



Esplanade®



Science For A Better Life

Introducing Esplanade

David Spak, Ph.D.
Product Development Manager
IVM Herbicides



Esplanade

- **New Mode of Action for IVM Market**
- **Broad spectrum weed control**
- **Low use rates**
- **Long residual**
- **Low volatility/photodegradation**
- **Low potential for off-target plant injury**
- **Many user benefits**



EsplAnade – Canadian Update

Registration: PMRA submission 2012, **Approved March 2014**

Research Permits: 2012-13

Formulation: 200SC (200 g indaziflam/L)

Uses Areas: Railroad, roadside, utilities, industrial areas, etc.

Weed Control: Preemergence control of annual grasses, broadleaf weeds, and annual sedges.

Use Rate:

- 375 ml/ha = 75 g ai/ha
- One application per year

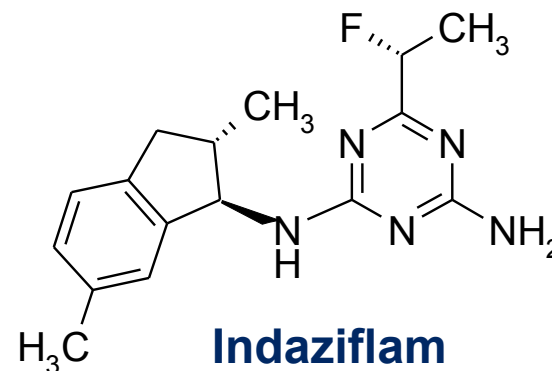


Indaziflam

New Mode of Action for IVM



- **Cellulose-Biosynthesis Inhibitor (CBI)**
 - HRAC group L, WSSA Group 29
- **Chemical class - alkylazine**
- **Indaziflam is the most active CBI discovered**
- **Pre-emergence activity (limited postemergence)**
- **Indaziflam inhibits crystalline cellulose deposition in the plant cell wall affecting cell wall formation, division and elongation**
 - **Meristems**
 - **Expanding cells**
 - **Growing roots**



Indaziflam Labeling

Group 29 Herbicide



Resistance Management Guidelines

- Continual use of herbicides with a single mode of action encourages the development of resistant weeds.
- Esplanade Herbicide may be used in programs with other preemergence herbicides with different modes of action.
- **No known resistance to Esplanade Herbicide exists**, and there are no known instances of cross resistance between this product and other classes of herbicides, or modes of action.
- Performance of this product is not affected by the presence of biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulator, or other herbicide modes of action.
- When resistance of a specific weed is confirmed, rotation of Esplanade 200 SC Herbicide in one season followed by a preemergent herbicide with another mode of action in the subsequent season, for example, will reduce existing populations and minimize further development of resistant weeds.
- **Contact a Bayer Environmental Sciences representative for the latest information on resistance management guidelines for this product.**



Indaziflam – Chemical Properties

Solubility: 2.8 ppm @ pH 6.6 to 9

4.4 ppm @ pH 4

Indaziflam Soil Degradation Rate:

Laboratory half-life (indaziflam): 25-161 days

Field half-life (indaziflam): 9-66 days

Microbial degradation

Low volatility

Not readily photodegraded

Soil Mobility (Koc): 496 (mean of 5 soils)

Esplanade

Physical & Chemical Properties



Product (A.I.)	Vapor Pressure (x 10 ⁻³ mPa)
indaziflam (Esplanade)	0.068 (1X)
diuron	9.2 (135X)
bromacil	41 (602X)
pendimethalin (Pendulum)	1,250 (18,382X)
flumioxazin (Payload)	321 (4,721X)
oxyfluorfen (Goal)	3.9 (57X)

Vapor pressure: the higher the value the more likely to volatilize

Indaziflam

Chemical Properties



Product (A.I.)	Solubility (mg/L)	KOC
indaziflam (Esplanade)	2.8 (1X)	396-742
diuron	42 (15X)	480
bromacil	700 – 815 (250-291X)	32
pendimethalin (Pendulum)	0.28 (0.1X)	17,200
flumioxazin (Payload)	1.8 (0.6X)	582
oxyfluorfen (Goal)	0.12 (0.04X)	2,891-32,381
rimsulfuron (Matrix)	<10 (<3.6X)	47

Solubility: the higher the value the more likely to leach

KOC: the higher the value the tighter bound to soil, less likely to leach but needs more water for activation

**Delivers broad-spectrum
control of over 75 weed
species including:**

ESPLANADE IS BROAD SPECTRUM



Crabgrass | *Digitaria* spp



Sprangletop | *Leptochloa* spp.



Cheatgrass | *Bromus* spp.



Marestail | *Erigeron Canadensis*



Kochia

Broadleaf Weeds Controlled

ESPLANADE IS BROAD SPECTRUM

Courtesy of WSSA and XID Services Inc.



Kochia



Yellow starthistle



Russian thistle



Redroot pigweed



Henbit

American black nightshade
Bittercress
California burclover
Canada thistle, Common (seedlings)
Chickweed, Common
Chickweed, Mouse-ear
Cudweed, Linear-leaf/purple
Curly dock (seedlings)
Cutleaf evening primrose
Dandelion, cat's ear
Dandelion, common (seedlings)
Eclipta

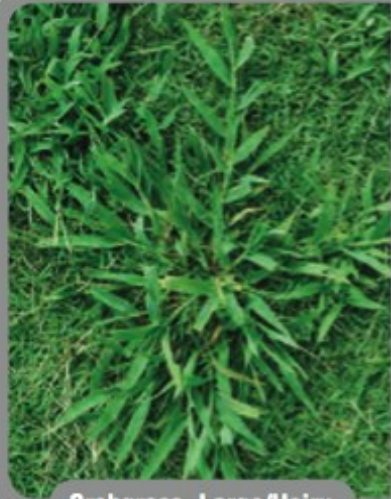
Evening primrose, common
Evening primrose, cutleaf
Filaree, redstem
Fleabane, blackleaved
Gromwell, Yellow
Groundsel, common
Hairy fleabane
Hairy nightshade
Henbit
Horseweed/ Marestail
Kochia
Lambsquarters, common

Little mallow
Long-stalk phyllanthus
Panicle willowweed
Plantain, Buckhorn
Plantain, Paleseed
Prostrate knotweed
Prostrate spurge
Purslane, common
Ragweed, common
Red tasselflower
Redmaids
Redroot pigweed

Redstem fleabane/Storksbill
Russian Thistle
Shepherd's-purse
Sowthistle, Annual
Spotted catsear
Swinecress
Tropic ageratum
Velvetleaf
Wild buckwheat (seedlings)
Wild mustard

ESPLANADE IS BROAD SPECTRUM

Grasses + Sedges Controlled



Crabgrass, Large/Hairy



Goosegrass

Annual bluegrass
Barnyardgrass, common
Cheatgrass
Crabgrass
Crabgrass, Henry
Crabgrass, Smooth
Foxtail brome
Foxtail, Giant
Foxtail, Green

Foxtail, Yellow
Guineagrass
Mouse barley
Rice flatsedge
Ryegrass, Italian
Ryegrass, Perennial
Sedge, Annual
Sprangletop
Tufted lovegrass

Weeds Suppressed



Black Medic



Woodsorrell, Yellow

Black mustard
False chamomile
London rocket
Prickly lettuce
Sesbania, hemp
Sida, prickly/teaweed
Southern brassbuttons
Sunflower, common
Vetch, purple

Wild carrot
Woodsorrel/Oxalis



Label – Weeds Controlled

APPLICATION RATE	WEED SPECIES	
375 ml/Ha	Black Mustard	Brome grasses including downy brome, riggut brome, and cheat
	Barnyard grass	
	Giant foxtail	Yellow starthistle
	Green foxtail	Wild barley
	Italian ryegrass	Wild oats
	Large crabgrass	Kochia – suppression
	Yellow foxtail	St. John's wort
	Annual sow-thistle	Medusa head
	Wild mustard	Bluestem broomsedge
	Common groundsel	Volunteer common rye
	Field bindweed	Smooth hawk's-beard
	Lamb's-quarters	Morning glory
	Prickly lettuce - suppression	Cudweed
	Redroot pigweed - suppression	Dog fennel
	Shepherd's purse	
	Spotted spurge	
	Stork's-bill	
	White sweetclover	

Esplanade SC Herbicide may be applied once per season.

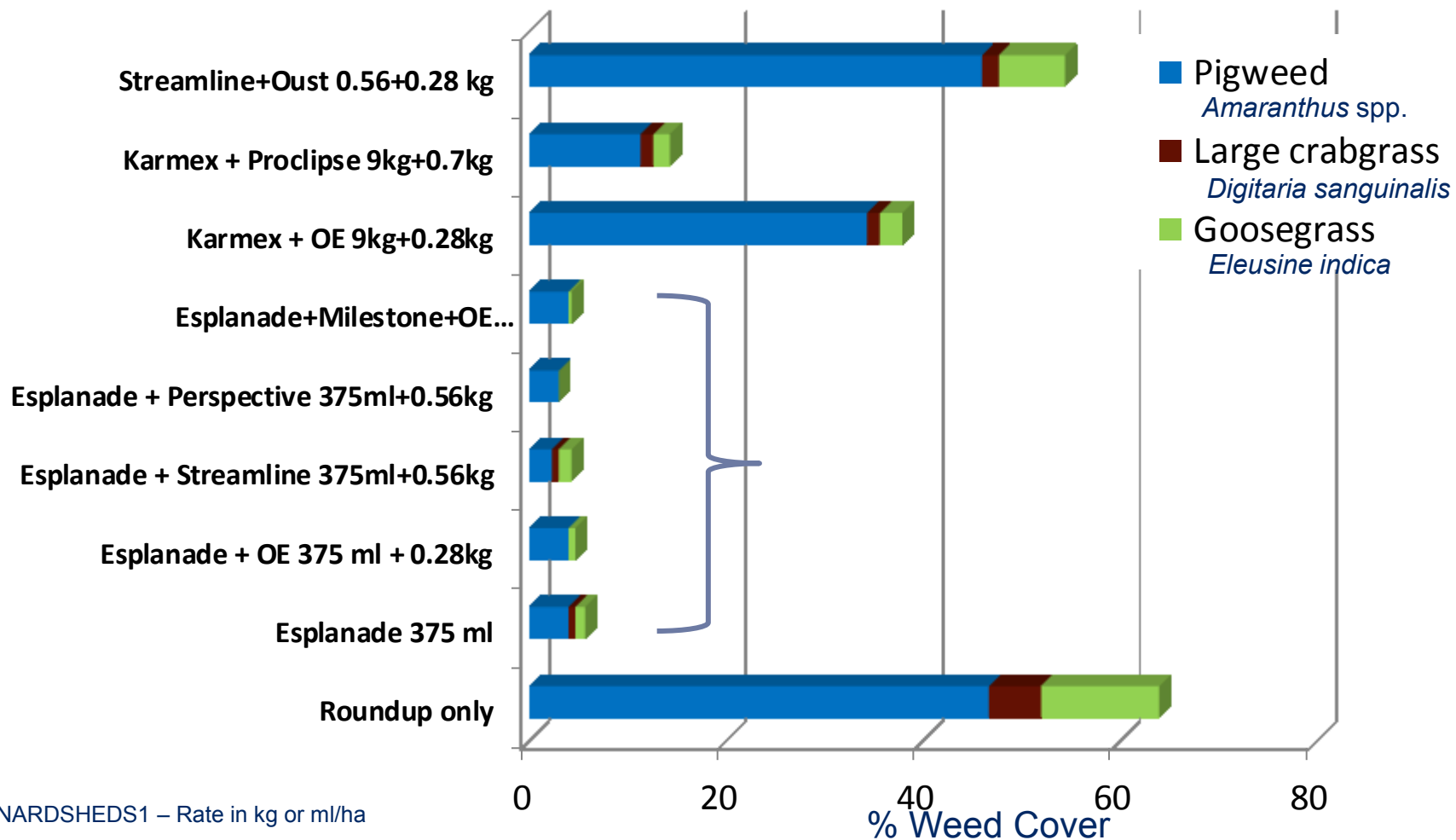


Esplanade Control lasts longer

- Up to 8 months control
- Long-lasting pre-emergent performance:
 - High and low rainfall environments
 - Northern and southern bare-ground applications
 - Year round application

RR Weed Control - South

Elizabeth City, NC (5 MAT)



Applied 4/10/12; All treatments tank-mixed with 4.7 L/ha glyphosate

Bayer CropScience

U.S. - 2012 Market Introduction Esplanade 200SC



**375 ml Esplanade + 375 ml Milestone +
0.21 kg Oust, 4 MAT, NC**



**Esplanade 375 ml + 0.56 kg Perspective
5 MAT, FL**

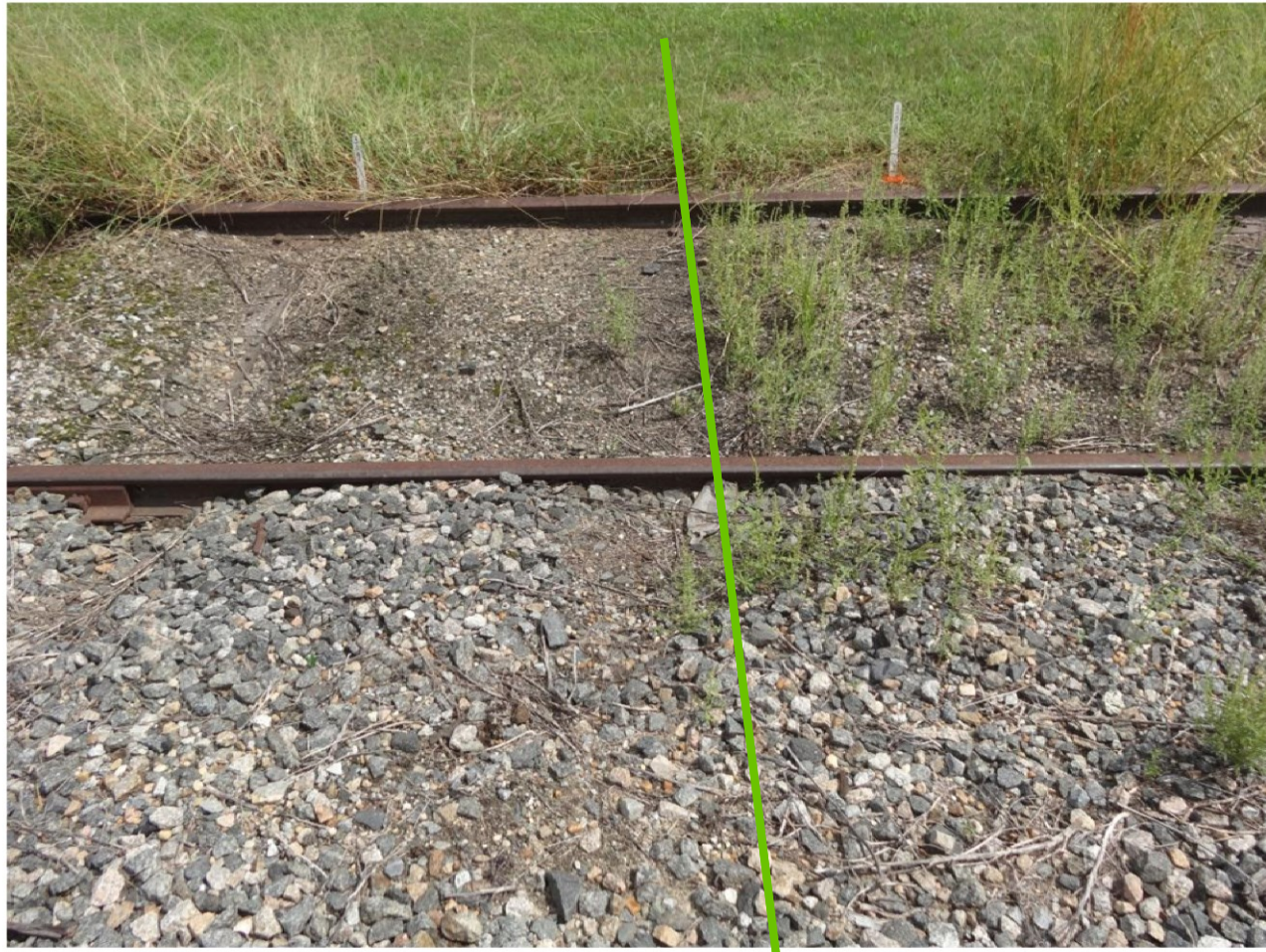


**Esplanade 292 ml + 420 g Streamline + 0.21 kg Oust
5 MAT, PA**



**Esplanade 511 ml + 0.77 kg
Perspective , 5 MAT, OR**

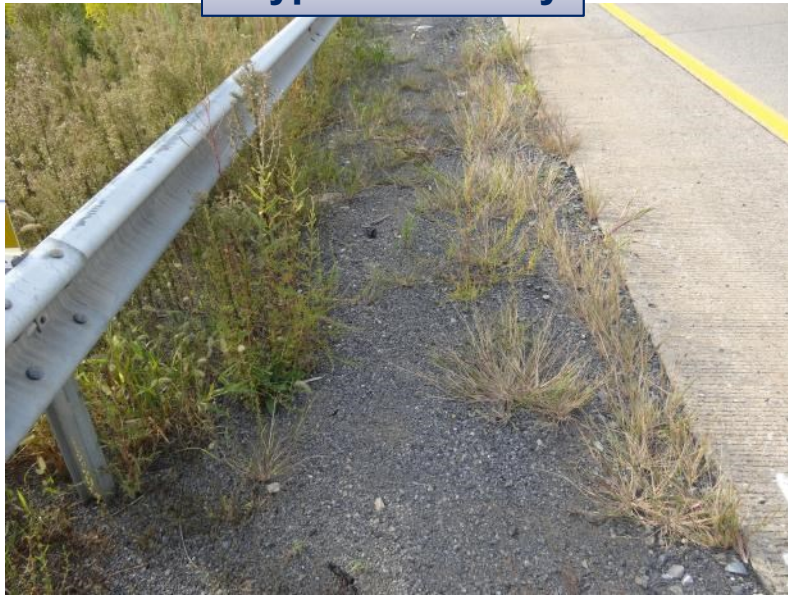
5 Months After Treatment



Esplanade+Perspective 375ml+0.56 kg/ha

Karmex + Proclipse 9kg + 2.6kg/ha

Glyphosate Only

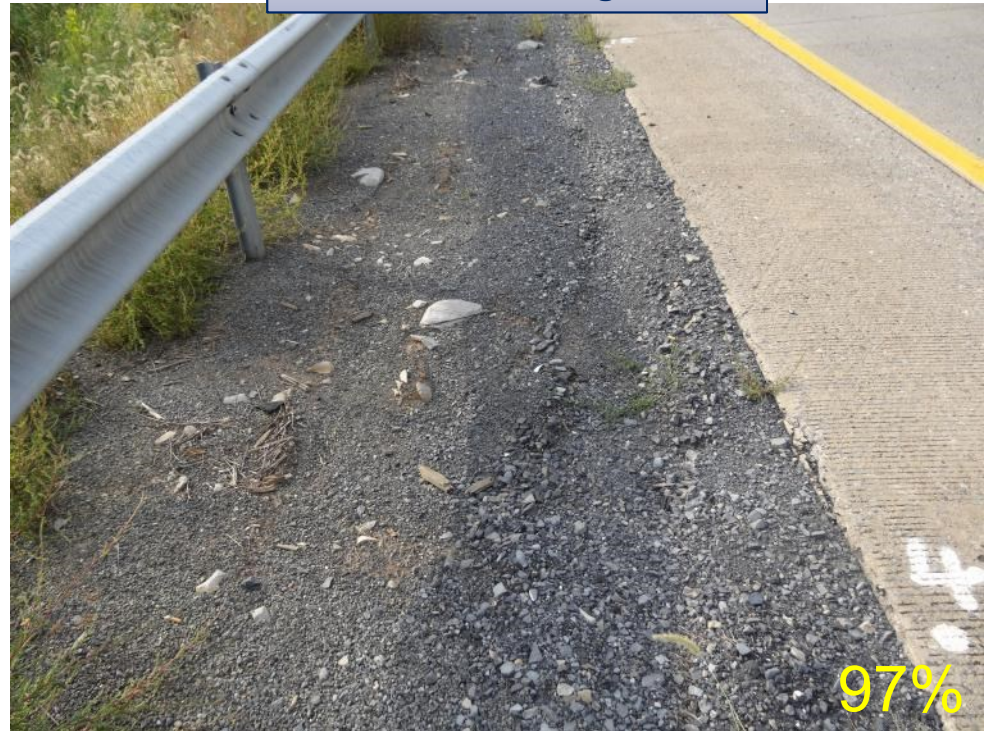


Sprangletop/Kochia

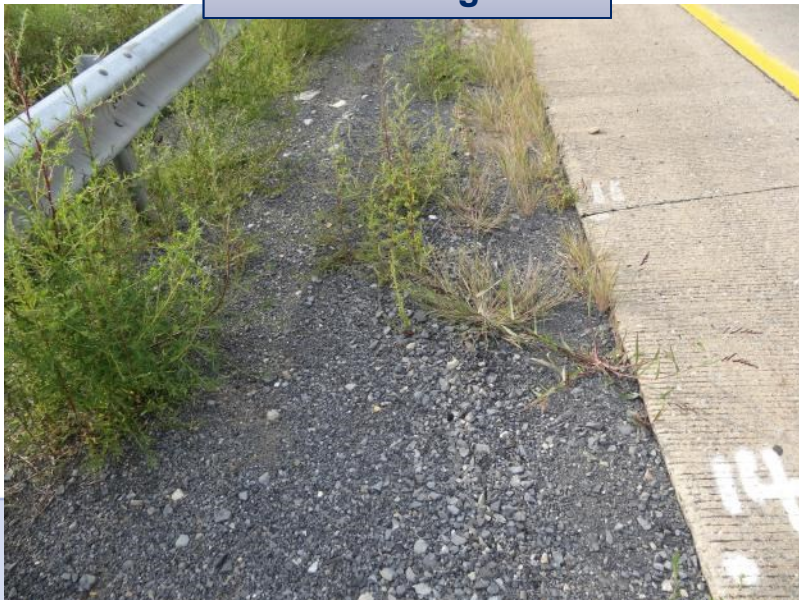
4 Months After Treatment
PA



Esplanade+Streamline
375 ml + 560 g/ha



Streamline + Oust
560 + 210 g/ha



Protocol HE12NARDSHDR1

* All treatments applied with 4.7L/ha glyphosate

Bareground weed control on guardrails

- Kochia control, 4 months after application



Diuron® 9 kg
+ Oust Extra® 0.29 kg
+ glyphosate 2.3L



Esplanade® 375 ml
+ Perspective® 0.58kg
+ glyphosate 2.3L

Wilmington and Western RR, 2013

- 3 Months After Treatment (applied 6/10/13, pictured 9/4/13). Applicator: Weeds Inc.
- What value is Esplanade 200SC bringing to the treatment?



Esplanade® 375 ml/ha + Streamline®



Streamline®

2012 Ogden, UT Trial Dr. Harvey Holt

Applied April 2012

Photos taken July 2013 (15 Months)



Glyphosate 2340 ml/ha



Esplanade + Perspective +
Oust Extra 375ml +
0.56 kg + 0.28 kg/ha

2012 Ogden, UT

Applied April 2012

Photos taken July 2013 (15 Months)



Esplanade + Milestone +
Oust Extra
375 ml+560 ml+0.28kg/ha



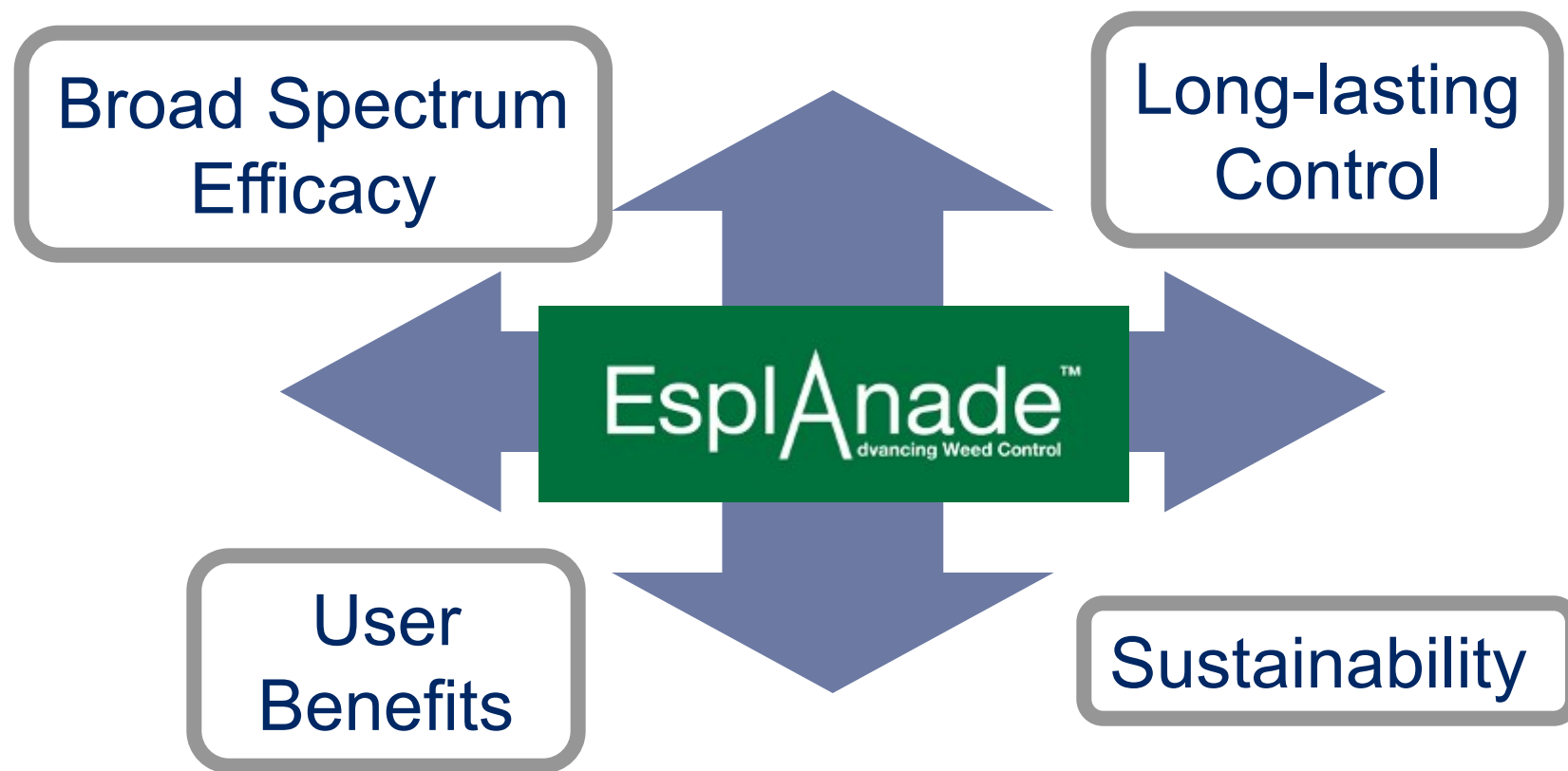
Payload + Prodiamine
0.7 + 2.2 kg/ha



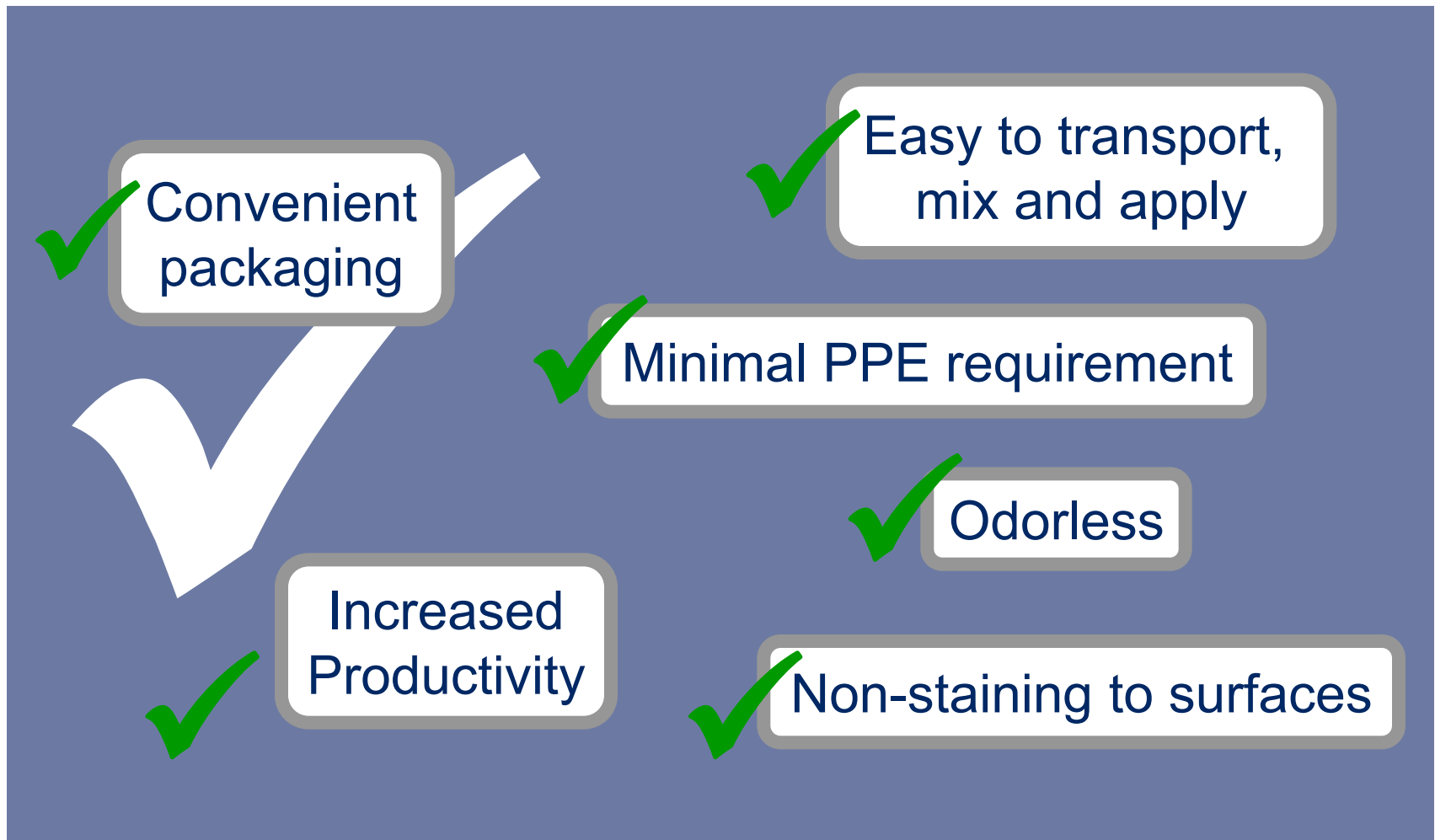
12 Months After Esplanade Application



Introducing Esplanade: Advancing Weed Control



Esplanade User Benefits



User Benefits Proof



Easy to transport, mix and apply

diuron 80 DF

EsplAnade[®]
dancing Weed Control

400

25 pound bags of standard product

10 pallets
(10,000 lbs.)

VS

50

Cases (4 x 1L)

(450 lbs)



User Benefits Proof



Easy to use and handle

Diuron 80 DF*

REQUIRED PERSONAL PROTECTION EQUIPMENT

NIOSH approved Dust Mist filtering respirator

Long sleeved shirt

Chemical resistant, water proof gloves

Chemical resistant apron

Long pants

Shoes plus socks

20
25lb bags
cover 64 acres
@ 8lbs per acre

VS

EsplAnade™
draining weed control

REQUIRED PERSONAL PROTECTION EQUIPMENT

Long sleeved shirt

Chemical resistant, water proof gloves

Long pants

Shoes plus socks

1
2.5gal container
covers 64 acres
@ 5.0oz per acre

~10 liters

* PPE based on the USEPA Reregistration Eligibility Decision (RED) for Diuron, September 30, 2003

User Benefits



✓ Odorless: less public concerns due to odor



User Benefits Proof



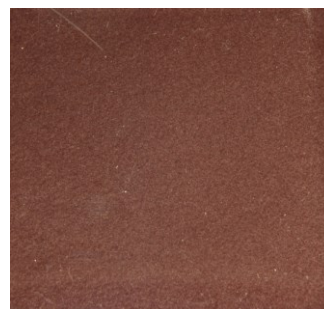
Non-staining or residue on surfaces



Esplanade (5 oz/A)



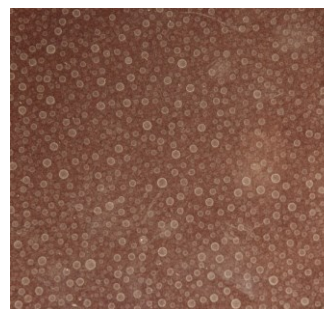
Diuron (10 lb/A)



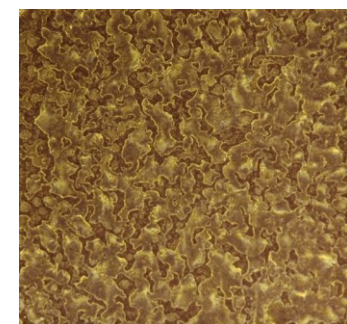
Untreated



Diuron (10 lb/A)



Esplanade (5 oz/A)



Procllipse (2.3 lb/A)

Influence of Soil Properties and Soil Moisture on Indaziflam Efficacy

M.S. Student: Derek Sebastian

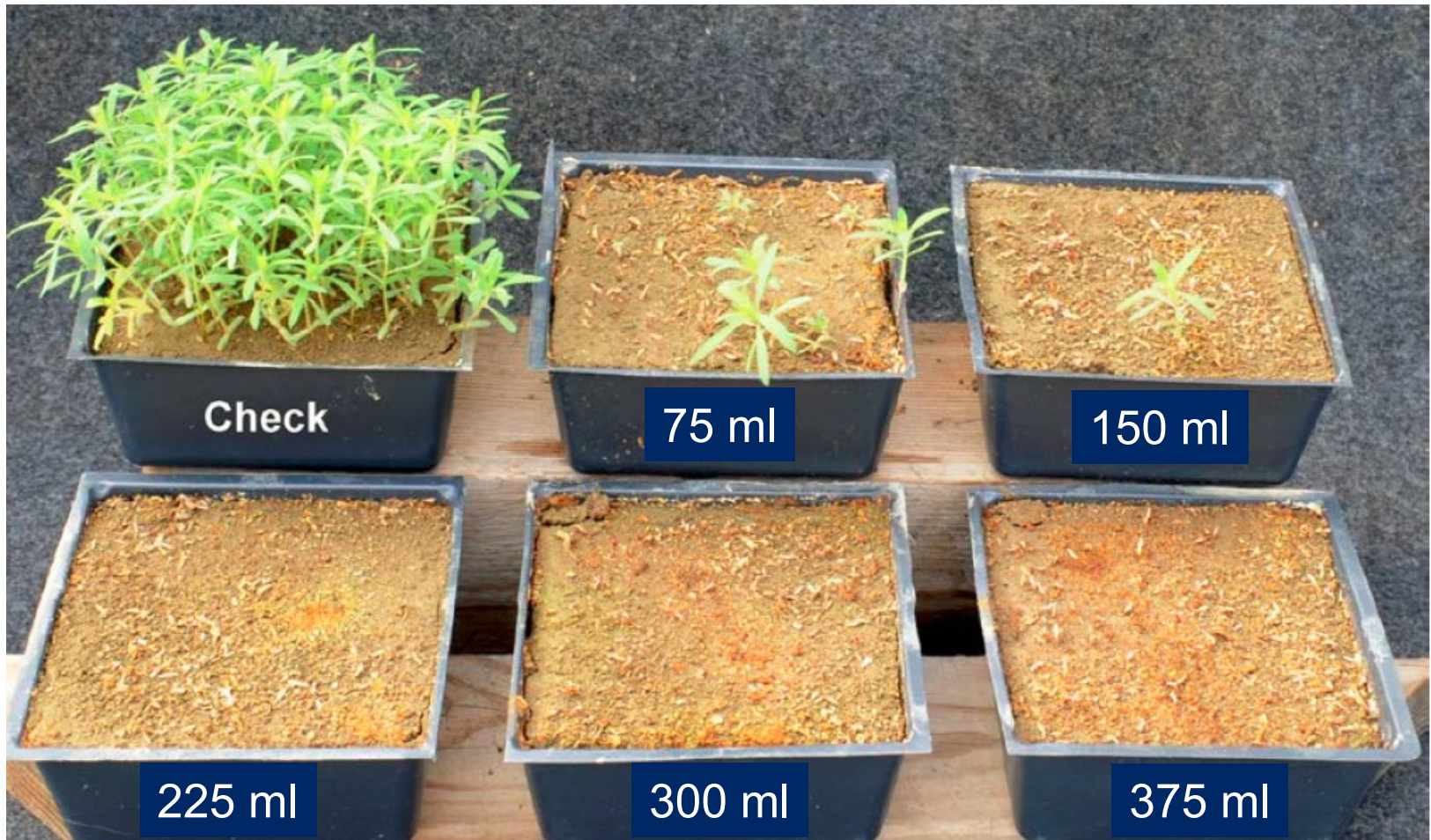
Advisor: Dr. Phil Westra

Co-advisor: Dr. Scott Nissen

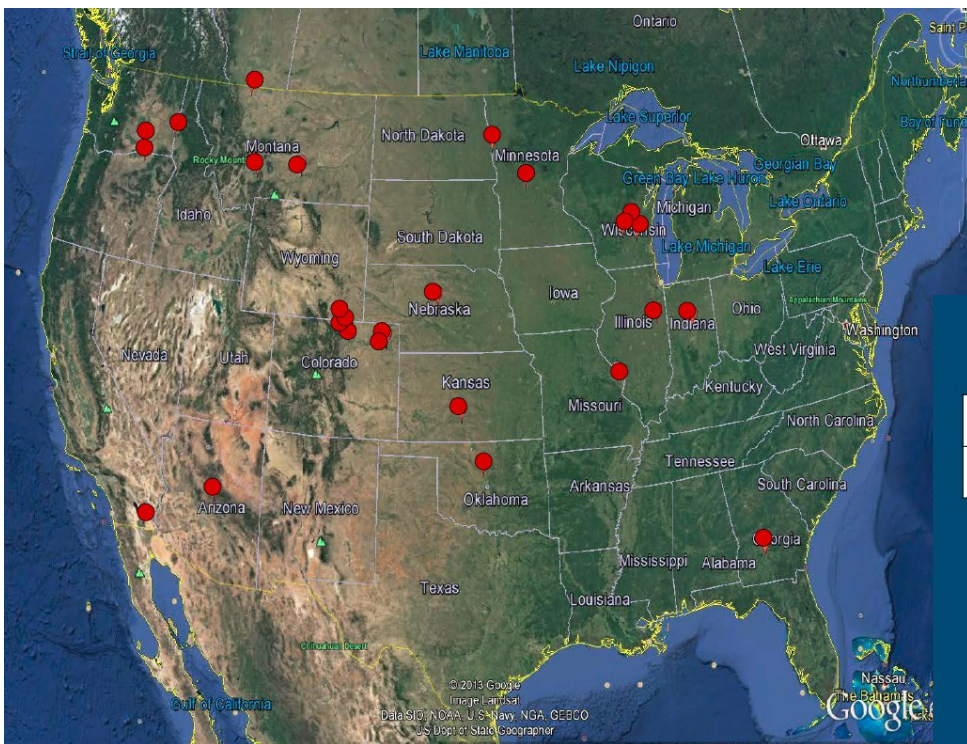


Colorado State University

Efficacy of Esplanade on Kochia



Soil types and sampling locations

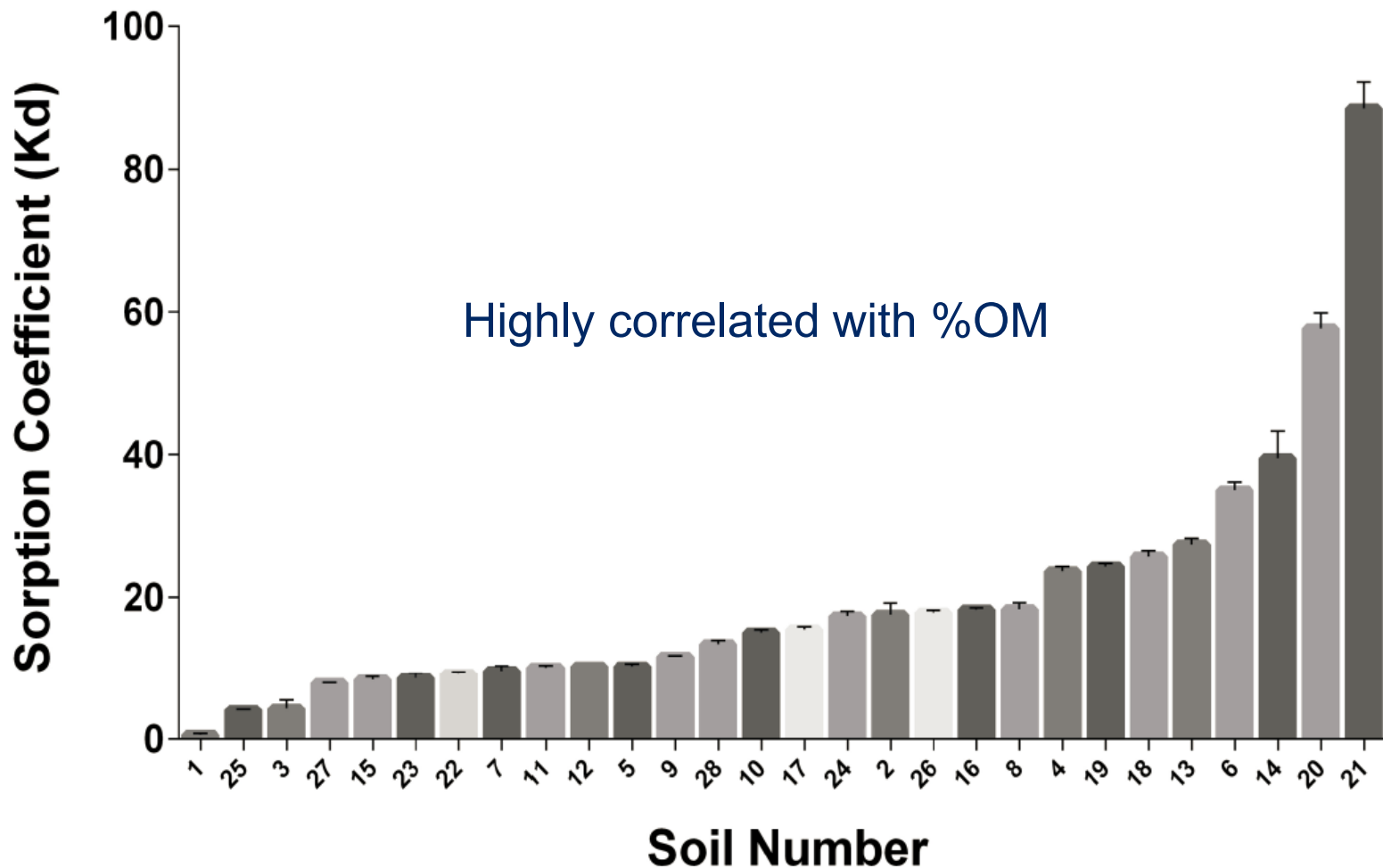


Soil Property Distribution

pH	% OM	CEC	% Sand	% Silt	% Clay
5.2 – 8.2	0.4 – 6.25	2.2 – 48.7	10.2 – 88.8	4.0 – 75.0	1.2 – 50.2

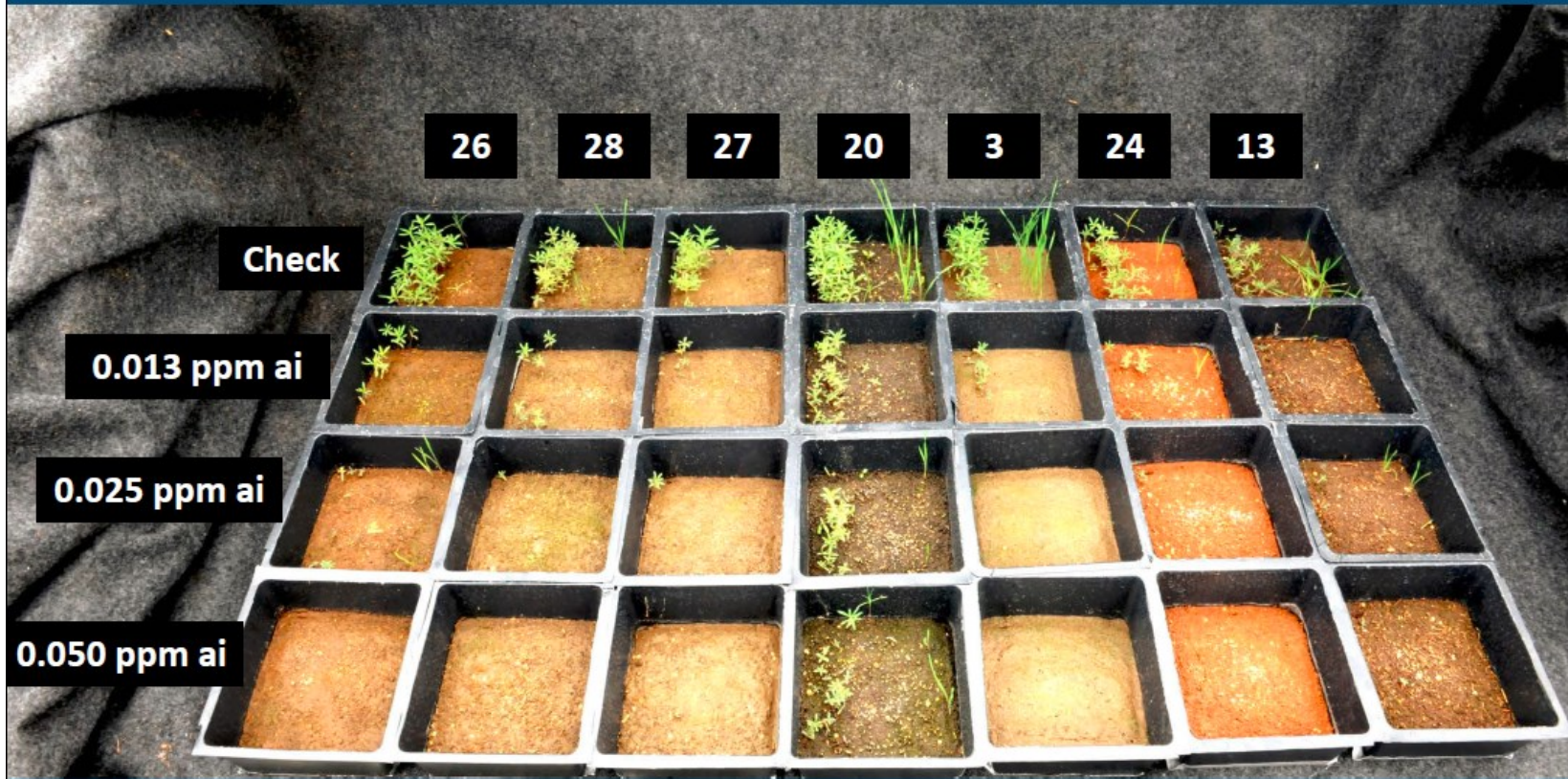


Soil Sorption Coefficients



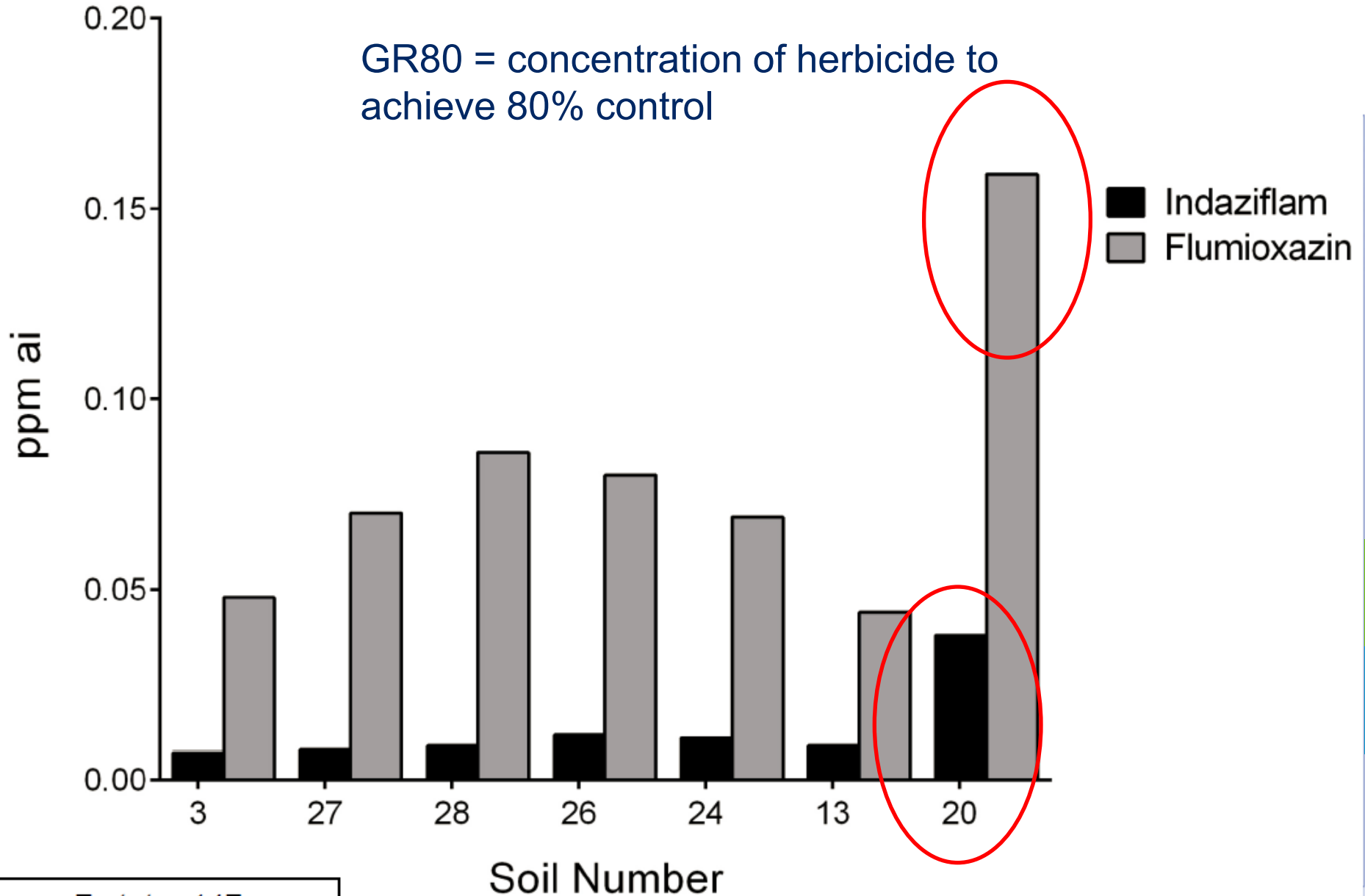
Soil type influences Kochia control

Indaziflam



Kochia GR80 Values

GR80 = concentration of herbicide to achieve 80% control



F-stat = 147
MSE = 0.50

Soil moisture influences Kochia control



Kochia can germinate at soil moistures below what is required to activate the herbicide.

Application timing for bareground weed control

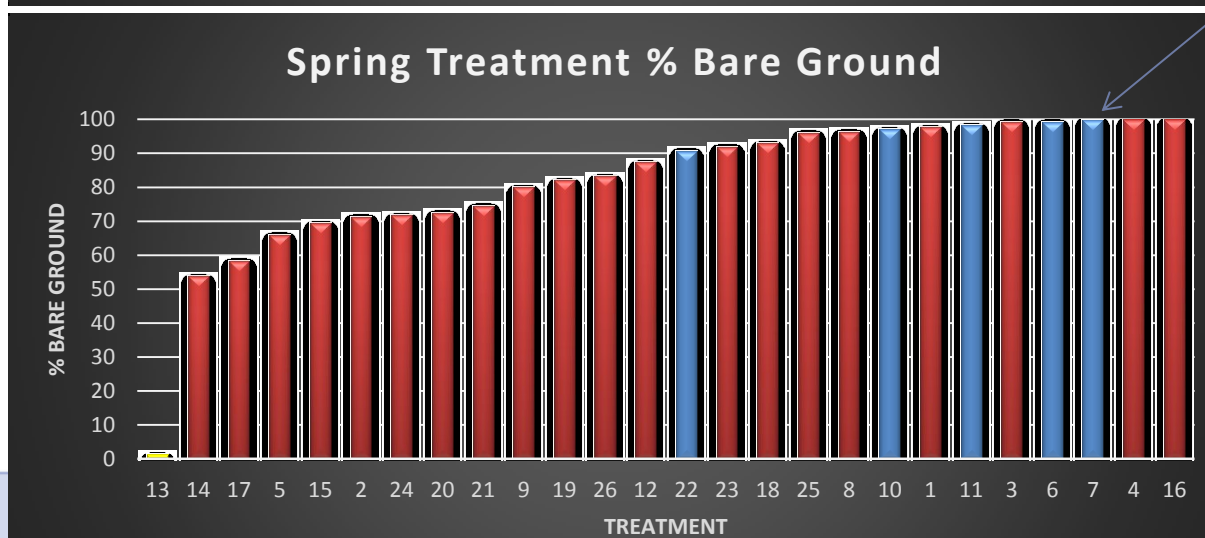
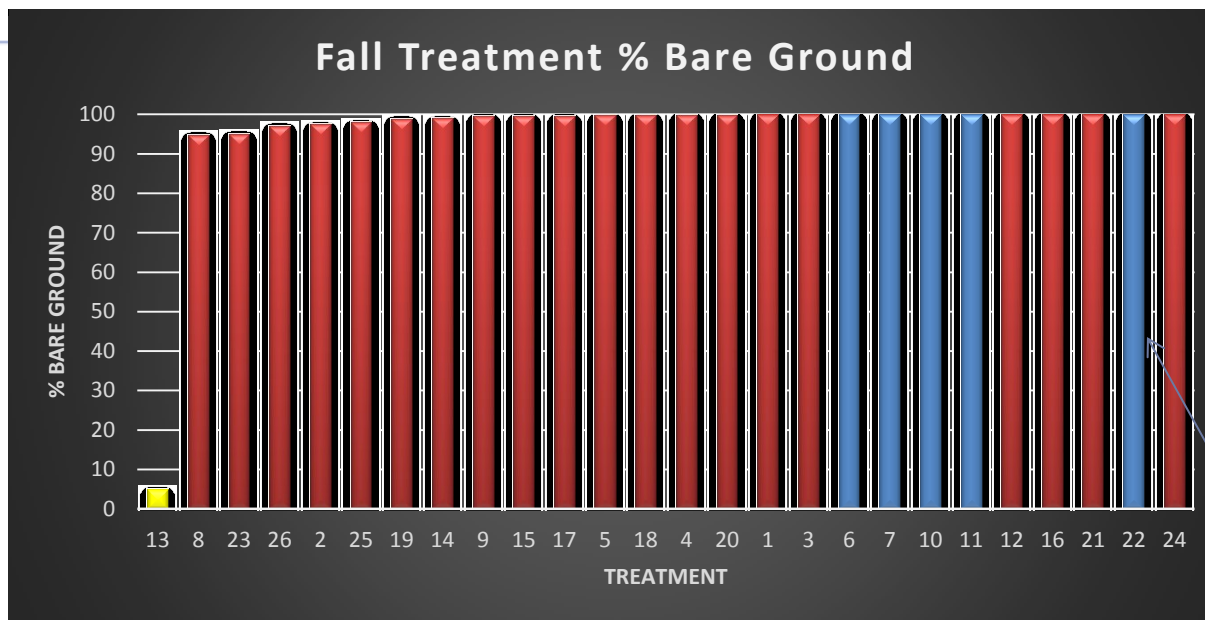
Colorado State University



- Colorado State University; Nunn, Colorado
- Primary weed species: Kochia and Russian Thistle
- Application Dates:
 - October 17, 2013 (Fall)
 - Excellent soil moisture, 0.25 inches precipitation 2 days after application.
 - Kochia and Russian thistle 4 to 14 inches tall and setting seed.
 - March 15, 2014 (Spring)
 - Excellent soil moisture. 0.36 inches of precipitation one week following application.
 - Kochia / Russian thistle not emerged



Fall timing better than Spring



Esplanade
containing
treatments
in Blue

Native Grass Restoration

Ferrel rye and downy brome control



6 months after treatment

Tank-mix Compatibility of Esplanade 200SC with Glyphosate Formulations



- Some glyphosate formulations have been shown to be physically incompatible with Esplanade 200SC.
- Mixing order is very important and should be followed.
- Always add Esplanade to the tank first before adding any glyphosate product.
- Roundup ProMax and Roundup WeatherMax are incompatible when added to the tank before Esplanade.
- Other commonly used glyphosate formulations including: Accord XRT II, AquaNeat, Glyfos X-Tra, Razor, Razor Pro, Rodeo, and Roundup PowerMax show no issues when the correct mixing order is followed.
- Surfactants such as NIS may also improve compatibility.



Tank-Mixing Review

Tank Mixing Order:

1. Dry compatibility agents (AMS, UAN)
2. Dry herbicide products (WG, DG, etc.)
3. Esplanade 200SC (ensure thoroughly mixed)
4. Soluble products (glyphosate, 2,4-D)
5. EC formulations (MSO, ESO, etc.)
6. Surfactants/adjuvants (NIS)



Science For A Better Life

Thanks!