Urban and Small Farms Conference Program

Thursday February 18, 2016

	GAP Workshop *Moderated by: Shawn Olsen/James Barnhill*	Beginning Farmer - Fruit Crops *Moderated by: Brent Black/ Lori Spears*	Direct marketing and Management *Moderated by: Marion Bentley/Bob Newhall*
8:00 AM	**Introduction to GAP for Small Farms** Tiffany Maughan, USU **pg. 122**	**Overview of Workshop and Introductions** Brent Black, USU **Orchard Floor Mgmt and Weed Control** Teryl Roper, USU **pg. 154**	**USDA - NRCS Conservation Planning and Farm Bill Cost Share Programs** Danny McBride, USDA-NRCS **pg. 201**
9:00 AM	**GAP Basics** Dr. Kurt Nolte, Univeristy of Arizona and Stewart Jacobson, Arizona Dept. of Ag **pg. 123**	**Nursery Tree Considerations and Rootstocks** Stuart Adams, USU **pg. 164** **Tree Training & Pruning** Sheriden Hansen, USU **pg. 174**	**USDA Farm Service Agency Programs** Steven Bartholomew, FSA **pg. 212** **USDA Rural Development Co-op Programs and Rural Business Development Grants** Jason Justesen,USU Barry Christensen, USU **pg. 213**
10:00 AM	**BREAK**		
10:30 AM	**GAP Training Continued**	**Managing Common Diseases of Fruit Trees** Marion Murray, USU **pg. 179** **IPM Strategies for Tree Fruit Insects & Mites** Diane Alston, USU **pg. 190**	**Specialty Crop Pollinator Health Updates** Joey Caputo, UDAF **pg. 223** **Overview of the Crop Insurance Program** Leticia McElroy, RMA-USDA **pg. 226** **Whole Farm Revenue Insurance** Karli Salisbury, USU **pg. 229**

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Noon	**LUNCH BREAK**		
	Irrigation Track *Moderated by: Niel Allen/Ron Patterson*	**Beginning Farmer-Alternative II** *Moderated by: Ruby Ward/Donna Minch*	**Direct Marketing & Mgmt. Continued** *Moderated by: Andree Walker-Bravo/ Supreet Gill*
1:00 PM	**Water, Land, and Irrigation: What's on Your Mind?** L. Niel Allen, USU **pg. 237**	**Organic Farm Plans - Getting the Rows Aligned** Dan Drost, USU **pg. 255**	**Food Safety Modernization Act Final Rule for Produce Safety: What Growers Need to Know** Karin Allen, USU **pg. 272**
	A Comprehensive Investigation into Urban/Small Farm Irrigation Efficiency Tyler Pratt, USU **pg. 241**	**Using *My Fi Assist* for Financial Decisions** Ruby Ward, USU **pg. 261**	
	Precision Water Stress in Tree Crops Using Thermal Imaging and Trunk Hydration Lance Stott, USU **pg. 246**		
2:30 PM	**BREAK**		
3:00 PM	**Drip Irrigation: Practical Ways to Increase Crop Production with its use** Jake Harward, USU **pg. 247**	**Production and Marketing of Specialty Ethnic Crops in Utah** Grace Henley, International Rescue Committee **pg. 269**	**Selling Produce to Schools and School Districts** Supreet Gill, Salt Lake County **pg. 280**
	Producer Irrigation Management Kelby Johnson and Braydon Johnson, Johnson Farms **pg. 248**	**Farm Incubator** Shawn Peterson, Green Urban Lunchbox **pg. 270**	**Producer Food Hub Discussion**
4:00 PM	**Orchard Irrigation Mgmt Using Soil Moisture Sensors** James Barnhill, USU **pg. 254**	**Agriculture and Conservation Easements** Charity Jessop, Utah Open Lands Rusty Milholland, Stewardship Director for Utah Open Lands **pg. 271**	

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Introduction to GAP for Small Farms

Biographical Information:
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Utah State University

Tiffany earned a bachelor degree in Horticulture and a master degree in Plant Science from USU with a focus on fruit and vegetable production. She currently works as a research associate in Extension.

Session Description:

This session will introduce the GAP certification process with a focus on tools and resources available for growers.

February 2016 Horticulture/GAP/2016-01

Good Agricultural Practices (GAP): Certification Basics

Tiffany Maughan, Dan Drost, Shawn Olsen, and ***Brent Black***

Good Agricultural Practices (GAP), which includes Good Handling Practices (GHP), was formally implemented by the United States Department of Agriculture and Food and Drug Administration in 2002. It is a voluntary audit program designed for the fruit and vegetable production industry to verify that the produce is grown, packed, handled, and stored as safely as possible. These audits check for adherence to the FDA's production guide (Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables) as well as recognized industry food safety practices. Although these audits are voluntary, many buyers, wholesale organizations, grocery chains and risk-adverse institutions such as schools and hospitals are beginning to independently require growers to be GAP certified.

Food safety should be an extremely important issue for fruit and vegetable producers and be taken seriously by them. Foodborne illnesses and deaths have been highly publicized over recent years. The loss of consumer confidence over these contamination outbreaks has serious effects on the industry. Almost without exception, the price of the affected crop drops following an outbreak, resulting in significant economic losses. The GAP program is a good way for growers to regain and maintain consumer trust and prevent contamination.

Before starting on the GAP certification process, check with your buyer(s) and see if they have a preference for a certain type of audit. There are different types of GAP audits such as harmonized GAP, Global GAP, and GroupGAP. Different audit protocols may have different requirements. For example, Global GAP requires that produce be tested for pesticide residues. GAP audits can be conducted by USDA, some state departments of agriculture, and private companies (see Appendix). Currently, some buyers will only accept a GAP certification from a private certifier, so ensuring that you pursue certification that is accepted by your buyers is absolutely critical.

Once you have selected an audit protocol and a certifying agency, then start to develop your food safety policies and procedures, employee training, and record keeping. Check with your certifying agency for their specific forms and requirements. Understand that the needed employee training and recordkeeping to successfully pass a GAP audit is significant. You will need to plan time for training sessions, additional paperwork, and other GAP related activities. The USDA's GAP-GHP Checklist provides an outline of documentation that is needed. Different audit protocols and different certifying agencies may have slightly different record keeping

requirements. Some audit protocols may require testing of soil, manure, wash water, irrigation water, and produce. Be aware of these requirements so the testing can be done at the proper time. Check with the certifying agency you have selected because they may have a preference or requirement that you use certain testing labs.

Most GAP audits are completed at harvest time but the record keeping begins with site selection, planting, pesticide use, irrigation, etc. Develop appropriate policies and procedures to meet different requirements and then document that procedures were followed and employees were trained.

USDA GAP audits begin with some general questions about the implementation of the food-safety program. Additionally, there are seven parts/areas that can be audited. The grower can choose to be audited on all seven or just one of the parts. No matter how many parts are chosen to be audited, the section of general questions must always be completed. The number of areas to be audited is typically dictated by the operations goals or the requirements of the buyers. Growers can also choose which products they will have audited. The seven parts are as follows 1) farm review; 2) field harvest and field packing activities; 3) house packing facilities; 4) storage and transportation; 5) not used; 6) wholesale distribution center/terminal warehouse; and 7) preventative food-defense procedures. A GAP audit consists of parts 1 and 2 and a GHP audit includes parts 3, 4 and 6. Part 7 is an optional area for operations that need to verify food defense. This bulletin includes an overview of preparing for your audit, the general questions section and an introduction to each of the GAP portions of the audit (along with simple examples).

Preparing for Your GAP Audit

Timing. Identify the best times to schedule an audit. Try to time the audit to get the most out of the 12 months that the certificate is valid. In general, it is best to schedule the audit so that the auditor comes when you are harvesting the largest variety of crops. Be aware that if a second visit is deemed necessary, your certificate will not be valid until after that visit. Be sure to schedule your audit at least 2 weeks prior to your desired audit date.

Food Safety Plan. A food safety plan is typically reported as a compilation of documents, records and policies and should be implemented as early in the growing season as possible. This will allow time to make changes in the plan if needed as well as gather all of the necessary documents and records for the audit. A copy of the food safety plan must be submitted when applying for an auditor to come to your farm. For most farms, this takes form as a written document that details your growing and handling process as well as identifies areas of risks and how you address them. A well-written and thorough food safely plan can significantly ease and improve your GAP certification process. Written policies, procedures, and records make up most of the food safety manual.

Food Safety Officer. You will need to appoint a food safety officer; this can be the owner/operator, a co-operator or a member of the staff. The officer needs to be very familiar with the food safety practices and be present when the auditor comes to the farm.

Paperwork. Having the correct documentation is critical for successfully completing a GAP audit. Proper paperwork can earn two-thirds of the points needed to pass an audit. Before scheduling an audit, make sure all your paperwork is in place and accurate. Since employees will

be interviewed, be sure to review all your safety policies and procedures with them. The best way to make sure you have all of the needed paperwork/documentation is to carefully go over the USDA's GAP-GHP Checklist.

There are three types of paperwork which document procedures and protocols associated with a farm food safety plan: records, policies, and documents. A record shows a process that has been completed or records an action that has taken place (i.e., activity logs, dates pesticides were applied). A policy is a written statement describing food safety procedures (i.e., hand-washing policy, sick day policy). A document may be a combination of policy and record or test result (i.e., employee signed policy after a training meeting, official water or soil tests).

Internal audit. It is a good idea to conduct an internal audit (a practice run) before scheduling an official audit in order to improve your chances of passing the audit on the first USDA visit. Typically, this can be done by your food safety officer. Since you must pay for each visit to the farm, doing everything possible to be sure you pass on the first visit will save you money and time. Again, be sure to carefully check the audit checklist and take any corrective actions needed.

USDA GAP Audit Costs. The cost of an audit averages around $1,000, although the distance the auditor has to travel to your farm will significantly affect the overall cost of your audit. This includes administrative fees, paperwork, auditor's travel time and time at your farm (approximately $90/hour). If a follow-up visit is needed, the cost will be about the same as your initial audit. To reduce the cost you must pay for the auditors travel, consider teaming up with other farms nearby to consolidate the auditor's trip into one. The cost of travel will then be divided among the participating farms.

Group GAP. On April 4, 2016, a new option called GroupGAP will be available that will open up the possibility of GAP certification to small and mid-scale producers by having many growers collaborate. In GroupGAP, independent farms will organize under a central entity (food hub, grower co-op, etc.) and create a common food safety plan that can be audited as a group rather than individually. In GroupGAP, independent farms come together to organize a food safety system tailored to their buyers. Together, the farms prepare for an audit by sharing resources and certification costs. Although the focus of GroupGAP is on GAP certification for smaller growers, the program can be applied to all growers regardless of size or market. Participants will need to collectively create a Quality Management System (QMS) that addresses the group's organization structure, policies, procedures and resources that will be used to implement a group certification process. GroupGAP certification has two layers of audits. First, internal audits conducted by the group's internal auditor and second, the formal GroupGAP certification audit conducted by the USDA. The formal audit focuses on the group as a whole and conducts farm-visit audits on a randomly selected percentage of the group. Answers for common questions about the GroupGAP program can be found at http://www.ams.usda.gov/sites/default/files/media/FAQs%20GroupGAP.PDF (USDA's GroupGAP Frequently Asked Questions).

What to Expect on Audit Day

The auditor will confirm which sections you requested to be audited and review your submitted food safety plan. You will need to provide a field map to assist the auditor in the farm tour. You can expect the auditor to interview employees at the farm as well as examine harvesting equipment, hygiene areas, and crop production areas. The auditor will score your farm on site

and have a closing meeting with you to discuss the results. You will be scored using the audit checklist referenced above. Each question on the list can earn 0, 5, 10, or 15 points (no partial points are awarded). To pass, you must earn at least 80% of the available points.

Automatic Failure

If the auditor finds product contamination, high presence of rodents or other pests in the production area, employee practices that threaten safety of produce, no food safety manual or food safety officer, or falsification of records, each can result in automatic failure.

These requirements, costs, and the additional time needed for becoming GAP certified can be quite intimidating. While the process can be frustrating, try to take each section one at a time and think of ways you can make this work for your operation. Growers who have successfully completed GAP certification report having increased confidence in how their operation can navigate a food safety problem and feel like their overall risk as a farmer is decreased.

General Questions

The general questions are mandatory for each audit, no matter which sections you decide to have audited. In order to successfully pass the GAP and GHP audit you must complete the general questions portion. The five parts are: the food safety plan, traceability, recall program, worker health and hygiene, and pesticide/chemical use. Examples of what is needed for each of these parts follow and all parts together compose an example Farm Safety Plan.

In order to get the most out of these examples, reference the GAP&GHP checklist while reading them. Each section of the checklist has a code (i.e. P-1). These codes are included at the beginning of each sample section to allow for easy reference to the checklist.

EXAMPLE FARM INFORMATION

Farm Location: Logan, Utah

Legal Description/GPS/Lat-Long of Location: 41.7378° N, 111.8308° W

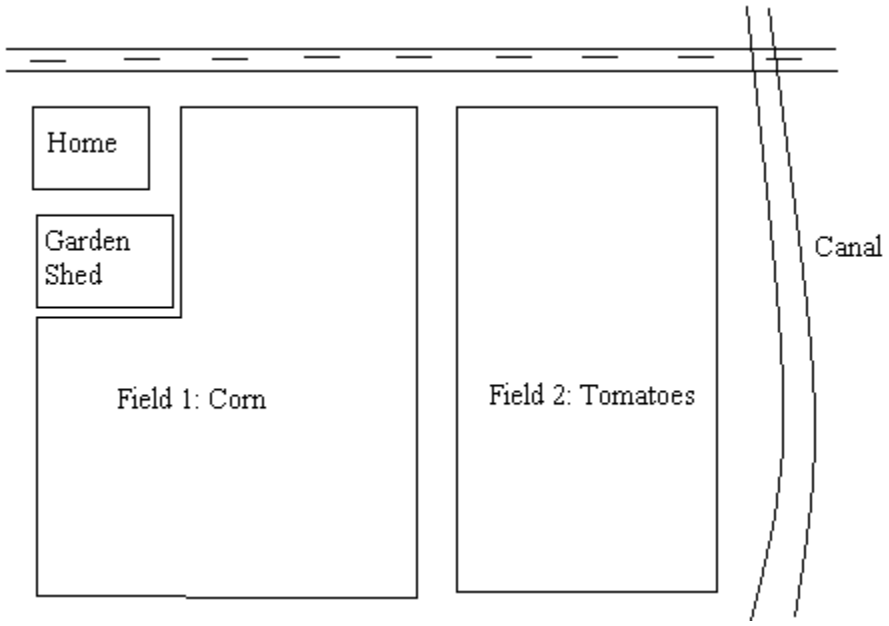
A legal description of your farm is included in your tax record.

Total Acres Farmed: 2 acres

Description of crops farmed

Crop	History	# of Acres
Sweet Corn	Mixed vegetable production for 8 years, converted from pasture.	1
Tomatoes	Mixed vegetable production for 8 years, converted from pasture.	1

Farm Map: This can be an aerial photo from Google maps with labels of each section of your farm added in, or a line drawn map with labels like the example below.



Notes

Agricultural Activities Description: We grow corn and tomatoes in two fields adjacent to our personal residence. Our water supply is secondary water. We sell our produce wholesale and use a shaded shed to hold the produce before pickup. Our family provides most of the labor with some local hired help during the busy times.

Food Safety Plan (P-1 through P-2)

Mission Statement: We are committed to growing, harvesting, and delivering high-quality, fresh produce that is free of contaminates that may lead to illness. We take precautions to ensure this is possible by requiring all employees attend food safety, hygiene, and sanitation training meetings and enforcing food safety policies.

Goal: We aim to meet our safety goals each day by maintaining checklists of farm policies and keeping up to date on needed procedures. Agricultural operations are conducted in such a way as to minimize negative effects on our farm, its products, and the environment.

Records: This Food Safety Plan is reviewed on an annual basis and updated as needed. We maintain all documentation for at least 2 years. Our goal is to implement the objectives outlined in the USDA "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables" and meet the guidelines of the Good Agricultural Practices (GAP) audit.

Disciplinary Policy: If a worker does not exhibit proper food safety practices, he/she is verbally corrected and retrained if needed. In the event of repeated offenses the worker will be dismissed.

Management

Food Safety Officer

Name/Position	Address
Ima Farmer/Owner	1212 Example Rd. Logan, UT
Phone Number	Email
(435) 555-1234	ima.farmer@example.com

Alternate Contact (Optional)

Name/Position	Address
Awesome Farmer/Co-owner	1212 Example Rd. Logan, UT
Phone Number	Email
(435) 555-4321	awesome.farmer@example.com

Notes

Traceability and Recall (G-1 through G-2, 1-26)

Each production area is clearly defined and coded to enable traceability in the event of a recall. Field 1 is represented as 01 and Field 2 as 02. Each day produce is harvested, we use the date to create a label for the produce as our identifier. For example, corn harvested from field 1 on July 21 of 2016 would be labeled: (01.07.21.16).

Including a picture of a lot tag may be helpful.

Each pick-up of produce will have a delivery form filled out. An example form follows.

Pick-up Form	
Farm Name	Example Farm
Pick-up Date	7/22/2016
Harvest Date	7/21/2016
Crop/Variety	Tomato/Sunbrite
Number of Units	20 Bushels
Lot Name	02.07.21.16
Harvester Name(s)	Ima, Awesome
Driver Name	Joe Driver

Notes:

Recall Program (Not required for first year of application)

A mock recall will be conducted annually. A mock recall was conducted on 08/01/2016 and was completed in 2.5 hours. This recall included emailing our wholesaler, explaining the mock recall and providing a sample lot number for them to locate for the mock recall. After they located the produce they emailed a confirmation copy of the tags/delivery documents associated with the product. We have outlined a plan of action for the contaminated produce below.

Be sure to include the email correspondence as documented proof of the mock recall.

Recall plan of action: In the event of a contamination, we will take immediate action to reduce the effects of the contamination. We will identify the problem and assess health risks. Next we will determine what products and lot numbers were involved. Next, we will determine where the affected inventory is located and notify our wholesaler or buyer of the problem and request all produce from the affected lot be located and pulled from the sale floor. Exact amounts of produce shipped will be specified and matched with the amount of produce disposed of. We will ask the wholesaler to dispose of the product and provide us with proof of disposal including the date, time, and method of disposal.

We have created a recall contact list with names and phone numbers of our buyers, our insurance company, and our legal counsel to speed the recall process.
After completion of the recall we outlined weaknesses in our plan and will be taking steps to improve it.

Be sure to create a customer/buyer contact list with names, phone numbers, and emails. For a CSA, this means all members' email and phone numbers. For a farmer's market or roadside stand this may be achieved by having an email sign-up sheet at the stand and by updating a company webpage with recall information.

Worker Health and Hygiene (G-3 through G-15)

(G-3) Potable water policy: Potable water is available to all employees for drinking, hand washing, and for harvesting activities. This water is available at our personal home and garden shed. An annual city water test is checked for safety and included below.
An emergency water source is available via bottled water.

> *Include annual water report here for culinary water. If well water is used you will need to have it tested and include results here.*

(G-4) Employee and Visitor Hygiene policy: All employee's and visitors to the farm sign a log-in sheet and are informed of and required to follow proper sanitation and hygiene practices in the field.

Farm Visitor Policy and Log Sheet			
Date	Name	Company	Nature of Visit
6/10/2016	Curious Neighbor	--	Tour
6/21/2016	John Doe	--	Tour
7/24/2016	Joe Doe	--	Tour
7/26/2016	Dan Drost	USU	Crop production advice

Notes

(G-5) Sanitation and Hygiene Training Policy: All workers will be trained in proper sanitation and hygiene practices at the beginning of each season. (Note: Farm should have a written policy manual for the crew to review and then get the training) A signed log of training is below.

Sanitation and Hygiene Training Meeting

By signing below I certify that I have attended the sanitation and hygiene training on May 25, 2016 at Example Farm.	
Name	Signature
Ima Farmer	
Awesome Farmer	
Har D. Worker	
P. Ick Fast	
Sonny Farmer	

This training log can be used as a format to create many other training logs that may be useful for your farm such as: worker safety during lifting, proper tractor/equipment use, safety during chemical applications, proper hygiene, how to avoid heat stroke and other first aid training, farm policy training, proper harvesting and storage techniques, and emergency protocols. This list and the examples in this farm plan are not all-inclusive as training needs will vary from farm to farm.

Notes

(G-6 and G-7 are observations of the auditor on day of visit)

(G-8 is observation of auditor on day of visit) Signs instructing proper hand washing are posted in garden shed above sink.

When main bathroom facility is in the owner home a sign in the bathroom is not required. However, it must be somewhere else on the premises in a prominent location.

(G-9 is observation of auditor on day of visit)

Be sure to have all toilet/restroom/field sanitation facilities clean and fully stocked.

(**G-10) All restrooms will be cleaned daily and stocked with proper supplies (toilet paper, hand soap, and single-use towels).**

Restroom Cleaning/Supply Log			
Date	Cleaned	Supplied	Name
6/1/2016	x	x	Ima
6/2/2016	x	x	Awesome
6/3/2016	x	x	Sonny
6/4/2016	x	x	Awesome
6/5/2016	x	x	Ima
6/6/2016	x	x	Sonny
6/7/2016	x	x	Ima
6/8/2016	x	x	Awesome
6/9/2016	x	x	Sonny
6/10/2016	x	x	Awesome
6/11/2016	x	x	Ima

This sample log is shortened for brevity. Be sure to include all cleaning dates/logs. This cleaning log can be used as a template for many other types of activities that need to be done and recorded such as equipment and container cleaning, maintaining equipment to maintain safety, checking farm for potential food safety hazards, etc.

(G-11) Food and Smoking Policy: All eating and smoking activities will be conducted outside the crop production areas. Meals will be eaten in the family home with breaks taken in the side yard of the house.

Notes

(G-12) Employee Infectious Disease Policy: Any employee with diarrhea, an open lesion, or who is exhibiting symptoms of other infectious diseases are not allowed to handle fresh produce or to conduct any tasks which may lead to contamination of the product. As a family operation, we understand that this may occur to all employees at once. In this event, we will have our hired help harvest the crop or will postpone harvest until workers are recovered. See sick-day log below.

Employee Infectious Disease Log				
Date	**Employee Name**	**Description**	**Action Taken**	**Supervisor Signature**
7/5/2016	Sonny Farmer	Diarrhea	Sent home until recovered	Ima Farmer
7/28/2016	Har D. Worker	Flu-like symptoms	Sent home until recovered	Ima Farmer

(G-13) Product Contamination Policy: Employees will notify their supervisor/designee if produce comes in contact with blood or other bodily fluid. This is for both human and animal contamination events. The supervisor/designee will then safely dispose of the contaminated product, clean the surrounding area and sanitize surfaces, fill in the log sheet and take any action needed to remove the threat of contamination.

Blood/Body Fluid Policy and Log			
Date	Description	Action Taken	Supervisor Signature
7/28/2016	Har D. Worker vomited at side of field.	Worker sent home, contaminate dug up and thrown in trash and tools sanitized.	Ima Farmer
8/2/2016	Ima cut her hand while packing.	Tomatoes in contact with blood thrown in garbage. Area disinfected and Ima wrapped cut and worked on paperwork.	Ima Farmer

(G-14) First Aid Policy: Employees have been trained and instructed to seek prompt treatment for cuts, abrasions and other injuries, even if very minor. First aid box is located in the garden shed and in the restroom in the house. All cuts will be covered before the employee returns to handling produce or working around food contact surfaces/containers.

First Aid Policy and Log			
Date	Description	Action Taken	Supervisor Signature
7/8/2016	Awesome got a small cut on wrist.	Cut bandaged and shirt changed.	Ima Farmer
8/1/2016	Sonny fell and scraped knee.	Knee bandaged and shorts changed to pants.	Ima Farmer
8/2/16	Ima cut her hand while packing.	Cut bandaged and Ima moved to paperwork.	Ima Farmer
8/3/2016	Awesome got a paper cut from a corn leaf.	Cut bandaged.	Ima Farmer

Notes

Pesticide/Chemical Use

(G-15) Preharvest/postharvest Material Applicators Policy: All employees applying regulated pre-harvest and/or post-harvest materials are licensed. Employees applying non-regulated material have been trained on its proper use. All personnel will have knowledge of and comply with proper use of chemicals used around the farm and what to do if there is a spill. All workers will comply with re-entry requirements of the applied product. Spray records will be kept of all applied products. Our training log is included below.

Chemical Use Log			
Date	Description	Area Applied	Supervisor Signature
5/25/2016	Trifluralin	Between plastic in tomato field.	Ima Farmer
6/15/2016	Trifluralin	Between corn rows.	Ima Farmer
6/28/2016	Glyphosate	Along canal bank and field perimeter	Ima Farmer
7/10/2016	Halosulfuron	Over tomato and corn field	Ima Farmer
8/1/2016	Bonide Copper Spray	Spot application in tomato field	Ima Farmer

All pre and post-harvest material will be stored in a clean and organized site designated for just that purpose. All employees will be trained on proper storage of these chemicals.

Regulated and Non-regulated Material Training Meeting

By signing below I certify that I have attended the chemical applicators training on May 25, 2016 at Example Farm.

Name	Signature
Ima Farmer	
Awesome Farmer	
Har D. Worker	
P. Ick Fast	

Insert a copy of pesticide applicator license here.

Part 1: Farm Review

Introduction: This section addresses water usage in the crop production areas, sewage treatment, animal presence on the farm, manure and municipal biosolids applications, soil, and traceability.

Water (Pond, Stream, Well, Municipal, Other)

You will need to have the water tested for microbial pathogens (and supply documentation). The most common test is for generic E. coli. This test can be done at accredited private laboratories. Irrigation water quality tests (salinity, sodium, etc.) can be submitted to the Utah State University's Analytical Laboratories. Visit http://usual.usu.edu/ for more information on tests available and pricing.

> **Municipal water**: test results can be acquired from the local water authority annually. If municipal water is used on the farm, include the water test report in the Food Safety Plan.
> **Well water**: must be tested at least one time per growing season. Monitor to make sure livestock and manure storage areas are far from well recharge and pumping areas.
> **Surface water**: tested three times during growing season (planting, peak use, near harvest)

Farm Example

(1-1, 1-2) Our goal is that all water used on our farm is safe and appropriate for its intended use. Water is a critical component of our operation and also has a potential to spread microbial and chemical contamination. We have listed all activities that require water and where that water comes from below.

Water Use and Sources Log	
Activity	**Primary Source**
Cleaning Equipment	Municipal
Irrigation	Secondary
Cooling	Municipal
Pesticide application	Secondary
Hand washing	Municipal
Drinking	Municipal

(1-3, 1-4) Samples of secondary irrigation water will be submitted three times during the growing season (early, mid, and late).

> *Insert/attach water test report and dates here.*

Municipal water test reports are obtained annually and will be kept on file. Our city's water quality report is attached below.

Contaminant	Violation Y/N	Level Detected ND/Low-High	Unit Measurement	MCLG	MCL	Date Sampled	Likely Source of Contamination
Microbiological Contaminants							
Total Coliform Bacteria	N	3	N/A	0	Presence of coliform bacteria in 5% of monthly samples	2014	Naturally present in the environment
Fecal coliform and E.coli	N	ND	N/A	0	If a routine sample and repeat sample are total coliform positive, and one is also fecal coliform or E. coli positive	2014	Human and animal fecal waste
Inorganic Contaminants							
Barium	N	60-85	ppb	2000	2000	2012	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Copper a.90% results b.# of homes that exceed the AL	N	a. 156 b. 0	ppb	1300	1300	2014	Corrosion of household plumbing systems; erosion of natural deposits
Fluoride	N	200	ppb	4000	4000	2012	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
Lead a.90% results b.# of homes that exceed the AL	N	a. 5600 b. 1	ppt	0	AL=15000	2014	Corrosion of household plumbing systems, erosion of natural deposits
Nitrate (as Nitrogen)	N	200-500	ppb	10000	10000	2014	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	N	500	ppt	50000	50000	2012	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines
Sodium	N	5-34	ppm	None set by EPA	None set by EPA	2012	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills.
TDS (Total Dissolved solids)	N	194-314	ppm	2000	2000	2012	Erosion of natural deposits

(1-5)Water areas (canal/filtration area/hydrants) will be periodically inspected for potential contaminates. Trash or other potential contaminates will be removed and disposed of properly.

Notes

Sewage Treatment

For farms where a sewage line or septic systems are in close proximity to the fields, these systems will need to be monitored.

Farm Example

(1-6, 1-7) The house septic system will be checked annually to ensure proper function.

Sewage Treatment
Septic system performance check on April 14th, 2016.
Signed _____

Animals/Wildlife/Livestock

Animals pose a serious contamination risk since animals are in contact with soil, manure, and water. Steps to reduce animal contact with the crop need to be taken. Efforts to deter animals should be taken and will be checked for by the auditor.

(1-8 to 1-11) These sections deal with proximity of the farm to potential contamination sources such as dairy, livestock, fowl production, or manure lagoons. Manure storage is contained and livestock animals are restricted from access to the crops.

Farm Example

(1-12, 1-13) Employees will report animal tracks or visual evidences of animal presence on the farm to their supervisor. Noted animal presence will be logged and steps taken to try and deter reoccurrence.

Animal Presence Log

Date	Sign	Action taken
6/6/2016	Deer tracks noted at bottom of field 1.	Continue to monitor
6/20/2016	Dog feces by canal	Talk to dog owner to keep dog off property
6/27/2016	Deer tracks noted again in same place	Deer repellant sprayed by entrance and exit of deer track on property
7/15/2016	Ducks feeding in flooded area	Keep area from flooding again

Manure and Municipal Biosolids

The use of manure helps improve the soil composition and can decrease fertilizer costs. There are three options to choose from for this section. A) Raw manure applied, B) Only composted manure/biosolids applied, and C) No manure or municipal biosolids applied. Different questions/documentation are required depending on what your farm uses.

> **Raw manure**: apply at least 2 weeks prior to planting or a minimum of 120 days before harvest.
> **Composted manure:** apply only properly treated, composted manure and have analysis reports available for compost. Compost samples can be submitted to the USU Analytical Labs for testing. Many compost manufacturers have analytical reports and can provide these with the product.

Farm Example

(1-18 through 1-21) Option B: Composted manure was applied to field 01 and 02. The composted manure was obtained from a nearby farm with cattle livestock. The composting process was carried out on that property. Before application, the compost was tested.

> *Attach bill of sale for compost here*
>
> *Attach test results here*

Notes

Soils

Field selection is an important first step in reducing possible microbial contamination. Field selection should seek to find a field that provides an excellent opportunity of producing high yielding quality produce as well as minimize the risk of chemical contamination.
You will need to perform a land risk assessment with a description of the land for at least the last 5 years. Depending on what the history is, determine if any steps to mitigate known risks are needed.

> **Land history risks:** evidence of old buildings, flooding or the potential for flooding, heavy metals, chemical spills, recent dumping of trash, recent use of the farm as a dairy, livestock or poultry feedlot.

Be sure each production area is identified and has a unique code to enable easy traceability back to field.

Farm Example

(1-23) The two fields currently being farmed were converted from a conventionally managed pasture 8 years ago. They have been rotated since then between tomatoes, corn and on occasion mixed vegetables. There were no buildings, flooding, spills or dumping on these fields to our knowledge.

(1-24, 1-25) Not applicable

> *If your land has identified land risks, preventative measures need to be taken and documented as well as a soil test to indicate lack of contaminants.*

Traceability
Each product grown should be identified, coded, and a reliable tracing program used to keep track of where produce was grown.

(1-26) *See traceability and recall section in the General Questions section.*

Notes

Part 2: Field Harvest and Field Packing Activities

Introduction: This section deals with conditions in the field as well as harvesting commodities and post-harvest packing if it occurs directly in the field or greenhouse.

Field Sanitation and Hygiene
Hand washing and toilet facilities that are not properly maintained are a potential source of contamination. Steps need to be taken to minimize this risk.

Farm Example
(2-1) A pre-harvest risk assessment was carried out on each production area and documented. (Assessment follows)

Sanitation Units:
Are toilet and wash facilities properly located? Yes, the facilities are within easy walking distance of each production area.
Are the facilities properly stocked? Yes, see cleaning and restock log in general questions section.
Is potable water available for workers? Yes, clean potable water available within easy walking distance of each production area.
Containers/Equipment:
Are harvest containers clean, available and protected? Yes, harvest bins are stored within the storage shed to minimize contaminates and are disinfected at the end of each harvest day.
Is harvest equipment in good condition, clean and available? Yes, the equipment is rust-free, kept in/on/above a clean storage bench in the storage shed and disinfected at the end of each harvest day.
Contamination:
Evidence of domestic or wild animal crop damage? No significant damage, but presence of domestic and wild animals noted. See section 1-12 for specific log.
Evidence of physical contamination or fuel/chemicals which might contaminate crop areas? None noted, all equipment is filled and re-filled away from the production area. Chemical application are prepared away from production are to reduce risk of contamination.
Any sources of biological or physical contamination such as dump sites, manure, or water that might affect food safety? The canal that borders one side of our property could feasibly flood the field. This risk has been noted and a visual assessment of the strength of the canal walls is carried out periodically to monitor for possible breaches.

The questions in the box above serve as an example of questions to ask during a pre-harvest field assessment. Risks and consequently questions about risk will vary from operation to operation. Additional questions may be needed.

(2-2) Sanitation units are not required due to a toilet facility being readily available for the workers.

(2-3, 2-4) Toilet facility available for worker use is in the home adjacent to the fields.

(2-5) Not applicable

Field Harvesting and Transportation

Harvesting equipment and containers are potential contamination sources. Implementing a cleaning schedule for the equipment and containers will help to minimize this risk.

Note that the field harvesting and transportation section can only be audited when the crop is actively being harvested so be sure to schedule your audit at a time when harvesting will be occurring. Of particular importance in this section is keeping containers, vehicles and other harvesting equipment clean and sanitized on a scheduled basis.

Farm Example

(2-6, 2-7) Containers and harvesting equipment will be cleaned at the end of each harvesting day.

Harvesting container and hand harvesting equipment cleaning log

Date	Person
7/15/2016	Ima
7/16/2016	Ima
7/17/2016	Ima
7/18/2016	Awesome
7/21/2016	Ima
7/22/2016	Sonny
7/23/2016	Sonny

Notes

(2-8) Damaged containers will be repaired if possible and disposed of if no longer functional.

(2-9) Equipment and machinery used to harvest are kept in good repair and minimize damage to crops or possible harm to workers.

(2-10, 2-11) No glass or light bulbs are used on harvesting equipment in our operation.

(2-12) Standard operating procedure in the event of a chemical spill is posted and workers have been trained to comply with this use.

> *See example training logs provided in the general section on how to compose a training log. Provide a training log for chemical spill SOP here.*

(2-13) During harvest, workers will remove any foreign objects (such as glass, metal, rocks, or other items) from the harvesting containers as they work.

> *Provide a training log for removing foreign objects here.*

(2-14) Workers will be trained not to use harvesting containers for non-harvest activities during the harvest season.

> *Provide a training log for single purpose harvesting containers here.*

(2-15) The water we use on harvested product is municipal water and is safe. Workers will be trained to only use municipal water on produce.

(2-16) Workers will remove as much dirt/mud as possible during the harvesting process.

Provide a training log for dirt/mud removal here.

(2-17) Equipment used to transport harvested product is in good repair.

(2-18) Harvested product policy:

All harvested produce will be placed in to clean containers and will be moved from the field to the storage area as soon as possible (at least within 1 hour of harvest) to minimize time in the direct sun after harvest. This product will be loaded onto the 4-wheeler trailer and covered with a tarp during transportation.

(2-19, 2-20) Not applicable

(2-21) Each product container moving out of the field is marked with field of origin and date, as laid out in the traceability section.

Notes

Part 3: House Packing Facilities

This section is for packinghouses located on or near the crop production areas. The main focuses of this section are water used for packing, packing equipment, cleanliness, worker health and hygiene, containers and pest control. Be aware that you may only have this section of the audit performed if the packinghouse is in active use when the auditor is present.

Part 4: Storage and Transportation

The storage and transportation discussed in this section covers those activities that are located on or near crop production areas. This includes transporting harvested produce to the on-site packing facility, and storage in the packinghouse or in standalone storage facilities.

Part 5: No Longer Used

Part 6: Wholesale Distribution Center/Terminal Warehouse

This section is for the wholesale end of the food distribution food chain. Many of the questions and requirements in this section are very similar to those in Part 3 but are geared toward wholesale packing centers. Operations may only accept produce that has come from a GAP certified producer.

Part7: Preventative Food-defense Procedures

This section deals with food supply protection from an intentional contamination by an aggressor (in contrast to the previous sections dealing with accidental contamination). A specific person is assigned to implementing the Food Defense plan.

Audit Scheduling

To apply for USDA GAP & GHP Audit Services, complete the Request for Audit Service form FV-237A (pdf) and the Agreement for Participation in Audit Services form FV-651, and submit them to your local FV audit office, or the contact below, via email or fax. You will need to have your farm plan composed and ready to submit when applying for an audit. Remember that a well-documented and complete farm plan can earn many of the total points available, and will be very helpful in a positive audit experience.

For additional information about fruit and vegetable auditing services, contact the SCI Division, Audit Services Branch at:
Telephone: (202) 720-5021
Fax: (202) 260-8927
Email: FVAudits@ams.usda.gov

Additional Reading and Resources:
AMS GAP Homepage: http://www.ams.usda.gov/services/auditing/gap-ghp
USDA's GAP and GHP User Guide:
http://www.ams.usda.gov/sites/default/files/media/GAPGHP_Audit_Program_User's_Guide%5B1%5D.pdf
USDA's GAP and GHP Checklist: https://www.ams.usda.gov/sites/default/files/media/GAP-GHP-Checklist.pdf

Other Guides for Preparing for a GAP audit:
Good Agricultural Practices for Small Diversified Farms: Tips and Strategies to Reduce Risk and Pass an Audit. Caroline Farm Stewardship Association. http://www.carolinafarmstewards.org/wp-content/uploads/2013/07/CFSA_GAPS-web.pdf

Good Agricultural Practices Educational Resources. Kentucky Department of Agriculture.
http://www.kyagr.com/marketing/GAP-resources.html

Agrifood Safety. Michigan State University Extension. http://gaps.msue.msu.edu/usda_gap_2011.pdf

Good Agricultural Practices Food Safety Plan. Penn State Extension.
http://extension.psu.edu/food/safety/farm/how-do-i-write-a-food-safety-plan/sample-harmonized-food-safety-plan

Real-Farm GAP Application Example:
https://www.kyagr.com/marketing/documents/GAP_USDASampleSafetyManual.pdf

APPENDIX

Some Companies Who Have Conducted GAP Audits in Utah

Certification Services, QCS
352-377-0133
http://www.qcsinfo.org/contact/
Local Utah auditor: Frank Sesto (frank@produsure.net)

NSF Agriculture
1-877-893-1325 or email: agriculture@nsf.org.
http://www.nsf.org/services/by-industry/food-safety-quality/agriculture

Primus GFS
805-361-1912
http://www.primuslabs.com/services/primusgfs.aspx

World Quality Services
www.wqscert.com
Local contact: Miles Murphy, 360-298-0742

USUAL's List of Testing Laboratories

Miller Labs
1675 West 2750 South
Ogden, UT 84401
Phone: 801-627-2202
www.kelatron.com/lab-testing

Pacific Agricultural Laboratory
12505 NW Cornell Road
Portland, OR 97229
Phone: 503-626-7943
www.pacaglab.com

PrimusLabs—listed above

Utah State University Analytical Laboratories
9400 Old Main Hill
1541 N 800 E
Logan Utah 84322-9400
Phone: 435-797-2217
http://usual.usu.edu/index.html

USU Analytical Laboratories: What we don't do (and who does)
http://usual.usu.edu/about/referral/index.html

Utah State Universityis committedto providing an environment free from harassment and other forms of illegal discrimination based on race, color, religion, sex, national origin, age (40 and older), disability, and veteran's status. USU's policy also prohibits discrimination on the basis of sexual orientation in employment and academic related practices and decisions.

Utah State University employees and students cannot, because of race, color, religion, sex, national origin, age, disability, or veteran's status, refuse to hire; discharge; promote; demote; terminate; discriminate in compensation; or discriminate regarding terms, privileges, or conditions of employment, against any person otherwise qualified. Employees and students also cannot discriminate in the classroom, residence halls, or in on/off campus, USU-sponsored events and activities.

This publication is issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University

Introduction to **Good Agricultural Practices (GAP)** for Small Farms

Tiffany Maughan, USU Extension

EXTENSION
UtahStateUniversity

USDA
RMA

New Publication

February 2016 Horticulture/GAP/2016-01

Good Agricultural Practices (GAP): Certification Basics

Tiffany Maughan, Dan Drost, Shawn Olsen, and *Brent Black*

Good Agricultural Practices (GAP), which includes Good Handling Practices (GHP), was formally implemented by the United States Department of Agriculture and Food and Drug Administration in 2002. It is a voluntary audit program designed for the fruit and vegetable

GAP Background

- Formally implemented by the USDA and FDA in 2002
- Designed for the fruit and vegetable production industry to verify that the produce is grown, packed, handled, and stored as safely as possible

Does My Operation Need to be Certified?

- GAP Certification is voluntary
- But your buyer may independently require it
  - Some wholesale organizations
  - Some grocery chains
  - Schools
  - Hospitals

Certification Incentive

- Buyer requires it
- Added security to grower
- Increase food safety
  - Good for consumers
  - Good for production industry

Getting Started: Audit Type

- Check with your buyers for audit type preference
- Types of GAP audits
  - Harmonized GAP, Global GAP, GroupGAP

Group GAP

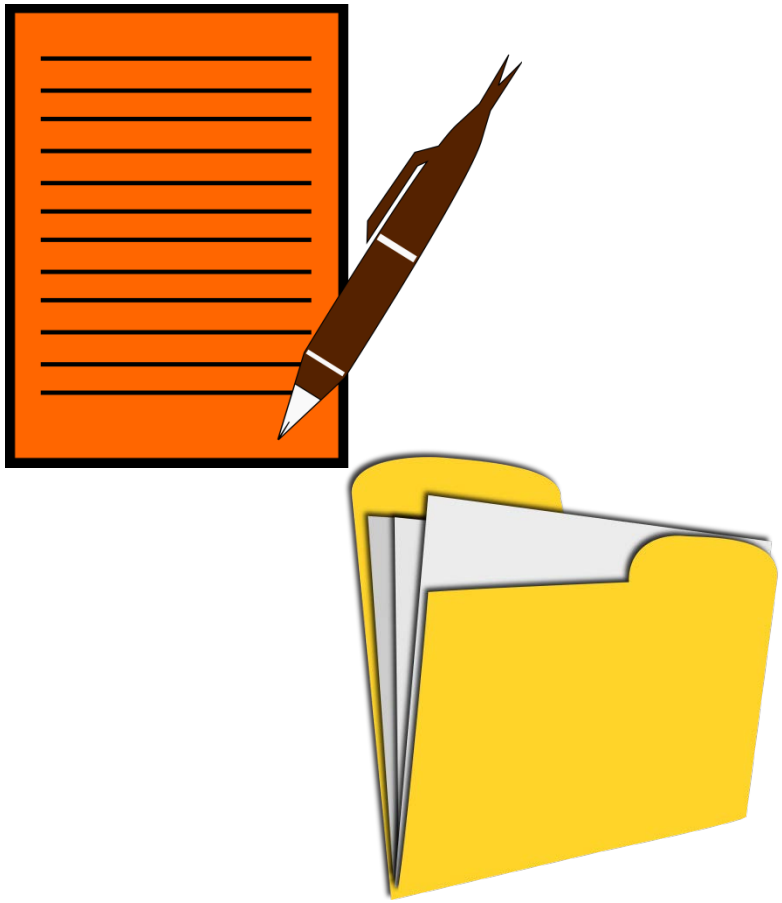
Good Agricultural Practices

https://www.ams.usda.gov/sites/default/files/media/FAQs%20GroupGAP.PDF

Getting Started: Certifiers

- USDA
- Some state departments of agriculture
- Private companies
  - See Appendix of Paper
- Some buyers will only accept a GAP certification from a specific certifier
  - Knowing which certifier your buyer requires is critical!

Getting Started: Commitment

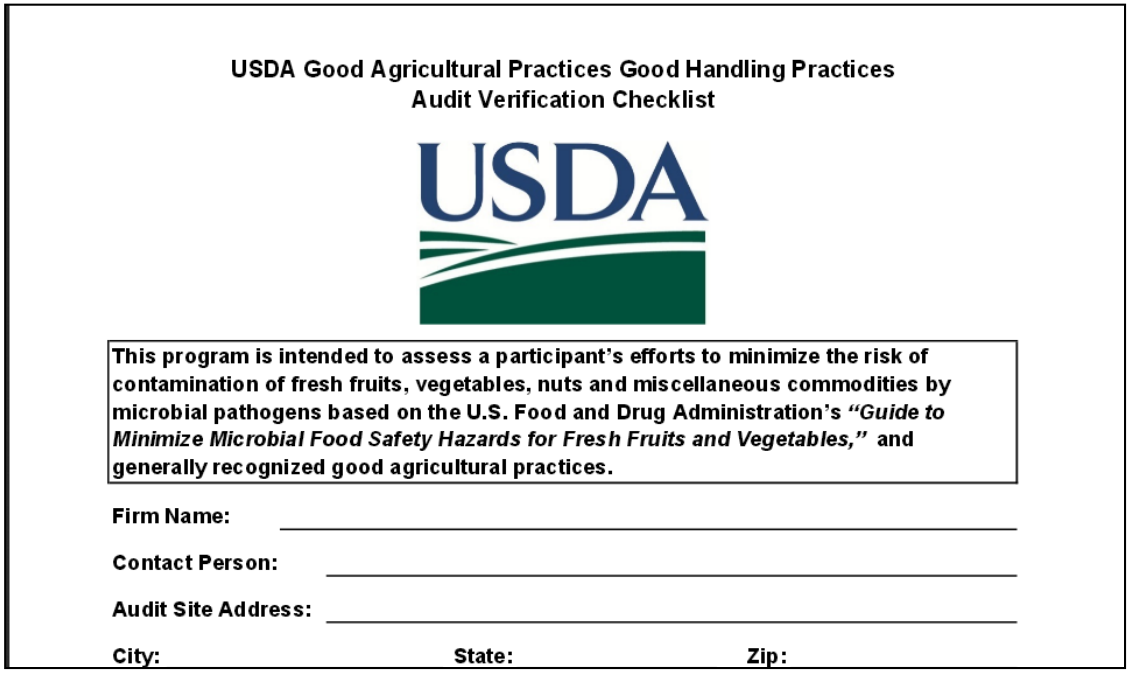


- GAP certification takes time and effort!
- Understand that significant planning, time, and record keeping is needed
- Set aside time for employee training

The USDA's GAP-GHP Checklist

https://www.ams.usda.gov/sites/default/files/media/GAP-GHP-Checklist.pdf

- Outline of required documentation
- Remember different certifiers may have slightly different requirements



USDA Good Agricultural Practices Good Handling Practices
Audit Verification Checklist

USDA

This program is intended to assess a participant's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration's *"Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables,"* and generally recognized good agricultural practices.

Firm Name: _____

Contact Person: _____

Audit Site Address: _____

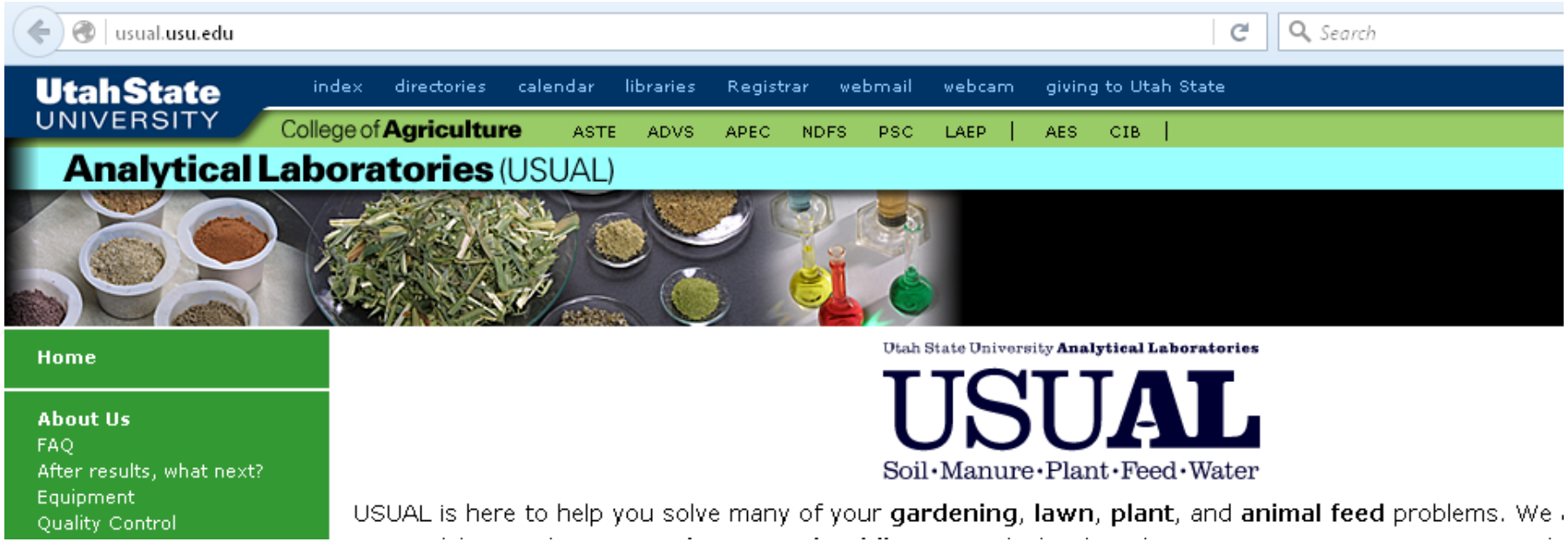
City: **State:** **Zip:**

Start off right!

- Most GAP audits are completed at harvest time
- Record keeping begins much earlier
  - site selection, planting, pesticide use, irrigation, etc.
- Develop appropriate policies and procedures
- Document that procedures were followed
- Document employee training

Testing

- Plan from beginning of season
  - Timing
- Soil, manure, compost, wash water, irrigation water, pesticide residue
- Some certifying agency's have a testing lab preference
- See new publication for more specifics



What to expect

- USDA GAP audits begin with some general questions
- 7 parts/areas that can be audited
  - Choose just 1 or all 7
  - Depends on buyer requirements and operation goals

1) Farm review
2) Field harvest and field packing
3) House packing facilities;
4) Storage and transportation
5) Not used;
6) Wholesale distribution center/terminal warehouse
7) Preventative food-defense procedures.

Timing Your GAP Audit

- 12 month certification
  - Usually schedule audit to occur during harvest
- Schedule at least 2 weeks before you'd like them to come

GAP Workshops

- In-depth GAP workshops in Utah County and Kaysville
  - March 15: Utah County 10:00 to 1:00
  - March 22: Kaysville 9:00 to 12:00
- Come PREPARED!!
- Use the next month to start making your farm plan

- We will help you go over and answer questions
- Can’t write it for you!!
- Email sign-up sheet

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More Resources: New Publication

February 2016 Horticulture/GAP/2016-01

Good Agricultural Practices (GAP): Certification Basics

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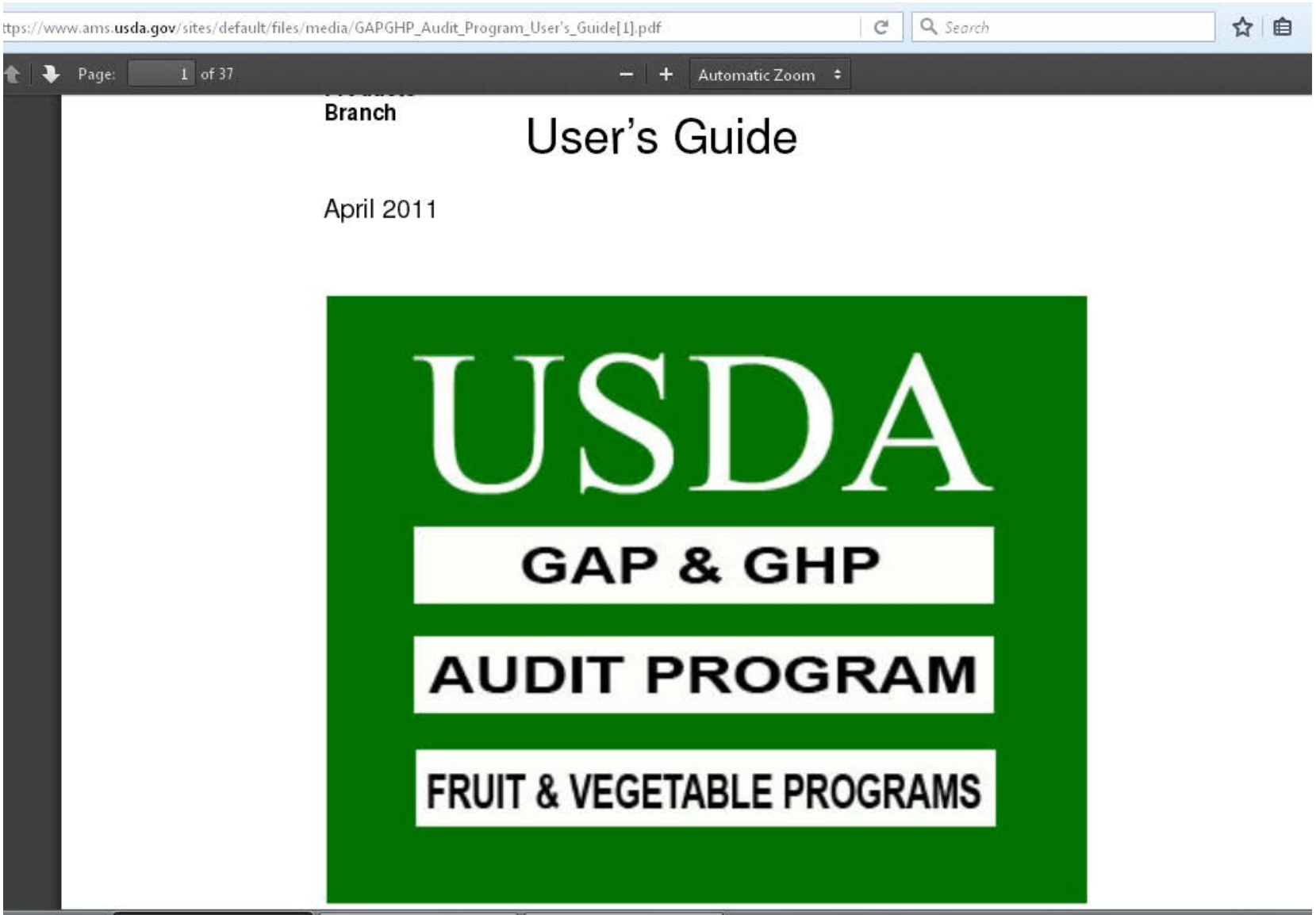
More Resources: USDA's User Guide

https://www.ams.usda.gov/sites/default/files/media/GAPGHP_Audit_Program_User's_Guide%5B1%5D.pdf

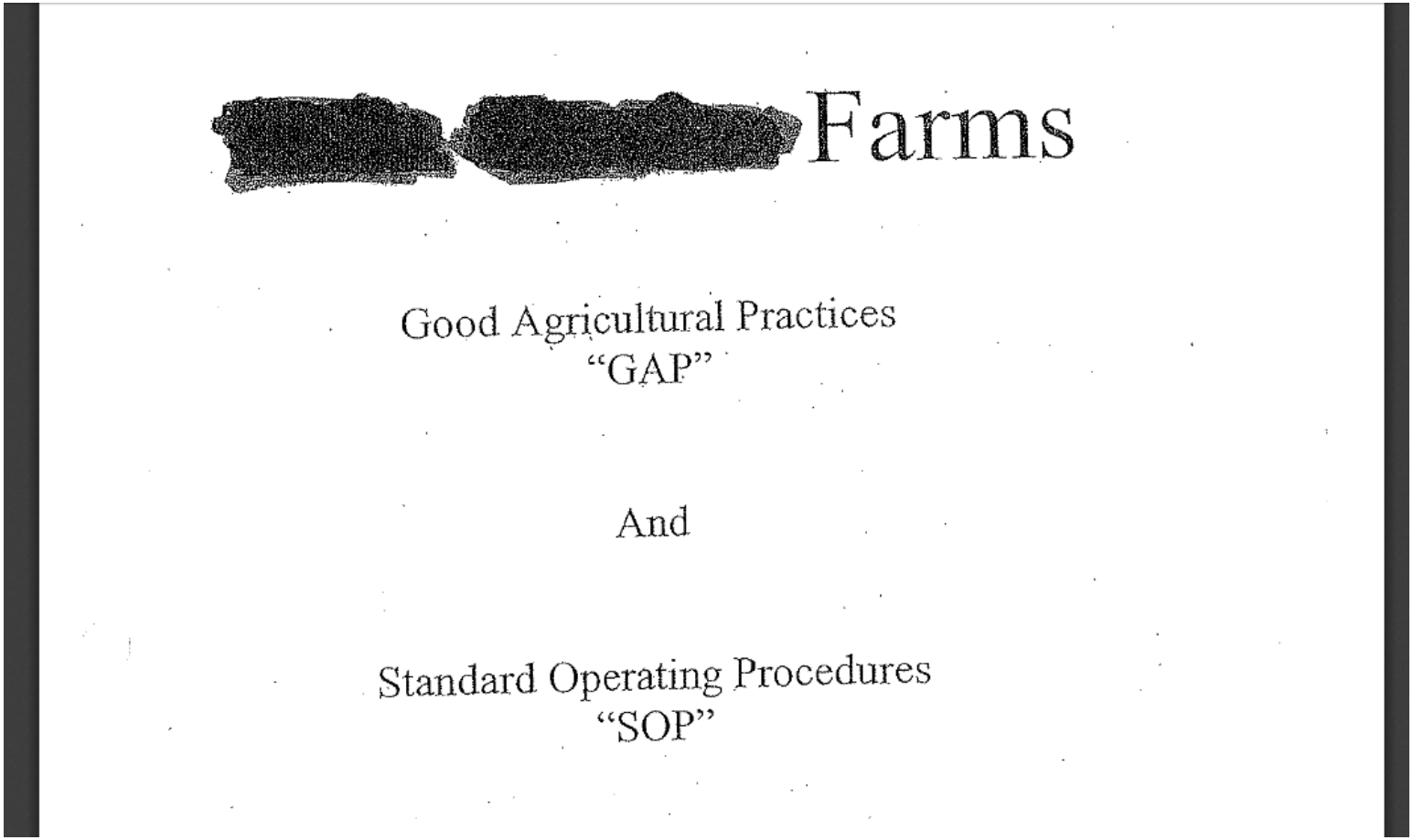


More Resources: Carolina Farm Stewardship Association

http://www.carolinafarmstewards.org/wp-content/uploads/2013/07/CFSA_GAPS-web.pdf

More Resources: Real-farm Example

https://www.kyagr.com/marketing/documents/GAP_USDASampleSafetyManual.pdf



[redacted] Farms

Good Agricultural Practices
"GAP"

And

Standard Operating Procedures
"SOP"

Conclusion

- **Research** what audit type and certifier work best for your situation
- **Plan** for success
- Keep **record**s

- Don’t forget to prepare for the GAP workshops!!
  - March 15th and 22nd

EXTENSION
UtahStateUniversity

USDA
RMA

- Back to Top -

GAP Basics

Biographical Information:
Dr. Kurt Knolt
Area Extension Agent and
County Director
University of Arizona

Kurt Nolte is the Yuma County Cooperative Extension and Economic Development Director with the University of Arizona. He has served as the vegetable production intermediary, integrating applied research impacts through Extension programming within the agricultural industries in the desert southwest since 1997. Dr. Nolte is a regional specialist in Arizona Vegetable production, serves on the Arizona Leafy Green Marketing Agreement Outreach Committee, is part of the Fresh Produce Safety research and training team, and is a 2016 Arizona Farming and Ranching Hall of Fame inductee for outstanding Extension programming.

Biographical Information:
Stewart Jacobson
Food Safety Projects Coordinator
Arizona Department of Ag.

Stewart Jacobson is with the Agricultural Consultation and Training Program of the Arizona Department of Agriculture. A 38 year employee of the department, Stewart has spent over 33 of those years as enforcement with Meat and Poultry Inspection, as an inspector, trainer and the Program Manager. Now with ACT, Stewart's role is consultation in food safety programs for leafy greens and other vegetables leading to the GHP/GAP audit. Whether traditional agriculture in a field, hydroponics or other systems, Stewart will assist in the development of your food safety program.
Stewart understands Arizona agriculture and will discuss the food safety audit and program with everyone.


People See This
What Really Happens

Meet Your Training Team

Good Agricultural Practices & Good Handling Practices for Food Safety Training & Certification

Dr. Kurt Nolte
Area Extension Agent & County Director

Yuma County Cooperative Extension
2200 W. 28th St., Ste 102
Yuma, AZ 85364

928-726-3904
knolte@cals.arizona.edu

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Food Safety Projects Coordinator

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1688 W. Adams St.
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602-542-0950
sjacobson@azda.gov

Karen E. Edwards
Program Coordinator

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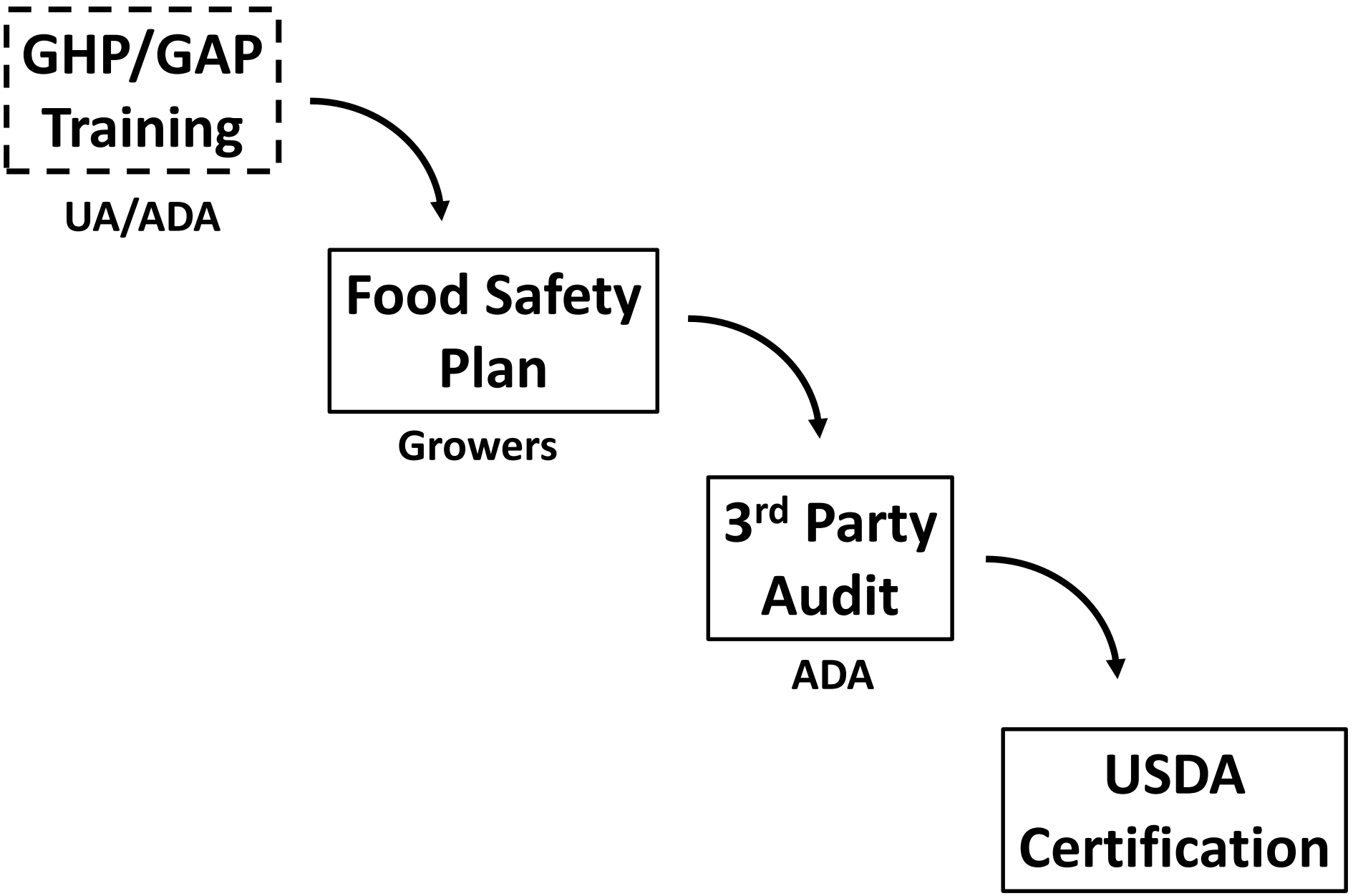
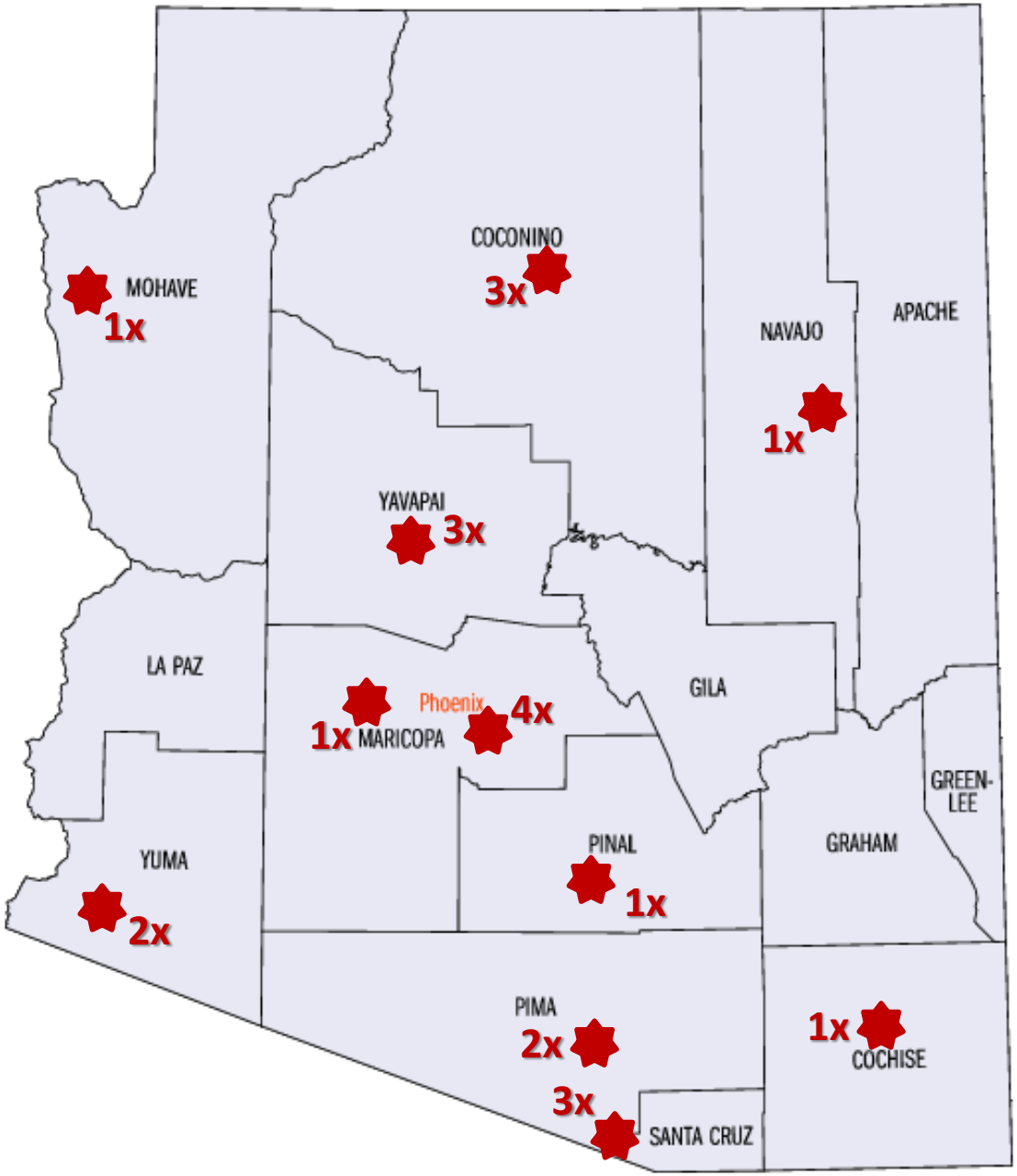
http://cals.arizona.edu/fps/


GHP/GAP Training
UA/ADA
Food Safety Plan
Growers
3rd Party Audit
ADA
USDA Certification



Arizona Fresh Produce Safety Workshops 2010 - 2015


Name this crop…


How is this crop irrigated?

Irrigation Water

Surface

Well

Municipal

Microbial Water Testing

Irrigation Water

Surface
3x/year

Well
1x/year
(During Production)

Municipal
1x/year

Lettuce linked to E. coli outbreak 'possibly' grown in Yuma area

May 07, 2010 4:54 PM

BY JOYCE LOBECK - SUN STAFF WRITER

There's a "possibility" that romaine lettuce linked to a widespread E. coli outbreak could have come from the Yuma area, acknowledged a local agriculture agent.

"A potential location has been identified in Yuma," Kurt Nolte, Yuma County Cooperative Extension director and agriculture agent, said Friday.

However, as of late Friday afternoon, the Food and Drug and Administration had not confirmed that the lettuce was grown here, he said. "The investigation is ongoing."

enlarge

YUMA SUN FILE PHOTO

Romaine lettuce linked to a widespread E. coli outbreak could have come from the Yuma area, according to Kurt Nolte, Yuma County Cooperative Extension director and agriculture agent. However, the Food and Drug Administration as of Friday afternoon had not confirmed that it was grown here.

Name this Crop…

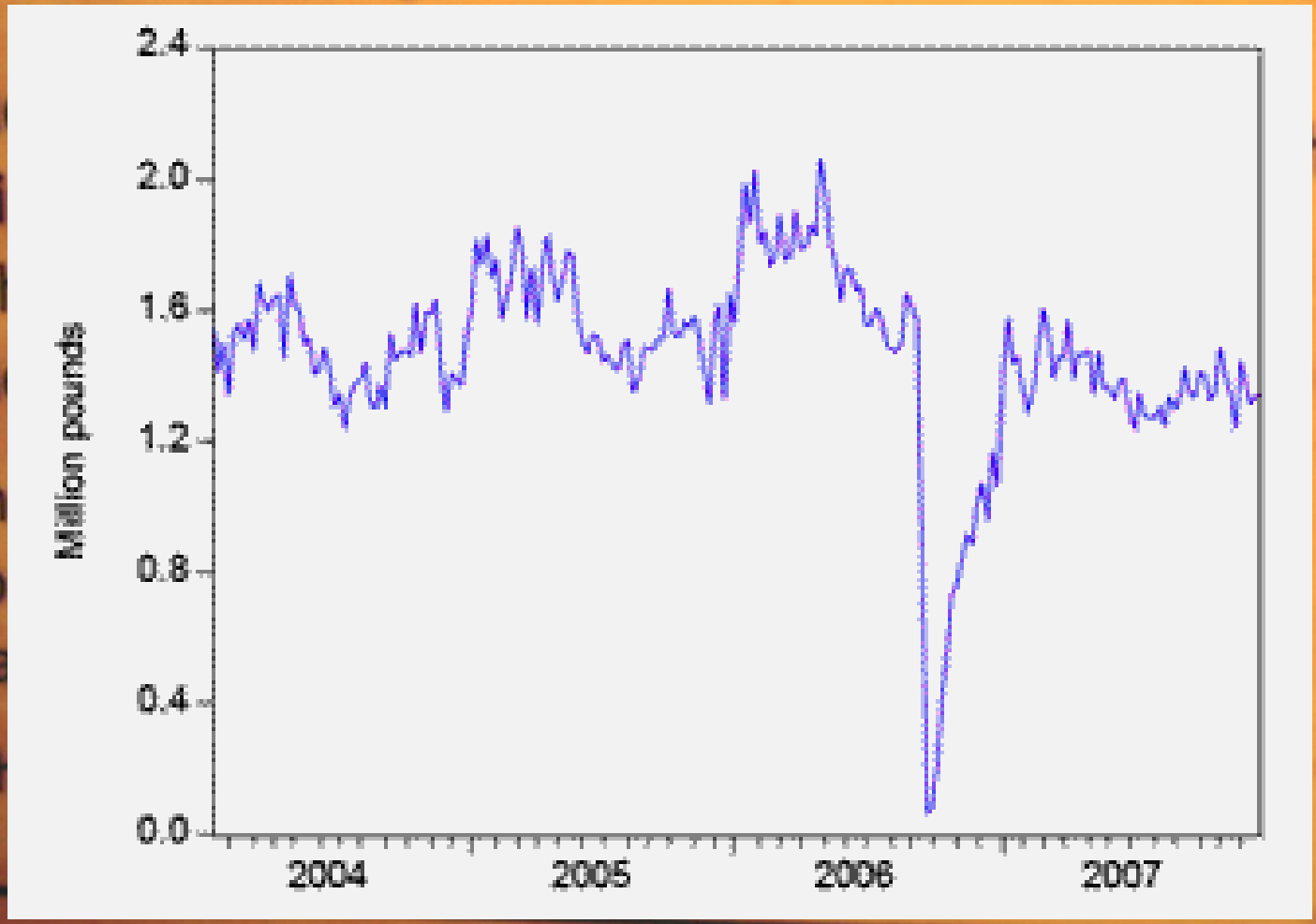

JENSEN
FARMS
LISTERIA
CANTALOUPES

Commercial Arizona Cantaloupe: Field Packed

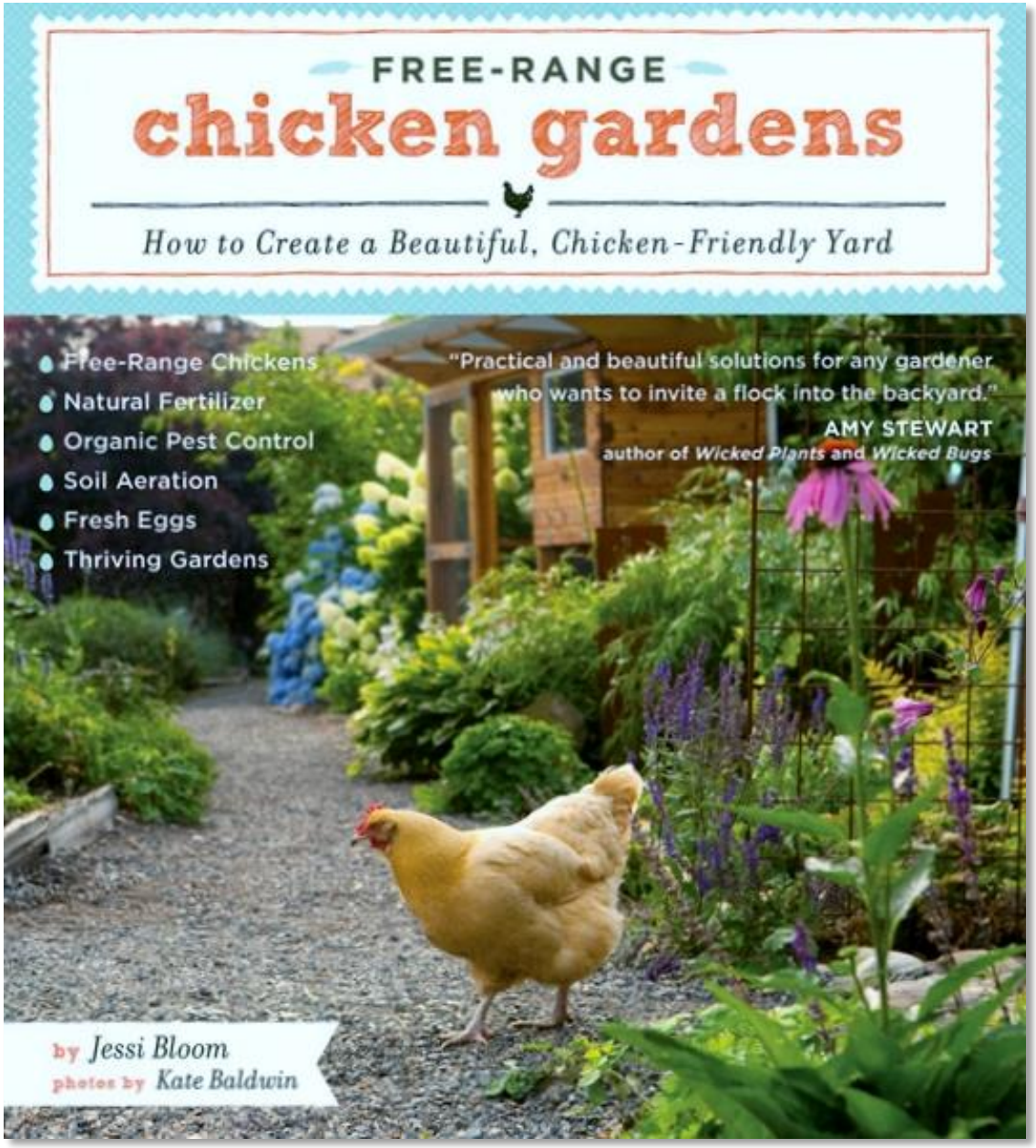

Cantaloupe
Listeria Outbreak:
More Deaths Likely
Sep 29, 2011 3:07 PM CDT

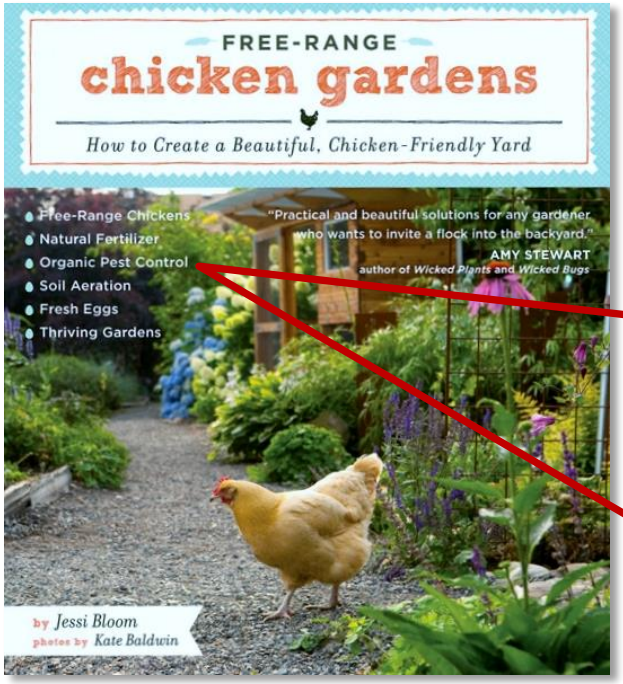
Name this Crop…

Fresh Spinach Is Back!




I'm in ur spinach
U wantz my E. koli?


FREE-RANGE
chicken gardens
How to Create a Beautiful, Chicken-Friendly Yard
Free-Range Chickens
Natural Fertilizer
Organic Pest Control
Soil Aeration
Fresh Eggs
Thriving Gardens
"Practical and beautiful solutions for any gardener who wants to invite a flock into the backyard."
AMY STEWART
author of Wicked Plants and Wicked Bugs
by Jessi Bloom
photos by Kate Baldwin


FREE-RANGE
chicken gardens
How to Create a Beautiful, Chicken-Friendly Yard
Free-Range Chickens
Natural Fertilizer
Organic Pest Control
Soil Aeration
Fresh Eggs
Thriving Gardens
"Practical and beautiful solutions for any gardener who wants to invite a flock into the backyard."
AMY STEWART
author of Wicked Plants and Wicked Bugs
by Jessi Bloom
photos by Kate Baldwin


How to Create a Beautiful, Cl
Free-Range Chickens
Natural Fertilizer
Organic Pest Control
Soil Aeration
Fresh Eggs
Thriving Gardens
"Practical a
who wa

Why Certification?

- **Not required by the law….yet**

FDA Food Modernization Act of 2010: A Brief Overview

New Food Safety Standards and Regulations: Impact on the Produce Industry

FDA Regulatory Authority

www.fda.gov/Food/GuidanceRegulation/FSMA/

www.fda.gov/Food/FoodSafety/FSMA

Flexibility/Exemptions for Small Farmers (and others)

- < $25,000, completely exempt
- Partial exemption, must satisfy all:
  - 3 yr average sales < $500,000 **ALL** food sales
  - Distribution intrastate or within 275 mi. radius
  - **Majority (over 50%)** distribution to "qualified end-users" e.g. directly to customers, restaurants or retail food (NO distributors)

Flexibility/Exemptions for Small Farmers: Act

- **Product label required: name/place business, if no label provided through placard at a retail, for example**
- **Exemption can be withdrawn** by FDA with reason of contamination or outbreak
- **Must document applying controls for hazards or in compliance with other state, local requirements**

Produce Safety Rule

Covered Produce – Risk based

- Grow, harvest, pack or hold most fruits and vegetables in raw agricultural state
- Includes herbs, mushrooms
- Produce not covered
  - low risk, rarely consumed raw
    - winter squashes, yams, potatoes, sweet corn, brussel sprouts, cranberries, beets, pumpkin…..
  - grains, peanuts (roasted)
  - will be receiving a kill step (documentation)
  - personal or on-farm use

Covered Produce – Risk based

- **For Non-exempt farms Produce Safety rules only apply to covered produce**
- **Covered produce includes crops commonly consumed raw–** almonds, apples, apricots, asian pear, avocados, bananas, Belgian endive, blackberries, blueberries, broccoli, cabbage, cantaloupe, carrots, cauliflower, celery, cherries, citrus, cucumbers, curly endive, garlic, grapes, green beans, guava, herbs (such as basil, chives, cilantro, mint, oregano, and parsley), honeydew, kiwifruit, lettuce, mangos, other melons, mushrooms, nectarine, onions, papaya, passion fruit, peaches, pears, peas, peppers (such as bell and hot), pineapple, plums, plumcot, radish, raspberries, red currant, scallions, snow peas, spinach, sprouts, strawberries, summer squash (such as patty pan, yellow and zucchini), tomatoes, walnuts, watercress, and watermelon; and mixes of intact fruits and vegetables (such as fruit baskets).

Produce Safety Standards

- Address growing, harvesting, sorting, packing/storage
- Science-based minimum standards for
  - Agricultural water
  - Biological Soil amendments
  - Worker Health and Hygiene
  - Equipment, Tools, Buildings and Sanitation
  - Domesticated and Wild Animals
- High Risk Produce - prioritize

Produce Safety Standards

- Address growing, harvesting, sorting, packing/storage
- Science-based minimum standards for
  - **Agricultural water**
  - **Biological Soil amendments**
  - **Worker Health and Hygiene**
  - **Equipment, Tools, Buildings and Sanitation**
  - **Domesticated and Wild Animals**
- High Risk Produce - prioritize

COVERED TODAY IN GHP/GAP

Compliance Dates Produce Standard Regulations: Very Generous

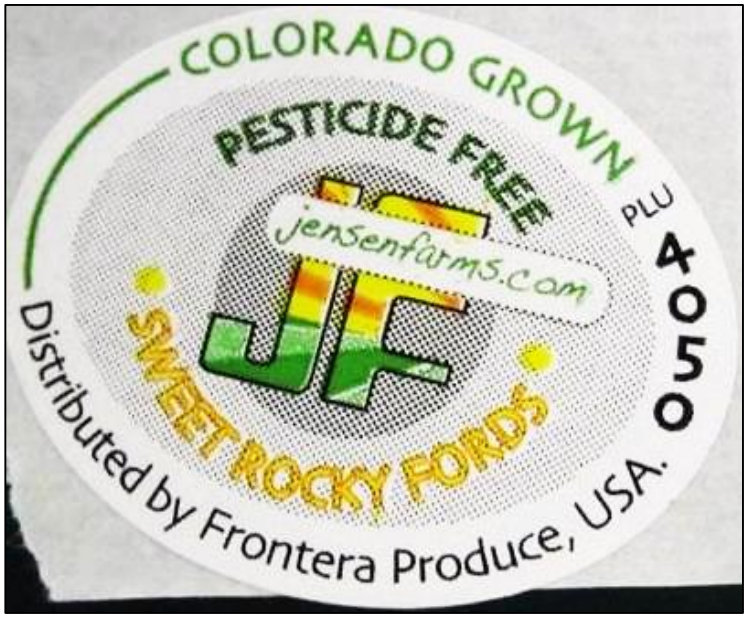
- Very small farms, >$25,000 ≤ $250,000
  - 4 years from effective date
  - Some water requirements, 6 years
- Small farms, > $250,000 ≤ $500,000
  - 3 years from effective date
  - Some water requirements, 5 years
- Others
  - 2 years from effective date
  - Some water requirements, 4 years

Why Certification?

- Not required by the law….yet
- **Minimize the Risk of Food Borne Pathogens within Specialty Crops. Public Safety**

Why Certification?

- Not required by the law….yet
- Minimize the Risk of Food Borne Pathogens within Specialty Crops. Public Safety
- **Buyer-driven**
  - **Produce buyers want (demand?) food safety programs**
  - **Grocery chains, restaurants, distributors**



- Albertson's
- Safeway
- Wal-Mart
- Wegmens
- Harris Teeter
- Publix
- ShotRite
- Shop & Stop
- Top Food & Drug
- US FoodService

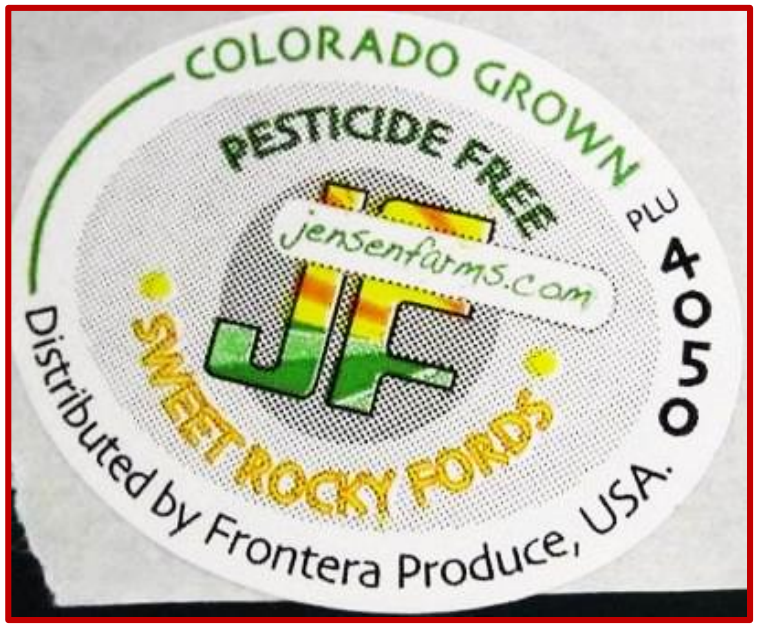
Little or No Grower Level Food Safety

Shared Liability/Risk

- Albertson's
- Safeway
- Wal-Mart
- Wegmens
- Harris Teeter
- Publix
- ShotRite
- Shop & Stop
- Top Food & Drug
- US FoodService

Grower Level Food Safety:
Limited Implementation and Flagrant Violations

High Liability/Risk



Low Liability/Risk

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- Harris Teeter
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Why Certification?

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- Minimize the Risk of Food Borne Pathogens within Specialty Crops. Public Safety
- **Buyer-driven**
  - **Produce buyers want (demand?) food safety programs**
  - **Grocery chains, restaurants, distributors**
  - **Improved Marketability**
  - **Approved Food Source(?)**
    - ***Supports GHP/GAP, Enforced Where Appropriate***

Arizona Food Safety Evaluation Report

Facility Name_____ ID#_____

Address_____ Facility Type_____

Rating

Ratings: E= Excellent S= Satisfactory N= Needs Improvement U= Unacceptable
The circled items indicate whether the critical items were met during the food safety evaluation.
y= yes n= no n/o= not observed n/a= not applicable

Cooking, Holding & Cooling Temperature Controls

y n n/o n/a Potentially hazardous foods cooked to proper temperature.

y n n/o n/a Cooked potentially hazardous foods held at 130°F or above.

y n n/o n/a Potentially hazardous foods reheated properly.

y n n/o n/a Cooked potentially hazardous foods cooled properly.

y n n/o n/a Potentially hazardous foods held at proper cooling temperature.

Food/Equipment	Temp	Food/Equipment	Temp

Employee Health & Hygiene

y n n/o n/a Hands and exposed arms clean and properly washed.

y n n/o n/a Hand washing facilities available and functional.

y n n/o n/a Employees using proper hand and arm cleaning procedures.

y n n/o n/a Live animals handled properly.

y n n/o n/a Person in charge requires employees to report illnesses.

y n n/o n/a Employees eating, drinking, or using tobacco only in designated areas.

y n n/o n/a Persons with discharges from eyes, nose and mouth prohibited from working with exposed food.

y n n/o n/a Food handlers preventing contamination of ready-to-eat food by limiting bare hand contact to approved methods.

y n n/o n/a Food handlers tasting food properly.

Food Condition & Source

y n n/o n/a All foods are from approved sources, safe, unadulterated and honestly presented.

y n n/o n/a Food received in proper condition and temperature.

y n n/o n/a Shellfish tags kept as required.

Prevention of Contamination

y n n/o n/a Food separation, packaging, segregation and substitution methods are preventing food contamination.

y n n/o n/a Effective food contact controls are preventing food contamination.

y n n/o n/a Food contact surfaces and equipment are cleaned frequently and properly to prevent food contamination.

y n n/o n/a Food contact surfaces sanitized properly and approved equipment being used.

Date Marking & Disposal

y n n/o n/a Foods are correctly date marked.

Consumer Advisories & Protection

y n n/o n/a Consumer advisories are conducted properly.

Demonstration of Food Safety Knowledge

y n n/o n/a Designated person in charge demonstrates adequate food safety knowledge applicable to operation.

Time Only as a Food Safety Control

y n n/o n/a Food holding and storage time is within food safety limits.

HACCP Plan Followed

y n n/o n/a HACCP plan followed properly.

Standard Operating Procedures

y n n/o n/a Other critical and non critical items in compliance (if not, specify violations under comment section).

Comments and corrective action necessary:

Person in Charge_____ Date_____ Sanitarian_____ Date_____

OEH-01 10/01 Contact phone #_____ Time_____

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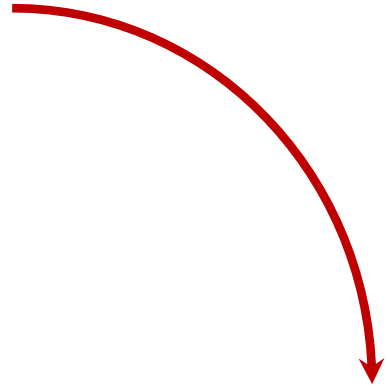

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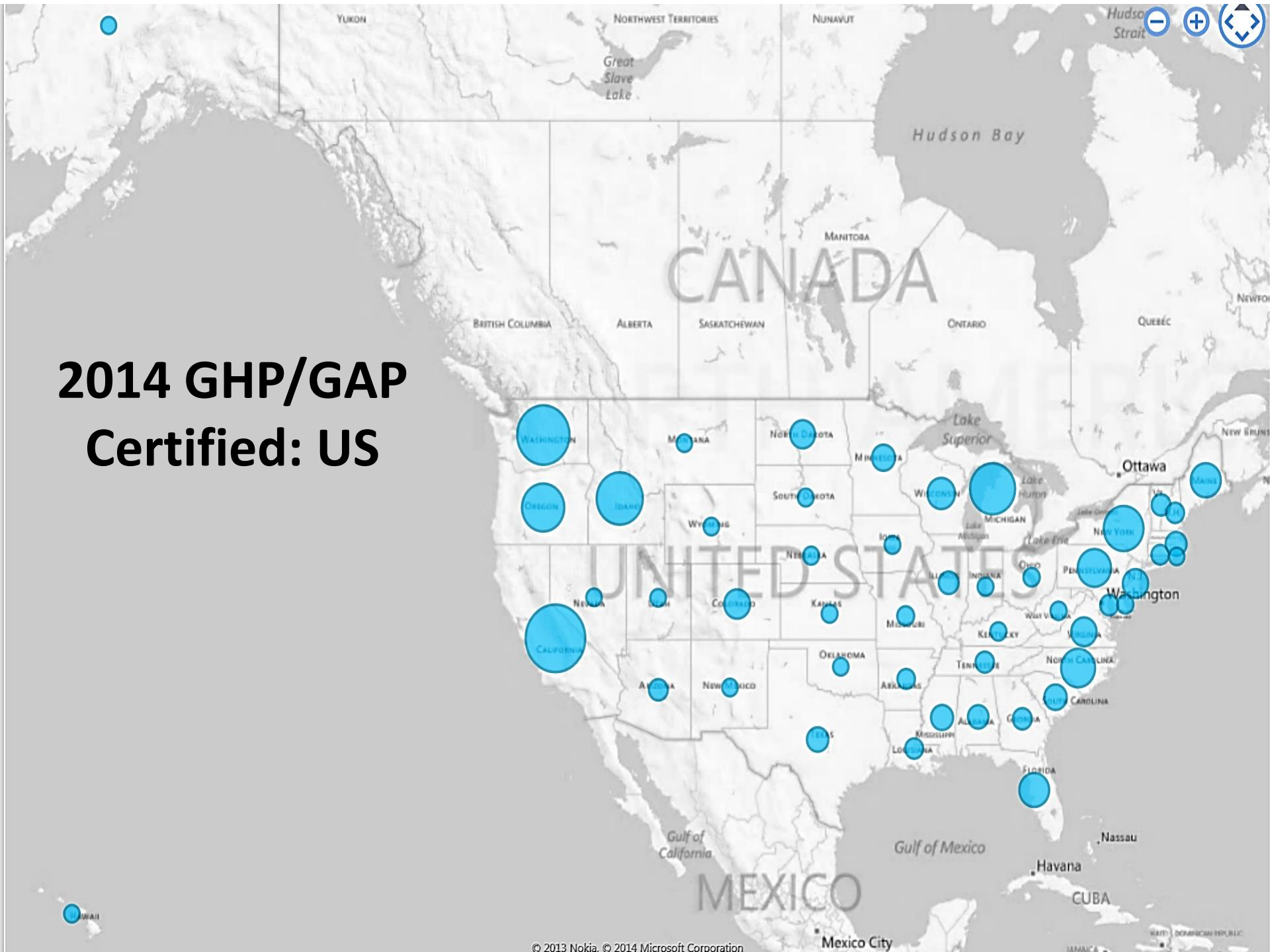
Why Certification?

- Not required by the law
- Minimize the Risk of Food Borne Pathogens within Specialty Crops. Public Safety
- Buyer-driven
  - Produce buyers want food safety programs
  - Grocery chains, restaurants, distributors
  - Improved Marketability
  - Approved AZ Food Source
- **Your Protection, Limits Liability (Buyers, Growers, Volunteers, Visitors)**

What is the GAP/GHP Program?

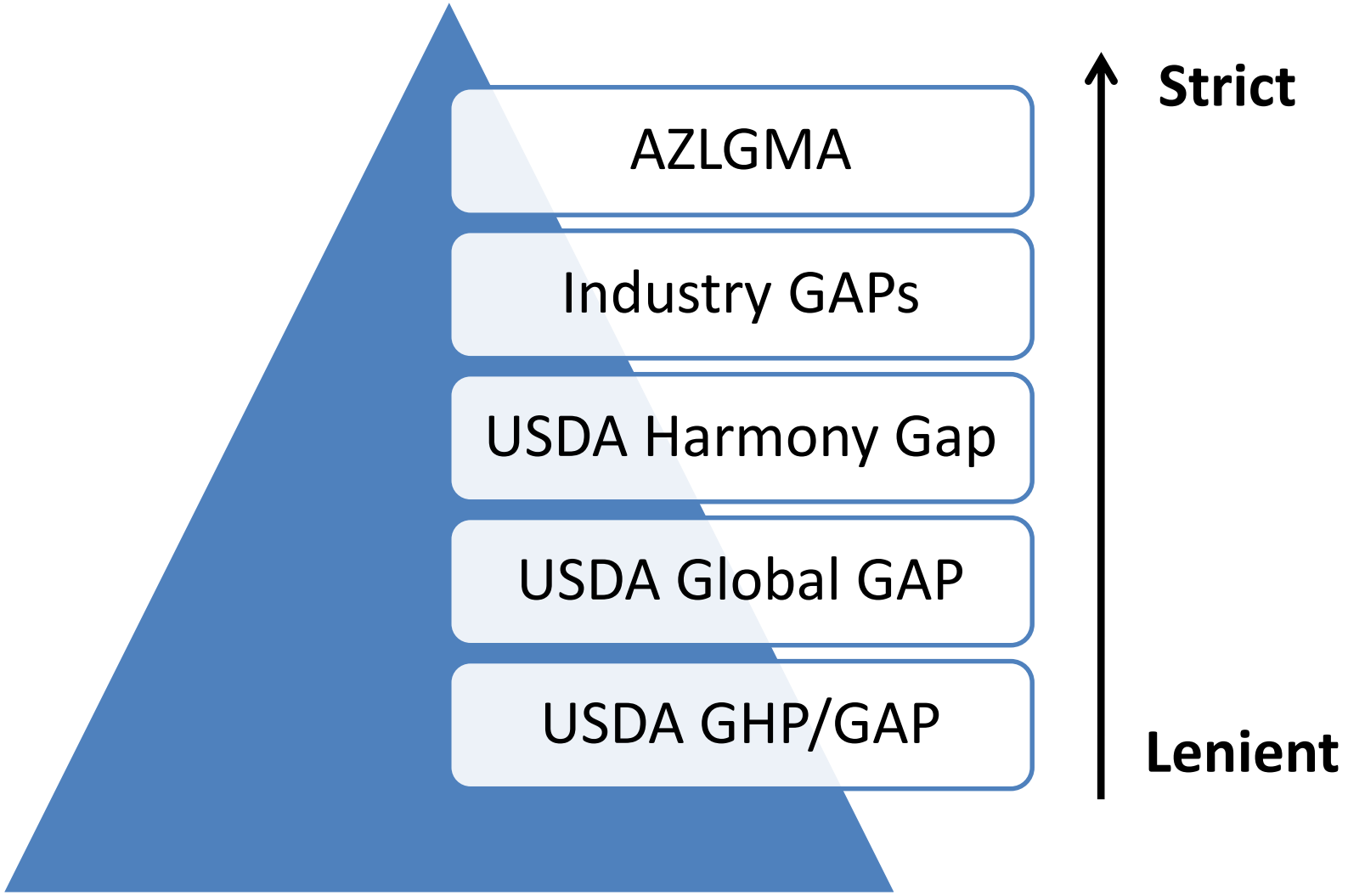
- **Good agricultural practices (GAPs) encompasses the general procedures growing and harvesting of crops.**
- **Good Handling Practices (GHPs) refers to all post-harvest procedures including washing, packing, storage, repacking and distribution.**
- **Nomenclature Quirks…**
  - **Some use "GAPs" as a comprehensive term**
  - **For others, "GHP/GAP" is a term which describes the food safety programs.**

2014 GHP/GAP
Certified: US

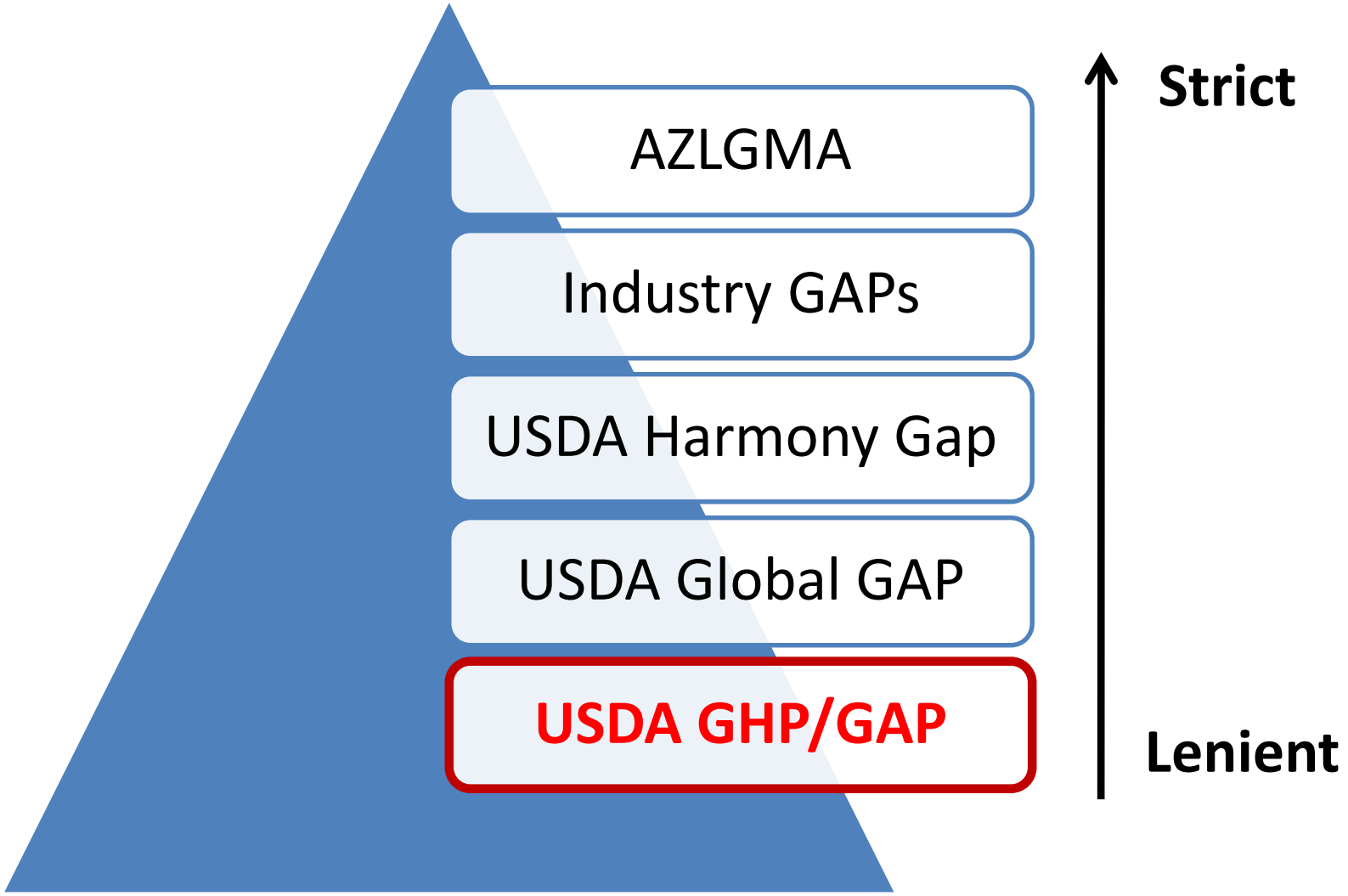


PREVENTION is the Key to Reducing Microbial Contamination of Fresh Fruits and Vegetables

US Produce Safety Programs



US Produce Safety Programs



History of GAP/GHP Audits

- **1998 - FDA and USDA issue "*The Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables*"**
- **Wholesalers want assurance**
- **Shippers and Growers approach USDA to develop an audit system**
- **Result: GAP/GHP Audit system was developed by USDA and FDA**

Audits

- Six components of GHPGAP
  - Plus a general section
  - Must pass to advance to other components
  - Each component is treated individually
- Audits:
  - First party = You audit yourself
  - Second party = Buyer audits you
  - Third party = independent (blind) audit ← GHP/GAP
- Must score a minimum of 80% to pass audit

If you did not RECORD IT, you did not do it

- **Record keeping allows you to keep track of farming operations and worker training.**
- **Record keeping documents your activities should this information ever be required.**
- **Use log sheets for daily activities.**

Audit Components

General Questions

Implementation of a Food Safety Program

	Questions	Points	YES	NO	N/A	Doc
P-1	A documented food safety program that incorporates GAP and/or GHP has been implemented.					D
P-2	The operation has designated someone to implement and oversee an established food safety program. Name _____					D

Traceability

	Questions	Points	YES	NO	N/A	Doc
G-1	A documented traceability program has been established.	15				D
G-2	The operation has performed a "mock recall" that was proven to be effective.	10				R

Worker Health & Hygiene

	Questions	Points	YES	NO	N/A	Doc
G-3	Potable water is available to all workers.	10				R
G-4	All employees and all visitors to the location are required to follow proper sanitation and hygiene practices.	10				P
G-5	Training on proper sanitation and hygiene practices is provided to all staff.	15				D
G-6	Employees and visitors are following good hygiene/sanitation practices.	15				
G-7	Employees are washing their hands before beginning or returning to work.	15				
G-8	Readily understandable signs are posted to instruct employees to wash their hands before beginning or returning to work.	10				
G-9	All toilet/restroom/field sanitation facilities are clean. They are properly supplied with single use towels, toilet paper, and hand soap or antibacterial soap and potable water for hand washing.	15				

D = Documented Policies

R = Records

P = Procedures (SOPs)

Policies, SOPs & Records

- We will be assembling a collection of:
  - Documented Policies (D)
  - Standard Operating Procedures (P)
  - Records (R)
- What's the Difference?

Policy

Policy = Consists of Simple Facts or Statements that may be verified through record keeping

<u>Policy Examples:</u>

- **Workers that are ill are not allowed in the garden…**
- **Eating is confined to designated areas…**
- **Gloves will not be taken to the restroom…**
- **Wearing jewelry in the garden is prohibited…**
- **Long hair must be tied back and contained within a hair net…**
- **Product containers are not intended for personal use…**

Policy

- **Policy = Consists of Simple Facts or Statements**

“Everyday In April, I’ll serve Peanut Butter and Jelly Sandwiches for Lunch in the Cafeteria”

Policy

- **Policy = Consists of Simple Facts or Statements**

"Everyday In April, I'll serve Peanut Butter and Jelly Sandwiches for Lunch in the Cafeteria"

<u>Noteworthy Items in Statement:</u>
When: **Today (4/18/2013), Lunch**
What: **Sandwich, Peanut Butter & Jelly**
Who: **I, You, Students, Volunteers…**
Where: **Cafeteria**
How: **???**

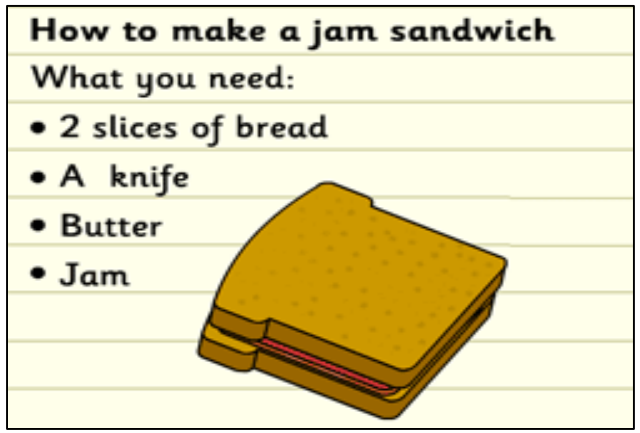
Standard Operating Procedures (SOPs)

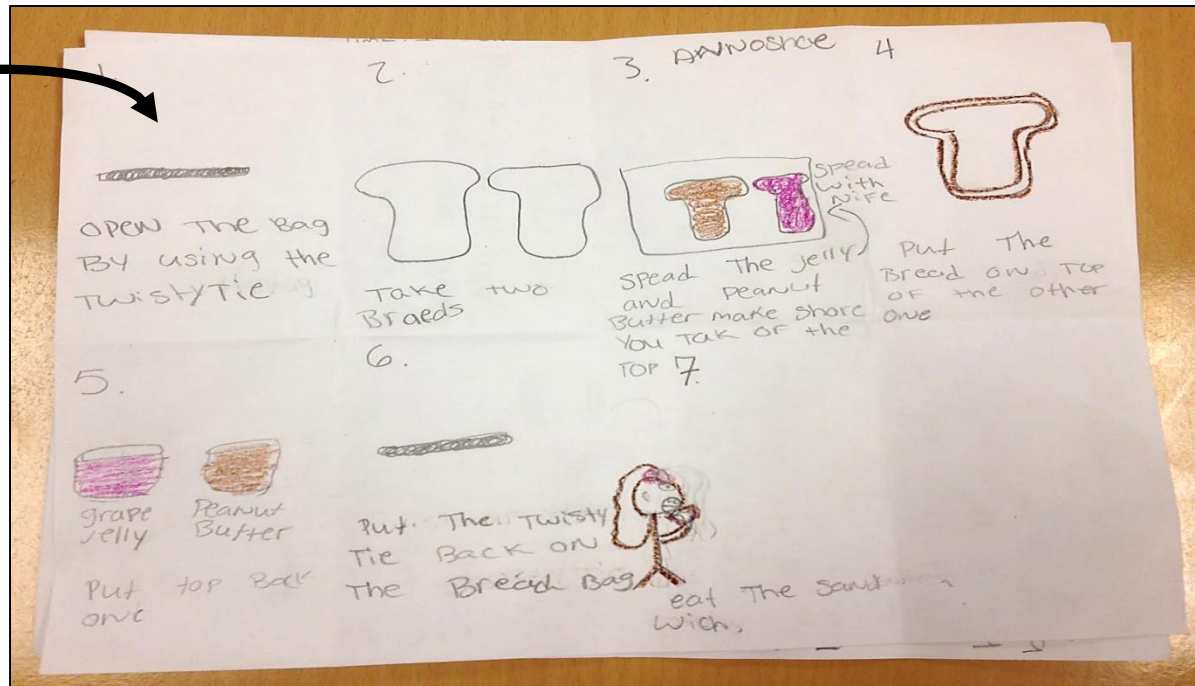
Standard Operating Procedures

Set of prescribed methods to be routinely followed

Noteworthy Items in Statement:

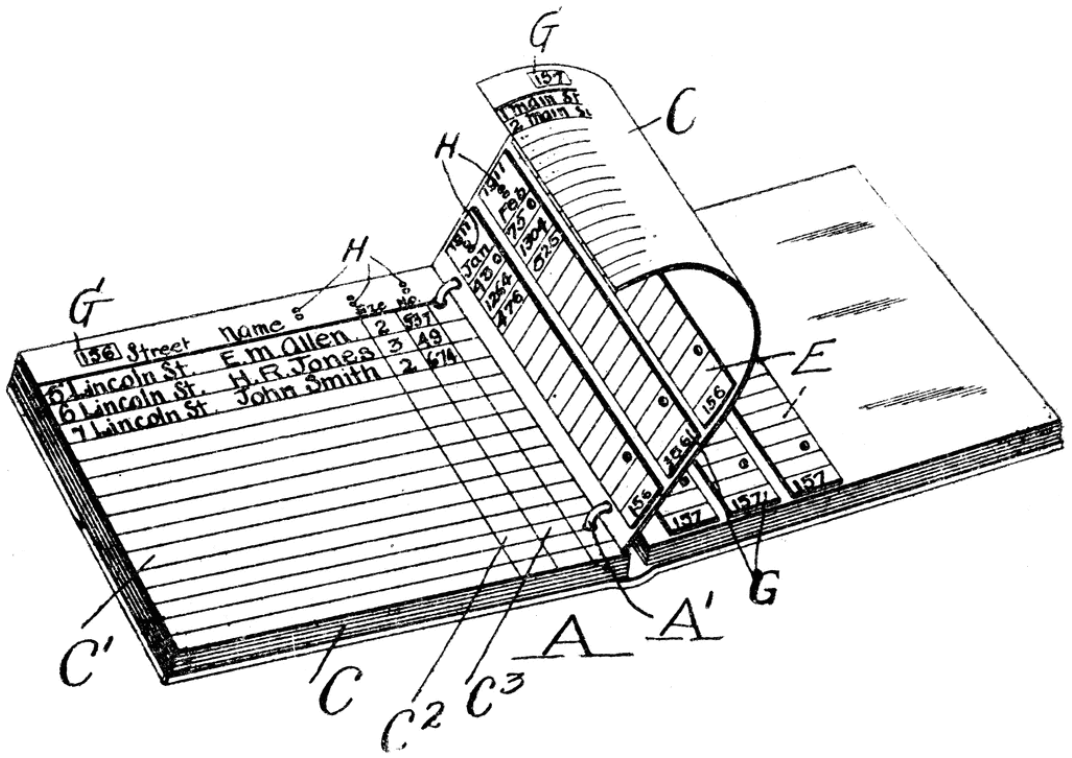
When: Today (4/18/2013), Lunch
What: Sandwich, Peanut Butter & Jelly
Who: I, You, Students, Volunteers…)
Where: Cafeteria
How: **Follow SOPs**





Records

Records = Collection of Logs that Shows Compliance



ex

Records

Records = Collection of Logs that Show Compliance

Compliant Example

Cafeteria Lunch Menu Record Log Sheet

Date	Meal	Item Served	Bread	Peanut Butter	Jelly	Ham	Lettuce	Tomato	Initials
4/12/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/15/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/16/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/17/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/18/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN

Records

Records = Collection of Logs that Show Compliance

Noncompliant Example

Cafeteria Lunch Menu Record Log Sheet

Date	Meal	Item Served	Bread	Peanut Butter	Jelly	Ham	Lettuce	Tomato	Initials
4/12/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/15/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/16/13*	Lunch	Ham	Yes	No	No	Yes	Yes	Yes	KN
4/17/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN
4/18/13	Lunch	PBJ	Yes	Yes	Yes	No	No	No	KN

***4/16/13: Ran out of jelly, served ham sandwich**

***Corrective Action: Replenished jelly supplies**

Policies, Documents and Records…

The University of Arizona

ARIZONA COOPERATIVE EXTENSION
COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Record
G-10

Restroom & Toilet Facility Maintenance Log

Location: _____

Date	Toilet & Hand Washing Facilities		Soap		Single-use Paper Towels		Toilet Paper		Trash Can		Potable Water		Employee's Initials
	Checked	Cleaned	Checked	Filled	Checked	Filled	Checked	Filled	Checked	Emptied	Checked	Filled	

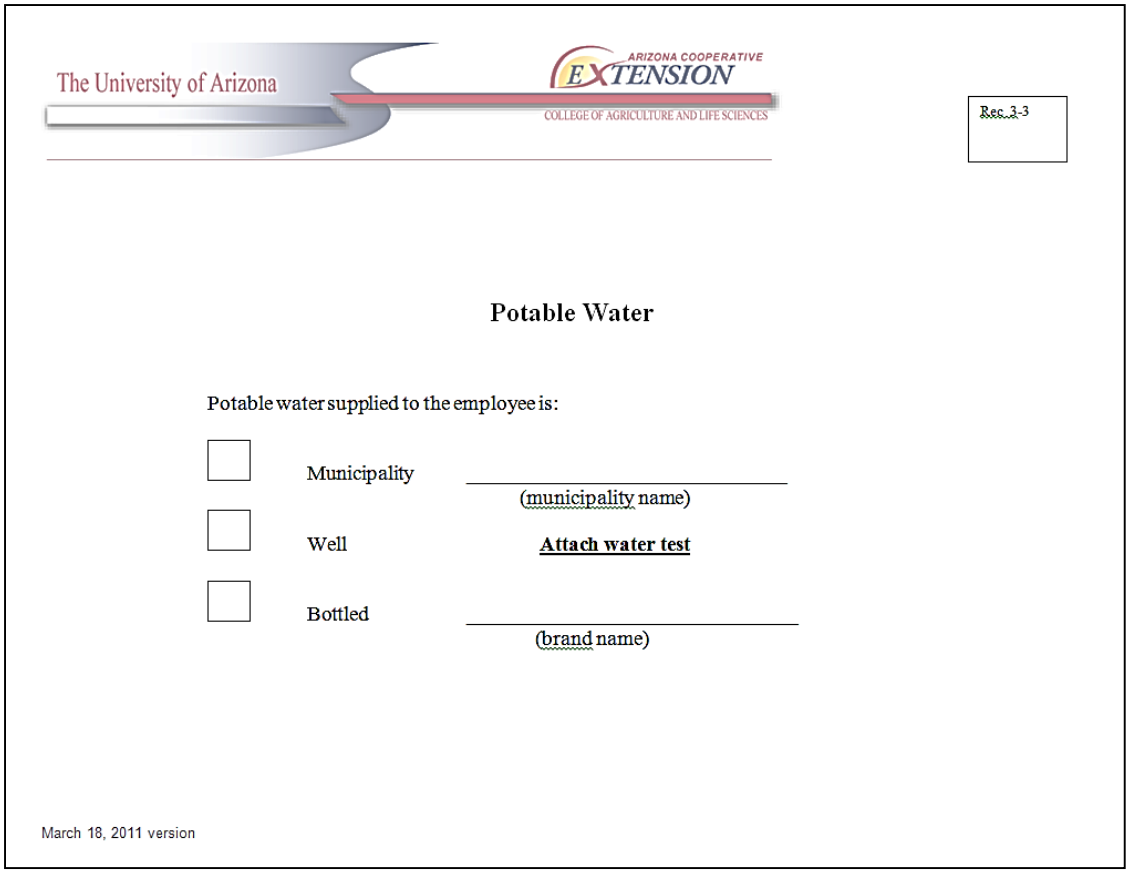
Sheet Reviewed by: _____ on _____
(Management) (Date)

Note: Use a different sheet for each facility
5/23/2012

Policy (example): Restrooms will be cleaned every 2 hours. Record shows adherence to policy.

Policies, Documents and Records…

A record, "R" indicates that a record is required to be kept showing an action was taken.



The University of Arizona

ARIZONA COOPERATIVE EXTENSION
COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Rec 3-3

Potable Water

Potable water supplied to the employee is:

☐ Municipality _____
(municipality name)

☐ Well **Attach water test**

☐ Bottled _____
(brand name)

March 18, 2011 version

Seven Components

- General Questions (all audits)
- Part 1: Field Production
- Part 2: Field Harvesting & Field Packing
- Part 3: Packing and Processing Facilities
- Part 4: Storage and Transportation
- Part 5*: Traceability (Embedded within all other parts)
- Part 6: Wholesale Distribution/Warehouse
- Part 7: Preventative Food Security Procedures

Traceback questions are incorporated into each component.

General Questions

- Mandatory component of all audits
- Covers employee & visitor hygiene practices
- Training of employees
- Sanitation of farm/facility
- Traceability

Part 1 – Field Production

- Water
- Manure
- Animal/Wildlife
- Land Use

Part 2 – Field Harvest and Field Packing

- **Field Sanitation**
- **Field Harvesting and Transportation**

Part 3 – Packing & Processing Facilities

- Water use
- Packing Line Operation and Sanitation
- General Facility Sanitation

Part 4 – Storage and Transportation

- Containers and Pallets
- Pest Control
- Temperature Control
- Transportation/Loading

Part 5 - Traceability

- **Contained within all other audit parts**

Part 6 – Wholesale Distribution Center/ Warehouses

Part 7 – Preventive Food Defense Procedures

- **Based on FDA's "Food Producers, Processors, and Transporters: Food Security Preventive Measures Guidance for Industry"**
- **Audit-based**

Automatic Failure

- Immediate food safety risk
- Presence of rodents, pets, etc.
- Employee practices that might jeopardize the safety of produce
- Falsification of records
- No Quality Manual (Question G-1)
- No one designated to oversee an established food safety program (Question G-2)

Audit Fees

- $92 per hour
- $50 administrative fee (each time)
- Billing starts when inspector leaves office until inspector returns to office
- Grants available
- Travel time can be shared between multiple producers in same area

United States Department of Agriculture

This is to verify that **Tir na n'Og (Land of the Young); Farmersburg, Iowa**

has successfully passed the initial elements of the voluntary

USDA Audit Program for

GOOD AGRICULTURAL PRACTICES & GOOD HANDLING PRACTICES

To verify continued adherence to the program, please visit http://www.ams.usda.gov/gapghp

Potatoes, Okra, Onions, Broccoli, Cabbage-Farm Review, Field Harvesting & Field Packing Activities, House Packing Facility

Fresh Products Branch

September 2010

Date Valid for One Year

USDA

GAP & GHP

AUDIT PROGRAM

FRUIT & VEGETABLE PROGRAMS

RESTRICTED ACCESS

USDA GAP/GHP ONLY

NO PRIVATE AUDIT FIRMS ALLOWED ACCESS

USDA

GAP/GHP

VERIFIED

Where to find GAP/GHP Audit Info

USDA website

www.ams.usda.gov/gapghp

University of Arizona website

http://cals.arizona.edu/fps/

- Back to Top -

Orchard Floor Management and Weed Control

Biographical Information:
Teryl R. Roper
Utah State University
Department of Plants, Soils, and Climate

Dr. Roper teaches the fruit production course at USU. He was Extension Fruit Crops Specialist at the University of Wisconsin-Madison for 20 years. He earned BS and MS degrees in Botany from Brigham Young University and a PhD in Horticulture from Washington State University. Teryl's academic career focused on the production of fruits in the upper Midwest, including cranberries, apples, and tart cherries. Much of his research included mineral nutrition of perennial fruit crops.

Session Description:

Mineral nutrition of perennial crops is significantly different than for annual crops. The objective is to ensure that the plant has sufficient mineral nutrients at all times. Growers need to know the correct rates, timing, products, and placement for fertilizer application. Elements of data driven decision making with regards to fertilizing brambles will be presented.

Orchard Floor Management

Teryl R. Roper
Department of Plants, Soils, & Climate
Utah State University

Principles to cover

- Why consider the Orchard Floor?
- What is a weed to a tree?
- Effects of competition
- Indirect effects
- Management options
- Methods of weed management
  - Chemical
  - Mechanical

Why?

- Cost to maintain
- Competition water/nutrients/light
- Pest habitat
- Trafficability
- Radiation
- Prevent erosion
- Maintain soil structure
- Clear sprinklers

Weeds <u>can</u> compete with trees for light!

Rodent Injury

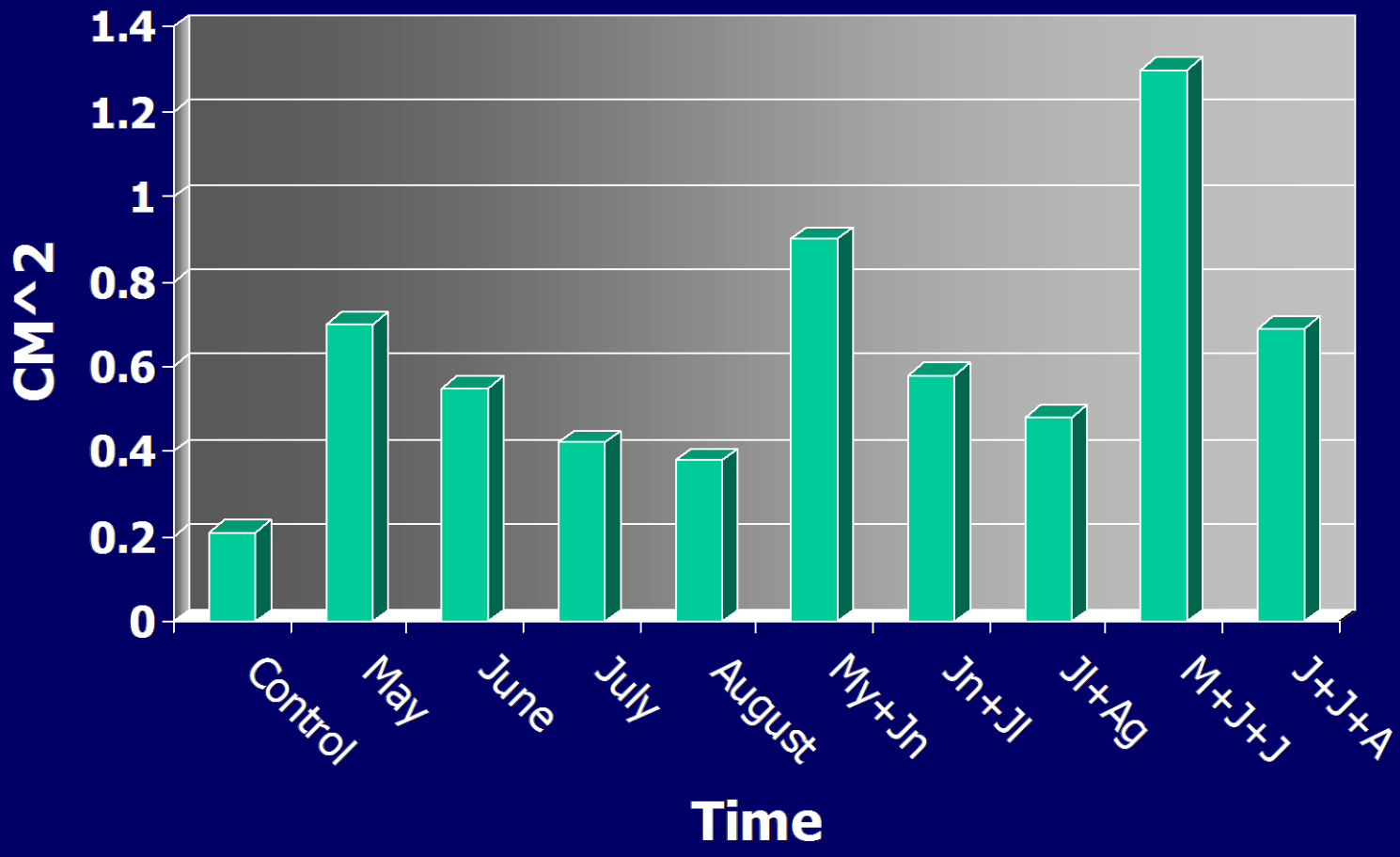
Questions:

- What time of year is weed control most important?
- How large of an area should be vegetation free?
- What weeds are most competitive?

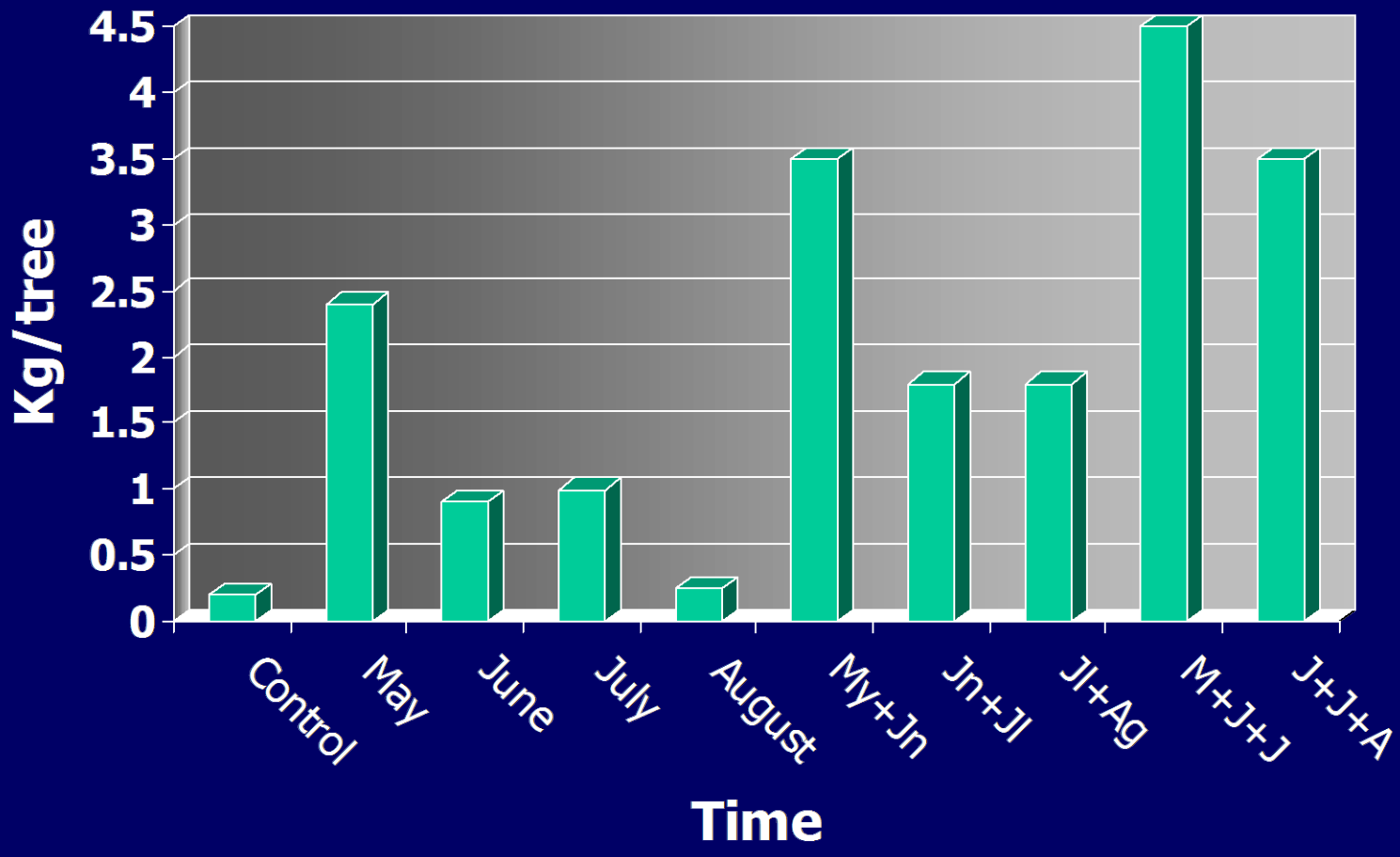
Duration

- Is season long control necessary or desirable?
- What time is most important?
- Will a single herbicide application suffice?

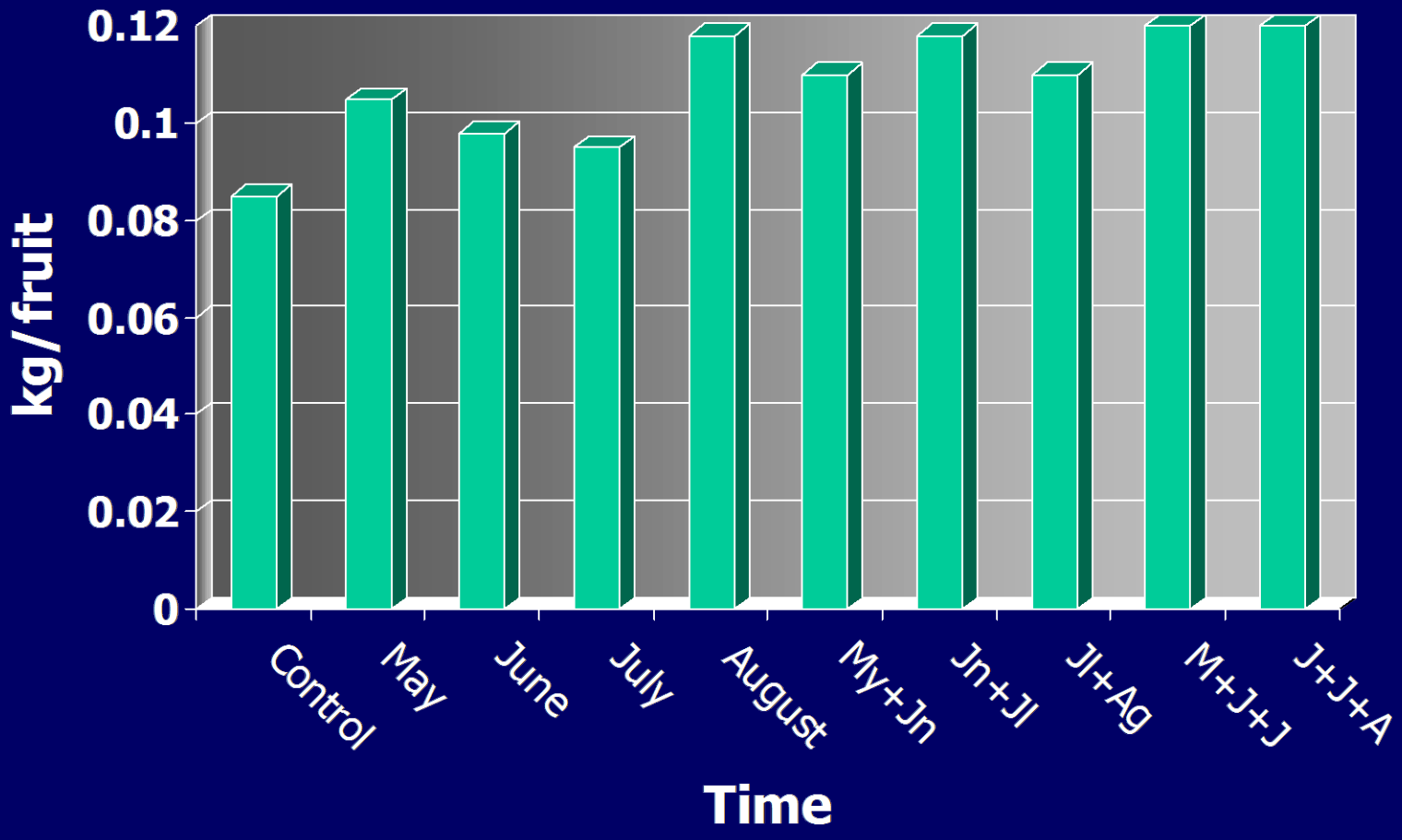
TCA Increase



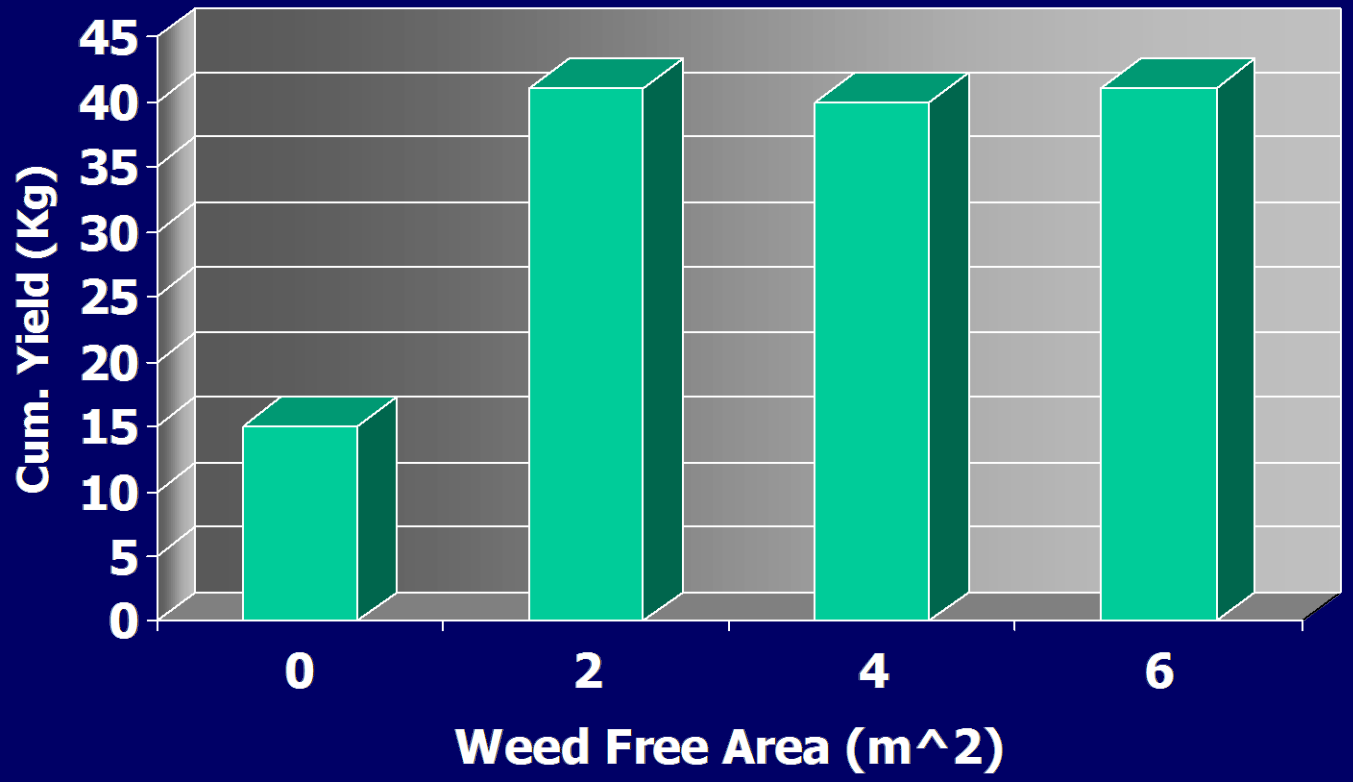
Crop per Tree



Fruit Size


0.12
0.1
0.08
0.06
0.04
0.02
0
kg/fruit
Control
May
June
July
August
My+Jn
Jn+Jl
Jl+Ag
M+J+J
J+J+A
Time

Weed Free Area



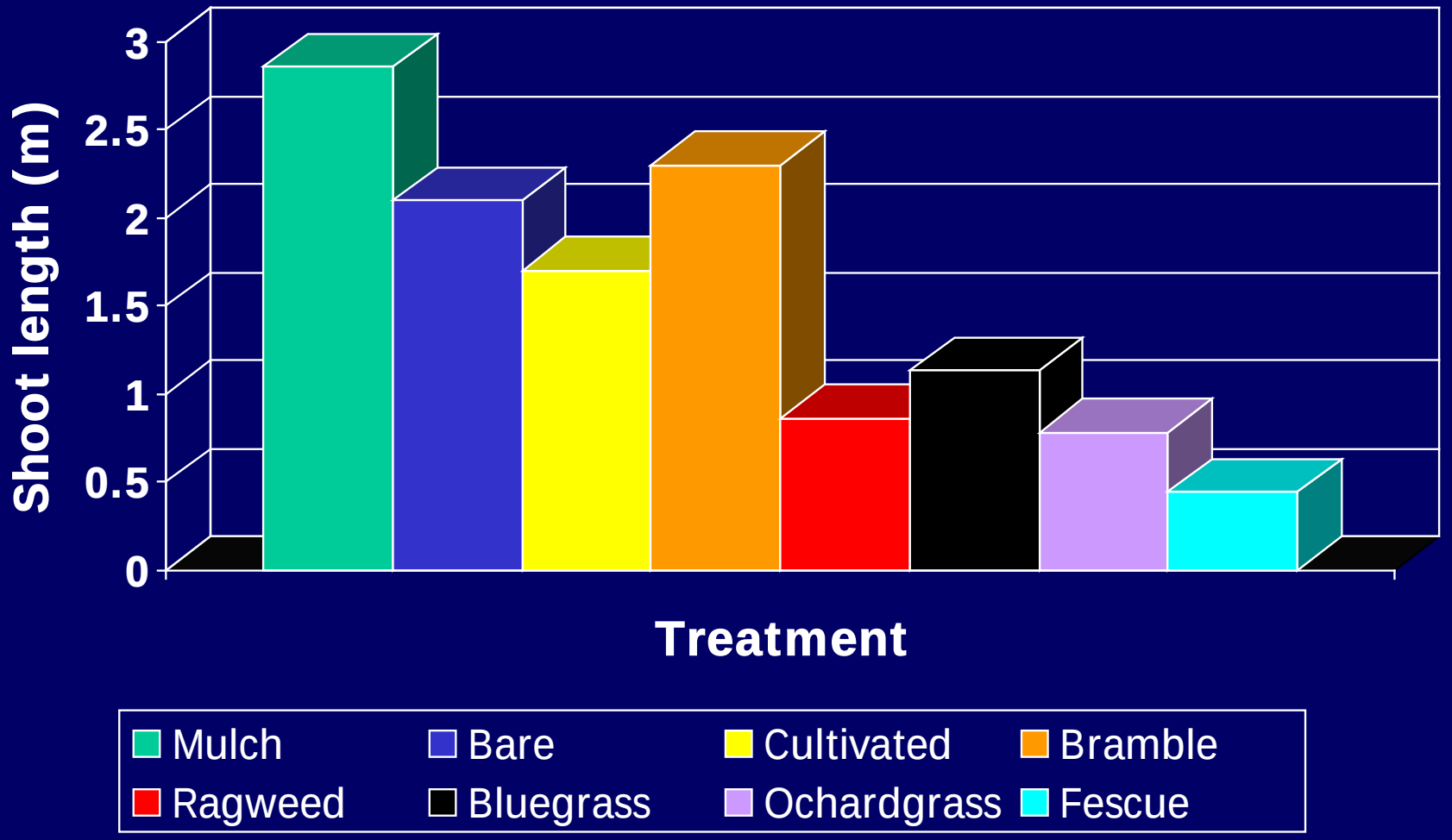
What is a weed to a tree?

- Woody perennials
- Herbaceous perennials
- Annual broadleaves
- Grasses

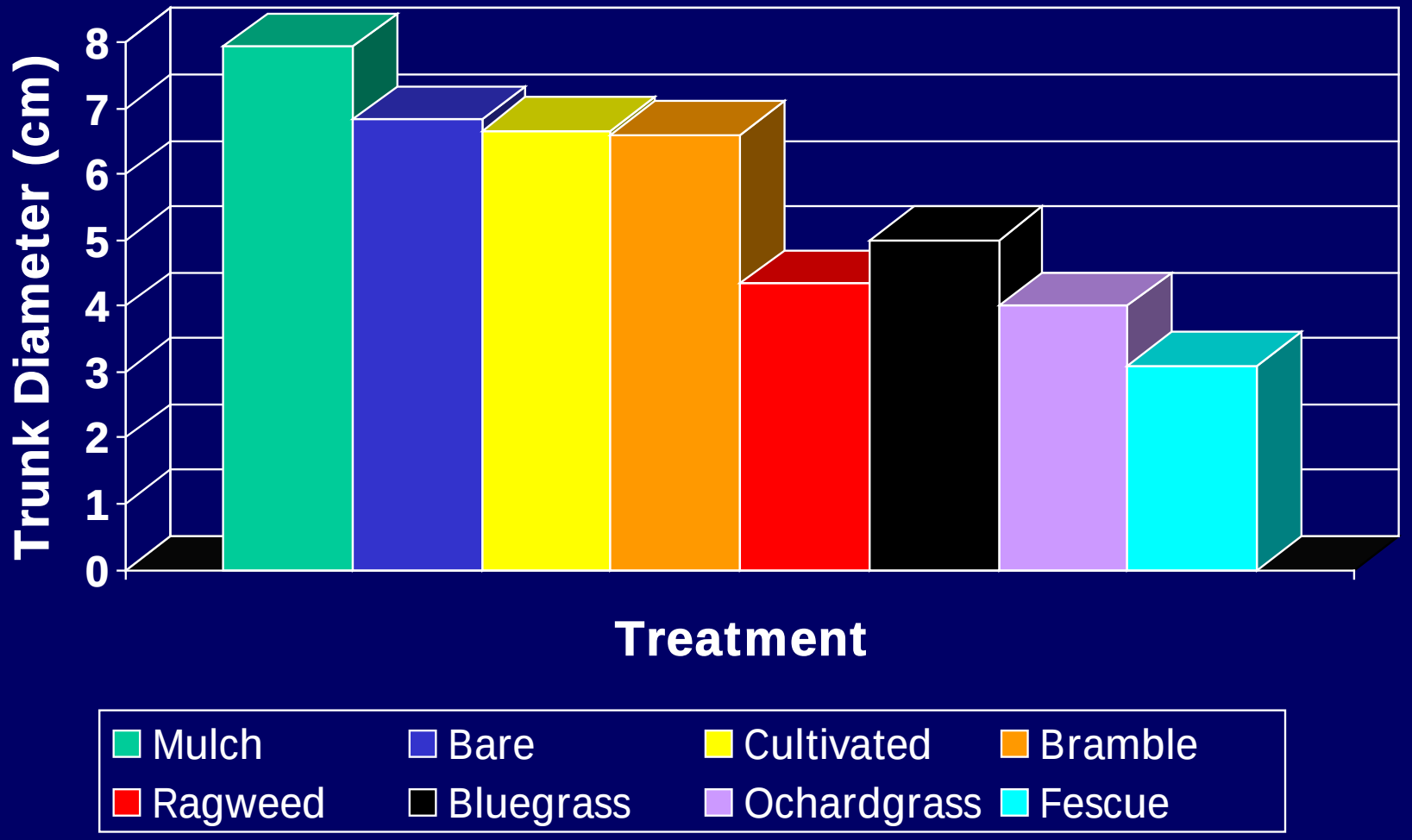
Competitiveness

- Bare Ground
- Mulch
- Cultivated
- Bramble
- Ragweed
- Kentucky Bluegrass
- Orchardgrass
- Tall Fescue

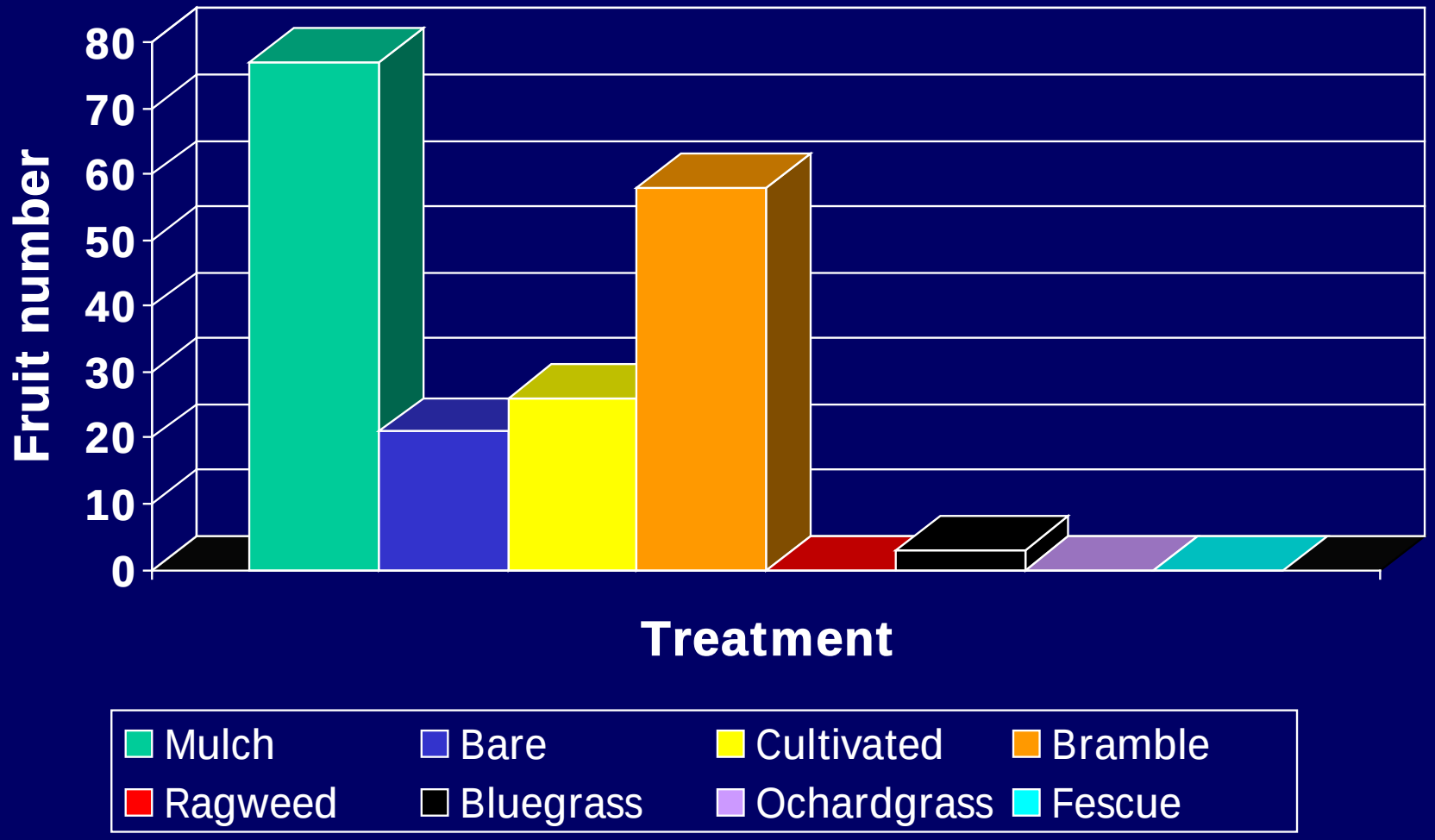
Shoot Length



Trunk Diameter



Fruit per tree



Indirect Weed Effects

- Competition for pollinators
- Harbors pest and beneficial insects
- Radiation

Frost Protection

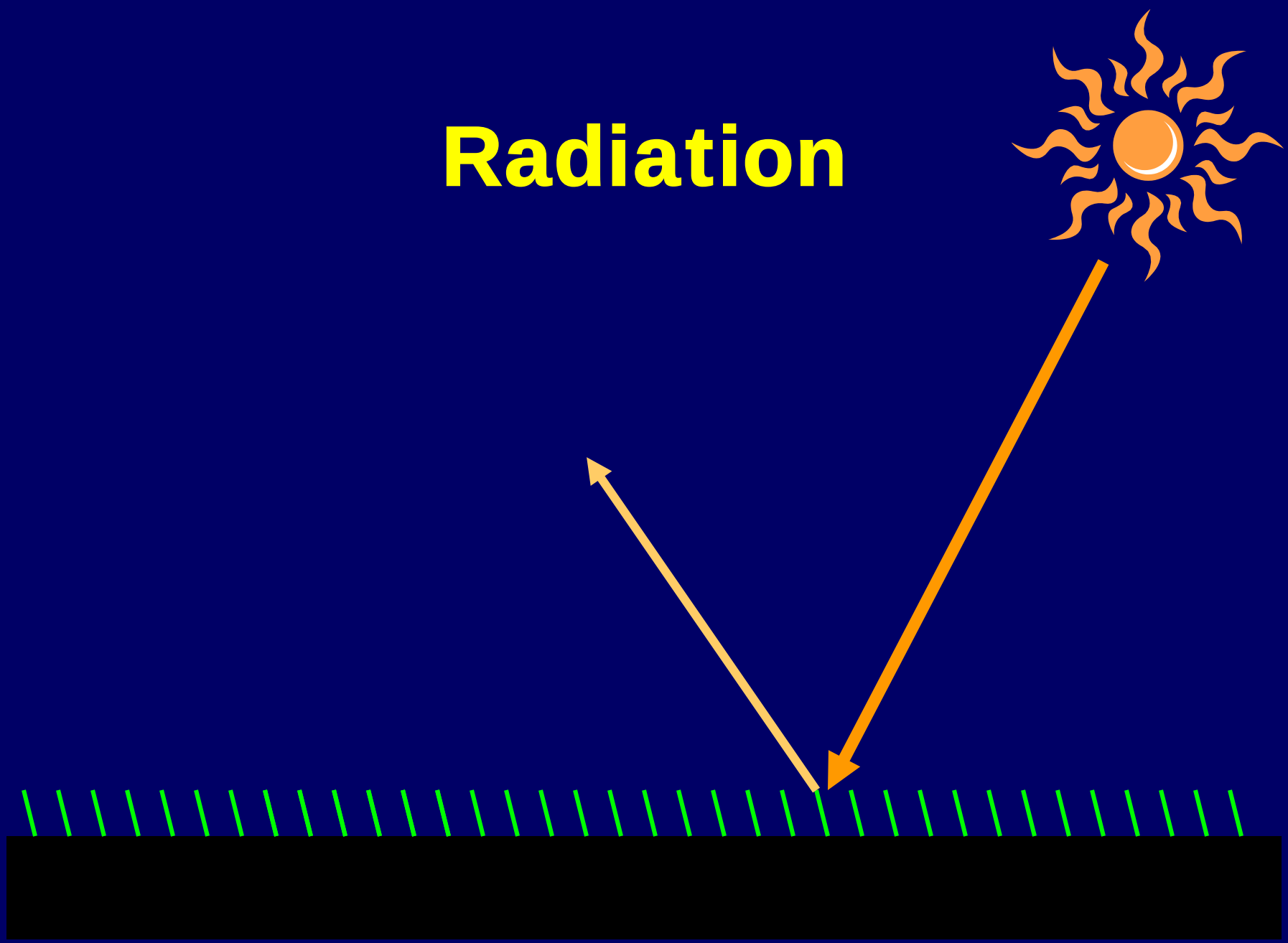
- Radiation frosts
  - Calm nights
  - Clear skies
- Advection frosts
  - Windy nights
  - Skies may be cloudy

Frost Protection

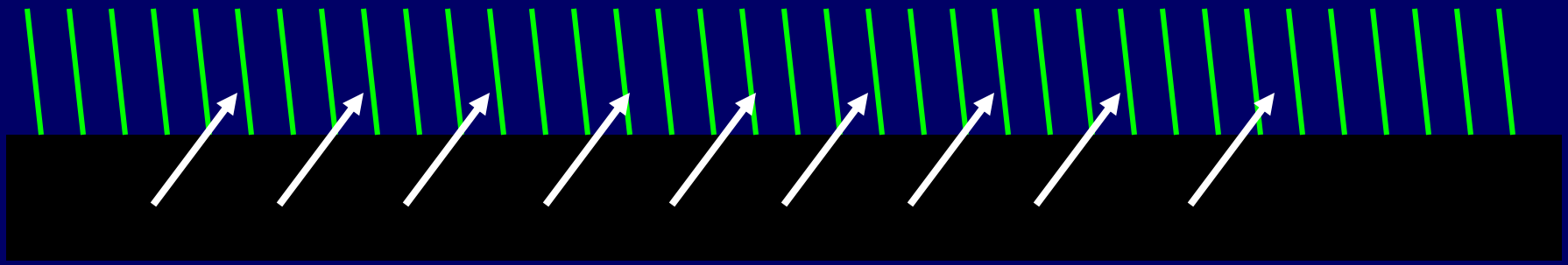
- During radiation frosts heat radiates from the earth to the sky
- Heat stored in the soil is released and can moderate cold air temperatures
- Vegetation reflects this heat allowing air in orchards to become colder
- Close mowing in spring can maximize orchard soil heating and radiation

Radiation

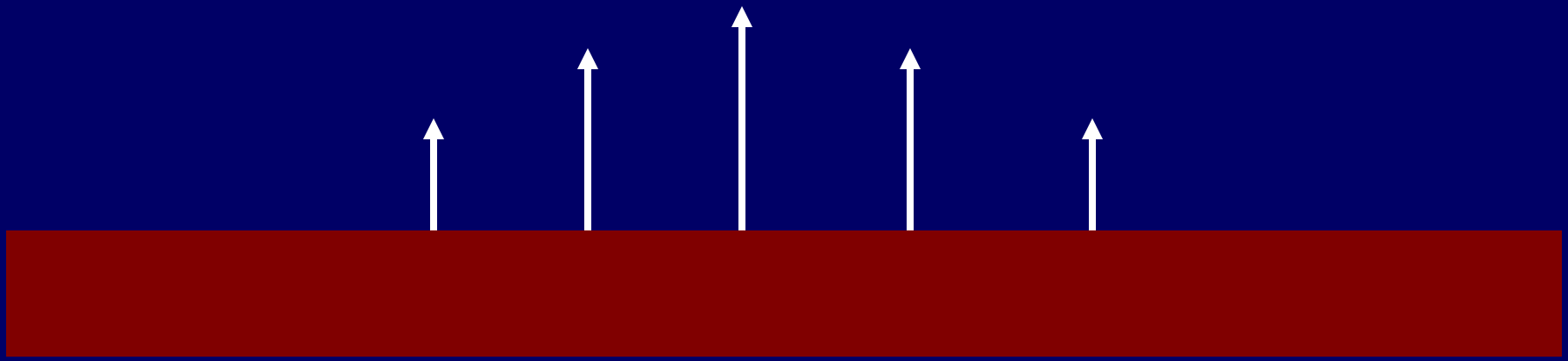
Radiation



Radiation



Radiation



Management options

- Solid vegetation
- Total clear cultivation
- Mulches
- Weed free strips/grass alleys

Solid Vegetation

Problems

- Competition
- Pest habitat
- Expense
  - Mow
  - Irrigate

Advantages

- Trafficability
- Maintain soils

Tuft of vegetation around trunks harbored rodents

Total clear cultivation

Problems

- Expensive
- Tuft around trees
- Soil loss
- Trafficability
- Damage shallow roots
- Selects perennials

Advantages

- Water use
- No competition
- Poor pest habitat
- Frost control

Mulches

Problems

- Expensive
  - Obtain
  - Apply
- Scarce
- Rodent habitat
- Weed source

Advantages

- Retain water
- Suppress weeds

Mulches

- Chips
- Hay/straw
- Fabrics
- Spray on cellulose

Alleys & Strips

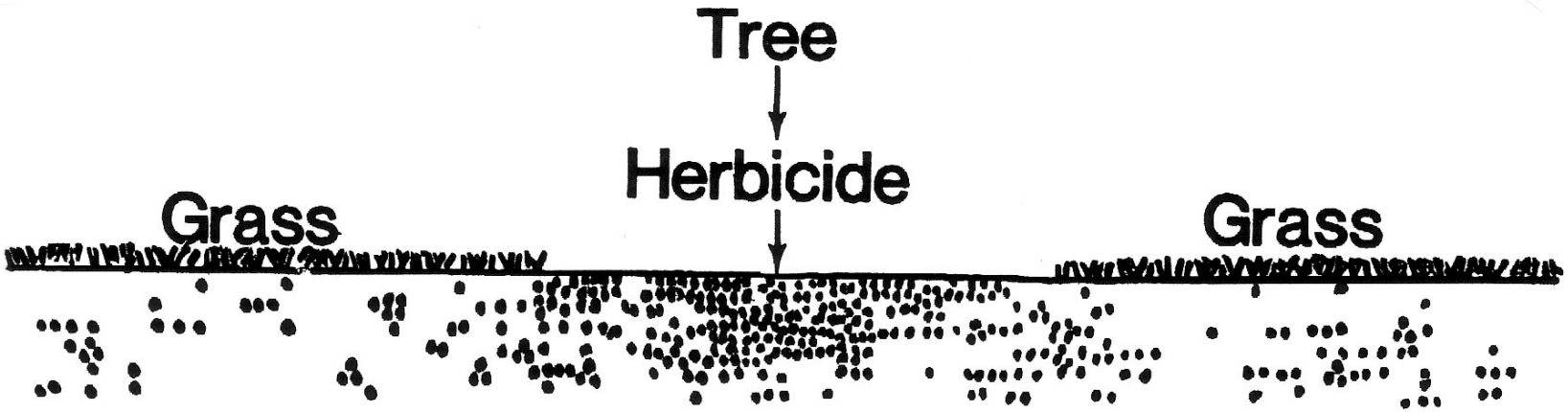
Problems

- Chemistry
- Requires some inputs
- Expensive, but less than others

Advantages

- Compromise
- Soil retention
- Reduced competition
- No pest habitat

Root distribution



Weed Management

- Chemical
  - Pre-emergent
  - Post-emergent
- Mechanical
  - Cultivation
  - Mulch

Herbicide Information

- PNW Weed Handbook
- http://pnwhandbooks.org/weed/

Pre-emergent

- Princep
- Karmex
- Solicam
- Surflan
- Casoron

- Goal
- Sinbar
- Prowl
- Kerb

Check current product labels.
The label is the law.

Post-emergent

- Roundup
- Gramoxone
- Rely
- Touchdown
- 2,4-D amine
- Fusilade
- Poast
- Prism

Check current product labels.
The label is the law.

Chemical Rotation

- Mix Pre-emergent herbicide with postemergent
- Rotate the Pre-emergent herbicide
  - Princep/Karmex
  - Goal
  - Solicam
  - Surflan

Chemical problems

- Residues
- Reduces soil OM content
- Selects for uncontrolled weeds
- Resistance management

Boom sprayers

Sprayer principles

- Large droplets avoid drift
- Nozzles close to ground
- Shields

Mechanical Control

- Cultivation
- Temperature (flame, steam)
- Mulch

Wonder Weeder

Temperature

- Only provides burn down
- Poor job on perennial weeds
- HIGH energy requirement
- Fire hazard

Conclusions

- Understand competition
- Know your weeds
- Manage weeds to meet your management goals

- If chemical, rotate chemistry to manage a broad spectrum and prevent resistance


Questions?

- Back to Top -

Nursery Tree Considerations and Rootstocks

Biographical Information:

Stuart Adams
Utah State University

I am a graduate student from Utah State University working on a master's degree in plant science. My research focus is on the strength of apple graft unions with different apple rootstocks. I'm originally from Eastern Washington where I was raised on a commercial fruit tree nursery, namely, Willow Drive Nursery. I'm most familiar with scion wood production and acquisition and tree propagation techniques such as chip budding and bench grafting. Following the completion of my degree I plan to return to Willow Drive Nursery and help manage it with my brother and three cousins.

Session Description:

1. What makes a good nursery tree?
2. Basics of rootstocks and scions.
3. How long it takes to generate a nursery tree

Choosing the Right Rootstock for Your Orchard or Garden

Scion Characteristics (Fruiting portion)

- Fruit variety (Gala vs. Fuji, Rainier vs. Bing, Redhaven vs. Halehaven, etc.)
    - Probably the most important decision
- Vigor and growth habit
- Leaf characteristics (size, shape, orientation)
- Disease resistance
- Environmental Tolerance

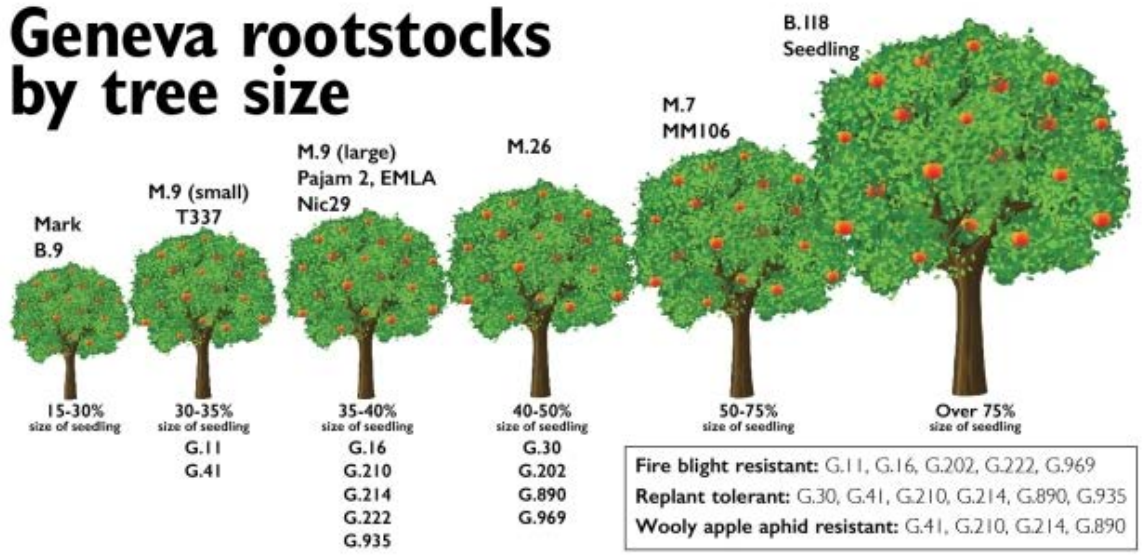
Rootstock Characteristics (Root portion)

- Provide the anchorage, and water and nutrient uptake
- Vigor and habit (vigorous vs. dwarfing)
- Precocity (early bearing), fruit size, yield, yield efficiency
- Biotic resistance
- Environment tolerance

How do you plan to train the tree?

- Free standing – used almost exclusively by most stone fruits, pears and more vigorous apple rootstocks
- Supported – essential for high-density apple plantings

Apple Rootstock Size Comparison



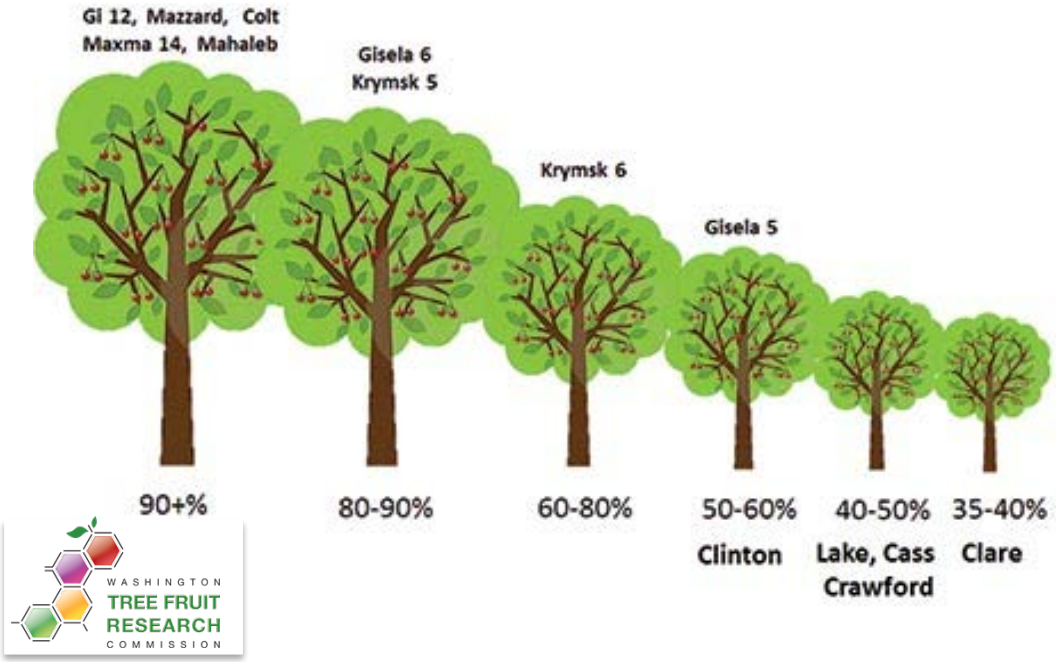
- M.26 and above can be used as free-standing trees
- Vigorous Geneva rootstocks (G.30, 202, 890, 969) may need support early on
- Everything below M.26 needs support for the life of the tree.

Pear Rootstock Size Comparison

Amelanchier Brossier series *Crataegus* *Malus* *Sorbus*	Adams Quince Eline Quince QR517/9 QR719-3 Quince EMA Quince BA29 Quince EMC Quince C132 Quince EMH Sydo Quince	Fox 9 Fox 11 Fox 16 Horner 10 OHxF 40 OHxF 51 OHxF 69 OHxF 87 OHxF 333 Pyro 2-33	BM2000 OHxF 97	Bartlett seedlings Horner 4 Winter Nelis seedling *P. calleryana* D6 *P. calleryana* seedling	*P. betulifolia* seedling

- Quince rootstocks often require interstock and are not winter hardy (not suggested for Utah)
- Commercially available OHxF selections are common good options

Cherry Rootstock Size Comparison



- Clinton, Lake, Cass, Crawford, and Clare are not commercially available yet.

Peach Rootstock Selections

- For Utah:
    - Neutral Soil – Lovell, Bright's Hybrid #5, Atlas, Bailey, Nemagaurd (for nematode tolerance).
    - Alkaline Soil – Cadaman, Viking, Bright's Hybrid #5, Atlas
    - Krymsk 86 and Controller selections may be some dwarfing options on neutral soil

Where and when to buy trees?

Where

- Local nurseries and garden centers
    - Limited by quantity and selection
- Commercial nurseries
    - Usually have a minimum (10-25 trees)
    - Often have more choices
    - Better prices if buying multiples

When

- If working with garden centers and local nurseries it depends on availability.
- If purchasing from commercial nursery, your order will take 2-3 years.
    - Best to order early (late fall, early spring)

Acknowledgments

IFTA
INTERNATIONAL FRUIT TREE ASSOCIATION

UDAF
Utah Department of Agriculture and Food

Nursery Tree and Rootstock Considerations

By: Stuart Adams

Introduction to Fruit Trees

Discussion Points:

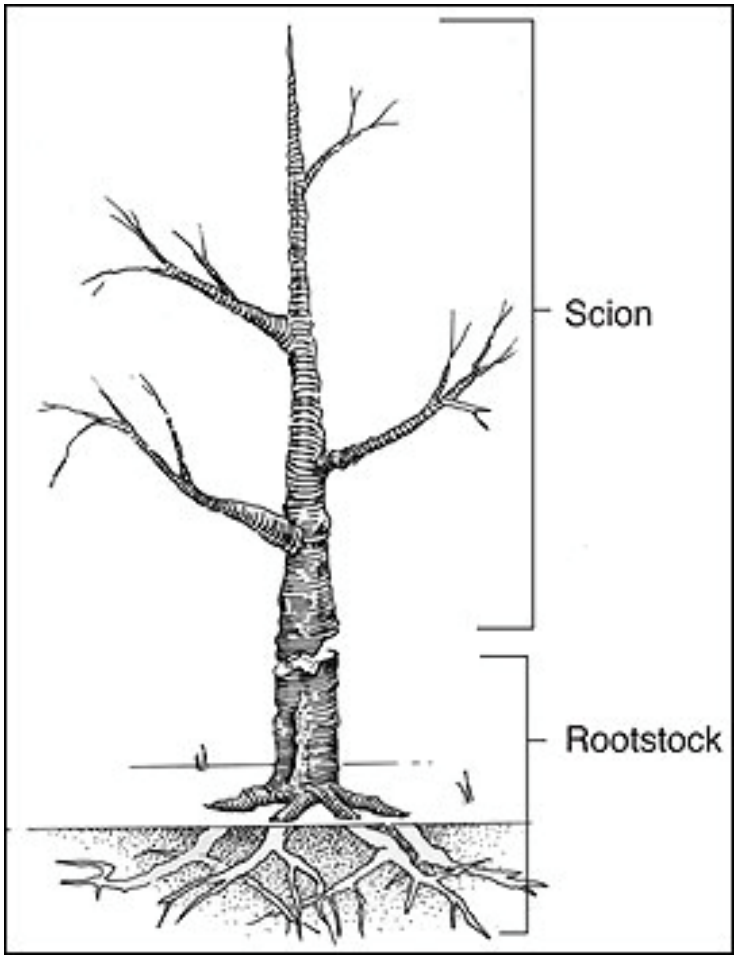
- Grafting
- Rootstock vs. Scion
- Nursery production
- Characteristics of a good tree

Grafting

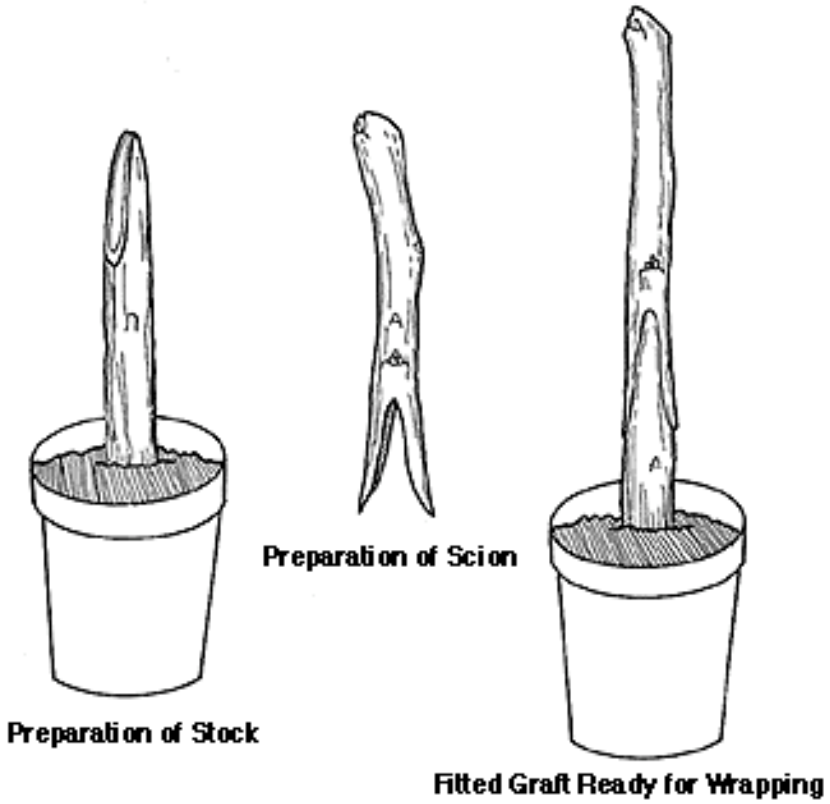
- All fruit trees are products of grafting
- What is grafting?
  - The process of combining two or more genetically distinct cultivars to form a complete tree
  - This happens as tissues from each partner form successful connections
  - Two general ways/times to graft
    - Bench graft in the spring
    - Chip bud in the fall

Grafting

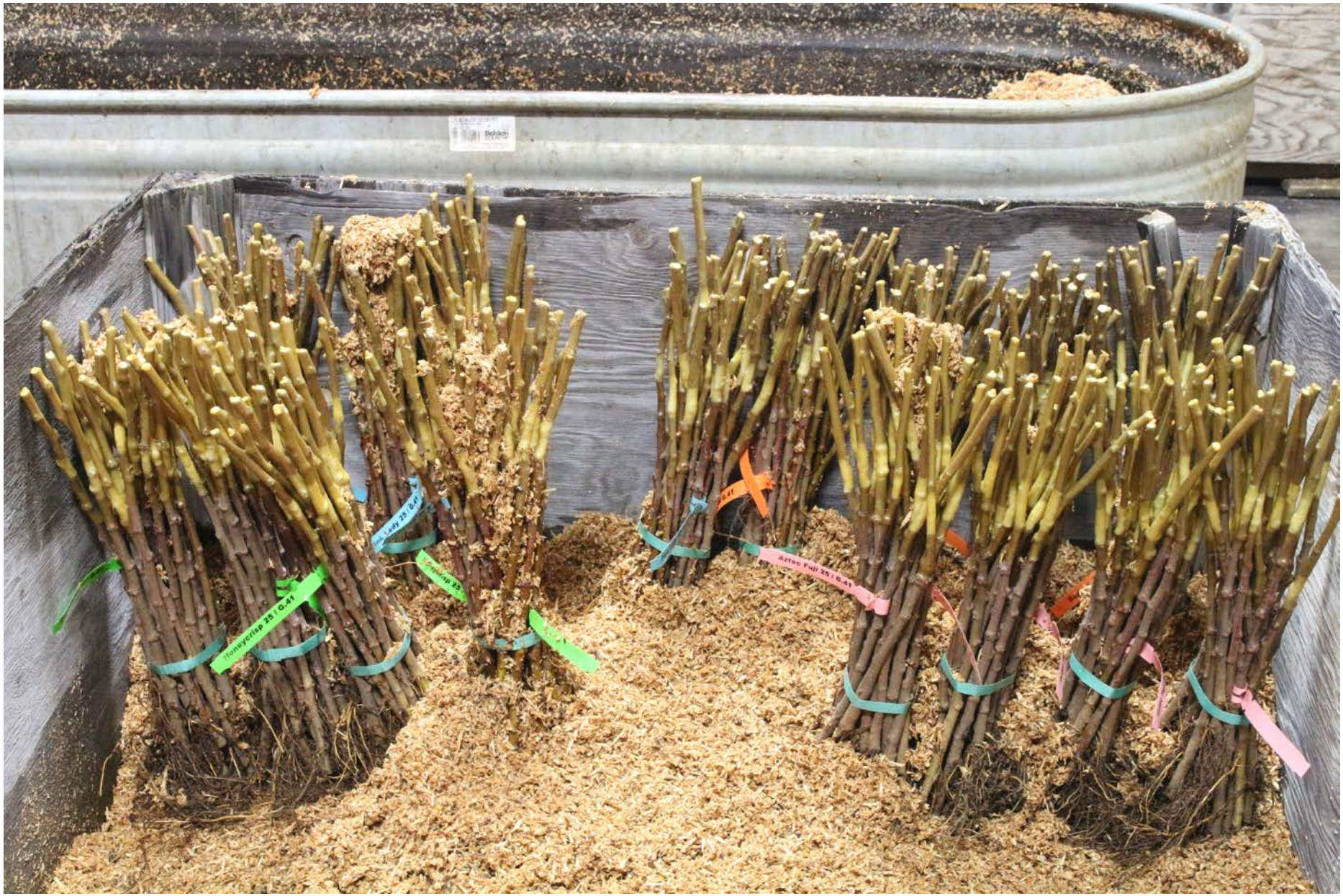
- Two essential parts to grafting
  - Rootstock: Root system and a portion of the trunk
  - Scion: Makes up the fruiting portion of the tree
- These two parts work together to provide the water, nutrients, and energy for the tree.
- There are different cultivars of scions and rootstocks.



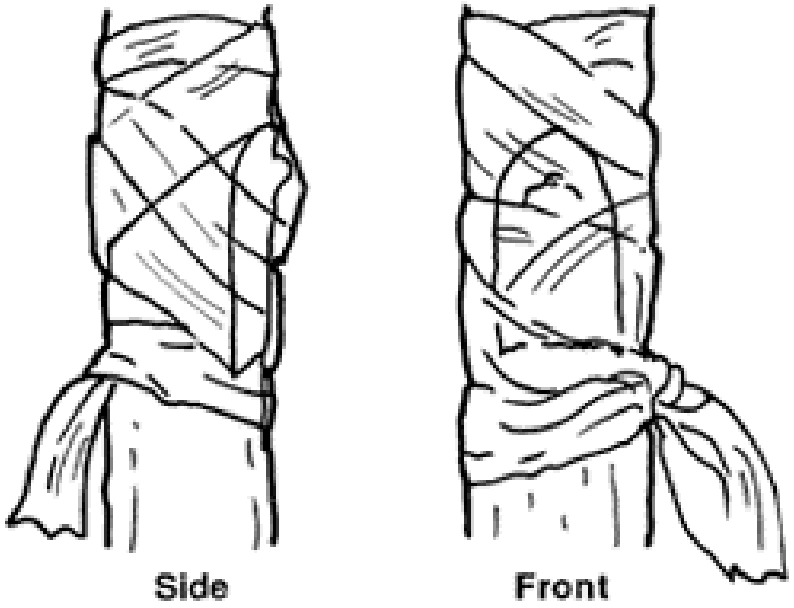
Bench Grafting



- This is an example of saddle grafting
- Uses whole stem segments
- Others:
  - Splice graft
  - Whip and tongue graft


Tonaycrisp 25 | G.41
Aztec Fall 25 | G.41

Chip Budding



- This is an example of Chip budding
- Uses a single bud
- Others:
  - T-bud

Grafting

- Apple trees are a good model for learning about grafting due to there relative ease in propagation
  - Rootstocks may be purchased to do grafting at home
  - For some newer varieties it is illegal to propagate them due to patent laws
  - Stick to propagating ‘heirloom’ varieties

Basics of Scions and Rootstocks

Scion Characteristics:

- Fruit variety (Gala, Fuji, Honeycrisp, etc.)
- Vigor and growth habit
- Leaf characteristics
- Disease resistance
  - Apple scab, Fireblight, Rusts, Powdery Mildew
- Environmental tolerance (Hardy)

Differences in Vigor

Variety Vigor Comparisons

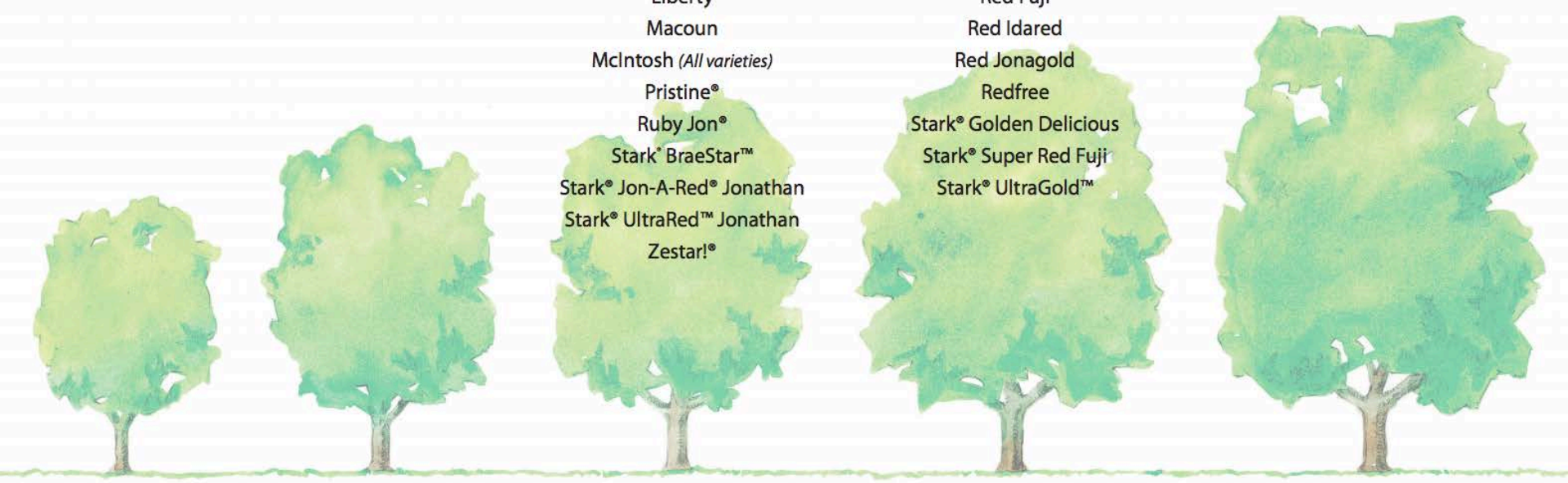
Very Low Vigor
Red Delicious *(All varieties)*
Starkspur® Winesap

Low Vigor
Honeycrisp™
Snowsweet®
Starkspur® Arkansas Black
Starkspur® Red Rome Beauty

Moderate Vigor
Blondee™
Candycrisp®
Dandee Red®
Empire *(All varieties)*
Fireside
Golden Supreme®
GoldRush
Liberty
Macoun
McIntosh *(All varieties)*
Pristine®
Ruby Jon®
Stark® BraeStar™
Stark® Jon-A-Red® Jonathan
Stark® UltraRed™ Jonathan
Zestar!®

Moderately High Vigor
Gala *(All varieties)*
Gibson Golden
Honeygold
Idared
Jonafree
Jonagold
Myra Fuji
Red Fuji
Red Idared
Red Jonagold
Redfree
Stark® Golden Delicious
Stark® Super Red Fuji
Stark® UltraGold™

High Vigor
Cortland
Enterprise
Granny Smith
Mutsu
Stark® Supreme Staymared™
Williams' Pride



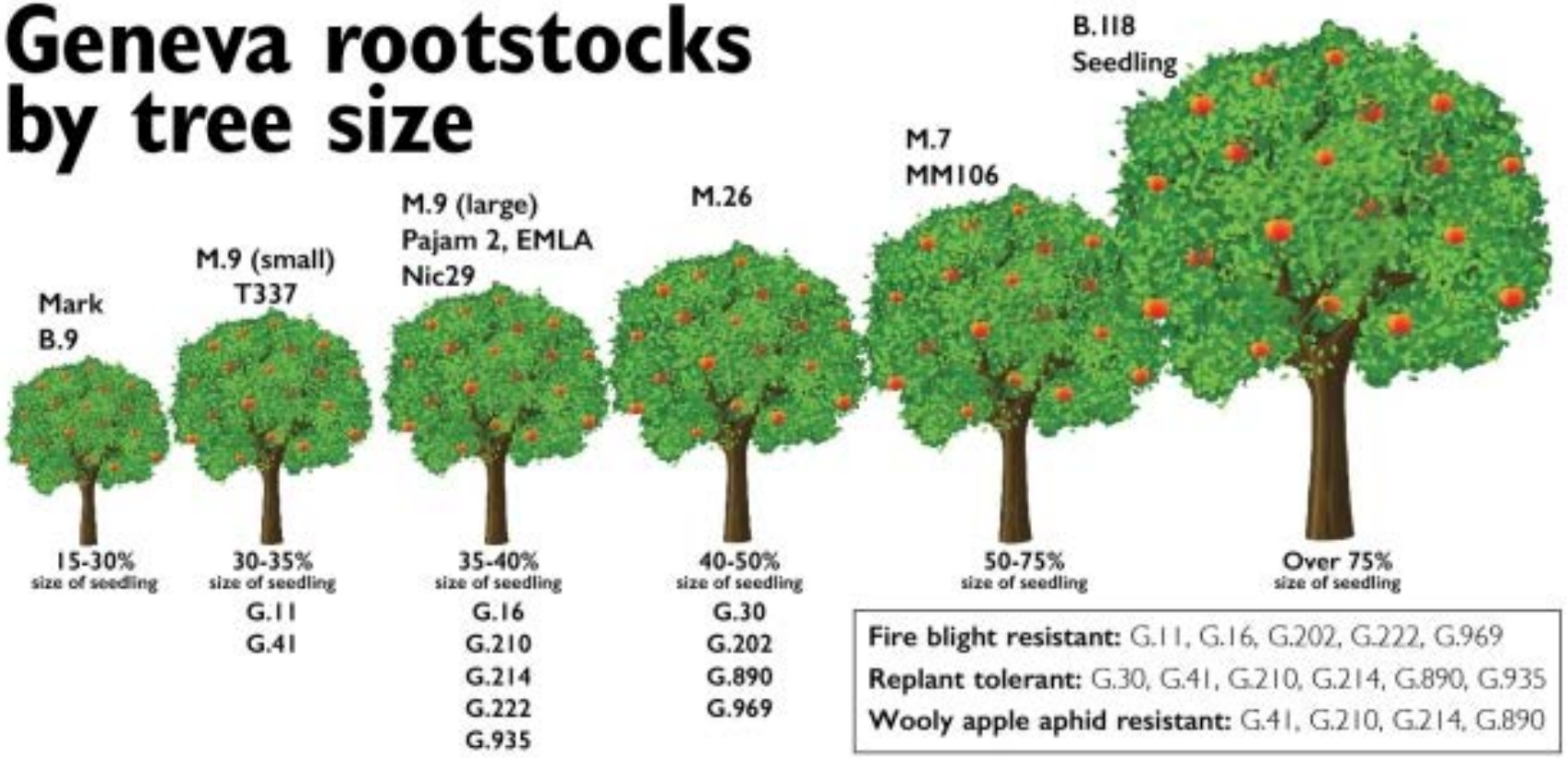
From Stark Bros Nursery

Basics of Scions and Rootstocks

Rootstock Characteristics:

- Provide the root system for the tree
  - Anchorage; water and nutrient uptake
- Vigor and habit
- Precocity
- Fruit size, yield, yield efficiency
- Pest resistance
  - Fireblight, Woolly Apple Aphid, Phytophthora
- Environment tolerance
  - Hardiness, Drought Tolerance

Apple Rootstock Size Comparison



From Washington Tree Fruit Research Commision/Gennaro Fazio, USDA

Free-standing vs. Supported

- For apple, most dwarfing rootstocks require support for tree survival
  - Why?
  - Most are highly precocious (bear early)
  - Tree anchorage and strength not able to bear crop load and will lean or break
  - Especially of concern for Geneva rootstocks due to graft union brittleness (G.30, G.41)

Free-Standing Trees

Supported

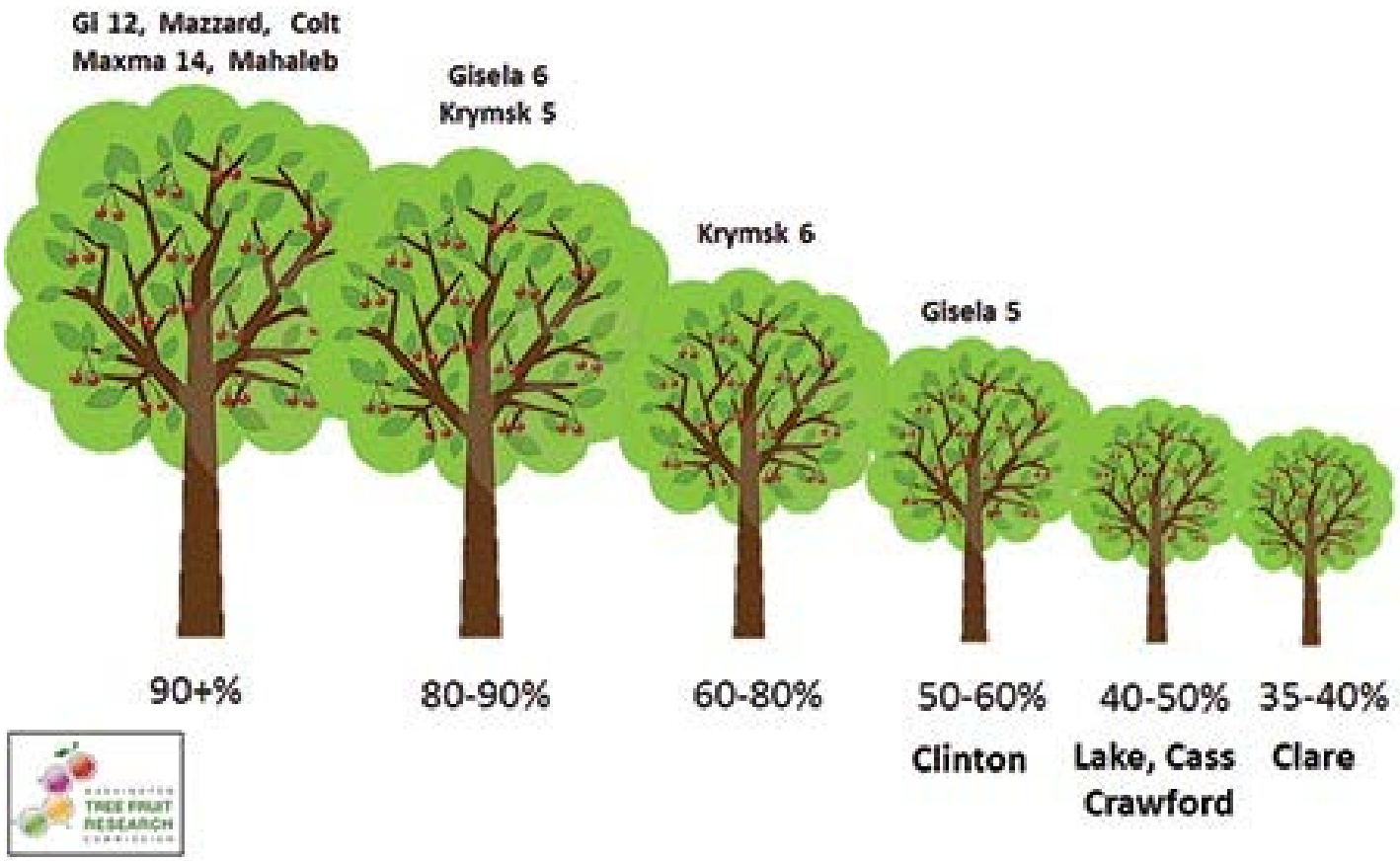
Graft Union Brittleness

Pear Rootstock Size Comparison

Amelanchier	Adams Quince	Fox 9	BM2000	Bartlett seedlings	*P. betulifolia* seedling
Brossier series	Eline Quince	Fox 11	OHxF 97	Horner 4	
Crataegus	QR517/9	Fox 16		Winter Nelis seedling	
Malus	QR719-3	Horner 10		*P. calleryana* D6	
Sorbus	Quince EMA	OHxF 40		*P. calleryana* seedling	
	Quince BA29	OHxF 51			
	Quince EMC	OHxF 69			
	Quince C132	OHxF 87			
	Quince EMH	OHxF 333			
	Sydo Quince	Pyro 2-33			

Adapted from treefruit.wsu.edu

Cherry Rootstock Size Comparison



From treefruit.wsu.edu

Peach Rootstock Comparison

- Fewer innovations for size control in peach
  - Krymsk 86, Controller rootstocks
- Considerations for Utah:
  - Neutral Soil - Lovell, Atlas, Bailey, and Nemagaurd (for nematode tolerance)
  - Alkaline Soil – Cadaman, Viking, Bright's Hybrid #5, Atlas
- Nematode/disease considerations?

Peach Alkalinity Tolerance

Photo courtesy of Brent Black

Nursery Production

Propagation Timeline:

- 1st year – Liner production, harvest, and storage
- 2nd year – Liner planted in spring, grafted (budded) in the fall.
- 3rd year – Finished trees grown in field, harvested, and then stored

Rootstock Stoolbeds – 1st Year

Liners Planted – 2nd Year (Spring)

Liners at Budding – 2nd Year Fall

Chip Bud Growth – 3rd Year Spring

Chip Bud Growth – 3rd Year Fall

Photo courtesy of Richard Adams

Finished Tree Storage

Photo courtesy of Richard Adams

Characteristics of a Good Tree

- Has a good root system
- Highly feathered (branched)
- Good caliper (3/4”-1/2”)
- Has the desired characteristics (rootstock and scion)
- Looks healthy

Where to buy trees?

Commercial Nurseries

- Considerations:
  - Quantity (10-25 minimum), Size, Cultivar choices, Price
  - Order in advance (2 years)
  - Dormant delivery

Local Nursery or Garden Centers

- Considerations:
  - Quantity (usually limited numbers), Size, Cultivar availability, Price

Questions

- Back to Top -

Tree Training and Pruning

Biographical Information:
Sheriden Hansen
Utah State University

Sheriden is a Graduate student at USU studying plant science. Own and run a market garden and small orchard and have sold at a local farmer's market for several years.

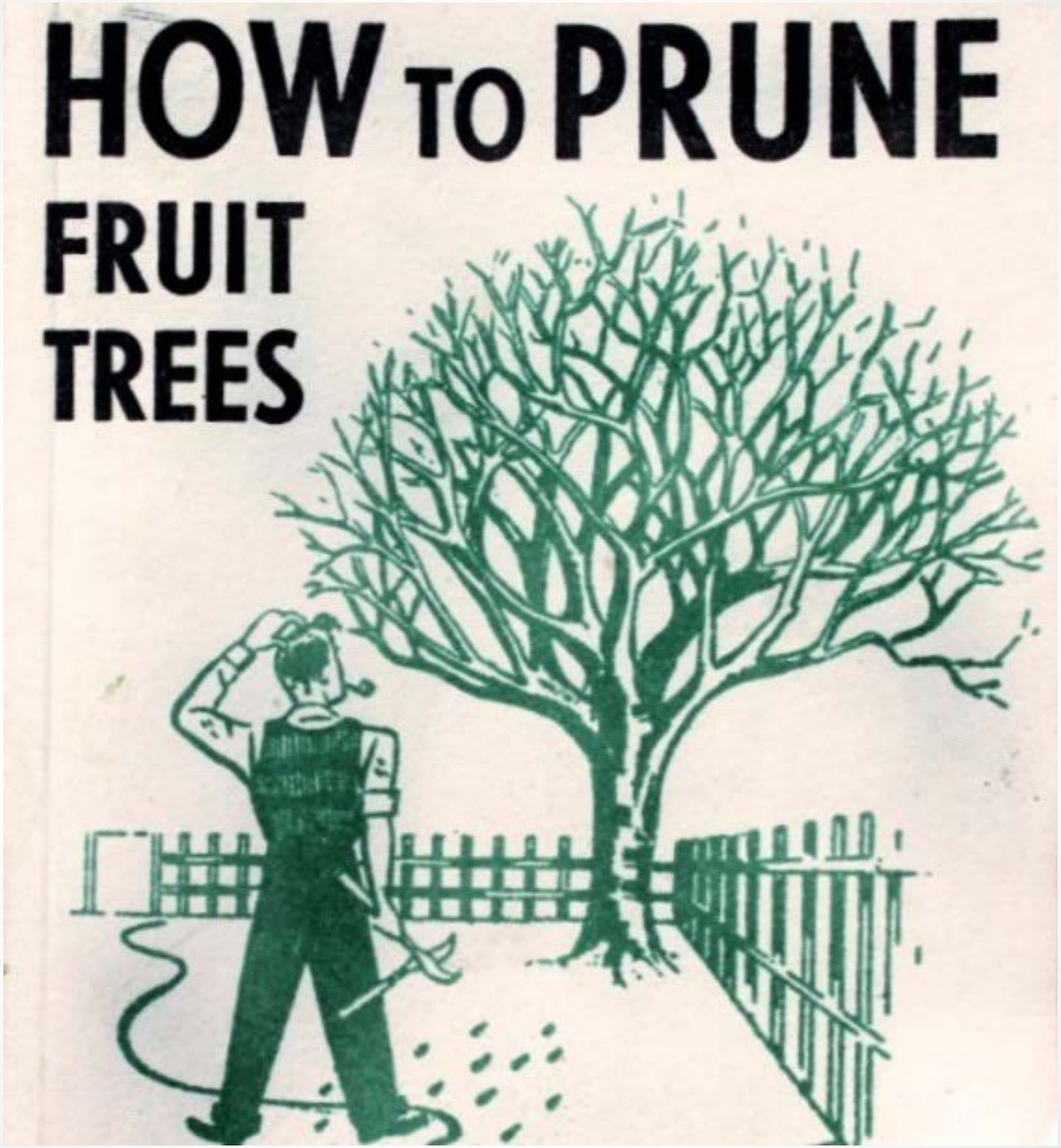
Session Description:

Brief overview of basic pruning practices for fruit trees. Anatomy, Light, Branch Angle, and Pruning Strategies.

Fruit Tree Pruning Basics

Sheriden Hansen, USU

HOW TO PRUNE FRUIT TREES



Why prune?

- Three main reasons why we prune:
  1. HEALTH
     - Remove dead, diseased, or dying branches
     - Increase air circulation in the canopy
  2. DIRECT GROWTH
     - Direct growth and create a desired results
     - Renew spur growth and/or vegetative growth
  3. CREATE ENVIRONMENT TO PRODUCE QUALITY FRUIT
     - Fruit quality = color, sugar, size
     - Increase light distribution and penetration in the canopy
     - Crop load management, better ratio of foliage to fruit.

When to prune?

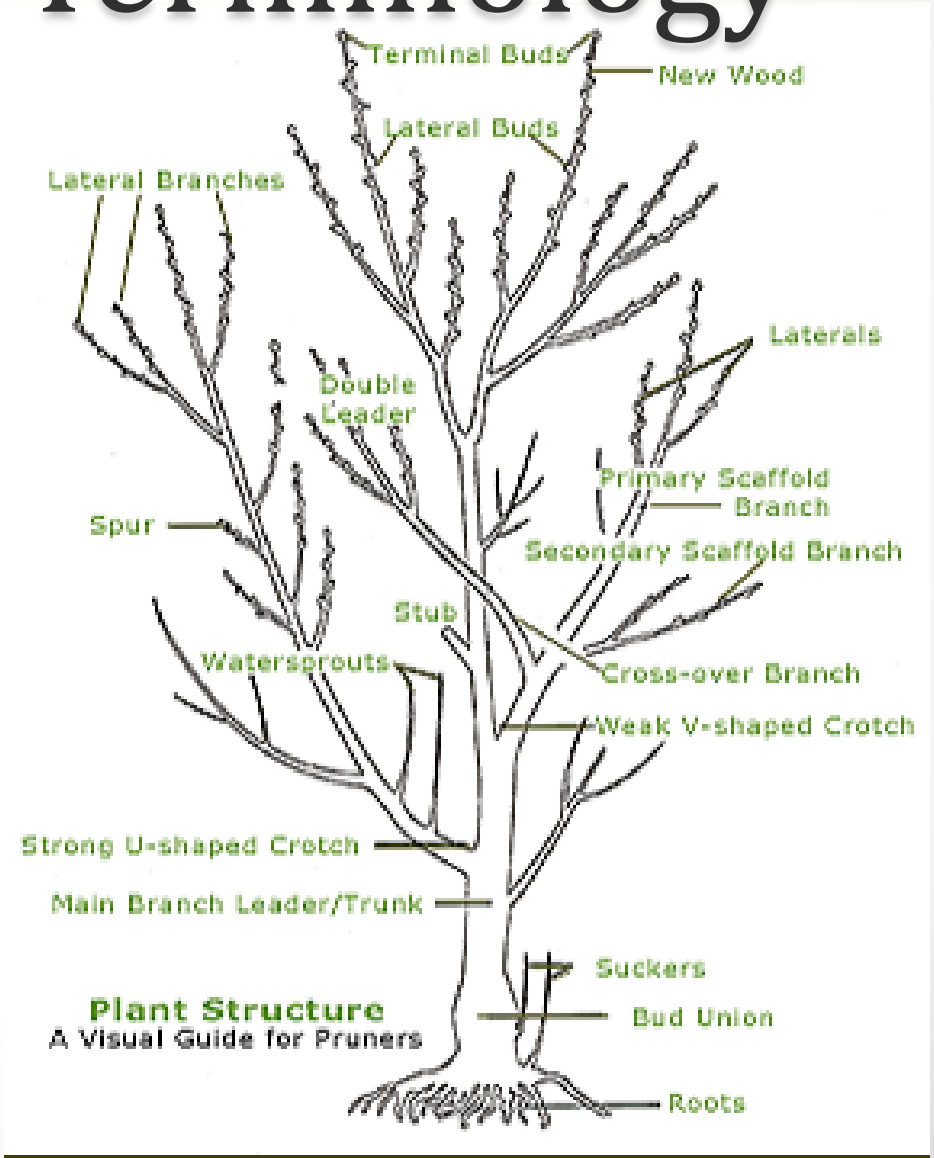
- Dormant pruning
  - Visual
  - Invigorate older trees
  - Less disease risk
- Summer pruning
  - Reduce vigor and slow tree growth
  - Higher disease risk

Guiding Principles

- Anatomy, where is fruit produced on the tree?
- Light in the canopy
- Branch angle
- Pruning strategies

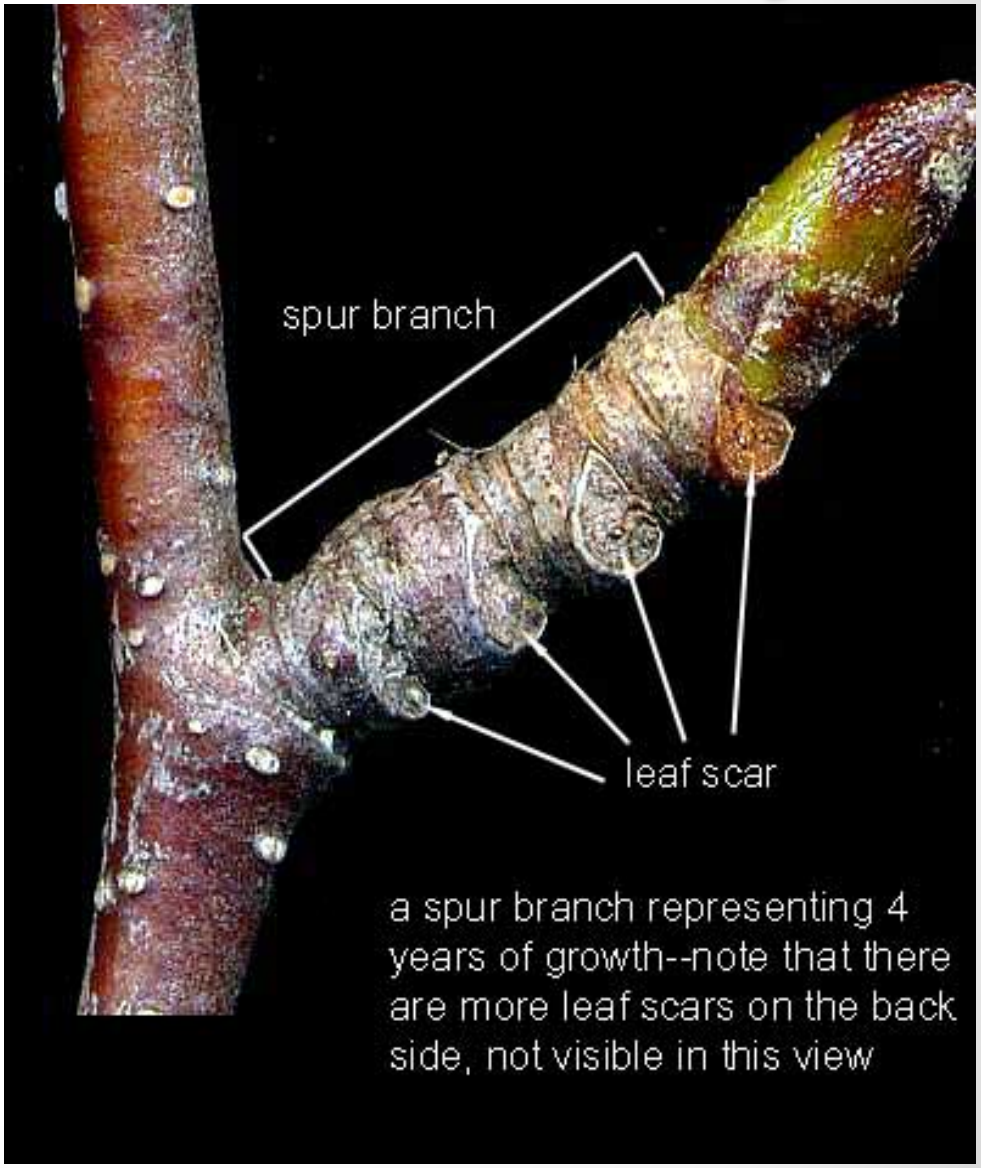
Pruning Terminology

- Leader
- Primary scaffold
- Secondary scaffold
- Laterals
- Spurs
- Watersprout
- Sucker
- Vegetative buds
- Mixed buds
- Heading
- Thinning
- Stub (Dutch) cut



Apple and Pear Anatomy

- Fruit on two-year-old and older wood
- Bears fruit on laterals called “spurs”
- Two types of buds
  - Mixed bud
  - Vegetative bud



Picture source: uwbg.edu Photo credit: Gary Fewless 2004

Stone Fruit Anatomy

- Peach
  - 1-year-old wood
  - Pure buds
- Apricot
  - 1-year-old wood and spurs
- Cherry
  - Spurs
  - Two-year-old wood
  - Sometimes base of year-old wood

Stone Fruit Anatomy

Guiding Principles

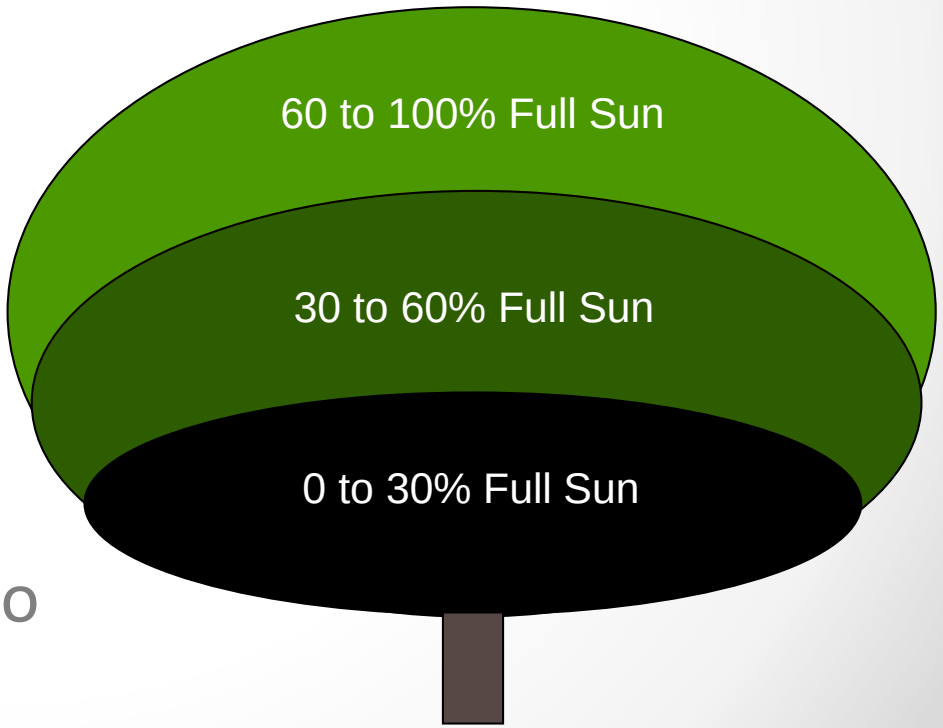
- Anatomy, where is fruit produced on the tree?
- Light in the canopy
- Branch angle
- Pruning strategies

Light in the Canopy

- What drives fruit yield?

LIGHT

- Effect of light in the canopy:
  - Fruit color and flavor
  - Flower bud formation – 30%
- Tree shape is important
- Create light channels into the center of the tree
-



Graphic courtesy of Dr. B. Black, USU

Guiding Principles

- Anatomy, where is fruit produced on the tree?
- Light in the canopy
- Branch angle
- Pruning strategies

Branch Angle

- Vertical growth vs. horizontal growth
  - Vegetative vs. fruitful
- Ideal branch angle is
  - Between 30º and 45º above horizontal (60º and 45º from vertical)
- Wider crotch angles
  - Support heavy crop loads

Spreaders, Clothes Pins, Tying, and Trellising

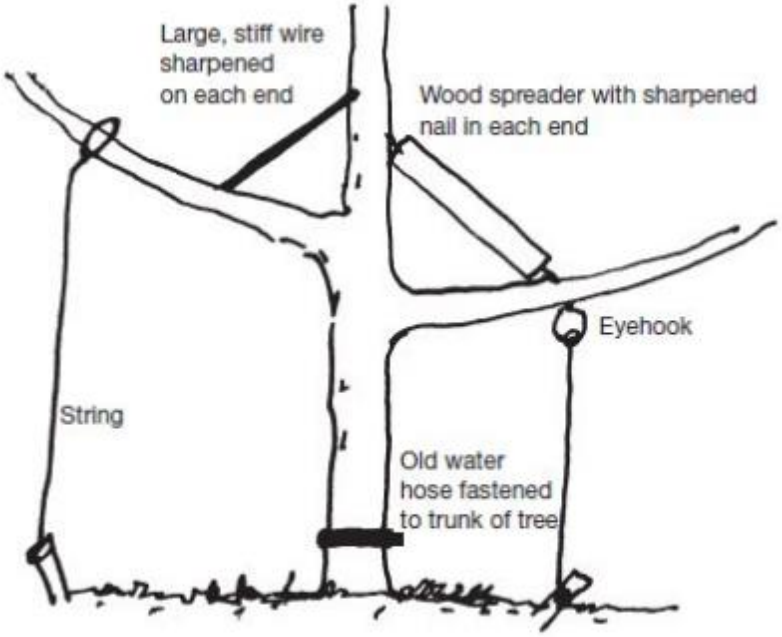
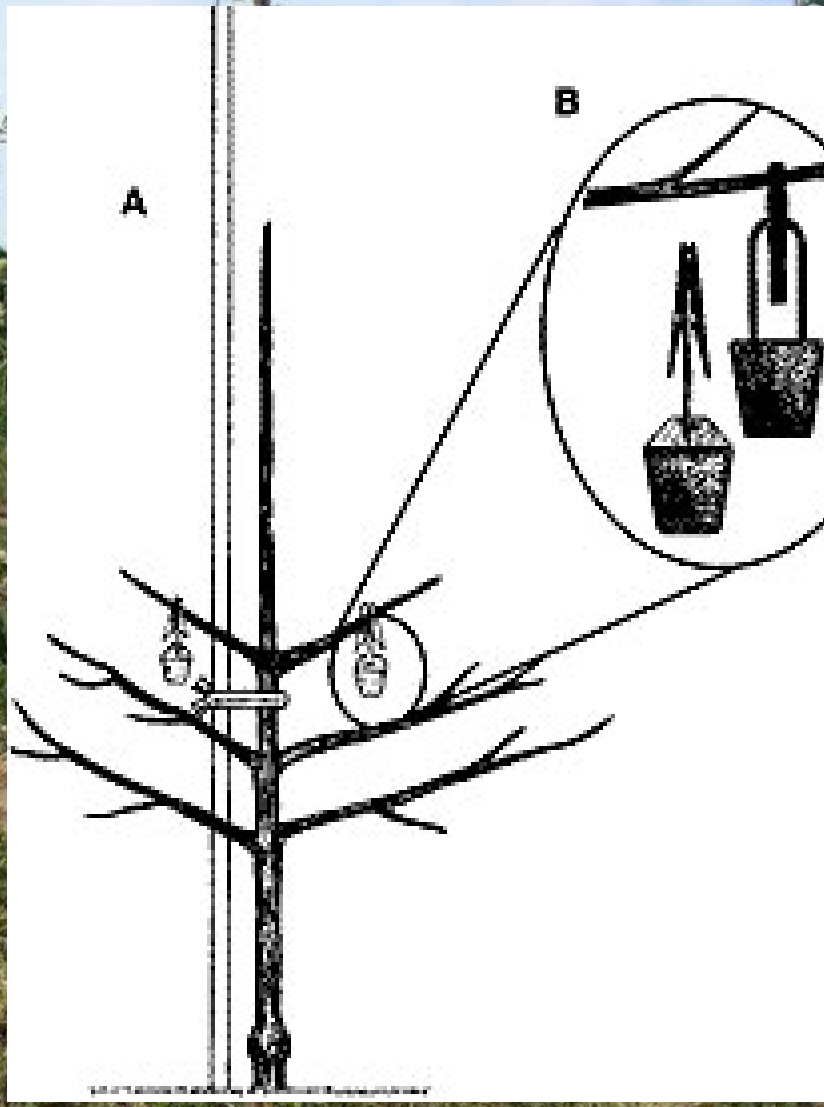
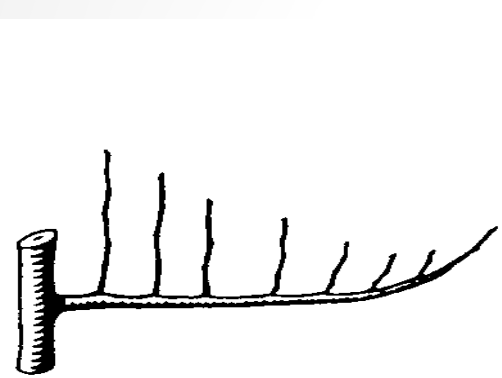


Figure 4. Several methods of spreading scaffold branches are shown above.

Weights

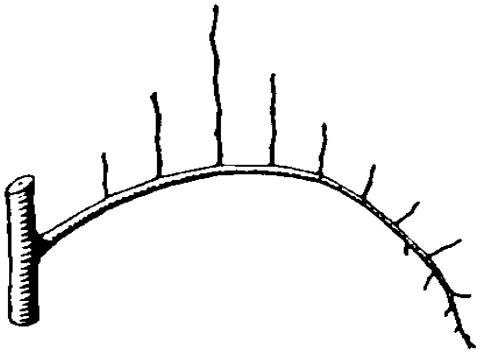


Branch Bending



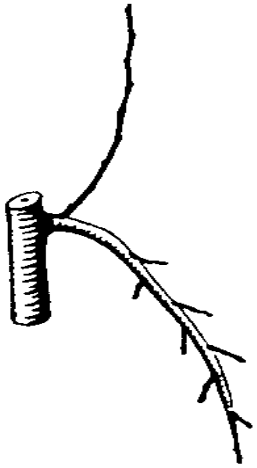
Horizontal -

Growth on upper side, greatest near trunk.



Arched -

Vigorous growth at high point.



Downward -

Growth occurs at high point.

Guiding Principles

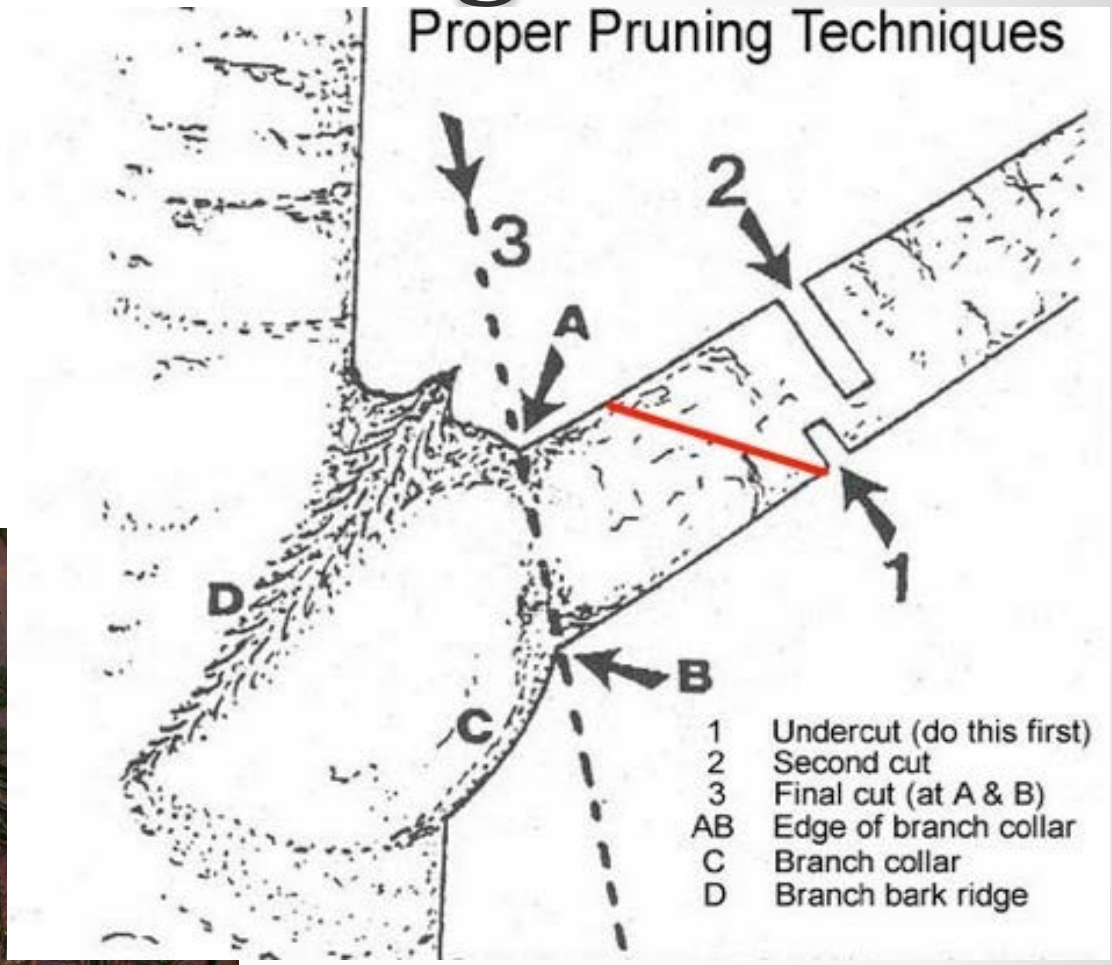
- Anatomy, where is fruit produced on the tree?
- Light in the canopy
- Branch angle
- Pruning strategies

Pruning Triage

- Dead
- Diseased
- Broken
- Rubbing or crossing

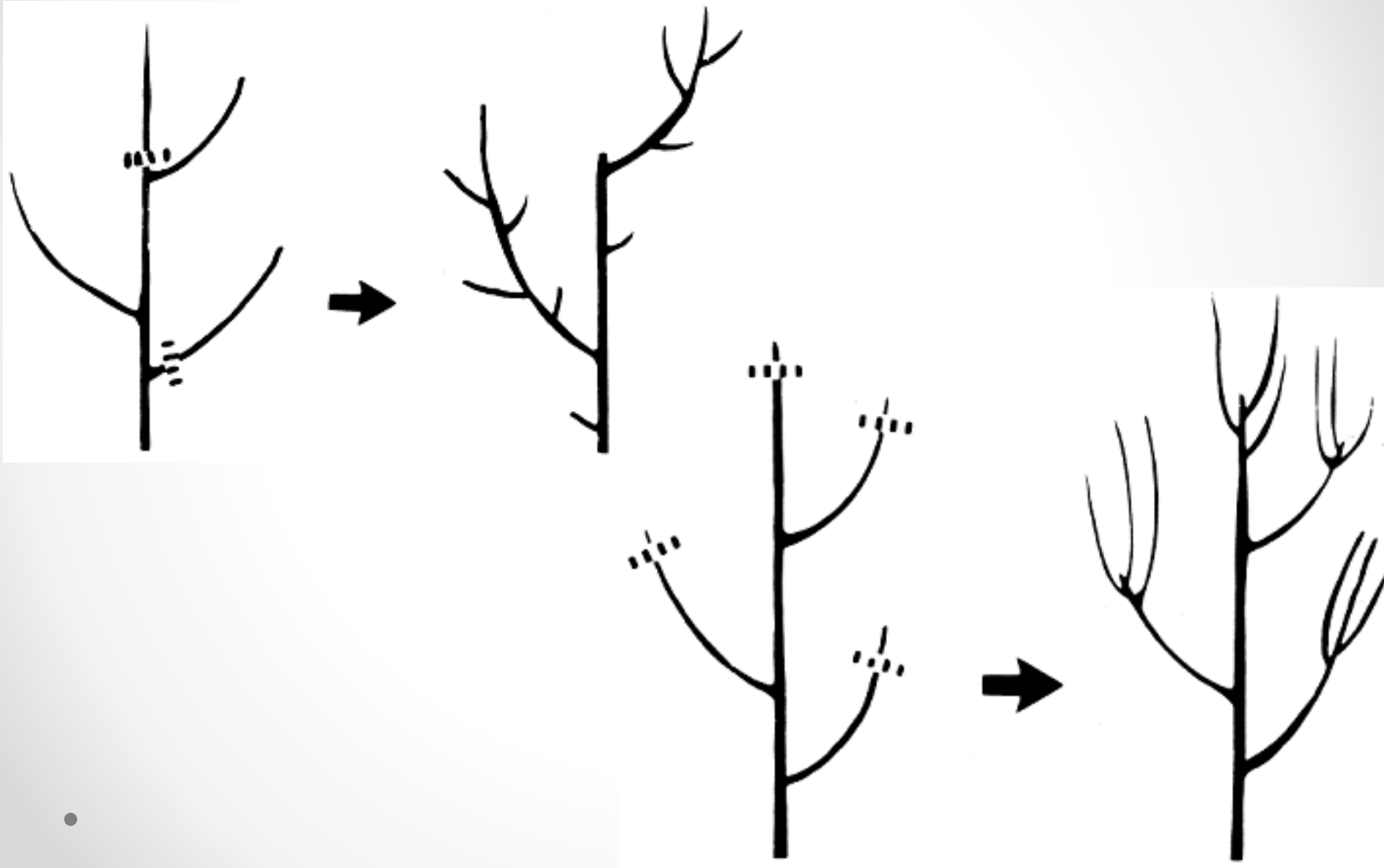
Types of Pruning Cuts

- Heading Cut
- Thinning Cut
- Stub (Dutch) Cut

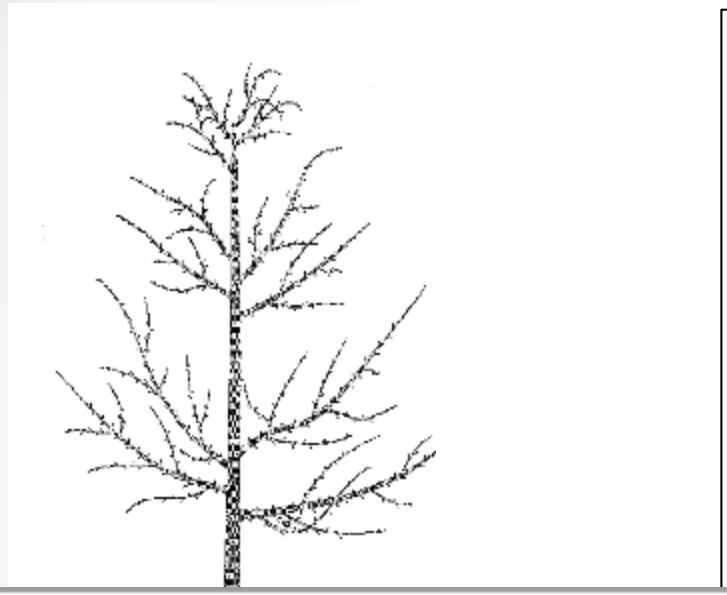


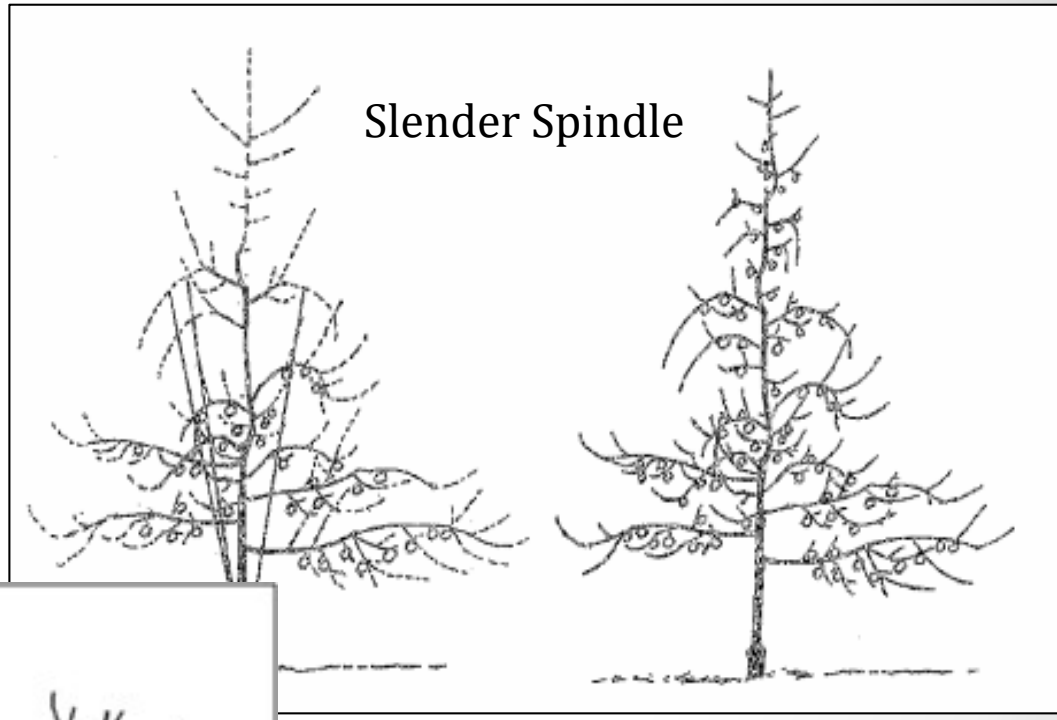
Courtesy of Dr. B. Black, USU

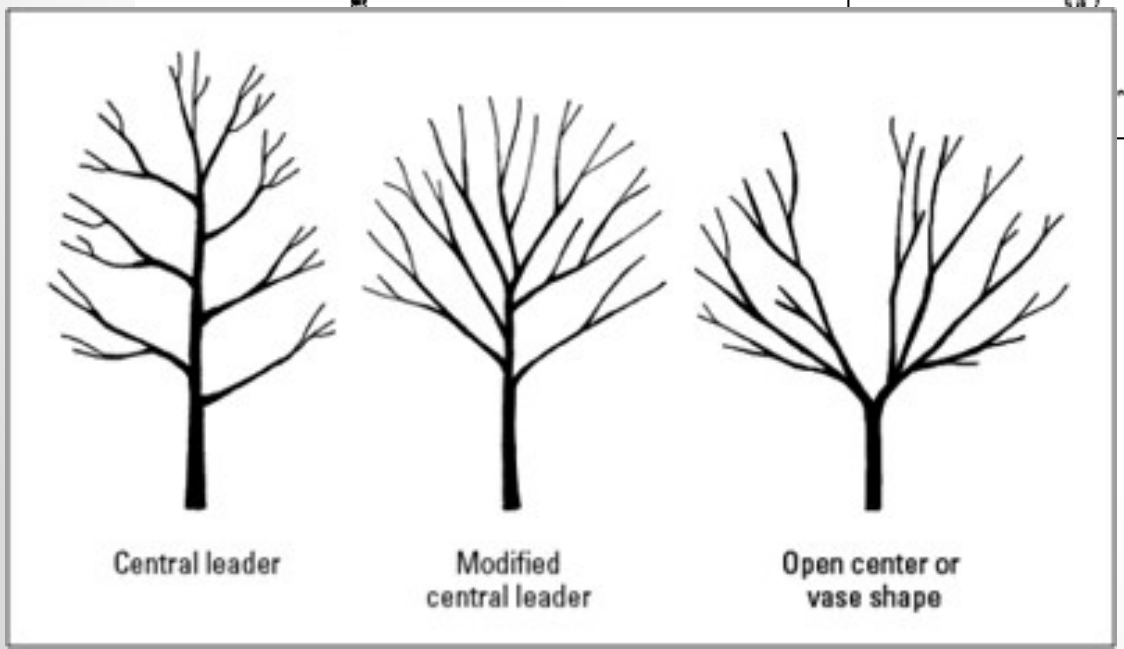
Types of Pruning Cuts



Training Systems







Training Systems

Training Systems


Training Systems

Summary

- Anatomy, where is fruit produced on the tree?
  - Know where fruit is produced
  - Remove appropriate branches
  - Thin crops with appropriate pruning
- Light in the canopy
  - Create light channels
  - Tree forms that will maximize light interception

Summary

- Branch angle
  - Techniques to get good angles 30º-60º
  - Appropriate branch angles that will maximize yield
- Pruning strategies
  - Tree form
  - Appropriate pruning cuts
    - Heading, Thinning, Stub

Thank you to


WESTERN
SARE
Sustainable Agriculture
Research & Education

- Back to Top -

Managing Common Diseases of Fruit Trees

Biographical Information:

Marion Murray
Utah State University

Marion has been the IPM Project Leader at Utah State University Cooperative Extension, Logan, since 2006. She conducts Extension outreach and research in integrated pest management and distributes weekly pest advisories for tree fruits, landscape ornamentals, and vegetables. Prior to coming to USU, she spent 10 years in public horticulture education and landscape management. She received her Master's degree in plant pathology from Oregon State University and undergraduate degree at Penn State University. She is originally from North Carolina.

Session Description:

Fruit trees in Utah have few diseases, but those that do occur can devastate a crop if left unmanaged. This talk will help you to identify and manage common fruit diseases.

Diseases of Tree Fruits

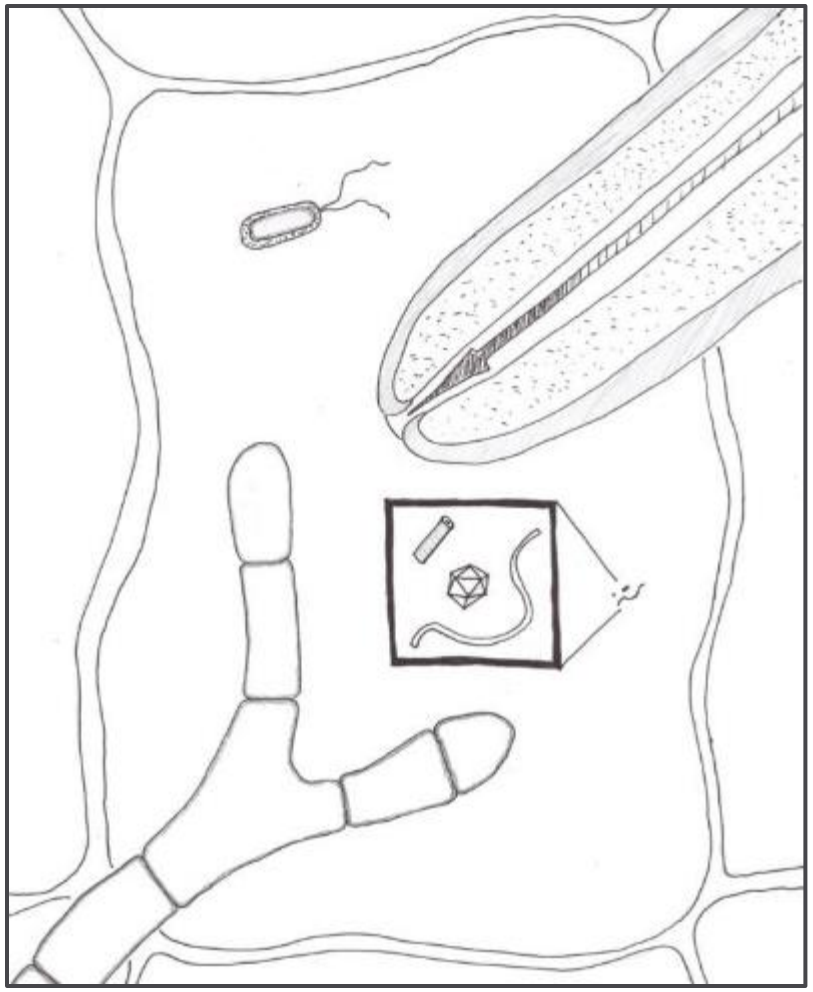
Marion Murray

Causes of Plant Diseases

Living organisms (infectious diseases)

- Fungi
- Bacteria
- Viruses
- Nematodes

Non-living factors (abiotic, non-infectious)



Causes of Plant Disease: Fungi

EXTENSION
UtahStateUniversity

- More than 8000 pathogenic species (parasites)
- Grow via fungal threads = **hyphae**
  - mass of hyphae = **mycelium**
- Reproduce via **spores**
  - spores borne within fruiting body

Causes of Plant Diseases: Bacteria

- About 200 pathogenic species
- Simple, unicellular
- Reproduce by binary fission

Viruses

EXTENSION
UtahStateUniversity

- Can only be seen using an electron microscope
- Extremely simple - nucleic acid with a protein coat
- Reproduce by “hijacking” plant cells
- Often associated with insect vectors

Know the difference…

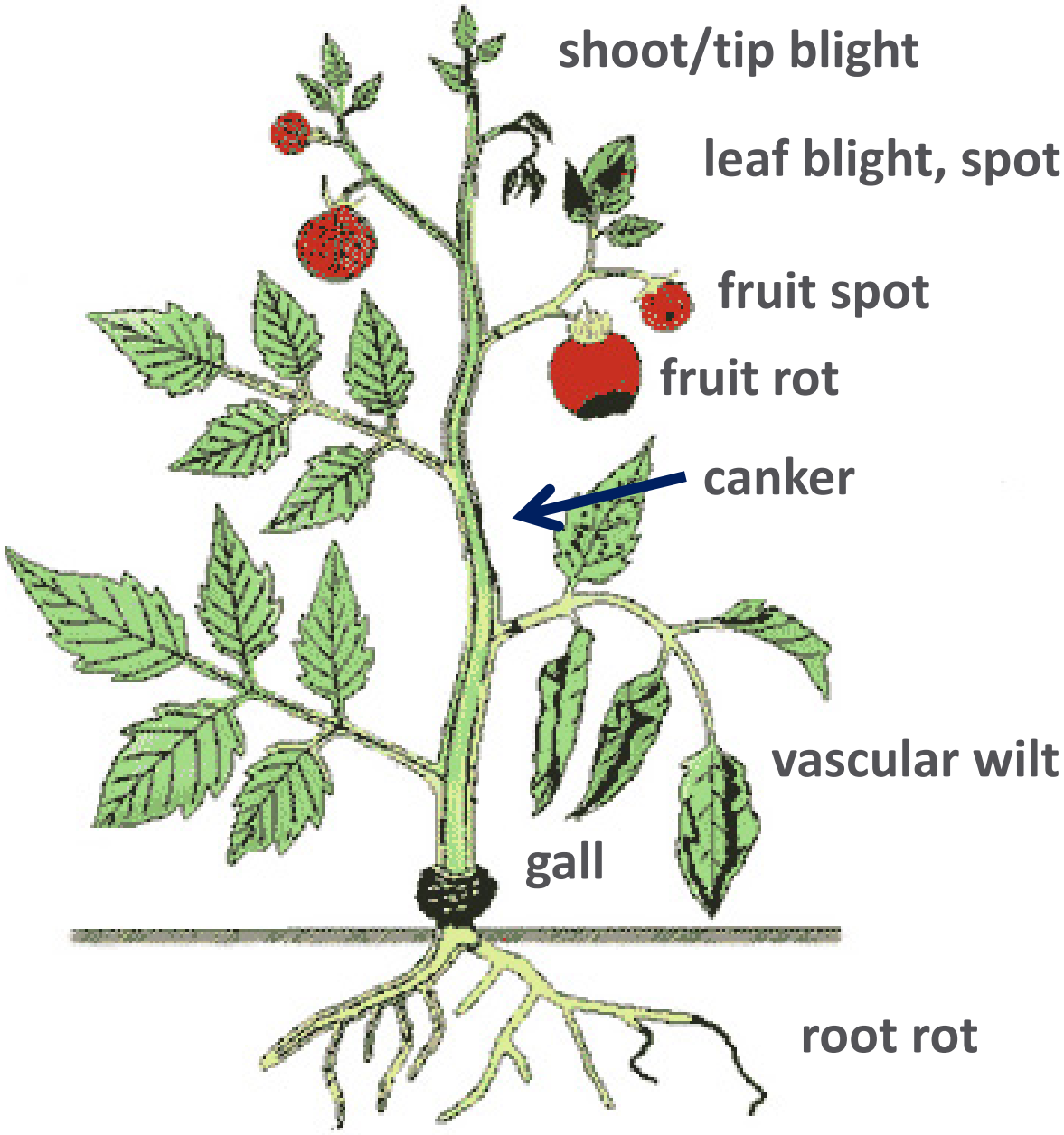
EXTENSION
UtahStateUniversity

Symptoms

- damage to or response of the plant

Signs

- physical evidence of the insect or pathogen causing the symptoms


shoot/tip blight
leaf blight, spot
fruit spot
fruit rot
canker
vascular wilt
gall
root rot

General Disease Management

EXTENSION
UtahStateUniversity

Soil amendments and green manures

Renovate orchard soil before replanting

- remove entire root debris
- rotate out of fruits for 2 years with a cover crop or vegetable crop

---

Good sanitation practices

- prune out diseased wood
- clean pruning and work tools
- remove fallen fruit and unharvested fruit

Drip or micro-sprinkler irrigation

Proper pruning practices

Resistance

General Disease Management

EXTENSION
UtahStateUniversity

Fungicides

- Copper compounds
- Potassium bicarbonate
- Sulfur
- Oils
- Biologicals (bacterial or plant-derived)

utahpests.usu.edu/IPM

Home Orchard Pest Management Guide

Table of Contents pdf version

intermountainfruit.org

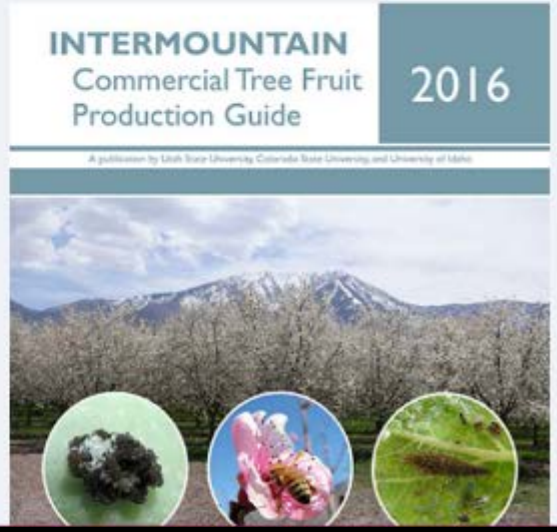
INTERMOUNTAIN
Tree Fruit Production Guide | Utah, Colorado, Idaho

- Home
- Download Guide
- IPM Methods
- Special Management Programs
- Insect and Mite Biology
- Disease Biology
- Pesticide Tables
- Spray Tables
- Orchard Floor Management
- Plant Growth Regulators
- Thinning and Return Bloom

2016 Intermountain Tree Fruit Production Guide

The Intermountain Commercial Tree Fruit Guide covers pest management and general production issues for growing healthy fruit in Utah, Colorado, and Idaho.

The guide emphasizes integrated pest management and sustainable agriculture, and includes spray recommendations based on crop stage and pest.



INTERMOUNTAIN
Tree Fruit Production Guide | Utah, Colorado, Idaho

Apple Spray Tables Based on Fruit Stages

INTERMOUNTAIN
Tree Fruit Production Guide | Utah, Colorado, Idaho

Apple Spray Table - BLOOM

Codling Moth

Fire Blight

Home
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Insect and Mite Biology
Disease Biology
Pesticide Tables
Spray Tables
Apple
Phenology Calendar
Delayed Dormant
First Pink
Pink to Petal Fall
Bloom
Petal Fall
Fruit Present
Apricot
Cherry
Peach/Nectarine
Pear
Plum
Orchard Floor Management

Apple Spray Table - BLOOM

Codling Moth

Fire Blight

Products	Rate/ac	Rate/100 g	Eff.	MOA
Conventional:				
Agri-Mycin 17 (streptomycin)	24-48 oz	4-8 oz	3-4	25
Kasumin (kasugomycin)	64 oz	---	3	24
Mycoshield (oxytetracycline)	---	1 lb	2-3	41
Reduced Risk/Organic:				
BlightBan A506^{O} (Pseudomonas fluorescens)	See label	---	1-2	NC
Blossom Protect^{O} (Aureobasidium pullulans)	1.25 lb	---	2-3	NC
Cueva^{O} (copper soap)	---	1 gal	2-3	M1
Serenade MAX (Bacillus subtilis)	2-3 lb	---	2	NC
General Comments:				
Biologicals: products must be on flowers before infection. Apply at 10, 40, 70 and 90% open flowers.				
Pesticide Comments:				
Agri-Mycin 17: Where there is resistance, use only once per year mixed with oxytetracycline. **Kasumin:** Max 4 applications; alternate after 2 applications. **Mycoshield:** Repeat in 3 days if Cougarblight model recommends; max 5 applications. **Blossom Protect:** As of 2015, not labeled in Utah. **Cueva:** A soluble copper that is less phytotoxic; may cause russetting in some varieties.				

Biology:
- When rain occurs and average temperatures are >60 F, bacteria may be spread to open flowers.

Scouting/Threshold:
- Check the Cougarblight model on climate.usu.edu/traps and the CO fruit website for treatment recommendations.

Cultural:
- Another option is to not spray, but watch for dead terminals 7-14 days after bloom, and prune out immediately.

INTERMOUNTAIN Tree Fruit Production Guide | Utah, Colorado, Idaho

Restricted Entry and Pre-Harvest Intervals

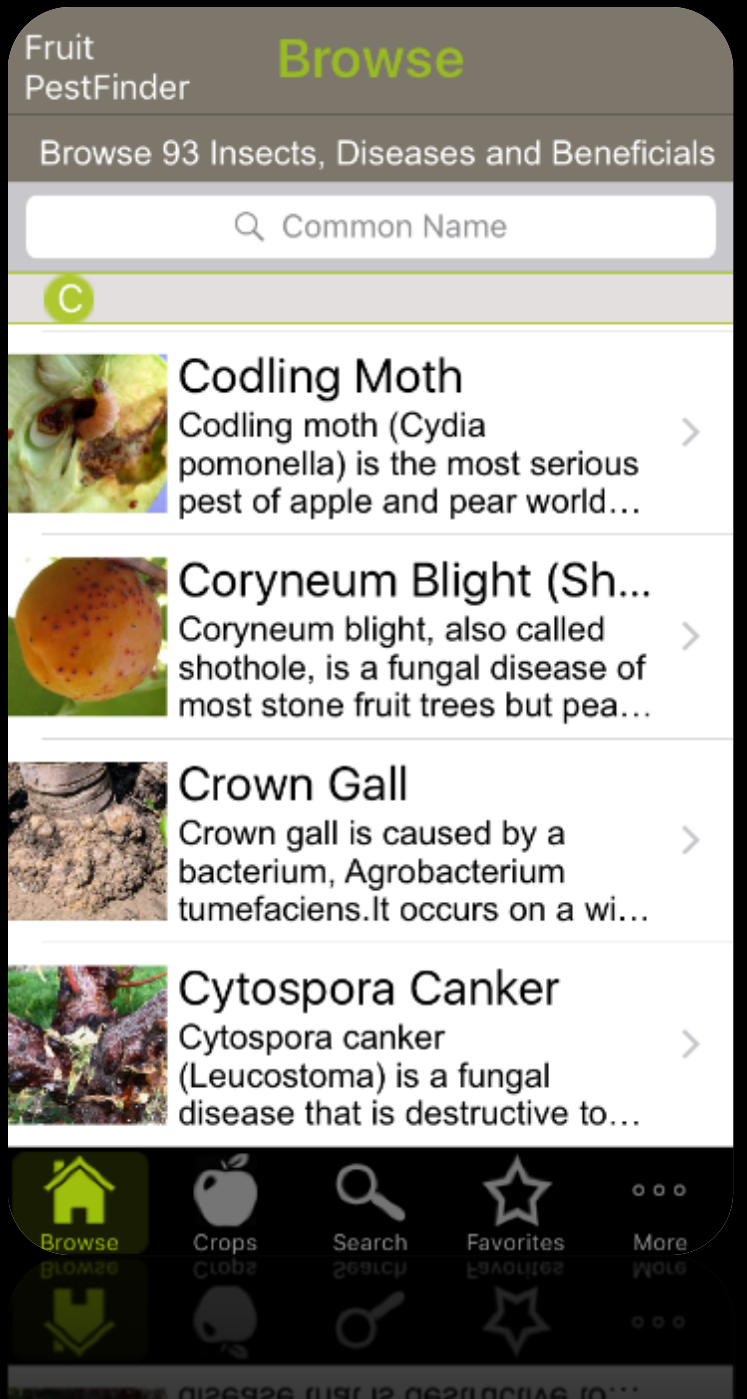
Understanding the Table

NL = no time listed
a = non-bearing trees only
b = do not apply after petal fall
c = dormant/pre-bloom only
d = do not apply after pink stage
e = dormant/delayed-dormant only
f = not labeled for Colorado
g = do not apply after shuck split
h = not labeled for Idaho
I = insecticide
F = fungicide
H = herbicide

Pesticide (active ingredient)	Type	REI (hrs)	PHI (days) apple	pear	cherry	peach	nectar-ine	apri-cot	plum
Admire Pro (imidacloprid)	I	12	7	7	7	0	0	0	7
Agri-Flex (abamectin/ thiamethoxam)	I	12	35	35	---	---	---	---	---
Agri-Fos (mono- and dibasic sodium, potassium, and	F	4	0	0	0	0	0	0	0

Fruit PestFinder App:

- iTunes
- Google Play



Pome Fruit Disease Examples

Fire Blight

Powdery Mildew

Fire Blight

Caused by a bacterium –
Erwinia amylovora

Fire Blight Management

EXTENSION
UtahStateUniversity

Monitor trees for cankers and **prune/remove** 8-12 inches beyond visible damage

Dormant season

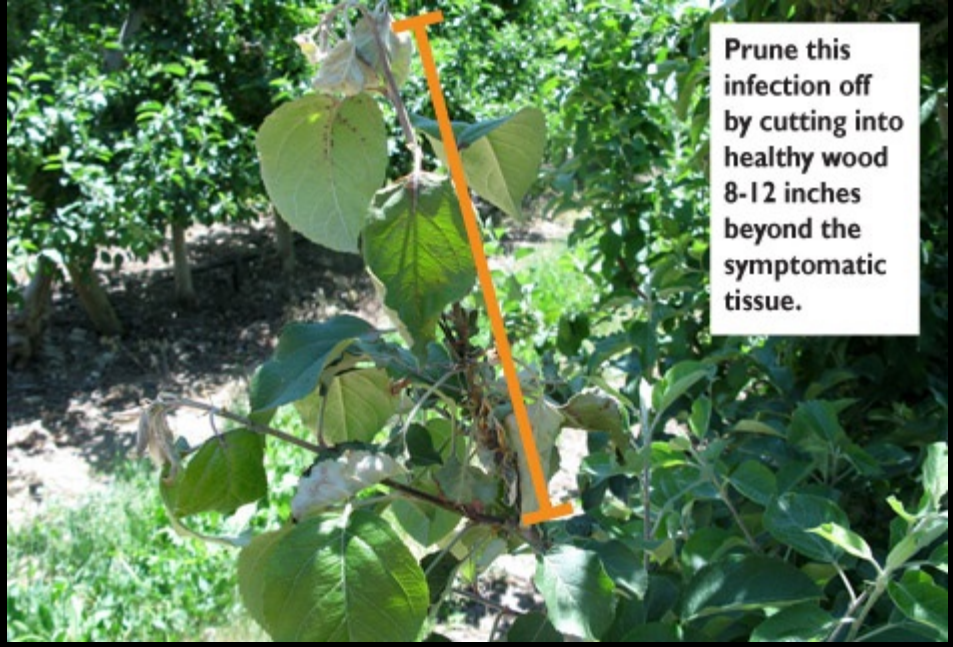
- stem cankers and old shoot infections

Early summer

- new infections


8-10
inches
below
dead
tissue


Cut twig at twice this length


Prune this infection off by cutting into healthy wood 8-12 inches beyond the symptomatic tissue.

Fire Blight Management - Organic

EXTENSION
UtahStateUniversity

During bloom

- Thin flowers by hand or with 2 applications of lime sulfur at 20% and 70% bloom

<u>If blight has been a problem</u>

- Biological products: colonize flower stigma
  - Blossom Protect (yeast) twice, at 80% and full bloom

OR

- Cueva (soluble copper) at delayed dormant and during bloom

90

85

78

75

70

65

60

High Temps =
BLIGHT RISK

MODERATE RISK

NO WORRIES

Fire Blight Management - Antibiotics

EXTENSION
UtahStateUniversity

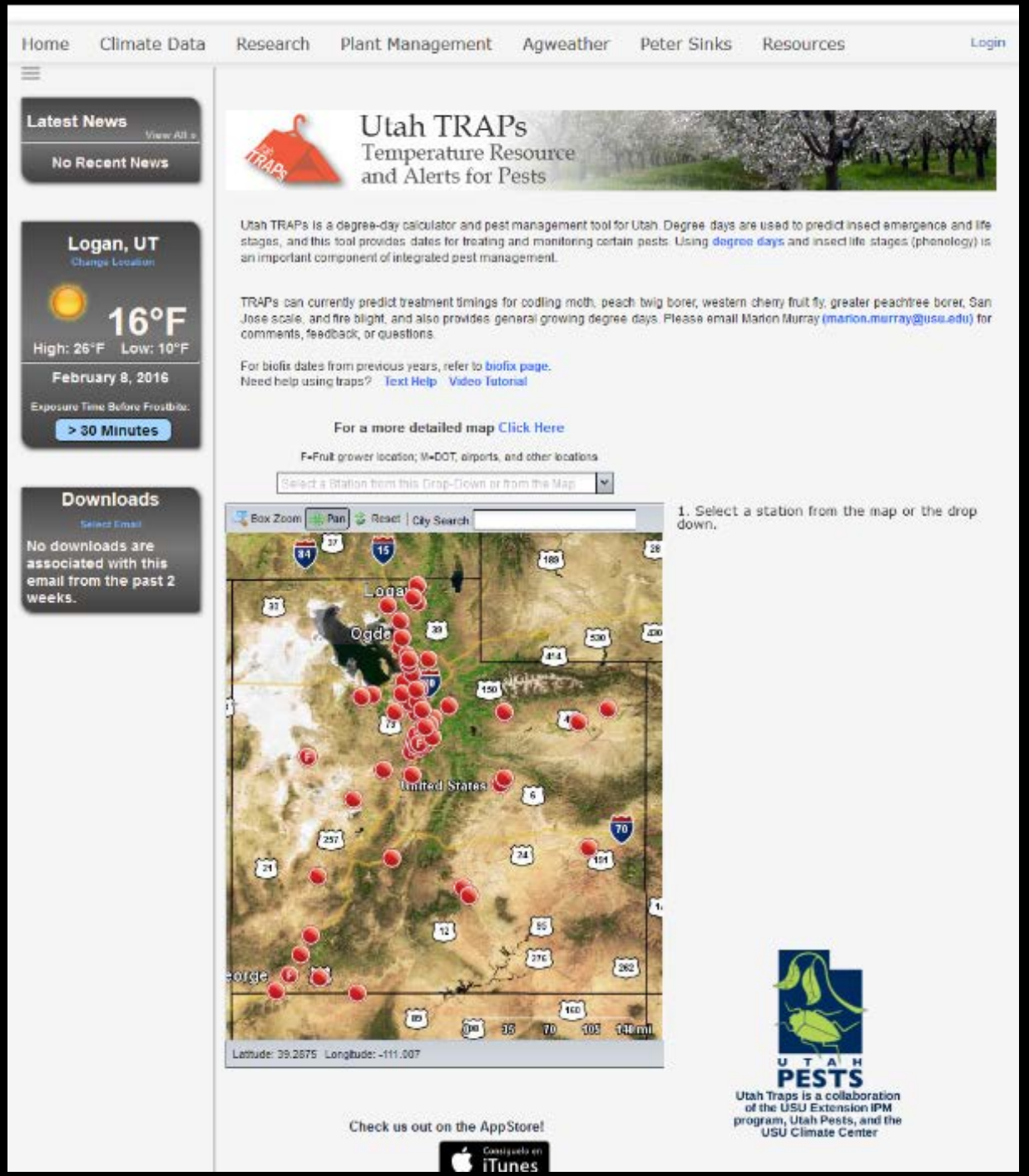
Use **USU Extension recommendations** for when to treat, based on Cougarblight model

OR

Use **Utah TRAPs** for forecasting

climate.usu.edu/traps

climate.usu.edu/traps

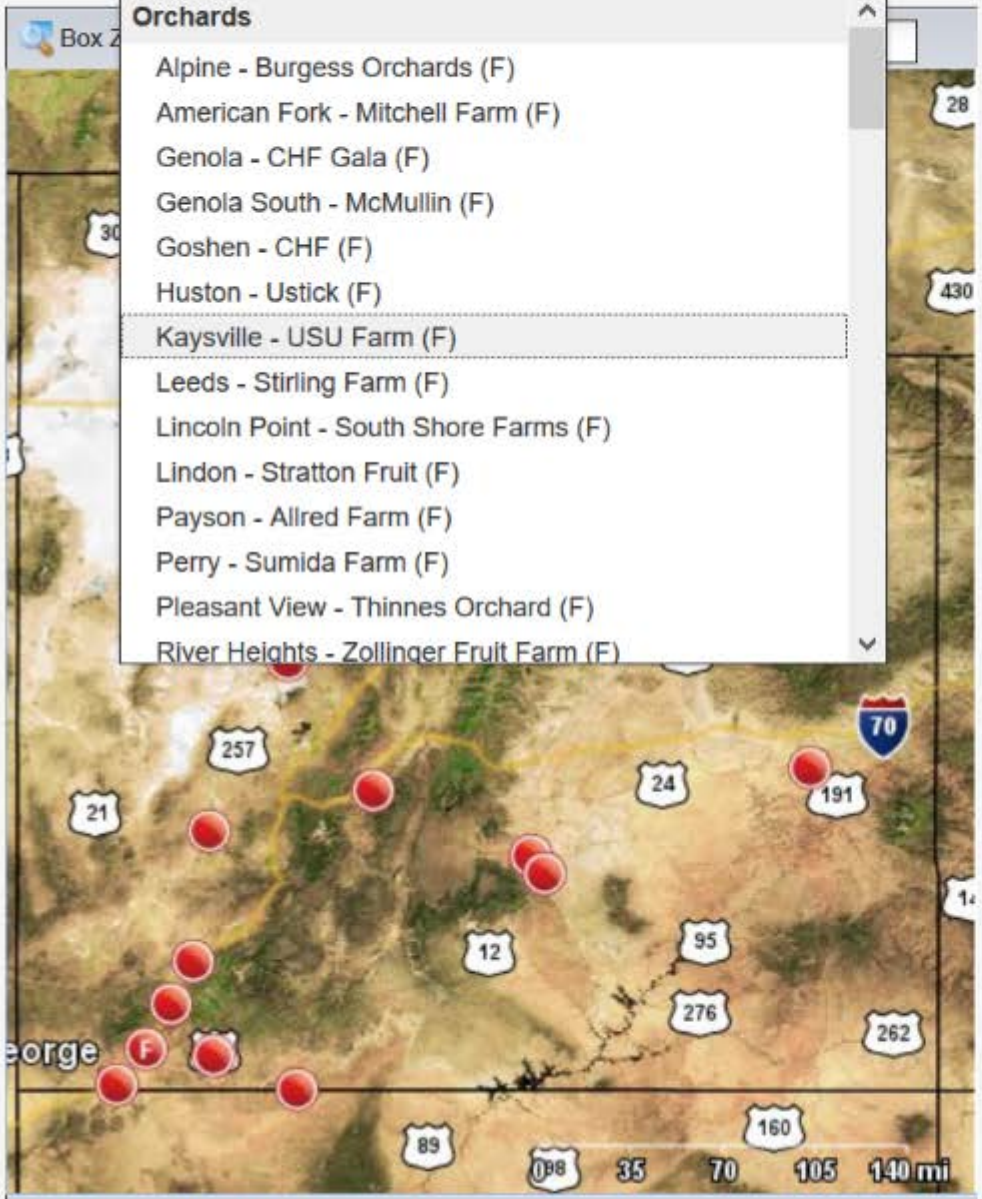


F=Fruit grower location; M=DOT, airports, and other locations

Kaysville - USU Farm (F)

Orchards

- Alpine - Burgess Orchards (F)
- American Fork - Mitchell Farm (F)
- Genola - CHF Gala (F)
- Genola South - McMullin (F)
- Goshen - CHF (F)
- Huston - Ustick (F)
- Kaysville - USU Farm (F)
- Leeds - Stirling Farm (F)
- Lincoln Point - South Shore Farms (F)
- Lindon - Stratton Fruit (F)
- Payson - Allred Farm (F)
- Perry - Sumida Farm (F)
- Pleasant View - Thinnes Orchard (F)
- River Heights - Zollinger Fruit Farm (F)



Latitude: 39.2875 Longitude: -111.007

1. Select a station from the map or the drop down.
2. View *Weather Data* (if available), *Pest Summary* or select pest from drop-down menu.
3. Hit *Submit*, or you may use your own start and end dates.

Station Name: **Kaysville - USU Farm (F)**

Weather Data

Pest Management Information

Pest Summary

Individual Pest Details

Pest: Fire Blight

Start Bloom Time: 05-07-2015

End Date: 06-08-2015

Submit

UTAH PESTS

From the drop down menu below, select the fire blight status of your orchard

Model Authors Smith, T. J. 1993. A Predictive Model for Forecasting Fire Blight of Pear and Apple in Washington State. Acta Horticulturae 338:153-157.
Also see: **Cougarblight 2010 Fire Blight Risk Model** for more information.

Station Name: **Kaysville - USU Farm (F)**

Date Range: 05-07-2015 - 06-08-2015

Fire blight was found in your orchard last season

Export to Excel

Date	Min °F	Max °F	4 Day Risk Val...	Blight Potential	Source
2015-05-07	47	67	25	CAUTION	
2015-05-08	49	64	25	CAUTION	
2015-05-09	43	50	16	CAUTION	
2015-05-10	42	61	19	CAUTION	
2015-05-11	39	73	49	CAUTION	
2015-05-12	57	76	153	HIGH	
2015-05-13	52	74	207	EXTREME	
2015-05-14	48	73	234	EXTREME	
2015-05-15	44	59	197	HIGH	
2015-05-16	43	48	86	CAUTION	
2015-05-17	47	64	40	CAUTION	
2015-05-18	47	69	19	CAUTION	
2015-05-19	47	62	20	CAUTION	
2015-05-20	49	68	35	CAUTION	

An * indicates temperature data missing and replaced by an alternate source

Management Actions

Date: 2015-05-12

Blight Potential: HIGH

Action: If unprotected flowers are wetted, infection is possible. If flowers are numerous, you may choose to protect every 2 - 3 days with biological product during the high risk period. Or, apply antibiotic within 24 hours before or after the infection (wetting) event.

LOW > CAUTION > HIGH > EXTREME >

Fire Blight Management - Antibiotics

EXTENSION
UtahStateUniversity

Streptomycin (Agri-Mycin, Ferti-Lome FB Spray)

- slight systemic activity

Oxytetracycline (Mycoshield, FlameOut)

- not systemic
- does not KILL bacteria, but slows it down
- works best when on plants before infection (up to 24 hours before wetting)

Powdery Mildew – Apple

Powdery Mildew – Apple

Powdery Mildew

Different fungal species for each host species (apple, cherry, peach)

Apple powdery mildew overwinters in terminal buds

Powdery Mildew Management

EXTENSION
UtahStateUniversity

- Monitor for the disease in spring by looking for whitish patches on leaves or shoots.
- If necessary, apply fungicide applications at pink stage (open cluster) to prevent secondary infections.

Conventional Fungicides

EXTENSION
UtahStateUniversity

Small Orchard: captan, myclobutanil (Spectracide Immunox)

Large Orchard: Rally, Adament, Indar, Procure

IMPORTANT: Rotate chemicals from one class to another

Organic Fungicides

EXTENSION
UtahStateUniversity

Bicarbonates: Armicarb "O", Kaligreen

- poor to moderate control; reapply every 5 days

Regalia biofungicide: works by improving plant defenses

Sulfur: do not apply in heat

Oil: Saf-T-Side, SuffOil-X, Trilogy: do not apply in heat

- 1% rate
- poor to moderate control; reapply every 5 days

Stone Fruit Disease Examples

Coryneum Blight

Cytospora Canker

Powdery Mildew

Brown Rot

Collar Rot

Coryneum Blight

Coryneum Blight

EXTENSION
UtahStateUniversity

- Caused by a fungus – *Wilsonomyces carpophilus*
- Primarily apricot, peach/nectarine, and occasionally plum and cherry
- Active in fall and spring; fungal spores are spread by rain and water splash

Coryneum Blight Management

EXTENSION
UtahStateUniversity

Monitor trees and prune out dead twigs

Prevent wetting of canopy with irrigation

Clean up fallen and unharvested fruit

Coryneum Blight Management

EXTENSION
UtahStateUniversity

Two important spray timings

- Fall: copper (Cueva, NuCop, Nordox) at 50% leaf drop to prevent new infections
- Spring: petal fall and/or shuck split

Conventional Fungicides

EXTENSION
UtahStateUniversity

Small Orchard:

- Chlorothalonil (not after shuck split)
- Captan
- Spectracide Immunox

Large Orchard:

- Adament, Bravo, Fontelis, Pristine, Quilt

Organic Fungicides

- Sulfur
- Cueva copper (OK to apply during growing season)

Gummosis

EXTENSION
UtahStateUniversity

Oozing of sap or gum from wounds or other openings in bark

- borers – crusty, amber-colored ooze
- environmental stress – clear ooze
- fungal canker (disease) – gummy, dark amber ooze

Cytospora Canker Management

Prevent wounding

- Paint trunks to prevent sunscald

Delay pruning until spring

- Do not prune in wet weather

Remove all dead or diseased branches and limbs as they appear

- Cut 4 inches below diseased area

Powdery Mildew

- Different fungal species for each host species (apple, cherry, peach)

- Cherry and Peach powdery mildews overwinter mostly on fallen leaves

Powdery Mildew – Cherry

Powdery Mildew – Cherry

Powdery Mildew – Peach

Powdery Mildew Management

EXTENSION
UtahStateUniversity

- Remove cherry and peach leaves from under trees.
- Monitor for the disease in spring by looking for whitish patches on the underside of leaves.
- If necessary, apply fungicide applications at shuck split to prevent secondary infections.
- On cherry, apply fungicide after harvest

Conventional Fungicides

EXTENSION
UtahStateUniversity

Small Orchard: Captan, myclobutanil (Immnox)

Large Orchard: Abound, Gem, Quintec, Rally

IMPORTANT: Rotate chemicals from one class to another

Organic Fungicides

EXTENSION
UtahStateUniversity

Bicarbonates: Armicarb "O", Kaligreen

- poor to moderate control; reapply every 5 days

M-Pede insecticidal soap

- 1.5% rate
- Good coverage is essential

Regalia biofungicide

Sulfur

Oil: Saf-T-Side, SuffOil-X, Trilogy

- 1-1.5% rate
- poor to moderate control; reapply every 5 days

Brown Rot

EXTENSION
UtahStateUniversity

- *Monilinia fructicola*
- All stone fruits susceptible
- Favored by humid weather at the time that fruit are ripening
- Disease can develop on harvested fruit

Brown Rot Management

EXTENSION
UtahStateUniversity

- Do not over fertilize
- Thin fruit properly
- Remove and destroy old mummified fruit

Conventional Fungicides

EXTENSION
UtahStateUniversity

Small Orchard:

- Captan
- Spectracide Immunox

Large Orchard:

- Adament, Pristine, Rally

Organic Fungicides

EXTENSION
UtahStateUniversity

Sulfur

- pink stage and 7 days later;
- repeat close to harvest if conditions are cool and wet

Use Surround to discourage stink and lygus bug feeding (which creates entry sites for brown rot)

DoubleNickel 55 (*Bacillus amyloliquefaciens*)

- Not recommended for fruit rot control

Serenade ASO (*Bacillus subtilis)*

- *U*se only for blossom blight during bloom.

Crown and Collar Rot

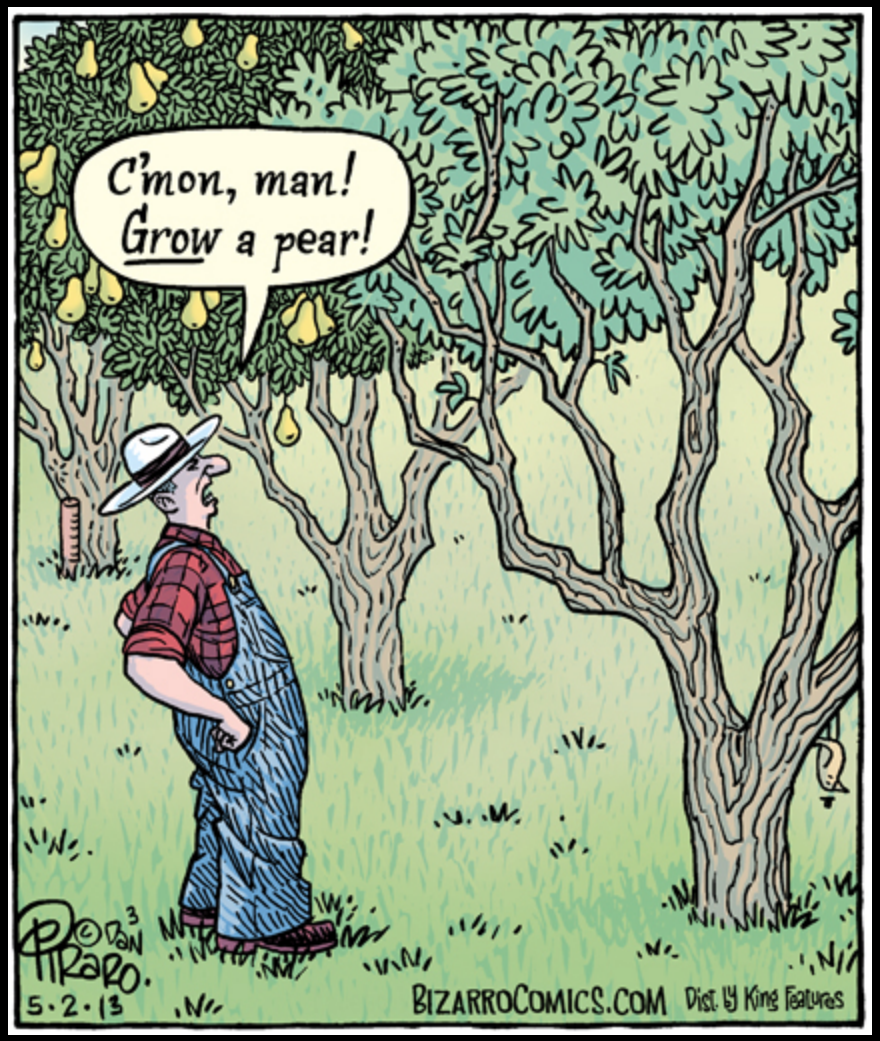
Causal agent: many species of *Phytophthora*, including *P. cactorum, P. megasperma, P. cambivora*, and others

Hosts: all fruits; cherry most common in Utah

Crown and Collar Rot Management

Use an integrated approach:

- monitor trees for symptoms in early spring and early fall
- plant on well-drained soil
- do not over-irrigate and fix any water leaks
- plant trees on berms
- use targeted chemical control only



Marion Murray

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- Back to Top -

IPM Strategies for Tree Fruit Insects and Mites

Biographical Information:

Diane Alston
USU Extenstion
Department of Biology, Utah State University

She has over 30 years' experience in integrated pest management, or IPM, the approach to using multiple pest suppression methods in combination to lower pest populations below economically damaging levels. Diane works with the horticultural industries and gardeners in Utah. She conducts research and education outreach on fruit, vegetable, and ornamental insect and mite pest management.

Session Description:

Diane will teach an introductory mini-course on tree fruit entomology. She will discuss the primary insect and mite pests of tree fruits in Utah, as well as the numerous beneficial insects that provide natural biological control in Utah's fruit orchards and gardens.









IPM Strategies for Tree Fruit Insects & Mites

Diane Alston, Entomologist, Utah State University

Urban and Small Farms Conference
February 18, 2016

Integrated Pest Management (IPM)

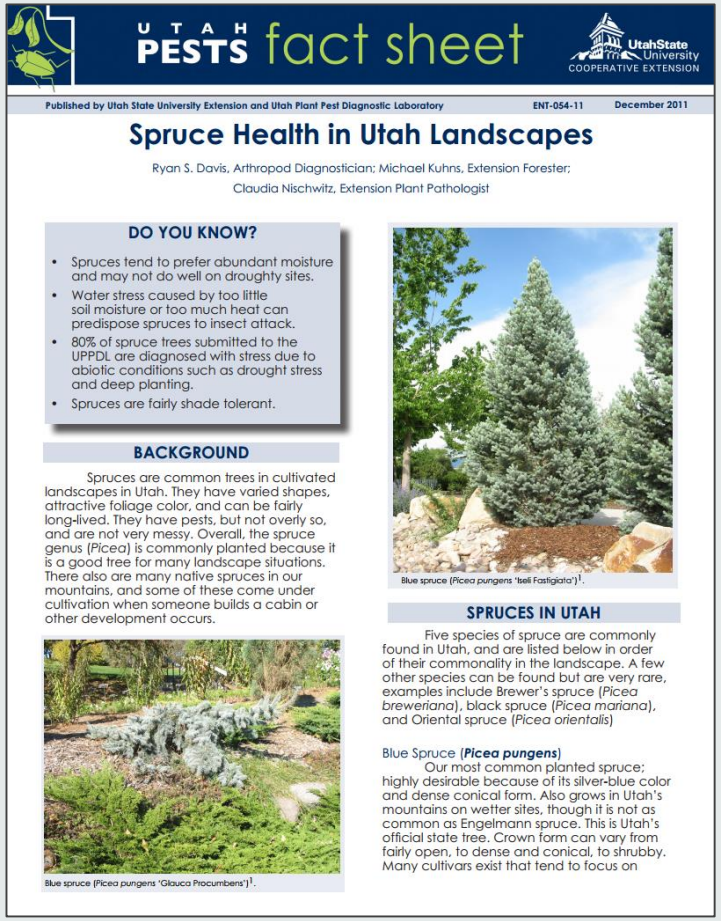
- Sustainable
  - Economics, Environment, and Society
- Integrate Strategies
  - Cultural (plant & site management)
  - Mechanical (barriers, disruption, traps)
  - Biological (natural enemies)
  - Chemical (conventional, organic & bio-pesticides)
- Monitor pest numbers/injury
  - Treat only when needed

Utah Pests Online Resources

Utah Pests Online Resources

www.utahpests.usu.edu

Fact Sheets: over 200 fact sheets on pests of ornamentals, turf, fruits, vegetables, field crops, health-related, nuisance, stored products, structural, etc.



UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-054-11 December 2011

Spruce Health in Utah Landscapes

Ryan S. Davis, Arthropod Diagnostician; Michael Kuhns, Extension Forester; Claudia Nischwitz, Extension Plant Pathologist

DO YOU KNOW?

- Spruces tend to prefer abundant moisture and may not do well on droughty sites.
- Water stress caused by too little soil moisture or too much heat can predispose spruces to insect attack.
- 80% of spruce trees submitted to the UPPDL are diagnosed with stress due to abiotic conditions such as drought stress and deep planting.
- Spruces are fairly shade tolerant.

Blue spruce (*Picea pungens* 'Iseli Fastigiata')[1].

BACKGROUND

Spruces are common trees in cultivated landscapes in Utah. They have varied shapes, attractive foliage color, and can be fairly long-lived. They have pests, but not overly so, and are not very messy. Overall, the spruce genus (*Picea*) is commonly planted because it is a good tree for many landscape situations. There also are many native spruces in our mountains, and some of these come under cultivation when someone builds a cabin or other development occurs.

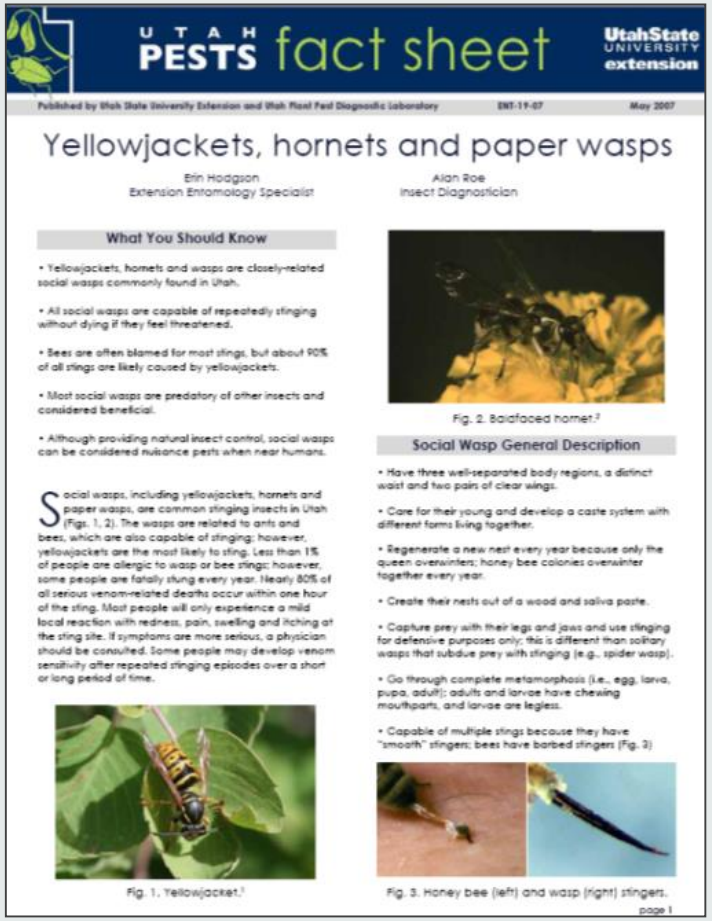
Blue spruce (*Picea pungens* 'Glauca Procumbens')[1].

SPRUCES IN UTAH

Five species of spruce are commonly found in Utah, and are listed below in order of their commonality in the landscape. A few other species can be found but are very rare, examples include Brewer's spruce (*Picea breweriana*), black spruce (*Picea mariana*), and Oriental spruce (*Picea orientalis*)

Blue Spruce (***Picea pungens***)

Our most common planted spruce; highly desirable because of its silver-blue color and dense conical form. Also grows in Utah's mountains on wetter sites, though it is not as common as Engelmann spruce. This is Utah's official state tree. Crown form can vary from fairly open, to dense and conical, to shrubby. Many cultivars exist that tend to focus on



UTAH PESTS fact sheet

UtahState University extension

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-19-07 May 2007

Yellowjackets, hornets and paper wasps

Erin Hodgson, Extension Entomology Specialist — Alan Roe, Insect Diagnostician

What You Should Know

- Yellowjackets, hornets and wasps are closely-related social wasps commonly found in Utah.
- All social wasps are capable of repeatedly stinging without dying if they feel threatened.
- Bees are often blamed for most stings, but about 90% of all stings are likely caused by yellowjackets.
- Most social wasps are predatory of other insects and considered beneficial.
- Although providing natural insect control, social wasps can be considered nuisance pests when near humans.

Social wasps, including yellowjackets, hornets and paper wasps, are common stinging insects in Utah (Figs. 1, 2). The wasps are related to ants and bees, which are also capable of stinging; however, yellowjackets are the most likely to sting. Less than 1% of people are allergic to wasp or bee stings; however, some people are fatally stung every year. Nearly 80% of all serious venom-related deaths occur within one hour of the sting. Most people will only experience a mild local reaction with redness, pain, swelling and itching at the sting site. If symptoms are more serious, a physician should be consulted. Some people may develop venom sensitivity after repeated stinging episodes over a short or long period of time.

Fig. 1. Yellowjacket.[1]

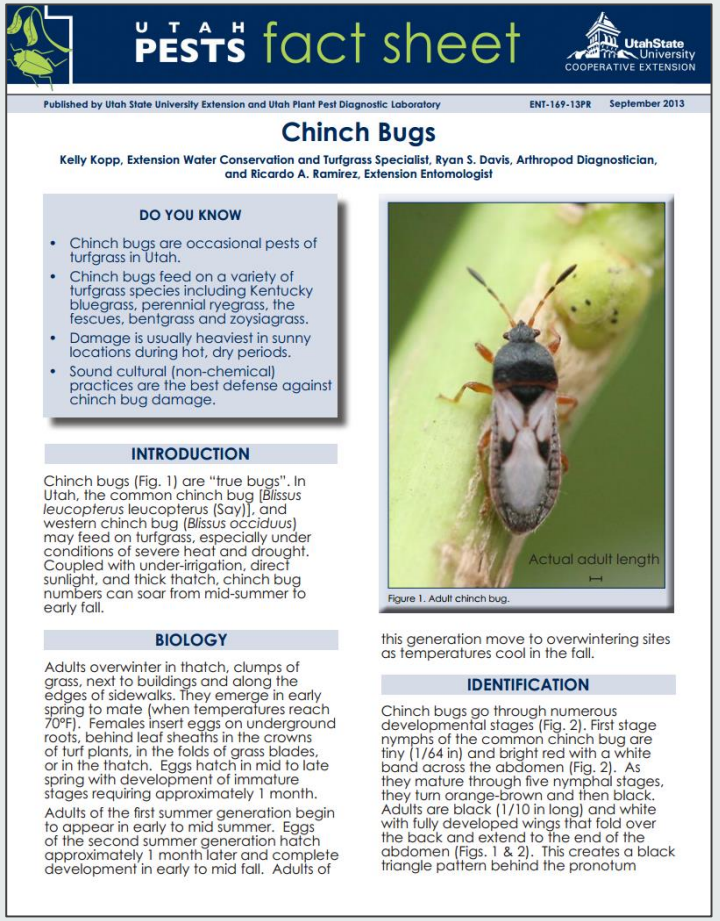
Fig. 2. Baldfaced hornet.[2]

Social Wasp General Description

- Have three well-separated body regions, a distinct waist and two pairs of clear wings.
- Care for their young and develop a caste system with different forms living together.
- Regenerate a new nest every year because only the queen overwinters; honey bee colonies overwinter together every year.
- Create their nests out of a wood and saliva paste.
- Capture prey with their legs and jaws and use stinging for defensive purposes only; this is different than solitary wasps that subdue prey with stinging (e.g., spider wasp).
- Go through complete metamorphosis (i.e., egg, larva, pupa, adult); adults and larvae have chewing mouthparts, and larvae are legless.
- Capable of multiple stings because they have "smooth" stingers; bees have barbed stingers (Fig. 3)

Fig. 3. Honey bee (left) and wasp (right) stingers.

page 1



UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-169-13PR September 2013

Chinch Bugs

Kelly Kopp, Extension Water Conservation and Turfgrass Specialist, Ryan S. Davis, Arthropod Diagnostician, and Ricardo A. Ramirez, Extension Entomologist

DO YOU KNOW

- Chinch bugs are occasional pests of turfgrass in Utah.
- Chinch bugs feed on a variety of turfgrass species including Kentucky bluegrass, perennial ryegrass, the fescues, bentgrass and zoysiagrass.
- Damage is usually heaviest in sunny locations during hot, dry periods.
- Sound cultural (non-chemical) practices are the best defense against chinch bug damage.

Actual adult length

Figure 1. Adult chinch bug.

INTRODUCTION

Chinch bugs (Fig. 1) are "true bugs". In Utah, the common chinch bug (*Blissus leucopterus* leucopterus (Say)), and western chinch bug (*Blissus occiduus*) may feed on turfgrass, especially under conditions of severe heat and drought. Coupled with under-irrigation, direct sunlight, and thick thatch, chinch bug numbers can soar from mid-summer to early fall.

BIOLOGY

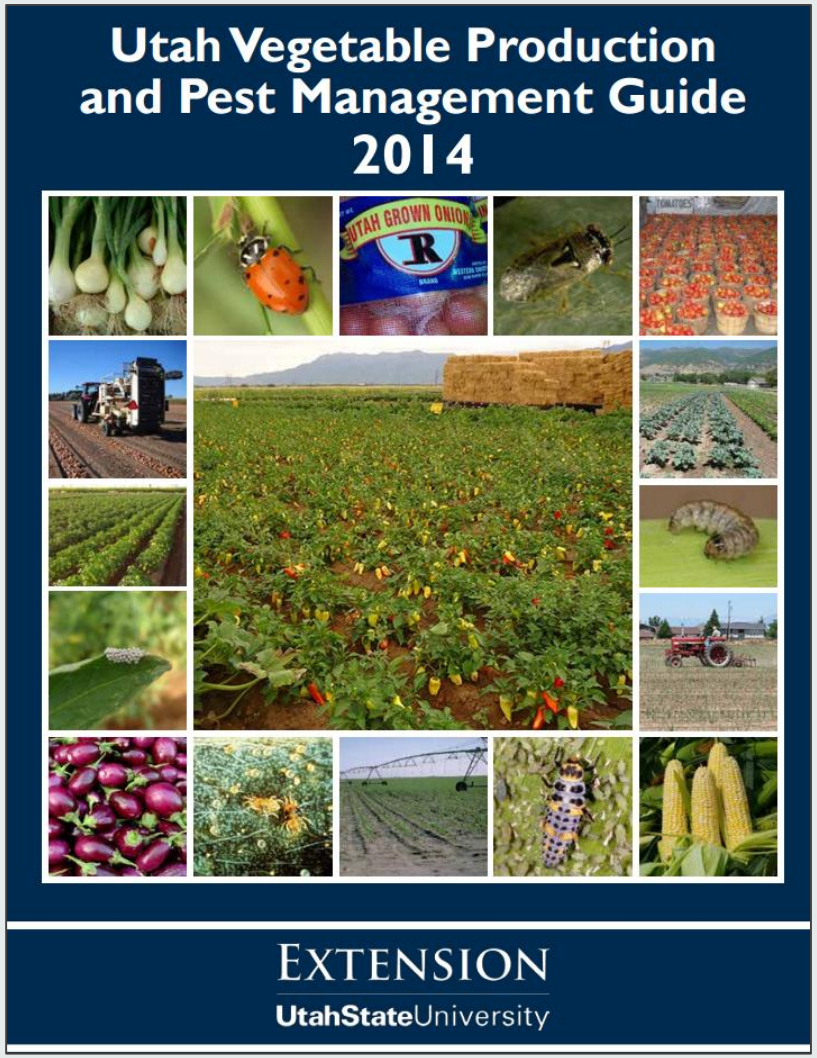
Adults overwinter in thatch, clumps of grass, next to buildings and along the edges of sidewalks. They emerge in early spring to mate (when temperatures reach 70°F). Females insert eggs on underground roots, behind leaf sheaths in the crowns of turf plants, in the folds of grass blades, or in the thatch. Eggs hatch in mid to late spring with development of immature stages requiring approximately 1 month.

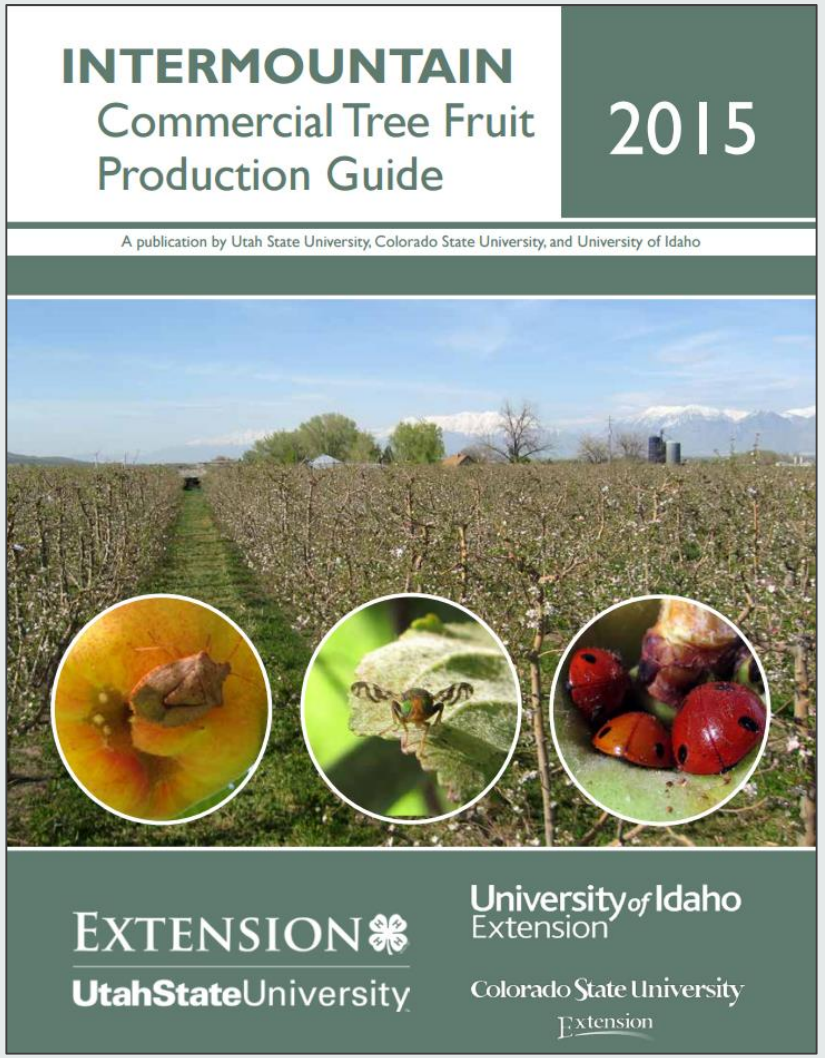
Adults of the first summer generation begin to appear in early to mid summer. Eggs of the second summer generation hatch approximately 1 month later and complete development in early to mid fall. Adults of this generation move to overwintering sites as temperatures cool in the fall.

IDENTIFICATION

Chinch bugs go through numerous developmental stages (Fig. 2). First stage nymphs of the common chinch bug are tiny (1/64 in) and bright red with a white band across the abdomen (Fig. 2). As they mature through five nymphal stages, they turn orange-brown and then black. Adults are black (1/10 in long) and white with fully developed wings that fold over the back and extend to the end of the abdomen (Figs. 1 & 2). This creates a black triangle pattern behind the pronotum

Guides


Utah Vegetable Production and Pest Management Guide 2014
EXTENSION
UtahStateUniversity


INTERMOUNTAIN
Commercial Tree Fruit Production Guide
2015
A publication by Utah State University, Colorado State University, and University of Idaho
EXTENSION
UtahStateUniversity
University of Idaho Extension
Colorado State University Extension


INVASIVE INSECT
FIELD GUIDE for
UTAH
2014
EXTENSION
UtahStateUniversity
Lori R. Spears & Ricardo A. Ramirez


Common Pests of Schools & Structures in Utah
EXTENSION
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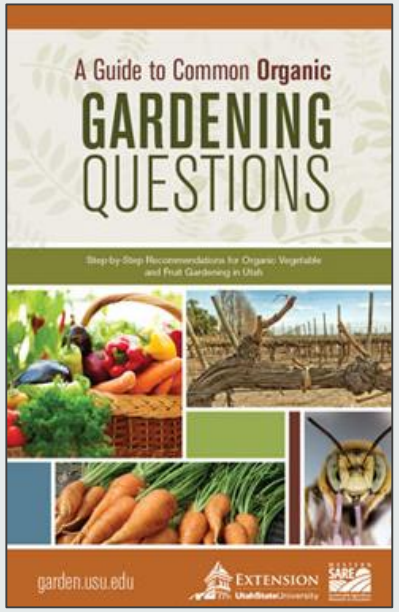
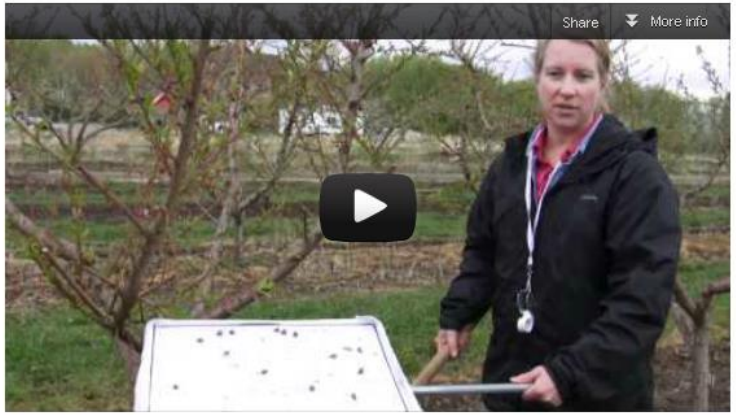

A Guide to Common Organic
GARDENING
QUESTIONS
garden.usu.edu
EXTENSION

Video Fact Sheets

Paper Wasp Traps
Entomologist Diane Alston discusses the difference between native paper wasps and European paper wasps, and how to make your own traps to combat them.

Billbug Identification and Detection in Turf
Entomologist Ricardo Ramirez discusses the identifying characteristics of billbugs in turf, and demonstrates how to detect the damaging larval stage.

Using a Beating Tray
A beating tray is a large cloth frame that is used to catch insects that fall from a shaken branch. It is helpful for monitoring a large area, such as an orchard, quickly.

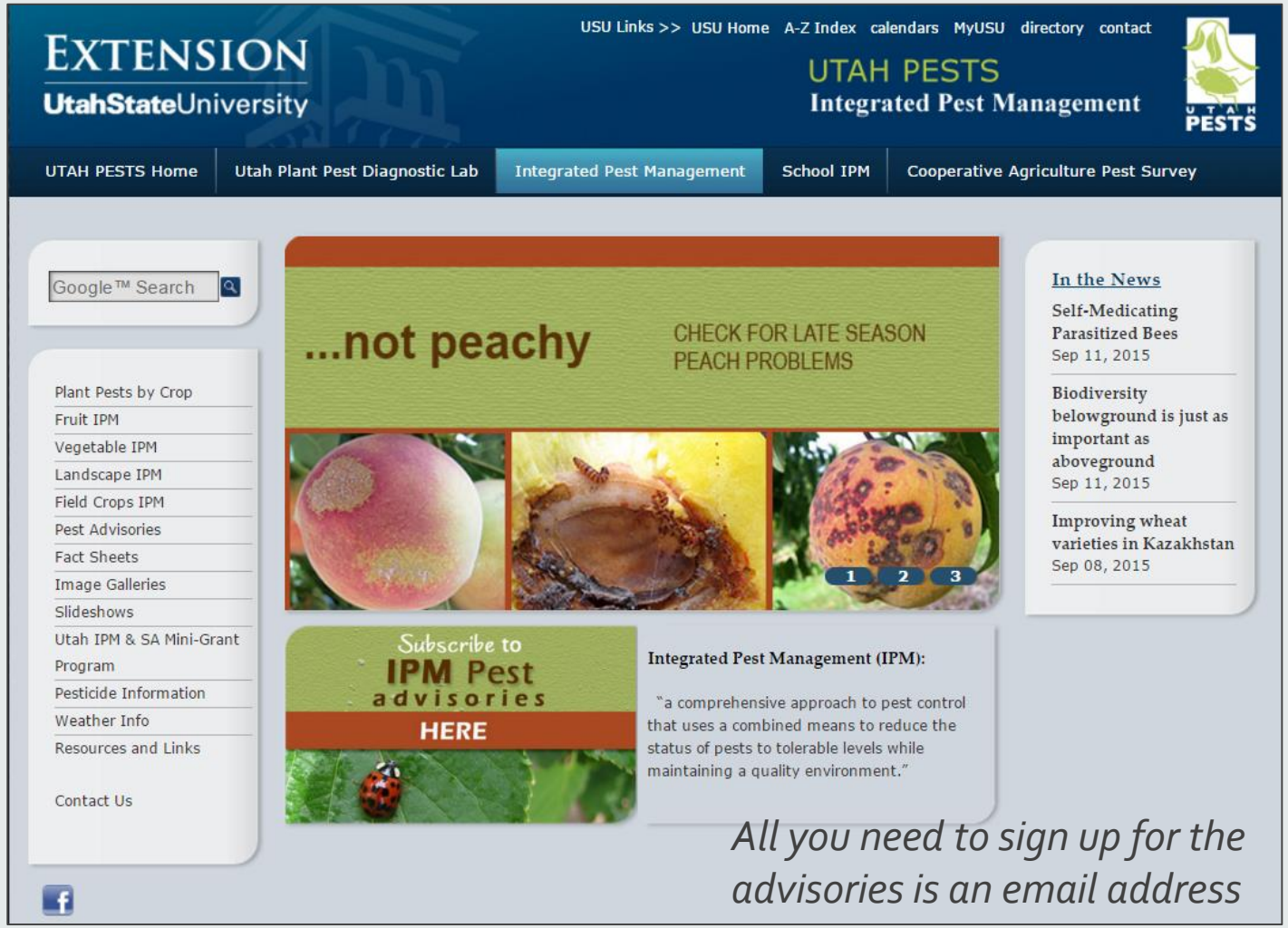


Tips for avoiding bed bugs while traveling.
Entomologist Ryan Davis discusses safe travel techniques to avoid falling prey to bed bugs, and how to minimize the chances of bringing bed bugs back to the home.

IPM Advisories:

ornamentals, turf, fruits, vegetables

www.utahpests.usu.edu/ipm



All you need to sign up for the advisories is an email address

Free subscription

Timely info on pest activity

- -insects
- -mites
- -diseases
- -nutrient deficiencies
- -environmental stress

Lots of images!

IPM recommendations

Effective pesticides

IPM Advisories (2015 Examples)

EXTENSION UtahStateUniversity **Landscape IPM Advisory**

UTAH PESTS

Weekly Pest Update for Woody Ornamentals, Utah State University Extension, **April 29, 2015**

What's In Bloom

(Salt Lake City area)

Blackhaw viburnum: first bloom
Crabapple: end bloom
Lilac: bloom - end bloom
Redbud: end bloom
Redtwig dogwood: first bloom
Japanese flowering cherry: bloom
Kwanzan cherry: full to end bloom
Quince: end bloom
Serviceberry: full bloom

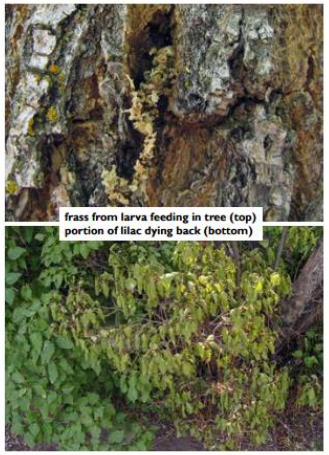
Insect/Disease Information

DECIDUOUS TREES

Lilac-Ash Borer

Hosts: lilac and ash; occasionally privet and mountain-ash

- ***treat susceptible trunks now until mid-July***



frass from larva feeding in tree (top)
portion of lilac dying back (bottom)

Lilac-ash borer adults have just started to emerge and females are laying eggs on the bark of ash trees and lilac. Green and white ash (*Fraxinus*) are the most susceptible. Sometimes, mountain-ash (*Sorbus*) and privet are attacked.

Lilac-ash borer does not directly kill trees, but repeated infestations can cause branch dieback and can leave trees susceptible to breakage in storms. Infested trees will have round exit holes on the bark, sawdust-like frass near the holes or at the base of the tree, and rough, swollen, cracked bark, mostly near branch crotches.

This insect overwinters as a larva inside the host plant and pupates in spring, emerging as an adult moth, usually in early to mid May. Emergence and egg-laying continues for about 6 to 8 weeks.

Treatment:

Healthy plants are able to withstand minor infestations, while stressed plants are more susceptible to attack and failure, so give trees optimal water and fertilizer, and prune properly.

Insecticides target the adults. Small trees can be treated by the home gardener, but in order to get thorough coverage on large trees, treatments should be made by a licensed pesticide applicator.

Residential options: Hi-Yield Permethrin, Spectracide Triazicide (lambda-cyhalothrin)

Commercial options: Acelepryn (chlorantraniliprole), permethrin (Astro, Covert, Waylay), or Onyx (bifenthrin)

UtahState UNIVERSITY extension **Turfgrass IPM Advisory**

UTAH PESTS

Seasonal Turfgrass Pest Update, Utah State University Extension, Winter 2014

Turfgrass Management

At this time of year, your thoughts may be turning to the potential effects of winter conditions on your turf. "Winterkill" is the general term describing turf loss that may occur as a result of winter conditions. This issue will discuss the actual causes of winterkill and how they may be prevented.

News/What to Watch For

During winter, most turfgrass diseases and insects are relatively inactive. However, one disease complex, the snow molds, may be at work despite recent low temperatures.

Focus on: Winterkill

When turfgrasses die over the winter months, it may generally be described as "winterkill" (Figs. 1 and 2). The term covers a multitude of actual causes of turfgrass death in the winter, which may include snow mold, low temperatures, ice sheets, dessication and crown hydration.

Crown Hydration

Crown hydration is of most concern during the warmer days of late winter or early spring when there is the potential for a day or two of warm daytime temperatures followed by a hard freeze. Turfgrass plants may start to take up water as temperatures warm and then re-freeze rapidly. As a result, ice crystals may form in the crown of the plant, rupturing cells and causing death.

Of the commonly-used cool-season turfgrass species, annual bluegrass and creeping bentgrass are most susceptible to crown hydration problems, though annual bluegrass is the more susceptible of the two because it emerges from dormancy earlier.

Dessication

During the winter when turfgrass plants are dormant or semi-dormant, drying of the leaves or plants (dessication) may cause death. Dessication is typically only a factor on elevated or extremely exposed or windy sites, and areas where surface runoff is rapid.

Figure 1. Winterkill symptoms in turfgrass.

EXTENSION UtahStateUniversity **Tree Fruit IPM Advisory**

UTAH PESTS

Orchard Pest Update, Utah State University Extension, **October 5, 2015**

JUST THE BASICS: Current Treatments

GENERAL

- Clean up fallen fruit to reduce pest pressure for next year.
- Mow tall weeds around trees/install barrier or wire to reduce rodent problems and deer rubbing.
- Make sure all new plantings get white tree paint or tree wrap (base of tree to scaffold limbs) from December through early April, to prevent sun scald.
- Give trees a good watering before the ground freezes.
- Do not do any pruning now; wait until winter (apples) or early spring (peaches).

APPLE & PEAR

- Apply lime-sulfur when the first leaves start turning color to control *blister mites*.
- To reduce *codling moth* for next year, remove bins and debris from the orchard after harvest and remove fruit on the ground or left on the tree.

PEACH/NECTARINE

- Prevent new *coryneum blight* (shothole) infections this fall by applying copper to trees when 50% of leaves have fallen.

Insect and Disease Information

: *information for residential settings* : *information for commercial orchards*

APPLE & PEAR

Blister Mites

Hosts: apple, pear

Blister mites cause early fall color change and leaf drop (shown here on apple).

Blister mites and other eriophyid mites can be treated now, and no later than just before leaf drop. They are more of an aesthetic problem, and do not harm the health of the tree. In fact, they serve as a food source for early emerging predatory mites in the spring. In turn, the predatory mites will take care of the harmful spider mites that are active during summer.

Blister mite spots on pear turn black by mid to late season.

If treatment is desired, options include:

- 1.5-2% oil, thoroughly covering the bottoms of the leaves
- Sevin (carbaryl), alone or with 1% oil
- lime-sulfur (only at this time of year, you can mix with oil, but not on drought-stressed trees)

Blister mites belong to a group of mites called eriophyid mites (air-ee-oh-FYE-id). They are so small that they are invisible to the naked eye, but their feeding can cause visible symptoms.

continued on next page

Utah Pests News

Quarterly newsletter on all things "insects and plant diseases" in Utah

UTAH PESTS News

Utah Plant Pest Diagnostic Laboratory and USU Extension — Vol. X, Winter 2016

What's Inside

News Highlights

NEW PUBLICATIONS

Raspberry Crown Borer

Rose Stem Girdler

utahpests.usu.edu

Utah Orchard Leafroller Survey

Leafrollers are a type of moth-caterpillar (Lepidoptera: Tortricidae) that may roll or tie leaves together to form a protective shelter, from which they feed on the leaves and fruits of plants. This group contains many economically important pests that attack fruits, vegetables, and ornamentals. The need for an orchard leafroller survey was prompted by an outbreak of leafroller caterpillars in Utah County tart cherry orchards just before harvest in July 2012.

We surveyed for five species that commonly occur in western U.S. orchards. The survey included five counties of northern Utah from late spring through early fall in 2014 (21 orchards) and 2015 (20 orchards). We used pheromone traps for moths, and feeding injury inspections and beating tray sampling for larvae. In 2014, 11 of the orchards received minimal management, such as limited insecticides, pruning, and irrigation. The remaining orchards were commercially managed.

Total Leafroller (LR) Trap Catches

The survey showed that OBLR is the most common leafroller species in Utah, followed by FTLR.

Our objectives were to determine the species of leafrollers present, types of orchards at greatest risk for infestation, leafroller phenology (timing of moth flight and caterpillar activity), and validate an existing temperature-based (degree-day) model that predicts timing of leafroller treatments.

Obliquebanded leafroller (OBLR) was the primary species caught in the pheromone traps, followed distantly by fruittree leafroller (FTLR), as shown in the graph above. We detected very few European leafroller (ELR) moths, and no omnivorous or pandemis leafrollers. In more limited surveys in 2012 and 2013, OBLR numbers were very high in 2012, the season of the larval outbreak in tart cherries. OBLR moth capture in 2015 increased over those in 2013 and 2014, and although several orchards had high trap captures, the overall catch in 20 orchards was not as high as the total catch in 2012 (6 orchards). Growers were notified when OBLR numbers were high, and populations will be monitored in 2016 to prevent another outbreak.

continued on next page

Pest Diagnostics

Utah Plant Pest Diagnostic Lab

www.utahpests.usu.edu/uppdl

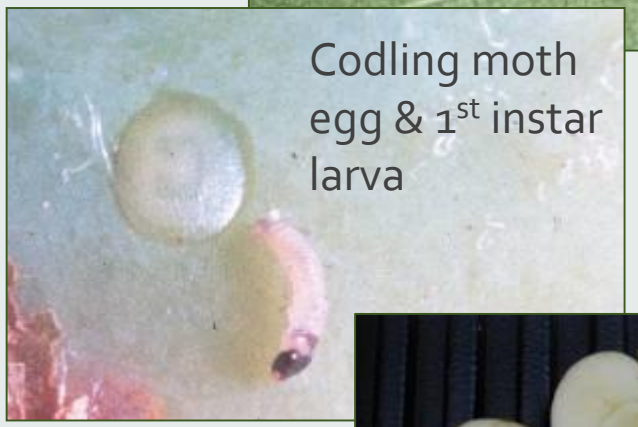
Sample Submission

Primary Tree Fruit Insect Pests

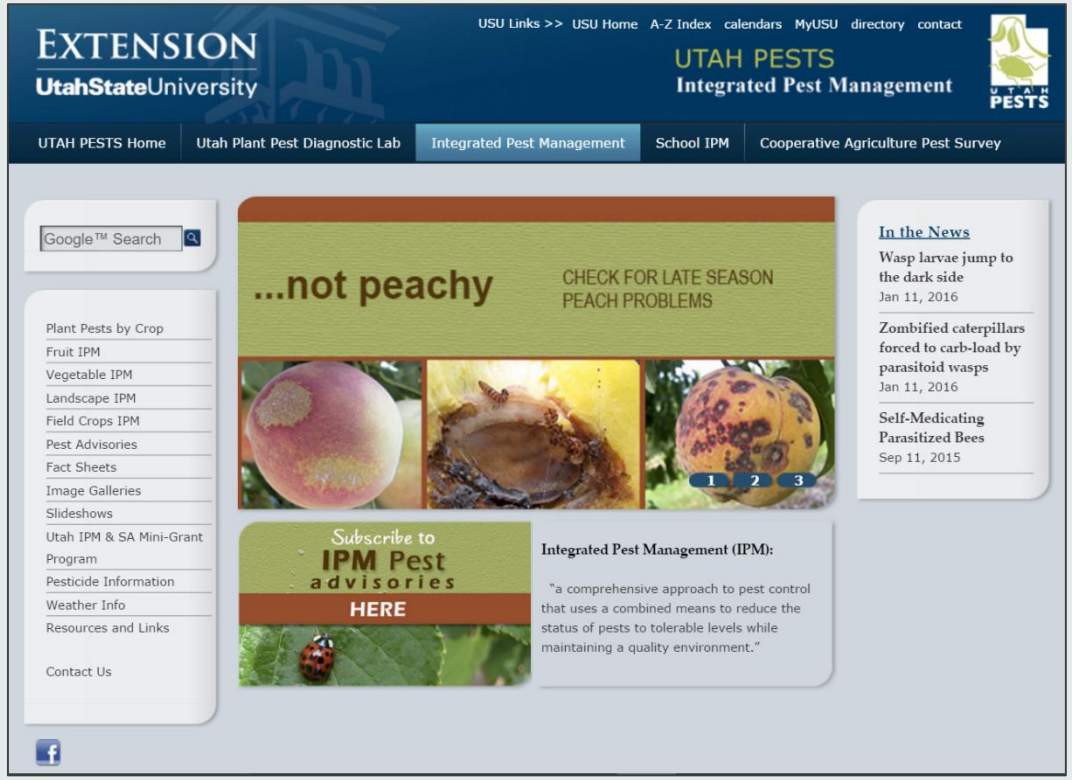
Codling Moth

- Primary internal fruit pest of apple & pear
- Spends the winter as an immature caterpillar under tree bark
- Adult stage is a moth; emerges beginning at apple bloom time
- Eggs laid on fruit & leaves
- 1st instar larva bores into fruit w/in 24 hr
- Chemical control: target newly hatched larva; timing based on moth trap catch info. & degree-days in your area
  - Tree Fruit IPM Advisory – tells you the proper timing
    - acetamiprid/Ortho, Assail (14 d)
    - carbaryl/Sevin (14 d)
    - gamma cyhalothrin/Spectracide (14 d)
    - spinosad (7 d)
    - malathion (7 d)
    - CM virus (CydX; 7 d)
    - Horticultural mineral oil (mix with above or use alone)
- Sanitation: pick up dropped fruit


Codling moth cocoon under bark


Codling moth egg & 1st instar larva

Tree Fruit IPM Advisory



Please check this table at each advisory as the information may change as the dates get closer. The forecasts use the average temperature for each site. Fruit should remain protected through each generation according to interval provided on your pesticide label. Many more locations can be viewed on the Utah Climate Center TRAPs website (select location; select codling moth).

Codling Moth, First Generation

In the table, choose either Option A or B when starting your codling moth sprays.

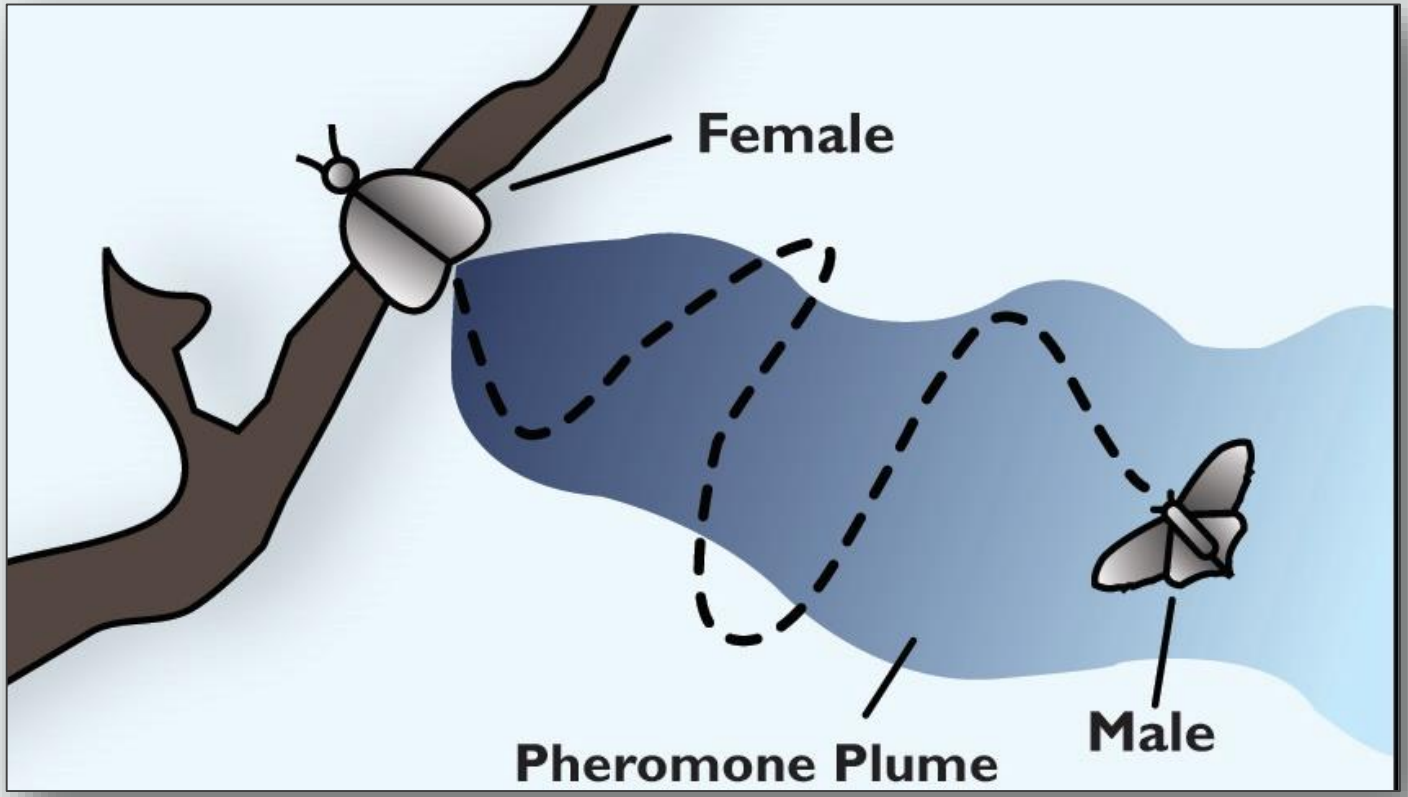
> ***Option A*** is what most people will do. Apply insecticide at the recommended date, and repeat. ***Option B*** is an alternative that may help to reduce sprays. Liberally apply horticultural oil (1%) on the first date, and then apply your regular insecticide on the later date. The oil kills eggs that have been laid on fruit up to that point.

The "period of greatest egg hatch" is the time when 75% of all eggs for the first generation will hatch. Use this information to time your treatment applications.

		Option A	Option B		Period of Greatest Egg Hatch
County	Location	Apply first spray	Apply oil	Apply first spray	
Box Elder	Perry	passed	passed	May 27	May 27 - June 17
	Tremonton	May 21	May 19	June 2	June 1 - 20
Cache	Logan Airport	May 31	May 29	June 11	June 10 - unknown
	River Heights	May 29	May 27	June 10	June 9 - unknown
Carbon	Price Airport	May 28	May 26	June 7	June 6 - unknown
Davis	Kaysville	passed	passed	May 27	May 26 - June 14
Grand	Moab	passed	passed	passed	through June 1
Iron	Cedar City Airport	May 27	May 25	June 6	June 5 - unknown
Salt Lake	Benches/Cooler sites	passed	passed	May 29	May 29 - June 13
	Most areas	passed	passed	May 24	May 23 - June 9
Sevier	Monroe	passed	passed	May 26	May 25 - June 16
Tooele	Erda Airport	passed	passed	May 27	May 26 - June 15
	Grantsville	passed	passed	May 25	May 24 - June 13
Uintah	Vernal Airport	May 31	May 29	June 10	June 9 - unknown
Utah	Alpine	May 20	passed	June 2	June 1 - 20
	American Fork	passed	passed	May 28	May 27 - June 15
	Genola (CHF)	passed	passed	May 21	May 23 - June 14
	Lincoln Point	passed	passed	May 30	June 1 - 19
	Orem (Lindon)	passed	passed	May 27	May 27 - June 12
	Payson	passed	passed	May 27	May 26 - June 14
	Provo Airport	passed	passed	May 27	May 27 - June 14
	Provo Canyon	May 25	May 27	June 4	June 5 - 20
	Santaquin (South Ridge)	passed	passed	May 31	May 31 - June 20

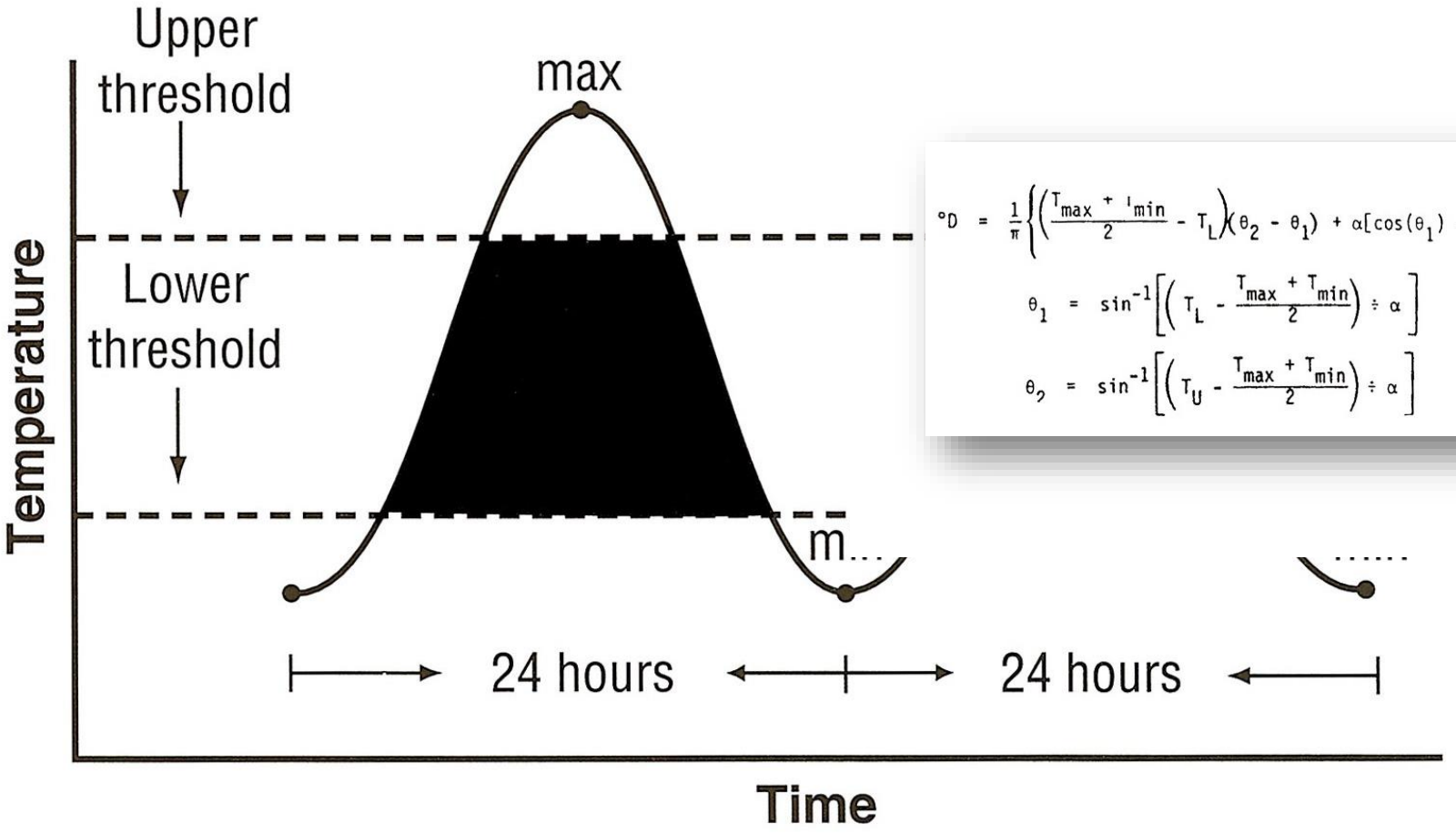
Pheromones for Monitoring

Communication within a species



Pest detection and evaluation – Degree Days

Degree days are a measurement of heat units over time



$$^{\circ}D = \frac{1}{\pi}\left\{\left(\frac{T_{max} + T_{min}}{2} - T_L\right)(\theta_2 - \theta_1) + \alpha[\cos(\theta_1) - \cos(\theta_2)] + (T_U - T_L)\left(\frac{\pi}{2} - \theta_2\right)\right\}$$

$$\theta_1 = \sin^{-1}\left[\left(T_L - \frac{T_{max} + T_{min}}{2}\right) \div \alpha\right]$$

$$\theta_2 = \sin^{-1}\left[\left(T_U - \frac{T_{max} + T_{min}}{2}\right) \div \alpha\right]$$

Codling Moth Fact Sheet

UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-13-06 June 2010

Codling Moth (*Cydia pomonella*)

Diane Alston, Entomologist • Marion Murray, IPM Project Leader • Michael Reding, Former IPM Project Leader

Do You Know?

- Codling moth is the major pest of apple and pear in Utah.
- Damaging stage: larva tunnels into fruit
- Monitoring stage: adult moth
- Use of pheromone traps and the degree-day model (based on daily temperatures) are critical for determining optimal treatment timings.
- Insecticides and pheromone-based mating disruption are currently the main management tactics.
- Insecticides are targeted at newly hatched larvae and/or eggs.
- Mating disruption devices need to be applied immediately before or at biofix (first moth activity) to prevent or adequately delay moth mating.
- Biological control is minimally effective because larvae are protected inside fruit.
- Insect development and spray timing information are available on the USU Extension Integrated Pest Management (IPM) Tree Fruit Pest Advisories Web page (www.utahpests.usu.edu/ipm/htm/advisories/treefruit) or from your county USU Extension office.

Fig. 1. Codling moth adult

Fig. 2. Codling moth larva

Codling moth (Order Lepidoptera, Family Tortricidae) is the most serious pest of apple and pear worldwide (Fig. 1). In most commercial fruit producing regions and home yards in Utah, fruit must be protected to harvest a crop. Insecticides are the main control tactic. There are new insecticides available, many of which are less toxic to humans and beneficial insects and mites than earlier insecticides. For commercial orchards with more than 10 acres of contiguous apple and pear plantings, pheromone-based mating disruption can greatly reduce codling moth populations to allow reduced insecticide use. Effective biological control has not been possible because fruit is attacked by newly hatched larvae, which are protected from natural enemies once inside the fruit (Fig. 2). Sanitation methods can help reduce codling moth densities within an orchard, but alone cannot provide satisfactory control.

In Utah, there are two to three generations of codling moth each year (Fig. 3). In northern Utah, there are typically two full generations and a partial third generation. In southern Utah, most or all of a third generation will occur. First generation moths begin to emerge about bloom time and peak in June in northern Utah. Second generation moths begin emerging in late June to early July and peak in late July to early August. Third generation moths are active from about mid August to mid September before declining day length induces the end of activity for the year.

HOSTS

apple, pear, crabapple, English walnut, quince, hawthorn, apricot, plum, peach, cherry

- Plan to use the same type of trap and lure from year to year so that you can compare results.

Degree-day Model

The Degree-day Method

- The development of codling moth, like all insects, can be predicted based on accumulated heat over time, called degree days (DD). Use of the codling moth phenology model based on DD will help to more accurately time insecticide applications and reduce the number of applications to a minimum.
- Codling moth development occurs between the lower and upper temperature thresholds of 50° F and 88° F.
- Starting March 1 in northern Utah or January 1 in southern Utah, begin accumulating DD for an individual location by:
  - collecting representative daily maximum and minimum air temperatures and using the DD look-up table (Table 2), or
  - obtaining the information provided by the online degree-day calculator at Utah Climate center TRAPs website (http://climate.usurf.usu.edu/pest.php) or from your county Extension office.
- Place pheromone traps in orchards when 100 DD have accumulated (first pink of Red Delicious). The first moths are expected by 150 - 200 DD (full bloom of Red Delicious).
- Once biofix (first consistent moth catch) has occurred, accumulated DD are reset to zero (Table 1).

Timing Sprays

- If mating disruption (MD, see page 6) is used in an orchard, dispensers should be hung immediately before or at biofix to prevent mating and egg-laying (get a biofix at a nerby non-MD location). Supplemental insecticide treatments are usually necessary even when MD is used. The first cover spray is often the most important to apply as this timing should suppress the first generation, and thus, the following generations.
- Depending on the type of insecticide used, the first cover spray should be applied as follows:

DD after biofix	Timing/Target	Examples
50 - 75	pre-egg-laying	Rimon
100 - 200	early egg-laying	Horticultural oil, Esteem, Intrepid
220 - 250	first egg hatch (emergence of larvae)	Altacor, Assail, Asana, Calypso, Carbaryl, Codling Moth Granulosis Virus, Delegate, Diazanon, Guthion, Imidan, Proclaim

Table 1. Major events in a codling moth management program, based on accumulated degree days

Degree Days	% Adults Emerged	% Egg Hatch	Management Event
100 *	0	0	• Place traps in orchards
150 - 200	First moths expected	0	• Check traps every 1-2 days until biofix is determined
First Generation			
0 (biofix)†	First consistent catch	0	• Reset degree days to 0
50 - 75	5 - 9	0	• First eggs are laid • Apply insecticides that need to be present before egg-laying
100 - 200	15 - 40	0	• Early egg-laying period • Apply insecticides that target early egg-laying period
220 - 250	45 - 50	1-3	• Beginning of egg hatch • Apply insecticides that target newly hatched larvae
340 - 640	67 - 98	12 - 80	• Critical period for control, high rate of egg hatch • Important to keep fruit protected during this period
920	100	99	• End of egg hatch for 1st generation
Second Generation			
1000 - 1050	5 - 8	0	• First eggs of 2nd generation are laid • Apply insecticides to target early egg-laying
1100	13	1	• Beginning of egg hatch • Apply insecticides that target newly hatched larvae
1320 - 1720	46 - 93	11 - 71	• Critical period for control, high rate of egg hatch
2100	100	99	• End of egg hatch for 2nd generation
Third Generation			
2160	1	15	• Beginning of egg hatch • Keep fruit protected through September 15 • Check pre-harvest interval of material used to ensure that final spray is not too near harvest.

*Begin accumulating degree days after daily temperatures begin to exceed 50°F, typically on January 1 for southern Utah or March 1 for northern Utah.

† Biofix is when at least two moths are caught on consecutive nights

Mechanical Control: Codling Moth

Pupate inside silken cocoons on trunk
Corrugated cardboard band - “mass-trap” to reduce population
Late June to Mid-September

Fruit bags to exclude codling moth eggs
Place bags over 3/4” diameter fruit

Fruit Tree Leaf Burn Caused by Spider Mites

Induced by multiple applications of pyrethroid insecticides for control of codling moth & other insects

Pyrethroid insecticides stimulate spider mite feeding & reproduction

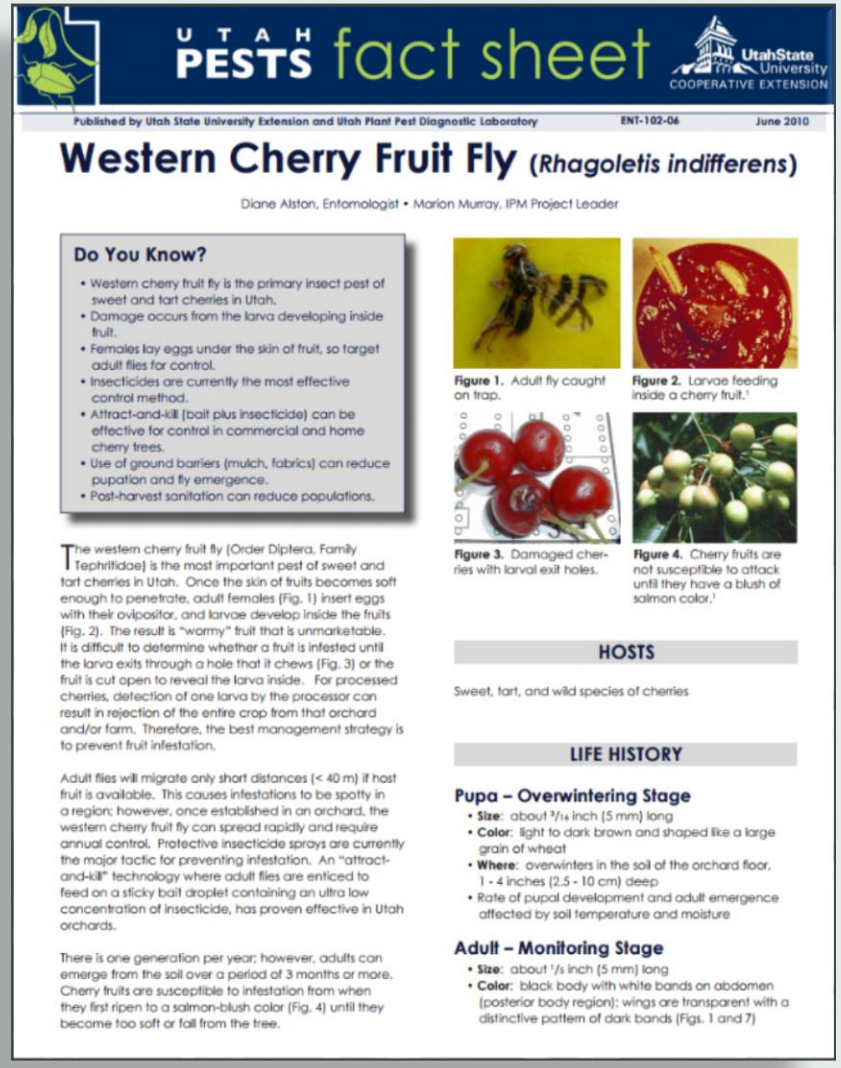
Pyrethroid insecticides can kill beneficial predatory mites

Pyrethroid active ingredients: beta-cyfluthrin, bifenthrin, deltamethrin, esfenvalerate, fenpropathrin, gamma-cyhalothrin, lambda-cyhalothrin, permethrin, zeta-cypermethrin

Western Cherry Fruit Fly

- Larvae feed in sweet & tart cherries; female flies lay eggs in ripening fruit; fruit doesn't become soft enough for egg-laying until it turns salmon colored
- Cultural controls: Landscape fabric or barrier under tree canopy
- Chemical control: spinosad (7 d), malathion (5 d), carbaryl (7 d), pyrethrin (3 to 5 d)
- Predation by fowl: chickens, guinea hens

Western Cherry Fruit Fly Fact Sheet



UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-102-06 June 2010

Western Cherry Fruit Fly (*Rhagoletis indifferens*)

Diane Alston, Entomologist • Marion Murray, IPM Project Leader

Do You Know?

- Western cherry fruit fly is the primary insect pest of sweet and tart cherries in Utah.
- Damage occurs from the larva developing inside fruit.
- Females lay eggs under the skin of fruit, so target adult flies for control.
- Insecticides are currently the most effective control method.
- Attract-and-kill (bait plus insecticide) can be effective for control in commercial and home cherry trees.
- Use of ground barriers (mulch, fabrics) can reduce pupation and fly emergence.
- Post-harvest sanitation can reduce populations.

Figure 1. Adult fly caught on trap.

Figure 2. Larvae feeding inside a cherry fruit.[1]

Figure 3. Damaged cherries with larval exit holes.

Figure 4. Cherry fruits are not susceptible to attack until they have a blush of salmon color.[1]

The western cherry fruit fly (Order Diptera, Family Tephritidae) is the most important pest of sweet and tart cherries in Utah. Once the skin of fruits becomes soft enough to penetrate, adult females (Fig. 1) insert eggs with their ovipositor, and larvae develop inside the fruits (Fig. 2). The result is "wormy" fruit that is unmarketable. It is difficult to determine whether a fruit is infested until the larva exits through a hole that it chews (Fig. 3) or the fruit is cut open to reveal the larva inside. For processed cherries, detection of one larva by the processor can result in rejection of the entire crop from that orchard and/or farm. Therefore, the best management strategy is to prevent fruit infestation.

Adult flies will migrate only short distances (< 40 m) if host fruit is available. This causes infestations to be spotty in a region; however, once established in an orchard, the western cherry fruit fly can spread rapidly and require annual control. Protective insecticide sprays are currently the major tactic for preventing infestation. An "attract-and-kill" technology where adult flies are enticed to feed on a sticky bait droplet containing an ultra low concentration of insecticide, has proven effective in Utah orchards.

There is one generation per year; however, adults can emerge from the soil over a period of 3 months or more. Cherry fruits are susceptible to infestation from when they first ripen to a salmon-blush color (Fig. 4) until they become too soft or fall from the tree.

HOSTS

Sweet, tart, and wild species of cherries

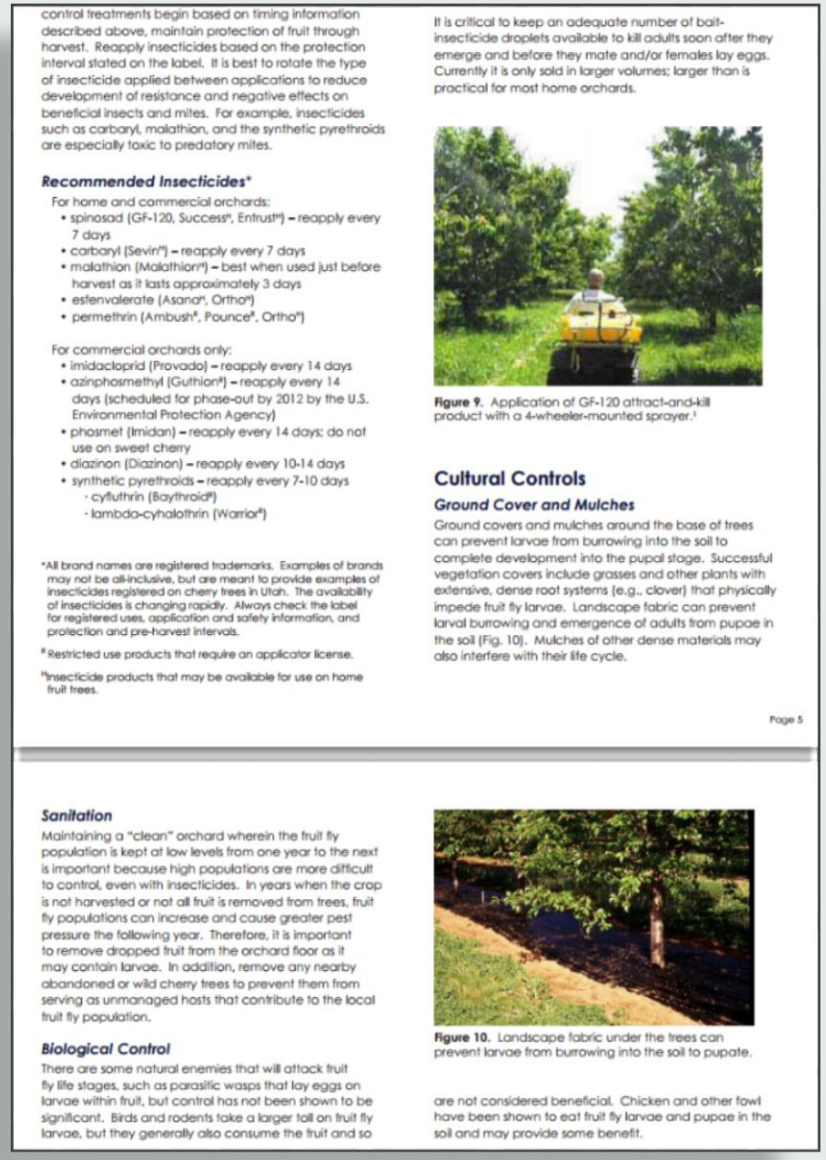
LIFE HISTORY

Pupa – Overwintering Stage

- **Size**: about 3/16 inch (5 mm) long
- **Color**: light to dark brown and shaped like a large grain of wheat
- **Where**: overwinters in the soil of the orchard floor, 1 - 4 inches (2.5 - 10 cm) deep
- Rate of pupal development and adult emergence affected by soil temperature and moisture

Adult – Monitoring Stage

- **Size**: about 1/5 inch (5 mm) long
- **Color**: black body with white bands on abdomen (posterior body region); wings are transparent with a distinctive pattern of dark bands (Figs. 1 and 7)



control treatments begin based on timing information described above, maintain protection of fruit through harvest. Reapply insecticides based on the protection interval stated on the label. It is best to rotate the type of insecticide applied between applications to reduce development of resistance and negative effects on beneficial insects and mites. For example, insecticides such as carbaryl, malathion, and the synthetic pyrethroids are especially toxic to predatory mites.

*Recommended Insecticides**

For home and commercial orchards:

- spinosad (GF-120, Success®, Entrust®) – reapply every 7 days
- carbaryl (Sevin®) – reapply every 7 days
- malathion (Malathion®) – best when used just before harvest as it lasts approximately 3 days
- esfenvalerate (Asana®, Ortho®)
- permethrin (Ambush®, Pounce®, Ortho®)

For commercial orchards only:

- imidacloprid (Provado) – reapply every 14 days
- azinphosmethyl (Guthion®) – reapply every 14 days (scheduled for phase-out by 2012 by the U.S. Environmental Protection Agency)
- phosmet (Imidan) – reapply every 14 days; do not use on sweet cherry
- diazinon (Diazinon) – reapply every 10-14 days
- synthetic pyrethroids – reapply every 7-10 days
  - cyfluthrin (Baythroid®)
  - lambda-cyhalothrin (Warrior®)

*All brand names are registered trademarks. Examples of brands may not be all-inclusive, but are meant to provide examples of insecticides registered on cherry trees in Utah. The availability of insecticides is changing rapidly. Always check the label for registered uses, application and safety information, and protection and pre-harvest intervals.

®Restricted use products that require an applicator license.

®Insecticide products that may be available for use on home fruit trees.

It is critical to keep an adequate number of bait-insecticide droplets available to kill adults soon after they emerge and before they mate and/or females lay eggs. Currently it is only sold in larger volumes; larger than is practical for most home orchards.

Figure 9. Application of GF-120 attract-and-kill product with a 4-wheeler-mounted sprayer.[1]

Cultural Controls

Ground Cover and Mulches

Ground covers and mulches around the base of trees can prevent larvae from burrowing into the soil to complete development into the pupal stage. Successful vegetation covers include grasses and other plants with extensive, dense root systems (e.g., clover) that physically impede fruit fly larvae. Landscape fabric can prevent larval burrowing and emergence of adults from pupae in the soil (Fig. 10). Mulches of other dense materials may also interfere with their life cycle.

Sanitation

Maintaining a "clean" orchard wherein the fruit fly population is kept at low levels from one year to the next is important because high populations are more difficult to control, even with insecticides. In years when the crop is not harvested or not all fruit is removed from trees, fruit fly populations can increase and cause greater pest pressure the following year. Therefore, it is important to remove dropped fruit from the orchard floor as it may contain larvae. In addition, remove any nearby abandoned or wild cherry trees to prevent them from serving as unmanaged hosts that contribute to the local fruit fly population.

Biological Control

There are some natural enemies that will attack fruit fly life stages, such as parasitic wasps that lay eggs on larvae within fruit, but control has not been shown to be significant. Birds and rodents take a larger toll on fruit fly larvae, but they generally also consume the fruit and so are not considered beneficial. Chicken and other fowl have been shown to eat fruit fly larvae and pupae in the soil and may provide some benefit.

Figure 10. Landscape fabric under the trees can prevent larvae from burrowing into the soil to pupate.

Peach Twig Borer

- Over winter as young larvae on limbs within cocoons
- From bloom to petal fall, brown caterpillars tunnel into new shoots
- 2nd & 3rd generation caterpillars enter fruit, usually at the stem end
- Delayed Dormant Spray: Dormant oil + permethrin or gamma-cyhalothrin (by first pink) – targets twig boring OR At-Bloom Sprays: 2 Bt sprays (early & full to late bloom)
- Fruit Protection: same insecticides as for CM
- See Tree Fruit IPM Advisory for timing


PTB larva feeding on peach shoot

Peachtree (Crown) Borer

- Female clear-winged moths lay eggs on lower trunk or in cracks in soil near the base; larvae bore into the cambium in lower trunk; trees may be girdled & die; adults begin activity in late June to early July in northern Utah
- Control: Trunk spray with carbaryl, permethrin, or gamma-cyhalothrin during first week of July; repeat every 2-3 weeks through August
- Kill larva in trunk with sharp point

Fruit-Eating Wasps:
Paper Wasps

European paper wasp (fruit-eater):
Thin waist, more black than yellow,
Upside down umbrella-shaped nests

Yellow jacket:
"Chunky" body, more yellow than black
Paper nests in ground & under dense vegetation
Aggressively defend nest (painful sting!)

Wasp Traps

- Place around perimeter of garden and yard and in spots slightly away from high human activity
- Yellow jacket – predator/scavenger
  - Commercial traps with heptyl butyrate bait
  - Homemade trap with raw meat
  - Locate ground nests in area - treat with insecticides & remove
- European paper wasp – fruit-eater
  - Homemade trap - liter plastic bottle with diluted fruit juice (1 part juice: 10 parts water) – ferment juice (1/4 tsp yeast) + 1/4 tsp liquid dish detergent (add piece of ripe fruit to excel fermentation) – see Video Fact Sheet!
  - Treat & remove nests

Common Tree Fruit Aphids in Utah

- Apple
  - Rosy Apple Aphid
  - Green Apple Aphid
  - Woolly Apple Aphid
- Cherry
  - Black Cherry Aphid
- Peach
  - Green Peach Aphid
- Plum
  - Mealy Plum Aphid
  - Leaf Curl Plum Aphid

How to identify aphids:

-green, black, pink, purple
-small, soft pear-shaped bodies
-slow moving
-pair of “tailpipes” – cornicles exude defensive fluid
-adults with & without wings

Aphids

- Aphids have "tailpipes"
- Non-winged & winged adults
- Suck fluids from leaves & stems; curl leaves; produce sticky honeydew; black sooty mold growth
- Protect young trees, older trees can tolerate more aphid feeding
- Controls: Dormant oil at green tip stage
- In-season: Insecticidal soap, horticultural oil, azadirachtin, malathion
- Biological control: lady beetles, lacewings, syrphid flies, parasitic wasps

Rosy Apple Aphid

Green Apple Aphid

Woolly Apple Aphid

Aphid & Mite Mechanical Control

Stiff spray of water every 2-3 days until aphid or mite numbers decline

Best if initiated before leaves are tightly curled (aphids) or extensive webbing & leaf injury occurs (mites)

Aphid Biological Control

Convergent Lady Beetle

Syrphid or Hover Fly

Brown Lacewing

Green Lacewing

Phenology: Woolly Apple Aphid
Apple

Monitor → Monitor

overwinter on roots & in bark crevices feed on limbs & fruits twig & root galls

Woolly Apple Aphid

- Can be a severe pest of apple
- Mid- & late-season pest
- Forms galls on roots & twigs
  - reduced tree vigor
  - stunted roots & trees
- Contaminate stem bowl of fruit

Root galls

Aphids covered in white woolly wax

Twig galls disrupt transport of nutrients & water

Woolly Apple Aphid Biological Control

Aphid mummies

Aphelinus mali
parasitoid wasp of WAA

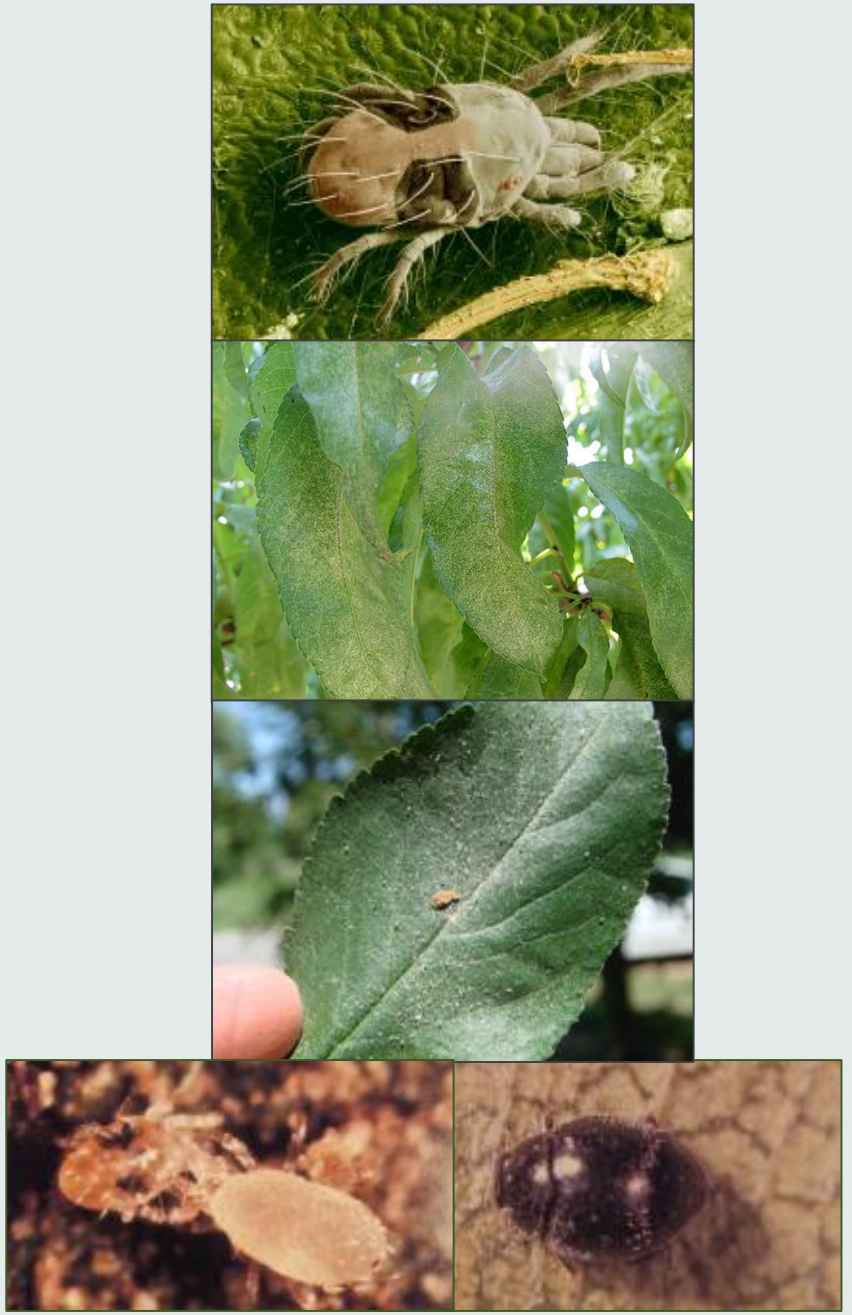
Aphid Predators:

ladybeetles
lacewings
syrphid flies

Alyssum planted to attract
Syrphid flies to nectar & pollen

Spider Mites

- Feed on leaves; produce webbing; injury appears as white speckles; severe feeding leads to bronzing
- Mites build up on broadleaf weeds (bindweed, knotweed, mallow, prickly lettuce); reproduce rapidly in hot weather
- Cultural controls: Avoid mowing, herbicides, drying of vegetation - prompts mites to move into trees
- Avoid multiple applications of pyrethroid insecticides
- Biological control: naturally occurring predatory mites & small black lady beetle
- Chemicals: horticultural oil, insecticidal soap



Aphid & Mite Mechanical Control

Stiff spray of water every 2-3 days until aphid or mite numbers decline

Best if initiated before leaves are tightly curled (aphids) or extensive webbing & leaf injury occurs (mites)

Beneficial Insects for Natural Biological Control

Biological Control Insect Groups

Robber Fly

Aphid Wasp

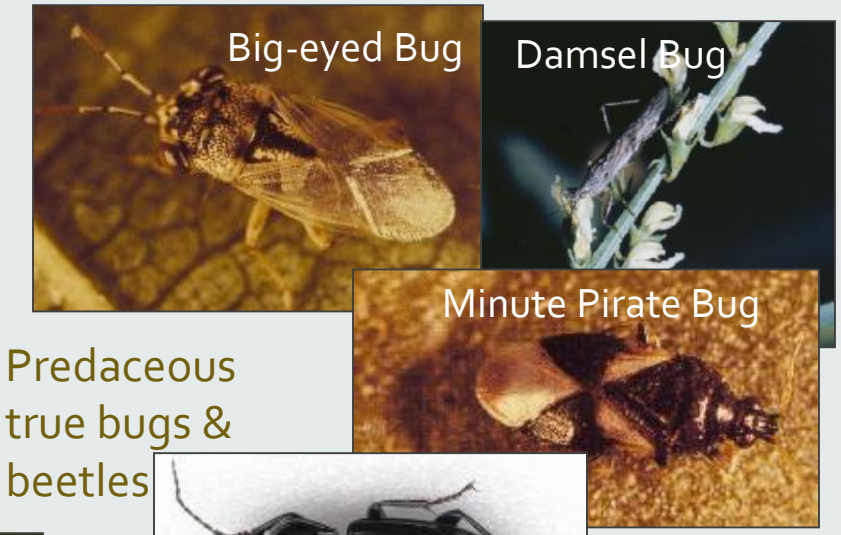
Varroa Mite

- Predator
  - consumes (kills) two or more individuals to complete its development
- Parasitoid
  - consumes (kills) exactly one individual to complete its development
- Parasite
  - consumes, but generally does not cause the death of one or more individuals; reduces growth rate & health of host

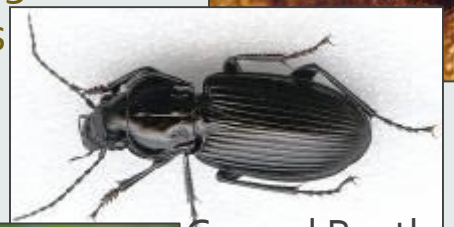
Beneficial Insects & Mites

Cast of Common Characters in the Garden

Parasitic wasps & flies



Predaceous true bugs & beetles



Ground Beetle

Common aphid predators

Predaceous mites

Misconceptions About Biological Control for Outdoor Situations

- Releasing insects is the best method - No
- Predatory insects will stay in your garden after release - No
- Other practices/activities don't matter - No

Biological Control:
Conserve Natural Enemies

- Enhance biodiversity
- Spatial diversity across the landscape
- Temporal diversity, throughout the season and from year to year
- Needs to be the right kind of diversity!!

Beneficial Insects & Pollinators Need a Diverse Diet & Shelter

- Protein and carbohydrate (sugar) food sources
  - Protein
    - Insect prey, pollen, bird droppings
  - Carbohydrate
    - Nectar, plant nectaries, aphid honeydew
- Shelter & varied habitat

Flowering perennials & annuals
Trees & shrubs
Herbs
Wildflowers

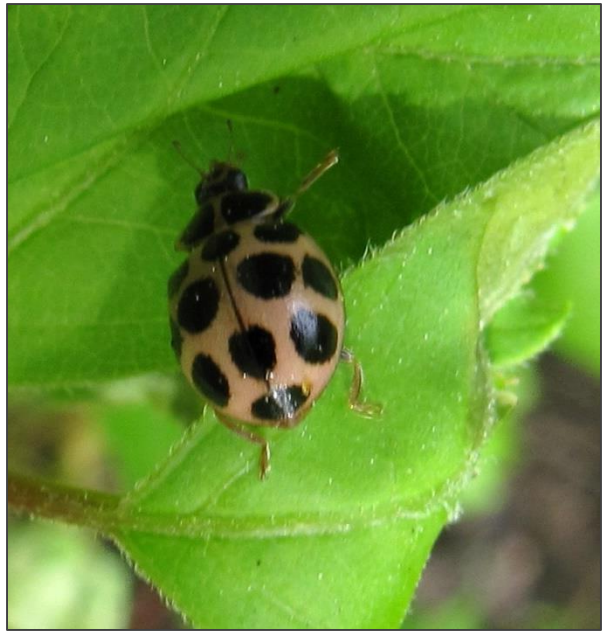
Alyssum Attracts Hover Flies
Hover Fly Larvae Prey on Aphids

Alyssum intercropped in lettuce fields

Alyssum planted in orchard alleyways

Beneficial Insects

Lady Beetles






Lacewings

Lacewing eggs are laid on stalks

Green Lacewing Egg Cluster

Green lacewings lay their eggs in clusters

Brown Lacewing Eggs

Laid singly

Lacewing larva preying on aphids

Siphoning mouthparts

Syrphid Fly/Hover Fly

Syrphid or Hover Fly Adult

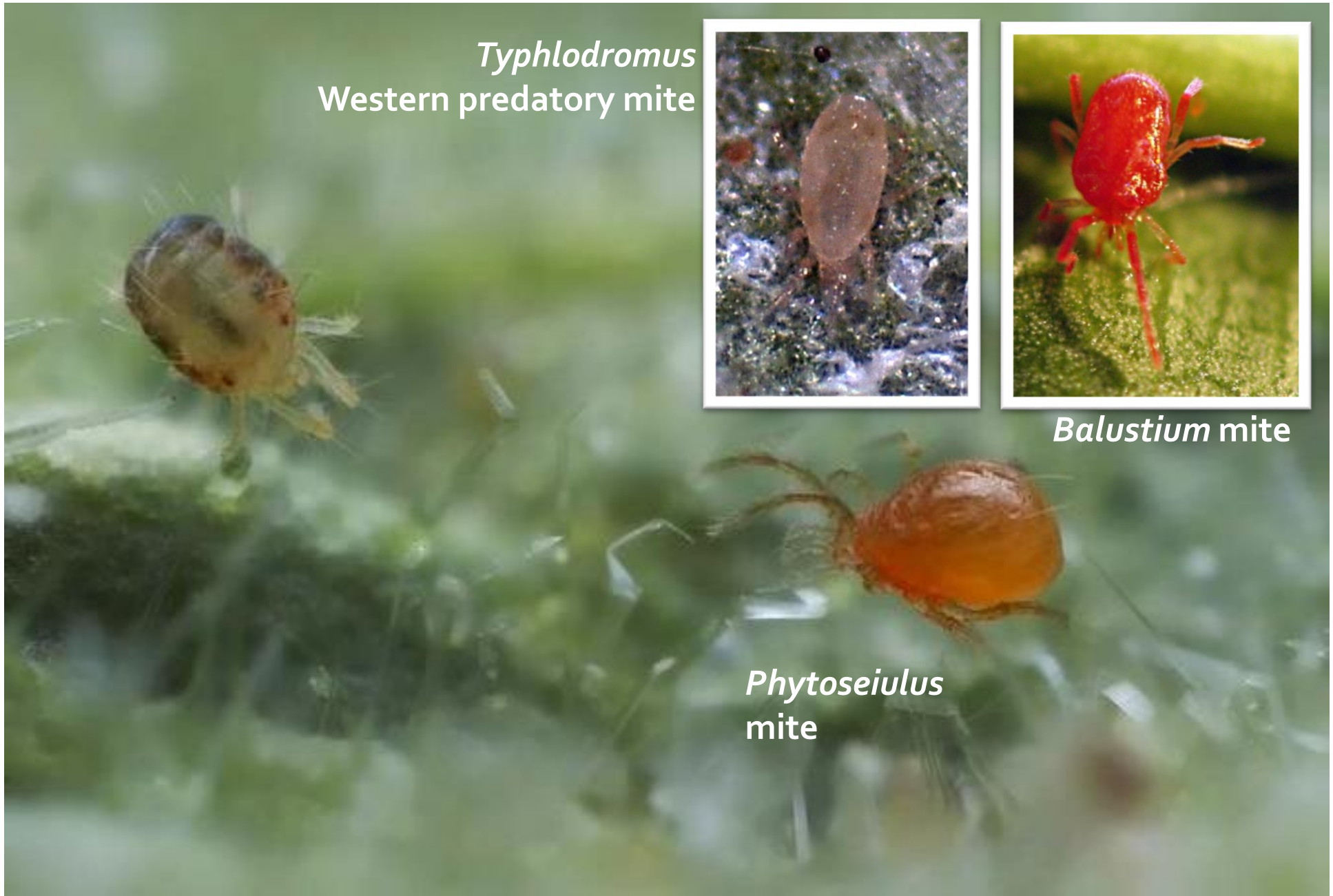
Mimic bees & wasps – black/yellow stripes on abdomen

Flies have large eyes

Feed on nectar at flowers

Minute Pirate Bug

Predatory Mites



Parasitoids (Wasps, flies)

Parasitoids (Wasps, flies)

Parasitoids

Wasps parasitizing insect eggs & scale

Aphid Parasitoids

Find this slideshow and others at www.utahpests.usu.edu

for your attention…

Contact us

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USDA – NRCS Conservation Planning and Farm Bill Cost Share Programs

Biographical Information:

Danny McBride
USDA- Natural Resource Conservation Service

I am an Area Resource Conservationist for the NRCS. I have worked with NRCS for the past 8years and worked with the Utah Association of Conservation Districts before that. I work closely with farmers and ranchers helping them put conservation on the ground. I focus on agronomic principles; Nutrient and Manure Management, Irrigation, Soil Health, Cover Crops, Pest management, and grazing. I grew up on farm in Southern Idaho and graduated from Utah State University with a degree in soil and water science. I love agriculture and enjoy spending time with my beautiful wife and 3 kids.

Session Description:

The presentation will explain all of the benefits and opportunities that NRCS has to offer for landowners. With technical assistance in developing a conservation plan on their property and helping them make sound management decisions to financial assistance to help implement projects on their property.

Urban and Small Farms Conference

February 18, 2016

Conservation Planning &
USDA Farm Bill Programs

Danny McBride
NRCS North Area Resource Conservationist &
Civil Rights Committee Chair

NRCS Background and Purpose

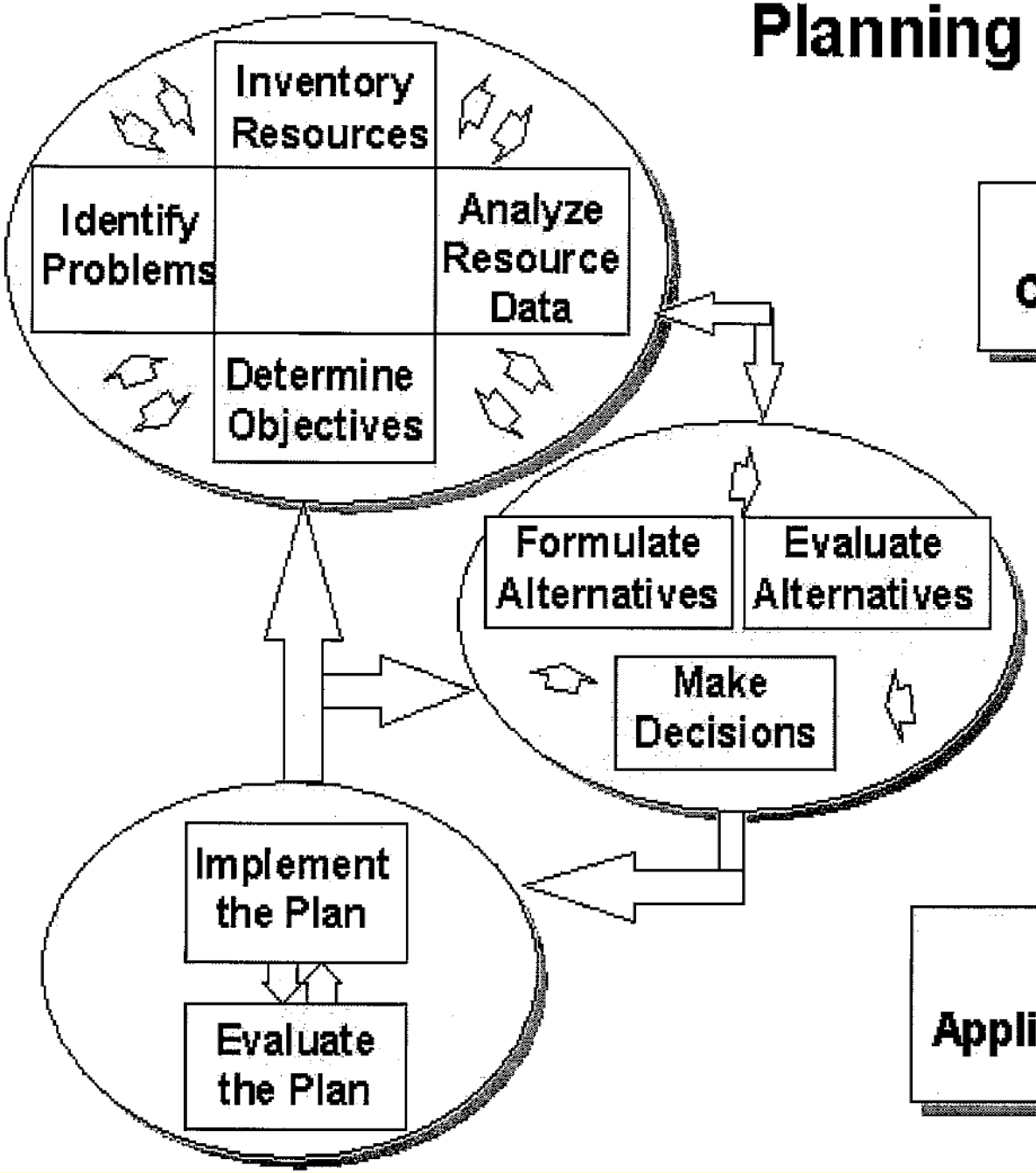
Conservation Plan

What is it?

Who needs one?

EVERYONE!

Planning Process



I.
Collection & Analysis

II.
Decision Support

III.
Application & Evaluation

Components of the Plan

- Soils
- Water
- Air
- Plants
- Animals
- Energy
- Human Interaction

Sustainable & Productive Soils

Quality (Erosion, Nutrients, Contaminants)

Clean & Abundant Water

Quality (Nutrients, Pathogens, Petroleums, Salinity)
Quantity (Irrigation, Drought, Water Flow)

Air

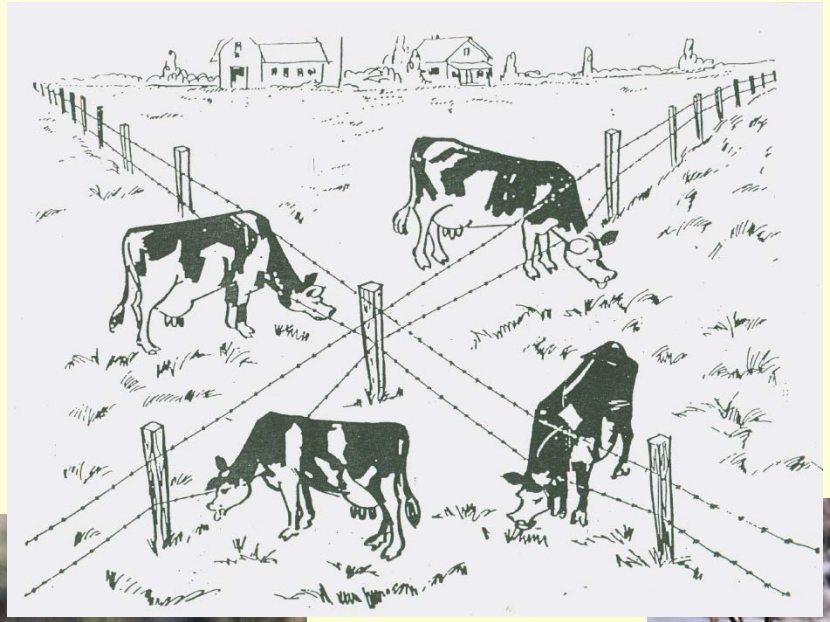
Quality (Odor, Particulate Matter, Reduced Visibility)

Plants

Condition (Invasive Weeds, Wildfire, T&E Species)

Animals

Wildlife (Habitat, Food, Cover, Shelter)
Domestic (Water, Forage Quality, Grazing, Manure Management)



Adequate Energy Supply

Fuel, Alternative, Power

Human

Economics, Sustainability, Cultural Resources, Traditions

NRCS Programs

NRCS's natural resources conservation programs help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Public benefits include enhanced natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty.

- Environmental Quality Incentives Program (EQIP)
  - General (Irr. Cropland, Dry Cropland, Range, Pasture, Forestry, Riparian, AFO/CAFO)
  - Initiatives (High Tunnels, Sage Grouse, Salinity, Wildlife, Drought, Energy, Organics)
- Agricultural Management Assistance Program (AMA)
- Conservation Stewardship Program (CSP)
- Agricultural Conservation Easement Program (ACEP)
  - Agricultural Land Easement (ALE)
  - Agricultural Land Easement Grasslands (ALE-GSS)
  - Wetland Reserve Easement (WRE)

Composting Facility
Code 317

DEFINITION:
A facility to process raw manure or other raw organic by-products into biologically stable organic material.

Cover Crop
Code 340

DEFINITION :

Grasses, legumes, forbs, or other herbaceous plants established for seasonal cover and conservation purposes.

Fence
Code 382

DEFINITION:
Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock, wildlife or people.

Irrigation Ditch Lining
Code 428

DEFINITION:

A lining of impervious material or chemical treatment, installed in an irrigation ditch, canal, or lateral.

Irrigation Pipeline
Code 430

DEFINITION:

A pipeline and appurtenances installed to convey water for storage or application, as part of an irrigation water system.

Irrigation System Microirrigation Code 441

DEFINITION:

An irrigation system for frequent application of small quantities of water on or below the soil surface: as drops, tiny streams or miniature spray through emitters or applicators placed along a water delivery line.

Irrigation System Sprinkler
Code 442

DEFINITION:
An irrigation system in which all necessary equipment and facilities are installed for efficiently applying water by means of nozzles operated under pressure.

Pasture and Hayland Planting Code 512

DEFINITION:
Establishing native or introduced forage species.

Pipeline
Code 516

DEFINITION:
Pipeline having an inside diameter of 8 inches or less.

Pumping Plant
Code 533

DEFINITION:

A facility that delivers water at a designed pressure and flow rate. Includes the required pump(s), associated power unit(s), plumbing, appurtenances, and may include on-site fuel or energy source(s), and protective structures.

Residue Management
Code 329

DEFINITION:

Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil disturbing activities to only those necessary to place nutrients, condition residue and plant crops.

Seasonal High Tunnel System for Crops
Code 798

DEFINITION:

A seasonal polyethylene covered structure with no electrical, heating, and/or mechanical ventilation systems that is used to cover crops to extend the growing season in an environmentally safe manner.

Watering Facility
Code 614

DEFINITION:

A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife.

Conservation Crop Rotation Code 328

DEFINITION

Growing crops in a recurring sequence on the same field.

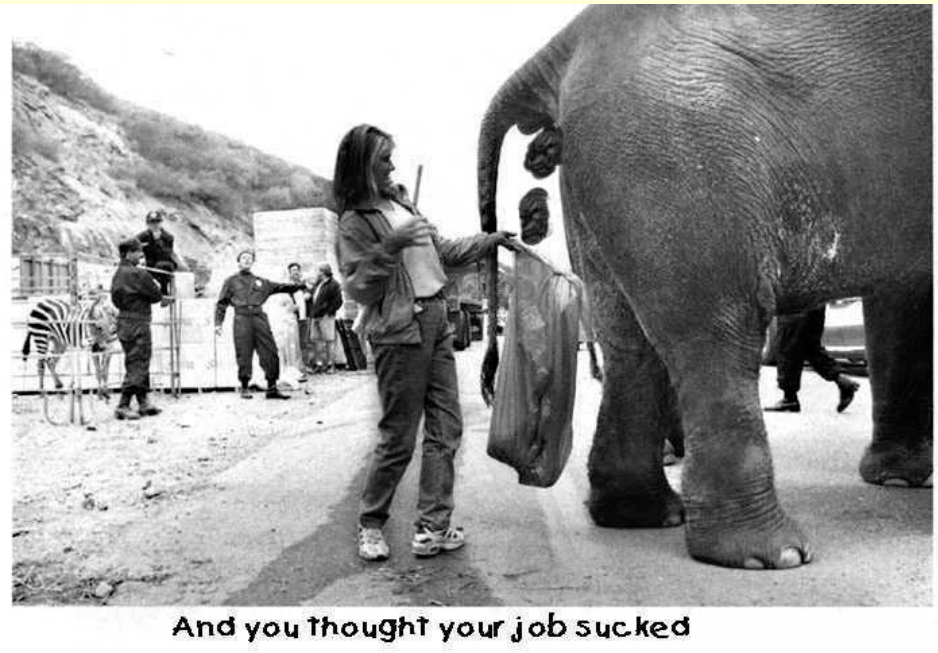
Irrigation Water Management
Code 449

DEFINITION

The process of determining and controlling the volume, frequency and application rate of irrigation water in a planned, efficient manner.

Nutrient Management
Code 590

DEFINITION:
Managing the amount, source, placement, form and timing of the application of plant nutrients and soil amendments.

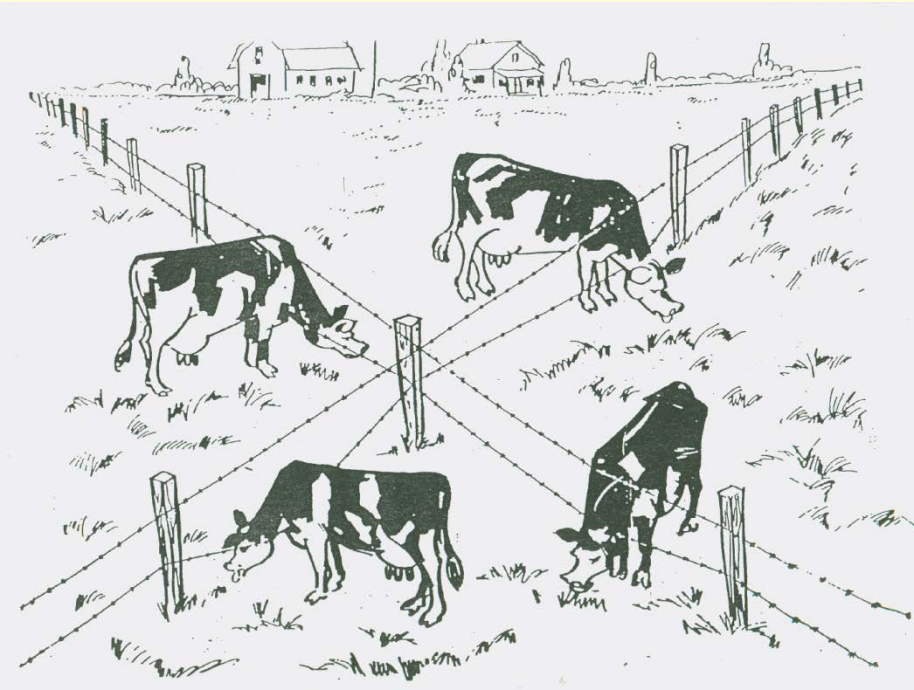


Pest Management
Code 595

DEFINITION:
Utilizing environmentally sensitive prevention, avoidance, monitoring and suppression strategies, to manage weeds, insects, diseases, animals and other organisms (including invasive and noninvasive species), that directly or indirectly cause damage or annoyance.

Prescribed Grazing
Code 528

DEFINITION:
Managing the harvest of vegetation with grazing and/or browsing animals.



Forage Harvest Management
Code 511

DEFINITION:
The timely cutting and removal of forages from the field as hay, green-chop, or ensilage.

Upland Wildlife Habitat Management Code 645

DEFINITION:
Provide and manage upland habitats and connectivity within the landscape for wildlife.

Utah NRCS Civil Rights Committee

- 2014 – Working on a Beginning Farmer Focus Report on Transitioning into Agriculture http://www.nrcs.usda.gov/wps/portal/nrcs/main/ut/about/outreach/slbfr/
- Provide NRCS staff with information and resources to help with outreach
- Provide New and Beginning Farmers with resources on a variety of subjects; land, machinery, loans, grants, BF groups and associations, etc.

New USDA Beginning Farmer Website

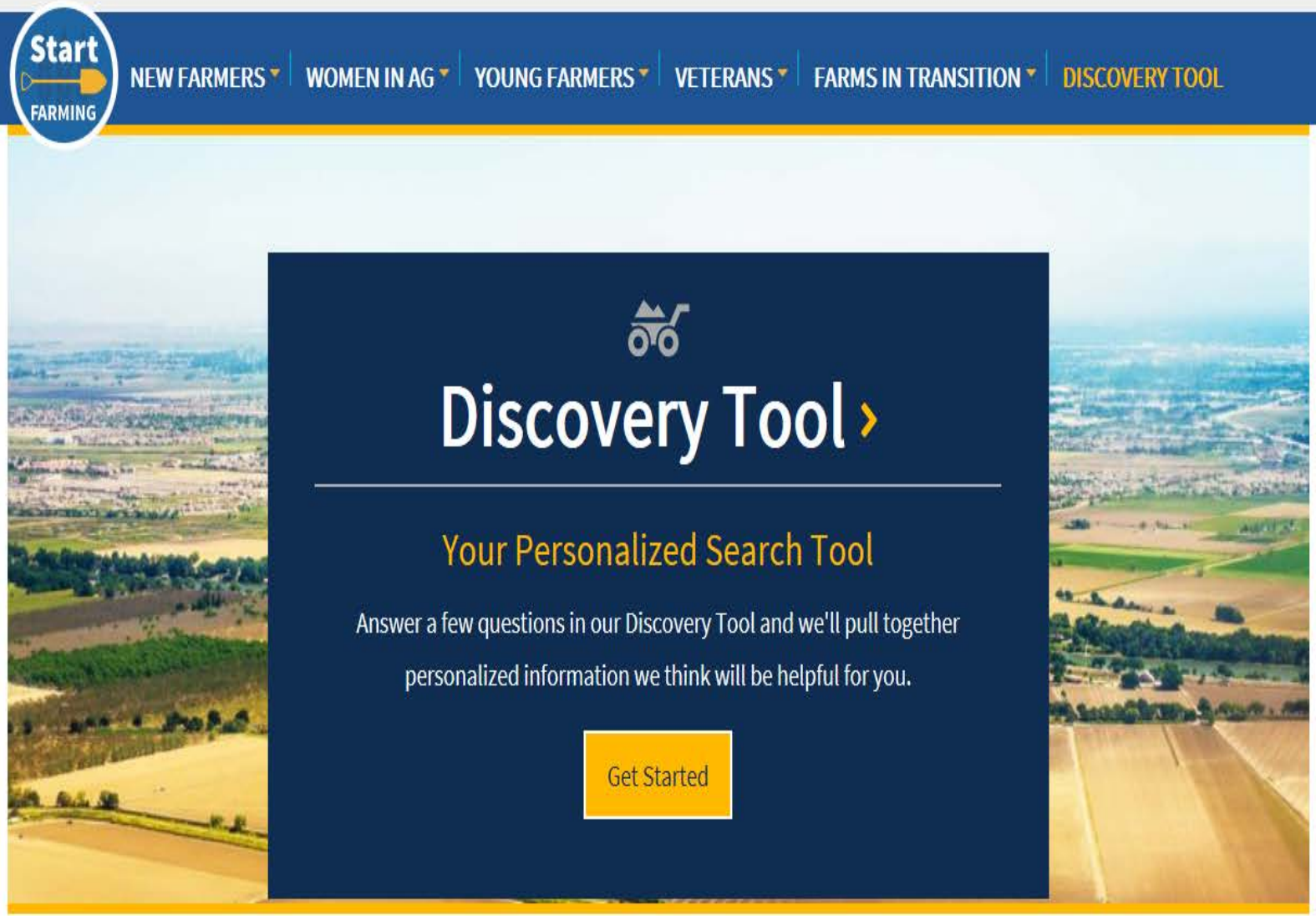
- https://newfarmers.usda.gov/

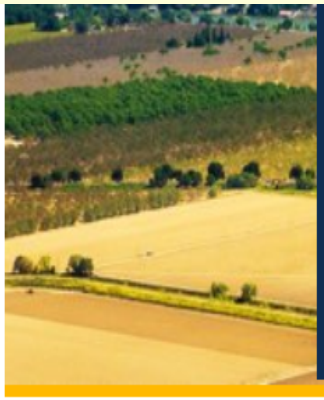
New Farmers

Discover it here.

Agriculture is full of exciting and rewarding opportunities. Farming is a tough job, but at the heart of it all, you'll see a vibrant community contributing to the future of our nation's health and food security.

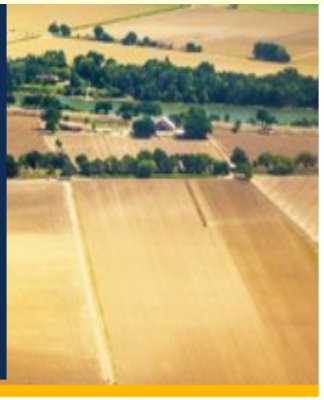
Find the resources you need to get started or personalize your search with our Discovery Tool.


Start FARMING
NEW FARMERS
WOMEN IN AG
YOUNG FARMERS
VETERANS
FARMS IN TRANSITION
DISCOVERY TOOL
Discovery Tool ›
Your Personalized Search Tool
Answer a few questions in our Discovery Tool and we'll pull together personalized information we think will be helpful for you.
Get Started



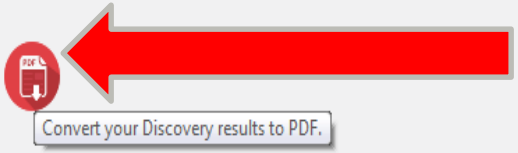
Answer a few questions in our Discovery Tool and we'll pull together personalized information we think will be helpful for you.

Start Over



Results

Disclaimer: This customized information is not intended to be comprehensive of all USDA can offer a new and beginning farmer; it is merely a guide to help focus your initial review of resources. We encourage new farmers and ranchers to come to a USDA office near you to learn more.



Utah

Utah State University, Extension

The Cooperative Extension System, in partnership with NIFA, is a nationwide, non-credit educational network that addresses public needs by providing non-formal higher education and learning activities to farmers, ranchers, communities, youth, and families throughout the nation

The End

Natural Resource Conservation Service

Danny McBride – Area Resource Conservationist &
Civil Rights Committee Chair

801-629-0575 ext. 118
2871 S. Commerce Way
Ogden, UT 84401

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USDA Farm Service Agency Programs

Biographical Information:
Steven Bartholomew
Farm Service Agency

Steven is a Farm Loan Specialist for Farm Service Agency. He supervises the loan programs for Farm Service Agency along the Wasatch Front including Juab, Utah, Wasatch, Summit, Salt Lake, Tooele, Weber, Davis, Morgan, and Rich Counties.

Session Description:

General information about farm loans that are available through Farm Service agency for beginning farmers who cannot get the credit they need from other credit sources. I will discuss the Youth Loan Program, Micro Loan Program, Operating Loan Program, and Real Estate Loan Programs.

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USDA Rural Development Co-op programs and Rural Business Development Grants (RBDG)

Biographical Information:
Jason Justesen
USDA Rural Development

Jason was raised on a family farm in Sanpete County. He earned a Bachelor's degree in Finance from Utah State University and has worked in the financial and ag industry for 19 years. Jason began with USDA Rural Development 11 years ago and is currently the State Energy Coordinator. His main focus is working with ag producers and rural small businesses to help implement energy efficiency improvements and renewable energy systems.

Biographical Information:
Barry Christensen
USDA Rural Development

He grew up in rural Utah and was raised on a turkey farm in Moroni. Barry graduated from Snow College in 1995 & Utah State University in 1998. He started working for USDA Rural Development in 2006 in the Provo office working in single and multi-family housing. In February 2015 he moved to the Ephraim office to work in business and community programs. There his primary responsibilities include working with lenders throughout the southwestern part of Utah to provide guarantee loans for rural small businesses. He is also the Coop Specialist for the State of Utah which includes the Value Added Producer Grant program

Session Description:

We will be sharing two USDA programs. The first is our Rural Energy for America program which works with ag producers and rural small businesses to help implement energy efficiency improvements and finance renewable energy systems. The second program is the Business and Industry Loan guarantee program which encourages lenders to finance businesses to help improve the economy and create jobs.

Rural Business-Cooperative Service (RBS) Guaranteed Loan Programs

	Business & Industry (B&I)	Rural Energy for America Program (REAP)
MINIMUM LOAN	No minimum	$5,000
MAXIMUM LOAN	Maximum $25 million and up to $40 million on rural cooperative organizations that process value-added agricultural commodities	$25 million or 75% of total eligible project costs, whichever is less (75% includes grant dollars received under REAP, if applicable)
ELIGIBLE PURPOSES	• Business and industrial acquisitions • Purchase of land, machinery and equipment • Construction, enlargement of modernization • Eligible fees and costs • Educational or training facilities • Tourist facilities • Hotels/motels • Pollution control or abatement • Recreation facilities • Working capital • Refinancing when it is determined that the project is viable and equal or better rates and terms are offered • Commercially available energy projects that produce biomass fuel or biogas. (May include co-digestion of non-renewable feedstocks) • Processing of locally/regionally produced Ag food products • Loans to purchase stock issued by a cooperative organization	Eligible projects are: 1. Installation of renewable energy systems such as solar photovoltaic, solar thermal, wind turbines, anaerobic digesters, biomass/bioenergy, geothermal, hydrogen, ocean energy, and small-hydroelectric 2. Energy efficiency improvements to buildings, equipment, and processes that reduce use of energy such as Heating, Ventilation, and Air Conditioning (HVAC), heat and heat recovery, combined heat and power, cooling/refrigeration, lighting, variable frequency drive or automated control updates, window replacement, motor conversions, insulation, power usage, etc.) Eligible loan purposes include post application costs that are directly related to a commercially available renewable energy system and energy efficiency improvement, including: • Purchase and installation of new or refurbished equipment • Construction, retrofitting, replacement and project improvements • Energy efficiency improvement identified in an energy assessment or energy audit • Fees for construction permits and licenses • Building/Equipment for existing renewable energy system • Refinancing of outstanding debt (subject to conditions) The following purposes cannot exceed more than 5% of the loan amount**:** • Working capital • Land acquisition • Routine lender fees • Energy Assessments, Energy Audits, technical reports, business plans, and Feasibility studies

	Business & Industry (B&I)	Rural Energy for America Program (REAP)
INELIGIBLE PURPOSES	• Relocate jobs or to expand a business where an excess of supply of the goods or services already exists • Pay any distribution an owner or beneficiary who will continue in business • Transfer the ownership of a business unless the transfer is necessary to keep the business from closing • Finance inherently religious activities • Finance agricultural production with the exception of specialized crops • Finance golf courses, racetracks and gambling facilities	• Residential projects • Agricultural tillage equipment • Used equipment • Vehicles • Lines of credit • Lease payments • Finance a project if the business operations derive income from activities of a sexual nature, illegal activities, or derive more than 10% of gross revenues from gambling activity • Finance political or lobbying activities • Finance a project that creates a conflict of interest or the appearance of a conflict of interest. • Pay off any Federal direct or guaranteed loans or other Federal debts
ELIGIBLE BORROWERS	Non-profit and for profit entities engaged or proposing to engage in a business that are located in rural area under 50,000 population	• Agricultural producers • Small business located in rural area under 50,000 populations
GUARANTEE PERCENTAGE	• 80% maximum guarantee on loans up to and including $5 million • 70% maximum guarantee on loans greater than $5 million and up to and including $10 million • 60% maximum guarantee loans greater than $10 million	• 85% maximum guarantee on loans $600,000 or less • 80% maximum guarantee on loans more than $600,000 but less than $5 million • 70% maximum guarantee on loans $5 million up to and including $10 million • 60% maximum guarantee loans greater than $10 million
EQUITY	**Tangible balance sheet equity requirement:** • 10% for existing business • 20% for startup • 25-40% for energy projects • Determined from balance sheets prepared in accordance with Generally Accepted Accounting Principles	**Other funding requirement:** • 25% of the total project cost • Agricultural Producers can submit financial information in a format that is accepted by Agricultural Lenders
COLLATERAL	• Real estate - 80% of appraisal value • M&E – 60-70% of appraised value • Accounts Receivable/Inventory- 50% of book value	• Real estate - 80% of appraisal value • M&E – 60-70% of appraised value • Accounts Receivable/Inventory- 50% of book value
FEES	**Guarantee fee:** 3% of the guaranteed portion of the loan payable to USDA Rural Development when the guarantee is issued --- ***Annual renewal fee***: *0.5%* • Based *on the outstanding balance of the guaranteed portion of the loan as of December 31st.*	**Guarantee fee**: 1% of the guaranteed portion of the loan payable to USDA Rural Development when the guarantee is issued --- ***Annual renewal fee****: 0.25%* • *Based on the outstanding balance of the guaranteed portion of the loan as of December 31st.*
TERMS	• 30 years for real estate • 15 years or useful life of equipment • 7 years for working capital	• 30 years for real estate • 15 years or useful life of equipment • 7 years for working capital

Committed to the future of rural communities.

RURAL BUSINESS-COOPERATIVE PROGRAMS

BUSINESS AND INDUSTRY (B&I) LOAN GUARANTEE PROGRAM

The Business and Industry Loan Guarantee program guarantees loans made by eligible local lenders to businesses to benefit rural areas. The program's primary purpose is to create and maintain employment and improve the economic and environmental climate in rural communities. This is achieved by expanding the existing private credit structure capability to make and service quality loans to provide lasting community benefits. USDA Rural Development typically guarantees losses of up to 80 percent of the original loan amount. Inability to obtain other credit is not a requirement.

Benefits To Businesses

- Higher loan amounts, strengthens the loan application, less equity injection, lower interest rates and longer repayment terms assist businesses that may not qualify for conventional lender financing.
- Assists a business in providing stability, growth, expansion and rural employment.

Benefits To Lenders

- Provides lenders with another tool to expand their loan portfolio while reducing risk exposure.
- Improves the economy and quality of life in rural communities.
- Reduces concerns regarding collateral/appraisal issues often found in smaller communities.
- Allows lenders to make loans above their legal lending limits.
- Increase profitability by selling guaranteed portion on the secondary market.

Eligible Areas

Business and industrial loans can be guaranteed in rural cities up to 50,000 population. Priority is given to applications for loans in rural communities of 25,000 or less.

Eligible Borrowers

- Any legal entity, including individuals, public and private organizations and federally recognized Indian tribal groups, may qualify.
- There is no size restriction on the businesses.
- Local economic development organizations and investors can be considered.

Eligible Loan Purposes

- Business and industrial acquisitions, construction, conversion, expansion, repair, modernization or development costs.
- Purchase of equipment, machinery or supplies.
- Startup costs and working capital.
- Processing and marketing facilities.
- Pollution control and abatement.
- Refinancing for viable projects, under certain conditions.
- Purchase of startup cooperative stock for family sized farms where commodities are produced to be processed by the cooperative.

Maximum Loan Amount

Loan guarantees are limited to a maximum of $25 million per borrower.

Loan Guarantee Limits (Maximum Percentage Applies To The Entire Loan)

- 80% up to $5 million.
- 70% over $5 million to $10 million.
- 60% over $10 million to $25 million.

Collateral - Appraisals

- All collateral must secure the entire loan.
- Repayment must be reasonably assured.
- Personal and corporate guarantees are required.
- A qualified appraisal report is required on property that will serve as collateral.

Loan To Appraised Market Value Ratios

Lenders will discount collateral consistent with sound loan to value policies and standards.

Maximum Repayment Terms

- Working Capital - 7 years.
- Machinery and Equipment - 15 years (or useful life).
- Real Estate - 30 years.

Ineligible Loan Purposes

- Line of Credit.
- Agricultural production which is not part of an integrated business involved in the processing of agricultural products.

- Any project likely to result in the transfer of employment from one area to another.
- Any project involving transfer of ownership, unless this will keep the business from closing, prevent the loss of jobs in an area or provide more jobs.
- Paying off a creditor in excess of the value of the collateral.
- Payment to owners, partners, shareholders or others who retain any ownership in the business.
- Corporations and businesses not at least 51% owned and controlled by U.S. citizens.
- Charitable and educational institutions, religious organizations and affiliated entities and fraternal organizations.

Fees and Costs

A one-time guarantee fee of 2 percent of the guaranteed principal amount is paid by the lender and may be passed on to the borrower. Subject to annual renewal fee on the unpaid principal balance; guaranteed portion of the loan only. Other typical lender costs may also be incurred.

Borrower Equity Requirements

A minimum of 10 percent tangible balance sheet equity is required at the time of issuing the loan note guarantee for existing businesses. Twenty percent (20%) tangible balance sheet equity is required for new businesses. All financials must be prepared in accordance with general accepted accounting principles. **Feasibility studies may be required**.

Interest Rate

- Interest rates for loans may be fixed or variable.
- The rate is negotiated between the lender and borrower and is similar to those rates customarily charged to other borrowers in similar circumstances.
- A variable rate must be tied to a nationally published rate.
- Variable rates cannot be adjusted more than quarterly.

Credit Quality

Lender addresses the business adequacy of equity, cash flow, collateral, history, management and the current status of applicable industry in a written credit analysis.

Servicing/Liquidation

Financial statements developed in accordance with generally accepted accounting principles are required. Lenders will service and, if necessary, liquidate the loans (with USDA Rural Development's concurrence).

For More Information

For more information contact Rural Development:

USDA Rural Development
Federal Building, Room 152
100 Centennial Mall North
Lincoln, NE 68508-3888
Phone: (402) 437-5568 or (402) 437-5554

National Office Web site: http://www.rurdev.usda.gov/rbs
Rural Development Toll Free: (800) 670-6553
Nebraska Rural Development Web site: http://www.rurdev.usda.gov/ne
Nebraska State Office Telephone Number: (402) 437-5551
Nebraska State Office Facsimile Number: (402) 437-5408
Nebraska State Office TDD Number: (402) 437-5093

U.S. Department of Agriculture
Rural Development - Rural Business-Cooperative Programs
(May 2010)

USDA

Rural Energy for America Program (REAP)

Renewable Energy Systems and Energy Efficiency Improvement Loans and Grants

Talking Points

What does this program do?

- Provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses to purchase or install renewable energy systems or make energy efficiency improvements

Who may apply?

- Agricultural producers with at least 50% of gross income coming from agricultural operations
- Small businesses in eligible rural areas
- Agricultural producers and small businesses must have no outstanding delinquent federal taxes, debt, judgment or debarment

What is an eligible area?

- Businesses must be in an area other than a city or town with a population of greater than 50,000 inhabitants and the urbanized area of that city or town. Check eligible business addresses
- Agricultural producers may be in rural or non-rural areas

How may the funds be used?

Funds may be used to purchase, install and construct renewable energy systems such as:

- Biomass, for example
  - Biodiesel and ethanol
  - Anaerobic digesters
  - Solid fuels
- Geothermal for electric generation or direct use
- Hydropower below 30 megawatts
- Hydrogen
- Small and large wind generation
- Small and large solar generation
- Ocean (tidal, current, thermal) energy

Funds may also be used to purchase, install and construct energy efficiency improvements such as:

- High-efficiency heating, ventilation and air conditioning systems (HVAC)
- Insulation

- Lighting
- Cooling or refrigeration units
- Doors and windows
- Electric, solar or gravity pumps for irrigation pivots
- Replacing energy-inefficient equipment

What funding is available?

- Loan guarantees on loans up to 75% of total eligible project costs
- Grants for up to 25% of total eligible project costs
- Grants and loan guarantees may be combined to fund up to 75% of total eligible project costs

What are the loan guarantee terms?

- $5,000 minimum loan amount
- $25 million maximum loan amount
- Up to 85% loan guarantee
- Rates and terms are negotiated with the lender and are subject to USDA approval
- Maximum term is 30 years for real estate
- Maximum term is 15 years for machinery and equipment
- Maximum term is 7 years for capital loans

What are the grant terms?

Renewable Energy System Grants:

- $2,500 minimum
- $500,000 maximum

Energy Efficiency Improvement Grants:

- $1,500 minimum
- $250,000 maximum

Are there additional requirements?

- Applicants must provide at least 75% of the project cost if applying for a grant only
- Applicants must provide at least 25% of the project cost if applying for loan, or loan and grant combination
- Energy efficiency projects require an energy audit or assessment

How do we get started?

- Applications for this program are accepted year round at your local office
- Program Resources are available online (includes forms needed, guidance, certifications, etc.)

Who can answer questions?

Contact your State Rural Development Energy Coordinator
http://www.rd.usda.gov/files/RBS_StateEnergyCoordinators.pdf

What governs this program?

- Basic Program – Code of Federal Regulation, 7 CFR 4280, Subpart B
- This program is authorized by Title IX of the Agricultural Act of 2014, (2014 Farm Bill)

Why does USDA Rural Development do this?

This program helps increase American energy independence by increasing the private sector supply of renewable energy and decreasing the demand for energy through energy efficiency improvements. Over time, these investments can also help lower energy costs for small businesses and agricultural producers.

NOTE: Because citations and other information may be subject to change, please always consult the program instructions listed in the section above titled, "*What Law Governs this Program?*" You may also contact your local office for assistance.

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Specialty Crop Pollinator Health Updates

Biographical Information:

Joey Caputo
Utah Department of Agriculture and Food

I am a honey bee inspector for the Utah Department of Agriculture and Food. The Utah State and County Cooperative Apiary Program has been in existence since 1892 when one of the first bee laws in the nation was passed in the territory of Utah. Its mission is to protect the health of managed pollinators from abiotic and biotic threats through inspection, education and the promotion of best management practices.

Session Description:

The presentation is part of a larger effort to promote communication and cooperation between beekeepers and growers. Data will be presented on the health of managed pollinators within fruit and berry growing areas of the state. A short survey will be given to measure grower's understanding of pollinator management practices. This will be followed by information about best management practices that promote the health of bees for both growers and beekeepers.

Improve Your Yields With Pollinator Management

Pollinator management is an important component of successful berry and melon production. This fact sheet is designed to assist growers with maximizing honey bee productivity by understanding more about honey bee biology and ecology.

The European honey bee (*Apis mellifera*) is indispensable to agriculture because of the pollination services it provides.

Stephen Ausmus USDA-ARS

Honey bees are polylectic bees, meaning they forage for nectar and pollen on numerous types of plants. Individual foragers exhibit flower fidelity; therefore once a flower of a specific plant is visited, the bee will continue to forage on the same species of plant, in some cases for days. Honey bee hives can also be transported, which makes honey bees useful to many different growers.

The biology and behavior of the honey bee makes them uniquely capable pollinators. Which is why this single insect is responsible for over $15 billion in pollination services annually.

Pollination Requirements

Many berries are self-pollinating, but these crops cannot reach maximum yield without pollinators. For instance raspberries are self-pollinating, nevertheless bee pollination services account for 90-95% of pollination; a common cause of misshaped and unmarketable raspberry fruit is poor pollination. Blackberries, blueberries and melons also require pollination services to maximize yield. Certain berry flowers are not very attractive to honey bees, such as strawberries. Managed colonies provide marginal benefits and are only useful if kept at saturation rates (5-10 colonies per acre).

The table below provides general guidelines for how many honey bee colonies are needed per acre of growing area. ***Please note that an area may need more or fewer colonies depending on local conditions.**

Table 1. Number of colonies needed per acre of crop grown	
Blackberry	2-3 colonies
Blueberry	3-5 colonies
Currant	1-2 colonies
Muskmelon	1 colony
Raspberry	1 colonies
Watermelon	1 colony

It is also important to note that honey bee flight is temperature and light dependent. Honey bees typically do not forage below 55°F. If your crop is often in bloom at low temperatures, creating habitat for native pollinators or utilizing alternative pollinators may be beneficial.

Keith Weller USDA-ARS

Improper use of pesticides can reduce the foraging effectiveness of both honey bees and native bees

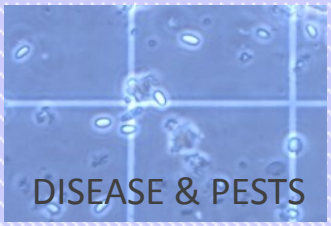
Best Practices for Pesticides

Protecting bees from pesticide poisoning is critical. It is important to consider that bees do not have to die from exposure for there to be negative effects on pollinator productivity.

- Read and strictly follow the pesticide label (it is the law)
- If a pesticide is toxic to bees, consider using a less hazardous alternative
- Dusts and wettable powders tend to be more hazardous to bees than emulsifiable concentrates and granular formulation
- Apply pesticides when bees are not actively foraging (i.e. when temperatures are below 55 degrees or during the evening)
- Whenever possible avoid applying pesticides when flowers are in bloom (this includes weeds)
- If weeds are in bloom and need to be removed, mow them or use an herbicide which is not harmful to bees
- Communicate your spraying schedule with the nearby beekeepers

Determining the Quality of Honey Bees

The quality of bees used to pollinate an area is important to assess and cannot be determined by outward appearances, such as the condition of hive bodies. Ask the beekeeper to open the hives when it is warm enough and inspect at least 10% of hives so that an evaluation of quality can be determined.



DISEASE & PESTS

Colonies which are infected with disease are less productive foragers. Hives infected with American foulbrood should not be tolerated and should never be rented. Other diseases such as European foulbrood, Parasitic Mite Syndrome, Nosema, chalkbrood and sacbrood can be tolerated at low levels. However it can be difficult to diagnose these diseases if one does not have beekeeping experience. If you would like to determine if the hives you are renting are infected with disease, you can request an inspection from a UDAF Apiary Specialist or your county's bee inspector.

COLONY STRENGTH

The State of Utah does not have colony-strength regulations for honey bees involved in commercial pollination. Therefore it is recommended that the grower and beekeeper use Oregon and Washington State standards as guidelines for assessing strength of hives rented and corresponding payment.

Grade A Colonies: A laying queen with at least 6-8 deep frames covered with bees (or approximately 14,400-19,200 bees) and at minimum 4 frames well filled with brood (about 600 square inches). A colony of this size is considered to be of adequate pollination value.

Grade B Colonies: A laying queen with at least 4 1/2 deep frames covered with bees (or approximately 10,800 bees) and at minimum 450 square inches of brood. A colony this size is considered of inferior pollination value.

FLIGHT ACTIVITY

If it is not possible to open the hives flight activity can be used as a rough indication of colony quality. If a hive has more than 100 incoming bees per minute at 65° F, the colony is likely a good pollinator unit. Bee populations in the field can also provide loose estimates of foraging activity. A minimum of 8—12 bees should be visiting a fruit tree in a 30 second period.

Photo Credits Top: Katie Lee, Bee Informed Partnership Middle: Stephen Ausmus, USDA-ARS Bottom: Jim Eklund, USDA-ARS

References:

Brittain, C., William, N., Kremen, C. and Klein, A-M (2013) *Synergistic effects of non-Apis bees and honey bees for pollination services.* Proc. R. Soc. B 7 March 2013 vol. 280 no. 175420122767

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McGregor, S.E. *Insect Pollination of Cultivated Crop Plants* (1976), published by the United States Department of Agriculture.

Sagili, R.R. and Burgett D.M. *Evaluating Honey Bee Colonies for Pollination A Guide for Commercial Growers and Beekeepers* (2011). Pacific Northwest Extension

Vaughan, M., Shepard, M., Kremen, C. and Black, S.H. (2011) *Farming for Bees Guidelines for Providing Native Bee Habitat on Farms.* Xerces Society for Invertebrate Conservation, Portland, Oregon

Placement of Hives

It is useful to consider proper hive placement that maximizes flight and forage activity. This planning will prove beneficial, especially under marginal weather circumstances.

Colonies should be grouped in small clusters of 4-8 hives and distributed throughout the patch. The hives should be in a sunny location that is shielded from wind. Low-lying spaces that collect cool, moisture-saturated air should be avoided.

Hives should not be placed directly on the ground but instead be on stands at least 6-12 inches high.

Alternative Pollinators

Some plants benefit from "buzz pollination" a process in which the flower is vibrated by an insect. Honey bees are not capable of buzz pollination, but certain wild bees such as bumble bees are. Non-Apis bees are commercially available for berry and melon pollination. Research has indicated that increasing pollinator diversity can synergistically improve honey bee productivity. For more information about alternative pollinators visit:

USDA Bee Biology and Systematics Laboratory
http://uaes.usu.edu/htm/farms-and-facilities/usda-bee-biology-and-systematics-laboratory/

This fact sheet was prepared by the

Utah Department of Agriculture & Food

State and County Cooperative Apiary Program

Phone: (801) 538-4912

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Overview of the Crop Insurance Program

Biographical Information:
Leticia McElroy
Risk Management Agency, USDA

Born and raised in the Philippines. Graduated with BSC Degree in Business Management. Came in the US late 90's; landed a clerical job with FCIC and got promoted to my current position as Risk Management Specialist in Davis Regional Office. Duties include crop insurance underwriting and agricultural program activities such as develop, evaluate, improve, maintain, implement and promote the crop insurance program in addition to providing technical expertise on crop insurance policy and administration. Also serve as agency liaison for activities designed to deliver risk management outreach education

Session Description:

The Crop Insurance Cycle
Insurable Crops in UT
Important Program Dates
Where to find AIP's
Agents Contact Information

4th Annual Urban and Small Farm Conference
2/17-18/2016

Crop Insurance Overview

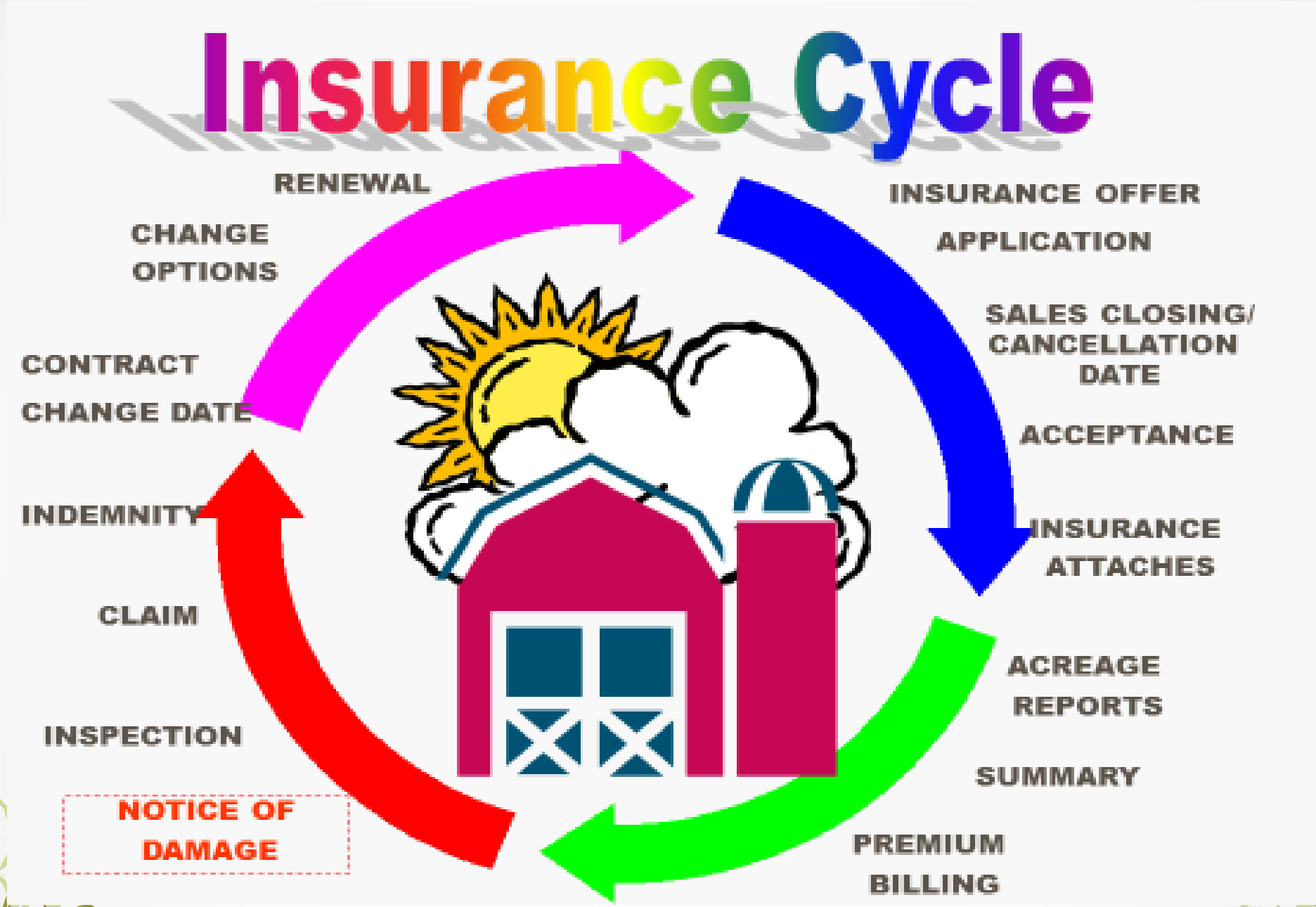
Letty McElroy – Davis Regional Office
530-792-5886

Disclaimer

The purpose of the following material is to promote awareness of risk management concepts and to highlight USDA's risk management products, features, benefits and availability. This material does not change the content or the meaning of current policy provisions, filed actuarial documents or approved procedures.

If you use this material please check to assure it is still accurate.

Insurance Cycle



Coverage and Premium Options

- Coverage levels range from 50% to 75% or up to 85% in some crops of your approved yield or revenue. The crop insurance premiums are subsidized by the Federal Government.

Item	Percent					
Coverage Level	50	55	60	65	70	75
Premium Subsidy	67	64	64	59	59	55
Your Premium Share	33	36	36	41	41	45

Applicable Crops

Crop	Counties
Alfalfa Seed	Box Elder
Apiculture (VI)	All counties
Apples	Box Elder, Utah
Barley	All Counties
Cherries	Juab, Utah
Corn	All Counties
Dry Beans	San Juan
Forage Production	All Counties
Forage Seeding	All Counties
Fresh Freestone Peaches	Utah
Oats	All Counties
Onions	Box Elder, Davis, Weber
Pasture, Rangeland, Forage	All Counties
Safflower	Box Elder, Cache, Juab, San Juan, Utah
Wheat	All Counties
Whole Farm Revenue Protection	All Counties
LRP/LGM	All Counties
Nursery	Box Elder, Cache. Carbon, Davis, Grand, Juab, Salt Lake, Utah, Washington, Weber

Some crops have multiple plans. Contact your crop insurance agent for more information.

Utah Program Dates

Crop	Sales Closing/ Cancellation Date	Final Plant-ing Date	Acreage Reporting Date	End of the Insurance Period
Alfalfa Seed	10/31/2015	N/A	7/15/2016	10/31/2016
Apiculture	11/15/2015	N/A	N/A	12/31/2016
Apples	11/20/2015	N/A	1/15/2016	11/5/2016
Barley	3/15/2016	5/31/2016	7/15/2016	10/31/2016
Cherries	11/20/2015	N/A	1/15/2016	N/A
Corn	3/15/2016	6/5/2016	7/15/2016	12/10/2016
Dry Beans	3/15/2016	6/15/2016	7/15/2016	10/31/2016
Forage Production	10/31/2015	N/A	12/15/2015	10/15/2016
Forage Seeding	7/31/2015	5/20/2016	6/15/2016	4/14/2017
Fresh Freestone Peaches	11/20/2015	N/A	1/15/2016	9/30/2016
Oats	3/15/2016	6/10/2016	7/15/2016	10/31/2016
Onions	2/1/2016	4/20/2016	7/15/2016	10/15/2016
Pasture , Rangeland, Forage	11/15/2015	N/A	11/15/2015	12/31/2016
Safflower	3/15/2016	5/15/2016	7/15/2016	10/31/2016
Wheat	10/31/2015	10/31/2015 Dates vary by county Earliest listed	12/15/2016	10/31/2016
Whole Farm Revenue Protection	3/15/2016	N/A	7/15/2016	N/A
Livestock Risk Protection (LRP)/ Livestock Gross Margin (LGM)	Producers submit a one time application. Upon acceptance, LRP policies may be purchased throughout the year using an online system available through approved livestock agents.			
Nursery	New policy applications may be filed at any time. All applicants are subject to a 30-day waiting period before coverage begins. For carryover policyholders: Sales Closing: 5/01/16; Cancellation: 5/31/16; End of Insurance: 5/31/17			

AIP and Agent Contacts

- For more information and to access list of crop insurance agent, go to USDA Risk Management Agency website at: www.rma.usda.gov
    - Under Quick Links, select Agent/company locator

Questions?

Thank You

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Whole Farm Revenue Insurance Program (WFRP)

Biographical Information:

Karli Salisbury
Department of Applied Economics
Utah State University

Karli graduated from USU in 2010 in Economics. Since then she has opened and managed Luke's Café on the Quad. She is now working as a Research Assistant in the Department of Applied Economics under the direction of Dr. Ruby Ward.

Session Description:

This is a general overview of Whole Farm Revenue Insurance Program. We will be looking at what is covered under WFRP, how to apply, and the pros and cons, so you can make a better decision if WFRP is right for your insurance needs.

Whole Farm Revenue Protection

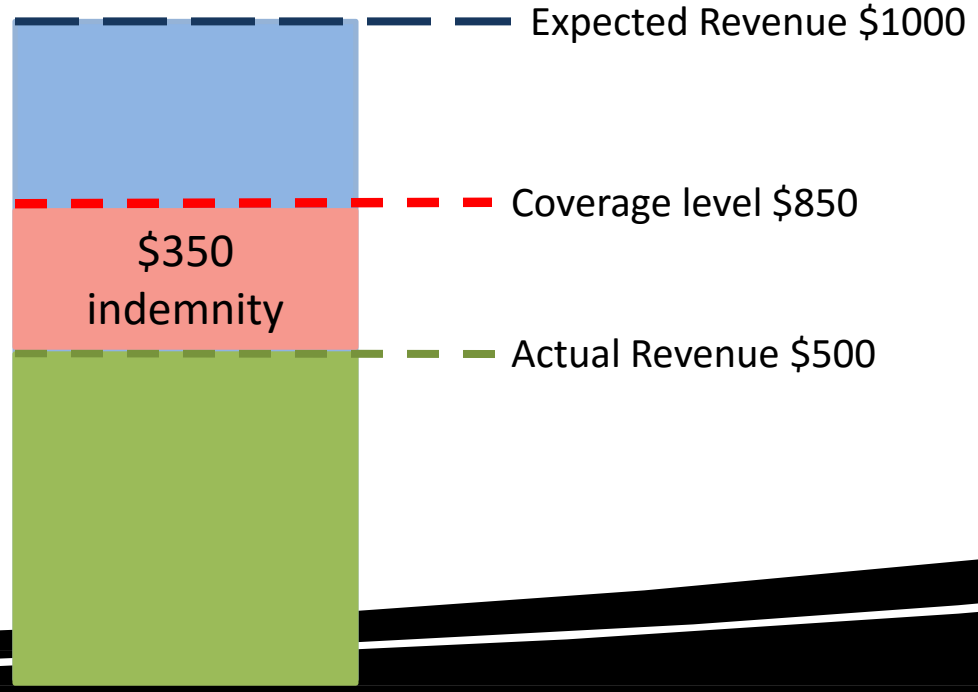
Federal Crop Insurance Corporation Insurance Program

Risk Management Agency

How Does Crop Insurance Work?

- Historical Average – Your farm has a revenue of $1000, so the expected revenue for the current year will be $1000
- You buy a policy that insures 85% of your expected revenue:
  - $1000 x 85% = $850

Major Flooding hit and wiped out half of your crop. Leaving you with only $500 in total revenue.



What kinds of farms can benefit from WFRP?

- Well-suited for:
  - Highly diverse farms
  - Farms with specialty commodities
  - Farms selling to direct markets, specialty markets, regional or local markets, and farm-identity preserved markets
  - as well as organic farms
- Available to all farms or ranches that qualify
- There are some limits for qualification

What does WFRP cover?

- Approved Revenue from all commodities produced on the farm:
  - Including animals and animal products up to $1 million
  - Commodities purchased for resale (up to 50% of total)
  - Excluding timber, forest, forest products, and animals for sport, show or pets
- Replant costs (with approval)

Are there new features for 2016?

- Streamlined records requirement for direct-to-consumer sales
- Removed percentage limits for producers selling animals and/or nursery products
- Minimized tax record burden for USDA-qualified "Beginning Farmers and Ranchers" as well as qualified persons not required to file a US Tax Return

What does WFRP cover?

- WFRP provides protection against loss of revenue due to unavoidable natural causes
- Protection against loss of revenue due to local market fluctuations (These are presumed to be from unavoidable natural causes)

WFRP does NOT cover

- Negligence, mismanagement
- Damage to machinery or equipment
- Failure to carryout good irrigation practices
- Abandonment
- Theft, mysterious disappearance
- Lack of labor/management of farm
- Failure to obtain a price for any commodity that is reflective of the local market value
- Deterioration of commodities in storage

What are the features of WFRP?

- Coverage levels 50-85%
  - 5% increments
  - Diversification of 3 commodities (commodity count) required for 80% and 85% coverage levels.
  - No catastrophic level of WFRP available
- Historic revenue is adjusted to reflect farm expansion
  - Automatic indexing process accounts for farm growth historically (Insured may opt out of Indexing)
  - Expanding operations provision allows for up to 35% growth over historic average with insurance company approval

What are the features of WFRP?

- All farm revenue is insured together under one policy
  - Individual commodity losses are not considered, it is the overall farm revenue that determines losses
- Premium subsidy is available and depends on farm diversification
  - Farms with 2 or more commodities (commodity count) receive whole-farm premium subsidy
  - Farms with 1 commodity receive basic premium subsidy

WFRP Premium Subsidy

WFRP Subsidy: Percentage of Total Premium Paid by Government

Coverage Level	50%	55%	60%	65%	70%	75%	80%	85%
Basic Subsidy-Qualifying Commodity Count: 1	67%	64%	64%	59%	59%	55%	N/A	N/A
Whole-Farm Subsidy-Qualifying Commodity Count: 2	80%	80%	80%	80%	80%	80%	N/A	N/A
Whole-Farm Subsidy-Qualifying Commodity Count: 3 or more	80%	80%	80%	80%	80%	80%	71%	56%

WFRP limits for qualification:

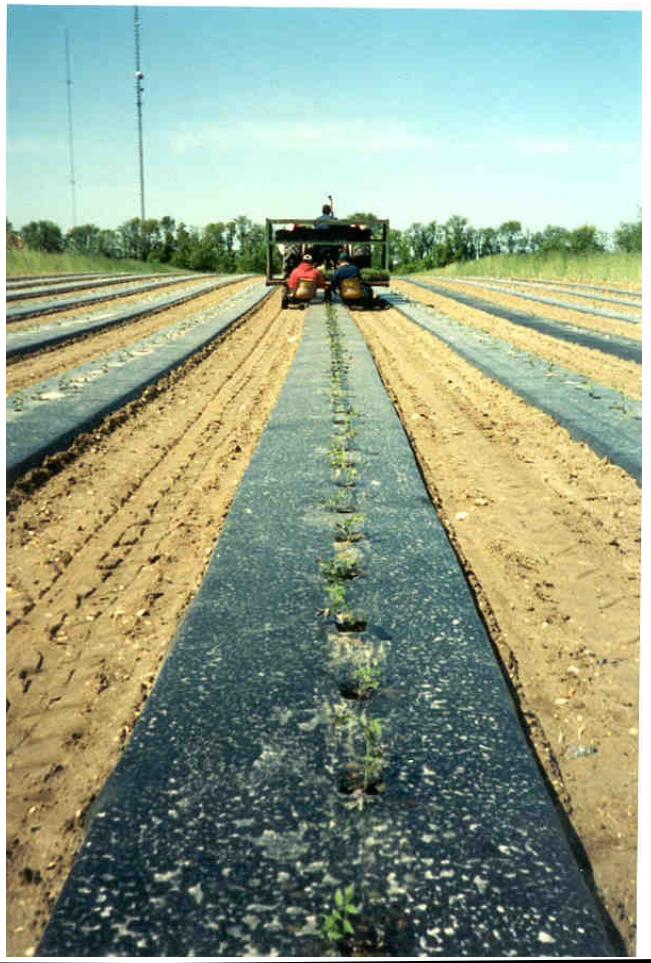
Coverage Level	Commodity Count (Minimum Required)	Maximum Farm Approved Revenue
85	3	$10,000,000
80	3	$10,625,000
75	1	$11,333,333
70	1	$12,142,857
65	1	$13,067,923
60	1	$14, 166,167
55	1	$15,454,545
50	1	$17,000,000

- Covers up to $8.5 million of revenue
- Farm/ranch may have up to $1 million in expected revenue from animals and animal products
- Farm/ranch may have up to $1 million in expected revenue from greenhouse/nursery

Does diversification on my farm matter for WFRP? Yes!

- The number of commodities produced are counted toward the diversification requirement within WFRP
  - Each commodity must provide a calculated percentage of the expected farm revenue to be counted
  - Commodities providing small amounts of revenue may be grouped to meet the qualification

Does diversification on my farm matter for WFRP? Yes!



- The diversification measure determines:

  -Eligibility for WFRP

  - Potato farms must have 2 commodities
  - Commodities insurable with other revenue coverage must have 2 commodities

  -Eligibility for the 80 & 85% coverage levels

  - Requires 3 commodities

Does diversification on my farm matter for WFRP? Yes!

- The diversification measure also determines:
  - The amount of the diversification discount to the premium rate
  - Whole-farm premium subsidy for farms with 2 or more commodities

How is the amount of insured revenue determined?

- WFRP insured revenue is <u>the lower of</u>:
  - Your current year's expected revenue (determined by your farm plan) at the selected coverage level, or
  - Your historic revenue adjusted for growth at the selected coverage level

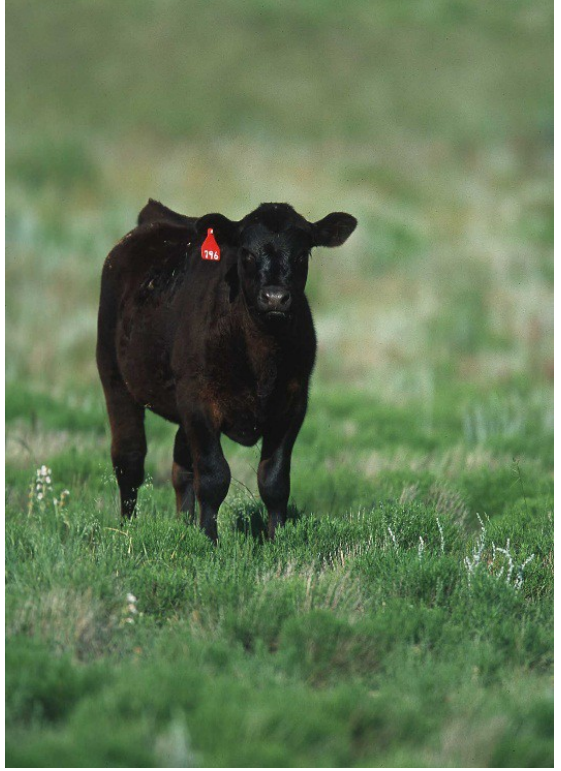
Other facts to understand about WFRP:

- WFRP covers revenue 'produced' in the insurance year
  - A commodity not harvested or sold will count as revenue
  - A commodity grown last year and sold this year will not be covered
  - For commodities that grow each year, like cattle, only the growth for the insurance year counts.
    - Example: Calves worth $800 at beginning of the year and to be sold at $2000, the value insured will be $1200
  - Inventory and Accounts Receivable are used to get to the 'produced' amounts
- Prices used to value commodities to be grown must meet the expected value guidelines in the policy

Eligibility Requirements

- Animal and animal product revenue is less than $1 million
- Nursey and Greenhouse revenue less than $1 million
- You must not ONLY raise potatoes
- NOT eligible if you have only ONE commodity and there is a revenue plan under MPCI
- You may use another's tax records if you purchase, inherit or lease an operation
- Cannot have a short tax year
- Cannot be "pass-through" revenue

What will my agent need from me?



- Five years of farm tax forms (Schedule F)
  - For 2016, requires tax forms from 2010-2014
    - Exceptions are made for Beginning Farmers and Ranchers, Qualifying persons not required to US Tax Return (Tribal Entities), and producers that were physically unable to farm one year.
- Needs to know if you are a:
  - Calendar year tax filer
  - Fiscal year tax filer and what your fiscal year is
- Information about what you plan to produce on the farm during the insured year
  - Used to complete the Intended Farm Operation Report
- Other information as applicable
  - Such as supporting records, your organic certification, inventory or accounts receivable information

What is the timeline for WFRP?

- Sales begin upon release of actuarial materials
- Last day to purchase: Sales Closing Date
  - County specific date- March 15
  - Intended Farm Operation Report is completed
- Revised Farm Operation Report Due (like an acreage report)
  - July 15 for Calendar and Early Fiscal Filers (Jan-July fiscal years)
  - By end of first 30 days of fiscal year for August, September, October fiscal years
  - By Oct 31 for November and December fiscal years

What is the timeline for WFRP?

- Billing dates
  - August 15 for Calendar and Early Fiscal Filers (Jan-July fiscal years)
  - December 1 for Late Fiscal Filers (August-December fiscal years)
- Final Farm Operation Report completed earlier of:
  - Time of loss determination
  - By next year's Sales Closing Date
  - If not completed-limited to 65% coverage the next year

What is the cost for coverage?

Example: You are a fresh market seller of a dozen different vegetables, 5 of which are individually a substantial part of your total revenue. The other 7 crops combined give you another substantial piece of revenue.

This would be a commodity count of 6 crops
Your expected revenue is $100,000

At a 75% coverage level, you qualify for an 80% subsidy

Your Premium would be $855

Can I look up my cost?

You can seek out a crop insurance agent, or

You can go to RMA's website, and use their Cost Estimator at this link:

https://ewebapp.rma.usda.gov/apps/CostEstimator/Default.aspx

How do I buy WFRP protection?

- Purchase through a Crop Insurance Agent:
  - The agent locator tool on RMA's website:

http://www.rma.usda.gov/tools/agent.html

Questions?

www.rma.usda.gov

Recordkeeping Aid for Direct Marketers with Price Information					
1. Insured's Name			2. Date		
3. Name of Market			4. Total Cash Receipts		
5. Commodity	6. Amount Taken To Market	7. Amount Returned Home	8. Amount Sold	9. Today's Price	10. Revenue By Commodity
				11. TOTAL	
12. Remarks:					

This is an aid that can be used to record daily direct-market sales. **This is not a required form.** It is intended as an example of how daily sales could be recorded in a way that is acceptable for WFRP purposes. By keeping the information shown on this record the producer may be allowed to use the data from this record to calculate the 3-year average farm price for future use for WFRP insurance.

Item	Required Element	Description
1	Insured's Name	Name of insured as shown on the application
2	Date	Date the commodity was taken to market
3	Name Of Market	Name of the market where the commodity was sold.
4	Total Cash Receipts	Total cash receipts for the day from all commodities taken to the market.
5	Commodity	Name of the commodity. If there are multiple types of a commodity that have different sale prices, each commodity should be listed on a separate line,
6	Amount Taken To Market	Total amount of the commodity that was taken to the market for sale on the date listed in (2.) above. Use the units in which you measure each commodity (e.g. bushels, pounds, baskets, etc.)
7	Amount Returned Home	Total amount of the commodity that remained unsold at the end of the day and was returned to the farm on the date listed in (2.) above. Do not include the unit name.
8	Amount Sold	Total amount of the commodity sold at the market on the date listed in (2.) above (Item 6 - item 7).
9	Today's Price	Sale price for the commodity for the day.
10	Revenue By Commodity	Revenue from the commodity sold for the day (Item 8 X Item 9).
11	Total	Total amount of revenue from the sale of all commodities for the day. This amount must match the entry in item 4 above.
12	Remarks	Enter any remarks pertinent to the sale of the commodities.

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Water, Land, and Irrigation: What's on Your Mind?

Biographical Information:

L. Niel Allen, Ph.D., P.E.
Extension Irrigation
Specialist

Dr. L. Niel Allen is the Extension Irrigation Specialist for Utah. He grew up on an irrigated farm in Cove, Utah and received his BS and MS degrees from Utah State University in Agriculture and Irrigation Engineering and a PhD in Civil Engineering from the University of Idaho. He has over 35years of professional experience including design and installation of irrigation systems, consulting with irrigation districts, water rights, irrigation research, and extension. Agricultural irrigation water diversions consists of about 80 percent of Utah's fresh water diversions. Additionally, irrigation of landscapes, gardens, golf courses, and parks consume about 60 percent of the urban, domestic, and municipal water supplies. The efficient use of irrigation water benefits all residents of Utah. His current research includes safflower irrigation, pasture irrigation, and water use of gardens and small farms.

Session Description:

This will be an open discussion session based on the results of a clicker survey, with topic ranging from water use, land and irrigation.

Utah Water, Land, and Irrigation

Urban and Small Farm Workshop
February 18, 2016

Presentation by
L. Niel Allen
Extension Irrigation Engineer
n.allen@usu.edu
http://extension.usu.edu/irrigation/

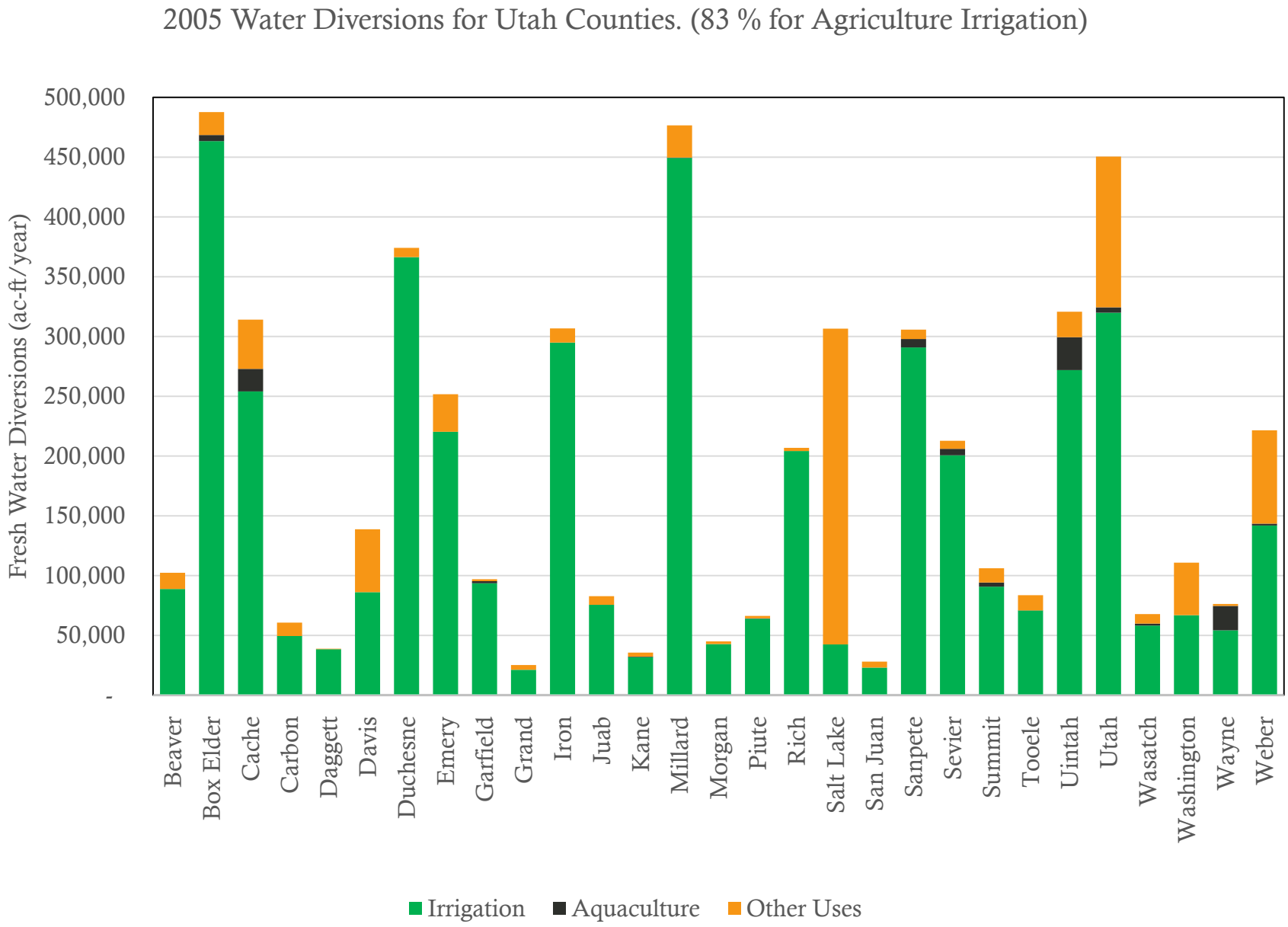
UtahState University
COOPERATIVE EXTENSION

2015 Urban and Small Farm Clicker Survey
First and Second Biggest Challenges Facing Agriculture in Utah

- 79% of participants rated ***Insufficient Water*** as the first or second biggest challenge facing agriculture and
- 62% rated ***Loss of Farm Land*** as the first or second biggest challenge.

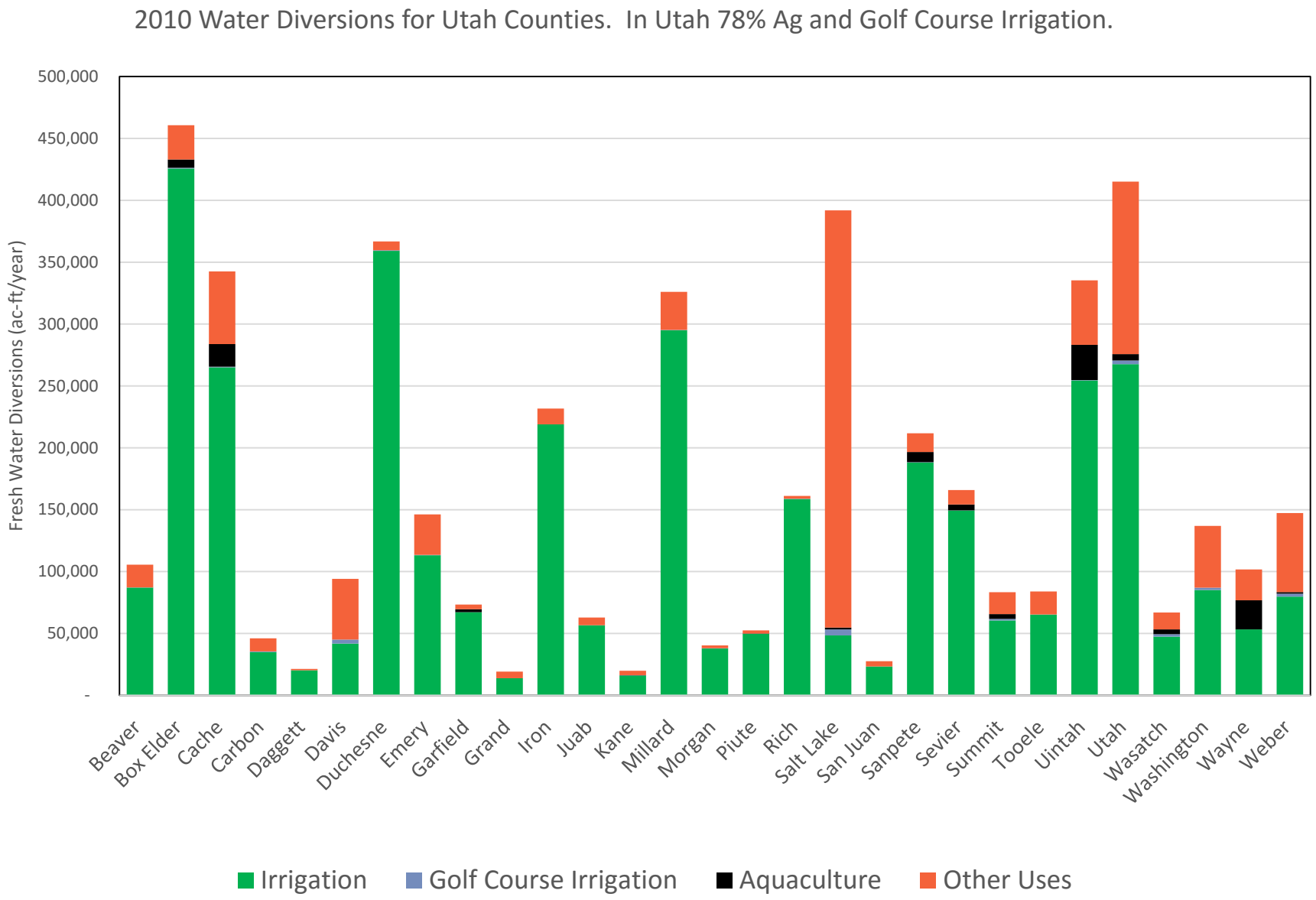
Water Use by Counties

Estimated Use of Water in the United States in 2005 (USGS, 2009)



Water Use by Counties

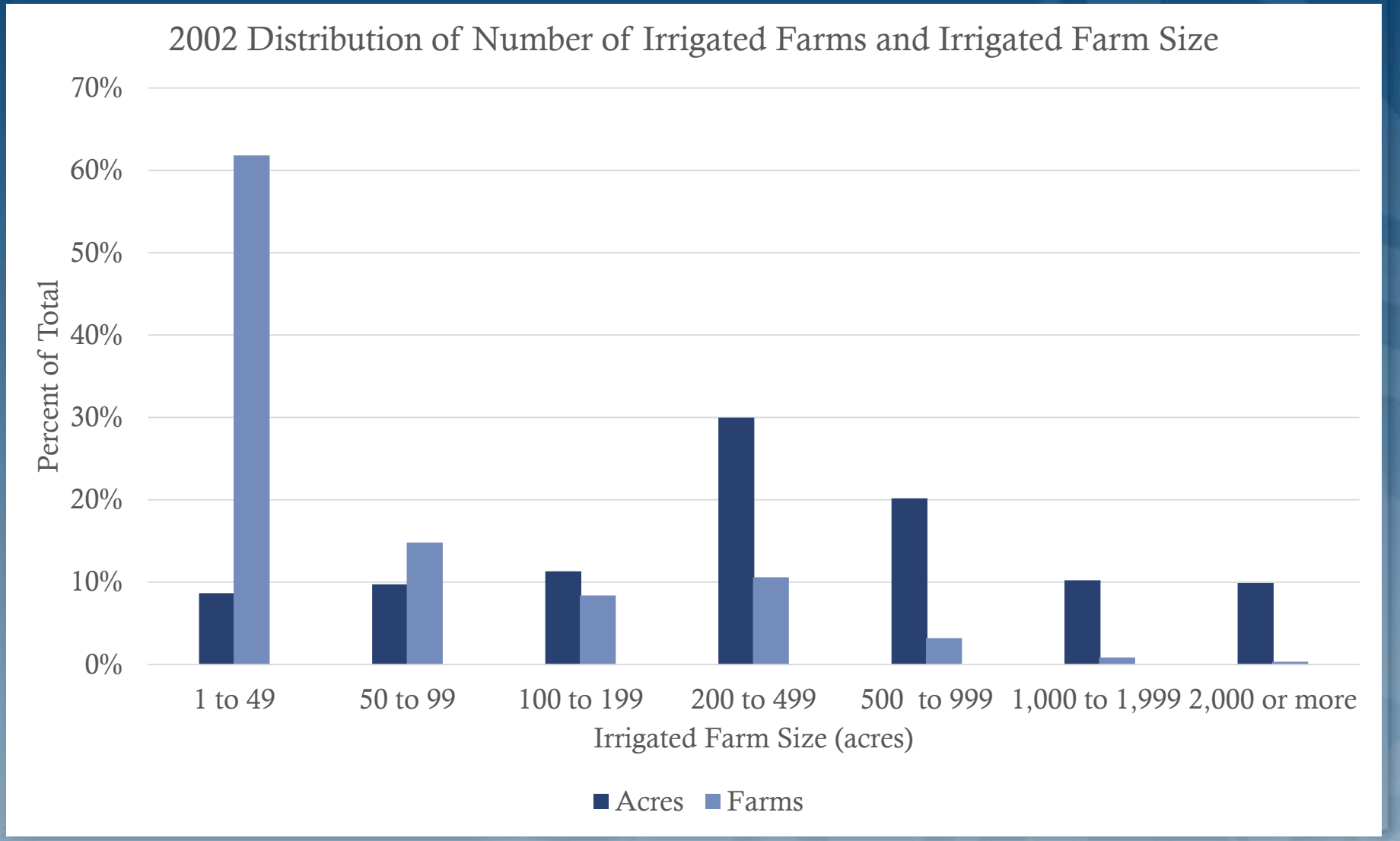
Estimated Use of Water in the United States in 2010 (USGS, 2014)



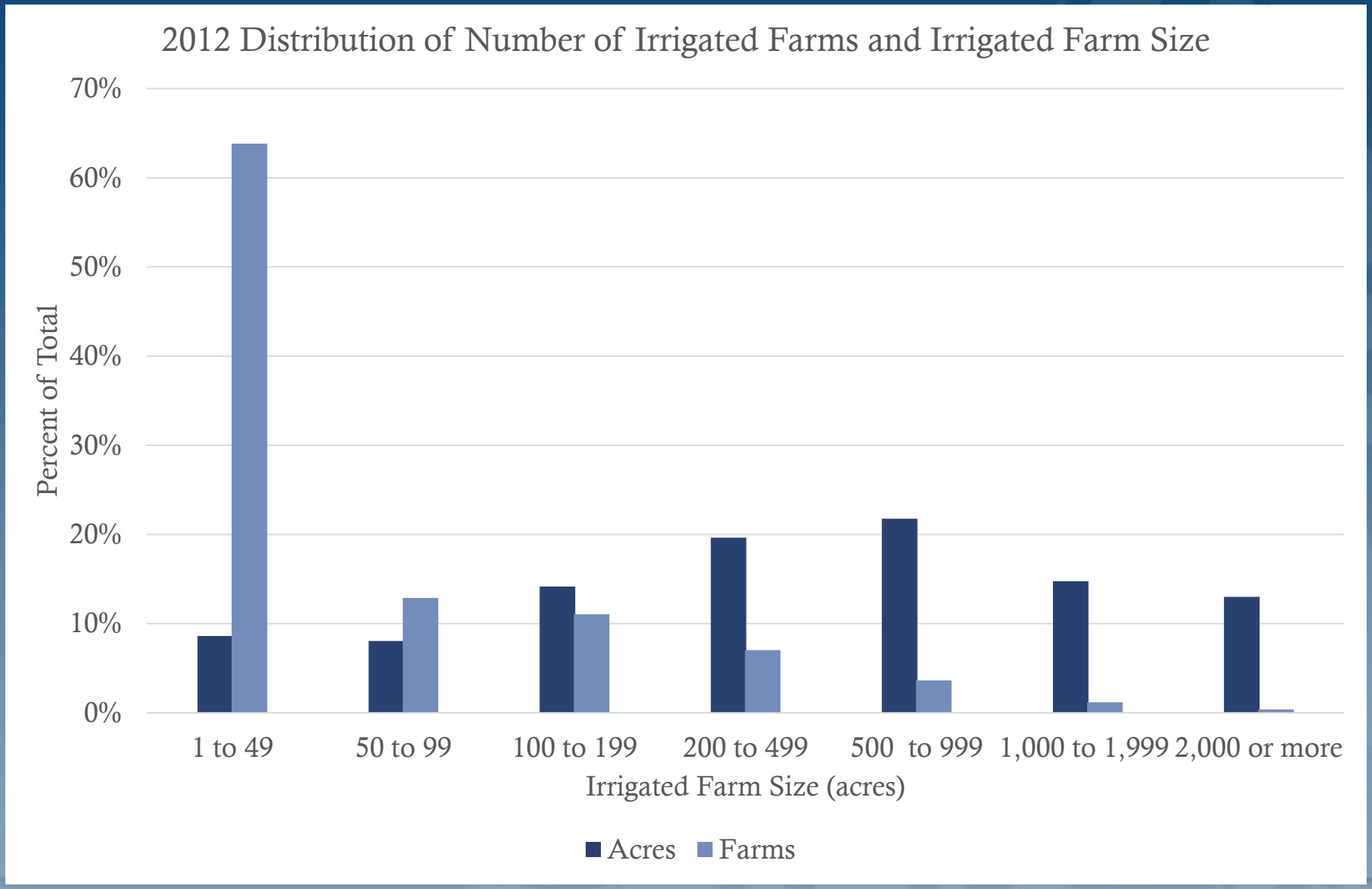
Differences between 2005 and 2010 Water Use

- In 2010, 870,000 acre-feet less water diverted for irrigated agriculture than in 2005.
- In 2005 much more water was available for diversion for irrigated agriculture.
- For example, in two counties (Millard and Sanpete) in the Sevier River Basin the diversion were 257,000 acre-feet less in 2010 than 2005. This was a 35 percent decrease. This was all due to lower water supply in 2010.
- The irrigation demand in most of the state is higher than the water supply in many years.

Utah's Irrigated Farm Size Distribution (2002)



Utah's Irrigated Farm Size Distribution (2012)



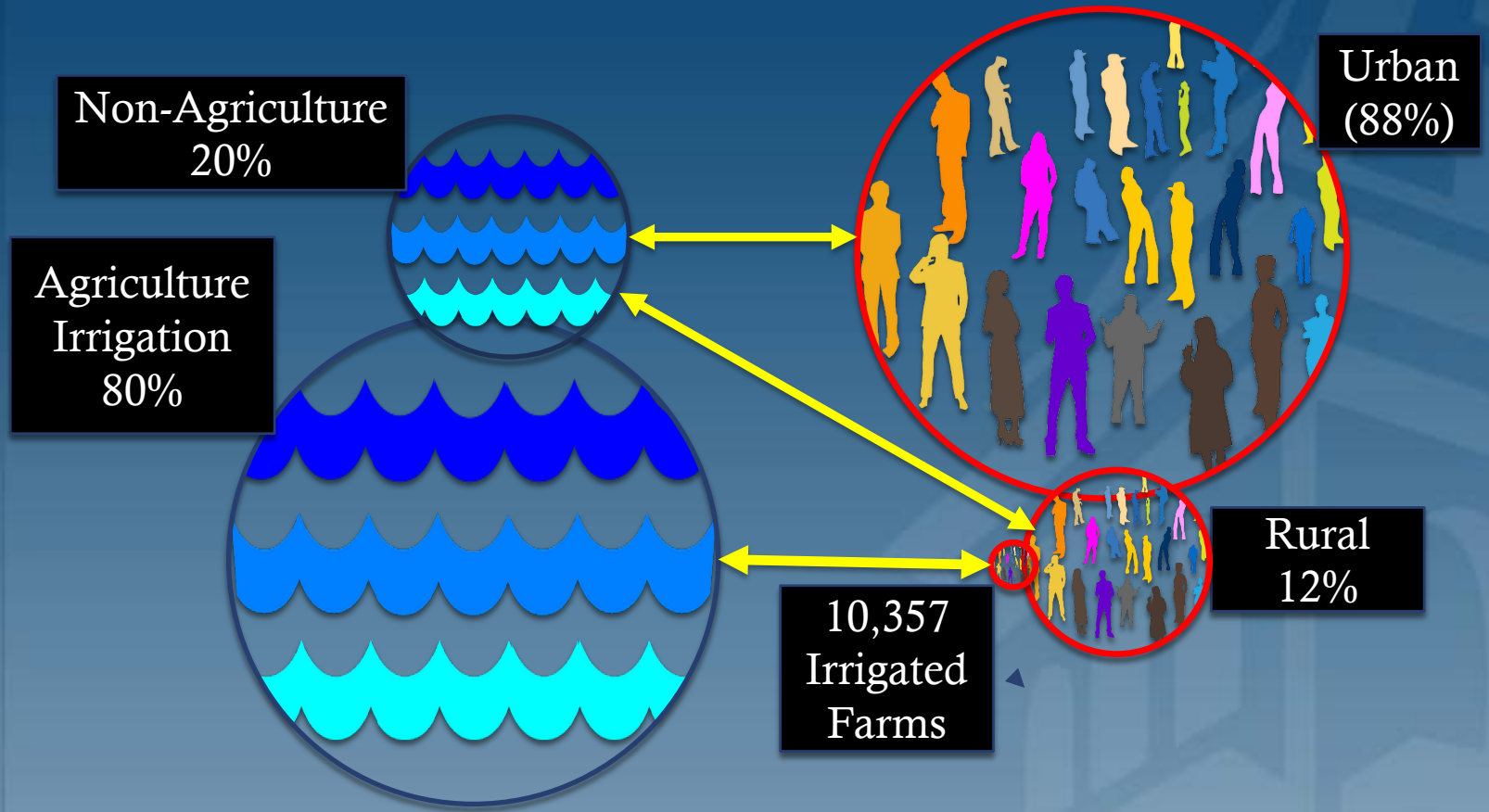
Farmer and Irrigated Land Summary

USDA 2012 Irrigated Farm and Ranch Survey

- Utah has 10,357 irrigated farms with a total of 1,125,106 acres.
- **Utah has a few big irrigated farmers and many small irrigation farmers.** 5.2% (540 farms) of irrigated farms account for 49.5% of the irrigated land. 63.8% (6,610 farms) of irrigated farms account for 8.6% of the irrigated lands.

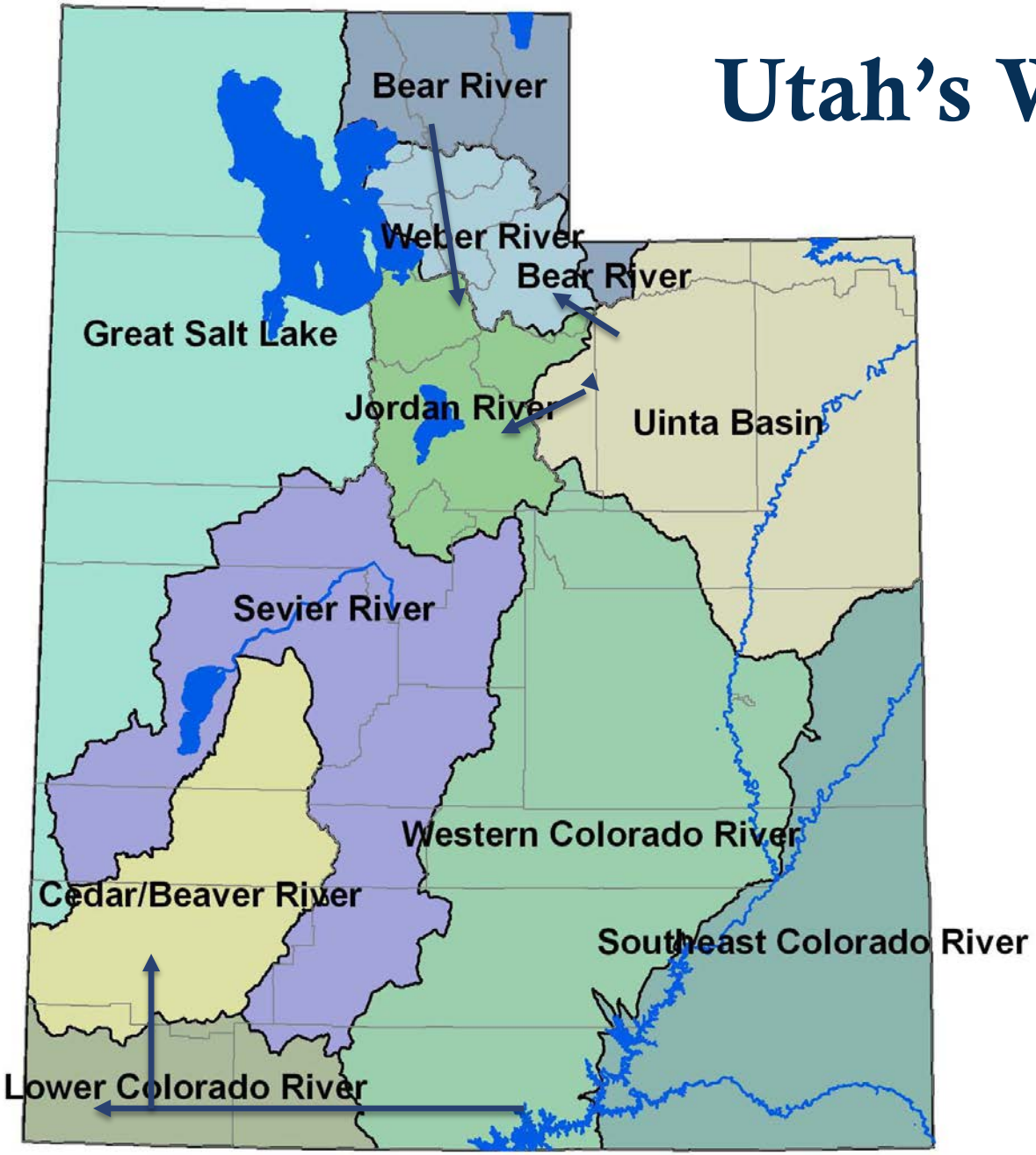
Utah Water and Water Users

Approximate Annual Water Use, Use Varies each Year based on Supply



UtahState University
COOPERATIVE EXTENSION
WATER-EFFICIENT
LANDSCAPING

Utah's Watersheds



Utah's Land and Growth Rate

- Utah's cities and towns cover 2.4 percent of Utah's total area (US Census). Some towns are rural towns.
- Currently, over 90% of Utah's population live in urban areas that occupy about 1.1% (about 600,000 acres) of the Utah's total area (US Census).
- Utah has the second fastest sprawl rate in the United States and sprawl attributed to population growth has increased 130,000 acres from 2002 to 2010. Most on good agriculture land.

Utah's Land

- In Weber, Davis, Salt Lake, and Davis Counties the number of farms between 1 and 9 acres has increased 275% from 640 in 1974 to 1,758 in 2007, while the total land in farms has decreased by 41 percent. Properties smaller than 1 acre are not reported
- Irrigated agriculture lands are about 2.1 percent of Utah's total area. Cropped dry lands are about 1 percent of Utah's farms.
- Utah cities and towns are about 2.4 percent of Utah's total area. Some of this are is also irrigated agriculture lands (i.e. Lewiston Utah is 25.65 square miles with population of 1,766 and Taylorsville is 10.85 square miles with a population of 58,652.

Production of Fruits and Vegetables

- In U.S. 2.7 percent of cropped land is used for vegetables (includes melons and potatoes), fruits, and nuts; 9 million acres of 335,000 acres. (12% of agriculture receipts and about 26% of crop receipts).
- In the U.S. 90% of the vegetables are grown by 9% of the vegetable growers.
- In Utah 1.4% of the irrigated lands is used to grow vegetables and fruit (15,209 acres), about 9 percent of cash receipts for crops. Sod and nurseries would add another 5,732 acres.
- (USDA, 2014) 2012 Agriculture Statistics

My Opinion of What This Means to Small and Urban Farms in Utah

- It doesn't take a lot of area to grow fruits and vegetables for Utah's fresh market.
- There is a great opportunity to expand small and urban farms growing fruits and vegetables.
  - On a nation-wide basis there is about 1,300 square feet of vegetables and fruit per person.
  - In Utah there is only about 220 square feet of fruits and vegetables per person.

Discussion of Results of 2016 Irrigation Track Clicker Survey

- Irrigation Method
  - Surface, Sprinkler, Drip/Micro
- Irrigation Scheduling
  - Estimated ET, Soil Moisture, Plant Stress
- Irrigation System Component
  - Water Supply, Pump, Chemical Injection, Pipeline, Sprinkler, Drip, Micro
- Irrigation System Improvements
  - Upgrade, Maintenance

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A Comprehensive Investigation into Urban and Small Farm Irrigation Efficiency

Biographical Information:

Tyler Pratt
Utah State University
Civil and Environmental
Engineering Department

Tyler is currently a M.S. student in the Civil and Environmental Engineering Department (CEE) and am a Research Assistant (RA) for Dr. Niel Allen, Associate Professor, CEE, USU. My research entails a study of Urban and Small Farm Agricultural Water Use in Utah.

Session Description:

In my presentation I will share the results of my thesis research regarding the total irrigation water use and irrigation efficiencies of urban and small farm agricultural irrigation in Utah. I will discuss the observed irrigation trends, challenges, and potential improvements in urban and small farm irrigation systems design and management from the 20 locations in my study.

An Investigation into Urban/Small Farm Irrigation Efficiency

Tyler Pratt
Research Assistant
tyler.pratt@aggiemail.usu.edu
(707) 307-3936

Niel Allen, Ph.D., P.E.
USU Extension Irrigation Engineer/Specialist
n.allen@usu.edu
(435) 797-3926

Research Objective

To gain insight into the current state of urban and small farm irrigation

(Quantity, Practices, Effectiveness, Efficiency)

Why study small farm irrigation?

- **Increasing scarcity**
- **Competing uses**
- **Unpredictability of supply (climate change)**
- **Environmental concerns**
- **Need for improved understanding of**
  - **Farmer needs**
  - **Irrigation practices**
- **Irrigation can be a lot of work!**

Method

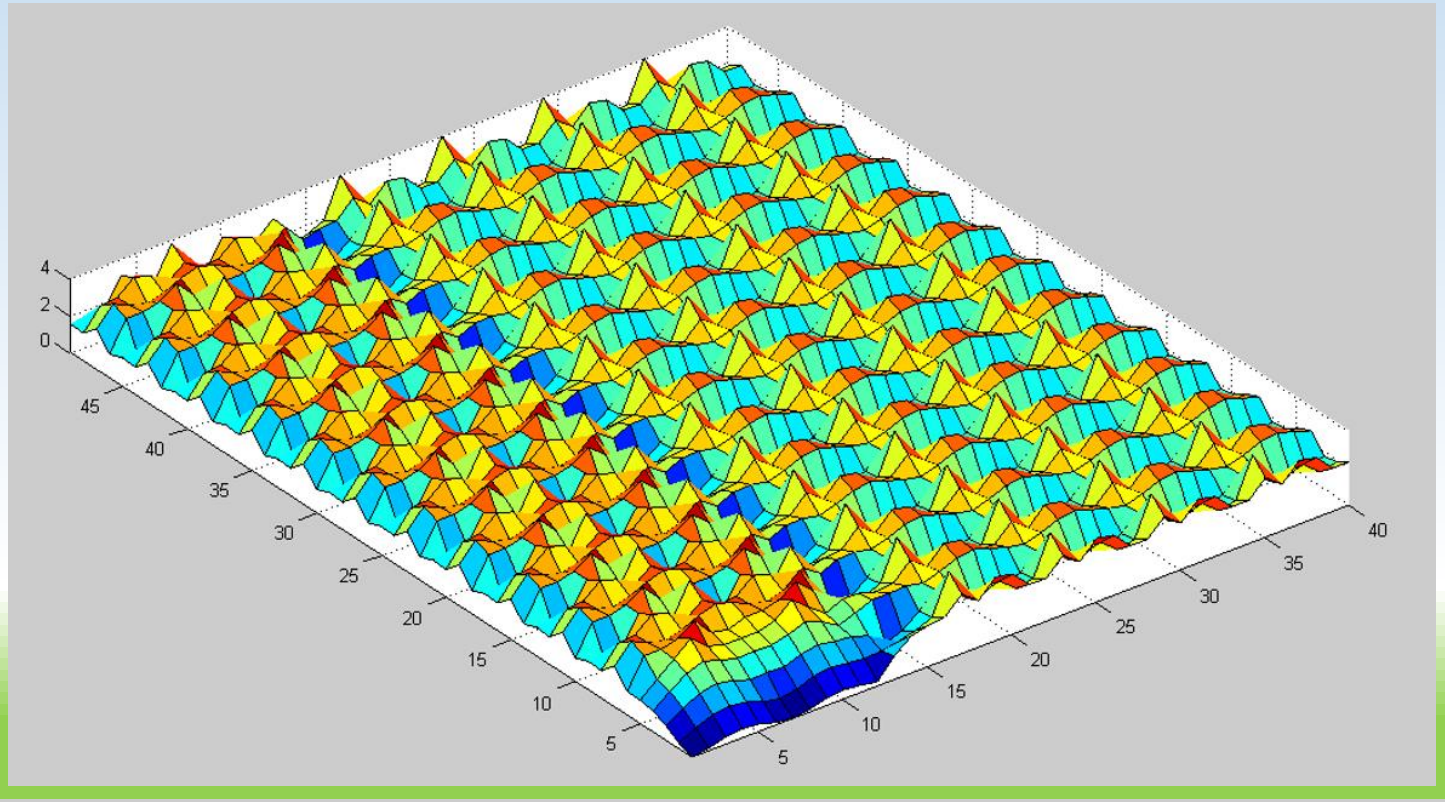
- **Find 20 participants**
- **Install water measurement device**
- **Collect field measurements/observations**
- **Analysis**
- **Compare results between farms and with state estimates**
- **Make suggestions to DWRe, Extension, and Farmers**

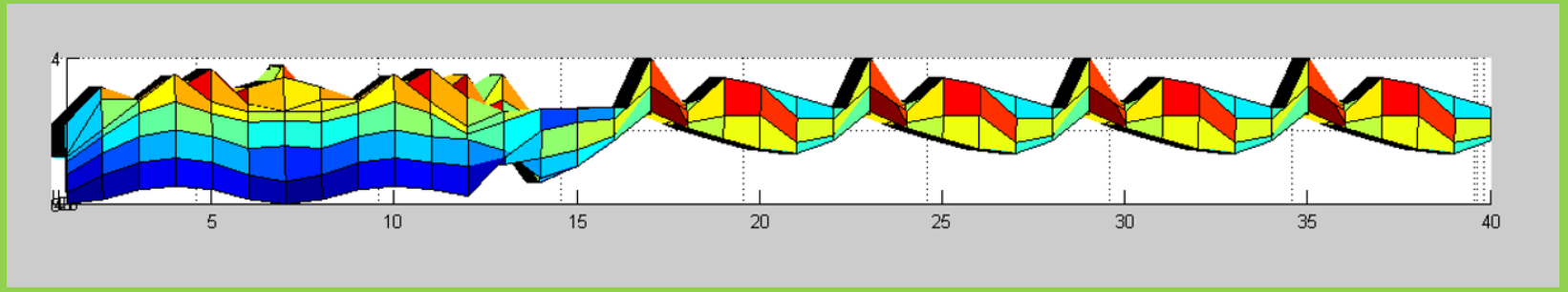
20 Participants

Flow Measurements

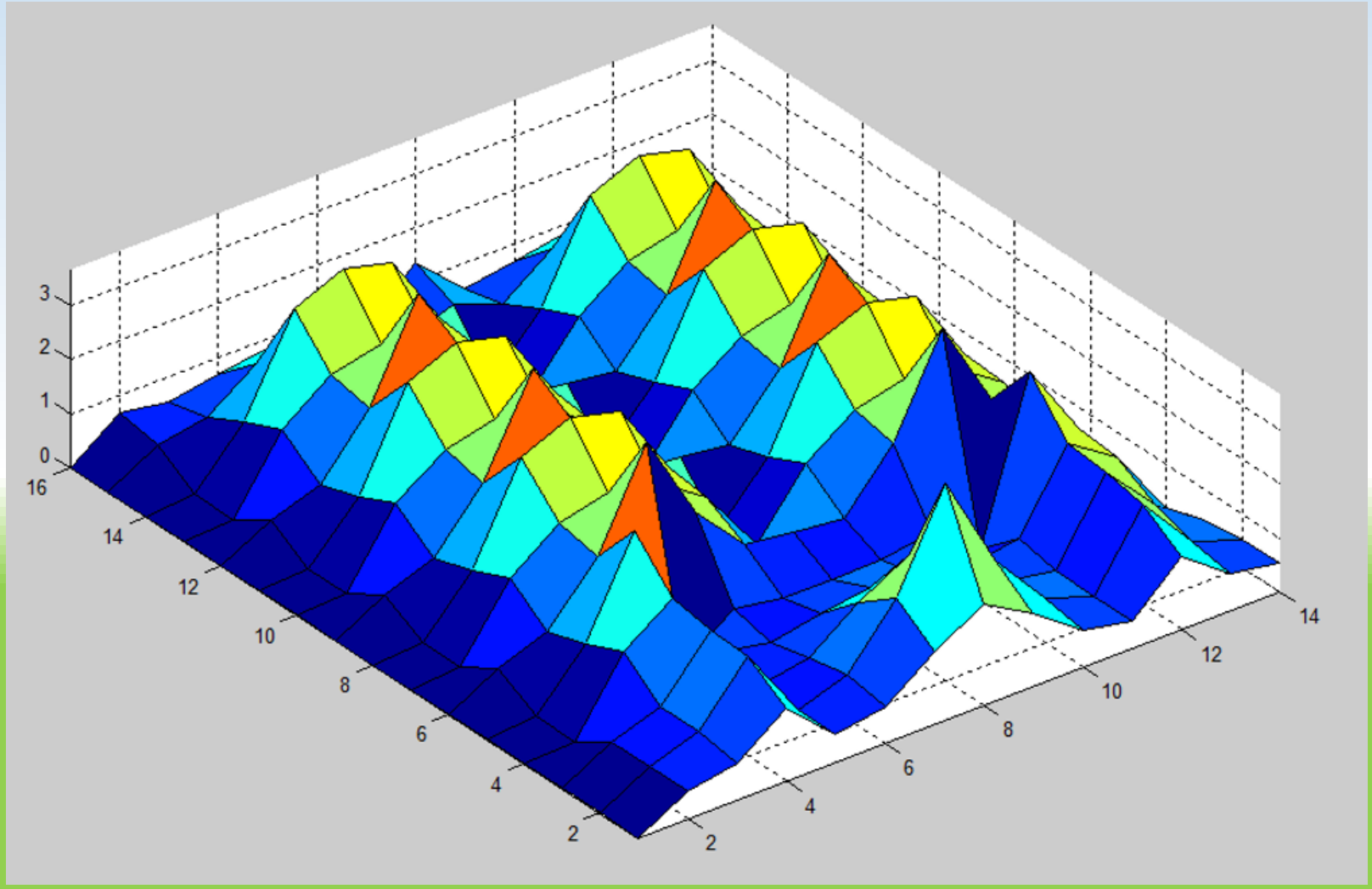
Field measurements

Analysis – Uniformity
Good example

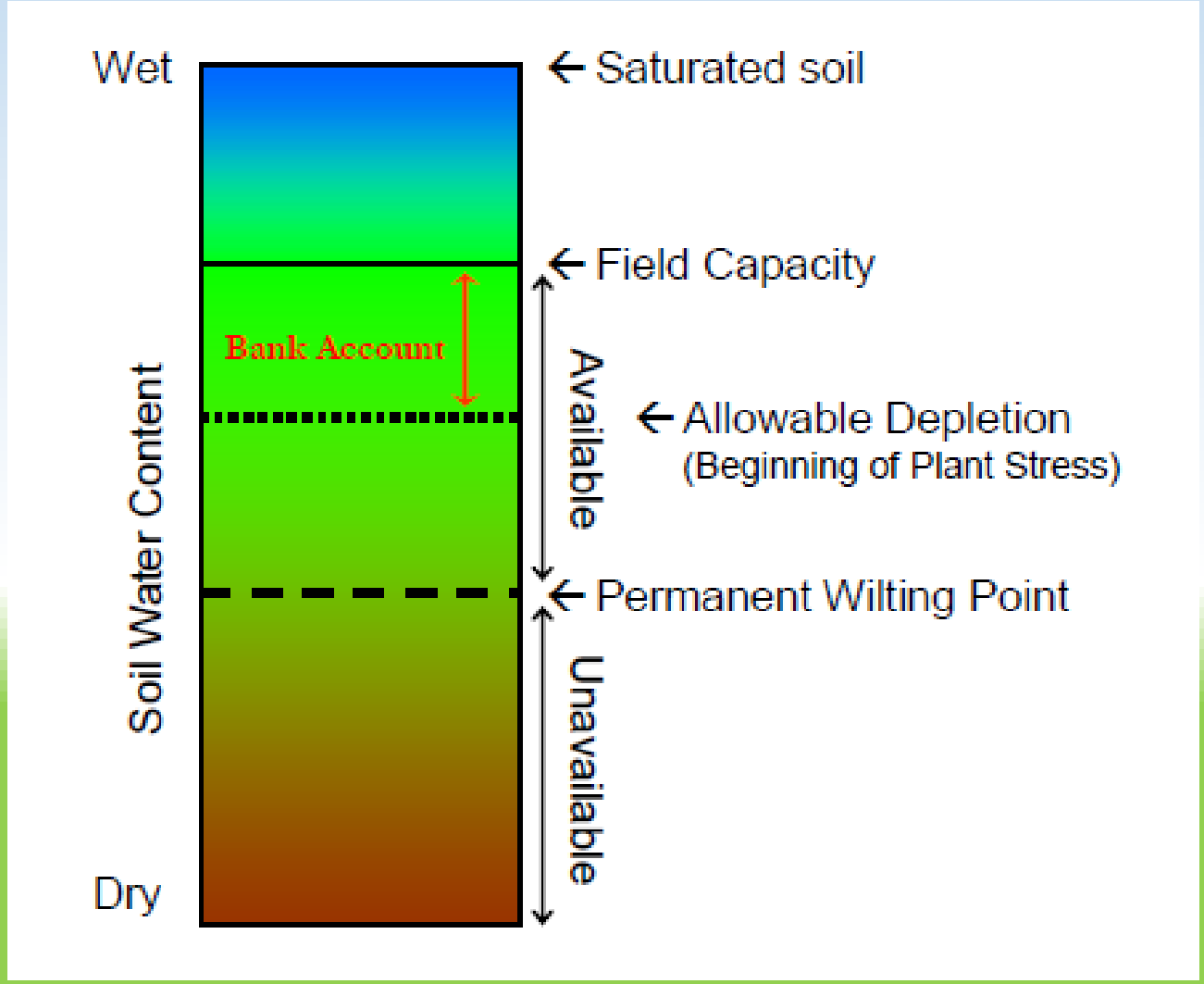




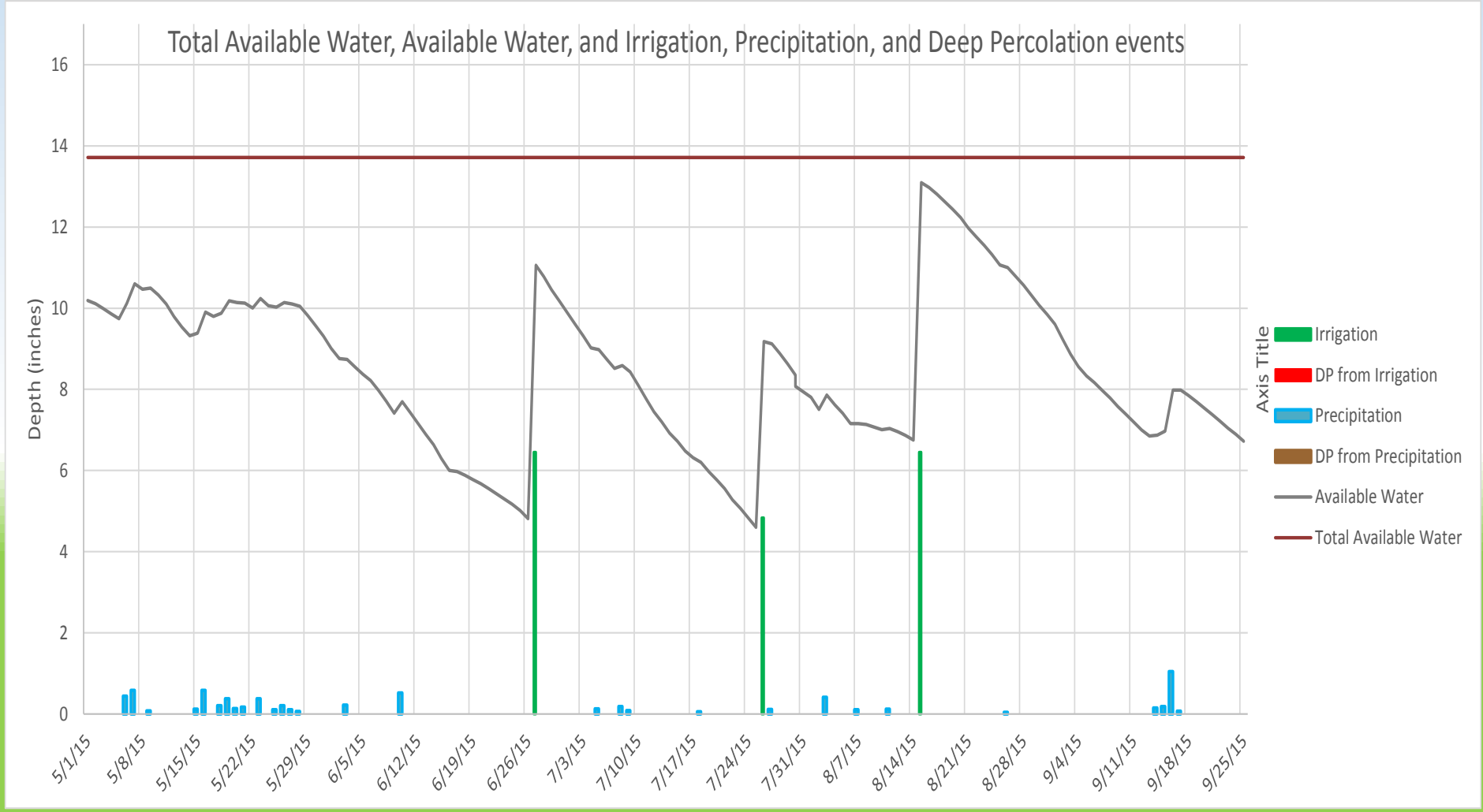
Analysis – Uniformity
Poor example



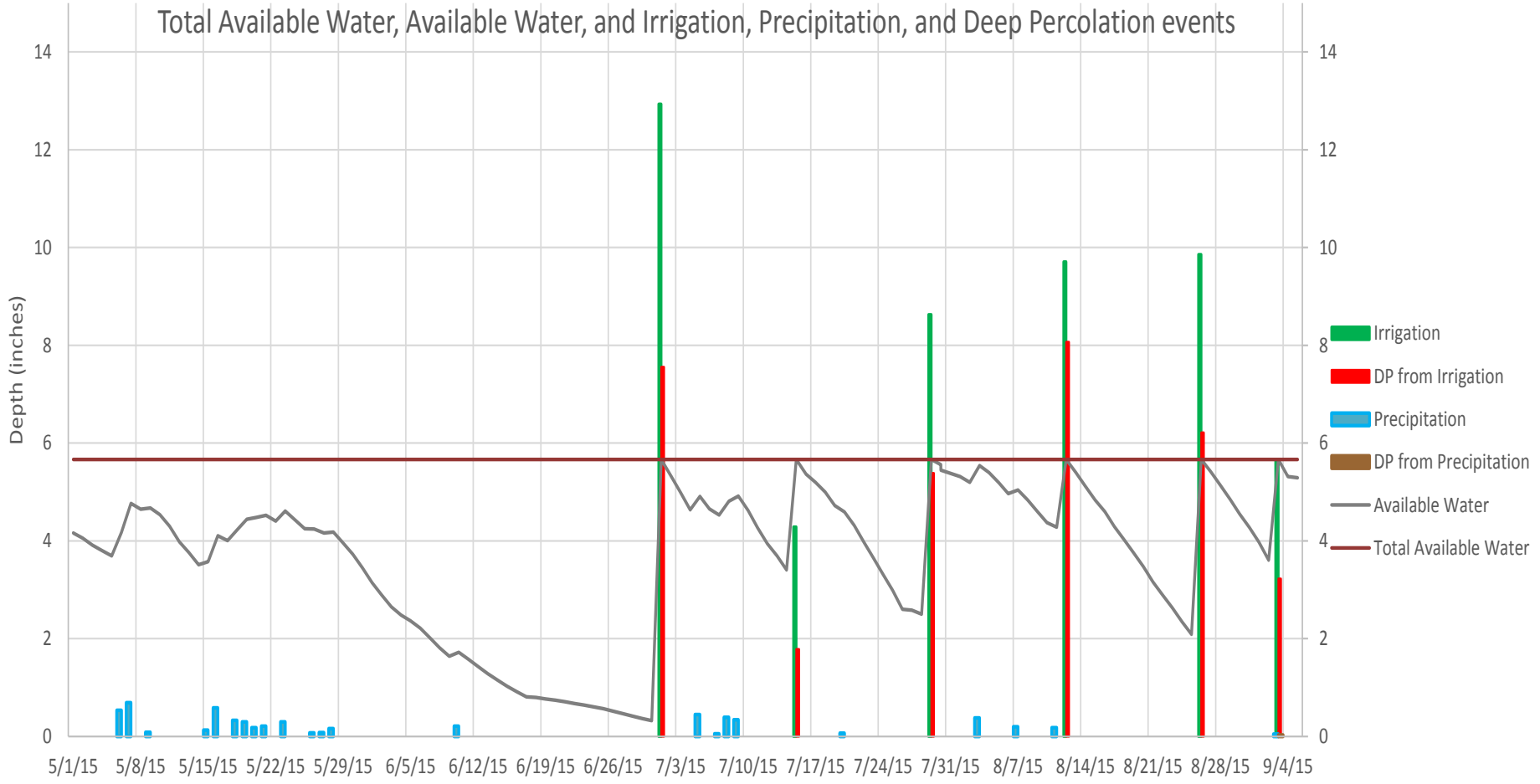
Analysis – Scheduling



Analysis – Scheduling Good example



Analysis – Scheduling
Poor example



Analysis – Quantity

(Mixed Vegetable Crops)

Method	Depth (inches)
Flood	188
Sprinkle	14
Drip	8

Extremely High Variability between Methods!!!

Findings

- **Scheduling lacking**
  - **No knowledge of ET or Soil Moisture**
  - **Farmers irrigated based on routine, not need**
- **Maintenance lacking**
  - **Most systems were mismatched**
- **Smaller the farm the poorer the Uniformity**

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Precision Water Stress in Tree Crops Using Thermal Imaging and Trunk Hydration

Biographical Information:
Lance Stott
Utah State University

Lance is a Graduate Student at Utah State University working on a plant-based indicator or tree water status that could be used to manage precision irrigation systems in order to save water and improve fruit quality.

Session Description:

Learn what soil moisture sensors can tell you that will assist in irrigation management decisions.

Precision Water Stress in Tree Crops Using Thermal Imaging and Trunk Hydration

Lance Stott

Bruce Bugbee

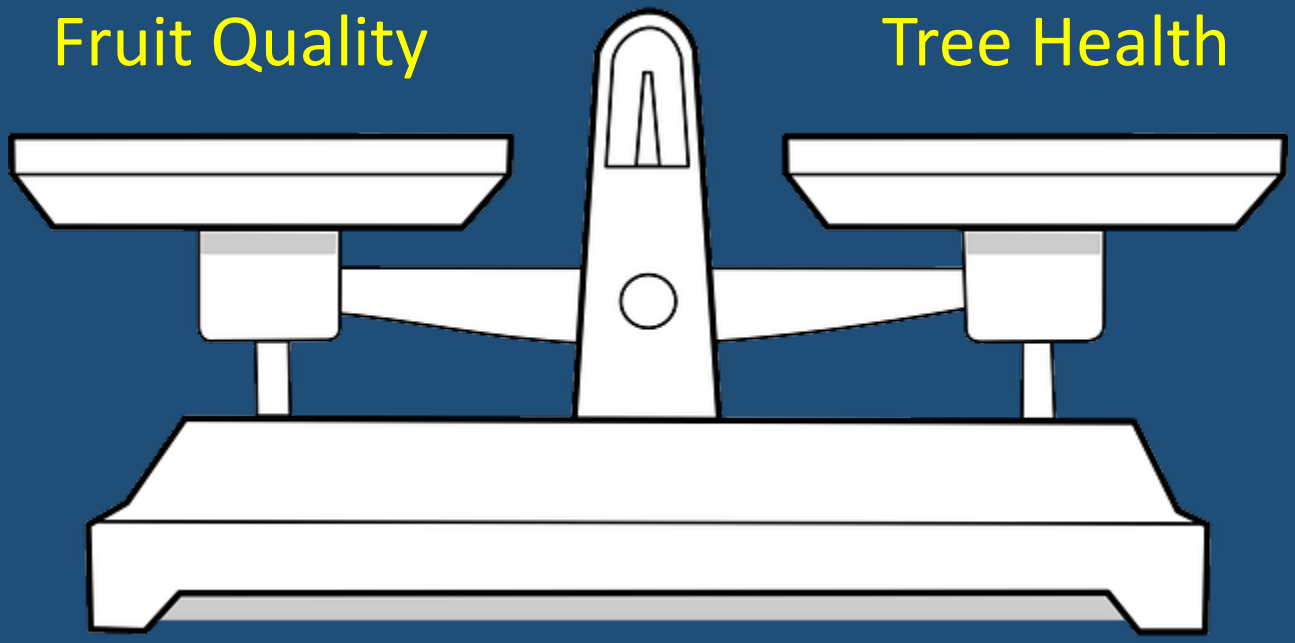
Significance

Water Savings

Fruit Quality

Yield

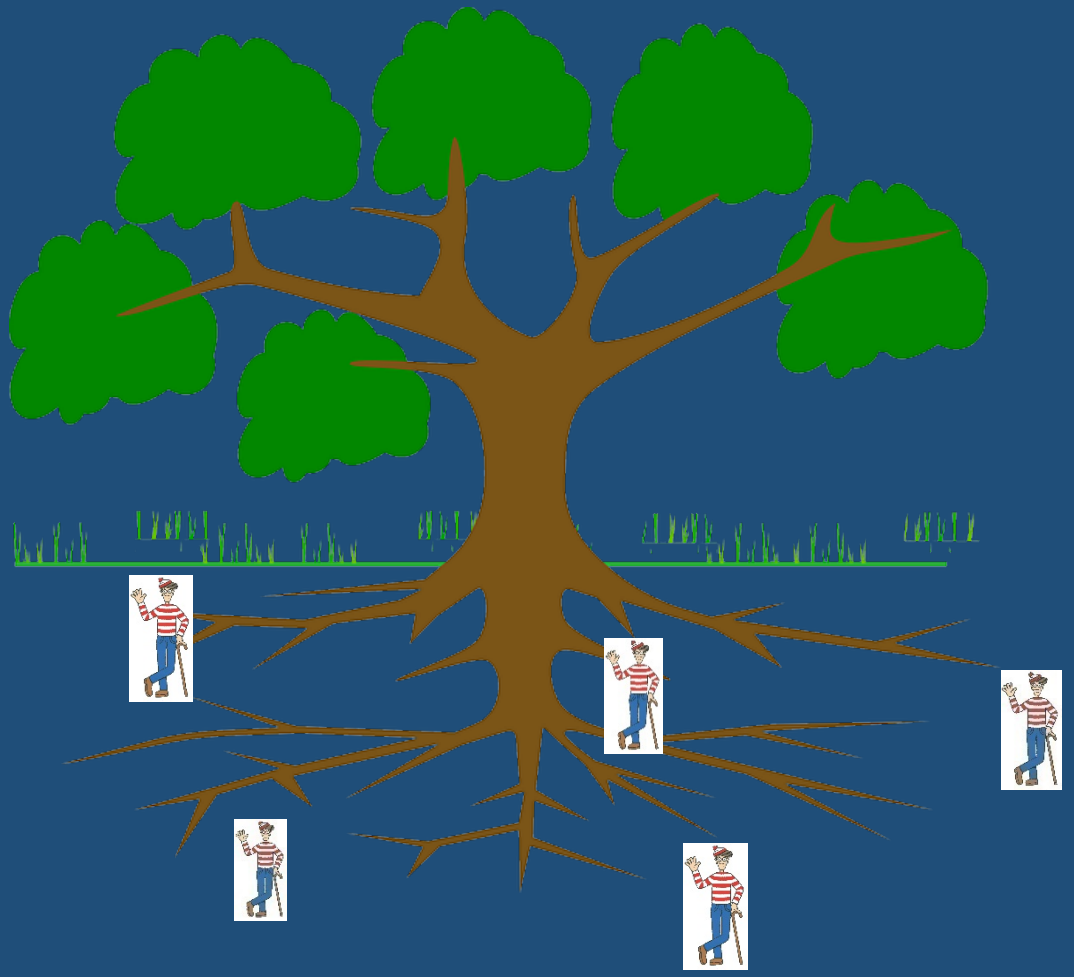
Tree Health



Below-Ground Measurements

Soil Moisture Sensors

Where are the roots?



Intrigliolo and Castel 2006, McCutchan and Shackel 1992, Naor et al. 2006, Girona et al. 1993 Acevedo-Opazo et al. 2010

Above-Ground Measurements
Stomatal Conductance

- Spatial and Temporal Variation

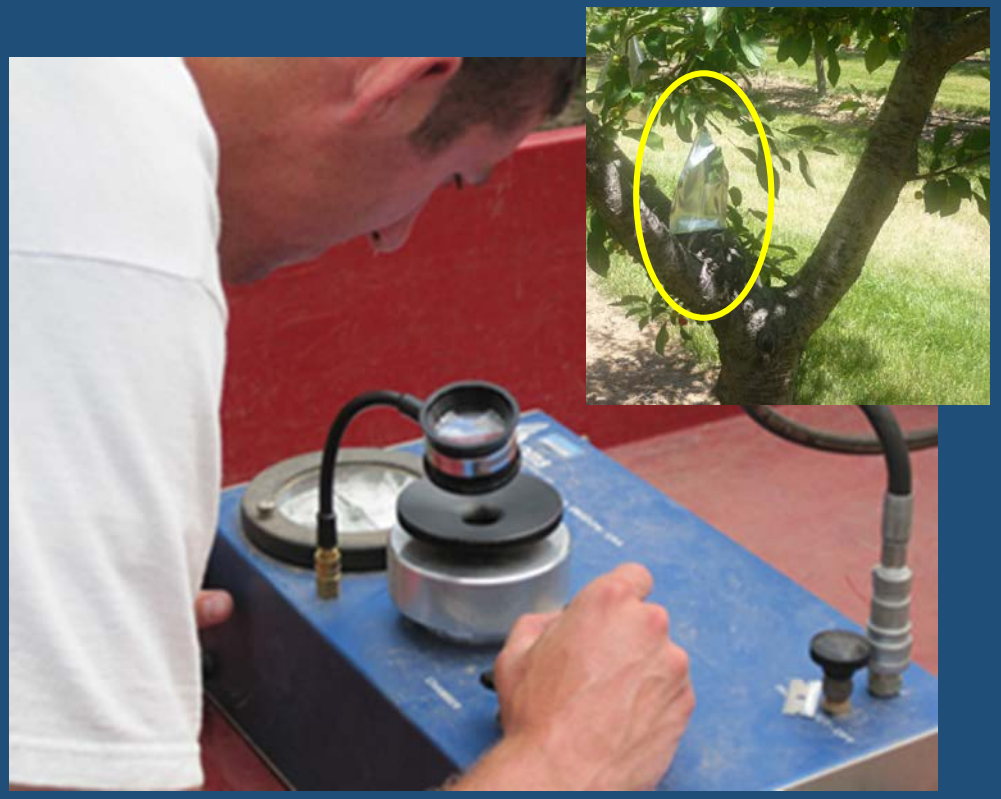
Berni et al. 2009, Romero et al. 2004b, Goldhamer et al. 1999a, Moriana and Fereres 2002, Ortuno et al. 2004

Above-Ground Measurements

Plant Water Potential

- Comparison standard for other potential plant water stress indicators
- Pressure chambers can't be automated

Mylar Bag



Pressure Chamber

McCutchan and Shackel 1992, Shackel et al. 1997, Naor et al. 1999, Shackel et al. 2000, Naor et al. 2001, Naor et al. 2006, Pérez-Pastor et al. 2009, Wang and Gartung 2010, Intrigliolo and Castel 2004, Fernandez et al. 2008

Above-Ground Measurements
Trunk Circumference

- Challenging in young trees
- Has potential, but expensive

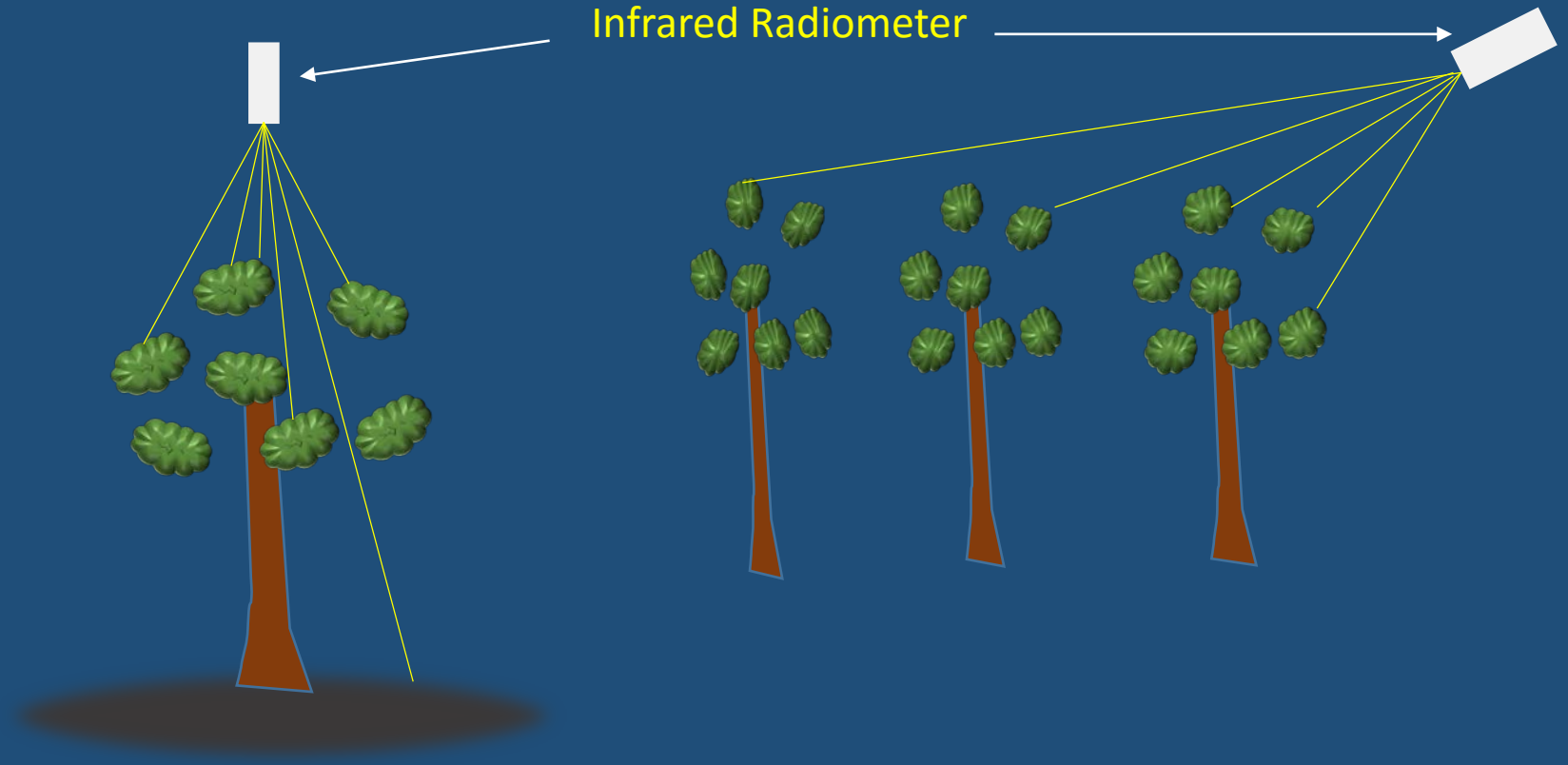
Dendrometer

Otruno et al. 2004, Goldhamer et al. 1999b, Cohen et al. 2001, Fereres and Goldhamer 2003, Remorini and Massai 2003, Ginestar and Sanchez 1996, Goldhamer et al. 1999a, Naor and Cohen 2003, Goldhamber and Fereres 2004, Moriana and Fereres 2002, Intrigliolo and Castel 2004, Harguet et al. 1992, Ortuno et al. 2010

Above-Ground Measurements

Leaf Temperature

- Promising
- Field of view issues



Fruit Tree Training Systems

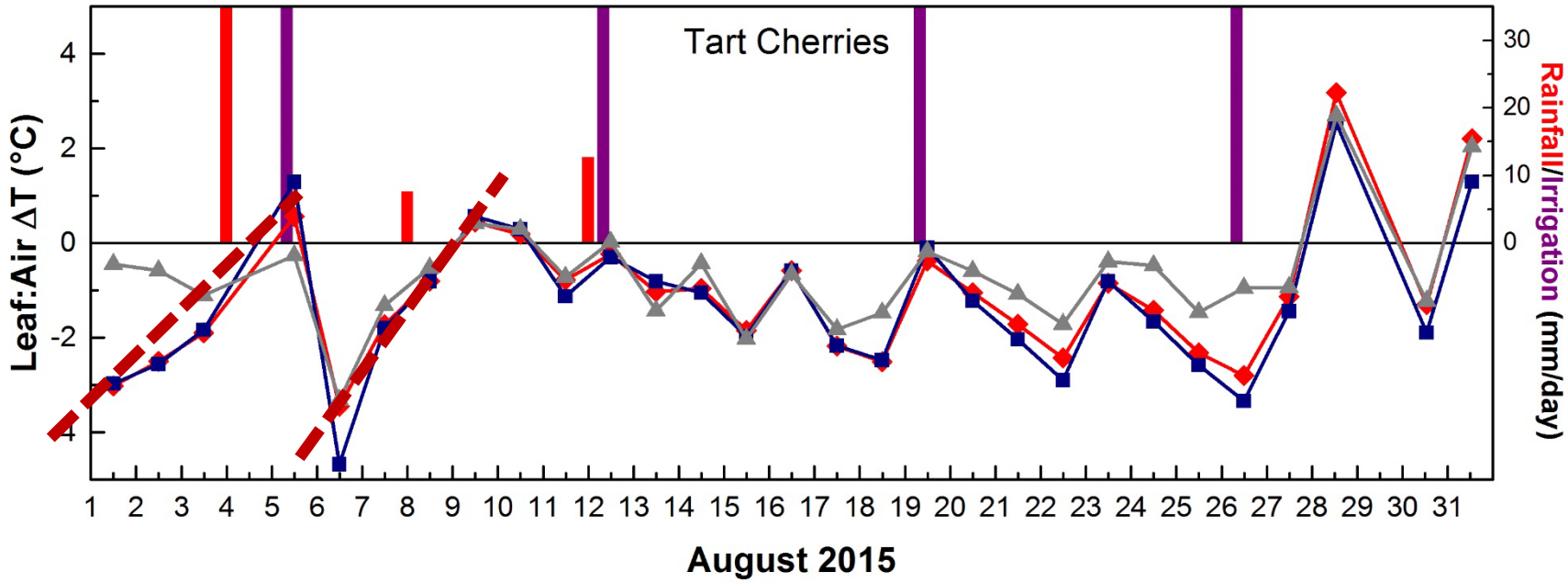
Field of View

Single Tree

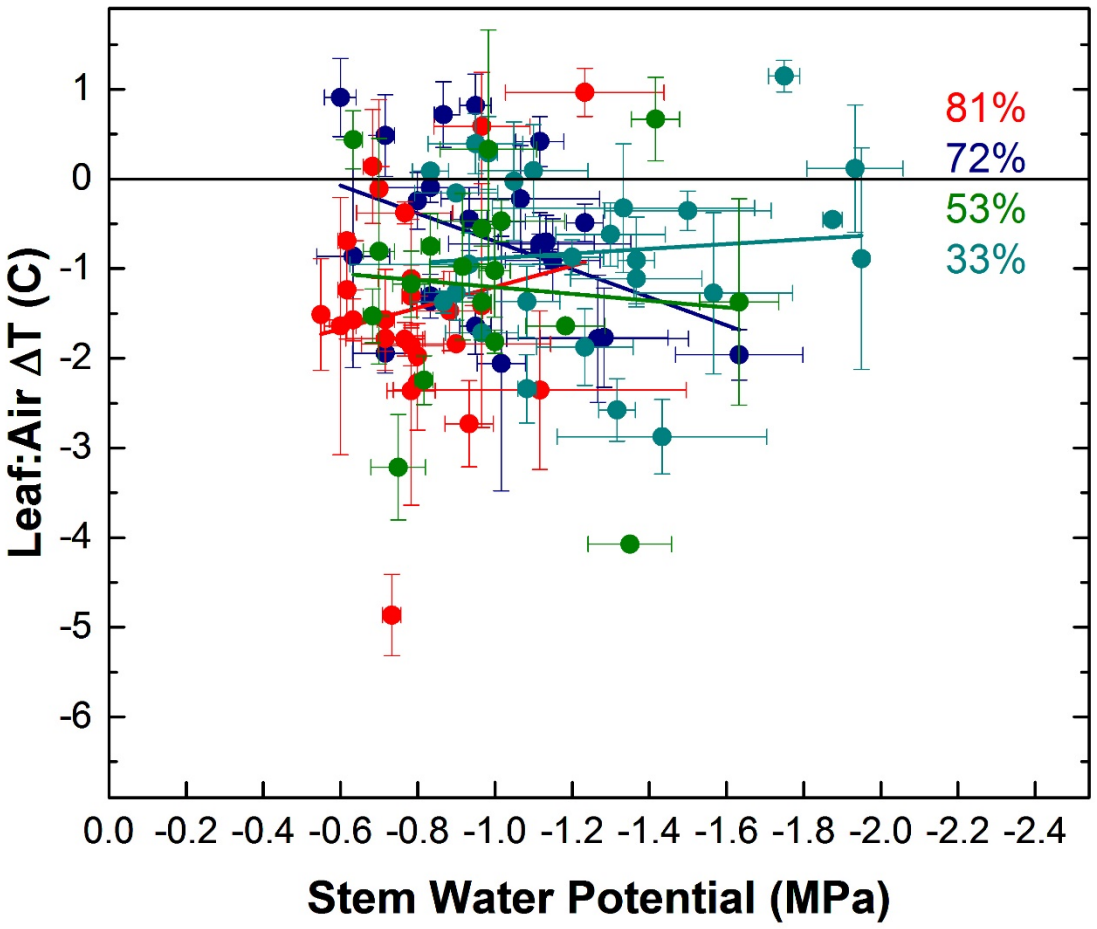
Whole Orchard

Leaf to Air Temperature Differences

Single Tree

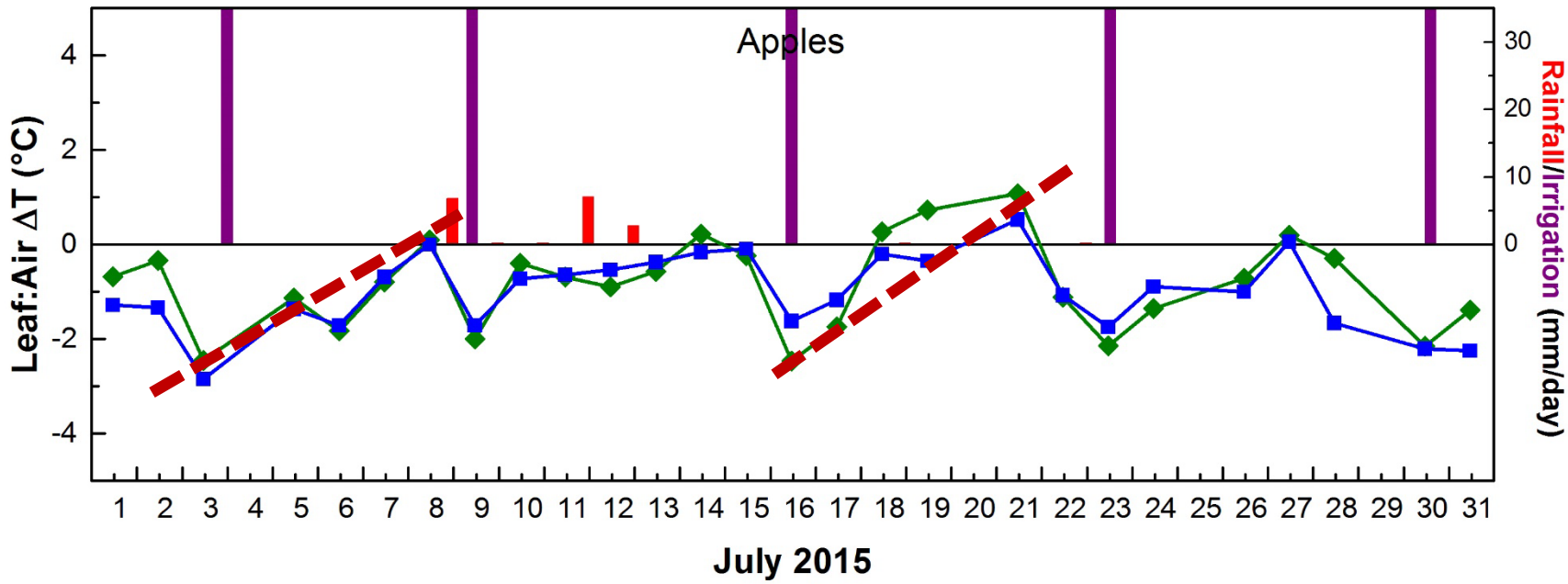


Tart Cherries



Leaf to Air Temperature Differences

Whole Orchard



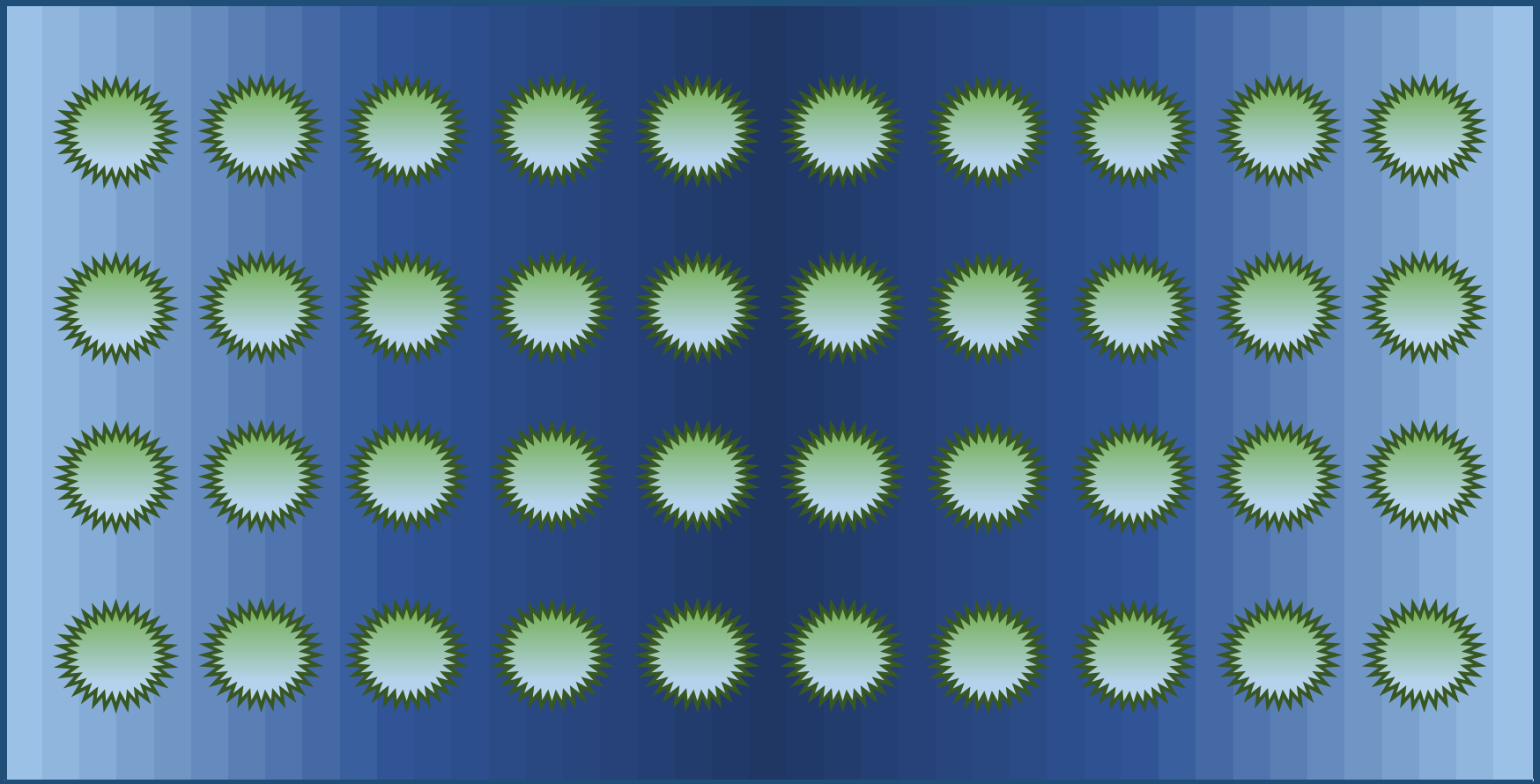
Above-Ground Measurements

Volumetric Water Content

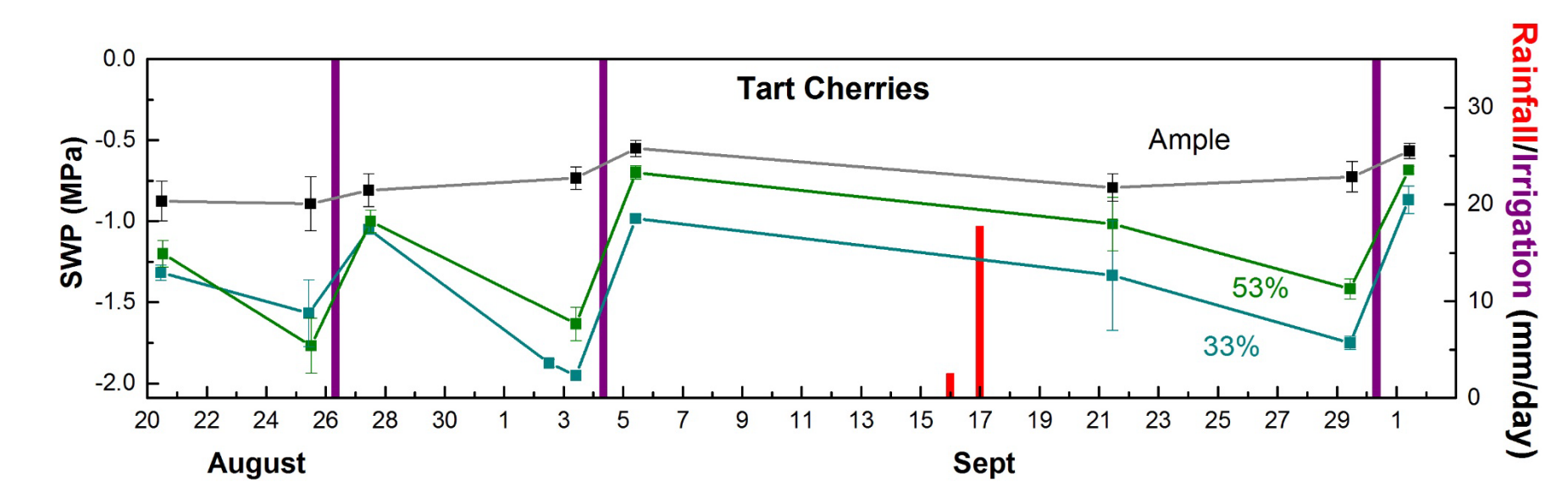
Campbell Scientific
Model CS655

Decagon Devices
Model GS1

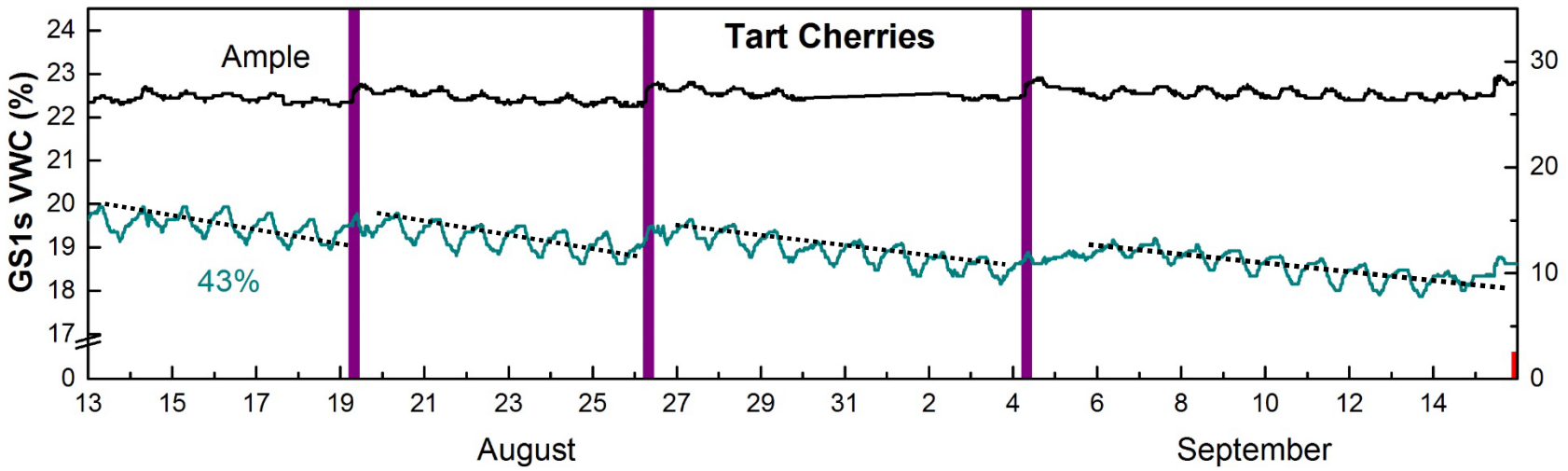
Line Source Irrigation



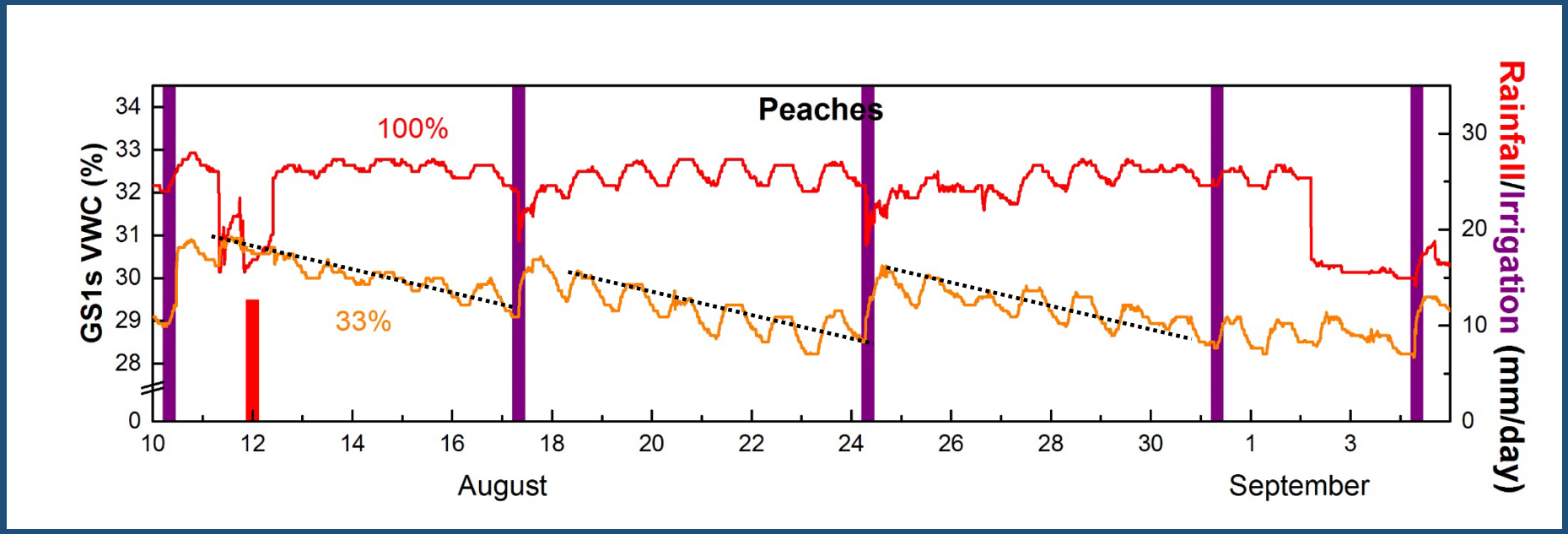
Stem Water Potential (SWP)



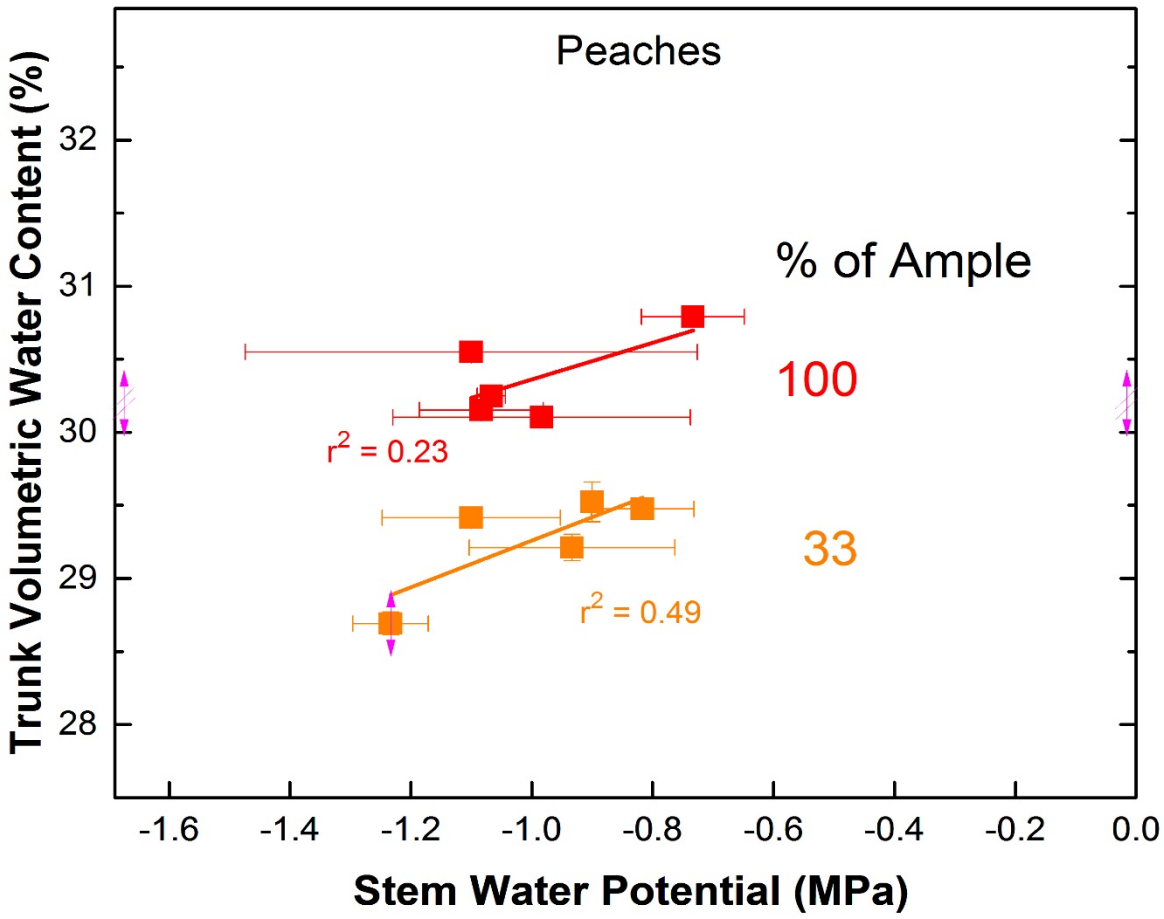
Stem Volumetric Water Content



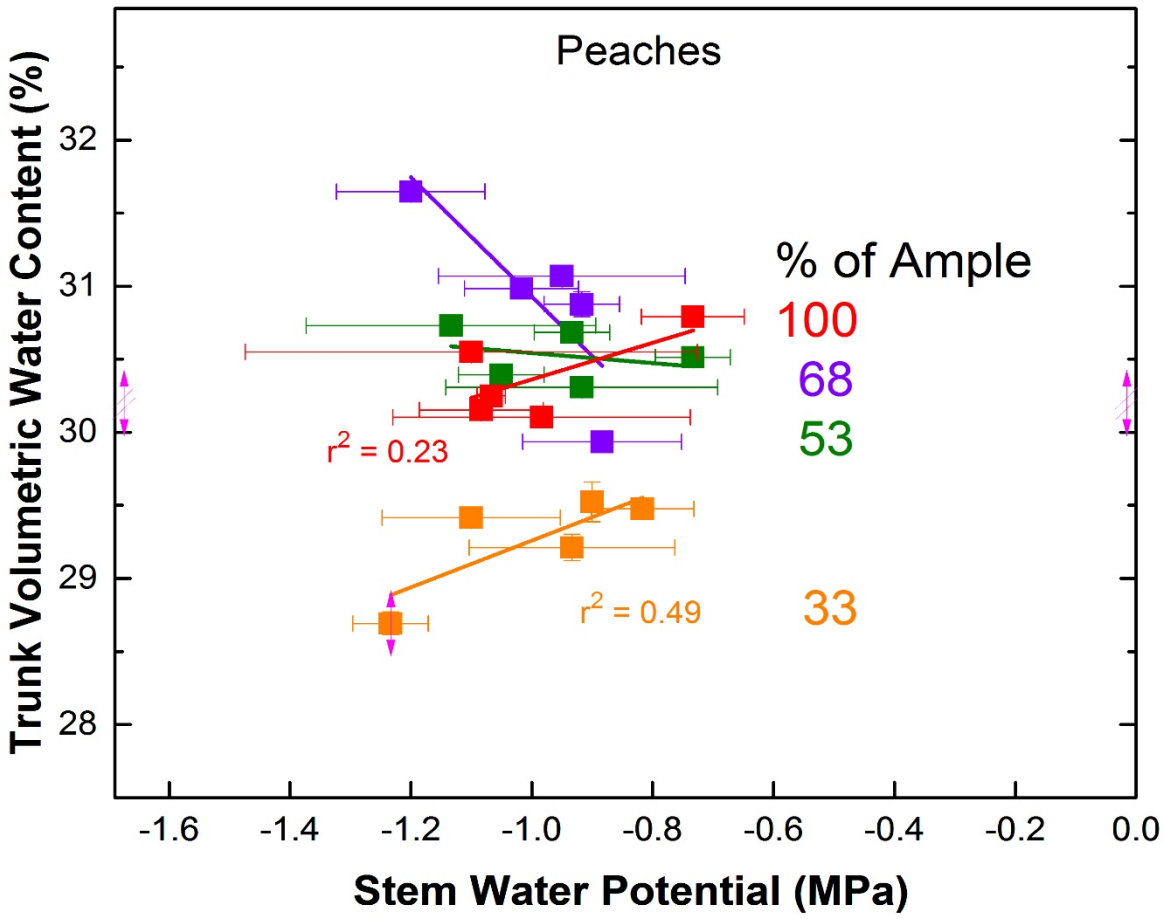
Stem Volumetric Water Content



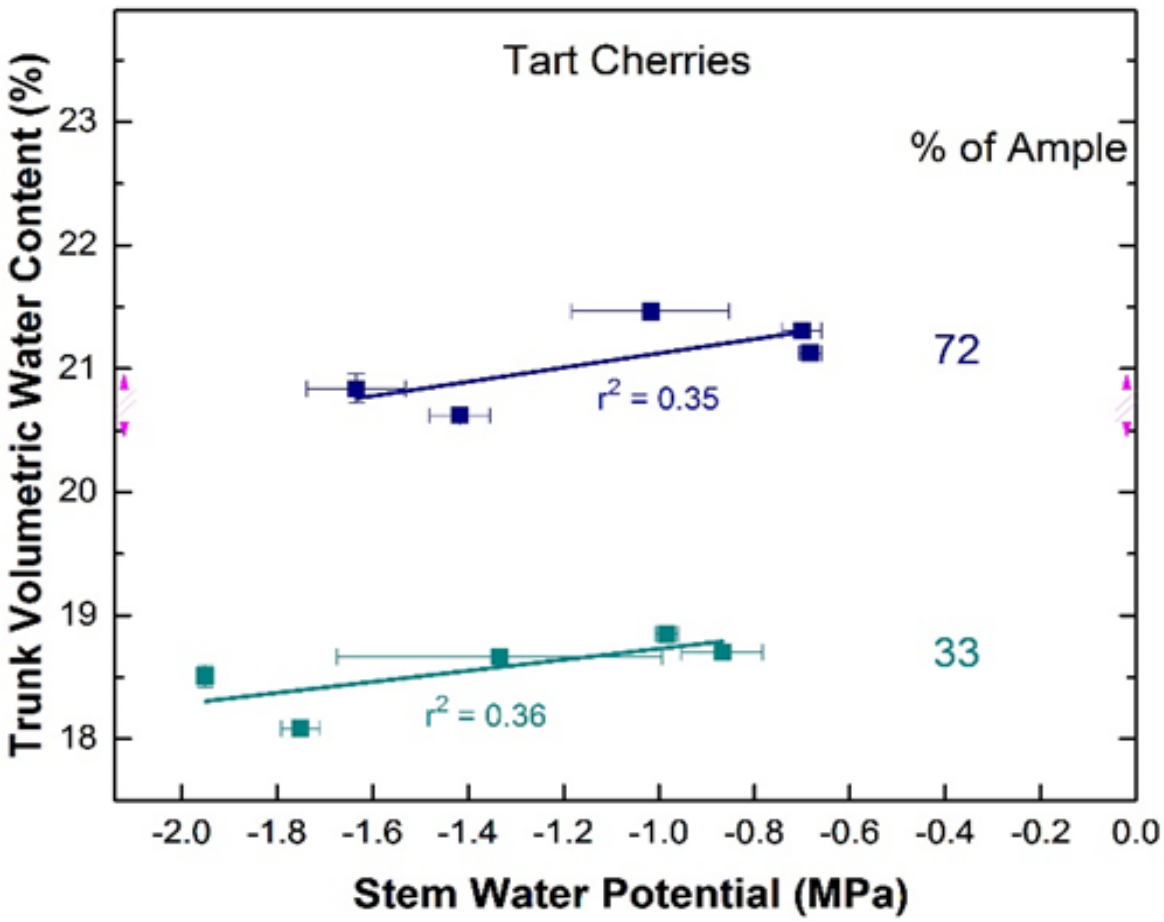
Peaches


Peaches
% of Ample
100
33
r^2 = 0.23
r^2 = 0.49
Trunk Volumetric Water Content (%)
32
31
30
29
28
-1.6
-1.4
-1.2
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
Stem Water Potential (MPa)

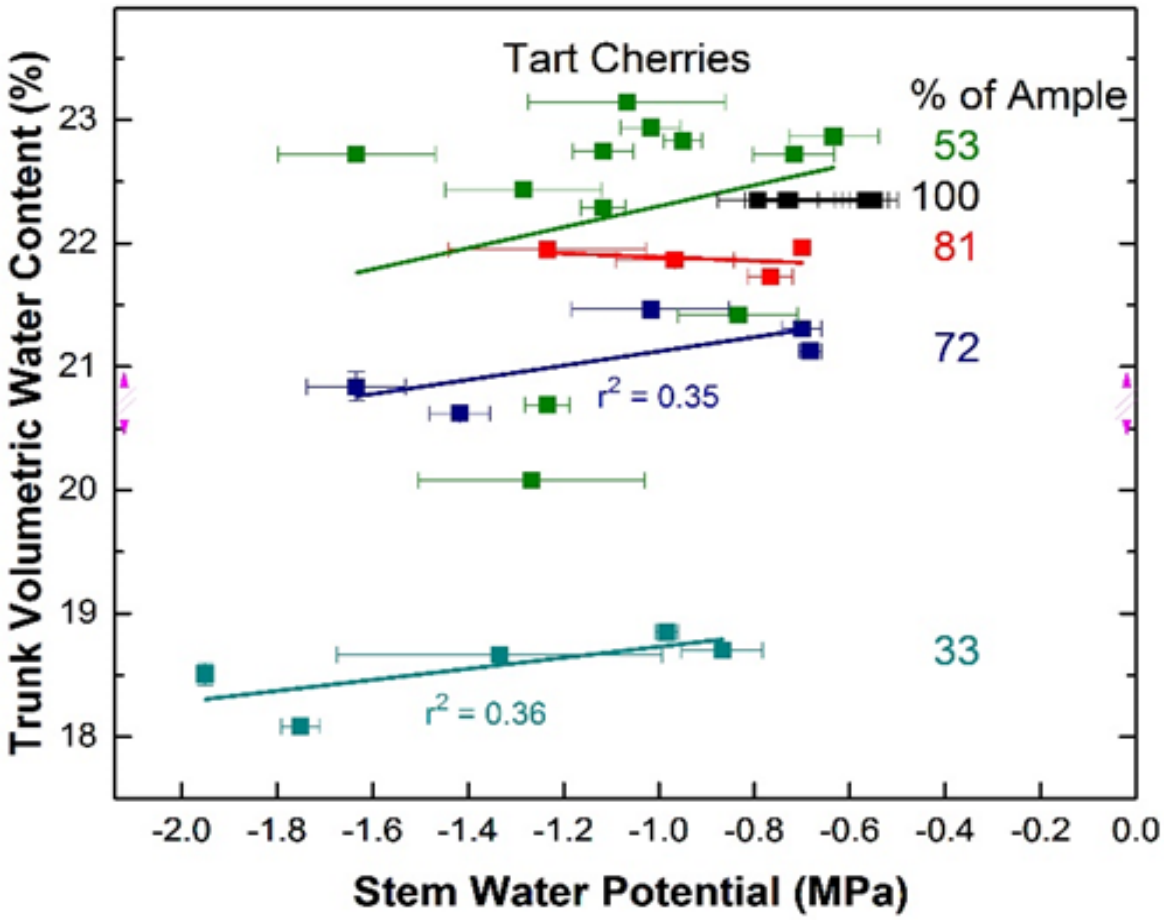
Peaches


Peaches
Trunk Volumetric Water Content (%)
32
31
30
29
28
-1.6
-1.4
-1.2
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
Stem Water Potential (MPa)
% of Ample
100
68
53
33
r2 = 0.23
r2 = 0.49

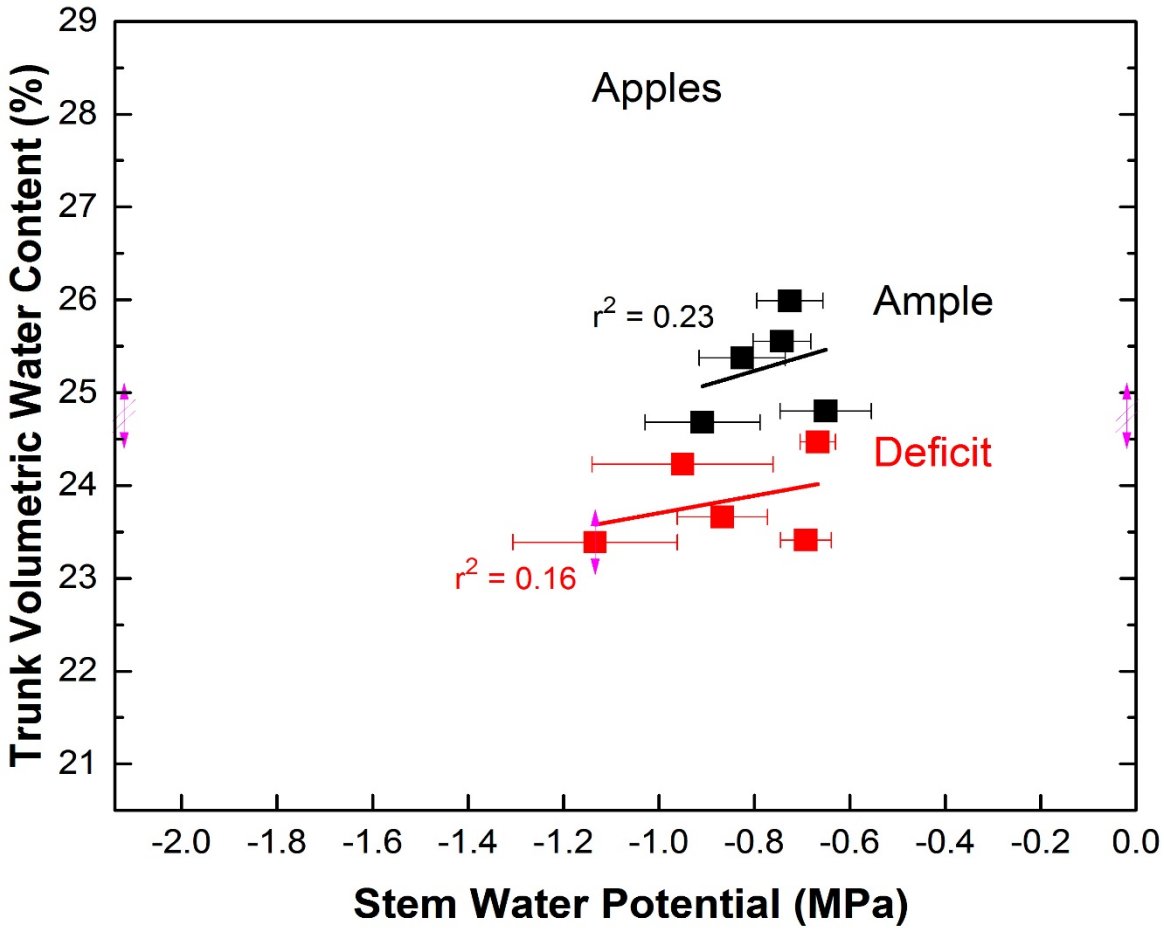
Tart Cherries



Tart Cherries



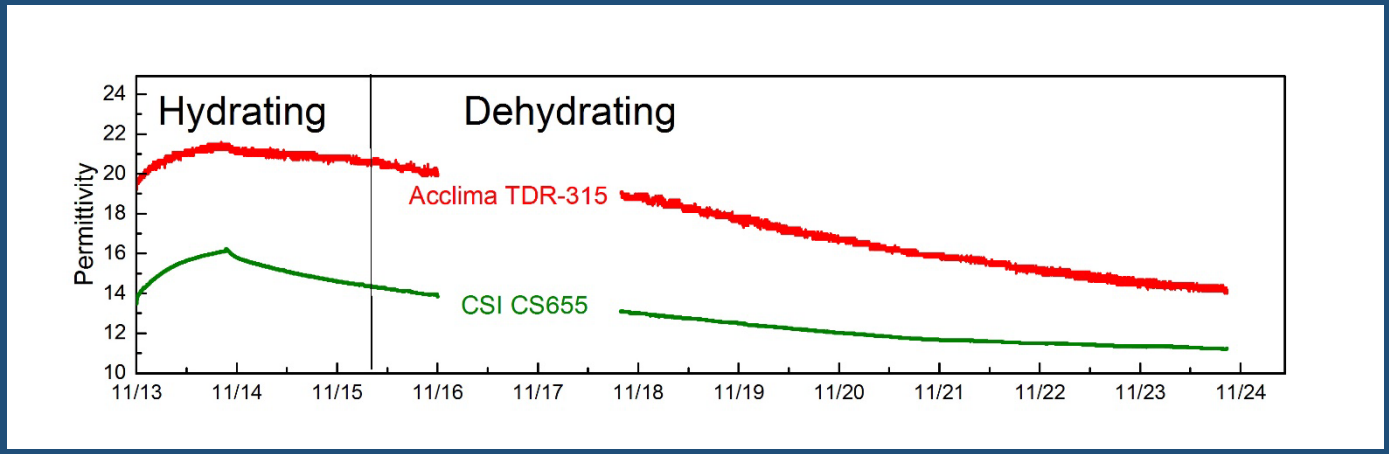
Apples


Apples
Ample
r^2 = 0.23
Deficit
r^2 = 0.16
Trunk Volumetric Water Content (%)
29
28
27
26
25
24
23
22
21
-2.0
-1.8
-1.6
-1.4
-1.2
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
Stem Water Potential (MPa)

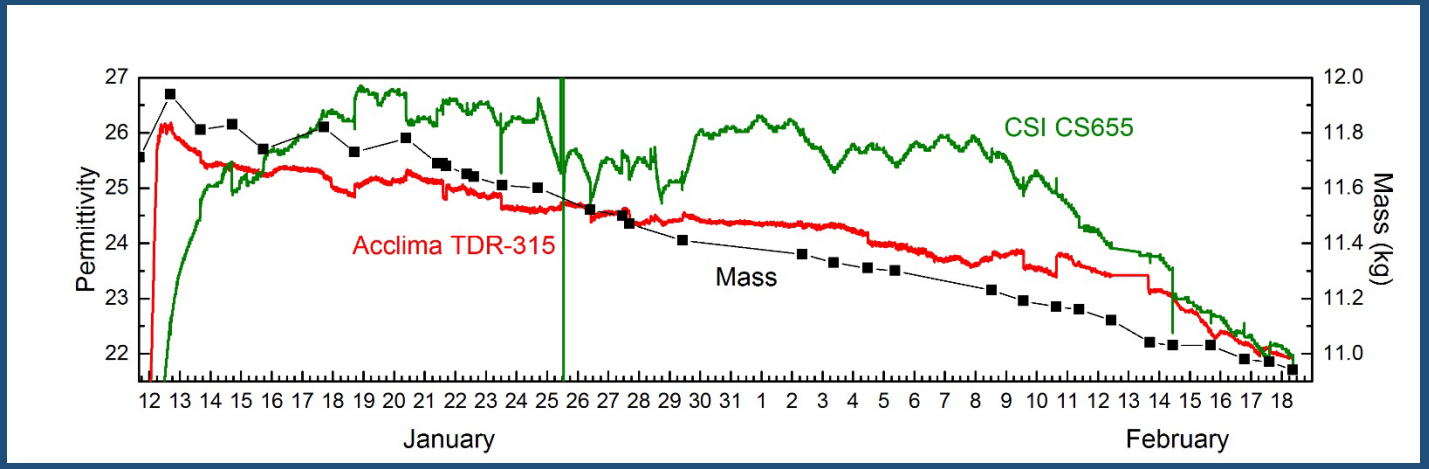
Conclusion

- Infrared temperature and trunk hydration measurements both need more refining before they can be recommended.

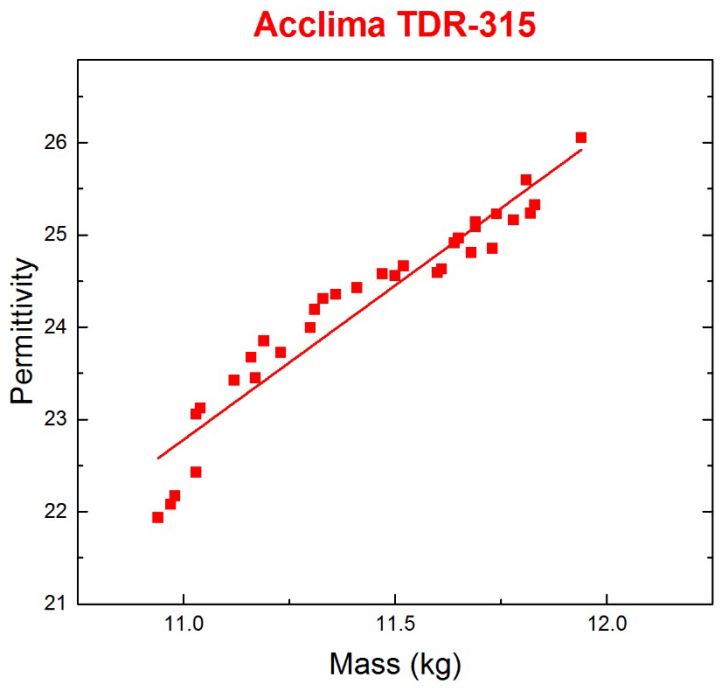
Higher vs Lower Frequency?

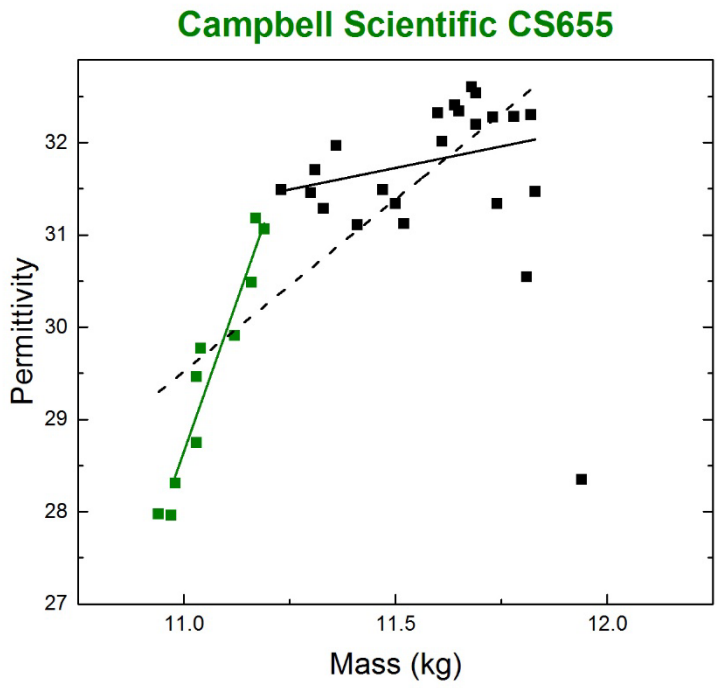


Higher vs Lower Frequency?

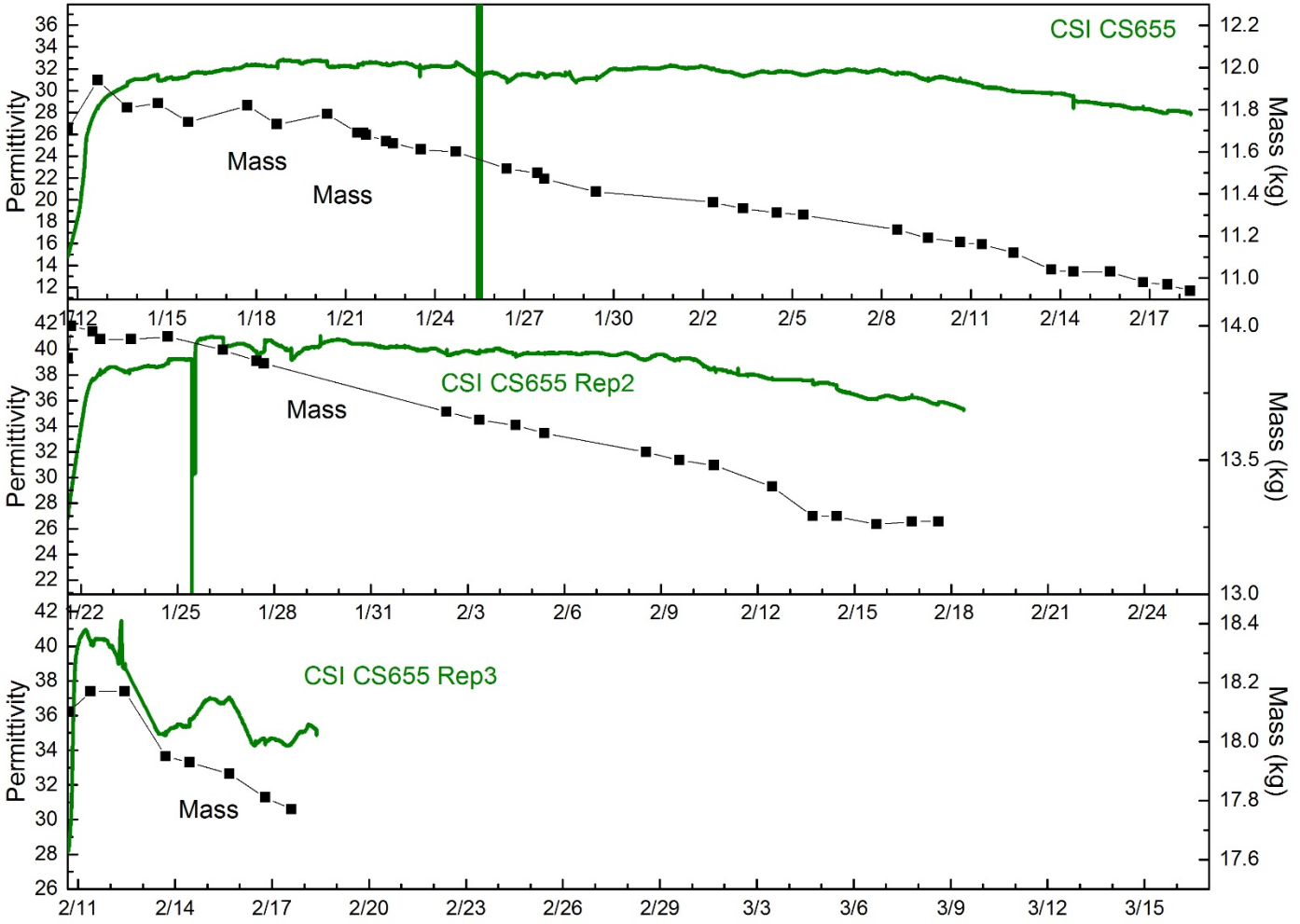


Higher vs Lower Frequency?

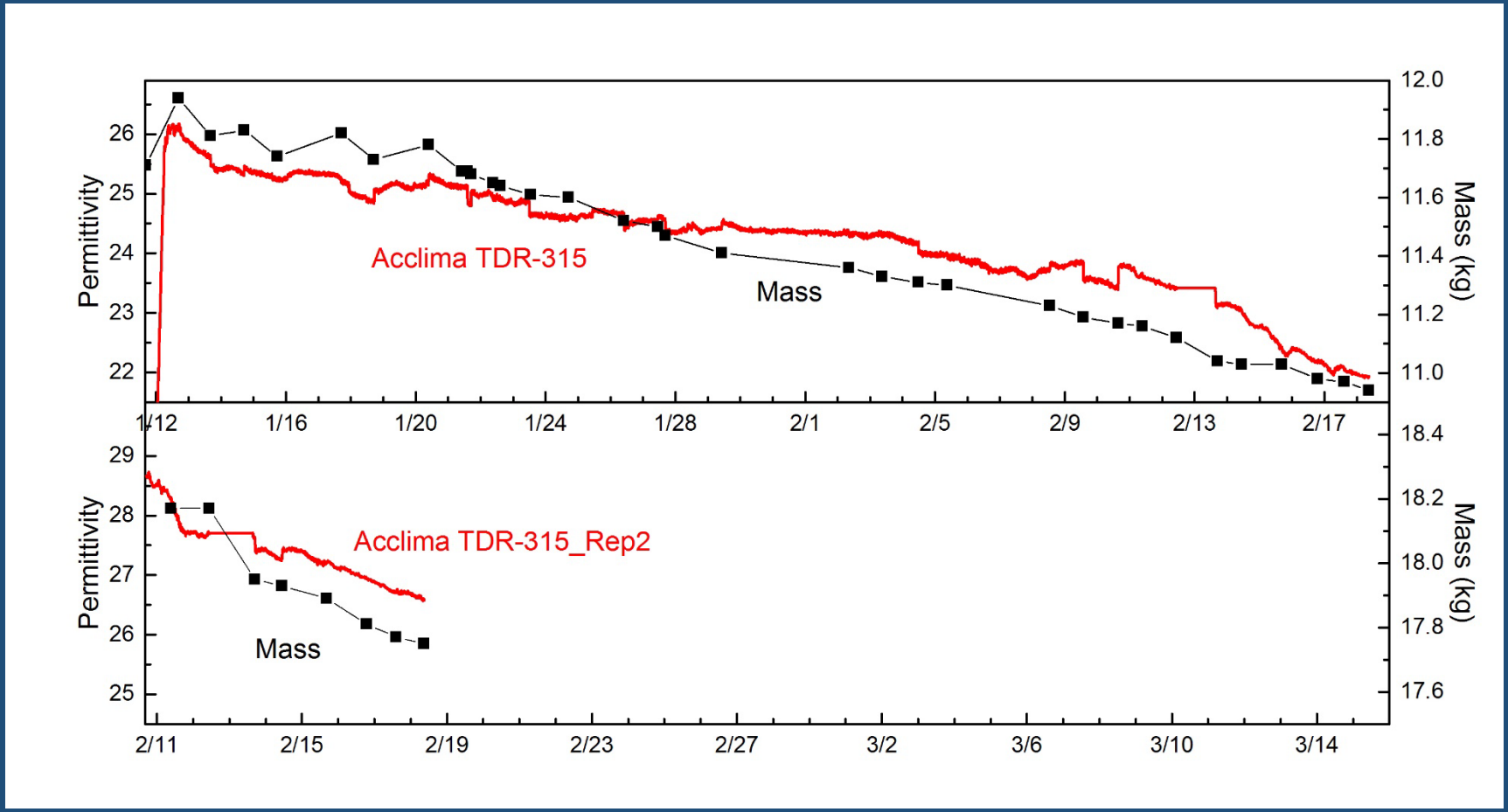




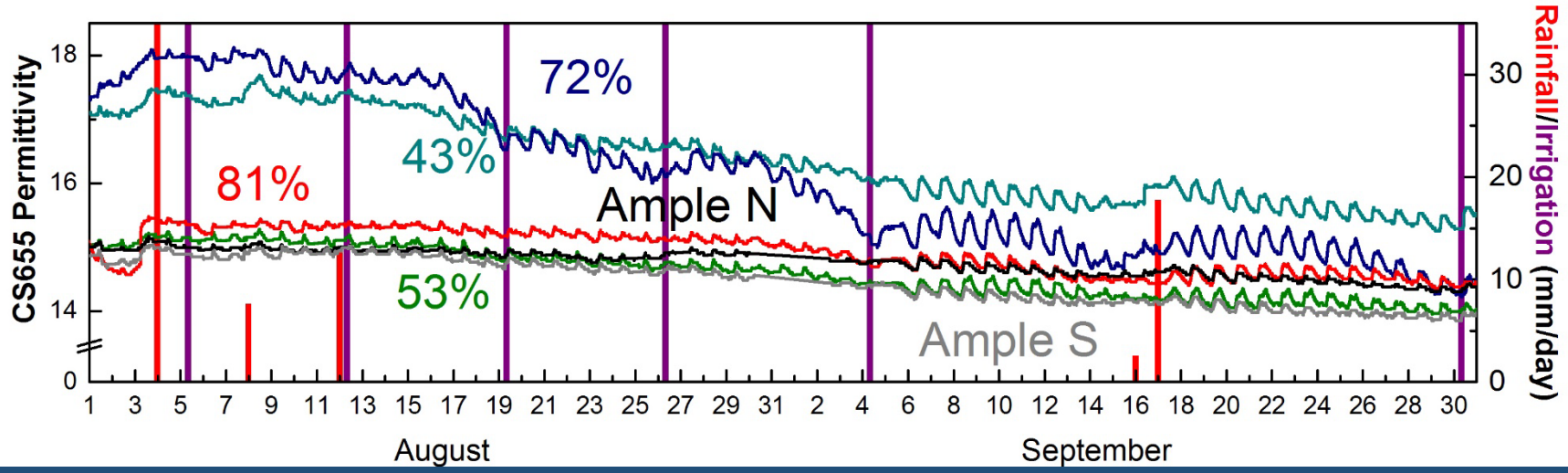
Is it repeatable?



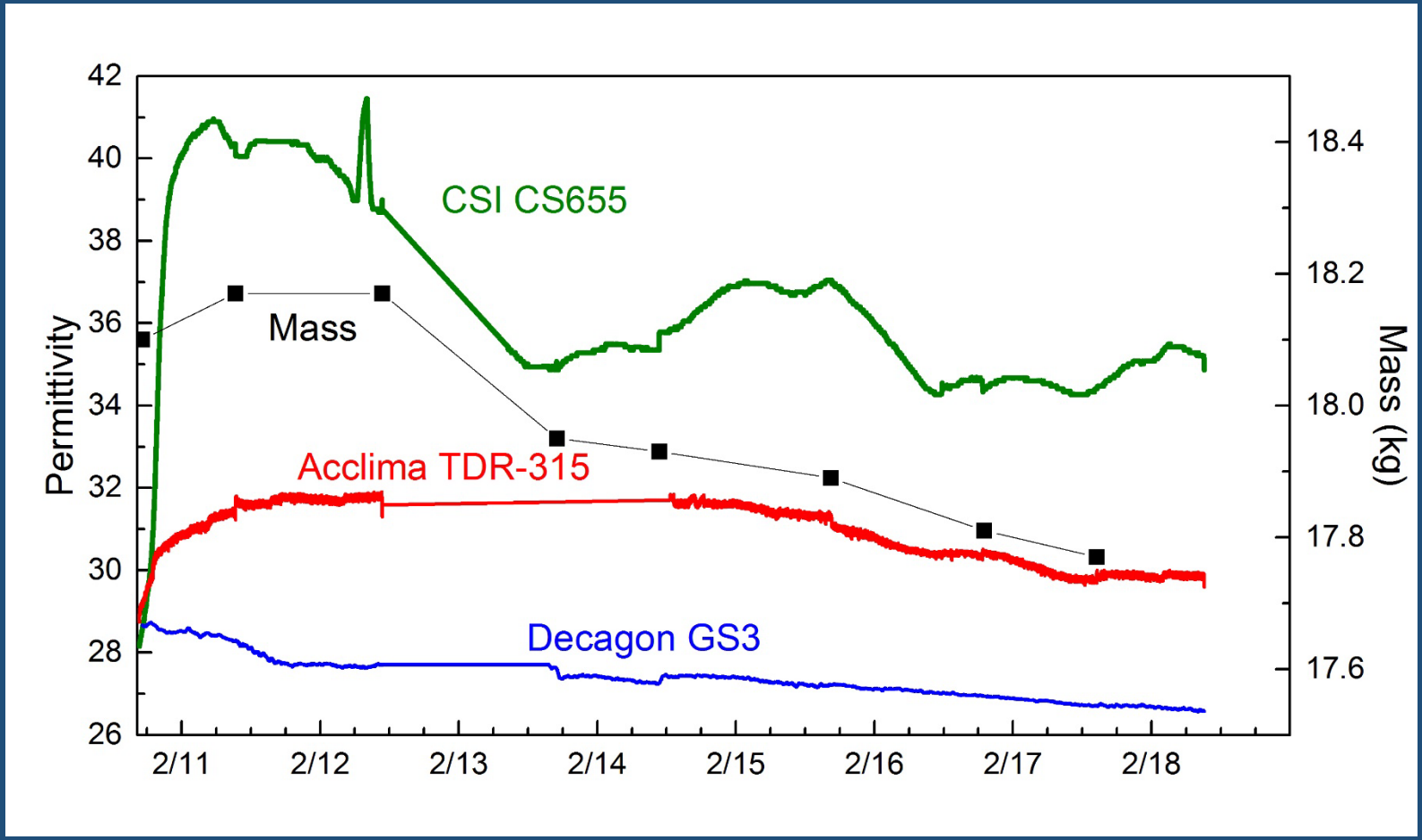
Is it repeatable?



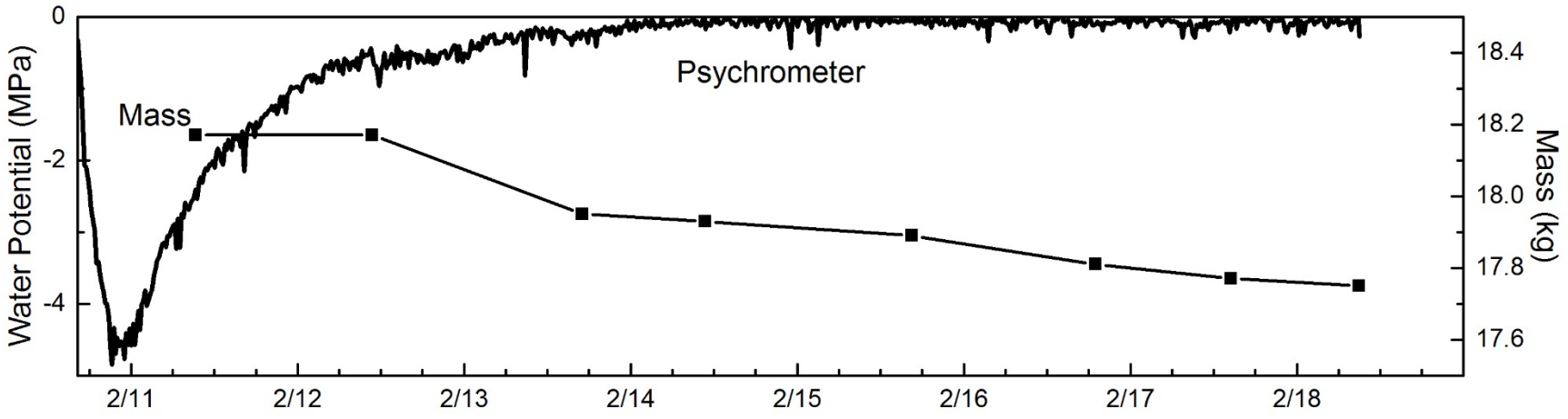
Lower Frequency May Work When Trees are Drier



Latest Work


Permittivity
Mass (kg)
CSI CS655
Mass
Acclima TDR-315
Decagon GS3
42
40
38
36
34
32
30
28
26
18.4
18.2
18.0
17.8
17.6
2/11
2/12
2/13
2/14
2/15
2/16
2/17
2/18

Thermocouple Psychrometry: Another Possibility



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Drip Irrigation: Practical Ways to Increase Crop Production with it's use

Biographical Information:
Jake Harward
Harward Farms
Harwardfarms@hotmail.com
Harwardfarms.com

My wife and myself farm in Springville. We operate Harward Farms sweet corn Inc. Jaker's Jack-o-lanterns and little Hands Farm Camp. I have been farming my whole life and took over ownership in2002 of Harward Farms Sweet Corn. We have 4 children ages 11 to 5, 3 girls and 1 boy. We farm 450acres of Corn, Watermelon, Pumpkins, Tomatoes and other fruits and vegetables. We mostly market our product through roadside stands around the state. We enjoy working together as a family and spending time together.

Session Description:
Installation of Drip
Practical ways to repair drip tape
Parts that work the best
Cost Labor

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Producer Irrigation Management

Biographical Information:
Kelby and Braydon Johnson
Johnson Farms
Johnsonfamilyfarms1@gmail.com
(435) 754-5638

Kelby and Braydon are the 4th generation on the family farm. Both have or are receiving degrees in plant science from Utah State University. Kelby and Braydon both farm full time in Cache Valley raising a variety of vegetable crops, alfalfa and wheat. The farm started over 100 years ago as a dairy and has evolved though the years to a predominately vegetable operation.

Session Description:

An overview and discussion of our farms move from a dairy to vegetable production as well as the successes, challenges etc of such a move and entering the ag world as young beginning farmers.

Johnson Family Farms Produce

Home Grown Natural Goodness

Drip Irrigation On our Farm

What is drip?

What is drip?

What is drip?

What is drip?

What is drip?

What is drip?

What is drip?

- **Accurate application and placement of water**

What is drip?

- Can be slow or fast application of water
- you can put 2” of water on 40 ac of corn in 45 hours

What is drip?

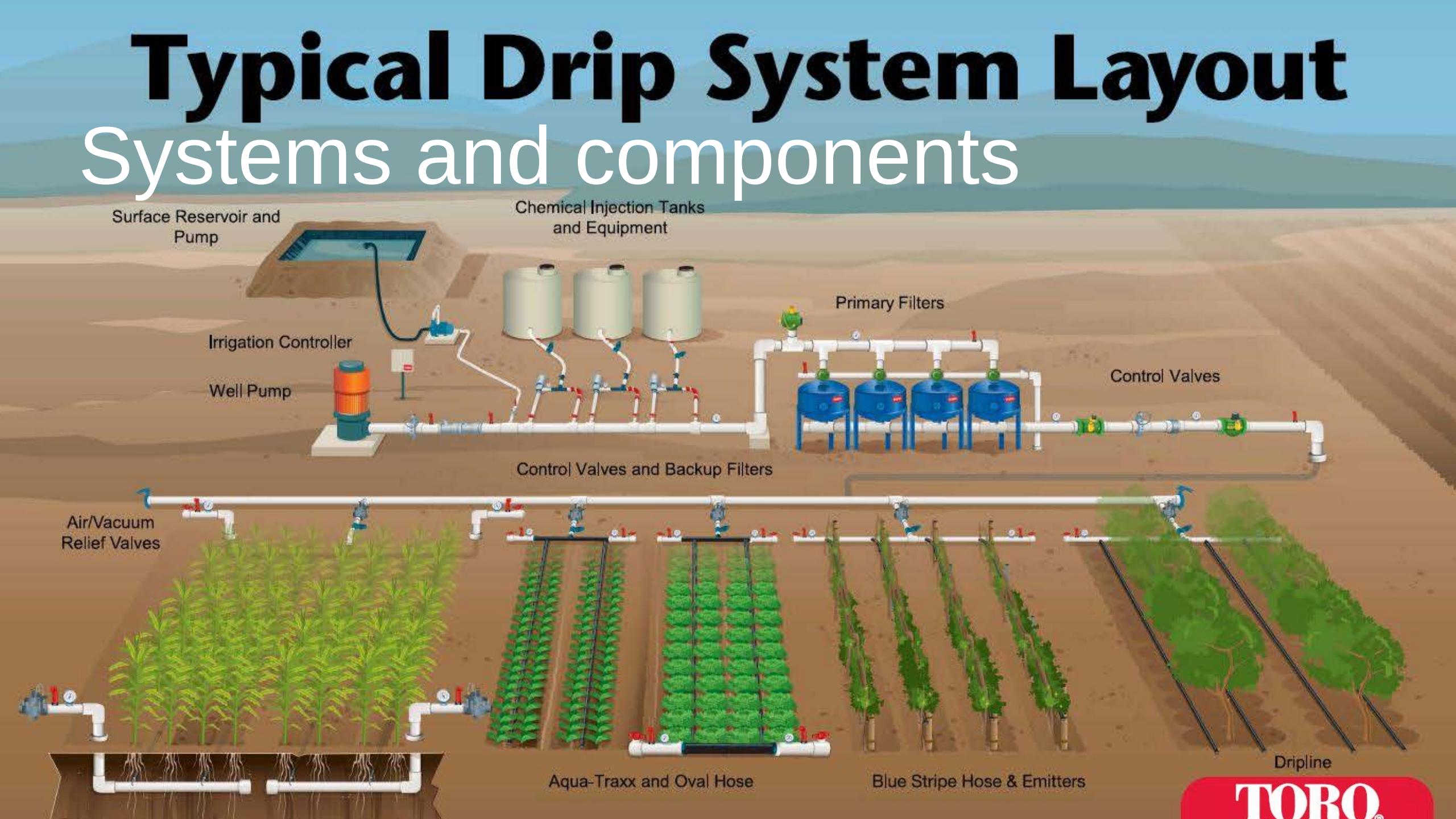
- Accurate application and placement of water
- It can be very uniform and efficient

What is drip?

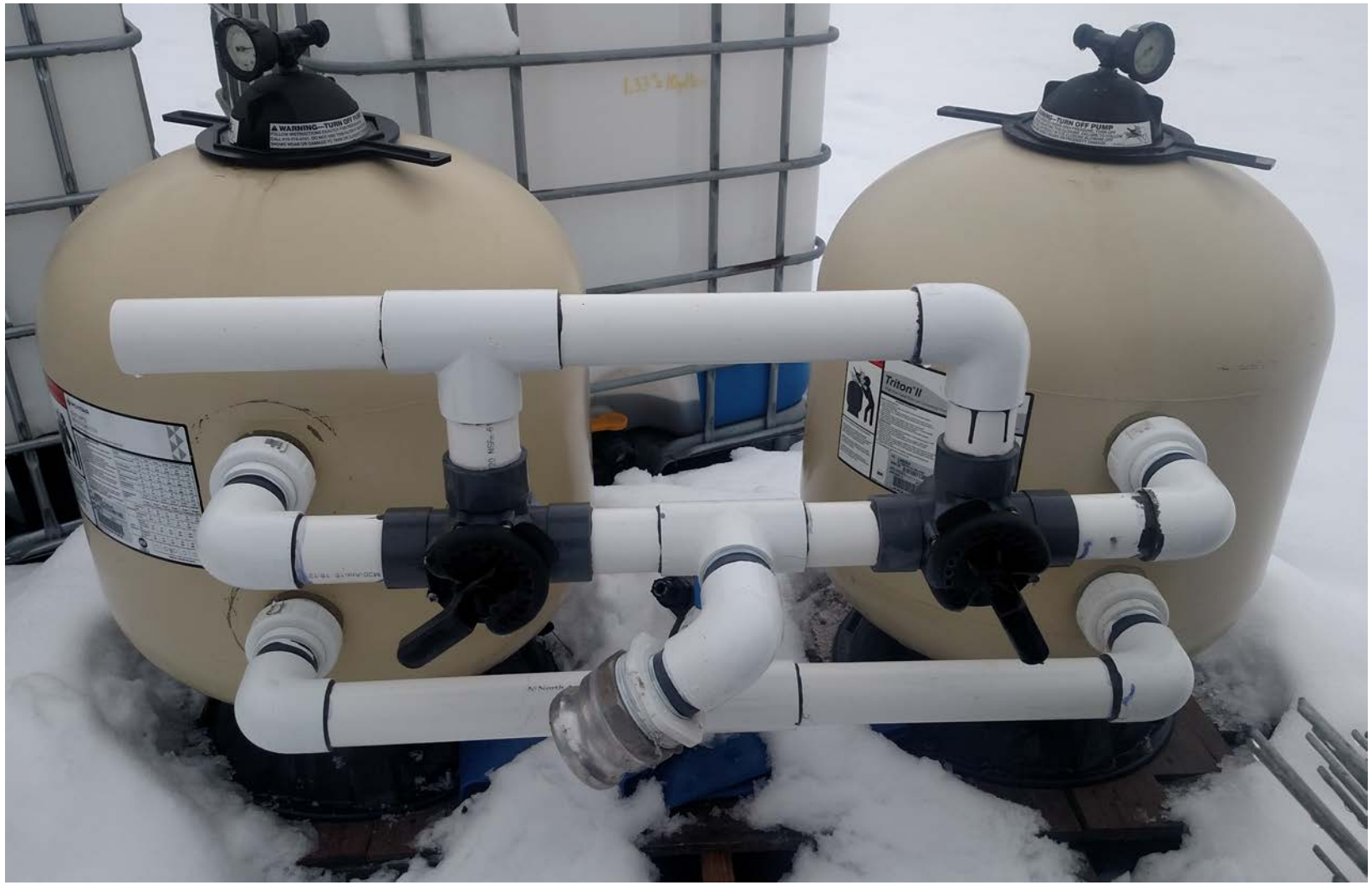
- Comes in tape, lines, micro sprinklers etc

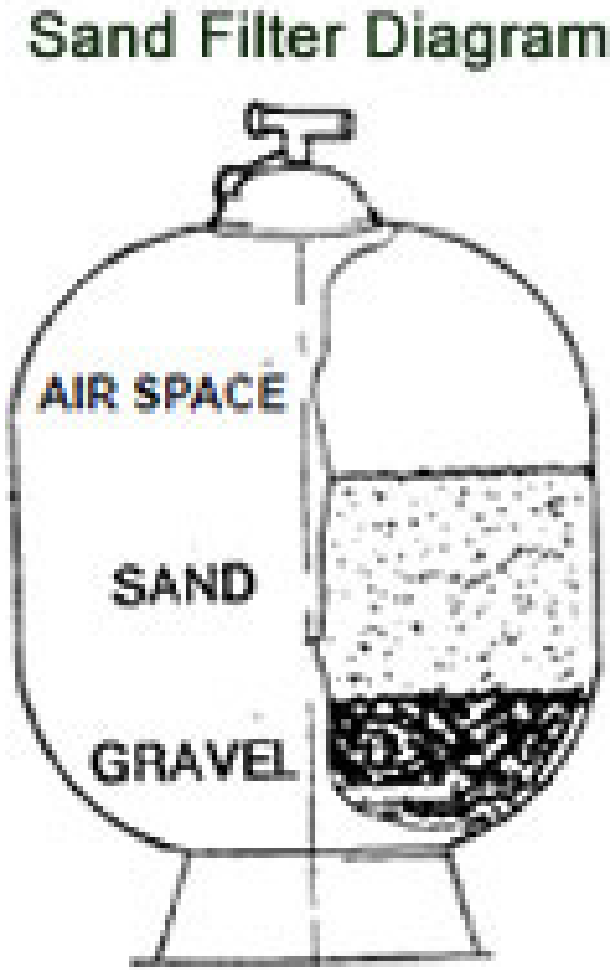
Typical Drip System Layout

Systems and components

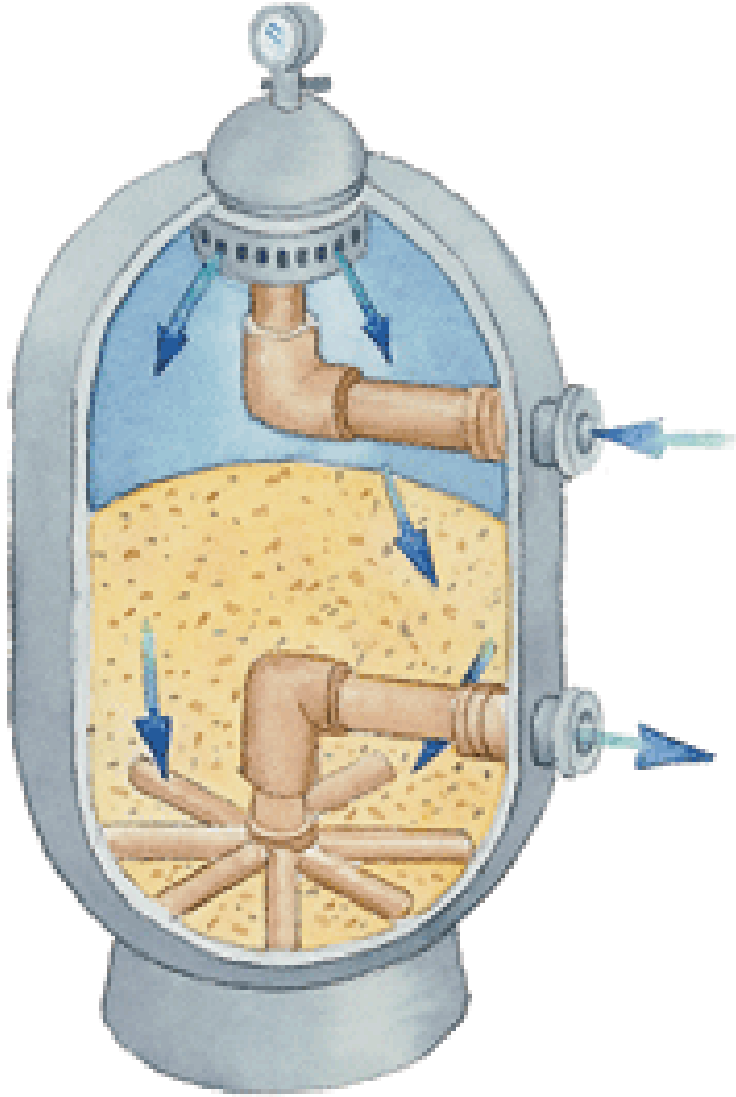


Systems and components

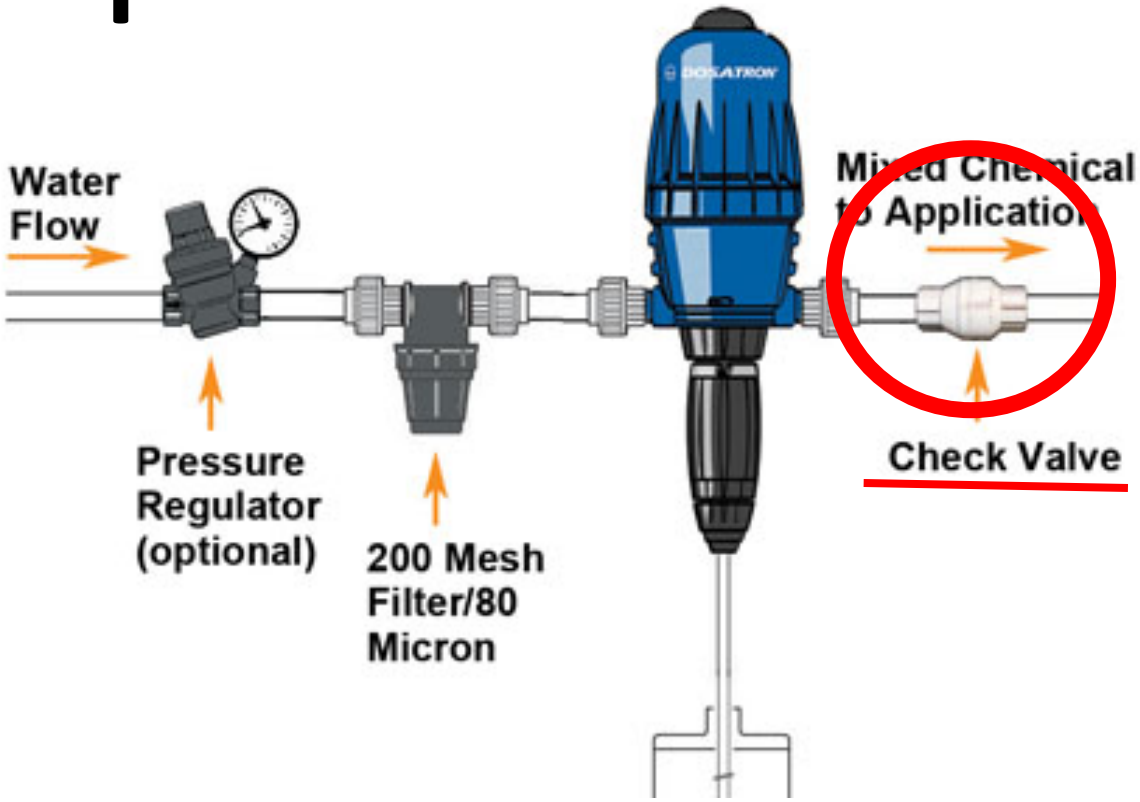




Systems and components



Systems and components



You MUST have a HIGH QUALITY *Spring Loaded* Check Valve on your system!!

Systems and components

Systems and components

Why drip - why/Where did we start?

Why drip - What is it going to do for us?

- Efficient and even watering
- Fertilizer
- Reducing Labor
- Weed reduction

Pros and Cons

Pros

- Accurate and Uniform watering
- Watering efficiency

Pros

- Potential increase of irrigated acres
- Potential reduction in labor during irrigation season

Pros

- Ability to more closely manage irrigation
- Ability to water more acres at a time

Pros

- Potential decrease in disease in crop
- Potentially higher quality of crop

Cons

- Cost – over $400.00 an acre
- More equipment
  - Filters
  - layer
  - lifter
  - retriever
  - pump
  - injector
  - headers
  - pressure regulators
  - valves/fittings

Cons

- Got to get the water clean!
- Generally need to water more often

Cons

- fitting in with water turns etc
- State of Utah precedence for water –

“if you don’t use it you loose it”

Cons

- Can be damaged in installation, during the year (mice bugs mud people equipment etc)
- Can blow away if not under the ground or plastic
- Cleanup at the end of the year

Things to watch out for

Things to watch out for

Thank You

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Orchard Irrigation Management Using Soil Mositure Sensors

Biographical Information:
James Barnhill
Utah State University Extension

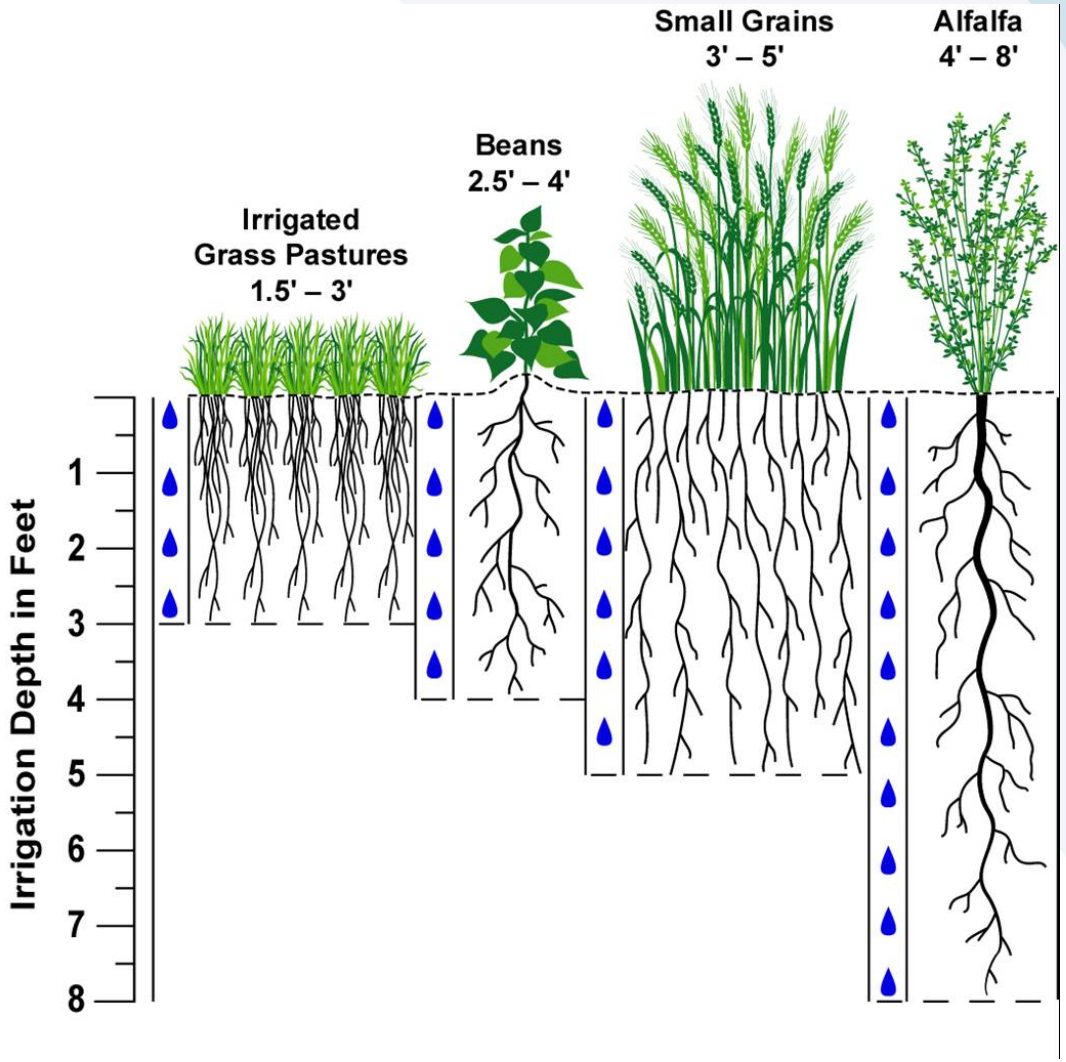
Agriculture Extension Agent for 30 years. Worked with soil moisture management in many crops using feel, tensiometers and WaterMark resistance sensors.

Session Description:

Learn what soil moisture sensors can tell you that will assist in irrigation management decisions.

Pleasantview Orchard
Irrigation

James Barnhill USU Extension
Bruce Liston Pleasantview Orchard



EXTENSION

UtahStateUniversity

Pleasantview Peach Orchard

EXTENSION
UtahStateUniversity

27 Acres in Orchard

Micro-sprinklers

EXTENSION

UtahStateUniversity

WaterMark Sensors

$200

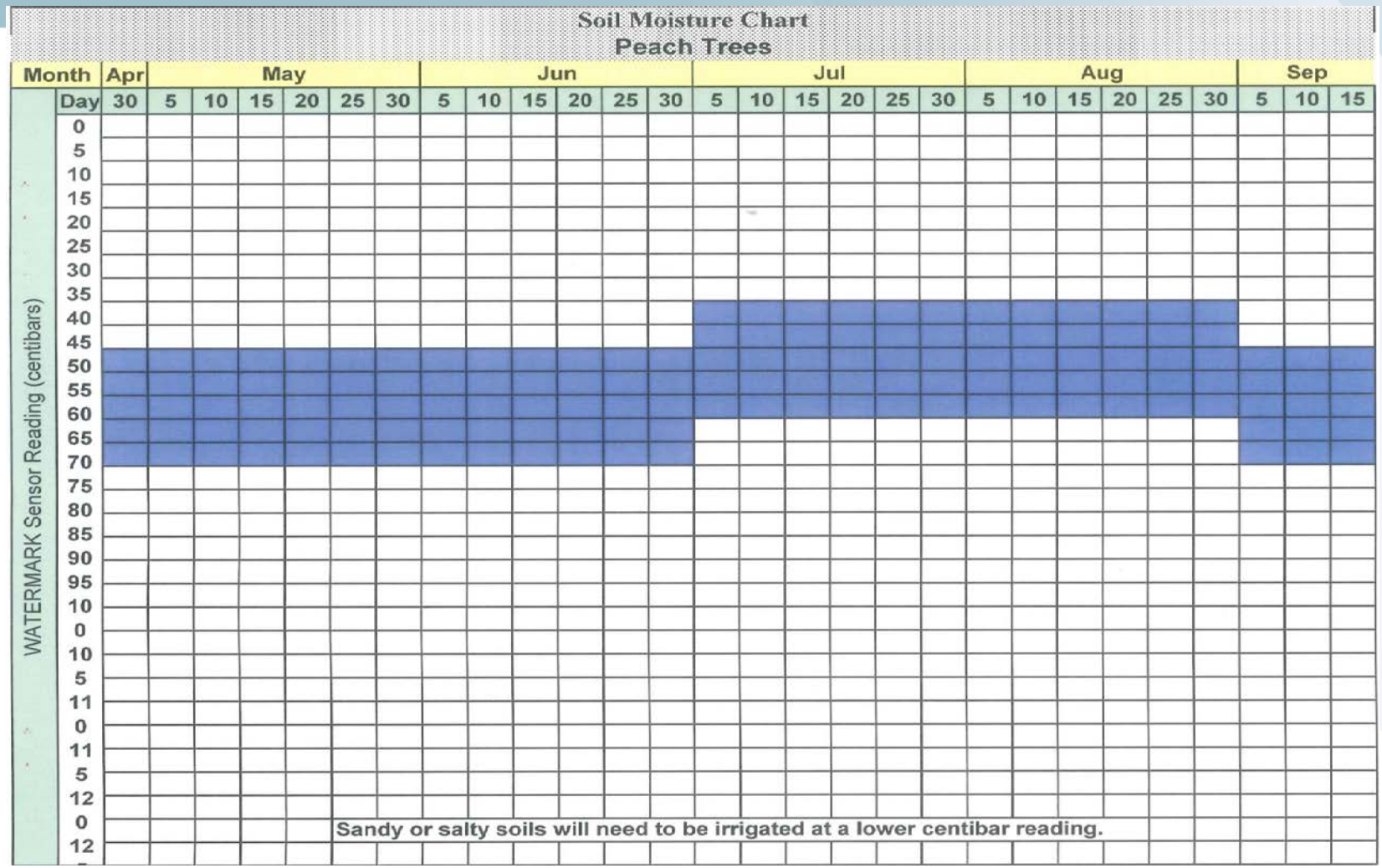
$35

40 sensors

EXTENSION

UtahStateUniversity

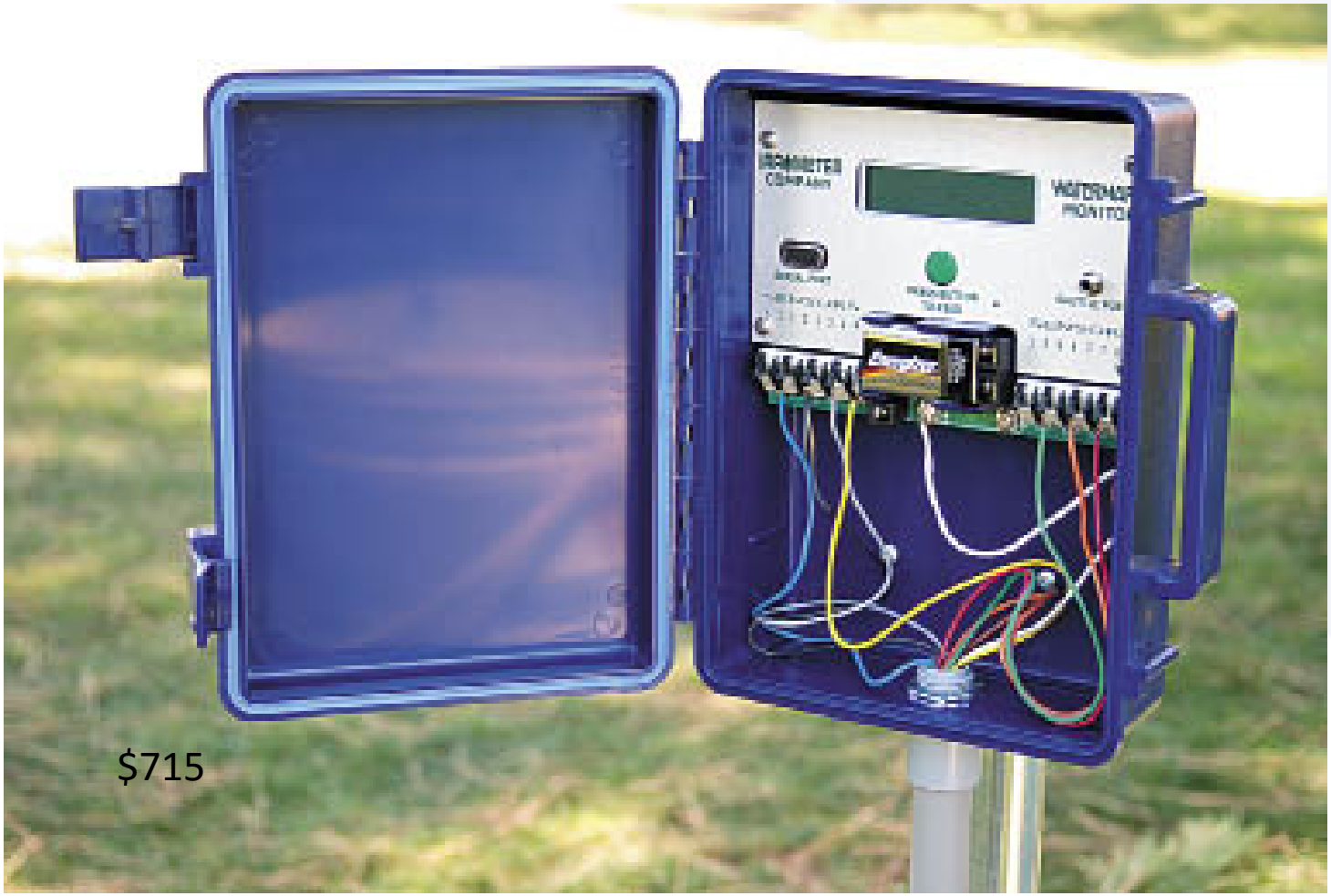
Soil Moisture Chart



EXTENSION

UtahStateUniversity

WaterMark 900M Monitor

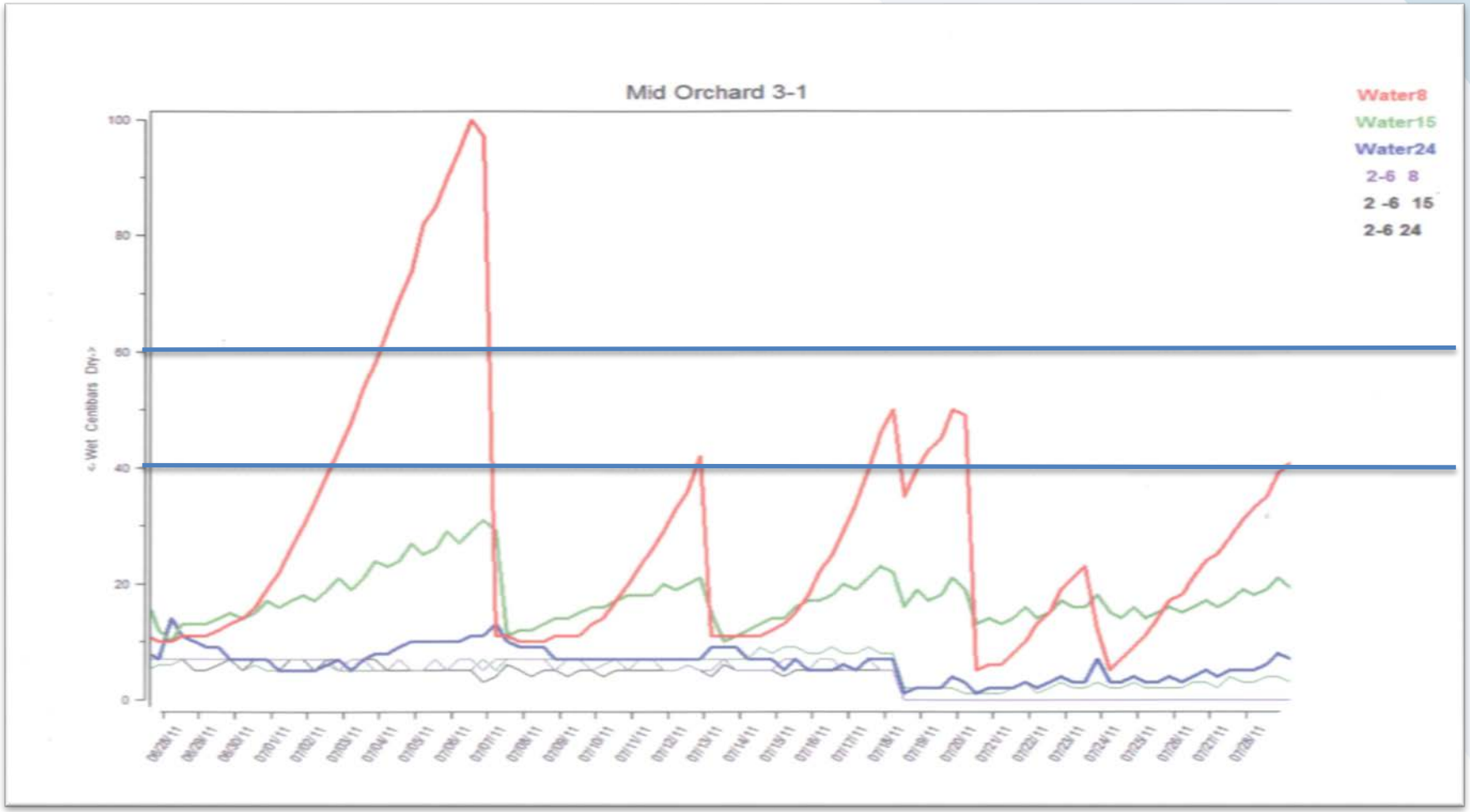


$715

EXTENSION

UtahStateUniversity

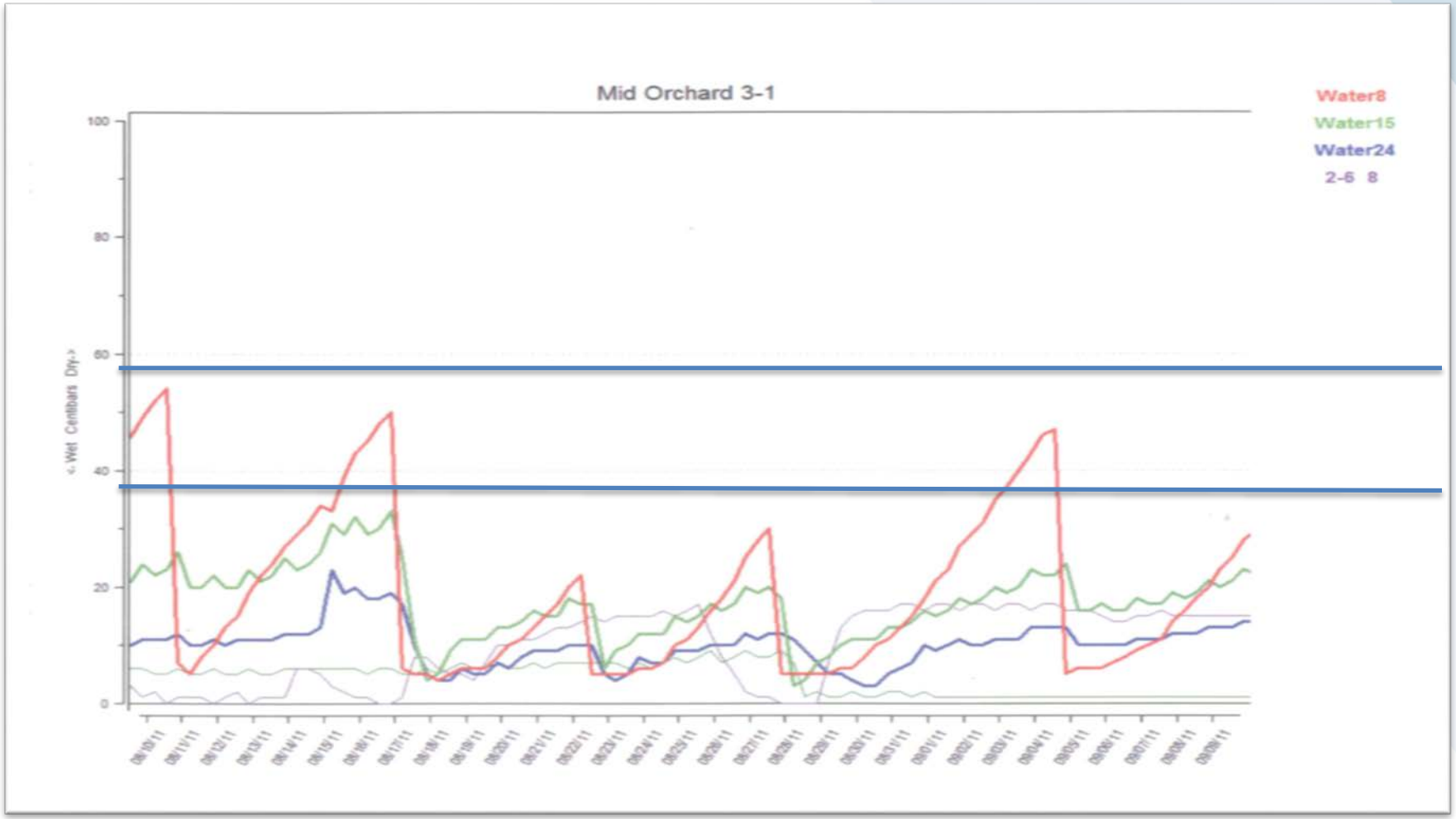
June 28 to July 28, 2011



EXTENSION

UtahStateUniversity

August 10 to September 9



EXTENSION

UtahStateUniversity

High Ground Water

- Many trees with iron deficiencies
- Drained the swampy areas
- Orchard went from 8-10 hours 2X /Week to 8 hours 1X/week or 4 hours, 2X/week
  - Less waterlogged soil
    - Less peach split pit
    - More production

EXTENSION

UtahStateUniversity

EXTENSION
UtahStateUniversity

EXTENSION

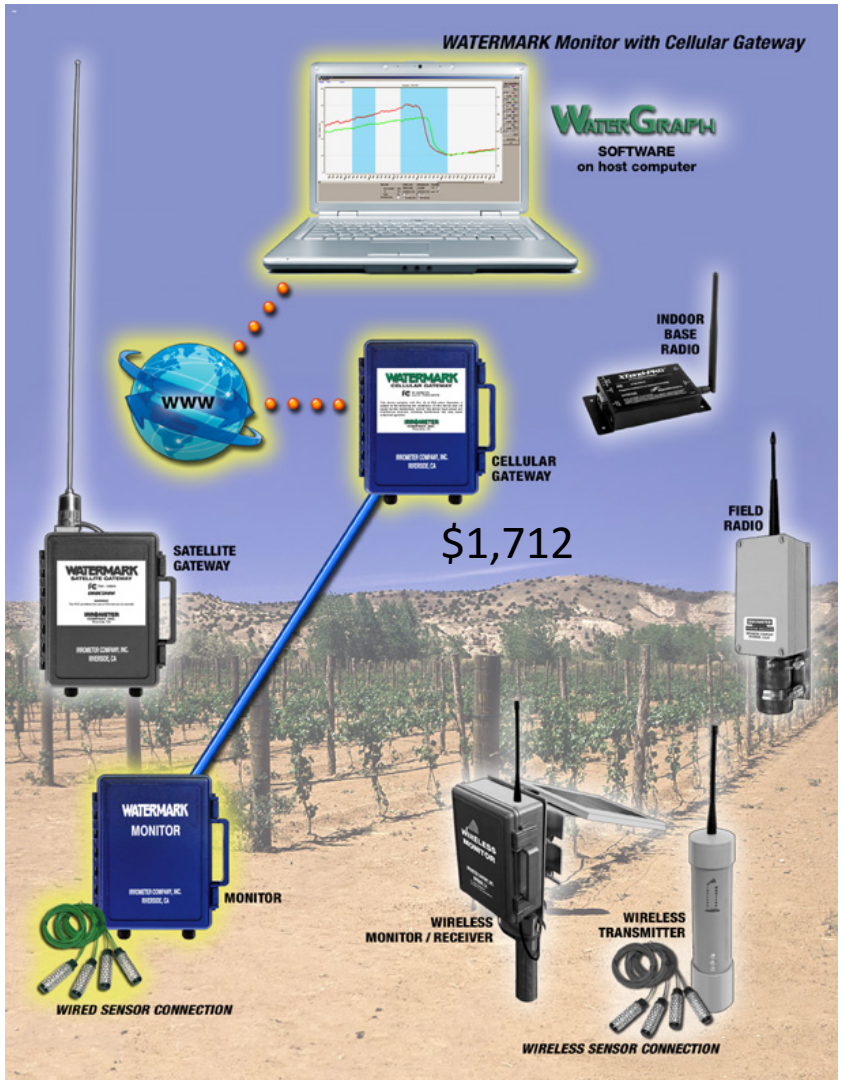
UtahStateUniversity

Reduced water use by 33%

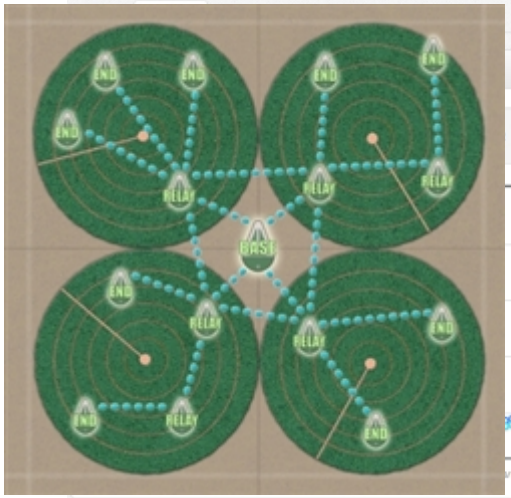
- Used 45 Acre Feet
- Now use 30 acre feet

- Used to water everything the same
  - Now 1 X per week spring and fall
  - 2 X per week summer
  - 3 X per week very hot weather
  - 4 hours per irrigation top orchard, 8 hours per irrigation middle orchard & 2 hours per irrigation bottom orchard

Solar Powered Data Loggers



Each node is capable of reading three soil moisture sensors and a soil temperature sensor, along with inputs for recording irrigation events and rain gauge data. (Max:32 sensing locations)
($100)



$1,350 per Cellular Gateway
$500 per Base Node
$330 per End Node or Relay Node

UtahStateUniversity

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Organic Farm Plans – Getting the Rows Aligned

Biographical Information:
Dr. Dan Drost
Utah State University

Dan Drost grew up on a small diversified farm in western Michigan. He graduated from Michigan State University with a BS and MS degrees in Horticulture. In 1983, he moved to New Zealand to teach Horticulture. He returned to the US to pursue his PhD in 1987 which was awarded in 1991 from Cornell University in Vegetable Crops and Plant Physiology. He arrived at Utah State University in January 1992 to work as the Extension Vegetable Specialist for Utah. Dan is interested in small farm production systems, organic agriculture (helped get USU's Organic Program going), focuses on the creation of efficient farm systems, and how intensive land-use management impacts the productivity and economic activities of vegetable farms.

Session Description:

If you're really interested in farming organically, you should get the farm certified. In this session, Dan Drost will wander through what information is required, how certifying agencies evaluate the farm, and how to create a farm plan that meets the National Organic Programs requirements. The presentation will provide real examples from the USU Organic Farm and layout the steps required to "transition" your farm operation from "conventional" to "certified" organic. It really isn't too hard so let's get started.

ORGANIC FARM PLANS

Getting the Rows Aligned

Dan Drost (USU)
Professor of Horticulture
Extension Vegetable Specialist

GO TO PLACES:

Organic Farming Certification

http://ag.Utah.gov/plant-pests/organic-certification.html

Guidelines of Producers: visit National Center for Appropriate Technology (NCAT)

https://attra.ncat.org/index.php

- Look at crops or market farm plans

National Center for Appropriate Technology (NCAT) Forms, Templates, Descriptions

ATTRA

RMA

Forms, Documents, and Sample Letters for Organic Producers

A Publication of ATTRA, the National Sustainable Agriculture Information Service • 1-800-346-9140 • www.attra.ncat.org

By George Kuepper, NCAT Agriculture Specialist; Jim Riddle and

Organic farmers and ranchers must provide a wide range of documents to retain certification by the National Organic Program. This publication provides sample copies of some common forms, letters, maps, and other documents in current use.

The Purpose and Use of These Forms and Documents

This publication contains draft letters, forms, and other documents that can aid producers in obtaining organic certification and remaining in compliance with the National Organic Standard. We are grateful to Organic Independents, Indiana Certified Organic, and the Minnesota Department of Agriculture for granting per-

mission to reprint and ad
als. Feel free to copy or a
documents to meet your n

This set of forms and do
the following.

A. Land Use History Ver
verify that land has n
cations of prohibited
previous 36 months.
when you have rented
for less than 36 month
the landlord or previo
out and sign the form.

Related ATTRA Publications

Organic System Plans: Market Farms and Greenhouses

NCAT ATTRA

This document was developed in 2006 by the National Center for Appropriate Technology (NCAT) with funds provided by the USDA National Organic Program (NOP). It provides a realistic example of an organic system plan based on best interpretations of the National Organic Standard by NCAT and a team of representatives from the wider organic community. It is not an official NOP document and should not be treated as such. Distribution is provided by NCAT's ATTRA - National Sustainable Agriculture Information Service project.

Organic System Plans: Field and Row Crops and Pasture and Range Systems

NCAT ATTRA

This document was developed in 2006 by the National Center for Appropriate Technology (NCAT) with funds provided by the USDA National Organic Program (NOP). It provides a realistic example of an organic system plan based on best interpretations of the National Organic Standard by NCAT and a team of representatives from the wider organic community. It is not an official NOP document and should not be treated as such. Distribution is provided by NCAT's ATTRA - National Sustainable Agriculture Information Service project.

ORGANIC CERTIFICATION PROCESS

1) Application submitted to a certifier
2) Certifier reviews application
3) Farm Inspection (each year)
4) Inspection report generated
5) Certifier issues Organic Certificate

WHO NEEDS CERTIFICATION?

- Utah state law requires that products making organic claims must be from certified organic sources.
- Operation that sells “organic produce” but whose gross ag income from organic sales totals $5,000 or less annually are exempt **BUT** must comply with the applicable organic production and handling requirements.
- IDEALLY: If your interested in selling organic produce, **GET CERTIFIED**

WRITING YOUR PLAN

Organic System Plans:
Market Farms and Greenhouses

NCAT

ATTRA

This document was developed in 2006 by the National Center for Appropriate Technology (NCAT) with funds provided by the USDA National Organic Program (NOP). It provides a realistic example of an organic system plan based on best interpretations of the National Organic Standard by NCAT and a team of representatives from the wider organic community. It is not an official NOP document and should not be treated as such. Distribution is provided by NCAT's ATTRA - National Sustainable Agriculture Information Service project.

SECTION 1: General information — **NOP Rule 205.401**

Name	Farm name		Type of farm/crops
Andy & Suzi Wannabee	Wannabee's Organic Farm		Horticultural crops & greenhouse production
Address	**City**		**For office use only**
123 Shady Hollow Road	Oak Tree		Date received
State	**Zip code**	**Date**	Date reviewed
Arkansas	72700	2/28/06	Reviewer initials
Phone	**Fax** 479-581-0000		Fees received
479-581-0000	**Email** asnaturéintended@natural.net		Inspector

Legal status ☑ Sole proprietorship ☐ Trust or nonprofit ☐ Corporation ☐ Cooperative
☐ Legal partnership (federal form 1065) ☐ Other (specify)

Year first certified	List previous organic certification by other agencies	List current organic certification by other agencies	Year when complete Organic Farm Plan Questionnaire was last submitted
1993	Mid-South Organics (1993-2000) Ozark Organic Certification Services (2001-present)	None	2001

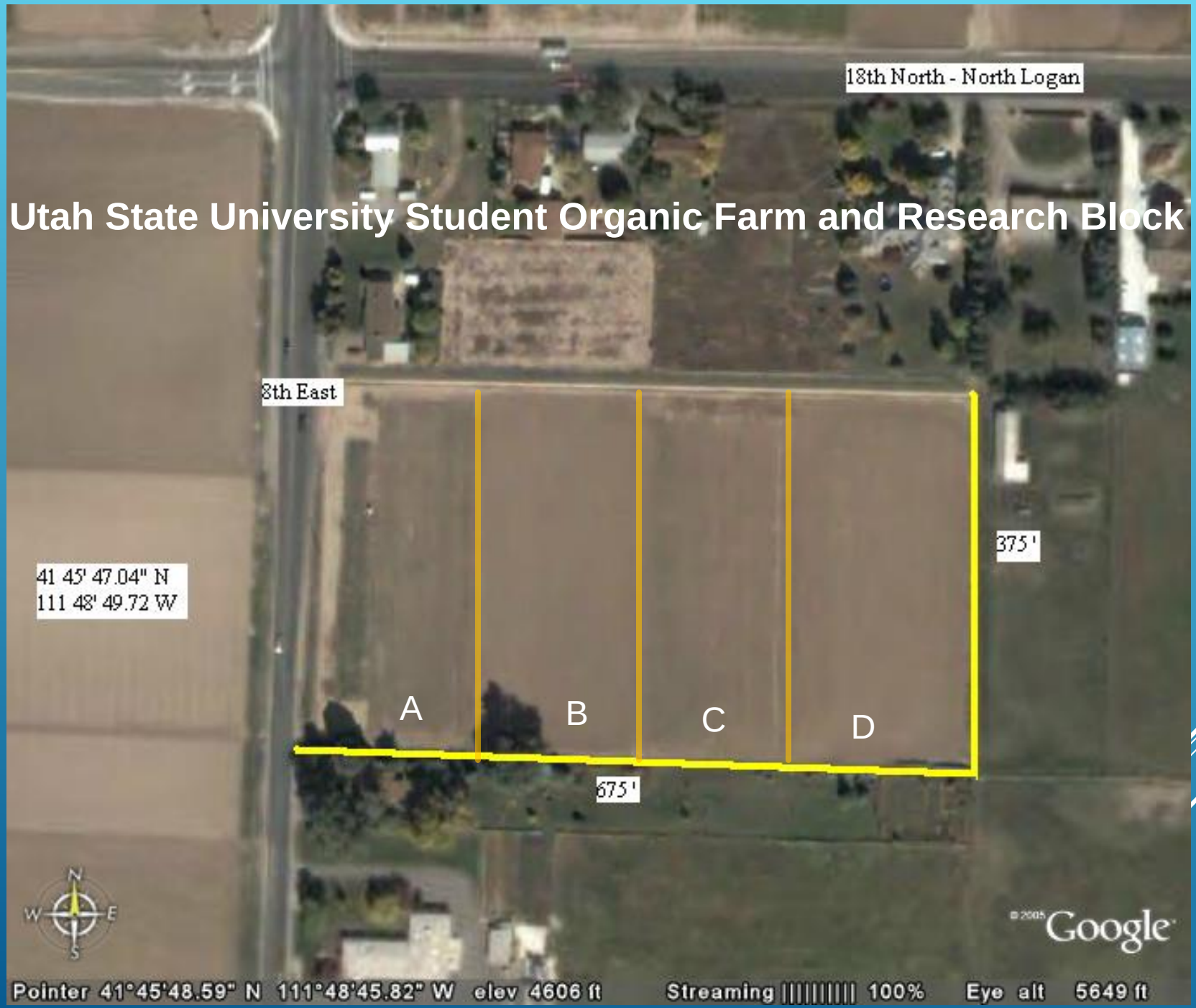
List all crops or products requested for certification.

Vegetables, small fruits, vegetable transplants

Have you ever been denied certification?	If yes, describe the circumstances:
☑ Yes ☐ No	In 1992, my first application for certification was denied by Mid-South Organics because of prior use of prohibited potassium chloride.

Do you understand the current organic standards?		
☑ Yes ☐ No	Do you have a copy of current organic standards?	☑ Yes ☐ No
	Do you have a copy of current OMRI Materials List?	☑ Yes ☐ No

Utah State University Student Organic Farm and Research Block



SECTION 2: Farm plan information — **NOP Rules 205.201(a) and 205.202(a) and (b)**

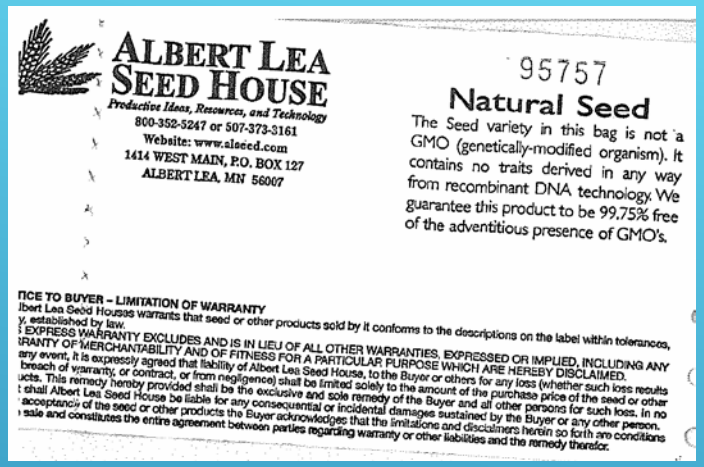
Please complete the table below and attach updated field history sheets that show all fields [organic (O), in transition (T) or conventional (C)], field numbers, acres, crops planted, projected yields, and inputs applied. The acreages listed in this table must equal field histories and maps. Pastures are considered a crop and must be listed on each form. At least 36 months of histories are required for all fields.

CROPS REQUESTED FOR CERTIFICATION	FIELD NUMBERS	TOTAL ACRES PER CROP	PROJECTED YIELDS (VOLUME)
Summer squash	A-1	0.25	7,500 lbs
Winter squash	B-1	0.25	9,500 lbs
Spring mixed leafy greens	B-1	0.25	1,700 lbs
Fall mixed leafy greens	A-5	0.25	1,700 lbs
Sweet potatoes	A-2	0.25	5,000 lbs
Onions	B-2	0.10	3,000 lbs
Carrots	B-2	0.10	3,000 lbs
Beets	B-2	0.05	900 lbs
Green beans	A-3	0.25	2,100 lbs
Southern peas	B-3	0.25	2,200 lbs
English peas	A-5	0.25	750 lbs
Cucumbers	B-5	0.25	5,000 lbs
Tomatoes	A-4	0.25	5,000 lbs
Peppers	B-4	0.20	3,600 lbs
Eggplant	B-4	0.05	1,000 lbs
Broccoli	A-6, B-6	0.30	3,000 lbs
Cabbage	A-6, B-6	0.20	5,000 lbs
Decorative corn	B-7	0.25	3,900 ears
Potatoes	A-8, B-8	0.50	14,000 lbs
Okra	A-7	0.25	2,500 lbs
Sweet corn	S-6	1.00	1,300 dozen
Strawberries	S-1, S-2, S-3	3.00	12,000 lbs
Wild-harvest ginseng	F	6.50	350 lbs
Vegetable transplants	Greenhouse A	700 sq. ft.	1,250 6-plant flats (sale only)

Have you managed all fields for three or more years? ☐ Yes ☑ No

If no, you must submit signed statements from the previous manager stating the use and all inputs applied during the previous three years on all newly rented or purchased fields.

Are all fields requested for certification located at the main address listed in Section 1? ☐ Yes ☑ No



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Website: www.alseed.com
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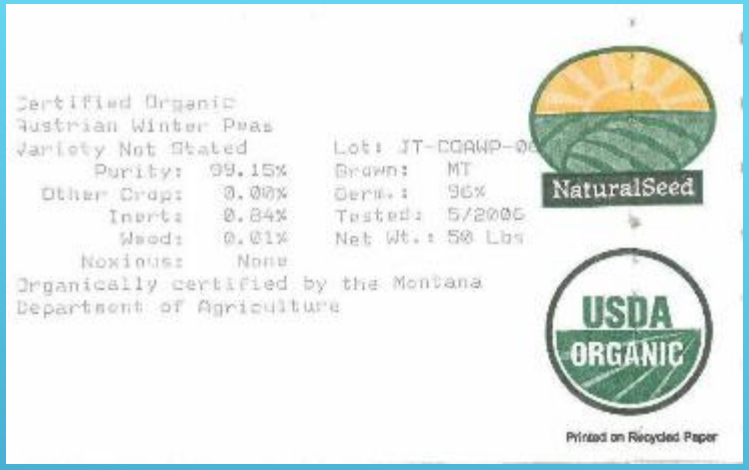


Certified Organic
Austrian Winter Peas
Variety Not Stated
Purity: 99.15%
Other Crop: 0.00%
Inert: 0.84%
Weed: 0.01%
Noxious: None
Lot: JT-COAWP-0
Grown: MT
Germ.: 96%
Tested: 5/2006
Net Wt.: 50 Lbs
Organically certified by the Montana Department of Agriculture

NaturalSeed

USDA ORGANIC

Printed on Recycled Paper

SECTION 3: Seeds and seed treatments — **NOP Rule 205.204**

NOP Rule requires the use of organically grown seeds, unless the variety is not commercially available. If using nonorganic seeds, you must have records of your attempts to source organic seed. Synthetic seed treatments are prohibited unless included on the National List. Genetically engineered or modified (GMO) seeds and inoculants are prohibited in organic production. NOP Rule uses the phrase "excluded methods" to refer to GMO products. Please save all seed and inoculant labels, and documentation of commercial unavailability of organic seeds to show the inspector.

List all seeds used or planned for use in the current season. Check the appropriate boxes and provide other information as needed. Attach additional sheets if necessary.

☐ No seeds used ☐ All seeds are organic ☑ Some untreated seed used ☑ No GMO seeds purchased/planted

SEED/VARIETY/BRAND	ORGANIC (✓)	UNTREATED (✓)	TREATED (✓)	GMO (✓)	TYPE/BRAND OF TREATMENT FUNGICIDE	TYPE/BRAND OF TREATMENT INOCULANT	WHAT ATTEMPTS DID YOU MAKE TO USE ORGANIC/UNTREATED SEED?
Zuchini Elite F1	√						
Multipik F1	√						
Golden Scaloppini	√						

SECTION 4: SEEDLING/PERENNIAL STOCK SOURCES

SECTION 4: Source of seedlings and perennial stock — **NOP Rule 205.204**

Annual seedlings must be produced according to organic standards. Nonorganic perennial plants (planting stock) must be managed organically for at least one year prior to harvest of crop or sale of the plant as certified organic planting stock. Organic seedlings and planting stock must be used if commercially available. Contact the certifying agent if you need to use non-organic seedlings because of an emergency. A prohibited treatment may be used if such treatment is a federal or state phytosanitary requirement.

A. DO YOU PURCHASE ORGANIC SEEDLINGS? ☐ Yes ☑ No ☐ Not applicable

Who are the suppliers?

If certified, by which agents?

Do you purchase non-organic seedlings? ☐ Yes ☑ No

If yes, state why and describe your attempts to purchase organic seedlings.

B. IF YOU GROW ORGANIC SEEDLINGS ON-FARM: ☐ Not applicable

What type and size is your greenhouse?

2 old-style glass houses. Each is 20ft X 80ft.

Do you raise potted plants or plant crops directly in the ground in the greenhouse?

Everything grown in pots and/or transplant trays.

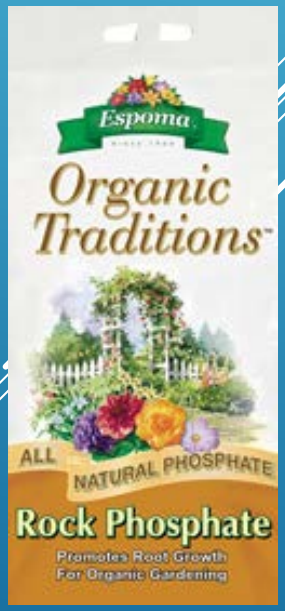
List all soil mix ingredients, fertility products, foliar sprays, and/or pest and disease inputs used or planned for use in your organic greenhouse operation. *Attach labels or have labels available for inspection, as applicable.*

PRODUCT	BRAND NAME OR SOURCE	STATUS: APPROVED (A) RESTRICTED (R) PROHIBITED (P)	IF RESTRICTED, DESCRIBE COMPLIANCE WITH NOP RULE ANNOTATION	CHECK IF GMO (✓)
Compost	Made on-farm	A		
Leaf mold	Made on-farm	A		
Sphagnum peat moss	Black Gold Peat Moss	A		
Ag-lime	SFA	A		
Dolomite lime	Bonide	A		
Blood meal	Bonide	A		
Bone meal	Bonide	A		
Sharp sand	Arkansas Builder's Supply	A		
Fish emulsion	Alaska Fish 5-1-1	A		
Kelp extract	Maxicrop Soluble Powder 1-0-4	A		
Insecticidal soap	M-Pede	R	Will be used only if an outbreak occurs. Use yellow sticky cards for monitoring.	
Diatomaceous earth	Perma-Guard	A		
Bordeaux mix	Bonide	R	Will use only if scouting reveals evidence of disease. Copper accumulation not a greenhouse issue.	
Chlorine bleach	Wal-Mart	R	Rinse all surfaces with clear well water following chlorine treatment.	

What equipment do you use in your watering system?
Hand watering using hose and spray wand.

How do you prevent seedling diseases and/or insect problems?
We make our own clean soilless potting mix. Re-usable trays and pots are sanitized with chlorine. Control airflow. Release lace-wing predators.

SECTION 5: SOIL & CROP FERTILITY



SECTION 5: Soil and crop fertility management — **NOP Rule 205.203 and 205.205**

A. GENERAL INFORMATION AND EVALUATION:

What are your general soil types? Sandy loam

What are your soil/nutrient deficiencies? ☐ No deficiencies

Soil is naturally low in pH, low in organic matter, and deficient in most nutrients. The land we have had in production for many years is now well-supplied with nutrients. However, we have an excess of phosphate which has led to a zinc deficiency.

How do you monitor the effectiveness of your fertility management program? ☑ soil testing

☐ microbiological testing ☑ tissue testing ☑ observation of soil ☑ observation of crop health

☑ comparison of crop yields ☐ crop quality testing ☐ other (specify)

Attach copies of available test results. See attached.

How often do you conduct fertility monitoring? ☐ weekly ☐ monthly ☑ annually ☑ as needed

☐ other (specify) Soil test every year on rotations. Will soil test annually on blueberries and tissue test as needed beginning in 2006.

Rate the effectiveness of your fertility management program. ☐ excellent ☐ satisfactory ☑ needs improvement

What changes do you anticipate? Will no longer be using poultry litter due to high phosphorus accumulation and concern over arsenic. Will use more feathermeal when nitrogen is needed. Looking for alternative feedstocks for on-farm compost production; have found a source of horse manure, but quantities are limited.

What are the major components of your soil and crop fertility plan?

☑ crop rotation ☑ green manure plowdown/cover crops ☐ interplanting ☐ incorporation of crop residues

☐ subsoiling ☐ summer fallow ☑ compost ☐ on-farm manure ☑ off-farm manure ☑ soil amendments

☐ side dressing ☑ foliar fertilizers ☐ biodynamic preparations ☐ soil inoculants ☑ other (specify)

legume inoculants

B. COMPOST USE:

NOP Rule 205.203(c)(2) requires that the composting process include a C:N ration of between 25:1 and 40:1 and maintenance of temperatures between 131°F and 170°F for a specific number of days, depending on the method of composting. Keep a compost production record to verify compliance.

List all compost ingredients/additives. ☐ Not applicable

Horse manure w/straw bedding, rotted hay, feathermeal, gravel dust, Pfeiffer's Bio-dynamic Compost Starter

What composting method do you use? ☐ in-vessel ☑ static aerated pile ☐ windrows ☐ other (specify)

What is your C:N ratio?

We try to keep the starting C:N at about 30:1.

Do you monitor temperature? ☑ Yes ☐ No

If yes, what temperature is maintained. *We ensure that the temperature reaches the required range of 131°-170°F.*

How long is this temperature maintained?

We make sure it holds the required temperature for at least for 3 days as required. A log is maintained.

If compost is windrowed, how many times are materials turned?

Not applicable.

C. MANURE USE:

NOP Rule 205.203(c)(1) requires that raw manure be fully composted unless applied to fields with crops not for human consumption or incorporated into the soil 120 days prior to harvest for crops whose edible portions has direct contact with the soil, or 90 days prior to harvest for all other crops for human consumption.

SECTION 6: CROP MANAGEMENT

- WEEDS/INSECTS/DISEASES

SECTION 6: Crop management	NOP Rules 205.205 and 205.206

NOP Rule requires a crop rotation plan that maximizes soil organic matter content; prevents weed, pest, and disease problems; and manages deficient or excess plant nutrients. Your crop rotation may include sod, cover crops, green manure crops, and catch crops. Producers must utilize sanitation measures to remove disease vectors, weed seeds, and habitat for pests. Cultural practices, including selection of plant species and varieties adapted to site-specific conditions, must be used to enhance crop health.

A. CROP ROTATION PLANS: (Use one line for each rotation used) *Note: "CC" denotes green manure "Cover Crop."*

CROP ROTATION PLAN	FIELD NUMBERS WHERE PLAN IS FOLLOWED	ANTICIPATED CHANGES
Summer squash/CC→sweet potatoes→beans/ CC→tomatoes→peas/ fall greens→spring cole crops/CC→okra→spring potatoes/CC→repeat cycle	A-1 through A-8	None
Spring greens/winter squash→root crops/CC →southern peas/CC→ peppers & eggplant→ cucumbers→CC/fall cole crops→corn→CC/fall potatoes→repeat cycle	B-1 through B-8	None
Oats/sweetclover→sweetclover→ sweet corn/CC → strawberries→strawberries→strawberries/oilseed radish→repeat cycle	S-1 through S-6	Seeking a good companion grass for the sweetclover.

B. WEED MANAGEMENT PLAN: ☐ No weed problems

What are your problem weeds? *Bermudagrass, johnsongrass, horsenettle*

What weed control methods do you use? ☑ crop rotation ☑ field preparation ☑ prevention of weed seed set

☐ delayed seeding ☐ monitoring soil temperature ☐ soil sterilization ☐ use of fast emerging varieties

☑ mechanical cultivation ☑ use of hand tools ☑ hand weeding ☑ mowing ☐ livestock grazing

☑ flame weeding ☐ steam weeding ☐ electrical ☑ smother crops ☐ black fallow ☑ non-synthetic mulch

☐ synthetic mulch ☐ corn gluten ☑ soap-based herbicides ☐ other (specify)

Do you keep a record of how often you utilize these weed control methods, such as dates and fields when you cultivate or flame weed? ☑ Yes ☐ No

All inputs used or intended for use during the current year and used in the previous three years must be listed on your field history sheet.

C. PEST MANAGEMENT PLAN: ☐ No pest problems

What are your problem pests? ☑ insects (list) *On vegetables & strawberries: squash vine borer, squashbug, aphids, thrips, cabbage worms, flea beetles, cucumber beetles, slugs, potato beetles, corn earworm/tomato fruitworm, tomato hornworm. On blueberries, anticipate problems with mites, cranberry & cherry fruitworm complex, cutworms.*

☐ rodents ☐ gophers ☐ birds ☑ other animals (specify) *Deer*

Do you work with a pest control advisor? ☑ Yes ☐ No

If yes, give name and contact information.

Casey Jordan, Ozark County Cooperative Extension Service, P.O. Box 13, Brushy Creek, AR 72701 479-586-0000

What strategies do you use to control pest damage to crops? ☐ none used

☑ crop rotation ☑ selection for plant species/varieties ☑ development of habitat for natural enemies

☐ timing of planting ☐ companion planting ☐ frog ponds ☑ bat houses ☑ bird houses ☐ hand picking

☑ monitoring ☐ trap crops ☑ physical barriers ☑ physical removal ☐ traps ☐ lures ☐ IPM

☐ insect repellents ☑ animal repellents ☑ release of predators/parasites of pest species

☑ use of approved products ☑ use of restricted products ☐ limited use of prohibited products

☑ other (specify) *Noise makers, reflectors, scarecrow devices, solar-powered electric fencing for deer.*

Do you keep a record of how often you utilize these pest control methods, such as dates when you scout or apply inputs to a specific field or crop? ☑ Yes ☐ No



D. DISEASE MANAGEMENT PLAN: ☐ No disease problems

What are your problem crop diseases? vegetables & strawberries: powdery mildew, clubroot, downy mildew, anthracnose, early blight, late blight, gray mold, blossom-end rot. Blueberries: twig blight, mummy berry.

What disease prevention strategies do you use? ☑ crop rotation ☑ field sanitation ☐ plant spacing
☑ selection of plant species/varieties ☑ timing of planting/cultivating ☐ vector management ☐ soil balancing
☐ solarization ☐ companion planting ☐ compost/tea use ☑ use of approved materials
☑ use of restricted materials ☐ limited use of prohibited materials ☐ other (specify)

List all disease management inputs used or intended for use on your organic and transitional fields/crops. *All inputs used or intended for use during the current year and used in the previous three years must be listed on your field history sheet.*
☐ Not applicable

DISEASE PROBLEM	CONTROL PRODUCT	STATUS: APPROVED (A) RESTRICTED (R) PROHIBITED (P)	IF RESTRICTED, DESCRIBE COMPLIANCE WITH NOP RULE ANNOTATION	CHECK IF GMO (✓)
Powdery Mildew, downy mildew, anthracnose, early blight, late blight, gray mold	Bordeaux Mix	R	Monitor weather conditions; soil test for copper levels	
Twig blight	Lime sulfur	R	Will use only for disease control when evidence of disease occurs.	
Wetting agent	Therm X 70	A		



Water tests are required annually for nitrate and coliform bacteria if water is used for greenhouse use, washing organic products, and on-farm processing. Tests may be required for irrigation water and organic livestock drinking water. Irrigation water should not contaminate organic crops with prohibited materials. Methods to conserve water usage should be part of the irrigation plan.

TYPE OF WATER USE: ☐ irrigation ☐ greenhouse ☐ foliar sprays ☐ washing crops ☐ none ☐ other _____

☐ No Changes

A. SOURCE OF WATER: ☐ on-site well ☐ river/creek/pond ☐ spring ☐ municipal/county * ☐ irrigation district*

☐ other_____ Name of municipal/irrigation district_____

Attach current water tests for coliform bacteria and/or nitrates if applicable.

C. TYPE OF IRRIGATION SYSTEM: ☐ none ☐ drip ☐ flood ☐ center pivot ☐ other _____

What input products are applied through the irrigation system? _____ ☐ none

What products do you use to clean irrigation lines/nozzles? _____ ☐ none

How do you conserve irrigation water? ☐ scheduling ☐ tensiometer/monitoring ☐ laser leveling/land forming

☐ drip irrigation ☐ micro-spray ☐ other_____

Known contaminants in your irrigation water: *(Attach residue analysis and/or salinity test results if available.)*

SECTION 7: Maintenance of organic integrity — **NOP Rules 205.201(a)(5) and 205.202(c)**

A. ADJOINING LAND USE:

NOP RULE requires that organic production areas have distinct boundaries and buffer zones to prevent the unintended application of a prohibited substance or contact with a prohibited substance that is applied to adjoining land not under organic management. Adjoining land includes crop land, pastures, residential property, fallow land, etc. Buffer areas may change annually, depending on contamination potential from adjoining land uses. The width of the minimum buffer is dependent on certifying agent policy. The NOP Rule requires that the buffer must be sufficient in size or other features (windbreaks, diversion ditches) to prevent the unintended contact by prohibited substances applied to adjacent land areas. Crops within the required buffer must be left unharvested or harvested, stored, and disposed of as nonorganic crop, with records kept of crop disposition. Indicate buffer zones and show all adjoining land uses on your field maps.

List specific buffer areas you maintain. (Show all adjoining land uses on your field maps.) ☐ Not applicable

B. EQUIPMENT:

To prevent commingling and contamination, all equipment used in organic crop production must be free of nonorganic crops and prohibited materials. Equipment used for both organic and nonorganic farming must be cleaned and flushed prior to use on organic fields or crops. Keep records of equipment clean and flush activities.

List equipment used for planting, tillage, spraying, and harvesting. ☐ Not applicable

Note: "Conventional" use below refers to operations on transitional blueberry field 2. No other conventional use.

EQUIPMENT NAME	OWNED (O), RENTED (R), OR CUSTOM (C)	CHECK IF USED ON BOTH ORGANIC AND CONVENTIONAL (✓)	HOW IS EQUIPMENT CLEANED BEFORE USE ON ORGANIC FIELDS?
BCS 948 walking tractor	O	√	Vegetation & dirt clods removed
BCS rotary plow	O		
BCS tiller w/middlebuster	O		
BCS brush mower	O	√	Vegetation & dirt clods removed
Craftsman lawn tractor	O	√	Vegetation & dirt clods removed
Gravely walking tractor	O	√	Vegetation & dirt clods removed
Gravely cultivator	O		
Gravely brush mower	O	√	Vegetation & dirt clods removed

C. HARVEST:

NOP Rule 205.272(b)(1) and (2) requires that containers, bins, and packaging materials must not contain synthetic fungicides, preservatives, or fumigants. All reusable containers must be thoroughly cleaned and pose no risk of contamination prior to use.

How are your organic crops harvested? ☐ mechanical ☑ by hand

Are any organic crops custom harvested? ☐ Yes ☑ No

If yes, provide name and address of custom harvester.

Describe steps taken to protect organic crops from commingling and contamination during harvest.

Because we do not have parallel production, there is no hazard of commingling. We use only clean, uncontaminated containers and tools for harvesting.

What containers are used for harvesting? ☐ gravity wagons/boxes ☐ truck boxes ☑ cardboard/waxed boxes ☑ wooden totes ☑ plastic containers ☐ other (specify)

HANDLING AND STORAGE

E. CROP STORAGE: ☐ No organic crop storage

Operators must keep organic and nonorganic crops in separate storage areas and prevent commingling and contamination. Storage records must be maintained.

Describe your storage locations.

STORAGE ID #	TYPE OF CROPS STORED	TYPE OF STORAGE	CAPACITY/SIZE	ORGANIC (O), TRANSITIONAL (T), BUFFER (B), CONVENTIONAL (C)
Cooler	Highly perishable vegetables & fruits	Walk-in cooler	200 sq. ft.	O, T
Cellar	Root crops, squash	Root cellar	110 sq. ft.	O

Do you use the same storage areas for organic, transitional, buffer, and/or conventional crops. ☑ Yes ☐ No

If yes, how do you segregate organic crops from nonorganic crops? The only nonorganic crop in storage is transitional blueberries which are easily distinguishable from organic vegetables and strawberries. Blueberries are never stored above organic produce.

How do you clean storage units prior to storage of organic crops? Sweep it out.

How do you prevent/control insect pests in crop storage areas? ☑ No insect problems

How do you control rodents in crop storage areas? ☐ No rodent problems

Mechanical traps. Keep cats on farm.

What stored crop inputs have you used in the last three years? ☑ none

☐ synthetic fumigants ☐ rodenticides ☐ sprouting inhibitors ☐ ripeners ☐ growth regulators
☐ preservatives ☐ oils ☐ coloring agents ☐ waxes ☐ other (specify)

Are any stored crop inputs used or planned for use on organic crops? ☐ Yes ☑ No

If yes, specify input and retain labels.

SECTION 8: Recordkeeping System **NOP Rule 205.103**

NOP Rule requires that records disclose all activities and transactions of the operation, be maintained for five years, and demonstrate compliance with the NOP Rule. Organic products must be tracked back to the field or location where they were produced and harvested. All records must be accessible to the inspector.

A. RECORDS: *Please have these records available for the inspector.*

Which of the following records do you keep for organic production?

- ☑ field maps
- ☑ field activity log(s)
- ☑ field history sheets (previous three years)
- ☑ documentation of previous land use for rented and/or newly purchased land
- ☑ input records for soil amendments, seeds, manure, foliar sprays, and pest control products (keep all labels)
- ☑ documentation of attempts to source organic seeds and/or planting stock
- ☑ documentation of organic seedlings
- ☑ residue analyses of inputs (such as manure sourced off-farm)
- ☑ compost production records
- ☑ monitoring records (soil tests, tissue tests, water tests, quality tests, observations)
- ☑ equipment cleaning records
- ☑ harvest records that show field numbers, date of harvest, and harvest amounts (including custom harvest records)
- ☐ label records
- ☑ storage records that show storage location, storage identification, field numbers, amounts stored, and cleaning activities
- ☐ clean transport records
- ☑ sales records (purchase order, contract, invoice, cash receipts, cash receipt journal, sales journal, and more)
- ☐ shipping records (scale ticket, dump station ticket, bill of lading)
- ☐ transaction certificates
- ☐ audit control summary
- ☑ complaint log
- ☐ other (please specify)

How long do you keep your records?

I have detailed records going back to 1993.

YOUR TASK: GET CERTIFIED

- Develop the farm plan.
- Decide on crops, fertility, rotations, pest management and buffering of this site.
- Organize this you can start the transition; or complete the organic certification.
- Keep good records; Update regularly.
- Required each year to update and re-certify

SOURCES OF INFORMATION

(LOTS OF ON-LINE INFO)

- https://attra.ncat.org/
- http://ag.utah.gov/plants-pests/organic-certifications.html

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Using *My Fi Assist* for Financial Decisions

Biographical Information:

Ruby Ward
Department of Applied Economics
Utah State University

Dr. Ruby Ward was raised on a farm and ranch in South-eastern Idaho. After graduating from Ricks College, she received a BS in Agricultural Economics and Accounting from Utah State University. From Texas A&M University she received an MBA and a PhD in Agricultural Economics. Dr. Ward is a professor in the Department of Applied Economics at Utah State University. Her current assignment involves all three areas emphasized at a land grant University—teaching, research and extension. She teaches agricultural finance and community planning. Dr. Ward has delivered educational programs in Utah and the surrounding region for the last 15 years. Ward was the committee chair for the Diversified Agricultural Conference for 10 years and currently co-chairs the Urban and Small Farms Conference in Utah. Ward is the project leader for the Rural Tax Education website (RuralTax.org) and Co-chair of the National Farm Income Tax Extension Committee. She has given many presentations on Tribal tax and financial issues. Ward works primarily in the area agriculture entrepreneurship.

Session Description:

My Fi Assist is an app available for free on both IOS and Google Play. It was developed by Dr. Ruby Ward to allow people to have a simple tool to examine both loans and credit card payments as well as savings. The app has a user preferences setup to input an item of choice and the value of the item. This allows the user to examine financial decisions in terms that they normally think about. For example, the item could be hours worked and would and could say how many hours per week you would need to work to pay off a credit card or make a loan payment. It can also be used with an item you sale. For example, it could be pounds of tomatoes or CSA shares. If you put in the amount of a tractor, you could examine how many extra CSA shares you would need to sell each month or year to make the payments on the loan.

This session will show you methods of examining financial situations by using the app. The App is simple to use and does the math for you. Before going to a dealer you could examine how much you could afford to pay for a piece of equipment or a car or truck. You could see how much your overall payment will change if you change the interest rate. The app is designed to give people more control over their financial decisions.

Using My Fi Assist for Financial Decisions

Ruby Ward,Utah State University

Ruby.ward@usu.edu

Motivation

- Take the math out of the calculation
- Give you more control
- You do not need the internet or Excel
- Put it in terms you understand
- Make it fun

Why are finances important?

- Understand how loans and payments are calculated
- Understand what you can do
  - If have the ability to see actual examples, can make better decisions
  - Put a person in control
- Understand what will happen if
  - Buy a tractor

Loan Payments

- The payment is what you have to pay back when you borrow money
  - Includes the amount borrowed plus interest
- The higher the interest rate the higher the payment will be.
- Interest rate is based on
  - Time (same for everyone)
  - Inflation (same for everyone)
  - Risk (different and based upon individual)

Risk and interest rate

- If the bank thinks you are riskier to lend to, they charge you a higher interest rate or will not give you the loan
- Risk is assessed on various factors
- One is a credit score

Is Your Credit Score Good?

A	B	C	D
730 – UP	729 – 680	679 – 630	629 - 600

From Jennifer Kintz, University of Nevada, Reno.

Your Credit Score is Created by These 5 Things

- 35% PAYMENT HISTORY
- 30%TOTAL DEBT
- 15% AGE OF ACCOUNTS
- 10% NEW CREDIT
- 10% TYPE OF CREDIT

From Jennifer Kintz, University of Nevada, Reno.

How to find loan rates?

- Available for all states or National average
- http://www.myfico.com/CreditEducation/Calculators/loanrates.aspx
- Rates for mortgages and new and used auto loans

Interest Rates for Range of Credit Scores

- Utah Used Auto Loans for 48 months (4 years).

720-850	3.49%
690-719	4.92%
660-689	7.44%
620-659	10.07%
590-619	16.36%
500-589	18.35%

From MyFico.com

What does that mean for how much you pay? Borrow $10,000 for a tractor

Credit Score	Interest Rate	Monthly Payment
720-850	3.49%	$224
690-719	4.92%	$230
660-689	7.44%	$242
620-659	10.07%	$254
590-619	16.36%	$285
500-589	18.35%	$296

What does that mean for how much you pay?

Credit Score	Interest Rate *	Monthly Payment	Paid Each Year
720-850	3.49%	$224	$2,682
690-719	4.92%	$230	$2,759
660-689	7.44%	$242	$2,898
620-659	10.07%	$254	$3,048
590-619	16.36%	$285	$3,423
500-589	18.35%	$296	$3,547

How many cartons of peppers do you have to sell? ($14/carton)

Credit Score	Interest Rate *	Monthly Payment	Paid Each Year	Car. Of Peppers
720-850	3.49%	$224	$2,682	192
690-719	4.92%	$230	$2,759	197
660-689	7.44%	$242	$2,898	207
620-659	10.07%	$254	$3,048	218
590-619	16.36%	$285	$3,423	244
500-589	18.35%	$296	$3,547	253

Sell 32% more peppers with bad credit.

What about the whole loan? ($14/carton)

Credit Score	Interest Rate	Total Paid	Interest Paid	Head of Calves for interest
720-850	3.49%	$10,729	$729	52.1
690-719	4.92%	$11,037	$1,037	74.0
660-689	7.44%	$11,592	$1,592	113.7
620-659	10.07%	$12,190	$2,190	156.4
590-619	16.36%	$13,692	$3,692	263.7
500-589	18.35%	$14,188	$4,188	299.1

Where do you start to fix credit?

- creditsesame.com
- annualcreditreport.com
- consumerfinance.gov

From Jennifer Kintz, University of Nevada, Reno.

What if you can't pay your bills on time?

- Contact the companies you owe
- Pay your home and car loans first
- If you know you can not make your car payment, try to sell your car first. Do not have it repo'ed if you can avoid it.

From Jennifer Kintz, University of Nevada, Reno.

Other Applications

Teaching Youth

- Get their attention
- What I want to teach
  - Credit and savings are tools.
  - Effects of time and interest rate on savings
    - Saving early gives more time to accumulate interest
    - Higher interest rate makes a difference
  - Goals are within their reach. To reach goals they need to give something up. Life is about choices
  - Buying on credit has a cost

Teaching Youth

- What I tell them I am teaching
  - Let's make you a millionaire
    - How much would you have to save each month to have $1 million when you are 65?
    - Put it in terms of what they are giving up each month
      - Hours worked
      - Sodas from vending machine
      - Trips to movies with concessions
    - Vary years and interest rate

Rates for Saving & Investing

- Historic Returns available at:
  - http://people.stern.nyu.edu/adamodar/New_Home_Page/data.html

	Annual Returns on Investments in		
Arithmetic Average	S&P 500	3-month T.Bill	10-year T. Bond
1928-2014	11.53%	3.53%	5.28%
1965-2014	11.23%	5.04%	7.11%
2005-2014	9.37%	1.44%	5.31%

Source: http://www.stern.nyu.edu/~adamodar/New_Home_Page/data.html

If saving at a lending institution with a CD or savings account the rate may be less than 1%

What do you need to save?

Start Saving when	Earn 7% interest	Earn 10% interest
15 years old	$183.55	$57.72
25 years old	$380.98	$158.13
35 years old	$819.69	$442.38
45 years old	$1,919.66	$1,316.88

What do you need to give up?

If make $10 per hour? How many hours do you need to work?

Start Saving when	Earn 7% interest		Earn 10% interest	
15 years old	$183.55	18.4 hrs	$57.72	5.8 hrs
25 years old	$380.98	38 hrs	$158.13	15.8 hrs
35 years old	$819.69	82 hrs	$442.38	44.2 hrs
45 years old	$1,919.66	19.2 hrs	$1,316.88	131.7 hrs

Could also use bottles of pop, trips to movies, skateboards, etc.

Teaching Youth

- Take home messages
  - They can become a millionaire if they choose to
  - If they have longer to save, they need to save less for retirement
  - If they have a larger interest rate they need to save less

Teaching Youth

- Teaching about using credit
- Two examples.
  - Both make the same amount of money per hour and work the same number of hours
  - Ask the students to pick something to buy
    - How many hours do they need to work?
      - Student works and saves
      - Student buys on a credit
    - If they buy on credit can they afford to have as many things as someone who does not?

Buying $200 Xbox

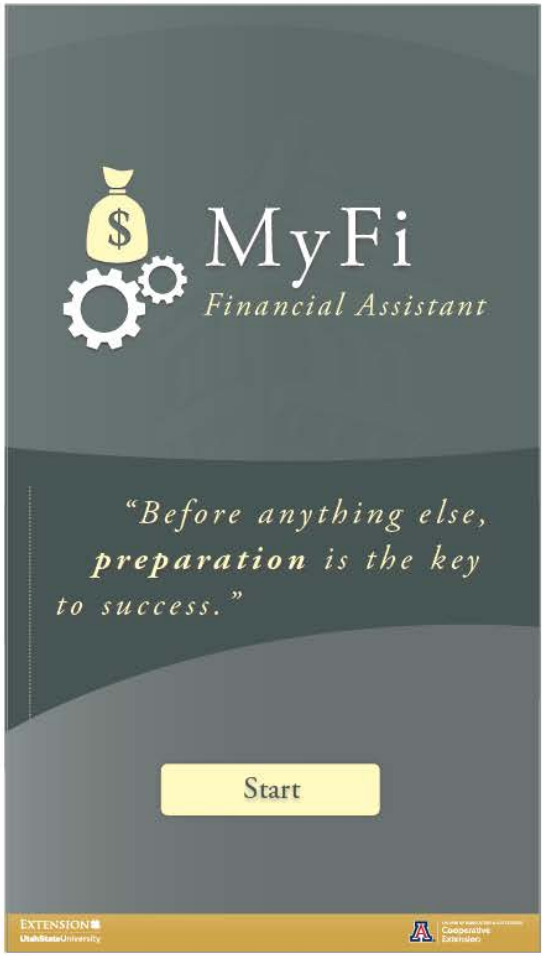
- Each person can make $10 per hour
- One would need to work 20 hours to save enough
- The other buys on credit and pays it off over 1 year at 18% interest
  - Would pay $220 and work 22 hours
- If they work the same hours can they afford the same things?

Teaching Youth

- Take home messages
  - Buying on credit costs
    - They will either need to work more hours
    - Or buy less to pay for the cost of credit
  - Credit can be a tool. To buy house and other things may not be possible without credit

The APP

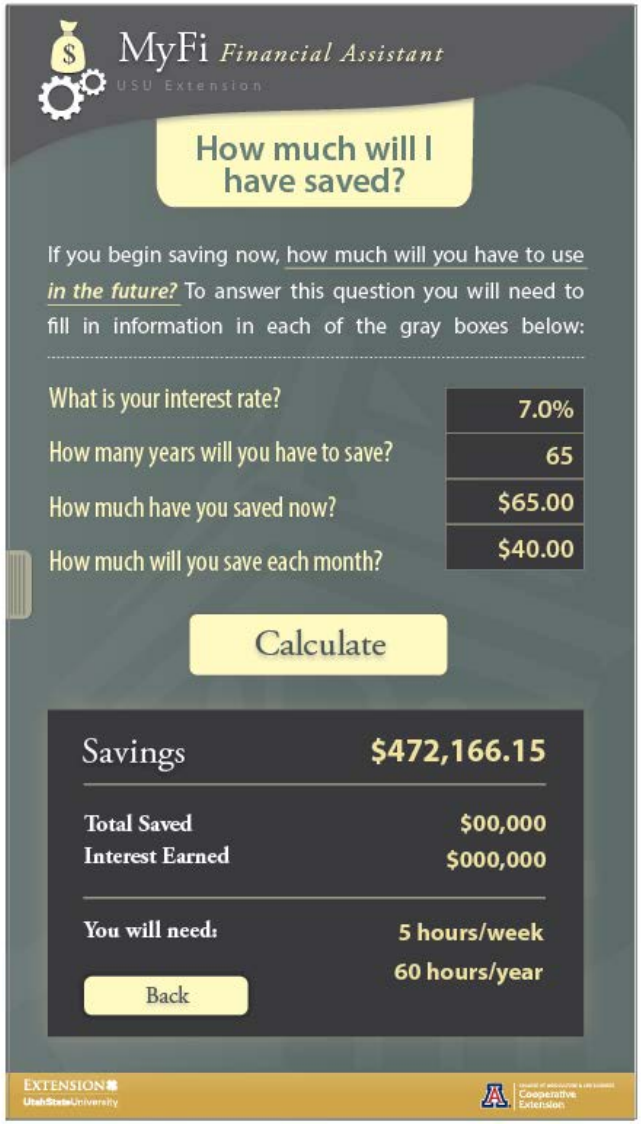

EXTENSION
UtahStateUniversity
COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative
Extension


MyFi
Financial Assistant
"Before anything else, preparation is the key to success."
Start


MyFi
Financial Assistant
How would you like to display your results?
1. What is your item?
Head of calves
Examples: hours worked, head of calves, bales of hay, etc.
2. What is the value of this item?
$4,000
Example: the value of each hour worked is $10
Next
*You can change these later in personal preferences.

The APP


MyFi Financial Assistant
USU Extension
Menu
Savings Amount
Savings Payment
LOAN
Paying for a Loan
How Much Can I Afford?
Pay off Credit Card
Common Term Definitions
Personal Preferences
EXTENSION
UtahStateUniversity
Cooperative Extension


MyFi Financial Assistant
USU Extension
How much will I have saved?
If you begin saving now, how much will you have to use in the future? To answer this question you will need to fill in information in each of the gray boxes below:
What is your interest rate?
7.0%
How many years will you have to save?
65
How much have you saved now?
$65.00
How much will you save each month?
$40.00
Calculate
Savings
$472,166.15
Total Saved
$00,000
Interest Earned
$000,000
You will need:
5 hours/week
60 hours/year
Back
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What happens if …

- Things will happen that can affect your net profit
- Knowing the relationship of your revenue, costs and profit allows you to predict the effect on net income
- Help you make adjustments and prepare during the year

Doing it

- Need to know how much revenue (value of sales) for a typical year
- How much you paid for
  - Expenses
  - Labor
  - Overhead (electricity, phone, insurance, etc.)
- Convert to percentages of Revenue

- Use sensitivity worksheet

- You do not need to be a financial expert
- Understand how changes affect bottom line so you know what to work on
- DiverseAg.org/money will have the Excel file and other information

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Production and Marketing of Specialty Ethnic Crops in Utah

Biographical Information:

Grace Henley
International Rescue Committee in Salt Lake City
Grace.henley@rescue.org

Grace Henley is the Food Entrepreneurship Program Manager for the International Rescue Committee in Salt Lake City. Within this role she manages both the New Roots program, which offers community gardening, farmer training, and food access opportunities for refugees and immigrants in Salt Lake County, and the Spice Kitchen Incubator Program which supports refugees, immigrants, and community members of low to moderate income in starting small food businesses. Grace's personal connection to agriculture started as a kid growing up in the rural Midwest, and some of her first jobs as a teen were on organic farms. After earning a bachelor's degree from the University of Vermont in 2010, where she also worked with a refugee agriculture program in the Burlington Intervale, Grace moved to Salt Lake City, started with the New Roots program in 2010, and immediately began digging into food access, urban farming, and small business development topics. She now oversees two small business incubators, the New Roots Farm Training Program and Spice Kitchen, and directs a number of interesting agriculture projects including the New Roots Redwood Road Incubator Farm and Farmer Training Program, the Sunnyvale Farmers Market, and new community garden development in Salt Lake County.

Session Description:

This presentation will introduce the Specialty Ethnic Crop Manual produced by New Roots as a result of this project and will review pictures, planting schedules, seed variety sources, post-harvest and handling guidance, and culturally relevant information on each crop including ethnic populations who consume it. New Roots has networked with local buyers to increase demand and expand marketing opportunities for specialty ethnic crop producers. There are a number of challenges associated with expanding specialty ethnic crop production and ensuring its profitability for agricultural producers. In regards to the challenges they face, there will be a couple points that we will discuss. First, it is difficult to find seeds and Utah-specific production information, particularly in regards to soil fertility and water use. Second, receiving accurate and easy information on post-harvest and handling, and food safety best practices can be difficult. Lastly, learning how to profitably market these crops can pose a challenge for agricultural producers.

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Green Urban Lunchbox

Biographical Information:

Shawn Peterson
The Green Urban Lunch Box
Shawn@gulb.org
http://thegreenurbanlunchbox.com/

Shawn is a fifth generation farmer who planted and harvested his own garden when he was 12 years old. He began gardening with youth in 2011 when he founded The Green Urban Lunch Box. He is a very creative person who learns by doing. Shawn also has a history of living his dreams. Shawn taught himself how to sail and then sailed from the US to Fiji. He has also motorcycled from the US to Central America. His latest dream includes educating youth and the general public about urban agriculture through The Green Urban Lunch Box. Shawn is passionate about creating a food system that is more sustainable and healthy. He believes to do so we must look at problems and farming in new ways.

Session Description:

Beginning spring 2016, the Green Urban Lunch Box will be offering a farming training program for young and/or beginning farmers who are interested in making a career out of urban agriculture. We will be offering courses in: urban orchards, aquaponics, high intensity vegetable production and animal husbandry.

Each farmer will take 5-9 month classes in one of the four specialty areas as well as weekend workshops (open to the public) in other farm skills. We will offer beginning and advanced courses in all four areas. This will be hands on training, therefore each farmer will work with the class to maintain a group plot or system and be allocated a small plot of their own to practice their skills (with the exceptions of Urban Orchards and Animal Husbandry).

As part of the Small Farm Initiative, each farmer will have the opportunity to participate in: business planning, marketing, and advertising workshops as well as one on one mentoring. We hope to empower our students to create their own successful urban farming businesses.

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Agriculture and Conservation Easements

Biographical Information:
Charity Jessop
Rusty Milholland
Utah Open Lands

You already know Utah Open Lands: whether you live in Utah or have been lucky enough to visit, you are rejuvenated and inspired by the landscapes we protect. In preserving open spaces, recreation areas, and family farms, we protect the heritage and experience of the land, both for today's communities and tomorrow's generations. Utah Open Lands is a non-profit land trust funded by private donors and community members. We achieve our mission of preserving open space and maintaining Utah's natural heritage and quality of life by assisting private landowners and communities in the voluntary preservation of the agricultural, scenic, recreational, historic and wild lands which make Utah a great place to live.

Rusty Milholland is the Stewardship Director, and Charity Jessop is the Programs and Outreach Coordinator for Utah Open Lands

Session Description:

- Who is Utah Open Lands?
- What is a conservation easement?
- What is the process of placing a parcel under conservation easement?

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Food Safety Modernization Act Final Rule for Produce Safety: What Growers Need to Know

Biographical Information:
Dr. Karin Allen
Utah State University

Dr. Allen is the Extension Food Quality & Entrepreneurship Specialist at Utah State University. She focuses on assisting individuals and small to medium-sized businesses with regulatory requirements, processing and packaging issues, and product testing and optimization.

Session Description:

The Final Rule for Produce Safety, a key part of the Food Safety Modernization Act, was released in November 2015. This presentation will address the new regulations that apply to growers such as water quality and testing, the timing of compost or manure applications, what constitutes “processing”, and who may be exempt from certain requirements. Compliance deadlines and the status of official FDA training programs will also be discussed.

KEY REQUIREMENTS:
Final Rule on Produce Safety

The FDA Food Safety Modernization Act (FSMA) Produce Safety rule is now final, and the earliest compliance dates for some farms begin one year after the effective date of the final rule (see "Compliance Dates" below). The rule establishes, for the first time, science-based minimum standards for the safe growing, harvesting, packing, and holding of fruits and vegetables grown for human consumption.

This rule was first proposed in January 2013. In response to input received during the comment period and during numerous public engagements that included public meetings, webinars, listening sessions, and visits to farms across the country, the FDA issued a supplemental notice of proposed rulemaking in September 2014. The proposed revisions were designed to make the originally proposed rule more practical, flexible, and effective.

The final rule is a combination of the original proposal and revisions outlined in the supplemental proposal, with additional changes as appropriate. The definition of "farm" and related terms were revised in the final Preventive Controls for Human Food rule, and the same definitions of those terms are used in this rule to establish produce safety standards. Operations whose only activities are within the farm definition are not required to register with FDA as food facilities and thus are not subject to the preventive controls regulations.

Below are summaries of some key requirements, compliance dates, and other information.

1. AGRICULTURAL WATER:

- **Water quality:** The final rule adopts the general approach to water quality proposed in the supplemental rule, with some changes. The final rule establishes two sets of criteria for microbial water quality, both of which are based on the presence of generic *E. coli*, which can indicate the presence of fecal contamination.
  - No detectable generic *E. coli* are allowed for certain uses of agricultural water in which it is reasonably likely that potentially dangerous microbes, if present, would be transferred to produce through direct or indirect contact. Examples include water used for washing hands during and after harvest, water used on food-contact surfaces, water used to directly contact produce (including to make ice) during or after harvest, and water used for sprout irrigation. The rule establishes that such water use must be immediately discontinued and corrective actions taken before re-use for any of these purposes if generic *E. coli* is detected. The rule prohibits use of untreated surface water for any of these purposes.
  - The second set of numerical criteria is for agricultural water that is directly applied to growing produce (other than sprouts). The criteria are based on two values, the geometric mean (GM) and the statistical threshold (STV). The GM of samples is 126 or less CFU of generic *E.coli* per 100 mL of water and the STV of samples is 410 CFU or less of generic *E.coli* in 100 mL of water.
    - The GM is an average, and therefore represents what is called the central tendency of the water quality (essentially, the average amount of generic *E. coli* in a water source).
    - STV reflects the amount of variability in the water quality (indicating *E. coli* levels when adverse conditions come into play—like rainfall or a high river stage that can wash waste into rivers and canals). Although this is an over simplification, it can be described as the level at which 90 percent of the samples are below the value.

- The FDA is exploring the development of an online tool that farms can use to input their water sample data and calculate these values.
- These criteria account for variability in the data and allow for occasional high readings of generic *E.coli* in appropriate context, making it much less likely (as compared to the originally proposed criteria for this water use) that a farm will have to discontinue use of its water source due to small fluctuations in water quality.
- These criteria are intended as a water management tool for use in understanding the microbial quality of agricultural water over time and determining a long-term strategy for use of water sources during growing produce other than sprouts.

- If the water does not meet these criteria, corrective actions are required as soon as is practicable, but no later than the following year. Farmers with agricultural water that does not initially meet the microbial criteria have additional flexibility by which they can meet the criteria and then be able to use the water on their crops. These options include, for example:
  - Allowing time for potentially dangerous microbes to die off on the field by using a certain time interval between last irrigation and harvest, but no more than four consecutive days.
  - Allowing time for potentially dangerous microbes to die off between harvest and end of storage, or to be removed during commercial activities such as washing, within appropriate limits.
  - Treating the water.

■ **Testing:** The final rule adopts the general approach to testing untreated water used for certain purposes proposed in the supplemental notice, with some changes. The rule still bases testing frequency on the type of water source (i.e. surface or ground water).

- In testing untreated surface water—considered the most vulnerable to external influences—that is directly applied to growing produce (other than sprouts), the FDA requires farms to do an initial survey, using a minimum of 20 samples, collected as close as is practicable to harvest over the course of two to four years. The initial survey findings are used to calculate the GM and STV (these two figures are referred to as the "microbial water quality profile") and determine if the water meets the required microbial quality criteria.
  - After the initial survey has been conducted, an annual survey of a minimum of five samples per year is required to update the calculations of GM and STV.
  - The five new samples, plus the previous most recent 15 samples, create a rolling dataset of 20 samples for use in confirming that that the water is still used appropriately by recalculating the GM and STV.
- For untreated ground water that is directly applied to growing produce (other than sprouts), the FDA requires farms to do an initial survey, using a minimum of four samples, collected as close as is practicable to harvest, during the growing season or over a period of one year. The initial survey findings are used to calculate the GM and STV and determine if the water meets the required microbial quality criteria.
  - After the initial survey has been conducted, an annual survey of a minimum of one sample per year is required to update the calculations of GM and STV.
  - The new sample, plus the previous most recent three samples, create a rolling dataset of four samples for use in confirming that that the water is still used appropriately by recalculating the GM and STV.
- For untreated ground water that is used for the purposes for which no detectable generic *E. coli* is allowed, the FDA requires farms to initially test the untreated ground water at least four times during the growing season or over a period of one year. Farms must determine whether the water can be used for that purpose based on these results.
  - If the four initial sample results meet the no detectable generic E. coli criterion, testing can be done once annually thereafter, using a minimum of one sample. Farms must resume testing at least four times per growing season or year if any annual test fails to meet the microbial quality criterion.
- There is no requirement to test agricultural water that is received from public water systems or supplies that meet requirements

established in the rule (provided that the farm has Public Water System results or certificates of compliance demonstrating that the water meets relevant requirements), or if the water is treated in compliance with the rule's treatment requirements.

2. BIOLOGICAL SOIL AMENDMENTS:

- **Raw Manure:** The FDA is conducting a risk assessment and extensive research on the number of days needed between the applications of raw manure as a soil amendment and harvesting to minimize the risk of contamination. (A soil amendment is a material, including manure, that is intentionally added to the soil to improve its chemical or physical condition for growing plants or to improve its capacity to hold water.)
  - At this time, the FDA does not object to farmers complying with the USDA's National Organic Program standards, which call for a 120-day interval between the application of raw manure for crops in contact with the soil and 90 days for crops not in contact with the soil. The agency considers adherence to these standards a prudent step toward minimizing the likelihood of contamination while its risk assessment and research is ongoing.
  - The final rule requires that untreated biological soil amendments of animal origin, such as raw manure, must be applied in a manner that does not contact covered produce during application and minimizes the potential for contact with covered prdouce after application.
- **Stabilized Compost:** Microbial standards that set limits on detectable amounts of bacteria (including *Listeria monocytogenes*, *Salmonella* spp., fecal coliforms, and *E. coli* 0157:H7) have been established for processes used to treat biological soil amendments, including manure. The rule includes two examples of scientifically valid composting methods that meet those standards. Stabilized compost prepared using either of these methods must be applied in a manner that minimizes the potential for contact with produce during and after application.

3. SPROUTS

- The final rule includes new requirements to help prevent the contamination of sprouts, which have been frequently associated with foodborne illness outbreaks. Sprouts are especially vulnerable to dangerous microbes because of the warm, moist and nutrient-rich conditions needed to grow them.
  - Between 1996 and 2014, there were 43 outbreaks, 2,405 illnesses, and 171 hospitalizations, and 3 deaths associated with sprouts, including the first documented outbreak of Listeria monocytogenes associated with sprouts in the United States.
- Requirements specific to sprouts include, for example:
  - Taking measures to prevent the introduction of dangerous microbes into or onto seeds or beans used for sprouting, in addition to treating seeds or beans that will be used for sprouting (or relying on prior treatment by the seed/bean grower, distributor, or supplier with appropriate documentation).
  - Testing of spent sprout irrigation water from each production batch of sprouts, or in-process sprouts from each production batch, for certain pathogens. Sprouts cannot be allowed to enter commerce until it is ascertained that these required pathogen test results are negative.
  - Testing the growing, harvesting, packing and holding environment for the presence of *Listeria* species or *Listeria monocytogenes*.
  - Taking corrective actions if spent sprout irrigation water, sprouts, and/or an environmental sample tests positive.
- Sprout operations will have less time to come into compliance with the rule than farms growing other produce. They will have one to three years to comply based on the size of their operation, with no additional time to meet the water requirements.

4. DOMESTICATED AND WILD ANIMALS

- The rule addresses concerns about the feasibility of compliance for farms that rely on grazing animals (such as livestock) or working animals for various purposes. It establishes the same standards for these animals as it does for intrusion by wild animals (such as deer or feral swine). Farmers are required to take all measures reasonably necessary to identify and not harvest produce that is likely to be contaminated.
  - At a minimum, this requires all covered farms to visually examine the growing area and all covered produce to be harvested, regardless of the harvest method used.
  - In addition, under certain circumstances the rule requires farms to do additional assessment during the growing season, and if significant evidence of potential contamination by animals is found, to take measures reasonably necessary to assist later during harvest. Such measures might include, for example, placing flags outlining the affected area.

- Although the final rule does not require establishing waiting periods between grazing and harvest, the FDA encourages farmers to voluntarily consider applying such intervals as appropriate for the farm's commodities and practices. The agency will consider providing guidance on this practice in the future, as needed.

- As was stated in the supplemental notice, farms are not required to exclude animals from outdoor growing areas, destroy animal habitat, or clear borders around growing or drainage areas. Nothing in the rule should be interpreted as requiring or encouraging such actions.

5. WORKER TRAINING AND HEALTH AND HYGIENE

- Requirements for health and hygiene include:
  - Taking measures to prevent contamination of produce and food-contact surfaces by ill or infected persons, for example, instructing personnel to notify their supervisors if they may have a health condition that may result in contamination of covered produce or food contact surfaces.
  - Using hygienic practices when handling (contacting) covered produce or food-contact surfaces, for example, washing and drying hands thoroughly at certain times such as after using the toilet.
  - Taking measures to prevent visitors from contaminating covered produce and/or food-contact surfaces, for example, by making toilet and hand-washing facilities accessible to visitors.

- Farm workers who handle covered produce and/or food-contact surfaces, and their supervisors, must be trained on certain topics, including the importance of health and hygiene.

- Farm workers who handle covered produce and/or food contact surfaces, and their supervisors, are also required to have a combination of training, education and experience necessary to perform their assigned responsibilities. This could include training (such as training provided on the job), in combination with education, or experience (e.g., work experience related to current assigned duties).

6. EQUIPMENT, TOOLS AND BUILDINGS

- The rule establishes standards related to equipment, tools and buildings to prevent these sources, and inadequate sanitation, from contaminating produce. This section of the rule covers, for example, greenhouses, germination chambers, and other such structures, as well as toilet and hand-washing facilities.
  - Required measures to prevent contamination of covered produce and food contact surfaces include, for example, appropriate storage, maintenance and cleaning of equipment and tools.

EXEMPTIONS

The rule does not apply to:

- Produce that is not a raw agricultural commodity. (A raw agricultural commodity is any food in its raw or natural state)

- The following produce commodities that FDA has identified as rarely consumed raw: asparagus; black beans, great Northern beans, kidney beans, lima beans, navy beans, and pinto beans; garden beets

(roots and tops) and sugar beets; cashews; sour cherries; chickpeas; cocoa beans; coffee beans; collards; sweet corn; cranberries; dates; dill (seeds and weed); eggplants; figs; horseradish; hazelnuts; lentils; okra; peanuts; pecans; peppermint;potatoes; pumpkins; winter squash; sweet potatoes; and water chestnuts

- Food grains, including barley, dent- or flint-corn, sorghum, oats, rice, rye, wheat, amaranth, quinoa, buckwheat, and oilseeds (e.g. cotton seed, flax seed, rapeseed, soybean, and sunflower seed)

- Produce that is used for personal or on-farm consumption.

- Farms that have an average annual value of produce sold during the previous three-year period of $25,000 or less.

The rule provides an exemption for produce that receives commercial processing that adequately reduces the presence of microorganisms of public health significance, under certain conditions.

The rule also provides a qualified exemption and modified requirements for certain farms.

- To be eligible for a qualified exemption, the farm must meet two requirements:
  - The farm must have food sales averaging less than $500,000 per year during the previous three years; and
  - The farm's sales to qualified end-users must exceed sales to all others combined during the previous three years. A qualified end-user is either (a) the consumer of the food or (b) a restaurant or retail food establishment that is located in the same state or the same Indian reservation as the farm or not more than 275 miles away.

- A farm with the qualified exemption must still meet certain modified requirements, including disclosing the name and the complete business address of the farm where the produce was grown either on the label of the produce or at the point of purchase. These farms are also required to establish and keep certain documentation.

- A farm's qualified exemption may be withdrawn as follows:
  - If there is an active investigation of an outbreak of foodborne illness that is directly linked to the farm, or
  - If FDA determines it is necessary to protect the public health and prevent or mitigate an outbreak based on conduct or conditions associated with the farm that are material to the safety of the farm's produce that would be covered by the rule.

- Before FDA issues an order to withdraw a qualified exemption, the agency:
  - May consider one or more other actions to protect public health, including a warning letter, recall, administrative detention, refusal of food offered for import, seizure and injunction.
  - Must notify the owner, operator, or agent in charge of the farm, in writing, of the circumstances that may lead FDA to withdraw the exemption, provide an opportunity for response within 15 calendar days of receipt of the notification, and consider actions taken by the farm to address the issues raised by the agency.

- A withdrawn exemption may be reinstated if (as applicable):
  - The FDA determines that the outbreak was not directly linked to the farm, and/or
  - The FDA determines that the problems with conduct or conditions material to the safety of the food produced or harvested at the farm have been adequately resolved, and continued withdrawal of the exemption is not necessary to protect public health or prevent or mitigate an outbreak of foodborne illness.

VARIANCES

The rule also permits states, tribes, or foreign countries from which food is imported into the U.S. to submit a petition, along with supporting information, to FDA requesting a variance(s) from one or more of the requirements of this rule.

- The rule enables a state, tribe, or country, if it concludes that meeting one or more of the rule's requirements would be problematic in light of local growing conditions, to request variances to those

requirements. The state, tribe, or foreign country must demonstrate that the requested variance is reasonably likely to ensure that the produce is not adulterated and provides the same level of public health protection as the corresponding requirement(s) in the rule.

- The final rule makes it clear that federally recognized tribes may submit a variance petition.
- The request for a variance must be submitted by a competent authority, meaning a person or organization that is the regulatory authority for food safety for the state, tribe, or foreign country.
- A foreign government does not need to have a systems recognition arrangement or equivalence agreement with the FDA to obtain a variance.
- The variance request must include relevant and scientifically valid information specific to the produce or activity. Information could relate to crops, climate, soil, geography or environment, as well as the practices of that particular region.
- Examples of types of variances that may be granted include a variance from the agricultural water microbial quality criteria for water used during growing covered produce (other than sprouts) using a direct water application method, a variance from the microbial die-off rate used to determine the time interval between the last irrigation and harvest and/or the accompanying maximum time interval; and a variance from the approach or frequency for water testing for water uses subject to the rule's microbial quality criteria.

COMPLIANCE DATES

Compliance dates for covered activities, except for those involving sprouts, after the effective date of the final rule are:

- Very small businesses, those with more than $25,000 but no more than $250,000 in average annual produce sales during the previous three year period: four years.
- Small businesses, those with more than $250,000 but no more than $500,000 in average annual produce sales during the previous three year period: three years.
- All other farms: two years.
- The compliance dates for certain aspects of the water quality standards, and related testing and recordkeeping provisions, allow an additional two years beyond each of these compliance dates for the rest of the final rule.

Compliance dates for modified requirements for farms eligible for a qualified exemption are:

- For labeling requirement (if applicable): January 1, 2020.
- For retention of records supporting eligibility for a qualified exemption: Effective date of the final rule.
- For all other modified requirements:
  - Very small businesses, four years after the effective date of the final rule.
  - Small businesses, three years after the effective date of the final rule.

Compliance dates for covered activities involving sprouts after the effective date of the final rule are:

- Very small businesses: three years
- Small businesses: two years
- All other farms: one year

ENVIRONMENTAL IMPACT STATEMENT

The FDA has also released the Final Environmental Impact Statement (EIS), which places the Produce Safety rule in the context of its likely impact on the environment, including human health and socioeconomic effects. The Draft EIS was published in January 2015. The FDA considered public comments submitted in the two months that followed in drafting the Final EIS. The FDA considered the findings of the Final EIS in finalizing the produce rule.

- The EIS evaluated actions that FDA proposed in the original and supplemental rules, as well as a number of alternative actions for each of the provisions identified as having the potential to result in significant environmental impacts. The provisions of the final rule represent FDA's preferred alternatives, which are detailed in a Record of Decision (ROD). The ROD addresses how the EIS findings were incorporated into decisions about the final rule. The agency's preferred alternatives are those that the FDA believes best fulfill the agency's statutory mission and responsibility, giving consideration to economic, environmental, technical and other factors.

- A significant beneficial impact on public health is expected due to the anticipated decrease in the number of illnesses tied to produce contamination.

- As in the Draft EIS, the Final EIS notes that any produce regulation that causes a farmer to use ground water instead of surface water could exacerbate existing groundwater shortages, although added flexibility in the water provisions make such a management decision unlikely.

- The Final EIS also concludes that Native American farmers may be disproportionately affected by any increases in operating costs necessitated by the produce rule since their average income is 30 percent less than that of other farmers.

ASSISTANCE TO INDUSTRY

The FDA is developing several guidance documents on subjects that include:

- General guidance on implementation and compliance

- A Small Entity Compliance Guide that explains the actions a small or very small business must take to comply with the rule.

- Other documents, including guidance on sprouts, are being considered and prioritized.

Plans for training and technical assistance are well under way. They include:

- Establishing the FDA FSMA Food Safety Technical Assistance Network, already operational, to provide a central source of information to support industry understanding and implementation of FSMA.

- The FDA is developing a comprehensive training strategy that includes collaboration with:
  - The Produce Safety Alliance;
  - The Sprout Safety Alliance;
  - The National Institute of Food and Agriculture in the U.S. Department of Agriculture (to administer a grant program to provide food safety training, education and technical assistance to small and mid-size farms and small food processors, beginning farmers, socially disadvantaged farmers, and small produce merchant wholesalers); and
  - Cooperative agreement partners (to develop training programs for sustainable agriculture and tribal operations).

- The FDA also plans to work with cooperative extension units, land grant universities, trade associations, foreign partners, the Joint Institute for Food Safety and Applied Nutrition (JIFSAN), and other stakeholders to develop a network of institutions that can provide technical assistance to the farming community, especially small and very small farms.

- FDA has entered into a cooperative agreement with National Association of State Departments of Agriculture (NASDA) to help with the implementation of the produce safety regulations.

MORE INFORMATION

Visit http://www.regulations.gov/

FDA's Food Safety Modernization Act page at www.fda.gov/FSMA

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Selling Produce to Schools and School Districts

Biographical Information:
Supreet Gill
Farm to School Salt Lake City

Supreet Gill is the Farm to School program manager for Salt Lake County. She has been in this position since Jan 2014 and has developed numerous impactful programs geared towards improving nutrition education for children and increasing procurement of local produce in meals served to kids at schools and in child care centers.

Session Description:
Panel discussion with buyers from an individual school and large school districts. Buyers will discuss requirements for procurement for their individual organizations, food safety and delivery requirements, pricing information, forward contracting, etc. Last 10 mins of the workshop will be allocated for Q&A

Food Hub Buyer Interest Survey – Northern Utah

Wednesday, December 02, 2015

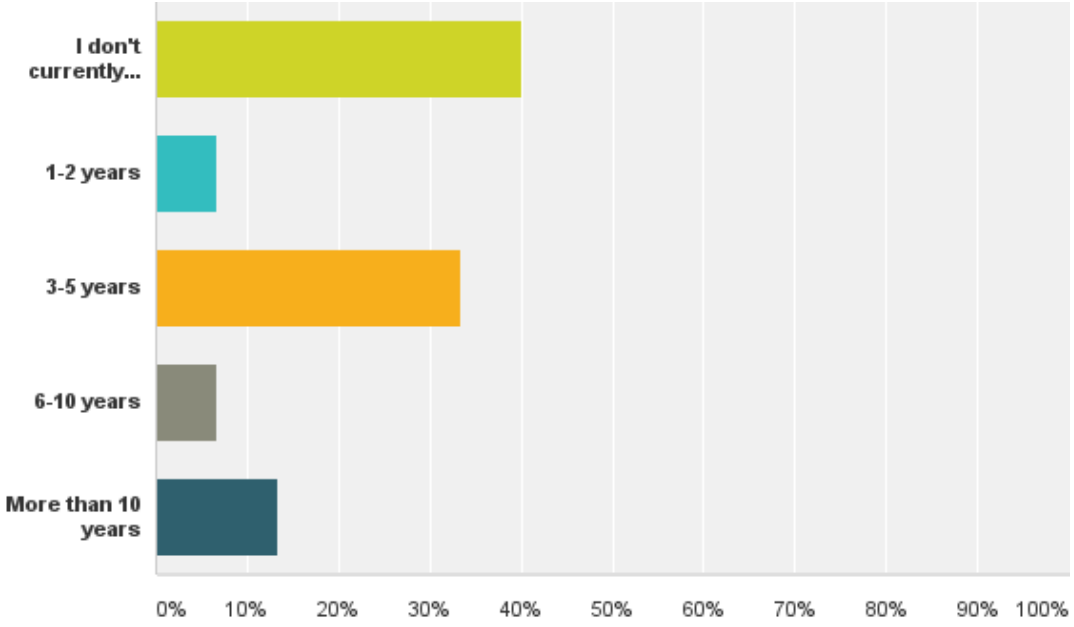
Q1: Which of the following best describes your business/affiliation?

Answered: 17 Skipped: 0

Answer Choices	Responses	
Restaurant	**0.00%**	0
Caterer	**17.65%**	3
Public school	**35.29%**	6
Specialty store	**5.88%**	1
Local grocery	**11.76%**	2
Grocery chain	**0.00%**	0
Hotel	**0.00%**	0
Hospital	**0.00%**	0
National or state park	**0.00%**	0
College or university	**0.00%**	0
Institutional buyer	**0.00%**	0
Other (please specify)	**29.41%**	5
Total		**17**

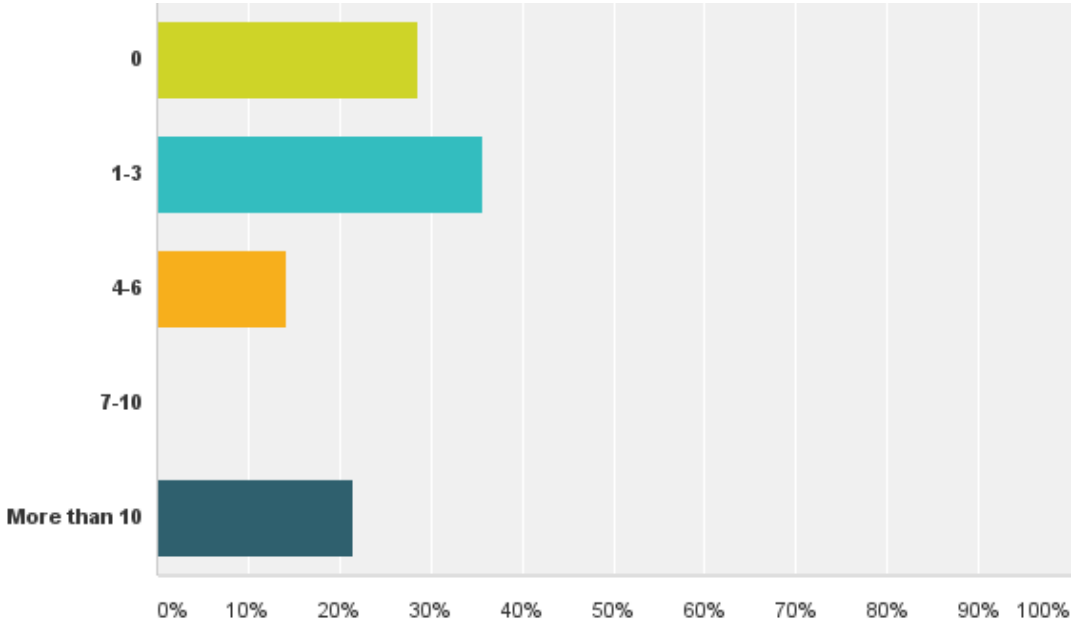
Q3: How long have you been sourcing products from local farmers/ranchers or small food producers?

Answered: 15 Skipped: 2



Q4: How many local farmers/ranchers or small food producers do you purchase from?

Answered: 14 Skipped: 3



Q5: At what maximum distance (in miles) from your location do you consider foods to be "local"?

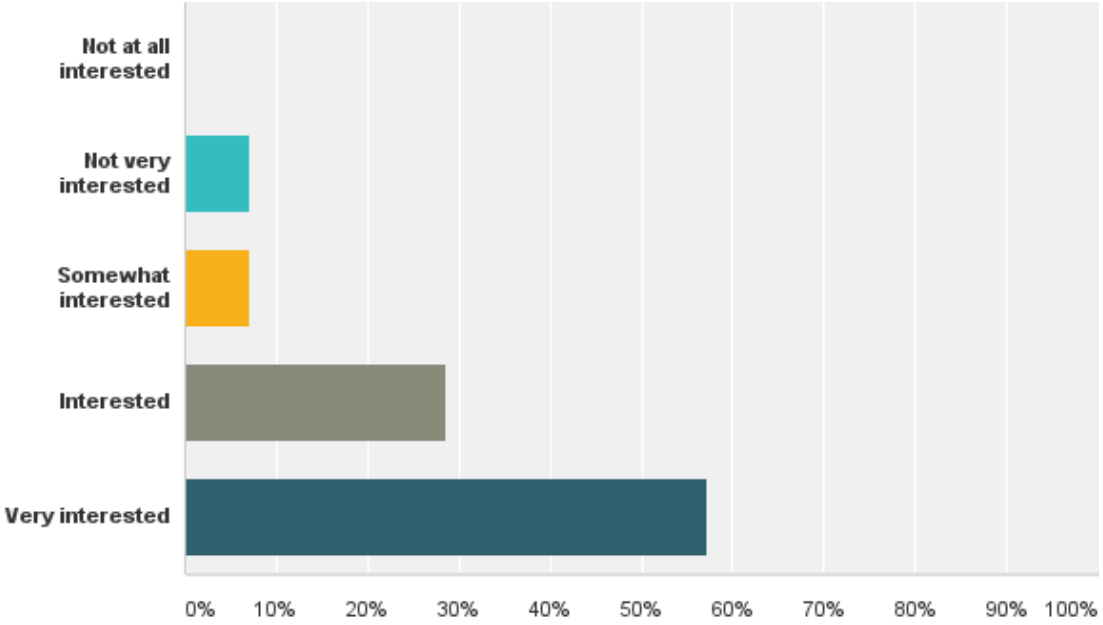
Number	Response Date	Response Text
1	Nov 24, 2015 5:17 PM	350
2	Nov 17, 2015 5:20 PM	300
3	Nov 16, 2015 8:18 PM	200
4	Nov 16, 2015 8:10 PM	250
5	Nov 16, 2015 12:52 PM	100
6	Nov 13, 2015 7:58 PM	100
7	Nov 11, 2015 2:23 PM	200
8	Nov 10, 2015 9:20 PM	300
9	Nov 9, 2015 10:40 PM	300
10	Nov 9, 2015 9:28 PM	20
11	Nov 9, 2015 9:19 PM	300
12	Nov 9, 2015 8:31 PM	30
13	Nov 9, 2015 8:07 PM	300
14	Nov 9, 2015 6:42 PM	300
		217.8571429

Q6: How likely is your establishment to source local food from each of the following?

Answered: 14 Skipped: 3

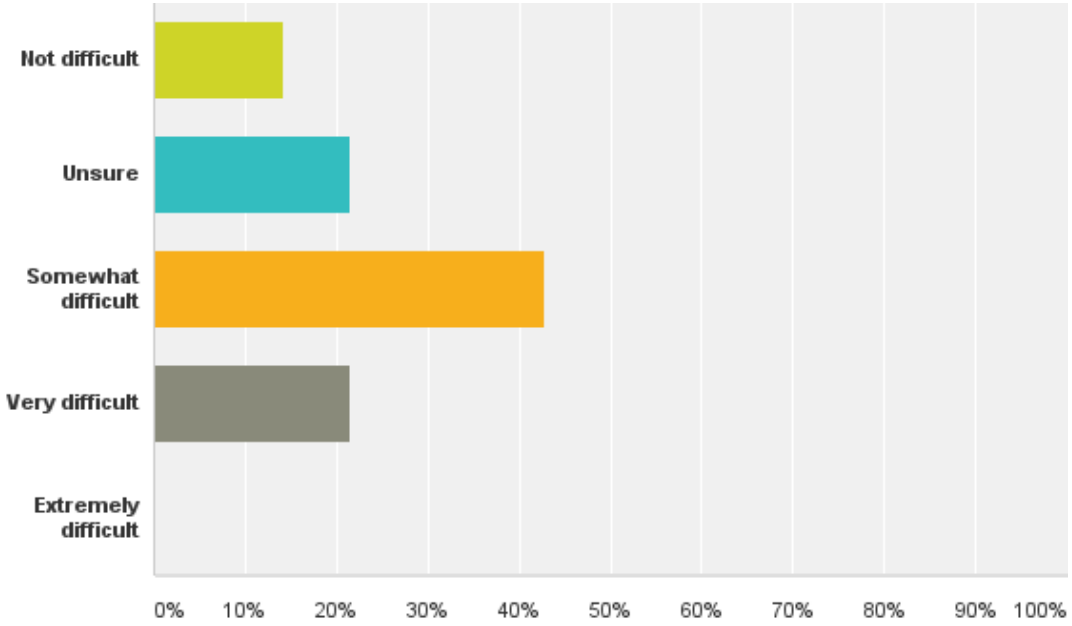
	Not at all likely	Unlikely	Somewhat likely	Likely	Very Likely	Total
Specific farmer/rancher/producer	**7.14%** 1	**14.29%** 2	**14.29%** 2	**21.43%** 3	**42.86%** 6	14
Producer coop, food hub, etc.	**7.14%** 1	**0.00%** 0	**14.29%** 2	**42.86%** 6	**35.71%** 5	14
Farmers' market	**14.29%** 2	**42.86%** 6	**14.29%** 2	**14.29%** 2	**14.29%** 2	14
Local manufacturer or processor	**14.29%** 2	**0.00%** 0	**7.14%** 1	**50.00%** 7	**28.57%** 4	14
Food service distributor	**7.14%** 1	**14.29%** 2	**14.29%** 2	**21.43%** 3	**42.86%** 6	14
Caterer	**53.85%** 7	**15.38%** 2	**15.38%** 2	**15.38%** 2	**0.00%** 0	13
Other	**50.00%** 3	**33.33%** 2	**0.00%** 0	**0.00%** 0	**16.67%** 1	6

Q7: Food hubs are businesses that connect producers with buyers by offering a suite of production, distribution, and marketing services. Food hubs typically provide items from multiple farmers, increasing quantity and quality of available products, while consolidating ordering, delivery, and billing. If a food hub was available in your region, please indicate your level of interest in buying through the hub?



Q8: Based on your experience, how difficult is developing relationships (connecting) with farmers/ranchers or small food producers in your area?

Answered: 14 Skipped: 3

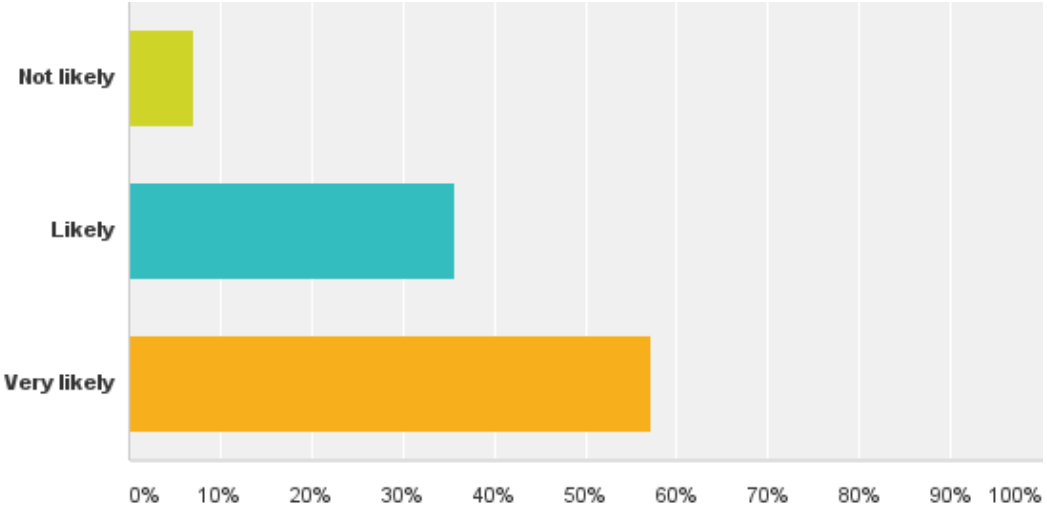


Q9: In your opinion, what two challenges or obstacles are the most difficult to overcome in purchasing local food?

Building relationships with farmers
In 6 years I have only been able to effectively connect with 5 local farmers
finding interested farmers
knowledge of what is produced locally
available quantities at any given time of year/moment
Being able to provide enough produce to demand.
Price
Cost
Not sure of growing practices.
Producer ability to deliver (specifically, on a weekly basis and during receiving hours to our warehouse)
cost
Determining a price that works for both parties
Food Safety conversations
consistency in supply
being able to have access the product
availability/accesibility of the farmer
transportation
Availability (need more flexibility with purchasing -- not just at Farmer's Markets or Food Co-ops that are certain days/times)
Reliability
No available cold storage facility on my property to store produce already picked
Volume fluctuation (shortages from supplier)
sustained availability of produce

Q10: Would you be willing to coordinate/change your meals/products/offerings in accordance with the growing season or local products/varieties available through the food hub?

Answered: 14 Skipped: 3



Q11: Please rate the importance of the following potential food hub benefits.

Answered: 14 Skipped: 3

	Not important	Unsure	Somewhat important	Important	Very important	Total
Labeling and certification (source, safety, etc.) assurances	**0.00%** 0	**7.14%** 1	**21.43%** 3	**21.43%** 3	**50.00%** 7	14
Reduced transaction costs of dealing with multiple suppliers	**7.14%** 1	**7.14%** 1	**28.57%** 4	**42.86%** 6	**14.29%** 2	14
Increased access to consumers seeking local foods	**0.00%** 0	**0.00%** 0	**7.69%** 1	**61.54%** 8	**30.77%** 4	13
Improved access to specialty or unique products/varieties	**21.43%** 3	**0.00%** 0	**21.43%** 3	**35.71%** 5	**21.43%** 3	14
Streamlined ordering and delivery services	**0.00%** 0	**0.00%** 0	**7.14%** 1	**28.57%** 4	**64.29%** 9	14
Improved communication and information sharing	**0.00%** 0	**7.69%** 1	**15.38%** 2	**53.85%** 7	**23.08%** 3	13
Increased quantities and reliability of products	**0.00%** 0	**7.14%** 1	**0.00%** 0	**42.86%** 6	**50.00%** 7	14
Increased quality and consistency	**0.00%** 0	**0.00%** 0	**0.00%** 0	**35.71%** 5	**64.29%** 9	14
Other	**100.00%** 2	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	2

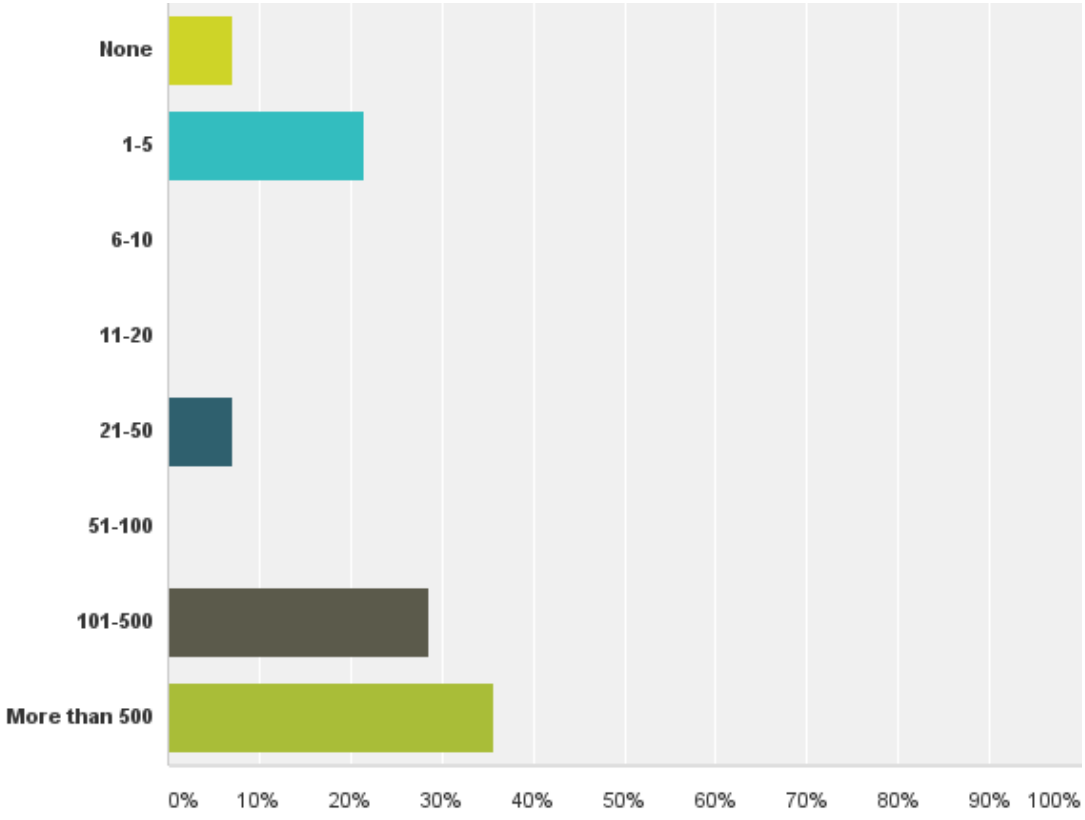
Q12: Which of the following labels/production methods are important to you? (Check all that apply)

Answered: 14 Skipped: 3

Answer Choices	Responses	
Origin certified (Utah's Own, Nevada Grown, etc.)	**85.71%**	12
Organic, not certified	**35.71%**	5
Certified organic	**50.00%**	7
Grass-fed	**28.57%**	4
Antibiotic free	**42.86%**	6
GAPs (Good Agricultural Practices) certified	**64.29%**	9
Good Handling Practices certified	**71.43%**	10
No synthetic sprays	**50.00%**	7
Free range/pasture raised	**35.71%**	5
Eco-friendly	**42.86%**	6
Other (please specify)	**0.00%**	0
Total Respondents: 14		

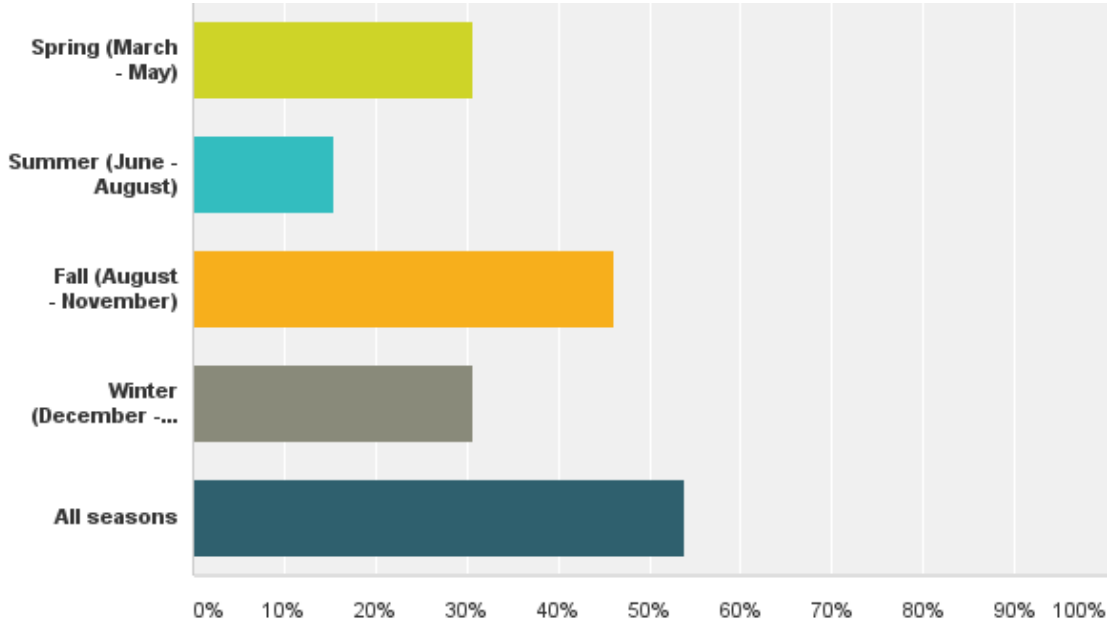
Q13: How many customers/clients/students do you serve or sell to daily?

Answered: 14 Skipped: 2



Q15: In which season(s) do you need products? (Choose all that apply)

Answered: 13 Skipped: 4

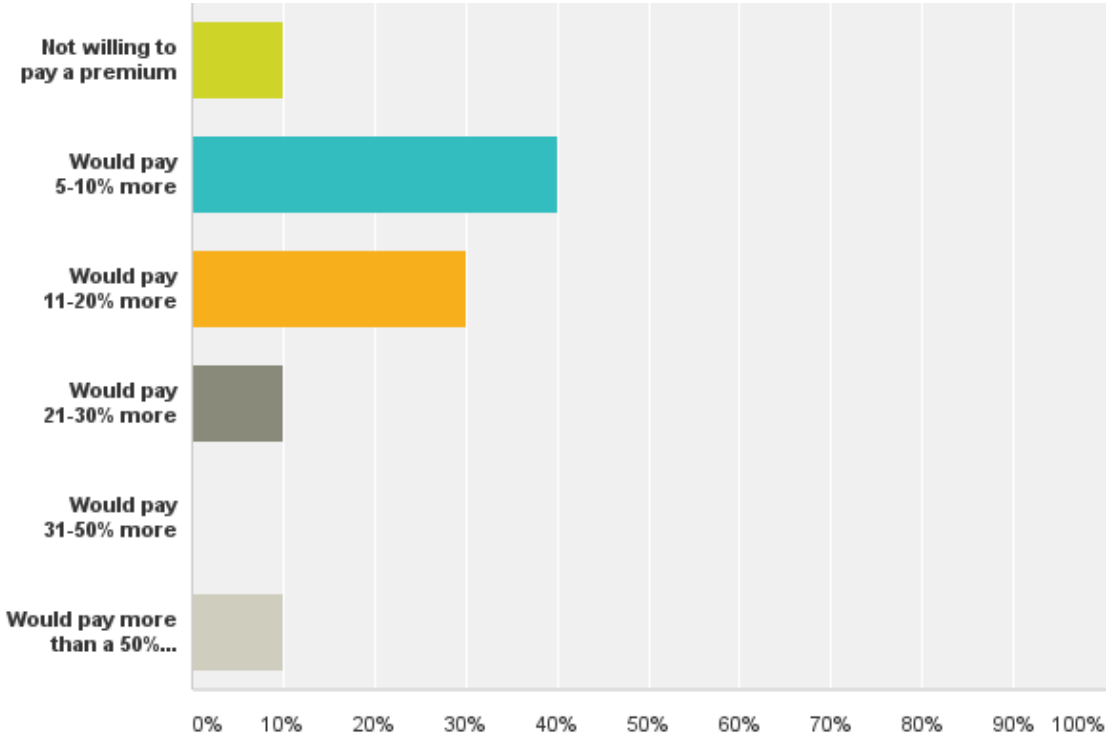


Q16:

Packaging	Delivery methods or timing	Minimum deliveries per week	Preferred communication: phone, email, on-line ordering, etc.	Certifications (safety, etc.)	Pricing limits/restrictions	Other
Sanitary, reusable packaging preferred	Must be delivered between 6-10AM	1	Email/online preferred		Working at about $1.50 per tray food cost	
that we know how many per case. .so we can let our warehouse know how many cases go to each school	that product be delivered to our docks the times and days specified	one to our central warehouse	email	At this time we go through a safe food handling sheet with our local farmers (would be nice if all could be GAP certified)	I do informal bidding on all local products	
clean, sturdy	morning availability	2	cell phone or email or online ordering are all possibilities	local, sustainable, humane	depends on the specific product	
must be consistent and sealed	Be able to deliver weekly to each school during working hours	1	online ordering	any food safety	within reason with distributors	
			As a consumer, I like the ability to use several different forms to order food/communicate with sellers. As a professional, it's easier to work with the low-income population if there are many options for receiving communication about the Food Hub.	As a consumer, I like the idea of having requirements with someone in charge of checking to make sure foods are safe while delivered and while at the food hub.	As a professional, I don't think pricing should be limited/restricted but I do like the idea of trying to keep most things "affordable" so they can be promoted to the general population as a way to be able to eat more and afford more fresh produce and other products.	When finding a place for the food hub, I would like to see room(s) for education/classes.
	Direct delivery to our store is ideal	1	email			
Varies greatly by item. Minimum requirements are individually-packaged produce items (e.g. a 6 count bag of apples) with a label that has the item name, size and packaged date on it.	Receiving hours are limited to five days a week, before 2 p.m.	Varies by item but a minimum of once/week for more items.	Email	GAP preferred for produce. Certified Organic preferred on dirty dozen produce items.	Flexible	
						I'm not set up to take other farmer's products at this time.
none	morning 7-9am	2	online order or email order	as required by state CNP	near or equal to wholesale regional distributors	

Q17: For local food products, if your quality and other standards were met, would you be willing to pay a premium price?

Answered: 10 Skipped: 7

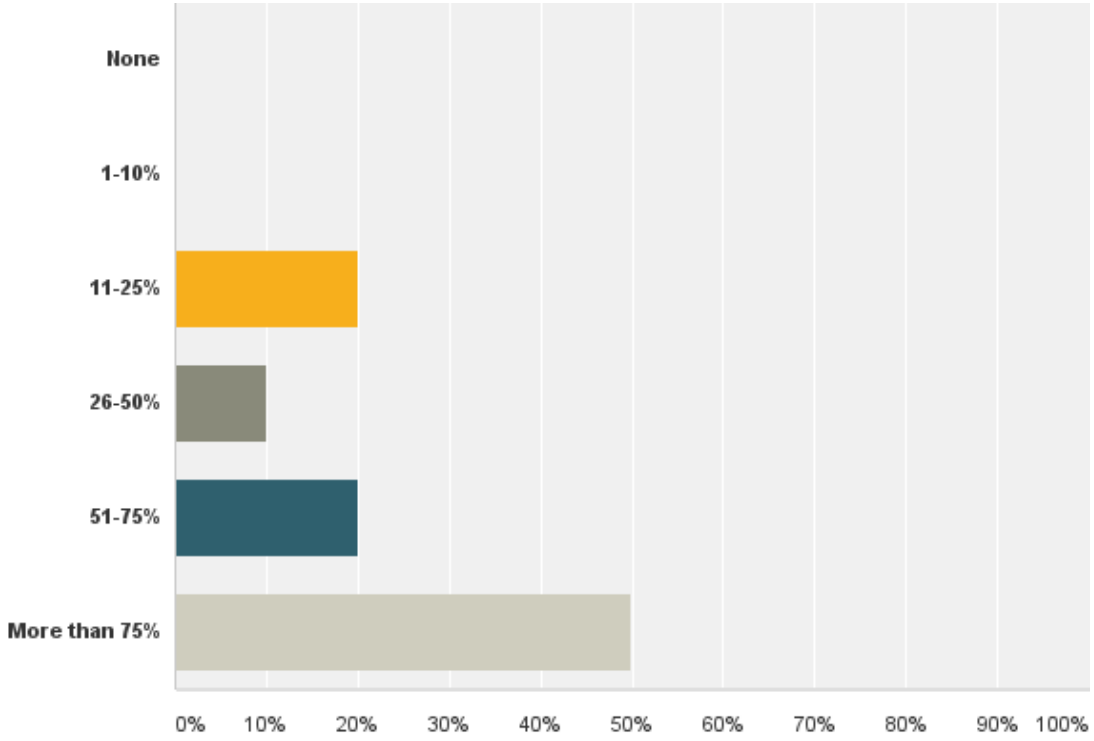


Q18: Briefly describe your clientele in terms of their interest in local, healthy foods, and their ability to pay premiums for local foods.

School food service - fixed price structure for meals
Number one client is our students. .elem, middle and high school. .we provide meals and 'learning' regarding healthier choices to all our school communities.
My clientele are always interested in food that uses local, healthy product and are generally willing to pay an added premium for the privilege of doing so.
we are a school district. Students enjoy fresh produce, but aren't as aware that the produce is local. It is more of a marketing thing for parents.
I think the general population is interested in local, healthy foods especially since those are the cool buzz words. Sadly, the population I am trying to work with to get them to eat healthier don't have any extra money in the budget for "healthy" foods (or at least don't have the knowledge in how to eat well on a tight budget, which is why I believe the future Food Hub could benefit from a room for education/classes).
local, organic, clean, simple, healthy/nutrition dense food is our main focus
Our service is a premium service so most customers are willing to pay a premium price for our items. We can charge a "Whole Foods" level price for an item if it is high quality. Our customers are interested in local but they are more interested in convenience and quality before local.
They come and pick their own fruit. We don't pick for people.
We serve several families with vegetarian, vegan, and food intolerance restrictions. We also serve many families that qualify for free/reduced lunch and so must adhere to flat fee pricing.

Q19: What percentage of your clientele would prefer locally sourced foods if available?

Answered: 10 Skipped: 7



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GEOGRAPHIC PREFERENCE

What It Is and How to Use It

* *

THE 2008 FARM BILL directed the Secretary of Agriculture to encourage schools to purchase locally grown and locally raised products "to the maximum extent practicable and appropriate." The Secretary was also instructed to allow schools to use a "geographic preference" when procuring locally grown and locally raised unprocessed agricultural products.

There are many ways for schools to buy local products for use in federal child nutrition programs (see USDA's 10 Facts About Local Food in School Cafeterias). While using geographic preference is not the only option for buying local foods, it is a powerful tool and particularly useful in formal solicitations where respondents are ranked and scored.

Types of Products

The ability to apply a preference for local products applies only to unprocessed or minimally processed items. The geographic preference rule does not apply to any products that have been cooked, heated, canned or that have any additives or fillers. It can be applied to a wide array of products that meet the definition of unprocessed or minimally processed such as various forms of fruits, vegetables, meats, fish, poultry, dairy, eggs, and grains.

Defining Local

Definitions for local vary widely depending on the unique geography and climate where a school is located and on the abundance of local food producers and manufacturers. Many schools define local as within a certain number of miles from the school, within the county, or within the state. Alternatively, definitions might include more than one state (i.e., Georgia, Alabama, and Florida) or discrete parts of several states (i.e., specific counties in southwest Washington, northeast Oregon, and Idaho). In addition, many schools use different definitions of local depending on the product or season. Also, please note that when applying geographic preference, origin is tied to the agricultural product, not the location of the respondent.

Who Defines Local?

Schools define what they mean by local. While many state and/or local governments have adopted definitions of local such as "within the state" or "within the county," schools using a geographic preference when sourcing food for the federal child nutrition programs are under no obligation to adopt any definition for local that might be in existence in local areas.

THE FARM *to* SCHOOL PROGRAM

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Three Examples for Using Geographic Preference

Federal regulations do not prescribe the precise way that geographic preference should be applied, or how much preference can be given to local products. Thus, there are a variety of ways to apply geographic preference and one way is not considered better or more effective than another. The key is to be sure that use of geographic preference does not restrict full and open competition. Further, regardless of which method is used, the selection criteria must be clearly described in all solicitation materials.

EXAMPLE ONE

A school district issues an invitation for bid (IFB) for apples and states a preference for apples grown within 100 miles of the school. IFBs are generally used when a firm fixed-price contract will be awarded to the lowest responsive and responsible bidder. The solicitation makes it clear that any respondent able to provide local apples will be awarded 10 points in the selection process. In this example, the 10 preference points are equivalent to a 10 cent reduction in price for the purposes of evaluating the lowest bidder.

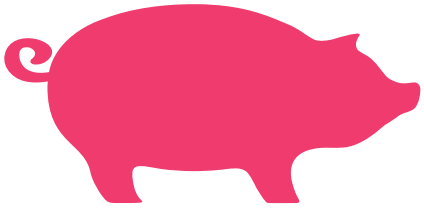
	OWEN'S ORCHARD	APPLE LANE FARMS	ZOE'S BEST
Price	$1.97	$2.05	$2.03
Apples within 100 miles of school	No	Yes (10 Points)	No
Price with preference points applied, for evaluation purposes only	$1.97	$1.95	$2.03

Apple Lane Farms meets the stated preference for local products and is awarded 10 additional points, which translates into deducting 10 cents from Apple Lane Farm's price. This makes Apple Lane Farms the "lowest bidder." The school still pays Apple Lane Farms $2.05 for its product; deducting 10 cents from the price of responsive bidders that meet the geographic preference only applies to determining the winning respondent and would not affect the actual price paid to the respondent.

* *

EXAMPLE TWO

A school district issues a request for proposals (RFP) for its produce contract and indicates a preference for fresh fruits and vegetables produced within the state. For the purposes of evaluating bids, respondents who can supply at least 60% of the requested items from within the state will receive a 10% price reduction.



	PRODUCE EXPRESS	RAY'S PRODUCE	F&V DISTRIBUTION
Contract Price	$31,000	$35,000	$34,000
% F&V from within the state	20	80	50
Geographic preference points to respondent able to meet > 60% local items	No	Yes (10% pref.)	No
Price with preference points applied, for evaluation purposes only	$31,000	$31,500	$34,000

Ray's Produce is the only firm that is able to supply greater than 60% of the requested items from the state, thus, Ray's Produce receives a 10% reduction in price for the purposes of evaluating bids. Even with the reduction, Ray's Produce is not the lowest bidder. If price alone were the determining factor for this school district, Produce Express would be awarded the contract.

EXAMPLE THREE

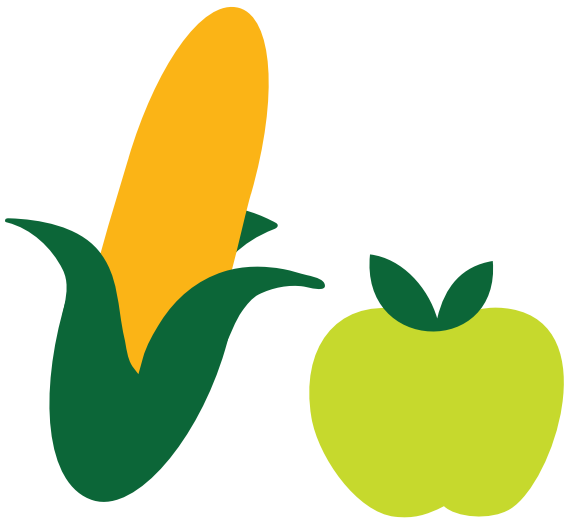
A preference for local products doesn't necessarily have to be calculated with absolute values; sliding scales may be appropriate. Further, solicitations may include evaluation criteria that allow for consideration of factors other than price alone.

Some of the factors in addition to price that might be considered include technical expertise, past experience, years in business, marketing, etc. School districts may also include elements such as ability to host farm visits, showing the state or farm of origin on the invoice, or providing farm information for education in the lunchroom as part of their selection criteria.

A school district issues a request for proposals for beans and grains and makes it clear that bids will be evaluated using a 100 point system. Ten preference points will be awarded to vendors able to provide over 70% of the requested items from within the state, 7 points for 50-69% and 5 points for 25-49%. Points for local sourcing will be included along with other evaluation factors.

	LAURIE'S LEGUMES	PAULA'S PULSES	GARY'S GRAINS
Price = 40	30	35	40
Contractor ability to perform all specifications Product quality = 15 Delivery = 10 Packaging and labeling = 5	25	30	30
Three references, past history = 10	10	10	10
Able to provide farm/ facility tour or classroom visits = 5	0	5	5
Able to provide state of origin on all products = 5	0	5	5
Ability to provide products sourced within the state = 10	0	10	7
100 possible points	65	95	97

In the example above, Paula's Pulses is able to source 75% of their products from within the state, earning them 10 points in the scoring process in the local products category. Gary's Grains can source 55%, earning them 7 points, and Laurie's Legumes is unable to guarantee any products from within the state so they receive 0 points in the local preference category. Gary's Grains wins the contract.



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Additional Resources

* **Procuring Local Foods for Child Nutrition Programs Guide,** from USDA's Food and Nutrition Service (FNS) – This comprehensive guide showcases the many ways schools can purchase locally, and correctly. The document also provides information on procurement basics, what local means and where to find local foods.
  http://go.usa.gov/KAFH

* **Finding, Buying, and Serving Local Foods Webinar Series,** from FNS - This series starts with an introduction to basic procurement principles, and then walks through strategies and tactics fro buying local foods.
  www.fns.usda.gov/farmtoschool/procuring-local-foods

* **Program-specific procurement regulations,** from FNS – Links to regulations governing each major Child Nutrition Program from Title 7 of the Code of Federal Regulations.
  www.fns.usda.gov/cnd/f2s/USDA_procurement_reg.htm

* **Final Rule: Geographic Preference Option,** from FNS – The final rule, published in the Federal Register, includes a summary, background, and final regulatory language, by program, for the geographic preference option.
  http://www.fns.usda.gov/sites/default/files/2011-04-22.pdf

* **Procurement Geographic Preference Q&As Part I,** from FNS – A memo published in February 2011 addressing questions regarding application of the geographic preference option.
  http://www.fns.usda.gov/sites/default/files/SP18-2011_os.pdf

* **Procurement Geographic Preference Q&As Part II,** from FNS – A memo published in October 2012 addressing additional questions regarding application of the geographic preference option and other mechanisms for local procurement.
  www.fns.usda.gov/sites/default/files/SP03-2013os.pdf

* **State Agency Guidance on Procurement,** from FNS in partnership with the National Food Service Management Institute – An online procurement training geared towards state agencies that focuses on federal procurement requirements.
  http://www.nfsmi.org/Templates/TemplateDefault.aspx?qs=cElEPTEzNQ

* **A School's Guide to Purchasing Washington-Grown Food,** from the Washington State Department of Agriculture – This guide provides information on using the geographic preference option to source local foods in Washington; however, much of the content is broadly applicable.
  www.wafarmtoschool.org/Page/74/procurement-guide

* **Geographic Preference: A primer on purchasing fresh local food for schools**, from School Food FOCUS and the Harrison Institute for Public Law at Georgetown Law – This guide provides an overview of procurement regulations and several examples for how a school might apply a geographic preference.
  www.schoolfoodfocus.org/wp-content/uploads/2013/07/FOCUS_GP_Primer_July-2013.pdf

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For more information, and to sign up to receive USDA's bi-weekly Farm to School E-letter, please visit www.fns.usda.gov/farmtoschool. Questions? Email us at farmtoschool@fns.usda.gov.

THE FARM to SCHOOL PROGRAM

This checklist is based on the food safety checklist created by the Center for Nutrition in Omaha, NE. The original version is available in their Farm to School Toolkit (http://toolkit.centerfornutrition.org/wp-content/uploads/2011/10/safety-checklist.pdf). This checklist is one of many tools that can be used to gather information about a producers food safety protocols.

Checklist for Retail Purchasing of Local Produce

(Send list to farmer in advance of visit and further discussion. Plan minimum of 2 site visits per season)

Name of Producer/Farm_____
City_____ State_____ Zip Code_____
Telephone_____Email_____
Total acres farmed_____ Availability of promotional materials YES NO
Products to be purchased_____
Is an insurance liability required YES (Dollar amount_____) NO
Is the facility licensed and inspected to process products YES NO
Are there acceptable substitutes available if an order cannot be filled YES NO

Production Practices

1) Are wells protected from contamination?
2) If irrigation is used, what is its source? Well Stream Pond Municipal Other
3) Is there documentation of water testing?
4) What types of manures are used? Raw manure Composted Aged No manure is used
5) Is raw manure incorporated at least 2 weeks prior to planting and/or 120 days prior to harvest?
6) Is the manure application schedule documented?
7) Is land use history for 3 years available to determine risk of product contamination (e.g., runoff from upstream, flooding, chemical spills, or excessive agricultural crop application)?
8) Is the field exposed to runoff from animal confinement or grazing areas?
9) Are farm animals restricted from growing areas? Are growing areas checked for wild animals? Are you doing what you reasonably can to restrict growing areas?
10) Are portable toilets used in a way that prevents field contamination from waste water?

Product Handling

1) Are storage and packaging facilities kept clean?
2) Is there risk of contamination with manure?
3) Is harvesting equipment/machinery that comes into contact with the products in good working order and kept as clean as possible?
4) Is dirt, mud, or other debris removed from product before packing (Does customer want product washed before shipping)?

5) Are product and non-product containers available and clearly marked?
6) Are food grade packaging materials clean and stored in areas protected from pets, livestock, wild animals, and other contaminants?

Transportation

1) Is product loaded and stored to minimize physical damage and risk of contamination?
2) Is transport vehicle well maintained and clean before hauling produce?
3) Are there designated areas in transport vehicle for food products and non-food items?
4) Are products covered during transport?
5) Are products kept cool during transit?

Facilities

1) Are packing areas kept enclosed or is product packed in the field?
2) Are food grade packaging materials used?
3) Is potable water/well tested at least once per year and results kept on file?
4) Is product protected as it travels from field to packing facility?
5) Is a product packing area in use with space for culling and storage?
6) Do workers have access to toilets and hand washing stations with proper supplies? (If pickers work in smaller fields at different locations, restrooms may be within ¼ mile).
7) Are toilets and hand washing stations clean and regularly serviced?
8) Is a pest control program in place at packing facility?

Worker Health and Hygiene

1) Is a worker food safety training program in place?
2) Are workers trained about hygiene practices and sanitation with signs posted to reinforce messages? (Recommended employees are trained at beginning of each picking season.)
3) Are workers and visitors following good hygiene and sanitation practices?
4) Are smoking and eating confined to designated areas separate from product handling?
5) Are workers instructed not to work if they exhibit signs of infection (e.g., fever, diarrhea, etc.)?
6) *Do workers practice good hygiene by:*
   a. *wearing clean clothing and shoes*
   b. *changing aprons and gloves as needed?*
   c. *keeping hair covered or restrained?*
   d. *washing hands as required?*
   e. *limiting bare hand contact with fresh products?*
   f. *covering open wounds with clean bandages?*

I confirm that the information provided above is accurate to the best of my knowledge.

Signature of Seller: _____ Date: _____