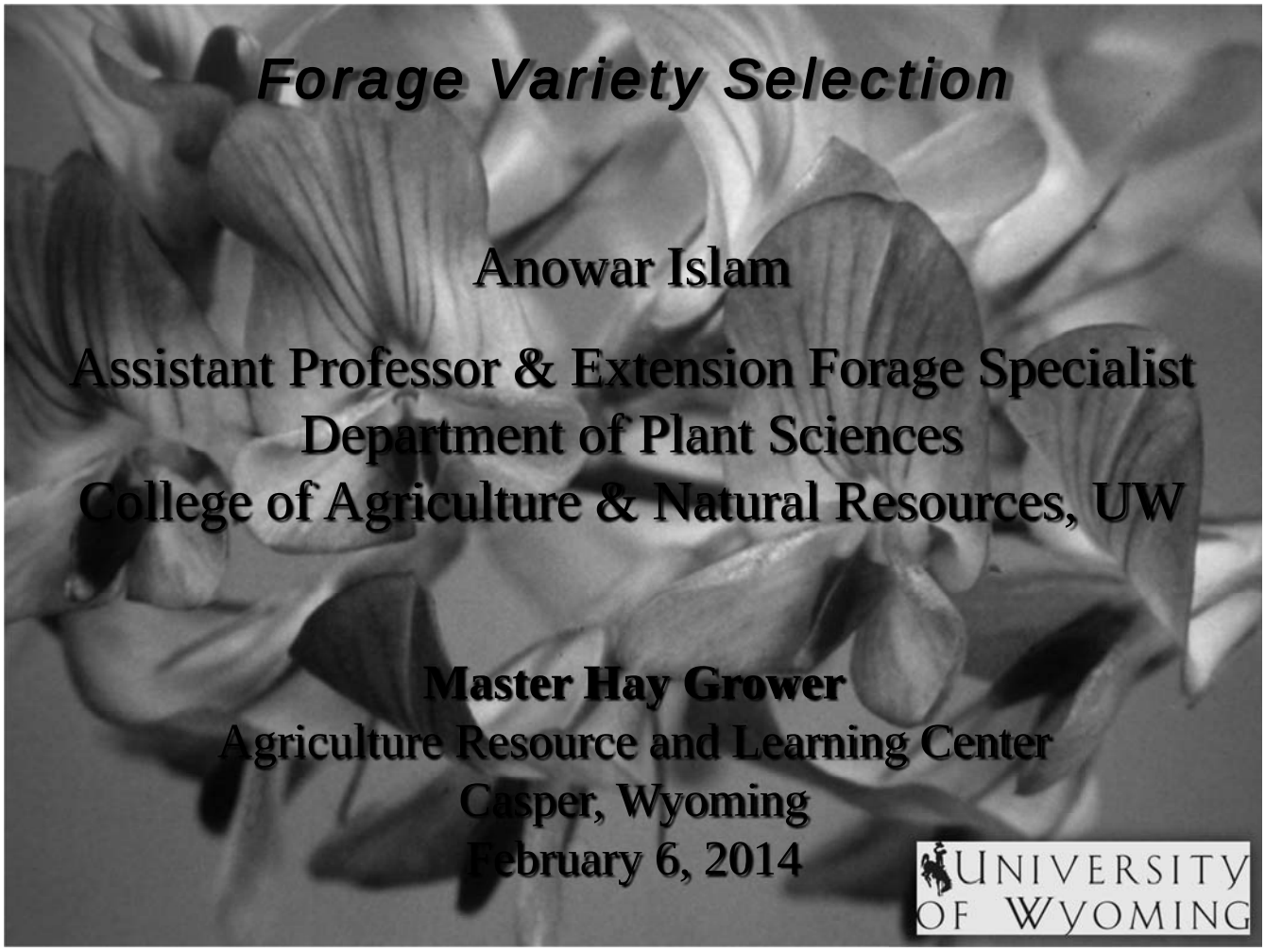


Genetics, Variety Development, and Species Selection

Forage Productivity is the function of:

Genetics +

Management +

Environment

Good genetics = good performance

- **Correct forage species for the operation**
- **Best variety of those species for maximum performance**
- **Best management practices for the best outcomes**
  - **Provided, weather cooperates as well**

Genetics vs. Variety and Species Selection

- **About 10,000 grass species worldwide**
- **About 12,000 legume species worldwide**
  - **only ~40 used for hay, silage, and pastures**
- **A "Forage Manager" must be familiar with these grasses, legumes, and few other miscellaneous forages**

Species and Variety Selection

Importance

Cost of Seeding:

Seed	$20-40/acre
Tillage	$20 or more
Drilling	$10-15
Herbicide	$0-20
Lost production	$70 or more
	$120-160/acre or more

If there is a partial success (or failure), *an inadequate stand not* ***reseeded*** will result in lost production over the life of the stand
i.e., 1/2 ton/year for 4 years is ***$140/acre or more****.*

Species and Variety Selection

Species/variety selection based on:

- Adaptation – related to persistence
  - soil
  - climate
  - relevant pests
- High yield
- Intended use
- Local variety testing

Species and Variety Selection

Site and Species Selection:

A good *planning does half-of-the-job!* Should start planning at least a year ago ---

Matching species needs soil characteristics

- Soil surveys
- Soil tests
- Previous crop experience

Species and Variety Selection

Considering high-quality seed:

- Certified seed
  - guaranteed purity - genetics
  - free of noxious weeds
  - fewer other weeds
- Seed treatment
  - fungicide
  - seed coating
- Legume inoculation

Alfalfa

Importance

1. One of the oldest domesticated crops.
2. Grown in all 50 states.
3. Highest feeding value of the forages.

Genetics

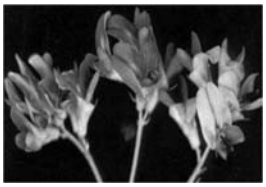
- Currently > 300 varieties
- > 30 varieties per year released
- 9 major germplasm introductions into U.S.
  Chile, Peru; Russia, Turkey; Flanders;

Species

Medicago sativa spp. *sativa* (purple flower alfalfa)

Medicago sativa spp. *falcata* (yellow flower alfalfa)

Medicago sativa spp. *media* (purple/green/yellow or "variegated")



Alfalfa

Adaptations/Requirements

- Deep well-drained soil
- Ph 6.5 or higher
- Lots of water
- Good fertility

Variety selection

- Look at variety trial results
- Disease resistance (multiple pest resistance)
- Avoid blends
- Buy certified
- Consider use (greater yields, purchase less protein, reduce winter feed costs, reduce N fertilizer bill)

Sainfoin

General Characteristics:

- Greater frost tolerance than alfalfa
- Very winter-hardy

- Early spring growth and maturity
- More water use efficient than alfalfa

- Less regrowth than alfalfa
- Short-lived under irrigation
- Tolerant to high-lime soils
- Doesn't tolerate wet soils or high-water table

Sainfoin

Varieties:

Eski and Remont – MT
Shoshone – WY (UW)
Melrose and Nova - Canada
Renumex – NM
Delaney or UWRD– UW AES and MT AES, *the latest one!*

Importance:

- Non-bloating
- Extremely palatable
- More compatible with grasses than alfalfa
- Tolerates low P soils
- Excellent drought tolerance

Best Fit?

Dryland pastures with > 13” precipitation

IRRIGATED PERENNIAL GRASSES

Smooth brome

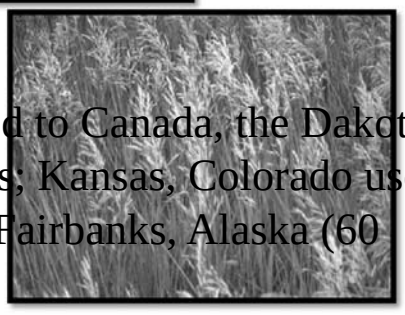
Adaptation

- Deep, well-drained, moist soil (same as alfalfa)
- Alaska, Canada, E. Great Plains-Northern Corn Belt
- >16 inches rainfall

Meadow brome

Adaptation

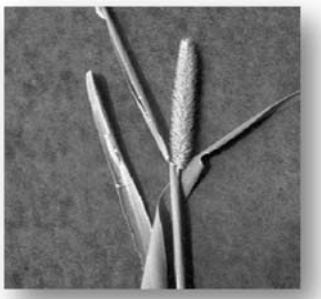
- Much more limited
- Intermountain West



Northern type of smooth brome best adapted to Canada, the Dakotas; Nebraska and Wyoming are transition zones; Kansas, Colorado use the southern type. Brome does just fine at Fairbanks, Alaska (60 degree N. latitude).

IRRIGATED PERENNIAL GRASSES

Timothy



Adaptation:

- Not as widely adapted as smooth brome
- Cool, moist areas
- Tolerant of acidity
- Tolerant of wetness, some flooding
- Low tolerance of drought or salinity

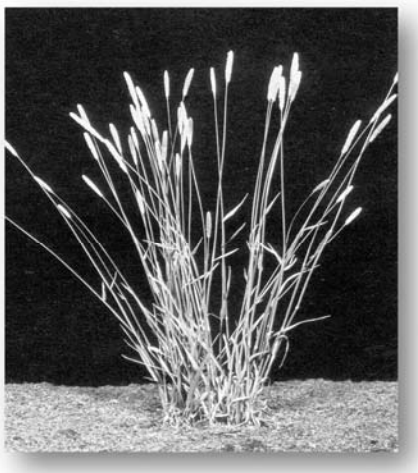
Uses:

- First growth – hay
- Regrowth - pasture
- Standard for horses
- Easily over-grazed

Note: Avoid sandy soils!

IRRIGATED PERENNIAL GRASSES

Creeping Foxtail



Adaptation:

- Mostly Intermountain West
- Annual precipitation - strictly irrigated
- Winter hardiness: excellent
- Salinity tolerance: good
- Wet soil/flooding tolerance: excellent
- Drought tolerance: none
- Heat tolerance: little

Use:

- Hay + Pasture: early greenup in spring; excellent palatability; good grazing tolerance
- Conservation use

Orchardgrass

Adaptation:

- Annual precipitation needs >18 inches
- Salinity tolerance - little
- Wet soil tolerance - little
- Flooding tolerance - none
- Drought tolerance - limited
- Heat tolerance - good
- Shade tolerance - good

Orchardgrass

Uses:

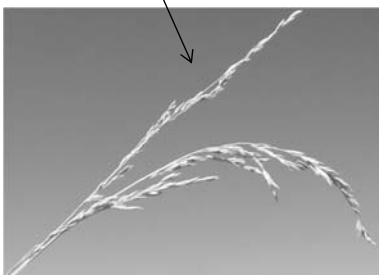
- Pasture preferred over hay
- Season - average earliness
- Growth habit - lots of basal leaves
- Regrowth - excellent
- Palatability - excellent because of very soft leaves
- Grazing tolerance - dependent on management

Tall fescue

(Festuca arundinacea Schreb.) – old name
Lolium arundinaceum (Schreb.) Darbysh
Schedonorus arundinaceus (Schreb.) Dumort.
Family: Poaceae
Origin: Europe, Africa

Description/Characteristics:

- Cool-season perennial
- Bunch grass (mainly); sod forming too
- Seed head a panicle



Bunch type, excellent seed production potential

Tall fescue

Adaptation:

- Adapted to humid, temperate areas
- Annual precipitation >16 in.
- Winter hardiness - good
- Salinity tolerance - good
- Wet soil/flooding tolerance - good
- Drought tolerance - good
- Heat tolerance - good

Reed canarygrass

- Cool-season perennial
- Long-lived
- Sod-forming

Adaptation:

- Annual precipitation - >16 in.
- Winter hardiness - excellent
- Salinity tolerance - little
- Wet soil/flooding tolerance - excellent
- Drought tolerance - good
- Heat tolerance - poor

Reed Canarygrass

Uses and Management:

- Pasture preferred over hay
  - -Forage quality decline
  - -Palatability - good until near heading
  - -Grazing tolerance - good
- Conservation use -waterways, ditch banks, not irrigation ditches
- Difficult to establish because of slow emergence; once established – vigorous and invasive in wet sites

Intermediate wheatgrass

Adaptation:

- Annual precipitation >14 in.
- Salinity tolerance - moderate
- Wet soil/flooding tolerance - little
- Drought tolerance - good
- Heat tolerance - little

Intermediate wheatgrass

Use and management:

- Establishment –relatively easy to establish, high seedling vigor
- Compatibility with legumes - compatible with alfalfa, particularly under dryland
- Palatability – fair to good
- Regrowth - limited
- Growth habit – upright, suitable for haying
- Hay vs pasture – useful for pasture or haying

Hybrid wheatgrass

Bluebunch wheatgrass x quackgrass

Agropyrum (Pseudoroegneria) spicatum x Agropyrum (Elytrigia) repens

Cultivar: ‘Newhy’

- good salt tolerance

IRRIGATED PERENNIAL GRASSES

Species Selection for Specific Situations:

1. **Wet, poorly drained, low salinity**

   Smooth bromegrass
   Meadow bromegrass
   Timothy
   Creeping foxtail
   Orchardgrass
   Tall fescue
   Reed canarygrass
   Intermediate wheatgrass
   Hybrid wheatgrass

Recommendation:

- timothy, creeping foxtail, tall fescue, and reed canarygrass

IRRIGATED PERENNIAL GRASSES

Species Selection for Specific Situations:

2. **Well-drained, high salts**

Smooth bromegrass
Meadow bromegrass
Timothy
Creeping foxtail
Orchardgrass
Tall fescue
Reed canarygrass
Intermediate wheatgrass
Hybrid wheatgrass

Recommendation:

- tall fescue, hybrid wheatgrass (best)

IRRIGATED PERENNIAL GRASSES

Species Selection for Specific Situations:

3. **Mixture with alfalfa for pasture**

Smooth bromegrass
Meadow bromegrass
Timothy
Creeping foxtail
Orchardgrass
Tall fescue
Reed canarygrass
Intermediate wheatgrass
Hybrid wheatgrass

Recommendation:

- smooth brome, meadow brome, orchardgrass, tall fescue, intermediate wheatgrass, (possibly hybrid wheatgrass)

Grass-Legume Mix to Reduce Nitrogen Fertilization

Objective:

- Identify an optimal grass-legume balance in mixture that sustains high yield stability over time
- Quantify legume nitrogen contribution to grass growth, and its variation across environments

Methods/approach:

- One grass (MaxQ tall fescue)
- One legume (alfalfa, Ameristand 403T)
- 10 treatments, replicated 3 times
  - 5 grass-legume mix: 1:0; 0.75:0.25; 0.50:0.50; 0.25:0.75; 0:1
  - 5 N rates: 45; 90; 135; 180; and 270 lb/acre
- Planting date: Sep 10, 2009; seeding rate: 22 lb PLS/acre
- Harvests: <u>2010-2012</u>, early June, late July, early October; <u>2013</u>, early June, late July, early October

Grass-Legume Mix to Reduce Nitrogen Fertilization

Results:

Dry matter yield (lb/A) of tall fescue-alfalfa mix at Lingle, 2010

Trt	TF-Alf	1st cut	2nd cut	3rd cut	Total	Increase/control (%)
1	TF-alf (1:0)	866	2675	890	4431	0
2	TF-alf (0:1)	1273	2180	1164	4618	4
3	TF-alf (0.75:0.25)	1302	2587	1726	5614	27
4	TF-alf (0.50:0.50)	1342	4529	3297	**9169**	**107**
5	TF-alf (0.25:0.75)	1197	3826	2252	7276	64
6	TF 45 lb N	1433	3149	1546	6128	38
7	TF 90 lb N	1162	2700	1677	5538	25
8	TF 135 lb N	1092	2860	1911	5864	32
9	TF 180 lb N	1096	3020	3126	7243	63
10	TF 270 lb N	1247	2502	2743	6492	46
LSD (0.05)		560	1583	1220	1983	

Harvests: 1st – 6/7/2010; 2nd – 7/26/2010; 3rd – 10/7/2010

Sustaining Legumes in Grasslands

Results:

Forage quality of tall fescue-alfalfa mix at Lingle, 2010

Trt	TF-Alf	ADF			NDF			IVTDM			CP			RFV		
		Cut														
		1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1	TF-alf (1:0)	44	36	34	60	54	46	65	66	67	**13**	**12**	**9**	85	104	126
2	TF-alf (0:1)	40	33	35	47	40	44	64	70	67	**20**	**19**	**17**	116	149	131
3	TF-alf (0.75:0.25)	42	35	32	58	52	45	66	64	68	**14**	**12**	**9**	90	110	133
4	TF-alf (0.50:0.50)	43	36	33	60	56	47	67	66	67	**14**	**13**	**10**	87	101	126
5	TF-alf (0.25:0.75)	43	38	33	61	51	48	64	67	68	**16**	**15**	**12**	84	111	123
6	TF 45 lb N	41	35	32	53	52	45	65	67	70	**15**	**13**	**12**	104	110	132
7	TF 90 lb N	45	36	32	61	54	47	64	69	69	**13**	**14**	**13**	82	105	126
8	TF 135 lb N	44	36	32	61	55	48	67	67	70	**14**	**14**	**16**	84	103	124
9	TF 180 lb N	40	36	32	58	54	48	69	67	71	**16**	**14**	**16**	93	104	125
10	F 270 lb N	44	37	33	68	55	49	62	68	70	**17**	**14**	**17**	76	102	120
LSD (0.05)		5	2	2	9	6	3	8	3	3	3	3	2	23	13	11

Harvests: 1st – 6/7/2010; 2nd – 7/26/2010; 3rd – 10/7/2010

Minimum seeding rate in monoculture and mixture (lb/acre)

1. Alfalfa	8
2. Sweet clover	8
3. Birdsfoot trefoil	6
4. Alfalfa + Red clover	6+3
5. B. trefoil + Red clover	3+3
6. Red clover + Orchardgrass	5+3
7. B. trefoil + Orchardgrass	4+2
8. Alfalfa + Orchardgrass	6+3
9. Alfalfa + Bromegrass	6+8
10. Alf. + Brome + Orchard.	6+6+2

Source: Barnhart 2004

Summary

- Investigating what strengths each variety has been bred is helpful in making better selection

- Use as many resources as possible to determine the best variety for the needed uses

  Seed catalogs, vendors, internet, extension publications, university website etc.

- Good planning is the key for successful pasture renovation/improvement

  - this needs to be planned at least a year ahead

- *As always, best returns depend on effective utilization and well-managed livestock and forage programs*