University of California
Agriculture and Natural Resources

Tulelake Farm Advisor Update

Fall 2013

Fall Farming Tips

By Rob Wilson, Center Director/Farm Advisor, IREC and
Steve Orloff, UC Farm Advisor, Yreka

Alfalfa

- Harvesting alfalfa at the proper time in the fall is important because it can affect yield the following year and even stand life. There is a window when you want to avoid harvesting but that window changes depending on weather conditions that year. The key is to:
    - cut early enough in the fall (early September) for the alfalfa to regrow and replenish root reserves and proteins or
    - cut so late (near a killing frost of 25 degrees) to that the alfalfa does not regrow and deplete carbohydrates. The problem is that real late harvests may be difficult to cure.
- Fall a good time to soil sample for P and make fertilizer applications. Phosphorus does not leach and a fall application ensures incorporation and availability to the alfalfa in early spring for a strong first cutting.
- It is often debated how important or unimportant irrigation is after the last cutting. Research in Scott Valley and at IREC showed alfalfa fully recovered the following year when irrigation was terminated before the end of the season, suggesting post-harvest irrigation is not necessary. However, in other states such as Idaho it is often recommended because winter rain is often insufficient to refill the soil profile in that environment. In most years winter rains in our area are sufficient to refill the profile. Let's hope that's the case this coming year.

Winter Wheat

- Planting before November 1 and irrigating up if necessary may help with winter survival and often results in better stands than planting later and relying on fall rainfall.
- Nitrogen use efficiency is improved if not all of the nitrogen is applied preplant and more of the N is applied later in the season.
- Use UC variety trial results to help select a variety (see article in this newsletter on winter wheat varieties).

Potatoes

- Proper soil moisture, tuber hydration, and pulp temperature are needed to minimize bruising.
    - Avoid waterlogged soils at harvest! Long, irrigations shortly before vine-kill are a perfect recipe for ruptured lenticels, disease, soil clods, and muddy tubers!
    - Pre-irrigate sandy fields if the soil is too dry shortly before harvest.
    - Intermediate tuber hydration levels minimize bruising. Hydrated, crisp tubers are more susceptible to shatter bruise and dehydrated, limp tubers are more susceptible to blackspot bruise.
    - Tuber pulp temperatures between 45 to 65 degrees F minimize bruising.
- Allow 4 to 5 weeks between the date of vine kill and harvest when harvesting Classic Russet!
- Minimize impact points on diggers, trucks, and conveyors; make sure harvester conveyor speeds are adjusted properly.
- If pink rot is problematic, consider a post-harvest treatment with phosphorous acid (several product names) to reduce pink rot incidence in storage. The following report details recent Idaho research on this topic.
  http://www.colostate.edu/Depts/SLVRC/CROPWATER/SRMAC2011/MillerSRMAC2011.pdf

Onions

- Record the location and incidence of white rot in fields
- Target fields infected with white rot for early harvest
- Avoid short-frequent irrigations in fields infected with white rot and bacterial disease
- Excessive nitrogen applications late in the growing season delay maturity
- Late season fungicides applications are not effective at suppressing white rot

Peppermint

- Peppermint should be irrigated as soon as possible after harvest. Avoid dry and waterlogged soil conditions going into winter. Too much irrigation during the fall can promote disease!
- Consider a fall herbicide treatment if fields are infested with Canada thistle, groundsel, and winter annual weeds. Fall treatment provides better control of these weeds and less crop injury compared to spring herbicide application.
- Consider fall insecticide treatment if mint root borer is a problem.
- Recent IREC research showed fall fungicide application was not effective at reducing *Rhizoctonia* the following spring.

IREC Hires New Superintendent of Agriculture

It is our pleasure to announce that Darrin A. Culp was hired as the new Principal Superintendent of Agriculture at the Intermountain Research & Extension Center. Darrin was hired in mid-August, two months after Don Kirby retired from the position after 35 years of service with the University. Darrin has been working at IREC as a Staff Research Associate since May of 2012. He came to us from the Oregon State University Research Center located in Klamath Falls, Oregon where he worked for five years. Darrin has a Bachelor of Science degree in Crop and Soil Science from Oregon State University and brings over fifteen years of combined experience in crop management and agricultural research to the position. Please join us in congratulating and welcoming Darrin to his new position at IREC.

Fall Management of Pastures and Grass Hay Fields in Drought Years

By Steve Orloff

As everyone is painfully aware, this has been a difficult year to adequately irrigate crops. Significantly below average rainfall has resulted in reduced surface water supplies and groundwater recharge. To make matters worse we have experienced several below average rainfall years recently and until recently this has been a fairly hot summer. For these reasons many growers are running short of irrigation water or have already been forced to quit irrigating their pasture or grass hay fields.
Dealing with a water shortage in alfalfa is easier than it is with most irrigated grass species. Alfalfa is relatively drought tolerant. It has a deep taproot so it is better able to access deep soil moisture, and when moisture levels are extremely low alfalfa goes into a "drought-induced dormancy". The plant typically recovers fully and resumes growth when sufficient water becomes available. In contrast, some grasses are not as resilient and plant vigor and density can suffer after an extended drought period.

What is the best way to deal with a water shortage for your pasture or grass hay field and what can be done to minimize the negative effects of deficit irrigation?

Steve Fransen, Forage Grass Specialist with Washington State University, has some advice for how to manage irrigated pastures and grass hay fields under drought conditions. Steve points out that the calendar for grass plants actually starts in the fall. This is when root growth is initiated and new growing points (or meristematic tissue) are formed. This sets the stage for forage production potential for the following year. Root shedding in grasses typically occurs from late June until early September when the roots begin to regenerate. If you dig grass plants in fall and carefully rinse them with water you should observe the new white roots. Then over the winter root shedding occurs again (roots turn from white to tan to brown to black as they decompose) until new roots are formed again in spring.

The plant crown or stubble is extremely important for grass survival. That is where the plant stores sugars and carbohydrates for respiration and subsequent plant growth. Most legumes store the majority of their sugars in the tap root and crown. In contrast, around 85 to 90% of the stored grass sugars are in the stubble internodes—only a small amount of sugar is stored in the roots. If grass plants do not have adequate stubble for carbohydrate storage, plant mortality can occur. It may be tempting in a water-short year like this to get as much as you can out of a pasture and graze it to the ground. However, even though the stubble may appear brown and dead, it is not. It is simply dormant and the sugars and starches can be remobilized and used for respiration and plant growth. Therefore, it is important NOT to graze the bottom 3-4 inches of the grasses because their storage function is critical for next year's production. So, what happens if the plants are grazed too close?

- The newly forming tillers can be starved of important sugars and starches
- The plant is more exposed and less protected from extreme weather

- Root formation is curtailed
- New tillers the following spring grow slower with fewer roots to support them

So even though it may be tempting to graze drought-stressed pasture close to the ground to greater utilize the available forage, this practice is a mistake in the long-term and is likely affect future productivity. You are best off to leave 3-4 inches ungrazed from fall throughout the winter even if that plant material appears dead.

Producers need to maintain the cows somewhere for fall and winter, and it is difficult to impossible to prevent the cows from grazing the stubble below 3-4 inches if they are fed on a pasture. Therefore, it is best to designate a small part of the property as a "sacrifice area" to house the animals so they will not consume too much of the stubble. This area can be a small pasture, dry range, dry lot, or a corral area. In effect, this area is "sacrificed" to protect your pasture from over-use at critical times.

The fertility status of the field is another factor to consider to help revive grasses after drought stress. Fall is a good time to fertilize pastures, including moisture-stressed pastures, with phosphorus and potassium. Oftentimes producers don't consider the phosphorus and potassium needs of grasses and think only about nitrogen fertilization in spring. Grasses need adequate phosphorus and potassium, and fall is a good time to make an application because these nutrients are needed for the development of new roots and growing points (meristematic tissue). Right now in early September is an ideal time. If growers apply P and/or K now they do not have to reapply these elements in the spring. An application of P or K now is not at risk of leaching from winter rains because these nutrients don't leach as do nitrogen or sulfur. It is fine to fertilize with these nutrients even when you don't have irrigation water or can't rely on rainfall for immediate incorporation, as these nutrients do not volatilize like nitrogen can from some fertilizer sources. Test soils now to determine whether your pasture is deficient in phosphorus or potassium.

While it is important to fertilize with P (and K if needed) in the fall, excessive rates of nitrogen at this time are discouraged because it can make plants more susceptible to winter injury. Nitrogen encourages growth and excessive N prevents plants them from adequately preparing for winter by "hardening off" and accumulating proline (an antifreeze-like compound). As N application is increased there is a decrease in stored sugars in grasses. This increases the chances of winterkill.

Cereal leaf beetle found in Klamath Basin: Will it affect your operation?

By Steve Orloff

Many of you have probably heard about the recent positive identification of the Cereal Leaf Beetle (CLB) in the Klamath Basin. The cereal leaf beetle was first found in Klamath County on the 21st of July and then later in Tulelake on August 1st. It was observed in several commercial grain fields in both the Modoc and Siskiyou County portions of the Klamath Basin. I subsequently surveyed fields in the Scott Valley (grain, Timothy and orchardgrass fields) and did not find the pest. While most grain fields were too mature to readily find CLB, I did find a late planted field that was still completely green and I did not find any cereal leaf beetles. After the Klamath Basin find, Joe Moreo, Modoc County Agricultural Department, surveyed other agricultural areas of Modoc County and did not find the pest. Similarly, fields in Butte Valley were surveyed by the Siskiyou County Agricultural Department and they did not find CLB there as well.

You're likely wondering what is the significance of CLB being found in the Klamath Basin for your operation. First, quarantine actions for movement of grain and grass hay within California have not been completely decided but should be shortly. The current plan for this year is that quarantine actions may be imposed for the Klamath Basin and not for Modoc and Siskiyou Counties as a whole. What form those quarantine actions might take is yet unknown but may involve holding the grain for 30 days before moving out of the area. This would not be too onerous in most situations. Grass hay is subject to inspection but no further restrictions will be imposed on grass hay prior to movement out of the area. Details on how the inspection will occur are currently being ironed out. Alfalfa hay will not be impacted because it is not a host for the CLB but alfalfa grass mixtures could be affected.

While CLB was only detected in the Klamath Basin this year this does not mean that the other areas of Modoc and Siskiyou Counties are home free. It is very likely that CLB will spread into these other areas as well. Cereal leaf beetle was first found in Oregon in 1999 but has now spread throughout most of the state where grain is grown. The rest of Siskiyou and Modoc counties will likely become infested as well—it is just a matter of time because climatic conditions are favorable for the establishment of this pest.

Cereal leaf beetle has a wide host range of grass species. It prefers spring seeded small grains, especially wheat barley and oats. However, it will also feed on orchardgrass, timothy, annual and perennial ryegrass and fescue. Adult cereal leaf beetles may also feed on the leaves of corn, sorghum and sudangrass.

Cereal leaf beetle, *Oulema melanopus,* is distinctive—the adults are a relatively small (about ¼" long and 1/16" wide) brightly colored insect of the beetle family (see figure 1). The outside wings and head are metallic blue-black. The legs and prothorax or "neck area" are orange-red. This coloration makes them relatively easy to identify in the field. The larvae or immature stage of the beetle are slug-like with orangish -yellow bodies and a dark brown head.

Figure 1. Adult cereal leaf beetle. (photo Helmuth Rogg)

The larvae cause the most damage. Their feeding causes transparent slits in the leaf blade, as they consume all the green leaf material down to the lower cuticle (Figure 2). The result is long narrow transparent "windowpanes" in the leaf. With severe damage, the field can take on a frosted appearance. The adults also feed on the foliage but rarely cause economic damage. The eggs are typically laid singly or in groups of two to three placed end to end in short chains on the upper leaf surface near the base of the leaf. They are about 3/16" long, cylindrical in shape with rounded ends with a yellow to burnt orange color (Figure 3).

Figure 2. Slug-like larvae cause windowpane like slits in the leaves. (photo Helmuth Rogg)

Figure 3. Cylindrical, burnt orange eggs laid on top of the leaf blade single or in chains of 2 to 3 eggs. (photo Helmuth Rogg)

In the long run, biological control will likely be the solution to this new problem. The beneficial insects will never completely eradicate CLB, but within a few years after the parasitic wasps are established,

pest levels will generally drop below levels that cause economic damage. Parasitic wasps that attack either the eggs or the larvae have been released in Oregon. The egg parasite has performed well in the eastern US but has failed to become established in Oregon and other parts of the West. However, the larvae parasite (*Tetrastichus julis*) has become well established (high parasitization rate) in areas where it has been released in Oregon and insecticide treatments are generally no longer needed. Plans are in place to release the larvae parasite in the Klamath Basin next year—it is too late for releases this year.

When CLB invades an area and before biological control can be effective, it may be necessary to treat infestations with an insecticide. In the absence of natural enemies, damage to small grain crops can be significant. An average of one larva per flag leaf has been found to cause a 300 to 360 pound yield loss per acre. However, in heavily infested fields yield losses as high as 55 percent in spring wheat and 23 percent in winter wheat have been reported. Fields with this level of infestation have a frosted, withered appearance. Studies in Union County, Oregon showed wheat yield was reduced 13 percent in untreated plots in 2004 and 21 percent in 2005. Overall, the effect of CLB on winter wheat is less than the effect on spring wheat. The effect of CLB on winter wheat grain yield in 2004 was variable (3% to 18%) depending on overall crop vigor in relation to CLB population.

Treatment thresholds have been established for cereal crops. In most states the treatment threshold before the boot stage is three eggs and/or larvae per plant. Once the flag leaf emerges, CLB feeding is usually restricted to the flag leaf where damage can significantly reduce grain yield and quality. Therefore, the treatment threshold drops at the boot stage to only one larva per flag leaf. The results from the Oregon study mentioned above suggested that flag leaf threshold levels may actually be lower than 1 larva per flag leaf for spring wheat but is adequate for winter wheat.

A well irrigated and vigorously growing crop is less susceptible to severe damage from CLB. While other grass crops, such as those used for pasture or hay crops, are considered hosts for the CLB, treatment with an insecticide is generally not needed.

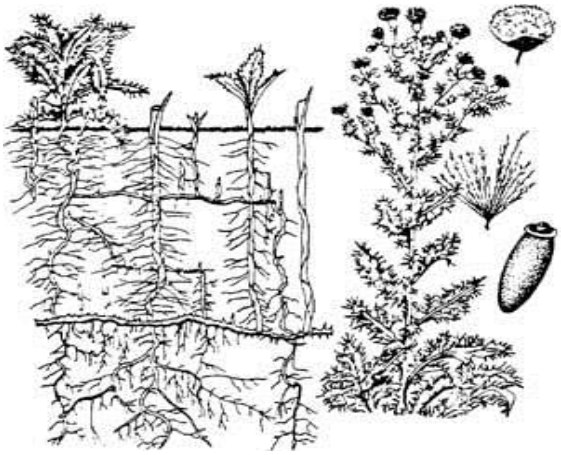
After this background information, let's return to the title of this article **Cereal leaf beetle found in Klamath Basin: Will it affect your operation?** The CLB so far has only been found in the Klamath Basin and not in other areas of Modoc and Siskiyou Counties. However, considering the spread throughout the western states, it is likely that CLB will eventually spread to the rest of these counties. This pest can cause significant injury and it is likely that some grain fields will need to be treated until beneficial insects (primarily the larval parasite) become well established. This will likely take years, but initial larval parasite releases are planned for next year. In the meantime, use economic thresholds to determine whether treatment is justified. One of the most significant questions remaining regarding how cereal leaf beetle might affect your operation depends on what quarantine restrictions are put in place regarding the movement of grass hay from infested areas to other areas of California. Hopefully, this will be decided soon and that the restrictions are not too onerous for producers.

Tips for Controlling Thistles

By Rob Wilson

The thistle species can become a farmer or rancher's worst enemy. If thistles are left untreated, they tend to form large, dense infestations in a short period of time. In pastures, thistles compete with desirable forage species and decrease land potentials for livestock production. Thistle's sharp spines make them unpalatable to livestock and wildlife once they reach maturity. In croplands and orchards, Canada thistle can become a problematic weed. The only known beneficial use for thistles is their nectar source for honeybees.

Thistles found in northeastern California can basically be broken into two groups: biennial thistles and perennial thistles. Biennial thistles, such as musk, scotch, and bull thistle, complete their lifecycle in two years. Biennial thistles reproduce exclusively by seed, making eliminating seed production the major control target. Likewise, it's foolish to spray or kill biennial thistles after they've flowered since the plants have already produced seed. Perennial thistles, such as Canada thistle, live for several years reproducing by seed and creeping roots. The major control target for perennial thistles is decreasing seed production and suppressing root growth/propagation.



Canada Thistle, *Cirsium arvense* (L.)

Musk Thistle, *Carduus nutans* (L.)

A good way to tell Canada thistle from biennial thistles is to pull the unidentified plant out of the ground and look for long, interconnected, creeping roots (Canada thistle) or a large, tap root (biennial thistle). Some biennial thistles can produce over 5,000 seeds per plant, so make sure to prevent seed production each year.

Controlling large thistle patches is a long, tedious task often taking several years. On the other hand, controlling small thistle patches is relatively easy. This fact makes it extremely important to buy weed-free seed and clean your vehicles/ implements after travelling in weed infested areas.

You should also scout your fields each year in order to find small thistle infestations. Regardless of thistle population size, those people who have successfully controlled thistles have done so through diligent observation and re-treatment of existing patches.

Herbicides are probably the best control method for killing thistles. Biennial thistles are most sensitive to herbicides when they are small rosettes (April and May). Colorado State University research showed that when herbicides were applied to bolting musk thistle, 43% to 65% of the plants were controlled, but when applied to musk thistle rosettes, 90% to 100% were controlled. Recent UC research in Modoc County investigating Scotch Thistle control with herbicides showed Milestone or 2,4-D + Banvel worked best when applied at the rosette stage compared to treatment at the bolting or flowering stage.

The best time to treat Canada thistle is in the fall when rosettes are greening up or the early summer when plants are in bud to flowering stage. In numerous trials conducted in Northeast California over the last 10 years delaying herbicide application until the flower-bud or flowering stage gave better control than treating Canada thistle in the rosette or bolting stage. In most of Modoc County, flowering occurs between late June and mid-August.

The reason why delaying herbicide application until flowering works well for controlling Canada thistle is related to its biology. Canada thistle spreads mainly by vegetative buds on the roots. For this reason, the goal is to suppress the weeds' root system and herbicide applications at flowering maximize herbicide translocation down to the roots. If Canada thistle is found in pastures or mowed areas where it is cut before flowering, treat the re-growth with herbicide in late summer or fall.

Research has shown that Milestone, Transline, dicamba (Banvel), and Telar are some of the best herbicides (registered in California) for biennial thistle control. For Canada thistle control, Milestone or Transline are the best herbicide options. Most studies have shown that Milestone is somewhat more effective than Transline on Canada thistle, but that Transline is safer to seedling grasses if an application is needed soon after reseeding a perennial grass. Both herbicides can reduce Canada thistle populations by at least 85% one year after treatment when applied at the correct timing. Glyphosate (Roundup) and 2,4-D can also be used to control thistles. Milestone, Transline, Banvel, Telar, and 2,4-D selectively control certain broadleaf weeds while leaving most grasses un-affected. Glyphosate is a non-selective, contact herbicide and kills most plants. In a rangeland setting, glyphosate only should be used for complete vegetation control since re-invasion by other noxious weeds typically occurs after glyphosate treatments. With any herbicide application, it is extremely important to follow all label directions and restrictions. The label can help you determine which rate to use, what the grazing or re-cropping restrictions are, what the possible environmental concerns might be, and what target and non-target plants might be affected. You should also obtain an operator ID and notify your local Ag. Commissioner when spraying restricted use pesticides.

Repeated mowing between the bolting and bud stage is considered an effective control practice for Canada thistle, but mowing is not effective for controlling biennial thistles. Many studies have shown mowing three to four times per year for a three-year period greatly reduces Canada thistle populations. Mowing a couple times a year followed by a fall herbicide application is a great strategy and consistently enhances herbicide control of Canada thistle. It is important not to skip

mowing times because Canada thistle can rebound quickly. Disking or cultivation is effective at controlling biennial thistles, although seeds left in the soil can germinate for many years. Cultivating Canada thistle is not effective, unless Canada thistle is cultivated at 20- day intervals for one to two years to exhaust the carbohydrate reserves in the roots. Hand-pulling biennial thistles can be a good strategy for controlling small patches before the thistles flower. Hand-pulling Canada thistle is not recommended since Canada thistle roots re-sprout from below the soil surface.

With any control strategy, you should monitor the site to look for new weed infestations after you achieve control. It's also important to re-seed the site with competitive plants if a healthy residual plant community is lacking to prevent thistle re-invasion. Feel free to call the Farm Advisor office in Tulelake 530-667-5117 to discuss site specific management strategies.

Winter Wheat Variety Results

By Steve Orloff

Winter wheat variety trials are conducted annually in Tulelake at the Intermountain Research and Extension Center (IREC) and in the Montague area of Shasta Valley. Data are presented below for the 2013 trials.

The IREC site had very high yields, averaging over 4 tons per acre while the highest yielding variety was over 5 tons per acre. The Montague site typically also has high yields, but this year yields were considerably lower than normal due to the drought and limited irrigation supplies. The Montague site averaged just over 2 tons per acre and the highest yielding variety was approximately 3.2 tons per acre. Because of the large difference in yield and growing conditions at the two sites, it does not make sense to average the results from the two locations—they should be considered separately.

The two highest yielding varieties at the IREC site are both experimental varieties. However, Mary, a commercially released variety, is the third highest yielding variety. Mary performed extremely well in 2012 as well and was the top yielding variety over the two evaluation sites. Mary has strong straw strength and low tendency to lodge. This is a variety growers should consider planting this year. Mary may be somewhat more susceptible to stripe rust though, as shown in field trials and in field experience in stripe rust prone areas in the Pacific Northwest. The disease has not been a significant problem in central Siskiyou County but is something to be aware of if the conditions are conducive to disease development. Two other varieties that performed reasonably well were Tubbs-06 and Bruneau. These varieties have also done well in the past in research trials and in grower fields.

The ranking of the varieties was considerably different at the Montague site due to the moisture stress. I would only rely on this ranking if you believe that moisture is likely to be limiting at your site in 2014. The high yielding named varieties mentioned above (Mary, Tubbs-06 and Bruneau) did not perform well at the Montague site. It is interesting to note that the highest yielding variety in Tulelake (YS 221) also performed very well in Montague (second highest yielding variety) despite the moisture limiting conditions.

Sometimes growers want a dual purpose variety—one that can be used for hay or grain depending on market conditions. Yamhill wheat is a long-standing forage variety. It was included in this year's trials to assess its grain yield potential compared with standard and experimental grain varieties. It is interesting to note that Yamhill ranked 22nd out of 54 varieties in Montague but near the bottom of the ranking under the high yielding conditions in Tulelake (51 out of 54 varieties). This indicates that Yamhill may be an acceptable variety in moisture-limiting conditions where a grower is not sure whether to make or hay or grain, but under high yield potential conditions, there is a significant penalty for producing a variety like Yamhill.

2013 Intermountain Winter Wheat Variety Trial Results

Entry	Name	TULELAKE Grain Yield (lbs/acre)	SISKIYOU Grain Yield (lbs/acre)	Entry	Name Cont.	TULELAKE Grain Yield (lbs/acre)	SISKIYOU Grain Yield (lbs/acre)
1	Stephens	8810 (17)	4150 (33)	28	SY Ovation	9020 (15)	4560 (27)
2	Tubbs-06	9120 (12)	4900 (18)	29	ORCF-101R	8000 (43)	5110 (12)
3	Goetze	7510 (49)	3540 (44)	30	ORCF-102	8300 (35)	4610 (24)
4	Skiles	8310 (34)	4010 (36)	31	ORCF-103	8630 (19)	5050 (13)
5	Mary	9430 (3)	3780 (38)	32	ORI2101840 - 2 gen	8050 (41)	4640 (23)
6	Kaseberg	8390 (30)	4030 (35)	33	ORI2101841 - 2 gen	8080 (40)	3710 (39)
7	Ladd	8330 (32)	3970 (37)	34	WA 8143 - 2gene El	8580 (24)	4950 (14)
8	Bruneau	9070 (13)	4560 (25)	35	AP 700 CL	9130 (11)	4550 (28)
9	02-10606A	9290 (7)	3690 (41)	36	WB 1070 CL	7060 (50)	1640 (52)
10	99-06202A	9280 (8)	4440 (29)	37	Cara	8200 (38)	4310 (32)
11	03-29902A	8890 (16)	5420 (7)	38	ARS 010669-2C	6560 (52)	3040 (47)
12	IDO 1108	9320 (5)	5540 (5)	39	OR2071071	8380 (31)	6410 (1)
13	LCS Artdeco	8450 (29)	3650 (42)	40	OR2080641	9420 (4)	5700 (4)
14	LWW10-1018	8180 (39)	4560 (26)	41	OR08047P94	9290 (6)	5440 (6)
15	LWW04-4009	8550 (26)	4910 (17)	42	OR2080924	8630 (20)	5210 (10)
16	WA 8151	9230 (9)	4680 (21)	43	OR2080637	8660 (18)	4360 (31)
17	WA 8153	8220 (37)	5340 (8)	44	OR2080926	9200 (10)	5910 (3)
18	YS 221	10180 (1)	6030 (2)	45	OR2090473	8260 (36)	4930 (16)
19	YS 461	8610 (23)	4840 (19)	46	GALGALOS	3340 (54)	1170 (53)
20	YS 434	9850 (2)	5320 (9)	47	NORWEST 553	7540 (48)	3580 (43)
21	Trifecta	8050 (42)	3700 (40)	48	BOUNDARY	7730 (46)	4140 (34)
22	WB Junction	8500 (27)	4390 (30)	49	YAMHILL	6760 (51)	4680 (22)
23	Exp 427 - Stephens	8620 (21)	2800 (50)	50	WHETSTONE	7920 (45)	3480 (45)
24	Exp 458	7570 (47)	3300 (46)	51	ARROWHEAD	9040 (14)	2790 (51)
25	Legion	8560 (25)	4760 (20)	52	RIMROCK	7990 (44)	2880 (48)
26	SY 107	8610 (22)	5130 (11)	53	KELDIN	8470 (28)	2860 (49)
27	AP Badger	8320 (33)	4940 (15)	54	EXPRESSO	3440 (53)	640 (54)
				MEAN GRAIN YIELD		8310	4270

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