Oregon Potato Commission

Research Progress Reports
FY 2014-2015

Prepared for the
Oregon Potato Commission
Research Committee

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Research Progress Reports and Proposals to the Agricultural Research Foundation for the Oregon Potato Commission

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Oregon Potato Commission

Research Progress Reports
FY 2014-2015

Research/Extension Progress Report for 2014-15 Funded Projects
Progress Report for the Agricultural Research Foundation
Oregon Potato Commission

Title: Central Oregon Potato Extension Program

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Funding History (last 2 years): Year initiated: 1995

2012 5,000
2013 6,000
2014 6,000

Abstract:

Aphid, tuberworm moths, and potato psyllids were collected and counted weekly in Jefferson County from June 18 to September 23, 2014. Counts were conducted to monitor pest populations and to assess potential risk of disease transmission. Collection methods included sixteen water pans for aphid collection, 16 delta traps for tuberworm, and 16 yellow sticky traps for psyllid. Weekly findings were distributed to growers, fieldman and industry representatives through in report form. Aphid numbers were moderately high at the beginning of the season, averaging fifteen to seventy-seven aphids per trap before decreasing to below twenty in mid-July. Aphids rose significantly in mid-September and continued until trap removal on September 23, 2014. Potato tuberworm moths were found on July 22 in very low numbers (0-3) until September 16, when numbers increased and continued until traps removed at harvest on September 23, 2014. The first recorded incidence of potato psyllid was detected in Jefferson County but was limited to two fields September 16. Specimens were tested for Lso (*Candidatus* Liberibacter solanacearum) and all tested negative. Early blight prediction modeling and crop water use data provide helpful information for seed potato management. Weekly monitoring continues to be a significant source of information for integrated pest management in Central Oregon potato fields.

Key Words: Aphids, Green Peach Aphid, Potato Aphid, Potato Tuberworm, Potato Psyllids, Tuberworm Moths, Psyllid, Lso, *Candidatus* Liberibacter solanacearum, IPM, Insects

Objectives:

1. Aphid and potato tuberworm trapping IPM project
2. Generate early blight prediction model and weekly water use data information
3. Create seasonal, weekly newsletter to provide growers with insect and disease updates

Procedures:

1. **Aphid, Potato Tuberworm and Psyllid trapping IPM project**

Aphids. Aphids are important pests in potato crops and can affect yield by removing nutrients from plants, stunting growth, or transmitting disease. Aphids are known vectors for several viruses, with the most important for our area being potato virus Y (PVY). Pan traps

are used to determine when aphid populations are increasing and when field monitoring becomes necessary. Sixteen yellow water traps were used to collect winged aphids in commercial potato fields throughout Central Oregon from June 16 to September 23. Trapped aphids were collected from water using a soft paint brush and transferred into vials filled with alcohol. Vials were transported to the OSU-COARC laboratory and identified as green peach aphid or other aphids. Date and location were used to identify aphid movement in area.

Potato Tuberworm. The potato tuberworm is one of the most important pests that infest potato worldwide. Potato tuberworm moth appeared in the area in 2013 and has the potential to impact production due to larvae mining in tubers. In the past, the presence of potato tuberworm in central Oregon was sporadic. Sixteen pheromone delta traps were placed at the edge of commercial potato fields from June 16 to September 23. Delta traps consist of a triangle shaped trap, removable sticky liner bottom, and a lure impregnated with the pheromone of the female potato tuberworm moth. Sticky liners were removed weekly and inspected for presence of male moths. Confirmation of an initial tuberworm moth find was verified by the OSU-HAREC Irrigated Entomology Program Laboratory, Hermiston, OR.

Potato Psyllid. The Pacific Northwest potato industry has recently been alerted of the finding of the zebra chip (ZC) disease in 2011. The pathogen causing ZC is 'Candidatus Liberibacter solanacearum' (Lso), a type of bacterium vectored by the potato psyllid (Bactericera cockerelli Sulc), Sixteen yellow sticky traps were placed five feet within the field from June 16 to September 23, 2014. Double sided yellow sticky traps measuring 4"x6" were placed at canopy height and monitored weekly for potato psyllid activity. One psyllid was initially found on September 16, with 7 more found the following week. Specimens were sent to OSU-HAREC for confirmation and LSO testing.

2. **Generate early blight prediction model and weekly water use data information.** Weekly early blight prediction models were published using June 1 and June 10 emergence dates. The model predicts the first seasonal rise in the number of spores of the early blight fungus based on the accumulation of 300 physiological days (P-days) from green row. Once 300 P-days have accumulated, the first fungicide for early blight control should be applied. This usually occurs when rows have closed. Potato is a moisture sensitive crop with a shallow active root zone compared to cereals and forages. Availability of moisture in the root zone is crucial for high yields and is influenced by soil properties such as texture and percent organic matter. Moisture demand increases as the crop begins to develop after emergence and peaks 7-9 weeks later during the tuber bulking growth stage. Weekly water use data was calculated for two major soil profiles in central Oregon.

3. **Create seasonal, weekly newsletter to provide growers with insect and disease updates**. A weekly newsletter was sent to potato industry participants from June 23 to September 23 that included the early blight prediction model, weekly water use, weekly aphid identification and population numbers, and notification of potato tuberworm moth and potato psyllid presence. Location of trap sites and population numbers were identified for grower use. Weekly reports were posted onto the OSU-COARC website and can be found at http://oregonstate.edu/dept/coarc/aphid-trap-reports, providing immediate access for our targeted audience.

Accomplishments:

Aphids. Aphid populations in central Oregon ranged between 4 and 24 aphids per trap in 2013 (Fig. 1). Overall, aphid populations were low all season long with a small peak on July 23 and another increase at the end of the season on September 3. Green peach aphid numbers were very low ranging from 0 to 3.6 aphids per trap. Identification and reporting remains a helpful tool in controlling vectors.

Potato Tuberworm. In previous years potato tuberworm moth has been absent or found periodically throughout the year. In 2013, first identification of potato tuberworm moth occurred on August 27 and was confirmed by the OSU-HAREC Entomology Lab. Tuberworm was found each week (at least one but no greater than 3) until trap removal on September 17 prior to harvest. The increasing presence of potato tuberworm is of great importance. Control methods include prompt harvest after vine kill and keeping soil moist as vines die to prevent cracking of the soil and exposure of tubers.

Beet leaf hopper and potato psyllid presence is a growing concern for potato production and monitoring in 2014 is suggested for these pests. Surveys conducted during the 2014 growing season should include yellow water pan traps for aphids, potato tuberworm delta traps, beet leafhopper and psyllid sticky traps.

Impacts:

Weekly aphid reports were sent growers, fieldmen and industry participants and made available at on the Central Oregon Agricultural Research Center Website. Weekly information provides opportunity for efficient and economical control of pests and disease. Trapping continues to be an important tool for potato seed producing areas to monitor pests capable of transmitting diseases.

The yearly survey assists in the prediction of crop water use important to proper crop management throughout the growing season and during maturation to assist with harvest and prevent storage rot. Use of the early blight prediction model assisted growers and fieldmen as they time fungicide sprays to efficiently prevent disease outbreak.

This project identified the first recorded incidence of potato psyllid detected in Jefferson County. One psyllid was initially found on September 16, with 7 the following week and were limited to two fields. Specimens were sent to OSU-HAREC for confirmation and were tested for Lso (Candidatus Liberibacter solanacearum); all tested negative. Early blight prediction modeling and crop water use data provide helpful information for seed potato management. Weekly monitoring continues to be a significant source of information for integrated pest management in Central Oregon potato fields.

Relation to Other Research:

Monitoring potato pests in the area can be used to alert industry of increased populations of pests that may affect other crops as well. Virus control efforts center on reducing the source of the virus and controlling potential vectors. Insect monitoring reports are available to central Oregon growers of other crops where aphids are considered pests.

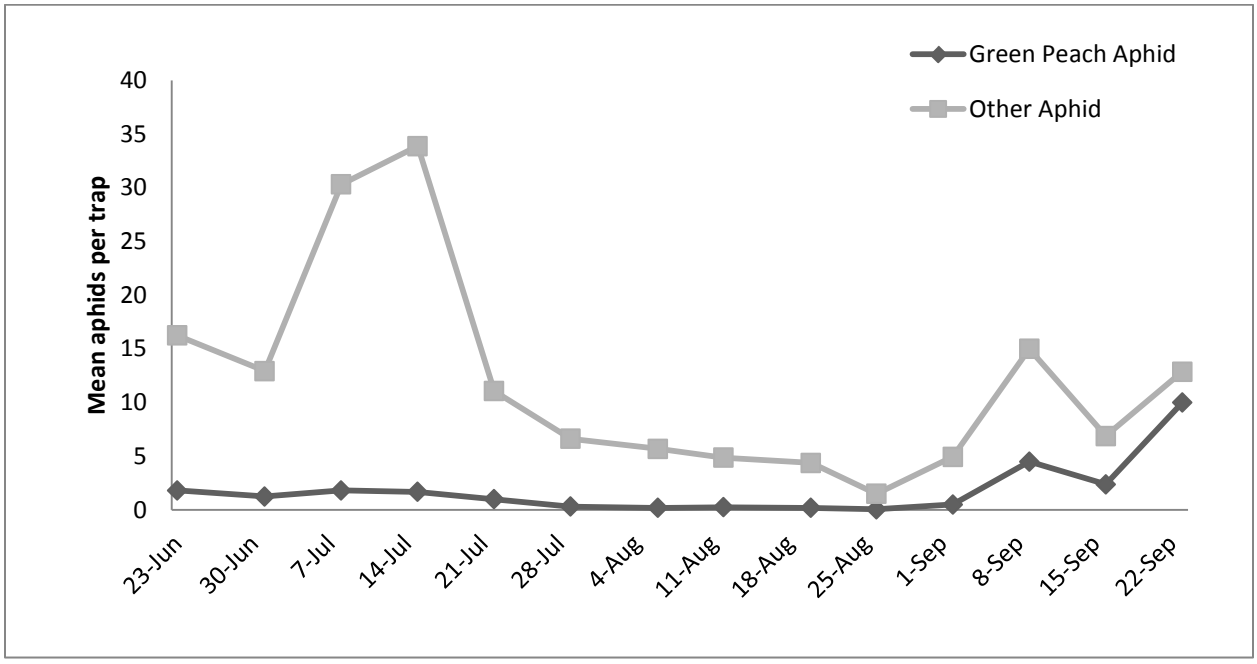

Fig. 1. Average population of aphids per trap in commercial fields in Jefferson County, Oregon 2014

Progress Report to the Agriculture Research Foundation
Oregon Potato Commission
2014-2015

Title: Klamath Basin Research & Extension Potato Program

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Funding History:

Funding for, 2008-2009 this donor: $16,100
Funding for, 2009-2010 this donor: $16,100
Funding for, 2010-2011 this donor: $17,000
Funding for, 2011-2012 this donor: $16,850
Funding for, 2012-2013 this donor: $16,850
Funding for, 2013-2014 this donor: $17,100
Funding for, 2014-2015 this donor: $17,100

Abstract:
Potatoes are an integral component of Klamath Basin agriculture comprising approximately 7% of gross farm gate sales. Basin potato growers produced a $38 million dollar commodity on approximately 14,000 acres in 2013. Local production is comprised of both fresh, processed (chips), and certified seed acreage. Extension insect trapping programs have provided producers with pertinent information to assist production management decisions. Degree-day monitoring has helped optimize application timing of non-fumigant nematicides for control of various nematode species. Chipping potatoes comprise approximately 45% of basin acreage and identification of public varieties suitable for export markets remains a high priority for basin producers. Superior verities have been identified and cultural management trials have been initiated (2010) to optimize yield and quality. Trials have been conducted the past three growing seasons with finding from the Oregon Potato Commission to identify acceptable chipping varieties for export markets using germplasm from the Tri-State, south-west, north-central, and eastern breeding programs. The Klamath Basin Research & Extension Center (KBREC) continues to provide valuable services to growers, shippers and local agricultural business in many facets of pest management, production, and marketing. Our goal is to continue searching for innovative ways to enable our local industry to keep ahead of the latest developments.

Key Words: Chipping, herbicides, varieties, aphids, nematodes, insects

Objectives:

Education and Service

1. Develop multi-state programs as major annual events for growers, agricultural industry, and the intermountain (southern Oregon and northern California) community.
2. Use various media outlets to communicate agricultural topics of importance to the rural and urban Klamath Basin community.
3. Continue insect trapping programs in the Klamath Basin to help generate local data about the distribution of potato tuberworm, leafhoppers, aphids, and psyllid distribution, life cycle and control.
4. Continue monitoring growing degree-days for nematode development in the Klamath Basin to help fine tune optimal application timings.
5. Provide technical field service to growers in the Klamath Basin through identification of potential problems and solutions.
6. Provide grower, agronomists, shippers, and related industry with timely newsletters on pertinent information.
7. Provide liaison between growers and campus-based specialists and various program services.
8. Provide leadership support to the Klamath Basin Potato Growers Association.

Research:

1. Screen chipping varieties from Tri-State, and Western Regional variety development programs to determine suitability to local production parameters with particular emphasis on meeting raw export standards.
2. Screen twenty herbicide treatments for weed control efficacy and yield and quality parameters.

Procedures:

Implemented all objectives listed.

Significant Accomplishments:

1. Chair and coordinator in cooperation with UC Intermountain R&E Center for Klamath Bain Potato Seminar, Merrill, OR, March 5, 2014. 50 participants.
2. Assisted with potato booth at Klamath Basin Farm Expo, Klamath Falls, OR. February 2014, more than 1,400 participants (grades K-12 and general public)
3. Hosted potato single-hill and preliminary yield trial selection tour on October 7-9.
4. Insect trapping program. Fifteen sticky traps and twelve yellow-pan traps were monitored from late June to early-September throughout the Klamath Basin in 2014. Results were reported in weekly issues of *Potato Bytes* and posted to the KBREC website for area producers. Once again, no potato tuber moths were detected in the Klamath Basin in 2014. Two potato psyllids were detected in the Klamath Basin in 2014 and were found to

be negative for Liberibacter. Leafhopper and aphids counts were also monitored (See graphs below).

5. Extensive visits to area potato fields were made to help determine the cause of various production problems. Growers raising Classic Russet the past few years continued with slightly reduced acreage in 2014. Routine correspondence, field and packing shed visits occurred throughout the production season.
6. Maintained growing season degree-day information for hatch of J2 root-knot nematode juveniles. Notified local pest control businesses and grower clientele to alert when target degree-days were approaching. Data was also available on our website and included in weekly issues of *Potato Bytes*.
7. Seventeen early and advanced chipping selections were evaluated for yield, grade, processing quality, and storability to determine suitability to fill existing export demands for raw product.

   Results and Discussion:

   The most promising entries were retained for further evaluation in 2014. For detailed analysis see tables below.
8. Continued publishing a newsletter titled *Potato Bytes.* This newsletter was delivered weekly beginning in late-June and ended in mid-September. Archives of the newsletter can be accessed on the KBREC website at: http://oregonstate.edu/dept/kbrec/potatoes. The newsletter contained tabulations of insect surveys, crop water use information, degree-day accumulation, and other pertinent information for growers.
9. Continued publishing a summarized report titled *Klamath Basin Potato Variety Development Summary.* This report details all KBREC potato research activities in a 'grower-friendly' format. Archives of this report (2008-2014) can be assessed on the KBREC website at: http://oregonstate.edu/dept/kbrec/potatoes.

Impacts:

The Klamath Basin Research & Extension Center continues to provide extensive and timely information to local and statewide potato interests. Pesticide trainings continue to provide basin producers and industry professionals with hours necessary to keep pesticide licenses current. Conferences and seminars facilitate the interaction of growers, business, and agencies to interact on important issues facing the potato industry and the local region in general. Insect trapping provides the production region with pertinent information to assist in production management decisions. Monitoring nematode growing degree-days allowed growers an opportunity to target pesticide applications at the weakest point in the nematode life cycle. Hence, greater control efficacy and higher quality potatoes were realized at harvest. Yield trials to identify superior public chipping varieties for export continues to help Klamath Basin and Oregon producers remain competitive as these markets continues to expand. Identifying optimum cultural management practices will help producers optimize net economic returns while delivering a high quality product to processors and consumers.

Relation to Other Research

This project interfaces with statewide variety development projects on three branch stations (Hermiston, Klamath Falls, and Ontario) and the Crop & Soil Science Department in Corvallis. In addition, Klamath Basin Research & Extension programs are fully integrated with other extension programs in the Tri-State area and northern California. Current research and information are effectively disseminated for maximum benefit and impact to the local agricultural industry.

2014 Preliminary Yield (PYT-2) Chip Trial

Location: OSU KBREC – Klamath Falls, OR
Planting Date: May 15
Harvest Date: September 23
Fertility: 180-80-200-215
Vine Kill Date: September 2
Days to Vine kill: 111
In-Row Spacing: 9.25 inch

The PYT-2 Chip Trial evaluates recently selected clones, often only two years removed from single-hill selection. Retained entries are further evaluated in replicated trials at several Oregon locations before advancing (if applicable) to the Tri-state trial which includes testing locations in Washington and Idaho. Five selections were evaluated with two retained for further evaluation.

Clone	Female Parent	Male Parent
AOR06209-3	A91790-13	MSJ316-A
AOR06209-5	A91790-13	MSJ316-A

2014 Statewide Chip Trial

Location: OSU KBREC – Klamath Falls, OR
Planting Date: May 15
Harvest Date: September 23
Fertility: 180-80-200-215
Vine Kill Date: September 2
Days to Vine kill: 111
In-Row Spacing: 9.25 inch

Chipping potatoes comprise a significant portion of Klamath Basin acreage and identification of public varieties suitable for export remains a high priority for Basin producers. Trials were initiated in 2008 and 2009 with funding from the Oregon Potato Commission to identify acceptable chipping varieties for export markets using advanced selections and recently released varieties from the Tri-State, Southwest, North-central, and Eastern breeding programs and have continued annually. In 2014 seven varieties and advanced chipping selections were evaluated for yield, grade, processing quality, and storability to determine their suitability to meet existing export demands for raw product. All field data was collected at the KBREC site. Tubers from each replication were placed in both short and long-term commercial storage with processing evaluations conducted by Baley-Trotman Farms. Results for 2014 are listed below.

Stand Counts

- **30 Day**
  Slow emergence: AOR00242-2 (87%)

- **45 Day**
  All entries but AOR00242-2 (89%) had greater than 95% final emergence

Plant and Tuber Growth and Development

- **Average Tuber Number Per Plant**
  Most: AOR09034-3 (12.7), AOR00242-2 (11.6)
  Least: Chipeta (5.7), OR09253-1 (7.0)

- **Average Tuber Size (oz.)**
  Largest: AOR09032-5 (4.8), Chipeta (4.1)
  Smallest: AOR00242-2 (2.4), AOR09034-3 (2.7)

- **Undersized Tubers (<4 oz.) cwt/Acre**
  Most: AOR09032-5 (109), AOR09032-5 (108)
  Least: Chipeta (31), Atlantic (48)

Yield Data

- **Total Yield (cwt/Acre)**
  Highest: AOR09034-3 (659), Atlantic (503)
  Lowest: OR09253-1 (433), AOR09032-5 (446)

- **Marketable Yield >4 oz. (cwt/Acre)**
  Highest: AOR09034-3 (497), OR09256-2 (421)
  Lowest: Chipeta (275), AOR09032-5 (317)

Tuber Defect Incidence (40 tuber sample)

- **External Defects:** Moderate greening observed in AO09034-3. AOR09034-3 and APR09032-5 had a high incidence of shatter bruise.

- **Internal Defects**
  Impact Bruise: AOR09032-5 (17%), OR09256-2, AOR09032-5, AOR09034-3 (12%)
  Hard Bite: OR09253-1 (12%), Atlantic (7%)

Entry	Total Yield		> 4 oz.*	< 4 oz.*	Culls*	Oversize > 14 oz.	Skin color (1-5 dark)
	(cwt/A)	STATS**	% of Total Yield				
Atlantic	504	B	77	10	7	6	2.1
Chipeta	475	B	58	7	9	26	2.3
OR09253-1	433	B	76	12	6	6	1.6
OR09256-2	503	B	84	13	1	2	2.9
AOR00242-2	498	B	75	22	3	0	1.5
AOR09032-5	446	B	71	24	5	0	1.9
AOR09034-3	659	A	75	15	9	1	1.6
LSD (0.05)		**99**					

Entry	Yield US # 1 (>4 oz.)					External Defects (1-5 none)			
	(cwt/A)	STATS**	%* 4-6 oz.	%* 6-10 oz.	%* 10-14 oz.	Green	Growth crack	Knobs	Shatter
Atlantic	389	BC	21	56	23	3.5	4.6	4.8	4.0
Chipeta	275	D	15	57	28	3.3	4.1	5.0	3.9
OR09253-1	328	BCD	21	56	23	3.1	4.6	5.0	3.8
OR09256-2	421	AB	32	53	14	4.2	4.6	5.0	4.0
AOR00242-2	376	BC	34	58	9	3.7	4.4	4.9	3.1
AOR09032-5	317	CD	41	50	9	4.2	4.8	4.9	2.6
AOR09034-3	497	A	35	55	10	3.6	3.8	4.9	2.3
LSD (0.05)		**97**							

Entry	Stand %	Average Tuber			Internal Defects (%)****					
		Wt. (oz.)	Number tubers/plant	Specific Gravity	HH	BC	SEB	VD	HB	IB
Atlantic	100	3.3	7.4	1.088	0.0	0.0	0.0	0.0	7.5	5.0
Chipeta	97	4.4	5.3	1.091	0.0	0.0	0.0	0.0	0.0	7.5
OR09253-1	95	3.2	6.6	1.109	0.0	0.0	2.5	10.0	12.5	5.0
OR09256-2	97	3.0	8.4	1.087	0.0	0.0	0.0	0.0	7.5	12.5
AOR00242-2	89	2.5	11.1	1.084	0.0	0.0	12.5	10.0	2.5	12.5
AOR09032-5	100	6.0	9.1	1.090	0.0	0.0	2.5	2.5	5.0	17.5
AOR09034-3	95	2.8	12.3	1.088	0.0	0.0	2.5	0.0	2.5	12.5

Entry	Rhizoc (1-5 ex.)	Russeting (1-5 hvy)	Shape (1-5 long)	Size uniformity (1-5 ex.)	Shape uniformity (1-5 ex.)	Eye Depth (1-5 shal.)
Atlantic	2.8	3.1	2.2	3.5	3.8	3.9
Chipeta	2.1	2.0	2.3	2.6	3.5	3.9
OR09253-1	3.1	1.8	1.5	3.5	3.9	4.0
OR09256-2	4.6	3.0	1.5	3.8	4.1	3.6
AOR00242-2	4.8	1.5	1.6	3.8	3.9	3.9
AOR09032-5	4.4	1.6	1.8	3.8	3.6	4.1
AOR09034-3	2.8	1.8	1.5	4.0	4.0	3.8

*Percent values may not total 100% due to rounding

**Entries showing the same letter are not significantly different at the 5% level

****Including >20oz. and #2's

****Internal Defects: HH=hollow heart, BC= brown center IBS= internal brown center, SEB=stem end browning, VD= vascular discoloration, HB= hard bite, IB= impact bruise

Entry	2014 KBREC- Chip Trial Comments
Atlantic	Lenticel scaring, rhizoc, folded bud ends, impact bruise
Chipeta	Oversize, rhizoc, russeting, low shatter bruise, flat
OR09253-1	Green, lenticel scaring, black dot, impact bruise, low shatter bruise, fair
OR09256-2	Russeting, smaller, not bad, low bruise, black dot, dents
AOR00242-2	Smooth, impact bruise, typy, not bad, sticky stolon, pears, black dot
AOR09032-5	Pears, shatter bruise, Fusarium, folded bud ends, smooth, low impact bruise
AOR09034-3	Lenticel scaring, growth cracks, shatter bruise, Fusarium, garbage

Entries Retained for Further Evaluation in 2015

Entry	2014 KBREC- Statewide Chip Comment	Entry	2014 KBREC- Statewide Chip Comment
Atlantic		**Chipeta**	
	Lenticel scaring, rhizoc, folded bud ends, impact bruise,		Oversize, rhizoc, russeting, low shatter bruise, flat

2014 Regional Chip Trial

Location: OSU KBREC – Klamath Falls, OR
Planting Date: May 15
Harvest Date: September 23
Fertility: 180-80-200-215
Vine Kill Date: September 2
Days to Vine kill: 111
In-Row Spacing: 9.25 inch

Chipping potatoes comprise a significant portion of Klamath Basin acreage and identification of public varieties suitable for export remains a high priority for Basin producers. Trials were initiated in 2008 and 2009 with funding from the Oregon Potato Commission to identify acceptable chipping varieties for export markets using advanced selections and recently released varieties from the Tri-State, Southwest, North-central, and Eastern breeding programs and have continued annually. In 2014 seven varieties and advanced chipping selections were evaluated for yield, grade, processing quality, and storability to determine their suitability to meet existing export demands for raw product. All field data was collected at the KBREC site. Tubers from each replication were placed in both short and long-term commercial storage with processing evaluations conducted by Baley-Trotman Farms.

Stand Counts

- **30 Day**
  Slow emergence: AC05153-1W (89%)

- **45 Day**
  All entries had greater than 95% final emergence.

Plant and Tuber Growth and Development

- **Average Tuber Number Per Plant**
  Most: AC03433-1W (9.2), AC03452-2W (8.0)
  Least: Chipeta (5.5)

- **Average Tuber Size (oz.)**
  Largest: Chipeta (8.0), AC05153-1W (7.5)
  Smallest: AC03452-2W (4.6), AC00206-2W (5.0)

- **Undersized Tubers (<4 oz.) cwt/Acre**
  Most: AC03452-2W (74), AC03433-1W (54)
  Least: Chipeta (22), AC05153-1W (32)

Yield Data

- **Total Yield (cwt/Acre)**
  Highest: AC03433-1W (694), AC05153-1W (622)
  Lowest: AC00206-2W (403), AC03452-2W (415)

- **Marketable Yield >4 oz. (cwt/Acre)**
  Highest: AC03433-1W (321), AC05153-1W (318)
  Lowest: Chipeta (193), AC00206-2W (196)

- **% Marketable Yield >4 oz.**
  Highest: A02138-2 and AC00206-2W (83%)
  Lowest: Chipeta (57%)

Tuber Defect Incidence (40 tuber sample)

- **Internal Defects**

  Impact Bruise: A02138-2 (7%)

  Stem End Browning: AC05153-1W (12%), AC03433-1W (10%)

Entry	Total Yield		> 4 oz.*	< 4 oz.*	Culls*	Oversize > 14 oz.	Skin color rating (1-5 dark)
	(cwt/A)	STATS**	% of Total Yield				
Atlantic	534	A	73	9	8	10	2.3
Chipeta	505	A	58	4	9	29	2.0
A02138-2	461	B	83	11	3	2	1.9
AC00206-2W	435	B	83	13	3	1	1.3
AC03433-1W	694	A	75	8	5	12	2.1
AC03452-2W	415	B	76	18	2	3	1.0
AC05153-1W	623	B	80	5	2	13	1.6
LSD (0.05)		**19**					

Entry	Yield US # 1 (>4 oz.)					External Defects (1-5 none)			
	(cwt/A)	STATS**	%*			Green	Growth crack	Knobs	Shatter
			4-6 oz.	6-10 oz.	10-14 oz.				
Atlantic	391	BC	18	54	28	2.4	4.4	5.0	3.4
Chipeta	290	A	13	54	33	3.1	4.0	5.0	3.5
A02138-2	384	C	23	59	18	4.4	4.5	4.8	3.8
AC00206-2W	359	C	30	59	11	4.0	4.8	4.9	3.0
AC03433-1W	521	B	15	52	33	3.6	4.6	5.0	4.1
AC03452-2W	316	C	32	52	16	4.3	4.9	5.0	2.6
AC05153-1W	498	B	14	50	36	3.9	4.8	5.0	4.1
LSD (0.05)		**62**							

Entry	Stand %	Average Tuber		Specific Gravity	Internal Defects (%)****					
		Wt. (oz.)	Number tubers/plant		HH	BC	SEB	VD	HB	IB
Atlantic	100	6.1	7.4	1.088	5.0	0.0	0.0	0.0	5.0	5.0
Chipeta	99	8.1	5.4	1.085	0.0	2.5	2.5	0.0	2.5	0.0
A02138-2	100	5.5	7.2	1.091	0.0	0.0	2.5	0.0	5.0	7.5
AC00206-2W	98	5.1	7.0	1.082	0.0	2.5	2.5	0.0	0.0	0.0
AC03433-1W	98	6.5	9.3	1.081	0.0	0.0	10.0	0.0	0.0	2.5
AC03452-2W	98	4.6	7.8	1.079	2.5	0.0	2.5	0.0	0.0	0.0
AC05153-1W	95	7.5	7.4	1.088	0.0	2.5	12.5	0.0	2.5	5.0

Entry	Rhizoc (1-5 ex.)	Russeting (1-5 hvy)	Shape (1-5 long)	Size uniformity (1-5 ex.)	Shape uniformity (1-5 ex.)	Eye Depth (1-5 shal.)
Atlantic	3.0	2.6	1.9	3.9	3.9	2.4
Chipeta	3.0	1.5	2.3	2.9	3.4	3.3
A02138-2	4.0	3.1	2.9	3.9	3.5	4.4
AC00206-2W	4.6	1.9	1.4	4.1	4.4	4.1
AC03433-1W	4.5	1.5	2.0	4.0	3.3	3.6
AC03452-2W	5.0	1.4	1.6	4.0	4.0	4.3
AC05153-1W	3.6	2.1	2.1	3.9	4.3	3.9

*Percent values may not total 100% due to rounding

**Entries showing the same letter are not significantly different at the 5% level

****Including >20oz. and #2's

****Internal Defects: HH=hollow heart, BC= Brown Center, IBS= internal brown center, SEB=stem end browning, VD= vascular discoloration, HB= hard bite, IB= impact bruise

Entry	2014 KBREC- Statewide Chip Comment	Entry	2014 KBREC- Statewide Chip Comment
Atlantic		**Chipeta**	
	Green, russeting, flat, bruised		Lumpy, oversized, folded bud ends, black dot, shatter bruised
A02138-2		**AC00206-2W**	
	Dented, pears, oblong, impact bruise, misshaped russeting		Typy, no skinning, smooth, smaller, minimal bruising
AC03433-1W		**AC03452-2W**	

Dented, lumpy, folded bud end, pointy stem end

Lenticel scaring, dented, smooth, fair, shatter bruised

AC05153-1W

Fusarium dry rot, some black dot, russeting, sticky stolon

2013 Regional Chip Processing Results

Chip processing data from storage was included in the 2012 report. The processing results of the 2013 Chip Variety Trial are included in the following graphs. Potatoes were processed in April 2014.

Likewise, 2014 processing data will be included in the 2015 report.

Entry	Specific Gravity		TDF %		Sugars	
	Field	Storage		Solids	Dextrose	Sucrose
Atlantic	1.094	1.092	12.20	18.89	N/A	N/A
Chipeta	1.091	1.087	10.00	18.03	N/A	N/A
A00188-3C	1.091	1.090	8.80	18.50	N/A	N/A
AC00206-2W	1.086	1.081	10.50	16.95	N/A	N/A
AC01151-5W	1.086	1.080	10.93	16.85	N/A	N/A
AC03433-1W	1.089	1.089	0.80	18.46	N/A	N/A
AC03452-2W	1.087	1.078	1.40	16.43	N/A	N/A
CO02024-9W	1.090	1.081	17.21	16.96	N/A	N/A
CO02033-1W	1.090	1.086	11.07	18.17	N/A	N/A
CO02321-4W	1.098	1.102	17.70	20.65	N/A	N/A
CO03243-3W	1.082	1.088	10.18	18.13	N/A	N/A

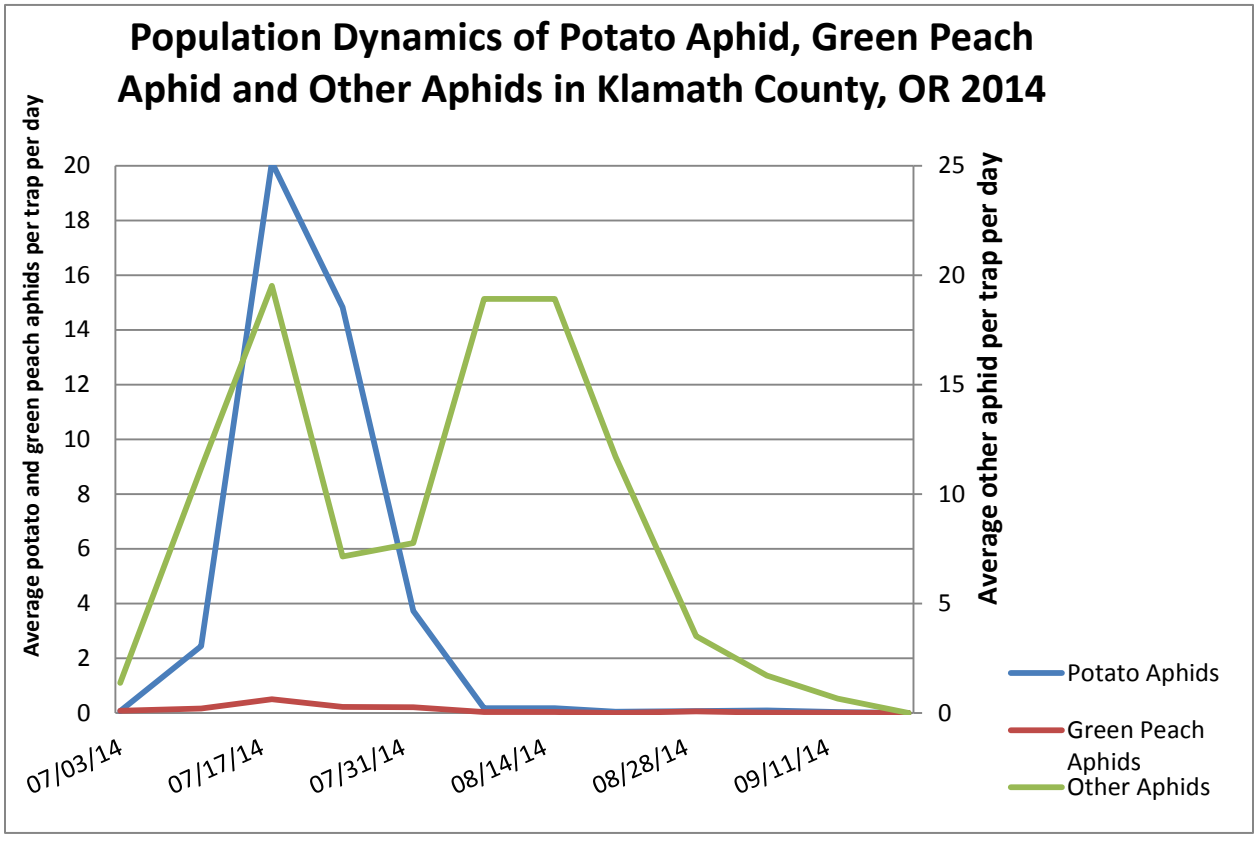
[1]Specific gravity measured out of field and after storage for 2 months at 50^0 F.

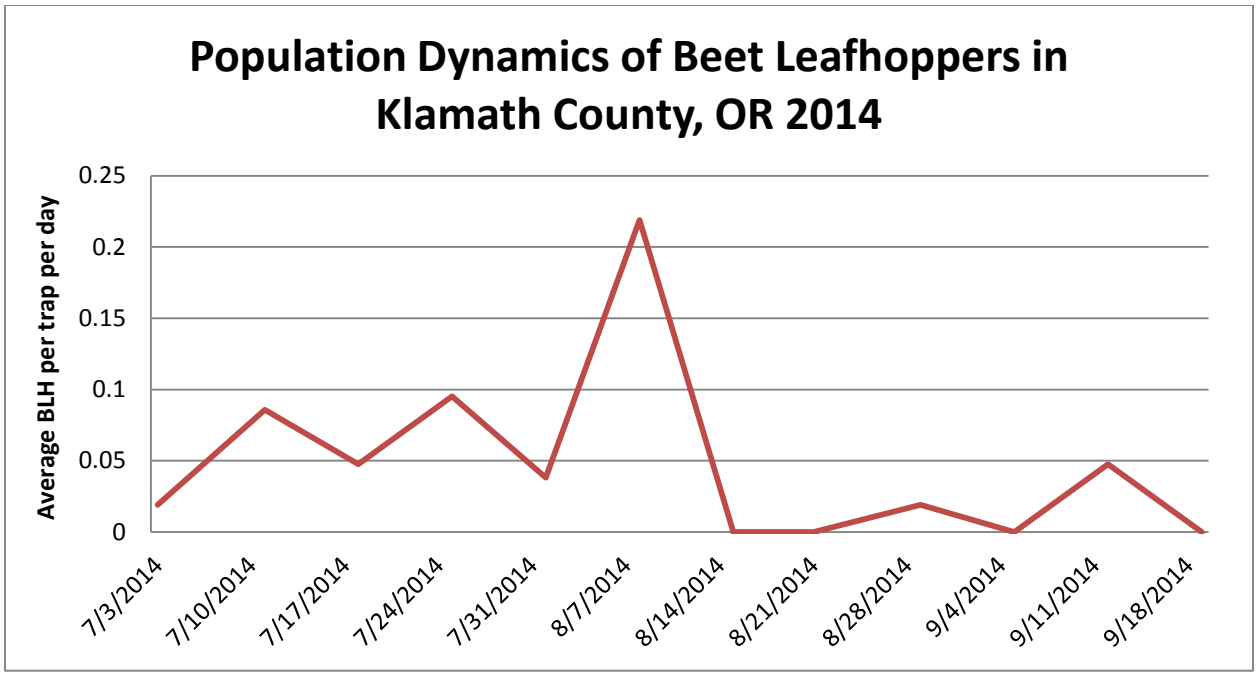
[2] % Total Defects = % of finished chips out of grade; includes internal & external defects (e.g. HH, Green, Dark Color, etc.)

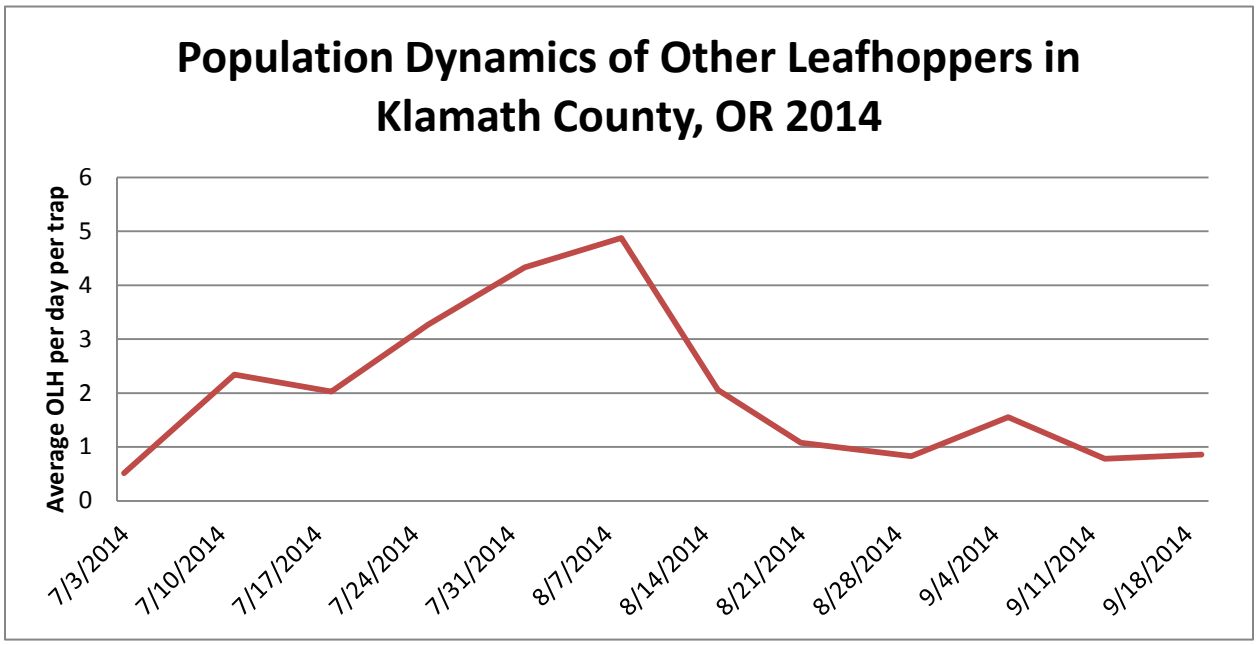
[3]Percent fresh weight basis measured after storage for 2 months at 50^0 F.

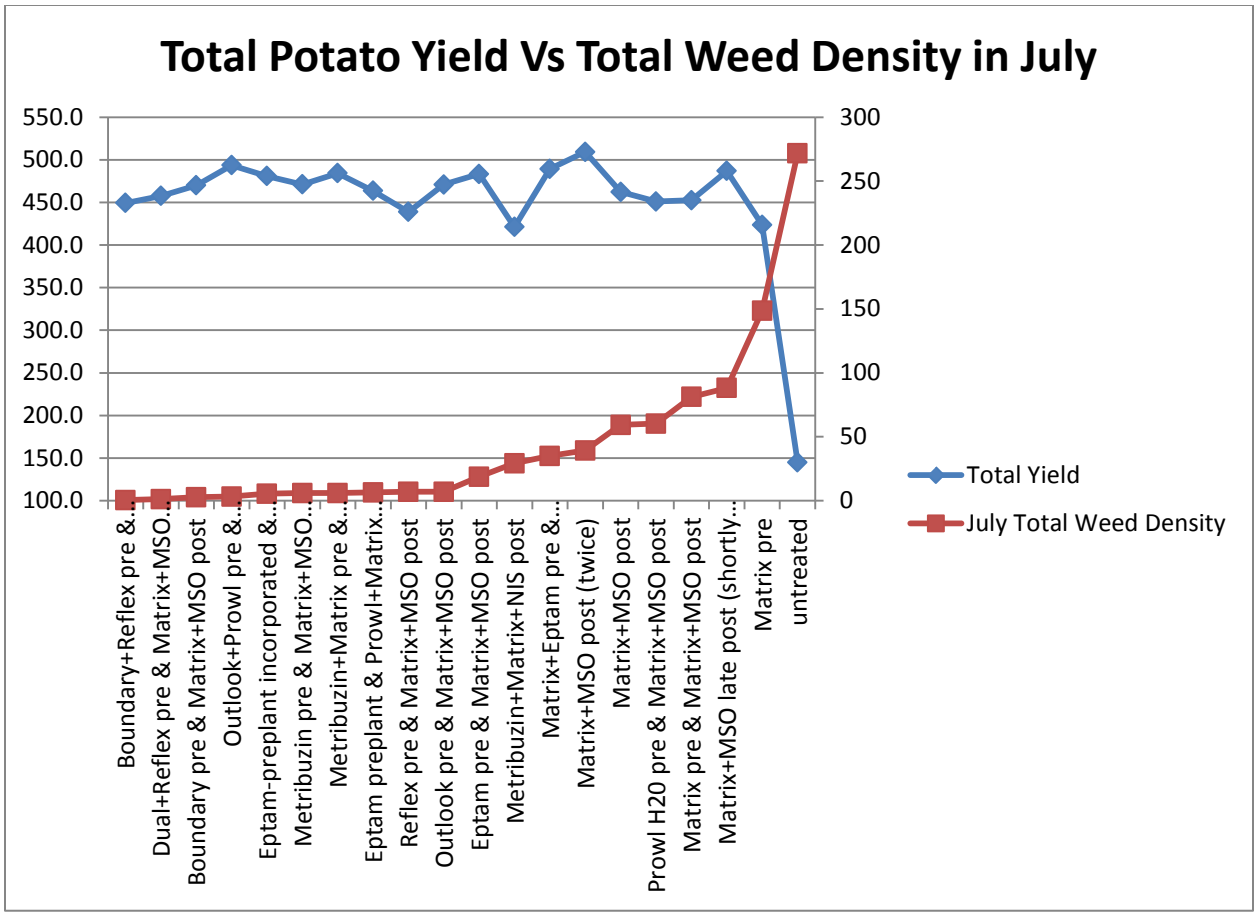
2013 State Chip Processing Results

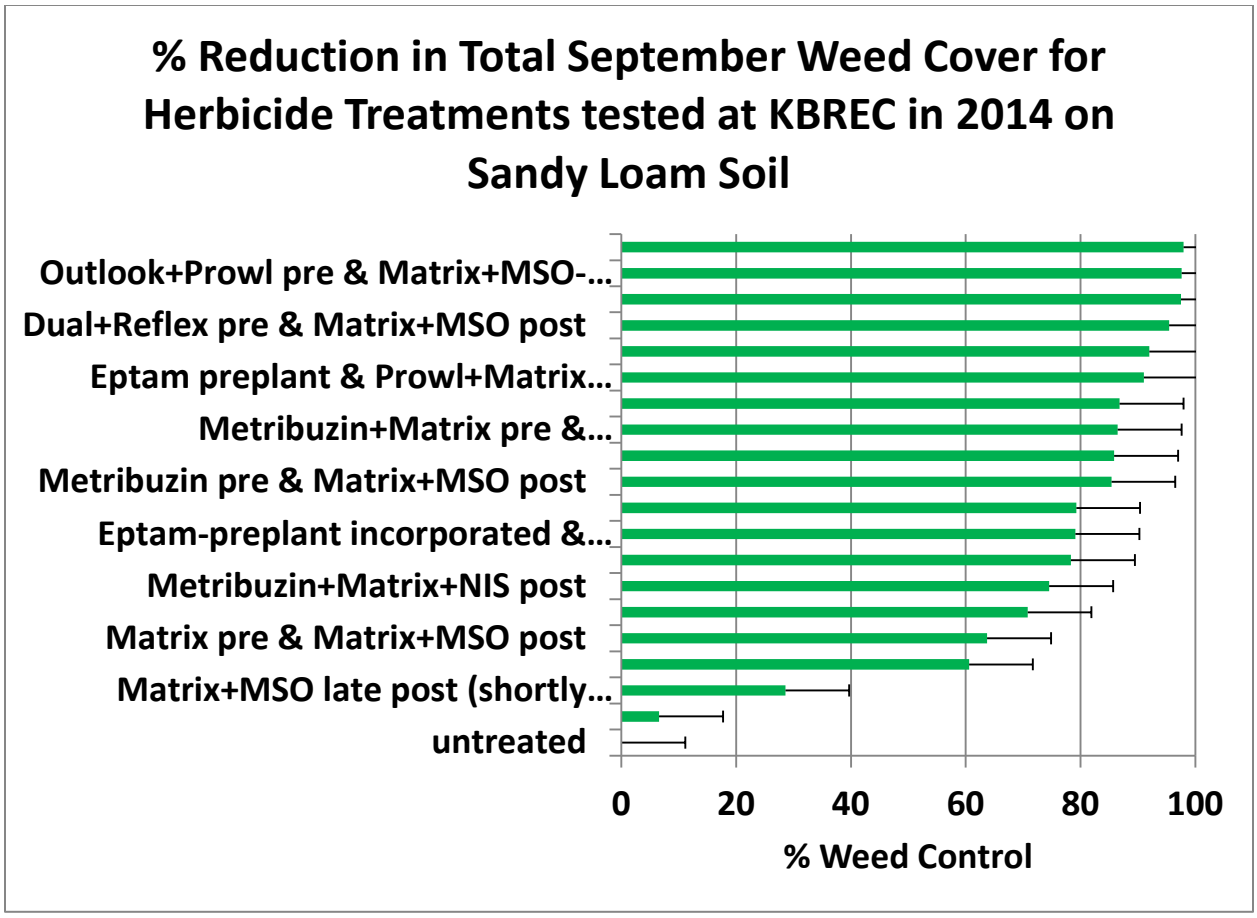
Entry	Specific Gravity		TDF %		Sugars	
	Field	Storage		Solids	Dextrose	Sucrose
Atlantic	1.082	1.086	10.10	17.88	N/A	N/A
Chipeta	1.083	1.089	11.25	18.43	N/A	N/A
NDOR071227CB-1	1.073	1.085	12.80	17.69	N/A	N/A
AOR01144-3	1.081	1.075	4.00	15.87	N/A	N/A
AOR08087-4	1.083	1.089	8.15	18.45	N/A	N/A
OR09253-1	1.089	1.101	12.00	20.57	N/A	N/A
OR09256-2	1.082	1.083	6.60	17.32	N/A	N/A

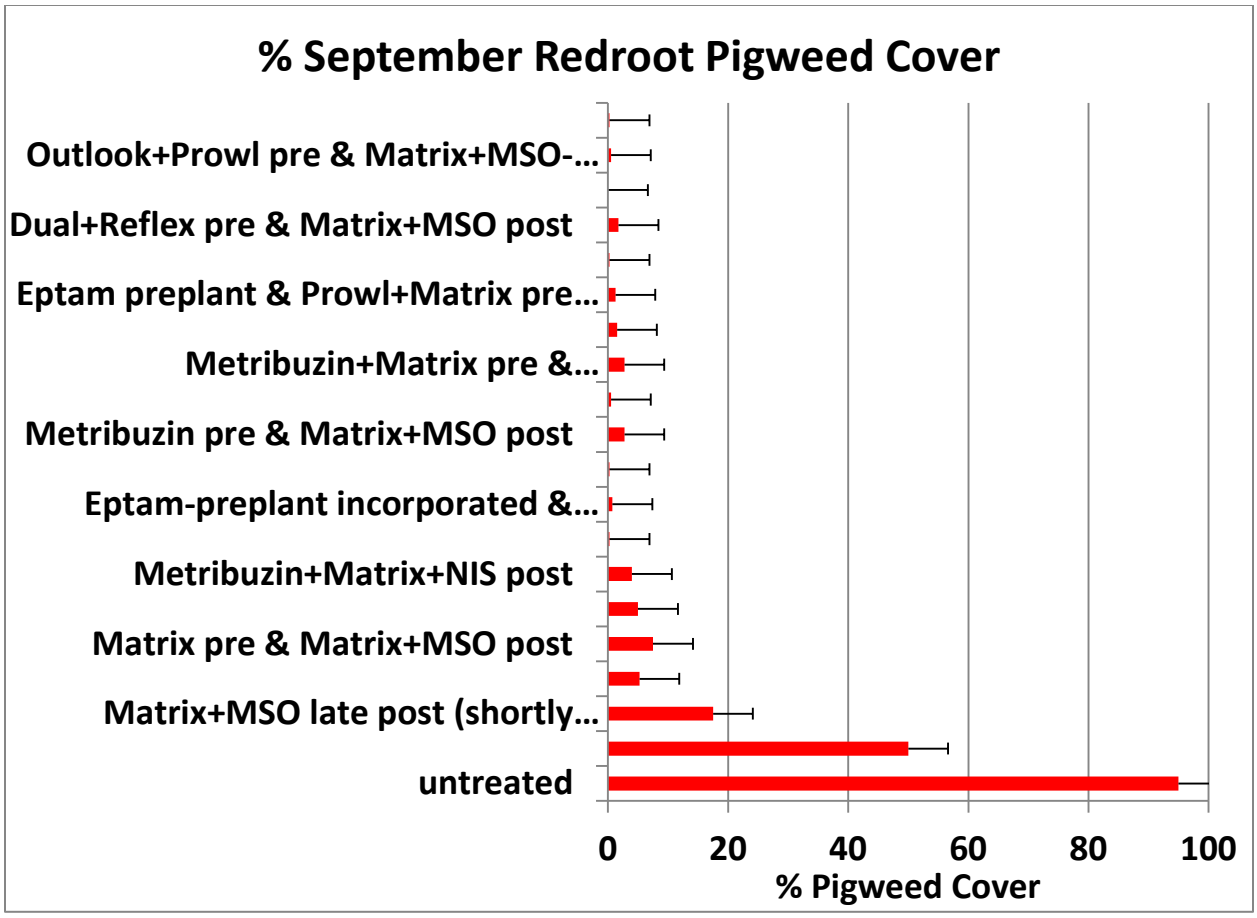


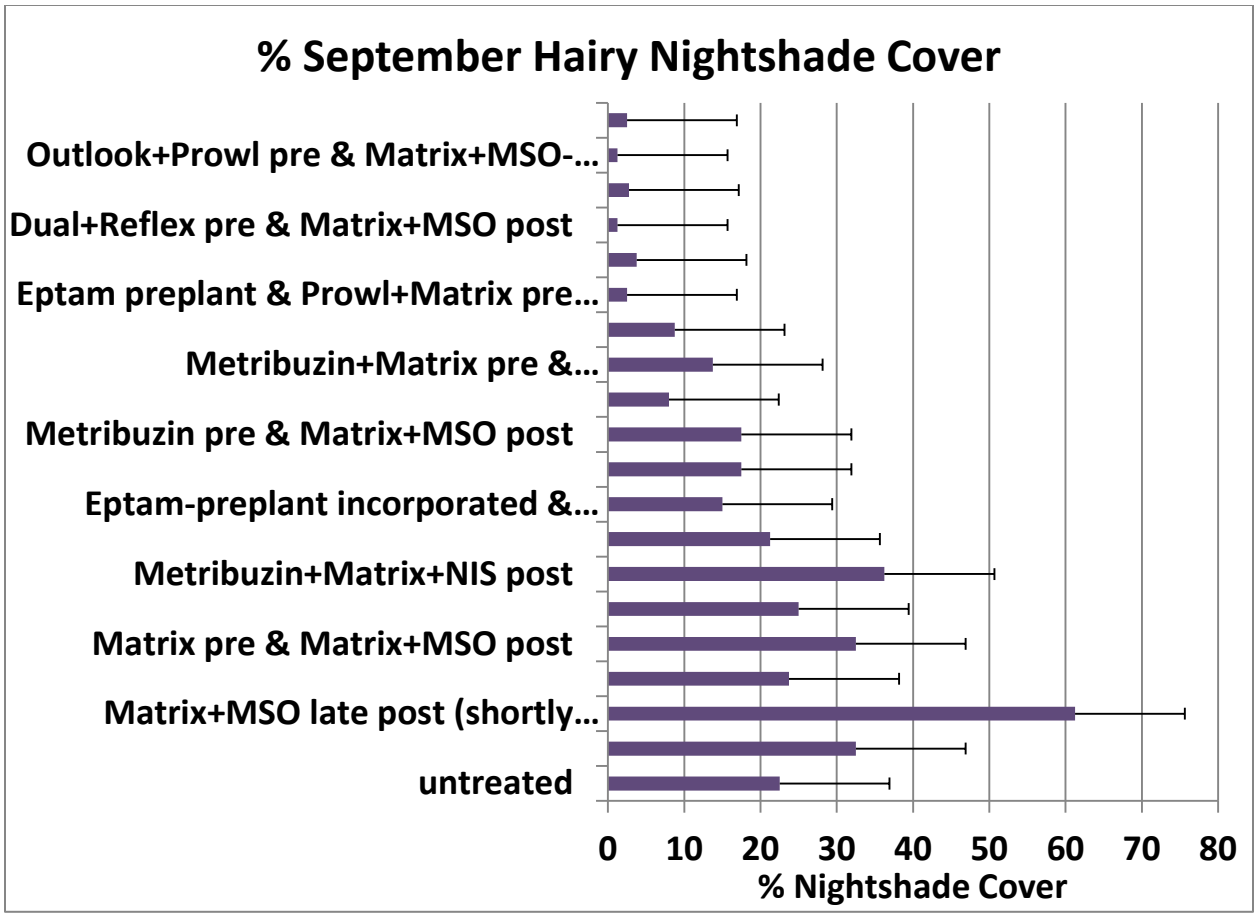

Population Dynamics of Beet Leafhoppers in Klamath County, OR 2014
Average BLH per trap per day
0.25
0.2
0.15
0.1
0.05
0
7/3/2014
7/10/2014
7/17/2014
7/24/2014
7/31/2014
8/7/2014
8/14/2014
8/21/2014
8/28/2014
9/4/2014
9/11/2014
9/18/2014

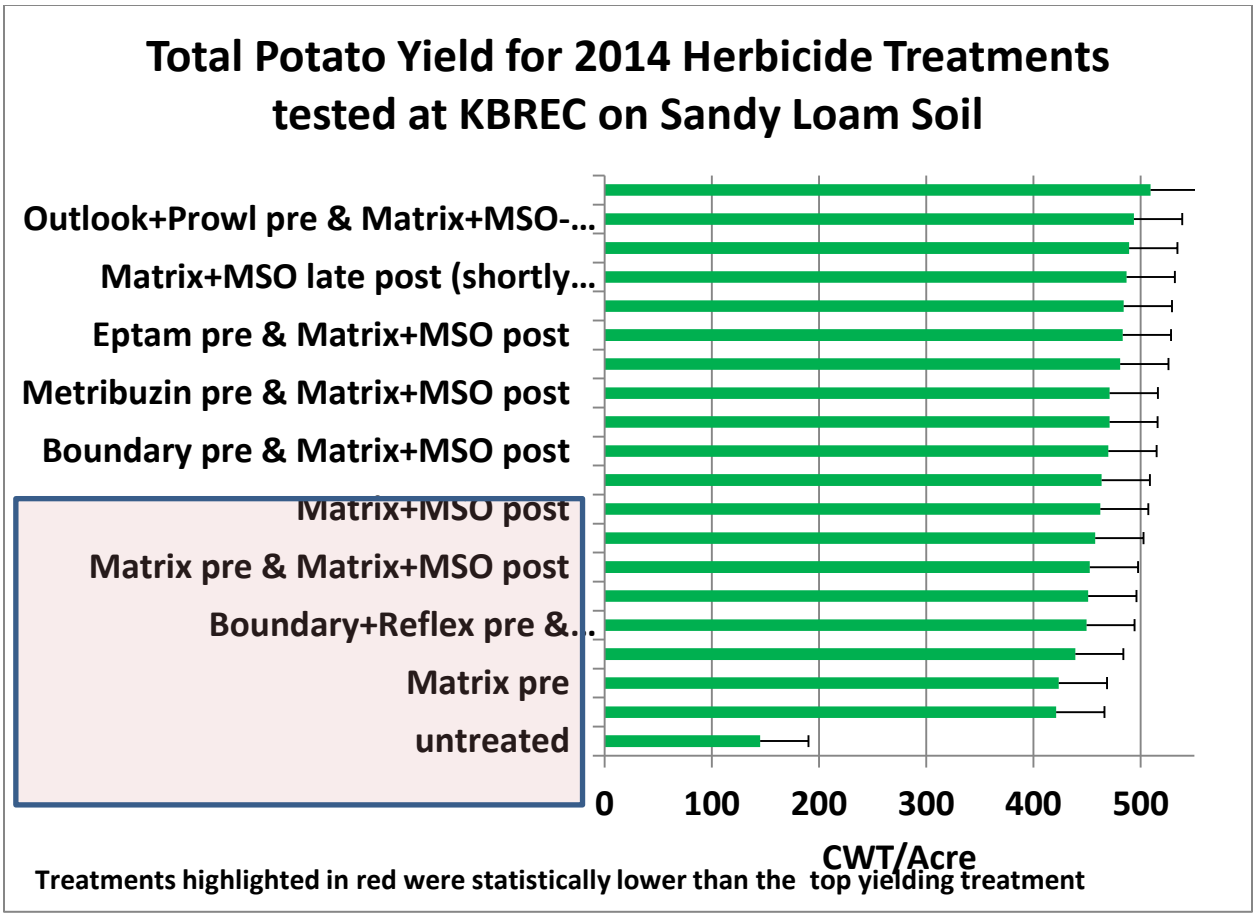

Population Dynamics of Other Leafhoppers in Klamath County, OR 2014
Average OLH per day per trap
6
5
4
3
2
1
0
7/3/2014
7/10/2014
7/17/2014
7/24/2014
7/31/2014
8/7/2014
8/14/2014
8/21/2014
8/28/2014
9/4/2014
9/11/2014
9/18/2014


Total Potato Yield Vs Total Weed Density in July
550.0
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
300
250
200
150
100
50
0
Boundary+Reflex pre &...
Dual+Reflex pre & Matrix+MSO...
Boundary pre & Matrix+MSO post
Outlook+Prowl pre &...
Eptam-preplant incorporated &...
Metribuzin pre & Matrix+MSO...
Metribuzin+Matrix pre &...
Eptam preplant & Prowl+Matrix...
Reflex pre & Matrix+MSO post
Outlook pre & Matrix+MSO post
Eptam pre & Matrix+MSO post
Metribuzin+Matrix+NIS post
Matrix+Eptam pre &...
Matrix+MSO post (twice)
Matrix+MSO post
Prowl H20 pre & Matrix+MSO post
Matrix pre & Matrix+MSO post
Matrix+MSO late post (shortly...
Matrix pre
untreated
Total Yield
July Total Weed Density


% Reduction in Total September Weed Cover for Herbicide Treatments tested at KBREC in 2014 on Sandy Loam Soil
Outlook+Prowl pre & Matrix+MSO-...
Dual+Reflex pre & Matrix+MSO post
Eptam preplant & Prowl+Matrix...
Metribuzin+Matrix pre &...
Metribuzin pre & Matrix+MSO post
Eptam-preplant incorporated &...
Metribuzin+Matrix+NIS post
Matrix pre & Matrix+MSO post
Matrix+MSO late post (shortly...
untreated
0
20
40
60
80
100
% Weed Control


% September Redroot Pigweed Cover
Outlook+Prowl pre & Matrix+MSO-...
Dual+Reflex pre & Matrix+MSO post
Eptam preplant & Prowl+Matrix pre...
Metribuzin+Matrix pre &...
Metribuzin pre & Matrix+MSO post
Eptam-preplant incorporated &...
Metribuzin+Matrix+NIS post
Matrix pre & Matrix+MSO post
Matrix+MSO late post (shortly...
untreated
0
20
40
60
80
100
% Pigweed Cover


% September Hairy Nightshade Cover
Outlook+Prowl pre & Matrix+MSO-...
Dual+Reflex pre & Matrix+MSO post
Eptam preplant & Prowl+Matrix pre...
Metribuzin+Matrix pre &...
Metribuzin pre & Matrix+MSO post
Eptam-preplant incorporated &...
Metribuzin+Matrix+NIS post
Matrix pre & Matrix+MSO post
Matrix+MSO late post (shortly...
untreated
0
10
20
30
40
50
60
70
80
% Nightshade Cover


Total Potato Yield for 2014 Herbicide Treatments tested at KBREC on Sandy Loam Soil
Outlook+Prowl pre & Matrix+MSO-...
Matrix+MSO late post (shortly...
Eptam pre & Matrix+MSO post
Metribuzin pre & Matrix+MSO post
Boundary pre & Matrix+MSO post
Matrix+MSO post
Matrix pre & Matrix+MSO post
Boundary+Reflex pre &...
Matrix pre
untreated
0
100
200
300
400
500
CWT/Acre
Treatments highlighted in red were statistically lower than the top yielding treatment

Progress Report to the Agricultural Research Foundation
Oregon Potato Commission
2014

Title: Blue Mountain Potato Extension & Potato Plant Pathology Research Program

Principal Investigator: Philip B. Hamm, Extension Plant Pathologist & HAREC, Oregon State University, P.O. Box 105, Hermiston OR 97838

Cooperators: Robert Cating, Don Horneck and Silvia Rondon, HAREC, Hermiston OR; Russ Ingham, OSU Corvallis; Brian Charlton, Oregon State University, Klamath Falls; Andy Jensen, Washington State Potato Commission; and Jeff McMorran, Oregon State University, Corvallis.

Funding History: $12,500 in 2013/14
$35,342 in 2012/13

Abstract
Objective 1: The extension plant pathology program at HAREC provides expertise in potato disease diagnosing as well as providing information related to understanding and the control of potato diseases. The program also provides services, such as testing psyllids for Liberibacter, tubers for general disease issues, and testing for Bacterial Ring Rot in both commercial and seed potatoes. The program also plants the seed lot trials, which over the years has provided valuable information to the commercial growers as an independent source of information regarding the quality and disease levels associated with each lot. Potato growers in Oregon are not charged a fee for diagnostic services, only for other services. Two new tests developed by the lab this past year; increase sensitivity test for ZC, and a multiplex PCR that in a single test can confirm simultaneously the presence or absence of 6 viruses than can cause tuber necrotic symptoms.
Objective 2: Ninety four seed lots were planted this year, close to the average (about 100). Seed lots were free of PLRV but 32 seedlots contained $PVY^{N: O}$ (34%), 17 seedlots had PVY^{NTN} (18%), 18 seedlots (19%) had PVY^{O} and 1 seedlot had $PVY^{NA\text{-}N}$ (North American N). Twenty seedlots had more than 1 PVY strain. No other disease issues were seen.

Key Words: Seed borne viruses, Potato Viruses, Seed lots, PVY strains

Objectives:
1. Plant Pathology Extension Program. Provide information (via presentations, field visits, phone calls, etc.) and diagnostics related to plant disease issues to area's potato growers. Assistance is also given to growers in other production areas in Oregon. Growers outside of Oregon are charged a diagnostic fee.
2. Seed Lot Trials. Plant seed lot trials to assist commercial growers in confirming the quality of seed being planted in commercial fields. Seed originates from throughout the Blue Mountain region.

Procedures (following objectives listed above):
1. **Plant Pathology Extension Program.** The program provided information via field visits, grower meetings, etc. as needed and provided other valuable information from potato research conducted by my program and others to potato growers in the region, Oregon, and beyond. Laboratory services used the latest and most modern equipment and techniques to support diagnostics services and other functions. Funding also supported general functions of the Extension Plant Pathology program and provided service and supplies to augment plant pathology laboratory diagnostic costs for area potato growers.

2. **Seed lot trials.** Seed lots from commercial plantings in the area were planted at the Hermiston Experiment Station to confirm the quality of potatoes (94 seed lots in 2014). Seed lots were viewed for seed borne virus and other seed borne issues. A report was provided to all growers who submit a sample, listing the seed lot and any problems that seed lot might have. Growers will be invited to visit the lots planted on HAREC.

Accomplishments:
Objective 1. Plant Pathology Extension Program (ongoing program). Farm Fair Potato Seminar: A very well attended meeting again in 2014. Maybe the best attended ever. Over 300 growers, fieldmen and chemical representatives participated in this one-day event dealing strictly with potato issues. Speakers primarily came from Washington and Idaho, and from throughout Oregon. Also, many visits to area potato fields to help determine the cause of production problems were done. Last year 80 samples from Oregon potato growers were submitted for diagnostic services representing 138 total samples (in many cases different tubers had different problems requiring different tests). The majority of these potato disease samples originated from the Oregon counties of Morrow, Umatilla, Union, Malheur, Baker and Klamath. These tests are either not available elsewhere or not able to be done within the region. Most of these samples were submitted by growers and or fieldmen but the lab also supports samples by Extension personnel from Oregon and Washington. Also see under impacts below new tests that have been developed by the plant pathology program.
Objective 2. Seed lot trials (ongoing program). Ninety four potato seed lots originating from six U.S. states and four Canadian provinces were planted in this year's trial in Hermiston. Fifteen cultivars representing both fresh and processing markets were planted. Information on individual seed lots is presented in Table 1 (emergence, viral infections, PVY Strain). The four most numerous entries were Russet Norkotah, including clonal selections, (21 lots), Russet Ranger (10 lots), Russet Burbank (27 lots) Umatilla (10 lots) and Shepody (7 lots). Seed lots were free of PLRV. Nearly 50% (45 lots) had PVY; 32 seedlots contained $PVY^{N:O}$ (34%), 17 seedlots had PVY^{NTN} (18%), 18 seedlots (19%) had PVY^{O} and 1 seedlot had $PVY^{NA\text{-}N}$ (North American N). Twenty seedlots had more than 1 PVY strain. Emergence ranged from 75-100%.

Impacts:
The Extension Potato Program continues to provide extensive and needed information to the local (and statewide) potato interests. The seed lot trial continues to provide an independent and needed source of information related to seed quality. The laboratory provides much needed disease identifications to area and statewide interests in potato. Information was also provided to other potato regions within the state. The Late Blight Hot line provides the latest information on the occurrence and control of late blight throughout Oregon and the Southern Columbia Basin in Washington. This past year the program, based first on observations from personnel from a local farm, tested Lugus bugs as possible carriers of BLTVA, and found a large percentage to be positive. Also, the plant pathology program developed two new PCR tests, one for increased sensitivity to ZC and the other, a multiplex that will test for 6 different viruses simultaneously that can cause tuber necrotic symptoms. In the past it took up to 6 tests to perform the same operation. This saves time and expenses. Both of these tests are being used or will be used by laboratories across the US.

Relation to Other Research/Extension activities:
The seed lot trial provides necessary baseline data for new and emerging virus diseases currently under study in the Pacific Northwest. Of particular interest are PVY^{N}, PVY^{NTN} and $PVY^{N:O}$. The PVY survey effort provided an opportunity for continued cooperation with USDA researchers in Idaho and Washington, and university researchers in Idaho, also studying this disease complex. Cooperation with other researchers and /or Extension personnel will continue in all disease/insect issues in potato and research based information is generated and communicated to our clientele primarily in the tristate.

Table 1. Percent emergence and seed borne infection of several pathogens from individual seed lots in the 2013 potato seed lot trial at Hermiston, OR.

Seed Lot Plot #	Variety[1]	Local Grower	State of Origin[2]	Seed Grower	Date Planted	# of Tubers Planted	# Emerged	% Emergence[3]	% PVY[4]	PVY Strain[5]
1	Norkotah	Amstad	OR	Rob Lane	4/10/14	200	193	96.5		
2	Lemoka	Hutterian	NB	Countrywide	4/10/14	200	200	100		
3	Clearwater	TMCF	ID	Ricks Farm	4/10/14	200	198	99.0	0.0	
4	Clearwater	TMCF	ID	Beutler Farms	4/10/14	200	186	93.0	0.5	N:O
5	Norkotah	Hutterian	WA	SHB	4/10/14	200	198	99.0	3.5	O, NTN
6	Ranger	Bud-Rich RA	WA	Spokane Hutterian Gross	4/10/14	200	198	99.0	0.5	N:O
7	Shepody	Hutterian	WA	SHB	4/10/14	200	164	82.0	11.0	o, NTN, N:O
8	Shepody	Hale Farms	Canada	Triple M	4/10/14	200	193	96.5	2.4	O,NTN
9	Ranger	TMCF	OR	GRSF	4/10/14	200	182	91.0	3.3	N:O
10	Norkotah	Hutterian	SK	True North	4/10/14	200	200	100.0		
11	Shepody	Hutterian	OR	Rob Lane	4/10/14	200	200	100.0	1.5	O,N:O
12	Shepody	Hale Farms	AB	Drost	4/10/14	200	171	85.5	2.3	O,NTN
13	Shepody	TMCF	ID	Gibbs Farm	4/10/14	200	160	80.0		
14	Ranger	Bud Rich / G2 Farming	MT	Hocker View Canyon	4/10/14	200	200	100.0		
15	Shepody	Hale Farms	Canada	David Francis	4/10/14	200	195	97.5	2.5	NTN,O
16	Norkotah	John Walchli	SK	True North	4/10/14	200	191	95.5		
17	Norkotah	Strebin Farms	AB	Groot Farms	4/10/14	200	176	88.0		
18	Alpine	TMCF	ID	Butler Farms	4/10/14	200	185	92.5		
19	Ivory	TMCF	Canada	H2PC	4/10/14	200	168	84.0		
20	Ranger	TMCF	OR	GRSF	4/10/14	200	195	97.5	1.0	N:O
21	Norkotah	John Walchli	WA	SHB	4/10/14	200	200	100.0	7.5	O

22	Umatilla	Hutterian	WA	SHB	4/10/14	200	197	98.5		
23	Norkotah	Bud Rich / G2 Farming	SK	True North	4/10/14	200	200	100.0		
24	Norkotah 296	John Walchli	ID	Arnold Farms	4/10/14	200	195	97.5		
25	Umatilla	Hale Farms	WA	Hutterian Brethren	4/10/14	200	177	88.5		
26	Ranger	Hutterian	WA	SHB	4/10/14	200	189	94.5	0.5	O
27	Clearwater	TMCF	ID	Silver Creek Seed, LLC	4/10/14	200	200	100.0	2.5	O,NTN, N:O
28	Norkotah	Bud Rich / G2 Farming	WA	Spokane Hutterian Gross	4/10/14	200	200	100.0	3.0	O
29	Norkotah	Hutterian	WA	Dick Beddlington	4/10/14	200	194	97.0		
30	Chippers	Hutterian	WA	Dick Beddlington	4/10/14	200	192	96.0		
31	Norkotah 278	John Walchli	ID	Dennie Arnold	4/10/14	200	189	94.5		
32	Norkotah	Bud Rich / G2 Farming	MT	Eugene Cole	4/10/14	200	192	96.0		
33	Norkotah 278	Bud-Rich RA	ID	Arnold Farms	4/10/14	200	189	94.5	0.5	O
34	Norkotah	Bud Rich / G2 Farming	NP	Johnson Farms	4/10/14	200	200	100.0		
35	Ranger	Bud-Rich/RA	MT	Foth Farms	4/10/14	200	190	95.0	0.5	N:O
36	Umatilla	TMCF	OR	GRSF	4/23/14	200	200	100.0		
37	Umatilla	Hale Farms	MT	Bill Cole	4/23/14	200	191	95.5	0.5	N:O
38	Burbank	TMCF	OR	GRSF	4/23/14	200	200	100.0	0.5	
39	Ranger	TMCF	OR	GRSF	4/23/14	200	191	95.5	1.5	N:O
40	Burbank	Hutterian	OR	Rob Lane	4/23/14	200	190	95.0	0.5	N:O
41	Norkotah	Strebin Farms	SK	True North	4/23/14	200	193	96.5	0.5	O

42	Norkotah	Amstad	OR	Lane Seed	4/23/14	200	187	93.5	0.5	N:O
43	Red Potato	Strebin Farms	Canada	Growesbeak	4/23/14	200	183	91.5		
44	Alturas	Patrick Walchli	ID	Telford SunValley Lost Riverseed	4/23/14	200	200	100.0		
45	Umatilla	Hale Farms	MT	Dykema	4/23/14	200	200	100.0		
46	Norkotah	Strebin Farms	SK	True North	4/23/14	200	186	93.0		
47	Umatilla	TMCF	MT	TRB Dykema	4/23/14	200	186	93.0		
48	Umatilla	TMCF	MT	Tobol Farms	4/23/14	200	189	94.5		
49	Burbank	Hale Farms	ID	Dennie Arnold	4/23/14	200	183	91.5		
50	Umatilla	TMCF	WA	SHB	4/23/14	200	191	95.5	2.0	N:O, Na-N
51	Premiers	GRPSF	MT	Larry VanDyke	4/23/14	200	193	96.5		
52	Alturas	GRPSF	MT	Larry VanDyke	4/23/14	200	198	99.0		
53	Ranger	Hale Farms	ID	Dennie Arnold	4/23/14	200	200	100.0		
54	Burbank	Allen Farms	MT	Kamp Seed Farm	4/23/14	200	178	89.0	0.5	O
55	Umatilla	Hale Farms	MT	Tobol Farms	4/23/14	200	150	75.0	4.6	N:O
56	Ranger	GRPSF	MT	Cottom	4/23/14	200	193	96.5	0.5	N:O
57	Ranger	GRPSF	MT	Larry VanDyke	4/23/14	200	185	92.5	1.1	N:O
58	Burbank	Allen Farms	ID	Gibbs Farm	4/23/14	200	171	85.5		
59	Burbank	Hale Farms	MT	Bill Cole	4/23/14	200	187	93.5		
60	Burbank	Eagletree	OR	Lane Farms	4/23/14	200	200	100.0	0.5	O
61	Burbank	Tom Kerns	ID	Flying A	4/23/14	200	196	98.0	4.1	NTN,N:O
62	Burbank	Blatchford Farms	ID	Reynold Brothers	4/23/14	200	190	95.0	0.5	N:O
63	Burbank	Allen Farms	ID	Johnson Farms	4/23/14	200	191	95.5		
64	Burbank	K Diamond	ID	Atchley	4/23/14	200	185	92.5	4.8	NTN,N:

										O
65	Burbank	Potato Greenhouse Testing		Parkenson PSF	4/23/14	200	183	91.5	0.5	NTN
66	All Blue	TMCF	ID	Double S Farms	5/14/14	200	175	87.5	0.5	N:O
67	Norkotah	Strebin Farms	SK	True North	5/14/14	200	180	90.0	0.5	N:O
68	Burbank	Blatchford Farms	WA	SHB	5/14/14	200	194	97.0	0.5	N:O
69	Red Potato	Strebin Farms	AB	Norland EPG	5/14/14	200	172	86.0		
70	Pikes	TMCF	NV	Winnemucca Farms	5/14/14	200	197	98.5	95.0	N:O
71	Burbank	Blatchford Farms	MT	Weidenaar Ranches Inc	5/14/14	200	200	100.0		
72	Norkotah strain	Strebin Farms	MT	Montana Seed	5/14/14	200	176	88.0		
73	Umatilla	GRPSF	MT	Bill Kim	5/14/14	172	170	98.8		
74	Shepody	GRPSF	MT	Dan Dyke	5/14/14	163	163	100.0		
75	Burbank	Potato Greenhouse Testing	ID	Clem Atchley	5/14/14	200	190	95.0	1.1	N:O, NTN
76	Burbank	Kerns Rainbow			5/14/14	195	183	93.8	3.2	NTN, N:O
77	Burbank	Ward Ranches	ID	Clem Atchley	5/14/14	166	166	100.0	1.8	N:O, NTN
78	Burbank	Blatchford Farms	ID	Flying A	5/14/14	200	193	96.5	2.5	NTN, N:O
79		Kerns Rainbow			5/14/14	200	190	95.0	4.0	N:O,NTN
80	Burbank	Potato Greenhouse	ID	Arnold Farms	5/14/14	200	200		0.5	O

		Testing								
81	Burbank	Kerns Rainbow	ID	Foster North Slope	5/14/14	102	102	100.0	0.5	NTN
82	Burbank	Kerns Rainbow	ID	Foster North Slope	5/14/14	192	172	89.5	3.4	O,N:O
83	Ambra	Agri-Star	WA	Ebbe	5/14/14	153	140	91.5		
84	Burbank	Kerns Rainbow	ID	Clem Atchley	5/14/14	166	166	100.0	4.2	N:O, NTN
85	FL-1867	TMCF	ID	Rindisbaker Farms	5/14/14	200	187	93.5		
86	Yukon Gold	Agri-Star	ND	Jorde	5/14/14	160	159	99.3		
87	Burbank	Delbert Stephens	WA	Phil Gross Hutterian	5/14/14	200	191	95.5		
88	Modoc	Agri-Star	ND	Jorde	5/14/14	185	185	100.0		
89	Burbank	Ward Ranches	ID	Christensen Farm	5/14/14	200	198	99.0		
90	Burbank	Ward Ranches	ID	Clem Atchley	5/14/14	180	180	100.0		
91	Burbank	Blatchford Farms	ID	Baum Seed Potatoes	5/14/14	200	199	99.5		
92	Norkotah 278	Agri-Star	ID	Skyline	5/14/14	200	200	100.0	1.0	N:O
93	Norkotah	Agri-Star	ND	Jorde	5/14/14	200	174	87.0	5.1	N:O,O
94	Burbank	Tom Kerns	ID	Flying A	5/14/14	162	152	93.8	5.9	NTN,N:O

[1]If available
[2]AB=Alberta; Can=Canada; CO=Colorado; ID=Idaho; MT= Montana; NE= Nebraska; NV=Nevada; ND=North Dakota; OR=Oregon; SK=Saskatchewan; WA=Washington.
[3]Percent plant emergence
[4]Percent Seed-borne Potato Virus Y (PVY)
[5]Strain of PVY found

Progress Report for the Agricultural Research Foundation
Oregon Potato Commission

Title: Malheur County Extension Potato Pest Monitoring Program

Year: 2014-15

Project leader: Stuart Reitz
Malheur County Extension
Oregon State University
710 SW 5th Ave.
Ontario, OR 97914

Funding history: 2013-2014 - $6,150
2014-2015 - $6,150

Abstract:
Potato growers throughout the Northwest face a wide array of crop management problems. Chief among these are pest and disease problems. The Malheur County Extension Service monitored potato pests in 23 fields throughout the county through the use of yellow sticky card traps, pan traps, pheromone traps, and plant inspection. Traps were monitored weekly from mid-June through mid-August, and results were reported via email to growers and fieldmen within 1 day of trap collection. Overall, pest abundance was lower than in 2013. Potato psyllids were found in all growing areas throughout the season, but at very low numbers, especially in comparison with 2013 results. However, none of the psyllids tested positive for the Zebra chip bacterium and no infected plants were found. Beet leafhoppers were present throughout the growing season with their abundance highest during July. However, no plants with potato purple top disease were found. Few potato tuberworm moths were found. Aphids were the most abundant pests monitored, but relatively few green peach aphids or potato aphids were found. Relatively large numbers of beneficial insects were found in all fields. OSU Extension also helped to keep growers and fieldmen up to date on other pest problems, such as bacterial ring rot, and new developments in the industry. Information was delivered to growers and fieldmen in weekly emails and phone calls. The monitoring project provided up to date information that allowed growers to reduce their insecticide applications in 2014.

Key words: Pest monitoring, potato psyllid, aphid, potato tuberworm, beet leafhopper, zebra chip, IPM

Objectives:

- Monitor populations of key potato pests across Malheur County and deliver that information on a weekly basis to potato growers, fieldmen and other interested people in the county. Pests to be monitored will include 1) potato psyllids, 2) aphids, 3) beet leafhoppers, and 4) potato tuberworms. Associated beneficial parasites, predators and pathogens will also be monitored, in support of developing future biologically-based IPM programs.

- Assist growers in scouting for other pests and diseases during the growing season.

- Assist growers with identifying and addressing other crop management issues.

- Relay information to growers and fieldmen directly through email and phone contact and publish pest monitoring data in the Treasure Valley Pest Alert Network.

Procedures:
Trapping stations were set at 23 potato fields in Malheur County and were monitored from June to until mid-August when fields were harvested. Trapping techniques specific for the different pests were used for monitoring.

Aphid Monitoring –Pan traps were placed within fields and monitored weekly for aphids. Aphids were identified and counted by species. Aphids were grouped by Green Peach Aphid, Potato Aphid and other species.

Potato Psyllid Monitoring – To aid growers in managing potato psyllids and zebra chip, yellow sticky cards were placed within potatoes fields. Traps were collected and replaced weekly. Aphid traps were also examined for the presence of psyllids.

Beet Leafhopper Monitoring – Yellow sticky traps were placed along borders of fields to monitor beet leafhoppers, which can transmit the pathogen that causes Purple Top,. Traps were collected and replaced weekly, and the numbers of leafhoppers recorded. Fields were also inspected for plants infected with Purple Top.

Potato Tuberworm Monitoring – To monitor tuberworm moth populations, pheromone traps were placed along field borders. Traps were collected and replaced weekly. Pheromone lures were replaced every 3weeks, or as needed.

Colorado Potato Beetle – Yellow sticky traps were also inspected for adult Colorado potato beetles and plants were examined for the presence of beetle larvae and egg masses.

Beneficial insects – Yellow sticky traps and pan traps used for pest monitoring were also inspected for beneficial insects, in particular predatory insects, including minute pirate bugs, big-eyed bugs, lacewings and ladybird beetles. These counts were used as an indication of the overall activity of natural enemies in a field.

Other Pest and Disease Monitoring – Assistance was provided to growers and fieldmen in identifying other pest and diseases problems that they encountered. Monitoring is continuing with additional traps placed near harvested fields to determine pest activity through the fall and winter, especially overwintering psyllids.

Accomplishments:
- Traps were monitored over a 8 week period from 17 June until 8 August when Shepody potato harvest was beginning.
- Growers and fieldmen received up to date weekly reports within 1 day after traps were collected.
- Assisted fieldmen with verifying insect identifications on traps they had set out.
- All pest populations were low and were considerably lower than in 2013 (Figure 1).
- Psyllids were collected from the first week of trapping (Figure 1) through the end of the season, but at exceedingly low numbers (average < 0.3 per trap). No psyllids have tested positive for LSo.
- Potato tuberworm moths, which had been common in 2013, were rarely encountered in 2014.
- Aphids were the most common pests recorded, but relatively few were Green Peach or Potato Aphids.
- Natural enemies were present in relatively large numbers in most fields throughout the season, with their populations peaking later in the season (Figure 2).

Impacts:
Malheur County potato growers have been strong supporters of IPM and continue to utilize these programs. Their use of pest alert information reflects their commitment to providing consumers with a safe, nutritious food. Growers were provided the latest recommendations and advice on potato psyllid management, which facilitated their pest management decisions. Because of the low numbers of psyllids found in the area wide monitoring program, growers had confidence to reduce their number of insecticide applications in 2014.

Inclusions of many different pests and natural enemies in the monitoring program provides growers with information to assess their individual pest management programs and when insecticide applications may or may not be necessary.elation to Other Research:

Because of the threat from potato psyllids and Zebra Chip, a collaborative regional insecticide efficacy trial was conducted in 2014. This project was funded by the Northwest Potato Research Consortium and involved researchers from Malheur County Extension (Stuart Reitz), Hermiston Agricultural Research & Extension Center (Silvia Rondon, Kimberly Research & Extension Center, Idaho (Erik Wenninger), Washington State Extension (Tim Waters) and Agriculture Development Group (Alan Schreiber). The trial included an evaluation of 12 different insecticide treatments for their efficacy against psyllids and their effects on other pest and beneficial insects. The trial was demonstrated to growers during the Malheur Experiment Station Summer Farm Fest.

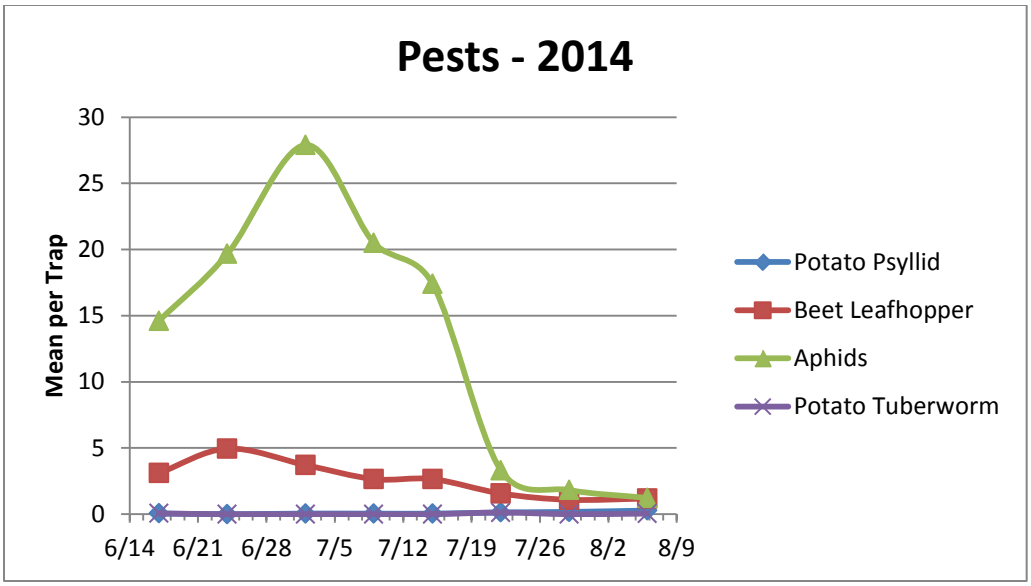


Figure 1. Seasonal dynamics of major pests in potato fields in Malheur County, Oregon during 2014.

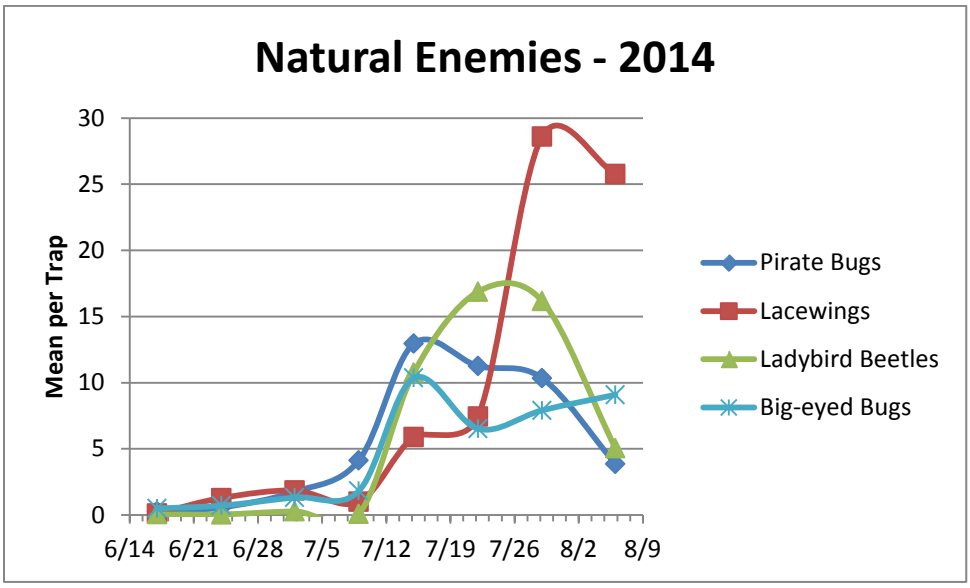


Figure 2. Seasonal dynamics of natural enemies of potato pests found in potato fields in Malheur County, Oregon during 2014.

Research/Extension Progress Report for 2013-14 Funded Projects
Progress Report for the Agricultural Research Foundation
Oregon Potato Commission

Title: Monitoring potato insect pests in eastern Oregon: education, communication and dissemination of information.

Project Leader: Silvia I. Rondon, Extension Entomologist Specialist, Associate Professor, Oregon State University (OSU), Hermiston Agricultural Research and Education Center (HAREC), Crop and Soil Science (CSS), Irrigated Agricultural Entomology Program (IAEP). Phone (541) 567-8321 ext 108, Fax (541) 567-2240, Cell phone (541) 314-3181, E-mail silvia.rondon@oregonstate.edu.

Cooperators: Darrin Walenta, OSU Extension Union County, N.E; Phil Hamm/Robert Cating, OSU-HAREC. Oregon Commercial and Seed Potato Growers, Blue Mt. Potato Growers. Insect trappers: Lois Douglass (Hermiston) and Bryon Quebbeman (La Grande).

Funding History (3 last years): Year initiated: 1972

Abbreviations: Oregon State University (OSU); Hermiston Agricultural Research and Extension Center (HAREC); Irrigated Agricultural Entomology Program (IAEP), Potato Tuberworm (PTW); Beet Leafhopper (BLH); Beet Leafhopper-Transmitted Virescence Agent (BLTVA); Green Peach Aphid (GPA); Potato Aphid (PA); Other Aphids (OA); Potato psyllid (PP); Other Psyllids (OP), *Candidatus* Liberibacter solanacearum (Lso).

Abstract:
Potato pests were monitored through the 2014 growing season, including PTW, BLH, aphids, and PP. The monitoring network included Umatilla, Morrow, Union, and Baker counties in Oregon. We also served as resource for the Klamath and Central Oregon trapping network. In Umatilla and Morrow counties, there were 34 total monitoring sites. Sites were composed of yellow bucket traps (aphids), delta traps (PTW), and AlphaScents yellow cards (BLH and PP). There were 8 sites selected for intensive PP sampling using an inverted leaf blower. In Union and Baker, 25 monitoring sites were established. Each of these sites monitored for aphids, and 10 sites were selected for additional sampling with an inverted leaf blower for PP. For both trapping networks, PPs were submitted weekly for testing for Lso to the plant pathology lab in Hermiston, OR. Updates regarding the status of all pests, ZC/Lso incidence in the region and emerging pest problems were distributed to subscribers weekly via email. Weekly communications included the trapping data for each pest and location, as well as helpful tips on monitoring, managing, or identifying various insects can be found at http://oregonstate.edu/dept/hermiston/trap-reports.

Key Words: Green Peach Aphid, Potato Aphid, Potato Tuber Worm, Beet Leafhoppers, Extension, Potato Psyllid, IPM, Pest Monitoring, Survey.

Objectives:
1. Monitor populations of PTW, BLH, aphids and psyllids in Umatilla-Morrow and Union-Baker counties.
2. Educate, communicate, and disseminate information about these pests and other potato pests to the industry.

Procedures:
1) Monitor populations of PTW, BLH, aphids and psyllids in Umatilla-Morrow and Union-Baker counties.

Aphids. Aphids have long been pests of potatoes in the Columbia Basin, mainly because they vector multiple potato diseases (Potato virus Y or PVY, Potato Leafroll Virus, etc.). Thus, to monitor aphids in the region, 34 yellow water-pan traps were placed in Umatilla-Morrow counties 25 traps in Union-Baker counties. The traps were monitored weekly until mid- September for Umatilla-Morrow and late August for Union-Baker counties. Winged aphids were carefully collected from water pans with the aid of a fine camel brush or fine-screened fish net. In Umatilla-Morrow counties the water was treated with 5 ppm copper sulfate ($CuSO_4$), in order to inhibit algal growth. Aphids were placed in vials/collection containers with alcohol and brought to the OSU-HAREC-IAEP for species identification (GPA, PA and OA). Date and trap location were carefully recorded.

Potato Tuber Worm (PTW). Potato tuber moths became a pest of potatoes in the region in 2004. Since then, we have monitored adults (male) PTW moths to determine population levels. Monitoring is accomplished using pheromone-baited delta traps that are changed weekly. **As populations can be extremely localized, growers are encouraged to monitor their fields as harvest approaches as well as remove any neighboring cull piles**. In Umatilla-Morrow counties, 34 pheromone delta traps were used in this study. Traps were monitored weekly from early May until mid-September. Sticky liners were brought to the OSU-HAREC-IAEP for identification and reporting.

Beet Leafhopper (BLH). Traditionally, we have used 4x6 in yellow sticky cards to survey for BLH. However, in 2014, we switched to using the 4x6 in AlphaScents Yellow cards instead. These cards tended to hold up better under central pivot irrigation and high winds. Traps were monitored weekly from early May until mid- September in Umatilla-Morrow counties. Sticky cards were attached to field stakes, six inches above the ground with binder clips, in close proximity to the PTW delta trap. BLH were identified, counted and reported.

Potato psyllids (PP). The potato psyllid, *Bactericera cockerelli*, has been a major concern for growers because it vectors *Candidatus* Liberibacter solanacearum (Lso), which causes ZC in potatoes. We monitored for PP using two separate methods. In Umatilla and Morrow counties, we counted the potato psyllids found on the 4X6 AlphaScents yellow sticky cards and used 5-minute inverted leaf blower samples in eight fields. In Union and Baker counties, we monitored potato psyllids using 2.5-minute inverted leaf blower samples in 10 fields. Occasionally, potato psyllids were also found in aphid bucket traps and these were included in weekly counts. Potato psyllids were monitored from early May until mid-September on sticky cards and inverted leaf blower in Umatilla, Morrow, Union and Baker.

2) Educate, communicate, and disseminate information about these pests and other potato pests to the industry.

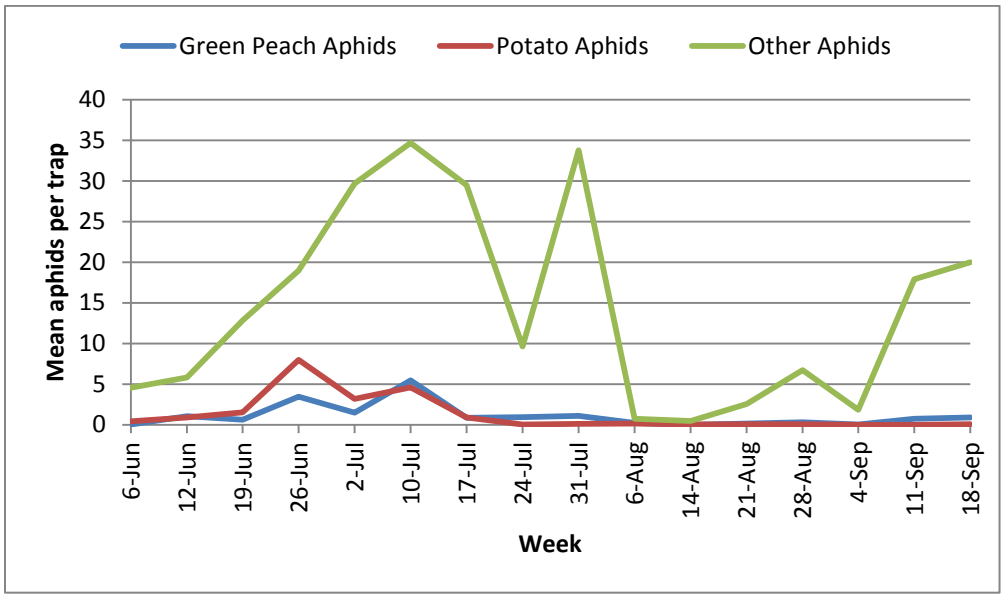
Since 2005, the OSU-HAREC entomology program has served extension clientele, such as crop consultants, agronomists and extension faculty. Results are summarized and presented in newsletters and informational meetings including field days, insect training sessions and commodity meetings. Relevant aspects of this and all potato projects have been highlighted and presented at regional and national meetings. Several insect ID workshops complemented our extension efforts. In 2014, the Rondon entomology program (a.k.a. Irrigated Agricultural Entomology Program) assisted growers with training field men and analyzing their potato psyllid and other pest collections. Project results were and will be published in extension publications (http://extension.oregonstate.edu/catalog/), potato update (http://oregonstate.edu/dept/hermiston/trap-reports), potato progress reports (http://potatoes.com) and other venues.

Accomplishments/findings: Insect surveys were conducted in Umatilla, Morrow, Union, and Baker counties. Weekly reports were sent to growers, field men, and agricultural suppliers as well as online: http://oregonstate.edu/dept/hermiston/ and http://extension.oregonstate.edu/union/ag/potatoaphid. This research provided information on the relative populations of aphids, PTW and BLH and psyllids in

the region, helping growers and field men execute their insect management programs more effectively. Pest population data may have had a significant role in reducing yield losses due to the phytoplasma carried by BLH, the ZC bacteria vectored by psyllids, and the spread of viruses by aphids. **More than 396 people currently are subscribed in our potato update mailing list!** More people in the region and around the world are interested in receiving this newsletter every year. Several hands-on workshops potato psyllid identification and monitoring were held in early 2014. Two are already planned for 2015. The overall goal was to teach an ecological and economical approach to agricultural pest control using integrated insect management strategies: monitoring, cultural control tactics, and understanding the biology of each pest. Identification workshops complemented our extension efforts. The ability to remotely access regular reports via wireless communication technology (e.g., smart phones, iPads, etc.) has enabled growers and field men to make informed and timely management decisions.

Reports/Accomplishments

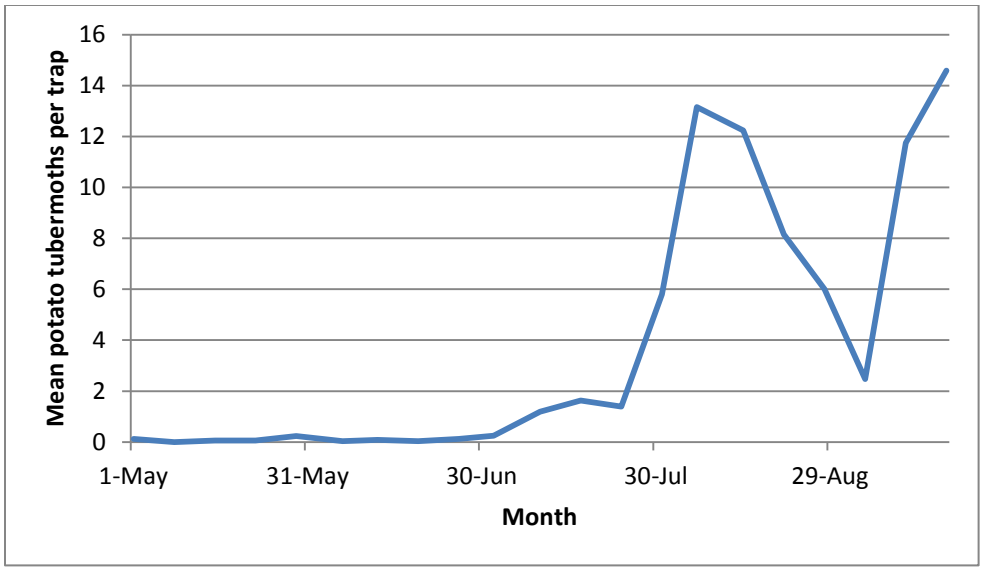
Aphids. In 2014, aphid populations in the lower Columbia Basin were relatively low compared to recent years. Most of the aphids observed in Umatilla-Morrow counties in 2014 were other aphids (OA, probably non-colonizing aphids), and populations remained relatively constant throughout the season. Colonizing aphids, including GPA and PA, remained relatively low through the summer, but peaked slightly in June, July and fall right after harvest.



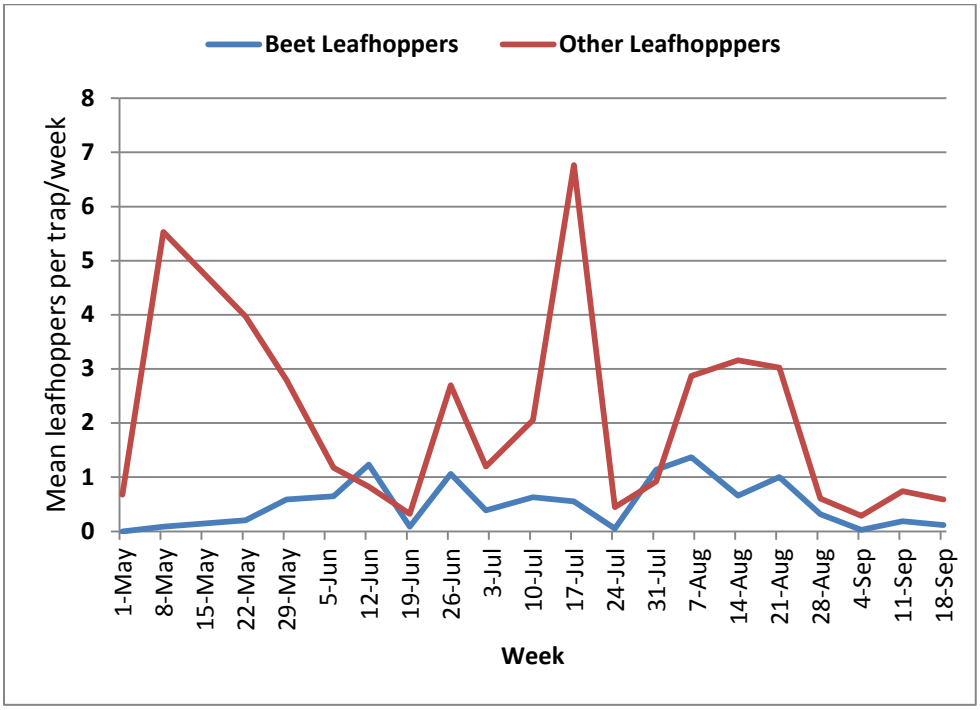
Besides following aphids, we have also started monitoring PVY in the area. Data still pending.

In Union and Baker, aphid counts were relatively low.

Potato Tuber Worm (PTW). Populations of PTW in Umatilla-Morrow counties were slightly higher than in previous years, but relatively low compared to outbreak years (2004-2005). Peak populations were observed in July which is early compared to previous years. This may explained several reports of PTW tuber damage in the area. However, growers in the lower Columbia Basin appear to be successfully following our recommendations and managing PTW populations near harvest.



Beet Leafhoppers (BLH). BLH populations demonstrated a noticeable increase compared to previous years. In some areas, BLH reached current recommended action thresholds. While the numbers seen in 2014 were far from outbreak levels, there were numerous reports of BLTVA (Robert Cating, OSU-Plant Pathology, personal communication). During the season, BLH numbers appeared to mirror other leafhopper (OLH) numbers, peaking from early June to July. Other leafhoppers were abundant and leafhopper identification remains an important part of potato pests' management. **The role of OLH in BLH population trends should be investigated as well as where BLTVA overwinters in the Columbia Basin.**

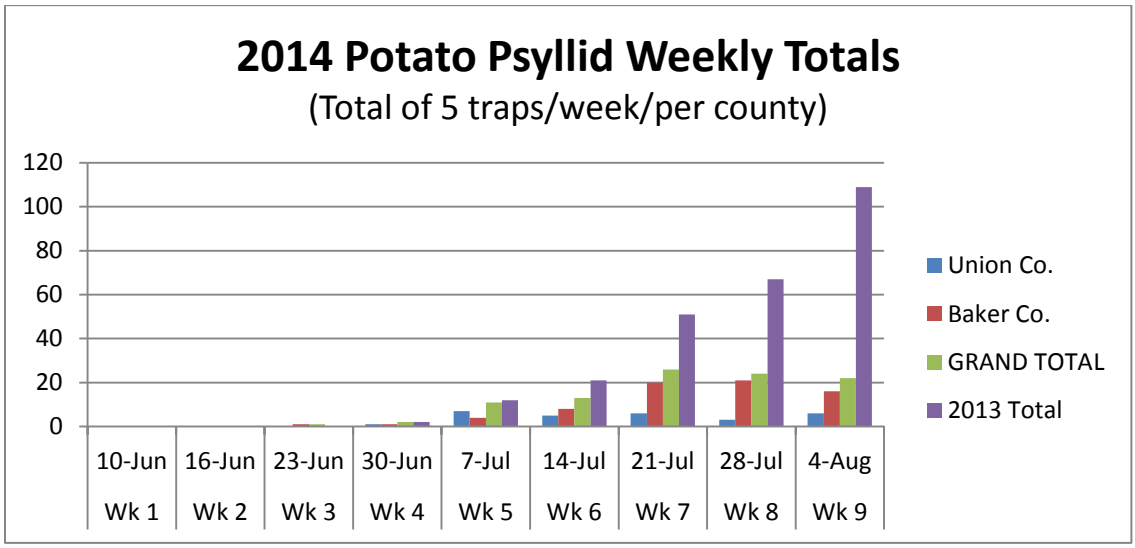


Potato Psyllids (PP). In Umatilla and Morrow counties, PP numbers were lower in 2014 than in 2012 and 2013, but overall relatively low. Peak PP numbers were observed later in the season. Other psyllid

(OP) numbers were low throughout the season. The new AlphaScents yellow sticky cards worked quite well for psyllid detection, even though inverted leaf blower samples tended to collect more psyllids earlier. The yellow AlphaScents cards were used for both BLH and psyllids, so the traps were placed outside the potato fields. Potato psyllid numbers would be expected to be lower on AlphaScents cards located outside the potato field. Sticky card data complimented inverted leaf blower samples. Only one potato psyllid from Umatilla-Morrow counties tested positive for Lso. Please refer to the weekly report for trap-specific details which are available online at http://oregonstate.edu/dept/hermiston/trap-reports.

All potato psyllid samples collected in Union to date have been subjected to Liberibacter (Lso) PCR analysis and all test results have been *NEGATIVE*. Please refer to the weekly report for trap-specific details which are available online at http://extension.oregonstate.edu/union/potato-aphid-reports-current.

Current season PP populations Week 7 – 9 are significantly lower compared to weekly totals in 2013 (purple bar in chart). Similar observations have been made in the Columbia Basin. However, it is important to remember that PP populations have the capability of building rapidly from this point on in the growing season.



Impacts: The Potato Update http://oregonstate.edu/dept/hermiston/trap-reports provided growers and consultants with important weekly information regarding potato pests in the area. Many subscribers use the information for integrated pest management purposes and to estimate pest pressure near their fields. The 'FYI' section provides them with additional assistance on relevant problems or pests each week: identification, monitoring, cultural control practices and insecticide recommendations.

Relation to other Research/Extension: Monitoring of aphid numbers relates to multiple ongoing virus projects in the plant pathology program and in the Rondon entomology program. Leafhopper, psyllid and PTW trapping is being done in collaboration with Washington State University (Carrie Wohleb) and Erik Wenninger (University of Idaho) to understand and learn how to control potato pests in the region. The Rondon potato psyllid research program is coordinating activities with several other research groups in the region (Erik Wenninger and Arash Rashed, University of Idaho; Dave Horthon and Kylie Swisher, USDA-ARS Wapato; Kevin Wanner, Montana State University; Dave Crowder, Washington State University, and others in the USA).

2014 Only

Publications-Peer reviewed

Murphy, A.F., R. Catling, A. Goyer, P.B. Hamm, and S.I. Rondon. 2014. First report of natural infection by "*Candidatus* Liberibatcer solanacearum'" in bittersweet nighshade (*Solanum dulcamara* L.) in the Columbia Basin of eastern Oregon. Plant disease note 05-14-0497PDNRI. Plant disease Journal 98(10) 1425. http://www.apsnet.org/publications/plantdisease/2014/October/Pages/98_10_1425.3.aspx

Swisher, K.D., G.S. Venkatesan, J. Dixon, J.E. Munyaneza, A.F. Murphy, S.I. Rondon, B. Thompson, A.V. Karasev, E.J. Wenninger, N. Olsen, and J.M. Crosslin. 2014. Assessing potato psyllids haplotypes in potato crops in the Pacific Northwest United States. Am. J. Po. Res. 91:485-491. http://link.springer.com/article/10.1007%2Fs12230-014-9378-8.

Murphy, A.F., S.I. Rondon, R. Marchosky, J. Buckham and J. Munyaneza. 2014. Evaluation of beet leafhopper transmitted virescence agent damage in the Columbia Basin. Am. J. Pot. Res. 91 (1): 101-108. DOI 10.1007/s12230-013-9335-y. *Role*: design experiment, co-wrote manuscript, PI grant. http://link.springer.com/article/10.1007%2Fs12230-013-9335-y.

Non-refereed journals. Proceeding and abstracts

Rondon, S.I., D.A. Horneck, and P.B. Hamm. 2014. Pest management implications when using precision agriculture in an irrigated potatoes cropping system. *In* Proc. XXVI Congreso Latinoamericano de la papa-ALAP. 28 Sept.-2 Oct. Bogota, Colombia. Pp. 240.

Murphy, A.F., R. Cating, P.B. Hamm, and S.I. Rondon. 2014. Evaluating sources of aphid vectors and *Potato Virus Y* in eastern Oregon and Washington. *In* 98th Annual Meeting of the Potato Association of America, Spokane, Washington. Pp. 64 (G28).

Cating, R.A., S.I. Rondon, and P.B. Hamm. 2014. High-fidelity PCR improves detection of zebra chip (*Candidatus* Liberibatcer *solanacearum*) in potato tubers, plants and potato psyllids (*Bactericera cockerelli*) when compared to a conventional protocol. *In* 98th Annual Meeting of the Potato Association of America, Spokane, Washington. Pp. 53 (P22).

Rondon, S.I. and E.E. Echegaray. 2014. Evaluating the effectiveness of pesticides in controlling potato psyllids. *In* 98th Annual Meeting of the Potato Association of America, Spokane, Washington. Pp. 81 (G62).

Murphy, A.F., A. Moreno, A. Fereres, and S.I. Rondon. 2014. International endeavors in investigating *Potato Virus Y* trasnmission. *In* 98th Annual Meeting of the Potato Association of America. 27-31 Jul. Spokane, Washington. Pp. 37 (G8).

Mills, C., and S.I. Rondon. 2014. Insect ID: the top new arrivals in eastern Oregon in 2013. *In* 73nd Annual Pacific Northwest Insect Management Conference. Pp 119.

Echegaray, E., A.F. Murphy and S.I. Rondon. 2014. Two years of evaluation of the potato psylud and zebra chip disease in the lower Columbia Basin. *In* 73nd Annual Pacific Northwest Insect Management Conference. Pp 85.

Rondon, S.I., E. Echegaray, A.F. Murphy and J.M. Alvarez. 2014. Potato psyllids control with a new chemistry. *In* 73nd Annual Pacific Northwest Insect Management Conference. Pp. 88.

Murphy, A.F. and S.I. Rondon. 2014. Aphid pressure and *Potato Virus Y* in potatoes in the Columbia Basin. *In* 73nd Annual Pacific Northwest Insect Management Conference. Pp 86.

Progress Reports: (Oregon and Washington Potato Commissions, Pacific Northwest Insect Management Conference, Others)

Rondon, S.I. 2014. Overwintering, phenology and migration of the potato psyllids/disease complex in the Pacific Northwest. *In* Oregon Potato Commission Research Progress Report FY 2013-2014.

Murphy, A.F., and S.I. Rondon. 2014. Aphid vectors and alternative sources of Potato virus Y in Oregon and Washington. *In* Washington Potato Commission Research Progress Report FY 2013-2014.

Murphy, A.F., and S.I. Rondon. 2014. Aphid vectors and alternative sources of Potato virus Y in Oregon and Washington. *In* Oregon Potato Commission Research Progress Report FY 2013-2014.

Rondon, S.I. 2014. Monitoring potato insect pests in eastern Oregon: education, communication and dissemination of information. *In* Oregon Potato Commission Research Progress Report FY 2013-2014.

Rondon, S.I. 2014. Biology, ecology and management aspects of the potato psyllids/Zebra Chip complex in the Pacific Northwest. *In* Oregon Potato Commission Research Progress Report FY 2013-2014.

Newsletter Articles (Potato Progress, Crops and Soil News and Views Newsletter)

Rondon, S.I., A.F. Murphy, R. Cating, and P.B. Hamm. 2014. Revisiting beet leafhopper damage in the Columbia Basin. Potato progress. May. Vol. XIV, No 6.

Horthon, D., J.E. Munyaneza, K.D. Swisher, E. Echegaray, A.F. Murphy, S.I. Rondon, V.G. Sengoda, L.G. Neven, and A. Jensen. 2014. What is the source of potato psyllids colonizing Washington, Oregon and Idaho potato fields? Potato Progress. Jan. Vol. XIV, No 2.

2014 PRESENTATIONS & REPORTS

Scientific Conferences (National and International)

Rondon, S.I. 2014. Chasing zebra chip in the Columbia Basin: updates and what is next. SCRI Zebra Chip Annual Reporting Session. 3-6 Nov. San Antonio, TX. Oral presentation (150 participants).

Jordan, A., I. Thompson, and S.I. Rondon. 2014. Alternative methods to control potato pests. 62nd ESA Annual Meeting. 10-13 Nov. Portland, OR. Oral presentation.

Klein, M. and S.I. Rondon. 2014. The effects of crop diversity on potato psyllid (Bactericera cockerelli). 62nd ESA Annual Meeting. 10-13 Nov. Portland, OR. Oral presentation.

Vinchesi, A., A. Goyer, and S.I. Rondon. 2014. Effects of thiamine treatment on potato to control Potato Virus Y and Zebra Chip. 62nd ESA Annual Meeting. 10 - 13 Nov. Portland, OR. Oral presentation.

Murphy, A., A. Moreno, A. Fereres, and S.I. Rondon. 2014. An international perspective on a global challenge: Potato Virus Y transmission in the US and Europe. 62nd ESA Annual Meeting. 10-13 Nov. Portland, OR. Oral presentation.

Walenta, D., E. Echegaray, and S.I. Rondon. 2014. Overwintering potential of the potato psyllid (Bactericera cockerelli Sulc) and the bacterium Candidatus Liberibacter solanaceraum in eastern Oregon. 62nd ESA Annual Meeting. 10-13 Nov. Portland, OR. Oral presentation.

Rondon, S.I., D.A. Horneck, and P.B. Hamm. 2014. Pest management implications when using precision agriculture in an irrigated potatoes cropping system. XXVI Congreso Latinoamericano de la papa-ALAP. 28 Sept.-2 Oct. Bogota, Colombia.

Murphy, A.F., R. Cating, P.B. Hamm, and S.I. Rondon. 2014. Evaluating sources of aphid vectors and *Potato Virus Y* in eastern Oregon and Washington. 98th Annual Meeting of the Potato Association of America. 27-31 Jul. Spokane, Washington. Oral Session.

Cating, R.A., S.I. Rondon, and P.B. Hamm. 2014. High-fidelity PCR improves detection of zebra chip (*Candidatus* Liberibatcer *solanacearum*) in potato tubers, plants and potato psyllids (*Bactericera cockerelli*) when compared to a conventional protocol. 98th Annual Meeting of the Potato Association of America. 27-31 Jul. Spokane, Washington. Oral Session.

Rondon, S.I. and E.E. Echegaray. 2014. Evaluating the effectiveness of pesticides in controlling potato psyllids. 98th Annual Meeting of the Potato Association of America. 27-31 Jul. Spokane, Washington. Oral Session.

Murphy, A.F., A. Moreno, A. Fereres, and S.I. Rondon. 2014. International endeavors in investigating *Potato Virus Y* trasnmission. 98th Annual Meeting of the Potato Association of America. 27-31 Jul. Spokane, Washington. Oral Session.

Scientific Conferences (regional):

Alvarez, J.M., R. Cameron, H.E. Portillo, B. Annan, S.I. Rondon, E. Echegaray, J.E. Munyaneza, T. Mustafa, D. Halls, and E. Ammar. 2014. The effect of cyazypyr on psyllid pests that vector the Huanglonbing and zebra chip disease in citrus and potatoes, respectively. 98th ESA Pacific Branch Annual Meeting. 6-9 Apr. Tucson, AZ. Poster presentation.

Klein, M. and S.I. Rondon. 2014. Crop diversity and landscape on the distribution of potato psyllids and aphids in the Pacific Northwest. 6th annual student research in Entomology Symposium. Oregon State University. Corvallis, OR.

Mills, C. and S.I. Rondon. 2014. Insect ID: the top new arrivals in eastern Oregon in 2013. *In* 73nd Annual Pacific Northwest Insect Management Conference. 6-7 Jan. Portland, OR. Section IV. Oral presentation.

Echegaray, E., A.F. Murphy, and S.I. Rondon. 2014. Two years of evaluation of the potato psyllid and zebra chip disease in the lower Columbia Basin. *In* 73nd Annual Pacific Northwest Insect Management Conference. 6-7 Jan. Portland, OR. Section IV. Oral presentation.

Rondon, S.I., E. Echegaray, A.F. Murphy, and J.M. Alvarez. 2014. Potato psyllids control with a new chemistry. *In* 73nd Annual Pacific Northwest Insect Management Conference. 6-7 Jan. Portland, OR. Section IV. Oral presentation.

Murphy, A.F. and S.I. Rondon. 2014. Aphid pressure and *Potato Virus Y* in potatoes in the Columbia Basin. *In* 73nd Annual Pacific Northwest Insect Management Conference. 6-7 Jan. Portland, OR. Section IV. Oral presentation.

Extension Meetings (ALL extension presentations are as invited speaker)

Rondon, S.I. 2014. A to Z: How do we practice pest management in the Columbia Basin? Potato Session. Farm Fair. 3-5 Dec. Hermiston, OR. (120 participants).

Murphy, A. and S.I. Rondon. 2014. The big picture on aphid and PVY: looking for vectors and virus in the landscape. Potato Session. Farm Fair. 3-5 Dec. Hermiston, OR. (90 participants).

Klein, M., and S.I. Rondon. 2014. Distribution of insect pests and beneficials in Columbia Basin Crops. Pest Management Session. Farm Fair. 3-5 Dec. Hermiston, OR. (95 participants).

Vinchesi, A., A. Goyer, and S.I. Rondon. 2014. Effects of thiamine treatment on pest control. Pest Management Session. Farm Fair. 3-5 Dec. Hermiston, OR. (95 participants).

Rondon, S.I. 2014. Emerging Pests in the Pacific Northwest. Safety and Stewardship Seminars sponsored by Oregon Agricultural Chemicals & Fertilizers Association. 4 Nov. Pendleton, OR.

Rondon, S.I. 2014. Managing *Potato virus Y* in Potato Production: A Modern Overview. Washington-Oregon Potato Conference. 29-30 Jan. Kennewick, WA. (250 participants).

Rondon, S.I. 2014. Zebra Chip: "El manchado de la papa: identificación, manejo y control". Washington-Oregon Potato Conference. 29-30 Jan. Kennewick, WA. (110 participants).

Rondon, S.I. 2014. Insect monitoring: identifying problem insects, how to monitor for them and how to manage an infestation. Washington-Oregon Potato Conference. 29-30 Jan. Kennewick, WA. (110 participants).

Field Days

HAREC Potato Field Day. Irrigated agricultural entomology program: 2014 research update and beyond. Hermiston, OR. *Role*: Speaker (160 participants).

Oregon Potato Commission

Research Proposals
FY 2015-2016

PROPOSAL

TITLE: Central Oregon Potato Pest Monitoring Program

YEAR INITIATED: 1995-96 **CURRENT YEAR:** 2015-16 **TERMINATING YEAR:** On-going

PRINCIPAL INVESTIGATOR: Marvin Butler, Professor, COARC, 850 NW Dogwood Ln, Madras, OR 97741 541-475-7107 Marvin.Butler@oregonstate.edu

COOPERATORS: Carol Tollefson, Director, COARC, 850 NW Dogwood Ln, Madras, OR 97741; 541-475-7107 Carol.Tollefson@oregonstate.edu

FUNDING REQUEST FOR 2015-2016:

OPC: $6,700
IPC: $0
WSPC: $0

JUSTIFICATION:

Potato production issues in Central Oregon are focused on seed tuber production and pest monitoring and alerting services are vital for successful production of high quality seed potato. Aphids are one of the primary pests that can affect the yield by extracting nutrients from the plants, stunting their growth, or transmitting diseases. One of the diseases aphids transmit is Potato Virus Y (PVY), which is the most common reason seed lots are downgraded or rejected from certification.

The potato tuberworm (*Phthorimaea operculella)* is another important pest that infests potato in central Oregon. Potato tuberworm moth appeared in higher numbers in the area in 2014 and has the potential to impact production due to larvae mining in tubers.

The Pacific Northwest potato industry has recently been alerted of the finding of the zebra chip (ZC) disease in 2011. The pathogen causing ZC is '*Candidatus* Liberibacter solanacearum' (Lso), a type of bacterium vectored by the potato psyllid (*Bactericera cockerelli Sulc*), is a third important pest to central Oregon growers and statewide potato producers. In 2014, potato psyllids were identified in the central Oregon area but tested negative for Lso. Population dynamics need to be assessed and monitored as a statewide collaboration when newly developing pests and pathogens appear. This information can help growers and fieldmen effectively plan their control programs.

Central Oregon routinely experiences early blight infections and late blight has appeared in some years. Fungicide applications for late blight can cost up to $250/acre annually. Models are being improved in the local area to help predict the potential occurrence of late and early blight. As prediction models are refined, fungicide applications can be centered on anticipated incidences instead of calendar spray schedules. Savings can be achieved by improving the timing and efficiency of the fungicide applications.

OBJECTIVES:

1. Monitor flights of aphids, adult male potato tuberworm moth, and potato psyllid in Central Oregon.
2. Generate early blight prediction model and weekly water use data
3. Educate, communicate, and disseminate information about these pests to industry.

PROCEDURES:
Yellow water traps to collect winged aphids will be placed near potato fields as plants begin to emerge. All trapped aphids will be collected weekly during the growing season and identified as either green peach aphids or other aphids. Potato tuberworm pheromone delta traps and yellow sticky cards for potato psyllid will be placed in all potato production locations during the 2015 growing season. Yellow sticky cards will be attached to field stakes with clips six inches above ground in proximity to the tuberworm moth trap. Potato tuberworm moth and potato psyllids will be identified and recorded. Results will be tabulated and made available to growers, crop consultants, and other industry personnel each week.

A weekly newsletter will be mailed to all central Oregon potato growers from mid-June to late September. Each issue of the newsletter will contain a summary of the aphid survey, pest updates, early blight prediction model (P-Day) and weekly crop water use calculated from AgriMet weather stations located at Madras. Occasionally, a feature article of a timely topic will be published in the local newspaper.

A weekly aphid report and other timely potato-related information will be posted on the potato page of the Central Oregon Agricultural Research Center website at http://oregonstate.edu/dept/coarc.

INFORMATION TRANSFER:
Potato Patches, a weekly newsletter, will be published from late June through mid-September, 2015. The newsletter contains a tabulation of the weekly green peach aphid survey, crop water use information, P-Day accumulation, and timely announcements. Aphid, tuberworm, and psyllid traps will be placed in potato fields in June and checked weekly throughout the growing season and notification of presence will be announced in newsletter. The newsletter will be sent to all Central Oregon potato growers, related industry personnel, and potato research and extension staff.

PROJECT TIMELINE: June – December, 2015

2015-16 BUDGET:

	OPC	IPC	WSPC	Total
Salaries: Faculty Research Assistant (FRA)	$3,500	$0	$0	$3,500
Graduate Student	$0	$0	$0	$0
Other Students	$0	$0	$0	$0
Other Labor	$0	$0	$0	$0
Employee Benefits (OPE): FRA	$1,500	$0	$0	$1,500
Graduate Student	$0	$0	$0	$0
Other Students	$0	$0	$0	$0
Other Labor	$0	$0	$0	$0
Equipment:	$0	$0	$0	$0
Travel: Domestic (in state)	$1,240	$0	$0	$1,240
Domestic (out of state)	$0	$0	$0	$0
Foreign (conferences, etc)	$0	$0	$0	$0
Operating Expenses	$460	$0	$0	$460
Other Expenses	$0	$0	$0	$0
Total	$6,700	$0	$0	$6,700

ANTICIPATED REQUESTS IN COMING YEARS:

2015-2016: 6,700 **2016-2017:** 6,850

PROPOSAL

OREGON POTATO COMMISSION

TITLE: **Klamath Basin Research & Extension Potato Program**

YEAR INITIATED: 1991

CURRENT YEAR: 2015-16

TERMINATING YEAR: Expect to Submit Annually

PERSONNEL & COOPERATORS:

PI: Brian A. Charlton, OSU – KBREC

6941 Washburn Way; Klamath Falls, OR; 97603

(541)883-4590 ext 8527 – office phone

(541)883-4596 – fax

(541)591-1255 – cell

Brian.A.Charlton@oregonstate.edu

Cooperators: Sagar Sathuvalli, OSU-HAREC

Rob Wilson, UC-IREC, Tulelake, CA

Jeff McMorran, OSU-Seed Certification

Silvia Rondon, OSU-HAREC

Nicole Baley, OSU-KBREC

FUNDING REQUEST FOR 2015-16:

OPC: $15,750

JUSTIFICATION:

Potato acreage in the Klamath Basin has remained relatively stable over the past 6 years despite irrigation uncertainties and fluctuating markets. Total acres average approximately 14,000 acres annually with 55% destined for fresh markets, 42% chipstock, and 8% seed. Economic contributions to the region average $38 million in farmgate sales.

Despite low numbers of potato tubermoth, beet leafhoppers, and potato psyllids in recent years, insect trapping remains a high priority for local producers. Aphid monitoring is essential for area seed producers and weekly data weigh heavily in management decisions.

Nematode-related diseases continue to be a major threat to local production and international export. Planting dates fluctuate widely despite our relatively short-growing season and soil type varies widely throughout the Basin. Both of these factors influence degree-day accumulation warranting widespread monitoring throughout the region. Degree-day monitoring allows growers an opportunity to target pesticide applications at the weakest point in the nematode life cycle and is widely used for application of non-fumigant control products.

A significant portion of chipstock is exported to various international markets. While PNW breeding efforts for chipping varieties has increased in recent years, reliance on 'public' varieties from other breeding programs constitutes the majority of export acreage. As such, continued evaluation of cultivars from these regions is needed to ensure producers have the highest quality varieties to remain competitive in international export markets.

The potato program at KBREC continues to provide valuable services to local growers, shippers, and local agribusiness in many facets of pest management, production, marketing, and natural resource stewardship. Our goal is to continue searching for innovative ways to enable our local industry to keep ahead of the latest developments.

HYPOTHESIS & OBJECTIVES:

Education and Service:

1. Develop multi-state Winter Potato Seminar for growers and agribusiness.
2. Use various media outlets to communicate topics of importance to local clientele.
3. Continue insect trapping programs to help generate local data about the distribution and population dynamics of potato tubermoth, leafhoppers, psyllids, and aphids.
4. Continue monitoring growing degree-days for nematode development.
5. Provide technical field service to growers.
6. Provide technical information via weekly newsletters throughout the growing season.
7. Provide liaison between growers and campus-based specialists.
8. Provide leadership support to Klamath Basin Potato Growers Association.

Research:

1. Screen existing and new herbicide chemistries to determine optimum tank mixes and application timing on both mineral and high organic matter. Continue chip quality evaluation of Tri-state, and Western Regional clones from long-term commercial storage with particular emphasis on meeting raw export standards.

PROCEDURES:

Education and Service

1. Provide technical information to local clientele via personal contact, email listservs, *Potato Bytes* newsletter, special meetings, website, field days, and winter seminars
2. Multiple pheromone traps (tubermoth), yellow water-pan traps (aphids and psyllids), and yellow sticky cards (leafhoppers and psyllids) will be placed in growers' fields shortly after emergence. Traps will be checked weekly during the growing season. Results will

be tabulated and made available to growers, and agribusiness clientele electronically in *Potato Bytes* and posted on the KBREC and Northwest Potato Research website.

3. Growing degree-day monitoring will consist of temperature sensors being placed in both mineral and high organic soils. Data will be downloaded weekly beginning in late-April and accumulated degree-day information will be reported in *Potato Bytes.*
4. Crop water use and physiological-days will be tabulated weekly and reported in *Potato Bytes.*

Research:

Long-term storage evaluation on chipping clones will be performed on samples stored in commercial storage facilities. Various herbicide combinations of existing and new chemistries will be evaluated on both mineral and high organic soils to determine weed control efficacy and impact on yield on quality.

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER:

Improved producer awareness of pest activity and ability to fine tune management decisions based on data supplied by weekly issues of *Potato Bytes*. Improved awareness of chip quality from long-term storage. Improved awareness of optimal tank mixes and application timings on herbicide efficacy.

PROJECT TIMELINE: TBD, general outline provided in 'Procedures' section.

LITERATURE REVIEW: NA

2015-16 Budget:

	OPC	IPC	WSPC	Total
Salaries: Faculty				
Graduate Student				
Other Students				
Other Labor				
Employee Benefits (OPE): Faculty				
Graduate Student				
Other Students				
Other Labor				
Equipment				
Travel: Domestic (in state)	**$1,485**			**$1,485**
Domestic (out-of-state)	**$1,895**			**$1,895**
Foreign (conferences, etc.)				
Operating Expenses[1]	**$12,370**			**$12,370**
Other Expenses[2]				
Total	**$15,750**			**$15,750**

1 Otherwise known as 'Goods and Services' or 'Supplies and Materials.'

2 Capital outlays, or other needs. Please detail in footnote.

ANTICIPATED REQUESTS IN COMING YEARS: **2016-17:** $15,750 **2017-18:** $15,750

OTHER SUPPORT OF PROJECT: USDA NIFA - $57,000+ of which 80% is utilized to partially fund FRA and seasonal positions, 12% is used for direct operational costs of research programs, and 8% is used for travel, publication, and other direct costs. As expected, OPC funds play a vital role in covering a portion of operational costs so Research and Extension activities can be completed.

PROPOSAL TO THE OREGON POTATO COMMISSION

TITLE: Contribution to New Potato Based Building at HAREC

YEAR INITIATED: 2014 CURRENT YEAR 2015-16 TERMINATING YEAR: 2015

PRINCIPAL INVESTIGATOR: Philip B. Hamm (Philip.b.hamm@oregonstate.edu),Director, HAREC, Oregon State University, P.O. Box 105, Hermiston OR 97838. 541 567 8321.

COOPERATORS: All staff members at HAREC and those who contribute to this building project.

FUNDING REQUEST 2014-15: $ 20,000

JUSTIFICATION:
HAREC is located in a very diverse and extremely important agricultural region within Oregon and the Pacific Northwest. In addition, faculty members at HAREC likely represent the most diverse programmatic faculty found at any other experiment station in the College of Agricultural Sciences. Included on the faculty are an entomologist, plant pathologist, potato and cereal breeder, molecular biologist, and two ecologists who work on invasive and non-invasive invertebrates associated with aquatic and riparian environments. All have extensive research programs.

Current laboratory space is at a premium at HAREC and there are inadequate facilities to provide basic support for growing programs. This proposal provides critical facilities to support the Extension entomology project (Rondon) by providing three separately controlled temperature rooms (approx. 8' X 11") for rearing three different insects. This project currently has only a single rearing room that only provides the temperature needed to rear a single insect species. Three insects (Beet leafhopper, Potato tuberworm and the Potato psyllid and new information suggest that Lygus bugs need to be added to the list to go with aphids) are of extreme importance to the potato industry. The facility is being built with "double doors" to the outside from to insure that insects cannot escape. This facility will provide timely and important information to the potato industry and beyond.

The Agronomy lab (17' X 34') will provide the replacement for Don Horneck, the extension agronomist, who never had an assigned lab. In the past Don shared space with the molecular biologist but that is not and has not been a good compatible usage given the kinds of samples he processes in the lab. In other words, the soil and plant samples makes for a dirty lab while the molecular biologist needs a much clearner work space.

The tissue culture room (11 X 18) will used to support work being done by Goyer, Sathuvalli, Rondon and Hamm (his replacement…Frost). This kind of clean space to raise plants is currently not available at HAREC and is critical for the breeding and molecular programs and their interface with the pathology and entomology programs.

The equipment (12' X 25') room will help alleviate crowding in our labs by moving shared equipment including incubators, growth chambers and -80C freezers, to a central location. Currently incubators, growth chambers and low temperature freezers are spread out across all the laboratories at HAREC. These different pieces of equipment take up valuable space and in some cases they are not in controlled temperature environments. This situation causes the equipment to run inefficiently and influences the ability to maintain needed temperatures. In addition, some equipment is not located in clean rooms so air filters need frequent cleaning. The room in the proposed building will provide the necessary temperature control for efficient running, will provide a clean environment to help ensure proper equipment operation,

reduce maintenance and electrical costs, and will free up much needed laboratory space. The equipment room will be equipped with an emergency natural gas fired generator to offset power outages to prevent loss of critical biological material stored in the -80C freezers. In the past emergency backup power generation was required. DNA and RNA samples stored in these freezers must be kept at at least -50C or they would be subject to breakdown. The samples are irreplaceable. All station projects would benefit from having this new facility but particularly those working in potato (Horneck, Hamm (Frost), Rondon, Goyer, and Sathuvalli).

Lastly, the faculty at HAREC was successful in receiving a NIFA grant to hire 5 graduate students in addition to the one already on hand. HAREC is currently working to establish a "flow" of graduate students at HAREC. This much needed space will further the opportunity to attract and educate graduate students, the mission of HAREC, as well as help develop and maintain high quality diverse research programs that supports our clientele in this important agricultural region in eastern Oregon

The Director of HAREC would serve as the "general" contractor as he has on many past projects at this facility. By doing so substantial dollars can be saved to help keep the projects costs at or hopefully below those estimated above. Normal and expected campus and state (BOLI) rules will be followed related to building codes and contracts, the director will be responsible for getting bids, securing contracts (working with PaCS), and organizing work from the different subcontractors as work progresses. The building will be completed by summer 2015.

This facility will be directed 100% toward our research effort and is central to potato production. Two other possible building methods were investigated; one, a metal building and the other, a prefabricated one. In the former case I could not find a contractor willing to build one following BOLI rules. Even so the cost of the building because of the BOLI rules wasn't going to save that much money. The prefabricated route may have been less expensive but given the need for a concrete floor and the limitation of the size of the building, one wide or double wide, and the time wait, made this option less desireable.

OBJECTIVE:
Erect a new building (46 x 36' or 1,656 SF) at HAREC. The building will include 3 insect rearing rooms, 1 tissue culture room, an agronomy laboratory and an equipment room. This facility will be directed 100% toward our research effort and is critical to our effort. See attached floor plan.

PROCEDURES (FOLLOWING OBJECTIVES LISTED ABOVE):
The new building. Normal processes will be followed as required for a BOLI building project. Essentially that means getting building department approval and then bidding most jobs out to prequalified sub-contractors and using the carpenter that works part-time at HAREC for some of the minor projects.

ANTICIPATED BENEFITS/OUTCOMES/INFORMATION TRANSFER:
As mentioned above, this new building will provide research opportunities that have never been available at HAREC. The new information generated will be communicated to growers in appropriate venues.

PROJECT TIMELINE:
March –May Foundation and framing, roof and siding, rough heating and lights
June –Aug Insulate, hang dry wall, paint, install cabinets, finish interior

2014/15 BUDGET:

	Oregon Potato Commission
Salaries: Faculty	
Graduate student	
Other students	
Other labor	
Employee Benefits (OPE): Faculty	
Graduate student	
Other students	
Other labor	
Travel: Domestic (in state)	
Domestic (out of state)	
Foreign (conferences, etc.)	
Operating Expenses	
Other Expenses[1]	$20,000
Total	$20,000

[1] Funds will be used to purchase building materials and pay labor associated with the new building.

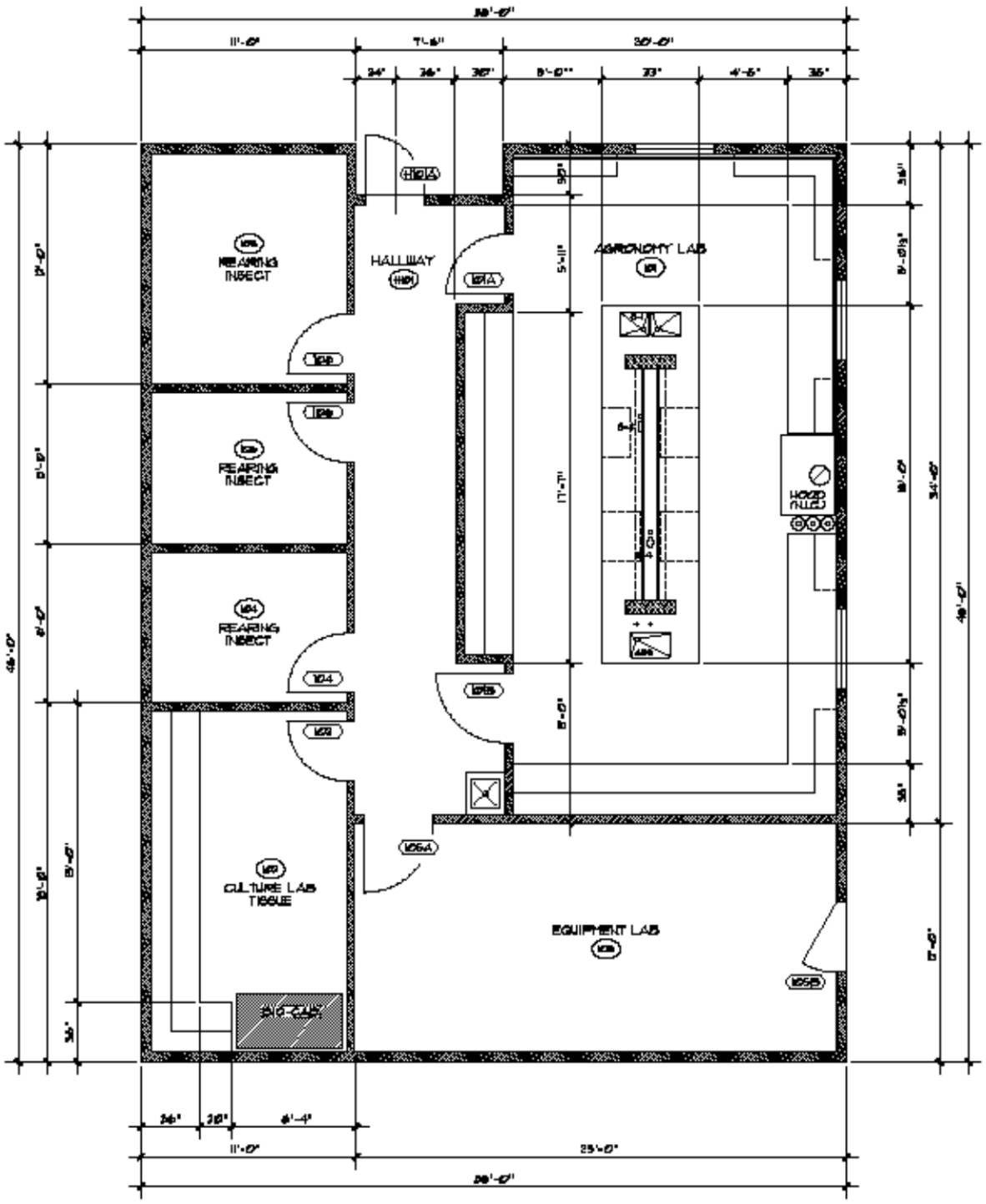
ANTICIPATED REQUESTS IN COMING YEARS:

2016-2017: $0 2017-2018: $ 0

OTHER SUPPORT OF PROJECT: See below

Estimated costs for erecting building is $301,000 + 5% Contingency = $347,550

Source	Amount
Growers in the Columbia Basin (includes Wash)	$40,000
Umatilla Electric Cooperative	$15,000
Oregon State University (College of Ag Sciences)	$60,000
Umatilla County	$20,000
Farm Credit Services	$5,000
HAREC (savings through reduce contractor fees)	$50,000
Faculty at HAREC (from research funds)	$117,550
Total to date	**$307,550**
Being Requested	
Oregon Potato Commission	$20,000
Washington State Potato Commission	$20,000
Overall Total	**$347,550**



Proposed Floor Plan

PROPOSAL TO THE OREGON POTATO COMMISSION

TITLE: Blue Mountain Plant Pathology Extension Program

YEAR INITIATED: 1990 CURRENT YEAR 2015-16 TERMINATING YEAR: 2020

PRINCIPAL INVESTIGATOR: Ken Frost (Ken.frost@oregonstate.edu) and Philip B. Hamm (Philip.b.hamm@oregonstate.edu), Plant Pathologists, HAREC, Oregon State University, P.O. Box 105, Hermiston OR 97838 . 541 567 8321.

COOPERATORS: Robert Cating and Silvia Rondon, HAREC, Hermiston OR; Russ Ingham, OSU Corvallis; Jeff McMorran, Oregon State University, Corvallis; and Dennis Johnson, WSU Pullman WA

FUNDING REQUEST 2014-15: $17,520

JUSTIFICATION:

1. Extension Program. Potato production in the Columbia Basin continues to be a challenge with decreasing profits and increasing production costs. The goal of the plant pathology program is to provide diagnostic help, information related to current hot topics (i.e. leafhopper, Lugus bugs, etc. that carry viruses or other disease agents), old topics, and being prepared for whatever new disease issues that might occur that will impact Oregon's potato productivity/viabililty. The Plant Pathology Diagnostic lab provides quick and reliable information impacting the potato crop to Oregon's potato growers (and beyond). Hopefully, this can be done while maintaining and/or reducing costs (to improve the "net" return). Many of these issues, regardless of where found, can and usually do relate to other potato production areas in the state.

2. Seed Lot Trials. The seed lot trial has been in existence for more than 40 years. These plantings provide significant information each year to growers who submit samples of their seed (nearly every grower in the Blue Mt District submits samples but samples from any grower in Oregon would be accepted). This trial specifically measures the overall quality of seed being grown in commercial fields and provides information when questions arise about seed found in particular fields. A similar trial is done in Washington for seed lots planted in that state. We assist in reading the Washington planting.

HYPOTHESIS & OBJECTIVES:

1. Plant Pathology Extension Program. Provide information and diagnostics related to plant disease issues to area's potato growers. Assistance is also given to growers in other production areas.
2. Seed Lot Trials. Plant seed lot trials to assist commercial growers in confirming the quality of seed being planted in commercial fields. This also allows for early detection of new diseases or diseases of issue of that year.

PROCEDURES (FOLLOWING OBJECTIVES LISTED ABOVE):

1. **Plant Pathology Extension Program.** Provide information via field visits, field days, grower meetings, etc. as needed and provide new information from potato research conducted by the plant pathology program and from other plant pathology programs to potato growers in the region. Funding will also support general functions of the Extension Plant Pathology program and provide diagnostic services to Oregon potato growers. Last year 80 samples from Oregon potato growers were submitted for diagnostic services representing 138 total samples (in many cases different tubers had different problems requiring different tests). Costs to growers to run these samples would have been about $8,000.
2. **Seed lot trials.** Seed lots from commercial plantings in the area will be collected and planted at the Hermiston Experiment Station to confirm the quality of potatoes. Seed lots will be viewed for seed

borne disease issues. Plants infected with PVY will be sampled and the strain confirmed. A report will be provided to all growers who submit a sample, listing the seed lot and any problems that seed lot might have. Growers will be invited to visit the lots planted on HAREC.

ANTICIPATED BENEFITS/OUTCOMES/INFORMATION TRANSFER:
Growers will be given information regarding the diseases in their fields based on the samples provided the plant pathology laboratory. Issues of importance found during diagnosis will be provided to the industry as a whole and recommendations for control. Information will be provided by weekly information via email and will be provided at growers meetings. Information will be provided to all growers who submitted seed lots for grow out.

PROJECT TIMELINE:
March –May Seed lots will be collected and planted
June –Aug Seed lots will be read for seed borne related issues
March-December Samples will be submitted to the plant pathology laboratory for diagnosis

2013-14 BUDGET:

	OPC
Salaries: Faculty	$6,000
Graduate student	
Other students	$4,000
Other labor	
Employee Benefits (OPE): Faculty	$3,000
Graduate student	
Other students	320
Other labor	
Equipment	
Travel: Domestic (in state)	$1,000
Domestic (out of state)	
Foreign (conferences, etc.)	
Operating Expenses	$3,200
Other Expenses	
Total	$17,520

ANTICIPATED REQUESTS IN COMING YEARS:
2016-2017: 18,000 **2017-2018:19,000**

OTHER SUPPORT OF PROJECT: None

Title: Evaluation of Potato Insect Pest Management Programs

Year Initiated 2014 **Current Year** 2015 **Terminating Year** 2017

Personnel:
Principal Investigators:
Stuart Reitz, Oregon State University, 541-881-1417, stuart.reitz@oregonstate.edu, 710 SW 5th Ave., Ontario, OR 97914
Silvia Rondon, Oregon State University, 541-5678321, silvia.rondon@oregonstate.edu, 2121 S First Street, Hermiston, OR 97838
Alan Schreiber, Agriculture Development Group, Inc., 509 266 4348, aschreib@centurytel.net, 2621 Ringold Road, Eltopia, WA 99330
Tim Waters, Washington State University Extension, 509 545-3511, twaters@wsu.edu, 404 W Clark Ave, Pasco, WA 99301
Erik Wenninger, University of Idaho, 208-423-6677, erikw@uidaho.edu, 3806 N 3600 E, Kimberly, ID 83341

FUNDING REQUEST FOR 2015-2016:
Reitz, OSU - $24,307
Rondon, OSU - $26,656
Schreiber, ADG - $25,000
Waters, WSU - $17,500
Wenninger, UI - $24,000

Justification: A number of insect pests negatively affect yield and quality of potatoes throughout the Pacific Northwest (PNW), although the distribution and intensity of infestations vary by location and year. The number of insect pests is increasing. In the early nineties, recognized insect pests of potatoes included wireworms, Colorado potato beetles, aphids, and two-spotted spider mites. Other species that have become a problem or have been recognized more recently (since the mid-nineties) include thrips, cutworms, loopers and armyworms, potato tuberworm (2004), beet leafhopper (2005), potato psyllid (2011), and stink bug (2013). With the increase in pest species, loss of products such as Monitor and Temik, and the rapid introduction of several new insecticidal products, control of potato insects has become increasingly complicated.

Historically, the primary drivers of product choice have been price and efficacy, but factors such as spectrum of control and mode of action increasingly influence growers' decisions as well. Complicating grower choice is the lack of efficacy and use pattern information on most new products for several pest species. One example of this is that although the label allows chemigation of Movento (spirotetremat), one of the most widely used potato insecticides, neither the registrant nor entomologist-based control guidelines support this use pattern due to lack of knowledge of whether chemigation is effective.

The recent emergence of potato psyllid, vector of the pathogen that causes zebra chip, as a serious threat to PNW potato production has fundamentally changed insect control strategies and has effectively ended traditional integrated pest management programs. Growers have no

tolerance for potato psyllid with an action threshold of detection at any level triggering a season-long control program. Many growers at risk of potato psyllid are designing their insect management programs around control of this one pest and fitting in control of other insect pests around psyllid management strategies. Since 2012, psyllids have become the cornerstone insect pest of potatoes for many growers.

There are a number of unanswered questions regarding biology and management of potato psyllid, but growers need to know which products will control potato psyllid, how and when to best deploy these products, and effects these products will have on other insect pests and beneficials.

Objectives.
1) Generate efficacy data on products and programs for control of potato psyllids.
2) Examine the effects of insecticides that target potato psyllid on chemical control strategies for other insect pests.
3) Determine if potato psyllid control foments outbreaks of other insect pests.
4) Determine the effect of potato psyllid control on natural enemies of psyllids and other pests.

Procedures: A team of entomologists has been assembled to conduct a set of regional efficacy trials conducted using essentially identical testing procedures. The locations are south-central Idaho, Malheur County, Columbia Basin of Oregon, and two locations in Washington's Columbia Basin. The team will select a common set of treatments and test them in all locations.

We propose to use trial methods similar to those used in our initial trial in 2014. We expect to include the following details:

- Treatments will be season long and will focus on psyllids as a primary target.
- Not only will we count psyllid eggs, nymphs and adults, but we also will collect data on thrips, aphids, mites (beneficial and predaceous), whiteflies, potato tuberworm, Colorado potato beetles, and other insect pests (the specific pests sampled at each location will vary according to region-specific pest complexes). Beneficial and pest counts will be collected at the plot level at first detection of psyllids.
- To foster other research projects that are characterizing interactions between psyllids and Lso, the bacterium that causes zebra chip disease, psyllid samples will be submitted to cooperating researchers to test for the presence of Lso and for psyllid biotype, using established protocols.
- Tubers will be evaluated at harvest for symptoms of zebra chip. Presence of zebra chip will be confirmed by laboratory analysis.
- Treatments will be applied on a 14-day schedule, with a 7-day sampling interval. This sampling protocol will enable us to examine residual strengths of the different chemistries.
- Adult psyllids will be collected using an inverted leaf blower. These vacuum samples will also be used to assess populations of most other pest and beneficial species. Immature psyllid stages (eggs and nymphs) will be measured by examining leaf samples (n=10) weekly. Leaf samples will be used to assess populations of certain other species, such as mites and immature whiteflies. We will collect ten full leaves per plot per week.

- Plots will be 4 rows by 25 feet long with an alley way on each end of the plots. Vacuum samples will come from the outside rows, leaf samples will come from the inside two rows. Tuber samples will come from the inside two rows.
- Treatments will be replicated 4 times using a RCBD method.
- No at-plant insecticides will be applied for maintenance purposes. Maintenance insecticides, fungicides, and herbicides will be applied as needed. Prior to applying maintenance insecticides across the entire trial, care will be taken to ensure no interference with psyllid control (in case of high CPB levels, Coragen will be used at the highest labeled rate.)
- All applications by ground, except for the central Columbia Basin site (Schreiber), which will be applied by chemigation.

Treatment List. Product followed by rate and treatment interval. Justification for inclusion in italics. Eleven treatments with ten different modes of actions (every treatment is a different mode of action). This is not a final decision; we welcome input on whether different or additional products should be included. However, each additional treatment would cost roughly $2,000 per treatment, per location, more ($10,000 collectively).

1. UTC
2. Abamectin (6 fl oz) plus Movento (5 oz), followed by Movento (5 oz). *This is the recommended use for Movento in the PNW guidelines and by the registrant. Because the product has no activity against adults, it is recommended that an adulticide be used in combination with its first application.*
3. Abamectin (6 fl oz) every 14 days. *This has one of the most commonly used insecticides for psyllid and so should be included in the trial to see how it performs.*
4. Exirel (0.88 lbs ai), every 14 days. *Preliminary data for this new product are encouraging. We expect there will be a great deal of interest from growers in seeing its performance across the PNW.*
5. Blackhawk (3.5 fl oz), every 14 days. *Although this new product is an older a.i., it has a different mode of action from other products in the trials. It is a relatively cost effective product, with good worm and CPB activity.*
6. Aza-Direct (1.5 pt), every 14 days. *This has another different mode of action, and it is an organic product.*
7. Beleaf (2.8 fl oz) every 14 days, *Beleaf has a different mode of action, and it has good aphid activity*
8. Brigade, (4 fl oz) every 14 days. *We propose to include a pyrethroid because of their lethality to beneficials. This will help us to determine if this chemistry results in outbreaks of psyllids and/or other pests as suggested by Texas researchers.*
9. Torac (14 oz) every 14 days. *This is another new product with promising preliminary results. We need to see how it performs across the PNW.*
10. Sivanto (10.5 oz) every 14 days. *Sivanto has another different mode of action. It also has good aphid and leafhopper activity.*
11. Admire Pro (8.7 oz) A single application at planting time in furrow with no foliar applications other than maintenance treatments for pest control. *This treatment will permit examination of residual effects of at planting neonicotinoids.*

COLLABORATIONS, RELATION TO WORK OUTSIDE THIS LAB OR TEAM:
The scientists involved have interacted to some degree previously to varying degrees, and worked closely together to successfully complete the first year of this tri-state project in 2014. This regional project has enabled us to work together more closely and has increased our exchange of ideas. In addition to working together, the scientists have routinely interacted with the registrants of the products involved. Besides entomologist, plant pathologist (e.g., Phil Hamm) and virologists (e.g., Alex Karasev) will be collaborating with the entire group.

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER:
We will use the results of this set of trials to improve on our existing set of recommendations on how to best control potato psyllids and other insect pests of potato.

PROJECT TIMELINE:
February – order seed; March – spring fumigation; April – prepare fields, plant plots, planting; June – begin sampling, making foliar applications; July, August – sampling, making foliar applications; September – harvest, tuber evaluation; October – data analysis; November – prepare report.

BUDGET: Please provide the following in a table format as shown, listing only the budget items appropriate for your project. Add or subtract columns/tables as needed to accommodate all scientists/labs seeking funding under this project. DO NOT attempt to indicate how much is being requested from each Commission.

	Schreiber, Central Columbia Basin	Waters, Lower Columbia Basin	Rondon, Lowest Columbia Basin	Wenninger, Idaho	Reitz, OSU, Malheur County	**Total**
Salaries: Faculty						
Graduate student						
Other students		5,698	5,000		6,970	17,768
Other labor	15,000	4,577	2,666	17,500		39,734
Employee Benefits (OPE): Faculty						
Graduate student						
Other students		555	500		837	1,892
Other labor	3,750	1,923	1,280	3,500		10,453
Equipment						
Travel: Domestic (in state)		500	500	500		1500
Domestic (out of state)						
Foreign (conferences, etc.)						
Operating Expenses [1]	6,250	4,247	16,500	2,500	16,500	45,997
Other Expenses [2]						
Total	25,000	17,500	26,446	24,000	24,307	117,344

[1] Otherwise known as "Goods and Services" or "Supplies and Materials."
[2] Capital outlays, or other needs. Please detail in footnote

Information for Oregon State University (Reitz)
Funds are requested for an undergraduate student assistant from mid-May to mid-September (17 weeks, 40 hrs / week @ $10.25 per hour; $6,970). The OPE rate is 12% ($837). The student will collect and analyze samples and record data from the trial.

Information for WSU (Waters) Funds are requested for plot establishment and maintenance (11 treatment programs at $1,500 per treatment; $16,500). This includes seed, fertilizer, fungicide and herbicide treatments, other plot maintenance and harvest costs.

Rondon-OSU
Salary: Two students 25 weeks X 8 Hrs X 12.5 per/h =5,000; 0.1 FTE Biotech III (annual salary 32,000) $2,666. OPE students 10% = 500; OPE Biotech IIII(48%)= $1280; Cost per treatment $ 1,500.

PROPOSAL to the Oregon Potato Commission

TITLE: Malheur County Extension Potato Pest Monitoring Program

YEAR INITIATED: 2013-14 **CURRENT YEAR:** 2015-2016 **TERMINATING YEAR**: Ongoing

PERSONNEL:

Stuart Reitz
Malheur County Extension
710 SW 5th Ave.
Ontario, OR 97914

FUNDING REQUEST FOR 2015-16: $5,927

JUSTIFICATION:

Potato growers throughout the Northwest face a wide array of crop management problems. Chief among these are pest and disease problems. In Malheur County, growers must contend with ongoing pest threats such as aphids and aphid-transmitted viruses, and they need to be concerned with emerging pest problems, such as potato tuberworm infestations and zebra chip disease caused by transmission of *Candidatus* Liberibacter *solanacearum* (Lso) by potato psyllids. Area-wide monitoring of these and other pests by Oregon State University Extension in Malheur County provides growers with real-time information that allows them to select and deploy the best management options for their crop. In addition to providing information on pest activity, OSU Extension will keep growers up to date on new technical developments, and will provide an science-based expertise to solve immediate production problems.

OBJECTIVES:

- Monitor populations of key potato pests across Malheur County and deliver that information on a weekly basis to potato growers, fieldmen and other interested people in the county. All fields that growers would like to have monitored will be included in the program.
- Pests to be monitored will include 1) potato psyllids, 2) aphids, 3) beet leafhoppers, and 4) potato tuberworms, 5) Colorado potato beetles, 6) thrips, and other potentially significant pests, such as spider mites and lygus bugs. Associated beneficial parasites, predators and pathogens will also be monitored, in support of developing future biologically-based IPM programs.
- Assist growers in scouting for other pests and diseases during the growing season.
- Assist growers and fieldmen with identifying and addressing other crop management issues.
- Relay information to growers and fieldmen directly through email and phone contact and post pest monitoring data in the Pacific Northwest Pest Alert Network (www.tvpestalert.net / www.pnwpestalert.net).

This is an ongoing project in which different sampling methods are used for different pests and natural enemies. For example, adult psyllids, leafhoppers and natural enemies will be monitored with appropriately placed sticky card traps, tuberworm moths will be monitored with pheromone traps, aphids will be monitored with pan traps. Immature psyllids and spider mites will be monitored via foliage samples.

PROCEDURES:

At least 25 commercial potato fields in Malheur County will be monitored from June to September (12 weeks, depending on harvest date). Funding is requested for weekly travel to these fields (~1800 miles for the season depending on field locations @ $0.57 per mile).

Aphid Monitoring – Pan trapping is a valuable tool for monitoring aphid movement into potato fields. Pan traps will be placed at 25 fields throughout potato growing areas of Malheur County. Traps will be monitored weekly and aphids will be sorted and counted by species. This information will provide a general reference for

aphid activity in the area. The survey results will be reported to growers, fieldmen, and others and through direct email/phone contact and through the Pacific Northwest & Treasure Valley Pest Alert Network (http://www.tvpestalert.net). Reports will include the proportion of key vector species (e.g., green peach aphid, potato aphid) in the total aphid captures. Based on these survey results, growers and their fieldmen can assess scouting needs for individual fields for aphids. Assistance with designing and conducting plant sampling plans for aphids will be provided to growers. Funding is requested for 12 replacement pan traps ($7.00 each).

Potato Psyllid Monitoring – Large numbers of potato psyllids were found throughout Malheur County in 2013. Although none tested positive for *Candidatus* Liberibacter *solanacearum* (the bacterial causal agent of zebra chip), it is likely that psyllids will become more of a concern in Malheur County. To help growers manage potato psyllids and zebra chip, a monitoring program will be conducted in Malheur County. Yellow sticky cards will be placed within potatoes fields (2 per field) at 25 sites throughout Malheur County. Traps will be collected and replaced weekly. In addition, systematic surveys of foliage will be made to determine the presence of immature psyllids (eggs and nymphs). The numbers of potato psyllids will be reported weekly. Aphid traps will also be examined for the presence of psyllids. As in 2014, Dr. Joe Munyaneza, USDA-ARS, has agreed to test psyllids for the zebra chip bacterium. Funding is requested to ship samples overnight to his lab (6 shipments @ $50 per shipment).

Beet Leafhopper Monitoring – Beet leafhoppers carry Beet leafhopper-transmitted virescence agent (BLTVA) phytoplasma, the causal agent of Purple Top, which has caused significant yield and quality losses in the Columbia Basin in recent years. Although BLTVA has not emerged as a severe problem in the Treasure Valley yet, its nearby presence in the Columbia Basin and the presence of the leafhopper vector in the valley indicate there is a need for a proactive monitoring program.

To monitor leafhopper populations, yellow sticky traps will be placed along borders of fields (2 per field) where other trapping is conducted. Traps will be collected and replaced weekly, and the numbers of leafhoppers will be reported weekly. Fields will be inspected for the presence of potato purple top disease (caused by BLTVA).

Funding is requested for sticky traps for monitoring for potato psyllids and beet leafhoppers with at least 4 traps placed weekly at each of 25 fields for 12 weeks (5.5” x 8” Alpha Scent Yellow Card Traps: 1200 traps at $1.20 each).

Potato Tuberworm Monitoring – Potato tuberworm populations vary greatly from field to field and from area to area. Severe economic damage from the potato tuberworm has been recorded over the past decade in the Columbia Basin growing region. In the Treasure Valley of eastern Oregon and southwestern Idaho, tuberworms were found consistently in 2013, but not at economically damaging levels.

To monitor tuberworm populations, pheromone traps will be placed in fields where other pest trapping is conducted. Traps will be collected and replaced weekly. Pheromone lures will be replaced every 4 weeks, or as needed. Funding is requested for 25 trapping stations to be monitored for 12 weeks (lures, replaced every 3 weeks; 100 per season @ 1.20 per lure).

Other Pest and Disease Monitoring – Assistance will be provided to growers and fieldmen in identifying other pest and diseases problems that they may encounter. For example, growers were given assistance in dealing with an outbreak of bacterial ring rot in 2013.

In addition to monitoring supplies, funding is requested for a student worker to assist with the project (20 hours per week, 12 weeks, @ $11 per hour: $2,640, fringe benefits (12%): $317).

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER:
In the short term, growers, fieldmen, and other interested parties will receive timely information on pest activity in Malheur County throughout the growing season. This information will help them to make the best pest management decisions for their crop.

In the long term, this monitoring program will provide information that will be useful in characterizing the population trends for established and emerging pests and diseases in Malheur County.

PROJECT TIMELINE:
Monitoring activities will be conducted throughout the growing season. Aphids typically appear in traps by the middle of June, but less is known of the seasonal dynamics of other pests in the Treasure Valley. Therefore, monitoring activities will continue for the various pests and other problems throughout the growing season (June – September). In 2014, psyllids, beet leafhoppers, aphids and potato tuberworms were detected throughout the trapping season.

LITERATURE REVIEW:
Ongoing monitoring is essential for the detection of pests and to minimize their impact on potato yield and quality (Rondon, 2012). A number of insects are important pests because they vector various pathogens to potatoes. Chief among these are the various aphid species may transmit potato viruses (Radcliffe & Ragsdale, 2002). The most important vector in the Northwest is the green peach aphid, which is the primary vector of Potato leafroll virus (PLRV). Two other insects have emerged recently as significant pests in the Northwest because of the pathogens they are now recognized to transmit. Those insect vectors are the potato psyllid, the vector of the bacterium that causes zebra chip disease, which is now present in Oregon, Idaho and Washington (Crosslin et al., 2011a; Crosslin et al., 2011b). and the beet leafhopper, the vector of potato purple top disease (Munyaneza et al., 2006). All of these vector species can cause significant damage at relatively low population levels.

Area wide monitoring is a useful tool for assessing pest activity within a region and this information from area wide monitoring enables individual growers to adjust their crop management decisions to prevailing regional conditions. This type of information becomes especially critical for insect vectors of pathogens, which can cause considerable damage at low population levels, but yet may go undetected in scouting of individual fields when those populations are low.

Another species, the potato tuberworm has become a major pest in potato production regions near Malheur County (Rondon, 2010), and our monitoring program detected it in Malheur County in 2013. Because the larvae feed in tubers, damage can accelerate in storage (Arnone et al., 1998). Therefore, detection of low level populations is important for minimizing losses at the end of the season and in storage. Small founder populations of newly invasive species may best be detected through region wide monitoring rather than scouting individual fields (MacKenzie et al., 2005). Regional sampling performed through the Extension Service is also important for providing information on emerging pests because growers may not normally scout for those species and they may not be intimately aware of how to identify new pests and the damage that they cause.

Pest monitoring programs for potatoes have been conducted in Malheur County for a number of years. Similar monitoring programs are in place in other growing regions of the Pacific Northwest. Continuation of the monitoring program in Malheur County will assist growers there and complement other regional monitoring programs.

REFERENCES

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2015-16 BUDGET:

	OPC
Salaries: Faculty	0
Graduate student	0
Other students	2,640
Other labor	0
Employee Benefits (OPE): Faculty	0
Graduate student	0
Other students	317
Other labor	0
Equipment	0
Travel: Domestic (in state)	1,026
Domestic (out of state)	0
Foreign (conferences, etc.)	0
Operating Expenses [1]	1,944
Other Expenses [2]	0
Total	$5,927

ANTICIPATED REQUESTS IN COMING YEARS (if applicable):
2016-2017: $6,000 **2017-2018: $6,100**

OTHER SUPPORT OF PROJECT: n/a

PROPOSAL

Project numbers: ARF 7252

TITLE: Monitoring potato insect pests in eastern Oregon: education, communication and dissemination of information

YEAR INITIATED: 2007 **CURRENT YEAR:** 2015-16 **TERMINATING YEAR** continuous (Note: the monitoring program started in 1972).

PERSONNEL & COOPERATORS: Silvia I. Rondon, Extension Entomologist Specialist, Associate Professor, Oregon State University (OSU), Hermiston Agricultural Research and Extension Center (HAREC), Crop and Soil Science (CSS). Phone (541) 567-8321 ext 108; Fax (541) 567-2240; cell phone: (541) 314-318; e-mail silvia.rondon@oregonstate.edu. Darrin Walenta, Associate Professor, OSU Union County Extension Office, Phone (541) 963-1010; **Staff**: Ira Thompson, OSU HAREC, Bio Tech III, Phone (541) 567-8321 ext 124; Several full time students from the IAEP program and two trappers (Quebbeman in La Grande and one TBA in Hermiston).

FUNDING REQUEST FOR 2015-16: $19,767

JUSTIFICATION: Each summer, the OSU-HAREC Irrigated Agricultural Entomology Program (IAEP) surveys for insect pests known to occur in potato growing areas in Oregon including Umatilla, Morrow, Union and Baker. It also serves as contact information for the rest of the potato areas in Oregon (Central OR, Klamath mainly). Pests such as the potato tuberworm (PTW), beet leafhoppers (BLH), aphids and more recently potato psyllids are serious potato pests that could threaten Oregon´s potato industry. Early detection of these pests allows growers to be proactive in managing these pests. Surveys provide both, commercial and seed producers, **a weekly area-wide indication of pests' populations and movement that can be used to guide and complement growers' own field scouting.** The insect pest survey provides the potato industry with current information about location of important insect pest populations in the Columbia Basin. Two routes are set up to monitor insects, one in Umatilla/Morrow counties (34 sites) and one in Union/Baker counties (27 sites). In Washington, Carrie Wohleb (Washington State University) runs two insect trapping routes: one in the North Basin and one in the South Basin. In Idaho, Erik Wenninger (University of Idaho) conducts similar trapping system. Before the beginning of the field season, Carrie, Erik and other researchers from the Pacific Northwest get together to discuss sampling protocols. OR and WA data combined allowed us to establish distribution of potato pests in the lower and upper Columbia Basin (DeBano et al. 2009, Murphy et al. 2012, Walenta et al. in progress).

The "traditional" **Insect monitoring program for eastern Oregon** (2007-present) has a "built-in" strong Extension component that can immediately disseminate useful results to stakeholders throughout Oregon and beyond through web resources. For example, an insect ID resource webpage has been established at our OSU website (http://extension.oregonstate.edu/umatilla/insect-id). This website is our effort to link research, extension, and clientele communities involved in IPM and biological control, regardless of geographical location. Our long term goal is to continue disseminating information through field days, grower meetings, trade shows, trade publications, bulletins, and websites. Since 2009, we are including insect identification workshops targeting small focus groups. Feedback from participants has been extremely positive regarding our training and extension efforts. Two workshops are planned for 2015.

HYPOTHESIS & OBJECTIVES:

Our sampling and extension information are important for farmers and pest managers because it helps them understand insect activity in their crops and fields before they can make cost-effective and environmentally sound pest management decisions: action is taken against a pest unless the pest is present and poses a threat to the crop.

1) Monitor PTW, BLH, aphids and potato psyllids in Morrow/Umatilla counties; aphids and potato psyllids in Union/Baker counties.
2) Educate, communicate, and disseminate information about these pests and other potato pests to the industry.

PROCEDURES:

Objective 1. *Monitor PTW, BLH, aphids and potato psyllids in Morrow/Umatilla counties; aphids in Union/ Baker counties*. Pheromone delta traps, yellow buckets, and yellow sticky cards will be used to survey PTW, aphids, and BLH, respectively. Potato psyllids will be surveyed using a DVAC and sticky cards. Traps will be checked and replaced weekly beginning in early April and maintained through late October in Umatilla/Morrow counties. In Union/Baker counties traps will be placed in early June until end of September. PTW lures are purchased from Trece (http://trece.com/); BLH from Cascade Ag (Wenatchee, WA (509) 663-3461); yellow buckets from local stores (i.e. Home Depot, Ace). Our standard protocol for potato psyllids is to DVAC 5 minutes 5-10 feet from the edge of the field (see YouTube videos here http://oregonstate.edu/dept/hermiston/silvia-rondon). Potato psyllid samples are stored dry in vials for detection of Liberibacter (bacteria that causes Zebra Chip). The idea is to develop not only population curves for the potato psyllids but also for the bacteria. We have being using insects collected for several studies including haplotyping in Oregon (manuscripts from Cating et al, in progress; Walenta et al, in progress).

For information about trapping data: Umatilla/Morrow counties information can be found at http://oregonstate.edu/dept/hermiston/trap-reports; for Union/Baker counties http://extension.oregonstate.edu/union/ag/potatoaphid. All reports are emailed and made available for local growers, field men and general public. Currently, our mailing list contains more than 254 members from Oregon, Washington, Idaho, Montana, Florida, New York and overseas (i.e. Australia, New Zealand, Mexico).

Objective 2. *Educate, communicate, and disseminate information about these pests and other potato pests to the industry.* During and upon completion of the project our findings will be made available to growers, extension agents, and crop consultants for immediate use. Information will be published in relevant articles in potato newsletter, potato magazines, and other journals. We will use the OSU Entomology-HAREC website (http://oregonstate.edu/dept/hermiston/silvia-rondon) to post updates on potato pests on a regularly basis. We will present research results and information to grower and industry groups throughout the year at growers meetings, county meetings and annual meetings. During the 2015 Farm Fair meeting in Hermiston, a survey will be conducted on all stakeholders to evaluate if growers will find useful to use apps and/or remote access to get weekly reports via wireless communication technology (e.g. smart phones, IPads, etc.). I am interested in developing apps in 2016 for potato pests only if clientele is interested. “Bugwoodapps” can potentially work with us.

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER:

Since 2006, the OSU-HAREC-IAEP (Rondon’s program) in Hermiston has been conducting this survey (http://oregonstate.edu/dept/hermiston/trap-reports). Survey information has helped growers and field men more effectively planned their individual control programs. Our information provides growers and pest managers a “warning” system; they are still encouraged to set their own traps. Our program is a continuous source of information for potato growers throughout Oregon, Washington and beyond. We are pleased to have increased the number of clientele coming to our laboratory facilities, emailing or calling, etc, inquiring about information regarding pests’ issues, etc.

PROJECT TIMELINE: 1 Mar 2015 - 28 Feb 2016

Activities	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Purchase material for trapping season	x											
Set up traps in Umatilla/Morrow		x										
Set up traps in Union/Baker				x								
Pick up traps in Umatilla/Morrow								x				
Pick up traps in Union/Baker							x					
Summarize trapping data										x		
Present trapping data (reports, presentations)											x	
Extension (communication, newsletter, insect identification free for OR growers, website, etc)	x	x	x		x	x	x	x	x	x	x	x
Workshops		x	x									
Survey									x	x		

2015-16 BUDGET: Please provide the following in a table format as shown, listing only the budget items appropriate for your project.

	OPC
Salaries[1]**:** Faculty	
Graduate student	
Other students	5,952
Other labor	2,438
Employee Benefits (OPE): Faculty	
Graduate student	
Other students	595
Other labor	1,512
Equipment	
Travel[2]: Domestic (in state)	7,570
Domestic (out of state)	700
Foreign (conferences, etc.)	
Operating Expenses [3]	
Other Expenses [4]	1,000
Total	19,767

[1]0.125FTE @ $2,438 plus 62% fringe benefit $1,512 = $3,950. FRA will provide labor for organizing, getting supplies, setting up traps, etc. BioTech III will also tabulate data. [3]Hourly worker salary X 2 @ $12/hour plus 10% fringe benefit is also requested = $12/hr X 31 weeks X 8 hrs = $5,952 + 10% fringe $

595 = $6,547. [2] Cost per mile $0.555. Travel money requested to go to the field, collection travel in state; out state to attend OR/WA/ID consortium meetings. Average 220 miles per week X two locations X 31weeks; [3]Sticky cards, vials, alcohol, PCR material; [4]General cost for handouts, paper, photo paper, one peer reviewed publication.

ANTICIPATED REQUESTS IN COMING YEARS (if applicable):
2016-2017: 3% increased **2017-2018:** 3% increased

OTHER SUPPORT OF PROJECT:
TASC will be providing $18,939 for the potato psyllid trapping portion and research objectives not listed on this proposal.

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