



# WYOMING

# RURAL LIVING RESOURCES

## A PRACTICAL GUIDE

BARNYARDS  
& BACKYARDS







# Welcome!



Check out our ever-growing collection of useful video clips on YouTube.

Rural living in Wyoming has its rewards and its challenges. Whether you are new to rural living in Wyoming or a longtime resident, we hope you find this guide of interest and practical use.

The guide is brought to you by the Small Acreage Issue Team – a group of natural resource professionals interested in promoting good stewardship of natural resources. We understand the appeal of rural living and want to provide you with the tools and information needed to enjoy your country lifestyle while maintaining the value and aesthetics of the land that attracted you in the first place.

It is our mission to provide user-friendly information on a variety of topics pertinent to rural living, whether you have a few acres or many. To that end, our diverse team of natural resource professionals has boiled down information in a wide variety of areas. We present that information here and list helpful resources in each section where you can go to get more detailed information.

Don't assume that this guide is the end of the information, but see it as a gateway to a host of informational resources. These resources include:

- **Barnyards & Backyards** (B&B) magazine – An award-winning quarterly magazine of useful information.
- B&B website – An information-rich website ([barnyardsandbackyards.com](http://barnyardsandbackyards.com)) where you can find a host of resources including articles, videos, and current events around the state.
- Barnyards & Backyards workshops – We support a variety of educational workshops that take place around Wyoming each year. Visit [barnyardsandbackyards.com](http://barnyardsandbackyards.com) to see if one is scheduled for a location near you.

Successful living involves a lifetime of learning. We're here to provide practical educational resources to help you live better on your land.

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**Want practical, user-friendly information to arrive in your mailbox? Visit [barnyard-sandbackyards.com](http://barnyard-sandbackyards.com) or fill out the slip on the back of this guide to subscribe to the *Barnyards & Backyards* magazine.**





# Location, location, location

## A little bit about Wyoming, and some things to keep in mind

Wyoming, like other states in the Mountain West, has a broad array of elevations, climates, soils, and other factors that affect what will grow and thrive. The two greatest factors affecting your particular site are typically elevation and precipitation. From Wyoming's highest point of Gannett Peak at 13,804 feet to its lowest point where the Belle Fourche River leaves the state at approximately 3,100 feet, there is great variation in climatic conditions including temperature, precipitation, and wind. Precipitation ranges from more than 80 inches annually in Wyoming's mountains (most of this falls as snow) to as few as 6-8 inches in our dry Wyoming basins. Where your property is located in the state has enormous impacts on what practices, plants, and strategies you can apply to your land and in what time frame you can expect results.

The geology of your site determines what types of soils you have. These soils are the foundation of the ecosystem and will also have broad impacts on how to best manage your land. Perhaps you will need to maintain adequate plant cover to protect sandy or other light soils from erosion by wind or water, or perhaps you will need to alter your choice of plant species for your landscapes or pastures to cope with highly alkaline or salty soil conditions or heavy clays.

Mother Nature often moves slower than we humans like, and when we are working in sites with low precipitation or short growing seasons sometimes we have to be even more patient. Consider setting expectations at realistic levels so you won't be disappointed or waste your money and other resources trying to speed along these slow processes. For example, if you are reseeding a pasture in an arid region of the state, it may take up to four years for your seeding to completely establish. During the first few years, you may have to deal with annual weeds and an unkempt appearance while the seedlings take hold. Keep these

same factors in mind as you consider making changes on your land as some practices that disturb our sometimes fragile ecosystems can only be healed with a long recovery time. In the example above, the need for reseeding may have been avoided if the landowner had recognized the signs of overgrazing by livestock before it was too late for the existing plants to recover.

### Goal setting:

Wyoming's climate varies drastically across the state. Whatever expectations you may initially have for your property, you will be best served by setting realistic goals for





# — elevation, precipitation, and information

your particular site. For example, it is unlikely you will be the state's largest tomato producer if you live in Pinedale (high tunnel growers, prove me wrong!), or that you will grow banana trees in Torrington. On the same lines, if you have grazing animals, understand the natural productive potential of your rangeland or non-irrigated sites, and only stock the land with the number of animals it can support. Even 100 acres will not produce enough forage to support two horses year-round in the lower-precipitation areas of the state.

There are resources in your community to help determine the potential for your particular site for a variety of activities. Resource professionals at your local conservation district, Natural Resources Conservation Service, UW Extension, Wyoming Weed and Pest District, and Wyoming State Forestry Division offices can help you get started, depending on your area of interest.

## **New to the area or considering a move?**

If you are planning to move to the state or to a different location in the state, there are a number of things to consider before making the change. Know what to expect. Rural living in our state can be considerably more



challenging than where you may be living now or where you recently moved from. If you are considering buying land, you'll want to know all about it, including whether there is adequate quality water available or if you'll have to haul water, what water rights the property may have, whether you'll be responsible for the maintenance of your roads (winters can be severe in Wyoming, and roads often have to be plowed frequently due to snow and wind in order for you to get to town and back), how much wind there is in every season (this can vary greatly from summer to winter), how the local wildlife will impact you, and many other factors. Know before you buy! You'll be much happier if you are prepared to deal with whatever factors you will find when you get there.



Many communities across the state have a variety of rules when it comes to things you might want to do on your land, such as building activities. Playing by the rules is not always an easy task when the rules vary from county to county. You can avoid a great deal of trouble by finding out which particular rules apply in your community. A quick call or visit to your county courthouse to check on local planning and zoning rules is a good idea. Some counties have very little zoning, and others may have fairly restrictive zoning depending upon your particular situation. Check first; then proceed if it checks out.

A thorough understanding of the natural attributes of your proposed location, the community resources available, and the local rules that may affect your planned activities will all help you make a happy transition to your new home.

**Dallas Mount** is a *University of Wyoming Extension* educator serving the southeastern portion of the state.



# The right plants in the right place

## Water-wise landscaping

### **Want a great looking landscape without using a ton of water?**

That is what water-wise landscaping is all about. Water-wise landscaping is simply creating a landscape that fits our climate (with Wyoming's annual average precipitation of 12.68 inches). Landscaping in Wyoming also must be adapted to a number of other challenges including plentiful wind (in some parts of the state), hungry wildlife, intense sunlight, variable weather (hail, cold, and, in some areas, heat), and alkaline soils. Landscaping must also fit your needs including budget, time, interests, and family activities. Remember that not doing any traditional "landscaping" is also an option and one that might be least time intensive.

The key to successful water-wise landscaping generally is choosing plants to fit the site, not trying to change the site to fit your plants. Some site manipulation can be accomplished, but save it for the plants and landscape features that are your top priorities (such as a vegetable garden or cherished shrub).

### **How to Start**

The first thing to do is closely observe your property. Take time to note some things about it. Sketching a quick map of your property and making some notes on it

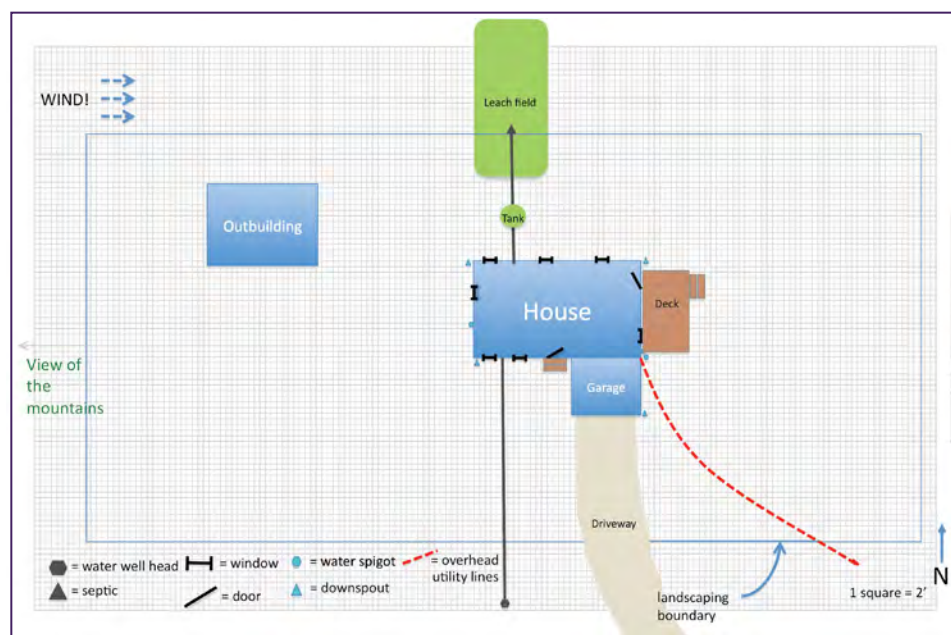
can be a useful tool in planning your landscape.

Items you'll want to note in addition to those on the map shown include:

- What types of wildlife inhabit your property or the surrounding area
- Soil types and quality (more on this later)
- Amount of sunlight in different areas
- Amount and direction of wind in different areas
- How water moves across your property
- General seasonal high and low temps (knowing your U.S. Department of Agriculture Plant Hardiness Zone can help with selecting cold-tolerant plants)
- General topography (cold air moves down hill in general)

- Microclimates (smaller areas with significantly different climates than the rest of your property) – a single house can create at least four microclimates – north side creates a cooler, shady area with more constant temperatures; south side is hotter with more temperature extremes; west is exposed to strong sun and often the most winter winds; east is sheltered from many winds and has a more moderate climate in general.
- Existing plants such as trees and shrubs that you'd like to retain in your landscape.

Once you have in mind the general conditions of your property, next consider what uses or features you'd like in a landscape. Do you want a turf area for the kids? Do you need a path to the barn? Would you like a







vegetable and/or flower garden and area for a compost pile? Do you have a view you'd like to block or frame? Limiting the size of more resource-intensive areas such as a vegetable garden or lawn to just what you need will reduce your work load and the investment of water and other inputs over the long run. A rough sketch of these areas on your map will give you a feel for how things will look and how people will use and travel through the landscape.

## Weed work

While you are observing your property and making notes, determine if there are any weed issues present. If so, do your best to take care of them BEFORE you create your new landscape. Tackling tough perennial weeds, such as Canada thistle, that have nestled themselves between desired ornamental plants is significantly more difficult than those that are not amongst desired plants. See our "Weeds, ways to whip'em" section for more information.

## Soil prep

Soils vary considerably around the state and sometimes within a small area. If you are looking to reduce your workload and save water,

choosing plants suited to your soils is the best way to go. Read the "Soils" section in this manual to get a good understanding of soils and their issues. If you don't know what type of soil you have, you can get it tested at a variety of testing labs for a fee (contact your local University of Wyoming Extension office to find about the labs in your area). In general, many native or well-adapted plants do not require you to amend (add stuff to it like organic matter) the soil when the plant has been chosen to fit the conditions. In fact, some native plants don't like being fertilized – it can contribute to lush, weak growth and sometimes encourage rot. Many tend to like it on the "mean and lean" side. However, some soils such as extremely sandy soils may benefit from the addition of organic matter to support a wider array of landscape plants.

Soils also factor into how you water. Watering deeply but infrequently is often suggested for water-wise plants. How you do this depends on your soil type. In sandy soils, the water tends to move straight down fairly rapidly. Therefore, applying just enough water to wet the root zone area is best, and it can be

added fairly quickly. Sandy soils lose their water quickly as well, so you may have to water more frequently. Clay soils absorb water more slowly, and the water tends to move outwards as well as down. Therefore, you may need to apply water slowly to allow it to soak in (drip emitters, soaker hoses, etc., apply water slowly). Clay soils hang onto water longer so watering infrequently but deeply fits the bill.

Vegetables tend to like "rich" soils and constant moisture. If you have a vegetable garden in your landscape, applications of well composted organic matter will help it thrive.

## Selecting plants

Once you have decided what functions and features you'd like in your landscape, you can now have fun choosing plants and thinking about how they will be grouped.

Some general tips in choosing plants for landscapes are:

- Make sure your plants are hardy enough for your site, and, in general, choose plants that will be happy with the conditions you have. Knowing the USDA Plant Hardiness Zone number for your location will help you choose cold-hardy plants. (It's not a perfect system, but it helps.) <http://planthardiness.ars.usda.gov>. Most locations in the state fall in the USDA zones 3-5. You can also chat with folks at your local extension office, conservation district, and nurseries to find plants to suit your site.
- Choose plants that will give you something interesting (flowers, foliage, bark, fruit, etc.) during most parts of the year. A garden of mainly spring bulbs looks great in spring and blah the rest of the year. Consider incorporating some plants that have winter appeal.



- If you are interested in a more cultivated form of “lawn,” consider using more water-thrifty grass species or varieties. There are even varieties of bluegrass that have been developed to thrive on less water. You can find info to help you choose a grass variety by visiting [barnyardsandbackyards.com](http://barnyardsandbackyards.com). and clicking on “Lawns.”
- If you’re not sure a plant will be successful in your area, plant one or two and see what happens! Some experimentation will help you learn what best suits your conditions.
- Look around your area and see what other folks are growing successfully, and note where they are growing them. In some of our more exposed parts of the state, what succeeds in town is not always successful outside of town in less protected locations. Learn from the locals (reputable nurseries and local garden clubs are good resources, and try to chat with the owners of landscapes you truly admire and local Master Gardeners).

### **Some general considerations when deciding how to place the plants:**

- Group plants with similar water and exposure needs together. This allows you to care for them most efficiently, and they are more likely to grow well.
- If you are trying to produce a more naturalistic, eye-appealing effect, clump plants in odd-numbered groups (3, 5, etc.), and don’t plant them in straight lines unless you’re trying to achieve a very formal look. You can create naturally curved

beds by laying a garden hose down to mark the edge of the new bed and then creating gentle curves with it.

- Also for a naturalistic affect – if planting trees or shrubs, try to plant different ages of plants in each grouping, if you can find them to purchase.
- Locate any lawns where you will use them the most. Also, make sure they are located near water sources. Consider a lawn shape that best suits your watering system, for maximum

watering efficiency. Also, make sure lawn boundaries make mowing easy, if you plan to mow.

- Locate plants that need more water closer to your water source and/or home where you can best enjoy them.
- Leave room for generous paths for people to move through the landscape to various destinations.

### **Finding Plants for Your Garden**





Choices for obtaining plants for your landscape depend on the resources you have locally and your budget. Some communities have good local nurseries/garden centers (sometimes seasonal) where you can obtain good plants and advice; other communities are not so fortunate. Scout out what your community has to offer, and ask others where they get their plants. In general, some sources are:

- Local and regional nurseries.
- Many conversation districts in Wyoming offer seedling (and, in some cases, larger) shrubs and trees for conservation use.
- Mail/Internet-order sources (be careful when utilizing sources far away from your area to make sure that the plants offered will be a good fit for your site and will arrive in good condition).
- Friends with gardens (one caveat – if possible, ask to see the plant in the garden, ID it, and ask how much it spreads – many a plant that turns out to be a “weed” has come from an unsuspecting friend).
- Grow plants from seed. More and more native plants are being offered by the horticultural industry; however, for certain species you’ll still have to grow them yourself. This can be a less expensive way to stock a landscape with flowering perennials, but it takes some practice/learning if you haven’t grown plants from seed before. Many native plants produce seeds that need a period of moist cold (outside or in your refrigerator) before they’ll germinate.

## Maintenance

All landscapes that look good require some kind of maintenance.

Choosing plants adapted to your conditions and that aren’t overly aggressive (aka “weedy”) will reduce the amount of maintenance needed.

- **Water.** Water your plants regularly until they are well established (usually for the first year or so for perennials, longer for many trees and shrubs). Even plants that are water wise need to be watered regularly until they are settled in. Watering during the winter can help some evergreen trees and shrubs survive. When you do water, water deeply to wet the whole area the roots inhabit. When plants are established, it is better to water infrequently but deeply than it is to water frequently but shallowly, though this is dependent on your soils as mentioned previously.
- **Weed.** Be on the watch for weeds of all kinds. In general, the quicker you take care of weeds, the less problematic they are especially for the first couple of years. Be vigilant. If you choose to use an herbicide follow the label directions and be careful in their application as many herbicides can kill flowers, shrubs, and trees, in addition to weeds.
- **Mulch.** In many areas of our state, mulch can be very beneficial in keeping moisture from evaporating from the soil, suppressing weeds, and moderating soil temperatures during all times of the year. What type of mulch you use depends on your personal preferences, but they all need maintenance. Organic mulches (bark, wood chips, etc.) all eventually break down and will need to be “topped up” with more mulch. Our wind eventually blows dirt and weed seed

into rock mulches so you’ll need to maintain those as well. Weed barrier fabrics can be used as well but are probably best suited to stable landscaped areas (trees and shrubs, etc.). If you plan on changing things around much you’ll eventually poke too many holes in the fabric, reducing its efficacy.

- In the windier areas of our state on exposed locations, mulch becomes more problematic as the 70+ mph gusts can blow your mulch toward Nebraska or South Dakota, even picking up small pea gravel and pelting your house with it. It is said that those mulches that “knit-together” such as shredded bark, etc., are best at resisting wind. Also, having established plants that crawl along the ground or creating windbreaks can help to keep mulch in place. Your best bet is to experiment with mulches to determine if any will work in the various microclimates on your property (visiting with area homeowners who have tried different mulches can be helpful).

## For the Windier Locations:

Wind can be a challenge! Take the time to read our section on windbreaks. This will help you decide if you’d like to plant one on your place, if you have the space. Established windbreaks make a big difference on many properties, but they can be slow to grow in some areas. Consider the wind-breaking aspects of existing buildings, and take advantage of them. Consider the short-term use of artificial windbreaks (snow fencing, hay bales, other handy items) to help get your plants established. However, in addition to thinking about how they



will change wind patterns, also consider how they will affect where and how snow drifts form.

In the end, remember that “shelter begets shelter” as one smart lady once told me. A building’s shelter helps a shrub grow, the shrub helps a flower grow, etc., etc. It can be a long process, but if you plan to call your property home for some time to come it’s probably worth the effort.

## Wildlife

In many locations, wildlife creates challenges for landscapes. The challenges vary depending on the type of wildlife that is the issue. There are some ornamental plants that you can plant that are less likely to be eaten by wildlife; however, if the wildlife are hungry enough all bets are off. Visit [barnyardsandbackyards.com](http://barnyardsandbackyards.com) for lists of these plants and for other information on dealing with wildlife. Vegetable gardens planted in areas with significant wildlife will probably have to be fenced. See the “Wildlife” section of this guide for more information on fencing and wildlife issues. Above all, keep your cool, be adaptable, protect what you most value, accept some losses, and remember that the wildlife were probably there before you were.

## Resources

There are a lot of resources available to help with landscaping efforts in our often challenging climate. Many of these can be found at [barnyardsandbackyards.com](http://barnyardsandbackyards.com) (including resources on a variety of other topics including vegetable gardening, extending the gardening season, irrigation, and more)

**Jennifer Thompson** is the *Small Acreage Outreach* coordinator.

# Some water-wise plants to consider for



## Wild Four O' Clock

*Mirabilis multiflora*

Native plant

Height: 1-3'

Width: 2-4'

Very long lived. Has large taproot, will likely die if you try to move it (if you injure it's taproot) so plant it where you want it and then leave it be. Can reseed.



## Rocky Mountain Penstemon

*Penstemon strictus*

Native plant

Height: 18-24"

Width: 12-18"

Easy to grow; can get powdery mildew on the leaves though doesn't seem to hurt the plant much. Short-lived perennial (up to 4 years or so). Can reseed a lot so dead-head if reseeding is not wanted.



## Lamb's Ear

*Stachys byzantina*

Height: 8-18"

Width: 12-24" (or much wider)

Foliage plant. 'Silver Carpet' is a ground cover and 'Helen Von Stein' has larger leaves than the generic type. Both varieties flower very little so they don't reseed as much as the common variety.



## Small-Leaf Pussytoes

*Antennaria parvifolia*

Native plant

Height: 1-2" (foliage)

Width: 8-12"

Native plant common in our region; slowly spreading groundcover; about 6" tall in flower. 'McClintock' is a variety in cultivation.

## 'Moonshine' Yarrow

*Achillea*

Height: 24"

Width: 18-24"

Some yarrows spread around a lot. This yarrow is more self-contained and forms a clump. Has nice lemony yellow flowers and silvery green foliage.



# your landscape (see "Windbreaks" section for tree suggestions)



## Prairie Coneflower

*Ratibida columnifera*

Native plant

Height: 18-24"

Width: 18-24"

Long bloom period; short lived (1-2 years) but reseeds moderately. There are burnt orange and yellow colored flowered strains available.



## Sulfur Buckwheat

*Eriogonum umbellatum*

Native plant

Height: 6-12"

Width: 8-12"

Long season of interest. Flowers turn a rusty orange color as they age.



## Large Beardtongue

*Penstemon grandiflorus*

Native plant

Height: 2-3'

Width: 8-12"

Large showy blooms. Short blooming period (two weeks or so). Short-lived but reseeds moderately.



## Iris

Height: varies (dwarf, intermediate and tall iris)

Width: varies

Great water-wise plant. Plant different types (dwarf, intermediate, and tall iris) to spread out bloom season. Divide every 3-5 years to maintain flowering. Variegated variety provides interest when not in bloom.



## Gayfeather

*Liatris punctata*

Native plant

Height: 12-18"

Width: 6-12"

Slow grower. Drought tolerant. Attracts pollinators.



## Blue Woolly Veronica

*Veronica pectinata*

Height: 1-2"

Width: 12-18" (or wider)

Early summer blooms; good groundcover in many sites. If the winter is dry (lack of snow cover) may get winter burned.



## Catmint

*Nepeta*

Height: 15-18"

Width: 2-3'

Long bloom time. Resistant to many kinds of wildlife. Choose only those varieties that are "sterile" (don't produce viable seed) and "vegetatively propagated" or can become a pest by reseeding.



# Getting a grip on grazing

How to feed your livestock while maintaining the health and value of your land



Many folks move to rural acreages to enjoy the open space, to potentially own livestock for hobby or pleasure, or to provide space for their children to raise animals. Improperly managed animals grazing on rural acreages can create a large number of resource problems that people may not be aware of. These problems include a shortage of grass cover resulting in soil erosion, reduced soil and water quality, reduced livestock health, and an increased number of weeds. Proper grazing can invigorate plants and make use of a renewable natural resource. This section is designed to provide information that will help you avoid negative results while optimizing the forage resources your land offers. Among the questions to answer include:

- How much do my animals need to eat to be healthy?

- How much forage can my land provide while remaining healthy?
- What are some specific grazing strategies that will allow me to best take advantage of the available forage while keeping forage plants healthy and producing to their full potential?

## How much our livestock need to eat (forage demand)

So, we all love our animals, but how much forage do they need to be healthy critters? Depending on the type and stage of growth of our animals, they have varying nutritional requirements. Below are considerations and a conversion table outlining such differences.

## How much does your livestock eat every day?

Forage required by an animal is commonly measured in “animal

units” or an AU (one AU equivalent is about 25 pounds of feed per day). It is a way to compare different animals and their feed requirements. See Table 1.

- One mature 1,200-pound pleasure horse will eat approximately 32 pounds of grass or hay per day (1.25 AU).
- A 1,000-pound cow not lactating will require approximately 25 pounds of grass or hay per day (1.00 AU).
- A mature ewe or doe goat will eat 4 to 5 pounds of grass or hay per day (0.2 AU).

It is important to note that most forages quickly lose nutritional value as they flower and move into dormancy (dry up and turn brown). Because of this factor during winter months or whenever forage quality is decreased, supplemental feed is generally required. This may be

The U.S. Department of Agriculture's Natural Resources Conservation Service has developed ecological site descriptions (ESDs) for Wyoming that can help guide you in estimating various ecological aspects of land, including estimating forage production for your area. For more information and a more detailed explanation of how to find ESDs for your area, see pages 3-5 at: <http://www.wyomingextension.org/agpubs/pubs/B1204.pdf>

in the form of a complete feed, a grain, and/or a protein supplement. Replacement feed in the form of hay may also be required if there is insufficient forage available due to previous harvesting or snow cover.

As forage amount is discussed, you may hear the term "animal unit month," or AUM, being used. This is simply the forage required for one animal weighing 1,000 pounds for one month. For example, based on the numbers above, one 1,000-pound cow will consume one AUM, which equals approximately 800 pounds of forage for one month. A 1,200-pound saddle horse will consume 1.2 AUMs (960 pounds) in one month.

Once we have determined how much forage your animals need to eat, we can start to think about the

**Table 1.** Average annual pasture and hay production values (values may vary depending on area and management).

	Fertile Soils		Poor Soils	
	Hay Tons/Acre	Forage AUMs (lbs)/Acre	Hay Tons/Acre	Forage AUMs (lbs)/Acre
Irrigated hay pasture	2 – 4	3 – 4 (2,400-3,600)	<2	1 – 2 (800-1,600)
Non-irrigated hay pasture	1 – 2	1 – 2 (800-1,600)	0 – 0.5	0.5 (400)
Rangeland/ woodland	0 – 1	0 – 0.5 (400)	0 – 0.5	0.25 (200)

amount of forage our land or pastures can provide. This is the second part of the equation in determining how many animals can use the property for how long while maintaining healthy pastures.

### So, how productive are our landscapes (also known as forage supply)?

Now that we know how much feed our animals require, the next question is: can the forage from our property keep them full and healthy? What can we realistically expect from our pasture(s)? Very general guidelines (these figures are averages and can vary to a greater or lesser degree, depending on management strategies and land conditions) regarding estimates of annual pasture and hay production are in Table 2 (figuring

approximately 800 pounds = 1 AUM). Also understand that pastures are unique and your conditions may vary significantly from the figures listed.

To get a more accurate estimate of the amount of forage on your property, follow a few simple steps to calculate pounds of forage per acre.

1. Using PVC pipe or another durable material, construct a square with inner dimensions of 25 by 25 centimeters. This is a quarter meter square and will help with calculations.
2. Randomly place the square on the ground in several representative areas of the pasture.
3. Clip all of the grasses and forbs (not shrubs because you are trying to quantify plants likely consumed by livestock) inside the square to a height of 1", and place the clippings in a paper bag (brown lunch bags work well).
4. Let the contents dry in the bags for 2 days.
5. Zero the scale with the weight of an empty bag (to subtract the weight of the bag from the final weight you will record).
6. Weigh each bag with the plants in them, and record the weights (in grams) on a piece of paper.
7. When done weighing all the bags, calculate the average weight for a bag, then convert it to pounds per acre by multiplying by 35.7.

**Table 2.** Animal Unit Equivalents based on animal weights and pounds of forage consumed on average each day.

Animal	Weight	AU Equivalent	# Animals per AU	Pounds of forage per day
Cow	1,000	1	1	25
Cow	1,500	1.5	0.66	37.5
Yearling Cow	700	0.85	1.25	21.25
Mature Bull	1,700	1.5	0.67	37.5
Milking Cow		1.5	0.67	37.5
Working Horse		2	0.5	50
Saddle Horse		1.25	0.8	31.25
Colt < 2 yrs.		0.5	2	12.5
Sheep	120	0.2	5	5
Goat		0.17	5.9	4.25
Elk	600	0.66	1.5	16.5
Mule Deer	125	0.22	4.5	5.5
Pronghorn	90	0.17	5.9	4.25



## Calculate your stocking rate

Once you know your animals' requirements and your land's production, it is easy to estimate how much forage you have available for your livestock.

You will need the following numbers:

Pasture Size \_\_\_\_\_ acres

Pasture Production \_\_\_\_\_ pounds/acre

Animal Requirements \_\_\_\_\_ pounds/day

### Example

Assumptions:

30 acres "High Plains Southeast" native range

10-14 inch precipitation zone

Sandy soil range site

Needle and thread/Rhizomatous Wheatgrass

Plant Community

Predicted plant production:

Favorable precip year = 1,500 lbs/acre

Average precip year = 1,200 lbs/acre

Poor precip year = 700 lbs/acre

1,200 lb horse will eat around 32 lbs of dry matter/day

In an average year, this pasture will produce 36,000 lbs of forage. (1,200 lbs/acre x 30 acres)

*Half of this must be left in place to keep the plants healthy, and 15 percent will be lost to other grazers (deer, antelope, rabbits, mice, etc.).* **So only 35 percent of this is available to domestic animals.**

This pasture has **12,600 lbs of available forage** (36,000 lbs x .35) and can support **one 1,200 lb horse for 394 days** (12,600 lbs / 32 lbs/day) or **three 1,200 lb horses for 131 days** (12,600 lbs / 108lbs/day).



Now that we know how much our animals need to eat and the productivity (in pounds/acre or AUMs/acre) of our pastures, we can calculate our stocking rate (see sidebar). Our stocking rate calculation will tell us how many animals we can put on our property without causing damage to the plants that keep our animals healthy.

### Healthy grasses make happy horses ☺

The more knowledge a landowner or manager has regarding how grass grows, the better he or she will be able to keep grasses healthy and the most productive. Healthy grasses are not only more nutritionally valuable, but they often produce more forage.

#### *Is grazing necessary?*

Many of Wyoming's landscapes have evolved with grazing, beginning with bison roaming the plains. This has allowed our native grass species to adapt and flourish with grazing. There is a catch: now that we have fences everywhere, it is our responsibility as landowners to control grazing, due to our animals being unable to migrate naturally. As much as we need to control grazing so as to not overgraze plants, it can also be detrimental to have no grazing. This is because of the lack of stimulation to the grasses. In the absence of grazing, plants often become less healthy and productive. A heavy layer of litter (dead plant material) can prevent or block new emerging vegetation from getting needed sunlight and the nutrients to grow.



*Litter (or dead plant tissue) that has accumulated due to a lack of grazing or other disturbances.*

### Unhappy grasses keep everyone unsatisfied ☹

You may find yourself in a situation where your animals need more than your pasture can supply; this is very common in Wyoming because of our semiarid conditions. Continually grazing plants during the growing season numerous years in a row (when the supply doesn't meet the demand) can damage the plants, not allowing them to recuperate once grazing has occurred. This keeps the grasses from producing enough food from sunlight to keep themselves healthy. As a result, they will be reduced in size and often die. This type of mismanagement will create a reduction of your forage supply in future years. On the next page are two pictures illustrating sustainable grazing management and the unfortunate outcome of mismanagement.



Fortunately, as you can see in picture 2, mismanagement can be avoided, leaving your pastures productive and healthy. As land managers, we can properly manage our pastures to avoid a situation like picture 1.

### Other consumers

Although we often do not see more than our livestock grazing our pastures on a regular basis, we cannot assume that livestock are the only ones consuming forage. There are numerous other consumers taking advantage of the growing plants in our pastures. Large wildlife like deer, antelope, and elk and much smaller creatures such as gophers and grasshoppers all consume forage. Research has shown that, on a majority of pastures, 15 to 25 percent



*1. Continuous grazing allows weeds to grow where healthy desirable plants grew before but have been weakened and outcompeted.*



*2. Good grazing management promotes more forage, fewer weeds, and less bare ground.*

of forage is eaten by these types of consumers. In most season-long grazing situations, harvest by domestic livestock is only about 25 to 35 percent. Therefore, when we are developing our grazing management plan, losses by other animals need to be accounted for to maintain plant health and vigor.

So, grazing by livestock and wildlife can benefit grasses by stimulating

growth of individual stems, but too much grazing can remove important plant tissue for further growth. So, how can we reach a happy medium?

### A happy medium...

There is a happy medium that can be found between the complete absence of grazing and overgrazing. Here are some guidelines to help you reach that balance and responsibly

## Options for rehabilitating degraded pastures

Preventing mismanagement of our property is always the best and often easiest plan to follow, but what if you purchase a property that has already been overused and the plants have been mismanaged?

### How do you know if your property is degraded?

Does your property have large patches of bare ground?	Yes	No
Do the plants consist of mostly weedy or annual species?	Yes	No
Is soil being lost due to wind or water erosion?	Yes	No
Is there browsing damage on your trees, shrubs, fences, or barns?	Yes	No

If you answered yes to any of these questions, your pasture may be a candidate for rehabilitation.

Depending on your goals and the status of your native seedbank (native grass seeds lying dormant in the soil), you have several options. If there are adequate desirable species still living, you may be able to rest the pasture and allow the existing grass species to recolonize the bare ground by their production of seed and the increase in plant width. However, if the plants are mostly weedy or annual and there is a lot of bare ground, you may have to consider more drastic measures such as seeding. Seeding can be expensive and requires proper planning, and the landowner must be patient and allow at least two years of rest following seeding. When seeding dryland sites (no irrigation), success is highly dependent on the amount of precipitation the site receives.

Some essentials for successful seeding include:

- designing the proper seed mix
- preparing a firm seedbed
- using the best planting methods
- properly timing the seeding so there is adequate moisture

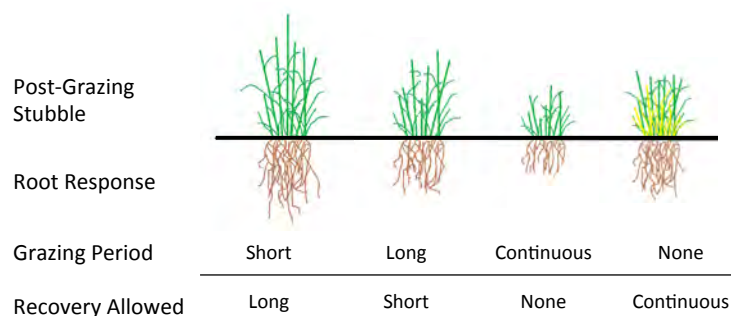
A seeding plan can be made with the help of your local conservation district or University of Wyoming Extension office. With a successful seeding, desirable plants will fill the gaps, hold the soil, and produce good quality forage.



# Prevent overgrazing... ...leave a **STUBBLE**

- ✂ Leaving 2-6 inches (dry vs. irrigated) protects both soil and plant health
- ✂ Plant leaves must remain for rapid regrowth to occur (by photosynthesis) after grazing
- ✂ Exposed soil allows wind and water erosion along with the high chance of weed invasion
- ✂ Allow plants to recover (re-grow without animals grazing) before grazing again

Grass Health with Grazing Periods



manage your pasture for years to come.

- Don't allow livestock time to remove too much of the plant at one time
- Allow the plants time to re-grow their leaves and store some food before grazing again
- Don't allow year-round continuous grazing of smaller pastures
- If using rotational grazing, don't have the livestock graze the same pasture at the same time each year

## Take half, leave half

Plants produce food through the process known as photosynthesis (utilizing sunlight and other resources) to supply themselves with needed nutrients. Plants require a certain amount of carbohydrates, fats, proteins, and minerals just the same as animals do. Healthy growing plants produce a surplus of nutrients, which can be safely harvested by plant-eating animals. However, to maintain the health of our plants, their needs must be adequately supplied. So allow your plants to feed themselves.

Research suggests that, in a normal year, plants need to keep about 50 percent of their tissue (mainly leaves) to stay healthy and conduct photosynthesis. It is true that with available moisture in the soil and adequate time to rest and recover from

grazing, grasses can recover from more severe defoliation; however, the generalization holds for most pasture situations – take half for the animal (which may also mean wildlife as outlined in the above stocking rate calculation) and leave half for the plant. If the plant is continually grazed with no time to grow or regrow during the growing season, too much leaf material is removed and the root system is depleted. This makes the grass less competitive for limited soil moisture and less able to regrow leaves or tolerate drought. When plants are overgrazed, they also become more susceptible to being outcompeted by less desirable plants (weeds) and the chance of erosion increases.

It can be difficult to determine a 50-percent harvest level, so stubble height may be an easier measurement. As stated above, leaving around 4 inches of plant stubble left is a good rule of thumb to maintain the health of most grasses.

## *Grazing at the right time (time and timing of grazing)*

Grazing intensity (the amount of plant material removed) and frequency (the number of times a plant is grazed) are influenced by the number of animals and length of time they graze an area. Generally, plants withstand grazing best when plants are grazed lightly or at a moderate

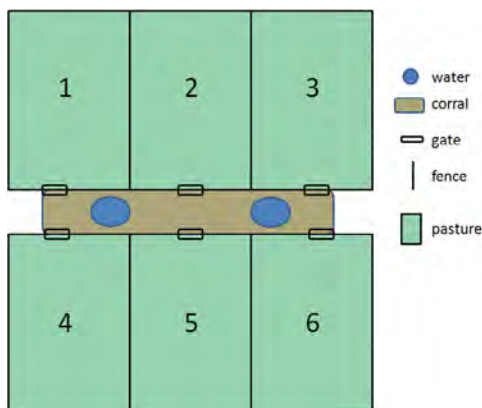
intensity and are then allowed to regrow. Herbivores rarely take all of the leaf tissue the first time they graze a plant; they often take one or two bites and then go to the next plant. Therefore, moving animals quickly through a pasture prevents repeated grazing of regrowth and is less stressful on actively growing plants.

Seasonality, or the time of year when grazing occurs, also affects how well plants withstand grazing. In arid or semiarid areas, grazing early in the growing season (as plants are in the vegetative stage) is relatively harmless if there is ample soil moisture available for plants to regrow. However, when the plants are in the early reproductive (or boot stage) of growth, grazing removes growing points that are responsible for the continuation of plant growth. In areas where moisture and nutrients are limited, plants may be safely grazed for short periods early in the growing season, when moisture levels are highest, or after plants have matured fully and are less vulnerable to grazing (dormant season). In places with adequate available moisture for plants to regrow, timing of grazing is less critical for plant health. In irrigated pastures or wet areas, the main management concern is rapid plant growth where there is too much forage that becomes mature very

## Strategies you can use to keep grasses happy while keeping forage production high

quickly and the nutritional quality decreases.

There are a few tools that can help maintain healthy pastures; one strategy is by altering a season-long *Example rotational grazing system.*



grazing system.

### Pasture Design / Grazing Strategy

- Rotational Grazing – this strategy makes use of numerous paddocks where animals are rotated from paddock to paddock, so each area undergoes a short grazing period, followed by a longer rest period. Deciding on the number and size of paddocks to be grazed are important aspects of this grazing strategy. Paddock layout will vary from acreage to acreage due to topography, watering areas, animal traffic, and other logistical management concerns. When considering adopting a rotational grazing strategy for your own property, first consult with someone who is familiar with rotational grazing, such as resource professionals at your local University of Wyoming Extension, conservation district, or Natural Resources Conservation Service office.
- Upside-Down Grazing – If your forage quantity is not adequate to sustain your animals

year-round, consider “upside-down grazing.” This strategy involves letting your animals graze in the winter (if there isn’t deep snow) when the damage to the plants is the least and confining and feeding your animals in the summer. This strategy is great for the plants, and your animals will require less hay in the summer. Supplementation may be required in the winter.

Proper facility setup, including fencing and building materials, can enhance your property. You can use a combination of corralling and cross-fencing to create paddocks, which can be easily managed for the needs of your livestock. If you do not plan to corral animals, develop a rotation system to ensure adequate resting of each pasture before regrazing the same area. Poor producing pastures that have been degraded may require rest, renovation, or reseeding to bring them back to their original production levels. Different fence types and installation methods suit a number of management and aesthetic goals. A wildlife friendly fence (see “Wildlife” section of this guide) will enhance the movement of wildlife across your property.



### Food, Water, and Animal Health

- Feed year round (buy hay) – as mentioned earlier, feeding hay

all year may be necessary for many Wyoming landowners to maintain grass cover throughout the property.

- Stock water – in most cases, animals like to be near a water source. With that in mind, if there is only one water source for the entire property, the property may be overgrazed around the water source and undergrazed in other areas. Placement of properly spaced watering facilities (or mineral supplements) can encourage more uniform grazing of a property by livestock.

Determining a grazing strategy that works best for your situation and maintains vegetative cover will ensure healthy plants, which leads to happy and healthy livestock.

Mismanagement of grazing can lead to problems with pastures, but properly managed grazing can benefit the entire ecosystem. To achieve this, land managers must have an idea of the amount of forage animals will consume (forage demand) as well as production values within pastures (forage supply) before developing a grazing plan. In developing a grazing management plan, try to devise grazing strategies that account for the nutritional needs of plants and animals while working within individual situations.

The UW Extension, your local conservation district, or Natural Resources Conservation Service are available to assist with natural resource and land management planning, questions, and concerns.

### Resources

Go to the *Barnyards & Backyards'* website's “Forage/Pasture/Grazing” page, where you will find great articles, videos and other resources on grazing.



## Keys to Successful Grazing

- Check your animals frequently to limit the amount of plant material being grazed.
- Avoid continuous season-long grazing; instead, develop flexible grazing strategies that allow plants to recover after grazing.
- Grazing plans must be flexible; consider differences in growing conditions across years as a result of wet or drought cycles, grazing by wildlife or insects, and other changing environmental conditions.
- Continue year-round rotation to distribute manure, food wastes, and trampling across pastures, or hold animals in a corral.
- Have a water source available for each pasture.
- Horses and other livestock do not necessarily need 24-hour access to feed or forage. Corral animals and feed if needed to prevent over-grazing of pastures.
- On a limited acreage, you may have only enough pasture to exercise your animals and will need to feed throughout the year.
- Grazing capacity varies from area to area. Make sure you are stocking pastures according to the amount of forage they can provide.
- Base your decision to move animals on how much grasses are used and the amount of green leaf material remaining, not on a calendar date.

**Rachel Mealor** was the University of Wyoming Extension range specialist.

**Mae Smith** was a University of Wyoming Extension educator based in Carbon County and serving southeast Wyoming.

# WATER, not

## Introduction

Because water is in scarce supply in Wyoming and highly regulated, knowing the basics of the legal, social, geological, and other practical issues related to its use may contribute directly to your happiness as a landowner.

In Wyoming, water links our lives to those of our family, neighbors, communities, and region. We cannot emphasize enough the importance of understanding the laws and customs pertaining to water and of communication with neighbors and regulators to ensure that there is enough of this precious resource to go around and to avoid getting into hot water.



# Water rights & law, water quality, irrigation a dry subject in Wyoming

## A Little Bit of Law (or How It All Works) – Wyoming Water Law and Administration

**The Wyoming Constitution states that water from all natural streams, springs, lakes, and other collections (such as aquifers) is the property of the state.** People may only use that water if they put it to “beneficial use” and receive permission from the state. Beneficial uses include, for the purpose of this section: domestic household use, irrigation, stock water, and instream flow (water flowing in a creek, stream, or river, etc.).

The Wyoming State Engineer’s Office is the chief administrator of Wyoming waters in streams, wells, irrigation ditches, ponds, and reservoirs. To manage these waters, the state is divided into four water divisions.

A superintendent administers the waters of each division with assistance from water and hydrographer commissioners. The four superintendents and the state engineer constitute the state Board of Control, which is often synonymous with the State Engineer’s Office when discussing water administration. The State Engineer’s Office may be

contacted for necessary forms and information through written correspondence or the Internet.

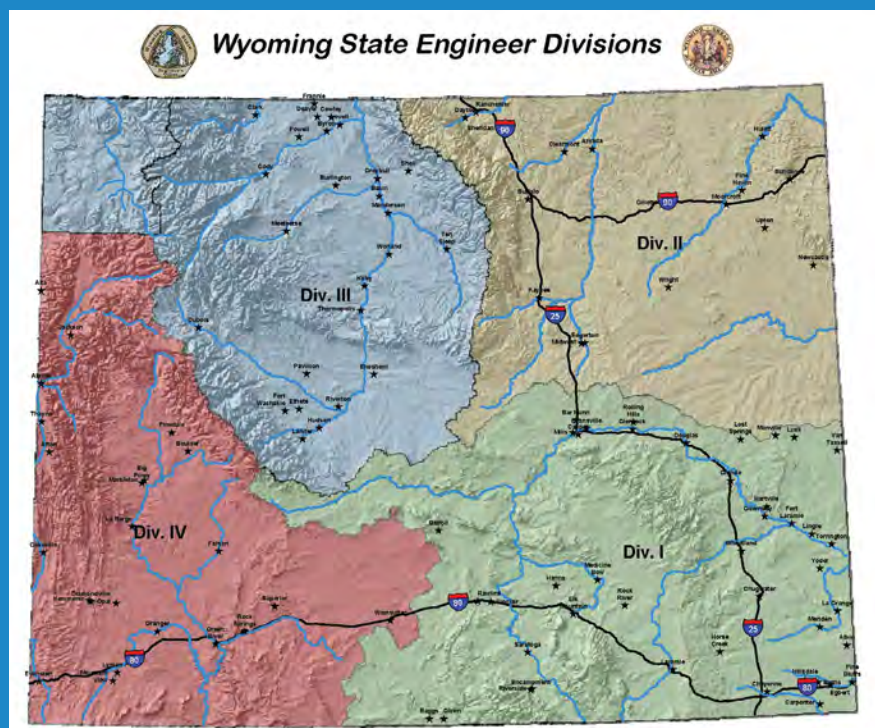
State Engineer’s Office  
4th Floor East  
Herschler Building  
Cheyenne, WY 82002-0370  
telephone: 307-777-5063  
email: [seoleg@state.wy.us](mailto:seoleg@state.wy.us)  
<http://seo.wyo.gov/>

### Other web resources on Wyoming water law such as:

“Wyoming water rights fact sheet” and *Wyoming water law: A summary* can be found by visiting [barnyardsandbackyards.com](http://barnyardsandbackyards.com) and clicking on “Water”.

### Surface Water

Under Wyoming water law, the state retains ownership and control





of water in streams through the state Board of Control. Water is appropriated and distributed under the “doctrine of prior appropriations,” based on the date the water was first put to “beneficial use” on a particular parcel of land. Water rights are tied to the land they are used on. Lands on which water was first used have “senior rights” and receive their appropriations (so many cubic feet of water/second flowing onto the irrigated hay meadow for example) first. Younger (dated later) “junior rights” are appropriated in chronological

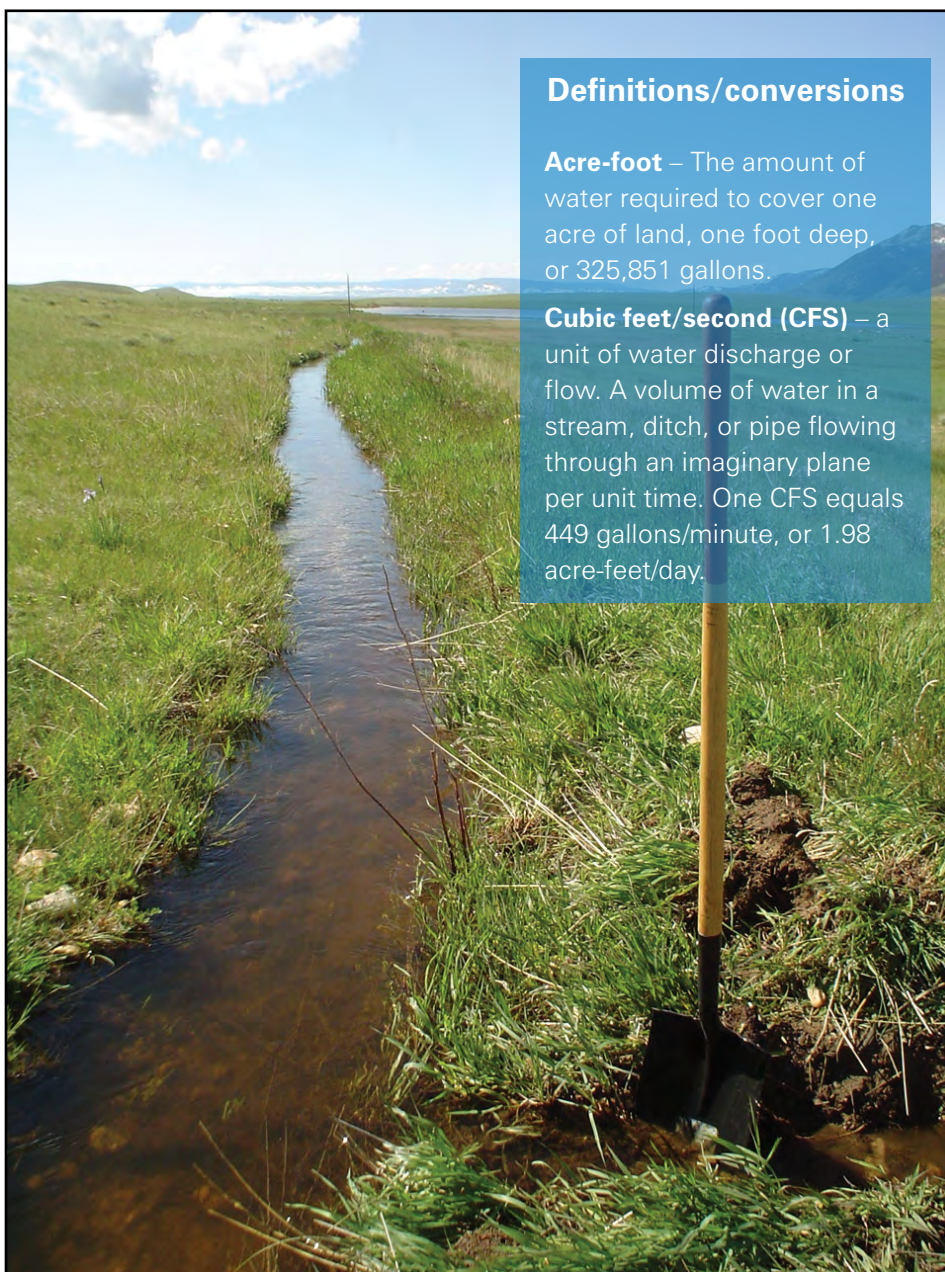
order as each preceding permittee receives his or her appropriation. Early water rights in Wyoming date back to the late 1860s – before statehood. Early water rights are more likely to receive water in dry years; whereas more junior rights may not receive water at all in some dry years, particularly in watersheds that are over-appropriated like the North Platte Basin.

If you are buying land or own land with live surface water flowing across it or a small stock reservoir, and you are unsure of your water right status,

contact the State Engineer’s Office (SEO) to find out details. New permits for junior water rights may be obtained by working with a professional engineer or surveyor to produce the appropriate maps and plans required for the SEO permitting process. A priority date is established based on date of acceptance of the application in the SEO. Once the project is in place and the water has been put to beneficial use (or a reservoir constructed), and more paperwork is submitted to the SEO, the water right is adjudicated or legally assigned. After adjudication, water may be delivered to that right after all earlier rights on the stream or the irrigation system are fulfilled. Water rights for irrigation are adjudicated on the basis of 1 cubic foot/second (cfs) of flow per 70 irrigated acres. A second cfs of flow is available for irrigation rights with a priority date earlier than March 1, 1945, to be fulfilled after everyone in the given stream or ditch system receives their first appropriation. If everyone in a system has received their full appropriation, the system or stream is said to be “not in regulation,” and individuals may divert more than their legal appropriation.

**Bottom line: even if you have an irrigation ditch or stream flowing across your property, the water may not be yours to use – call the SEO to find out the situation before pumping or diverting.**

Stock ponds or small private reservoirs are also regulated as surface water, and they are governed similarly to streams as far as permitting and priority dates. Building a pond or small reservoir for livestock or recreation is also governed by the SEO with an elaborate permitting process that must be followed with the assistance of a professional engineer licensed in Wyoming. There are two general types of ponds. One



### Definitions/conversions

**Acre-foot** – The amount of water required to cover one acre of land, one foot deep, or 325,851 gallons.

**Cubic feet/second (CFS)** – a unit of water discharge or flow. A volume of water in a stream, ditch, or pipe flowing through an imaginary plane per unit time. One CFS equals 449 gallons/minute, or 1.98 acre-feet/day.



is created by damming a stream or building an impoundment (reservoir) below a natural spring. The other is created by excavating into a shallow water table like those found in flood plains near streams. Talk to a professional engineer or geologist to find out if your property is suitable for pond or reservoir construction before digging or applying for the appropriate permits.

The most recently defined beneficial use of surface water in Wyoming is called "instream flow." This concept recognizes that keeping water in stream channels can benefit people by maintaining or improving fisheries. Unlike other uses, only the Wyoming Game and Fish Department can hold instream flow water rights, which are non-consumptive (no water is removed from the stream).

For more information read or visit:

"Wyoming water 101: How our state regulates our most important natural resource" – *Barnyards & Backyards* magazine article, Summer 2007. You can find it at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

"To build a pond in Wyoming" – *Barnyards & Backyards* article, Spring 2008. Find it at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

"Wyoming fish ponds: How to build and stock them" – *Barnyards & Backyards* article, Fall 2011.

To obtain a back-issue or other issues of *Barnyards & Backyards*, email [cespubs@uwyo.edu](mailto:cespubs@uwyo.edu), or call 307-766-2115.

Water management and instream flow – Wyoming Game & Fish Department, <http://gf.state.wy.us>

Water Resources Data Systems – University of Wyoming, [www.wrds.uwyo.edu](http://www.wrds.uwyo.edu) (this is a great database of water resources in Wyoming).



*Extensive, thick limestone and sandstone layers exposed near the edges of Wyoming's great basins are often the best producing sources of high quality drinking water.*

## Well Water and Well Water Law

Wyoming ground water laws were enacted long after surface water laws, and ground water is similarly treated as property of the state. Use must be permitted through the SEO. Domestic wells are defined as non-commercial household use, which includes lawn and garden watering not to exceed one acre and not to exceed 25 gallons per minute (gpm) production. Livestock watering wells are also limited to 25 gpm. Before drilling a new domestic well, or any water well, an application must be filed with the SEO. Permission will generally be granted if it is believed the aquifer (underground geologic water source) can supply the water without being depleted or otherwise damaged. Once the permit is issued and the well is drilled, a notice is filed with the SEO stating that the well complies with Wyoming regulations, along with a plat showing the location of the well and the point(s) of use. All of this must be certified by a professional engineer or surveyor licensed in Wyoming. Finally, a certificate of

appropriation is issued by the Board of Control and recorded in both the local county clerk's office and at the SEO.

## Water Quality

Having well or surface water rights is one thing; having high quality water is something different altogether. What is water quality? Users should consider a variety of factors that affect the water quality since well or stream waters are never pure H<sub>2</sub>O. The major issue confronting rural Wyoming residents is high total dissolved solids or TDS. The purest natural waters come to us in the form of rain or snow that pick up dissolved minerals as they interact with geologic materials in sediment and bedrock. Thus, your water quality will be governed to a great extent by local geology. All rocks dissolve in water, releasing salts, hardness, and alkalinity. Of the common rock-forming minerals, quartz and feldspar (the major minerals making up granites in Wyoming's major mountain ranges) are extremely resistant to weathering; whereas, salts like gypsum and



halite (rock salt) are the easiest to dissolve and add total dissolved solids (TDS) to the water solution, reducing water quality. Shales or clays are usually loaded with salts, and due to their properties these formations rarely contain significant amounts of useable water. What water they do contain is usually of very low quality. Intermediate to these extremes are limestones and sandstones, which usually lie exposed at the margins of Wyoming's great basins or valleys. If these are fractured (creating permeable underground reservoirs) and have fresh rain or snowmelt flowing into them, they can be the best producers of high quality water for domestic wells. Water quality can vary significantly in a small area – just because your neighbor has good water doesn't mean that you will also have such good luck.

The term total dissolved solids, or TDS, is a general term for all of the constituents including dissolved salts, calcium, sodium, magnesium, potassium, sulphate, and bicarbonate. These are not harmful chemicals in themselves, but in high enough concentrations they can render water undrinkable for people or livestock and can even kill plants. Dissolved salts cannot be filtered like suspended particles. They can only be removed with distillation or reverse osmosis (RO), both of which are expensive and energy intensive. Your local conservation district can probably give you a general indication of your water's saltiness by measuring electrical conductivity (EC). Before you drink, water your livestock, or irrigate from a new source of water, have it tested at a reputable lab. Guidelines for levels of TDS acceptable for irrigating and stock watering can be found in the *Barnyards & Backyards* magazine articles referenced below. Guidelines for human consumption

## **Bureau of Reclamation Reservoirs Provide Much of the Irrigation and Municipal Water in Wyoming**

The U.S. Department of the Interior's Bureau of Reclamation (BuRec) has a large presence in Wyoming: 18 projects that include 13 power plants and 28 dams. BuRec makes it possible to irrigate pasture and crop land with surface water. Water held in BuRec reservoirs is allocated to specific uses in specific amounts. For example, in Buffalo Bill Reservoir near Cody, water is allocated to irrigation districts, municipalities, instream flow, and the State of Wyoming. Water in Buffalo Bill Reservoir is used mainly for irrigating agricultural crops.

levels, as recommended by the U.S. Environmental Protection Agency (EPA), are lower than stock and irrigation concentrations and are based on palatability (tasting reasonably good) rather than toxicity (reference below).

Other water issues associated with streams, irrigation water, or water from shallow wells near corals or septic systems are bacteria and other pathogens that may have entered the water and high nutrient levels (nitrate and nitrite), which can cause health problems when present in certain amounts. Unlike high TDS, these may not be detectable by taste. When in doubt, test your water. When siting a new well or a new corral, keep in mind the distance between the well and corral – see the article "Proper well maintenance helps ensure a good water supply" in Winter 2007 issue of *Barnyards & Backyards* magazine for more info.

If your drinking water is found to have E. coli bacteria and/or other pathogens, it can be boiled or can be

filtered with activated charcoal or very fine mechanical filters. On the other hand, nitrate is a dissolved salt and can only be removed by RO or distillation. Water quality in shallow wells affected by shallow aquifers may change with the seasons. High flows in the aquifer will dilute some pollutants like salts during the spring while low flows during fall and winter will concentrate them. The best plan is to regularly test drinking water at different times of the year and keep a log book to look for trends over time.

For more information read or visit:

"Water quality determines plant health" – *Barnyards & Backyards* article, Winter 2007. Find it at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

"How geology affects your well water quality" – *Barnyards & Backyards* article, Fall 2008. Find it at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

"The right stuff: Water quality plays big part in livestock performance" – *Barnyards & Backyards* article, Spring 2009. Find it at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

**Water: Drinking Water Contaminants** – <http://water.epa.gov/drink/contaminants/index.cfm>. This EPA website is an in-depth source covering federal drinking water standards, private wells, pollution prevention, and many other topics relating to water.

## **Irrigation Districts and Water Associations**

Water is such an important commodity in Wyoming that state statutes allow for the creation of legal political subdivisions called irrigation districts to manage and fund local irrigation projects and systems. Irrigation districts fall under Wyoming Special District Law, which sets guidelines for taxation, governance, and accountability to the state for handling of funds. These districts are



organized by landowners with water rights around a water supply system, like a main ditch or a natural stream. These landowners share the common goal of keeping the system in good working order and level assessment fees on themselves for repairs and to pay staff to keep the system in good operating condition. Membership in these associations is usually limited to people with properties within the district boundaries who have water rights.

## Subdivisions and Water Masters

New landowners take on important responsibilities when they purchase a home or lot in a subdivision served by an irrigation district. Landowners must talk to and cooperate with their neighbors, the water master, and the irrigation district to ensure efficient water delivery. There is no free water in Wyoming. A landowner pumps it, maintains ditches to deliver it, or pays a municipality or irrigation district to deliver it. Failure to pay irrigation district fees may result in a lien on the property.

Subdividing and building homes on a ditch-irrigated pasture or crop

field results in a water delivery system that is different than a farm/ranch system. The irrigation district ditch rider (an employee who opens and closes ditch gates) still opens the top gate that feeds what used to be one field. He or she does that at the request of the subdivision water master, a legally appointed/elected officer of the subdivision who manages the irrigation system. Once the water is flowing through the gate, it is the responsibility of the water master and subdivision homeowners to agree on how, when, and where the water will flow through the subdivision and into the wastewater system at the bottom of the property.

**Lot owners have a responsibility to pay subdivision annual dues (even if they are not using the water) and water fees, to clean and repair irrigation ditches that cross their property (even if they are not using the water), to avoid damaging neighboring land by flooding, and to use water appropriately for Wyoming's arid climate.** There are likely more arguments about water than any other topic in the West. As Mark Twain reportedly said: "Whiskey is for drinking; water is for fighting

over." **Time invested in understanding and carrying out these responsibilities makes for good neighbors and happy communities.**

## Irrigation and irrigation practices

Landowners wanting to change the method of irrigation (say from flood to sprinkler) on their property must work through several regulations because Wyoming waters are legally tied to the land they flow through or irrigate. Pivot sprinklers typically are served by wells. The SEO will be involved in permitting the well. Irrigation districts are interested in and have procedures for changing the use of flood irrigation waters.

When determining how much irrigation water you'll need to raise a crop, consider that pasture grasses and crops need varying amounts of water at different growth stages. Growth slows when too much or too little water is applied. It is possible to calculate exactly how much water a pasture or crop needs per week. Contact your local UW Extension educator for assistance. Crop health will improve with appropriate watering, and landowners will save money when they apply only what plants can use.

## Flood Irrigation

Many Wyoming irrigation districts are able to deliver water using inexpensive gravity feed (once the infrastructure is in place) because of our high-elevation snowpack and low-elevation pasture/crop lands. A series of canals, pipes, and/or ditches deliver water to individual fields or subdivisions.

Fields are flooded when siphon tubes are used to transport water from the ditch to the crop row or when gated pipe gates are opened. With flood irrigation, water rushes down furrows in fields with row



*This wetland in the western Laramie Valley is a result of an 1883 water right. In addition to supporting cattle grazing, this irrigated meadow is home to the endangered Wyoming toad, numerous waterfowl species, and other wildlife. The shallow ground water from irrigation also supplies a drinking water well for a children's educational camp.*





crops or spreads out across the field without the use of furrows, such as in pastures.

Soil has many living organisms that require oxygen. These organisms can be killed when a row crop field is flood irrigated too long, excluding oxygen from the soil. Also, water from pastures irrigated too long usually moves downhill to a neighbor's property where it may not be wanted. Therefore careful monitoring of irrigation water is necessary. Experienced irrigators know just how long to irrigate their fields.

There are some benefits of flood irrigation that are not always obvious to someone first viewing it. In some areas of the state, flood irrigation recharges aquifers that supply wells and keeps salts from accumulating in the soil. In other parts, ephemeral wetlands are created that support a wide array of wildlife species during the irrigation "season".

## **Sprinkler Irrigation**

Land without surface water or an irrigation ditch is often irrigated with pivot sprinklers that draw water from a deep well. Producers may choose to use pivot sprinklers to better control the irrigation amount and timing. Landowners must go through all the Wyoming permitting procedures described above for a well in order to change to pivot sprinklers. Always test well water to determine if it is appropriate for plants before using it for irrigation.

Sprinklers are capable of delivering the exact amount of water a

crop needs when the crop needs it. Fertilizer and pesticides can also be delivered through a pivot irrigation system. With some water sources and soils, salt accumulation in the soil should be monitored when using sprinkler irrigation.

Some producers put irrigation ditch water through pivot sprinklers. A series of filters and screens are needed to clean ditch water before it is used or it can clog pumps and nozzles.

Small rural lawns are often watered by sprinklers on garden hoses connected to a domestic well. These require no special permitting. Watering lawns can be labor intensive and use a lot of water. If you have the luxury of starting a small lawn from scratch, keep the size to a minimum and use low-water, drought-resistant grass species – native turf grasses can require one-half to one-third the amount of water as traditional varieties of Kentucky bluegrass, which need up to 35 inches per year. Also, limit your watering to early mornings to avoid water losses due to evaporation. Water-wise landscaping can be attractive and reduce your work. Many resources are available to help you.

Talk to your local UW Extension office or conservation district about landscape and lawn species selection for your area and watering requirements for these plants.

## **Drip Irrigation**

Residents of the arid West often use drip irrigation in landscape areas

around their homes for trees, shrubs, and vegetable gardens. Commercial row crop growers in California have used it for years in high-value crops. A few Wyoming producers are using sub-surface drip irrigation for crop production, and many landowners utilize such systems to establish windbreaks.

Drip irrigation has benefits such as efficient water use and reduction of plant disease, but drawbacks can include high initial costs, clogged emitters, and rodents chewing on tubing.

Municipal water would be clean enough to run through a simple filter before using. Well water or ditch water may require more filtering before putting it through a drip system.

Typical equipment used in a drip system includes: backflow preventer, automatic timer, Y-filter, pressure regulator, drip tubing, micro tubing, emitters, sprayers and stakes, end cap or a figure-eight fitting, and some method of supporting the head assembly. See the "Windbreaks" section for detailed information on creating a drip system for windbreaks.

Wyoming winters freeze everything! Drain tubing, pipes, and pumps before they freeze, or they may get damaged.


## **For more information:**

Many articles, videos, and other resources can be found on water-related subjects including water law, irrigation, and low-water-use lawns and garden plants by visiting [barnyardsandbackyards.com](http://barnyardsandbackyards.com)

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# The WILD, the WONDERFUL, and the HUNGRY

## Living with wildlife in Wyoming

Rural land in Wyoming comes with many wonderful qualities such as wide open spaces, wildlife, and room to do many things. While wildlife can be one of the enjoyable aspects of living on a rural property, they can also become a problem. Learning to live with wildlife is an important part of being a good steward of the land, and once one has figured out how to live with them, wildlife can be very enjoyable. It helps to develop some perspective by keeping in mind that wildlife were usually on your property before you were.

First, decide if wildlife are something you want to encourage on the property or not. Wildlife are usually drawn to an area by at least one of three things: food, water, or shelter. These three components of wildlife habitat are key in either encouraging or discouraging the use of the property by wildlife.

Second, figure out the different types of wildlife that live in the area and then determine which ones are wanted, which are to be tolerated, and which can't be tolerated in

certain parts of your property. When planning any improvements to your property, think ahead about how the change will attract or discourage wildlife. If you are trying to encourage wildlife, both the negative and positive impacts of any change on your property need to be thoroughly evaluated. Once an animal has called the property home, trying to keep the animal from using the area can be difficult.

### Basic wildlife considerations on a rural property

#### Sources of food for wildlife

- Pet food attracts many forms of wildlife so, if possible, keep it inside your home or garage, or feed amounts that will be consumed all at once. If food has to be stored outside, ensure that it's in a secure container. Depending on the wildlife in the area, it may need to be kept in a bear-proof container or in just a mouse-proof container.
- Garbage needs to be kept picked up and kept in a secure container.

- Bird feeders may attract some beautiful birds but can also attract unwanted animals – such as raccoons, skunks, and bears. Feeding birds only in the winter when bears are not at large may be the best strategy for areas where bears roam.





### Sources of water for wildlife

- Birdbaths can be great for birds but can also provide a water source for unwanted animals.
- Old tires on your property can accumulate water, which will not only attract wildlife but provide an area for mosquitoes to lay eggs.
- Small swimming pools should be dumped out after use for similar reasons while large pools should be covered.

### Sources of cover

- Firewood piles create excellent shelter for many animals such as mice, rabbits, skunks, and raccoons. Keeping the pile a distance from the house will help reduce the number of mice entering the house and will reduce the potential wildfire hazard to your home. Storing firewood in a secure shed or under a secure cover will help keep out skunks.

- Scrap piles of wood, auto parts, and tires can create cover.
- Sheds built off the ground are attractive areas for skunks, rabbits, snakes, and many other critters. If access is limited when the building is originally built, it is easier to keep wildlife out. If an animal has already made a home under a shed, it can be more difficult to discourage it from using the shed even if its access hole has been boarded up.

These are all things to consider whether encouraging or discouraging wildlife. Thoughtful planning and the thorough consideration of all the intended and possible unintended impacts on wildlife from changes to the property are very important. Think before you act, or you may create a problem for yourself that didn't exist before.

### Gardens and wildlife

Many wildlife species love vegetable gardens because they provide an excellent source of food. Gardeners often don't take kindly to wildlife in their vegetable gardens. Fences around the garden are the best way to ensure vegetable-consuming wildlife are kept out. When planning a garden, take into consideration the wildlife in the area.

Ground squirrels, pocket gophers, and other rodents can be kept out with a fence that is two feet tall, but it will need to be buried at least a foot into the ground, possibly more, due to their ability to tunnel. The fence will need to be constructed with a woven wire mesh material that has openings no larger than a quarter inch in size. This will help keep most rodents from digging under the fence. If there are rabbits in the area, it would still be advisable to bury the fence a foot and build it three feet tall or that amount above the highest level the snow drifts rise to if you need to protect anything during winter. Antelope can usually be kept out with a four-foot-high fence. There are two options for deer, elk, and moose. The first is a fence at least seven feet tall. Another option that has been reported to work is an electric fence with a hot wire at about 36 to 46 inches off the ground. If animals jump an electric fence, attach small pieces of aluminum foil to the hot wire with a little peanut butter while the fence is off. The aluminum foil is just a way of attaching the peanut butter to the electric fence. After the fence is back on they will lick the peanut butter causing them to be shocked; usually this will cure them from jumping the fence. A combination of these may be necessary to keep the garden protected.





## Landscaping

Trees, shrubs, lawns, and flowers all make a property more appealing both for the property owner and wildlife. Vegetable gardens are usually confined to one location, which makes it easier to fence, but landscaping is often more spread out and not as economical to fence. However, it is cheaper to build a fence around a tree than to replace it several times. A substantial amount of money can be invested in landscaping so proper planning will help protect your investment.

First, the selection of plants can help reduce wildlife problems. Deer, elk, antelope, and moose will consider some species of trees, shrubs, and flowers a delicious buffet. Some species of trees are more appealing for animals to rub their horns or antlers on than others. Following is a list of trees and shrubs that will survive in Wyoming but wildlife usually won't eat – unless they're really hungry.

- **Trees:** boxelder maple, Engelmann spruce, pines (pinyon, limber, ponderosa, lodgepole), larch, honeysuckle, and hawthorn.
- **Shrubs:** dryad (yellow and white), common juniper, cinquefoil (potentilla), raspberry, creeping mahonia, silverberry, buffaloberry, and white spirea.

Try planting a few of a chosen plant species to see how they do in your area before you invest in many. You can find more plant suggestions at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

Second, fencing, while expensive, if placed around each and every tree is an effective way to keep wildlife out (see garden section above). Some repellents can be effective if used correctly. Spray repellents are applied directly to the plant and will help keep animals from browsing or grazing on them. The drawbacks are they have



## Wyoming Wildlife law

Many species of wildlife are protected in some way by Wyoming or federal laws. After identifying your animal of concern, contact the Wyoming Game and Fish Department for more information on its protection status.

to be reapplied often, it doesn't work for rodents that eat roots, and it will not deter wildlife from rubbing their antlers/horns on the plants. Systemic repellents (for example, tablets that are often "planted" with the tree) contain bitter ingredients that are pulled into the plant through the root system. Benefits of the systemic repellents include protection of the entire plant including the roots, and one application will often last a couple of years. Drawbacks of systemic repellents include taking several months for the repellent to spread throughout the plant, the fruit of the

plant cannot be eaten, and it will not deter wildlife from rubbing their antlers/horns on the plants. Follow directions and use proper protection when utilizing repellents.

## Raptors (birds of prey)

Eagles, hawks, and owls can be beneficial in removing rodents from around a property, but they will sometimes use a cat or small dog as a food source. Tall trees will attract these birds of prey. If mice, squirrels, or other rodents are causing problems, 10-to 20-foot-tall posts can be placed in these areas for raptors to perch on and help control the problem. Just remember to keep Fluffy safe.

## Rabbits

Cover is usually what attracts rabbits the most. Brush piles and outbuildings (especially those elevated off the ground) around the property will help draw them into a property. If they are causing problems, figure out where they are hiding, and try to eliminate the protection the area provides.

## Skunks

Most often skunks become a problem if there is a food source (garbage, pet food, etc.) or a place to call home (under a shed). Elimination of access to these amenities may reduce the problem.

## Badgers

Big holes are probably the biggest nuisance a badger will cause although sometimes they will go after dogs and cats. They are primarily nocturnal so the holes are often the only sign that there is one on the property. Their primary food source is small mammals like squirrels and prairie dogs. If a den is located in an inconvenient place on the property, sometimes repeatedly filling the hole with large rocks will encourage them to relocate.





### Tree squirrels

These creatures can get into many different places, which can create a variety of problems. Making sure all holes on buildings are covered can eliminate many problems. Wire mesh can be used to cover entry points. Live trapping is the most effective method of control depending on surrounding populations. If there are others in the area, they may move in when the original problem squirrel is removed. Before trapping, make sure you have a way of destroying the animal or an area to release it where it won't cause problems for other landowners.

### Ground squirrels

Problems with ground squirrels are usually seen in flower beds and lawns. Ground squirrels are often

mistakenly called gophers. Gophers are rarely seen above ground whereas ground squirrels can be seen above ground throughout the summer. Ground squirrels may have stripes on their back, spots, or just a plain tan color. Poisons\* and traps can be used to eliminate these pests, but others from adjacent properties will often move in to fill the vacated area.

### Prairie dogs

Similar but larger than ground squirrels, prairie dogs create large mounds. Wyoming has two species of prairie dog: the black-tailed and white-tailed. Poisons and kill traps are effective on these animals, but others may move in. Prairie dogs like to be able to see a long way from their holes to watch for predators. So, shrubs, tall grass, or other obstacles to block their view can help deter the use of a property.

### Pocket gophers

Mounds of fresh dirt without holes are a good indication pocket gophers are in the area. These critters are rarely seen but can cause a significant amount of damage. Lawns, gardens, flower beds, and trees are all susceptible to damage. Usually dirt mounds will be noticed in the area, then plants start to die due to the root systems being chewed on. Tree damage will often be noticed when the tree is sitting at a funny angle. When the tree is pulled on, it comes right out of the ground because the roots have been chewed off. Systemic repellents (see info above) can be effective for trees and shrubs. Poisons\* are an effective control method. Killer traps can effectively be used if someone is willing to spend the time.

### Beavers

These animals are an important link in many riparian ecosystems but can also become a big nuisance. A beaver's ability to take down large deciduous trees in a couple of days can be devastating to a landscape. Chicken wire mesh wrapped around trees from the base up to four feet will deter the beaver. Kill trapping can be used for control although trapping can be difficult and usually requires an experienced trapper. Most areas have trappers that, for a fee, will do the work. If a beaver has become a nuisance, contact the local WGFD office for assistance as state laws govern the trapping of beavers.



\*Always read the labels when using any poison.

Poisons can be a very effective method of control for pests when used properly and according to manufacturer's instructions. When using any poison, take into consideration other wildlife and use caution to avoid any pets or children (yours or neighbors) who may use the area. Some poisons require a search of the area daily to pick up and dispose of any dead animals. This is to reduce the chance of secondary poisoning. For example, a domestic cat or wild bobcat eating a mouse killed by poison may get poisoned from eating the mouse.



## Raccoons

These masked bandits can become a big nuisance with their ability to get into many places and closed containers. Eliminating places for them to hide and food sources are the best prevention. Trapping raccoons is an easy and effective method of control. Live traps baited with cat food work well, but it may take a few times of catching the cat before a raccoon is captured. Before live trapping is done, make sure a good location miles from other homes is selected for the release. Contact your local WGFD office for information and locations on releasing animals. That way it will not become a nuisance for others.

## Mountain lions

If you see a mountain lion in your area contact your local WGFD office. Usually a lion will just be moving through to another area. Lions will go after pets and livestock. Do not try to confront the animal.

## Deer, antelope, elk, moose

These large mammals can be a great thrill to see in the yard but can quickly become a nuisance. Usually just the appearance of people will scare them off, but sometimes they can become aggressive so always be aware. Moose are probably the most likely to charge, but the others will go after small dogs. Loud noises like shouting will often scare them away. If any of them get aggressive and threatening, call the local office of the WGFD. Fencing is the most effective way to keep them out of particular areas.

## Wildlife-friendly fences

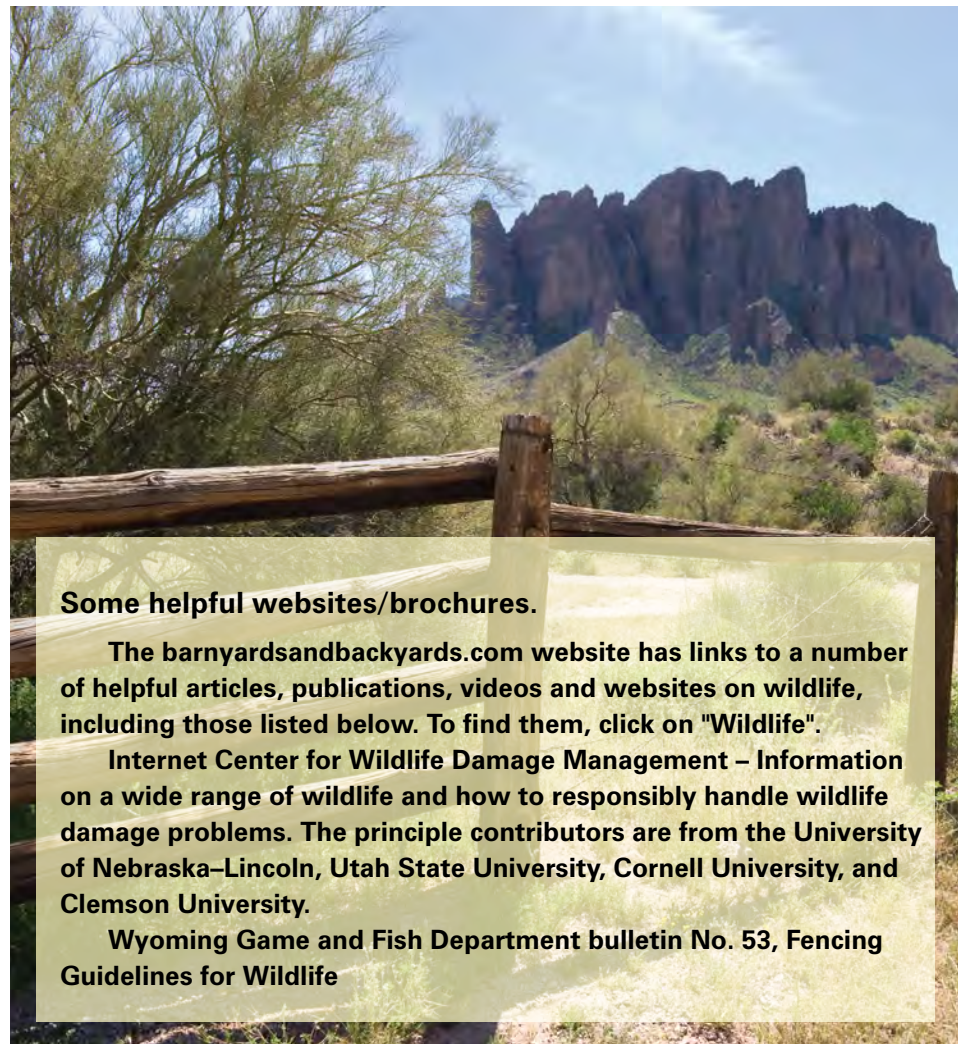
It is important to consider wildlife when you are building livestock fences. Wildlife-friendly fence construction will reduce the chance that animals will get tangled and keep your fence from being destroyed by

wildlife. Deer, elk, and moose usually jump over a fence while antelope typically go under the wire. So take into consideration what type of wildlife use the area and construct a fence that is easier for them to navigate. For areas with primarily deer and antelope, a four-strand wire fence with the top wire at 42 inches, the next wire 12 inches below that, and the bottom wire smooth at 16 inches above ground level is ideal. In areas with moose and elk, replace the top wire with a wood rail. For more information and detailed fence constructing, see the WGFD habitat extension bulletin No. 53 Fencing Guidelines for Wildlife [http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/BULLETIN\\_NO530001795.pdf](http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/BULLETIN_NO530001795.pdf)

## Trapping

Live trapping is an effective way to get rid of unwanted wildlife and keep pets from getting injured. If a domestic cat is caught, it can be released. Before live trapping is done, make sure a good location miles from other homes is selected for the release. Contact your local game and fish office for information and locations on releasing animals. This way it will not become a nuisance for others.

Handle all wildlife carefully because they can bite. Also, fleas are common on wildlife so when handling the trap with the animal make sure to have a long-sleeve shirt, pants, and gloves on. Insect repellent would also be beneficial. If



### Some helpful websites/brochures.

The [barnyardsandbackyards.com](http://barnyardsandbackyards.com) website has links to a number of helpful articles, publications, videos and websites on wildlife, including those listed below. To find them, click on "Wildlife".

Internet Center for Wildlife Damage Management – Information on a wide range of wildlife and how to responsibly handle wildlife damage problems. The principle contributors are from the University of Nebraska–Lincoln, Utah State University, Cornell University, and Clemson University.

Wyoming Game and Fish Department bulletin No. 53, Fencing Guidelines for Wildlife



the animal is acting aggressively or unusually it may have rabies; in this case, stay away from the trapped animal and call a veterinarian, animal control, or the local WGFD office. Skunks are often unintentionally caught in live traps creating another problem. In this situation, use a large piece of plastic or unwanted tarp and approach the trap using this as a shield, then drape the plastic over the trap and wrap it up to haul it away or release it.

Killer traps work well as long as pets, kids, or non-target animals are not in the area. When disposing of the dead animal, make sure and wear a long-sleeve shirt, pants, gloves, and insect repellent. Dispose of the animal in a place pets and other animals cannot get to. If you have neighbors close by you may want to visit with them before starting so that they are aware and can keep animals in and kids away. Also, when using kill traps be aware of all the animals that are in your area. If you are using bigger traps that may catch fox or badger, for example, then you will want to contact your local WGFD office or game warden to find out the laws on trapping furbearing animals. You may have to obtain a license.

Wildlife can be a very enjoyable part of the rural lifestyle if one knows how to live with them. This section provides just a brief overview. There are many other sources of information to help with handling problem wildlife or creating habitat for desired species. For more information, contact your local WGFD, University of Wyoming Extension, conservation district, or Natural Resources Conservation Service office.

**Rex Lockman** is the wildlife and range specialist with the Laramie County Conservation District.

# Weeds, ways to



**W**hat is a weed, and why should I care about them? Weeds are simply plants growing where you don't want them to be. If a plant interferes with your management goals, it is considered a weed. Weeds know no boundaries, and they aren't just a problem of agriculture production. They impact small and large acreages, urban and rural properties, roadsides, rangelands, riparian areas, and forests. Just a few biological characteristics that allow weeds to flourish are their life cycles, growth habits, and reproductive abilities, which allow them to out-compete other plants. Add land-use issues such as overgrazing, past land history, and human-caused disturbance and we begin to see why weeds can be so persistent on our lands. With proper weed management strategies, you can help assure your property will maintain the desirable qualities that led you there in the first place.

There are nuisance weeds – these are usually annuals that appear after some sort of disturbance. Construction, agriculture activities, flooding – anything that causes seeds in the ground to be redistributed or “disturbed” and gives them the opportunity to grow. Disturbed lands are also vulnerable to weed seeds blowing in from neighboring lands. Kochia, Russian thistle or tumbleweed, and common lambsquarters are typical nuisance weeds (not listed as a Wyoming designated noxious weeds). Then there are the weed species that cause significant environmental and economic



# *whip 'em*

*(or at least keep them from whipping you)*

harm. Weeds in this category are considered “noxious” and are so aggressive that they are regulated by state and federal agencies. These species are usually non-native invasive plants that require a greater amount of effort to control. In Wyoming, these species are regulated by the Wyoming Weed and Pest Control Act. Weeds in this category include species such as Leafy spurge, Canada thistle, and Yellow toadflax. (For a complete listing and information on Wyoming’s designated noxious weed species as well as each county’s “declared” noxious weed species, go to [www.wyoweed.org](http://www.wyoweed.org) or talk to your local weed and pest district office).

If you have acreage with grazing animals, a proper grazing management plan is a useful weed control mechanism and will help ensure that your property remains productive. Healthy pastures also help ensure healthy livestock. A healthy stand of desirable plants will typically out-compete the weeds. Most of Wyoming is a high plains desert. Depending on your location and property size, your property may not be able to sustain grazing animals for more than a few weeks. Rotational grazing (moving animals between two or more pastures) aids in weed control because it gives beneficial plants the opportunity to rest after grazing and then grow undisturbed before being grazed again. Grazing management alone,

however, may not correct serious weed problems. Most weed species are not eaten by grazing animals as they choose more desirable plants for consumption. In heavily infested or overgrazed pastures, this pattern of continually grazing the desirable plants creates a downward spiral in the health of the pasture, allowing the weeds to flourish.

Just as all weeds are not created equal, neither are the treatment methods used for successful weed control. Many of the nuisance species require nothing more than mechanical control measures such as mowing or hand pulling. Of course when you factor in the amount of time you have to allocate to your weed management program, you may choose several methods to keep your property free of these species. (Or at least get them under control).

Different weed species require different control methods, and in most situations several methods, or an “**integrated**” approach, is usually most effective. The methods that may be incorporated to eliminate the nuisance species noted above may actually encourage complex perennials (like Canada thistle) to grow more! This integrated approach takes this into account and uses all the tools we have in our weed control toolbox.

***So which method is the right one for the target species?***

The method used to control weeds depends on many variables such as management goals, resources available (time and money), future plans, identification of target species, pasture availability, and location to name a few. Here are some **guidelines** to consider when choosing treatment methods:

1. **Group** the weeds into two categories: **broadleaf (non-grasses)** and **grass** weeds.
2. **Identify the target species:** Proper identification (ID) will assist in choosing the right method. Wrong ID equals wrong treatment equals waste of resources equals no weed control! **If you do not know what the weed is, find out before proceeding!** Weed and pest districts, University of Wyoming (UW) Extension, and others in the community may be able to properly identify your “weeds”. If you have a weed on your property that turns out to be a “noxious” weed, you also may qualify for “cost share” programs where local weed and pest districts contribute to part of the cost of control.
3. Consider the **life cycle** of the plants:
  - **Annuals** – (complete their entire life cycle in one season) ONLY reproduce via seeds.

- **Biennials** – (live two seasons; usually grow a rosette or cluster of leaves close to the ground the first year and the following season put up a flower stalk, set seed, and die) ONLY reproduce via seeds.
- **Perennials** - (live longer than two seasons).
  - simple – having a taproot or fibrous root and ONLY reproduce via seeds.
  - complex – have creeping underground rhizomatous root systems and reproduce not only from growth points on the root located every ½-inch or so but also via seeds. Take a piece of this root and move it to another area and, BINGO!, there's a new weed growing where you didn't have one before.

***It is crucial to know the life cycle of the target plant to choose the right treatment method.***

Choose the best **method of control for the target species**. In general:

- **Annual** species respond to mechanical control and cultural controls to a certain extent. Remember the only thing you are trying to accomplish is eliminating seed production. Most annual weeds such as kochia and Russian thistle can be mowed; however, they will respond to the height of your mower and start producing seed at 3 inches or the height of your mower deck. Depending on the size of the infestations, you may have to hand pull, mow, hoe, or use other mechanical means. If the area is too large, consider using herbicide treatments.
- Remember that whatever method you choose, there are many seeds left in what's called the "seed bank" in the soil; these seeds will also germinate under favorable conditions. This could mean flushes of new growth several times throughout the season (or for many years to come).
- **Biennials also respond to mechanical control** because, like annuals, they only spread by seed. Manual removal of either annuals or biennials may be time consuming so you may have to consider other methods. If you choose to use an herbicide, don't wait until the annual or biennial weeds are big enough to hide your children and dogs. ***All methods of control are more effective if you treat these weeds early!***
  - **Tap-rooted perennials (those having a single main root that goes straight down)** may be mechanically removed if the entire root is removed. The size of the infestation and the amount of time available will play a role in the control/removal methods chosen.
  - **Complex perennial** weeds such as Canada thistle, field bindweed, or whitetop may require chemical treatment as it is almost impossible to remove the entire root system. ***The proper herbicide for the intended species is crucial for effective control of these species.*** Remember some perennials also reproduce by seed so you may have to incorporate mechanical
- methods as well. If you successfully control the existing growth you'll need to be on the lookout for re-sprouting vegetation or new plants from germinating seed (field bindweed have seeds that stay alive and are able to germinate for 60 years or more in the soil!). Persistence and vigilance are key to controlling complex perennial weeds.
4. Consider **timing**: Proper timing of any method is critical to success. Many complex perennial weeds respond well to fall applications of herbicide as the chemical gets pulled into the root system (along with the "food" compounds the plant is storing for winter) where it's most effective.
  5. **Evaluate** throughout the season to determine if the control method(s) is effective. If you have tough perennial weeds, results may not be seen until the following year. Good stewardship is a long-term commitment so think long-term. Change methods if results are not satisfactory.
  6. Once again, **consider asking** for assistance. Weed and pest districts, UW Extension, Natural Resources Conservation Service, and conservation districts are among your options.
  7. **Enjoy!** Weed control is the result of planning, implementation of your plan, and persistence. Now you can sit back and watch the grass grow, play a football game, garden, or ride your horses. Don't forget to keep an eye open for some weedy suspects moving into your weed-free areas! And remember to monitor the areas you treated for satellite plants you may have overlooked.





# The weed management toolbox

**Choosing the correct method saves time and money. The integrated approach uses all the tools we have in our “Toolbox” of weed control.**

• **Prevention:** By far the easiest form of control!

- ♦ Maintain healthy, desirable vegetation. If you don't have any ... plant some perennial grasses. Proper watering, fertilizing if needed, managed grazing, etc. make a difference!
- ♦ Use weed-free end products (topsoil, sand, gravel, trees, shrubs, compost, manure, etc.). Ask suppliers if their products are weed free.
- ♦ Limit disturbances. Disturbed soil is a prime target for new weed species to move into.
- ♦ Ensure equipment brought on your property is clean of dirt and debris that may contain weed seeds or plant parts. Clean this equipment before moving it to the next location.
- ♦ Have a **plan!** A grazing management plan is essential if you have grazing animals. Your local University of Wyoming Extension, NCRS, or weed and pest office can help develop one for your property.
- ♦ **Don't purchase or plant invasive species.** Replace invasive plants in your garden with non-invasive alternatives. Information is available from weed and pest districts, Natural Resources Conservation Service, nurseries, publications, Internet, etc. If it is invasive elsewhere, there is a good chance it will be invasive on your property, too!

• **Cultural:** Knowing what previous land-use practices were and how this may impact your efforts. These

practices include burning, grazing, crop rotation, pasture rotation, crop selection, the planting of cover crops, etc.

- **Mechanical:** Just as you thought, these are practices that involve manual labor...mowing, hoeing, hand pulling, etc. This also includes the use of mulch and weed-suppressing plastics and fabrics.
- **Chemical:** Use of herbicides to control weed species. ***Not all herbicides are created equal!*** Different types include:

- ♦ **Selective** – damage or kill only broad-leaved plants or grasses (not both),
- ♦ **Non-selective** – have potential to kill or damage all plants they contact
- ♦ **Pre-emergent** – applied before the weeds appear
- ♦ **Post-emergent** – applied after weeds begin growing
- ♦ **General use** – may be purchased by any adult
- ♦ **Restricted use** – must have a license to apply

- **Biological control** – This is the use of a biological agent (such as an insect, disease, pathogen, etc.) to **control or suppress** weed spread. Use of these “agents” will not eliminate the weed! These are usually released in areas difficult to access. Contact your local weed and pest office for information on available agents and applicability to your situation. Also use of grazing animals (goats, sheep, cattle) to target specific weeds. This eliminates the top growth only. For complex perennials, a combination of methods is usually necessary for eradication.

# Developing your Weed Management Plan

1. Define your goals. Be realistic. If you inherited a weed problem, it may take several years to effectively control the weeds. Include the amount of time and money you can spend on the project.
  - a. Short-term – If noxious weed species or poisonous weeds are present, these will be a priority. Focus on controlling these species, especially if found along a travel corridor. Roads, irrigations ditches, etc., are pathways these species move along to un-infested areas. Not sure if you have any noxious species? Contact your local weed and pest control district and schedule a survey of your property. Telephone numbers, along with a list of noxious weeds and other information, is available at [www.wyoweed.org](http://www.wyoweed.org). Many noxious species may have cost share (the district will pay part of the cost of control) associated with them.
  - b. Long-term – Establish parameters for what you consider acceptable as far as weeds on your property. (Remember, noxious weeds have regulatory statutes regarding control). Do you want to increase forage production? Do you wish to maintain only “native” species on your property? Whatever your goals are, after a weed survey has been completed and infestations located, work on establishing a weed-free perimeter around your property. You can do this for each “parcel” or pasture you own. Determine where the outer edges of each weed infestation are located, and target treatments working from the outside toward the center of the infestation. This helps keep you to systematically treat weeds and keeps you from “chasing” them from one area of your property to another.
2. Survey your property. Inventory not only the weed species that may be present but also the desirable plants or areas you wish to maintain as is.
  - a. Make a map. NO GPS ... No problem. It doesn't have to be fancy. Plain paper and pen work just fine. The purpose of drawing a map and locating key species or areas is to allow you to be able to assess whether your plan is working and if you are meeting your goals.
  - b. Take pictures. A picture is worth a thousand words. Photos will also help assess the effectiveness of your treatment.
3. Develop your plan. Using the information from the above steps and that are provided in the rest of this section, begin to determine what strategies will be utilized in your plan. Do you have nuisance species in your pasture? Are noxious weeds taking over a riparian area? Use the integrated techniques suggested. Will you be mowing, pulling, or using herbicides? Are you doing spring, summer, and fall treatments? Remember that plant species, densities, and severity of the problem will help determine correct methods. Time and money are going to play a key role in your plan. Remember to get estimates if you are unsure of the cost of services or supplies. Ask for assistance from resource experts in your area. The Natural Resources Conservation Service, University of Wyoming Extension, and weed and pest districts are a few that may be able to help.
4. During planning remember that re-vegetation (re-seeding, etc.) of severe infestations after the weeds are under control may be necessary. There is nothing like a healthy stand of perennial grasses and forbs to assist in keeping weeds at bay.
5. Implement your plan. Mow, apply herbicide, graze, or hand pull. Whatever you wrote down on paper, take it to the field! Spend an entire season putting your plan into action. For some annual weeds, you will see results of your efforts this season; however, for perennial weeds, whether noxious or not, you may have to wait until the following spring/summer season to determine if your plan was successful.
6. Monitor your results. Survey your property on a regular basis. Bring out the maps and the photos. They will be great tools in determining the success of your plan. You may have to alter some components of your plan depending on the results. Timing of your control may have to be altered, or perhaps a different herbicide may produce better results. Remember that weed management is not a quick fix or a one-time event. Good land stewardship is a long-term commitment. Once major weed problems have been addressed, it will require less resources to maintain. Continual monitoring is vital for long-term success of any weed management plan.





## Common Mistakes

- **Incorrect ID** of weed resulting in wrong treatment method.
- **Improper herbicide** selection/timing/application. *You must match the right herbicide to the right plant species.* Some herbicides have no activity on certain plants. Seek the assistance of qualified personnel such as weed and pest districts in choosing the right product! Herbicides also have specific uses in regard to the areas you may be applying – agricultural use, turf use, range and pasture, aquatic, etc. Herbicide labels provide this type of information.
- Purchased the **cheapest** herbicide. Some less expensive herbicides are better suited to annual or biennial weeds. Perennial species, especially those of the noxious variety, may require a specialty herbicide to eliminate the weed infestation. (Contact your local weed and pest district for recommendations.)
- **Used more** than the recommended amount of herbicide. More chemical does not necessarily mean better control. **Read the label as these instructions are requirements, not recommendations!** This is especially important in treating **complex** perennials. Many herbicides are slow to act. In the case of those perennials, slower activity is better! If too much herbicide is applied, you may damage the top growth too quickly. This will keep the plant from absorbing enough of the herbicide through

its leaves to kill the whole plant, and it will recover.

- **Didn't follow through** with *retreatment* – severe infestations may require several years of treatment! **Persistence** is your weapon against weeds.
- **Always consider where the product is to be used. Will it be used near:**
  - Ditch banks
  - Riparian areas
  - Vegetable or flower gardens
  - Lawns
  - Pastures
  - Shrubs or trees

### **Then ask yourself these questions:**

- Is damage to non-target plants (plants in the area to be treated that aren't weeds) acceptable?
- "Residuals" – Herbicides can remain active for varying lengths of time after application; some herbicides have long residuals (stay active a long time) while

## Common Herbicides

The following are some common general-use herbicides. No license is required to buy or apply these products. The following are *general* recommendations. Your situation may be unique and have specific elements that require other methods. **Always read the label** to ensure you are using the product in a manner consistent with the labeling. **Label instructions are requirements, not recommendations!** Consult your weed and pest district or other qualified entity for proper selection of herbicides – especially if “noxious” weeds are present. The common names of active ingredients are listed first. Many herbicides with the same active ingredients are available under a variety of trade names. This listing does not imply an endorsement of any particular product manufacturer.

**2,4-D Amine. Sold by various manufacturers with various trade names** – Selective **post-emergent** herbicide. Effective on many annual broadleaf plants if treated early.

Has a turf label.

Also effective on most biennials when treated in rosette stage, including musk thistle, houndstongue, burdock, etc.

**2,4-D Amine + Dicamba. Many products available such as Weedmaster® or Clarity®** – Selective **post-emergent** herbicide. Effective on many annual weeds and SOME perennial species only with **repeated** applications (showy milkweed, field bindweed).

**Glyphosate. Found in Roundup®, Buccaneer®, or Cornerstone®.** – Non-selective herbicide – effective on most broadleaf and grass plants.

No residual – *only kills what is green, what is growing, AND what it touches!*

Good on some perennials in the fall (Canada thistle)

**Safe in flowerbeds, gardens, around trees** – as long as the herbicide doesn't contact non-target species!

One of the most non-toxic herbicides available. Targets a specific enzyme found only in plants.

**Trifluralin. Found in Treflan® and Preen®** – A pre-emergent herbicide, these products prevent annual weed seeds from germinating. Can be used in perennial flower beds, gardens (after *ALL* desirable species are established), and around driveways. Must be incorporated or watered in.

others have short ones. Will anything be planted on the site in the future? If so, you may want to choose an herbicide with a short residual, or be sure the herbicide won't affect the new type of plant.

- What resources do I have to control weeds (cost/time)?
- Can I mix this herbicide with other herbicides in my sprayer tank (tank mixes), or will one product inactivate the other? For many weed species with a thick waxy cuticle, a surfactant or adjuvant may be necessary. These products act as stickers, prevent rapid evaporation of product, or assist in the penetration of the herbicide through the leaf surface. The herbicide label will provide examples of herbicide mixtures and other products that may be added to get the best results. **Always read the label!**
- What time of year is the best for effective application of this herbicide?
- Many weed species are more susceptible to herbicides at specific growth stages. The product label will have this information, or contact your local weed and pest district.

**Used properly, herbicides can be an effective tool from your toolbox. While they shouldn't always be your first option, in many instances, (especially for tough noxious species) they are an economical, useful component of integrated weed management.**

For lots of information regarding weeds and weed management, check out the Barnyards & Backyards website at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

**Mary McKinney** is the assistant supervisor of the Park County Weed and Pest Control District

## Common problematic weeds in Wyoming



Yellow toadflax



Russian knapweed



Houndstongue flower



Houndstongue seed



Leafy spurge



Canada thistle





Perennial pepperweed



Russian olive (foreground)



Spotted knapweed — potential hybrid



Scotch thistle



Cheatgrass



Saltcedar tree





# Keeping the land you paid for

## *Protecting your soil from wind and water*

**W**ould you be upset watching your dollars blow away in the wind or wash down a stream? If you see unusual amounts of dirt leaving your property, it is a similar loss. Topsoil is an extremely precious resource in Wyoming that contributes directly to the value of your land. Nature has taken thousands of years to build this nutrient-rich layer, and it supports many of the features of land that we consider beautiful, useful, or otherwise valuable. One way to protect this investment is to protect your land from erosion.

Erosion is the gradual (and in some cases quick) removal of soil by the action of water and/or wind on an unprotected soil surface. Erosion removes the nutrient-rich organic matter and finer soil particles, leaving behind nutrient-poor coarser materials. Along with being less fertile than intact topsoil, this coarse material doesn't hold water very well. This exposes your land's plant life to more frequent drought conditions, and plants growing in this material typically aren't as healthy and productive as plants growing in good topsoil.

Erosion is a natural process, but it can be greatly accelerated when the soil is disturbed. As you carry out

activities on your property, always consider their effect on the rate of erosion and take steps to minimize it. This is especially important if your place is located on some of our more fragile areas such as ones with extremely sandy soils or in areas having strong winds. Removal of vegetation exposes the land to the erosive power of wind and can make it very hard to re-vegetate.

The key to minimizing erosion on our Western lands is maintaining adequate plant cover (less bare ground exposed). Trees, shrubs, forage crops, and dense native grasses all provide good soil protection.

Some other tips for protecting your investment:

If you have livestock, read our "Grazing" section thoroughly, and consider how you can best protect your ground while making use of this great renewable resource (forage). A certain amount of bare ground is natural in many parts of the state; however, if you end up with more bare ground than you had before in your pastures, re-evaluate your grazing practices.

Reduce the amount of soil disturbance by vehicles, implements, and construction equipment or other

sources. Especially in sandy soils, these seemingly simple acts can result in channels forming that wash out during rain storms or snowmelt. See the Winter 2009 *Barnyards & Backyards* magazine article "Planning to build? Thinking ahead can save you time, money – and precious topsoil" for a host of tips on things to do before, during, and after construction that will conserve the good things you purchased your land for and minimize the development of bad ones.

Keep roads to a minimum, and use good road base to reduce soil disturbance.

Mulching flowerbeds and around trees is an excellent way to help stop erosion and help conserve water. Read this guide's "Water-wise Landscaping" section for a further discussion of mulch.

When growing conventional row crops, consider using conservation tillage practices. Let residues from past crops cover the soil surface.

Investing time and effort into the protection of your topsoil pays enormous dividends. Take care of your land, and it will take care of you.

*Material for this section was contributed by Kelli Belden, Dallas Mount, and Jennifer Thompson.*





# Manure: Turning a potential problem into a valuable resource

## Tips for manure management and composting

Proper management of manure from livestock, poultry, and other animals has a host of benefits including controlling flies and parasites spread through manure and protecting your water quality. Properly handled, manure can be a resource rather than a problem.

The first step in manure management is to decide where to place your corrals, chicken coops, and other animal pens as well as the manure storage areas.

Try to locate any corrals, pens, or manure storage areas on a dry upland site. Watch how water moves across your property, and do not locate these facilities in areas where the water runs off or in low-lying areas near water. Keep all manure sources and storage or application areas at least 100 feet from any water body (irrigation ditches, ponds, streams, well-heads, etc.), and farther away if they are located on a slope.

It is a good idea to keep a vegetated strip around manure sources (corrals, storage areas). This vegetated area can help capture any manure or runoff. The width of this area varies with soil type and with the slope of the area. Suggested widths for a loamy soil:

- 25-50 feet for 0-3% slopes
- 50-100 feet for 3-8% slopes
- more than 100 feet for steeper slopes

Try to keep the clean rainwater landing on the roofs of buildings clean. Do this by using gutters and directing the downspouts away from areas containing manure.

Know where your water table is and what your soil types are. If your soils are very permeable due to being sandy or gravelly and the water in your well is close to the surface, it is easier for contaminants such as nitrogen or *E. coli* to reach your water source. Those with soils containing more clay should be extra vigilant about controlling runoff from the soil surface as water takes longer to soak into these soils.

You can spread manure or composted manure on fields. Amounts that can be applied depend on the nutrient amounts in the manure, soil type, the plants growing in the application area, and other factors. Do not apply uncomposted manure to vegetable gardens. Manure must reach high temperatures during the composting process to kill off potential pathogens. See the reference below

for more information, or consult your local University of Wyoming Extension, conservation district, or Natural Resources Conservation Service office.

Good composting helps decrease the spread of parasites and weeds (through live weed seeds in the manure) and convert the nutrients in the manure to slow releasing, beneficial forms. A spring application of manure or compost to a hay field can provide valuable nutrients and reduce the need for synthetic fertilizers. In the garden, apply compost in the fall so the worms and microbes have plenty of time to break it down before you plant in the spring. Don't apply it to frozen or snow-covered ground as it is more likely to run off or blow off the area. Remember to keep application areas at least 100 feet away from water bodies and sources.

### Composting Livestock Manure

Composting livestock manure on a rural acreage in Wyoming can be challenging yet rewarding.



**For more information about manure management, the following resources may be useful:**

*Managing small-acreage horse farms in central and eastern Oregon* – Oregon State University Extension Service, <http://extension.oregon-state.edu/catalog/pdf/ec/ec1610.pdf>

*Manure management for small hobby farms* – Northeast Recycling Council, Inc., [http://www.nerc.org/documents/manure\\_management/manure\\_management\\_handbook.pdf](http://www.nerc.org/documents/manure_management/manure_management_handbook.pdf)

"The scoop on manure management" – *Barnyards and Backyards* magazine, Summer 2007. This article is online at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

Making good compost is similar to making good cookies – you need a good recipe, and then you need to follow it carefully to get the best result. Adding the right kinds and amounts of ingredients to a manure compost pile will result in a good product with minimal odor during the process.

## Beginning

Where and how to compost is the first decision. A preferred location might be in an area that's relatively out of view, such as the backyard. A small compost pile can be contained on three sides with three wooden pallets to form a U shape. This sized pile can be turned with a pitchfork. For larger compost piles, large square bales of straw can form a U. Having a small loader tractor makes turning larger piles much easier.

## Carbon and Nitrogen – Getting the Mix Right

Next, decide what to put in the compost pile. Your goal is to create a good carbon:nitrogen (C:N) ratio with the ingredients you add. Common carbon-rich ingredients that could be added are straw, old hay, wood shavings, sawdust, shredded paper, shredded cardboard, dry grass (to

the point that it's brown in color), and dry leaves. Common nitrogen-rich ingredients are fresh livestock manure, green grass clippings, green leaves, green plant wastes from the garden, and fruit and vegetable scraps. Another common material on rural acreages is used horse and other livestock bedding material, which is typically comprised of both high carbon (straw or sawdust, for example) and high nitrogen (manure) materials.

Dog, cat, or pig manures can contain parasites that can infect humans. These parasites can survive a long time when these manures are applied to the soil. Compost piles must reach high temperatures to destroy these parasites. Don't use them for compost that will be applied to areas growing crops for human consumption. Other manures (beef, dairy, goat, chicken, etc.) can contain pathogenic strains of *Salmonella sp.* and *E. coli* bacteria. As the manure ages the bacteria decline but they can still be a potential threat to your health if applied uncomposted to food crop areas within certain time periods. The present USDA Organic Standards (<http://www.ams.usda.gov/AMSV1.0/nop>) require that after aged uncomposted manure application, you must wait 90-120 days depending on the crop grown before harvesting crops for human consumption. The 120-day wait applies to anything grown in a vegetable garden. The 90-day wait would apply to fruit trees. You can compost these manures to minimize the risk of disease organisms, but it is hard to maintain the appropriate conditions throughout the compost pile. The USDA Organic Standards require that the compost pile must be maintained at 131 F to 170 F for 3 days using an in-vessel or static aerated pile. If anyone with a compromised immune system will be eating produce from

your garden, you shouldn't apply any form of manure (composted or uncomposted) to it.

Things to eliminate from compost materials are plastic twine or any other plastic. Do not compost meat, bones, dog and cat feces, or fatty foods such as cheese, salad dressing, and cooking oil, as these materials tend to attract unwanted visitors. If you know the compost is going into a vegetable garden, avoid adding plant materials that have been treated with herbicides. It's also not recommended to add plants containing weed seeds unless you are sure high temperatures can be reached.

C:N ratios of 20:1 (20 parts carbon to 1 part nitrogen) to 40:1 are acceptable. Having the C:N ratio at 30:1 is optimal for compost microbe activity and also reduces odor associated with composting. For example, this ratio can be created by combining about ½ pound of straw to 1 pound of livestock manure. On a volume basis, this would be 1 part straw to 1 part manure since a wheelbarrow full of straw is a lot lighter than a wheelbarrow full of fresh manure. If using leaves as a carbon source in the mix, use twice as many leaves as straw.

The following table can help formulate your recipe. There are free online compost calculators that

**Table 1. Carbon: Nitrogen ratio of common compost ingredients**

Sawdust, wood, paper	400:1
Straw	80:1
Cornstalks	60:1
Leaves	50:1
Fruit wastes	35:1
Rotted manures	20:1
Food wastes	15:1
Grass clippings	15:1
Alfalfa hay	12:1



will help take the guesswork out of having the correct ratios.

## Water – Another Key Ingredient

Water will need to be added to a compost pile, especially during hot, dry, summer months. For best results, water the pile as you stack materials instead of waiting until the end. Moisture contents between 40 and 60 percent are acceptable. As a rule of thumb, the materials are too wet if water can be squeezed out of a handful and too dry if the handful does not feel moist to the touch—like a wrung-out sponge. Moisture probes can be purchased to get a better estimate of moisture content.

## Oxygen – The Breath of Life

The size and density of particles affect the composting process rate. Large chunks of wood take longer to decompose than sawdust or wood shavings. Smaller particle size may reduce the movement of oxygen (a vital component of decomposition) within the compost pile. Optimal particle size is from 1/8 to 2 inches in diameter. Larger products can be incorporated in the pile when they have been partially decomposed. The larger the particles, the less the pile needs to be turned to incorporate oxygen.

There are two different temperature ranges that achieve composting – mesophilic (50-105°F) and thermophilic (more than 105°). Mesophilic temperatures allow for effective composting, but, at thermophilic temperatures, more pathogens are killed, more weed seed is destroyed, and fewer fly larvae survive (110° to 150°F is ideal). Having the right C:N ratio and moisture content, along with turning it once a week to incorporate oxygen, will help achieve a higher temperature.

The ideal thermometer for composting includes some basic features: 1-3/4 inch, easy-to-read dial, 20-inch stem, and a waterproof plastic lens. You may already have a probe thermometer that will work, even though it may not have all these features.

## Time

Composting raw material takes 10 to 14 weeks, or longer. The rate at which a compost pile matures depends on the C:N ratio, moisture content, particle size, temperature, and how often it is turned. You can turn the pile as often as every five to 10 days to create compost more quickly.

Commercial in-vessel composting can produce compost in as little as three days. In-vessel composters look similar to large cement mixers. Most in-vessel composters are set up as a continuous process – material is going in as the finished product is coming out. Arena owners, garden clubs, towns, and cities may have an interest in in-vessel composters.

When the piles no longer reheat after turning, the curing stage begins. The curing stage takes three to four weeks. Curing provides maturity, which means the energy and nutrient-containing materials in the compost have been transformed into a stable organic mass. Mature compost has undergone decomposition, contains slow-releasing plant nutrients, is low in phytotoxins (plant-harmful substances), and no longer ties up large amounts of nitrogen and oxygen when mixed with soil. When complete, the compost will smell, feel, and look similar to rich, dark topsoil.

## Application Rate

The amount of compost applied depends on the plants being grown. Consider applying ¾ to 1 inch of compost and then tilling it in for a

vegetable garden. Apply ½ to 1 inch to a vegetable garden in the fall and let the worms work it into the soil over the winter. Well-cured compost can also be used as a mulch to protect the soil and provide a slow-release nutrient source. For new and existing lawns, you can apply ¼ of an inch in the spring and ¼ inch late summer if the lawn appears to need more nitrogen. Adding compost is a great way to add organic matter to Wyoming's often poor soils. This organic matter will provide food to the plants that may be feeding your body or soul!

For more information on composting, visit [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

**Dallen Smith** was a University of Wyoming Extension educator based in Big Horn County and serves Big Horn, Park, Hot Springs, Fremont, and Washakie counties.

*Additional information supplied by Kelli Belden, manager of the Laramie Research and Extension Center Greenhouse Complex in the University of Wyoming College of Agriculture and Natural Resources, and by Jennifer Thompson, Small Acreage Outreach coordinator.*





# DEFENSIBLE

## Landscaping

### Create defensible space for fire safety

Every year, wildfires have burned hundreds of thousands of acres in the United States, forced evacuations, burned structures, and claimed lives. Firefighting agencies will do all they can in the event of wildfire but can become quickly overwhelmed by a large blaze. Only you, the homeowner, can help guarantee your safety, the safety of family members, firefighters, and pets, and increase the ability of your home, outbuildings, and landscaping to survive a wildfire. For Wyoming homeowners, there are many things that can be done during a weekend to increase the survivability of structures and the safety of your family.

### The 3 R's of defensible space

Use these 3 R's as a guide for creating defensible space around your home. Inventory the vegetation around you and your neighbors' homes. Neighborhoods and subdivisions should work together to create defensible space around homes.

#### Remove

- Remove dead vegetation, and clear weeds.
- Remove low tree branches.
- Remove ladder fuels (these are explained below).
- Remove firewood piles from near the house.

#### Reduce

- Break up dense shrub fields and thick tree cover.
- Prune dead wood from shrubs.
- Reduce the amount of highly flammable native vegetation.

#### Replace

- Replace highly flammable plant material with less flammable, low-growing species within 30 feet to 100 feet of your house; check with your fire agency for local regulations.
- Consider replacing flammable roofing, siding, and other combustible building materials with fire-rated

*(continued on page 44)*



# SPACE

## steps to reduce wildfire threat



*From Natrona County Firewise — [www.firewisewyoming.com](http://www.firewisewyoming.com)*

### What is Defensible Space?

The term "defensible space" is used to describe an area of reduced wildfire threat around a home. You can modify your landscape to create defensible space by altering vegetation to decrease overall fuel volume and altering the arrangement and height of plant material. It is also important to ensure adequate space for firefighters to operate safely. These practices can make the difference between a structure surviving a wildfire or being destroyed.

Factors affecting how easy it will be to create your own defensible space are:

- The size of your property.
- Types of vegetation.
- Accessibility.
- Slopes and steepness.

In some instances, a homeowner may already have an effective defensible space in place and need to perform only minimal additional work to contribute substantially to protecting a home from wildfire.



non-combustible materials such as class A asphalt roof shingles, fiber cement siding, etc.

- Replace attic vents and soffits that are plastic or can easily allow embers to pass into the attic or other parts of the house. Vents should be metal and less than ¼-inch mesh.

It is also important to follow local regulations when creating defensible space. For example, the Casper Mountain Zoning District of Natrona County has regulations pertaining to fuel reduction requirements (see sidebar for Casper Mountain requirements). These requirements for homeowners on Casper Mountain are the only of their kind in Wyoming. If you live in an area without any requirements, these regulations may work as a guide.

Most people realize that homes in or adjacent to wildland vegetation are at risk for damage from wildfire. However, few people recognize that homes within urbanized areas are also threatened. During intense wildfires, burning pinecones, branches, and other material can be carried a half-mile or more beyond the fire front. As a result, showers of embers are produced. If these embers land in spots where there are easily ignited fuels such as wood shingle roofs, trash piles, and dried grass, new fires can start. Consequently, homes located in the urbanized portions of mountain communities, blocks away from wildland vegetation, are also at risk.

## How to create effective defensible space

Make the areas closest to your house lean, clean, and green—reduce the amounts of fuel, remove dead or high-risk vegetation, and keep the areas closest to your home well-maintained, green, and healthy. Many people find defensible space fits their other landscape objectives as well. The area closest to the house is where you entertain guests, eat outside in good weather, and enjoy a lawn or flower garden. Many homes are located adjacent to forests or prairie or on steep vegetated slopes, which are areas of high wildfire hazard. They need both the lean, clean, and green zone (first 100 feet) and the area outside of that as well.

### Step One: Determine your defensible space

The two main factors that will influence how much defensible space you'll need for your property are 1) the amount and type of highly flammable wildland vegetation (grass, shrubs, or trees) growing on or adjacent to your property and 2) how steep the area around and leading up to the home is. The minimum for most homes in Wyoming is 100 feet from the home, but a heavier



*This mountain cabin owner thinned and pruned up the trees, and removed a significant amount of under-brush. Limbs and whole trees have been chipped.*

amount of vegetation or steep slopes could mean at least 200 feet.

If the recommended distance goes beyond the property boundaries, contact the adjacent property owner, and work cooperatively to create defensible space. The effectiveness of defensible space increases when property owners work together. Do not implement defensible space practices on neighboring properties without first securing permission. The county assessor's office can provide assistance if the owners of adjacent parcels are unknown.

Once the recommended distance is determined, temporarily mark the outer boundary with survey flagging, or paint on trees or shrubs. The land located within this designated boundary is the defensible space you need.

### Step Two: Make a list of what you need to do, and do it *Clean Up*

Look around; is there any dead vegetation in your defensible space zone?

Dead vegetation includes dead trees and shrubs, dead branches lying on the ground or still attached to plants, dried grass and flowers, dropped leaves and needles, and firewood. Dead vegetation should be removed from the defensible space area. Two important exceptions are pine needles covering bare soil and downed trees embedded in the ground. Pine needles are good cover for bare soil but should be kept to a thickness of between one and two inches—more is a hazard, and less promotes erosion. Be careful not to remove the duff area – the dark brown zone beneath the needles where the needles have begun to decompose. Remove all pine needles under decks and





*This cabin owner followed up a year after the treatment with a native wildflower mix on the bare soil. Photo credit: Nick Williams*

within two feet of any structure. Move firewood piles away from the structure during fire season.

### **Break up the canopy**

Within your defensible space area, is there a dense, continuous cover of shrubs or tree canopies? Sometimes wildland plants grow as an uninterrupted layer of vegetation as opposed to patchy or widely spaced plants. The more continuous and dense the vegetation, the greater the threat of wildfire. If the branches of neighboring trees or shrubs touch without large openings between them, break them up. There are two types of dense, continuous vegetation that homeowners are likely to encounter in mountain areas – brush fields and crowded stands of coniferous trees.

#### ***Prairie and other brush fields***

Create a separation between shrubs based on shrub height and steepness of slope. The separation between individual or small groups of shrubs on flat to gently sloping terrain should be twice the height of remaining shrubs. For example, if the shrub height is four feet, then the recommended separation should be eight feet ( $2 \times 4\text{-foot shrub height} = 8\text{-foot separation}$ ). Separation is measured from the edge of the canopy of one shrub to another, not from trunk to trunk. The separation between shrub canopies should increase as the steepness of the slope increases.

#### ***Crowded and dense stands of trees***

In many mountain areas, coniferous trees occur in dense, overcrowded stands where their branches are touching or interwoven. These conditions contribute to the risk of an uncontrollable and possibly catastrophic

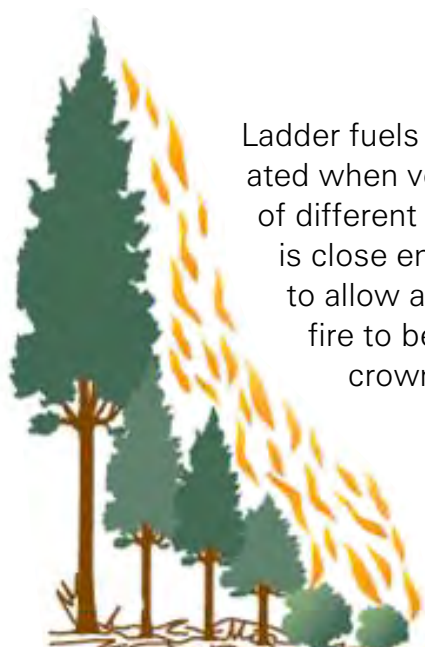
crown fire (wildfire burning through the tree canopies, independent of the understory vegetation). To address this problem, create a separation between trees within the defensible space area. This is typically accomplished through tree removal or thinning of the stands. Note the photos in this section; homeowners do not have to “clear cut” or completely remove all of the trees around their homes to have adequate defensible space.

### **Make sure there are no ladder fuels within your defensible space**

Sometimes plants serve like rungs of a ladder; they can carry flames from fuels burning at ground level, such as dead grass and weeds, to taller fuels such as shrubs, which ignite still taller fuels such as tree branches. The ladder fuel problem can be remedied by raising the height of the upper fuel layer by removing lower tree branches or reducing the height of lower fuel layers by pruning or removing tall shrubs or small trees. You could remove the lower tree branches or reduce the height of the shrub, or both. Exceptions to this practice are:

Removal of lower tree branches should not exceed one-third to half of the tree’s total height.

- Lower tree branches should be removed to at least seven feet in height when no understory vegetation is present.



Ladder fuels are created when vegetation of different heights is close enough to allow a surface fire to become a crown fire.

*From "A Landscape Guide for Mountain Homes," by University of Nevada Cooperative Extension*



*This cabin appears at first glance to not have any problems, but look closely at how thick and dense the forest is, how tall the brown grass is, and the firewood pile under and near the deck. See the photo to the right after the wildfire arrived*



*Firefighters were unable to reach this home in time before embers entered the firewood pile and the cabin, which caused the cabin to become fully involved with fire. Wildland fire fighters are often not equipped to handle structure fires once the house is fully involved with fire. Photo credit: Chris Fallbeck*

- Lower branches on shrubs taller than three feet should be removed to provide at least 12 inches of separation from the ground.

### **Step Three: Choose plants for defensible space areas**

Once you have accomplished the steps above, consider enhancing your defensible space when planning a landscape or planting. This can be fundamental to the effectiveness of the defensible space you are creating. In addition to choosing plants to meet needs such as providing shade, producing wind protection, adding color,

and controlling erosion—select plants rated as having a low fire hazard. Unfortunately, there are no fireproof plants. Any plant can burn during extreme fire conditions. There are, however, important differences in flammability. Some plants are more difficult to ignite, burn more slowly, produce less heat, and have shorter flame length. Ask a forester or arborist in your area if you are considering planting trees, shrubs, or grasses in your defensible space. Another resource is the “Wildfire” section of the *Barnyards & Backyards* website ([barnyardsandbackyards.com](http://barnyardsandbackyards.com)). There are a number of informative articles ranging

## **If forced to evacuate, you will want to be ready.**

Have a plan and list of things needed well before fire season. Here is a list of items to have on hand:

1. Three days of supplies for each person and animal
  - Water
  - Food that will not spoil (including pet food)
  - Clothes
2. Sleeping bag or blankets for each person
3. Sanitation supplies
4. Extra car keys, cash, and checks

5. Emergency tools

- First aid kit
- Flashlight
- Extra batteries
- Portable radio

6. Important family documents in a waterproof container
7. Extra supplies or medications for infants, older family members, or those having disabilities.
8. Map with two evacuation routes.

Put these items in easy-to-carry containers such as backpacks, duffle bags, or plastic crates.



from fire resistant landscape plants to ponderosa pine and aspen fire ecology.

#### **Step Four: Maintain for fire safety**

Remember these three words—lean, clean, and green—when there is any potential of wildfire in your area. Keep your landscape lean by reducing, removing, or replacing the most flammable vegetation within your defensible zone. Keep it clean—make sure there is no accumulation of dead vegetation or other flammable debris. Keep it green—make sure plants are healthy and green during the fire season. Creating a defensible space should not be viewed as a one shot effort. Maintaining an effective defensible space is an ongoing process.

Working together in your community, neighborhood, or homeowners association will improve the chances of you and others, along with your home and property, surviving a wildfire. Ask a forester or local fire department about how your community could become a nationally recognized “Firewise Community.” For more information about Firewise USA™, including additional tips on preparing your home for wildfire season, go to <http://firewise.org/>.

#### **Step Five: Ready, Set, GO!**

Once wildfire season is here, follow these three easy steps to help ensure you and your family’s safety:

**Ready – Preparing for the Fire Threat:** Be ready, be prepared, and create defensible space through completing the steps described above. Take personal responsibility, and prepare long before the threat of a wildfire so you, other family members, and your home are ready in case of fire. Assemble emergency supplies and belongings in a safe spot. Make sure all residents residing within the home are on the same page; plan escape routes.

**Set – Situational Awareness When a Fire Starts:** Pack your vehicle with your emergency items. Keep up on the latest news from local media and your local fire department. Think ahead and prepare domestic animals and livestock early if they may need to be evacuated.



Photo: BLM Idaho

Livestock trailers should be pre-positioned to capture any large animals long before the fire arrives.

**Go – Leave early!** Following your plan makes you prepared to leave at a moment’s notice, which gives firefighters the best opportunity to deal with the wildfire. Do not return to your home unless directed that it is safe to do so by an official person.

#### **Obtaining more information**

Wyoming State Forestry Division and most counties have Firewise® and fuels reduction programs to assist landowners who live in the wildland–urban interface. Some counties even have federal assistance grants for landowners to help offset some of the costs of creating defensible space. For more information, please contact your local state forester or Reed Oldenburg, Senior Resource Forester - Fuels, with the Wyoming State Forestry Division in Cheyenne, at [reed.oldenburg@wyo.gov](mailto:reed.oldenburg@wyo.gov) or (307) 777-6137. Or go to <http://wsfd.wyo.gov/fire-management/fire-grants-assistance/fuels-mitigation>.

*This document was modified from the University of Nevada’s Cooperative Extension document “A Landscape Guide for Mountain Homes”.*

**Nick Williams** was the fire resource forester for the Wyoming State Forestry Division.

**Public agencies and some local homeowners associations have fuel reduction requirements. Below are those for the Casper Mountain Zoning Area of Natrona County:**

**Casper Mountain Zoning Fuel Reduction Requirements for Building Permits**

**VEGETATIVE MANAGEMENT & DEFENSIBLE SPACE:**

(a) A mitigation plan for vegetative management and defensible space/fire safety shall be submitted with site plans for principle building construction. Zoning Certificates shall be issued after approval by the reviewing officials (fire inspector or other designated official, and building official).

(i) Vegetative Management Recommendations:

(A) Fuel breaks: This can be implemented along access roads, driveways, and subdivision boundaries. The fuel break should be a minimum of 10 feet wide, and all material should be removed as well as all live brush and trees under 20 feet tall. A few larger trees (20 feet tall and larger) can be left, although all branches should be pruned off to a height of 10 feet.

(ii.) Defensible Space Zones:

(A) Zone 1 – This area is the first 30 feet from the structure.

(I) Remove all dead material from this area, as well as firewood piles and other combustible materials.

(II) Maintain an area of non-combustible material 3 to 5 feet away from structure.

(III) Remove all shrubs and trees except for a few individuals. (Minimum spacing between crowns of trees is 10 feet.)

(IV) Prune branches off of remaining trees to a minimum height of 10 feet. If a tree is less than 20 feet tall, prune it to half of total height.

(V) Plant species in this zone should be of a fire resistant variety, which is mostly leafy species.

(These plants need to be watered well to maintain adequate moisture content.)

(VI) Keep all vegetation mowed to a height not exceeding 2 inches.

(VII) Prune away any branches that are within 10 feet of structure and 15 feet away from any chimney outlets.

(VIII) Clear pine needles, leaves, limbs and other debris from roofs and gutters.

(B) Zone 2 – This zone extends 70 feet beyond the outer edge of zone 1.

(I.) Thin all trees to a spacing of 8 feet between tree crowns.

(II.) Prune all remaining trees to a minimum height of 10 feet

(III.) Remove dead trees and downed combustible materials. (Firewood and other combustible material can be stored here, but keep it at least 15 feet away from trees.)

(IV.) Control ground vegetation.

(C) Recommendations for remaining lot area:

(I.) Mark all fire protection equipment and water sources so they are clearly identified.

(II.) Inspect power lines which are located on the property and ask the utility company to remove any trees located within 15 feet of the lines.

(III.) Locate propane tanks at least 50 feet from structures and maintain a clear 10 foot area around the tank. Also locate tanks at same or lower level as structure.





# TAKE A BREAK, FROM THE WIND!

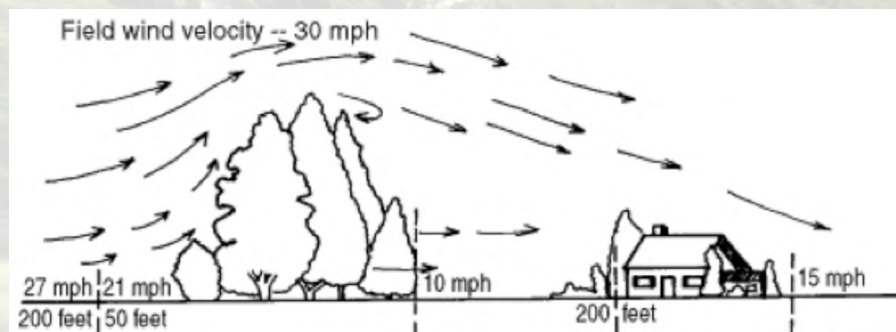
## Windbreak/living snow fence benefits, planning, and planting

Trees in our landscapes provide important benefits to our homes including wind and snow protection, energy conservation, shade, fruit, wildlife habitat, beauty, and possibly increased property values. Using trees and shrubs to create windbreaks can be especially beneficial for rural acreages. Depending on the area of the state you live, they can provide all the benefits mentioned above and make a substantial difference in your quality of life on your acreage.

A windbreak, which also acts as a living snow fence, is a band of shrubs and trees perpendicular to the prevailing winds. A multi-row windbreak can create a protected zone or microclimate on the leeward side (Figure 1). Large windbreaks surrounding homesteads create islands of increased comfort for you or your livestock in the open spaces of our state.

Properly designed multi-row windbreaks can provide many benefits:

- **Wind protection** – Protection from our sometimes fierce Wyoming winds creates more comfortable working conditions throughout all four seasons. Physical damage to buildings, paint, windows, roofs, and other structures can be reduced.
- **Snow collection and control of drifting** – Controlling where snow collects around your property can be a major factor in your quality of life. Snow that collects in your driveway can keep you from leaving or entering your property. You can spend many, many hours and significant amounts of money each year in snow removal.
- **Energy savings** – By reducing the wind that reaches buildings, windbreaks can significantly reduce heating costs. Savings of up to 40



**Figure 1.** Windbreak protection zone. (adapted from U.S. Department of Agriculture's Natural Resources Conservation Service)



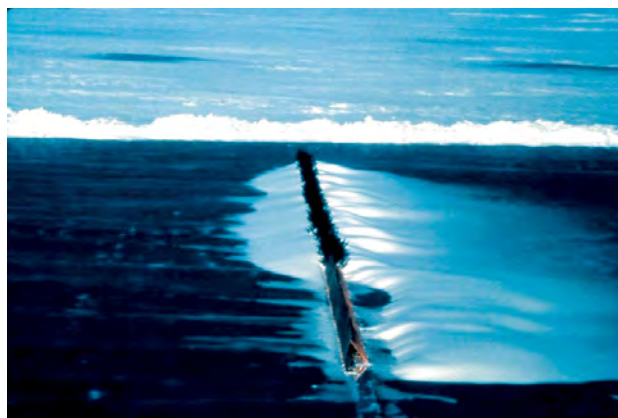
percent have been documented in buildings protected by windbreaks compared to unprotected buildings.

- **Aesthetic beauty** – Trees and shrubs with ornamental flowers, foliage, bark, and fruit can add a lot of beauty to your life. In addition, ornamental and otherwise useful trees and shrubs are an investment in your property's long-term value.
- **Wildlife habitat** – Wildlife utilize windbreaks for food, habitat, and cover. Many birds that nest in windbreaks eat insect pests. Fruit trees and shrubs such as chokecherry, sandcherry, gooseberry, and currant can be integrated into a windbreak planting to provide food for wildlife as well as for personal use.
- **Screening and filtration** – Windbreaks can help filter blowing soil or dust particles from fields and gravel roads, improving air quality around the home. They can also increase privacy and help reduce road noise.

## General considerations in windbreak/living snow fence planning

So you've decided to add a windbreak to your property. You'll first want to consider a few key points when coming up with a design. The first is the effect of density on how a windbreak acts as a windbreak and a living snow fence.

Density has a considerable effect on how the windbreak will function and is also directly related to height. Density is the relative proportion of closed space as compared to open space. For example, wooden snow-fence structures are commonly constructed of 4-inch boards each



*Research models show that density has a large impact on how a barrier will function. Note the drifting pattern created in the research model replicating the effects of a dense planting of trees in the upper barrier versus the effects a wooden snow fence would have (lower barrier).*



*Although this planting will provide good wind protection, the potential to cause severe drifting problems is high.*

separated by a 4-inch space. Because open space is equal to closed space, these structures would have a density of 50 percent.

Windbreaks that are designed to distribute snow over a large area should be tall and of moderate density (40 to 50 percent). Those designed to capture snow within a limited area should be composed of multiple rows with species that exhibit high winter densities (greater than 65 percent), like evergreens. A barrier that is 50-percent dense will cast a downwind drift equal to approximately 30 times its height when the windbreak is full. Thus, a 4-foot slatted snow fence (approximately 25-30 percent dense) can cast a downwind drift of approximately 120 feet. On the other hand, a twin-row planting of an evergreen species like juniper will exceed densities of 60 to 70 percent. These types of plantings behave more like a solid barrier. Snow will be deposited on the upwind side first then on the downwind side. When dense barriers reach equilibrium, drift lengths of 10 to 12 times barrier height can be expected.

The trick to designing a functional windbreak is to keep it close enough to areas the landowner wants to protect so wind velocity reductions are realized yet far enough away that snow is not deposited on the area to be protected. Areas to be protected should be no further away than 10 times the estimated height of the tallest tree row – but how close can the planting be? The Natural Resources Conservation Service (NRCS) recommends the first row in the windbreak that the wind hits be no closer than 150 feet from the area to be protected. This minimum distance is based upon average windbreak densities, heights, and expected snowfall amounts and will keep protected areas free of snow during most storms while maximizing wind-control benefits. Local conditions should be considered when determining the final location of the planting. Poor tree location may create considerable problems.

A common mistake in windbreak design is failing to make the planting long enough. Wind sweeps around the end of a barrier much like



water as it moves around a rock in a stream. This phenomenon is known as “end effect” and reduces snow-storage capacity and increases wind velocities at each end of the barrier. The windbreak should be extended at least 100 feet beyond the areas requiring protection on each end.

In summary – allow room for snowdrifts to accumulate. Plant the first row that will be hit by the wind 150 to 200 feet away from the area to be protected. Setbacks of 150-200 feet from a roadway are often required by county governments to prevent snow collection on road surfaces. Placing it closer could cause drifting on the area you wanted to be protected. Second, allow space for trees and shrubs to mature. Generally, small shrubs should be planted 4 to 6 feet apart; medium shrubs and small evergreens 6 to 8 feet apart; and large trees 12 to 15 feet or farther apart. The spacing between rows is generally no less than 12 feet, to allow for the growth of large evergreens and to allow room for the use of mechanical equipment between rows for maintenance activities.

## Draw a Rough Sketch

With those basic considerations in mind, the first step is to draw a rough sketch of your property. Indicate the direction of prevailing winds in your area, property lines, irrigation source, any overhead or underground utilities, and the area to be protected. Next, determine how many rows to plant. The most common arrangement is three rows: one shrub row for the row that will be hit first by the wind, a medium evergreen row in the middle, and then a large evergreen row closest to the area to be protected. The more rows that are planted, the denser the snow fence will become.

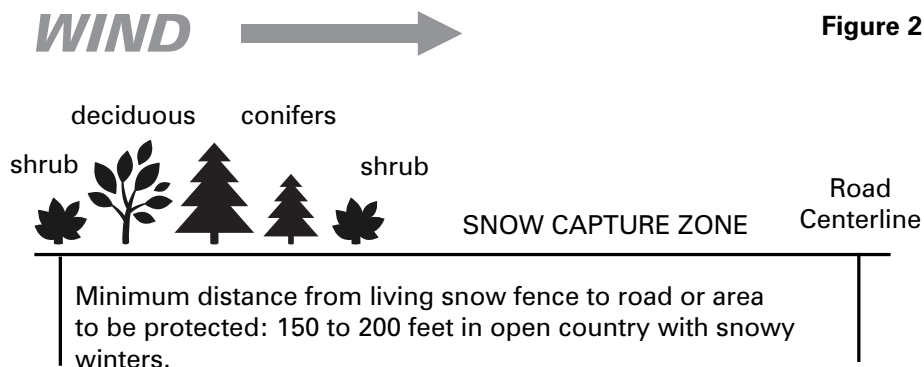


Figure 2

## Select Your Trees

Pick the species of trees and shrubs that will be the most successful for your region. Several factors should be considered. Soil types (sandy, loamy, and clayey), soil quality (pH, alkalinity, salinity, and nutrient availability), average annual precipitation, and the U.S. Department of Agriculture Plant Hardiness Zone for your area are among the factors that have a large impact on the success of trees and shrubs. Being aware of your soil characteristics will assist

in determining which tree and shrub species are best adapted to the site and will have the best chance for survival. The NRCS, conservation districts, and University of Wyoming Extension can help answer questions, and soil testing laboratories can assist in determining your soil type. It is also important to choose species that are either native to your area or a hardy non-native that will survive a Wyoming winter. Consider whether the species needs to be drought tolerant. A windbreak can consist of a

## Potential tree and shrub species

### Shrub

Common lilac  
Sandcherry  
Nanking cherry  
Currant  
Cotoneaster  
Serviceberry  
Chokecherry  
American plum  
Buffaloberry  
Privet

### Small Deciduous Trees

Amur maple  
Gamble oak  
Hawthorn  
Tartarian maple

### Tall Deciduous Trees

Green ash  
Hackberry  
Bur oak  
Honeylocust

### Small Conifer

Rocky Mountain juniper  
Eastern red cedar  
Pinion pine

### Tall Conifer

Ponderosa pine  
Colorado spruce  
Austrian pine  
Douglas fir



single plant species if that is the only type adapted to the site; however, use of multiple species can add diversity that will help the windbreak better survive disease or insect issues.

## Preparing the Site

Stake the intended rows. Always “call before you dig” by dialing 811. The people at One Call of Wyoming will let you know if there are underground lines or wires that will need to be avoided. When planting seedling trees, it is best to “rip” the soil about 18 inches deep and 3 to 4 feet wide. For some, this is not possible due to lack of access to equipment. At the very minimum, rototilling to a depth of 6 to 8 inches will loosen the soil and make way for tree or shrub roots to establish and grow.

Next, place a fabric weed barrier over the rows; this will help trees survive by conserving moisture and controlling weeds. The weed barrier is pulled taut and then secured by using long staples on the edges and then burying the edges with soil. Start at one end, cut an X in the middle of the fabric (this is where you will dig your planting hole) (Photo 1). Then measure

from there the distance to the next tree and continue.

When planting seedling trees (see Figure 3), dig a hole the depth and width of a shovel head (Photo 2). Dig until the shovel head fits snugly. Make sure roots all point down and spread out. If improperly planted, a tree root can curve back up to the surface (called a J-root, Photo 3) and can kill your tree. Push the soil into the hole around the roots, firmly packing as you go (Photo 4). Large air pockets around the roots can cause roots to dry out.

## Amend or Not to Amend

People often ask if the soil should be amended prior to planting seedlings. A soil amendment is any material added to a soil to improve its physical properties, such as water retention, permeability, water infiltration, drainage, aeration, and structure. The problem that arises with amending soil for trees is that eventually their roots will grow beyond the organic or inorganic improvements that have been made, and they will have to live in the soil in which they are planted. Once the tree’s roots spread through the good “amended” soil into the



original soil, the tree may be stressed. Trees acclimated to their environment from the beginning do best. Also, high-nitrate fertilizers can burn the roots of the trees and should not be applied for the first three years.

Once planted, trees require careful attention the first few years. Water without overwatering. A drip irrigation system is often useful in getting the right amount of water where you need it. See *Barnyards & Backyards* magazine’s Spring 2011 issue article “Drip irrigation system delivers right amount of water right where it should” for detailed information on installing a drip system. The article is available online at [barnyardsandbackyards.com](http://barnyardsandbackyards.com). Species such as pine and juniper can easily be overwatered. Irrigation and drip systems can efficiently deliver a measured amount of water to each tree. Drip systems use emitters that are 1 to 2 gallons per hour. Your local conservation district is a good resource for helping design a watering system and showing you how much to water the trees.

## Protect Against Wildlife

Wildlife can harm seedling trees. Deer, antelope, elk, gophers, rabbits, and even livestock can make a meal of newly planted trees (Photo 5), and during the fall rut, buck deer can cause

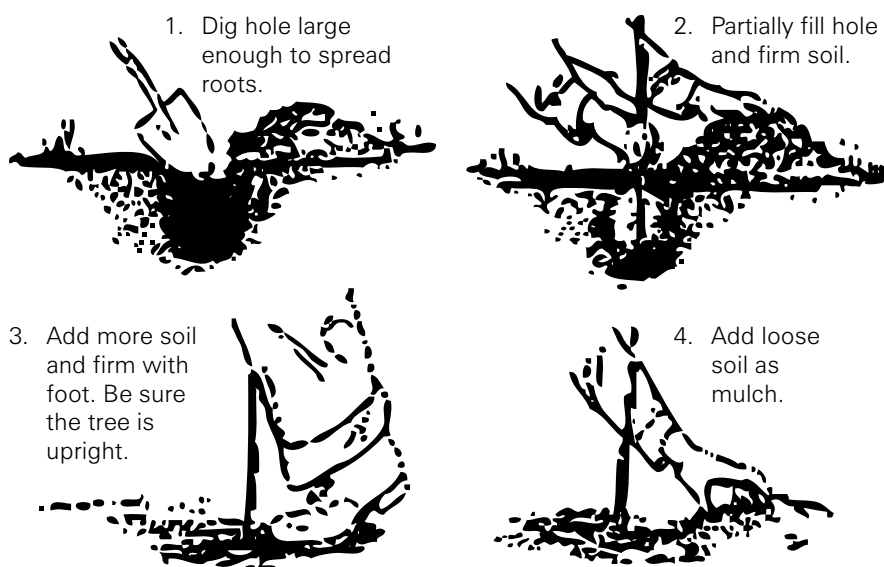
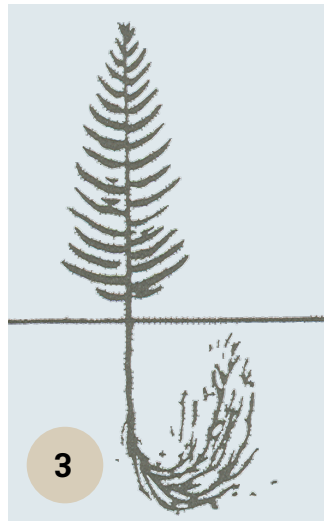


Figure 3: *University of Minnesota Extension*





2



3



4



5

severe damage to some species (depending on the height) when they rub their antlers on the bark. Some precautions include putting a fence around the tree rows, using tubes, or using a repellent for browsing. Tree protectors (Photo 6) and tubes can help protect seedling trees from wind. These can be purchased from forestry suppliers, some nurseries, or your local conservation district.

To protect conifers and broadleaf evergreens, you can use an anti-transpirant, available at your local

weed and pest control district and some conservation district offices. Antitranspirants, sprayed over the tree usually in March and November, seal in moisture and create a barrier that will help protect the trees from becoming wind burned.

Growing trees in Wyoming is always a challenge. With a little planning and a lot of care, your living snow fence can be successful. The benefits go far beyond beauty and summer shade.

Good luck, and happy planning and planting!



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### The material in this section was adapted from:

"Windbreak and Living Snow Fence Design," North Dakota State University Extension Service.

"Trees, a natural solution to snow problems," Winter 2006 *Barnyards & Backyards*, by James Arnold, available at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

"How to plan and plant a living snow fence," Winter 2011 *Barnyards & Backyards*, by Liz Harvey and Martin Curry, available at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

Additional contributors: Jennifer Thompson and Mark Hughes

### For more information

Wyoming conservation districts – <http://www.conservewy.com/DISTRICTS.htm>

Natural Resources Conservation Service Wyoming offices – [www.wy.nrcs.usda.gov/wymaps/wycomap.html](http://www.wy.nrcs.usda.gov/wymaps/wycomap.html)

Wyoming State Forestry Division – <http://slf-web.state.wy.us/forestry.aspx>

University of Wyoming Extension county information – <http://www.uwyo.edu/ces/areas/index.html>

### Other written resources

*Trees for conservation – A buyer's guide*, is a publication from Colorado State Forest Service that provides

information to select your tree and shrub species for a living snow fence and is available at [csfs.colostate.edu/pdfs/08byrgd-www.pdf](http://csfs.colostate.edu/pdfs/08byrgd-www.pdf)

*Windbreaks for snow management*, EC1770, is a publication from the University of Nebraska—Lincoln Extension at <http://www.ianrpubs.unl.edu/epublic/live/ec1770/build/ec1770.pdf>

"Reducing deer and rabbit damage to woody plants," Spring 2008 *Barnyards & Backyards*, available at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

"Getting the straight dirt: How to test the health of your soil," Spring 2006 *Barnyards & Backyards*, Available at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).



## FIGURING OUT WHAT YOU HAVE

Soils take hundreds to thousands of years to form. While states in the Midwest are usually blessed with deep, fertile topsoil (the layer of the soil where most of our plants grow), our Western soils can be more challenging and good topsoil can be scarce in supply. The characteristics of the soils we live on dictate what we can do with them and how we should sustainably manage them. Gathering information on the soils that exist on your property will allow you to best utilize and care for them.

In general, Wyoming soils present several special challenges. Our pHs, a measure of how acid or alkaline a soil is, are often high, which changes the availability of many nutrients in the soil. Our soils generally have low organic matter, which decreases water holding capacity and decreases the potential for deriving some nutrients from the decaying organic matter. There are areas of the state where salts and/or sodium are high,

which can also interfere with nutrient uptake. Some of these issues can be dealt with by selecting the appropriate plant species for your soil; others can be minimized by proper management techniques.

In this section, we will cover how to find general information about your soil, collect soil for testing, and interpret the results.

### **Finding general information about your soils through a soil survey**

We use soil in a variety of ways. It provides the foundation for buildings, supports crops and landscapes, and can be used to treat our wastes. To get a general idea of what your soils may be best suited for, consult a Natural Resources Conservation Service (NRCS) soil survey. These surveys, which consist of maps of the dominant soil types in your area and data about their physical and chemical properties, are the result of many years of on-the-ground scientific

inventories. In addition to identifying the soil types in your area, these surveys also provide information on what uses each soil type is suited for and what limitations it might have. Though conducted on a larger scale, information from the survey is even useful for small areas as it will help you understand how the surrounding area affects your site.

The soil survey maps, soil descriptions, and data about the soil's chemical and physical properties can help you understand what you are seeing when looking at the actual site. An on-site evaluation is critical since, as mentioned previously, the soil survey is done on a broad scale and does not record small areas whose conditions may vary significantly from the majority of the surrounding landscape. You'll need your own on-site observations and the results of soil samples taken from your site before making any big decisions on how to use your land.



Much of Wyoming has been mapped, and the soil surveys are available in printed form at NRCS offices, some libraries, and online at [websoilsurvey.nrcs.usda.gov](http://websoilsurvey.nrcs.usda.gov). Check with your local NRCS office to find out if the survey for your area is complete. If it isn't, the local office may have preliminary unpublished maps that you can study.

For more information on soil surveys and on how to use the website read:

"You can use the web to explore your soils", – *Barnyards & Backyards* article, Spring 2009. Find it at [barnyardsandbackyards.com](http://barnyardsandbackyards.com).

## **Soil Tests Provide Nutrient and Soil Physical Property Information That Can Help You Grow Plants**

Soil tests give you specific information about your soil that a soil survey cannot provide. They can help assess the suitability of a site for growing specific plant species and tell you what nutrients are needed, whether it is grass, alfalfa, small grains, garden vegetables, trees, or flowers.

There are many types of tests available – select your test package based on what is known about your site and what your objectives are. If growing crops and production has been acceptable and there are no obvious problem areas in forage or field-crop yields, you may only need to test for nitrate, phosphate, potassium, organic matter, pH, salt and texture. If you are looking at landscaping, you may wish to include iron, zinc, copper, and manganese. If you have had trouble growing a particular plant type, you may need more extensive tests. A University of Wyoming (UW) Extension educator or the laboratory where you have your tests run can help you decide if you need supplemental tests (specific

information on testing and facilities that analyze soil is discussed later).

## **Timing is Important**

If you are planning to apply fertilizer to your land, soil sampling a few weeks before the planned date of application is usually best. Equipment and time constraints can sometimes prevent this, and samples can be taken at other times. If you are planning to test your soil multiple years in a row (such as for crop production), it is best to take samples the same time each year so results can be compared "apples-to-apples". This is because the residual nutrient content of the soil can change over time. Some nutrients leach out as the year goes on, and others can be released and made available from the organic matter or the mineral material in the soil. So establish a sampling time that suits your needs, and be consistent. For crops, keep records showing production results, and compare them to soil test reports. Remember, fertilizer recommendations are based on average crop performance, and other factors (sample timing, changing water availability, slope, etc.) may require slightly increasing or decreasing the suggested rates.

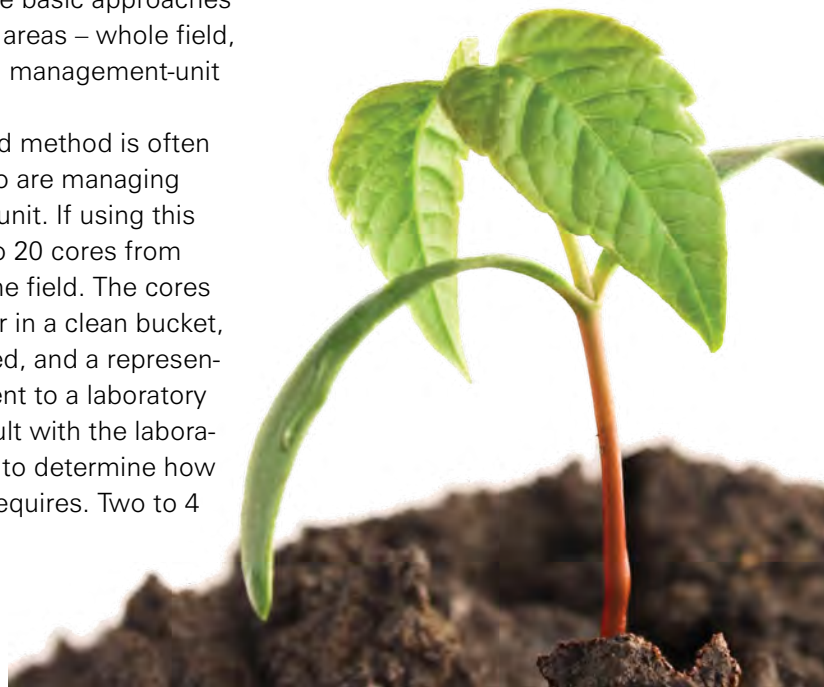
## **Where to Sample**

Next, identify the areas to sample. There are three basic approaches to choosing these areas – whole field, grid sampling, and management-unit sampling.

The whole-field method is often used by those who are managing a whole field as a unit. If using this method, take 15 to 20 cores from random areas in the field. The cores are mixed together in a clean bucket, stones are removed, and a representative sample is sent to a laboratory for analysis. Consult with the laboratory you are using to determine how large a sample it requires. Two to 4

cups of soil are usually sufficient. Unusual areas in the field, such as salt deposits, animal watering or feeding areas, and old building sites should be avoided. If information is desired about those sites, they should be sampled separately. The whole-field method treats the entire field in the same manner and can result in over-fertilizing some areas and under-fertilizing others.

Grid sampling is the method that is often chosen by those who are growing high-value crops and have equipment that can apply varying rates of fertilizer to different parts of the fields. With grid sampling, the field is divided into uniform cells, usually one to two acres in size. Ten to 15 cores from random areas within each cell are taken. The cores are mixed, and a subsample is sent in for analysis. Avoid unusual areas. Grid sampling usually results in more accurate estimates of nutrient availability. If variable-rate fertilizer application equipment is not available, growers will not be able to take advantage of that accuracy. This method requires many samples for one field and can be expensive. Unless high-value crops are being grown, it may not be worth the additional expense.



A compromise between whole-field and grid sampling is the management-unit approach. Divide a large field into several smaller sampling areas based on known characteristics. These may be soil type (from soil survey data), historical management differences, yield data, or aerial photographs that show distinct differences in plant growth. Fifteen to 20 random cores are taken from each management-unit area. Mix these, remove the rocks, and submit a subsample to your chosen laboratory.

For landscape areas, the management-unit approach usually works well. Your lawn, garden, shrub area, and flowerbeds would each be separate samples. Take 10 to 15 random cores for each area, mix the samples from the area, pitch the rocks out, and submit a subsample for the mixed material.

## Taking the Sample

A good soil test requires collecting good soil samples. First, decide if surface (0-6 inches or 0-8 inches) samples will be taken or if surface and deep samples (to 2 or 3 feet) will be taken. Deep samples are usually only taken for field crops. These deep samples are tested for nitrate. They can help the lab make a more accurate nitrogen fertilizer recommendation than if just surface samples are submitted.

Start with clean tools. A plastic bucket and a shovel are all that are needed; however, a soil probe, which removes a soil core, makes taking consistent samples easier. Many of

the University of Wyoming Extension offices have a probe that you may borrow. To sample, remove plant debris (dead plants and roots, thatch, seed pods) from the top of the soil, and use a soil probe to remove a 6- or 8-inch-long core of soil. If using a shovel, dig a hole and then shave a 1- to 2-inch wide slice off the side of the hole to a depth of 6 or 8 inches. Make sure the slice is as thick at the bottom as it is at the top.

Go to other random sampling areas and repeat the process. Mix the cores or slices well, and discard any large stones. The soil should be spread on a clean, non-metallic surface (a plastic tray is a good choice) and allowed to dry in the shade. Mix the soil again, and put 2 to 4 cups of soil in a clean plastic bag. DO NOT dry it in the oven or microwave to speed the process; this can collapse the clays and trap some nutrients, therefore ruining the sample.

## Submit the Sample

You are now ready to send your sample for testing. The more information provided to the laboratory, the better the quality of the recommendation. Information about your water source, watering schedule, method of irrigation, condition of current plant life, expectations for future plant life, depth of soil, manure applications, drainage, and type of fertilizer you wish to use (organic or conventional) are all considered when making a fertilizer recommendation. Most laboratories have an information sheet that you fill out and submit with your sample. It will ask for the information

the laboratory needs to make a good fertility recommendation.

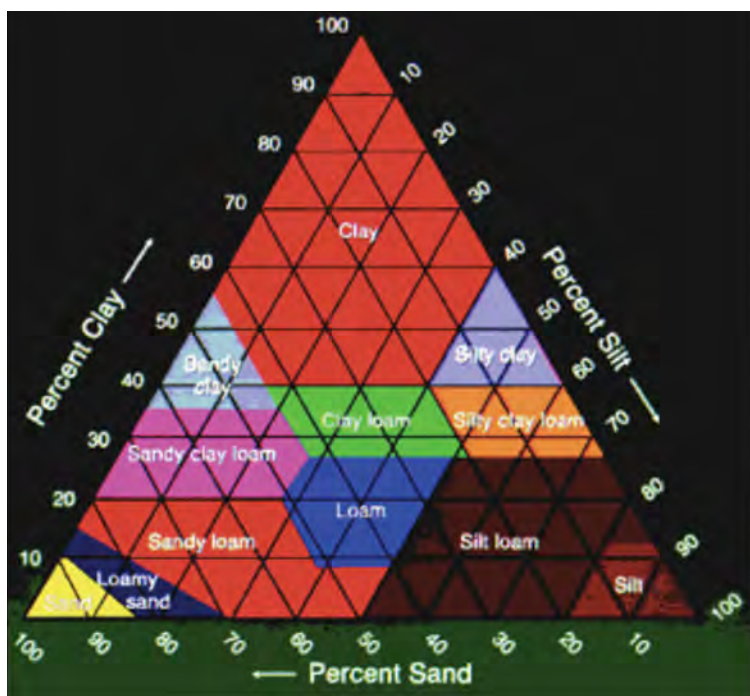
There are a variety of soil testing labs in the region. Contact your local UW Extension office for information on the labs that are available. The Colorado State University Soil Testing Laboratory takes samples from across Wyoming – information sheets and costs can be found at <http://www.soiltestinglab.colostate.edu>.

## Reading your soil test report

Your soil test report can provide valuable information about soil conditions and help you become a more successful grower of crops, garden vegetables, or ornamental plants. To make the best use of the soil, you need to understand how to interpret soil test results. The soil properties covered in your soil test report interact in a complicated system. Physical and chemical properties both affect a plant's ability to grow and produce seed, foliage, roots, or fruit. The fertilizer recommendations given on the soil test report are only guidelines based on test results and information provided on the sample questionnaire when the soil sample was submitted. There may be other adjustments that should be made based on factors beyond the control or knowledge of the laboratory that makes the recommendation. Different crops require different amounts of nutrients. Follow the recommendations on your soil test report (which are based on the crop you told the lab you wanted to grow) to determine the quantity of any amendment(s) that should be added.







**Figure 1: Soil Texture Triangle (U.S. Department of Agriculture)**

## Possible Soil Tests

**Texture:** Soil texture describes the amount of sand, silt, and clay in a soil. Soil textures can be divided into three broad groups: **light** (sand, loamy sand, and sandy loam), **medium** (loam, silt loam, silt, and sandy clay loam), and **heavy** (clay loam, silty clay loam, sandy clay, silty clay, and clay).

**Light** soils drain quickly and need to be watered frequently to maintain enough water for good growth of most plant species. Light soils allow soluble nutrients like nitrate and sulfate to be leached (travel through and out of the soil layer with water) quickly. Two or three small applications of soluble nutrients over the growing season will help prevent loss of valuable fertilizer.

**Medium**-textured soils are usually the most favorable for plant growth. They generally hold the most plant-available water and usually have adequate nutrient-holding capacity.

**Heavy** soils are often characterized by slow water-infiltration rates

and high nutrient-holding capacity. They hold more water but generally do not release as much of it to the plants as a medium soil will release. Heavy soils may require more phosphorus but are less prone to nutrient leaching losses and require less frequent irrigation than lighter soils.

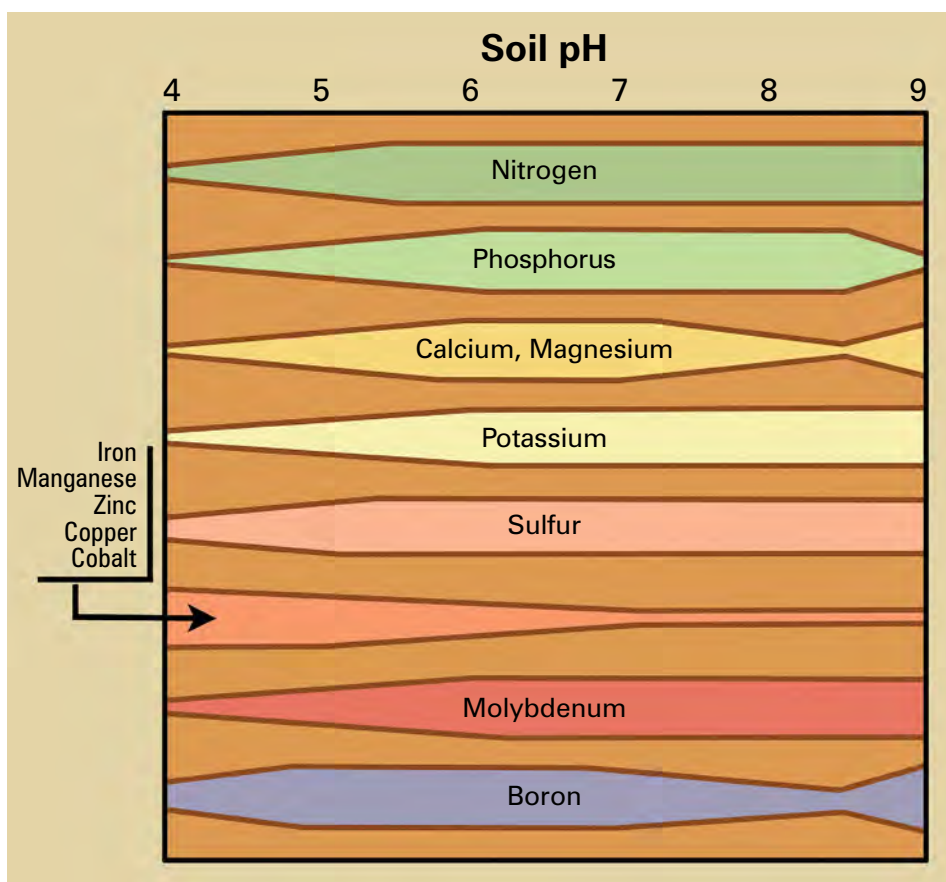
Figure 1 shows the sand, silt, and clay percentages for different soil textures.

Very light and very heavy soils can create management problems. Soil texture is not easily modified, and soil texture problems are usually corrected by careful water management and building up soil organic matter.

**Soil Organic Matter:** Organic matter is important in maintaining the soil's desirable chemical and physical properties. Organic matter improves water-holding capacity (especially plant-available water), permeability, aeration, and resistance to compaction. Organic matter increases the soil's ability to absorb and hold plant nutrients and releases nutrients as it decomposes. Herbicide

rates can be affected by soil organic matter levels. Some herbicides are adsorbed by organic matter and this can cause their effectiveness to change. Consult the product label for specific guidelines. Organic matter is also important in maintaining necessary biological activity in soil. Many Wyoming soils have less than 2 percent organic matter and will benefit from practices that encourage organic matter accumulations. Over time you should try to build your soil organic matter up to 5 or 6 percent if you are trying to grow crops. Organic matter is a tool you can use to help address a number of soil issues. You can use it to modify drainage, water retention, or soil texture/structure problems. Add high quality organic matter when needed, fall or spring. Use manure and compost carefully because both can be a source of disease, contaminants, and salts. Use only well-aged or composted manure (see this guide's "Manure" section for more information on composting). Other sources of organic matter include: sawdust (If you use sawdust, you'll need extra nitrogen, about 2lb N /cu yd of sawdust), green manure from a cover crop, leaves, straw, or peat moss.

**Lime Estimate:** Lime is a source of calcium, an essential plant nutrient, but high-lime soils (lime content >2 percent), which are common in Wyoming, require more phosphorus and possibly more potassium than other soils. Many nutrients exist in plentiful quantities in these soils but some can't be used by plants due to the excess calcium and high pH of high-lime soils. Therefore, some plant nutritional imbalances may be observed. (For example, iron, though abundant in many of our soils, becomes insoluble and unavailable to plants at high pH. This is a common problem in home landscapes.)



**Figure 2:** Nutrient availability at different pHs A wider bar indicates the nutrient is more soluble at that pH and therefore more available to plants. (Source: eXtension)

**Soil pH:** pH is a measure of the acidity or alkalinity of a soil. The pH of most Wyoming soils is between 7.0 and 8.5. As a comparison, lemon juice has a pH of about 2, while ammonia has a pH near 11. A pH above 7.0 is alkaline; a pH below 7.0 is acidic. A pH of 7.0 is considered neutral. The optimum pH for most common plant species grown in crop fields or gardens will fall between about 6.0 and 7.0 (slightly acid), but many plants will actually tolerate a wide range in soil pH. If the pH is below 6 or above 8, the solubility of some essential nutrients changes dramatically (see Figure 2.), and toxicities can even occur at the extremes. Perhaps the most common problem observed with soil-pH extremes is nutritional imbalance. Soil pH can also affect herbicide activity.

Very acidic soils can be improved by adding lime, but alkaline soils resulting from high lime are not easily changed. The higher pHs of Wyoming's soils are usually due to the presence of free calcium carbonate (lime). Neutralizing lime is difficult to do on a landscape basis, and over time the soil usually returns to its original pH. If you want to grow plants that prefer acidic soils, consider purchasing potting mixes formulated for acid-loving plants and grow them in pots or other decorative containers.

**Salt Estimate:** Salt buildup, or soil salinity, is common in arid and semiarid regions and is often caused by poor quality irrigation water and/or poor soil drainage. Soil salinity may usually be corrected by improving soil drainage and leaching. The sensitivity

of plants to salts vary with growth stage. Many species are more sensitive to salts during germination and emergence than during vegetative growth.

**Salts can come from many sources:** the rock from which the soil weathered, dissolved salts in water, manure or fertilizer applications, or salts from applications to roads and sidewalks during wintry weather. High salt levels can cause wilting, leaf burn, stunting, germination failure, and nutrient uptake failure in plants.

In general, if the problem is salt and you have good drainage, the answer is to leach the soil with good water and then retest the soil. If you do not have access to good water or cannot establish good drainage, consider choosing plants that are tolerant to salt. Tables 2 and 3 show the salt sensitivity of some common Wyoming crops. If you are trying to grow trees and shrubs in these areas, read the Spring 2010 *Barnyards & Backyards* article "Establishing trees and shrubs on salt-affected sites" (at [barnyardsandbackyards.com](http://barnyardsandbackyards.com)) for more information.

Sodium is a component of some salts and creates special problems in the soil. In addition to causing symptoms similar to high salt, sodium can cause a loss of soil structure, which can slow water infiltration and movement or even stop it. Under sodic (high sodium) conditions, the pH often increases to 8.5 or above, and the decay of organic material may be slowed.

Laboratory tests can determine if the problem is high salt, high sodium, or both. If soil is high in sodium, the treatment becomes more difficult. There are a number of materials (gypsum, sulfur, and lime sulfur, for example) that can be used to replace sodium in the soil. After the material has been allowed to react with the

(continued on page 61)



**Table 1. Relative crop tolerance to soil salinity.**

Relative crop salinity tolerance rating	Salt estimate at which yield loss begins
Sensitive	< 1.3 dS/m (deciSiemens per meter)
Moderately sensitive	1.3 – 3.0
Moderately tolerant	3.0 – 6.0
Tolerant	6.0 – 10.0
Unsuited for most crops (unless reduced yield is acceptable)	> 10.0

From Ayers, R. S., and D. W. Westcot. 1985. Water quality for agriculture. FAO Irrigation and Drainage Paper no. 29.

**Table 2 – Relative salt tolerance of field and forage crops.\***

			Interpretation		
Field crops	Forage grasses	Forage legumes	Low	Moderate	High
			-----mmhos/cm----- or dS/m		
-----Sensitive-----					
Dry bean Onion	Meadow foxtail	Alsike clover Ladino clover Red clover White Dutch clover	0-2.0	2.1-4.0	>4.0
-----Moderately Sensitive-----					
Corn Oat (forage) Potato Rye (forage) Millet Sunflower Turnip	Bluebunch wheatgrass Garrison creeping foxtail (seeding) Grasses (general) Green needlegrass Intermediate wheatgrass Meadow fescue Needle and thread Orchardgrass Redtop Reed canarygrass Slender wheatgrass Smooth bromegrass Timothy	Alfalfa (seeding) Cicer milkvetch	0-3.0	3.1-6.0	>6.0
-----Moderately tolerant-----					
Canola Oat (grain) Rape Rye (grain) Safflower Sorghum Sudan grass Sugar beet Wheat	Beardless wildrye Canadian wildrye Crested wheatgrass Garrison creeping foxtail (estab- lished) Indian ricegrass Native ricegrass Streambank wheatgrass Tall fescue Tall wheatgrass Western wheatgrass	Alfalfa (established) Birdsfoot trefoil White sweet clover Yellow sweet clover	0-6.0	6.1-12.0	>12.0
-----Tolerant-----					
Barley Asparagus	Altai wildrye Russian wildrye Tall wheatgrass (established)		0-9.0	9.1-15.0	>15.0

\*This list is only an indication of the salt tolerances of major plant groups. These “indicator” plants can be useful in determining the salt tolerances of closely related plants or plants adapted to similar sites.

**Table 2 – Relative salt tolerance.\***

			Interpretation		
Woody fruits and trees	Ornamentals, grasses, and groundcovers	Herbaceous fruits, vegetables, and flowers	Low	Moderate	High
			-----mmhos/cm----- or dS/m		
-----Sensitive-----					
Apple	American linden	African violet	0-2.0	2.1-4.0	>4.0
Cherry & Prunus spp.	Cotoneaster	Bean			
Chokecherry	Littleleaf linden	Carrot			
Currant	Mock orange	Onion			
Gooseberry	Oregon grape	Parsnip			
Pear	Redtwig dogwood	Strawberry			
Plum	Rose				
Raspberry					
-----Moderately Sensitive-----					
Aspen	Clematis	Broccoli	0-3.0	3.1-6.0	>6.0
Black locust	Common snowball	Cabbage			
Cottonwood	English ivy	Cantaloupe			
Fir	Honeysuckle	Corn			
Grape	Kentucky bluegrass	Cucumber			
Green ash	Lilac	Flowers, general			
Honeylocust	Orchardgrass	Gladiolus			
Maples (most)	Privet	Lettuce			
Poplar	Serviceberry	Pea			
Siberian elm	Wayfaring tree	Pepper			
Spruce	Yellow sage	Potato			
Willow		Pumpkin			
		Radish			
		Spinach			
		Tomato			
		Turnip			
		Watermelon			
-----Moderately tolerant-----					
Autumn olive	Blue grama	Beet	0-6.0	6.1-12.0	>12.0
Evergreens	Buffalograss	Carnation			
Hackberry	Caragana	Chrysanthemum			
Juniper	Crested wheatgrass	Squash, zucchini			
Pine	Fine fescue				
	Perennial ryegrass				
	Potentilla				
	Tall fescue				
-----Tolerant-----					
	Alkali grass	Asparagus	0-9.0	9.1-15.0	>15.0
	Creeping bentgrass				
	Iceplant				

\*This list is only an indication of the salt tolerances of major plant groups. These “indicator” plants can be useful in determining the salt tolerances of closely related plants or plants adapted to similar sites.



soil, the treated area is leached to remove the sodium.

Never begin treatment for a salt or a sodium problem without having the soil tested and consulting with a qualified professional. If treatments are done improperly, soil conditions can become worse. After leaching a saline or sodic soil, have the soil retested to establish the effectiveness of the process.

**Nitrate-NO<sub>3</sub>-N:** Nitrogen (N) is usually the nutrient required in the greatest quantities by plants. The nitrate form of N is available to plants. Most nitrogen fertilizer will be transformed to the nitrate form if water and oxygen are present in the soil. Be aware, however, that excessive N applications can be detrimental to both the crop and the environment. Because nitrate is easily leached from the soil, excess nitrate can end up in the ground water (high levels in water can cause methemoglobinemia, or blue baby syndrome, and excess nitrogen in soils can also be toxic to plants). Nitrogen recommendations are usually adjusted for soil organic matter, past manure applications, cropping history, and several other factors as necessary when such information is available. Follow application recommendations carefully, and do not exceed the recommended rate.

**Phosphate-PO<sub>4</sub>-P:** Phosphorus (P) is essential for all plants and is often applied as fertilizer because much of the total P in the soil is in forms unavailable to plants. It functions as one of the major factors in photosynthesis, nutrient transport, and energy transfer. Phosphate application is often recommended when soil P has not been built up by previous fertilization. Phosphorus is considered immobile in soil, does not leach readily in soil, and does not usually constitute an environmental hazard when soil erosion is

prevented. Soil-test phosphate is an index of phosphorus availability and should not be considered a measure of the actual amount available to plants. Different labs use different methods for determining an available phosphorous index so be sure to only compare results between laboratories if they have used the same method. Phosphorus recommendations are often increased on heavier soils (sandy clay loam, clay loam, silty clay loam, sandy clay, and clay) and on high-lime soils.

**Potassium:** Potassium (K) is usually required by plants in relatively large amounts. Potassium assists in photosynthesis, stronger stalks and stems, and movement of water, nutrients, and carbohydrates in plant tissue. Potassium is considered immobile in soils and does not usually constitute an environmental hazard. Most Wyoming soils have large K reserves, and K fertilizer applications are usually not necessary. However, some K deficiencies

have been observed in some parts of the state having soils that have been under production for many years in areas where the soil is light in texture. Potassium analysis is recommended if the soil has not been tested for K recently.

**Iron and Zinc:** Iron (Fe) and zinc (Zn) are often abundant in Wyoming soils but are in forms unavailable to the plant. Deficiencies of these nutrients may be observed in susceptible plants growing in high-lime soils. Zinc may be applied to soil, but soil applications of Fe are often ineffective because the iron is rapidly transformed to an unavailable form. When Fe and/or Zn deficiencies are confirmed, foliar fertilizer treatments may be beneficial.

**Copper and Manganese:** We don't usually see a plant response to copper or manganese in Wyoming. Apply these at the recommended rate if your soil test report indicates low levels.



### Calculating Your Fertilizer Needs:

Fertilizers are rated by percentage of available nutrients. Diammonium phosphate fertilizer with a grade of 18-46-0 contains 18 percent nitrogen (N), 46 percent phosphorus (P<sub>2</sub>O<sub>5</sub>), and 0 percent potassium (K<sub>2</sub>O).

One 10-pound bag of 16-20-0-24S contains 16 percent (1.6 pounds) nitrogen, 20 percent (2 pounds) phosphorus (P<sub>2</sub>O<sub>5</sub>), no potassium, and 24 percent (2.4 pounds) sulfur. The rest is filler or companion ions.

To calculate the amount of fertilizer needed:

$$\frac{(\text{Pounds nutrient needed}) \times 100}{\% \text{ nutrient in fertilizer}} = \text{pounds of fertilizer needed}$$

For example, if the fertilizer grade is 34-0-0 (34% N, 0% P<sub>2</sub>O<sub>5</sub>, 0% K<sub>2</sub>O), and you need 1 pound N/1,000 sq ft, you would apply 2.94 pounds:

$$\frac{(1 \text{ pound N/1,000 sq ft}) \times 100}{34\%} = 2.94 \text{ pounds fertilizer (34-0-0)/1,000 sq ft}$$



# Seeing the forest and the trees

## Managing forest properties

Forests today are recognized for much more than just the trees. Forests are a diverse community of plants, animals, soils, and water that are constantly changing and evolving. Understanding how to manage a forest – whether a small one on your property or a public forest consisting of thousands of acres – to improve conditions for the entire ecosystem can be a difficult task. Also, as threats such as noxious weeds, wildfire, fragmentation, and insects and disease continue to degrade a forest, sustaining a healthy and diverse forest has become an even greater challenge.

As a society, we have come to realize the vast benefits that forests provide and understand the importance of properly managing forests to maintain a healthy ecosystem. Despite the size of your forest, whether two or 2,000 acres, it is a critical piece of the ecosystem and well

worth the effort to manage. Whether your forest is small or large, it could be the model for other forest landowners to follow, which could lead to a domino effect of better forest management across the ecosystem.

The first step to managing your forest is getting to know it. This includes being able to identify tree species and understand the processes and threats that shape the health and composition of your forest. The Internet is an excellent resource for learning forestry basics (check out the Society of American Foresters website at: <http://www.safnet.org/>). An even better source is a real forester who, upon visiting the property, can give you an in-depth evaluation of your forested land (see sidebar).

Once a forester has identified the predominant tree species on your property, the next step is to get a feel for the age and health of your forest and identify any threats,



such as insects and disease, which might be contributing to the decline of your forest. With this information, the forester can start to form a picture of your forest and together with an inventory of the other natural resources on the property, i.e., rangeland, wildlife, riparian areas, etc., the forester can give you a comprehensive evaluation of your forest. With this critical information, the ground-work is laid for future management, which could include a forest stewardship plan.

### **What is a forest stewardship plan?**

What are some typical goals of a forest stewardship plan? Landowners, similar to their properties, are very different, which leads to many different goals and objectives; however, most landowners often share several of the same goals, including: improving forest health, reducing tree mortality from insects and disease, improving wildlife habitat, generating forest products, reducing noxious weeds, improving rangeland health, mitigating wildfire danger, improving riparian health, increasing streamflows, and improving outdoor recreation. A forest stewardship plan is often a written plan, composed of multiple sections, that is designed to move a property toward these landowners' goals

### **How do you meet goals and take property from the current condition to the desired condition?**

This section of the plan is where the forester/natural resource professional will recommend forest activities to meet your goals. For example, if a goal is to reduce tree mortality from mountain pine beetle, the forester will first take steps to protect the forest from the current epidemic then make recommendations to protect the forest from future epidemics. To protect the present forest, an evaluation of the forest stands susceptible to mountain pine beetles is completed and infested trees identified. Next, infested trees are treated to prevent beetles from spreading, healthy trees susceptible to attack are sprayed with an insecticide, and the area is monitored to gauge the effectiveness of the practices. Next, thinning might be recommended to remove unhealthy, highly susceptible trees from the forest, thus increasing spacing and reducing competition between remaining trees, making the forest more vigorous and more resilient to future attacks.

An added benefit of having a forest stewardship plan is the on-the-ground expertise and local forestry knowledge a forester will impart to the landowner. For instance, while fieldwork is being conducted, the landowner is invited to accompany the professional and learn how the forest is inventoried and evaluated. If landowners have

questions or concerns about their forest, the forester can address them in the field and show specific examples. On-the-ground assistance is also available for administering specific activities, such as marking trees for a timber sale, identifying locations for logging trails, identifying boundaries for forest thinning units, marking beetle-infested trees, etc. The forester's local knowledge and experience with contractors in the area will also assist the landowner in hiring the contractor best-suited to conduct a specific activity.

A schedule for implementing each activity is included in the plan and typically covers a 10-year period. The schedule is based on the goals and priorities of the landowner and recommends specific timeframes to complete activities. It assists the landowner in yearly planning and allocating needed resources to complete each activity. After 10 years, the plan should be revised to reflect current conditions, and, if necessary, additional activities should be recommended to ensure the landowner's goals are being achieved.

### **Is there funding available to landowners for forest activities?**

Having a forest stewardship plan opens some doors for landowners in terms of funding. Many activities recommended in a typical forest stewardship plan qualify for cost-share assistance through several different agencies and organizations. Your local forester can assist in determining which cost-share programs would apply best to your property. Activities that may be cost-shared include forest thinning, weed eradication, tree planting, fuels reduction, aspen enhancement, stream bank stabilization, etc.

### **What else is included in a stewardship plan?**

All plans have several requirements and standards that must be met; however, each plan is unique to the individual property and may include several unique items. The following are common elements of a typical forest stewardship plan:

- **Accurate and up-to-date maps** – utilizing recent aerial photography, topographic maps and county assessor property data, maps, are customized for each property. GIS and GPS technologies accurately determine acreages, distances, and elevations, and they pin-point locations of: property boundaries, specific management units (forest stands, riparian areas, rangeland areas, etc.), roads, water bodies, historical/cultural sites, buildings, etc.
- **Forest stand recommendations** – the forest is broken into stands of similar characteristics. Stands are

*(continued on page 65)*

For forestry assistance, both public and private consulting foresters are available in Wyoming. The Wyoming State Forestry Division provides free assistance to private landowners upon request; please contact your district office ([wsfd.wyo.gov](http://wsfd.wyo.gov)). State forestry personnel are commonly contacted to provide advice on forest management and to devise forest stewardship plans; however, since these services are free of charge, many offices have a backlog of requests. Private consulting foresters provide these same services and though they will likely charge a fee, they may be able to provide more timely service. In addition, they can also provide actual on-the-ground project work, such as forest thinning, prescribed burning, herbicide application, insecticide tree spraying, fuels reduction, etc. Check with your district state forestry office to get a list of private consulting foresters in your area.

From the brochure “You Need a Forester” by the Society of American Foresters:

### **What else can a forester do?**

- Improve wildlife habitat and recreational opportunities
- Protect soils and water quality
- Improve protection from wildfire
- Inventory your forest to learn its quality and value
- Identify opportunities, problems, and needs
- Reestablish trees on bare land
- Improve forest stands or desired tree species
- Enhance ecological diversity
- Prevent or control harmful insects and diseases
- Administer a timber harvest and related activities
- Identify financial incentives programs and other help
- Obtain inventories and values for estate settlement

### **Contracts are important.**

A landowner should have a contract with a consulting forester and other contractors to avoid possible misunderstandings and make clear what is expected by both parties. Items to consider in your contract:

- Location and description of the property
- Responsibility for determining and marking boundaries
- Description of services to be performed
- Ownership of data such as timber inventory, maps, computations, and analyses
- Assurances that legal requirements including workers’ compensation insurance, liability protection, and other labor and safety laws are met for persons working on your property
- Contract performance and quality standards, including penalties for failure to meet contract specifications
- Amount to be paid and the schedule for payment





typically based on tree species, age, density, and/or condition. Recommendations are made for each specific stand to address forest health and the goals of the landowner.

- **Firewise recommendations** – recommendations are given to reduce fuel loads and prevent catastrophic wildfire from destroying resources on the property. If a residence is on the property, defensible space recommendations are made to create a safe area for firefighters to protect the residence. Alterations to the residence itself are also recommended to reduce the flammability of the structure.
- **Domestic livestock grazing recommendations** – improperly managed domestic livestock such as cattle, sheep, horses, etc., can have lasting negative effects on your forest. Recommendations are made to assist the landowner in devising a grazing plan to limit the damage to the forest.
- **Wildlife habitat recommendations** – recommendations are made to improve habitat for a wide range of animal species. Recommendations could include aspen enhancement, riparian improvements, fish pond establishment, rangeland improvements, invasive plant eradication, etc. Activities might include prescribed burning, forest thinning, weed spraying, stream bank stabilization, fencing, and tree planting.
- **Forest health/diversity recommendations** – recommendations are made to improve forest health and increase tree species and tree age diversity. Activities might include forest thinning, timber harvesting, tree planting, prescribed burning, and invasive plant removal.
- **Forest product production** – recommendations are made to maximize production of desired forest products. Products might include house logs, sawtimber, post and poles, firewood, and wood chips.

If you think a forest stewardship plan could help you better manage your forest, please contact your local Wyoming State Forestry Division office or a private consulting forester (see sidebar).

To learn more about the national Forest Stewardship Program, which can help you develop plans for sustainable forest management, go to <http://www.fs.fed.us/managing-land/forest-stewardship/program>.



### Wyoming State Forestry Division District Offices

#### DISTRICT #1

431 Delaware Ave.  
Newcastle, WY 82701  
Phone: 746-4261

#### DISTRICT #2

2020 Fairgrounds Road, Suite 101  
Casper, WY 82604  
Phone: 234-6116  
  
710 E. Garfield, Suite 259  
Laramie, WY 82070

#### DISTRICT #3

2500 Academy Court  
Riverton, WY 82501  
Phone: 856-8655

#### DISTRICT #4

100 Sage St.  
Lyman, WY 82937  
Phone: 787-6148  
  
145 S. Fremont  
Pinedale, WY 82941  
Phone: 367-2119

#### DISTRICT #5

600 Veterans' Lane – Rm. #2  
Buffalo, WY 82834  
Phone: 684-2752



# GROWING YOUR

**P**roducing your own food can be a rewarding experience in a number of ways.

In Wyoming, however, growing fruits, vegetables, and herbs can be challenging. Some of the challenges for those on rural acreages include:

- Soil issues
- Water supply
- Short growing seasons
- Wildlife
- Pests
- Diseases
- And, in some areas, wind

## **Soil issues**

See the “Soils” section of this guide for more information on determining what type of soil you have.

## **The importance of organic matter**

Vegetable crops like soils with high levels of organic matter. Unfortunately, Wyoming soils don’t contain much organic matter (which comes from decomposed plant material) because of our short growing seasons and scarce rainfall. These conditions aren’t favorable to the growth of an abundance of vegetation that will die down and create organic matter.

Common problems we see in Wyoming soils include low fertility, low water retention, compaction, and poor drainage. Organic matter can

help you address these issues. As organic materials degrade during the growing season, they release valuable nutrients that plants can utilize. If the soil is heavy clay, adding organic matter loosens the soil, which helps relieve compaction problems and improves drainage. Soil structure is improved. Many organic materials retain significant amounts of water and improve moisture-holding capacity in very sandy soils. Organic matter is truly a wonder drug for your soil.

## **Improving organic matter in soil on a small scale**

Organic matter content is easy to improve on a small scale. Incorporate a 1- to 2-inch layer of organic material to vegetable gardens whenever the soil is turned. Add the layer and then turn the soil to mix in. Adding compost, lawn clippings, and manure are ways to add organic matter, but each has its own limitations.

## **Compost**

Compost can be a great source of organic matter. However, you should only use mature compost. Compost that has not finished the decomposition process can contain compounds toxic to plants. See the [barnyardsandbackyards.com](http://www.barnyardsandbackyards.com) “Composting” section and the “Manure” section in this guide for more information on simple methods of composting. Note the comments on manure use in compost in the manure paragraph below.

## **Lawn Clippings**

Lawn clippings can be added as a mulch. If using lawn clippings, ensure the grass has not been treated with herbicides that might damage your plants. Apply a 1-inch layer between garden rows. Be sure to let a layer dry before adding additional layers. If the grass is still wet or a too-heavy layer is added, the layers will turn soggy, the amount of air will be reduced, and it will begin to smell due to the activity of anaerobic bacteria. The mulch can be turned into the soil at the end of the growing season.

## **Manure**

Manures have been used as a nutrient and organic matter source for thousands of years, but they have unique issues. Because of the high, volatile nitrogen content in fresh manure, it can burn plants. Let manure age at least six months to a year before use. Manures often contain high levels of salts. This varies by the type of livestock, what they’ve been eating and drinking, and how often the manure is cleaned out of holding areas. Have a sample tested for salt content before use. Check with the Colorado State University soil testing laboratory (<http://www.soiltestinglab.colostate.edu>) for more information on testing.

Never use dog, cat, or pig manures on plants you plan to eat. They often contain parasites that can infect humans. These parasites can



# OWN FOOD

survive a long time in the soil. Don't even add them to your compost pile. Other manures (beef, dairy, goat, chicken) can contain pathogenic strains of *Salmonella sp.* and *E. coli* bacteria. As the manure ages, the bacteria decline, but they can still be a potential threat to health. The U.S. Department of Agriculture (USDA) Organic Standards (<http://www.ams.usda.gov/AMSV1.0/nop>) require a 90- or 120-day waiting period after uncomposted manure application, depending on the crop, before harvesting for human consumption. The 120-day wait applies to anything grown in a vegetable garden. The 90-day requirement applies to fruit trees. Manure can be composted to minimize the risk of disease organisms, but it is hard to maintain the appropriate conditions throughout the compost pile. The USDA Organic Standards require a compost pile be maintained at 131 to 170 degrees Fahrenheit for three days using an in-vessel or aerated static pile (<http://www.epa.gov/osw/conserve/rrr/composting/static.htm>).

Manure should be avoided if anyone with a compromised immune system is likely to eat produce from the garden. Manure can also contain weed seeds. These seeds have had their hard outer coats weakened by their trip through an animal leaving them ready to germinate. Composting will usually kill weed



*These raised beds are 4' wide and 32' long.*

seeds if the appropriate temperatures are maintained.

## **Raised Beds**

One very effective way of dealing with poor soil is to utilize raised beds. These beds can be filled with topsoil and decomposed organic material such as compost to create a great soil mix for growing vegetables. The mix also tends to warm up a bit earlier in the spring, and the vegetables can be easier to tend as you don't have to lean down so far. When considering how wide to make your

raised beds, consider how easy it will be for you to reach the middle of the bed to tend plants or harvest. Raised beds can be made out a variety of materials including lumber, composite materials, and even straw bales. Keep in mind that eventually all organic materials (wood, straw bales, etc.) will decompose.

## **Water**

Most of our state does not receive adequate precipitation for raising vegetables and fruits. Therefore, consider how you plan to irrigate your garden. Running a



### **Some great edible crops that can be grown in Wyoming:**

- asparagus
- green beans
- beets
- broccoli
- Brussels sprouts
- cabbage
- carrots
- cauliflower
- garlic
- greens including arugula, pac choi, mustard greens such as mizuna, and Chinese cabbage
- green onions (bunching onions)
- herbs: dill, parsley, and many others
- kale
- kohlrabi
- lettuce
- leeks
- onions (choose "long-day" varieties)
- peas
- potatoes
- radishes
- raspberries
- rhubarb
- spinach
- strawberries
- summer squash (zucchini, etc.)
- Swiss chard

### **These crops often need some kind of protection/season extension to produce well in many Wyoming locations**

- cucumbers
- eggplants
- muskmelons (cantaloupes)
- peppers
- sweet corn
- tomatoes
- watermelons
- winter squash

water line so that you have a handy tap near your vegetable garden will make irrigation easier. Many folks water by hand using a hose. Others prefer some kind of drip irrigation or soaker hose system (often using a timer). It's usually best to hand water in the morning when the wind is low. This helps prevent some plant disease issues (as any excess water will evaporate off the leaves by night fall) and helps keep you from losing water to evaporation by the wind. Mulching vegetable crops can also help conserve water.

Another issue in Wyoming when it comes to water has to do with the quality of your water source. If you haven't irrigated with your water before, consider getting it tested by a lab to see if it has any issues. (See this guide's "Water" section for more information on water quality issues.)

Visit [barnyardsandbackyards.com](http://barnyardsandbackyards.com) to learn more about irrigating crops.

### **Short growing seasons**

Most of Wyoming's elevations are high. This translates to short growing seasons for many of our communities. Residents in these areas, and even folks living in lower elevations having warmer temperatures, may want to extend their growing season for longer-seasoned vegetables, for "warm-season" crops such as tomatoes or corn, or to produce more food during the year.

Season extenders can help you do this. These can include everything from starting seeds indoors or using row covers, hot caps, cold frames, or high tunnel (greenhouse) structures.

Another strategy that will help you succeed in our short, often cool growing seasons is to select vegetable varieties with short maturation times. When deciding between vegetable varieties, try choosing those that take the least



*On this high elevation rural property, the fence around the garden keeps out larger critters while decreasing the wind and creating a much better climate for vegetable growth.*



number of days to mature (usually listed on the seed packet, and in hard copy or online catalogs).

There are great articles, links, and videos on the [barnyardsandbackyards.com](http://barnyardsandbackyards.com) website under "Gardening" that can help you get started in season extension. You can also visit the "Events" section to see if a workshop is taking place in a community near you on one of these topics. If you don't have Internet access, stop by your local University of Wyoming (UW) Extension office (or many local community libraries have computers for use by the public) to access these resources.

## Wildlife

Wildlife can be a major challenge in rural areas when it comes to growing vegetables and fruits. Your most reliable option for dealing with many different kinds of wildlife will be exclusion (fencing, etc.). If they can't get to your produce, they can't eat it. Read the "Wildlife" section of this guide for more details and resources on keeping critters out of your veggies.

## Pests

One advantage of having short seasons and tough winters is that our insect pest problems tend to be less numerous than in more gentle climates; however, issues do crop up. The first step whether you have an insect or a weed issue is to identify the culprit. Many beneficial insects and their young can look like pretty alarming (take a look at a lady bug larvae to see what we mean) so you may assume they are pests. Accurate identification is a critical step to determine if you have a problem and what to do about it. Along with online resources,



your local UW Extension or weed and pest district offices can help identify potential pests and weeds. If you do have an issue (such as an insect infestation or weed issue) the next step is to decide what, if anything, you should do about it. Read the "Weed" section of this guide to learn about weed identification and control steps. For insects, determine if beneficial insects or diseases are already taking a toll on the pest; if so, waiting might be your best option. If not, then determine your strategy. You'll find many great publications on insect pests and their control on the [barnyardsandbackyards.com](http://barnyardsandbackyards.com) website.

Plant diseases can also be an issue. One of the best defenses against many plant diseases is choosing vegetable and fruit varieties that are resistant to them (if you are shopping for vegetable seeds in a catalog or online, they'll list which diseases they are resistant to). Again, the first step is deciding what the issue is. Many soil issues can give plants symptoms that look like plant diseases. The Summer 2010 *Barnyards & Backyards* magazine article "Don't have a plant M.D.? Here's how to determine what's ailing them" provides many tips on determining what's wrong with your plants.

## Wind

In some areas of our state, wind can be a major issue – whether in spring when it dries out the soil and carries dirt that can injure seedlings or in the winter when it can pick up and carry off your precious garden soil. Consider wind when you initially site your garden. Careful placement in a more sheltered area can save you some headaches. Windbreaks can be constructed or planted. See this guide's "Windbreak" section for more information on establishing living windbreaks. If you are planning to build a windbreak



fence of some sort, visit the "Windbreak" section to get a handle on how windbreak fences function (such as how density affects wind and snow deposition). Depending on your wildlife issues, sometimes a fence built to keep out wildlife (the larger herbivores) can also act as a windbreak, creating a cozy microclimate for your vegetables.

Growing your own food in Wyoming can be a great experience for you and your family. Keeping in mind some of the challenges as you begin your adventure can help you succeed. Nothing beats a great meal featuring your own produce!

For a variety of publications, videos, and links to great websites, visit the [barnyardsandbackyards.com](http://barnyardsandbackyards.com) website.

*This section was compiled from information from the Summer 2012 *Barnyards & Backyards* magazine article "Fixing what ails your soil," by Kelli Belden, manager of the Laramie Research and Extension Center Greenhouse Complex in the University of Wyoming College of Agriculture and Natural Resources, and from material by Jennifer Thompson, Small Acreage Outreach Coordinator.*

*Selected pictures by Jan Cartwright.*



# Avoiding an expensive

## Understanding and maintaining your septic system

Selecting or maintaining a septic system is a consideration most people do not have to worry about when they live in town. But if you're one of the many rural homeowners who have a septic system, then understanding how they work and what you need to do to maintain them may prevent the occasional – but very exasperating – problem.

### How it works

Everything that goes down any of the drains in your house (sinks, toilets, baths, showers, washing machines, etc.) travels first to the septic tank. The septic tank is a large-volume, watertight tank that provides initial treatment of household wastewater by intercepting solids and “sinkable” organic matter before disposal of the wastewater (effluent) to the drain field.

The construction and operation of a septic tank is fairly simple but provides numerous important functions through a complex interaction of physical and biological processes. The essential functions of the septic tank are to receive all wastewater from the house, separate solids from the wastewater flow, cause reduction and decomposition

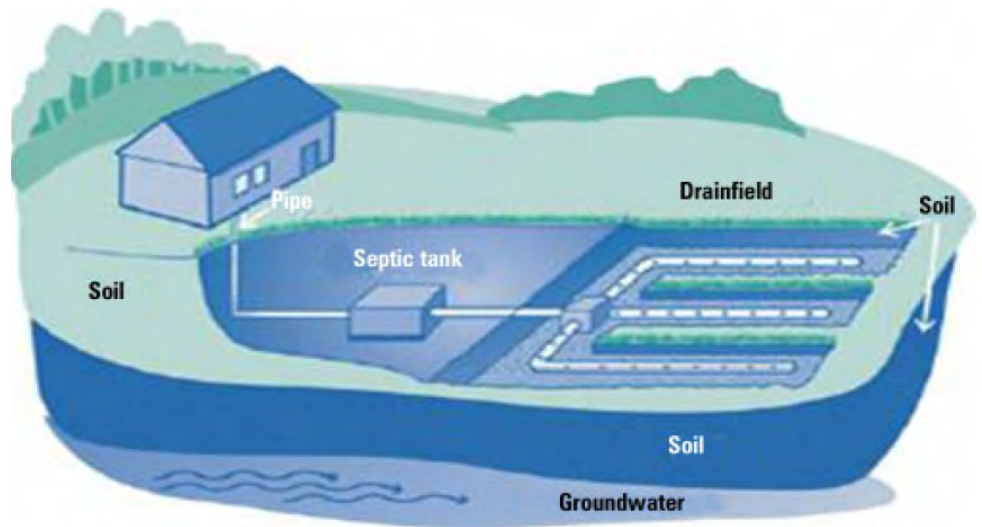
of accumulated solids, provide storage for the separated solids (sludge and scum), and pass the clarified wastewater (effluent) out to the drain field for final treatment and disposal.

As stated, the main function of the septic tank is to remove solids from the wastewater and provide an effluent relatively free of sludge for disposal to the drain/leach field. The septic tank provides a relatively inactive body of water where the wastewater is retained long enough to let the solids separate by both settling and flotation. This process is often called primary treatment and results in three products: scum, sludge, and effluent. Scum is an extraneous matter or impurities risen to or formed on the surface of a liquid often as a foul filmy covering. Sludge is a slushy mass, deposit, or sediment as precipitated solid matter produced by water and sewage treatment processes that usually lies at the bottom of the septic tank. Effluent is the wastewater that is discharged or flows out of a septic system.

A septic system is normally powered by nothing but gravity. Water flows down from the house to the



# STINK



tank and down from the tank to the drain field.

As new water enters the tank, it displaces the water that's already there. This water flows out of the septic tank and into a drain field. A traditional drain field is made of perforated pipes buried in trenches filled with gravel. A typical drain field pipe is 4 inches in diameter and is buried in a trench that is 4 to 6 feet deep

and 2 feet wide. Gravel fills the bottom 2 to 3 feet of the trench and dirt covers the gravel. The water is slowly absorbed and filtered by the ground in the drain field. The size of the drain field is determined by how well the ground absorbs water and the number of bedrooms in your home.

This is a traditional septic system. There are several other designs that can be utilized for areas with specific

challenges such as high ground water levels, heavy clay soils, steep slopes, etc.

## New properties

Before you purchase a piece of property, make sure that the soil characteristics are suitable for the installation of a septic system. Nothing is worse than being stuck with a piece of heaven not suitable for a septic system. To find out about your soil, you can hire a professional to take soil samples or you can contact your local UW Extension office to find out how to collect a proper sample yourself. Samples are then submitted to a lab for analysis (see the "Soils" section). Ask the local planning and zoning department about wastewater disposal issues. Most county and state health departments or environmental quality agencies require that homeowners apply for a septic permit prior to construction.

In most Wyoming counties, residents should check with their county government about obtaining permits before constructing a septic system. Residents in a few Wyoming counties must



*Gravity fed system in a trench configuration. A plastic (poly) tank and distribution box are used with this system.*

obtain small wastewater permits from the Wyoming Department of Environmental Quality.

At a minimum, the permitting agency should perform a site evaluation, which includes a trench inspection and soil test, and determine if there is high ground water or impermeable layers. A percolation test determines the soil's water absorption capability, a vital characteristic for properly functioning septic systems. A geologist, professional engineer, sanitarian, or the property owner most often performs this. Improper percolation tests could result in an inadequately sized drain field or a costly oversized field. Owners must also make sure the property is large enough to have a replacement area if the first system fails. The property owner is responsible for providing the necessary equipment, such as a backhoe, for these tests. The overseeing agency will not provide the equipment.

Sites with impermeable soils, high clay content, or shallow bedrock will not absorb and treat septic effluent readily. Sites with steep slope (greater than 15 percent) may also pose challenges. These limiting site conditions may require special septic design and construction practices to avoid failure. County and state personnel can discuss options with you and your contractor. Poor septic system siting or design can lead to premature failure of the system.

Septic/small wastewater system permits contain valuable information such as the age of the system, size of the tank and drain field, and location. They can also be a part of the lending process at the bank.

## Maintenance

Septic systems do not last forever – many are designed to last around 20 years with proper maintenance. Having your septic system



*Conventional gravity fed septic system with concrete tank and distribution box. Drainfield is a bed configuration with graveless chambers.*



*Commonly when a drainfield fails, effluent can be seen surfacing in the area.*

pumped out at regular intervals (information about this is contained Table 1) is an important part of that maintenance. Neglecting to have your system pumped on the recommended schedule, excessive household chemical use, or sending excessive wastewater to a septic tank at one time can shorten the life of your leach field, resulting in system failure. Septic systems are designed to break down and discharge

household wastewater at a rate that allows it to be adequately treated by microbes in the soil. If your septic system fails, along with creating a stinky, expensive mess, it can also be a source of contamination for surface and ground water (aka your drinking water source).

Maintenance of septic systems comes in two parts. First, the sludge layer that accumulates on the



bottom of the tank must be pumped out and hauled away regularly (Table 1). The frequency depends on the household occupancy and tank size. The second part involves the bacteria that are necessary for digesting organic solids in the floating (scum) layer. Moderation should be the rule when soaps, detergents, bleaches, or other household cleaners are disposed in septic systems. Certain household products and wastes should never be dumped down drains because they can directly contaminate ground water: excessive amounts of grease, paints or solvents, petroleum products, flammable liquids, paint strippers, and other volatile cleaners. Commercially available septic system cleaners containing organic cleaners or active agents, such as sodium hydroxide (lye) or potassium hydroxide, can disrupt the operation of the system and cause ground water pollution.

An inspection by a licensed contractor can tell you when to pump. A contractor will measure scum, liquid effluent, and sludge layers in the septic tank. The sludge depth will determine pumping frequency, generally every three to five years; however, if you have a large household, increase your pumping frequency (see Table 1). The U.S. Environmental Protection Agency has an excellent maintenance schedule ([www.epa.gov/owm/septic/pubs/septic\\_sticker.pdf](http://www.epa.gov/owm/septic/pubs/septic_sticker.pdf)) you can use to record septic maintenance activities.

### Other keys to getting the most out of your septic system

Knowing where the tank and leach field are located is a critical step in the maintenance process. Look for line cleanouts or tank risers that provide access to the septic system without digging. If unable to locate

**Table 1**

**How often to pump (numbers in table are in years):**

Suggested Pumping Interval (years)						
	Number of Persons Living in Home					
Tank Size in Gallons	1	2	3	4	5	6
1,000	12	6	4	3	2	2
1,250	16	8	5	3	3	2
1,500	19	9	6	4	3	3



*Risers on a concrete tank.*



*Gravity fed system in a trench configuration. A plastic (poly) tank and distribution box are used with this system.*



*An effluent filter reduces the possibility of solids moving out of a tank and clogging a leach field.*

these components, consider having a licensed contractor inspect the system with a sewer camera.

**Driving and Parking Over a Septic System** Plan parking areas and driving routes so they will not interfere with a septic system. The weight from vehicles can collapse pipes, septic tanks, and leaching chambers requiring costly excavation and repair. Driving and parking on a leach field also compacts soil, reducing its ability to effectively treat effluent. During winter, be mindful that driving over sewer pipes can increase frost penetration, resulting in the inconvenience and expense of repairing frozen plumbing.

**Tree Roots** Many commercial products claim to prevent roots from clogging pipes, but nothing takes the place of careful landscaping practices. To prevent septic system damage, do not place a leach field near trees and shrubs, and plant only grass or shallow-rooted perennials and annuals around a septic system. If you buy a property with an existing septic and leach field and there are trees in the leach field already, it

would be recommended to consider having a licensed contractor inspect the system with a sewer camera or at the least carefully watch your leach field for any signs of failure including surface ponding of water and sewage. If this happens, the leach field will need to be replaced and the new field located away from these plants.

#### **Flushing Foreign Objects Down**

**the Drain** We have probably all had that sinking feeling when an object accidentally drops into the toilet. Once flushed, removing that toy truck can be costly and time consuming. For households with small children, prevent unwanted objects from going down the drain by installing toilet seat locks. Other notorious septic system cloggers include diapers, baby wipes, paper products other than toilet paper, cat litter, cigarettes, coffee grounds, feminine products, etc. Purchase toilet paper labeled "Septic Safe." Excess kitchen grease will congeal in the sewer line, causing blockages and backups. Kitchen grease does not break down in the tank – it accumulates, filling the tank quicker, and ultimately shortens the time until it will need to be pumped. Dispose of kitchen grease, after it has properly cooled, in the trash rather than down the drain. The goal is to reduce the amount of solids entering the tank. Whatever is put in, will have to be pumped out!

**Failure to Install According to Local Codes** Local codes and regulations help ensure proper installation practices and protect public health. A poorly installed system will not work effectively and will fail early. A properly installed septic system will be designed according to your specific site conditions (soil types, bedrock, ground water, slope). Finally, local regulations protect surface and ground water quality. A septic system that does not conform to regulations can potentially affect the health and

safety of you and your neighbors. Test your household well regularly! For information, contact commercial water testing laboratories, or the Wyoming Department of Agriculture Analytical Services at 307-742-2984.

**Salts/Chemicals: Water Softeners, Washing Machines, Cleaning Products** Excessive use of household chemicals or salts from a malfunctioning water softener disrupts the natural bacterial action necessary for wastewater treatment. **Moderate amounts** of household cleansers and detergents should not pose a problem; however, dispose of solvents, pesticides, herbicides, motor oil, antifreeze, and paint through a household hazardous waste collection facility rather than down the drain.

**Organic Overloading** Garbage disposals contribute excessive amounts of solids, which do not break down in the septic tank, requiring it to be pumped more frequently. Try creating a compost pile for fruit and vegetable scraps, coffee grounds, etc., and properly dispose of kitchen waste that shouldn't go into compost, such as meat scraps and fat. The goal with a septic system is to prevent accelerated leach field failure from solids moving into the field. Consider installing sink strainers, hair traps in drains, lint traps on washing machines, and an effluent filter (see photo) at the outlet of the septic tank. These devices reduce the possibility of solids moving out of the tank and clogging the leach field prematurely.

**Hydraulic Overloading** Hydraulic overloading occurs when too much water enters the septic system at one time, resulting in wastewater backing into drains or effluent surfacing in your yard. Being conservative with water use can prevent hydraulic overloading.

- Ensure all plumbing fixtures are in good working order. No drips or leaks!



- Replace aging fixtures with new water-saving toilets, shower heads, and faucets.
- Adequately space showers, laundry, dishwashing, and other high-volume water uses so they do not coincide with one another, which may flood the septic tank and push solids into the leach field.
- If possible, avoid using a water softener since backwash will enter the septic tank and can cause hydraulic overloading. Oversize your septic tank and leach field if a water softener is in use.

## Conclusions and Contacts

There are many steps to ensure a properly sited, correctly installed, regularly maintained septic system. Done properly, your system should last 20 or more years. There are an abundance of situations or mishaps that can occur with property you may buy or property you already own when it comes to septic systems and leach fields. Please contact your local county planning department for more information on these situations. They will be able to tell you if you need to hire a contractor or if an inspector can conduct a site visit.

**This section was adapted from material in the following articles (all can be found on [barnyardsandbackyards.com](http://barnyardsandbackyards.com)):**

"A Guide to septic systems," Spring 2005 *Barnyards & Backyards* magazine. Article author Michelle Cook.

"Prevent a stink by checking septic system considerations before buying," Summer 2006 *Barnyards & Backyards* magazine. Article author April Gindulis.

"Top reasons for septic system failure and how to prevent them," Summer 2008 *Barnyards & Backyards* magazine. Article author Author Mila Ready.

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## Mission:

"To create a culture of stewardship among small acreage land managers by promoting sustainable practices which enhance the ecological, economic, and social aspects of the land and its people."



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