**Unit 20: Rangeland Ecology and Management**

**Barron S. Rector,** Associate Professor and Extension Range Specialist, Texas A&M University

**Unit Goals**

* Define and describe rangeland
* Define rangeland management
* Describe why rangeland management is different from an agricultural vocation
* List the basic component categories of rangeland management
* List and describe the four founding principles of grazing management
* Understand and be able to communicate the importance of land management goals
* Describe how native grasses grow
* Describe, compare, and contrast rangeland management tools
* Develop an awareness of grazing, brush, and weed issues and management on Texas rangelands

**What Is a Rangeland?**

* Land on which the indigenous vegetation is predominately grasses, grass-like plants, forbs or shrubs that are grazed or have the potential to be grazed
* 36% of the United States, 60% of Texas from original 90%.
* Not plowed, fertilized, or irrigated. Unsuited for cultivation. Support livestock, game, wildlife
* Range vs. Forestlands vs. Pastures
* Land use transitioning away from ranching, toward non-production purposes
* Cultural value, “Western” heritage
* Conversion of rangeland, conflicts of use, poor management practices-> need for stewardship

**Development of Rangeland Management**

* Focused on manipulation of livestock grazing, more complex than that.
* Philosophical balance between needs of society, needs of resource.
* History of range-livestock industry in Texas. Feral Spanish livestock->Extreme overstocking led to “die-up” beginning in 1884, severe abuse of rangelands.
* Led to beginning scientific approach to rangeland management, concept of carrying capacity. Ranchers and stockmen dismissive, uninterested.
* WWI exacerbated overstocking, land badly degraded from decades of chronic misuse. Rangeland management, conservation came into its own. Conservatory laws passed.

**What is Rangeland Management?**

* Described as “the science and art of optimizing the returns from rangelands… through the manipulation of range ecosystems”
* Two basic components:

1. Protection and enhancement of the soil and vegetation complex
2. Maintenance or improvement of the output of consumable range products

* Unique vocation: deals with the plant and animal interface rather than plants or animals in isolation.
* Involves manipulating of livestock grazing, other components such as fire, wildlife, human activities.
* Multidisciplinary approach, built on a foundation of ecology

**Grazing Management for Native Pastures**

* Means of supervising cost of producing/harvesting raw materials while keeping/sustaining the productivity of the land resource.
* Founded on 4 principles:

1. Proper Use: closely tied to stocking rate. Overstocking #1 factor in degradation.
2. Proper Season of Use: cool-season forage vs. warm-season forage. Dormant-season grazing for wildlife needs during winter.
3. Proper Distribution of Animals: affected by variety of factors, more important on large ranges, looked at more uniform grazing across pasture.
4. Proper kinds and classes of animals: need to recognize important diet components for grazers

* Grazing management=tool to impact plant succession, soil erosion, and animal production.
* Maintain optimum balance between plant/animal requirements, maintain organic matter/litter cover, control species composition
* Different rules/outcomes for native vs. fertilized exotic (introduced) pastures.

**Goals of Landownership**

* Clear communication of management goals essential, establish order of importance.
* Short-term vs. Long-term, Operational vs. Non-business, Personal vs. Financial, etc.

**How Do Native Grasses Grow?**

* Leaves only live 30-90 days, roots/crowns may live 1-3 years.
* As long as the tiller is vegetative, can produce indefinite number of leaves.
* Resistance, response to grazing differs between species
* Overgrazing reduces ability to photosynthesize, can harm grasses
* Rotational grazing reduces grass stress, allows recovery, photosynthesis

**Grass Growth: Implications for Management**

* Native grasses well suited to soil, no fertilizer, irrigation needed. Uneconomical.
* Native pastures should be managed for 15-25% grazing of total growth
* Prevents overgrazing, maintains ecosystem functions, services, health
* Past grazing history affects quantity of plants. Abuse reduces growth, productivity, water quality, accelerates erosion, invasion of brush, noxious plants

**What Does Grazing Management Control?**

* Breed selection determines amount of forage needed, available. Age of animals determines type of forage, quality needed.
* Type/number of animals must be properly matched with type/amount of forage.

**What Is the Best Grazing Method?**

* Begins with the right stocking rate, most important consideration.
* Rotational stocking vs continuous stocking less important than adjusting forage demand.

**Grazing and Risk**

* Impact of cattle, carrying capacity must be considered. Risk of failing to adjust stocking rate.
* Cattle do not eat all types of plant in pasture. Uniformed landowners may blame management failures on wildlife competition, weeds, drought.
* Must learn from mistakes, plan conservatively to handle unforeseen situations, recognize warning signs.
* Moderate grazing = higher net economic returns. Cannot jeopardize long-term success for short-term gains.

**Wild and Managed Animal Populations**

* Distinct diet preferences, food gathering habits reduce competition.
* Ranching industry manages for wild and domestic on same range resource, restraints imposed on system to meet needs.
* Historical management:

1. Fencing: movement restricted, grazing patterns altered.
2. Focus on high populations -> high returns.
3. Manager’s view short-term.

* Texas rangelands -> Abuse -> Disclimax community. Simple composition of short, opportunistic grasses/forbs, undesirable brush species.
* More diverse rangelands -> support greater animal production if they utilize different plant classes, combination of livestock

**Competition among Animals**

* Mutual use of a limited resource (forage, water, cover , space)
* Greatest competition: intraspecific, “cow to cow”.
* Cattle complementary to sheep, goats, deer.
* Different foraging styles, little competition unless one food supply becomes limiting.

**What Should the Manager Do?**

* Cattle “fend for themselves” with inadequate forage -> overgrazing -> lowered carrying capacity, productivity, net returns
* Goal: grow best grass possible. Wildlife -> diverse native grasses/forbs.
* Must be flexible, adjust stocking rates based on 25% of annual forage, check frequently
* Stocking rates must be based on actual grazeable area of pasture, build in pasture rest, deferment

**Integrated Brush Management and Concepts for Rangeland**

**What Is Brush?**

* Dense growth of bushes, shrubs, small trees. Taken over grasslands due to overstocking, removing range fires. Labelled as pests.
* Competes for water, shade changes grass species composition, impede movement. Can enrich soil, act as protective barrier from grazing, act as nursery for desirable species.
* Brush may increase value of land, sometimes considered aesthetically pleasing.
* Mesquite can be used for firewood, furniture, barbecue.
* “Pest” status depends on land use, long-term goals

**Brush Management Concept**

* Recognizes potential value of some quantity of woody plants in range/pasture management
* Tied to realization that wildlife is an economic asset, increasing livestock production shouldn’t be at expense of other products.
* Multidisciplinary approach for multiple land uses, tools include mechanical, chemical, biological, prescribed burning.

**Choosing Best Management Practices**

* Most effective, economical with a combination of methods integrated over years.
* Should manage climatic, biological, financial, and political risks of operation, more important to success than capacity to increase output.
* Must be pro-active, cannot ignore problems, treat only symptoms. Contingency plans essential.
* Key Points:

1. Determine cause of brush problem, seek solutions to the source, not symptoms.
2. When using chemicals, match the target plant to a chemical labeled for it
3. Always read and follow herbicide instructions, violations of the law otherwise
4. Cost of treatment escalates quickly as the problem goes untreated
5. Multi-stemmed or rough-barked plants more difficult to control individually
6. When using stem treatment, do not spray when basal stems wet, shake mixture vigorously during application.
7. Stem, basal bark treatments less effective if dense grass present.

**Range Weed Management**

* “Weeds”, undesirable plants, cause economic losses. Also applied to forbs, natural part of succession process.
* Drought resistant, require little soil. Range manager goal: weeds create new environment by changing soil, water, nutrients.
* Wildlife managers: weeds undesirable, indicative of disturbance
* Human caused disturbances make weeds appear, stabilize the site, protect/build the soil.
* Seeds can lay dormant in soil for many years, respond to condition of need in ecosystem.
* Annual vs. Perennial, Cool vs. Warm Season helps us understand value, management of plant.

**Weed Management Concept**

* May control populations by eliminating a requirement for growth (sunlight, water, space, etc.)
* Recognizes potential value of some quantity of weedy plants, part of natural system.
* Weeds defined by lack of value as livestock forage, but may be essential to native wildlife.
* Weed for one management plan may be food for another.
* Hunting, ecotourism, landowners may be managing for more than just cattle.

**Control Recommendations for Specific Weeds Common in Texas**

* Annual weeds:

1. Most effectively controlled by pulling them up by their roots.
2. Spring herbicide application
3. biological control by sheep/goats
4. prescribed burning (not effective against some like broomweed)

* Perennial weeds:

1. Most can be effectively controlled by herbicide/herbicide mixtures in spring prior to flowering
2. If top-killed by grazing/fire, can resprout from the crown, return. Cannot be controlled this way, but can be managed and/or suppressed.

**Get Your Money’s Worth in Weed Management**

* Determine cause of weed problem, seek solutions for source and not merely symptoms.
* Match herbicides with the target plant they are labeled for.
* Always read and follow herbicide instructions.
* Recognize not all weeds react the same.
* Conduct a survey to read the landscape, determine why weeds are coming.
* Determine where weeds are, target specific area for treatment
* Determine desired level of control.
* See if cutting off sunlight, water, nutrients could help reduce weed stand.
* Develop a plan for weed control, change current management to prevent resurgence next year

**Seeding Rangeland as a Management Practice**

* Expensive, risk of failure always present, but often most practical and environmentally sound practice available to restore rangelands, missing ecosystem functions.
* Increase production potential, grazing capacity. Not a cure or substitute for good management.
* Will not solve problems previous management created, not always profitable.
* Other objectives:

1. Revegetating barren, abandoned croplands
2. Revegetating after fire
3. Provide better seasonal balance in the forage supply
4. Improve nutritive value and quantity of forage
5. Reestablishing native plants
6. Providing cover/litter to prevent soil erosion, water runoff

* Tool to restore ecological properties/functions, establish desirable vegetation.
* Risk = Interpretation. What does success look like? Major risk planted area will not resemble what was envisioned. Patience often required.
* Greatest risk: inability to predict rainfall, unforeseen conditions during establishment period.

**Decision to Seed:**

* If more than 10% of vegetation is desirable native species, can rely on natural succession.
* Seeding may be desirable if insufficient desirable native plants remain.
* Succession cheaper, may take many years to recover, final outcome uncertain.
* Often must accept, adjust management to actual conditions.

**Grass Mixture versus Monoculture:**

* Loss of vegetation diversity -> loss of wildlife diversity, monoculture leads to habitat fragmentation.
* Monocultures easier, may meet current needs. Vulnerable to pests, disease.
* Mixture of plants for seeding provides better ground cover, varied diet, less risk in heterogeneous soils.

**Native versus Nonnative Plants:**

* Introduced plants commonly function as weeds. Risk of not understanding invasive properties. Often selected for resistance to overgrazing, extremely competitive, become pests.

**Planting Method:**

* Aerial dropping, roller chopping, “lite” raking. More soil/seed contact, less risk of failure.

**Land Preparation:**

* Seedbed must be firm prior to planting, recently plowed areas do not have time to settle.

**Weed Control:**

* Disking or chemicals can reduce competition with seeded grasses.
* Injury to young grasses is reduced if chemicals are delayed until they reach 4-6 leaf stage.