Roadside Management for Tygh Valley Milkvetch

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Mission

Conserve native species and habitats through restoration, research, and education.

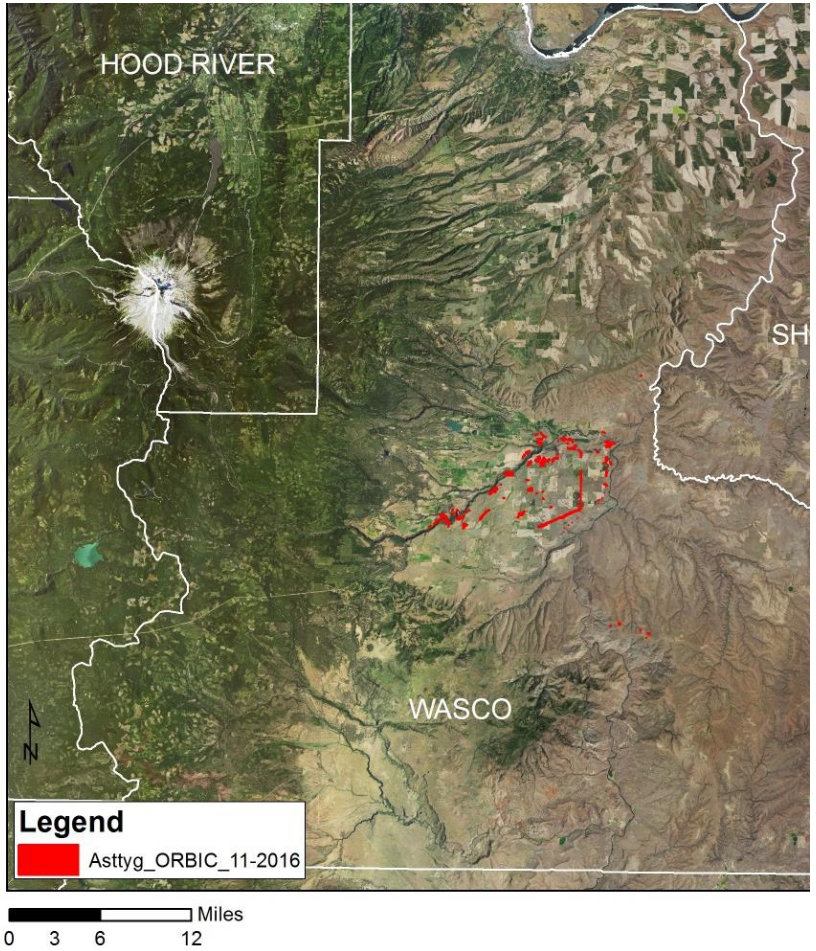
http://nativeseed.info/wp-content/uploads/NSNlogo-sm.png

Tygh Valley Milkvetch (*Astragalus tyghensis)*

- Perennial legume
- Threatened: OR ESA
- Species of Concern: Federal ESA
- Sagebrush/bitterbrush steppe habitat
- Insect pollinated
- Not seed limited?

Tygh Valley Milkvetch (*Astragalus tyghensis)*

- Endemic to Wasco County, OR
- ~ 20% of species is on ODOT right of way
- Primary weed threats:
  - medusahead (*Taeniatherum caput medusa*)
  - cheatgrass (*Bromus tectorum*)
  - bulbous blue grass (*Poa bulbosa*)
  - diffuse knapweed (*Centaurea diffusa*)



Objectives

- Evaluate management options for roadside Special Management Areas (SMA) for the Tygh Valley milkvetch.

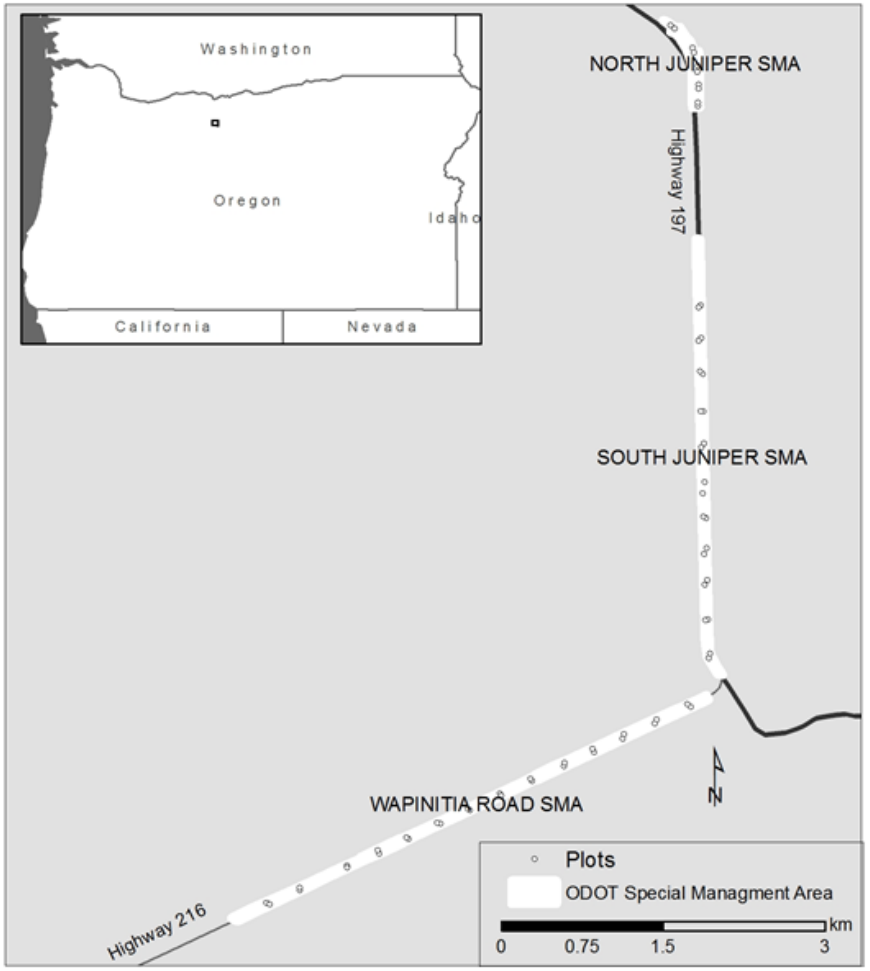
- Incorporate results in management plan for SMAs with the milkvetch- part of ODOT HCP for road maintenance activities.

Two Phase Approach

- Phase I: 2011-2013
  - In areas without Tygh Valley milkvetch, identify effective herbicide treatments to control exotic invasive plants.
  - Select most effective treatment with least impact to native species.
- Phase II: 2014-2017
  - Apply selected treatments from Phase I, determine impacts in areas with Tygh Valley milkvetch.

Phase I Study Design

- Herbicides
  - Fluazifop (Fusilade II)
    - Grass specific post emergent
  - Rimsulfuron (Matrix SG)
    - Pre and post-emergent
  - Imazapic (Plateau)
    - Pre and post-emergent
- Treatments:
  - Control, F, M, P, F+M, F+P
  - 10 plots per treatment

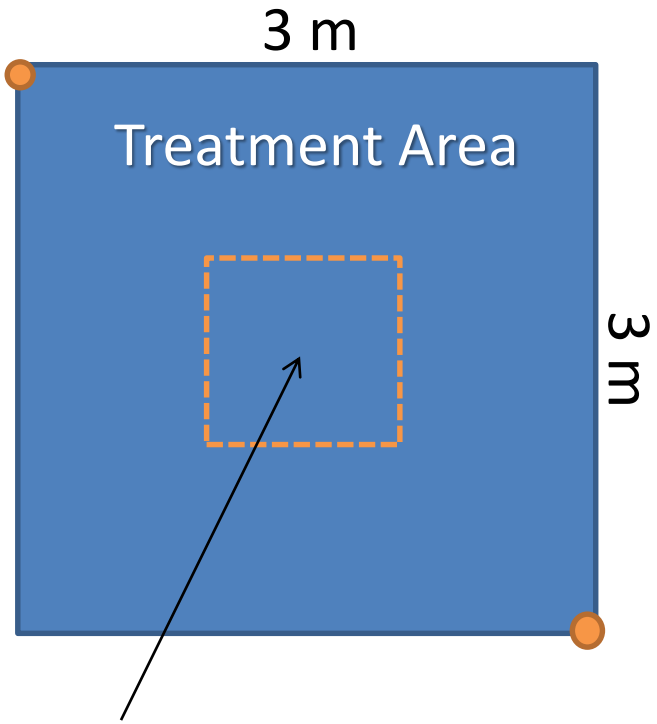


	Rimsulfuron	Imazapic	Fluazifop - P- butyl
Trade Name	Matrix® SG	Plateau®	Fusilade® II
Mode of Action	Pre & post-emergent	Pre & post-emergent	Post-emergent
Target Species	All	All	Grasses
Application Rate	70 g ai[a] ha^{-1}	66 g ai ha^{-1}	275 g ai ha^{-1} with 0.25% v/v R11® nonionic surfactant
Application	Fall	Fall	Spring
Manufacturer	du Pont	BASF Corporation	Syngenta Crop Protection

[a] Active ingredient.

Phase I Study Design

PLOT STRUCTURE



Study Design & Analysis

- Plots treated fall 2011 and spring 2012.
- Plant community cover by species
  - 2011 (pre-treatment), 2012, 2013
- Compare target spp. and functional group cover across treatments
  - ArcSIN squareroot transformation
  - Two factor ANCOVA with 2011 data as covariate, Fisher's protected LSD

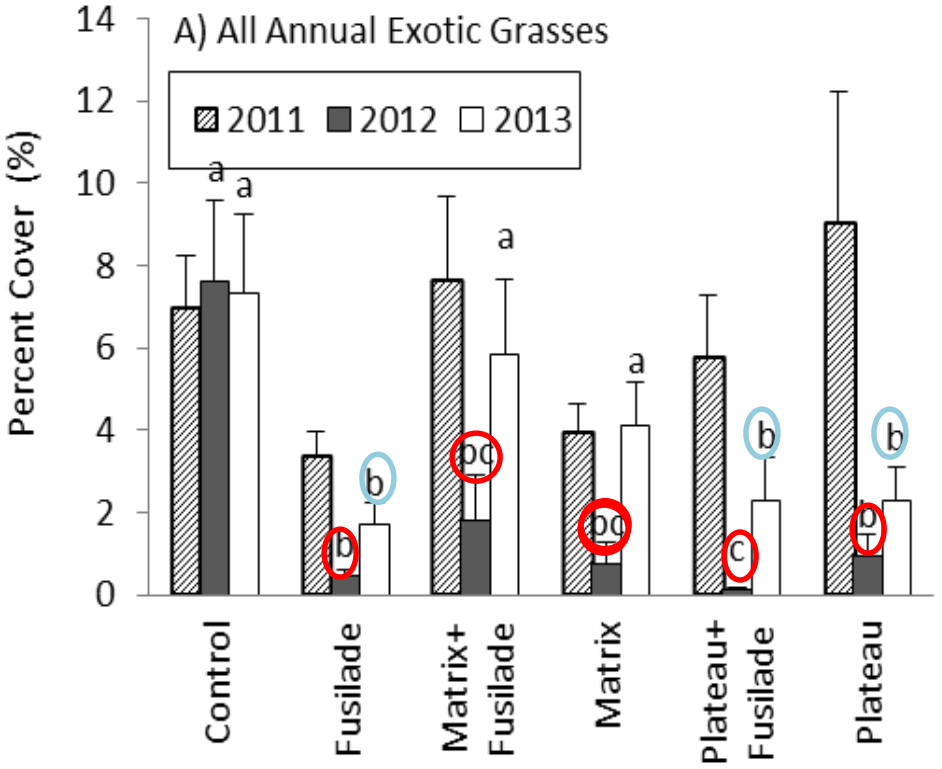
Results

- Conditions
  - High litter
  - Low green plant cover
  - Low diversity

Results

Exotic Annual Grasses

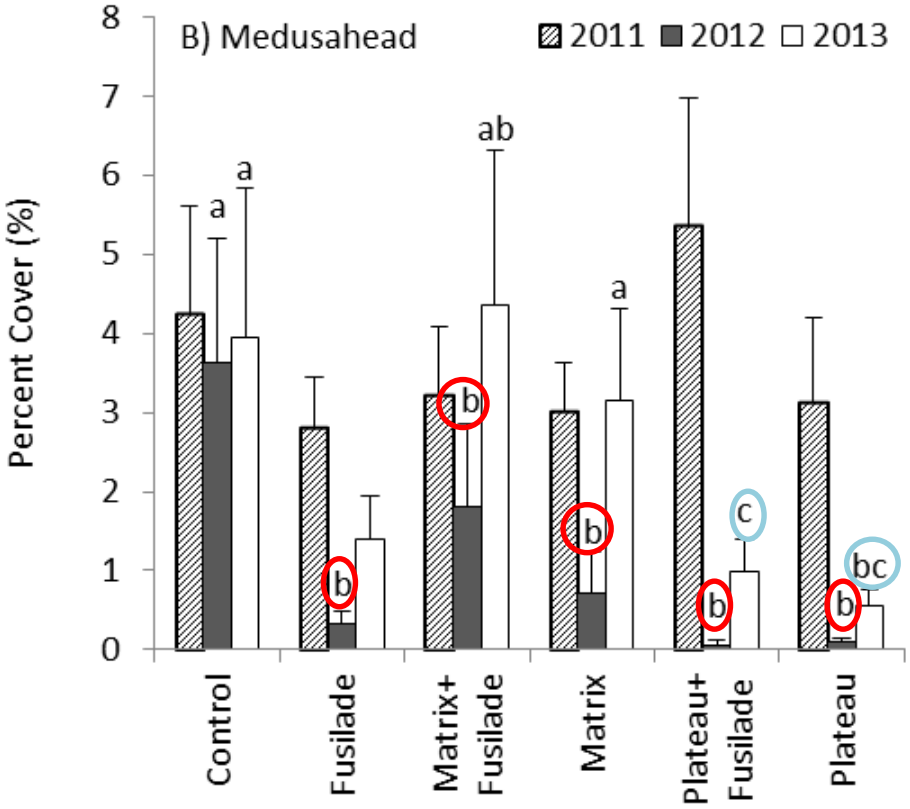
- 1st season after treatment
  - All treatments reduced annual exotic grass cover
- 2nd season after treatment
  - Fusilade and Plateau most effective overall



Results

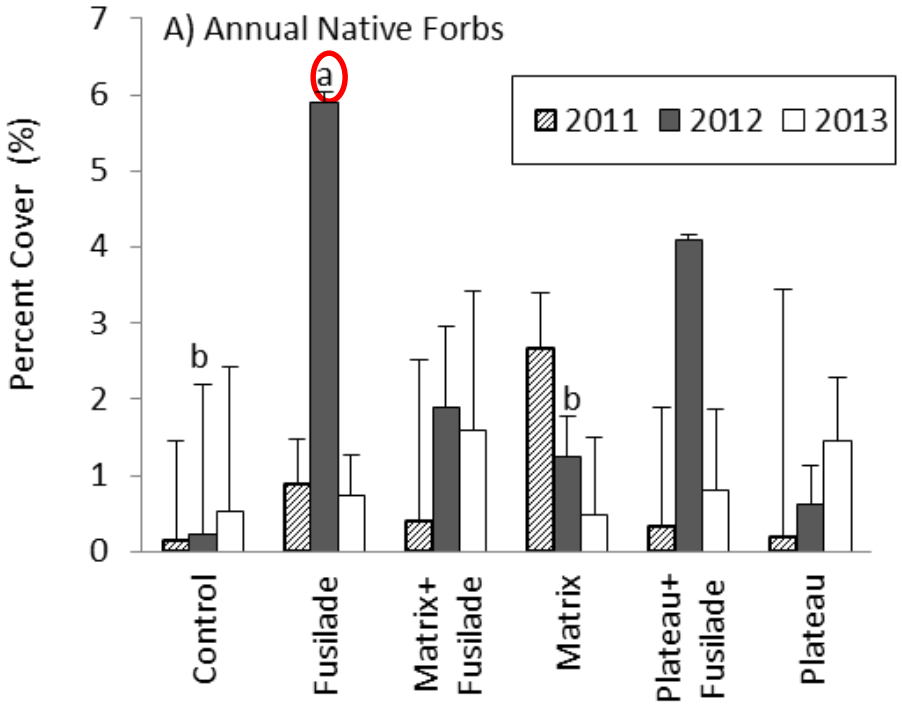
Exotic Annual Grasses

- 1st season after treatment
  - All treatments reduced overall and individual species cover
- 2nd season after treatment
  - Fusilade and Plateau most effective overall
  - Fusilade and Plateau most effective for medusahead
  - No treatment provided 2-yr control of cheatgrass



Results

- Unaffected:
  - Exotic annual forbs
  - Native and exotic perennial grasses & forbs
  - Plant litter
- Annual native forbs
  - First year flush with Fusilade



Results fit with other research?

- Medusahead
  - Expect 2 yr control with Plateau, best control if burn first to remove litter
- Cheatgrass
  - Control with higher rates of Plateau
- Plant community
  - Native species loss at higher rates of Plateau
- Few arid system grass-specific herbicide studies

Phase II: June 2014- June 2017

- Same study area, but plots selected to include Tygh Valley milkvetch
- 48 (4 x 12) plots established & sampled
- Plateau (fall 2014) and Fusilade (spring 2015)
- Incorporated native species seeding in split plot design (fall 2014).

Native Seeding

Common Name	Scientific Name	Growth Form	lbs/acre
Sandberg's bluegrass	Poa sandbergii	Perennial	3
Bluebunch wheatgrass	Psudoroegneria spicata	Perennial	5
Bottlebrush squirreltail	Elymus elymoides	Perennial	2.6
Idaho fescue	Festuca idahoensis	Perennial	3
		Sub Total Grasses	**13.6**
Farewell to spring	Clarkia amoena	Annual	0.6
Sunflower	Helianthus annuus	Annual	0.4
Western yarrow	Achillea millefolium	Perennial	0.2
Douglas dustymaiden	Chaenactis douglasii	Perennial	1.2
Shaggy fleabane	Erigeron pumilus	Perennial	0.6
Barestem lomatium	Lomatium nudicaule	Perennial	1.6
Pacific lupine	Lupinus lepidus	Perennial	1.6
		Sub Total Forbs	**6.2**
		Grand Total	19.8

Study Design & Analysis

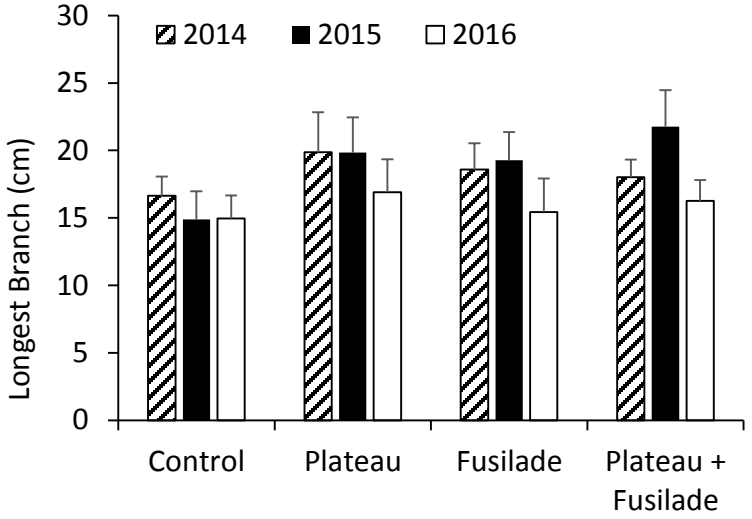
- Compare ASTY performance, target spp. and functional group cover across treatments
  - Two factor ANCOVA with 2014 data as covariate, Fisher's protected LSD.
  - GLM 2 factor ANOVA for plant and seedling survival.
  - Data transformed to improve normality and equality of variance.

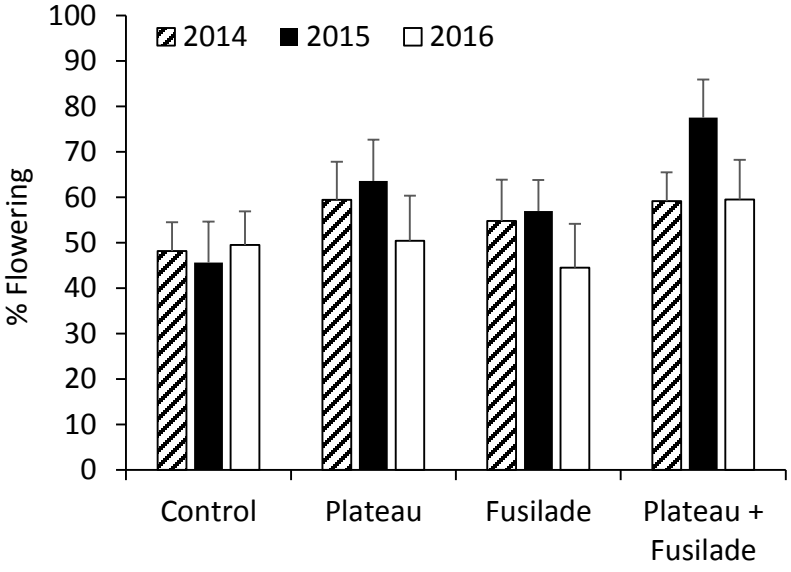
Tygh Valley Milkvetch (ASTY) Variables

- Plant size
- Level of flowering
- ASTY seedling abundance
- ASTY plant and seedling survival

Results

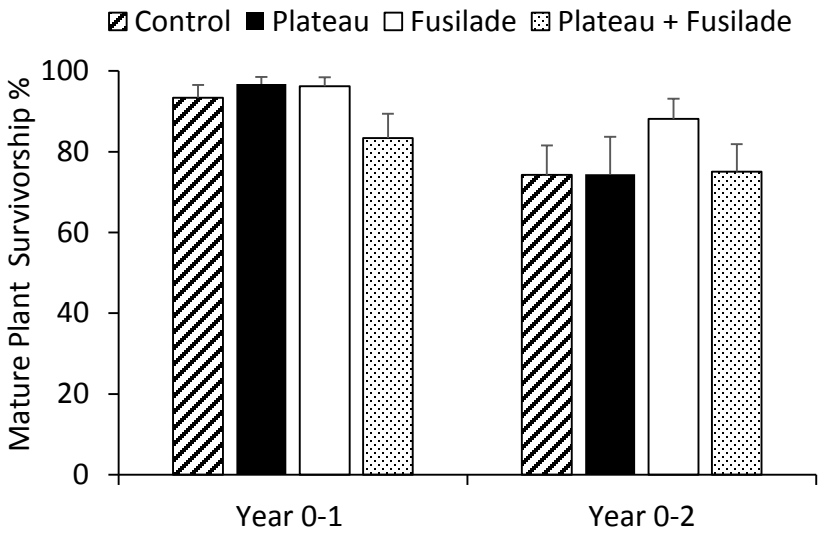
- Tygh Valley milkvetch
  - No treatment effects in 1st or 2nd season after treatment for mature plants:
    - plant size
    - # inflorescences/plant
    - % flowering

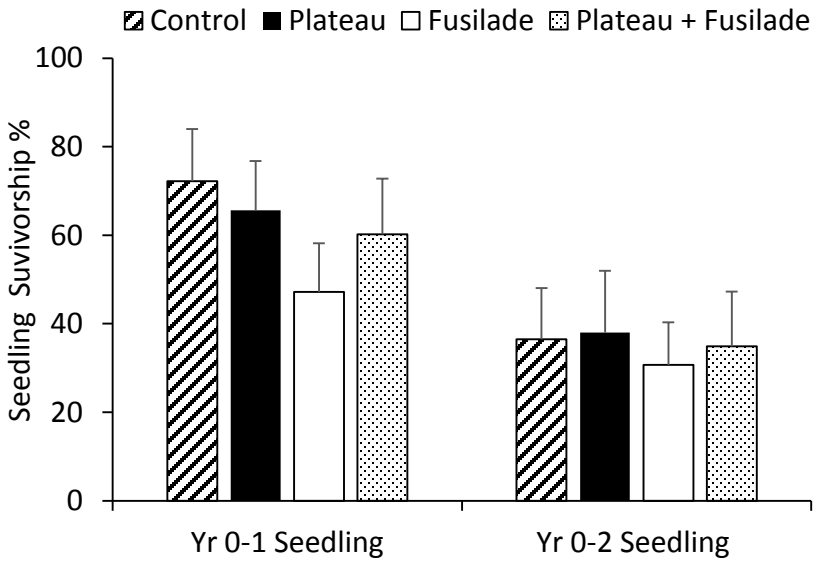




Results

- Tygh Valley milkvetch
  - No significant effects in 1st or 2nd season after treatment for
    - mature plant or seedling survivorship
    - # seedlings

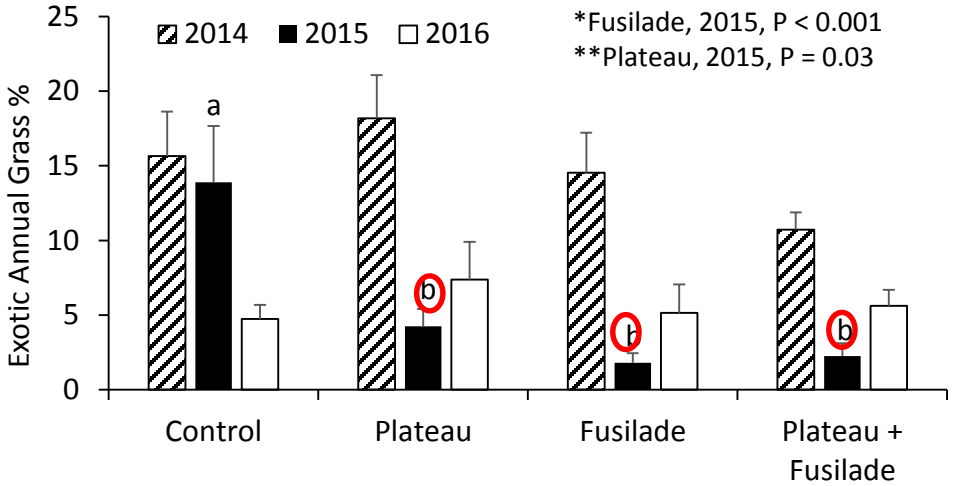


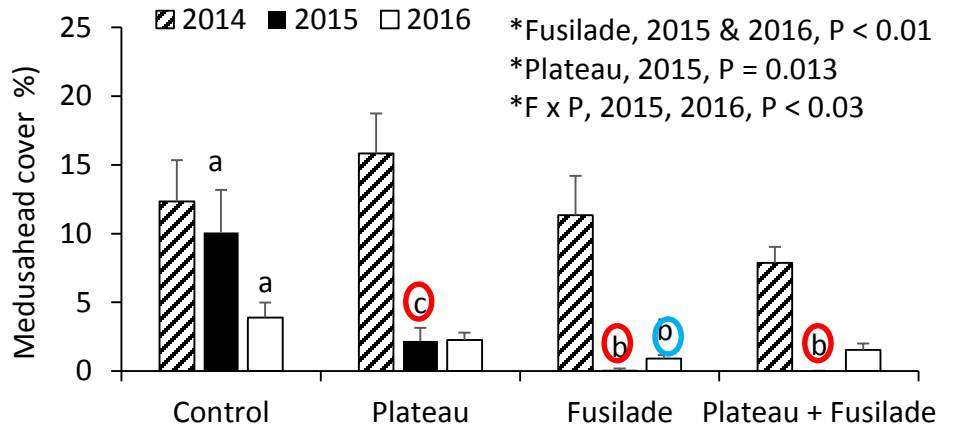


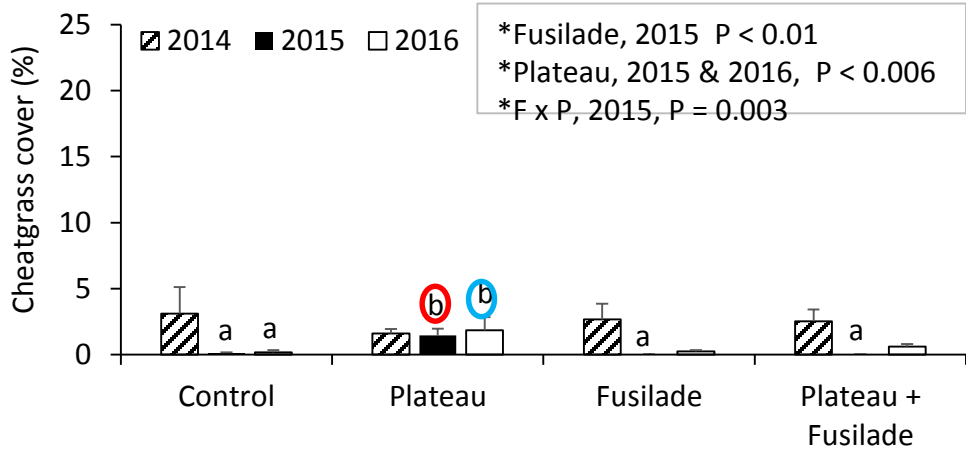
Results

Exotic Annual Grasses

- 1st season after treatment:
  - Overall cover & medusahead cover reduced by Fusilade and Plateau
  - Cheatgrass unaffected by Pleateau (?)
- 2nd season after treatment:
  - No overall reduction
  - Medusahead still reduced by Fusilade.
  - Cheatgrass unaffected by Plateau (?)

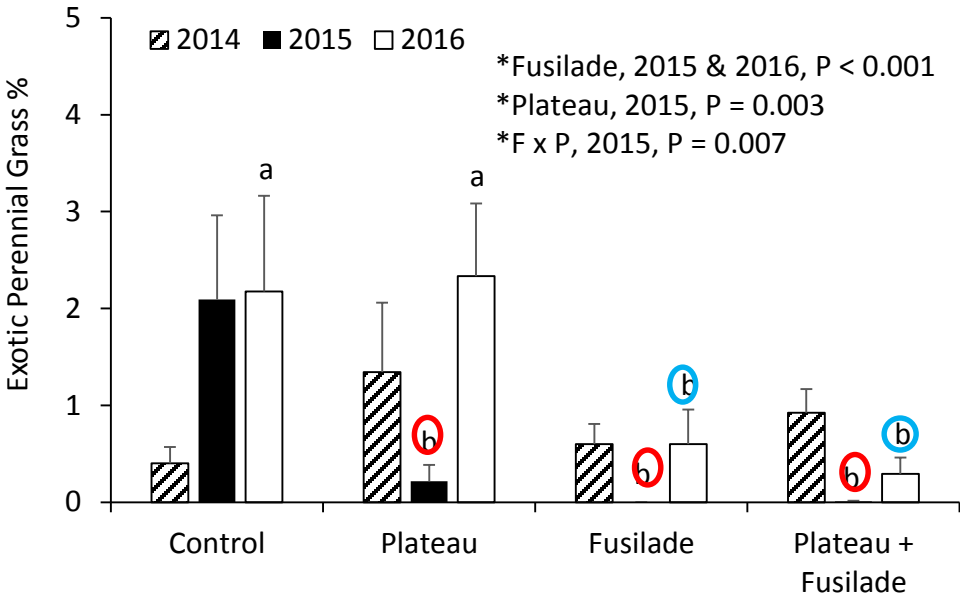


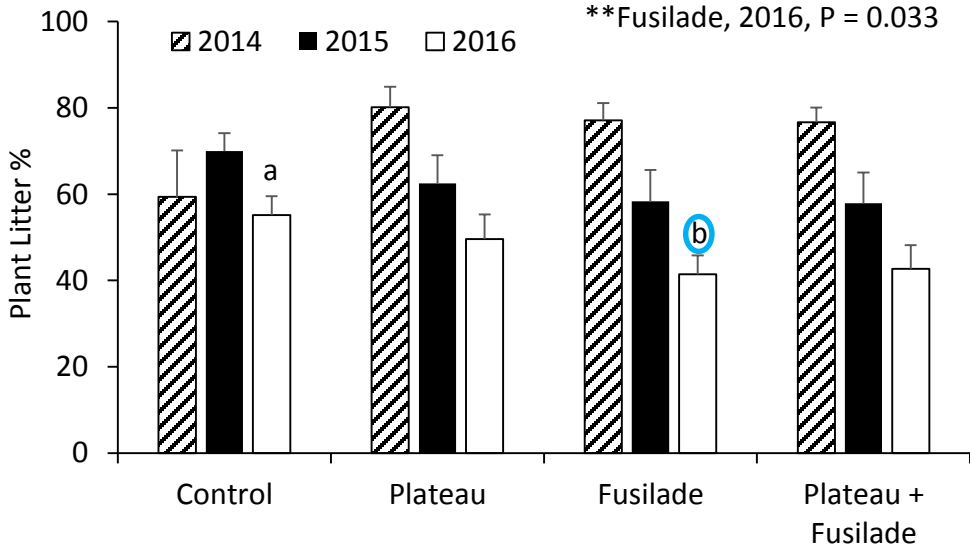




Results

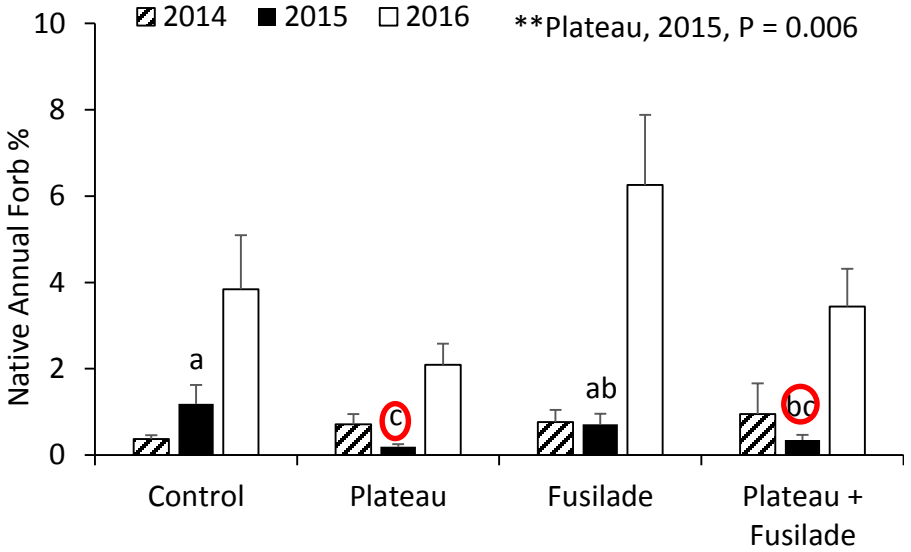
- Other Plant Community
  - Exotic perennial grasses
    - Plateau - reduction in 1st season
    - Fusilade - reduction for 2 seasons
  - Plant litter
    - Fusilade – reduction in 2nd season only

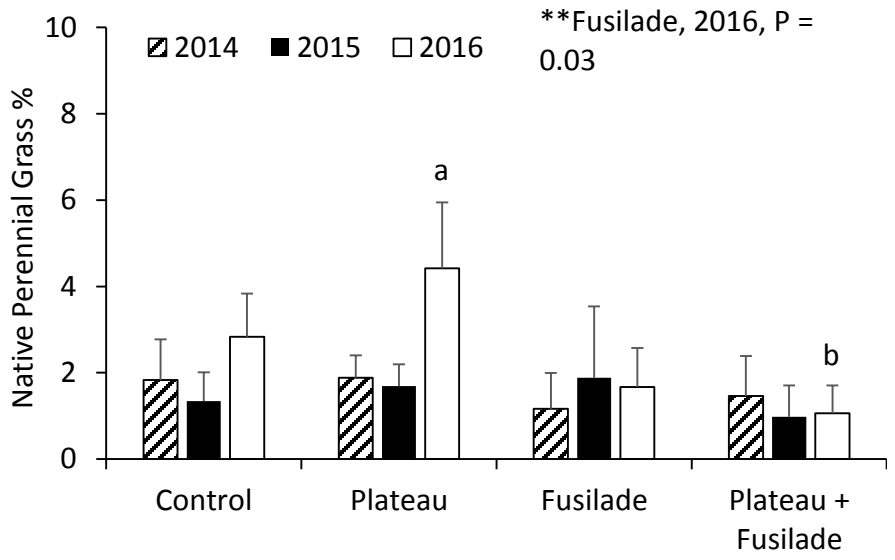




Results

- Other Plant Community
  - Native Annual Forbs
    - Plateau - reduction in 1st season
  - Native Perennial Grass
    - 2nd season indirect effects?
- Remainder unaffected





Seeding Results

- Observations of establishment
- No detectable difference in native species cover or richness
- 3rd year of data needed?

Preliminary Conclusions

- Herbicides may:
  - provide short term control of exotic annual grasses on roadsides
  - with neutral effects to Tygh Valley milkvetch.