Rangeland Plants Poisonous to Livestock

ADVS, WILD 5860

USDA/ARS Poisonous Plant Research Lab

Economic Impact of Poisonous Plants

(James 1992, JRM 45:3-8)

Direct Loss
- Death
- Weight loss
  - decrease gains
  - emaciation
  - wasting
- Reproductive loss
  - abortion
  - birth defects
  - disrupt estrus
  - reduce libido
  - stop spermatogensis
- Photosynthesization
- Compromise immune system
- Chronic illness

Indirect Loss
- Fencing
- Herding
- Alter grazing systems
- Additional feed and supp.
- Increase Vet cost
- Increase replacements
- Reduce land values

Economic Impact of Poisonous Plants

Marsh (1934) 3-5% of animals grazing rangelands

National Academy of Science (1968)

9% of nutritionally sick cattle

Nielsen (1992) 3rd Int. Symp. Poisonous Plants

Cattle	1% death loss	$216,031,200
Calves	1% loss of calf crop	88,172,000
Sheep	3.5% death loss	29,063,650
Lambs	1% loss of lamb crop	6,265,670
Total		$339,532,520

Catastrophic livestock losses to poisonous plants

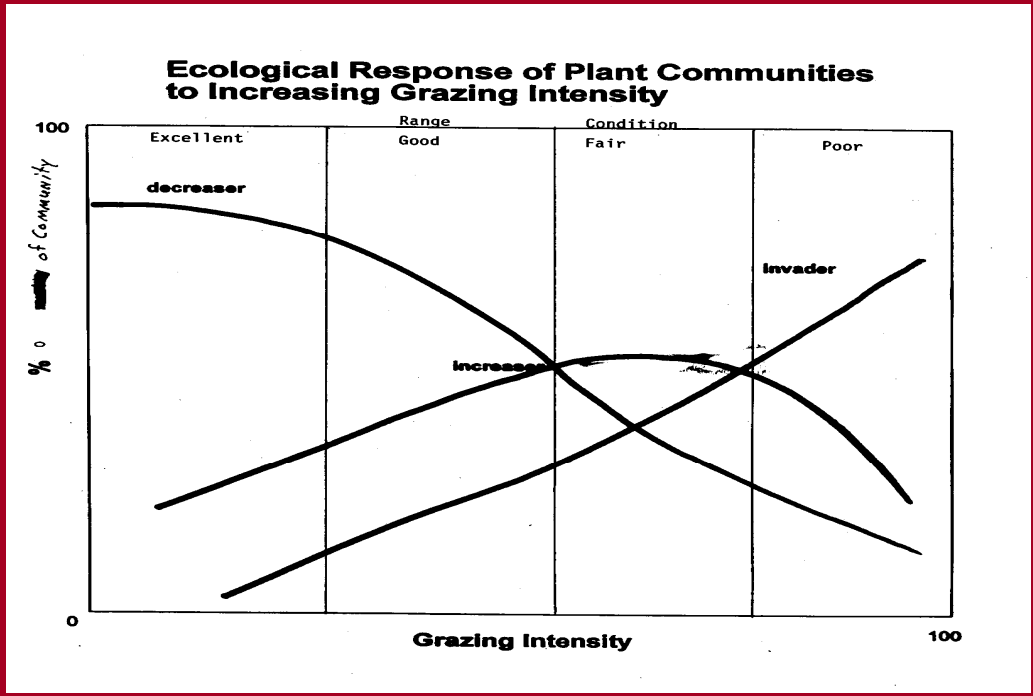
Catastrophic livestock losses to poisonous plants.[1]

Plant	Year	Location	Livestock	Loss
Locoweed	1893	Kansas	Cattle	25,000
Deathcamas	1909	Wyoming	Sheep	500 of 1,700
Deathcamas	1909	Wyoming	Sheep	20,000 reported in one county
Larkspur	1913	Utah	Cattle	200 in one herd
Milkweed	1917	Colorado	Sheep	730 of 1,000
Greasewood	1920	Oregon	Sheep	1,000 of 1,700
Lupine	1942	Utah	Sheep	260 from 1 band
Lupine	1942	Montana	Sheep	700 of 2,000
Lupine	1942	Montana	Sheep	2,500
Halogeton	1945	Idaho	Sheep	1,620 in one band
Halogeton	1945	Idaho	Sheep	750 in one band
Halogeton	1945	Idaho	Sheep	250 in one band
Halogeton	1971	Utah	Sheep	1,200 in one band
Locoweed	1958	Uinta Basin	Sheep	6,000
Locoweed	1964	Uinta Basin	Sheep	1 band $45,000 1 band $125,000
Milkweed	1975	New Mexico	Cattle	200
Selenium	1981	Utah	Sheep	250 of 1,400
Senecio	1982	Oregon	Cattle	630
Deathcamas	1983	Idaho	Sheep	75 of 125
Deathcamas	1983	Idaho	Sheep	80
Deathcamas	1983	Idaho	Sheep	83
Deathcamas	1985	Idaho	Sheep	250 of 2,400
Oakbrush	1986	California	Cattle	1,700
Larkspur	1986	FS Region 4	Cattle	1,000
Larkspur	1991	Colorado	Cattle	30 of 210
Lupine	1992	E. Oregon	Cattle	67 deformed calves out of 131
Lupine	1997	E. Oregon	Cattle	15-40% of all calves on 10 ranches
Locoweed	1996	Utah	Sheep	300 died, 340 aborted in one band

History of Plant Poisonings

- Western rangelands are extremely variable in topography, soils and climate, resulting in diverse plant communities and a rich variety of species.
- Kingsbury (1964) > 1000 poisonous plants in US and Canada
- Range livestock era began after Civil War (1865) with trail drives from Texas to Plains states
- Prairies were fully stocked by 1880's, Mountains and deserts by early 1900's
- Most ranges were overstocked until 1934 – Taylor Grazing Act
- Overgrazing led to degradation of vegetation
  - Desirable vegetation declined, Increaser and Invader poisonous plants increased.
  - Hungry animals faced with abundant poisonous plants.

Ecological Response of Plant Communities to Increasing Grazing Intensity



Stoddart (1949) “Livestock poisoning is natures sign of a sick range.”
“Retrogression following misuse was the greatest single factor contributing to livestock poisoning.”
1.Poisonous plants increased as desirable forage declined .
2. Livestock were forced to eat poisonous plants because of shortage of feed.

Schuster (1978) “Good range management is the surest and most economical means of reducing livestock loss to poisonous plants.”

Historical Aspects of Plant Poisoning (Marsh 1913)

- The loco habit is usually acquired during a season of short feed, when the locoweeds are the most attractive form of vegetation (Loss 5-50% of herds)

- Larkspur poisoning is most likely during the season of short feed, or on overgrazed areas; in either case the larkspur is the most conspicuous form of vegetation and is eaten in lieu of anything better.

- The roots of water hemlock are picked up when there is little else to eat with disastrous results.

- Successive bands of sheep are driven over the same trial until everything suitable for food disappears, and then there follows cases of poisoning from chokecherry. On some trails there is an almost continuous hedge of chokecherry, and the leaves are eaten as high as the sheep can reach.

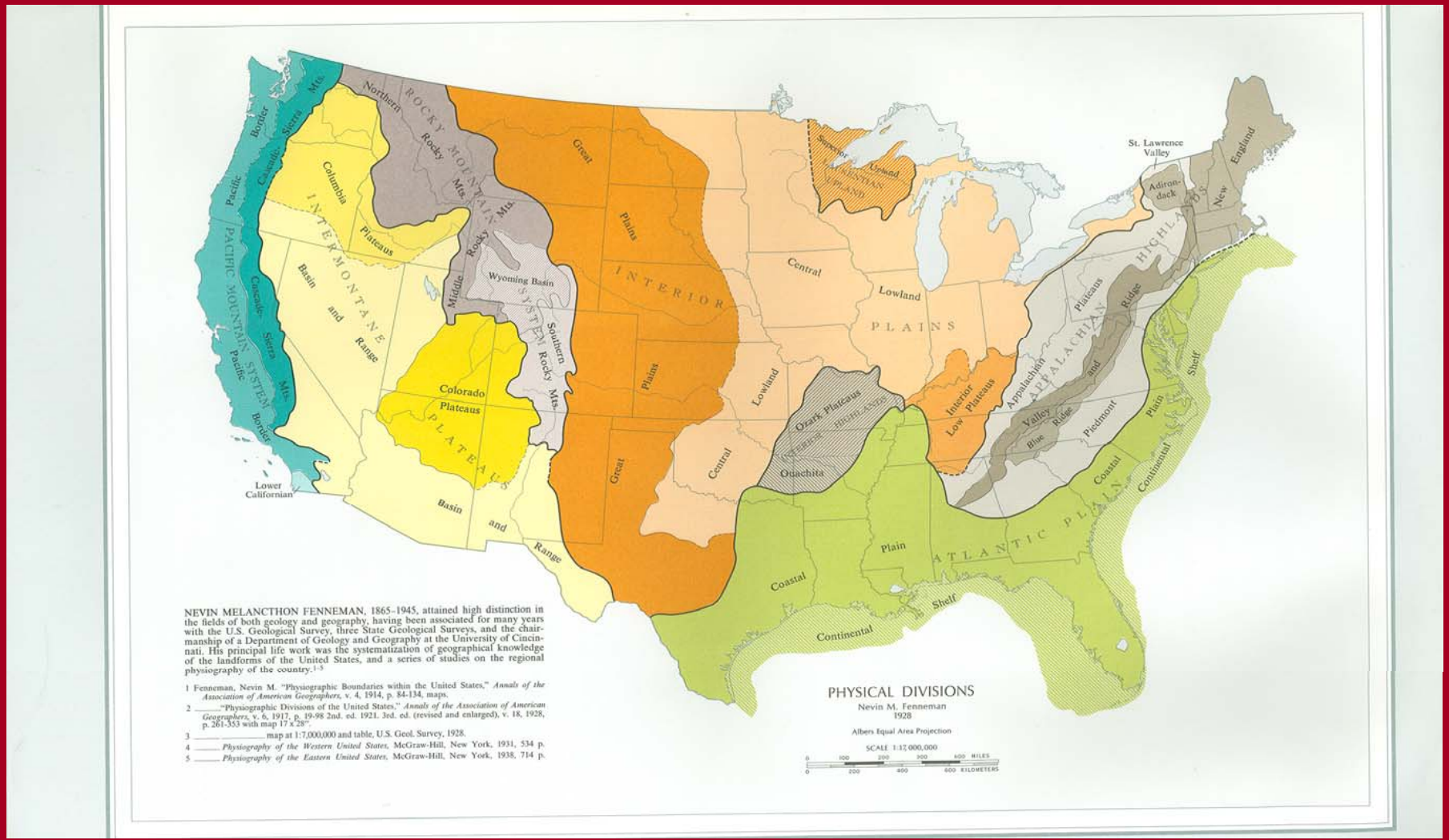
Chronology of Poisonous Plant Problems

- Chestnut (1894) Poisonous plant research started – USDA Bureau of Plant Industry
- Marsh (1905) “Livestock poisoning from plants has become a national concern.”
- Stoddart and Smith (1943, Range Management) “Poisonous plants cause great loss on western ranges. Losses are increasing in spite of increased knowledge concerning poisonous plants and treatment of poisoned animals.”
- Stoddart and Smith (1955) “Losses have decreased measurably because stockmen have learned to recognize poisonous species and have learned to avoid them or to minimize damage from them.”
- Stoddart Smith and Box (1975) “Poisonous plants are normal components of range ecosystems. Most losses can be avoided by good management; others occur with such irregularity due to unpredictable conditions that they constitute and ever-present hazard.”
- Valentine (1990, Grazing Management) “Prolonged droughts and overgrazing sometimes force livestock to eat harmful amounts of poisonous plants. On good condition ranges, poisonous plants are subjected to intense competition from vigorous, high producing forage plants, and there is a great variety of plant species available for selective grazing.”

Ecological status of important poisonous plants

Pristine	Seral	Alien
Climax sp.	Increaser sp.	Invader sp.
Tall larkspur	Locoweed	Halogeton
False hellebore	Lupine	St. Johns wort
Water hemlock	Death camas	Poison hemlock
Bracken fern	Snakeweed	Tansy ragwort
Chokecherry	Senecio	Houndstongue
Ponderosa pine	Low larkspur	African rue
Oak sp.	Milkvetch	Leafy spurge
	Bitterweed	Knapweeds
	Twin leaf senna	
	White snakeroot	
	Orange sneezeweed	

Physiographic Regions



NEVIN MELANCTHON FENNEMAN, 1865–1945, attained high distinction in the fields of both geology and geography, having been associated for many years with the U.S. Geological Survey, three State Geological Surveys, and the chairmanship of a Department of Geology and Geography at the University of Cincinnati. His principal life work was the systematization of geographical knowledge of the landforms of the United States, and a series of studies on the regional physiography of the country.[1-5]

1 Fenneman, Nevin M. "Physiographic Boundaries within the United States," *Annals of the Association of American Geographers*, v. 4, 1914, p. 84-134, maps.

2 _____"Physiographic Divisions of the United States." *Annals of the Association of American Geographers*, v. 6, 1917, p. 19-98 2nd. ed. 1921. 3rd. ed. (revised and enlarged), v. 18, 1928, p. 261-353 with map 17 x 28".

3 _____ map at 1:7,000,000 and table, U.S. Geol. Survey, 1928.

4 _____ *Physiography of the Western United States*, McGraw-Hill, New York, 1931, 534 p.

5 _____ *Physiography of the Eastern United States*, McGraw-Hill, New York, 1938, 714 p.

Poisonous Plants found in Physiographic Regions
Great Plains and Prairies

Tall-grass Prairie	Short-grass Prairie	Oak/Mesquite Savanna
White snakeroot	Plains larkspur	Bitterweed
Riddells groundsel	Locoweed	Twin leaf senna
	Threadleaf groundsel	Oak
	Broom snakeweed	
	Redstem peavine	

Poisonous Plants found in Physiographic Regions
Southwest Deserts

Sonoran Desert	Desert Grassland	Mohave Desert
Garboncillo	Sacahuista	Desert bailelya
Mescal bean	Rayless goldenrod	Milkweed
Red-stem peavine	Broom snakeweed	Coyotillo
Woolly paperflower		

Poisonous Plants found in Physiographic Regions
Mountains

Mountain Brush	Mt. big Sagebrush	Aspen Conifer
Chokecherry	Death camas	Tall larkspur
Oak	Low larkspur	Timber milkvetch
Orange	Lupine	False hellebore
Sneezeweed		Ponderosa pine

Poisonous Plants found in Physiographic Regions
Colorado Plateau / Great Basin

Salt desert Shrub	Sagebrush Steppe	Juniper Pinyon
Halogeton	Death camas	Locoweed
Greasewood	Anderson larkspur	Lupine
Horsebrush	Water hemlock	Pingue

Plant – Animal – Environmental Interactions of Poisoning

The interactive factors of:

- Plant species and specific toxin
- Level of the toxin within the plant
- The animals physiological condition
- Its propensity to eat the plant (palatability)
- The rate the plant is consumed
- Environmental influences on plant and animal

Determines whether poisoning occurs.

Plant – Animal – Environmental Interactions of Poisoning

Plant	Animal	Emvironment
Habitat	Post-ingestive consequence	Population cycle
Abundance	Detoxification	Toxin level
Toxin	Species & class	Animal behavior
Palatability	Physiological condition	Relative preference
	Hunger	

Management to Prevent Poisoning

- Few treatments available for poisoned animals
- Prevention – restrict access when poisoning likely
  1. Identify poisonous plants on your range.
  2. Learn signs and symptoms of poisoning.
  3. Learn when these plants are most toxic.
  4. Know when livestock are most likely to eat them.
  5. Understand the environmental and management conditions under which poisoning occurs.
  6. Devise grazing strategies that will restrict access to plants when they are likely to cause poisoning.

General management considerations to reduce risk of poisoning

Future Prevention Technologies

- Toxin Binding
  - Activated charcoal
  - Clay minerals
  - Cyclodextrins
- Vaccines
- Microbial breakdown of toxins
  - Inductible
  - Transplant microbes
- Behaviorial modifications
  - Aversive conditioning
- Control
  - Herbicide
  - Biological
  - Cultural

Test Question

Plant / Animal / Environmental Interaction

- Common name
- Scientific name
- Toxin & structure
- Poison syndrome
- Habitat – plant community
- Ecological status
- Management to reduce risk
- Control