Technical Info

DLF PICKSEED
SEEDS & SCIENCE

Forage Agronomics & Management Systems

TABLE OF CONTENTS

Introduction

All around the world the production of grass is the foundation of the ruminant and equine livestock industries. Western Canada is dependent on about twenty grass species and about five legume species that are used to produce forage for ruminants and horses. Each plant species has its own unique growth requirements, range of environmental adaptation, and production pattern, yet there is a general perception that growing forages is EASY (King, 1996).

The method used for establishing perennial forages can make the difference between a long-lived successful stand, and a poor stand requiring re-establishment. A uniform stand with an adequate number of plants is necessary for maximum yield. Use of an appropriate seeding rate at the proper time of year, coupled with suitable fertilization, will maximize the odds for establishment success (Cherney, 1990).

The purpose of this section is to introduce the reader to some of the complexities of growing forages. We will highlight the preferred procedures in establishing forages, as well as some tips in managing forage stands to maximize their production throughout their lifespan. Perennial forage crops are important for replenishing organic matter in prairie soils, as about half of it has been lost due to long periods of cultivation. Perennial forage crops can add more organic matter than most annual crops, because they reduce tillage and provide a permanent ground cover, which will also reduce soil erosion.

This section will help the reader understand why to use certified seed, and how to make the proper species and variety selection. This is a very important step in any successful forage stand, just as seeding rates, methods, time of seeding, fertility, etc. are important considerations to a successful and productive stand. You as the manager/advisor will have to make informed decisions that will help in each particular situation, as there is not one recommendation that will apply to all situations.

Technical Info

Tame Grasses
Forage Adaptation & Comparison Guide

Forage Species	Use	Longevity	Winter Hardiness	Drought Tolerance	Flooding Tolerance	Salinity Tolerance	Alkalinity Tolerance	Acidity Tolerance	# Seeds per kg	# Seeds per lb	Forage Species
Annual and Italian Ryegrass	Hay & Pasture	Short Annual 1 Year	Poor	Low	High	Low	Moderate	Moderate	507,000	230,000	Annual and Italian Ryegrass
Creeping Foxtail	Pasture	Long	Good	Low	High	Moderate	Moderate	Moderate	1,657,000	753,000	Creeping Foxtail
Creeping Red Fescue	Pasture Lawn	Long	Excellent	Moderate	Moderate	Low	Moderate	Moderate	1,353,000	615,000	Creeping Red Fescue
Crested Wheatgrass	Pasture & Hay	Long	Excellent	Moderate to High	Low	Low to Moderate	Moderate to High	Low	485,000	220,000	Crested Wheatgrass
Dahurian Wildrye	Pasture	Short	Good	Moderate	Low	High	Moderate	Low	175,000	80,000	Dahurian Wildrye
Intermediate Wheatgrass	Hay & Pasture	Short to Medium	Good	Moderate	Low to High	Low to Moderate	Moderate	Low	194,000	88,000	Intermediate Wheatgrass
Kentucky Bluegrass	Pasture Lawn	Long	Excellent	Moderate	Moderate	Low	Low	Low	4,800,000	2,182,000	Kentucky Bluegrass
Meadow Bromegrass	Hay & Pasture	Long	Good	High	Low	Low	Moderate	Moderate	176,000	80,000	Meadow Bromegrass
Meadow Fescue	Pasture	Short to Medium	Good	Moderate	High	Low to Moderate	Low	Moderate	506,000	230,000	Meadow Fescue
Meadow Foxtail	Pasture	Long	Good	Low	High	Low	Moderate	High	1,270,000	577,000	Meadow Foxtail
Orchardgrass	Hay & Pasture	Short	Fair	Moderate	Low to Moderate	Low	Low	Moderate	1,439,000	654,000	Orchardgrass
Pubescent Wheatgrass	Hay & Pasture	Medium	Good	Moderate to High	Low	Low to Moderate	Moderate	Low	220,000	100,000	Pubescent Wheatgrass
Russian Wildrye	Pasture	Long	Excellent	Very High	Low	Very High	High	Moderate	385,000	175,000	Russian Wildrye
Smooth Bromegrass	Hay & Pasture	Long	Excellent	Moderate	Moderate	Low to Moderate	Moderate	Moderate	300,000	136,000	Smooth Bromegrass
Tall Fescue	Pasture	Long	Good	Moderate to High	Moderate to High	High	High	Very High	500,000	227,000	Tall Fescue
Tall Wheatgrass	Pasture & Hay	Long	Excellent	Low	High	High +	Low to Moderate	Low to Moderate	174,000	79,000	Tall Wheatgrass
Timothy	Hay & Pasture	Medium	Good	Low	High	Low	Low	High	2,710,000	1,232,000	Timothy

SPECIES ADAPTATION AND COMPARISON

Preferred Climate and Growing Conditions	Growing Period	Positive Features	Negative Features	Plant Type
Produces best on soils of medium to high fertility and grows best with adequate moisture	Spring to Fall	Easy to establish. Very palatable. Makes good hay or silage. Can be used for companion crop.	Does not withstand drought or hot weather.	Bunch Grass
Adapted to areas where Reed Canarygrass grows well and soil moisture is continually available.	Early Spring to Fall	Suitable for erosion control. Spreads rapidly once it is established.	Light, fluffy seed. Slow Establishment. Poor competition during first 6 weeks.	Sod Forming
Does best in high rainfall areas. Will grow in wide range of soil types.	Spring to Fall	Tolerates close grazing. Tolerates areas too dry for Timothy. Grows well late summer to freeze up and retains good quality.	High moisture requirement. Vulnerable to Crown and root rots and snow mold.	Sod Forming
Adapted to dry areas with good soils but will also establish on lighter soils	Early Spring	Excellent for Spring pasture. Easy to grow. Withstands close grazing and trampling.	Does not tolerate cool, wet soils. Poor quality after heading out.	Bunch Grass
Adapted to all soil zones.	Spring to Fall	Highly competitive and quick to establish.	Short Lived	Bunch Grass
Well drained soils with ample moisture.	Late Spring to Mid Summer	Easy to establish. Good haygrass with alfalfa. Out yields CWG and smooth bromegrass.	Less winter hardy and drought tolerant than crested wheatgrass.	Sod Forming
Prefers cool and humid. Grows on most soils.	Spring to Fall	Tolerates close and frequent defoliation. Useful in erosion control.	Goes dormant in hot, dry weather. Slow to establish. High moisture requirement. Lower yielding.	Sod Forming
Grows well on most soils where Smooth Brome does well.	Early Spring to Late Summer	Very palatable. Good regrowth after grazing or cutting. Less aggressive than Smooth Brome.	Mainly a pasture grass. Difficult to put up as hay when in pure stand.	Bunch Grass
Prefers soil with good moisture and good drainage.	Early Spring to Late Fall	Best for pasture. Good fall pasture - stays green late in fall.	Susceptible to heavy grazing. Slow regrowth. Susceptible to leaf rust.	Bunch Grass
Prefers cool moist conditions. High water table.	Early Spring to Fall	Earliest grass to grow in Spring. Very palatable when young. Seeds fall off and reseeds self.	Light, fluffy seed. Susceptible to drought. Seeds need to be coated for seeding.	Bunch Grass
Prefers moist conditions. Sandy soils are too dry for good growth unless in high rainfall areas.	Spring to Fall	Easy to establish. Very palatable. Fast regrowth. Makes good hay with alfalfa.	Needs high nitrogen for good production. Only moderate winter hardy. Subject to overgrazing.	Bunch Grass
Widely adaptable with respect to precipitation, temperature, elevation, and low fertility soil.	Spring to Mid Summer	Has the ability to stay green into the summer months. Hardier than Intermediate Wheat Grass.	Strong creeping roots get sod bound and result in unproductive stand after a few years.	Sod Forming
Can be grown on a wide range of soils. Most productive on fertile loams.	Early Spring to Mid Summer	Salt tolerant, early growth and good for winter grazing.	Poor seedling vigour. Slow to establish.	Bunch Grass
Well adapted to all soil zones.	Mid Spring to Mid Summer	Winter hardy. Good yield. Palatable even at mature growth stage.	Seed is long, light and difficult to sow due to bridging. Becomes sod bound. Slow regrowth.	Sod Forming
Variety of soils. Does well on wet, poorly drained soils.	Late Spring to Fall	Suitable for late fall grazing or stock piling. Easy to establish. Good regrowth. It is one of the more drought resistant grasses.	Slow to cure when used for hay. Starts growing later than many other grasses in spring.	Bunch Grass
Adapted to saline and imperfectly drained alkali soils.	Late Spring to Mid Summer	Salt tolerant. High nutrition in early heading stage.	Slow to establish. Poor vigour and competitive ability. Coarse when mature.	Bunch Grass
Cool moist areas with good drainage.	Spring to Summer	Low seed costs. Easily established. Excellent hay for horses. Goes well with alfalfa in blends. Suitable for hay export market.	Susceptibleto heat and low moisture conditions. Low palatability at maturity.	Bunch Grass

SPECIES ADAPTATION AND COMPARISON

Legumes
Forage Adaptation & Comparison Guide

Forage Species	Use	Longevity	Winter Hardiness	Drought Tolerance	Flooding Tolerance	Salinity Tolerance	Alkalinity Tolerance	Acidity Tolerance	# Seeds per kg	# Seeds per lb	Forage Species
Alfalfa	Hay & Pasture	Long	Good	Good	Low	Low to Moderate	Moderate to High	Low	440,000	200,000	Alfalfa
Alsike Clover	Hay & Pasture	Short	Fair	Poor	Moderate	Low	Low to Moderate	Moderate	1,540,000	700,000	Alsike Clover
Birdsfoot Trefoil	Pasture	Long	Good	Moderate	High	Low to Moderate	Moderate	Moderate to High	825,000	375,000	Birdsfoot Trefoil
Cicer Milkvetch	Pasture	Long	Good	Moderate to High	Low	Moderate	Moderate	Moderate	286,000	130,000	Cicer Milkvetch
Red Clover	Hay & Pasture	Short	Poor	Low	High	Low	Moderate	Moderate	605,000	275,000	Red Clover
Sainfoin	Pasture	Long	Fair	High	Low	Low	High	Low	66,000	30,000	Sainfoin
Sweetclover	Hay & Silage	2 Years	Fair	Moderate to High	Low	Moderate	Moderate	Low	572,000	260,000	Sweetclover

Preferred Climate and Growing Conditions	Growing Period	Positive Features	Negative Features	Plant Type
Widely adapted to most prairie soils but will not tolerate areas that have periodic flooding.	Spring to Fall	Easy to establish. High yields, rapid regrowth. Highest nutrition of all forages.	Bloat hazard. Needs good drainage.	Tap, Branch, Rhizomatous, Creeping Rooted
Prefers low-lying moist areas.	Spring	Easy establishment. Tolerant to poor drainage and acid soils.	Bloat hazard. Short life span and low yield.	Branched
Prefers moist areas.	Spring to Fall	Non bloating. Reseeds itself. Feed value similar to alfalfa.	Poor seedling vigour. Poor competitor and lower yielding.	Tap Rooted with Branches
Widely adapted but exhibits its creeping habit best on more coarse textured soils.	Late Spring to Fall	Non bloating. Hardier than alfalfa. Very aggressive once established.	Slow to establish. Hard seeds. Slow regrowth after grazing.	Creeping Rooted
Best suited to humid areas with moderate temperatures.	Spring	Easy establishment. Tolerates wetter and more acid soils than alfalfa.	Bloat hazard. Short life span.	Tap Rooted with Side Branches
Best on brown and dark brown soil areas. In very dry areas it yields poorly. Does well on thin gravely soils.	Spring to Summer	Non bloating. More drought and cold tolerant than alfalfa.	Poor regrowth. Slow to establish.	Tap Rooted
Especially productive on fertile soils.	Spring of Second Year	Widely adapted. Good for soil and drainage improvement.	Low palatability unless harvested early. Self seeds.	Tap Rooted

Native Grasses
Forage Adaptation & Comparison Guide

Forage Species	Use	Longevity	Winter Hardiness	Drought Tolerance	Flooding Tolerance	Salinity Tolerance	Alkalinity Tolerance	Acidity Tolerance	# Seeds per kg	# Seeds per lb	Forage Species
Green Needlegrass	Pasture	Long	Good	High	Moderate	Moderate to Low	Moderate	Moderate	375,000	170,000	Green Needlegrass
Little Bluestem	Pasture	Long	Good	High	Low	Moderate	Moderate	Moderate	529,000	240,000	Little Bluestem
Northern Wheatgrass	Pasture	Long	Good	Very High	Moderate	Moderate	Moderate	Low	341,000	155,000	Northern Wheatgrass
Reed Canarygrass	Hay & Pasture	Long	Good	Moderate	Very High	Low	Moderate	Moderate	1,175,000	534,000	Reed Canarygrass
Slender Wheatgrass	Hay & Pasture	Short	Good	Moderate	Low	High	High	Low	352,000	160,000	Slender Wheatgrass
Streambank Wheatgrass	Hay & Pasture	Long	Good	Very High	Moderate +	Low to Moderate	Moderate	Low	344,000	156,000	Streambank Wheatgrass
Switchgrass	Pasture	Medium	Fair	Low	Moderate	Moderate	Low	Low	716,000	325,000	Switchgrass
Western Wheatgrass	Hay & Pasture	Long	Excellent	High	Moderate to High	High	High	Moderate	254,000	115,000	Western Wheatgrass

Preferred Climate and Growing Conditions	Growing Period	Positive Features	Negative Features	Plant Type
Performs best on medium to heavy textured soils. Prefers moist sites with good drainage.	Late Spring to Mid Summer	Palatable and nutritious. Tolerant to drought and grasshopper damage.	Seed has high level of dormancy. Easily overgrazed.	Bunch Grass
Sandy, gravely soils with shallow water table or where snow accumulates. Common on prairie upland.	Late Spring to Fall	Highly nutritious and palatable when grazed at early stages.	Light, fluffy seed. Becomes unpalatable in the fall.	Bunch Grass
Prefers medium to coarse textured soil.	Mid Spring to Mid Summer	Suitable for erosion control. Easy to establish. Produces good ground cover.	Tends to get sod bound. Becomes wiry and unpalatable in the fall.	Sod Forming
Moist cool climate. Poorly drained areas subject to temporary flooding.	Spring to Summer	Grows well in wet areas. Withstands flooding for up to 2 months. Grows tall, good yield.	Slow to establish. Nutrition and palatability low when mature.	Sod Forming
Adapted to wide range of soils but prefers sandy loams.	Mid Spring to Mid Summer	High salinity tolerance. Cures well on stem. Good seedling vigour and fast establishment.	Less competitive and persistent than other wheatgrasses. Not tolerant to close, heavy grazing.	Bunch Grass
Widely adapted. Tolerates periodic flooding but requires well drained soils.	Mid Spring to Mid Summer	Good for soil and water conservation. Can be used for lawns, playgrounds and parking lots.	Low in production. Unpalatable when mature.	Sod Forming
It has potential for good summer pasture when enough moisture. Grows best on loam and sandy loams.	Late Spring to Fall	Warm season grass. Can be used for summer pasture when cool season grasses go dormant.	Slow to establish. Should not be cut or grazed the first year. Unpalatable after maturity.	Bunch Grass
Widely adapted. Prefers heavy somewhat alkaline soil.	Early Spring to Fall	Salt tolerant and long-lived. Nutritious and productive under moderate grazing. Suitable for erosion control.	Slow to establish. Sensitive to overgrazing.	Sod Forming

These grasses are indigenous to North America. Available varieties have been improved through plant breeding programs.
(Source: Manitoba Agriculture & Food)

DLF PICKSEED SEEDS & SCIENCE

Selection of High Quality Seed

Seeding a new forage stand starts with the selection of species and varieties best suited for the situation. The number one criterion to apply is to buy Certified Seed. There is no such thing as “Bargain Seed”. Using Certified Seed of recommended varieties assures a high quality product that has good germination, is free of noxious weeds and is adapted to the area. Using Canada Common #1 seed does not guarantee the quality factors associated with certified seed of a recommended variety.

The table below for example, shows different quality standards set by the Canadian Food Inspection Agency that apply to a number of forage legumes, including alfalfa. The numbers stated are the maximum number of seeds per 25 grams, except for Germination percentage, which is set as a minimum.

		Noxious Weeds			Other Crops			
	Grade Name	Primary	Primary Plus Secondary	Total Weeds	Sweet Clover	Brassica Crops incl. S. alba	Other Non Brassica Crops	Min. Percent Germ.
1.	Canada Foundation #1	0	0	5	1	0	5	85
2.	Canada Foundation #2	0	2	30	2	2	20	70
3.	Canada Registered #1	0	0	5	1	0	5	85
4.	Canada Registered #2	0	2	30	2	2	20	70
5.	Canada Certified #1	0	5	50	20	4	1% by Weight	80
6.	Canada Certified #2	0	10	75	30	6	2% by Weight	70
7.	Varietal Blend #1	0	5	50	20	4	1% by Weight	80
8.	Varietal Blend #2	0	10	75	30	6	2% by Weight	70
9.	Common #1	0	5	75	25	8	2% by Weight	80
10.	Common #2	5	10	100	50	10	3% by Weight	70

Source: Schedule I, Grade Tables

PICKSEED Canada strives to offer the cleanest, highest quality seed possible in the market. Our seed production standards, grading system, and cleaning facilities allow us to offer you seed with standards above Canada Certified #1.

Soil Type

Perennial forage crops adapted to Western Canada have a wide range of agronomics that will make them suitable for different situations. Growing habits, ease of establishment, tolerance to drought, salinity, alkalinity, flooding, etc. are just a few characteristics that will help you decide which species are best suited for the situation at hand. In order to accomplish the right selection, one must have as much history as possible on the piece of land destined to forage production.

History of the field should include:

1. ***Soil Texture*** will determine the ability of different forage species to survive drought, poor drainage, fertility requirements, etc.
2. ***Soil pH*** determines whether the soil is Acidic, Neutral or Alkaline. Different species thrive in different soil pH, thus, this is a crucial part in helping select the right species.
3. ***Topography*** will be an asset in helping you choose species for a mixture of land layouts. If the landscape were variable with hill and draws, then the forage mix would include species that are drought tolerant for the hilltops, and have a moderate to high tolerance of spring flooding for the draws.
4. ***Herbicide history:*** be aware of what herbicides have been applied to the field destined for forage production, as there are a number of residual herbicides that will forbid the planting of forages within a period of time after application. For more information on recommendations, check the labels of the herbicides used on the field.
5. ***Salinity control:*** you may be able to establish forages while the land still supports barley production, if barley won't grow, most likely the soil is strong to very strong saline. If the land is undisturbed and native plants will not grow, it is highly unlikely that introduced species will establish. Soil test to find out the level of salinity. Perennial grasses are often more tolerant than legumes, also, less tolerant species should be included in the mixture so that it will allow for establishment on the edge of the affected area, as well as to provide cover in better soil pockets within the area. Including deep-rooted and high water usage species, such as alfalfa, may help reduce the upward movement of water and surface salt accumulation. Also consider the spring flooding tolerance, and be aware that even when adapted species are used, the production will be less than in good land (Fraser and Fraser, 2003).

A quick reference of adapted species and salt tolerance levels

Slightly Tolerant	Moderately Tolerant	Strongly Tolerant	Very Strongly Tolerant
Reed Canary Grass	Streambank Wheatgrass	Altai Wild ryegrass	Salt Meadowgrass
Timothy	Bromegrass	Western Wheatgrass	Beardless Wildrye
Sainfoin	Crested Wheatgrass	Slender Wheatgrass	Tall Wheatgrass
Alsike Clover	Northern Wheatgrass	Russian Wild Ryegrass	
Red Clover	Intermediate Wheatgrass	Dahurian Wildrye	
	Green Needlegrass		
	Sweet Clover		
	Alfalfa		
	Birdsfoot Trefoil		

Source: PFRA Forge Selection, 2003

Intended Use and Variety Selection

Once the field attributes have been determined and constraints have been identified, one can move onto the next step of forage establishment. This step will help the individual categorize his or her intentions for the stand and what will be the end use of the product. We will explore hay and grazing stands individually, so that the reader gets a chance to evaluate the adaptations and characteristics of different species and varieties to maximize production.

Numerous grass and legume varieties are available for dryland and irrigated hay and pasture. In general the forage species or varieties selected will depend on the intended use, area of adaptation, productivity potential, season of use if seeded for pasture and soil conditions, such as spring flooding or saline-alkaline soils.

Keeping mixtures simple will make the management of a productive stand much easier. One thing to keep in mind is that forage species included in mixtures should have similar growth patterns and palatability. This will provide a more uniform pasture grazing, better stand survival and a higher hay quality when harvested at the proper growth stage.

Hay

When deciding on establishing a forage stand for hay production, one should consider the life of the stand – do you want a stand with species that are short lived but are higher producing, and better suited to be incorporated into a rotation? Or do you want a stand with species that are long lived as you plan to keep the field out of rotations and in hay for an extended period of time, 7 to 10 plus years? Are you in an area where multiple cuts are achievable more often than not? What kind of forage quality are you looking for? Keep available markets in mind, as the dairy, beef and horse markets all have different requirements for type and quality of hay (Fraser & Fraser, 2003).

Pure dense stands of alfalfa rotated to new fields every three to five years will provide a greater yield than grass alfalfa mixtures, especially where adequate precipitation is available for two, three or more harvests. If a grass – alfalfa mixture is used for hay, highest yields will be obtained when the initial stand contains 50% or more alfalfa (Meyer, 1999).

There are three types of rotation in hay production:

1. ***Short Rotation:*** this type of rotation is targeted to be highly productive for three to four years. It is often preferred by high hay production operations that use alfalfa varieties that offer rapid spring growth; under good conditions after cutting, regrowth can be expected to take between 21 and 28 days, before the stand is ready to cut again. These types of fields are often pure stands of alfalfa, but if a grass is desired in the mix, then select a species that offers good regrowth throughout the season, and early spring growth. Species like orchardgrass or meadow bromegrass would fit this category. This type of rotation is best suited for fields under irrigation, or areas that receive good moisture throughout the growing season, often three to four cuts are expected out of these fields.
2. ***Medium Rotation:*** this type of rotation has a target lifespan of four to six years before production begins to decline. Alfalfa varieties used in this type of production systems are considered to be medium maturing, and are normally two to five days later maturing than the early varieties used in short rotations. These varieties are more persistent in marginal soils, and are intended for one to two cuts per year, depending on environmental conditions, and how marginal the soil is. Yield potential of these alfalfas is still very good, maybe slightly lower than the early maturing types. Grass species suitable for this type of production include meadow bromegrass, timothy, smooth bromegrass, intermediate wheatgrass, pubescent wheatgrass, tall fescue, and crested wheatgrass. Determining factors as to which species to use will depend in soil types and environmental conditions.

Intended Use and Variety Selection

3. Long Rotation: this type of hay production is normally designed for marginal soils that should remain undisturbed for as long as possible while still providing some sort of production. Long rotation hay fields are often used as pastures, as climatic conditions may force producers to put their cattle in when spring and summer pastures are in short supply. Alfalfa varieties used in these types of production systems are normally of the creeping root type, which tend to be a lot hardier than those of the tap root type alfalfas. Creeping rooted alfalfas are more flood and drought tolerant, withstand grazing pressure, are very persistent in marginal soils and tend to be very winter hardy. These qualities will have an effect in yield potential, as they have a lower yield potential than early and medium maturity varieties.

Spring flooding may be a factor influencing the species that are selected for the new hay stand. In general, grasses are more tolerant to spring flooding than legumes. Forage species are generally more tolerant of flooding when soil, water and air temperatures are cool. Under cool temperatures plants remain dormant longer in the spring, and their need for oxygen is less than during active growth. Flooding in mid-summer during active growth when soil, water and air temperatures are high easily kills most grasses and legumes. Flooding tolerance may vary from year to year due to temperature, water depth and age of stand (Fraser, 2003). Below is a list of grasses and legumes suited for hay production and their rating of flood tolerance.

Tolerance to Flooding

Good	Moderate	Poor
Reed Canarygrass	Smooth Bromegrass	Meadow Bromegrass
Tall Fescue	Intermediate Wheatgrass	Crested Wheatgrass
Western Wheatgrass	Streambank Wheatgrass	Slender Wheatgrass
Timothy	Red Clover	Alfalfa
Alsike Clover		Sweet Clover
Birdsfoot Trefoil		

Source: PFRA Forage Selection Manual, 2003

To plan a hay stand for a specific type of livestock and their nutritional requirements, please refer to Section #10 of this binder for complete details on nutrient requirements for Beef, Dairy and Horses.

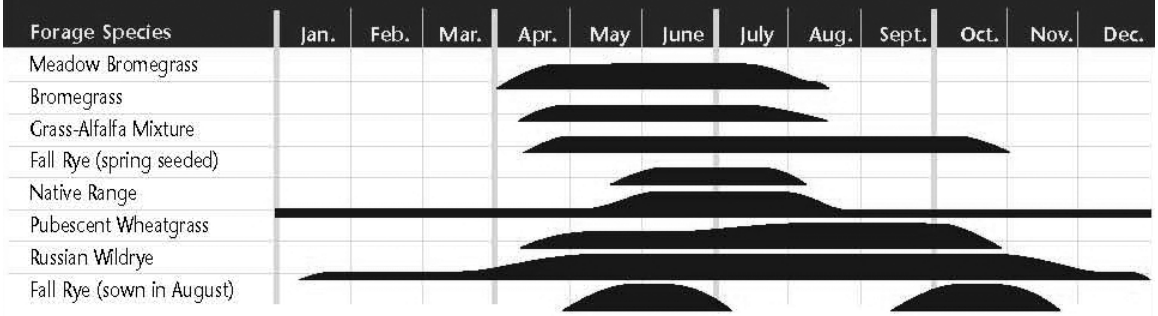
Pasture

It does not matter if correct seeding and establishment procedures were used if the wrong seed was planted. Species selection is critical for a successful grazing program. A well-planned grazing program will produce best results for both livestock and forage. When seeding a new pasture stand, choose species or mixtures that are compatible with your long term grazing plan. Consider the following when developing a plan:

- When do you intend to graze the forage stand: spring, summer or fall?
- Compare monthly demands to current monthly supplies and give careful thought as to when your pasture shortage occurs.
- Choose forage species that produce peak forage supplies during the season you need them (See Table 2).
- Consider cross fencing and rotational grazing to optimize forage stand and livestock production.

Intended Use and Variety Selection

TABLE 2 – GRAZING DISTRIBUTION
Grazing calendar showing periods of high and low forage availability for some of the pasture crops growing in drier areas.



Adding alfalfa to grass seed mixtures usually increases forage production and forage quality. When seeding grass – alfalfa mixtures for pasture use, try to obtain final stands containing about 60 to 70% grass, and 30 to 40% alfalfa. Bloat could be a problem when grazing alfalfa if improper management techniques are used. There are a number of anti-bloat products available in the market that can be helpful in reducing the risk of animals bloating, if consumed according to recommendations. There is also one reduced bloat alfalfa variety, AC Grazeland, that can reduce the incidence of bloat in animals up to 80%. Varieties selected to be seeded in pastures are often the creeping rooted type, as well as those tap rooted ones with the traffic tolerance trait better known as deep set, or sunken crown alfalfas. The sunken crown type alfalfa will, under normal conditions, out yield the creeping root type, but if soil is very marginal, or is coarse in texture then the alfalfa of choice would be the creeping root type.

Selection of species should be based on time of use, type of livestock to be grazed, soil type, environmental conditions, etc. Most pastures in Canada are normally used from mid-spring to mid-fall if conditions allow it. A combination of species that will allow for production throughout that period of time is desired. Also for establishing pasture stands, consider including a small percentage of one or two species that are easy to establish, like perennial ryegrass for areas with good amounts of moisture throughout the season, or for dryer areas consider using slender, intermediate and/or pubescent wheatgrass, as they are considered “insurance grasses” because they can germinate quickly, and produce vigorous, fast growing seedlings that provide considerable forage while other grasses and legumes are still becoming established. These grasses will disappear over time as they are poor competitors, especially under grazing conditions. Newer varieties of intermediate wheatgrass have improved stand persistence.

Russian wildrye is a special use grass that can be managed more intensively for grazing if seeded in pure stands. Its high nutrient-retaining quality allows spring and summer growth to be saved for late fall summer and fall grazing. Russian wildrye seedlings are very poor competitors and will not compete well with weeds or a companion crop, although new varieties have improved seedling vigour. Although, if a pure stand of this grass is desired, one should still plan to seed without cover crop if soil conditions permit.

Seeding Rates

Rates at which new forage establishment should be sown at will be determined by soil type, annual precipitation, and seed size of the species selected. Before determining how many pounds per acre are necessary, one needs to set a TARGET number of plants per square foot. Factors determining the achievement of this target will be greatly affected by species selected and their establishment percentage rates, growing conditions at seeding and developing stages, as well as seeding method.

Target number of plants that will provide a maximum or near maximum yield potential should range between 8 and 14 plants per square foot. Areas with good moisture conditions or irrigation should target 12 to 14 plants per square foot. Drier areas should have a target of 8 to 10 plants per square foot. The table below shows different species and their percentage establishment ranges, which will give you an idea of where to start to determine seeding rates.

Typical Estimates of Seedling Establishment Percentage

20 – 50	15 – 25	10 – 25	0.01 - 5
Crested Wheatgrass	Native Wheatgrass	Alfalfa	Kentucky Bluegrass
Bromegrass	Sainfoin	Alsike Clover	Canada Bluegrass
Timothy	Cicer Milkvetch	Red Clover	
		Creeping Red Fescue	
		Meadow Foxtail	

Source: David Walker

Estimated Seedling Establishment % = Emergence % X 1st season survivorship %

Then, considering differences in seed size (seeds/pound), plus taking into consideration the above numbers, one can move forward to determining how many pounds per acre will be required to achieve your target plant count.

Alfalfa for example will have around 4.5 seeds per square foot for every pound sown (200,000 seeds / pound seeded into 43,560 sq.ft. in 1 acre). This is assuming that the seed lot tested 100% for both germination and purity. With good seeding techniques, good seedbed preparation, use of seed treatment and reasonable moisture from seeding to fall, one can expect 20 to 25 % establishment. This means that for every pound seeded, 0.9 – 1.1 plants will establish. So, to achieve a target plant count of 12 plants / sq.ft., 11 to 13 lbs / acre should be seeded for a pure stand of alfalfa. **Since all PICKSEED Proprietary Alfalfas have been coated and inoculated at a rate of 10%,** then your seeding rate must be adjusted to achieve the desired target.

Grass seeding rate recommendations are generally based on 20 to 30 seeds / sq.ft. These rates can be adjusted according to moisture conditions, as well as species used, and bunch type versus rhizomatus type grasses, as the latter will spread over time and fill in the gaps present in the field.

DLF PICKSEED SEEDS & SCIENCE

Seeding Rates

Recommended Seeding Rates by Soil Zone for Pure Stands (lbs/acre)

Legumes	Light Brown Soil	Light Brown Soil Irrigation	Brown Soil	Black Soil	Grey Soil	Peace River
Alfalfa	10	14	10	12	12	12
Alsike Clover	NR	5	NR	5	5	5
Red Clover	NR	8	NR	6	6	6
Sweet Clover	8	10	8	10	10	10
White Clover	NR	5	NR	5	5	5
Sainfoin	40	40	40	40	NR	NR
Birdsfoot Trefoil	NR	7	NR	7	7	7
Cicer Milkvetch	10	12	10	12	12	12
Grasses						
Kentucky Bluegrass	NR	6	NR	6	6	6
Meadow Bromegrass	12	13	12	12	12	12
Smooth Bromegrass	10	10	10	10	10	10
Reed Canarygrass	NR	6	NR	6	6	6
Meadow & Tall Fescue	NR	9	NR	8	8	8
Creeping Red Fescue	NR	6	NR	5	5	5
Creeping Foxtail (Gro-Koted)	NR	17	NR	17	17	17
Meadow Foxtail (Gro-Koted)	NR	17	NR	17	17	17
Orchardgrass	NR	9	NR	7	7	7
Timothy	NR	4	4	4	4	4
Crested Wheatgrass	8	8	8	8	8	8
Intermediate Wheatgrass	10	10	10	11	11	11
Slender Wheatgrass	8	NR	8	10	10	10
Tall Wheatgrass	10	NR	10	11	10	NR
Northern Wheatgrass	8	NR	8	10	NR	NR
Western Wheatgrass	10	NR	10	11	NR	NR
Streambank Wheatgrass	8	NR	8	10	NR	NR
Annual / Italian Ryegrass	NR	15	NR	12	12	12
Perennial Ryegrass	NR	8	NR	7	NR	NR
Altai Wildrye*	12	NR	12	NR	NR	NR
Russian Wildrye*	8	NR	8	8	NR	NR

Note:
All rates assume Seed testing 100% Germination and 100% Purity
NR = Not Recommended
When Broadcasting seeding rate should increase by 30% Min.
*Seeding Rates based on 12” row spacing

Weed Control

Weeds reduce forage production during establishment by competing with and choking out young seedlings. Weeds also invade established forage stands and reduce forage quality and productivity. Effective weed control begins before seeding and continues throughout the life of the stand. The most important factor in weed control is to establish and maintain a vigorous forage stand. Soil fertility and pH, species selection, and seedbed preparation are very important factors affecting weed encroachment.

Forage stands are left in production for multiple years. Lack of tillage during this time favours the invasion of perennial weeds. Thus it is very important to eliminate weeds prior to seeding. Herbicides for perennial weed control can be applied in spring or fall. Fall application is recommended in most cases for more consistent control. Applying non-selective herbicides to perennial weeds at the proper growth stage in spring may delay forage planting past the optimum time. Quackgrass is one of the most serious perennial weeds in forage stands. Fall application of Glyphosate herbicide is more effective than a spring application. Quackgrass should be actively growing when the herbicide is applied.

In the seeding year, tillage is an important part of weed control when establishing forages. Thorough tillage helps uproot existing annual weeds and sets back established perennial weeds. Final tillage should be done as near to planting as possible to allow forages a head start on weed growth. Cover crops are often used to control weeds and soil erosion. Herbicides are rarely needed in these cases, especially if the cover crop is harvested as silage. For direct seeding forage stands planted in the spring, herbicides are usually needed for weed control.

Source: Undersander et.al., 1994

Seedbed Preparation

Seedbed preparation should begin the year before seeding. Scout the fields for perennial weeds and use appropriate control measures to help ensure a successful and long lasting productive stand. A firm seedbed is essential for forage establishment. A well-packed seedbed will permit a shallow, precise depth and will allow seed to be placed in close contact with moist soil.

Pack Seedbed enough so that tracks made by a person are no deeper than 3/8 inch (source: Meyer, 1999)

Conventional tillage is usually necessary, even though it varies from farm to farm. Generally, it should consist of a primary tillage that will loosen the soil and help control perennial weeds, followed by a second pass to level the land and break up large soil clods. The final tillage should be some type of smoothing operation. On level ground, primary tillage is best done in the fall as winter freeze-thaw cycles help break down clods and reduces field operations in the spring. On erosive soils, fall tillage may not be an option. The ideal soil condition for conventional seeding should be a smooth, firm, clod free soil for optimum seed placement with drills or air-seeders. Avoid overworking the soil as rainfall following seeding may crust the surface, preventing seedling emergence.

No-till forage establishment is a viable alternative to tilled seedbeds. Early spring seeding, about the time small grains are first seeded, into clean small grain stubble has been very successful when subsequent weed growth is controlled with post-emergent herbicides. Also, the lack of tillage preserves soil moisture for seed germination and early growth, allowing successful stand establishment even under less than optimum moisture conditions. Be sure to remove the straw or use a good straw chopper in fields where no-till seedings are planned.

Fertility

A well planned fertility program is necessary to maintain high forage yields under dryland and irrigated production systems. Adequate fertility improves forage's ability to compete with weeds, and also strengthens disease and insect resistance. Fields differ in their fertilizer needs. Take an inventory of your soil fertility needs – SOIL TEST. It is the most convenient and economical method of evaluating the fertility levels of a soil and accurately assessing nutrient requirements.

Seeds can germinate without fertilization. However, once the small amount of nutrients in the seed is used, the young seedling depends entirely on soil nutrients for their development.

Nitrogen is generally not needed for successful stand establishment under dryland or irrigation, but once established, proper nutrient application is required to maximize production. Moderate to high levels of applied nitrogen at seeding promote the growth of weeds and the companion crop, which may provide too much competition for the new forage seedling, especially on dryland. Legumes that have been properly inoculated before planting normally do not require nitrogen fertilization.

Phosphorous encourages root development. A well developed root system helps protect seedlings from winter injury and produce vigorous stands the following spring.

Potassium deficiencies occur on some very sandy soils. A soil test prior to seeding will determine the levels in your soil and its needs.

Soil pH: alfalfa is sensitive to soil pH and performs best at levels equal to or greater than 6.5. Alfalfa grown on soils with pH less than 6.0 must be limed in order to obtain good stands and maintain productivity. Limestone application should be incorporated prior to seeding for best results. Fineness of limestone grade is important because fine particles neutralize acidity faster than coarse particles. Generally, pelleted limestone sources are no more effective weight by weight than fine limestone. For a soil with a cation exchange capacity greater than 20, one ton of limestone will increase pH about 0.3 pH units.

Seeding Dates

The best seeding date depends on soil moisture and whether grasses or legumes are being seeded. Grasses require 8 to 14 days to germinate while legumes require 5 to 7 days to germinate, and if planted in mid-summer they will require 6 to 8 weeks or more before a killing frost to develop a plant that can survive the winter.

Spring Planting: planting forage crops in good clean stubble without a companion crop has been very successful; however, one crop year is lost with grasses. Early spring seeded alfalfa will allow for one to two cuts in the establishing year, as long as there is moisture available throughout the season. The stubble protects the seedlings from blowing soil without competing for moisture. Plantings on clean tilled land with a companion crop will be successful, provided soil moisture is not limiting. On soils subject to wind erosion, plant the companion crop first, and then seed the forage in the opposite direction. If oats or barley is used for a companion crop, it may be removed as silage to eliminate competition. Wheat, canola and flax can be harvested for grain, but should be removed early if conditions turn dry.

Late Fall (Dormant Planting): successful plantings have been made by seeding in late fall, just before freeze-up. Planting in clean stubble fields provides a good seedbed, but volunteer plants could become a problem if thick. Dormant seeding works better with grasses than with legumes. Most grasses germinate slower than legumes so there is less risk of fall germination.

IMPROPER planting depth is the cause of many grass and legume seeding failures. A shallow seeding depth is important in establishing grasses and legumes. Optimum seeding depths vary depending on soil types. Plant seed 1/4 to 1/2 inch deep on medium and heavy textured soils, and 1/2 to 1 inch deep on sandy soils as surface may dry up faster than heavier soils. Broadcasting is recommended if soil surface conditions are excellent, and you should seed at 1.5 to 2 times the recommended seeding rate for drilled in seed.

Source: Forage Establishment

Management After Seeding

Keep a close watch on new seedings. A soil crust may form before seedling emergence. A light irrigation or surface roughening will aid seedling emergence. Surface residues help prevent surface drying, break the force of raindrops and reduce soil puddling, thereby holding more moisture near the surface and reducing the surface crusting problems.

Growth of weeds may cause loss of new seedlings in spring plantings where companion crops are not used. Mow the weeds only if they offer severe competition to the new forage seedlings. Pure grass seedings can be mowed short without much injury to the seedlings. Legume seedlings are injured by close mowing for weed control. Mowing for weed control should be done when daytime temperatures are cool. Weed control can also be obtained with the use of herbicides (Meyer, 1999).

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