSN: 0002-1962

*Descriptors:* bowen ratio energy balance method/ mathematical and computer techniques/ biomass production/ canopy structure/ energy budget/ evapotranspiration/ forage production management/ grazed mixed grass prairie/ grazed western wheatgrass stand/ nongrazed mixed grass prairie/ northern semiarid grasslands/ semiarid environment/ soil water conservation  
*Abstract:* Management of forage production for livestock grazing on semiarid grasslands depends on water availability. Evapotranspiration (ET) was measured using the Bowen ratio energy balance method on three grasslands at Mandan, ND: a nongrazed mixed-grass prairie (prairie), a grazed mixed-grass prairie (grazed

prairie), and a grazed western wheatgrass (*Pascopyrum smithii* (Rybd) Love) site (western wheatgrass). Measurements were made from 24 April to 17 October (the growing period) in 1996, 1997, and 1998. Peak ET rates generally coincided with periods of peak biomass production and occurred between early July and early August. Peak biomass averaged 1097 kg ha<sup>-1</sup> for the prairie, 1227 kg ha<sup>-1</sup> for grazed prairie, and 1725 kg ha<sup>-1</sup> for western wheatgrass, and peak leaf area index averaged 0.38 for the prairie, 0.44 for grazed prairie, and 0.59 for western wheatgrass. Growing period (175 d) ET averaged 489 mm for the prairie, 455 mm for the grazed prairie, and 497 mm for the western wheatgrass while growing period precipitation averaged 320 mm. Evapotranspiration of grazed prairie was 7% less than nongrazed prairie and 8% less than western wheatgrass. Evapotranspiration of the nongrazed prairie and the grazed western wheatgrass were similar. The ratio of the latent heat of ET to net radiation averaged 0.25 for grazed prairie and 0.28 for prairie, suggesting that grazing changed the canopy structure and energy budget components that affected ET. These results suggest that in a semiarid environment, proper grazing of prairie grasslands conserves soil water.  
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**471. Factors influencing development of cryptogamic soil crusts in Utah deserts.**

Anderson, D. C.; Harper, K. T.; and Holmgren, R. C. *Journal of Range Management* 35(2): 180-185. (1982)  
NAL Call #: 60.18 J82; ISSN: 0022-409X  
<http://jrm.library.arizona.edu/data/1982/352/10ande.pdf>  
*Descriptors:* electrical conductivity/ silt/ phosphorus/ grazing pressure/ range management  
*Abstract:* The relation of some physical and chemical soil characteristics to cryptogamic crust development was determined from sites in semidesert regions of southern Utah. The effects of grazing on cryptogamic crust development also were examined. Electrical conductivity, percentage silt and soil P were correlated with well-developed cryptogamic crusts. Both total cryptogamic cover and the number of cryptogamic species decreased under grazing pressure. The management of rangelands, especially in arid regions, would be strengthened by understanding the role of cryptogamic crusts and considering them in range management decisions.  
© The Thomson Corporation

**472. Flash grazing and trampling effects on infiltration rates and sediment yield on a selected New Mexico range site.**

Weltz, M.; Wood, M. K.; and Parker, E. E. *Journal of Arid Environments* 16(1): 95-100. (1989)  
NAL Call #: QH541.5.D4J6; ISSN: 0140-1963  
*Descriptors:* cattle/ bulk density/ hydrology  
*Abstract:* This study evaluated the influence of flash grazing and livestock trampling on selected hydrologic variables on the Rio Bonito watershed in central New Mexico. Terminal infiltration rates were significantly reduced after cattle had grazed within an enclosure for 14 hours. After 110 days, the enclosures' infiltration rates were one-half that of the pretrampled treatment. Trampling during both sampling periods significantly increased sediment yield and bulk density.  
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**473. Grassland structure in native pastures: Links to soil surface condition.**

Mcintyre, Sue and Tongway, David  
*Ecological Management and Restoration* 6(1): 43-50. (2005)  
NAL Call #: QH75.A1 E362; ISSN: 1442-7001  
*Descriptors:* grassland/ grazing pasture/ soil surface condition  
*Abstract:* When grassland is grazed by livestock, the structure of the sward changes in a patchy manner. With continuous selective grazing there is a mosaic of short and tall patches but as grazing intensifies the area of short-grazed patch increases until the paddock has a lawn-like appearance. This mosaic of patch structures can be stable, as short patches tend to attract repeated grazing and tall patches tend to be avoided. Because heavy grazing can detrimentally affect soil and water functions in grassland (ultimately resulting in erosion), we aimed to assess how well the physical structure of the sward reflects soil surface condition. We described four grassland patch structures that were assumed to reflect different levels of present grazing, and to some extent, past grazing pressure. We assessed patch structure and two other grass-related variables (basal area of a 'large tussock' functional group and basal area of all perennial grass) as possible indicators of soil surface condition. Three indices of condition were measured in the field. The infiltration and nutrient cycling index declined progressively across patch structures, consistent with increasing grazing pressure. The stability index was found to be reduced only for the most heavily grazed grass structure (short patches). We found the 'large tussock' grass functional group to be a more sensitive indicator of soil surface condition than the group consisting of all perennial grasses. We found no evidence of sudden soil surface condition decline beyond a certain level of grass basal area, that is, there was no evidence of thresholds, rather, incremental loss of condition accompanied grass decline. We are thus not able to further refine an earlier proposed management recommendation 'Graze conservatively to maintain dominance of large and medium tussock grasses over 60-70% of the native pastures', except to suggest the use of short patches as a more practical indicator, rephrasing the recommendation as 'Graze conservatively to allow a maximum of 30% short-grazed patches in native pastures'.  
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**474. Grazing and haying effects on runoff and erosion from a former Conservation Reserve Program site.**

Gilley, J. E.; Patton, B. D.; Nyren, P. E.; and Simanton, J. R.  
*Applied Engineering in Agriculture* 12(6): 681-684. (Nov. 1996)  
NAL Call #: S671.A66; ISSN: 0883-8542  
*Descriptors:* agricultural land/ land management/ federal programs/ land use/ change/ soil conservation/ grassland management/ grazing/ rotational grazing/ haymaking/ prescribed burning/ runoff/ water erosion/ sediment/ losses from soil/ canopy/ vegetation/ coverage/ surface roughness/ bulk density/ soil compaction/ North Dakota/ season long grazing  
*Abstract:* Grazing and haying effects on runoff and erosion from a former Conservation Reserve Program (CRP) site near Streeter, North Dakota, were determined. Treatments included undisturbed CRP, twice-over rotational grazing,



season-long grazing, haying, and burning. Runoff and erosion were measured from simulated rainfall which was applied to 3.7 X 10.7 m (12.0 X 35.1 ft) plots. Following an initial stabilization period, no significant difference in runoff or erosion was found between the season-long grazing and burned treatments. Use of the CRP site for grazing or haying resulted in a significant increase in runoff compared to leaving the area in an undisturbed condition. Similar amounts of erosion were measured from the twice-over rotational grazing, season-long grazing, and hayed treatments. If adequate canopy and basal cover is maintained, use of this CRP site for grazing or haying would not be expected to result in excessive erosion. This citation is from AGRICOLA.

**475. Grazing and plant-canopy effects on semiarid soil microbial biomass and respiration.**

Kieft, T. L.

*Biology and Fertility of Soils* 18(2): 155-162. (1994)

NAL Call #: QH84.8.B46; ISSN: 0178-2762

*Descriptors:* soil microorganisms/ microorganisms/ microbial activity/ rangelands/ *Bouteloua*/ *Atriplex canescens*/ *Yucca glauca*/ canopy/ carbon/ range management/ grasslands/ semiarid zones/ grazing/ soil respiration/ New Mexico

This citation is from AGRICOLA.

**476. Grazing effects on soil water in Alberta foothills fescue grasslands.**

Naeth, M. A. and Chanasyk, D. S.

*Journal of Range Management* 48(6): 528-534. (1995)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/1995/486/528-534\\_naeth.pdf](http://jrm.library.arizona.edu/data/1995/486/528-534_naeth.pdf)

*Descriptors:* cattle/ soil water content/ grazing intensity/ slope/ groundwater recharge/ evapotranspiration/ soil depth/ grazing/ Alberta

*Abstract:* Grazing can have a profound impact on soil water through its influence on infiltration via treading and on evapotranspiration through defoliation. Hydrologic changes in rangelands are most often associated with heavy grazing intensities although these changes do not increase linearly with grazing intensity. The objectives of this study were to quantify the impacts of grazing on the soil water regimes of sloped areas of the foothills fescue grasslands of Alberta. The study site was located at the Agriculture Canada Research Station at Stavely, Alberta. The effects of 2 grazing intensities (heavy = 2.4 AUM ha<sup>-1</sup> and very heavy = 4.8 AUM ha<sup>-1</sup>) for 2 grazing treatments (short duration = 1 week in mid-June and continuous grazing = May through October) were compared to an ungrazed control. The study was initiated in June 1988 and ended in April 1991. Surface soil water and soil water with depth were measured throughout each growing season using a neutron probe. Surface soil water (0 to 7.5 cm) across slope positions was lowest in the control and highest in the continuous very heavy treatments, but the trend in profile soil water (to 50 cm) was the opposite. Total profile soil water in the short duration very heavy treatment was greater than that in the continuous very heavy treatment, while soil water in the short duration heavy treatment was similar to that in the continuous heavy treatment. Vegetation at the study site was regularly water-stressed, as evidenced by soil water that was often below permanent wilting point, generally by mid-summer each year. Soil was near or below permanent

wilting point in the autumn, regardless of its status throughout the growing season. Profile soil water was similar across treatments in autumn, indicating vegetation is using all available soil water. In contrast, soil water was generally near or above field capacity every spring, indicating the importance of snowmelt infiltration in these ecosystems. Only major (greater than 75 mm) summer rainstorms recharged soil water to field capacity. Thus it is concluded that maintenance of a vegetative cover that will trap snow for potential snowmelt infiltration is critical to soil water recharge of these ecosystems. Any grazing management regime that enhances litter accumulation and carryover should facilitate such snowmelt soil water recharge.

This citation is from AGRICOLA.

**477. Grazing effects on the bulk density in a Natraquoll of the Flooding Pampa of Argentina.**

Taboada, M. A. and Lavado, R. S.

*Journal of Range Management* 41(6): 500-503. (1988)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1988/416/12tabo.pdf>

*Descriptors:* soil water retention/ environmental condition/ land use

*Abstract:* The influence of grazing by cattle on soil bulk density was studied in a typical Natraquoll of the Flooding Pampa of Argentina for a period of 33 months, by comparing a grazed situation to an enclosure deferred from grazing for 7 years. Floods took place in this period as usual. Bulk density (BD) at -33.3 kPa of water retention varied from 1.00 to 1.11 Mg m<sup>-3</sup> in the ungrazed soil and in the grazed soil from 1.04 to 1.16 Mg m<sup>-3</sup>. Environmental factors were the primary agent controlling BD; only in some periods were there significant differences between treatments. Slight increases in BD occurred under grazing after the recession of the flood water, and significant decreases occurred in the ungrazed soil during the large and sudden falls in water content. In this case the effect of trampling, therefore, would consist mainly of impeding the decrease in BD. No compaction was observed in periods when no flood occurred or while soil remained submerged in water. The results indicated that the variations of bulk density caused by cattle trampling were superimposed on those produced by floods and showed an interaction between the effects of land-use and the particular environmental conditions of the region.

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**478. Grazing impacts on selected soil parameters under short-term forage sequences.**

Mapfumo, E.; Chanasyk, D. S.; Baron, V. S.; and Naeth, M. A.

*Journal of Range Management* 53(5): 466-470. (2000)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/2000/535/466-470\\_mapfumo.pdf](http://jrm.library.arizona.edu/data/2000/535/466-470_mapfumo.pdf)

*Descriptors:* beef cattle/ grazing intensity/ botanical composition/ rotational grazing/ *Bromus inermis*/ *Bromus riparius*/ *tritricale*/ *Hordeum vulgare*/ soil properties/ water holding capacity/ potassium/ soil test values/ mineral content/ carbon/ nitrogen content/ electrical conductivity/ soil depth/ soil pH/ Alberta

*Abstract:* Long-term cultivation is known to change soil physical and chemical properties, but little is known about whether short-term agricultural practices, such as rotational



grazing, can initiate such changes. This study investigated the impacts of 3 grazing intensities (heavy, medium, and light) and 4 forages on selected soil physical and chemical parameters of a Typic Haplustoll at Lacombe, Alberta. Measurements were conducted on soil samples collected at the beginning (1993) and the end (1996) of the study. Two perennial forages, smooth brome grass (*Bromus inermis* cv. 'Carlton') and meadow brome grass (*Bromus riparius* cv. 'Paddock'), and 2 annuals, a mixture of triticale (*X Triticosecale* Wittmack cv. 'Pika') and barley (*Hordeum vulgare* L. cv. 'AC Lacombe') and triticale alone were used for the study. Grazing intensity or forage species did not affect carbon-to-nitrogen ratio. Grazing intensity influenced changes in available water holding capacity for the 0-5 cm interval, soil nitrogen for the 30-45 cm interval, soil pH for the 5-15 cm interval and electrical conductivity for all depth intervals except for the 0-5 cm interval (P less than or equal to 0.05). Forage species affected changes in soil carbon in the 0-5 cm interval, soil pH between 0 and 15 cm, and electrical conductivity between 5 and 45 cm (P less than or equal to 0.05). Soil electrical conductivities for all grazing levels and forage treatments were within the range (i.e. 0-2 dS m<sup>-1</sup>) considered to have negligible effects on plant growth. The minimal effects of grazing and plant species on soil parameters in this study may have been due to the resilient intrinsic properties of the soil and/or the short study length.

This citation is from AGRICOLA.

**479. Grazing impacts on soil nitrogen and phosphorus under Parkland pastures.**

Baron, V. S.; Dick, A. C.; Mapfumo, E.; Malhi, S. S.; Naeth, M. A.; and Chanasyk, D. S.

*Journal of Range Management* 54(6): 704-710. (2001)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/2001/546/704-710\\_baron.pdf](http://jrm.library.arizona.edu/data/2001/546/704-710_baron.pdf)

*Descriptors:* range management/ *Bromus inermis*/ *Bromus riparius*/ triticale/ grazing intensity/ beef cattle/ NPK fertilizers/ soil chemistry/ nitrate nitrogen/ prairies/ phosphorus/ nitrogen content/ stocking rate/ soil fertility/ application rate/ Alberta

*Abstract:* Because intensive grazing is new to the humid western Canadian parkland (prairies), there is little information available about its effects on soil N and P status. This study addressed the question of grazing intensity and pasture species effects on soil macronutrient status in a Typic Haplustoll at Lacombe, Alberta. Paddocks of smooth brome grass (*Bromus inermis* Leyss.), meadow brome grass (*Bromus riparius* Rhem.), and winter triticale (*X Triticosecale* Wittmack.), replicated 4 times, were subjected to 3 grazing intensities (heavy, medium, and light as defined by frequency and severity of defoliation) using yearling beef heifers. Nitrogen (N), P and K fertilisers were broadcast annually at 100, 22 and 42 kg ha<sup>-1</sup> during production years. The experiment was maintained on the same paddocks for 4 years. In the establishment year and in the third and fourth production years, soil samples were taken randomly from each paddock to a depth of 60 cm. Concentrations of nitrate-N (NO<sub>3</sub>-N), ammonium-N (NH<sub>4</sub>-N), mineral-N (the sum of NO<sub>3</sub>-N and NH<sub>4</sub>-N), total Kjeldahl-N, and extractable-P were determined in the 0-15, 15-30, 30-60, and 0-60-cm depths. Nitrate-N concentration was (1.7 to 2.4 times) greater for heavy than light grazed treatments for each soil depth increment and the amount of

NO<sub>3</sub>-N in the 0-60 cm depth was 2.2 times greater than light paddocks. More NO<sub>3</sub>-N was measured under perennials than triticale (22.2 vs 13.6 mg kg<sup>-1</sup>), respectively) at the 30-60-cm depth. Ammonium-N amount (0-60 cm) was greater in meadow brome grass (30 kg ha<sup>-1</sup>) than in triticale (25 kg ha<sup>-1</sup>), but not smooth brome grass paddocks for the 0-15-cm depth. Extractable-P concentration was greater in the 0-15-cm depth of heavy (154 mg kg<sup>-1</sup>) than in medium (138 mg kg<sup>-1</sup>) or light-grazed (127 mg kg<sup>-1</sup>) paddocks and was higher under meadow brome grass than under triticale. Given the large amounts of NO<sub>3</sub>-N in the heavy paddocks, there is potential for loss through both leaching and denitrification. Differences among treatments for NH<sub>4</sub>-N, and P concentrations are not of particular concern environmentally, but are important from a fertility management point of view. This citation is from AGRICOLA.

**480. Grazing impacts on soil water in mixed prairie and fescue grassland ecosystems of Alberta.**

Naeth, M. A.; Chanasyk, D. S.; Rothwell, R. L.; and Bailey, A. W.

*Canadian Journal of Soil Science* 71(3): 313-326. (1991)

NAL Call #: 56.8 C162; ISSN: 0008-4271

*Descriptors:* livestock/ rangeland/ trampling/ soil infiltration/ seasonality

*Abstract:* Reduced soil water under grazing is generally attributed to reduced infiltration as livestock trampling compacts the soil surface. Grazing can also have the opposite effect on soil water through reduced evapotranspiration when vegetation is removed. On the Canadian Prairies, grazing impacts on soil water have been assessed in short-term studies but impacts of long-term grazing have not been documented. In this study, impacts of long-term grazing on soil water were assessed in mixed prairie, parkland fescue grassland, and foothills fescue grassland ecosystems of southern and central Alberta. Grazing regimes were of light to very heavy intensities, grazed early, late, and continuously during the growing season. Soil water was measured with a neutron probe to a depth of 1 m from April through October over three growing seasons. Normal patterns of soil water recharge in autumn and spring and soil water depletion in summer due to evapotranspiration were not altered by grazing. Fluctuations in soil water were most pronounced in the uppermost 30 cm but still evident in the 30- to 50-cm and 50- to 80-cm depth intervals. Heavy intensity and/or early season grazing had a greater impact on soil water than light intensity and/or late season grazing. Season of grazing affected soil water more under light than heavy grazing intensities. On most sampling dates, soil water in grazed treatments was lower than in the ungrazed control, particularly in the 30- to 50-cm and 50- to 80-cm depth intervals. Differences between the control and grazed treatments were least pronounced during the summer months with evapotranspiration depleting soil water reserves in all treatments.

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**481. Grazing impacts on the spatial distribution of soil microbial biomass around tussock grasses in a tropical grassland.**

Northup, B. K.; Brown, J. R.; and Holt, J. A.  
*Applied Soil Ecology* 13(3): 259-270. (1999)  
 NAL Call #: QH541.5.S6A67; ISSN: 0929-1393  
 Descriptors: grassland soils/ tropical grasslands/ soil microorganisms/ biomass/ carbon/ grazing/ grazing intensity/ *Bothriochloa*/ *Heteropogon contortus*/ slope/ stocking rate/ range management/ pastures/ soil fertility/ nitrogen/ phosphorus/ soil organic matter/ soil water/ Queensland  
 This citation is from AGRICOLA.

**482. Grazing management and soil salinization in two Pampean Natraqualfs.**

Lavado, R. S.; Rubio, G.; and Alconada, M.  
*Turrialba* 42(4): 500-508. (1992)  
 NAL Call #: 8 T86; ISSN: 0041-4360  
 Descriptors: grazing/ salinization/ Alfisols/ pampas  
 Abstract: The effect of grazing management (continuous grazing, rotational grazing and no grazing) on soil salinization was studied in two Natraqualfs of the Flooding Pampa of Argentina. Under continuous grazing the A1 horizon showed episodic increases in salt content due to the reduction of the soil cover and increased evaporation, resulting in salinization of the topsoil. This occurred to a much lesser degree under rotational grazing and was not observed under the no-grazing treatment.  
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**483. Grazing systems their influence on infiltration rates in the Rolling Plains of Texas.**

Wood, M. K. and Blackburn, W. H.  
*Journal of Range Management* 34(4): 331-335. (1981)  
 NAL Call #: 60.18 J82; ISSN: 0022-409X  
<http://jrm.library.arizona.edu/data/1981/344/18wood.pdf>  
 Descriptors: grass pastures/ rotation/ water movement/ aggregate stability/ organic matter/ mulch/ bulk density/ ground cover  
 Abstract: Water infiltration rates into soils after 30 min in shrub canopy areas and in shortgrass interspaces on the Rolling Plains were similar across grazing treatments of heavy and moderate stocking, continuous grazing; rested and grazed deferred-rotation; rested and grazed high intensity, low frequency (HILF); and 2 livestock enclosures grazed for 20 yr. The mid-grass interspace infiltration rates for the deferred-rotation treatments approached rates in the enclosures and exceeded rates in the heavily stocked, continuously grazed, and grazed HILF pastures. Infiltration rates in the HILF grazing treatments were similar to those of the heavily stocked, continuously and moderately stocked continuously grazed pastures. Infiltration rates in the rested HILF pasture were similar to those of the deferred-rotation pastures; however, the grazed HILF pasture had rates lower than the deferred-rotation pasture rates or rates of the enclosures. Aggregate stability, organic matter content, mulch, standing crop, bulk density, and ground cover significantly influenced infiltration rates.  
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**484. Guidelines for managing cattle grazing in riparian areas to protect water quality: Review of research and best management practices policy.**

Mosley, Jeffrey C.  
 Moscow, ID: Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho; 67 p. (1997)  
 Notes: "December 1997"--Cover. Includes bibliographical references (p. 51-63).  
 NAL Call #: SF85.35.I2G95--1997  
 Descriptors: grazing---Idaho---management/ water quality---Idaho/ riparian areas---Idaho---management/ stream conservation---Idaho  
 This citation is from AGRICOLA.

**485. Hydrologic characteristics of vegetation types as affected by livestock grazing systems, Edwards Plateau, Texas.**

Thurrow, T. L.; Blackburn, W. H.; and Taylor, C. A.  
*Journal of Range Management* 39(6): 505-509. (1986)  
 NAL Call #: 60.18 J82; ISSN: 0022-409X  
<http://jrm.library.arizona.edu/data/1986/396/6thur.pdf>  
 Descriptors: soil/ drainage/ erosion/ grazing systems/ soil water movement/ infiltration/ pastures/ soil organic matter/ soil density/ grasslands  
 Abstract: Infiltration rate and sediment production were assessed in sites dominated by either *Quercus virginiana* or *Bouteloua curtipendula*, *Stipa leucotricha* and *Aristida* spp. (bunchgrasses) or *Hilaria belangeri* in moderate continuous (MCG), heavy continuous (HCG) and short duration (SDG) grazing systems, and in a livestock enclosure (LEX). Infiltration rate was related to the total organic cover and bulk density characteristics of the site. SDG and HCG pastures had lower total organic cover with correspondingly lower infiltration rates compared to MCG and LEX pastures. Bulk density was lower in *Q. virginiana* mottes than in the grass areas between *Q. virginiana* plants, but there was no difference between pastures. Sediment production was related to total aboveground biomass and the bunchgrass cover of the site. Total aboveground biomass was greatest in the *Q. virginiana* motte and least in the *H. belangeri* areas, and was greater in the MCG and LEX than in the SDG and HCG pastures.  
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**486. Hydrologic impacts of sheep grazing on steep slopes in semiarid rangelands.**

Wilcox, B. P. and Wood, M. K.  
*Journal of Range Management* 41(4): 303-306. (1988)  
 NAL Call #: 60.18 J82; ISSN: 0022-409X  
<http://jrm.library.arizona.edu/data/1988/414/7wilc.pdf>  
 Descriptors: soil water movement/ infiltration/ grazing/ rangelands/ steepland soils/ semiarid zones/ animal husbandry/ land types/ soil types physiographic/ erosion/ sediment yield  
 Abstract: Infiltration, sediment concentration of runoff, and sediment production from lightly grazed and ungrazed semiarid slopes in the Guadalupe Mountains of southeastern New Mexico were compared using a hand-portable rainfall simulator. Average slope steepness was 50%. Infiltrability on the grazed slopes was 12-17% lower than on the ungrazed slopes. These results are comparable to those reported from moderate slope gradients. Sediment concentration of runoff from the lightly grazed slopes was significantly higher than from the ungrazed slopes only at the end of the dry run (45 min.) Sediment production was

significantly greater from the grazed slopes for the dry run, but not the wet run. Percentage difference of sediment production between the grazed and ungrazed slopes was well within the range published for moderate slope conditions. These data give no indication that steep slopes (30-70%) in semiarid regions are any more hydrologically sensitive to light grazing than are moderate slopes (<10%).  
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#### 487. Hydrologic response to cattle grazing in the Ethiopian highlands.

Mwendera, E. J. and Mohamed Saleem, M. A.  
*Agriculture, Ecosystems & Environment* 64(1): 33-41. (1997)

NAL Call #: S601 .A34; ISSN: 0167-8809

*Descriptors:* hydrology/ livestock/ grazing/ infiltration/ runoff/ soil erosion/ cattle/ pastures/ Ethiopia

*Abstract:* The effect of grazing pressure on infiltration, runoff, and soil loss was studied on a natural pasture during the 1995 rainy season in the Ethiopian highlands. The study was conducted on 0.01 ha plots established on sites with 0-4% and 4-8% slopes at the International Livestock Research Institute (ILRI) Debre Zeit research station, 50 km south of Addis Ababa. The grazing regimes were: light grazing stocked at 0.6 animal-unit-months (AUM) ha super(-1); moderate grazing stocked at 1.8 AUM ha super(-1); heavy grazing stocked at 3.0 AUM ha super(-1); very heavy grazing stocked at 4.2 AUM ha super(-1); very heavy grazing on ploughed soil stocked at 4.2 AUM ha super(-1); and a control with no grazing. Heavy to very heavy grazing pressure significantly increased surface runoff and soil loss and reduced infiltrability of the soil. It was observed that fine textured soils were more susceptible to trampling effects than coarse textured soils, and that reduction in infiltration rates was greater on soils which had been tilled and exposed to very heavy trampling. The problems of high runoff and erosion rates on the upper slopes is likely to be exacerbated by the fact that during the rainy season higher grazing pressure is exerted on the upper than lower slopes. Sediments produced from the highlands, which form headwaters of major rivers in the region, are likely to pollute streams and lakes and pile up on bottom-lands, in stream channels, and in reservoirs. With some modifications, the plot design presented here can be used for assessing livestock impacts on natural resources on different landforms at large scales such as watersheds. How the same amount of livestock mass dispersed by different livestock species impacts on the grazing lands needs to be studied further.

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#### 488. Impact of deferred rotation grazing on stream characteristics in central Nevada: A case study.

Myers, T. J. and Swanson, S.  
*North American Journal of Fisheries Management* 15(2): 428-439. (1995)

NAL Call #: SH219.N66; ISSN: 0275-5947

*Descriptors:* land use/ ranching/ watersheds/ fluvial morphology/ habitat improvement/ grazing/ range management/ USA, Nevada/ range management/ ranching/ fluvial morphology/ habitat improvement

*Abstract:* Three central Nevada streams were selected to study the watershed-scale effects on stream morphology and bank stability of deferred rotation cattle grazing, complete rest from grazing, and the presence of road

crossings. The streams had gravel substrates, and their entrenchments, width: depth ratios, sinuosities and gradients were moderate. Based on statistical analysis of 1980 stream survey results, geologic basin features, and the occurrence of similar flooding, we concluded that the three streams had similar conditions at the start of the grazing treatment. Since 1980, deferred rotation grazing allowed much improvement of aquatic and riparian habitats but the improvement was limited by the presence of roads, which apparently added sediment to the streams. Complete rest from grazing without the presence of roads allowed the most improvement. Of the variables measured in the 1980 survey, streambank soil stability, type and amount of vegetation cover, and quality of pools improved most in all three streams. The best values for channel and water width: depth ratios, channel entrenchment, bank angle, bank undercut, and bank depth were measured on the stream managed with complete rest. Deferred rotation grazing in the absence of roads produced the second best values. The ratio of channel width to base flow water width was significantly higher on bare ground transects. Shrub and tree cover increased significantly more on the rested than on the grazed watersheds. These results should help managers select aquatic habitat and stream morphology objectives for grazing management.

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#### 489. Impact of grazing and tillage on water erosion in northeastern Syria.

Shinjo, Hitoshi; Fujita, Haruhiro; Gintzbuger, Gus; and Kosaki, Takashi  
*Soil Science and Plant Nutrition* 46(1): 151-162. (2000)  
NAL Call #: 56.8 SO38; ISSN: 0038-0768

*Descriptors:* aggregate stability/ grazing impact/ semiarid conditions/ tillage impact/ water erosion

*Abstract:* Impact of grazing and tillage on water erosion under natural rainfall conditions was investigated during the 1994/95 and 1995/96 rainy seasons in the Abd Al-Aziz mountain region, northeastern Syria. The grazing impact was not significant (0.4 Mg ha<sup>-1</sup> y<sup>-1</sup> at most) because the vegetation coverage was relatively abundant. Tillage enhanced soil loss (1.4 Mg ha<sup>-1</sup> y<sup>-1</sup>) presumably due to the mechanical disturbance and the removal of shrub species. The ratio of the total nitrogen content in the sediments to that in the bulk soils (enrichment ratio) in the cropland exceeded unity, suggesting the selective removal of the organic matter by water erosion. Measures to reduce water erosion and to replenish organic matter should be taken.

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#### 490. Impact of grazing livestock and distance from water sources on soil fertility in southern Mongolia.

Stumpp, Markus; Wesche, Karsten; Retzer, Vroni; and Mieke, Georg  
*Mountain Research and Development* 25(3): 244-251. (2005)  
NAL Call #: GB500.M68; ISSN: 0276-4741

*Descriptors:* soil fertility/ habitat degradation/ grazing impact/ plant community composition/ pastoral land/ dung unit density

*Abstract:* The impact of livestock grazing on soil nutrients and vegetation parameters was studied in dry montane steppes of southern Mongolia in order to assess the risk of habitat degradation. Data were collected along transects radiating away from permanent water sources. Dung unit

density counts revealed gradients of livestock activity, but utilization belts around water sources overlapped, indicating that pastoral land use affects the entire landscape. Dung unit counts corresponded to gradients in soil nutrient parameters (C, N, P), which significantly decreased with distance from the wells. However, no significant correlation was observed for plant species richness and vegetation composition with distance from water source. This indicates that soil parameters and livestock grazing exert a relatively smaller influence on the vegetation than the high inter-annual variability in precipitation. Therefore, the ecosystem at the study site was found to react in a non-equilibrium way, which suggests that the risk of degradation is low, at least insofar as plant community composition is concerned.  
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**491. Impact of grazing on soil nutrients in a Pampean grassland.**

Lavado, R. S.; Sierra, J. O.; and Hashimoto, P. N.  
*Journal of Range Management* 49(5): 452-457. (1996)  
NAL Call #: 60.18 J82; ISSN: 0022-409X  
[http://jrm.library.arizona.edu/data/1996/495/452-457\\_lavado.pdf](http://jrm.library.arizona.edu/data/1996/495/452-457_lavado.pdf)

*Descriptors:* grasslands/ nitrogen/ phosphorus/ soil fertility/ soil organic matter/ nitrate nitrogen/ ammonium nitrogen/ spatial variation/ statistical analysis/ geostatistics/ Argentina  
*Abstract:* Cattle exclusion induced dramatic changes in the plant community and modifications in nutrient cycling in grazed native grasslands of the Flooding Pampa (Argentina). The study was carried out to analyze the effect of grazing on the status and spatial variability of soil organic matter, nitrogen and phosphorus. Sampling was performed in the late summer and early spring. Geostatistical methods were used to study the spatial dependence of these soil properties. Organic carbon (OC) and total nitrogen (TN) showed spatial structure only in the ungrazed area with a similar range of dependence (39 m and 36 m respectively). The occurrence of litter in this area lead to a large and spatially homogeneous C input to the soil, which would be the key factor of the spatial structure of organic carbon and total nitrogen. Mineral nitrogen content  $1(\text{NO}_3(-)\text{-N} + (\text{NH}_4+)\text{-N})$  was higher in the ungrazed area on both sampling dates. The mineral N content showed a large short-range variability (nugget variation) independent of grazing history. A significant decrease in the extractable P (Bray & Kurtz #1) in the grazed area was found. The extractable P exhibited spatial structure only in the ungrazed area. However, its spatial pattern was different from those of organic carbon and total nitrogen: the range of dependence was higher (57 m) and the spatial structure exhibited a great irregularity. The differences between C, N, and P variability were possibly related to their dynamics in the soil. No evidence of effects of animal excrete on nutrient content or spatial variability was found.  
This citation is from AGRICOLA.

**492. Impact of herbivores on nitrogen cycling: Contrasting effects of small and large species.**

Bakker, E. S.; Olf, H.; Boekhoff, M.; Gleichman, J. M.; and Berendse, F.  
*Oecologia (Berlin)* 138(1): 91-101. (2004)  
NAL Call #: QL750.O3; ISSN: 0029-8549  
*Descriptors:* biomass/ body size/ enclosure experiments/ floodplain grasslands: habitat/ grazing behavior/ herbivory/

laboratory conditions/ litter accumulation/ microclimates/ nitrogen cycling/ plant animal interactions/ soil parameters/ vegetation

*Abstract:* Herbivores are reported to slow down as well as enhance nutrient cycling in grasslands. These conflicting results may be explained by differences in herbivore type. In this study we focus on herbivore body size as a factor that causes differences in herbivore effects on N cycling. We used an enclosure set-up in a floodplain grassland grazed by cattle, rabbits and common voles, where we subsequently excluded cattle and rabbits. Exclusion of cattle lead to an increase in vole numbers and a 1.5-fold increase in net annual N mineralization at similar herbivore densities (corrected to metabolic weight). Timing and height of the mineralization peak in spring was the same in all treatments, but mineralization in the vole-grazed treatment showed a peak in autumn, when mineralization had already declined under cattle grazing. This mineralization peak in autumn coincides with a peak in vole density and high levels of N input through vole faeces at a fine-scale distribution, whereas under cattle grazing only a few patches receive all N and most experience net nutrient removal. The other parameters that we measured, which include potential N mineralization rates measured under standardized laboratory conditions and soil parameters, plant biomass and plant nutrient content measured in the field, were the same for all three grazing treatments and could therefore not cause the observed difference. When cows were excluded, more litter accumulated in the vegetation. The formation of this litter layer may have added to the higher mineralization rates under vole grazing, through enhanced nutrient return through litter or through modification of microclimate. We conclude that different-sized herbivores have different effects on N cycling within the same habitat. Exclusion of large herbivores resulted in increased N annual mineralization under small herbivore grazing.  
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**493. Impacts of cattle on streambanks in north-eastern Oregon.**

Kauffman, J. B.; Krueger, W. C.; and Vavra, M.  
*Journal of Range Management* 36(6): 683-684. (1983)  
NAL Call #: 60.18 J82; ISSN: 0022-409X  
<http://jrm.library.arizona.edu/data/1983/366/2kauf.pdf>

*Descriptors:* livestock/ environmental impact/ streams/ erosion/ river banks/ cattle/ USA, Oregon, Catherine Creek/ livestock/ streams  
*Abstract:* Impacts of a late season livestock grazing strategy on streambank erosion, morphology, and undercutting were studied for 2 years along Catherine Creek in northeastern Oregon. Streambank loss, disturbance, and undercutting were compared between grazing treatments, vegetation type, and stream-meander position. No significant differences were found among vegetation type or stream-meander location. Significantly greater streambank erosion and disturbance occurred in grazed areas than in enclosed areas during the 1978 and 1979 grazing periods. Over-winter erosion was not significantly different among treatments. However, erosion related to livestock grazing and trampling was enough to create significantly greater annual streambank losses when compared to ungrazed areas.  
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**494. Impacts of rest-rotation grazing on stream banks in forested watersheds in Idaho.**

Platts, W. S. and Loren Nelson, R.

*North American Journal of Fisheries Management* 5(4): 547-556. (1985)

NAL Call #: SH219.N66; ISSN: 0275-5947

*Descriptors:* grazing/ watersheds/ environmental protection/ agriculture/ water quality/ fluvial morphology/ river banks

*Abstract:* Rest-rotation grazing in Idaho allowed forage in the stream-side zone to be used at a higher rate than on either immediately adjacent range or the overall grazing allotment. Stream-sides received unauthorized grazing during the scheduled rest periods, however, and complete rest was difficult to achieve. Cattle appeared to graze stream-side meadows at high elevations with less intensity during the early grazing period when vegetation was lush than during the late grazing period. Stream-bank alteration occurred soon after cattle were turned into ungrazed meadows.

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**495. Increasing summer flow in small streams through management of riparian areas and adjacent vegetation: A synthesis.**

Stabler, D. F.

In: *Riparian ecosystems and their management: Reconciling conflicting uses.* (Held 16 Apr 1985-18 Apr 1985 at Tuscon, Ariz.) Johnson, R. Roy; Ziebell, Charles D.; Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H. (eds.)

Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, United States, Forest Service; pp. 206-210; 1985.

NAL Call #: aSD11.A42

*Descriptors:* stream flow/ riparian buffers/ grazing

This citation is from AGRICOLA.

**496. Infiltration and interrill erosion responses to selected livestock grazing strategies, Edwards Plateau, Texas.**

Thurow, T. L.; Blackburn, W. H.; and Taylor, C. A.

*Journal of Range Management* 41(4): 296-302. (1988)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1988/414/6thur.pdf>

*Descriptors:* livestock/ grazing/ grasslands/ interrill erosion/ runoff/ water conservation/ range management/ sediments/ Texas

This citation is from AGRICOLA.

**497. Infiltration and water quality on range sites at Fort Stanton, New Mexico.**

Wood, James C. and Wood, M. Karl

*Water Resources Bulletin* 24(2): 317-323. (1988)

NAL Call #: 292.9 Am34; ISSN: 0043-1370

*Abstract:* The hydrologic impacts of livestock grazing schemes on selected plant communities and soils at Fort Stanton, New Mexico, were evaluated. Simulated rainfall was applied to 1 m<sup>2</sup> plots. On a mesa-top, infiltration rates for a grassland livestock enclosure and a pinyon pine-juniper community closely approximated each other and were significantly greater (P equals 0.10) than either a moderate continuous or a heavy continuous treatment in a grassland community. Sediment concentration from the heavy continuous treatment was more than twice that of the

other treatments. Infiltration rates on the hillside site were highest in a pinyon pine-juniper community receiving short duration grazing. Infiltration for this treatment was found to be significantly higher (P equals 0.10) than that of a short duration grazing treatment on grassland. The short duration grazing treatment on a grassland had the highest sediment concentration.

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**498. Infiltration rates and sediment production as influenced by grazing systems in the Texas Rolling Plains.**

Pluhar, J. J.; Knight, R. W.; and Heitschmidt, R. K.

*Journal of Range Management* 40(3): 240-243. (1987)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1987/403/11pluh.pdf>

*Descriptors:* watershed condition/ stocking/ summer vegetation/ standing crop/ organic matter/ aggregate stability/ soil

*Abstract:* Research was initiated in August 1982 at the Texas Experimental Ranch to evaluate effect of selected grazing treatments on watershed condition. Two production scale grazing treatments were sampled on 4 dates over a period of 15 months. Treatments were yearlong continuous grazing stocked at a moderate rate (MC) and a 16-paddock rotational grazing treatment stocked at a heavy rate (RG). In addition, hydrologic conditions in an ungrazed enclosure (EX) and a moderately stocked 4-pasture, 3-herd deferred rotation treatment (DR) were examined during the summer of 1982. Regression analyses indicated infiltration rates increased and sediment production declined as vegetation standing crop and cover increased, soil bulk density decreased, and soil organic matter and aggregate stability increased. Averaged across the 4 sample dates, sediment production was least (33 kg/ha) and infiltration rate greatest (89 mm/hr) in the MC treatment as compared to the RG treatment (63 kg/ha and 82 mm/hr). Infiltration rates and sediment production in the RG and DR treatments before grazing were not significantly different from those in the MC treatment; however, grazing caused a significant decline in infiltration rates and a significant increase in sediment production in both treatments. Sediment production was least in the enclosure (23 kg/ha) while infiltration rates were generally greater and sediment production less in the midgrass communities as compared to the shortgrass communities. All effects were closely related to the effect of the various treatments on vegetation standing crop and cover.

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**499. Infiltration rates, surface runoff, and soil loss as influenced by grazing pressure in the Ethiopian highlands.**

Mwendera, E. J. and Saleem, M. A. Mohamed

*Soil Use and Management* 13(1): 29-35. (1997)

NAL Call #: S590.S68; ISSN: 0266-0032

*Descriptors:* conservation/ Ethiopian highlands/ government agency/ grazing pressure influence/ infiltration rates/ international livestock research institute/ land use planning/ soil loss/ soil science/ surface runoff/ trampling effects

*Abstract:* The effect of grazing pressure on infiltration, runoff, and soil loss was studied on a natural pasture during the rainy season of 1995 in the Ethiopian highlands. The

study was conducted at two sites with 0-4% and 4-8% slopes at the International Livestock Research Institute (ILRI) Debre Zeit research station, 50 km south of Addis Ababa. The grazing regimes were: light grazing stocked at 0.6 animal-unit-months (AUM)/ha; moderate grazing stocked at 1.8 AUM/ha; heavy grazing stocked at 3.0 AUM/ha; very heavy grazing stocked at 4.2 AUM/ha; very heavy grazing on ploughed soil stocked at 4.2 AUM/ha; and a control with no grazing. Heavy to very heavy grazing pressure significantly reduced biomass amounts, ground vegetative cover, increased surface runoff and soil loss, and reduced infiltrability of the soil. Reduction in infiltration rates was greater on soils which had been ploughed and exposed to very heavy trampling. It was observed that, for the same % vegetative cover, more soil loss occurred from plots on steep than gentle slopes, and that gentle slopes could withstand more grazing pressure without seriously affecting the ground biomass regeneration compared to steeper slopes. Thus, there is a need for developing 'slope-specific' grazing management schedules particularly in the highland ecozones rather than making blanket recommendations for all slopes. More research is needed to quantify annual biophysical changes in order to assess cumulative long-term effects of grazing and trampling on vegetation, soil, and hydrology of grazing lands. Modelling such effects is essential for land use planning in this fragile highland environment.

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**500. Influence of grazing management on vegetation soil structure and nutrient distribution and the infiltration of applied rainfall in a semi-arid chenopod shrubland.**

Graetz, R. D. and Tongway, D. J.

*Australian Journal of Ecology* 11(4): 347-360. (1986)

NAL Call #: QH540.A8; ISSN: 0307-692X

*Descriptors:* lichen/ vegetation cover/ plant growth/ soil chemistry/ Landsat imagery

*Abstract:* The experiment utilized a fenceline contrast in vegetation and soil condition that was clearly visible on Landsat imagery. Measurements of vegetation cover, soil structure and chemistry, and infiltration were made. The greatest vegetation change was at the soil surface where the loss of litter and lichen crust cover under heavy grazing accompanied the loss of perennial shrubs. Although grazing caused changes in soil structure and chemistry to less than 10 cm in depth, these changes are quite significant for plant growth. Consistent differences in the infiltration of applied rainfall at two intensities were measured between the grazed and ungrazed sites. At both intensities of application the absence of a lichen crust increased infiltration three-fold on the heavily grazed site compared with the ungrazed site. The implications of these observations on the long-term functioning of this landscape are discussed.

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**501. Influence of grazing on channel morphology of intermittent streams.**

George, M. R.; Larsen, R. E.; McDougald, N. K.; Tate, K. W.; Gerlach, J. D.; and Fulgham, K. O.

*Journal of Range Management* 55(6): 551-557. (2002)

NAL Call #: 60.18 J82; ISSN: 0022-409X

*Descriptors:* annual rangelands/ California/ grazing effects/ sediment/ streambank erosion

*Abstract:* Alteration of stream channel morphology by cattle and associated streambank erosion is a concern on rangeland watersheds. The objective of this study was to determine changes in stream channel morphology in response to 5 grazing treatments applied to 0.4 ha pastures and replicated on 3 intermittent streams at the San Joaquin Experimental Range in the central Sierra Nevada foothills of California. Baseline stream channel morphology parameters were determined along 10 transects in each pasture in June 1994. Seasonal grazing treatments (no grazing, wet season moderate, wet season concentrated, dry season moderate, and dry season concentrated) were repeated annually over 4 years beginning in July 1994. Stream channel morphology parameters were measured annually from 1995-1998. When stream morphological responses were averaged across years, there were no detectable effects of grazing on the parameters measured. Year effects and their interaction with grazing were significant, primarily for stream morphological parameters that included channel depth in their measurement or calculation. Channel depth increased significantly in the ungrazed controls, but did not change due to any grazing treatment. These results indicate that grazing had little effect on the morphology of these bedrock limited, intermittent stream channels.

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**502. Influence of grazing, vegetation life-form, and soil type on infiltration rates and interrill erosion on a Somalian rangeland.**

Takar, A. A.; Dobrowolski, J. P.; and Thurow, T. L.

*Journal of Range Management* 43(6): 486-490. (1990)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1990/436/3taka.pdf>

*Descriptors:* livestock/ rangelands/ pastures/ sandy soils/ clay soils/ watersheds/ watershed management/ grazing intensity/ interrill erosion/ shrubs/ hydrology/ grazing/ plant litter/ Somalia

This citation is from AGRICOLA.

**503. The influence of livestock trampling under intensive rotation grazing on soil hydrologic characteristics.**

Warren, S. D.; Thurow, T. L.; Blackburn, W. H.; and Garza, N. E.

*Journal of Range Management* 39(6): 491-495. (1986)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1986/396/3warr.pdf>

*Abstract:* Infiltration rate decreased significantly and sediment production increased significantly on a site with a silty clay surface soil devoid of vegetation following periodic trampling typical of intensive rotation grazing systems. The deleterious impact of livestock trampling generally increased as stocking rate increased. Damage was augmented when the soil was moist at the time of trampling. Thirty days of rest were insufficient to allow hydrologic recovery. Soil bulk density, aggregate stability, aggregate size distribution and surface microrelief were related to the soil hydrologic response of the trampling treatments.

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**504. Influence of stream characteristics and grazing intensity on stream temperatures in eastern Oregon.**

Maloney, S. B.; Tiedemann, A. R.; Higgins, D. A.; Quigley, T. M.; and Marx, D. B.

Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 1999. 19 p. General Technical Report.

[http://www.fs.fed.us/pnw/pubs/gtr\\_459.pdf](http://www.fs.fed.us/pnw/pubs/gtr_459.pdf)

*Descriptors:* forested watersheds/ grazing management strategies/ grazing intensity/ fisheries/ fish habitat/ chinook salmon/ steelhead trout/ cutthroat trout/ Dolly Varden trout  
*Abstract:* Stream temperatures were measured during summer months, 1978 to 1984, at 12 forested watersheds near John Day, Oregon, to determine temperature characteristics and assess effects of three range management strategies of increasing intensity. Maximum temperatures in streams of the 12 watersheds ranged from 12.5 to 27.8 oC. Maximum stream temperatures on four watersheds exceeded 24 oC, the recommended short-term maximum for rainbow trout (*Oncorhynchus mykiss*) and chinook salmon (*O. tshawytscha*). Streams with greater than 75 percent stream shade maintained acceptable stream temperatures for rainbow trout and chinook salmon. Lowest temperatures were observed in streams from ungrazed watersheds. Although highest temperatures were observed in the most intensively managed watersheds (2.8 hectares per animal unit month), the effect of range management strategy was not definitive. It was confounded by watershed characteristics and about 100 years of grazing use prior to initiation of this study. This citation is from Treesearch.

**505. Influences of continuous grazing and livestock exclusion on soil properties in a degraded sandy grassland, inner Mongolia, northern China.**

Su, Yong Zhong; Li, Yu Lin; Cui, Jian Yuan; and Zhao, Wen Zhi

*Catena* 59(3): 267-278. (2005)

NAL Call #: GB400.C3; ISSN: 0341-8162

*Descriptors:* desertification/ livestock exclusion/ overgrazing/ respiration/ soil erosion

*Abstract:* Overgrazing is one of the main causes of desertification in the semiarid Horqin sandy grassland of northern China. Excluding grazing livestock is considered as an alternative to restore vegetation in degraded sandy grassland in this region. However, few data are available concerning the impacts of continuous grazing and livestock exclusion on soil properties. In this paper, characteristics of vegetation and soil properties under continuous grazing and exclusion of livestock for 5 and 10 years were examined in representative degraded sandy grassland. Continuous grazing resulted in a considerable decrease in ground cover, which accelerates soil erosion by wind, leading to a further coarseness in surface soil, loss of soil organic C and N, and a decrease in soil biological properties. The grassland under continuous grazing is in the stage of very strong degradation. Excluding livestock grazing enhances vegetation recovery, litter accumulation, and development of annual and perennial grasses. Soil organic C and total N concentrations, soil biological properties including some enzyme activities and basal soil respiration improved following 10-year exclusion of livestock, suggesting that degradation of the grassland is being reversed. The results suggest that excluding grazing livestock on the desertified sandy grassland in the erosion-

prone Horqin region has a great potential to restore soil fertility, sequester soil organic carbon and improve biological activity. Soil restoration is a slow process although the vegetation can recover rapidly after removal of livestock. A viable option for sandy grassland management should be to adopt proper enclosure in a rotation grazing system in the initial stage of grassland degradation. Copyright 2004 Elsevier B.V. All rights reserved. © The Thomson Corporation

**506. Lag in stream channel adjustment to livestock enclosure, White Mountains, California.**

Kondolf, G. M.

*Restoration Ecology* 1(4): 226-230. (1993)

NAL Call #: QH541.15.R45R515; ISSN: 1061-2971

*Descriptors:* riparian environments/ environmental restoration/ livestock/ grazing/ streams/ channels/ sediments/ erosion/ sedimentation/ vegetation/ channel morphology/ cross-sections/ habitat improvement/ vegetation cover/ USA, California/ enclosure/ channel morphology/ cross-sections/ habitat improvement/ vegetation cover/ riparian environments/ environmental restoration/ livestock/ streams/ vegetation

*Abstract:* Livestock have been excluded from riparian zones along many streams in western North America in an effort to restore aquatic and riparian habitat degraded by livestock grazing. Within these enclosures, channel adjustment to elimination of grazing pressure may lag behind plant recovery because of the time required to deposit sediment along the vegetated banks of the stream channel. Moreover, unless grazing is eliminated from the watershed, the channel within the enclosure must still accommodate increased runoff and sediment loads from upstream. This hydrologic regime may prevent a return to predisturbance channel morphology. Cross sections of the North Fork Cottonwood Creek in the White Mountains of California showed no significant difference in channel width within and downstream of a 24-year-old enclosure, despite a lush growth of stream bank vegetation that gives the impression of a narrower channel within the enclosure. © CSA

**507. Livestock grazing impacts on infiltration rates in a temperate range of Pakistan.**

Bari, F.; Wood, M. K.; and Murray, L.

*Journal of Range Management* 46(4): 367-372. (1993)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1993/464/17bari.pdf>

*Descriptors:* grasslands/ grazing/ plant litter/ Pakistan  
*Abstract:* This study was conducted in a temperate range of northern Pakistan in 1987 and 1988. The main purpose of the experiment was to determine a suitable residual phytomass level for the moist temperate ranges of Pakistan. Data were collected for 2 consecutive growing seasons. A completely randomized design, with 4 treatments and 2 replications, was used. The treatments were 4 different residual phytomass levels. A rainfall simulator applied rainfall to 48 flexible circular plots (1m<sup>2</sup>). Analysis of variance and the LSD multiple mean comparisons determined treatment differences, and stepwise multiple regression identified the important vegetation and soil variables affecting infiltration. The control (no grazing) resulted in the highest infiltration while the treatment having the lowest residual phytomass had the lowest infiltration. Among the independent variables,



standing phytomass was the most important variable affecting infiltration. Foliar and basal cover were also highly correlated to infiltration.

This citation is from AGRICOLA.

**508. Livestock grazing impacts on interrill erosion in Pakistan.**

Bari, F.; Wood, M. K.; and Murray, L.  
*Journal of Range Management* 48(3): 251-257. (1995)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/1995/483/251-257\\_bari.pdf](http://jrm.library.arizona.edu/data/1995/483/251-257_bari.pdf)

*Descriptors:* watershed management/ grazing intensity/ rill erosion/ biomass/ water erosion/ *Pinus wallichiana*/ rainfall simulators/ soil water/ canopy/ Universal Soil Loss Equation/ sediments/ Pakistan

*Abstract:* This study was conducted for 2 consecutive growing seasons in a temperate region of Pakistan to determine a residual phytomass level necessary to adequately protect the soil against accelerated interrill erosion. A rainfall simulator was used to apply rainfall to 48 (1 m square) circular plots arranged in a completely randomized experimental design, with 4 residual phytomass levels and 2 replications. The residual treatment with 3,024 kg ha<sup>-1</sup> phytomass resulted in the lowest erosion rates, and the treatment with 624 kg ha<sup>-1</sup> phytomass produced the highest erosion. Standing phytomass was the most important variable affecting erosion with foliar cover and basal cover also highly correlated to erosion.

This citation is from AGRICOLA.

**509. Long-term aquatic habitat restoration: Mahogany Creek, Nevada, as a case study.**

Myers, T. J. and Swanson, S.

*Water Resources Bulletin* 32(2): 241-252. (1996)

NAL Call #: 292.9 Am34; ISSN: 0043-1370

*Descriptors:* grazing intensity/ overgrazing/ range management/ streams/ aquatic plants/ habitats/ watershed management/ sediment deposition/ Nevada

*Abstract:* We compared the recovery from abusive grazing of aquatic habitat due to different range management on two geomorphically similar rangeland streams in northwest Nevada. Managers excluded livestock from the Mahogany Creek watershed from 1976 to 1990 while allowing rotation of rest grazing on its tributary Summer Camp Creek. Bank stability, defined as the lack of apparent bank erosion or deposition, improved through the study period on both streams, but periodic grazing and flooding decreased stability more on Summer Camp Creek than flooding alone on Mahogany Creek. Pool quantity and quality on each stream decreased because of coarse woody debris removal and sediment deposition during a drought. Fine stream bottom sediments decreased five years after the removal of livestock, but sedimentation increased during low flows in both streams below road crossings. Tree cover increased 35 percent at both streams. Thus, recovery of stability and cover and decreased sedimentation are compatible with rotation of rest grazing on Summer Camp Creek. Width/depth ratio and gravel/cobble percent did not change because they are inherently stable in this stream type. Management activities such as coarse woody debris removal limited pool recovery, and road crossings increased sedimentation.

This citation is from AGRICOLA.

**510. Long-term stocking rate effects on soil physical properties.**

Greenwood, K. L.; MacLeod, D. A.; and Hutchinson, K. J.  
*Australian Journal of Experimental Agriculture* 37(4):

413-419. (1997)

NAL Call #: 23 Au792; ISSN: 0816-1089

*Descriptors:* soil physical properties/ unsaturated hydraulic conductivity/ soil strength/ bulk density/ soil compaction/ sheep/ stocking rate/ grazing/ range management/ New South Wales

This citation is from AGRICOLA.

**511. Management of Canadian prairie region grazed grasslands: Soil C sequestration, livestock productivity and profitability.**

Lynch, D. H.; Cohen, R. D. H.; Fredeen, A.; Patterson, G.; and Martin, R. C.

*Canadian Journal of Soil Science* 85(2): 183-192. (2005)

NAL Call #: 56.8 C162; ISSN: 0008-4271

*Descriptors:* GrassGro model: mathematical and computer techniques/ productivity/ farm profitability/ prairie region grazed grassland/ soil sequestration/ complementary grazing/ reduced stocking density

*Abstract:* The GrassGro model (a computer simulation of management-induced changes in range and pasture forage and livestock productivity) was combined with spreadsheet analyses to estimate the influence of improved grazing practices on soil organic carbon (SOC), and farm profitability, across native rangelands and tame pastures of the southern Canadian Prairies. Improved practices included complementary grazing (CG) and reduced stocking density (RSD) on rangeland; and N fertilization (FERT), seeded grass/legumes grazed continuously (GLGC) or rotationally (GLGR), and RSD on tame pastures. The analysis was stratified into three ecoregions on the basis of similarities in climate and soil type. Averaged over 30 yr and ecoregions, SOC rates of gain through improved management were 5 (RSD) to 26 (CG) kg C ha<sup>-1</sup> yr<sup>-1</sup> for rangelands, and 86 (RSD), 75 (GLGC), 62 (GLGR) and 222 (FERT) kg C ha<sup>-1</sup> yr<sup>-1</sup> for tame pastures. Gains with FERT were considered largely negated by associated energy (C) costs, N<sub>2</sub>O emissions, and shifts in grassland species. The CG system alone improved net returns to the producer. The estimated potential combined SOC gain on prairie grazinglands (11.5 Mha) was 1.63 MMT CO<sub>2</sub> yr<sup>-1</sup> (or 0.465 MMT C yr<sup>-1</sup>), slightly less than the 1.70 MMT CO<sub>2</sub> yr<sup>-1</sup> currently emitted from agricultural soils in Canada.

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**512. Microbiology and water chemistry of two natural springs impacted by grazing in south central Nevada.**

Hall, D. A. and Amy, P. S.

*Great Basin Naturalist* 50(3): 289-294. (1990)

NAL Call #: 410 G79; ISSN: 0017-3614

*Descriptors:* *Crenicthys baileyi baileyi*/ *Lepidomeda mollispinis pratensis*/ *Pseudomonas aeruginosa*/ *Aeromonas hydrophila*/ cattle/ endangered fish/ population density/ fish/ pathogens/ conductivity/ pH level/ ammonium nitrite/ nitrate/ ammonia/ phosphorus/ dissolved oxygen content/ temperature/ climate

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**513. Multi-decadal impacts of grazing on soil physical and biogeochemical properties in Southeast Utah.**

Neff, J. C.; Reynolds, R. L.; Belnap, J.; and Lamothe, P.

*Ecological Applications* 15(1): 87-95. (2005)

NAL Call #: QH540.E23; ISSN: 1051-0761

*Descriptors:* arid zones/ carbon/ chemical composition/ grassland soils/ grasslands/ grazing/ magnesium/ magnetite/ manganese/ national parks/ natural grasslands/ nitrogen/ nonclay minerals/ phosphorus/ silt fraction/ sodium/ soil composition/ soil fertility/ soil organic matter/ soil physical properties/ soil texture/ sustainability/ wind erosion

*Abstract:* Many soils in southeastern Utah are protected from surface disturbance by biological soil crusts that stabilize soils and reduce erosion by wind and water. When these crusts are disturbed by land use, soils become susceptible to erosion. In this study, we compare a never-grazed grassland in Canyonlands National Park with two historically grazed sites with similar geologic, geomorphic, and geochemical characteristics that were grazed from the late 1800s until 1974. We show that, despite almost 30 years without livestock grazing, surface soils in the historically grazed sites have 38-43% less silt, as well as 14-51% less total elemental soil Mg, Na, P, and Mn content relative to soils never exposed to livestock disturbances. Using magnetic measurement of soil magnetite content (a proxy for the stabilization of far-traveled eolian dust) we suggest that the differences in Mg, Na, P, and Mn are related to wind erosion of soil fine particles after the historical disturbance by livestock grazing. Historical grazing may also lead to changes in soil organic matter content including declines of 60-70% in surface soil C and N relative to the never-grazed sites. Collectively, the differences in soil C and N content and the evidence for substantial rock-derived nutrient loss to wind erosion implies that livestock grazing could have long-lasting effects on the soil fertility of native grasslands in this part of southeastern Utah. This study suggests that nutrient loss due to wind erosion of soils should be a consideration for management decisions related to the long-term sustainability of grazing operations in arid environments.  
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**514. Non-selective grazing impacts on soil-properties of the Nama Karoo.**

Beukes, P. C. and Cowling, R. M.

*Journal of Range Management* 56(5):

547-552. (Sept. 2003)

NAL Call #: 60.18 J82; ISSN: 0022-409X

*Descriptors:* range management/ grazing intensity/ mixed grazing/ cattle/ sheep/ goats/ stocking rate/ soil organic matter/ soil microorganisms/ cell respiration/ infiltration (hydrology)/ aggregate stability/ South Africa

*Abstract:* Non-selective grazing (NSG) is a relatively novel way of farming livestock in the Nama Karoo of South Africa. Our key question was how heavy grazing under this high-intensity, low-frequency grazing system would impact on certain soil properties. The study was designed to compare the impacts of NSG (treatment) with no grazing (control) in terms of: (1) amount of soil organic carbon (OC); (2) soil microbial respiration rates; (3) soil stability and infiltration properties. The treatment significantly lowered the amount of OC in the topsoil. Microbial respiration rates corresponded with the fertile patch matrix in both treatment and control with significantly higher respiration rates

measured under plants compared to open, unvegetated areas. Respiration rates in treatment open areas were significantly higher than in control open areas. There was a trend ( $P < 0.1$ ) for higher aggregate stability, final infiltration rate and cumulative infiltration for treatment open soils compared to controls during an initial rain event of 44 mm hour<sup>-1</sup> in a rainfall simulator. During a second rain event on sealed soils only aggregate stability was significantly higher for treatment compared to control soils. We conclude that the short-duration, low-frequency, intensive herbivory by livestock under the non-selective grazing system resulted in a more active microbial community, which turned over organic matter more rapidly and led to higher soil stability and infiltration capacity of open, unvegetated soils. We present this as an example of conditions where herding by high densities of large herbivores can have positive impacts on soil quality.

This citation is from AGRICOLA.

**515. Nutrient loss and water quality under extensive grazing in the upper Burdekin River catchment, North Queensland.**

O'Reagain, P. J.; Brodie, J.; Fraser, G.; Bushell, J. J.;

Holloway, C. H.; Faithful, J. W.; and Haynes, D.

*Marine Pollution Bulletin* 51(1-4): 37-50. (2005)

NAL Call #: GC1000.M3; ISSN: 0025-326X

*Descriptors:* nutrient loss/ catchments/ nutrient loading/ runoff/ geology/ livestock/ marine pollution/ lagoons/ rainfall/ cattle/ grazing/ nutrients/ suspended sediments/ catchment areas/ water quality/ slopes/ watercourses/ land management/ river flow/ rainfall intensity/ pollution load/ monitoring/ sediment load/ reefs/ agriculture/ catchment area/ topographic effects/ vegetation cover/ water management/ slopes (topography)/ sediment transport/ river basin management/ pollution monitoring/ barrier reefs/ stormwater runoff/ nutrients (mineral)/ river water/ land use/ Australia, Queensland, Burdekin R./ Australia, Queensland, Charters Towers/ Australia, Queensland, Great Barrier Reef/ animal grazing

*Abstract:* Increased sediment and nutrient losses resulting from unsustainable grazing management in the Burdekin River catchment are major threats to water quality in the Great Barrier Reef Lagoon. To test the effects of grazing management on soil and nutrient loss, five 1 ha mini-catchments were established in 1999 under different grazing strategies on a sedimentary landscape near Charters Towers. Reference samples were also collected from watercourses in the Burdekin catchment during major flow events. Soil and nutrient loss were relatively low across all grazing strategies due to a combination of good cover, low slope and low rainfall intensities. Total soil loss varied from 3 to 20 kg ha super<sup>(-1)</sup> per event while losses of N and P ranged from 10 to 1900 g ha super<sup>(-1)</sup> and from 1 to 71 g ha super<sup>(-1)</sup> per event respectively. Water quality of runoff was considered moderate across all strategies with relatively low levels of total suspended sediment (range: 8-1409 mg l super<sup>(-1)</sup>), total N (range: 101-4000 µg l super<sup>(-1)</sup>) and total P (range: 14-609 µg l super<sup>(-1)</sup>). However, treatment differences are likely to emerge with time as the impacts of the different grazing strategies on land condition become more apparent. Samples collected opportunistically from rivers and creeks during flow events displayed significantly higher levels of total suspended

sediment (range: 10-6010 mg l super(-1)), total N (range: 650-6350  $\mu$ g l super(-1)) and total P (range: 50-1500  $\mu$ g l super(-1)) than those collected at the grazing trial. These differences can largely be attributed to variation in slope, geology and cover between the grazing trial and different catchments. In particular, watercourses draining hillier, grano-diorite landscapes with low cover had markedly higher sediment and nutrient loads compared to those draining flatter, sedimentary landscapes. These preliminary data suggest that on relatively flat, sedimentary landscapes, extensive cattle grazing is compatible with achieving water quality targets, provided high levels of ground cover are maintained. In contrast, sediment and nutrient loss under grazing on more erodable land types is cause for serious concern. Long-term empirical research and monitoring will be essential to quantify the impacts of changed land management on water quality in the spatially and temporally variable Burdekin River catchment.

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**516. Organic carbon composition in a northern mixed-grass prairie: Effects of grazing.**

Ganjegunte, Girisha K.; Vance, George F.; Preston, Caroline M.; Schuman, Gerald E.; Ingram, Lachlan J.; Stahl, Peter D.; and Welker, Jeffrey M.

*Soil Science Society of America Journal* 69(6): 1746-1756. (2005)

NAL Call #: 56.9 So3; ISSN: 0361-5995

*Descriptors:* nuclear magnetic resonance: laboratory techniques, spectrum analysis techniques/ carbon sink/ grazing management/ mixed grass prairie

*Abstract:* Growing interest in the potential for soils to provide a sink for atmospheric C has prompted studies of effects of management on the amount and nature of soil organic C (SOC). In this study, we evaluated effects of different grazing management regimes (light grazing [LG], heavy grazing [HG], and non-grazed exclosures [EX]) on amount and composition of SOC at the USDA-ARS High Plains Grasslands Research Station (HPGRS), Cheyenne, WY. Soils (0-5 cm) from each treatment were analyzed for total C and N contents and lignin composition. Soil organic C and N contents were significantly greater in LG (SOC-13.8 Mg ha(-1); total N-1.22 Mg ha(-1)) than HG (SOC-10.9 Mg ha(-1); total N-0.94 Mg ha(-1)) or EX (SOC-10.8 Mg ha(-1); total N-0.94 Mg ha(-1)). From CuO oxidation studies, significantly greater ( $P < 0.05$ ) total lignin (Vanillyl [V] + Syringyl [S] + Cinnamyl [C] compounds) contents were noted in EX (21 g kg(-1) SOC) than LG (12 g kg(-1) SOC) and HG (15 g kg(-1) SOC) soils. The lignin composition of humic (HA) and fulvic (FA) acids indicated that HA under LG contained significantly greater V and S than HG or EX. Fulvic acids contained S-depleted lignin compared with HAs and FAs from HG, which contained significantly greater V and C than FAs extracted from LG and EX. Nuclear magnetic resonance (NMR) spectra of HA and FA, however, did not vary significantly among the three grazing treatments. Results from CuO oxidation and NMR spectroscopy emphasized the familiar problem that determining the nature of soil organic matter (SOM) is a difficult task and sometimes different analytical techniques provide different information about the nature of SOM. Nonetheless, results of this study indicate that LG is the most sustainable grazing management system for northern mixed-grass prairies.

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**517. Rangeland management impacts on soil biological indicators in southern Alberta.**

Dormaer, J. F. and Willms, W. D.

*Journal of Range Management* 53(2): 233-238. (2000)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/2000/532/233-238\\_dormaer.pdf](http://jrm.library.arizona.edu/data/2000/532/233-238_dormaer.pdf)

*Descriptors:* abandoned land/ introduced grasses/ monoculture/ soil transformations/ steady state

*Abstract:* Quantitative techniques are needed to determine the effects of cultivation and livestock grazing on biological indicators of soils of the Northern Great Plains. Our objective was to determine how various management practices, which were representative of those used since European settlement in the 1880's, affected 3 biological indicators of soil quality. The study was conducted at 3 sites that are representative of the major grassland ecosystems in Canada: a Mixed Prairie site with *Stipa comata* Trin. and Rupr. dominant in the Brown (Aridic Haploboroll) Soil Zone, a Mixed Prairie site with *S. comata* Trin. and Rupr. and *S. viridula* Trin. dominant in the Dark Brown (Typic Haploboroll) Soil Zone, and a Fescue Prairie site with *Festuca campestris* Rydb. dominant in the Black (Udic Haploboron) Soil Zone. At each site, 6 treatments representing common production practices were imposed and compared with the native community in a randomized complete block design with 4 replicates and a plot size of 3 x 10 m. The treatments included: 1) monoculture seeding of 2 grass species; 2) alfalfa (*Medicago sativa* L. 'Beaver'); 3) continuous spring wheat (*Triticum aestivum* L. 'Katepwa'); 4) spring wheat and fallow rotation; and 5) abandoned cultivated land. Our hypothesis that mineralizable-N, and phosphatase and dehydrogenase activities would be influenced by cultivation was confirmed by significant changes in these indicators that were detected after only 180 days after treatment establishment. The pool of readily decomposable organic matter was reduced with cultivation and not replenished over the period of the study. The 3 biological indicators were sensitive to not only time following external management changes, but also to seasonal fluctuations. We conclude that soil biological indicators can be used to quantify temporal and botanical changes in diverse ecotypes within the Northern Great Plains.

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**518. Recovery of cryptogamic soil crusts from grazing on Utah winter ranges.**

Anderson, D. C.; Harper, K. T.; and Rushforth, S. R.

*Journal of Range Management* 35(3): 355-359. (1982)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1982/353/17ande.pdf>

*Descriptors:* Utah

This citation is from AGRICOLA.

**519. Runoff and sediment yield under grazing in foothills fescue grassland of Alberta.**

Naeth, M. A. and Chanasyk, D. S.

*Water Resources Bulletin* 32(1): 89-95. (1996)

NAL Call #: 292.9 Am34; ISSN: 0043-1370

*Descriptors:* snow/ erosion/ sediment yield/ grazing/ grasslands/ soil water balance/ runoff/ grazing systems/ grazing intensity/ continuous grazing/ short-duration grazing

*Abstract:* The effects of select grazing systems on rainfall and snowmelt induced runoff and sediment yield from

sloped areas of the foothills fescue grasslands (*Festuca campestris*) of Alberta, Canada were quantified. The effects of two grazing intensities (heavy and very heavy) for two durations (short duration and continuous throughout the growing season) were compared to an ungrazed control between June 1988 and April 1991. Runoff was measured using 1-m-superscript 2 runoff frames and collection bucket systems. Sediment yields were determined on samples from the collected runoff. Snowmelt was the dominant source of runoff. Snowmelt runoff was higher from the heavily grazed areas than from the very heavily grazed areas, due to the higher standing vegetation which accumulated snow in the former areas. Sediment yields as a result of snowmelt were generally low in all areas. Only a few summer storms caused runoff. Runoff volumes and sediment yields from summer rainstorms were low, due to low rainfall and to generally dry antecedent soil moisture conditions. The greatest risk of summer runoff, and thus sediment yield, occurred in August.

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**520. Seasonal grazing affects soil physical properties of a montane riparian community.**

Wheeler, M. A.; Trlica, M. J.; Frasier, G. W.; and Reeder, J. D.

*Journal of Range Management* 55(1): 49-56. (2002)

NAL Call #: 60.18 J82; ISSN: 0022-409X

*Descriptors:* grazing/ soil water content/ bulk density/ soil pore system/ soil density/ spring/ summer/ hydrology/ porosity/ Colorado

*Abstract:* The effects of seasonal grazing treatments (early spring and late summer) on soil physical properties were studied in a montane riparian ecosystem in northern Colorado. Infiltration rates and bulk density were used as primary indicators of responses to a 1-time heavy grazing event on previously protected paddocks. Soil bulk density, porosity, gravimetric water content, organic carbon concentration and texture were measured at 0-5 cm, 5-10 cm, and 10-15 cm depths to determine how these parameters affected infiltration rates. Assessment of initial changes and subsequent recovery of the soil properties in response to the grazing treatments was conducted by measuring these parameters before each grazing event and at 4 time periods following the grazing event. Few differences between spring or late summer grazing periods on soil physical properties were found. A stepwise multiple regression model for infiltration rate based on soil physical properties yielded a low R<sup>2</sup> (0.31), which indicated much unexplained variability in infiltration. However, infiltration rates declined significantly and bulk density increased at the 5-10 cm depth and 10-15 cm depth in grazed plots immediately following grazing, but the highly organic surface layer (0-5 cm) had no significant compaction. Infiltration rates and soil bulk densities returned to pre-disturbed values within 1 year after grazing events, suggesting full hydrologic recovery. This recovery may be related to frequent freeze-thaw events and high organic matter in soils.

This citation is from AGRICOLA.

**521. Sediment from a small summer grazed watershed.**

Fortier, D. H.; Molnau, M.; and Saxton, K. E.

In: Symposium on watershed management. (Held 21 Jul 1980 at Boise, Idaho.); Vol. 2.

New York: American Society of Civil Engineers; pp. 790-801; 1980.

NAL Call #: TC409.W3 1980

*Descriptors:* erosion/ water/ animal husbandry/ grazing  
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**522. Sediment movement and filtration in a riparian meadow following cattle use.**

Mceldowney, R. R.; Flenniken, M.; Frasier, G. W.; Trlica, M. J.; and Leininger, W. C.

*Journal of Range Management* 55(4): 367-373. (2002)

NAL Call #: 60.18 J82; ISSN: 0022-409X

*Descriptors:* beef cattle/ grazing/ mowing/ rainfall simulators/ sediment deposition/ surface roughness/ overland flow/ plant density/ particle size/ water erosion/ sediments/ plant litter/ filter strips/ Colorado

*Abstract:* Improper livestock grazing practices in western U.S. riparian areas may reduce the nutrient and pollutant removal function of riparian communities, resulting in degradation of surface water quality. Short duration-high intensity cattle use in 3 x 10 m plots was evaluated in a montane riparian meadow in northern Colorado to quantify livestock effects on sediment movement and filtration under simulated rainfall (approximately equal to 100 mm hour<sup>-1</sup>) plus overland flow (approximately equal to 25 mm hour<sup>-1</sup>) conditions. Four treatments: 1) control, 2) mowed to 10 cm stubble height, 3) trampled by cattle, and 4) cattle grazed plus trampled (grazed) were evaluated. Sixty kg of sediment was introduced to overland flow in each plot. Sediment movement was evaluated using sediment traps positioned in microchannels and on vegetation islands at 5 distances downslope from the upper end of the plots and by sediment front advancement. Most sediment deposition occurred within the first meter downslope from application. About 90% of the applied sediment was filtered from runoff within 10 m in the control and mowed treatments, while approximately 84 and 77% of the applied sediment was trapped in the trampled and grazed treatment plots, respectively. The primary variables that influenced sediment filtration were stem density and surface random roughness. Stem density was the most influential variable that affected sediment filtration. Cattle grazing reduced the stem density by 40%. Monitoring of stem density should aid land managers in regulating cattle use of riparian communities and facilitate the protection of surface water quality from sediment in overland flow.

This citation is from AGRICOLA.

**523. Sediment production as influenced by livestock grazing in the Texas Rolling Plains.**

Wood, M. K. and Blackburn, W. H.

*Journal of Range Management* 34(3): 228-231. (1981)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1981/343/15wood.pdf>

*Descriptors:* mid grass/ short grass/ shrubs/ cow/ calf/ ground cover/ aggregate stability/ organic matter/ mulch/ bulk density/ deferred rotation

*Abstract:* The influence of livestock [cow, calf] on sediment production was evaluated on a Clay Flat range site with shrub canopy areas and midgrass and shortgrass interspace areas in the Rolling Plains near Throckmorton,

Texas. Sediment production in the shrub canopy areas was similar across grazing treatments of heavy and moderate stocking, continuous grazing; rested and grazed deferred-rotation; rested and grazed high intensity, low frequency (HILF); and 2 livestock exclosures which had not been grazed for 20 yr. Sediment production from the shortgrass interspace area was similar for all grazing treatments except from the heavily stocked, continuously grazed pasture, where sediment production exceeded that of the rested HILF treatment. The midgrass interspace sediment production for the heavily stocked, continuously grazed treatment exceeded that of the deferred-rotation treatments and the exclosures. Sediment production for the grazed HILF treatment was greater than that for the rested deferred-rotation treatment and exclosure. Soil and vegetation variables which significantly influenced sediment production included aggregate stability, organic matter content, mulch, standing crop, bulk density and ground cover.

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**524. Short duration grazing in central New Mexico: Effects on infiltration rates.**

Weltz, M. and Wood, M. K.

*Journal of Range Management* 39(4): 365-368. (1986)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1986/394/19welt.pdf>

*Descriptors:* grazing/ hydrology/ rangelands/ New Mexico

This citation is from AGRICOLA.

**525. Short-duration grazing in central New Mexico: Effects on sediment production.**

Weltz, M. and Wood, M. K.

*Journal of Soil and Water Conservation* 41(4):

262-266. (1986)

NAL Call #: 56.8 J822; ISSN: 0022-4561

*Descriptors:* cattle/ soil erosion/ stocking rate/ grazing/

environmental assessment/ range management/ arid

zones/ semiarid zones/ rangelands/ New Mexico

This citation is from AGRICOLA.

**526. Soil bulk density and water infiltration as affected by grazing systems.**

Abdel-Magid, A. H.; Schuman, G. E.; and Hart, R. H.

*Journal of Range Management* 40(4): 307-309. (1987)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1987/404/5abde.pdf>

*Descriptors:* rangelands/ grazing/ soil compaction/ bulk

density/ sandy loam soils/ soil water movement/ Wyoming

This citation is from AGRICOLA.

**527. Soil bulk density as influenced by grazing intensity and soil type on a shortgrass prairie site.**

Van Haveren, B. P.

*Journal of Range Management* 36(5): 586-588. (1983)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1983/365/11van.pdf>

*Descriptors:* Colorado

This citation is from AGRICOLA.

**528. Soil carbon and nitrogen of Northern Great Plains grasslands as influenced by long-term grazing.**

Frank, A. B.; Tanaka, D. L.; Hofmann, L.; and Follett, R. F.

*Journal of Range Management* 48(5): 470-474. (1995)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/1995/485/](http://jrm.library.arizona.edu/data/1995/485/470-474_frank.pdf)

[470-474\\_frank.pdf](http://jrm.library.arizona.edu/data/1995/485/470-474_frank.pdf)

*Descriptors:* Bouteloua gracilis/ botanical composition/ range management/ stocking rate/ prairie soils/ organic matter/ nitrogen content/ carbon/ grazing/ North Dakota

*Abstract:* Three mixed prairie sites at Mandan, N.D. were grazed heavily (0.9 ha steer-1), moderately (2.6 ha steer-1), or left ungrazed (exclosure) since 1916. These sites

provided treatments to study the effects of long-term grazing on soil organic carbon and nitrogen content and to relate changes in soil carbon and nitrogen to grazing

induced changes in species composition. Blue grama [Bouteloua gracilis (H.B.K) Lag. ex Griffiths] accounted for the greatest change in species composition for both grazing

treatment. Relative foliar cover of blue grama was 25% in 1916 and 86% in 1994 in the heavily grazed pasture and 15% in 1916 to 16% in 1994 in the moderately grazed

pasture. Total soil nitrogen content was higher in the exclosure (1.44 kg N ha<sup>-1</sup>) than in either grazing treatment (0.92 and 1.07 kg N ha<sup>-1</sup> for moderately and heavily

grazed, respectively) to 107-cm depth. Soil organic carbon content avg 72, 6.4, and 7A kg m<sup>-2</sup> to 30.4 cm soil depth and 14.1, 11.7, and 14.0 kg m<sup>-2</sup> to 106.7 cm soil depth for the exclosure, moderately grazed, and heavily grazed

treatments, respectively. Compared to the exclosure the moderately grazed pasture contained 17% less soil carbon to the 106.7 cm depth. Heavy grazing did not reduce soil

carbon when compared to the exclosure. Based on 13C analysis and soil organic carbon data to 15.2 cm depth, blue grama or other C4 species contributed 24% or 12 kg

m<sup>-2</sup> of the total carbon in the heavily grazed and 20% or 0.8 kg m<sup>-2</sup> of the total carbon in the moderately grazed pastures during the 1916 to 1991 time period. The increase

in blue grama, a species with dense shallow root systems, in the heavily grazed pasture probably accounted for maintenance of soil carbon at levels equal to the exclosure.

These results suggest that changes in species composition from a mixed prairie to predominantly blue grama compensated for soil carbon losses that may result from grazing native grasslands.

This citation is from AGRICOLA.

*Descriptors:* soil carbon/ nitrogen/ grazing/ prairie soils/ organic matter/ carbon/ grazing/ North Dakota

*Abstract:* Three mixed prairie sites at Mandan, N.D. were grazed heavily (0.9 ha steer-1), moderately (2.6 ha steer-1), or left ungrazed (exclosure) since 1916. These sites

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pasture. Total soil nitrogen content was higher in the exclosure (1.44 kg N ha<sup>-1</sup>) than in either grazing treatment (0.92 and 1.07 kg N ha<sup>-1</sup> for moderately and heavily

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treatments, respectively. Compared to the exclosure the moderately grazed pasture contained 17% less soil carbon to the 106.7 cm depth. Heavy grazing did not reduce soil

carbon when compared to the exclosure. Based on 13C analysis and soil organic carbon data to 15.2 cm depth, blue grama or other C4 species contributed 24% or 12 kg

m<sup>-2</sup> of the total carbon in the heavily grazed and 20% or 0.8 kg m<sup>-2</sup> of the total carbon in the moderately grazed pastures during the 1916 to 1991 time period. The increase

in blue grama, a species with dense shallow root systems, in the heavily grazed pasture probably accounted for maintenance of soil carbon at levels equal to the exclosure.

These results suggest that changes in species composition from a mixed prairie to predominantly blue grama compensated for soil carbon losses that may result from grazing native grasslands.

This citation is from AGRICOLA.

*Descriptors:* soil carbon/ nitrogen/ grazing/ prairie soils/ organic matter/ carbon/ grazing/ North Dakota

*Abstract:* The impacts of long-term grazing on compaction were assessed in mixed prairie and fescue grassland ecosystems of Alberta (Canada). Grazing regimes were of light to very heavy intensities, grazed early, late, and continuously during the growing season. Bulk density was measured with a surface moisture/density gauge and a combination moisture/density probe to 65 cm. Penetration resistance to 30 cm was measured with a cone penetrometer. Solonchic soils were less sensitive to compaction under grazing than Chernozemic soils. Heavy



intensity and/or early season grazing had greater impacts on compaction than light intensity and/or late season grazing. Under the former grazing regimes, bulk density increased to 7.5 cm at Kinsella and 65 cm at Stavely; penetration resistance increased to depths of 2.5 cm at Brooks, 15 cm at Kinsella, and 30 cm at Stavely. Heavy trampling versus regular grazing increased penetration resistance to depths of 30 and 10 cm under heavy intensity and/or early season and light intensity and/or late season grazing, resp. Late season grazing at Brooks and light to moderate grazing at Stavely can be used as management models to reduce compaction under grazing. Trends were not as clear at Kinsella, but light June and autumn grazing had the least compacting effect.

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**530. Soil microbial population and enzyme activity related to grazing pressure in alpine meadows of Nanda Devi Biosphere Reserve.**

Singh, Sanjeeva K. and Rai, J. P. N.

*Journal of Environmental Biology* 25(1): 103-107. (2004)

NAL Call #: QH540.J65; ISSN: 0254-8704

*Descriptors:* soil microbial analysis: laboratory techniques/ alpine meadows/ animal biodiversity/ grazing pressure/ intensively grazed meadow/ microbiological characteristics/ moderately grazed meadow/ physicochemical characteristics: cation exchange capacity, electrical conductivity, moisture/ plant biodiversity/ soil environment: biotic pressure/ soil fertility management/ soil fertility status/ soil respiration/ total viable count [TVC]

*Abstract:* The present study aims to analyze the interaction of prevailing biotic pressure on soil environment with emphasis on its physicochemical and microbiological characteristics determining soil fertility status and thus supporting plant and animal biodiversity in Nanda Devi Biosphere Reserve (NDBR) which is located in northern part of Uttaranchal hills between 79degree40'E to 80degree05'E longitude and 30degree17'N to 30degree41'E latitude. The experimental results revealed that the physico-chemical characteristics (viz., moisture, pH, EC, C, N, P, K, CEC) of soil were maximum in moderately grazed meadow and minimum in intensively grazed meadow. Soil microbial analysis measured in terms of total viable count (TVC) exhibited grazing sensitivity trend being maximum population of bacteria > fungi > actinomycetes. The soil microbial population was positively correlated with soil respiration, dehydrogenase activity, acid phosphatase and microbial biomass, which exhibited uneven trend with grazing pressure. Soil from moderately grazed meadow showed highest microbial count and enzyme activities, whilst intensively grazed meadow showed lowest microbial count and enzyme activities. This depicts the beneficial role of prescribed grazing upto limited extent in management of soil fertility, which might have supported luxuriant growth of a variety of grasses.

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**531. Soil microtopography on grazing gradients in Chihuahuan desert grasslands.**

Nash, M. S.; Jackson, E.; and Whitford, W. G.

*Journal of Arid Environments* 55(1): 181-192. (2003)

NAL Call #: QH541.5.D4J6; ISSN: 0140-1963

*Descriptors:* desertification/ erosion/ grasslands/ grazing/ height/ livestock/ mounds/ size/ spatial distribution/ topography

*Abstract:* The significant impacts of livestock in the creation of piospheres centred on water points is the loss of soil microtopography across a 'landscape' that has been influenced by many years of livestock grazing. The size, height, and spatial distribution of micromounds and surrounding depressions were measured by a modified erosion bridge at three distances (50, 450, and 1050 m) from water points in desert grassland pastures in the Jornada Basin, New Mexico, USA. Plots at 50 m had fewer micromounds and the mounds were smaller than those recorded on the more distant plots. Microtopography of plots at 450 m from water was not significantly different from that recorded at 50 m. Microtopography of plots that were 1050 m from water points was significantly different from that of plots nearer water points. Strong correlation between microtopography and the cover of long-lived perennial grasses ( $R^2=91\%$ ) was found, such dependence could be used for assessing the trend in organic matter content that is in concordance with that of microtopography. Loss of microtopography from the impact of livestock in piospheres exacerbates erosion processes and contributes to desertification.

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**532. Soil nutrients and salinity after long-term grazing exclusion in a Flooding Pampa grassland.**

Chaneton, E. J. and Lavado, R. S.

*Journal of Range Management* 49(2): 182-187. (1996)

NAL Call #: 60.18 J82; ISSN: 0022-409X

[http://jrm.library.arizona.edu/data/1996/492/182-187\\_chaneton.pdf](http://jrm.library.arizona.edu/data/1996/492/182-187_chaneton.pdf)

*Descriptors:* soil organic matter/ topography/ soil chemistry/ grasslands/ grazing/ botanical composition/ salinity/ cycling/ nitrogen/ carbon/ population dynamics/ pampas

*Abstract:* Soil organic C, total N, extractable P, and salinity were evaluated after 12-16 years of protection from grazing in 2 native grassland sites which differed in frequency of soil waterlogging in the Flooding Pampa of Argentina. The hypothesis that flooding affects the impact of grazing on soil chemical properties was tested. Soil was sampled to 10-cm depth in adjacent grazed and ungrazed plots in each site, and the percentage dissimilarity (PD) was assessed in vegetation composition among pastures. Grazing condition significantly interacted with site ( $P < 0.001$ ) in affecting topsoil C, N, and salinity. Soil C and N were higher in grazed grassland (C = 4.8%; N = 0.42%) than in long-term enclosure (C = 3.7%; N = 0.35%) for the more frequently flooded, lowland site, but did not vary between grassland plots in the upland site (C = 3.1%; N = 0.29%) Soil electrical conductivity (E.C.) was low in both ungrazed plots (< 2 dS/m), yet with grazing, salinization was higher in the upland (E.C. = 6.85 dS/m) than in the lowland site (3.88 dS/m). Soil extractable P did not change in any consistent way with grazing treatment. Grazing apparently amplified differences in soil chemistry between lowland and upland sites, while differences in botanical composition between topographical positions were smaller for grazed (PD = 44%) than for ungrazed (64%) grassland. Moreover, contrasting responses between sites occurred for various soil parameters, whereas compositional differences between grazed and ungrazed plots were

similar in each site (PD ~ 65%). Thus, soil-vegetation changes in response to grazing appeared to be loosely coupled in this rangeland ecosystem.

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**533. Soil organic carbon composition in a northern mixed-grass prairie: Effects of grazing.**

Ganjugunte, G. K.; Vance, G. F.; Preston, C. M.; Schuman, G. E.; Ingram, L. J.; Stahl, P. D.; and Welker, J. M.

*Soil Science Society of America Journal* 69(6): 1746-1756. (2005)

NAL Call #: 56.9 So3; ISSN: 0361-5995

*Descriptors:* atmosphere/ forbs/ fulvic acids/ grasslands/ grazing/ grazing intensity/ grazing systems/ humic acids/ lignin/ Mollisols/ nuclear magnetic resonance spectroscopy/ organic carbon/ organic nitrogen/ oxidation/ prairie soils/ prairies/ sandy loam soils/ soil organic matter/ soil types/ sustainability/ humic substances

*Abstract:* Growing interest in the potential for soils to provide a sink for atmospheric C has prompted studies of effects of management on the amount and nature of soil organic C (SOC). We evaluated effects of different grazing management regimes, such as light grazing (LG), heavy grazing (HG), and non-grazed exclosures (EX), on amount and composition of SOC at the USDA-ARS High Plains Grasslands Research Station (HPGRS), Cheyenne, Wyoming, USA. Vegetation in the area is dominated by grasses, forbs and sedges. Ascalon and Altvan sandy loams (mixed, mesic, aridic Argiustoll) are the dominant soil series on the landscape. Soils (0-5 cm) from each treatment were analysed for total C and N contents and lignin composition. Soil organic C and N contents were significantly greater in LG (SOC-13.8 t ha<sup>-1</sup>; total N-1.22 t ha<sup>-1</sup>) than HG (SOC-10.9 t ha<sup>-1</sup>; total N-0.94 t ha<sup>-1</sup>) or EX (SOC-10.8 t ha<sup>-1</sup>; total N-0.94 t ha<sup>-1</sup>). From CuO oxidation studies, significantly greater (P<0.05) total lignin (vanillyl [V]+syringyl [S]+cinnamyl [C] compounds) contents were noted in EX (21 g kg<sup>-1</sup> SOC) than LG (12 g kg<sup>-1</sup> SOC) and HG (15 g kg<sup>-1</sup> SOC) soils. The lignin composition of humic (HA) and fulvic (FA) acids indicated that HA under LG contained significantly greater V and S than HG or EX. Fulvic acids contained S-depleted lignin compared with HAs and FAs from HG, which contained significantly greater V and C than FAs extracted from LG and EX. Nuclear magnetic resonance (NMR) spectra of HA and FA, however, did not vary significantly among the three grazing treatments. Results from CuO oxidation and NMR spectroscopy emphasized the familiar problem that determining the nature of soil organic matter (SOM) is a difficult task and sometimes different analytical techniques provide different information about the nature of SOM. Nonetheless, results indicate that LG is the most sustainable grazing management system for northern mixed-grass prairies.

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**534. Soil properties following cultivation and non-grazing of a semi-arid sandy grassland in northern China.**

Su, Yong Zhong; Zhao, Ha Lin; Zhang, Tong Hui; and Zhao, Xue Yong

*Soil and Tillage Research* 75(1): 27-36. (2004)

NAL Call #: S590.S48; ISSN: 0167-1987

*Descriptors:* basal soil respiration [bsr]/ cultivated soils/ degraded grassland ecosystem/ desertification/

environmental conservation/ grassland soils/ grassland vegetation recovery/ overgrazing/ plow layer/ sandy grassland/ semi arid horqin sandy steppe/ semi arid region/ semi arid sandy grassland/ short term cultivation/ soil biological properties/ soil chemical properties/ soil particle size distribution/ soil physical properties/ soil resource management/ ungrazed exclosure/ wind erosion

*Abstract:* Cultivation and overgrazing are widely recognized as the primary causes of desertification of sandy grassland in the semi-arid region of northern China. Very little is known about the effect of cultivation and overgrazing on soil physical, chemical and biological properties in this region. The objective of this study was to quantitatively evaluate the magnitude of changes in soil properties due to 3 years of cultivation (3CGS) and 5 years of ungrazed exclosure (5RGS) in a degraded grassland ecosystem of the semi-arid Horqin sandy steppe. Short-term cultivation resulted in a 18-38% reduction in concentration of soil organic C, and total N and P in the 0-15 cm plow layer. Cultivation had a significant influence on N and P availability and soil biological properties, with lower basal soil respiration (BSR) and enzyme activities than the grassland soils. This was mostly due to strong wind erosion when sandy grassland was cultivated. Data indicated a considerable difference in soil particle size distribution between the cultivated and grassland soils, and fine fraction (<0.1 mm) in the cultivated soil was lower than that in the grassland soils. Moreover, grassland vegetation recovery in the 5RGS resulted in significant improvement in soil properties measured at the 0-7.5 cm depth. From the perspective of soil resource management and environmental conservation, a viable option for these sandy grasslands would be to stop conversion of grassland to cropland and adopt proper fencing practices to limit overgrazing.

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**535. Soil properties on grazed and ungrazed plots of a grassland sodic soil.**

Lavado, R. S. and Alconada, M.

*Soil Technology* 7(1): 75-81. (1994)

NAL Call #: S590.S65; ISSN: 0933-3630

*Descriptors:* soil physics/ soil chemistry/ reclamation/ controlled grazing/ soil types chemical/ sodic soils/ soil properties/ Pampas

*Abstract:* Soil structural improvement of the alkaline soils of the flooding Pampas of Argentina through grazing exclusion was investigated. A Typic Natraqualf near Veronica that had been kept free of grazing for three and twelve years was compared with adjacent plots. Total and water soluble organic matter, structural stability, bulk density, hydraulic conductivity, infiltration rate and the water easily dispersed fraction were not significantly different among treatments. The ungrazed soil did not accumulate soil organic matter and an important proportion of it was still water soluble. The absence of trampling, even after cattle exclusion for 12 yrs, did not improve the structural stability, clay dispersion and other properties. Sodium removal and flocculation would be a prerequisite for improvement of these sodic soils.

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**536. Soil property comparisons in virgin grasslands between grazed and nongrazed management systems.**

Bauer, A.; Cole, C. V.; and Black, A. L.

*Soil Science Society of America Journal* 51(1): 176-182. (1987)

NAL Call #: 56.9 So3; ISSN: 0361-5995

*Descriptors:* carbon/ nitrogen/ phosphorus/ nutrient cycling/ modeling/ bulk density

*Abstract:* Soil organic C and total N contents of grazed virgin grasslands have been used as the comparison standard to assess the change in soil organic matter (OM) generated by cultivation in the Northern Great Plains. The assumption has been that grassland soil properties were not altered by livestock grazing and therefore reflect the native grassland condition at the time man began cultivating for crop production. In this study, soil properties of grazed and nongrazed (relict) virgin grasslands are compared to assess the effect of grazing. Four sites each of moderately coarse-, medium-, and fine-textured soils under grazed and under relict management were sampled at 0- to 0.076, 0.076- to 0.152-, 0.152- to 0.305-, and 0.305- to 0.457-m depths. Analyses were made to compare organic C, total N, total P, organic P, and inorganic P contents, and bulk density between the management systems. Nutrient contents differed between the two management systems. The largest content was not exclusively associated with either system; neither was the difference the same among textural groups or sampling depth. When averaged over all soil textures and depths, organic C and total P contents showed opposite trends from total N. Organic C and total P contents to 0.45 m were larger in relict grasslands by about 1.27 and 0.029 kg m<sup>-2</sup>, respectively, while the total N content was larger in grazed grasslands by about 0.163 kg m<sup>-2</sup>. Since the fencing of grasslands for livestock control about 75-yr ago, differences between the two systems have developed at an average annual rate of about 165 kg C, 20 kg N, and 4 kg P ha<sup>-1</sup>. Bulk densities were highest in grazed grassland in the uppermost 0.076 m. Based upon the organic C and total N contents in relict grasslands, reported losses of OM resulting from cultivation have been either over- or underestimated, depending on whether organic C or total N content in grazed grasslands has been used as the comparison standard.

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**537. Soil response to trampling under intensive rotation grazing.**

Warren, S. D.; Nevill, M. B.; Blackburn, W. H.; and Garza, N. E.

*Soil Science Society of America Journal* 50(5): 1336-1341. (1986)

NAL Call #: 56.9 So3; ISSN: 0361-5995

*Descriptors:* livestock/ rangeland/ aggregate stability/ impermeable/ stocking rate/ bulk density/ Texas/ USA

*Abstract:* The impact of short-term, high intensity livestock trampling on selected properties of a silty clay soil was determined at the Texas Agriculture Experiment Station located near Sonora, [Texas, USA]. Intensive livestock trampling typical of multi-pasture rotational grazing systems had a negative impact on soil physical properties. The deleterious effects tended to increase as stocking rate increased. Trampling on dry soil disruption of naturally occurring aggregates and compaction of the surface soil

layer. Trampling on moist soil deformed existing aggregates and led to the creation of a flat, comparatively impermeable surface layer composed of dense, unstable clods.

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**538. Some responses of riparian soils to grazing management in northeastern Oregon.**

Bohn, C. C. and Buckhouse, J. C.

*Journal of Range Management* 38(4): 378-381. (1985)

NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1985/384/23bohn.pdf>

*Descriptors:* range management/ riparian forests/ soil properties/ grazing/ Oregon

This citation is from AGRICOLA.

**539. Steambank stability and cattle grazing in southwestern Montana.**

Marlow, C. B.; Pogacnik, T. M.; and Quinsey, S. D.

*Journal of Soil and Water Conservation* 42(4): 291-296. (1987)

NAL Call #: 56.8 J822; ISSN: 0022-4561

*Descriptors:* bioturbation/ river banks/ erosion/ land use/ soil mechanics/ USA, Montana/ cattle grazing/ streamflow

*Abstract:* A 4-year grazing study in southwestern Montana indicated both streamflow and cattle use were highly correlated with the degree of change in stream channel profile. The greatest streambank change occurred during periods of high streamflow (positive correlation) and low cattle use (negative correlation). However, further statistical analysis of the data indicated that streamflow itself was not a major factor in bank erosion. Although not significant in all years, the decline in channel change appeared related to the seasonal trend in soil moisture. As streambank moisture levels declined, the extent of channel alteration also declined. Channel profile changes in paddocks grazed after early August when banks had dried were not significantly different ( $P < 0.05$ ) from those in an ungrazed paddock.

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**540. Stocking rate effect on soil carbon and nitrogen in degraded soils.**

Potter, K. N.; Daniel, J. A.; Altom, W.; and Torbert, H. A.

*Journal of Soil and Water Conservation* 56(3): 233-236. (2001)

NAL Call #: 56.8 J822; ISSN: 0022-4561

*Descriptors:* cattle/ rotational grazing/ stocking rate/ soil organic matter/ carbon/ nitrogen content/ soil fertility/ loam soils/ disturbed soils/ soil degradation/ bulk density/ grazing intensity/ carbon nitrogen ratio/ silt loam soils/ Oklahoma

This citation is from AGRICOLA.

**541. Stream channel adjustments following elimination of cattle grazing.**

Magilligan, F. J. and McDowell, P. F.

*Journal of the American Water Resources Association* 33(4): 867-878. (1997)

NAL Call #: GB651.W315; ISSN: 1093-474X

*Descriptors:* grazing/ cattle/ streams/ riverbank protection/ geomorphology/ riparian buffers/ Oregon

*Abstract:* Cattle grazing practices in the western United States have contributed to widespread riparian degradation resulting in unstable channel morphologies and the loss of fish habitat. Because of prolonged disturbance, numerous riparian areas on both public and private lands have been

fenced to exclude cattle in order to promote vegetation establishment and riparian improvement. We selected four gravel-bedded, steep alluvial streams in eastern Oregon with cattle exclosures greater than 14 years old for an analysis of geomorphic adjustments following the removal of cattle grazing. We compare channels inside exclosures and in adjacent grazed reaches to identify the salient stream channel properties that respond to the removal of riparian stresses and to document the magnitude of these changes. Results indicate that significant changes occur, with reductions in bankfull dimensions and increases in pool area being the most common and identifiable changes. At all four sites, bankfull widths are narrower by 10 to 20 percent, and the percentage of channel area occupied by pools is higher in the exclosure by 8 to 15 percent. The increase in pool area is primarily offset by a reduction in the percent glide area. Not all of the channel properties demonstrate adjustment, indicating that perhaps 14 years is an insufficient duration for these variables to adjust. This citation is from AGRICOLA.

**542. Stream channel changes associated with mining and grazing in the Great Basin.**

Sidle, Roy C. and Sharma, Ashish  
*Journal of Environmental Quality* 25(5): 1111-1121. (1996)  
 NAL Call #: QH540.J6; ISSN: 0047-2425  
 Descriptors: biobusiness/ conservation/ environmental quality/ freshwater ecology/ grazing/ Great Basin/ mining/ stream channel changes

*Abstract:* Characteristics of channel morphology and streambed sediment were sampled at 5- and 10-m intervals, respectively, along a 6.4-km reach of Birch Creek in 1989 and 1992. In this case study we evaluate changes in these channel features using kernel regression analysis. The watershed is located high in the Toiyabe Mountains of central Nevada and has experienced historical grazing and more recent (1986-1989) mining for gold. Exclusion of grazing in the incised lower 1 km of the channel since 1990 did not lead to substantial geomorphic recovery by 1992. The bankfull width did decrease a bit in the grazing exclosure, but baseflow width increased. In both years, bankfull width was about 4 m greater in the exclosure compared with the upstream reaches, reflecting the long-term grazing influences. The shift of grazing pressure into wet riparian areas upstream apparently caused decreases in thalweg depth, increases in fine sediment deposition in the channel, and loss of pool volume in these upstream areas. Some of these changes in substrate sediment could be attributed to inputs from the mine dumps; however, since either fine sediment did not increase or D-50 did not decrease in the vicinity of the mines, the changes appear to be more related to recent changes in grazing patterns. Increased fine deposition also occurred in reaches with high volumes of large woody debris. Because of the episodic nature of peakflows that occur in the Great Basin, it may take many years for the full impacts of mining and grazing to be assimilated by the fluvial and riparian systems.

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**543. Stream chemistry responses to four range management strategies in eastern Oregon.**

Tiedemann, A. R.; Higgins, D. A.; Quigley, T. M.; and Sanderson, H. R.  
 Portland, Or.: U.S. Dept. of Agriculture, Forest Service,

Pacific Northwest Research Station; PNW-RP-413, 1989. 9 p.

Notes: ISSN 0882-5165

NAL Call #: A99.9 F7625Uni no.413

[http://www.fs.fed.us/pnw/pubs/pnw\\_rp413.pdf](http://www.fs.fed.us/pnw/pubs/pnw_rp413.pdf)

Descriptors: grazing--environmental aspects--Oregon/ water chemistry/ range management--Oregon  
 This citation is from AGRICOLA.

**544. Stream water quality as influenced by beaver within grazing systems in Wyoming.**

Skinner, Q. D.; Speck, J. E.; Smith, M.; and Adams, J. C.  
*Journal of Range Management* 37(2): 142-146. (1984)  
 NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1984/372/12skin.pdf>

Descriptors: livestock/ fecal coliforms/ fecal streptococci/ fluorescing bacteria/ nonpoint pollution/ damming/ stream flow

*Abstract:* Stream water flowing from watersheds subjected to continuous and deferred rotation grazing by livestock was sampled to enumerate bacteria to detect differences between grazing treatments and streams. Fecal coliforms, fecal streptococci, total counts at 20 degree C and bacteria capable of fluorescing under long wave radiation were selected as indicators of pollution. The study was conducted over the 2 summers of 1979 and 1980 on mountain rangeland near Laramie, Wyoming. Bacteria counts for different indicator groups varied in their ability to detect change between grazing treatments and streams. Fluorescing bacteria and total counts were of little value in explaining nonpoint source pollution; fecal coliform and streptococci were. Variation in counts of fecal coliform and streptococci could not be fully accounted for by differences in grazing management but was partially explained by beaver damming of stream flow. Given that beaver impoundment of selected stream reaches is equal, variation in nonpoint pollution may be caused by differences in grazing treatments.

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**545. Streambank erosion and ungulate grazing relationships.**

Buckhouse, J. C.; Skovlin, J. M.; and Knight, R. W.  
*Journal of Range Management* 34(4): 339-340. (1981)  
 NAL Call #: 60.18 J82; ISSN: 0022-409X

<http://jrm.library.arizona.edu/data/1981/344/21buck.pdf>

Descriptors: Oregon

This citation is from AGRICOLA.

**546. Structural stability changes in a grazed grassland Natraquoll of the Flooding Pampa (Argentina).**

Taboada, M. A.; Lavado, R. S.; Svartz, H.; and Segat, A. M. L.

*Wetlands* 19(1): 50-55. (1999)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: grasslands/ grazing/ soil structure/ ranching/ agriculture/ wetlands/ flooding/ man-induced effects/ soils/ water content/ soil stability/ cattle/ moisture content/ Argentina/ grazing/ trampling/ Flooding Pampa

*Abstract:* Several factors affecting soil structural stability interact in the natural grasslands of the Flooding Pampa (Argentina). This seasonal and flat wetland (usually ponded in winter-spring and dry in summer) has swelling soils, which are affected by seasonal increases in sodium, and continuous grazing by cattle. Our study aimed to determine