Utah Forest Facts

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Forest Grazing: Managing Your Land for Trees, Forage, and Livestock

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This fact sheet gives an overview of the relationships between trees and forage and provides suggestions on managing your land for forest grazing.

Introduction

Livestock grazing is common in Utah forests and woodlands and often plays an important role in the management decision of Utah landowners. The reasons for this are partly economic. Timber rotations are long in Utah, and many landowners cannot wait up to 100 years to realize an economic return on their property. Livestock, by contrast, can provide yearly income. The reduced property taxes that come with Greenbelt status are another economic incentive to graze forest land. Finally, research shows that raising livestock is an important cultural activity in Utah. Most of Utah's family forests have a long history of being grazed, and landowners want to continue this tradition.

Fortunately, there are many management practices that can maintain or even improve forage production while also maintaining or enhancing forest health. With a little planning, multiple benefits can be realized by managing for sustainable interactions between trees, forage, and livestock.

Managing Forest Density for Forage

Widely spaced stands were the norm for many forest types in the past. These open stands of trees allowed diverse understory vegetation to grow beneath them, which provided forage for livestock and wildlife. However, a century of aggressive fire suppression has left some forests so dense that forage plants do not receive the light, nutrients, and moisture they need. Increased forest density also means that trees are more prone to insects, diseases, and catastrophic fire. Returning these forest types to a more open stand structure can result in both enhanced forest health and increased forage.

Why manage for both?

Managing for both trees and forage (sometimes referred to as *silvopasture*) allows multiple benefits to be realized on your land. If managed properly, forest grazing provides diverse sources of income and enhances the health of your forest. Here are some specific advantages to managing for both trees and forage:

Livestock: Trees provide shade and weather protection for livestock. Also, shaded forage plants mature later and can be more nutritious.

Tree quality and size: Thinning your forest and grazing the understory can result in increased tree quality and size, due to decreased competition for light, water, and nutrients. These large, high quality trees can represent a significant long-term economic return if you choose to conduct a timber harvest at a later time.

Fire prevention: Reducing forest density to promote forage production will lessen the likelihood of catastrophic fire.

Wildlife: Forested rangeland provides important shelter and forage for wildlife. If you lease your land out for hunting, improved wildlife habitat has important economic benefits as well.

Aesthetics: Scenic qualities are often enhanced when appropriate forest types are returned to more open stand structures.

Forest Thinning

Thinning your forest allows more light and precipitation to reach the ground where forage grows, and often results in dramatically increased forage production. Thinning also hastens normal forest development processes by removing less vigorous trees and allowing the remaining trees to grow larger because of decreased competition for light, moisture, and nutrients. If you decide to thin your forest, it is very important to consult a professional forester who can determine the proper mixture of trees to remain. This will help to ensure the future health and productivity of your forest.

Consider these points when thinning a forest to improve forage production and increase forest health:

- Generally speaking, forests must be thinned to less than 50% canopy cover to support forage production. If the canopy cover of a forest is greater than 50%, insufficient light and moisture will reach the ground to grow forage.
- After a forest has been thinned to less than 50 percent canopy cover, forage production usually increases proportionately as canopy cover is further reduced. However, canopy cover should never be reduced by more than 60 percent at one time. This could result in windthrow damage to the remaining trees. You should consult a forester to determine the total percentage of canopy cover to remain, as it will vary with each forest type and local conditions.
- Some forest types, such as spruce-fir, should not be thinned by more than 30 percent at one time. It is therefore not appropriate to manage these stands for forest grazing. Grazing in these areas is usually confined to the meadows (parks) adjacent to the stands of trees, due to the short growing season of forage in these high elevation forests.
- Slopes with southern exposures receive direct sunlight, which depletes moisture available to forage plants. Maintaining more tree cover on these slopes provides shade and increases forage production. On northern exposures, sunlight is diffused, and shade is less important. Forests can be thinned more on these slopes.

Seeding

Thinning a forest is sometimes all that is needed to allow native understory species to increase and spread. However, it is often a good idea to seed these areas with grasses and forbs in order to speed up forage production and to prevent weeds from taking over. Seeding areas where the soil has been disturbed by forest management activities is also advised. When selecting which forage plants to seed in your thinned forest, it is best to choose species that complete most of their growth cycle in the spring. This will allow them to establish before having to compete with deeper rooted trees for soil moisture during the dry months. Selecting drought tolerant forage species will also help ensure their establishment while competing with trees. While seeding native species is desirable, introduced species are often better suited to forest grazing settings, because the seed is generally less costly and many introduced species are more drought and grazing tolerant than native species.

Al Schneider @ USDA-NRCS Plants Database

If you seed an area it is important to exclude livestock until the new forage plants have developed enough of a root system to prevent them from being pulled out by grazing animals. Listed below are some appropriate grasses, forbs, and legumes for forest grazing. For a list of seed suppliers in Utah, consult the USU Forestry Extension Web site at http://extension.usu.edu/forestry/Management/Timber_SeedSuppliers.htm

Late fall is generally the best time for seeding, when soil temperatures are cold enough to delay germination. This will allow seedlings to break dormancy early the following spring, when cool temperatures and moisture from snow pack will increase their chances of establishment. Broadcast seeding is generally effective in thinned forests and is considerably less expensive than drilling. In aspen forests, seeding just before leaf drop is an excellent practice as the leaves cover the seeds and provide an ideal seedbed.

Seeding a mixture of species provides some advantages over a single species seeding. A mixture of species often prolongs the growing season and provides better protection of the soil. In addition,

Some recommended forage species for Utah forest types

	Mixed conifer forest (30" + annual precipitation)	**Aspen/conifer/maple forest** (25"-30" annual precipitation)	**Pinyon juniper** (14"-18" annual precipitation)
Grasses	Big bluegrass (N)	Big bluegrass (N)	Bluebunch wheatgrass (N)
	Mountain brome (N)	Mountain brome (N)	Thickspike wheatgrass (N)
	Slender wheatgrass (N)	Slender wheatgrass (N)	Western wheatgrass (N)
	Orchardgrass (I)	Orchardgrass (I)	Indian ricegrass (N)
	Meadow brome (I)	Meadow brome (I)	Intermediate wheatgrass (I)
			Russian wildrye (I)
			Crested wheatgrass (I)
Forbs and Legumes	Rocky Mountain penstemon (N)	Rocky Mountain penstemon (N)	Rocky Mountain penstemon (N)
	Sweetanise (N)	Sweetanise (N)	Utah sweetvetch (N)
		Showy golden eye (N)	Blue flax (N)
		Crownvetch (I)	Small burnet (I)
		Cicer milkvetch (I)	Alfalfa (I)
		Sainfoin (I)	Sainfoin (I)

Adapted from Intermountain Planting Guide: USDA ARS-Forage and Range Research Lab, Logan Utah.
N=Native; I=Introduced

it provides a variety of forage for livestock. The Intermountain Planting Guide, put out by the Agricultural Research Service, USU Extension, and the Natural Resources Conservation Service, has more details about seeding methods, mixtures and complete information about forage plants. You can obtain a copy by contacting your county extension office. Request publication number 510. You can also visit http://extension.usu.edu/rangelands for a digital copy (to access the publication, select "Rangeland Management and Improvement" in the Rangeland Science and Management category).

Livestock Management

Grazing should be deferred on thinned forests until forage plants have produced viable seed and developed enough of a root system to prevent them from being pulled out by livestock. This usually occurs the second or third year after thinning. Timing thinning operations with regular pasture rotations is usually a good idea to ensure that new forage plants have enough time to successfully establish. Continuous, season-long grazing can be used, with appropriate stocking rates and animal distribution. However, this system allows animals to be more selective grazers, which puts the most desired and nutritious forage species at risk. Deferred, rotational, or intensive grazing management systems allow for more even utilization of forage and help to ensure that a diverse understory is maintained on your forest land.

Livestock and wildlife must be managed very carefully in young forests. New aspen shoots are palatable to sheep, cattle, deer, and elk, and uncontrolled grazing can prevent a stand from regenerating. Young conifers are not palatable to livestock and generally will not be damaged if sufficient alternate forage is present. However, if the top bud of a young conifer tree is removed, or if more than half of a young tree's foliage of that year is consumed, tree growth will be inhibited or growth form will be affected. After trees have grown taller than livestock, deer, and elk, potential damage from grazing will be greatly reduced. However, elk can still be problematic, sometimes pushing down small diameter trees to get at young shoots.

Forest Grazing Concerns

Although forest grazing has many advantages, there are some risks involved if it is not properly

Grazing Systems

Continuous grazing: A method of grazing livestock on a specific unit of land where animals have unrestricted and uninterrupted access throughout the time period when grazing is allowed. The length of the grazing period should be defined.

Deferred rotational grazing: Grazing management of more than one pasture that involves delaying grazing in one pasture until seed maturity, then deferring other pastures in subsequent years.

Rest rotational grazing: A grazing system in which one pasture receives a year of non-use while the other pastures absorb the grazing load. Most rest rotation schemes use three or four pastures.

Intensive grazing management: Grazing management that attempts to control duration and timing of grazing. This is often done with the goal of increasing production or utilization per unit area or production per animal through a relative increase in stocking rates, forage utilization, labor, resources, or capital.

Adapted from *Terminology for Grazing Lands and Grazing Animals:* The Forage and Grazing Terminology Committee.

managed. Most of these risks have to do with forest regeneration. Livestock grazing can impede new tree growth if seedlings are trampled or if excessive browsing takes place. Also, seeding the understory carries the risk of reducing new tree growth because of increased competition for moisture and soil nutrients.

However, many studies have shown that properly managed forest grazing does not affect seedling establishment or growth in regenerating forests. Proper management of livestock can prevent trampling and browsing of seedlings, and when seeded vegetation is grazed, its competition with tree seedlings is reduced. Grazing can also help in exposing the bare mineral soil that is necessary for the regeneration of some tree species.

Another important concern when managing forest grazing is water quality. Much of Utah's water supply originates in high elevation forests, so special care must be taken when these lands are grazed. As on any rangeland, livestock should be carefully managed or excluded from riparian areas. Consider installing portable water tanks away from streams in forest grazing areas. These tanks can easily be removed when forest management activities are taking place, and animals readily use them even when they are located just outside the riparian zone. See Utah Forest Fact Sheets 8, 9, and 10 for more details about managing forests for water quality (they are available at www.extension.usu.edu/forestry/reading.htm).

Forest Grazing Management in Specific Forest Types

The guidelines above illustrate some general principles to be utilized in a forest grazing system. Here are some unique considerations for the three Utah forest types best suited for forest grazing.

Aspen Forests

Aspen stands can contain up to ten times more forage than conifer stands, and the diverse grasses, forbs, and shrubs that grow in these areas are a valuable resource for livestock. Aspen are not tolerant of shade, which means that without regular disturbance, stands will not regenerate successfully and will eventually be crowded out by more shade tolerant conifer species.

Aspen stands contain diverse grasses and forbs

A recent study of Utah aspen forests found that forage production decreases exponentially as conifers replace aspen, and that significant decreases in forage production occur if conifers make up more than 20 percent of the canopy cover. Removing conifers from mixed conifer-aspen stands will result in improved forage production, as well as increasing the chances of an aspen stand's survival. Additionally, if you have an aspen stand that contains only old aspen trees, cutting some or all of these trees will stimulate new aspen growth and help to ensure the survival of the stand and the diverse forage that grows beneath it. This is because aspen typically reproduce through "suckering," a process in which new root sprouts ("suckers") form from an existing underground root system. In order for these suckers to begin growth, older trees in the stand must die or experience stress such as defoliation. When this occurs, a hormonal imbalance in the aspen root system stimulates the growth of new suckers.

There are several approaches you can take to remove trees from your aspen stand. Clearcutting will stimulate the greatest new sucker growth, and forage production will increase dramatically. One Utah study found that clearcutting an aspen stand resulted in an increase of nearly 2,000 kg/ha (1,784 lb/ac) of understory vegetation. However, careful planning should take place before clearcutting an extremely decadent aspen stand because it may not regenerate. Cutting scattered groups of adjacent aspen trees will also be effective in stimulating new aspen growth and promoting forage if the resulting openings are large enough to allow sunlight to reach the ground. Thinning an entire aspen stand can be problematic,

because harvesting activities frequently harm the remaining trees, and any bark wounds that occur during thinning operations can result in disease. Aspen's shallow roots are also susceptible to damage from ground disturbing activities.

Fire can also be used to stimulate the growth of new aspen and promote forage production. It is often difficult to start fires in aspen stands due to their high crowns and green understory, but carefully timed burns in the fall may be effective. Fire is not always an appropriate tool in mixed conifer-aspen forests. In these settings a fire can become too severe, resulting in heat damage to aspen root systems that can prevent regeneration from taking place. Fires, of course, carry the risk of getting out of control, and you should seek out the assistance of a professional forester and obtain the required permits if you choose this option.

Aspen suckers are extremely palatable to wildlife and livestock. Grazing should be carefully controlled or excluded from regenerating areas until the tops of the aspen trees are beyond their reach. This is particularly important on smaller plots, where there is a greater potential for livestock and wildlife to consume nearly all of the aspen suckers that emerge. Fencing a regenerating area will greatly increase the stand's chances of survival, especially if there are deer or elk herds in the area. If fencing costs are prohibitive, a significant number of acres must be cut to distribute grazing pressure. Taking these measures will help to ensure that your aspen stands provide forage, wildlife habitat, and scenic beauty for years to come.

Pinyon-Juniper Woodlands

Vegetation growing in low elevation pinyon-juniper woodlands is important spring and fall forage for livestock. These woodlands are also important as winter habitat for wildlife in Utah. Over the last century, the density of pinyon-juniper woodlands has been increasing, due mainly to fire suppression and perhaps climate change. Increased density of pinyon-juniper woodlands means that trees are under more stress as they compete for limited light, moisture, and nutrients. This stress leaves them more susceptible to attack by insects. Additionally, the encroachment of pinyon-juniper woodlands into previously open rangelands greatly decreases forage production.

Pinyon-juniper encroachment reduces forage production

Historically, the response to this problem was to remove pinyon and juniper trees in large blocks from an area. While this approach increased forage production, often dramatically, some considered it detrimental to wildlife and visually displeasing. Leaving scattered groups of pinyon and juniper trees in open grasslands allows more benefits to be realized from these woodlands. A mosaic of trees and openings allows both warm and cool season grasses to emerge. Additionally, the results are more aesthetically pleasing, and wildlife habitat is enhanced.

There are a number of ways that pinyon and juniper trees can be removed to increase forage production. Cutting with chainsaws is one of the most commonly used techniques. This method allows you to select which trees you remove, and also allows for more flexibility in the time of year and the terrain in which the treatment is done. Disadvantages to this method include the high cost, the limited area that can be treated at one time, and the high fuel loads that result from slash.

Using heavy machinery is sometimes a more efficient way to treat large tracts of pinyon-juniper woodlands. Bulldozers can be used to push over trees or to pull chains that uproot trees. Additionally, there are a number of devices that can be loaded onto logging equipment which cut and grind pinyon and juniper trees. These treatments are very effective in promoting forage growth. However, they are limited by rugged terrain and are expensive. Also, heavy machinery can cause damage to soils and existing

vegetation. One study in Utah, however, found that the soil disturbance caused by machinery helped seeded plants to establish after treatment.

Herbicide applications tend to have mixed results on pinyon-juniper woodlands. While some studies have found increased forage production after treatment with herbicides, others have not. One study found herbicides to be more effective on small trees (less than 6.5 feet tall).

Invasion by weeds is a particular concern following treatments of pinyon-juniper woodlands, especially on warm, dry, south facing slopes. Seeding treated areas will help forage plants to establish. As in other forest types, grazing on treated pinyon juniper woodlands should be deferred until the new forage has successfully established.

Ponderosa Pine Forests

Prior to European settlement, ponderosa pine forests were made up of park-like open stands with a diverse, abundant understory that provided forage for wildlife. These widely spaced stands, which usually contained about 50 trees per acre, were maintained by light surface fires that occurred every few years. However, the active fire suppression that began after European settlement, combined with overgrazing of the understory plants that would carry surface fires, led to extremely dense conditions in most ponderosa pine forests. Dense ponderosa pine forests do not allow sufficient light to reach the forest floor for forage production. These stands are also more susceptible to insect attacks, disease, and catastrophic fire. Returning ponderosa pine forests to a more open stand structure dramatically improves forage production. The most common tools for accomplishing this are thinning and prescribed fire.

Historically, fires crept through ponderosa pine forests every few years

If you chose to thin your forest, you need to decide whether to do an even or uneven-aged thinning. A major advantage to even-aged thinning in ponderosa pine forests is that it removes the ladder fuels that could lead to a stand replacing crown fire (ladder fuels are mid-level branches and shrubs that allow fire to climb into the top, or crown, of a tree). However, the results are less aesthetically pleasing to some, since small diameter trees are removed and the trees that remain are uniform in size and age. A recommended even-aged thinning method for ponderosa pine forests is thinning from below. In this method, the smallest diameter trees are removed until the desired forest density has been reached. If you choose to do an uneven-aged thinning, the stand is marked to take a representative number of trees from all diameter classes. Because the resulting stand will contain ladder fuels and be more prone to crown fires, care should be taken to leave adequate spacing between trees.

Reintroducing fire into ponderosa pine forests is another valuable tool in reducing stand densities and promoting forage production. Some studies suggest that ponderosa pine forests are so adapted to fire that thinning alone will not restore understory vegetation; rather, prescribed burns must be combined with thinning operations to stimulate forage production. Light-burning surface fires are the goal when conducting prescribed burns in ponderosa pine forests. This allows the seeds of understory vegetation to survive in the ground and prevents high-intensity stand-replacing fires from occurring. To prevent prescribed fires from getting too intense, consider thinning dense ponderosa pine forests before doing a burn. In addition to thinning, limbs from large trees should be removed to a height of 6-8 feet, and litter from the base of large trees raked away before conducting a prescribed burn. As with other forest types, you should get help from a professional forester and obtain the necessary permits before conducting a prescribed fire.

Sources of Assistance for Forest Grazing Management

Division of Forestry, Fire, and State Lands

Call (801) 538-5555 or visit http://www.ffsl.utah.gov to find a state service forester near you. These foresters can conduct a timber inventory on your land and help you plan a sustainable thinning operation to improve forage production.

USU Forestry Extension

Call (435) 797-0560, or visit http://extension.usu/forestry to get contact information for consulting foresters in the state. The USU Forestry Extension Web site also has a list of seed providers in Utah if you choose to seed your thinned forest with forage plants.

Natural Resources Conservation Service

The NRCS provides technical assistance and financial support to landowners who wish to implement conservation practices on their land. NRCS programs cover rangeland and woodland improvements. Call (801) 524-4550 or visit http://www.ut.nrcs.usda.gov/ to find a service center near you.

References:

Clason, Terry, and Steven Sharrow. 2005. "Silvopastoral Practices." Pp. 119-147 in *North American agroforestry: An integrated science and practice,* H.E. Garrett, W.J. Rietbeld, and R.F. Fisher (eds), American Society of Agronomy, Inc., Madison,Wisconsin.

DeGomez, Tom. 2006. *Guidelines for thinning ponderosa pine for improved forest health and fire prevention.* University of Arizona Cooperative Extension, Publication AZ1397.

Kolb, Peter F. Forestland grazing: Understory forage management. Retrieved on December 8, 2006 at http://www.mttreefarm.org.

Gottfried, Gerald J. and Kieth E. Severson. 1994. Managing pinyon-juniper woodlands. *Rangelands* 16(6): 234-236.

Griffis, Kerry L., Julie A. Crawford, Michael R. Wagner, and William Moir. 2001. Understory diversity in ponderosa pine forest stands of various management histories in northern Arizona. *Forest Ecology and Management* 146: 239-245.

Miller, Richard F., Jon D. Bates, Tony J. Svejcar, Fred B. Pierson, and Lee E. Eddleman. 2005. Biology, ecology, and management of Western Juniper. Oregon State University Agricultural Experiment Station, Technical Bulletin 152.

Shepperd, Wayne D. 2000. "Manipulations to Regenerate Aspen Ecosystems." Pp. 355-366 in *Sustaining Aspen in Western Landscapes: Symposium Proceedings, June 13-15, 2000.* RMRS-P-18. Grand Junction, Colorado.

Stam, Barton R. 2004. *Quantifying losses of understory forage in aspen stands on the Dixie and Fishlake National Forests.* M.S. Thesis, Utah State University, Logan, Utah.

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