WSU Wheat Academy 2024
Falling Numbers

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The Village

WSU


A. Carroll


J. Kelly

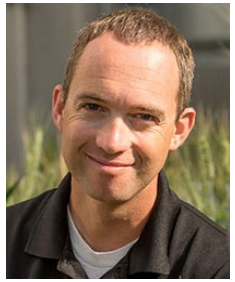

A. Hauvermale


M. Pumphrey


A. McCubbin


C. Neely


D. Lyon


A. Carter


Z. Zhang

OSU


A. Ross

UI


J. Piaskowski


J. Marshall


J. Chen

USDA-ARS


C. Steber


X. Li


B. Baik


A. Thompson


A. Kiszonas

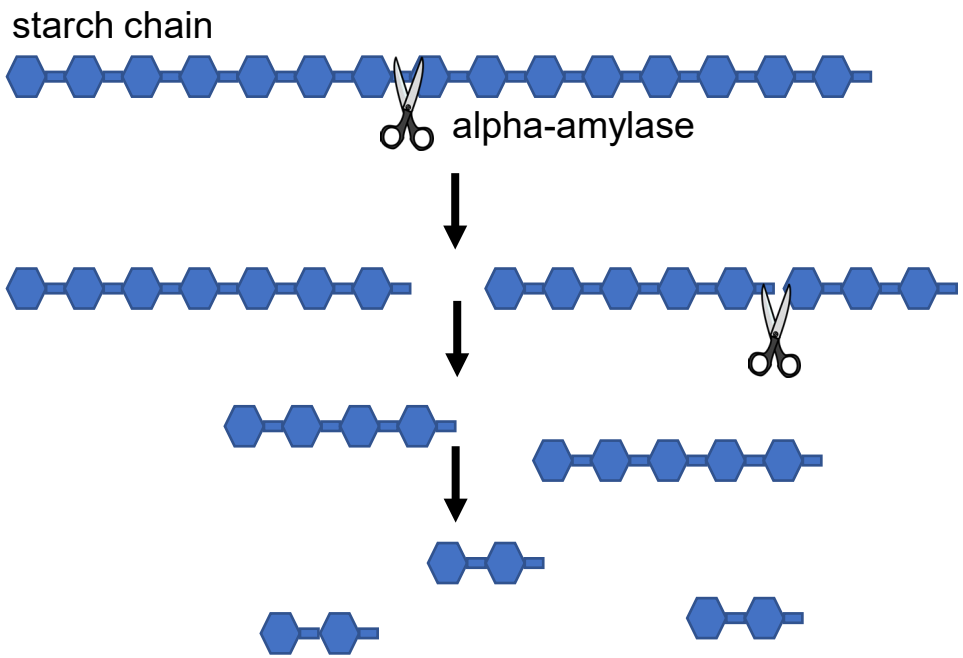

K. Campbell

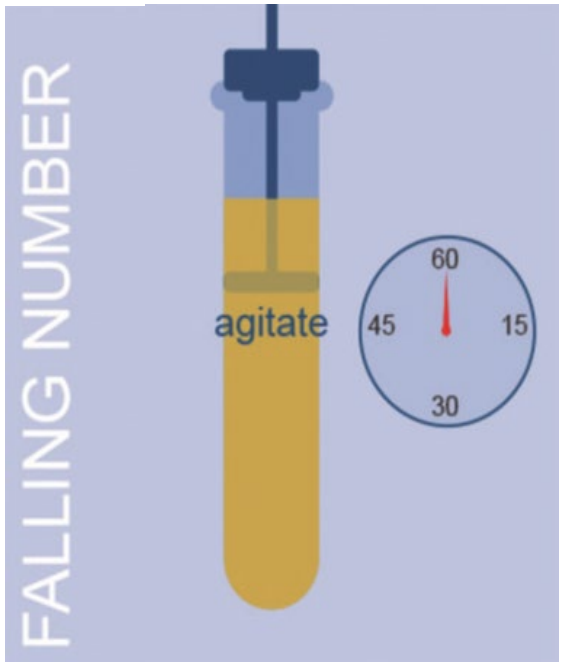

D. See

TOPICS

- What is a falling number?
- History of falling number in the PNW.
- Sources of falling number variation.
- Developing alternatives to the FN test.
- Communication about research needs, progress, about how varieties compare.

What is a Falling Number and What Does it Measure?



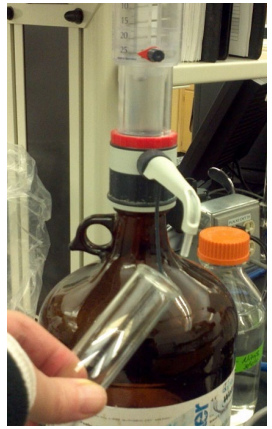


- The Hagberg-Perten Falling Number (FN) Method was invented in 1960.
- The FN test detects starch damage from the enzyme alpha-amylase in wheat meal.
- A falling number is the time in seconds it takes a stir rod to fall through a gravy.
- Starch damage results in thin gravy and poor end-use quality.
- A threshold for “soundness” is 300 seconds and is used to manage industry risk.

The FN Workflow

1. Grind

2. Mix and Weigh



3. Add Water

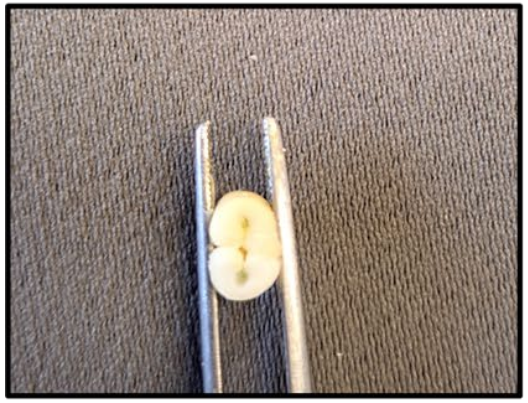
4. Shake

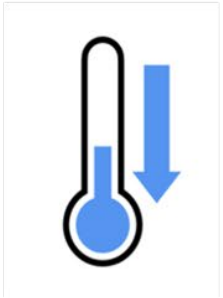
5. Add Stir rod and Test

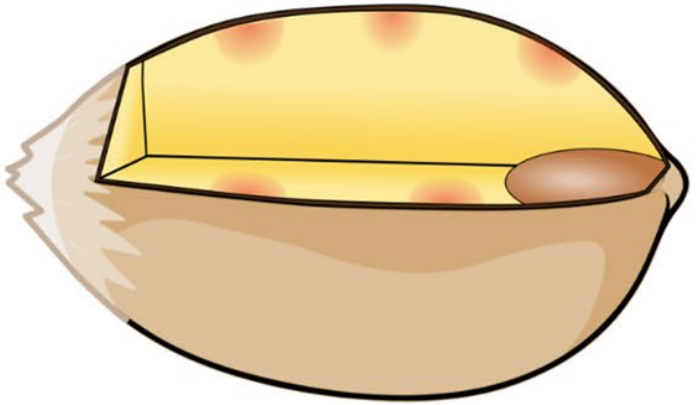
FN video

CAUSES of LOW FN

Late maturity alpha-amylase (LMA)

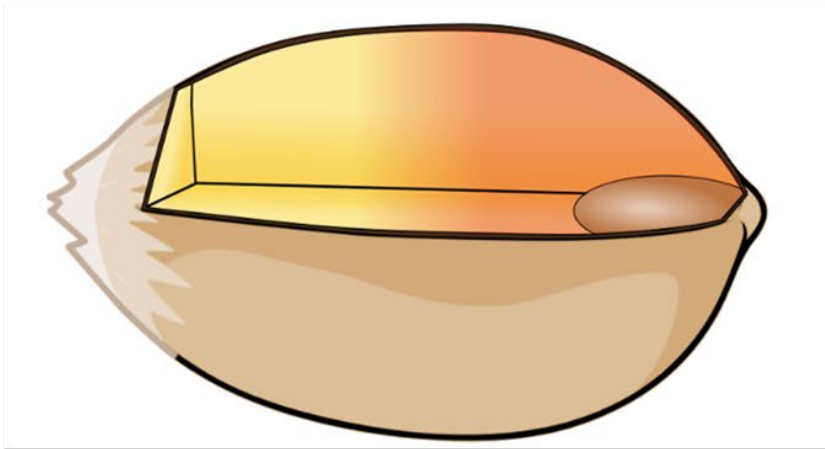






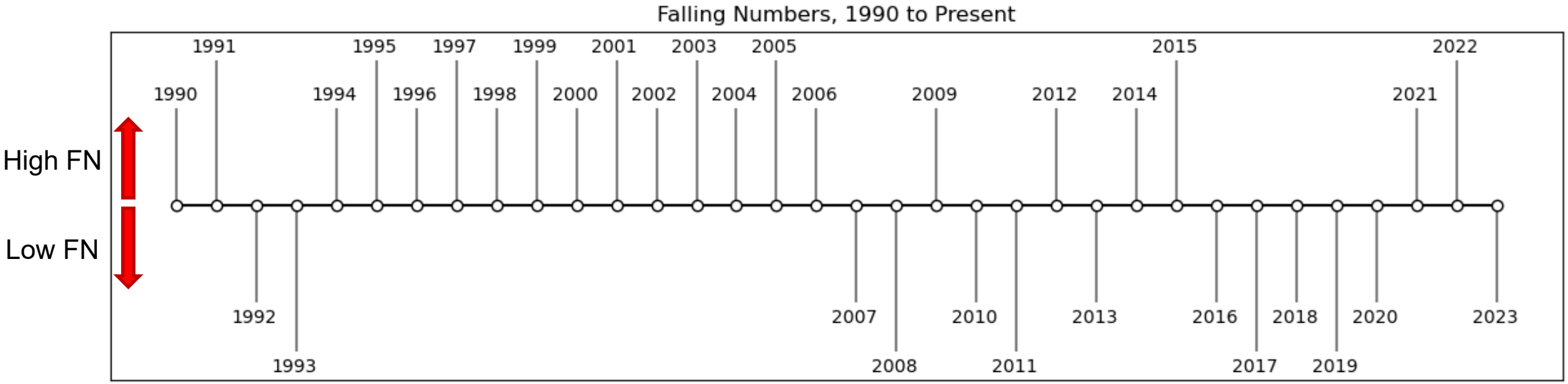
Preharvest sprouting (PHS)

Courtesy of Anna Carroll



A Brief History of Falling Number in the PNW

- It’s all about the timing…
  - Our ‘last’ spring cold snap is pushing into mid-June, historically it should be mid-May
  - Our fall rain is pushing into early September, historically it should be late-October



CAKE DEMO

Sampling Study

35,1007.9 Kg
351.0 mt

10,968.9 Kg
10.9 mt

1.09
Kg

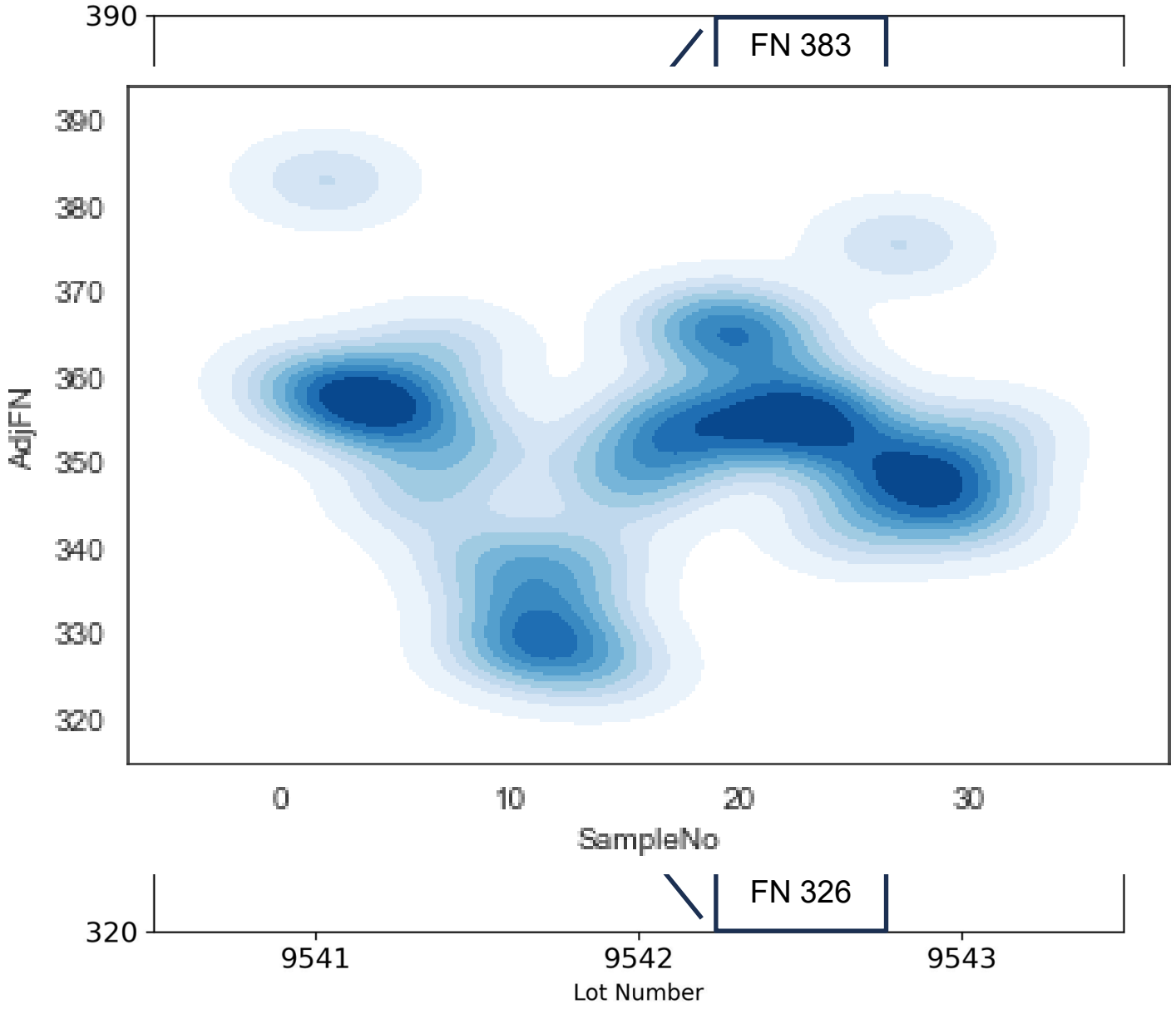
133.8
Kg

1.40
Kg

0.25
Kg

0.014
Kg

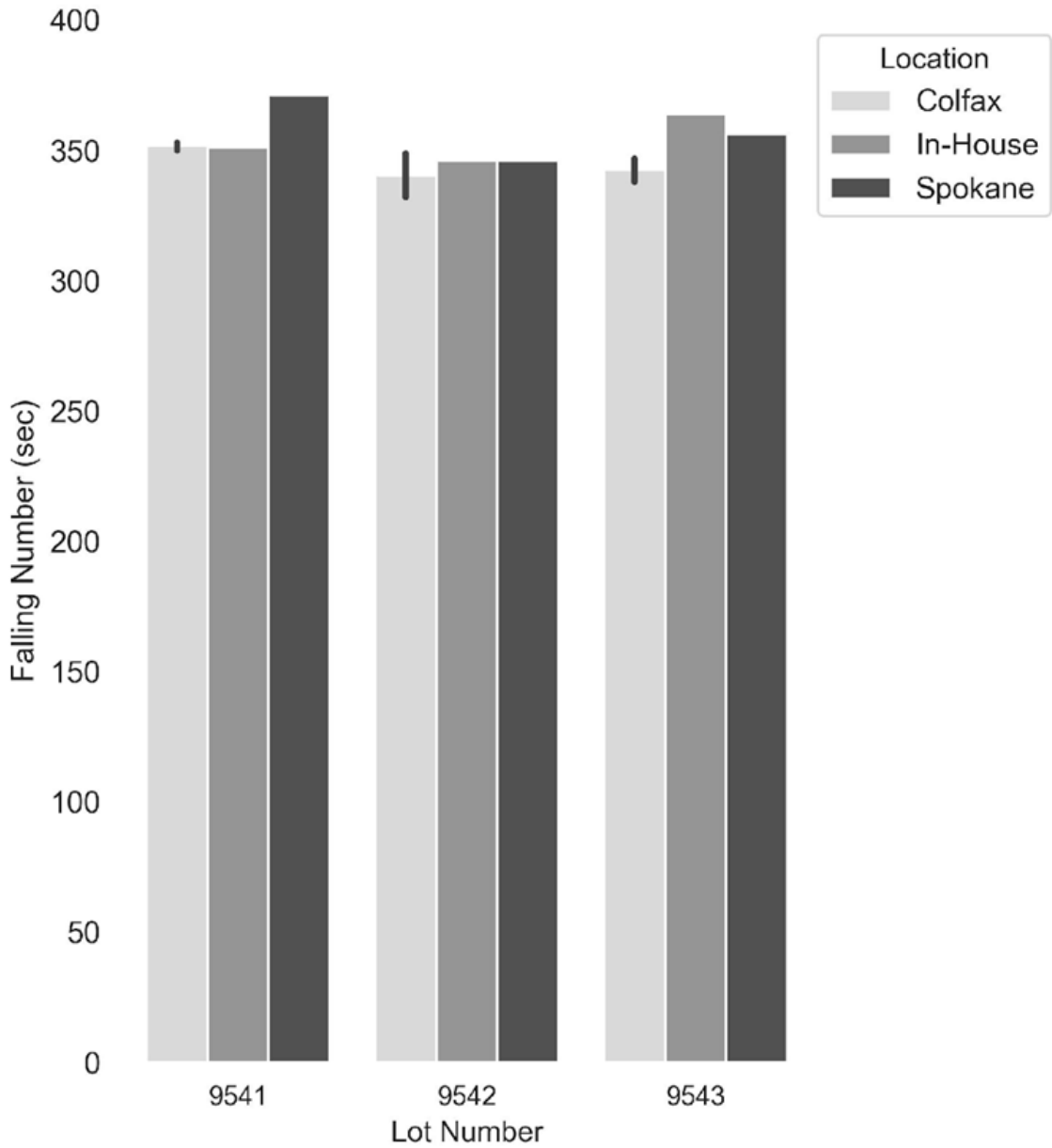
Schematic of grain sampling process: from field to lab

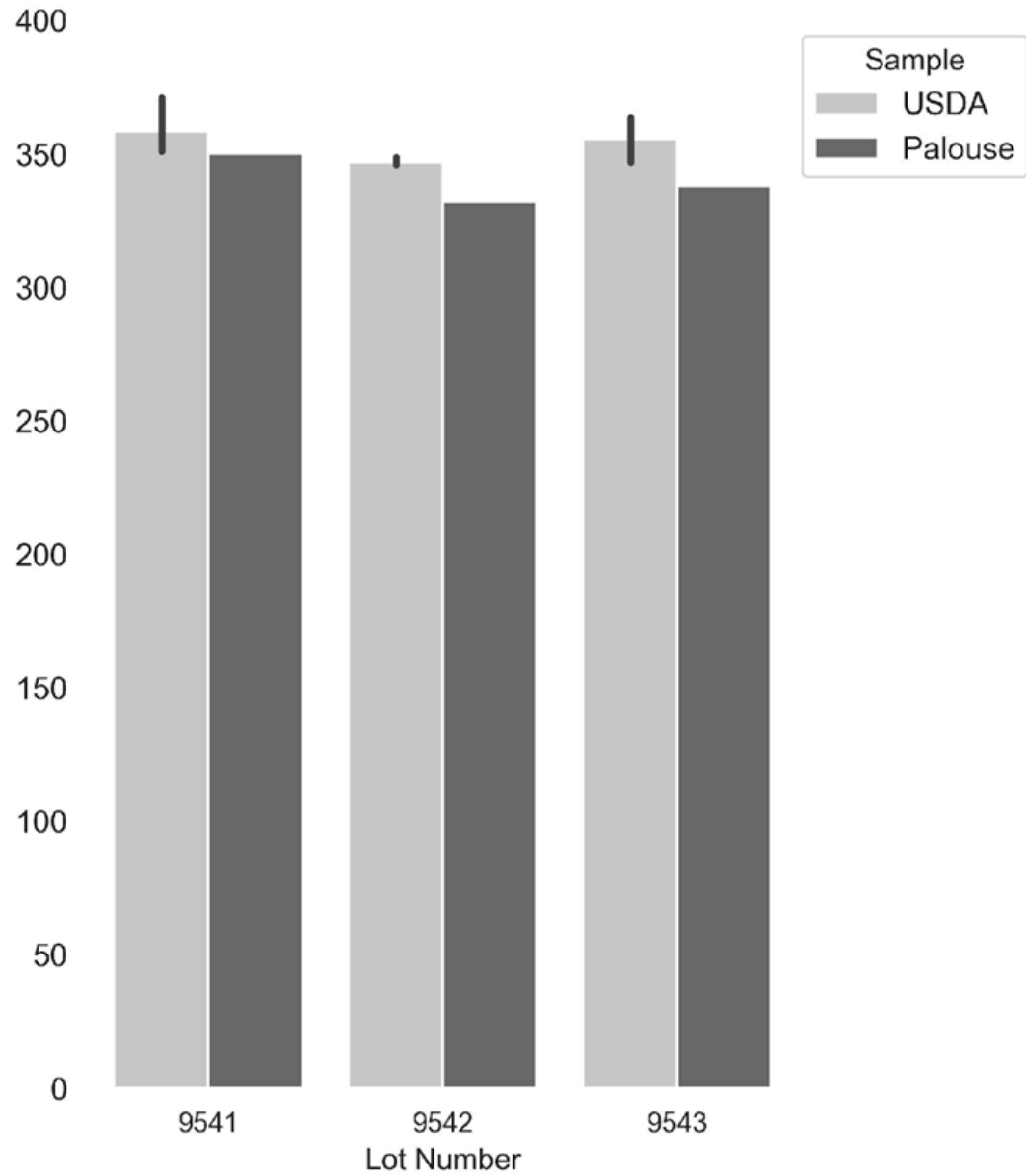


Lot 9542 Information:
Size: 155 acre or 62.7 hectare
Yield: 351 metric tons
No. samples: 32 (trucks)
Test weight: 60.5 lb/bu
Protein: 8.6%
Moisture: 9.7%
Falling Number: 341, 344, or 351
Variety: Sockeye

Composite falling numbers lot 9542:

Set1	Set2	Set3	Location
338	349	332	Colfax
352	346		In-House
346	346		Spokane


400
350
300
250
200
150
100
50
0
Falling Number (sec)
9541
9542
9543
Lot Number
Location
Colfax
In-House
Spokane

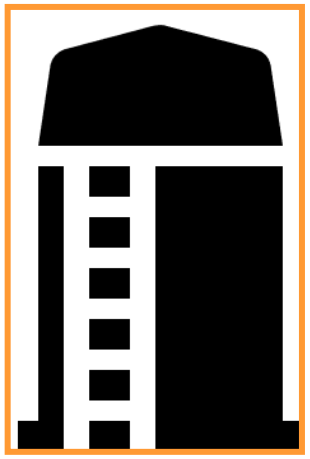

400
350
300
250
200
150
100
50
0
9541
9542
9543
Lot Number
Sample
USDA
Palouse

Sampling error, a game of roulette…

IN THE GRAIN CHAIN

Farm

Elevator



Export Center

THE CHALLENGES

Inadvertent Mixing

- FN is expensive and slow to run
- FN can’t be run in real-time or in field
- Due to logistics, FN can not prevent inadvertent mixing which means the horse has already left the barn.
- Growers receive the FN discounts

Rapid Tests

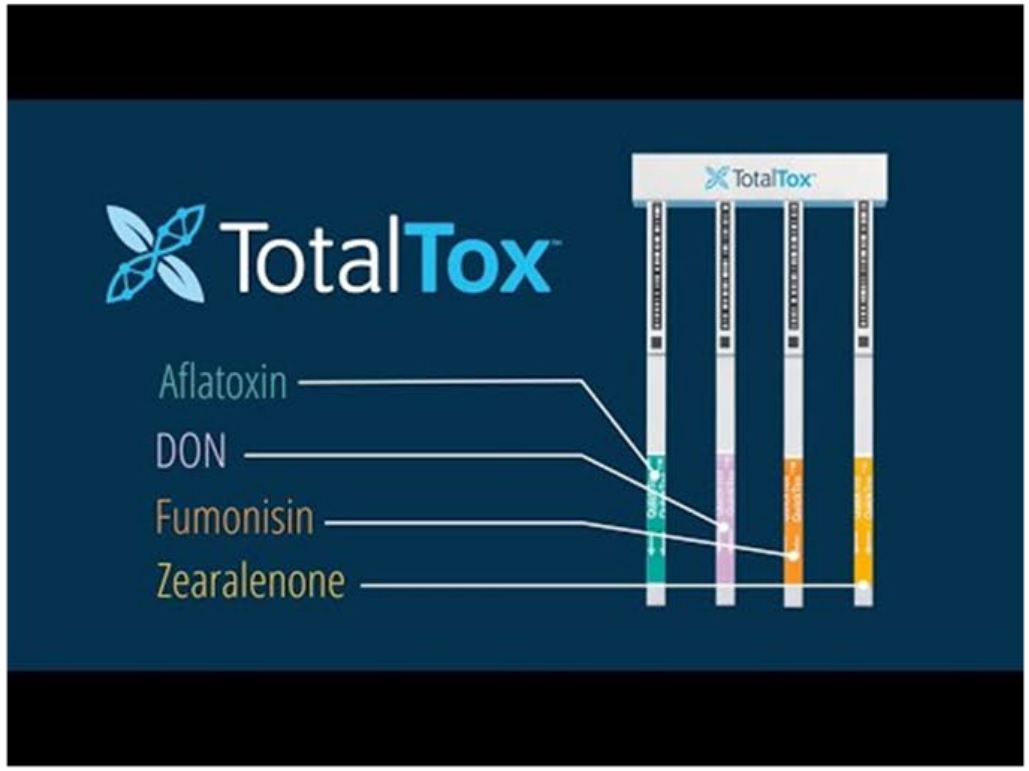
Fast and cheaper

Accurate and reliable

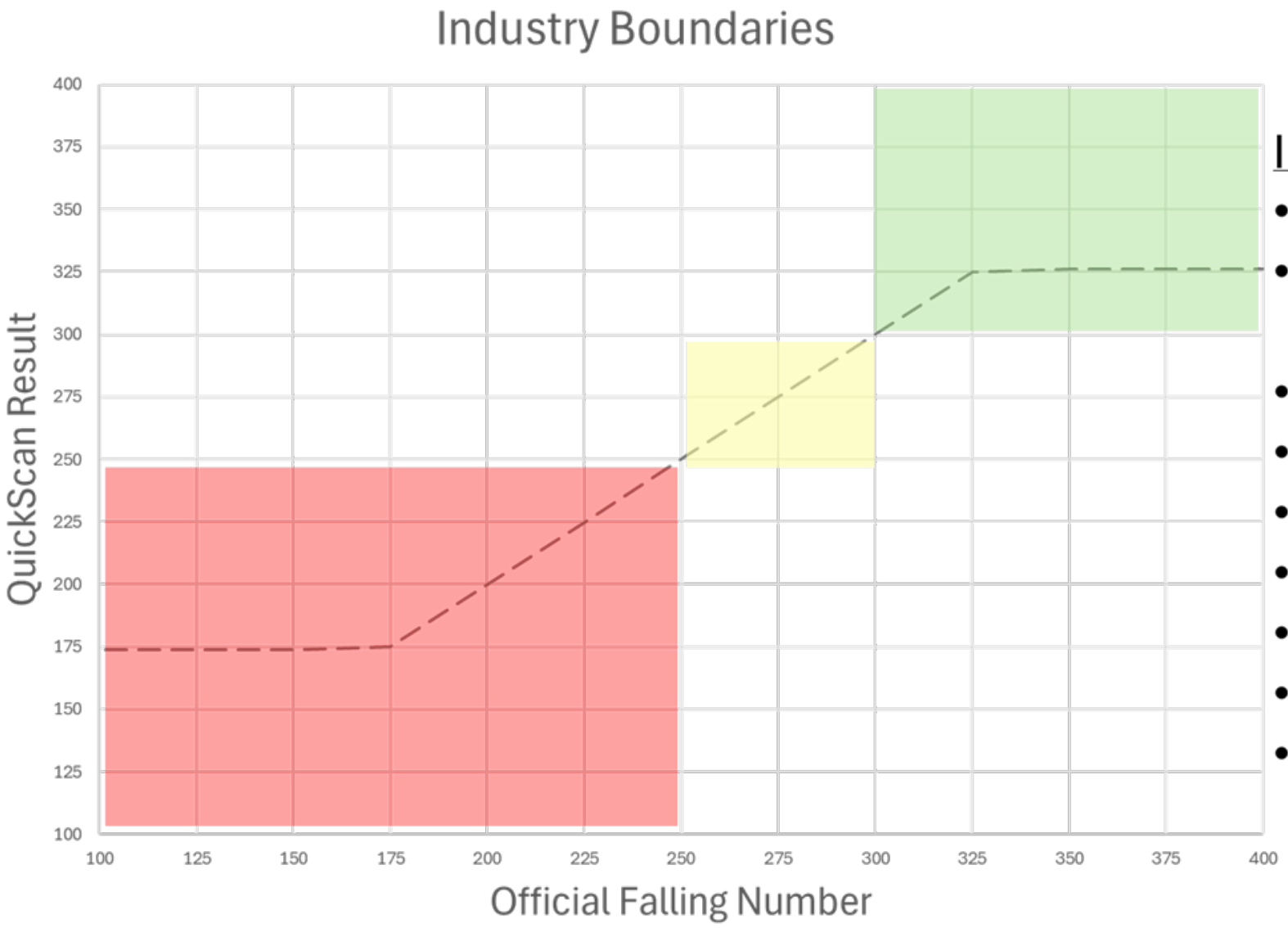
Ubiquitous

Crop testing

Use anywhere



Industry Needs



Industry Value Statements

- Industry language (FN)
- Use to sort by industry thresholds.
- “Green” – 300 and above
- “Yellow”- 299-250
- “Red” – below 250
- Faster than FN
- Accuracy 5% of FN
- Ease of use
- Less than $20 a sample

Rapid FN LFD & TotalTox DON Common Workflow

Two results in under **9 minutes**

ENVIROLOGIX

STEP	RAPID FN TEST	DON LFD
1	**Extract & Clarify Sample**	
2	**Prepare & Incubate** 1.5 min	
3	**Dilute, Add Strip Run** 3 min	**Dilute, Add Strip Run** 2 min
4	**Simultaneous Read**	

Proposed workstation with QuickScan system and EnviroLogix-provided accessories for Rapid FN test
*Wheat mill/grinder not included

Where Are We Now?

PLOTS

- Variety trials
- PHS & LMA trials
- Breeder trials
- 4 markets classes
- 2000 and counting

TRUCKS & TRAINS

- Trucks
- Lots & bins
- Railcars
- Soft white
- ~200

PNW & BEYOND

- PNW composites
- US composites
- 4 market classes
- ~500 samples

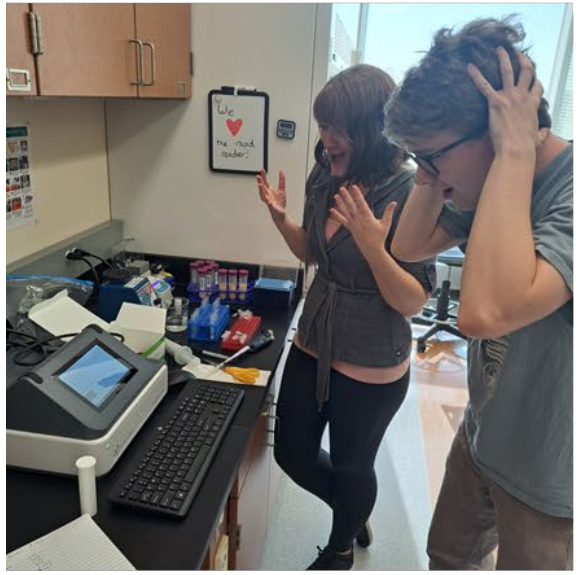
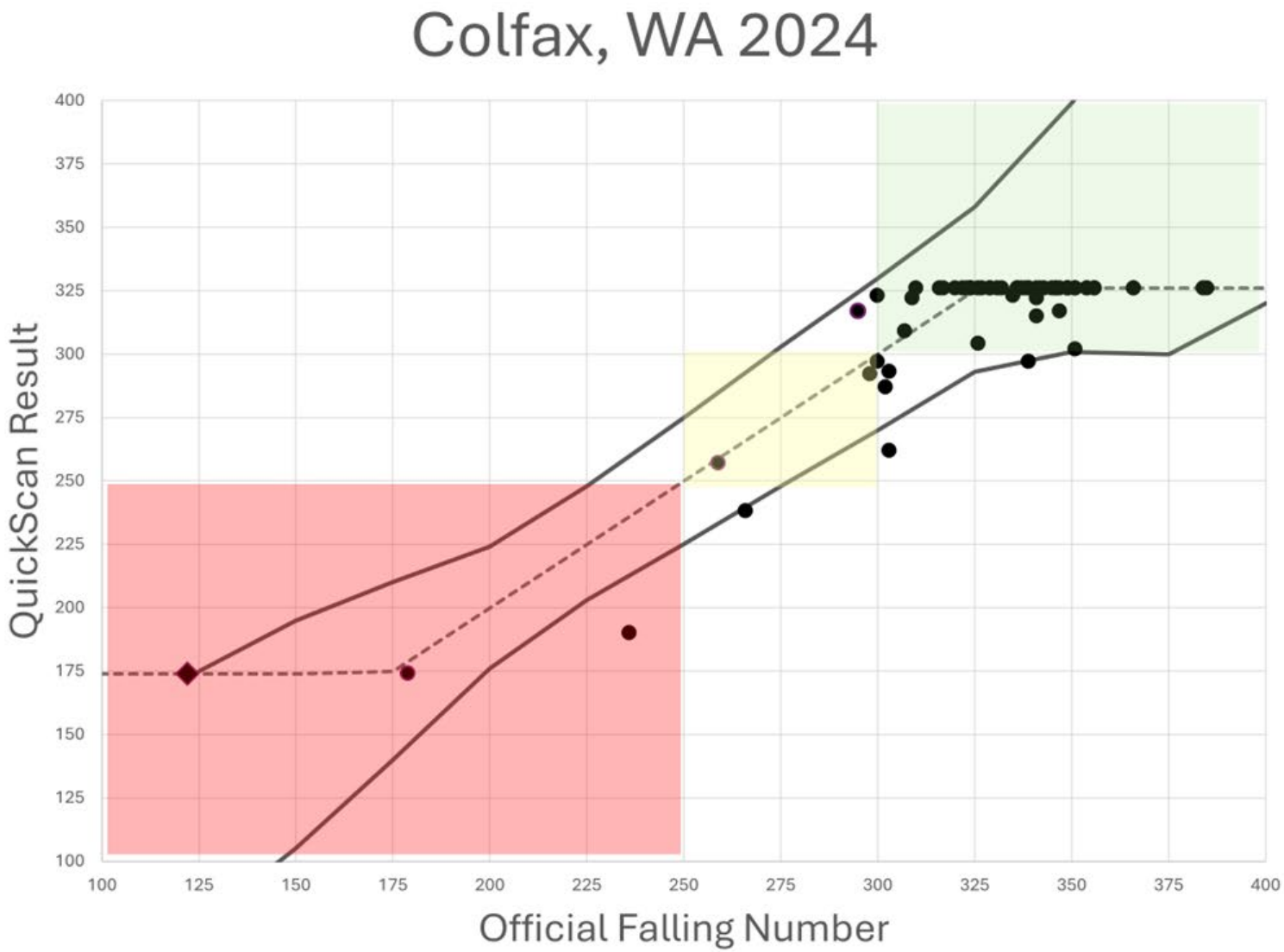


Photo by Matthew Weaver

QuickScan DEMONSTRATION

Led by Anna Carroll



RESULTS

- n= 69
- >90% accuracy with current thresholds
- Protein implications

WHAT RESOURCES DO YOU HAVE?

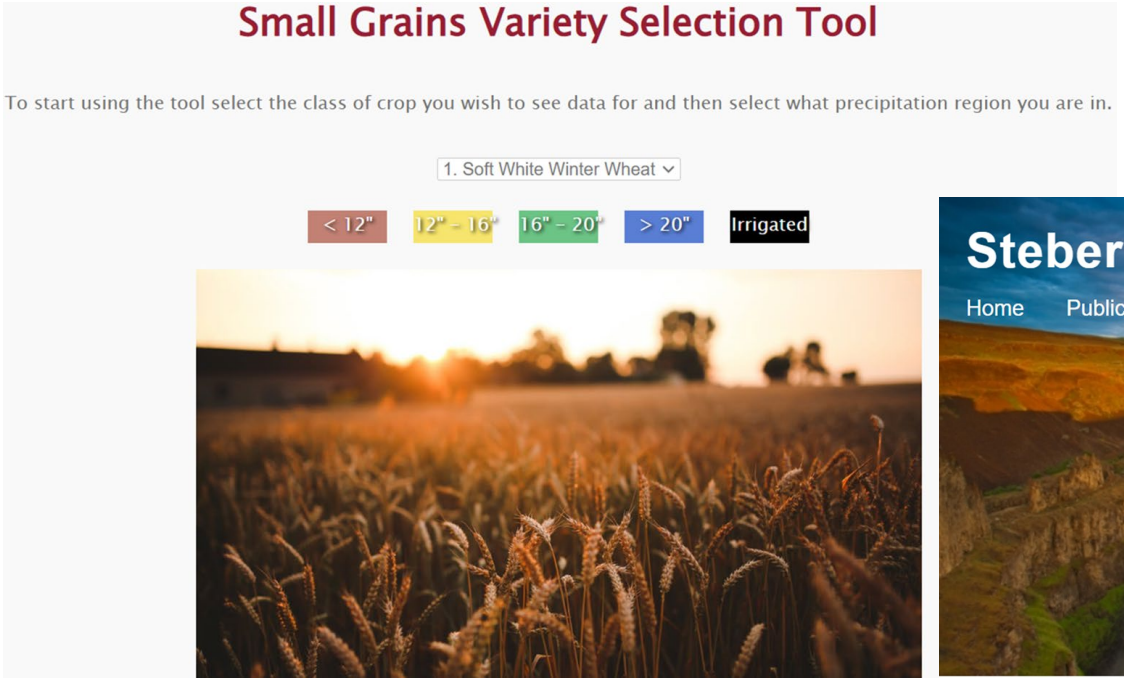
Photo courtesy of the Washington Grain Commission

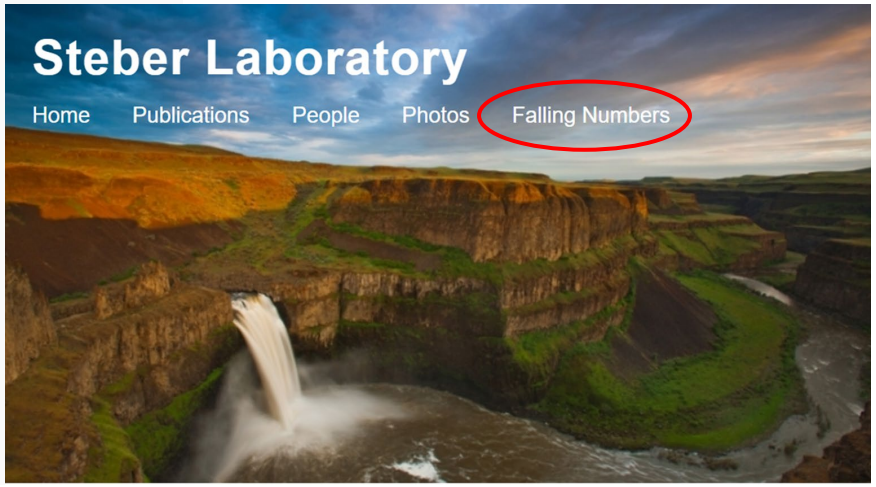
Suggestions for Reducing Risk

- Avoid cultivars known to be PHS or LMA susceptible**.
- Harvest wheat quickly after it reaches harvest maturity to reduce the risk of getting rained on.
- Avoid harvesting green plants since green kernels have higher alpha-amylase.
- It is better to harvest fields separately and keep them separate if they matured at different times. It is less likely an isolated cold shock or rain event will both early and late fields.
- If you have moderately low falling numbers (200-300sec), it can’t hurt to store it for awhile (2-3 months) to see if your FN rises.

The Importance of Tolerant Varieties

Management and mitigation of low falling number starts with variety selection!!





Rating scheme 1-9

Raw data

The Importance of Tolerant Varieties

/ EXTENSION / CEREALS / SOUTH CENTRAL & SE IDAHO / FALLING NUMBERS

Falling Numbers

2023 Soft White Winter Wheat

Aberdeen:		
Variety	**Outcome**	**Avg. Falling Number**
IDO2008	Acceptable	381

Agronomic Features	
Maturity	EARLY
Plant Height	SHORT
Lodging	EXCELLENT
Response to Osprey Xtra	LESS RESPONSIVE
Response to PowerFlex	LESS RESPONSIVE
Winter Hardiness	GOOD
Test Weight	VERY GOOD
Protein	MED LOW
Falling Numbers	GOOD
Spring Vigor	STRONG

LCS

- Intermediate maturity with good winter hardiness, strong straw and excellent test weight.
- One of the most broadly adapted varieties in the LCS portfolio, LCS Hulk's medium maturity allows this variety to move further North into Washington.
- Solid disease package, being tolerant to stripe rust, crown rot and C-Stripe.
- Three years of excellent falling number data from WSU trials.

Preferred rating and falling number

More consistency in end-use ratings, this rating is not indicative of falling number tolerance.

What is the preferred means of communication??? How and what.

Wheat & Small Grains

Agronomics

- Emergence is Excellent
- Yield Potential is Very Good
- Test Weight is Very Good
- Maturity is Similar to Xerpha
- Quality is Excellent
- Straw Strength is Very Good
- Protein is Good

Superior Seed Variety — McGREGOR — www.mcgregor.com

- TMC M-Pire™ is a high-yielding soft white winter wheat variety reigning in the 14-20+" rainfall zone with early-maturing and broad adaptability characteristics.
- Carefully crafted to join the TMC Genetics™ premium line, TMC M-Pire, boasts top-end yields and a remarkable disease package.
- Excellent lodging resistance and strong winter hardiness characterize TMC M-Pire, along with early spring vigor, above average test weight, and high end-use quality.

LCS

End-Use Quality

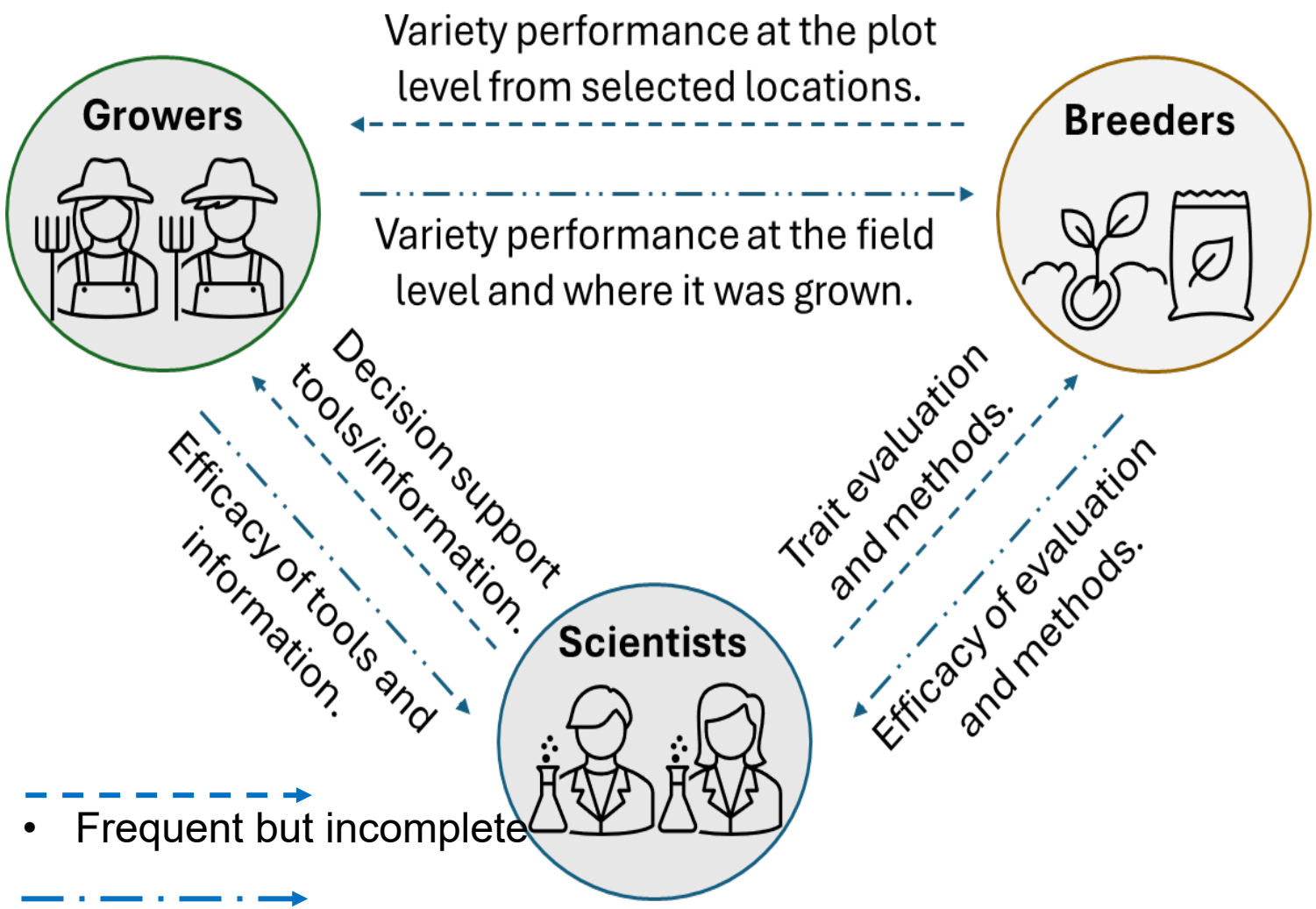
Overall Quality	Baking Quality	Flour Protein	Milling Quality
Acceptable	Less Desirable	Acceptable	Desirable

Data obtained from LCS Quality Laboratory.

Hard Red Winter

LCS Missile	LCS	MD
Guardian	PG	MD
Scorpio	WSU	MD
Gemini	WSU	MD
Sequoia	WSU	D
WB4311	WB	D
SY Touchstone	AP/SY	D
Keldin	WB	D
LCS Jet	LCS	A
WB4303	WB	A
WB4623CLP	WB	A
LCS Evina	LCS	A
LCS Rocket	LCS	A
WB4394	WB	A
LCS Helix AX	LCS	A
Battle AX	Montech	A
LCS Blackbird	LCS	LD

COMMUNICATION DESERTS



- Frequent but incomplete
- Sporadic/absent

<u>GOALS</u>

- Provide information in a timely fashion.
- Provide clear and accessible information.
- Seek feedback and develop tools through the lens of the end-users.
- “Take science out of the sky and hitch it back to the plow” *Alex McGregor*

Questions?

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Thank you for your attention!