

**Washington State University Department of Plant Pathology  
Field Plant Pathology (PI P 525), 3 credits  
Summer 2016 Course Syllabus**

Prof. Lindsey J. du Toit, Course Coordinator/Instructor  
WSU Mount Vernon NWREC  
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Mount Vernon, WA 98273-4768  
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***In case of emergency:***  
**360-391-2407 (Lindsey du Toit) or 509-335-4852 (Cheryl Hagelganz)**

Course Objectives:

The objective of this course is to *familiarize students with the diversity of fruit, vegetable, grain, forestry, and ornamental crops grown in Washington State, the nature and diagnosis of diseases affecting these crops, and diverse aspects of field plant pathology and extension*. Students will observe a wide variety of cropping systems and agro-ecosystems, and will interact directly with faculty, extension personnel, growers, consultants, regulatory agents, and other stakeholders involved in plant disease research, extension, consulting, and regulation. Refer to the ‘Specific Learning Objectives’ detailed below.

The course includes 2 separate weeks of travel across Washington State by bus.

**Week 1: 13-17 June 2016**

**Week 2: 11-15 July 2016**

Students travel together in the same bus, except as approved in advance by the instructor. It is very difficult to accommodate students missing components of the course because of travel across the state for the duration of the course. In addition, the bus is equipped with a microphone, which is used to engage in discussions with the instructor and other students while traveling between sites. Accommodation will be provided the nights students are not in Pullman.

<http://plantpath.wsu.edu/students/courses/plp-525-field-plant-pathology-and-mycology/>

2016 Course Itinerary:

Date	Location	Start time	Plant disease subject area(s)	Instructors & guests ( <i>direct contact hours</i> )	Accommodation & comments
June 13	Pullman	8:30 am	Course introduction	Lindsey du Toit (1.5 h)	
		10:00 am	Plant diagnostics, first detector training	Rachel Bomberger (1.5 h)	
		12 pm	Lunch (on your own)		
		1 pm	Diseases of grains	Tim Murray (3 h)	
	Drive to Prosser	4 pm			Prosser
June 14	Prosser	8 am	IAREC welcome	Gary Grove (0.5 h)	
		8:35 am	Hop downy mildew	Mark Nelson (1-1.5 h)	

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		10 am	Cherry diseases, Zirkle Fruit packing house	Claudia Probst (2.5 h)	
		1 pm	Lunch		
		2 pm	Field & experimental design	Lindsey du Toit (3 h)	
	Drive to Puyallup	5 pm			Puyallup
June 15	Puyallup	8 am	Molecular Biosciences Lab, Biosafety Level II containment facility tour (sudden oak death research)	Katie Coats, Gary Chastagner, Marianne Elliott, Andrea Garfinkel, Katie McKeever (2 h)	
		10 am	Plant & Insect Diagnostic Lab, Extension; Christmas tree, bulb, & ornamental diseases	Jenny Glass; Gary Chastagner (2 h)	
		Noon	Lunch		
		1 pm	Field tour of Christmas tree, bulb, & ornamental disease trials	Gary Chastagner, Marianne Elliott, Anna Leon, Katie McKeever (4 h)	
	Drive to Olympia	5 pm			Olympia
June 16	Drive to Mima Nursery, Olympia	8 am	Weyerhaeuser Mima Nursery (forestry)	John Browning Mike Poteet, Tom Stephens, Todd Wilson (3 h)	
	Drive to SeaTac Airport	11 am			
	Lunch	Noon			
	SeaTac	1 pm	USDA-APHIS PPQ Plant Inspection Station	Clinton Campbell, Tim St. Germain, Drew Minnis, Michael Kirkpatrick, Gary Ouellette (2 h)	
	Drive to Mount Vernon	3:30 pm			Mount Vernon
June 17	Drive to WSU Mount Vernon NWREC	8 am	Vegetable, small fruit, cider apple & cereal diseases in western WA	Debra Inglis, Whitney Garton, Lisa DeVetter, Dalphy Harteveld (3.5 h)	
		11:30 am	Vegetable seed crop production + lunch	Lindsey du Toit (1 h)	
	Drive to Burlington	1 pm	VIVA Farms	Kate Selting (1.5 h)	
	Skagit Valley	2:30 pm	Cabbage, table beet, & spinach seed crops	Lindsey du Toit (1.5 h)	
	Drive to Pullman	4 pm			
July 11	Drive to Othello from Pullman	7 am			
	WSU Othello REU	9 am	Potato and mint diseases	Dennis Johnson	
	Drive to Prosser	11 am			
		Noon	Lunch		
		1 pm	Virus control in	Rick Hamman (2 h)	

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			grapevines at Hogue Ranches		
		3:30 pm	Hop powdery mildew	Mark Nelson (1.5 h)	Prosser
July 12	Drive to Yakima	7 am			
	Yakima	8 am	WSDA Seed Lab	Victor Shaul (2.5 h)	
	Drive to Wenatchee	10:30 am			
	Wenatchee	1 pm	Tree fruit diseases	Tiana DuPont (3.5 h)	Wenatchee
July 13	Drive to Columbia Basin	7:30 am	Vegetable & seed crop diseases, Qualls Ag Lab, WA Assoc. Professional Crop Consultants, Precision Seed Production, Trout Lake Farms, Cloudview Farm	Lindsey du Toit, Carrie Wohleb, Mick Qualls, crop consultants (CBCCA), Ole Anderson, Bill Wirth, Phil & Darwin Hintz, Jim Baird (8 h)	Prosser
July 14	Prosser	8 am	Pea & bean diseases	Lyndon Porter (2 h)	
		10 am	Clean Plant Center Northwest (CPCNW), ELISA Lab	Debbie Woodbury (2 h)	
		Noon	Lunch		
		2 pm	Viruses of fruit trees	WSU Virologist (2 h)	
		4 pm	Update course journals		
	Drive to Kennewick	5 pm			
		6 pm	Dinner courtesy of Bill & Marie Cobb		Kennewick
July 15	Drive to Pasco	8 am			
	WSU Pasco Extension Farm	8:30 am	Running an Extension program	Tim Waters (1.5 h)	
	Drive to Othello	10 am			
	Othello	11 am	Private crop consulting, litigation, expert witness	Bill Cobb, Cobb Consulting (2 h)	
		Noon	Lunch		
	WSU Othello REU	1 pm	Review grower interviews & team report, finish journals (hand in today), complete course evaluation form	Lindsey du Toit (2 h)	
	Return to Pullman & RECs	3 pm			

**Total direct contact hours of students with instructor/guests: ~68 hours** (excluding the 3-hour interview each team of students completes with a grower, regional extension specialist, and the course instructor for preparing their disease management report; and excluding time on the bus discussing sites visited and related plant pathology topics).

Participating WSU faculty and areas of expertise:

Faculty	Location	Crops
Rachel Bomberger	WSU Pullman	WSU Pullman Plant Diagnostic Lab (509) 335-0619, <a href="mailto:plant.clinic@wsu.edu">plant.clinic@wsu.edu</a> <a href="http://plantpath.wsu.edu/diagnostics/">http://plantpath.wsu.edu/diagnostics/</a>
Gary Chastagner, Andrea Garfinkel,	WSU Puyallup REC	Ornamentals, Christmas trees, ... <a href="http://puyallup.wsu.edu/ppo/sod/">http://puyallup.wsu.edu/ppo/sod/</a>

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Katie McKeever, Marianne Elliott		<a href="http://puyallup.wsu.edu/ppo/obr.html">http://puyallup.wsu.edu/ppo/obr.html</a> <a href="http://puyallup.wsu.edu/ppo/ctr.html">http://puyallup.wsu.edu/ppo/ctr.html</a> <a href="http://puyallup.wsu.edu/ppo/madrone/">http://puyallup.wsu.edu/ppo/madrone/</a> (253) 445-4528, <a href="mailto:chastag@wsu.edu">chastag@wsu.edu</a>
Katie Coats	WSU Puyallup REC	Molecular Biosciences Lab (253) 445-4601, <a href="mailto:kpcoats@wsu.edu">kpcoats@wsu.edu</a>
Lindsey du Toit	WSU Mount Vernon NWREC	Vegetables, seed crops (360) 848-6140, <a href="mailto:dutoit@wsu.edu">dutoit@wsu.edu</a> <a href="http://www.mountvernon.wsu.edu/VSP/VSP_team.htm">http://www.mountvernon.wsu.edu/VSP/VSP_team.htm</a> <a href="http://mtvernon.wsu.edu/path_team/vegpath_team.htm">http://mtvernon.wsu.edu/path_team/vegpath_team.htm</a>
Director, Clean Plant Center – Northwest; Debbie Woodbury, Program Coordinator; Syam Pillai, Karen Kniep	WSU Prosser IAREC	Grape, hop, stone fruit viruses, Clean Plant Center Northwest (509) 786-9242 (Debbie Woodbury) <a href="http://healthyplants.wsu.edu/">http://healthyplants.wsu.edu/</a>
Jenny Glass	WSU Puyallup REC	Plant & Insect Diagnostic Lab <a href="http://puyallup.wsu.edu/plantclinic/index2.html">http://puyallup.wsu.edu/plantclinic/index2.html</a> (253) 445-4582, <a href="mailto:glass@puyallup.wsu.edu">glass@puyallup.wsu.edu</a>
Gary Grove/Claudia Probst	WSU Prosser IAREC	Grape and fruit tree diseases (509) 786-9283, <a href="mailto:grove@wsu.edu">grove@wsu.edu</a> <a href="http://plantpath.wsu.edu/people/faculty/grove/">http://plantpath.wsu.edu/people/faculty/grove/</a>
Dalphy Harteveld	WSU Mount Vernon NWREC	Small fruit pathology (360) 848-6157, <a href="mailto:doc.harteveld@wsu.edu">doc.harteveld@wsu.edu</a>
Debra Inglis	WSU Mount Vernon NWREC	Vegetable diseases (360) 848-6134, <a href="mailto:dainglis@wsu.edu">dainglis@wsu.edu</a> <a href="http://mountvernon.wsu.edu/plant_pathology/plant_path.htm">http://mountvernon.wsu.edu/plant_pathology/plant_path.htm</a> <a href="http://mtvernon.wsu.edu/path_team/vegpath_team.htm">http://mtvernon.wsu.edu/path_team/vegpath_team.htm</a>
Dennis Johnson, David Wheeler, Zack Frederick	WSU Pullman	Potato and mint diseases (509) 335-3753, <a href="mailto:dajohn@wsu.edu">dajohn@wsu.edu</a> <a href="http://classes.plantpath.wsu.edu/dajohn/">http://classes.plantpath.wsu.edu/dajohn/</a>
Stephen Jones	WSU Mount Vernon NWREC	Cereal breeding, bread lab (360) 848-6144, <a href="mailto:joness@wsu.edu">joness@wsu.edu</a> <a href="http://plantbreeding.wsu.edu/index.html">http://plantbreeding.wsu.edu/index.html</a>
Don McMoran	WSU Skagit Co.	Potato, vegetables, vegetable seed (360) 428-4270, <a href="http://skagit.wsu.edu/Agriculture/index.htm">http://skagit.wsu.edu/Agriculture/index.htm</a>
Whitney Garton	WSU Mount Vernon NWREC	Anthrachnose of cider apple trees (360) 848-6150, <a href="mailto:whitney.garton@wsu.edu">whitney.garton@wsu.edu</a> <a href="http://vegetables.wsu.edu/">http://vegetables.wsu.edu/</a>
Tim Murray	WSU Pullman	Wheat/grains (509) 335-7515, <a href="mailto:tim.murray@wsu.edu">tim.murray@wsu.edu</a> <a href="http://plantpath.wsu.edu/people/faculty/murray/">http://plantpath.wsu.edu/people/faculty/murray/</a>
Mark Nelson	WSU Prosser IAREC	Hop diseases (509) 786-9254, <a href="mailto:mark_nelson@wsu.edu">mark_nelson@wsu.edu</a>
Lyndon Porter	USDA ARS	Legume and potato diseases (509) 786-9237, <a href="mailto:lyndon.porter@ars.usda.gov">lyndon.porter@ars.usda.gov</a>
Naidu Rayapati	WSU Prosser IAREC	Grape virology (509) 786-9215, <a href="mailto:naidu@wsu.edu">naidu@wsu.edu</a> <a href="http://wine.wsu.edu/research-extension/plant-health/virology/">http://wine.wsu.edu/research-extension/plant-health/virology/</a>
Tiana DuPont	WSU Wenatchee TFREC	Fruit tree Extension (509) 663-8181 ext. 211, <a href="http://www.tfrec.wsu.edu/">http://www.tfrec.wsu.edu/</a>
Lisa Wasko	WSU Mount Vernon	Small fruit horticulture

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DeVetter	NWREC	(360) 848-6124, <a href="mailto:lisa.devetter@wsu.edu">lisa.devetter@wsu.edu</a> <a href="http://smallfruits.wsu.edu/">http://smallfruits.wsu.edu/</a>
Tim Waters	WSU Franklin/Benton Counties	Vegetables, seed crops: <a href="http://county.wsu.edu/benton-franklin/agriculture/plants/Pages/default.aspx">http://county.wsu.edu/benton-franklin/agriculture/plants/Pages/default.aspx</a> 509-545-3511, <a href="mailto:twaters@wsu.edu">twaters@wsu.edu</a>
Carrie Wohleb	WSU Grant/Adams Counties	Potato, vegetables, vegetable seed: <a href="http://county.wsu.edu/grant-adams/Pages/default.aspx">http://county.wsu.edu/grant-adams/Pages/default.aspx</a> (509) 754-2011 x 413, <a href="mailto:cwohleb@wsu.edu">cwohleb@wsu.edu</a>

Other guests:

<b>Name</b>	<b>Location/Program</b>	<b>Crops/expertise</b>
Ole Anderson	Rijk Zwaan, Quincy	Vegetable seed crops
Clinton Campbell, Tim St. Germain (Supervisor), Drew Minnis (Plant Pathologist), Michael Kirkpatrick (Botanist), Gary Ouellette (Entomologist)	USDA APHIS PPQ, Seattle Plant Inspection Station, SeaTac Airport	Plant Pathology, Botany, Entomology, Overall supervision of PPQ facility and function 835 S. 192 <sup>nd</sup> St., Suite 1600m, SeaTac. Tel: (206) 878-6658 <a href="http://www.aphis.usda.gov/">http://www.aphis.usda.gov/</a>
John Browning, Anna Leon, Mike Poteet, Tom Stephens, Todd Wilson	Weyerhaeuser forestry nursery	Forestry. Tel: (360) 330-1721 or (360) 561-5531 (cell) <a href="http://www.weyerhaeuser.com/">http://www.weyerhaeuser.com/</a>
Mick Qualls	Qualls Ag Lab, Ephrata	Private agricultural research: <a href="http://gal-lab.com/">http://gal-lab.com/</a>
Kate & Rob Smith	Viva Farms, Skagit Co.	WSU Latino Farming Program: <a href="http://www.vivafarms.org">www.vivafarms.org</a> , <a href="mailto:rob@vivafarms.org">rob@vivafarms.org</a> (360) 428-4270 ext. 223, <a href="http://smallfarms.wsu.edu/immigrant-farmers/">http://smallfarms.wsu.edu/immigrant-farmers/</a>
Victor Shaul	WA State Dept. of Agric. Seed Program Manager	Seed crops (seed certification, testing, etc.). <a href="http://agr.wa.gov/inspection/seedinspection/">http://agr.wa.gov/inspection/seedinspection/</a>
Bill Wirth/Troy Hesse	Precision Seed Production, LLC, Ephrata	Seed crops (vegetable, sunflower, canola, sugar beet, etc.) <a href="http://precisionseed.com/">http://precisionseed.com/</a>
WA Assoc. of Professional Crop Consultants	Contact: Pascal Bolduc, Friehe Farms	Diversity of crops in WA State: <a href="http://www.wapcc.org/">http://www.wapcc.org/</a>
Phil Hintz, Darwin Hintz	Trout Lake Farms, Ephrata	Diverse organic medicinal herb farm <a href="http://www.troutlakefarm.com/">http://www.troutlakefarm.com/</a> , <a href="mailto:phil@troutlakefarm.com">phil@troutlakefarm.com</a> , <a href="mailto:darwin.hintz@troutlakefarm.com">darwin.hintz@troutlakefarm.com</a>
Jim Baird	Cloudview Farm	Diverse, animal/cropping organic farm; experiential organic farming education center 14054 Rd. 11 SW, Royal City, WA 99357 (509) 760-4777, <a href="mailto:jimbaird@aol.com">jimbaird@aol.com</a>
Rick Hamman	Director of Viticulture, Hogue Ranches & Mercer Estate Winery, Prosser	Grapevines <a href="mailto:rickh@hogueranches.com">rickh@hogueranches.com</a>
Bill Cobb	Cobb Consulting	(509) 521-1306, (509) 783-3429
Various farmers/farm managers	Various farms in Washington State	Diverse crops. Student groups choose a farmer to interview from a list of farmers selected by Lindsey du Toit (see below).

Accommodation:

- Prosser Best Western: 509-786-7977. 259 Merlot Drive, Prosser, WA 99350 (nights of 13 June, 11 July, and 13 July)

- Puyallup Best Western: (253) 848-1500. 620 South Hill Park Drive, Puyallup, WA 98373 (14 June). Some students will stay at the Fairfield Inn & Suites by Marriott: (253) 770-3100. 202 15th Ave SW, Puyallup, WA 98371
- Olympia Best Western: (360) 956-1235. 5188 Capitol Blvd SE, Tumwater, WA 98501 (15 June)
- Mount Vernon Best Western: 360-428-5678. 2300 Market Street, Mount Vernon, WA 98273 (16 June)
- Wenatchee Holiday Inn: (866) 460-7456. 1921 N. Wenatchee Avenue, Wenatchee, WA 98801 (12 July)
- Kennewick Best Western Plus: (509) 586-1332. 4001 W. 27<sup>th</sup> Ave., Kennewick, WA 99337 (14 July)

WSU Research & Extension Centers:

- WSU Mount Vernon NWREC: 360-848-6120. 16650 State Route 536, Mount Vernon, WA 98273. <http://mtvernon.wsu.edu/>
- WSU Prosser IAREC: 509-786-2226. 24106 N. Bunn Rd., Prosser, WA 99350. <http://cahnrs-cms.wsu.edu/prosser/Pages/default.aspx>
- WSU Puyallup REC: 253-445-4501. 2606 W Pioneer, Puyallup, WA 98371. <http://www.puyallup.wsu.edu/index.html>
- WSU Wenatchee TFREC: 509-663-8181. 1100 N. Western Ave., Wenatchee, WA 98801. <http://www.tfrec.wsu.edu/>

Expenses:

Hotel expenses (6/13-6/16 and 7/11-7/14) will be covered by the Dept. of Plant Pathology. Each student is responsible for their own meal expenses, although some meals may be provided by hosts visited at particular facilities.

Course Requirements:

1. **Attendance:** Attendance is required for the entire course unless alternative arrangements are made in advance with approval of the instructor. However, as noted above, it is very difficult to accommodate students missing components of the course because of traveling in a bus across the state for almost the entire duration of the course. Students that have to miss one or two days of the course will be required to make up for the missed component with additional assigned readings and journal entries relevant to the topics of the sites visited on the days missed. Students are expected to be punctual, prepared, and courteous of the time commitment and effort of the various guests involved in the course.
2. **Readings:** No textbook is assigned for the course. However, students will receive plant pathology-related papers (refer to the list of required reading below) to read during the course that cover various aspects of field plant pathology. Students are expected to read these papers as they are assigned over the duration of the course, and discuss the papers while traveling on the bus. In addition, each student will write at least 1 paragraph in their journal (see below) on each of the assigned readings. The journal entry should describe the student's personal interpretation of each



paper, including their perceived value/understanding of the information presented in relation to the sites visited and information presented by the course guests.

**Required reading (*hard copies will be provided to each student*):**

Extension and the Land Grant mission (7 readings):

- a. Durst, P. 2012. Morrill Act turns 150 years old. Michigan State University Extension. [http://msue.anr.msu.edu/news/morrill\\_turns\\_150\\_years/old/](http://msue.anr.msu.edu/news/morrill_turns_150_years/old/)
- b. Gould, F. I., Steele, D., and Woodrum, W. J. 2014. Cooperative Extension: A century of innovation. *Journal of Extension* 52 (1), Article # 1COM1.
- c. Jardine, D. 2014. Seamn Knapp: Father of the Cooperative Extension Service. *Phytopathology News* 48:66 (Editor's Corner).
- d. Horsfall, J.G. 1980. A Perspective. *Plant Disease* 1:9 (Editorial).
- e. Everts, K. L., Osborne, L., Gevens, A. J., Vasquez, S. J., Gugino, B. K., Ivors, K., and Harmon, C. 2012. Extension plant pathology: Strengthening resources to continue serving the public interest. *Phytopathology* 102:652-655 (Letter to the Editor).
- f. Perkowski, M. 2015. Extension Service - A new role. *Capital Press* 88 (19), Friday, May 8, 2015.
- g. Gent, D. H., de Wolf, E., and Pethybridge, S. J. 2011. Perceptions of risk, risk aversion, and barriers to adoption of decision support systems and integrated pest management: An introduction. *Phytopathology* 101:640-643.

Field plant pathology, education and careers in plant pathology (4 readings):

- h. Jardine, D. 2011. The woes of field research. Editor's Corner, *Phytopathology News* 45:110. (Also two related letters to the editor submitted by other plant pathologists in Vol. 45:127, 163.)
- i. Gadoury, D. M., Andrews, J., Baumgartner, K. B., Burr, T. J., Kennelly, M. M., Lichens-Park, A., MacDonald, J., Savary, S., Scherm, H., Tally, A., and Wang, G.-L. 2009. Disciplinary, institutional, funding, and demographic trends in plant pathology. What does the future hold for the profession? *Plant Disease* 93:1228-1247.
- j. MacDonald, J., Allen, C., Gadoury, D., Jacobi, W., Kelemu, S., Moyer, J., Murray, T., Ong, K., Pearson, C., Sherwood, J., and Vidaver, A. 2009. Education in plant pathology. Present status and future challenges. *Plant Disease* 93:1238-1251.
- k. Ouimette, D. 2011. Demographic trends in plant pathology – An industry perspective. *Phytopathology News* 44:140, 146.

Disease assessment (3 readings):

- l. Bock, C. H., Wood, B. W., and Gottwald, T. R. 2013. Pecan scab severity – effects of assessment methods. *Plant Disease* 97:675-684.
- m. Hartung, K., and Piepho, H.-P. 2007. Are ordinal rating scales better than percent ratings? A statistical and “psychological” view. *Euphytica* 155:15-26.
- n. Bock, C. H., Poole, G. H., Parker, P. E., and Gottwald, T. R. 2010. Plant disease severity estimated visually, by digital photography and image analysis, and by hyperspectral imaging. *Critical Reviews in Plant Science* 29:59-107.

Plant diagnostics (5 readings):

- o. Skoglund, L. G., and Blunt, T. 2012. The Diagnostic Lab Experience. APSnet Features. 6 pp.  
<http://www.apsnet.org/publications/apsnetfeatures/Pages/diagnostician>
- p. Washington State University Extension Commercial Plant Disease Identification Form; also documents on plant diagnoses provided by WSU Plant Diagnosticians, Rachel Bomberger and Jenny Glass, at their site visits.
- q. McCauley, A., Jones, C., and Jacobsen, J. 2009. Plant nutrient functions and deficiency and toxicity symptoms. Nutrient Management Module No. 9, Montana State University Extension 4449-9. 16 pp.
- r. Vitosh, M. L., Warncke, D. D., and Lucas, R. E. 1994. Secondary micronutrients for vegetables and field crops. Michigan State University Extension E-486. 18 pp.

Chemical and biological aspects of disease management (3 readings):

- s. PNW Plant Disease Management Handbook – various sections on pesticide use in disease management: <http://pnwhandbooks.org/plantdisease/pesticide-articles>
- t. Noling, J.W. 2011. Movement and toxicity of nematicides in the plant root zone. University of Florida IFAS Extension Fact Sheet ENY-041.
- u. Deering, J. 2014. Biological break down: Biologicals 101. Seed World, 15 Oct. 2014. <http://www.seedworld.com/>

Practical aspects of experimental design (3 readings):

- v. du Toit, L. J. 2014. Why worry about experimental design. Handout for PI P 525 on practical aspects of selecting appropriate experimental designs for field and greenhouse research trials. 5 pp. This handout accompanies a field exercise in which students lay out an experiment in teams of 4-5 students, and then the teams provide constructive critique of each others' trials based on factors covered in the experimental design handout and discussion.
- w. du Toit, L. J., and Pataky, J. K. 1999. Variation associated with silk channel inoculation for common smut of sweet corn. Plant Disease 83:727-732.
- x. Casler, M.D. 2015. Fundamentals of experimental design: Guidelines for designing successful experiments. Agron. J. 107:692-705.

Case studies in field plant pathology (2 of the 3 listed will be discussed):

- y. De Leon, L., Siviero, F., Lopez, M. M., and Rodriguez, A. 2011. *Clavibacter michiganensis* subsp. *michiganensis*, a seedborne tomato pathogen: Healthy seeds are still the goal. Plant Disease 95:1328-1338.
- z. Pataky, J. K. 2010. Southern corn leaf blight epidemic: 40<sup>th</sup> anniversary. University of Illinois at Urbana-Champaign. Combined with the following journal article: Smith, D. R., Hooker, A. L., and Lim, S. M. 1970. Physiologic races of *Helminthosporium maydis*. Plant Disease Reporter 54:819-822.
- aa. *Cucumber green mottle mosaic virus* (CGMMV):
  - i. *Cucumber green mottle mosaic virus*. A Seed Production and Commercial Growers Guide. American Seed Trade Association. April 2014.
  - ii. *Cucumber green mottle mosaic virus* (CGMMV) Regulatory Options. United States Department of Agriculture Animal and Plant Health



Inspection Service – Plant Protection and Quarantine.

- iii. CGMMV Fact Sheet. Exclusion Protocols for Cucurbit (Melon, Cucumber, and Watermelon) Breeder, Stock or Commercial Seed Produced Off-Shore and Shipped into the US.

Papers produced by the American Seed Trade Association following detection in 2013 of CGMMV in cucurbit seed crops in California. This was the first documentation of the virus in the USA. The finding led to intense collaboration between USDA Animal & Plant Health Inspection Service Plant Protection Quarantine, the CA Dept. of Food & Agriculture, and seed companies producing cucurbit seed to prevent spread of the virus and develop methods to intercept potential future introductions on cucurbit seed and other material.

3. **Course journal (30% of the final grade):** Each student will receive a journal at the start of the course in which they will keep notes during the course. For each site visited and each guest speaker, students are expected to write a brief summary of what they learned – their overall impression of the visit, topic covered, speaker, etc. *Students are encouraged to be creative*, e.g., press plant samples in their journal, draw or illustrate, insert or track photos taken at the site, etc. Journal entries are not meant to be detailed, technical summaries (although students are welcome to do so if they wish), but *constructive, reflective, candid summaries* of technical, professional, and/or behavioral aspects at each visit. Journals should be reflective of a student's *intellectual curiosity*. Students are encouraged to bring a camera to document symptoms, crops, various cropping systems, guest speakers, etc.

In addition, for each assigned reading, students are expected to write at least a paragraph in their journal that describes their interpretation and perceived value of the reading in relation to field plant pathology.

On **15 July**, each student will submit their journal to the course instructor. A grade will be assigned to each student for their journal. Journals will be returned to students approximately 2 weeks after the last week of travel. Journal grading:

- 1/3<sup>rd</sup> of journal grade (10% of total grade) = documentation of learning experiences and impressions from the 18-20 sites/guests visited during the first week of the course.
  - 1/3<sup>rd</sup> of journal grade (10% of total grade) = documentation of learning experiences and impressions from the ~18 sites/guests visited during the second week of the course.
  - 1/3<sup>rd</sup> of journal grade (10% of total grade) = perception and interpretation of reading assignments. 0.5% for each of 20 readings assigned.
4. **Discussion and participation (30% of the final grade):** Students are expected to participate actively in constructive discussions during the course with other students, the instructor, and participating stakeholders. *When traveling on the bus, students are expected to discuss with each other and the instructor the assigned readings, their experience at each site, and questions that arise in relation to topics at each site visited.* A microphone is provided on the bus to facilitate discussion. This

expectation is to facilitate constructive, intellectually-stimulating discussion that builds on the diversity of experiences, technical backgrounds, and perspectives of students taking the course. The duration of bus travel facilitates establishing a rapport among students, promoted and utilized by the instructor to help students become comfortable asking questions and contributing their comments and opinions relative to issues covered in the course. Discussion grading:

- 1/3 of discussion grade (10% of total grade): student asks at least one question or otherwise engages in discussion with guests/instructor in at least 50% of the sites visited each day during the first week of the course. The instructor will track which students engage in discussion at each site.
- 1/3 of discussion grade (10% of total grade): student asks a question or engages in discussion with guests/instructor in at least 50% of the sites visited each day during the second week of the course.
- 1/3 of discussion grade (10% of total grade): student engages actively in the team conference call when interviewing the assigned grower and extension educator in preparation for writing their team disease management report. The instructor attends each team conference call with a grower and extension educator (2-3 hours/call) to document individual student's participation.

NOTE: *Inappropriate use of cell phones and other electronic devices, and/or lack of professional behavior interacting with stakeholders, guests, other students, or the instructor will result in a non-passing grade after the first warning.*

**5. Disease management report (40% of the final grade):**

- a. Students will form *groups of 4 or 5*, depending on final enrollment, based on rules provided by the instructor. Each team will prepare a disease management report.
- b. Each group must *select a crop and disease* from a list provided by the instructor in coordination with plant pathologists, growers, consultants, and extension personnel. Each group should finalize their selection *by the end of 13 June*. The crop and disease selected by each group may not be a crop or disease that any student in that group is working on as part of their MS or PhD research project. Preferentially (depending on the students enrolled), each group will include at least one MS student and one PhD student, at least one native English speaker and one non-native English speaker (to facilitate the 2-3 hour conference call with a grower, some of whom are not used to non-American accents), and at least one student with field research experience and one with molecular expertise (to ensure diversity of student backgrounds and expertise in each group).
- c. Students in each group will use *conventional resources* (scientific literature, books, internet, etc.) *as well as human resources* (growers, researchers, extension specialists, agronomists, etc.) identified during the course to gather information and prepare their reports. For the latter, students in each group will complete an *interview by phone, videoconference, or in person with the*

*grower and extension educator* selected for their report. Students are expected to work together on the report. Information from conventional resources should be gathered between the June and July weeks of travel. Each group will develop their interview questions during the interval between the two weeks of travel. The course instructor will review questions with each group over lunch or dinner during the July week of travel to refine the questions and prepare for the interview and final report.

- d. Each group must prepare a *final report* on a comprehensive, integrated management program for the disease selected. The report must include recommendations for the specific grower interviewed. The report will be sent to the grower and regional extension specialist for their review and feedback.
- e. Each report should be no longer than 10 pages, *not including figures, tables, and references, which should be placed at the end of the report*. Use single line spacing, 1" margins, size 10 or 12 font. The report must include the sections listed below (additional sections are welcome, but the main text must not exceed 10 pages). Total points = 100.
  - i. Title/cover page (1 page): 5 points
    - Common name and Latin binomial of the crop.
    - Common name of the disease.
    - Latin binomial of the pathogen.
    - Cover photos or drawings are welcome.
  - ii. Group information and formatting of the report (1 page): 15 points
    - Names and email addresses of all students in that group.
    - Role(s) of each student in preparing the report, e.g.: information gathered by each student, development of interview questions, when interviews were completed, who integrated information from the interviews into the report, each student's contribution to writing sections of the report, who edited the final report, etc. NOTE: *The grade assigned to individual students in a group will be influenced by this information and the quality of the final report, so define clearly the roles of each team member.*
    - Attention to formatting requirements for the report (page #, font, layout, reference citation formatting, figure/table formatting, etc.).
  - iii. Introduction (1 to 2 pages): 20 points
    - Background on the crop, including acreage in Washington State or the Pacific Northwest (WA, OR, ID), economic value, production methods, etc. Photos of the crop are encouraged. (5 points)
    - Background on the pathogen and disease, including biology, epidemiology, and estimated economic impact of the disease. Photos of symptoms are encouraged. (15 points)

- iv. Interview (1 to 2 pages): 15 points
- Format of the interview.
  - Method of interview (phone, videoconference, in-person).
  - Names of those interviewed, and when the interview occurred.
- Each group must review their interview questions with the course instructor and, if time permits, other teams during the second week of travel (**11-15 July**). The instructor and students will provide feedback on content, professionalism, and comprehensiveness of the interview questions. **Each group will schedule the interview with the grower and extension educator selected. The interview must be completed by 22 July.** All students in a group must participate in the interview. The instructor will attend each interview to monitor student participation and ensure professional interactions with the grower and extension specialist, but the students are responsible for directing the interview.
- v. Management practices currently used by the grower interviewed and other growers in Washington State (1-2 pages): 25 points  
Detailed description of what growers in Washington or the Pacific Northwest are doing to manage the disease, including management practices of the specific grower interviewed.
- vi. Additional management options (1-2 pages): 15 points  
Recommendations for improving management of the disease by the specific grower interviewed, including possible research projects that might lead to identifying more effective management practices or optimizing management of the disease for the grower interviewed.
- vii. List of supporting references (1 page): 5 points  
Journal articles, websites, photographs, interview dates and interviewee names, etc. **References must be cited using formatting for the journal *Plant Disease***, including internet URL's. If figures or photos are included, indicate who took each photo or the source of each photo/figure. Include a caption with each figure/photo.
- f. The report must be submitted electronically in Word or PDF format to the instructor **by 27 July. If a report is submitted after this date, each member of that group will receive a 0 grade for the report.** The instructor will give each report to the grower and extension specialist interviewed for their feedback to the group.
- g. **40% of each student's final grade** will be based on the report. The final grade for the report will be assigned by 31 July. Students will receive feedback on their reports by the end of August from the growers and extension specialists interviewed.

Specific Learning Objectives (and relevant course assignments for each objective):

At the end of this course, a student should:

1. Understand the **diversity of** fruit, vegetable, grain, forestry, and ornamental **crops** produced in Washington State, and the complexity of **cropping systems**, particularly in relation to how this affects the nature and management of diseases of these crops. (*Sites visited across Washington State and diverse guest speakers with expertise on various crops and diseases; journal assignment.*)
2. Appreciate the history and significance of the Morrill Act that was responsible for establishment of a **Land Grant University** in every state (including Washington State University), the Hatch Act that created Experiment Stations, and the Smith-Lever Act that created **Cooperative Extension** in the USA. Understand the types of research and extension programs developed to fulfill these acts, particularly in relation to helping stakeholders manage plant diseases, and the roles of extension educators, extension specialists, diagnosticians, and researchers to address disease diagnosis and management needs of stakeholders. (*5 assigned readings; discussion and engagement with diverse guest speakers with expertise on various crops and diseases; interviews with growers and extension educators.*)
3. Have observed and be able to recognize different **types of plant diseases** in Washington State, including diseases caused by fungi, bacteria, viruses, nematodes, and phytoplasmas, as well as abiotic plant problems; be familiar with a systematic approach to **diagnosing plant problems**, including resources, technical skills, and professional communication necessary for diagnoses and communication with clientele. (*Sites visited across Washington State and guest speakers and diagnosticians with expertise on various crops and diseases; 4 assigned readings.*)
4. Recognize the diversity of **career opportunities** and options in plant pathology, particularly applied/field plant pathology, and the types of skills (technical and soft skills) needed to be effective in these careers. (*Diverse guest speakers with expertise on various crops and diseases, including discussion with individual crop consultants during the second week of the course; 4 assigned readings.*)
5. Learn methods of **disease assessment**, including the use of disease rating scales, selecting units of measure and different scales of measuring disease to fulfill specific objectives of projects, avoiding confounding factors in disease ratings such as subjectivity/variation among raters, etc. (*Field and greenhouse disease rating exercises; 3 assigned readings.*)
6. Learn about chemical and biological aspects of **disease management** in organic and conventional agricultural production systems. (*3 assigned readings, discussions with guests, including crop consultants.*)
7. Understand practical aspects of selecting appropriate **experimental designs**, and assigning and carrying out treatments in research; recognize and minimize potential



confounding factors that weaken statistical robustness of experiments; learn how to critique experimental designs effectively; recognize how to address confounding issues such as potential sources of interplot interference; gain awareness of approaches to removing as much bias as possible in carrying out research and assessing diseases. *(3 assigned readings; field exercise during the first week of the course in which students set up a field trial in teams, and provide constructive critique of each team's trial design; journal.)*

8. Acquire first-hand experience and exposure to **professional communication verbally and in writing** by interacting directly with stakeholders (growers, consultants, extension educators, regulatory agents, etc.). Appreciate the degree to which professional communication, combined with technical expertise, facilitates effective careers in field plant pathology. Overcome the fear of ignorance and, instead, recognize how ignorance can serve as an opportunity to learn, if communicated professionally. Learn how to collate and evaluate resources critically for addressing plant disease issues, and how to communicate scholarly activities professionally both verbally and in writing. *(Direct verbal engagement with diverse guest speakers; conference call interviews with growers and extension educators; discussions with crop consultants during the second week of the course; preparation and writing of disease management reports; journal.)*
9. Learn to utilize diverse skills and personalities by **working in groups** to collate information from various resources, coordinate the interview of growers and extension educators, and prepare a disease management report with a group of students. *(Group interviews of growers and extension educators; preparation of group disease management reports that are edited by the instructor and reviewed by the grower and extension educator interviewed; journal.)*

Final grade:

Final grades will be assigned by **1 August**. Requirements to earn specific grades:

- A = 90% or greater
- A- = 87%
- B+ = 83%
- B = 80%
- B- = 77%
- C+ = 73%
- C = 70%
- C- = 67%
- D+ = 63%
- D = 60%

WSU Disability Statement:

Reasonable accommodations are available for students with a documented disability (<http://drc.wsu.edu>). If you have a disability and may need accommodations to fully participate in this course, please visit the Access Center (Washington Building 217) to



schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

WSU Academic Honesty:

Please visit the WSU website on academic integrity expectations of WSU students and employees (<http://conduct.wsu.edu/>). Academic integrity is the cornerstone of higher education and violations can disrupt the educational process for faculty and students. Academic dishonesty is any act of deception in which a student claims credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work. The definitions of dishonesty can be found under WAC 504-26-010(3). [Read more](#). You will be held responsible for knowing and understanding what is considered academic dishonesty. Whether intentional or unintentional, you can still be found responsible for violating university policies. “I didn’t know” is NOT an excuse and will not be considered grounds for appeal.

Inappropriate Student Behavior:

Behavior that persistently or flagrantly interferes with course activities (e.g., inappropriate use of cell phones during structured course time, consistently arriving late for scheduled activities, uncivil verbal and/or behavioral interaction with other students, instructors, or guests) is disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students’ ability to learn and an instructor’s ability to teach. A student responsible for disruptive behavior may be asked to leave the course pending discussion and resolution of the problem, and may be reported to the Office of Student Standards and Accountability.

WSU Safety:

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “**Alert, Assess, Act**” protocol for all types of emergencies and the “[Run, Hide, Fight](#)” response for an active shooter incident. Remain **ALERT** (through direct observation or emergency notification), **ASSESS** your specific situation, and **ACT** in the most appropriate way to assure your own safety (and the safety of others if you are able). Please sign up for emergency alerts on your account at [MyWSU](#). For more information on this subject, campus safety, and related topics, please view the [FBI’s Run, Hide, Fight video](#) and visit the [WSU safety portal](#).

***In case of emergency while traveling, call 360-391-2407 (instructor’s cell phone) or 911.***