*Understanding variations in response between inputs*

# Observations and Experiences from Oregon, USA

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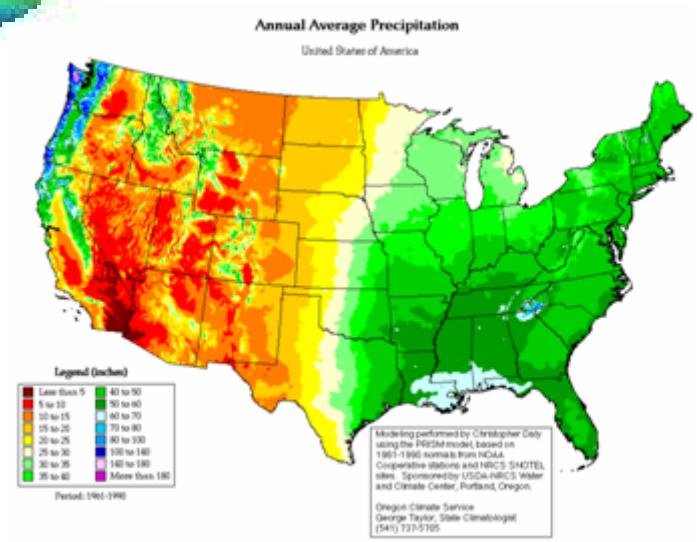
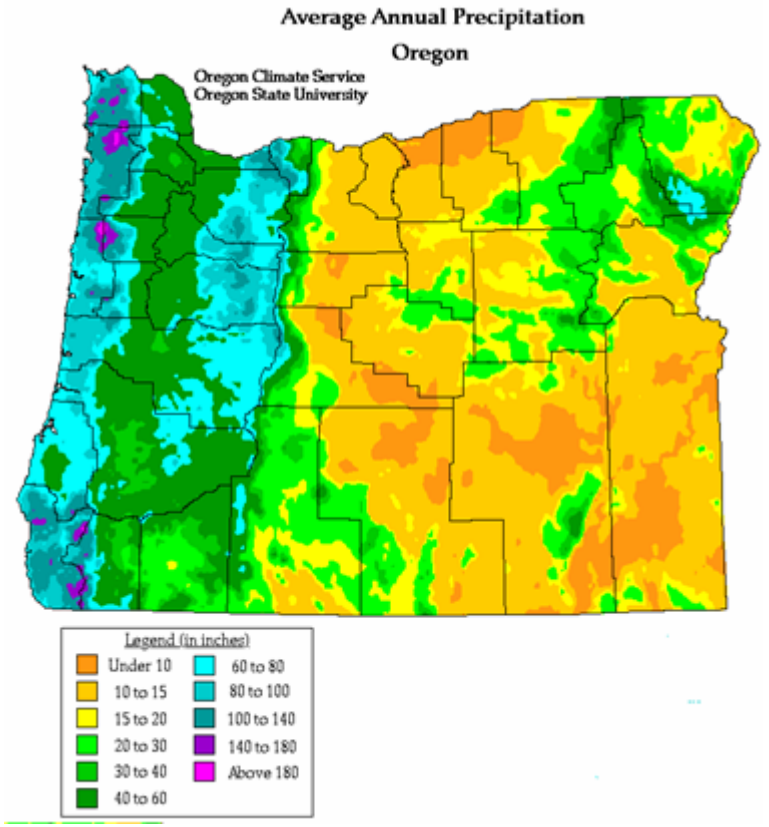
# Variation due to environment …

*will seasonally affect global, regional and local results.*



# Variation in seed research is good…

*we conduct experiments to measure it.*

Research trials at OSU's Hyslop Farm

**Plant Growth Regulator plots**

# Variation in seed research results from…

## *Experimental error*

**This the difference among crop units that are beyond the control of the researcher… we correct for this through *statistical methods*.**

**We use replication and randomization to estimate experimental error and to provide a more precise measure of treatment effects.**

# Statistics 101 *(a short review lesson)*

In most agricultural systems crops are simultaneously exposed to various factors during their lifetimes. Thus, many experiments are structured to involve more than one variable. In these studies, the behavior of one factor is suspected of changing with changes in another factor.

The differential effects of one factor on another are called *interactions*. The discovery of interactions broadens the conclusions of an experiment. Even if interactions do not occur, the results are more widely applicable as the main treatment effects have been shown to hold over a wider range of conditions.

# Variation in applied seed research…

*that is directed toward the immediate solution of an agricultural problem can be particularly challenging.*

**Field conditions**

**Crop maturity**

**Large equipment**

# Variation seen in our seed research…

*will be drawn from several recent studies that focus on:*

- Developing a better understanding of factors limiting reproductive efficiencies in cool-season grass seed species.
- Determining morphological, physiological and seed yield responses to post-harvest residue management, irrigation and plant growth regulator use.
- Reviewing agronomic practices related to fertility management and no-till cropping systems.




# Post-harvest residue management…

*Changes in management due to legislated reduction in open-field burning created variation in seed yield due to:*

- Weed control – destroys volunteer crop and weed seed and plants.
- Nutrient recycling – of several important nutrients including potassium and phosphorus.
- Stand density – due to increased volunteer seedling, particularly in annual ryegrass.

# Residue Management Methods… examples

- Thermal – Field burn, with or without full straw load, bale + propane burn.
- Clean non-thermal – Bale only, bale + flail, bale+ flail + rake, bale + reclip (with swather) + remove with loafer, vacuum.
- Full straw load – Flail 1X to 3X, flail 1X after combine straw chopper.

# Residue management affects seed yield

| Species | Full straw | Clean nonthermal |
|---|---|---|
| | --------- (% of burn) -------- | |
| Chewings fescue | 54 | 99 |
| Tall fescue | 96 | 101 |
| Orchardgrass | 105 | 101 |
| Perennial ryegrass | 94 | 99 |
| Kentucky bluegrass | 63 | 99 |
| Creeping red fescue | NA | 78 |

# Straw removal does not affect seed yield

| Straw removal | Perennial ryegrass | Tall fescue | Orchardgrass |
|---|---|---|---|
| (%) | ---------- (% of burn) ---------- | | |
| 0 | 94 | 96 | 105 |
| 39 | 99 | 101 | 101 |
| 90 | 100 | 100 | 100 |



# Plant growth habit affects…

- Bunch-type species have a high tolerance to clean non-thermal management, and most species tolerate full straw load.
- Creeping-type species have lower tolerance to clean non-thermal management, and no tolerance of full straw loads.

**Tall fescue**

**Full straw vs. Clean non-thermal**

# Row spacing and seed production…

Row spacing most affected root biomass in the shallow portion of the soil. In the 1st year, narrow rows resulted in greater root biomass in the shallow portion of the soil than wide rows. Smaller effects were noted at moderate depth in the 2nd year. Root biomass was essentially unchanged among years in the deep portion of the profile.

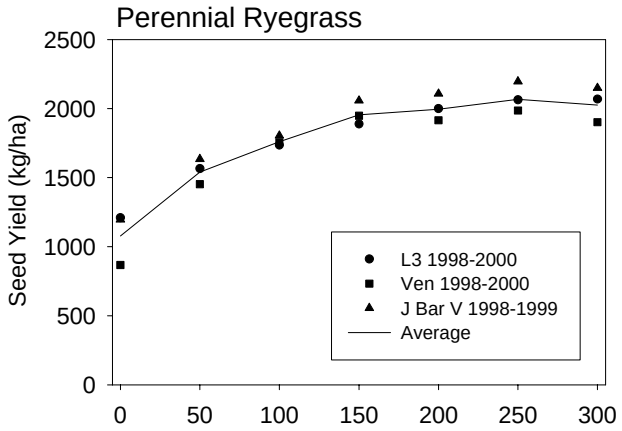
The crop density resulted in marked plasticity in tiller production. The fewest number of tillers per plant was observed in 15-cm rows and greatest number per plant was found in 60-cm rows.

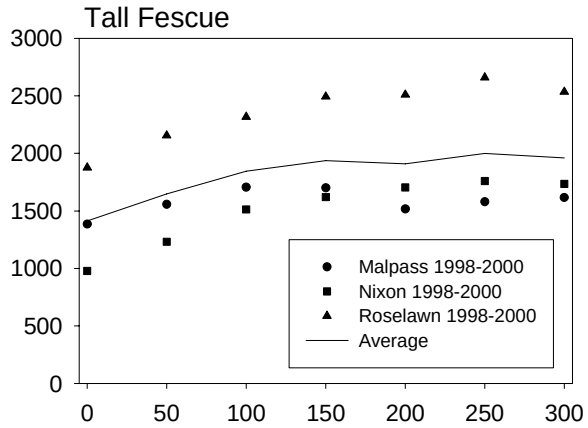
Row spacing had no effect on seed yield in tall fescue.

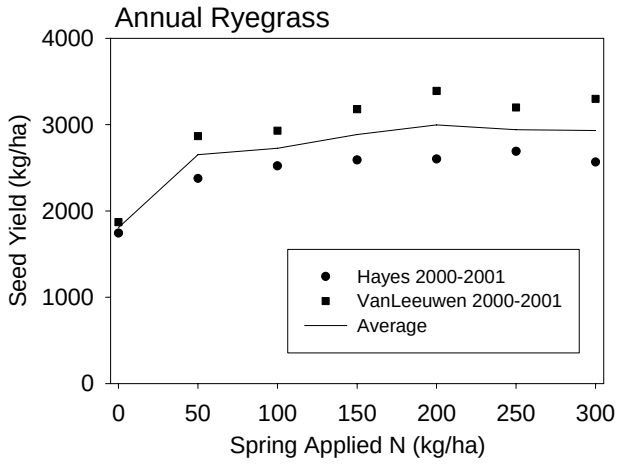


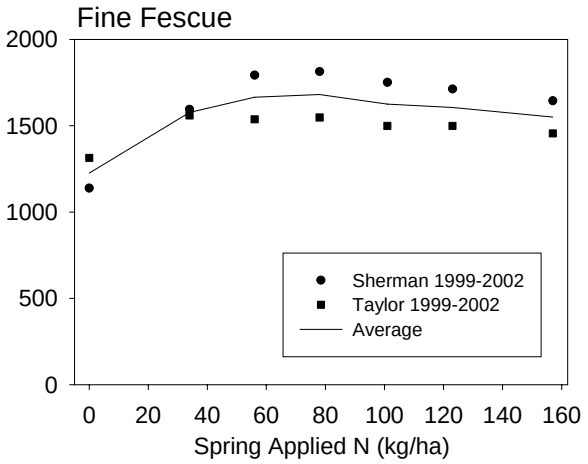

# Spring N fertilization rate affects…

**Optimum levels of spring applied N for seed production were: 150-200 kg/ha for perennial ryegrass, 100-150 kg/ha for tall fescue, 50-60 kg/ha for fine fescue, and 150-200 kg/ha for annual ryegrass as determined from site averages over several years.**



# PGR and Spring N on perennial ryegrass…

| Main Factors | Seed yield | Total biomass | Harvest index | 1000 seed weight | Plant height | Lodging. score |
|---|---|---|---|---|---|---|
| | (kg ha$^{-1}$) | (t ha$^{-1}$) | (%) | (g) | (cm) | (1-5) |
| N rate (kg ha$^{-1}$) | | | | | | |
| 100 | 1328 b[1] | 9.7 | 15.5 | 1.59 | 54.3 | 2.3 c |
| 160 | 1541 a | 11.3 | 14.0 | 1.61 | 57.1 | 2.6 b |
| 200 | 1589 a | 11.0 | 15.0 | 1.64 | 56.0 | 3.0 a |
| 250 | 1611 a | 11.7 | 14.3 | 1.63 | 56.7 | 3.2 a |
| LSD 0.05 | 99 | NS | NS | NS | NS | * |
| PGR | | | | | | |
| Untreated | 1210 b | 11.8 | 10.5 b | 1.61 | 65.4 a | 4.6 b |
| Palisade | 1670 a | 10.6 | 16.8 a | 1.64 | 51.8 b | 1.8 a |
| Apogee | 1671 a | 10.4 | 16.8 a | 1.61 | 50.9 b | 1.8 a |
| LSD 0.05 | 86 | NS | 2.8 | NS | 4.0 | * |

[1] Means in columns for each main factor followed by the same letter are not significantly different at FPLSD = 0.05

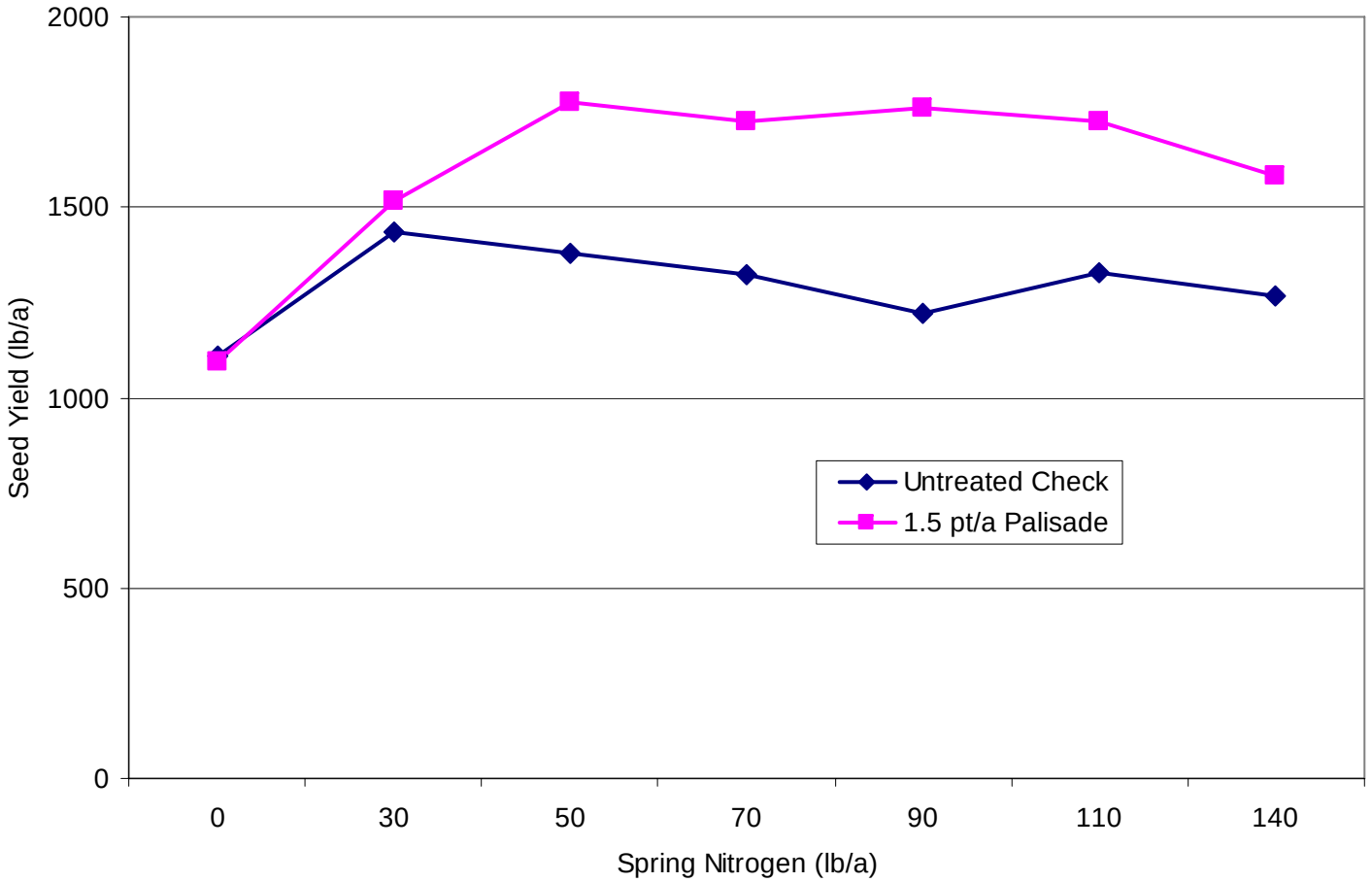
* Significant N rate x PGR interaction P value ≤ 0.01.

# N x PGR interaction for lodging score…

| Main Factors | Untreated | PGR | |
|---|---|---|---|
| | | Palisade® | Apogee® |
| | Visual scale is 1-5 (1= upright, 5 = flat) | | |
| N rate (kg ha$^{-1}$) | | | |
| 100 | 4.5[1] | 1.3 | 1.0 |
| 160 | 4.6 | 1.6 | 1.6 |
| 200 | 4.6 | 2.1 | 2.1 |
| 250 | 4.6 | 2.4 | 2.5 |

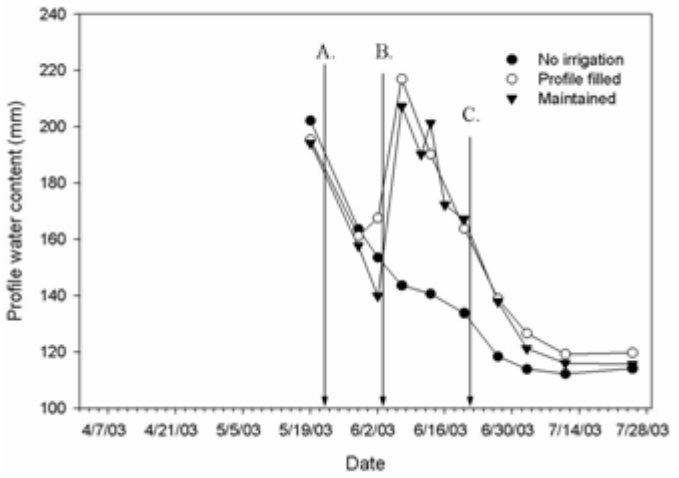
[1] Use FPLSD 0.05 value (LSD = 0.4) for N rate (columns) or PGR (rows) mean separation tests

# PGR and Spring N on creeping red fescue…

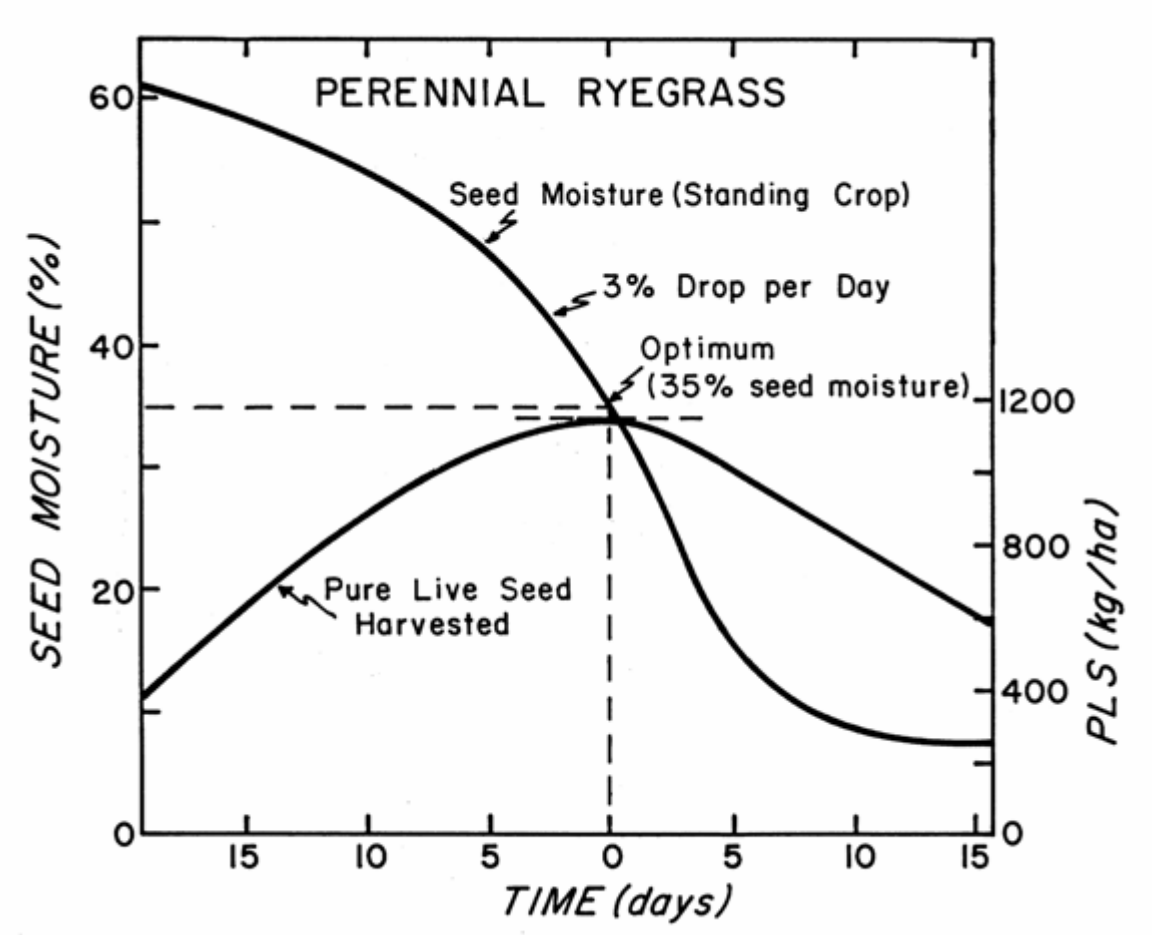


# Spring irrigation management…

- Soil water content declined rapidly during anthesis, and continued to decline through seed fill.
- Irrigation timing in perennial ryegrass seed production should be focused on alleviating water deficit from the onset of anthesis to the conclusion of seed fill.
- Applying 95 mm of water to fill the soil profile once alleviated water deficit during this period and increased yield in the silt loam soil of this experiment.




# Harvest time affects seed yield…




- Too early = light, immature seed
- Too late = increased shattering loss

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