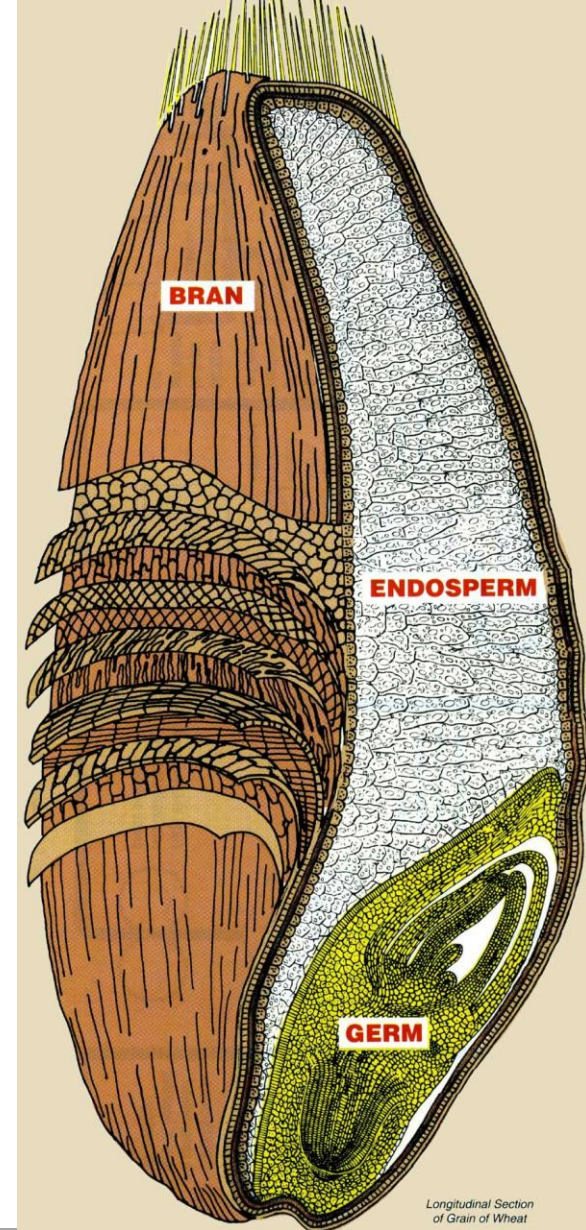


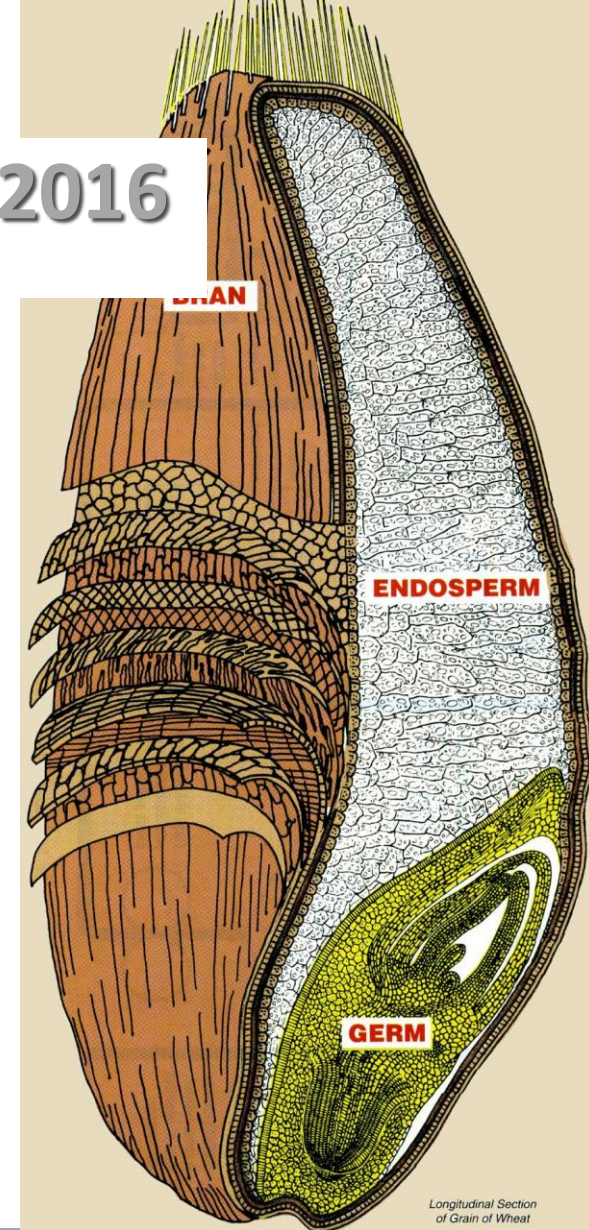
FALLING NUMBERS & PNW WHEAT 2016

DOUG FINKELNBURG
UI – EXTENSION



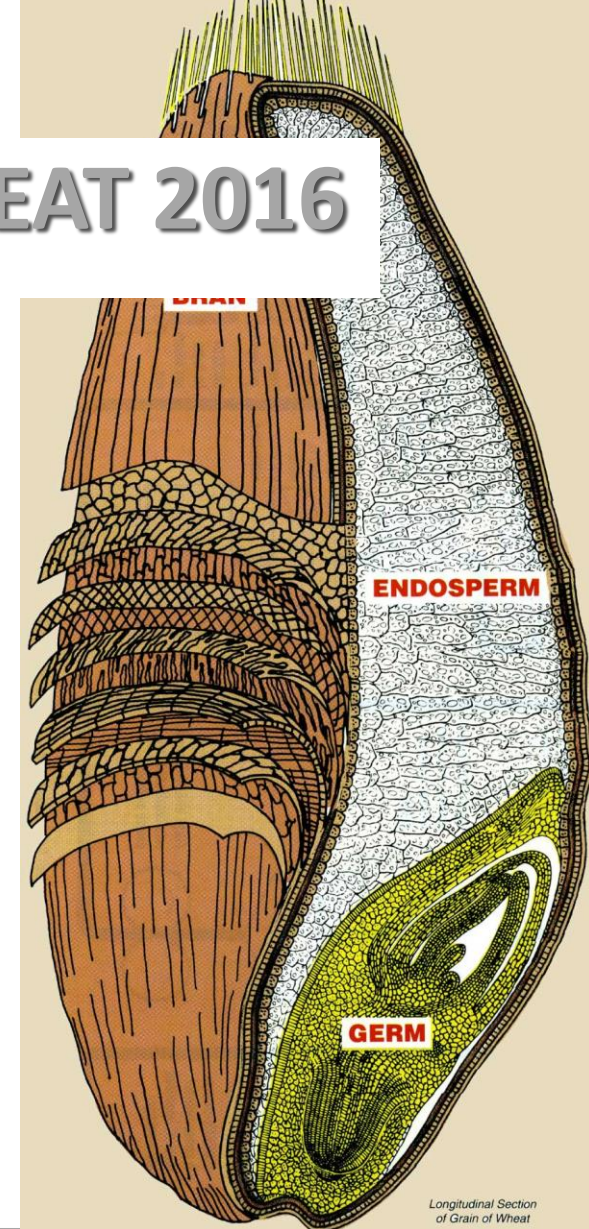
FALLING NUMBERS & PNW WHEAT 2016

- What is the Falling Numbers Test?
- Factors Affecting FN
- Late Maturity Alpha-amylase
- 2016 Growing Season
- Conclusions for the 2016 Growing Season
- Preventative measures



FALLING NUMBERS & PNW WHEAT 2016

- Low falling numbers widespread but sporadic
 - Two causes
 - Sprout
 - LMA (late maturity alpha amylase)

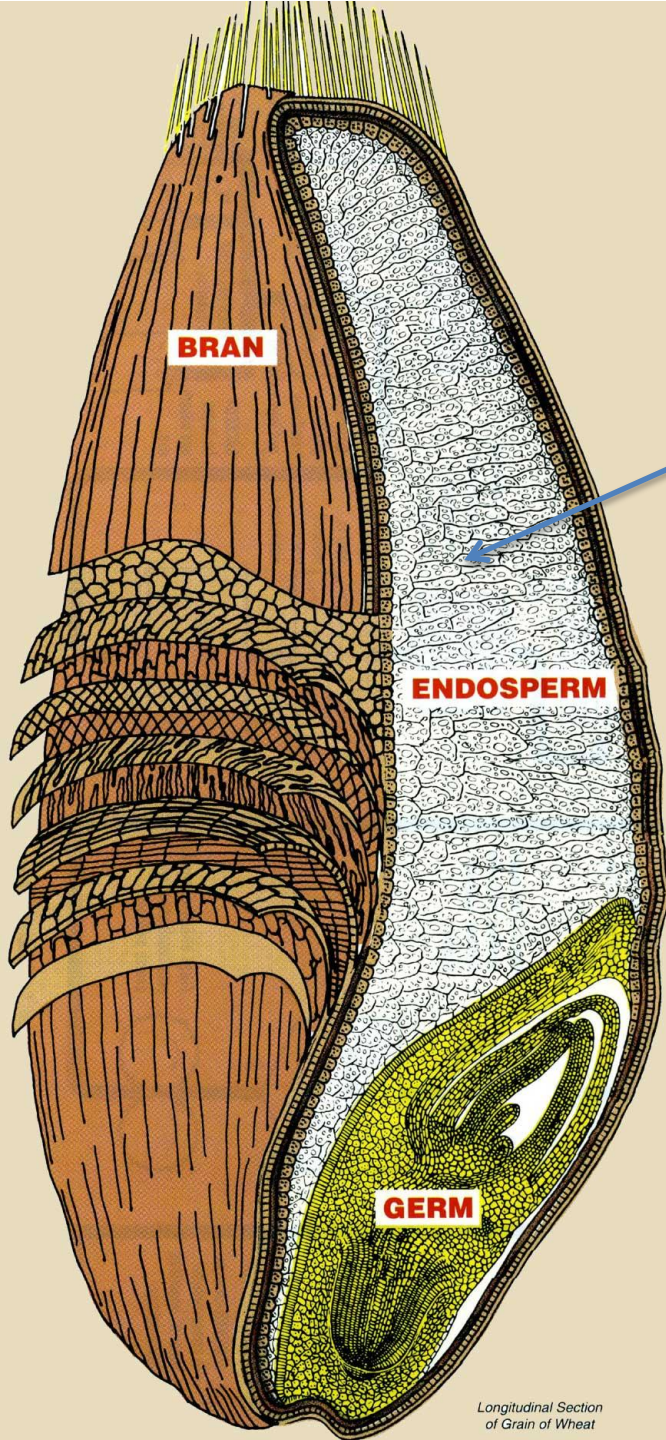


WHAT IS “FALLING NUMBERS?”

- The test measures the physical properties of grain starch.
- The test does not directly measure enzyme activity.
- The result (the falling numbers value) gives an indication of the starch quality as affected by sprout damage.
- Grain buyers may have discounts for wheat with below a 300 second falling number value.
- Wheat with sprout damage will significantly impact the end-use quality of the flour and the products made with that flour.

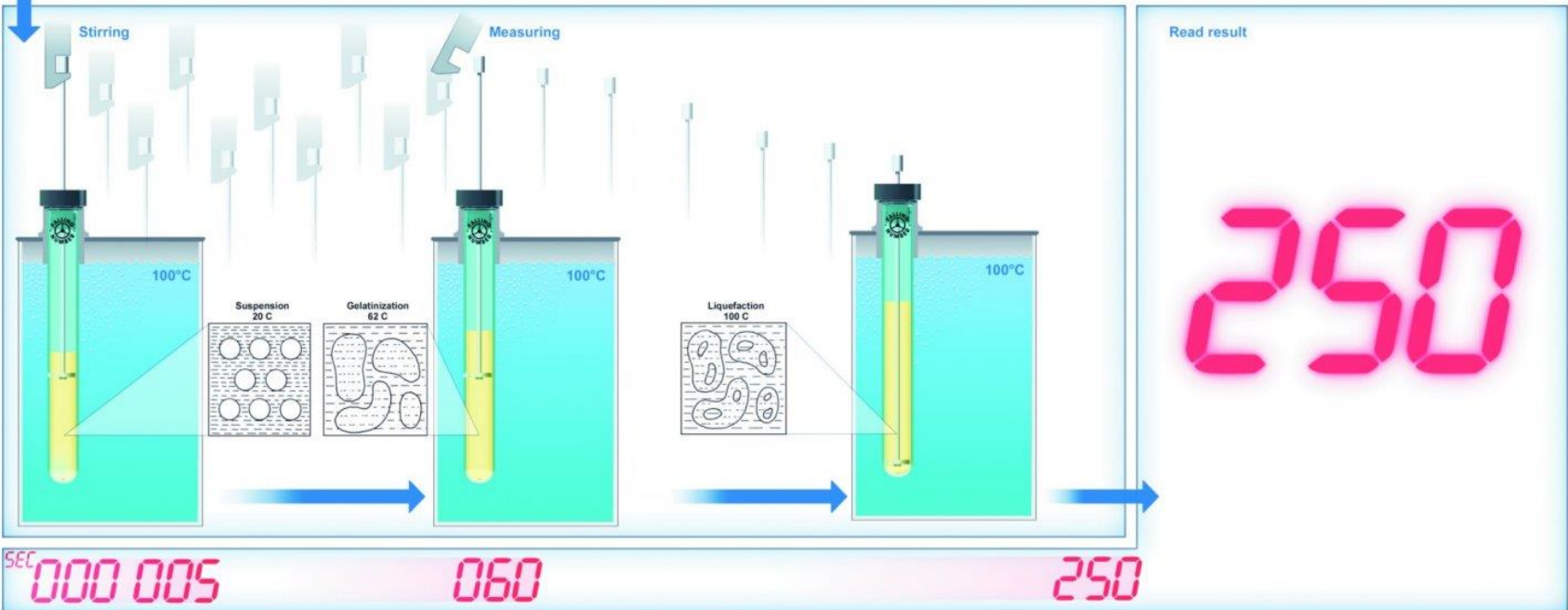
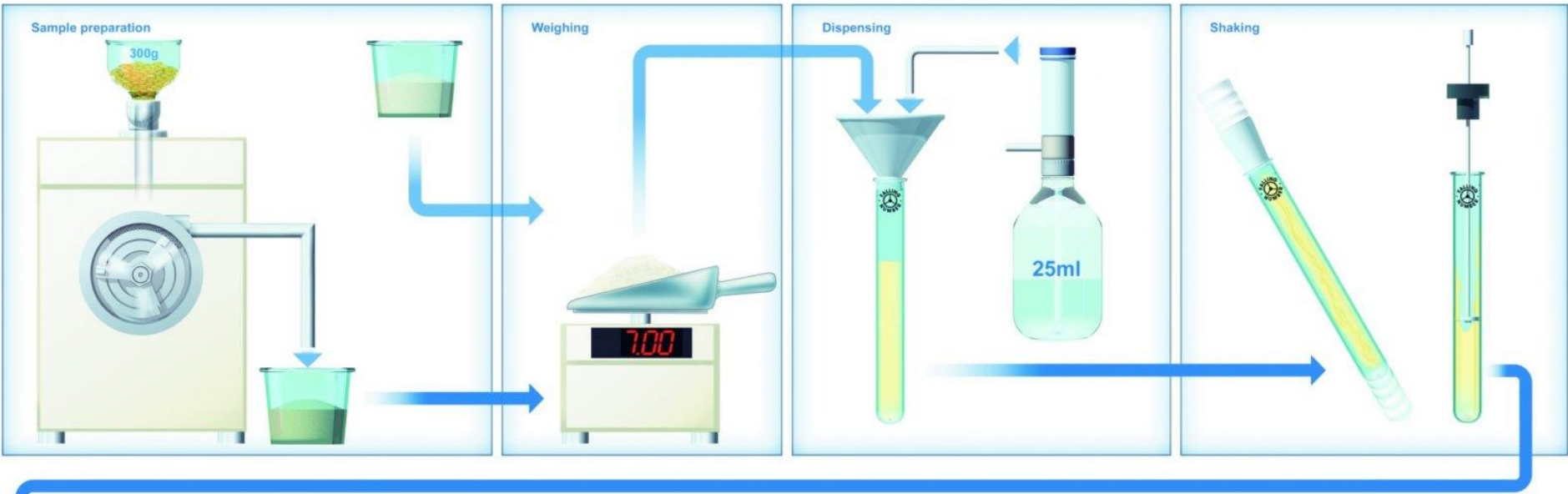


WHEAT KERNEL DIAGRAM



Cells with starch granules

Alpha-amylase breaks down starch granules to simple sugars



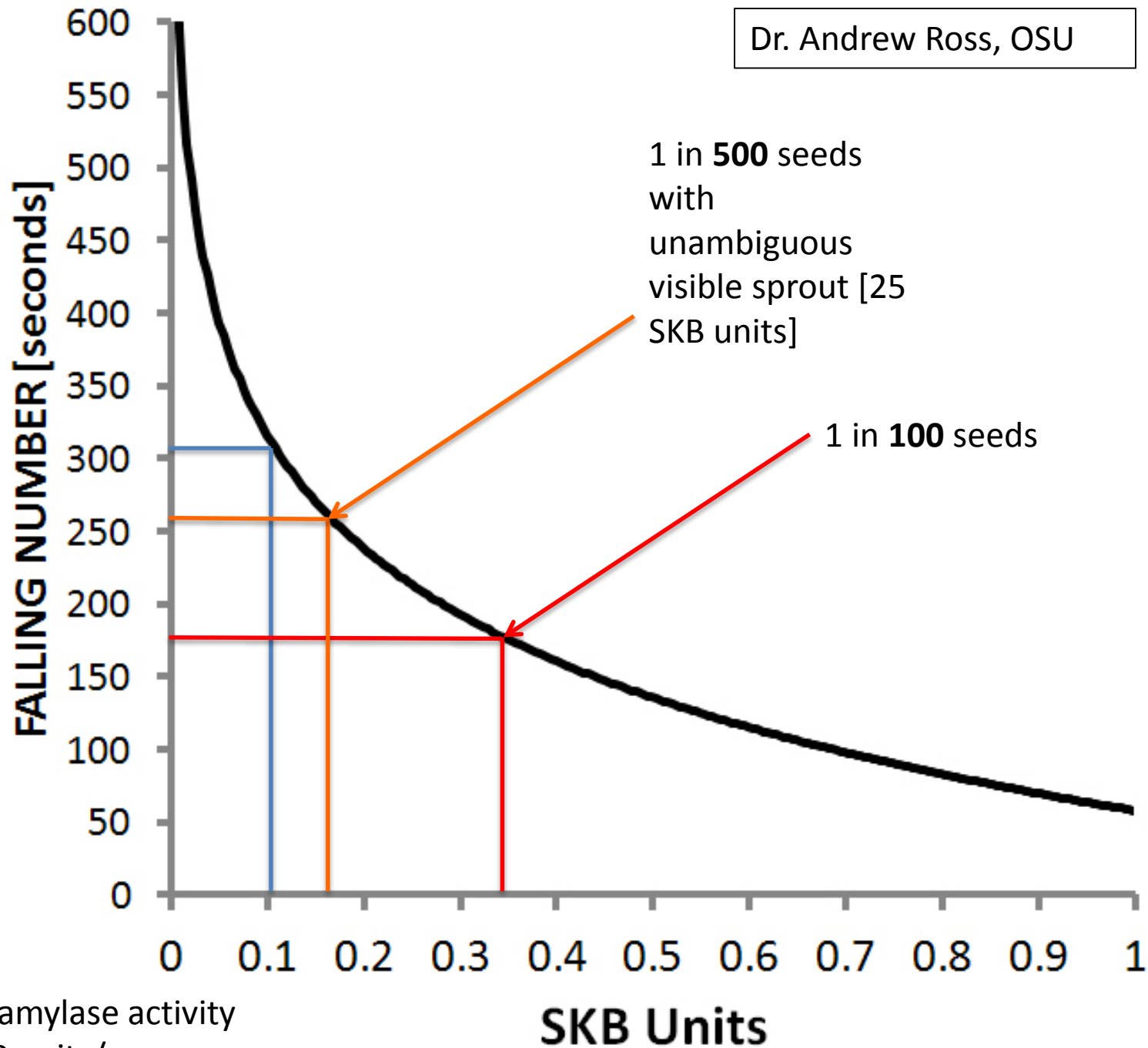
IMPACTS OF LOW FALLING NUMBERS

- Millers and Bakers (end users) are risk averse
- Suppliers *cannot* go to the limit with low FN (if it is amylase generated)

Sensitivity

- Just two visibly sprouted kernels added to 200 grams [~5500 to 6500 kernels] of sound wheat (0.03%) reduced FN by 100 seconds
 - Brian Sorenson (Northern Crops Institute) Jochum Wiersma, Small Grains Specialist University of Minnesota

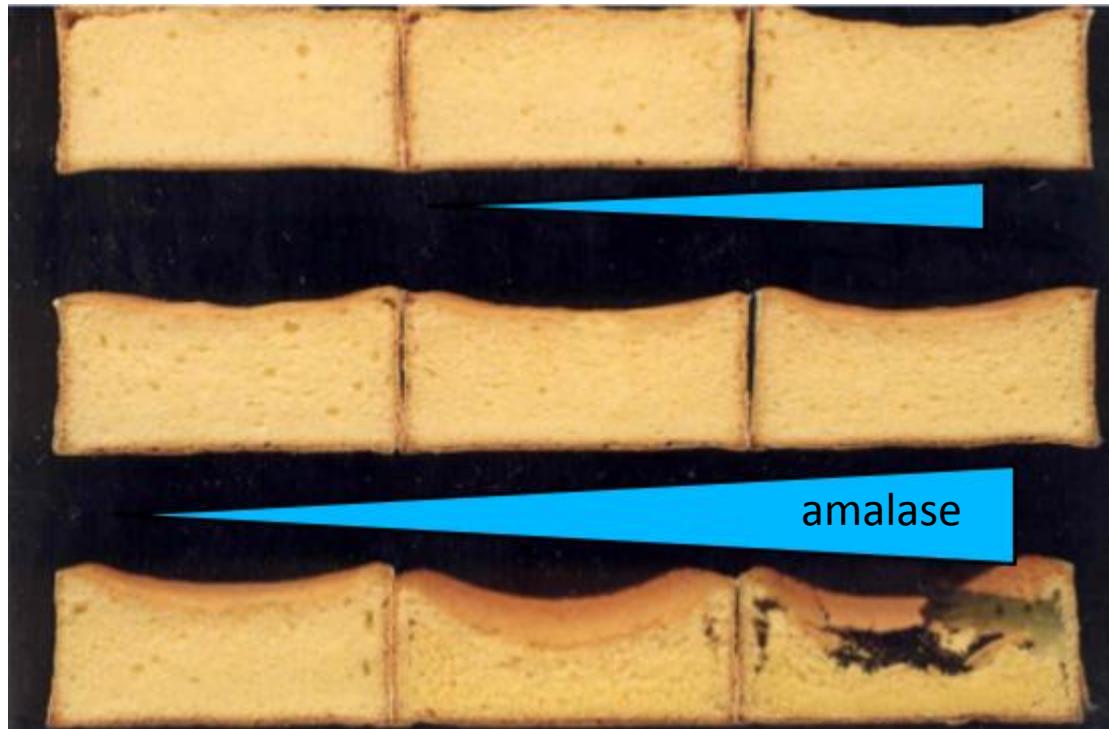




Alpha-amylase activity
SKB units/gram

SKB Units

IMPACTS OF LOW FALLING NUMBERS



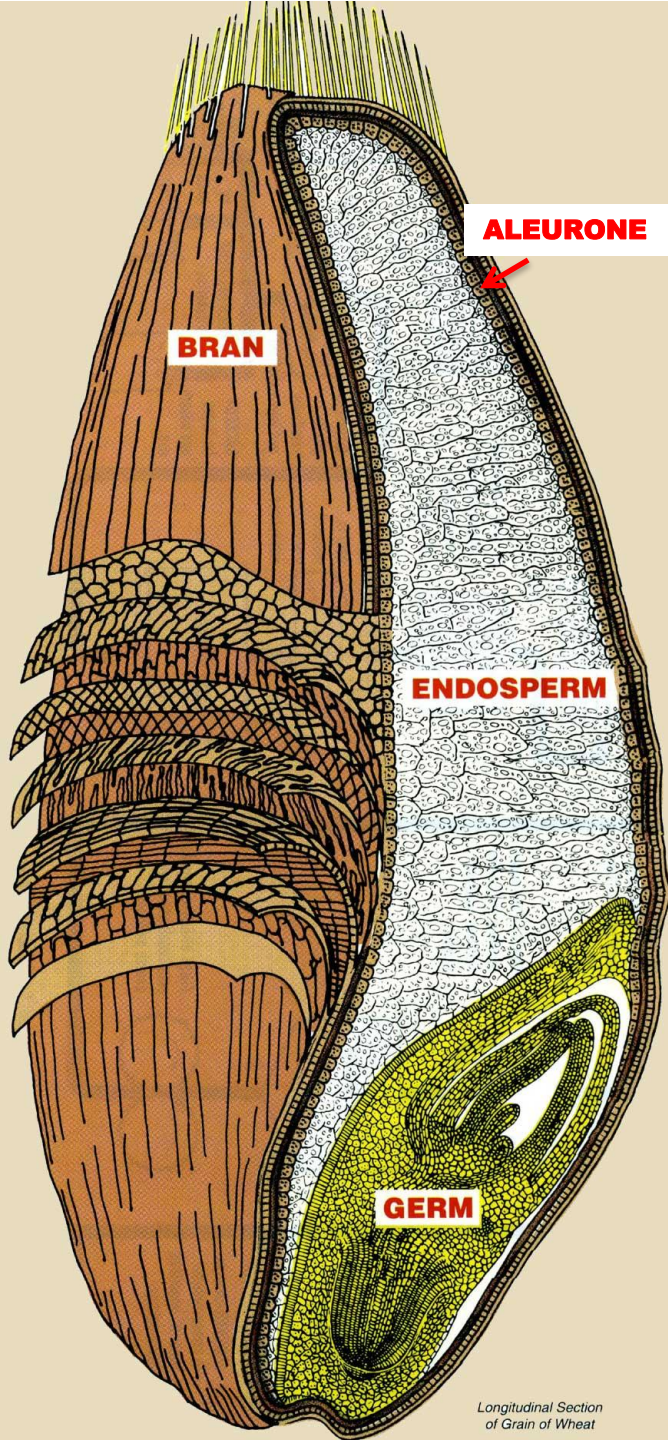
*WQL- USDA-ARS Pullman



FACTORS AFFECTING FALLING NUMBER

- Sprout damage
- Nitrogen fertilization – FN increases with N rate
- Temperature – lower temps = lower FN, temp shocks
 - LMA
- Fungicide treatments – is cultivar dependent (UK)
- Fusarium infection – small decrease in FN
- Varieties – LMA or Partial waxy wheat – lower FN





Longitudinal Section
of Grain of Wheat

Wheat kernel diagram

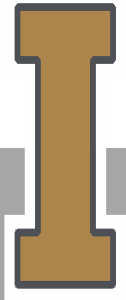
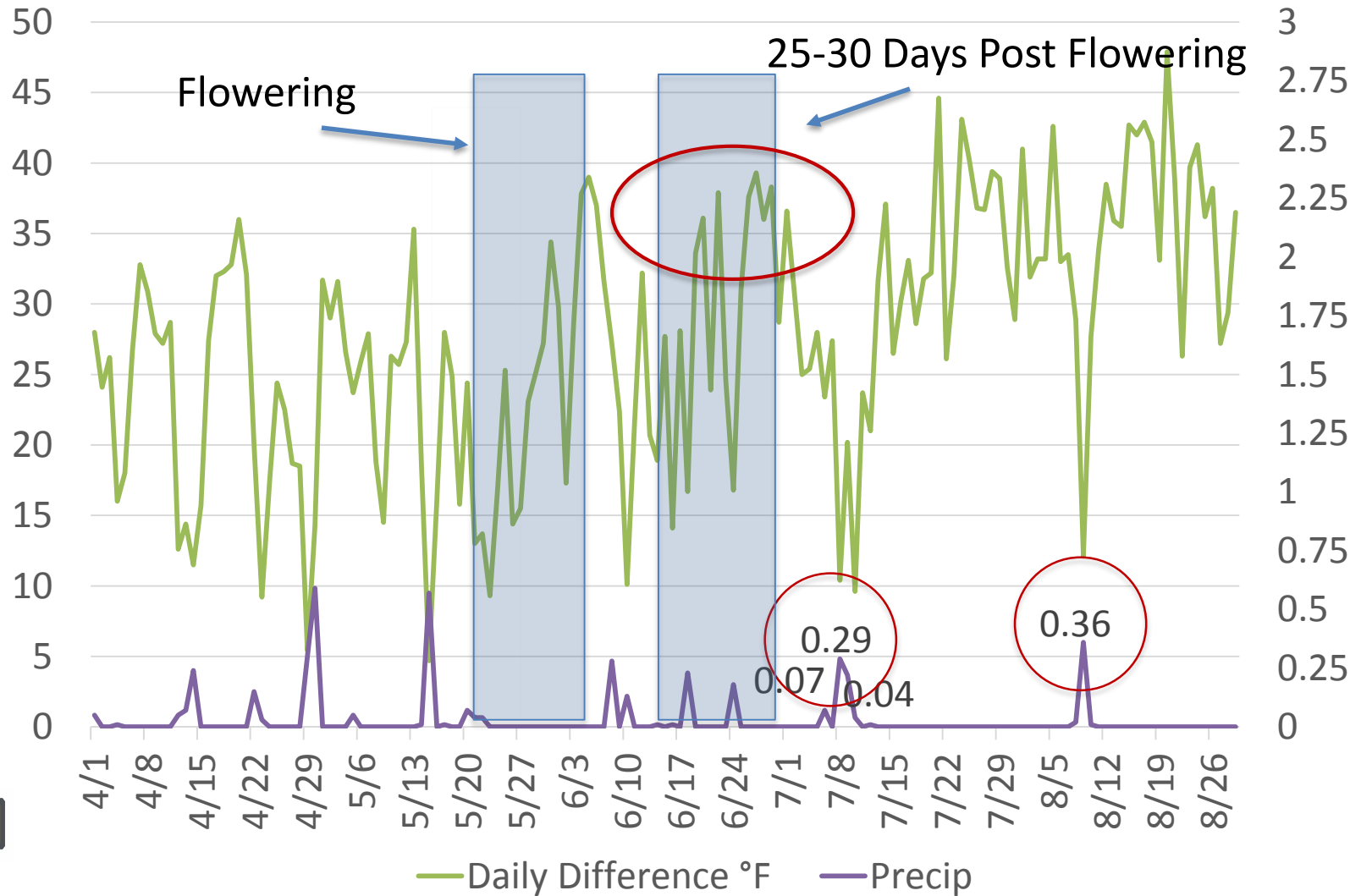
High and low temperature shocks damage aleurone cells, causing leakage of cell components and enzymes

Wheat is particularly vulnerable to temperature shock 25-30 days after anthesis (flowering)

2016 GROWING SEASON CONDITIONS

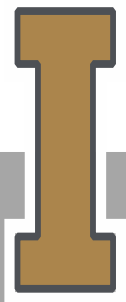


Pullman, WA 4/1 - 8/29

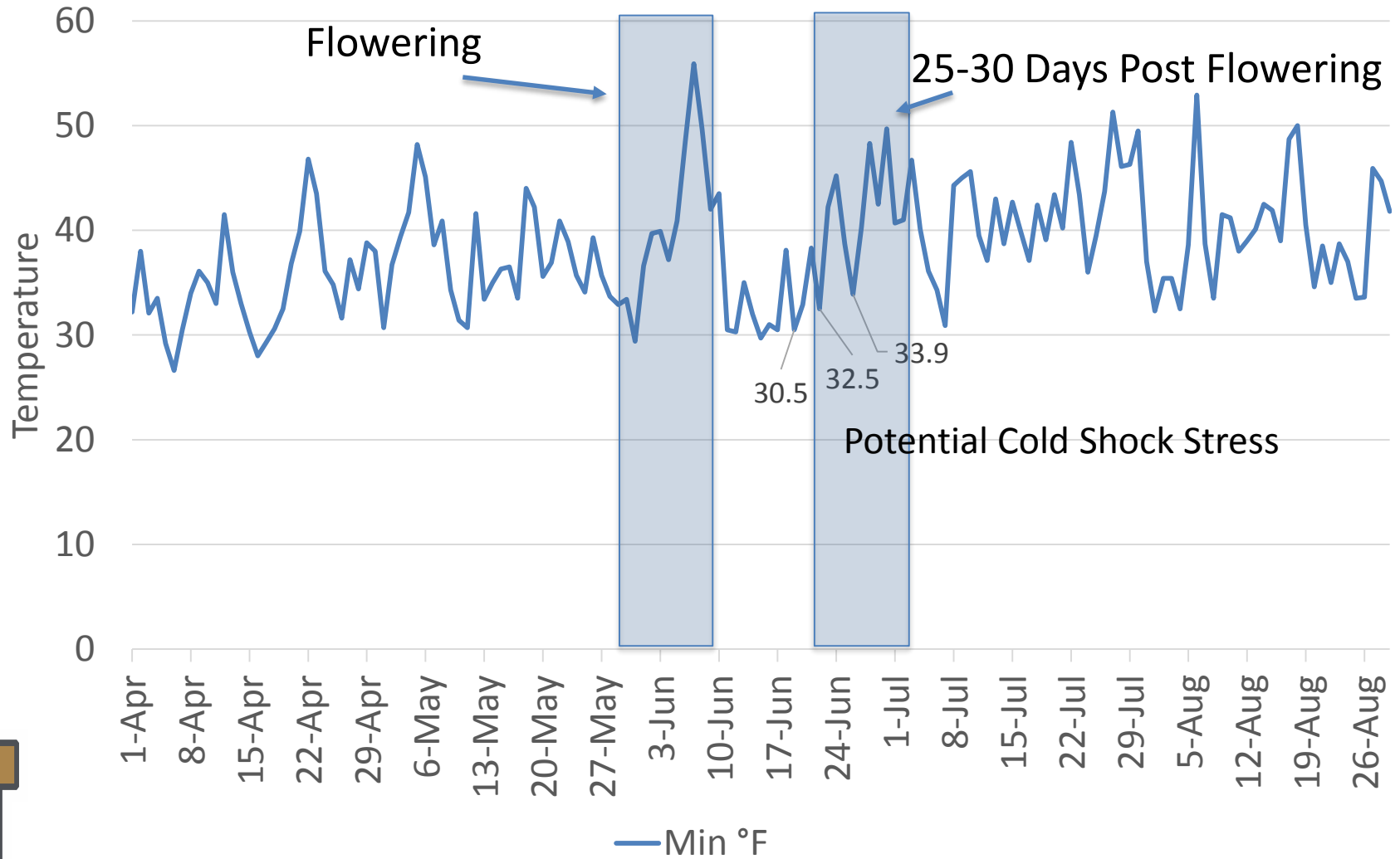


PALOUSE GROWING SEASON CONDITIONS

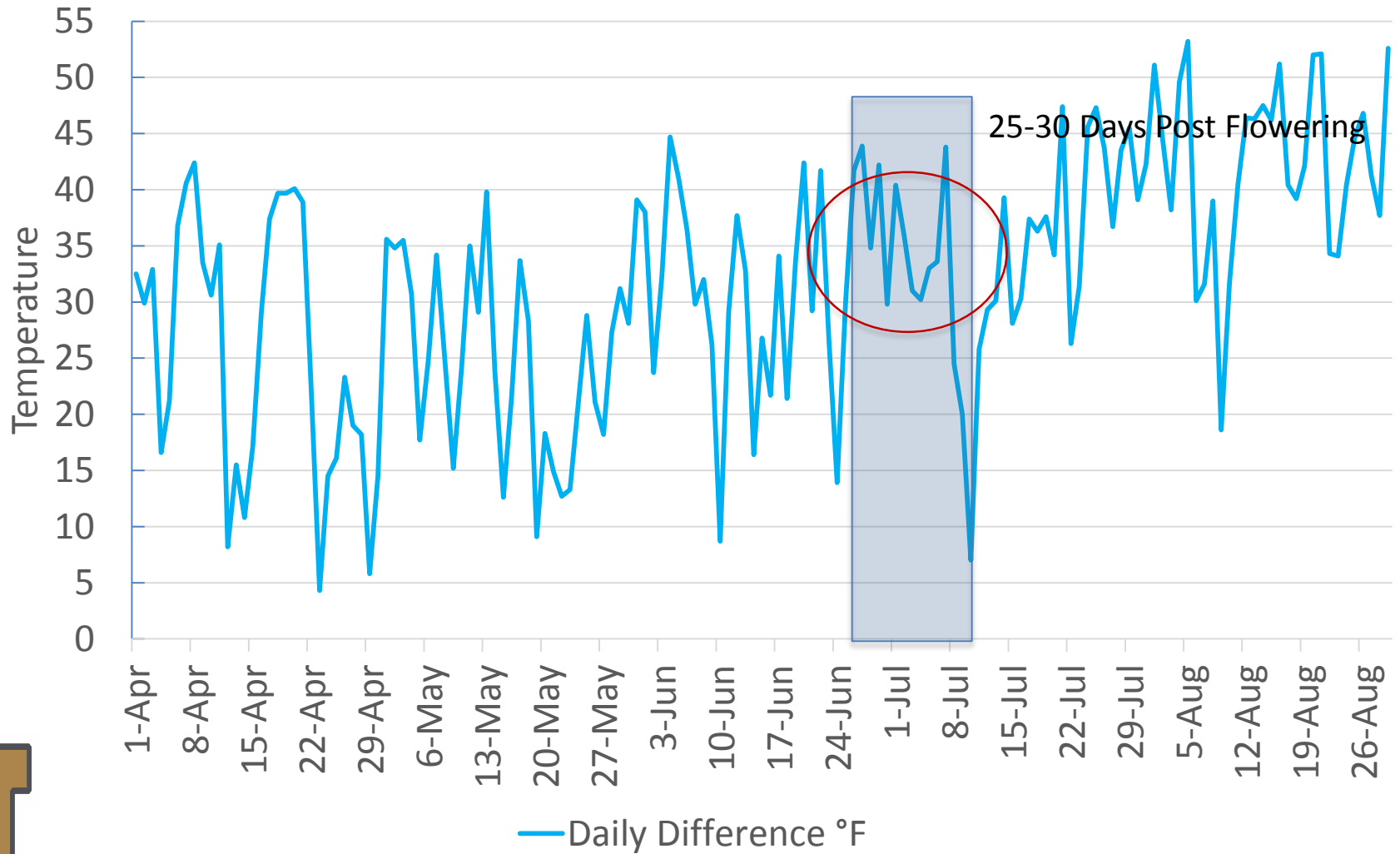
- Wide temperature swings 25-30 days post anthesis
- Multiple minor rain events during grain ripening



Min Temps at Craigmont, ID 4/1 – 8/29



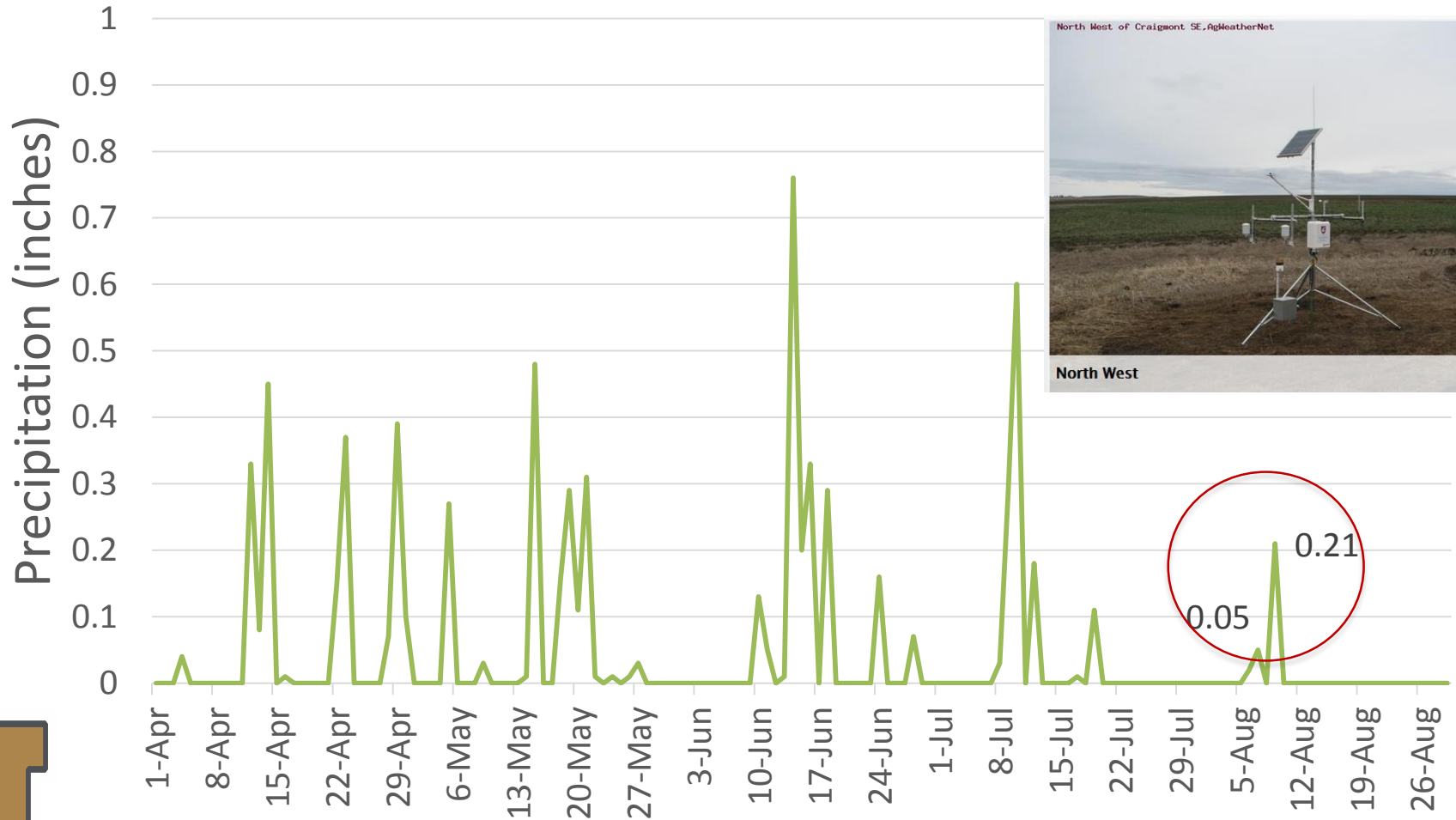
Temperature Swings at Craigmont, ID



<http://weather.wsu.edu/>

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Rainfall at Craigmont, ID



<http://weather.wsu.edu/>

University of Idaho
Extension



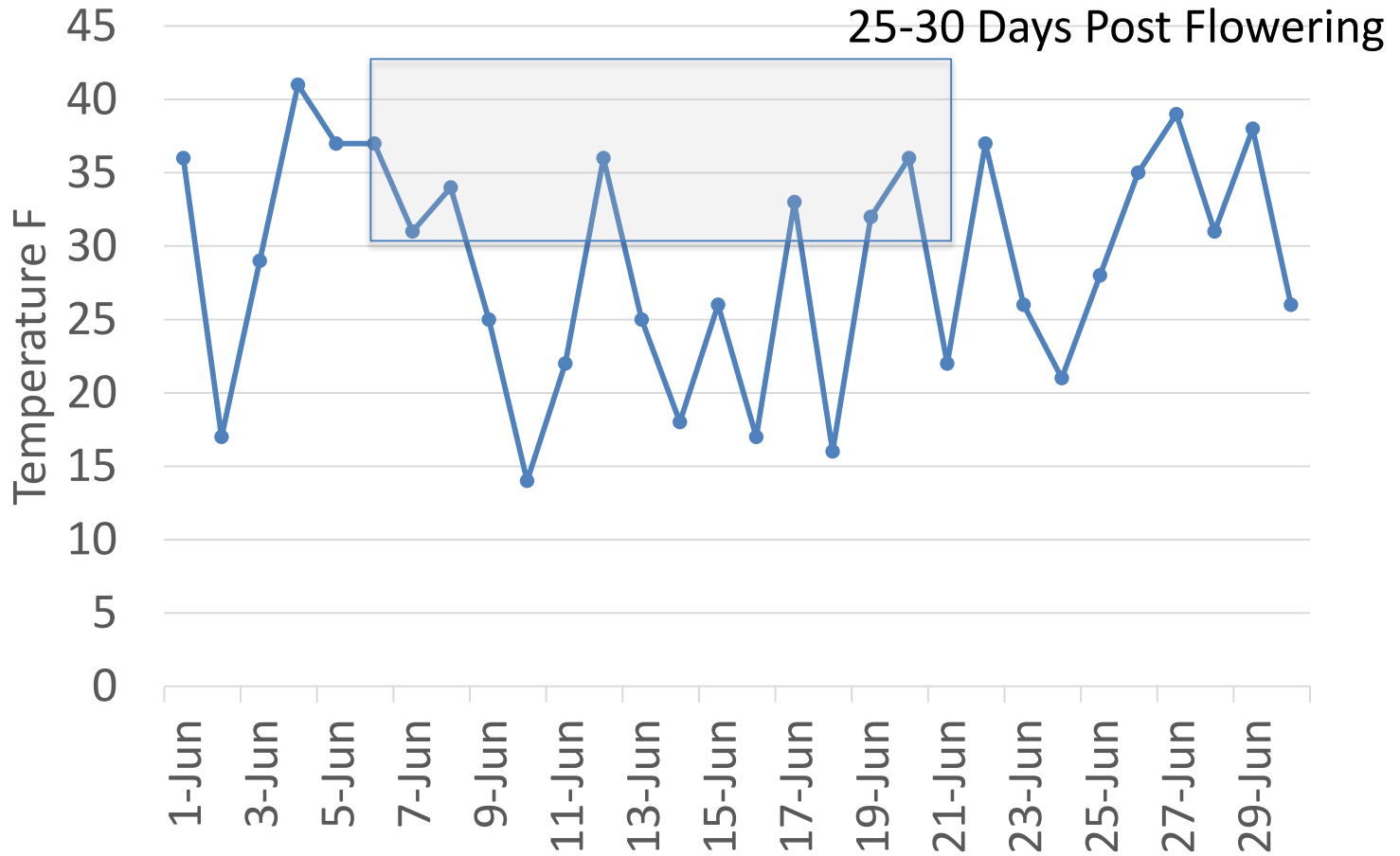
CAMAS PRAIRIE GROWING SEASON

- Potential for cold shock and wide temperature swings 25-30 days post anthesis
- Minor rain events during grain ripening



LFN AT LEWISTON

Daily Temp Swing At Lewiston



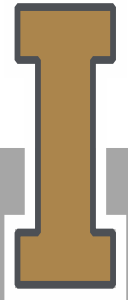
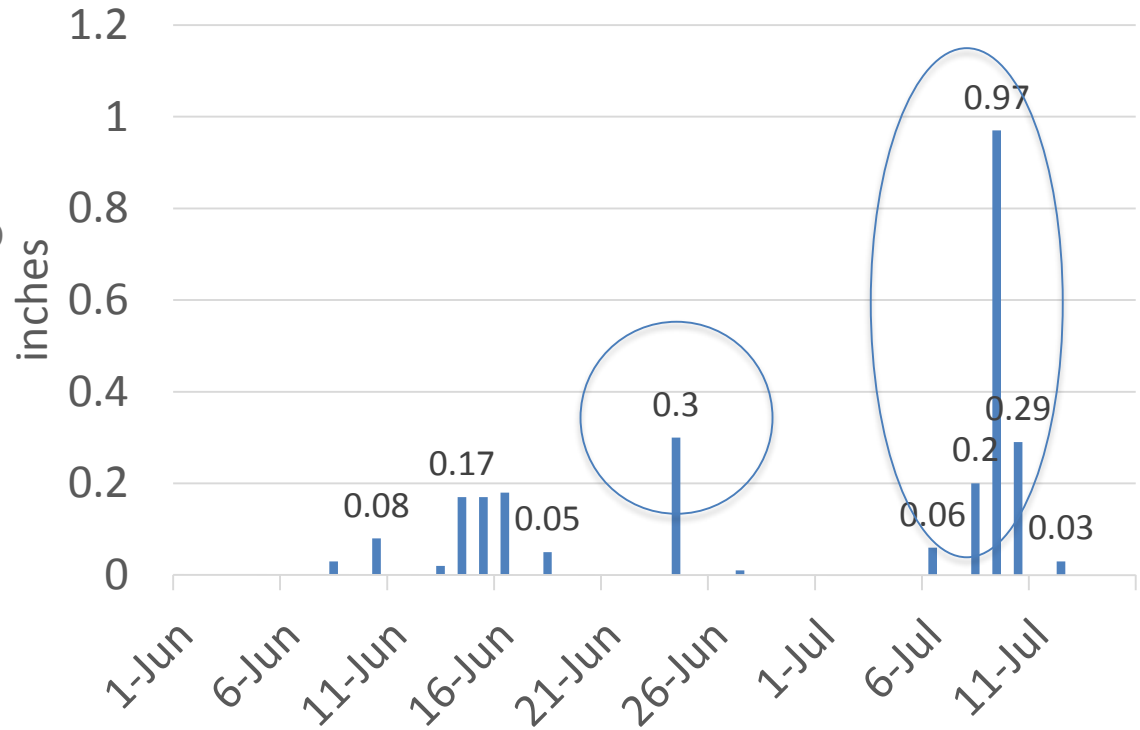
<https://www.ncdc.noaa.gov/cdo-web/>

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Extension

LFN AT LEWISTON

- No recorded cold shocks but wide temperature swings
- Multiple rain events prior to harvest

Rainfall at Lewiston, ID

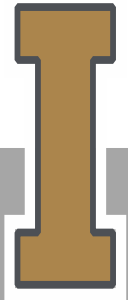


**THAT'S NICE,
BUT WHAT THE !*\$\$# ARE WE
SUPPOSED TO DO ABOUT IT?**



MANAGING LOW FALLING NUMBERS

- If FN is within 25 seconds of 300 – RE-TEST
- Blending is not a good option
 - Small amounts of amylase lowers the whole lots falling number score
- Storage
 - Long term (~40 day) storage in warm, dry space may help FN in sprout damaged grain
 - Baking quality continues to degrade even as FN increase
- Insurance
 - RMA has *some* coverage for LFN losses at *some* level
- Genetics



MANAGING LOW FALLING NUMBERS

- Three LMA genotypes in wheat:
 - Constitutive (high LMA genotypes under all environments)
 - Inducible (high LMA produced under some environments, especially cold shock)
 - Non-LMA genotypes
- UI, WSU, OSU, commodity groups via Wheat Marketing Center working to clarify
 - Currently no publicly released list of LMA genotypes in commercially released varieties



UI VARIETY TRIAL AT TAMMANY 2016

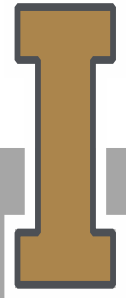
Variety	FN	Yield Rank	Yield	TWT	Heading date
	seconds	#	bu/A	lbs/A	
WB1376CLP	355	24	127	61.4	17-May
UI-Sparrow (IDO1108DH)	351	16	136	58.4	23-May
WB1529	325	8	146	60.8	18-May
LCSBiancor	319	4	149	57.3	13-May
Stephens	318	15	137	57.8	15-May
WB1604	308	5	147	59.1	13-May
SYOvation	308	9	146	59.1	17-May
UICastleCL+	305	17	136	59.9	20-May
Madsen	300	23	130	59.8	20-May
UI/WSUHuffman	299	18	136	59.6	21-May
WB528	296	6	147	59.8	14-May
LCSDrive(LWW12-7105)	295	7	147	55.1	11-May
Bobtail	288	2	152	56.1	16-May
LCSArtedeco	282	1	159	56.5	11-May
Puma	275	21	135	58.8	17-May
SY107	267	19	136	59.9	20-May
WBJunction	243	10	146	59.0	14-May
Jasper	237	13	140	58.8	21-May
Coda	231	25	125	59.9	25-May
UIPalouseCL+	212	22	132	57.2	23-May
Bruneau	182	11	146	59.8	18-May
Brundage96	176	14	140	57.9	18-May
NorwestDuet (LOR-092)	174	3	150	59.4	19-May
UIMagicCL+	150	12	142	59.5	16-May
WB456	134	20	136	60.5	14-May
Average			141	58.9	



2016 WSU W. WHEAT AT PULLMAN

SY Assure	2	249	IDN-07-28017B	2	283
IDN-06-18102A	2	254	LCS Artdeco	2	284
09PN062#18	2	256	Mela CL+	2	284
Rosalyn	2	256	UI Magic CL+	2	285
WB-Junction	2	261	WA 8206	1	286
SY Ovation	2	262	WA 8245	2	286
Curiosity CL+	2	263	WB 528	2	286
UI Palouse CL+	2	264	OR2110526	2	288
WA 8234	2	264	<i>Cara</i>	2	290
ORCF-102	2	264	LOR-833	2	290
IDN-06-03303B	2	267	WA 8187	2	291
WB 1604	2	269	Bobtail	2	292
KXB-01	1	269	WB 523	2	294
Legion	2	270	WA 8232	2	294
UI Sparrow	2	279	ARS06136-49C	2	295
Xerpha-G2	2	279	UI-WSU Huffman	2	298
			Xerpha	2	298

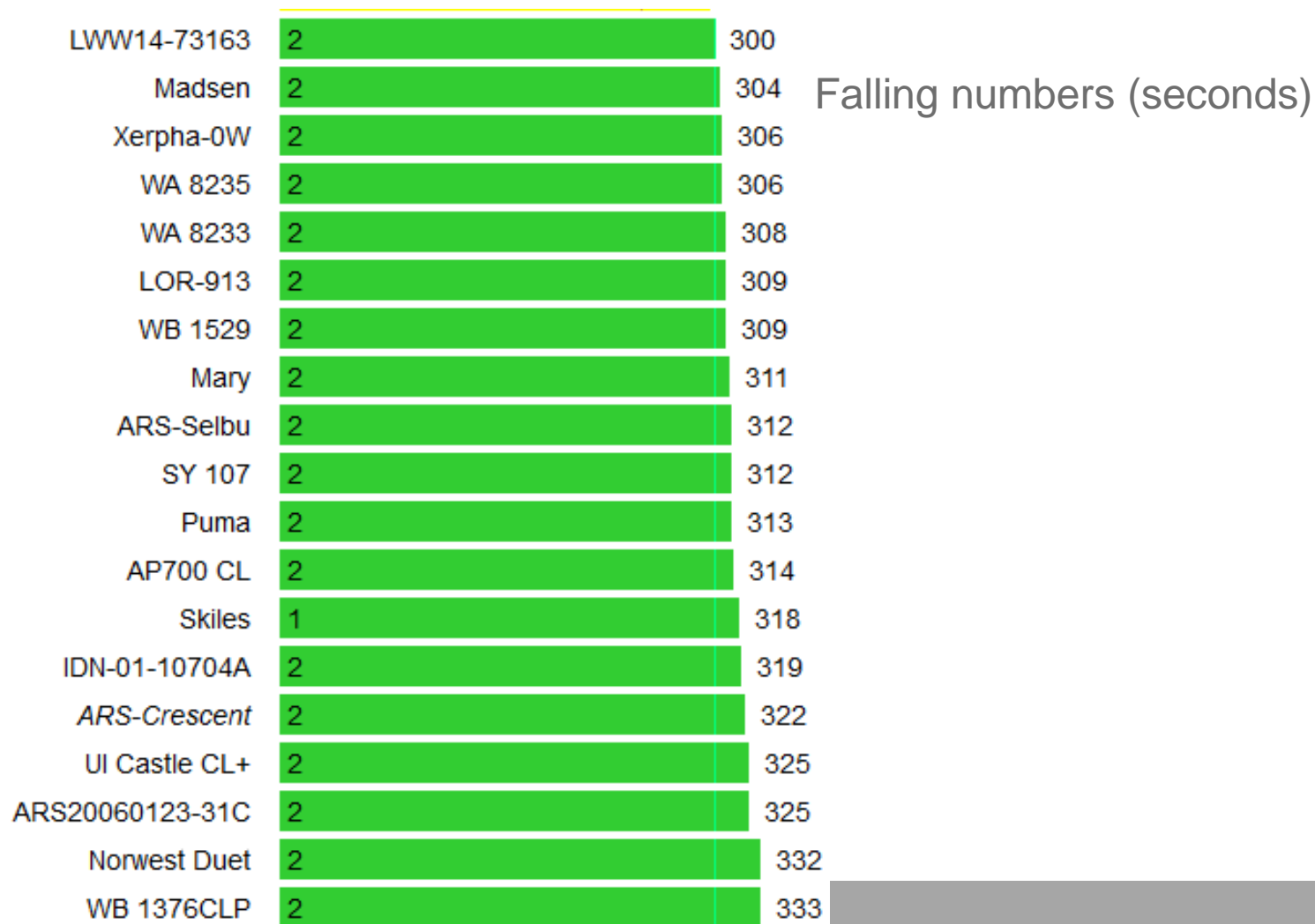
Falling numbers (seconds)



<http://steberlab.org/project7599SWWlocation2016.php>

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2016 WSU W. WHEAT AT PULLMAN



<http://steberlab.org/project7599SWWlocation2016.php>

2016 GROWING SEASON TAKE-AWAY

- Water not yield limiting factor
- Early spring put crop ahead of normal development
- Area crops at critical stage of development when temps swung widely – leading to LMA vulnerability
- Rains prior to harvest – lead to sprout vulnerability



SAMPLES NEEDED FOR QUALITY TESTING

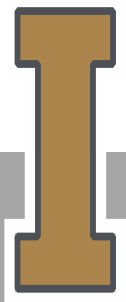
PHS -Rain	Varieties
	SY Ovation
	ORCF 102
	WB 528
	MADSEN
	MARY
Other varieties	
LMA - NO Rain	Varieties
	SY Ovation
	ORCF 102
	WB 528
	MADSEN
	MARY

Need 100#'s of varieties with FN:

- 300+ sec
- ~250 sec
- ~200 sec
- ~150 sec

Contact:

Doug Finkelburg
UI-Extension
208-310-1481
dougf@udaho.edu



QUESTIONS?



Photo: KAREN BLEIER, AFP/Getty Images

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