Urban Small Farms Conference 2019

Wednesday, February 20th, 2019

Time	Advanced Vegetable
8:30	Improving Water Management: Lessons Learned from Plastics and Shading - Dan Drost, USU **pg. 1**
9:00	Vegetable IPM: Pest Issues Updates - Nick Volesky, USU **pg. 5**
9:30	Starting and Successfully Operating a Small Vegetable Farm - Lyle & Kathy Holmgren **pg. 9**
10:00 - 10:30 Break	
10:30	Winter and Summer Cover Cropping Options - Dan Drost, USU **pg. 10**
11:00	New and Increasing Vegetable Disease Problems in Utah - Claudia Nischwitz, USU **pg. 15**
11:30	Grower Roundtable: Vegetable Issues Influencing Utah - Dan Drost, USU **pg. 23**

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Improving Water Management: Lesson Learned from Plastics and Shading

More growers are using plastic mulches and some are integrating shade into their farm operations. Use of these technologies alters soil water use patterns and this can influence vegetable growth and yield. This presentation will address how to better manage fields where shade and mulches are used while still maintaining plant growth and productivity.

Daniel Drost
Professor - Vegetable Specialist
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Dr. Dan Drost is a Professor of Horticulture and Extension Vegetable Specialist in the Department of Plants, Soils and Climate at Utah State University. Dr. Drost grew up on a small farm in western Michigan, graduated from Michigan State University (BS - Agricultural Education; MS – Horticulture) and earned his PhD from Cornell University (Vegetable Physiology). Dan taught in New Zealand (1983-87) at Massey University and has work for Utah State University (1992-present). Dr. Drost has more than 35 years of research and outreach experience with vegetables and focuses his efforts on earliness, water savings, fertility, organic production, and high tunnels.

Improving Water Management:
Lessons Learned from Mulch/Shade

Dr. Dan Drost
Advance Vegetable Session
Feb. 20, 2019
dan.drost@usu.edu

Fruit Losses & Farm Profits

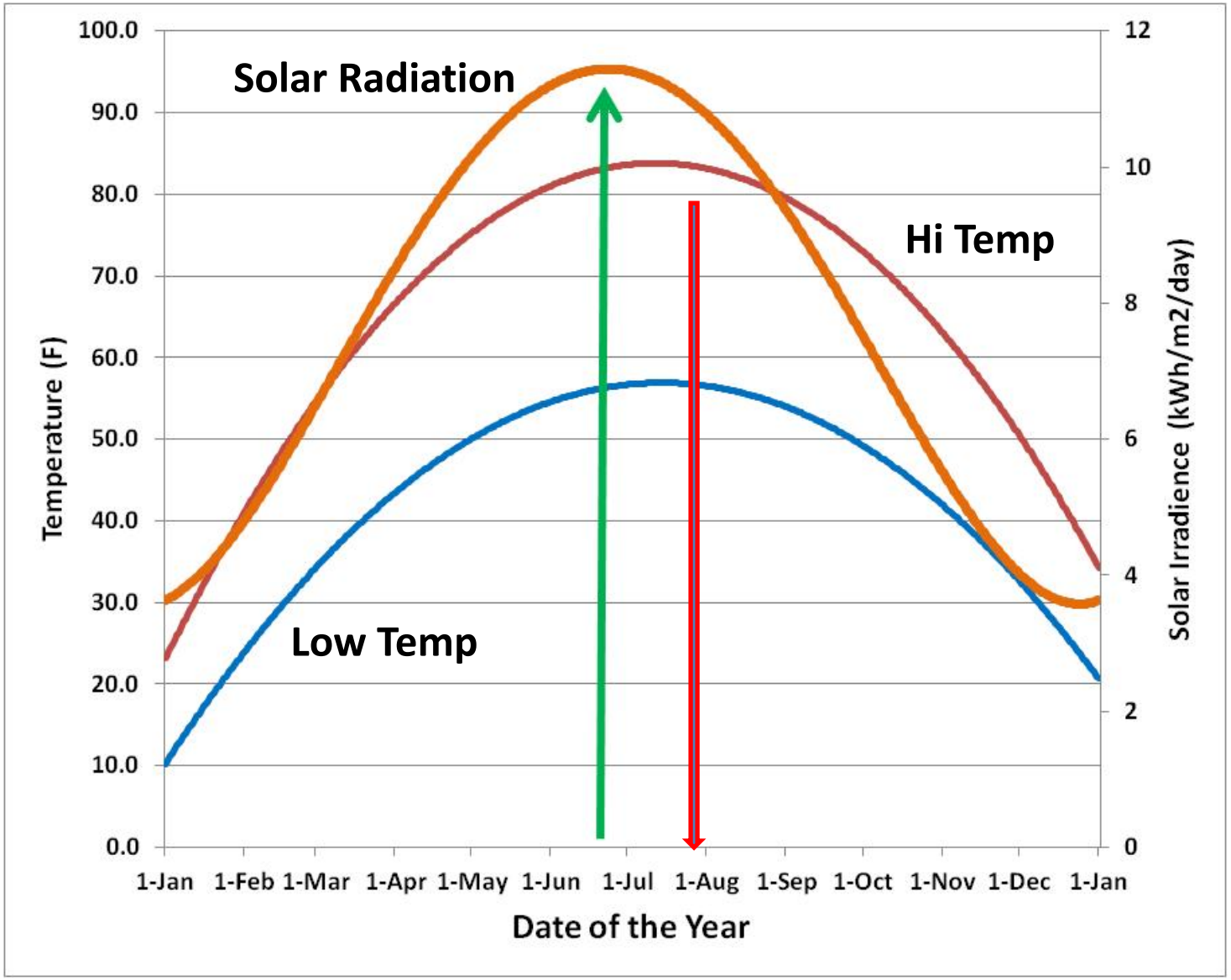
- **The Field-to-Store losses for fruits-vegetables is estimated at 20-40% (NRDC, 2012)**
  - **Farm Production 20% never harvested/damages/pricing**
  - **Post-harvest 3% quality/off-grade**
  - **Processing 1% trimming/**
  - **Distribution 12% temps/rejection/not sold/expired**
  - **Consumer 28% labeling/spoilage/etc.**

- **Consumed vs. Loss 48% vs. 52%**
- **Cost to Households $1300-2300/yr.**

Vegetable Losses - Farm

- Over Planting
- Stress Related
  - Water (under/over apply)
  - Temperature (high/low effects)
  - Pests (disease/insect/weeds)
- Quality Issues
- Labor Issues
- Food Safety Scares

Salt Lake City – Radiation & Temperatures



Shading Study – Pepper/Tomato

	Tomato Fruit Yield (lbs./Acre)			
	#1	#2	Mkt	Culls
– Shade	12,142	17,398	29,540	13,907
+ Shade	28,151	41,286	69,437	20,325
% change	**131**	**137**	**135**	**46**
	**	**	**	*
	Harvest window: 8/5 - 9/21			

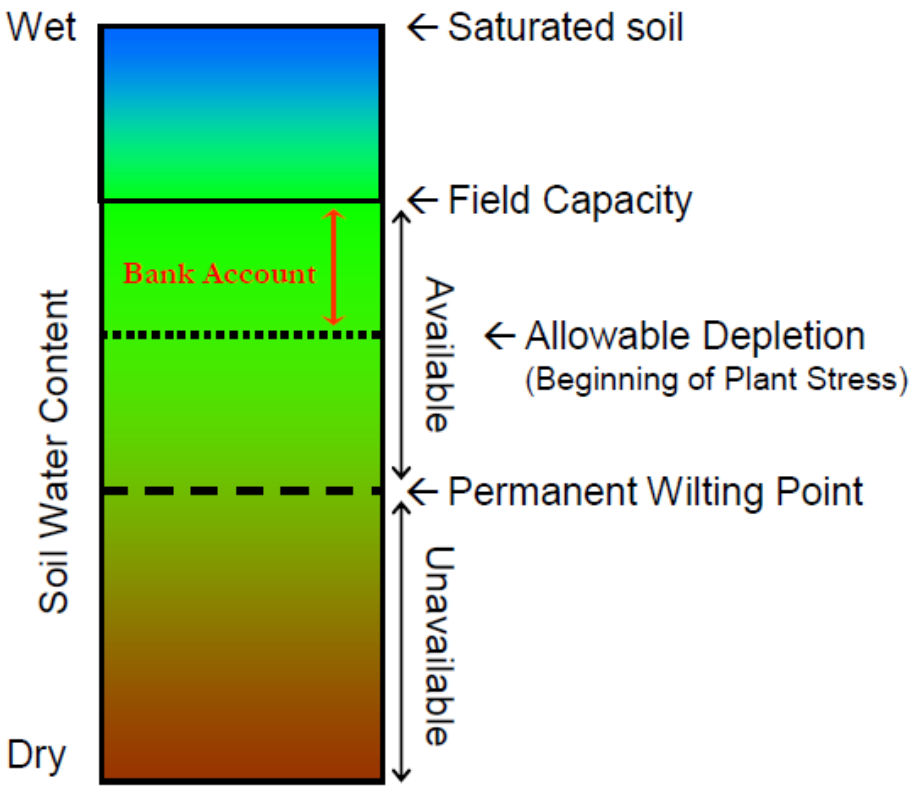
Tomatoes

Red Bell Pepper Yield & Quality

	Red Fruit Yield (lbs./Acre)			
	Fancy	**#1**	**#2**	**Culls**
– Shade	11,543	5,656	14,439	33,642
+ Shade	22,074	6,353	10,287	11,156
% change	**91**	**12**	**-29**	**-67**
	**	-	*	**
	8/23 - 9/29; red fruits only Marketable yield = 38,700 vs. 31,600 lb/A			

Water Mgt. Strategies

- Optimum Amounts
  - Healthier Plants
  - Maximum Yields
  - Higher Quality Fruits
- Over-Irrigation
  - Disease; Leaching; Water-loss
- Under-Irrigation
  - BER; Sunburn; Low Yield



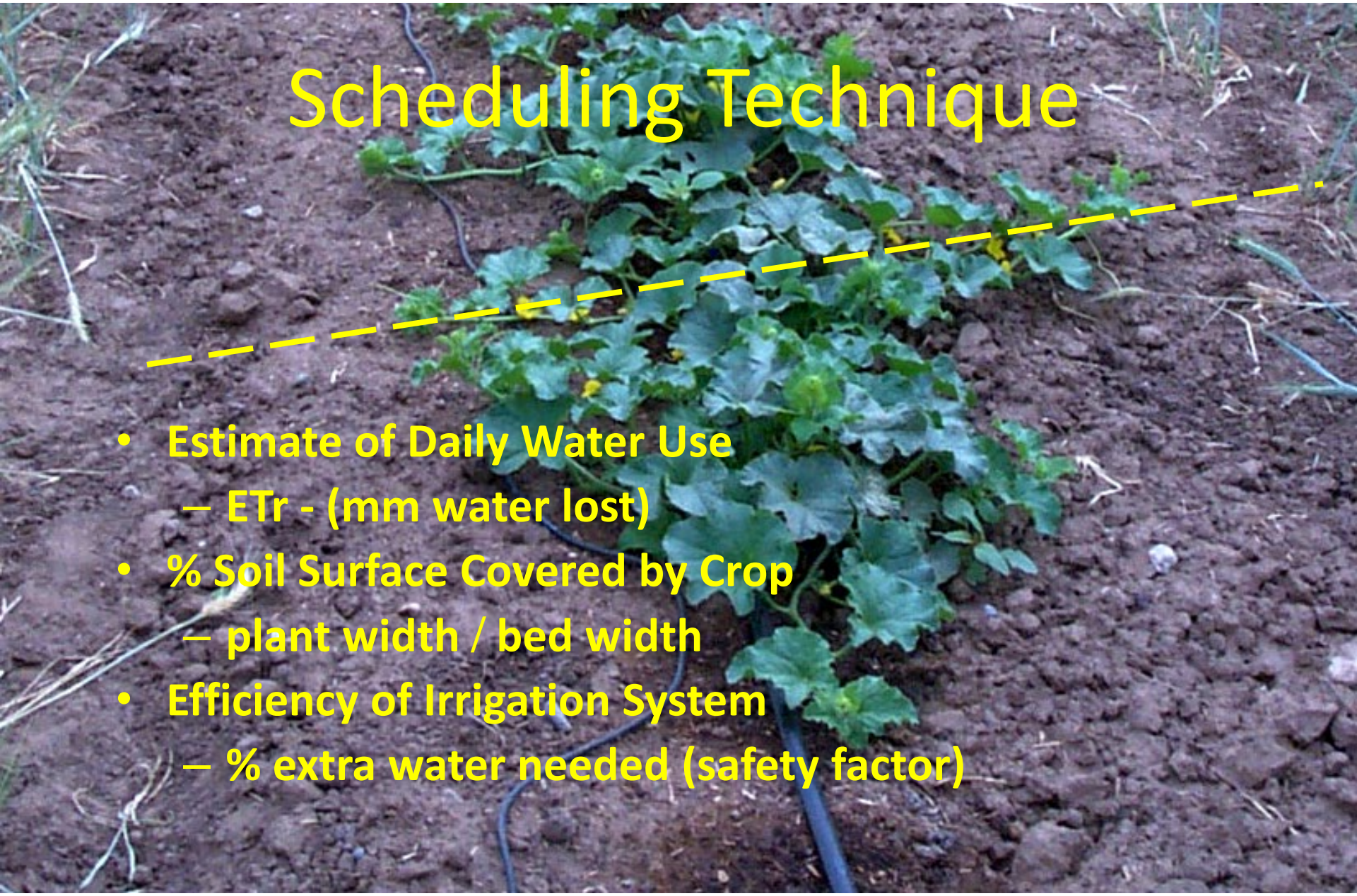
Soil Water Holding Capacity

- Allowable Depletion: 30-40%; Amount of plant use before stress starts to occur; Stress not always noticeable.

Soil Texture	Total Available Water	Allowable Depletion *inches* (Readily available)	
	inch/foot	In top1'	In top1.5'
Sands and fine sands	0.5 - 0.75	0.15 0.23	0.23 0.34
Loamy sand	0.8 - 1.0	0.24 0.3	0.36 0.45
Sandy loam	1.2 - 1.5	0.36 - 0.45	0.54 - 0.68
Loam	1.9 - 2.0	0.57 - 0.6	0.85 - 0.9
Silt loam, silt	2.0 - 2.1	0.6 - 0.63	0.9 - 0.95
Silty clay loam	1.9 - 2.0	0.57 - 0.6	0.85 - 0.9
Sandy clay loam, clay loam	1.7 - 2.0	0.51 - 0.6	0.77 - 0.9

Irrigation

Scheduling Technique



- Estimate of Daily Water Use
  - ETr - (mm water lost)
- % Soil Surface Covered by Crop
  - plant width / bed width
- Efficiency of Irrigation System
  - % extra water needed (safety factor)

$ET_{reference}$ & K_{crop}

- $ET_{cr}=ET_r-K_{crop}$
- Determine ET_r for your location
  - climate.usu.edu
- Know Soil Water holding Capacity
- Estimate Irrigation Interval

Crop Growth Stages & Crop Coefficients			
Crop	**10% Cover**	**10-70% Cover**	**70%-Harvest**
Pepper	**0.58**	**0.75**	**0.71**
Tomato	**0.58**	**0.75**	**0.66**

Example: ET and Water Needs

Month	SLC	Gal/A/day		St. George	Gal/A/day
	Ave. ET	Water		Ave. ET	Water
March	0.11	2987		0.15	4073
April	0.17	4617		0.22	5974
May	0.22	5974		0.28	7604
June	0.28	7604		0.32	8690
July	0.30	8147		0.31	8418
August	0.27	7332		0.28	7604
September	0.19	5160		0.21	5703
October	0.11	2987		0.14	3802

Doing the Calculations

- $ET_{cr} = ET_r * K_{crop}$
- Reference = 0.25”/day
- $K_{crop} = 0.90$
- Then ET_{cr} =

  0.25*0.9 = 0.225”/day

Loam soil – 2”/ft soil

Root depth 1.5 feet

3”water/0.225”$_{per}$ day =

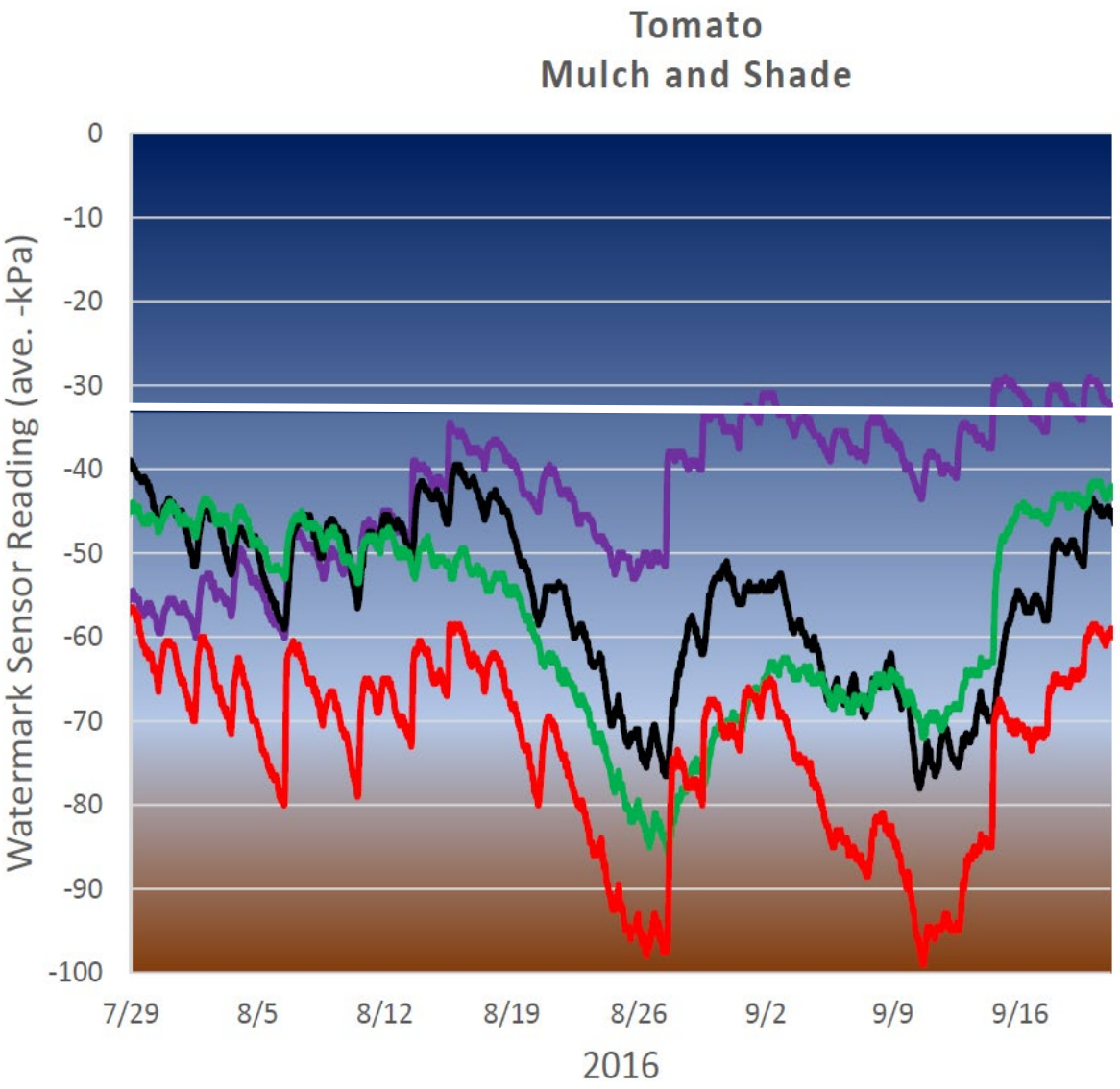
13.3 days * 0.35 ($_{allowable\ depletion}$) =

4.67 days till next watering

Tracking Soil Water

- Gypsum Blocks
- Resistance Meters
- Suction Meters
- Guessing?

Soil Water & Shade



Summary

- Minimize plant stress (weeds, pests, mulch)
- Collect soil water values
- Track ET & do calculations
- Irrigate based on DATA
- Consider mulch & shade
  - http://extension.usu.edu/productionhort/
- Use finding to evaluate economics & management

Questions

Horticulture

EXTENSION
UtahStateUniversity

extension.usu.edu

August 2017 Horticulture/Irrigation/2017-01pr

Drip Irrigation for Commercial Vegetable and Fruit Production

Tiffany Maughan, Niel Allen, and *Dan Drost*

Horticulture

EXTENSION
UtahStateUniversity

extension.usu.edu

January 2016 Horticulture/Vegetables/2016-01

Use of Plastic Mulch for Vegetable Production

Tiffany Maughan and *Dan Drost*

Horticulture

EXTENSION
UtahStateUniversity

extension.usu.edu

May 2015 Horticulture/Vegetable/2015-03

Vegetable Irrigation: Sweet Pepper and Tomato

Tiffany Maughan, Dan Drost, and *L. Niel Allen*

Horticulture

EXTENSION
UtahStateUniversity

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February 2017 Horticulture/Fruit/2017-02

Using Shade for Fruit and Vegetable Production

Tiffany Maughan, Dan Drost, *Brent Black* and *Sam Day*

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Veg IPM: Pest Issues Updates

I will provide a brief review of Integrated Pest Management, then I will go over some insects pests that were of concern for vegetable growers during the 2018 season along with what to look out for this season. I will conclude with highlighting some resources available through our Utah Pests program.

Nick Volesky
Vegetable IPM Associate
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I am a recent UNL graduate with two B.S. degrees in Agricultural Science and Horticulture. I currently work with the Integrated Pest Management Program with USU Extension. I scout various vegetable production farms and sites for any signs of disease or pests. I also send out seasonal pest advisories, edit publications and fact sheets, along with develop web content, and design outreach programs to better help our farmers and home owners.

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UTAH PESTS

Vegetable Integrated Pest Management

Pest Issues Updates

Nick Volesky

Vegetable IPM Associate

About Myself

Education:

- University of Nebraska-Lincoln
  - B.S. of Horticulture (Sustainable Food Production)
  - B.S. of Applied Science (Diversified Agriculture)

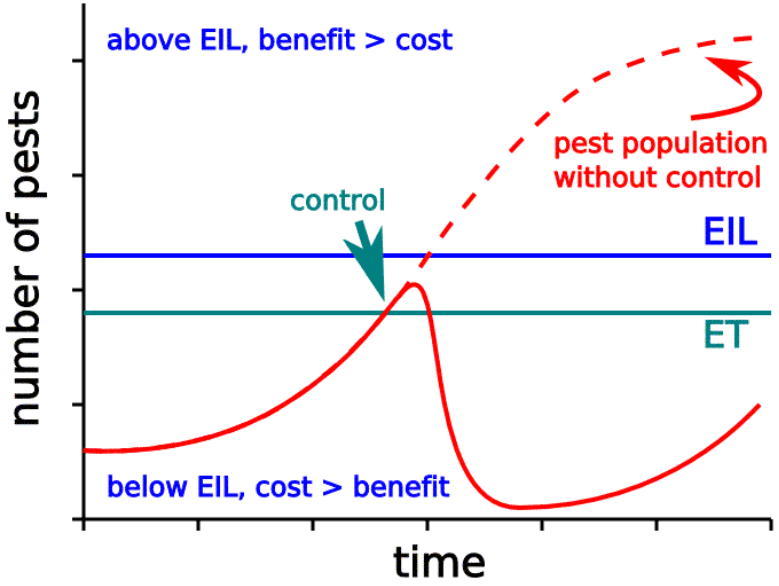
Experiential Background:

- Soil Nutrient Management / Irrigation Research
- Vegetable Production / Organic Farming Research
- IPM Field Scouting

IPM Overview

Pest Identification → Monitoring for Signs & Symptoms → Control Action Guidelines

Economic Injury Level – The lowest population density of a pest that will cause economic damage; or the amount of pest injury which will justify the cost of control.



Action Threshold – The point at which a pest control action must be taken to prevent unacceptable damage.

Cultural Control

- Land/Water Management
- Sanitation
- Habitat Diversification
- Tolerant/Resident Species and Cultivars
- Soils and Nutrition

Mechanical Control

- Hand Removal
- Mowing/Removing Weeds
- Traps
- Physical Barriers

Biological Control

- Predators
- Parasites
- Pathogens
- Herbivorous insects of weeds

Chemical Control

- Pesticides
- Synthetic Pesticides
- Organic Pesticides
- Biological Pesticides
- Insect Growth Regulators (IGRs)

2018 Season Pest Issues

- Scouting is crucial to know what insects are active (both harmful and beneficial) along with what diseases may be present.
- With regular monitoring a scout is able to gather current information on the identify and location of pest problems and to evaluate treatment effectiveness or make treatment decisions.

Earwigs

Forficula auricularia

Description
Adults: Slim with a brown body, red/brown head, and have a protrusive pair of cerci (pinchers) on the end of their bodies.
Nymphs: 4 instars, grey/light brown
Eggs: Elliptical shaped and white

Host Plants
sweet corn, beans, brassicas, cucumbers, tomatoes, lettuce, and potatoes.

Life Cycle
Adults will over winter in the soil as brooding pairs or above ground in aggregations.
In the spring, females will lay clutches of 30-50 eggs.

Earwigs

Damage
Adults noted feeding on the corn silks and occasionally the kernels as well.

Monitoring
Earwigs crawl into tight, dark places during the day and are often make an unwanted presence in harvested fruits, vegetables, and flowers. May seek shelter inside buildings.
Earwigs are more prevalent in highly irrigated + mulched areas.

Place “traps” in crop area throughout the early spring to catch and monitor populations.

Management
Earwigs can be both detrimental and beneficial to crops.
Only consider treatment when there is unacceptable crop damage.

Mites

Class: *Arachnida* | Family: *Tetranychidae*

Species: Bank's Grass Mite, Bulb Mite, Tomato Russet Mite, Two-spotted Spider Mite,

Description
Mites are best seen with a hand lenses, like spiders they have 8 legs

Host Plants
Most vegetable crops can be effected. Notably *solanaceae* crops

Life Cycle
Egg > Larva / Nymph > Adult
Most abundant during the hot, dry weather in the mid- and late summer.
Females can lay over 50 eggs, mites can complete life cycle in one week with ideal warm temperatures. (Several generations throughout the year)
Overwinter on decaying vegetation such as weed or crop debris.

Mites

Damage
Adults/Nymphs have piercing-sucking mouth parts which they use to puncture the plants which causes “stippling” or discoloration on foliage or fruits.

When and Where to Scout
Most common during hot/dry conditions.
Examine the lower and older leaves for stippling.

Threat Level
When not controlled, mites have the potential to kill plants.

Management
Predatory mites such as *Phytoselilus persimilis*
Pesticides

Grasshoppers

Order: *Orthoptera* | Family: *Acrididae*

Description
Adults: species can range in size.
Nymphs: are smaller in size and will have different coloration.
Eggs: are 4-5mm long and range from a white to light brown.

Host Plants
Tall broadleaf plants found along fence rows, irrigation ditches. Attracted to many weed species. Agronomic crops such as alfalfa, clover, corn, sugar beets, wheat, and soybeans

Life Cycle
Eggs > Nymphs > Adults
Eggs will over winter, and hatch around late spring. The nymphs will develop through their instars in about a month's time. The adults will present August through September.

Grasshoppers

Damage
Major agricultural pests. Damage is primarily caused to foliage of various crops.

When and Where to Scout
Populations fluctuate from year to year. Damage is mainly occurs in the early summer after rangeland weeds dry up.

Threat Level
Outbreaks are difficult to predict. Large populations can be economically damaging.

Management
Area-wide control
Row Covers
Application of baits, dusts, and sprays

Flea Beetles

Tribe: Alticini

Description
Adults: will jump when disturbed with their hind legs. Colors can range from metallic black, grey, bronze, to striped.
Larvae: are white with a brown head.

Host Plants
eggplants, brassicas, leafy greens, beets, melons, peppers, and tomatoes

Life Cycle
Egg > Larva > Pupa > Adults
1-3 generations per season
Adults will overwinter in nearby weedy vegetation.

Flea Beetles

Damage
Adults and larvae have chewing mouthparts that can create large holes in the cotyledon and foliage. Larvae will all feed on the roots of the crops.

Monitoring
Adults emerge from April through mid-June.
Inspect crops for injury near field borders.

Management
Keep crop area free of weeds.
Implement row covers.
Consider trap crops.
Apply insecticides.

Thrips

Order: *Thysanoptera*

Description
Adults: less then 2mm in length, elongated, and are yellow/brown with fringed wings
Larvae: creamy yellow

Host Plants
Target a wide range of vegetable hosts.
(Notable onions, tomatoes, squashes)

Life Cycle
Egg > Larvae > Pupa > Adult
5-8 generations can occur a year
Adults will over winter in plant debris/protected areas

Thrips

Damage
Thrips will use their mouthparts to feed on plants causing flecking wounds. Thrips can also vector various tospoviruses.

Monitoring
Adults are become active in the spring. Thrips populations increase in hot, arid conditions.

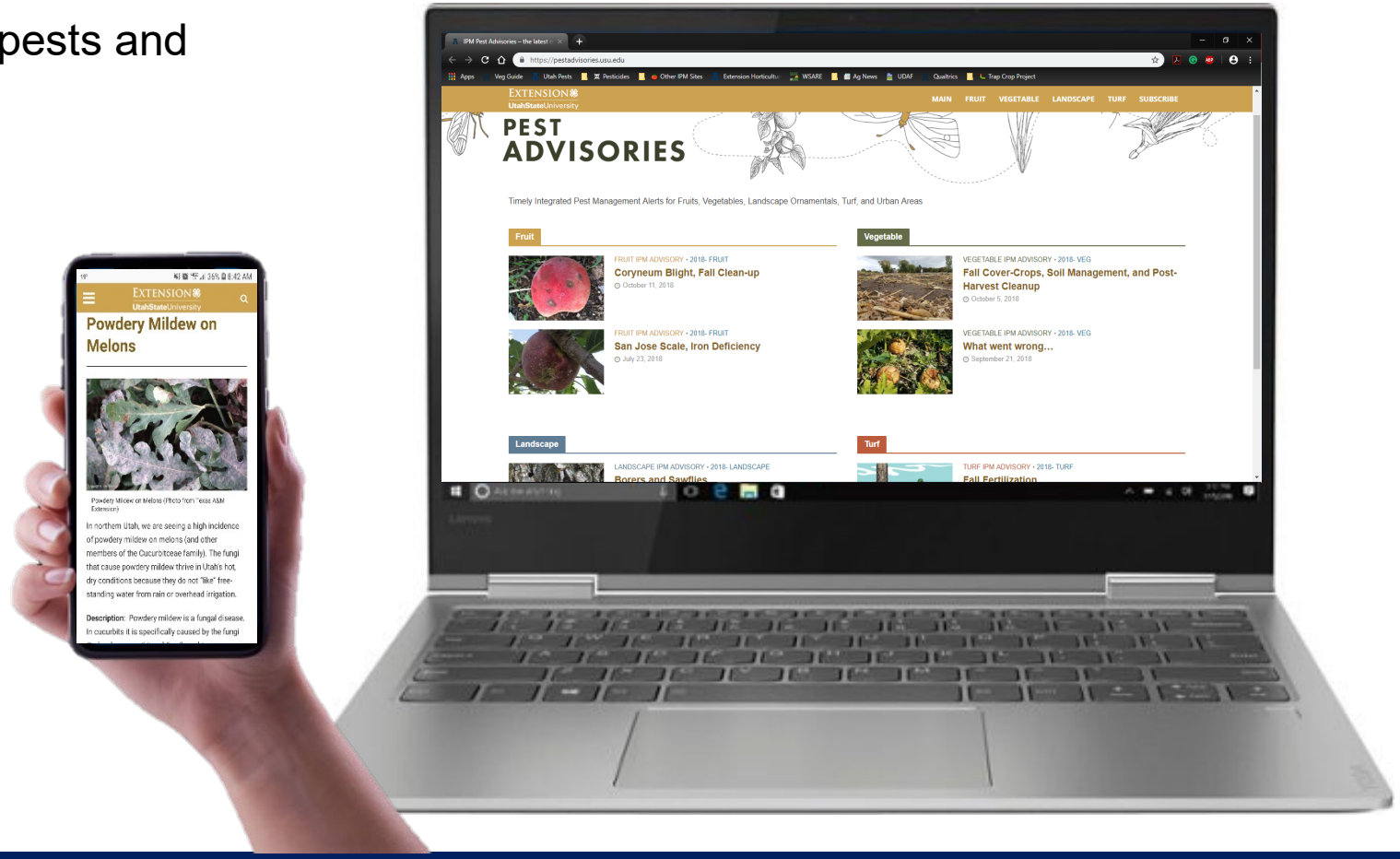
Management
Remove plant debris after harvest
Use overhead irrigation to wash thrips off the plants
Insecticides

Pest Advisories

pestadvisories.usu.edu/subscribe/

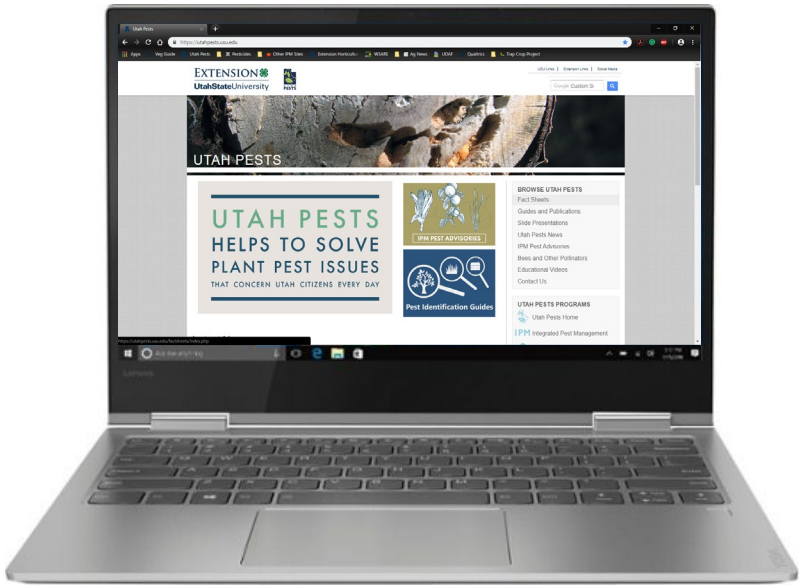
Receive an email with timely info on current pests and management tactics in your area!

- Vegetables
- Fruits
- Landscape Plants
- Turf

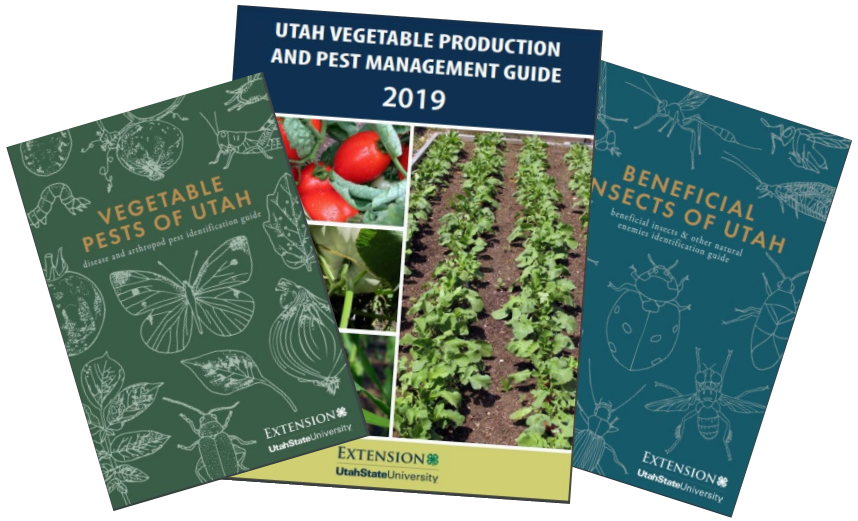


Additional Resources

utahpests.usu.edu/ipm



Guide Books



Fact Sheets

Contact Me

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Starting and Successfully Operating a Small Vegetable Farm

Starting the Business, Developing Markets, Our Concerns, Our Successes

Lyle and Kathy Holmgren
Owners - Holmgren's Produce
Holmgren's Produce
Lyle.holmgren@gmail.com

Kathy and Lyle Holmgren grow a variety of fresh vegetables on their 42-acre farm in East Tremonton, Utah. Lyle and Kathy recently retired from their jobs as a USU Extension agent and Intermountain Health Care to pursue their dream. They are excited to offer locally grown produce, not only to locals and travelers along highway 13 but to several local grocery stores and farmers markets throughout northern Utah.

For many years, East Tremonton – "the area between the Bear and Malad rivers" has been famous for its produce. The fertile sandy loam soil, Bear River water and just the right climate produce high quality flavorful produce. Their farm is chuck full of tomatoes, peppers, melons, squash, cucumbers, sweet corn and pumpkins. Except for the sweet corn, all produce is grown under a drip irrigation and plastic mulch system which helps to warm the soil and provide a barrier from weeds and pathogens that might otherwise come in contact with the vegetables from furrow or flood irrigation. It also conserves limited resources by using a fraction of water used by conventional irrigation practices.

Lyle and Kathy enjoy providing great tasting produce to the good folks in Northern Utah.

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Winter and Summer Cover Cropping Options

Cover crops provide a lot of on farm benefits. This includes soil stabilization, increased water retention, better weed management, reduced erosion, improved nutrient cycling and some disease management. These aspects will be discussed as well as some potential limitations to using cover crops.

Daniel Drost
Professor - Vegetable Specialist
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Sustainable Vegetable Crops: Winter/Summer Cover Crops

Dr. Dan Drost

Advance Vegetable Session

Feb. 20, 2019

dan.drost@usu.edu

UtahState University

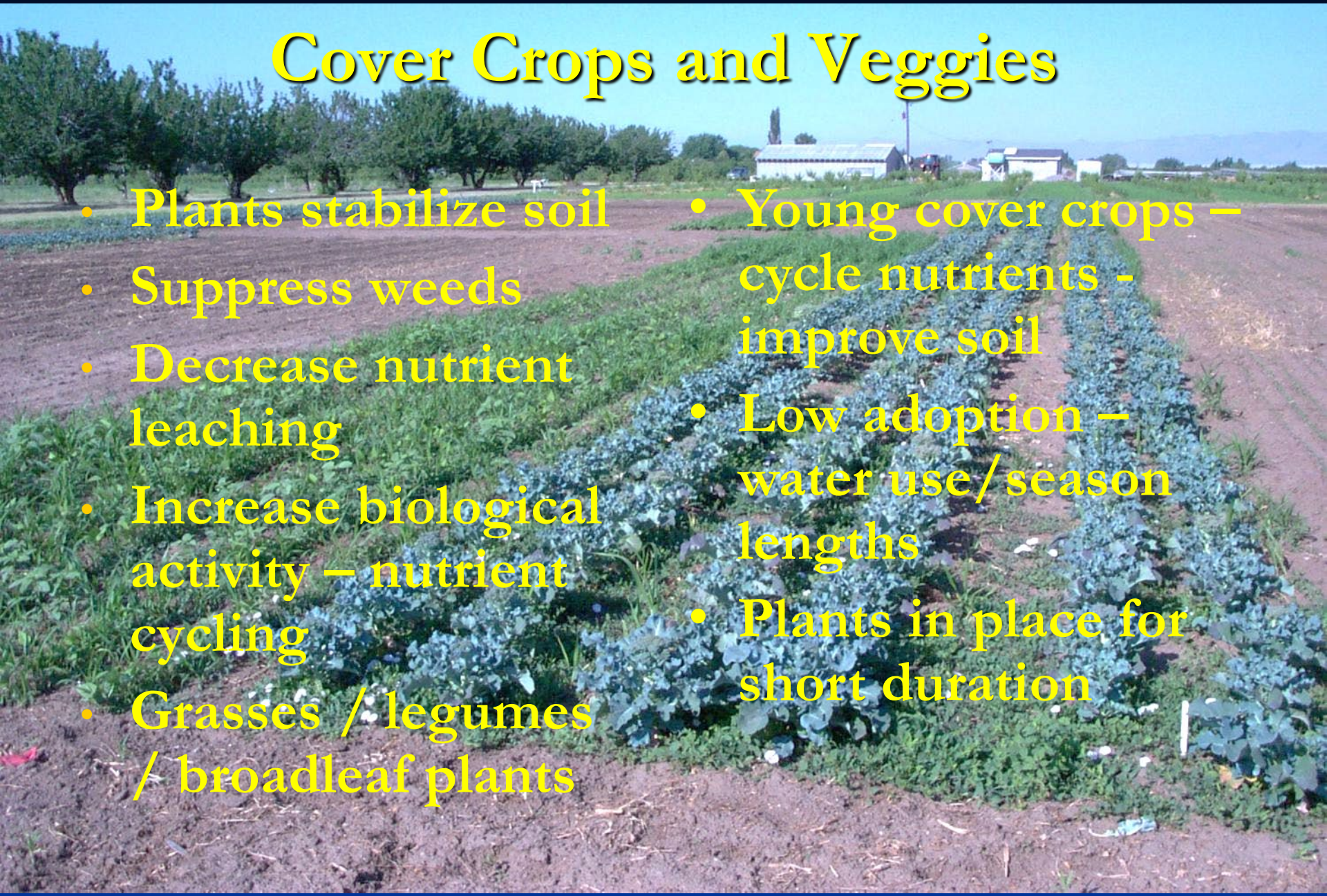
Vegetable Farming Systems

- Creating Sustainable Vegetable Farms in Utah.
  - Relating cover crops and vegetable crops;
  - Identifying appropriate cover crop for sustainable vegetables – Organic/Conventional.
  - Assessing winter-summer cover crops options and management strategies.

Cover Cropping Systems

- Winter – Summer Crops
- Watch out with Comparable Vegetables
- Nutrient Cycling and Vegetable Growth
- Weed Management & Long-term Influences

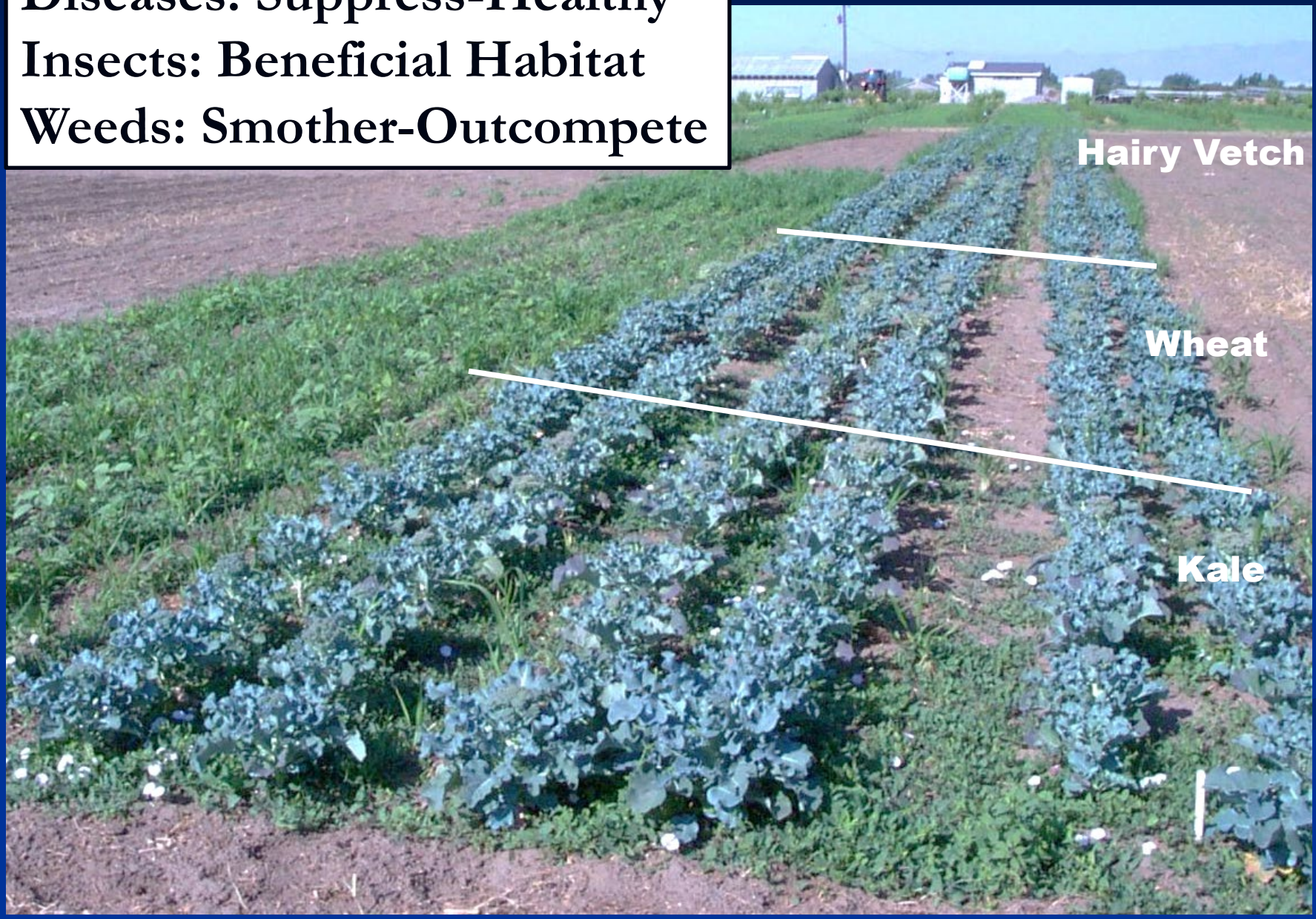
Cover Crops and Veggies



- Plants stabilize soil
- Suppress weeds
- Decrease nutrient leaching
- Increase biological activity – nutrient cycling
- Grasses / legumes / broadleaf plants
- Young cover crops – cycle nutrients - improve soil
- Low adoption – water use/season lengths
- Plants in place for short duration

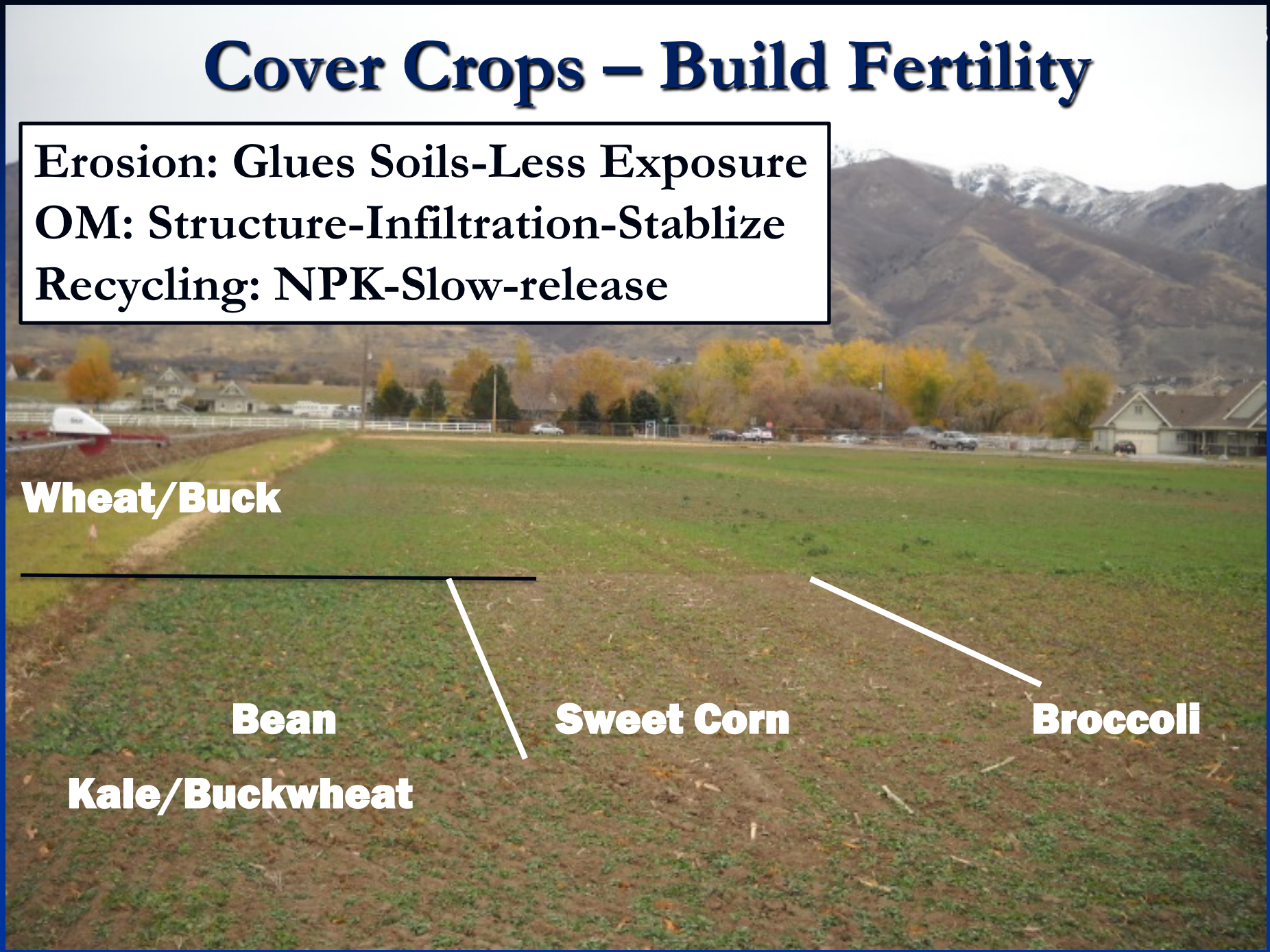
Cover Crop – Managing Pests

Diseases: Suppress-Healthy
Insects: Beneficial Habitat
Weeds: Smother-Outcompete



Cover Crops – Build Fertility

Erosion: Glues Soils-Less Exposure
OM: Structure-Infiltration-Stablize
Recycling: NPK-Slow-release



Cover Crops – Erosion

No-Till + Winter CC
Soil loss = 1.3 t/A

Annual Till + Grassy Margins
10.2 t/A

Selecting Cover Crops – Which Ones?

- Provide Nutrition
- Add Organic Matter
- Improve Soil Structure
- Reduce Erosion
- Conserve Water
- Manage Problems

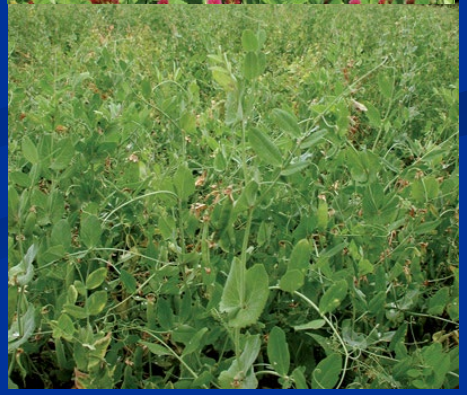
  - Legumes/Grasses
  - Slow Breakdown (BD)
  - Sorghum
  - Grasses
  - Live (?) or Slow BD
  - Many Options (??)

Cover Crop Options

Grasses

Broadleaf

Legumes



Cover Crops - Traits

Species	Type	Zone	Heat	Water	Wet	Fert.	Germ. Temp.	Timing
Barley	WA	7	+++	+++	+	+++	40F	Sp
Millet	SA	9	+++	++	+	++	60F	Su
Oat	CSA	8	+	++	++	++	35F	Sp, F
Rye	CSA	3	++	+++	++	++++	35F	Sp, F
Wheat	WA	4	++	++	+	+++	35F	Sp, F
Sorg-Sudan	SA	9	++++	++++	+	+++	65F	Su
Buckwheat	SA	9	++		+	+	60F	Su
Mustard	CSA	6	+++	+++	+	+	40F	Sp, F
Radish	CSA	6	+++	++	+	+	40F	Sp, F
Rape	WA	6	++	++	+	+	40F	Sp, F

Type – Winter Annual, Summer Annual, Short Perennial, Long Perennial
Heat – Tolerance to high temperatures
Water – Drought tolerances
Flood – Tolerance to wet conditions
Low Fertilizer – Growth potential without added fertilizer
Timing – Common time to plant. **Sp**ring, **Su**mmer, **F**all, **W**inter

+=poor; **++++**=excellent

Cover Crops - Traits

Species	Type	Zone	Heat	Water	Wet	Low Fert.	Germ. Temp.	Timing
Field Pea	WA	6	+	++	+	+	40F	Sp, F
Vetch (#)	WA	4	+	++	+	+	50F	Sp, F
Red Clover	ShP	4	+	+	++	+	40F	Sp, F
Wh. Clover*	LP	4	++	++	+	++	40F	Sp, F
Alfalfa*	LP	4	++	+	+	++	40F	Sp
Bean	SA	9	++	+	+	++	60F	Su
Cowpea	SA	9	++++	+++	+	++++	60F	Su

Type – Winter Annual, Short Perennial, Long Perennial, Summer Annual
Heat – Tolerance to high temperatures
Water – Drought tolerances
Flood – Tolerance to wet conditions
Low Fertilizer – Growth potential with out added fertilizer
Timing – Common time to plant. **Sp**ring, **Su**mmer, **F**all, **W**inter

+=poor; **++++**=excellent

Grass Cover Crops

Species	Total N (lb/A)	Dry Matter (lb/A)	N Mop	Soil Builder	Erosion Fighter	Weed Checker	Quick Growth	Lasting Residue
Barley		2-10	4	4	5	4	4	5
Millet		2-7	5	4	5	5	5	4
Oat		2-10	4	3	4	5	5	3
Rye		3-10	5	5	5	5	5	5
Wheat		3-8	4	4	4	4	4	4
Sorghum-Sudan		7-10	5	5	5	4	5	4

Total N – amount potentially supplied
N Mop – Ability to take up/store N
Soil Builder – OM adding/structure improver
Erosion Fighter – Soil holding ability
Weed Checker – Canopy density
Lasting Residue – Duration of residue

1=poor; 5=excellent

Broadleaf (other) Cover Crops

Species	Total N (lb/A)	Dry Matter (lb/A)	N Mop	Soil Builder	Erosion Fighter	Weed Checker	Quick Growth	Lasting Residue
Buckwheat	-	2-4	1	3	4	5	5	1
Mustard	30-100	3-9	3	4	4	4	4	2
Radish	50-150	4-7	4	4	4	4	5	2
Rape	40-150	2-5	4	3	4	4	4	3

Total N – amount potentially supplied
N Mop – Ability to take up/store N
Soil Builder – OM adding/structure improver
Erosion Fighter – Soil holding ability
Weed Checker – Canopy density
Lasting Residue – Duration of residue

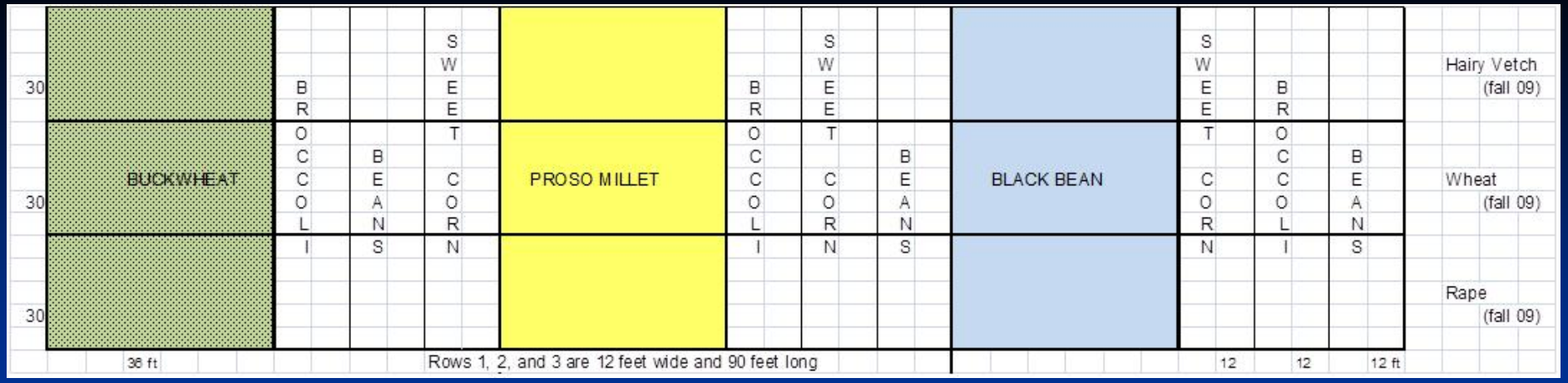
1=poor; 5=excellent

Legume Cover Crops

Species	Total N (lb/A)	Dry Matter (lb/A)	N Mop	Soil Builder	Erosion Fighter	Weed Checker	Quick Growth	Lasting Residue
Field Pea	75-125	4-5	2	3	4	3	4	2
Vetch (#)	80-150	2-5	2	4	3	3	2	2
Red Clover	70-125	2-5	3	4	4	4	2	2
Wh. Clover*	75-150	2-6	2	3	4	4	2	2
Alfalfa*	75-150	3-6	2	4	4	5	3	2
Bean	75-150	3-5	3	3	3	4	4	2
Cowpea	100-150	2-5	3	3	3	5	5	2

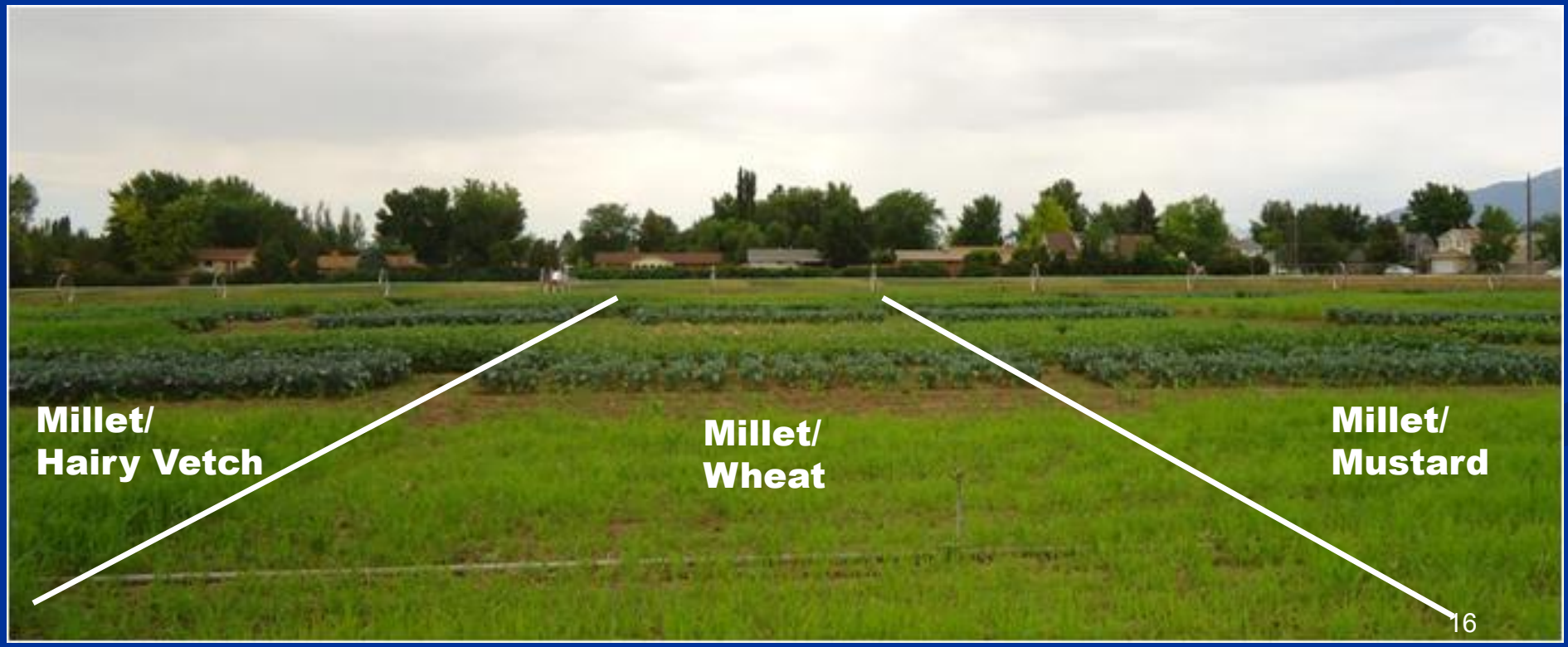
Total N – amount potentially supplied
N Mop – Ability to take up/store N
Soil Builder – OM adding/structure improver
Erosion Fighter – Soil holding ability
Weed Checker – Canopy density
Lasting Residue – Duration of residue

1=poor; 5=excellent



Green Beans – Broccoli – Sweet Corn
(rotated yearly between CC's and vegetable crops

- Need to cycle nutrients
- Complimentary or Antagonistic
- Ideally help manage weeds
- Achieve acceptable levels of productivity



Mustard – Black Bean

Mustard – Proso Millet

Mustard - Buckwheat

Wheat – Black Bean

Wheat – Proso Millet

Wheat - Buckwheat

Hairy Vetch-Black Bean

Hairy Vetch – Proso Millet

Hairy Vetch-Buckwheat

Kale – Black Bean

Kale – Proso Millet

Kale - Buckwheat

Wheat – Black Bean

Wheat – Proso Millet

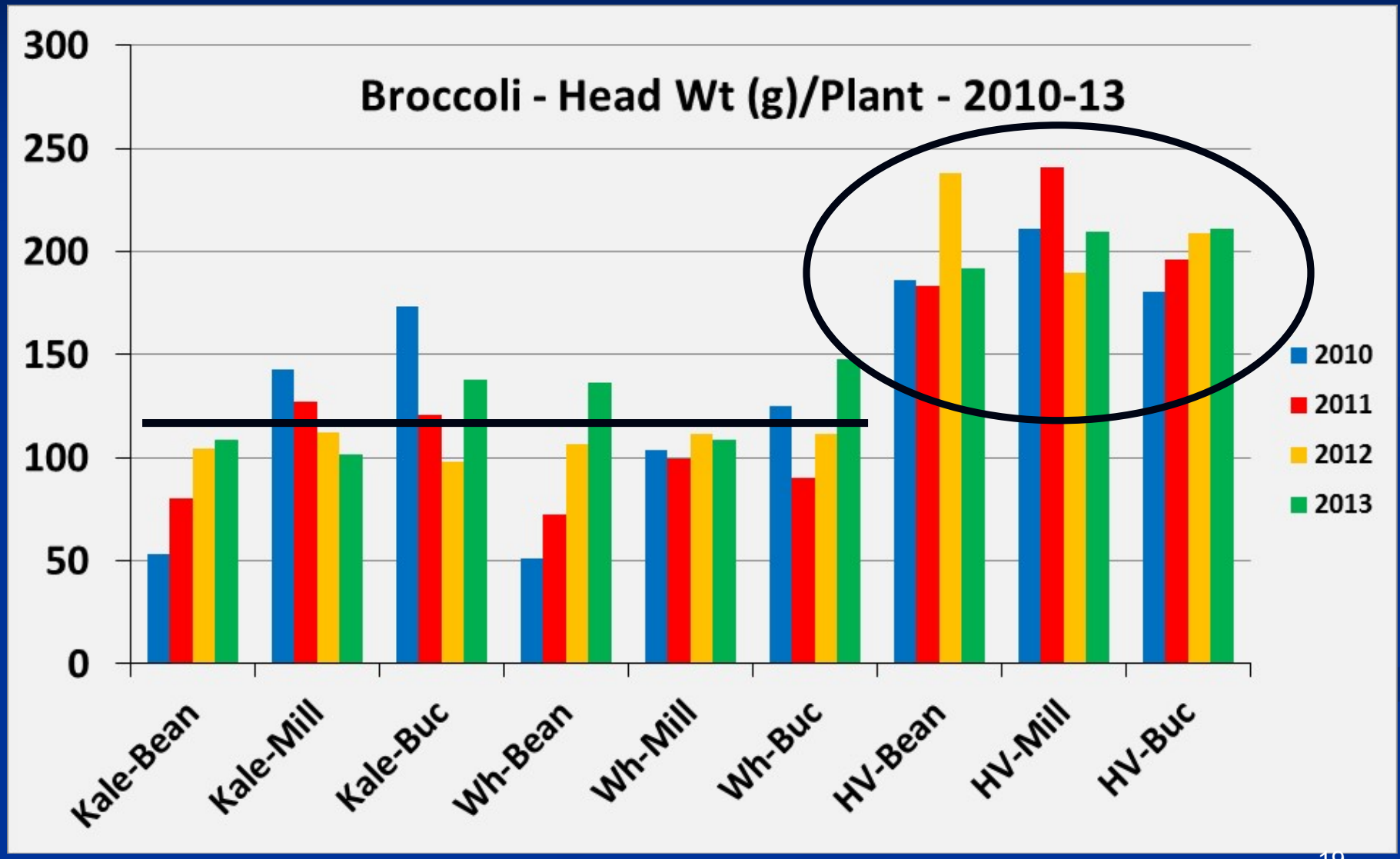
Wheat - Buckwheat

Hairy Vetch-Black Bean

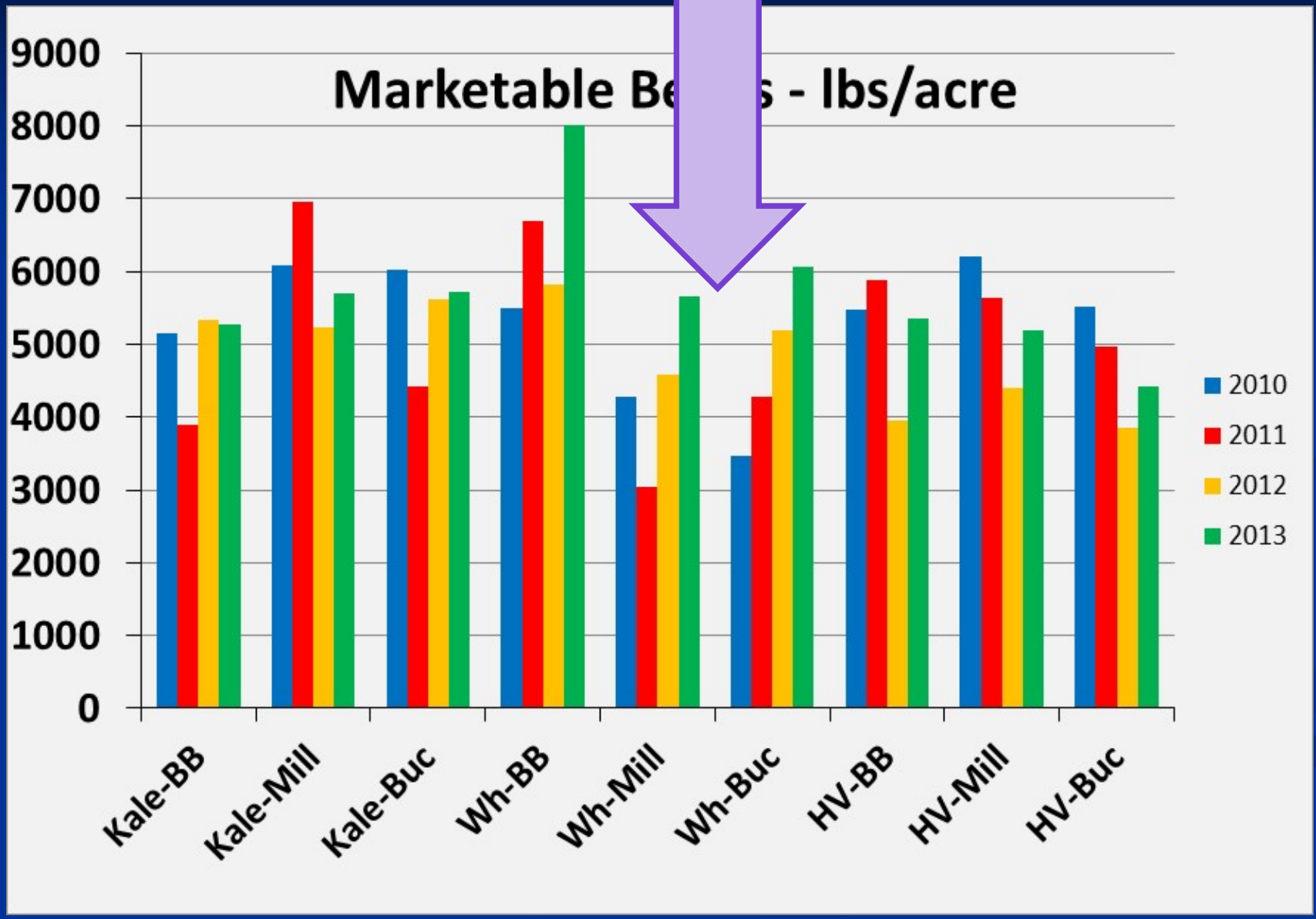
Hairy Vetch – Proso Millet

Hairy Vetch - Buckwheat

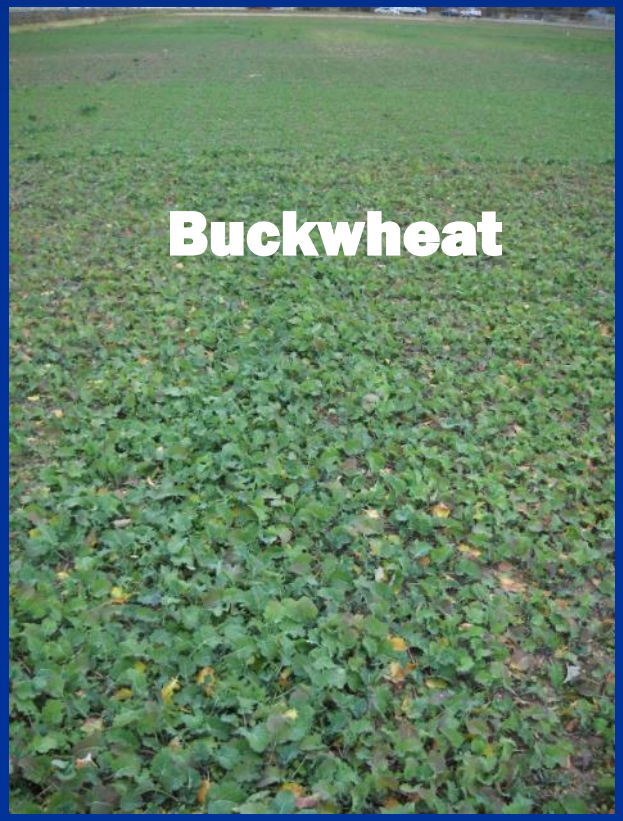
Broccoli Yield (g) by Rotation

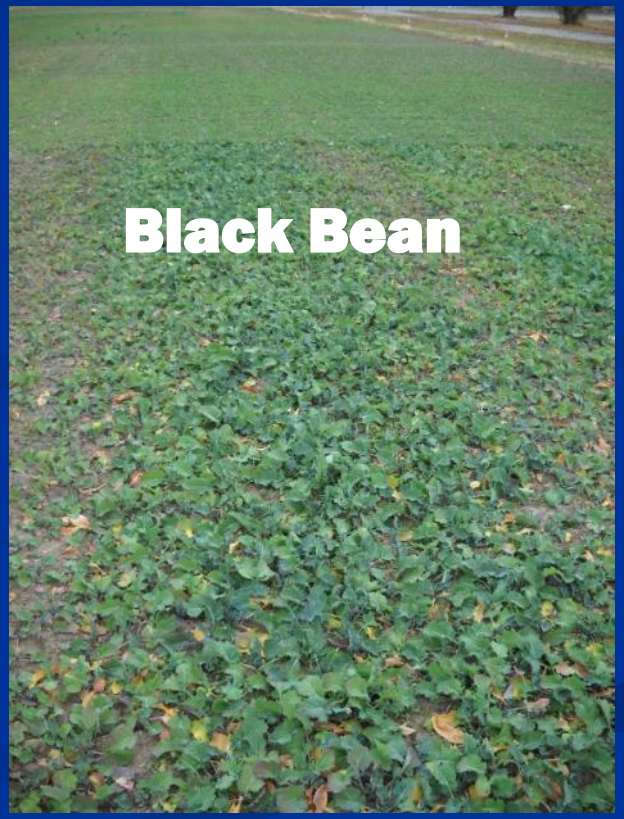


Bean Yield (lb/A)



Fall Brassica after Summer Cover Crops





Fall Brassica after Summer Veggies: Growth Issues

Bean

Sweet Corn

Broccoli

Fall Wheat after Summer Veggies

Bean

Sweet Corn

Broccoli

Conclusions

- Crops respond differently to Winter/Summer CC rotations.
- Work needed to ID best CC's and approaches for each farm.
- Be careful not to blindly accept information from afar. It may or often doesn't work.
- Think carefully but consider using!

Back to Top

New and Increasing Vegetable Disease Problems in Utah

The presentation will consist of new vegetable diseases identified in Utah in 2018 as well as new alternate hosts and increasing occurrence of plant diseases that are already in the state.

Claudia Nischwitz
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Associate Professor and Extension Specialist at USU. I have been at USU since August 2010. I work on diseases of plants with focus on vegetable and fruit tree diseases. In addition, I do diagnostics for the Utah Plant Pest Diagnostic lab.

The main research emphasis currently are:

Effect of soil and foliar nutrients on symptom expression of virus diseases in vegetables

Drone use for early disease detection and other planting problems in agriculture

Survey for Western X disease in stone fruit in Utah

Survey for vegetable diseases in Utah

New and increasing vegetable disease problems in Utah

Claudia Nischwitz

Associate Professor and Extension Specialist

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UtahStateUniversity
COOPERATIVE EXTENSION

Overview

- New hosts for curly top in Utah
- Spread of Tomato spotted wilt virus in Utah
- Powdery mildew on beets
- Powdery mildew on carrots
- Pythium in watermelon
- Potato mop top virus or herbicide damage?

New hosts for curly top

Curly top

- In Utah: Tomatoes and peppers
- Other vegetable hosts: Beans, pumpkins, gourds, beets and spinach
- Causal agent: Curtoviruses
- Transmitted by beet leafhopper

Curly top

- Symptoms (tomato):
  - Leaf margins turn upwards
  - Leaves turn yellow with purple veins
  - Premature fruit ripening
  - Stunted plants

http://wrir4.ucdavis.edu/Photos/FRCs/drec/pages/Tomato%20Curly%20Top%20Virus.htm

http://www.growingproduce.com/vegetables/virus-slams-california-tomatoes/

Curly top

- Symptoms (pepper):
  - Plants are yellow and stunted
  - No marketable fruit

http://wrir4.ucdavis.edu/PHOTOS/pest/pages/Beet%20Curly%20Top%20Virus%20on%20Bell%20Peppers%20NM.htm

http://www.growingmagazine.com/fruits/new-approaches-in-virus-resistance-development/

Curly top

- Symptoms (beets):
  - Plants are yellow and stunted
  - Vascular tissue in tuber is discolored

Curly top

- Symptoms (pumpkin and gourds):
  - Plants are yellow and stunted
  - Plants die

Curly top

- Symptoms (zinnia):
  - Plants turn yellow and die
- Symptoms (amaranth)?:
  - Plants dry up and die
  - Unfortunately symptomatic plants had already been distroyed

Curly top

- Management:
  - Floating row covers for young transplants
  - Shade cloth
  - Good weed control

Tomato spotted wilt virus

Tomato spotted wilt virus


http://www.caes.uga.edu/topics/diseases/tswv/index.html

- TSWV is an important pathogen of tomato and pepper in Utah.
- Over a 1,000 known hosts and counting
- New hosts in Utah: Tomatillo and Gaillardia (Blanket flower)
- The virus is transmitted by thrips
- Thrips have to acquire the virus as larvae to be able to transmit it as adults. Once larvae are infected, thrips carry and transmit the virus throughout their entire lifespan

Tomato spotted wilt virus


http://www.caes.uga.edu/topics/diseases/tswv/index.html

- *TSWV* is not seedborne
- Plants get infected early in the season, either in transplant greenhouses or after being planted in the field
- Symptoms:
  - Necrotic spots on leaves
  - Stunting of plants
  - Necrotic rings on immature fruit
  - Chlorotic ringspot on mature fruit
  - Chlorotic ringspots on leaves (Gaillardia)

Tomato spotted wilt virus

Tomato spotted wilt virus

Tomato spotted wilt virus

- Tomatillo symptoms:
  - Yellow mottling of leaves
  - No symptoms on fruit

Tomato spotted wilt virus

- Management:
  - Resistant tomato varieties (Finish Line, Fletcher, Crista, Red Defender, BHN 602 and Picus)
  - No resistant pepper or tomatillo varieties
  - Good weed control
  - Reflective mulch
  - Insecticides (potential resistance problems)

Tomato spotted wilt virus


http://www.caes.uga.edu/topics/diseases/tswv/index.html

- Survey in transplant greenhouses
  - Collect leaf samples of transplants and weeds to test for TSWV
  - Place yellow sticky cards in greenhouses to monitor for thrips
  - To participate, please, email:

    claudia.nischwitz@usu.edu

Powdery mildew on beets

Powdery mildew on beets

- Causal agent: *Erysiphe betae*
- Hosts: Table beets, sugarbeets, Swiss chard and spinach
- Environmental conditions: Dry and warm. High humidity for a few hours needed for infection

Powdery mildew on beets

- Symptoms:
  - Leaves covered with white, powdery spores

Powdery mildew on beets

- Importance:
  - Smaller beets causing yield loss due to reduced photosynthesis
  - Foliage of beets unmarketable
- Management:
  - Fungicide applications including sulfur work well
  - Need to be started as soon as the first spots appear
  - Reminder: Do not apply sulfur above 90F

Powdery mildew on carrots

Powdery mildew on carrots

- Causal agent: *Erysiphe heraclei*
  - E. heraclei has formae speciales
  - Formae speciales infecting carrot won't infect dill or celery etc
- Hosts: Plants in the Apiaceae including carrots, parsley, parsnips, celery and dill

Powdery mildew on carrots

- Symptoms:
  - Leaves covered with white, powdery spores

Powdery mildew on carrots

- Importance:
  - Smaller carrots causing yield loss due to reduced photosynthesis
- Management:
  - Fungicide applications including sulfur work well
  - Need to be started as soon as the first spots appear

Pythium in watermelon

Pythium in watermelon

- Causal agents: *Pythium aphanidermatum* and *P. ultimum*
- Host range: Alfalfa, small grains, vegetables
- Symptoms:
  - Root rot
  - Stunted and wilting plants
  - Fruit rot

Pythium in watermelon

Pythium in watermelon

- Pythium is soilborne
- Spores are motile ➡ swim in water
- Management:
  - Drip irrigation
  - Plastic mulch
  - Chemical control very limited: Mefenoxam (following the label) as a soil drench can reduce root rot; ineffective against fruit rot

Potato mop top virus or herbicide damage?

Potato mop top virus or herbicide damage?

Potato mop top virus or herbicide damage?

- Two known causes for the symptoms
- Potato mop top virus:
  - Transmitted by the fungus Spongospora subterranea
  - S. subterranean causes powdery scab on potato

Potato mop top virus or herbicide damage?

- Symptoms of PMTV (continued):
  - Uneven emergence from infected seed pieces
  - Rust colored arcs and rings in tubers
  - Tuber symptoms develop or get worse during storage
  - Malformed tubers
  - Foliar symptoms only develop when infected seed pieces are planted (usually during cooler weather)
  - Bright yellow blotches on lower leaves
  - V-shaped yellow patterns
  - Shortened internodes (mop top)

Potato mop top virus or herbicide damage?

Potato mop top virus or herbicide damage?

- Management
  - Certified disease-free seed (virus, vector or both)
  - Delay planting until ground is warmer

Potato mop top virus or herbicide damage?

- Negative for Potato mop top virus
- The cause was glyphosate drift!

TMV/ToMV - Management

Tobacco Mosaic Virus/Tomato Mosaic Virus: Symptoms, Transmission and Prevention of Infection

Virus del mosaico del tabaco/Virus del mosaic del tomate

TRANSMISSION
La transmisión

TMV/ToMV is transmitted from handling contaminated tobacco products. TMV/ToMV is also transmitted by handling infected plants.

TMV/ToMV es transmitido por el manejar con las manos los productos de tabaco contaminados. TMV/ToMV también es transmitido por el manejar con las manos las plantas infectadas.

Once a plant is infected with TMV/ToMV the virus will contaminate the seeds and subsequently infect the seedling.

Una vez que la planta sea infectada con TMV/ToMV el virus contaminará las semillas de la planta misma y después infectará los semilleros.

SYMPTOMS IN TOMATO, PEPPER AND PETUNIA
Las síntomas en el tomate, pimiento y las petunias

TOMATO/TOMATE

- Symptoms vary by variety and TMV/ToMV strain.
- Brown rings or sunken lesions occur on susceptible fruit.
- Dark and light green modeling will occur on some varieties on leaves.

- Las síntomas de tomate varian por la variedad y la cepa de TMV/ToMV.
- Anillos marrones con un halo o lesiones sangrado marrones ocurren en fruta susceptibles.
- Síntomas de mosaico se producirán en algunas variedades en las hojas. A veces son difíciles de ver.

PEPPER/PIMIENTO

- Only leaves show symptoms.
- Oak leaf pattern.
- Yield loss of tomato and pepper plants is between 5-100%.

- En pimiento, sólo las hojas mostrarán síntomas.
- Es un modelo de la hoja de roble.
- La pérdida de rendimiento de las plantas de tomate y pimiento es entre 5-100%.

PETUNIA/PETUNIA

- Symptoms can be seen on flowers.
- On purple flowers darker spots appear.
- On other flowers white spots appear.

- En las petunias, las síntomas se ven en las flores.
- En flores de color púrpura aparecen manchas más oscuras.
- Otras flores manchas blancas se muestran. Las hojas no pueden mostrar síntomas.

MANAGEMENT AND PREVENTING TRANSMISSION
El mantenimiento y el evitar la transmisión

Transmission can be prevented by dipping tools into 20% powdered milk suspension before use.

Se puede evitar la transmisión al undir las herramientas en una suspensión de 20% leche de polvo antes de usar.

Transmission can also be prevented/managed by wearing clean gloves while working with plant.

Transmisión también puede ser evitado/mantenido al vestir guantes limpios cuando se trabaja con la planta.

EXTENSION
UtahStateUniversity

Authors: Claudia Nischwitz, Brooke Olson, Rhett Taylor

Thank you for listening!
Questions?