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Over View

- Weed biology
- How to identify weeds
- Various weed control methods
- Chemical alternatives for lost glyphosate
- New products/Research

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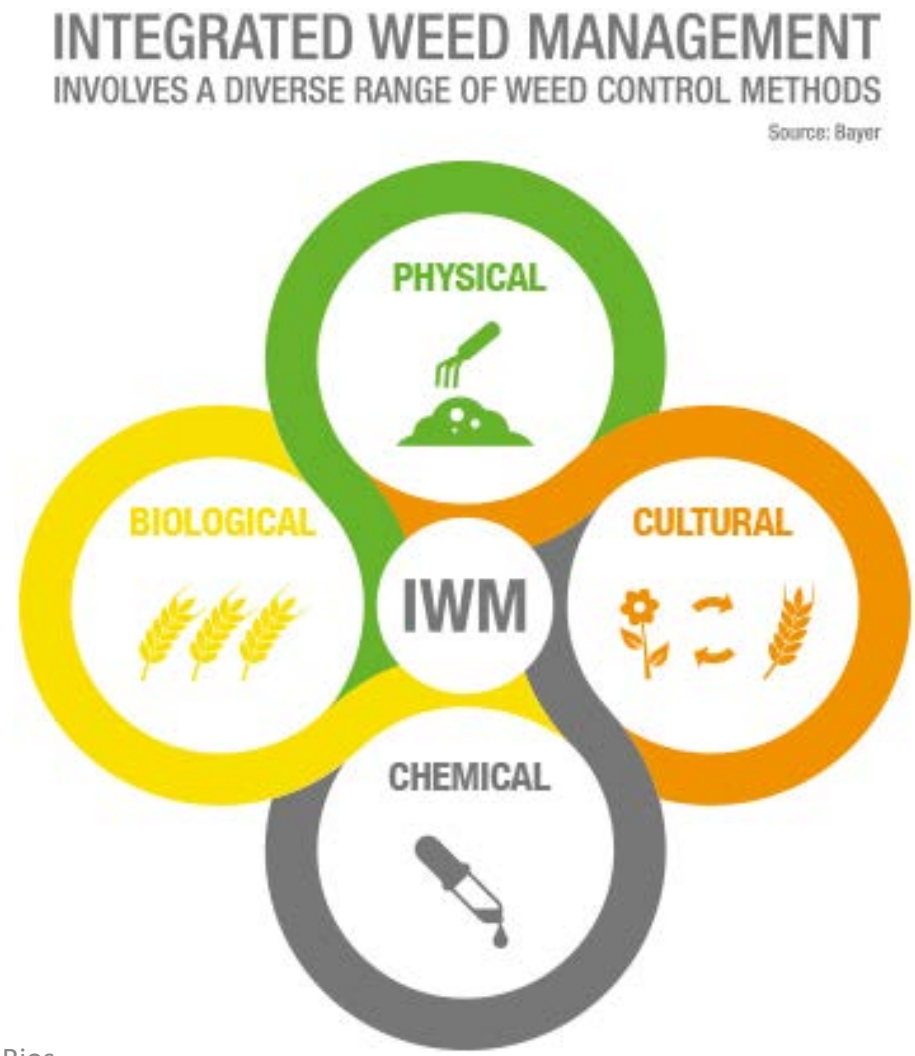
Photo credit: Chris Sayer

Weed Management

- Overall goal of weed management
  - Design the most appropriate methods in a variety of situations that ensure a sustainable ecological system and a minimum influence of nuisance weeds

What is a weed?

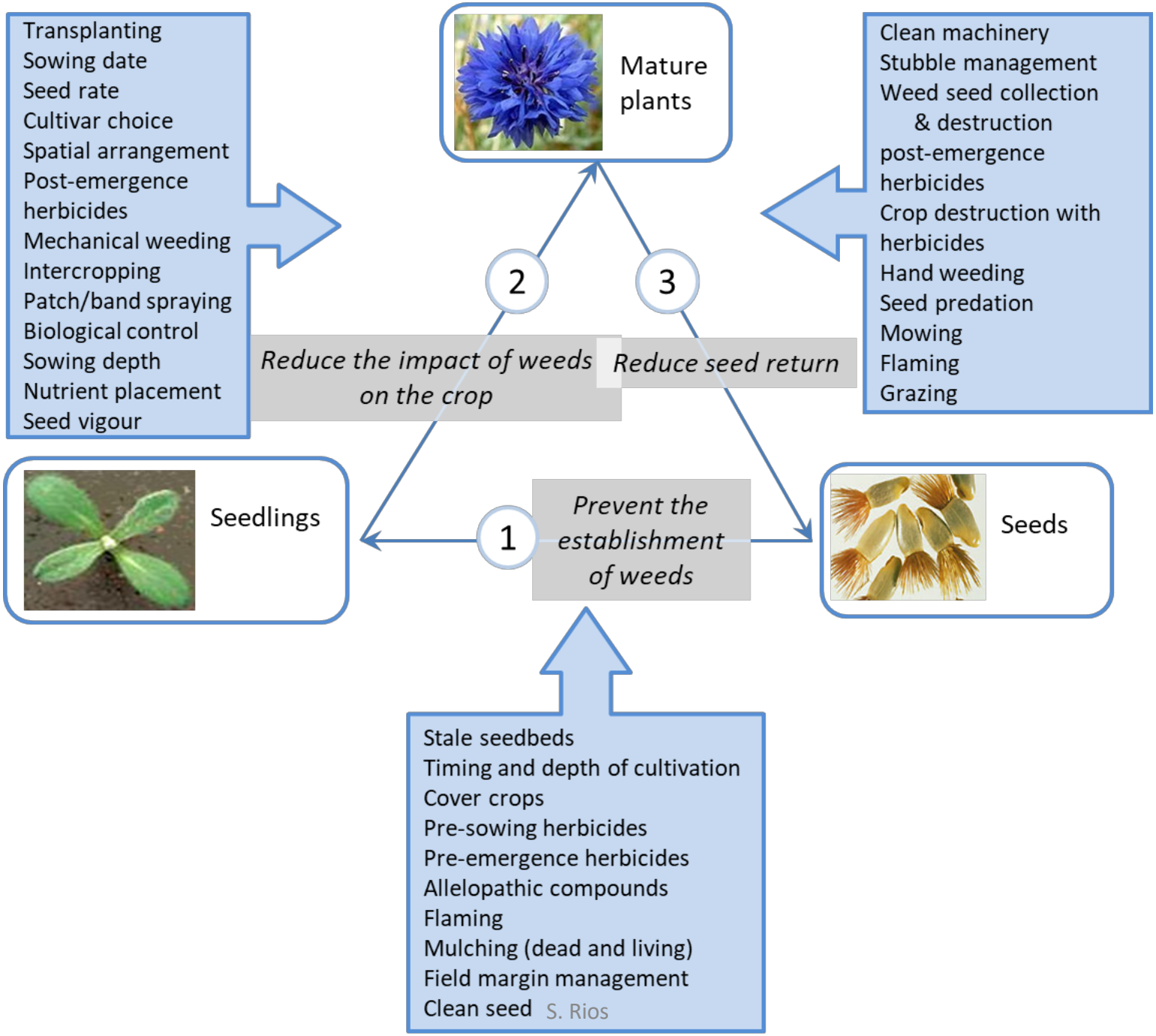
- Plant growing where it is not desired
- Plant out of place



Strategies for managing vegetation

- Biological
  - i.e. Insects, Fungi, plants, mammals
- Mechanical
  - i.e. mowing, pruning, burning
- Cultural
  - i.e. controlled burning, fertilizing/liming, mulching
- Chemical
  - i.e. tree growth regulators
  - i.e. herbicides

Triticale and Lamb-Hass.
Photo credit: Chris Sayer


Transplanting
Sowing date
Seed rate
Cultivar choice
Spatial arrangement
Post-emergence herbicides
Mechanical weeding
Intercropping
Patch/band spraying
Biological control
Sowing depth
Nutrient placement
Seed vigour
Mature plants
Clean machinery
Stubble management
Weed seed collection & destruction
post-emergence herbicides
Crop destruction with herbicides
Hand weeding
Seed predation
Mowing
Flaming
Grazing
2
3
Reduce the impact of weeds on the crop
Reduce seed return
Seedlings
1
Prevent the establishment of weeds
Seeds
Stale seedbeds
Timing and depth of cultivation
Cover crops
Pre-sowing herbicides
Pre-emergence herbicides
Allelopathic compounds
Flaming
Mulching (dead and living)
Field margin management
Clean seed
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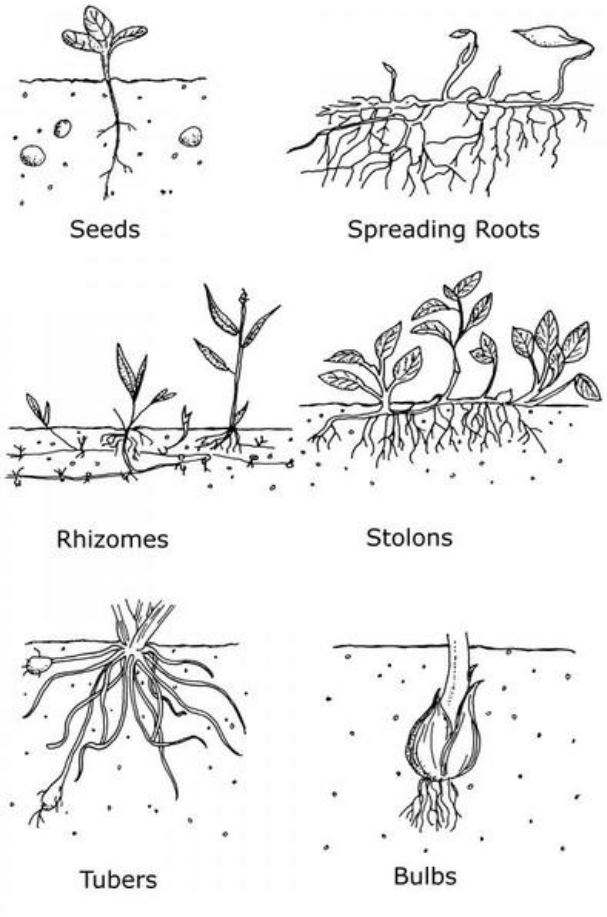
Why Control Weeds?

- Reduce competition for light, moisture, nutrients
- Can reduce yield, quality and tree growth (Young)
- Serve as hosts for diseases, vertebrates, and insects
- Decrease land value
- Human/pet/livestock Hazards and aesthetically unpleasing
- Seed Bank
- Line-of-site/visibility

Knowing the Life Cycle is Key

- Weed Biology
  - Weeds can be classified by their life cycle: annual, biennial, or perennial.
- Life form
  - i.e. Weeds can be identified or grouped as:
    - 1) broadleaf (including vines)
    - 2) grass
    - 3) sedge
- Morphology
  - i.e. Leaf surface area, angle and texture
- Growth and development
  - i.e. Plant size, plant maturity, seeding, plant responses to stress
- Genetics
  - Development of herbicide resistance



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- Scouting by foot on off-site locations may prevent small isolated problems from becoming larger problems.

- Weeds emerge throughout all growing seasons, schedule weed surveys throughout the year, especially after rains or soil disturbance.

- Scouting should occur even if weeds are not easily visible or appear to be dead.

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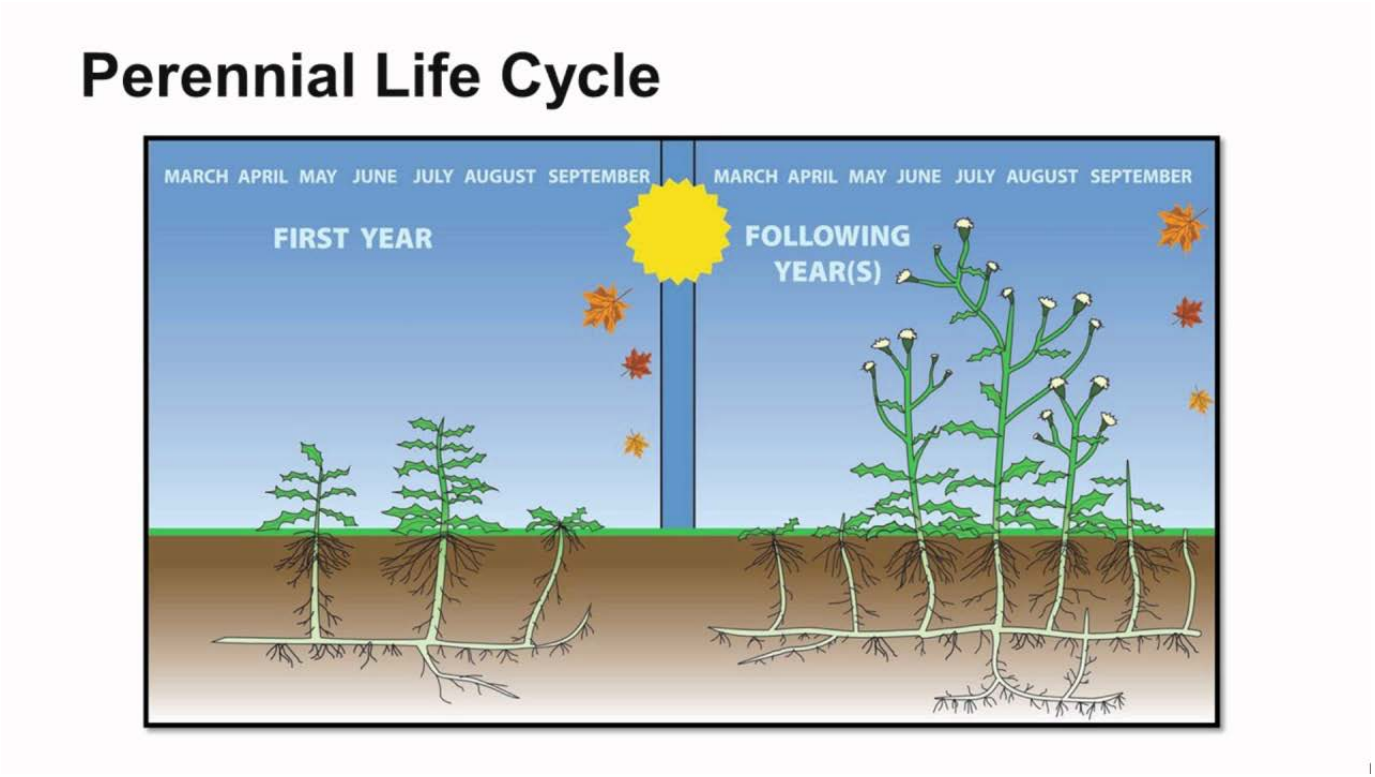
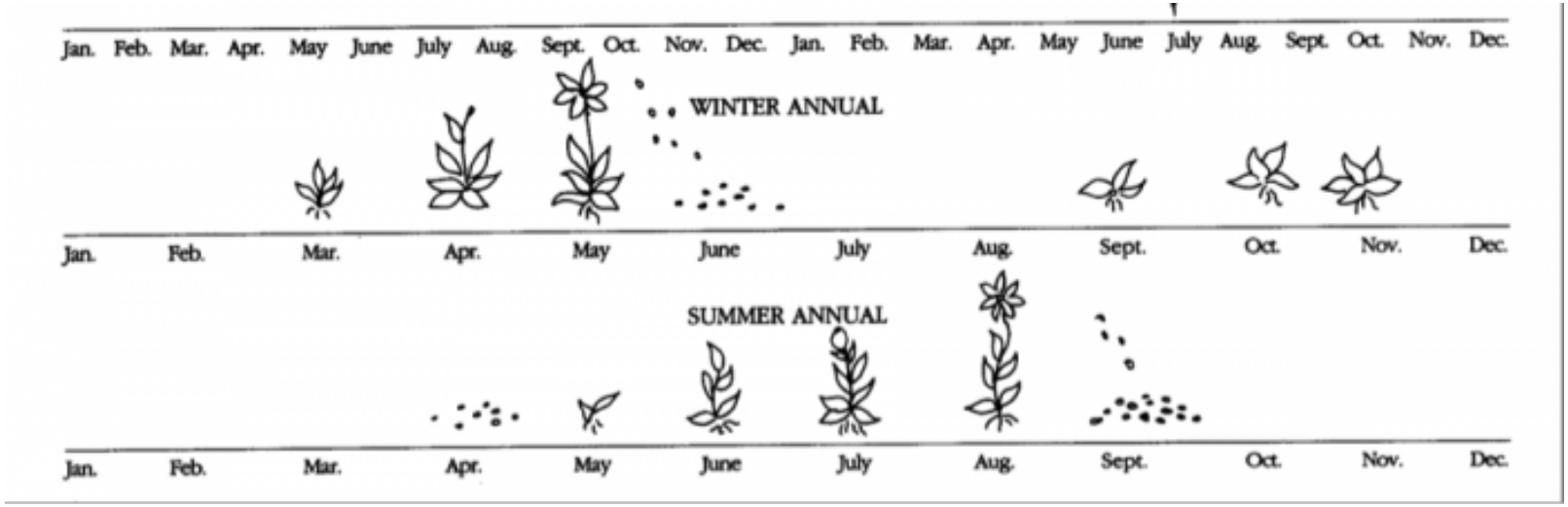


- Perennials live more than two years with seed production occurring as early as the first year.

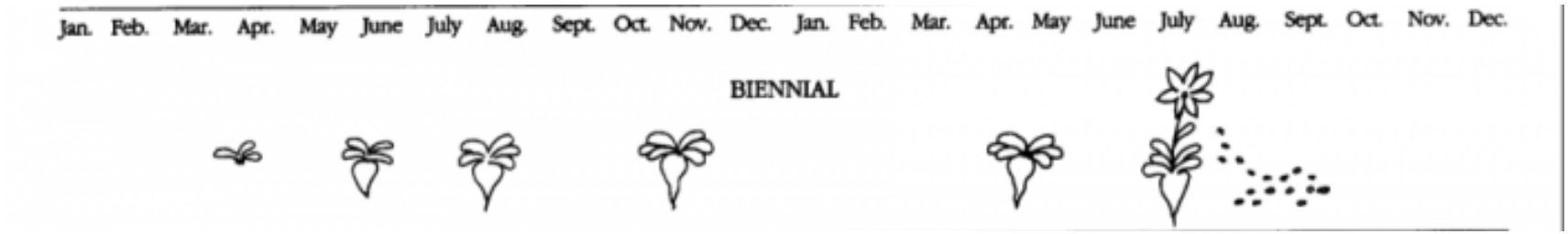
- For perennials species, vegetative propagules such as rhizons, tubers, and stolons are a challenge to eradicate. Infrequent soil disturbance favors perennial weeds.



- One-year life cycle, growing from seed, maturing, and producing seed for the next generation of plants in one year or less, this makes them the most difficult to control (WSSA 2015).

- Possess characteristics that facilitate their dispersal in space and time, such as dispersal by equipment, wind, or irrigation water, combined with dormancy and longevity (Steinmaus 2014).

- Can be further divided into summer (sprout in spring, grow, mature, and produce seed and die before winter) or winter (sprout in the fall, grow, mature, produce seed and die before summer).



- Biennials have a two-year life cycle, growing from seed and developing a heavy root system the first year followed by seed production in the second year and then plant death.

hairy fleabane

Horseweed

- Horseweed & hairy fleabane plants are difficult to distinguish from each other until about the 12- leaf stage.
- Once the plants bolt, it is easy to differentiate the two species.
- When horseweed bolts, it sends up a single, or primary, vegetative stem that is erect with dark green leaves that are 4 inches long and are crowded together with an alternative arrangement on the stem. The stem is either smooth or covered with shaggy hairs

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- Hairy fleabane, unlike horseweed, develops multiple lateral branching without a central stem, and has leaves that are much narrower with rigid hairs.

- The distance between leaves is greater in hairy fleabane than in horseweed.

- At maturity, horseweed can be 10 feet tall, whereas hairy fleabane is usually 1.5 to 3 feet tall.

Hairy fleabane

Horseweed

- Horseweed and hairyfleabane seeds cannot survive more than ~3 years under field conditions.
- Controlling plants before they produce seed is critical for long-term management.
- Action should be taken when weeds are young, generally before they start producing seeds.

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Background Information:
Consider two weed mgmt. truisms

Weed management issues we think are problems based on evidence from other crops in CA

- Problem #1: Diverse growing conditions (climate, soils, irrigation and cultivation practices, organic vs conventional) = no “one size fits all” for chemical control.

- Problem #2: Long-term use of single mode of action (MOA) herbicide chemistry = high risk for herbicide resistant weeds (Example, Glyphosate).

Photo credit: Chris Sayer

Problem #1: Diverse growing conditions (climate, soils, irrigation and cultivation practices, organic vs conventional) = no "one size fits all" for chemical control.

- limited in some cases by:
  - Economic
  - Environmental
  - Practical limitations

Organic groves are probably the biggest challenge when it comes to weed management

- lack available herbicide chemistries.
  - Research in alternatives methods- mulches, solaraztion, enclosed ground covers for large grove operations
- Most organic operations are usually the smaller scale growers that cannot simply afford weed management.
  - Organic production- Average registered in other counties ~180

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Preventive

- In weed science, PREVENTION is better than CONTROL, but control is required because weeds arrive without notice and present before they are prevented - Prevention and Eradication requires long-term planning

- Often overlooked as a method of weed control however seem to be the most cost-effective method.

- Entails the use of such practices as sanitation, spot spraying, or hand labor to prevent the source of weed infestation (seed and/or vegetative) from widespread dissemination throughout an area.

- By removing the undesirable weed species prior to seed development, dissemination by wind or mechanical transport on equipment can be effectively delayed.

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Ground cover

- Ground cover, in the row middles, also plays an important role in grove management by reducing soil erosion, sand blasting during windy conditions and retaining nutrients, but it can also impact tree growth when allowed to compete with the citrus younger trees.

- Established orchards and rotated every few years to avoid pathogen buildup.

- Frost hazard.
  - A vegetated orchard floor experience cooler ambient temperatures than do bare orchard floors.
  - Temperatures can be about 3° to 5°F Cooler

- Currently, there is no cover crop species that will fit all situations and provide all the possible benefits (Steinmaus 2014).

Photo credit: Chris Sayer

Chemical Weed Control

- Do it right
  - Proper herbicides (Broadleaf's? Grasses?)
  - Proper herbicide rate (too much isn’t always better)
  - Proper placement of material)direct spray?)
  - Proper time (Is the weed as tall as me?)
  - Proper application (coverage- backpack sprayer? CO2 sprayer ? Weeds Stressed?)

  - ***<u>READ THE LABEL</u>***

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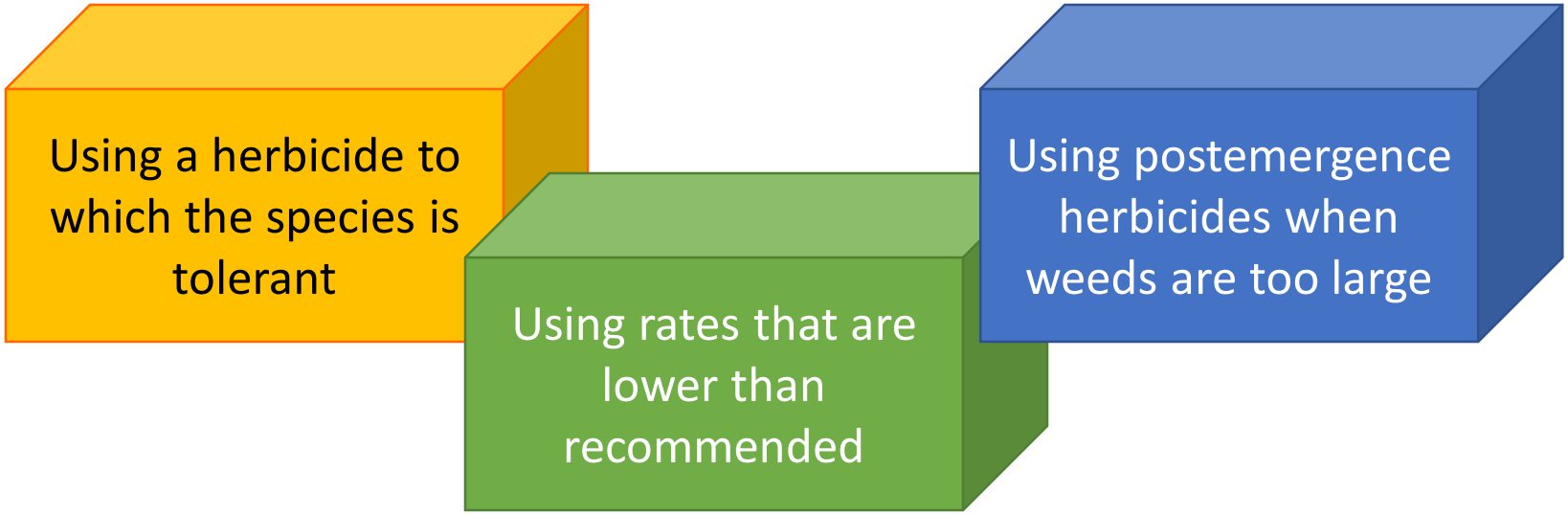
Herbicides can fail

- Environmental/Meteorological
  - Soil
    - Clay, OM can make herbicides unavailable
    - In less adsorptive soils, leaching can occur
    - Slope can lead to erosion or drainage
- Wind
    - Spray drift
    - Drought stress
- Temperature
    - Plant affects
      - *Plant growth rate*
      - *Cuticle development/herbicide absorption*
      - *Water/herbicide translocation*
    - Herbicide affects
      - *Volatilization*
      - *Degradation*

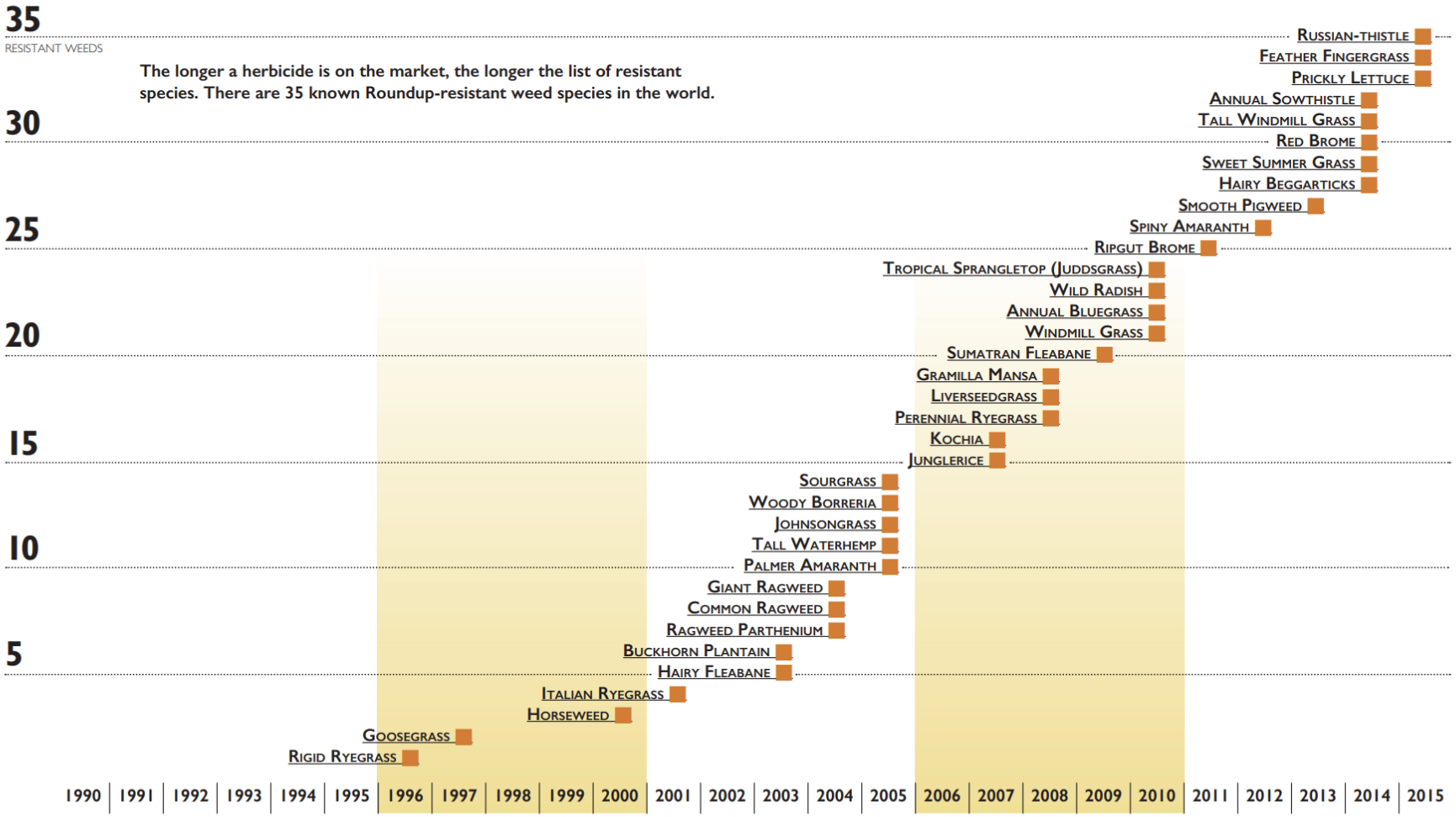
Weed Shifts

- With the repeated use of a herbicide, certain weed species may become dominant due to selection for those that are tolerant.
- These populations are not herbicide-resistant.
- Weed shifts due to herbicide use can be caused by:



Glyphosate-resistant weeds increase year by year

GOOD FRUIT GROWER



Learn more about resistant weeds and tips for helping to control weeds in vineyards by reading "Herbicide resistance, a growing concern," from the April 15, 2016 *Good Fruit Grower* magazine story online exclusevly at: *goodfruit.com/herbicide-resistance.*

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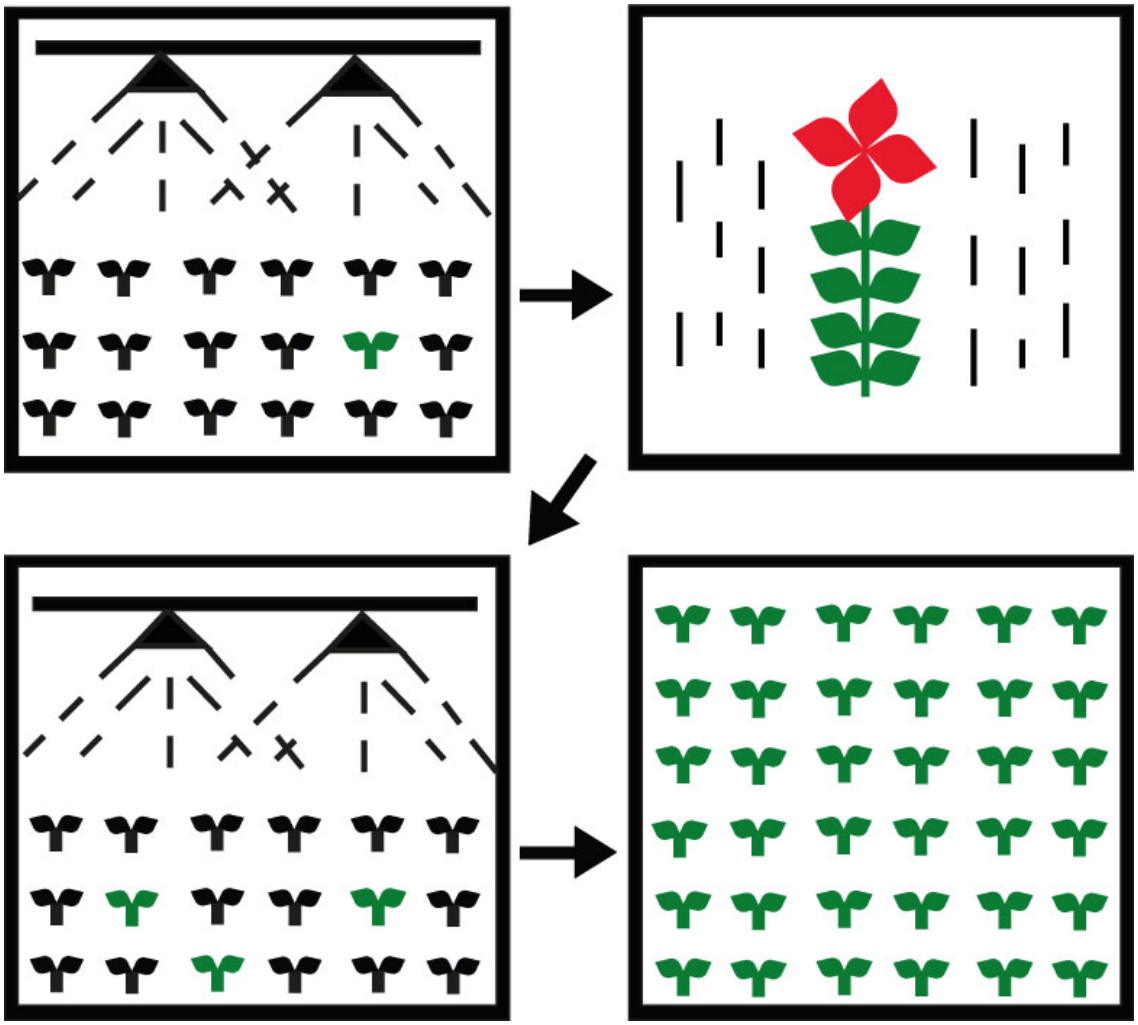

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Herbicide Resistance Types

Single Herbicide Resistance

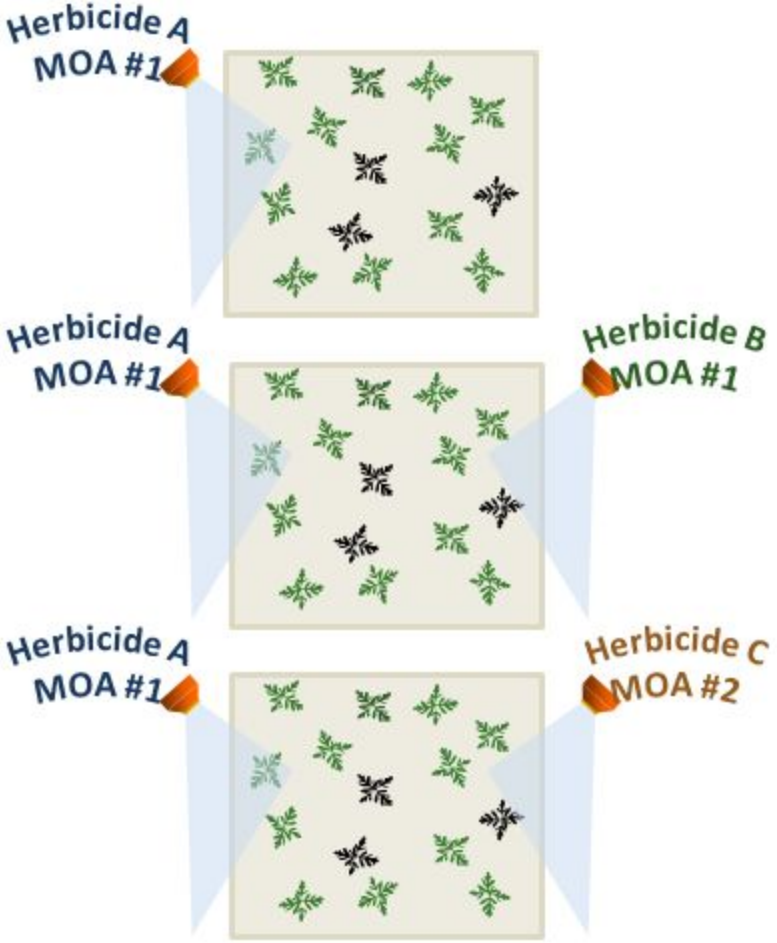
- Resistant to only *one* herbicide

Cross Herbicide Resistance

- Resistant to *two or more* herbicide families with *same mechanism of action*
- Single resistance mechanism

Multiple Herbicide Resistance

- Resistant to *two or more* herbicides with *different mechanisms of action*
- May be the result of two or more different resistance mechanisms



Lack of chemistries registered for specialty crops?

Herbicide Registration on CA Sbutripical Crops -*(updated October 2015 - UC Weed Science)*

Herbicide Registration on CA Sbutripical Crops -*(updated October 2015 - UC Weed Science)*

	Herbicide-Common Name *(example trade name)*	Site of Action Group[1]	Avocado	Citrus	Date	Fig	Kiwi	Pomegranate
Preemergence	dichlobenil *(Casoron)*	L / 20	N	N	N	N	N	N
	diuron *(Karmex,Diurex)*	C2 / 7	N	R	N	N	N	N
	EPTC *(Eptam)*	N / 8	N	R	N	N	N	N
	flazasulfuron *(Mission)*	B / 2	N	N	N	N	N	N
	flumioxazin *(Chateau)*	E / 14	NB	NB	N	NB	N	R
	indaziflam *(Alion)*	L / 29	N	R	N	N	N	N
	isoxaben *(Trellis)*	L / 21	NB	NB	N	NB	NB	NB
	napropamide *(Devrinol)*	K3 / 15	N	N	N	N	R	N
	norflurazon *(Solicam)*	F1 / 12	R	R	N	N	N	N
	oryzalin *(Surflan)*	K1 / 3	R	R	N	R	R	R
	oxyfluorfen *(Goal, GoalTender)*	E / 14	R	NB	R	R	R	R
	pendimethalin *(Prowl H2O)*	K1 / 3	N	R	N	N	N	R
	penoxsulam *(Pindar GT)*	B / 2	N	N	N	N	N	N
	pronamide *(Kerb)*	K1 / 3	N	N	N	N	N	N
	rimsulfuron *(Matrix)*	B / 2	N	R	N	N	N	N
	sulfentrazone *(Zeus)*	E / 14	N	R	N	N	N	N
	simazine *(Princep,Caliber 90)*	C1 / 5	R	R	N	N	N	N
Postemergence	carfentrazone *(Shark)*	E / 14	R	R	R	R	R	R
	clethodim *(SelectMax)*	A / 1	N	R	N	N	N	N
	clove oil *(Matratec)*	NC[3]	R	R	R	R	R	R
	2,4-D *(Clean-crop, Orchard Master)*	O / 4	N	N	N	N	N	N
	diquat *(Diquat)*	D / 22	NB	NB	NB	NB	NB	NB
	d-limonene *(GreenMatch)*	NC[3]	N	R	N	R	R	N
	fluazifop-p-butyl *(Fusilade)*	A / 1	NB	R	NB	NB	N	NB
	glyphosate *(Roundup)*	G / 9	R	R	R	R	R	R
	glufosinate *(Rely 280)*	H / 10	N	R	N	N	N	N
	halosulfuron *(Sandea)*	B / 2	N	N	N	N	N	N
	paraquat *(Gramoxone)*	D / 22	R	R	N	R	R	R
	pelargonic acid *(Scythe)*	NC[3]	R	R	R	R	R	N
	pyraflufen *(Venue)*	E / 14	N	N	R	R	R	R
	saflufenacil *(Treevix)*	E / 14	N	R	N	N	N	N
	sethoxydim *(Poast)*	A / 1	NB	R	NB	NB	N	NB

Notes: R = Registered, N = Not registered, NB = nonbearing. This chart is intended as a general guide only. Always consult a current label before using any herbicide as labels change frequently and often contain special restrictions regarding use of a company's product.

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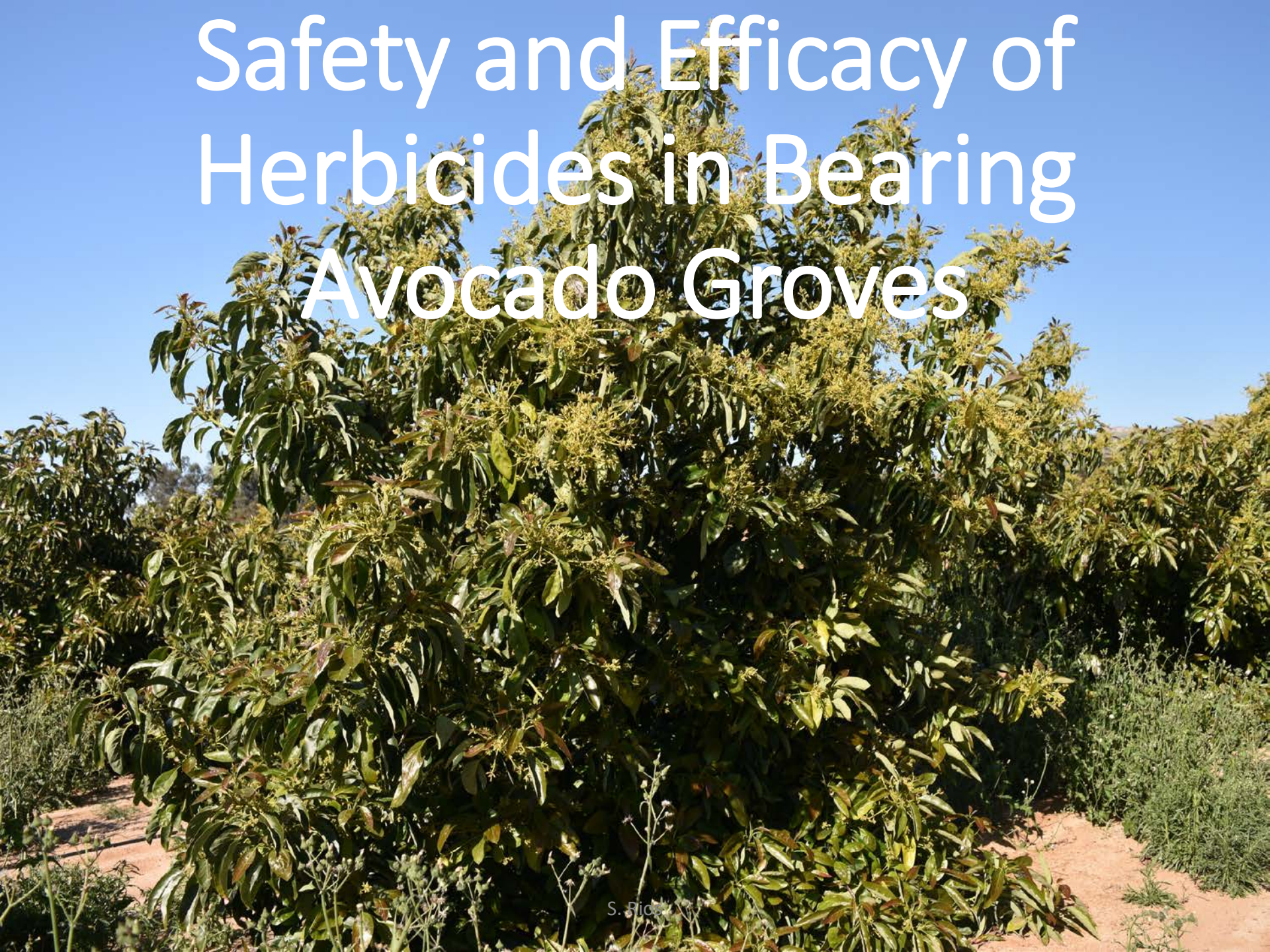
Safety and Efficacy of Herbicides in Bearing Avocado Groves



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Treatments

code	Rate per acre of product	Rate per..60ft² plot	Rate per 4 *60ft² plots = 1 bottle (4*20sec) = 240ft²
1	Pennant Magnum 2 pt/A		5.23 ml
2. **NB**	Chateau SW 12 oz/A		0.5 ml/0.46g
3	Simazine 90 DF 4.4 lb/A		11g
4	Matrix SG 4 oz/A		0.67 ml/0.62 g
5	GoalTender 3 pt/A		7.8 ml
6	Alion 6.5 oz/A		1.1 ml/ 1g
7	Prowl H2O 6.3 qt/A		33 ml
8. **NB**	Gallery 75 1.33 lb/A		3.32 g
9	Treevix 1 oz/A		0.16ml/0.15g
10	Intensity 16 oz/A		2.64 ml/2.5 g
11	Suppress 9%	@50 gal/A=4.5gal/A Suppress=17 l /43,560ft²	94 ml
12	Forfeit 280 56 oz/A		9.3 ml/8.6g
13	Glyphosate 3.8 lbs a.i./A, 7%		140 ml
14	Untreated	0	0

= USED in CA Citrus ONLY

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Untreated

Matrix SG 4 oz/A

Gallery 75 1.33 lb/A

Pennant Magnum 2 pt/Ac

1 Week After Treatment - PREmergent

Treevix 1 oz/A

Simazine 90 DF 4.4 lb/A

Prowl H2O 6.3 qt/A

Chateau SW 12 oz/A

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Untreated

Alion 6.5 oz/A

1 Week After Treatment - PREemergent

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Untreated

Forfeit 280 56 oz/A

Intensity 16 oz/A

Suppress 9%

Glyphosate 3.8 lbs a.i./A, 7%

1 Week After Treatment - POSTemergent

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Untreated

Gallery 75 1.33 lb/A

Matrix SG 4 oz/A

1 Week After Treatment - POSTemergent

Pennant Magnum 2 pt/A

Treevix 1 oz/A

Prowl H2O 6.3 qt/A

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Untreated

Chateau SW 12 oz/A

Alion 6.5 oz/A

1 Week After Treatment - POSTemergent

S. Rios

Untreated

Forfeit 280 56 oz/A

Itensity 16 oz/A

Suppress 9%

Glyphosate 3.8 lbs a.i./A, 7%

1 Week After Treatment - POSTemergent

Untreated

Forfeit 280 56 oz/A

Intensity 16 oz/A

Suppress 9%

Glyphosate 3.8 lbs a.i./A

1 Month After Treatment. POSTemergent (+ 2weeks)

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Untreated

Matrix SG 4 oz/A

Gallery 75 1.33 lb/A

Simazine 90 DF 4.4 lb/A

Prowl H2O 6.3 qt/A

Chateau SW 12 oz/A

1 Month After Treatment (+ 2weeks) - PREemergent

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Untreated

Alion 6.5 oz/A

GoalTender 3 pt/A

1 Month After Treatment
(+ 2weeks) – PREemergent

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Untreated

Matrix SG 4 oz/A

Gallery 75 1.33 lb/A

Simazine 90 DF 4.4 lb/A

1 Month After Treatment
(+ 2weeks) - PREemergent

Prowl H2O 6.3 qt/A

Chateau SW 12 oz/A

Prowl H2O 6.3 qt/A

Alion 6.5 oz/A

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Untreated

GoalTender 3 pt/A

1 Month After Treatment
(+ 2weeks) - PREemergent

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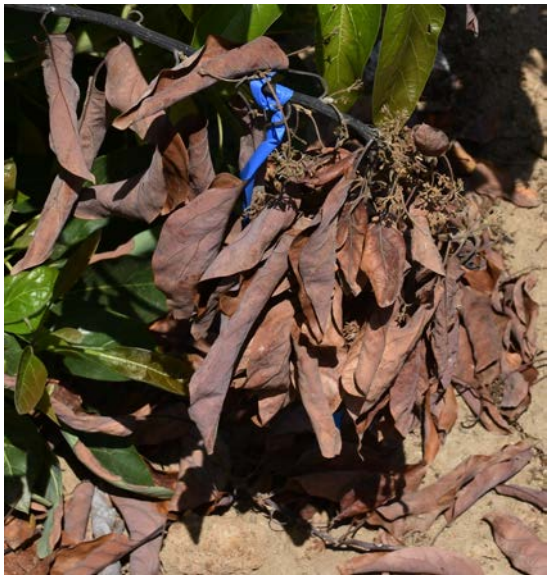
Untreated

Forfeit 280 56 oz/A

Intensity 16 oz/A

Suppress 9%



Glyphosate 3.8 lbs a.i./A

1 Month After Treatment (+ 2weeks) – POST emergent

Performance of Glufosinate in Young Avocado Trees

- The objective of this study was to evaluate the phytotoxicity damage of the active ingredient glufosinate (Rely 280) at 2 rates in young avocado.
  - The three major weed species present were filaree (*Erodium cicutarium*), London rocket (*Sisymbrium irio*), and fiddleneck (*Amsinckia menziesii*).




Weeds present (L to R): malva, coast fiddle neck, London rocket, and white-steam filaree. Size of weeds during first application where 2 inches to 3 inches in diameter.

Treatments and rates tested for plant safety on Glufosinate

Treatment	Product(s)	A.I	Rate of formulated Products	Rate of active ingredients	Application Placement & Timing	Spray Volume
1	Untreated	N/A	N/A	N/A		
2	Rely 280 (1X) + AMS	Glufosinate + AMS	82 oz/a	1.5 lb ai/a	Banded to the orchard Floor	40 GPA
3	Rely 280 (2X) + AMS	Glufosinate + AMS	164 oz/a	3.0 lb ai/a	Banded to the orchard Floor	40 GPA
4	Rely 280 (1X) + Roundup WeatherMAX (1x)	Glufosinate + Glyphosate	82 oz/a + 48 oz/a	1.5 lb ai/a + 2.06 lb ai/a	Banded to the orchard Floor	40 GPA
5	Rely 280 (2X) + Roundup WeatherMAX (2x)	Glufosinate + Glyphosate	164 oz/a + 96oz/a	3.0 lb ai/a + 4.12lb ai/a	Banded to the orchard Floor	40 GPA

Date, time and conditions for treatment application dates.

Application #	Application date	Time (24h)/ Temp (F)	Evaluation date
1	1-March	9:00/53	15-Mar/29- March
2	29-March	9:30/60	12- April/26- April

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Percent control of the major three weed species with the different treatments at 14 DAT & 28 DAT

Treatment	15-March (14 DAT)			29-March (28 DAT)		
	Species			Species		
	Filaree	London rocket	Fiddleneck	Filaree	London rocket	Fiddleneck
	% Control (±SE)			% Control (±SE)		
1. Untreated control	0.0 (0.0)c	0.0 (0.0)c	0.0 (0.0)b	0.0 (0.0)c	0.0 (0.0)c	0.0 (0.0)b
2. Rely 280 (1X) 82 oz/a + AMS	88.8 (1.3)ab	92.0 (2.9)b	95.0 (0.5)a	86.8 (6.8)ab	78.8 (4.3)b	100.0 (0.0)a
3. Rely 280 (2X) 164 oz/a + AMS	92.5 (2.1)a	94.0 (2.8)ab	100.0 (0.0)a	93.3 (6.1)a	93.8 (2.8)a	100.0 (0.0)a
4. Rely 280 (1X) 82 oz/a + Roundup WeatherMAX (1X) 48 oz/a	76.3 (9.0)b	98.3 (1.4)a	98.5 (0.6)a	71.5 (9.6)b	95.0 (2.9)a	97.5 (2.5)a
5. Rely 280 (2x) 164 oz/a + Roundup WeatherMAX (2X) 96 oz/a	99.8 (0.3)a	99.8 (0.3)a	100.0 (0.0)a	95.5 (2.7)a	97.5 (2.5)a	100.0 (0.0)a
Significance (P-value)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

First Application

Means with the same letter within a column are not significantly different according to the Fisher's LSD test at an 0.05 level of significance.

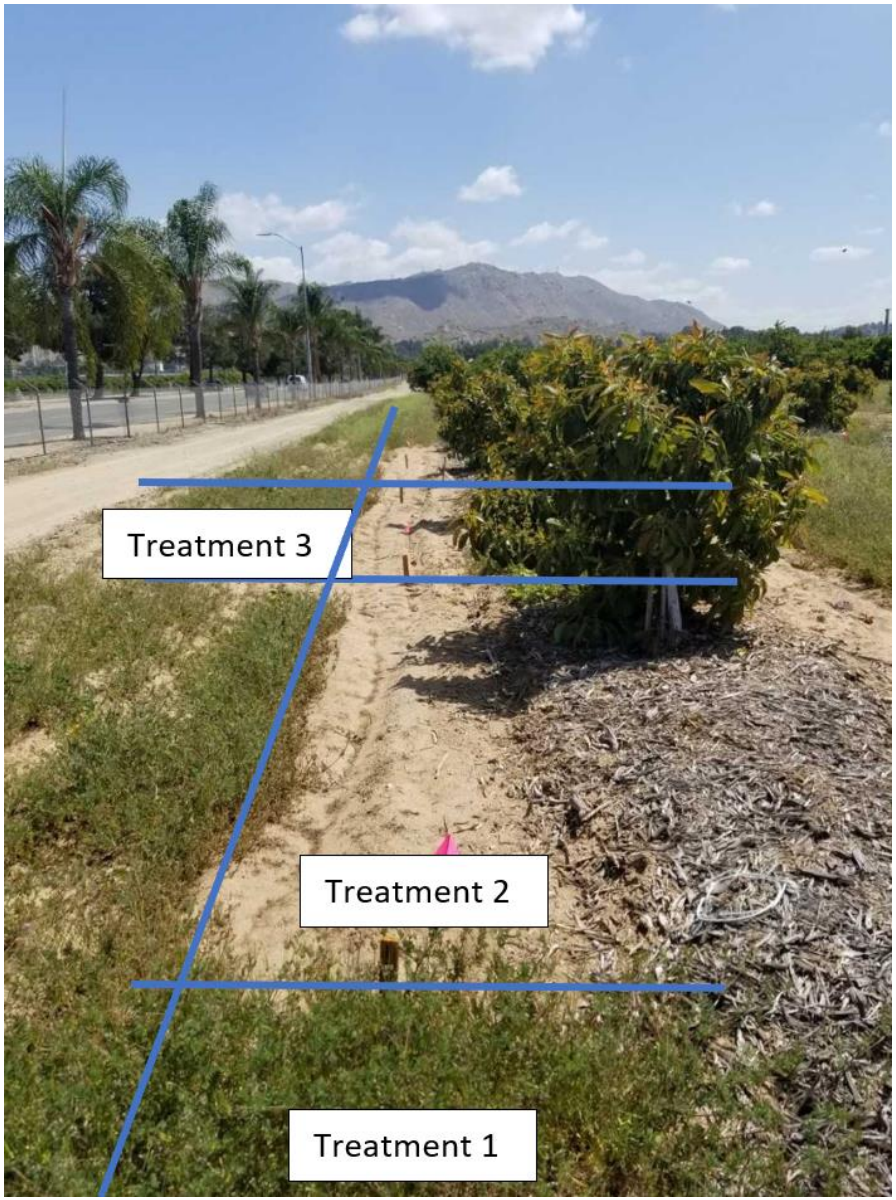
- The greatest level of control of filaree was achieved by Rely 2x + Glyphosate 2x, Rely 2x & Rely 1x.
- Therefore, Rely at 1x alone seemed to provide good control of filaree and a higher dose or addition of glyphosate did not result in a significant increase in control at this evaluation date.
- For London rocket, Rely 1x provided less control compared to the other herbicide treatments & combination with glyphosate provided better control.

% control of the major three weed species with the different treatments at 14` DAT and 28 DAT with application 2

	12-April (14 DAT)			26-April (28 DAT)		
Treatment	Species			Species		
	Filaree	London rocket	Fiddleneck	Filaree	London rocket	Fiddleneck
	% Control (±SE)			% Control (±SE)		
1. Untreated Control	0.0 (0.0)b	0.0 (0.0)b	0.0 (0.0)b	0.0 (0.0)b	0.0 (0.0)b	0.0 (0.0)b
2. Rely 280 (1X) 82 oz/a + AMS	100.0 (0.0)a	100.0 (2.9)a	100.0 (0.5)a	100.0 (0.0)a	100.0 (0.0)a	100.0 (0.0)a
3. Rely 280 (2X) 164 oz/a + AMS	98.0 (2.0)a	100.0 (2.8)a	100.0 (0.0)a	100.0 (0.0)a	100.0 (0.0)a	100.0 (0.0)a
4. Rely 280 (1X) 82 oz/a + Roundup WeatherMAX (1X) 48 oz/a	100.0 (0.0)a	100.0 (1.4)a	100.0 (0.6)a	97.0 (3.0)a	100.0 (0.0)a	100.0 (0.0)a
5. Rely 280 (2x) 164 oz/a + Roundup WeatherMAX (2X) 96 oz/a	100.0 (0.0)a	100.0 (0.3)a	100.0 (0.0)a	100.0 (0.0)a	100.0 (0.0)a	100.0 (0.0)a
Significance (P-value)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Second Application

- Average control for the 3 major species with the herbicide treatments at 14 DAT for the 2nd application.
- All the herbicide treatments provided excellent control of all 3 species.
- Therefore, Rely at 1x alone at 14 DAT was sufficient for control of these species & a higher dose or addition of glyphosate did not result in greater control.
- For application 2 at 28 DAT, all the herbicides provided excellent control of all 3 weed species. Rely at 1x alone was sufficient and a higher dose or addition of glyphosate did not result in a significant increase in control.


Treatment 3
Treatment 2
Treatment 1


Treatment 2
Treatment 3
Treatment 5

S. Rios

Phytotoxicity

- In addition to some drift, due to the nature of how the avocado tree canopy falls, the sprayer boom did unintentionally come into contact with the lower part of the tree skirt which caused most of the phytotoxicity damage noted.

- Most, if not, all the phytotoxicity damage that did occur, happened on the lower half of the tree near the skirts. Glufosinate has a very poor translocation ability, it is more of a contact herbicide.

Level of damage on the avocado plants at 14 days after treatment (DAT) and 28 DAT with the different treatments

Treatment	Rate	Ratings			
		First Application		Second Application	
		14 DAT	28 DAT	14 DAT	28 DAT
		15-March	29-March	12-April	26-April
1. Untreated	N/A	0.0 (0.0) b	0.0 (0.0) c	0.0 (0.0) b	0.0 (0.0) b
2. Rely 280 (1X) + AMS	82 oz/a	7.3 (2.3) a	7.8 (1.0) b	5.8 (1.1) a	2.0 (0.9) a
3. Rely 280 (2X) + AMS	164 oz/a	8.3 (1.7) a	6.5 (0.9) b	7.5 (0.9) a	3.5 (1.2) a
4. Rely 280 (1X) + Roundup WeatherMAX (1x)	82 oz/a + 48 oz/a	7.0 (1.7) a	8.0 (1.4) ab	5.3 (0.3) a	1.8 (0.6) ab
5. Rely 280 (2X) + Roundup WeatherMAX (2x)	164 oz/a + 96oz/a	7.8 (1.9) a	10.8 (1.1) a	7.8 (1.1) a	3.3 (1.2) a
Significance (*P*-value)		0.0400	<0.0001	0.0002	0.0130

Means with the same letter within a column are not significantly different according to the Fisher's LSD test at an 0.05 level of significance.

- So it is unlikely any damage was caused by translocation of the herbicide. There was only significant difference between the treatments (P<0.0001) at 28 DAT on the first application and none of the second application.

- However, there was no significant difference amongst either application at 14 DAT. All the herbicide treatments had a significantly higher damage compared to the untreated control, however these symptoms did not prove fatal or compromise trees.
  Weed Control

Performance of Glufosinate in Mature Avocado Trees

- The objective of this study was to evaluate the phytotoxicity damage of the active ingredient glufosinate (Rely 280) at 2 rates.
- Research took place at the University of California South Coast Research Station (SCREC) in Irvine, CA in a mature grove.
- Local agricultural practices for avocado production were conducted. Plot sizes were 20 feet long by 6 feet wide.
- Four replications of each treatment were arranged in a RCB design.
- Orchard floor sprays were applied on 16 Feb, 2018 and 16 March, 2018, respectively.

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Level of damage on the avocado plants at 14 days after treatment (DAT) & 28 DAT with the different treatments

Treatment	Rate	Ratings			
		First Application		Second Application	
		14 DAT	28 DAT	14 DAT	28 DAT
		2- March	16-March	30- March	13-April
1. Untreated	N/A	0.0 (0.0) b	0.0 (0.0) b	0.0 (0.0) b	0.0 (0.0) NS
2. Rely 280 (1X) + AMS	82 oz/a	3.3 (0.5) a	2.5 (0.3) a	2.3 (0.3) a	1.0 (0.4) NS
3. Rely 280 (2X) + AMS	164 oz/a	1.8 (1.2) ab	1.3 (0.8) ab	1.5 (0.9) ab	1.0 (0.6) NS
4. Rely 280 (1X) + Roundup WeatherMAX (1x)	82 oz/a + 48 oz/a	0.5 (0.5) b	0.5 (0.5) b	0.3 (0.3) b	0.3 (0.3) NS
5. Rely 280 (2X) + Roundup WeatherMAX (2x)	164 oz/a + 96 oz/a	3.0 (0.7) a	2.5 (0.6) a	3.0 (0.7) a	2.0 (0.9) NS
	Significance (*P*-value)	0.0100	0.0069	0.0072	0.1148

Means with the same letter within a column are not significantly different according to the Fisher's LSD test at an 0.05 level of significance.

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The other treatments caused intermediate damage, while damage with Rely 1X + Glyphosate 1X was similar to the untreated control (Photo to Left).

- In addition to some drift, due to the nature of how the avocado tree canopy falls, the sprayer boom did unintentionally come into contact with the lower part of the tree skirt which caused most of the phytotoxicity damage noted.

- Most, if not, all the phytotoxicity damage that did occur, happened on the lower half of the tree near the skirts.

- Glufosinate has a very poor translocation ability, it is more of a contact herbicide. So it is unlikely any damage was caused by translocation of the herbicide.

- This damage that was noted caused significant difference between the treatments ($P<0.0100$ and $P= 0.0072$, respectively for Application 1 and 2) on the damage on avocado plants .

What constitutes an effective weed control program?

- Identify the weed, life cycle, seed dispersal
- Select proper control measures(s)
- Implement a program
- Scout constantly

Questions?

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