Yellow Bluestem: An Encroaching Invasive Grass

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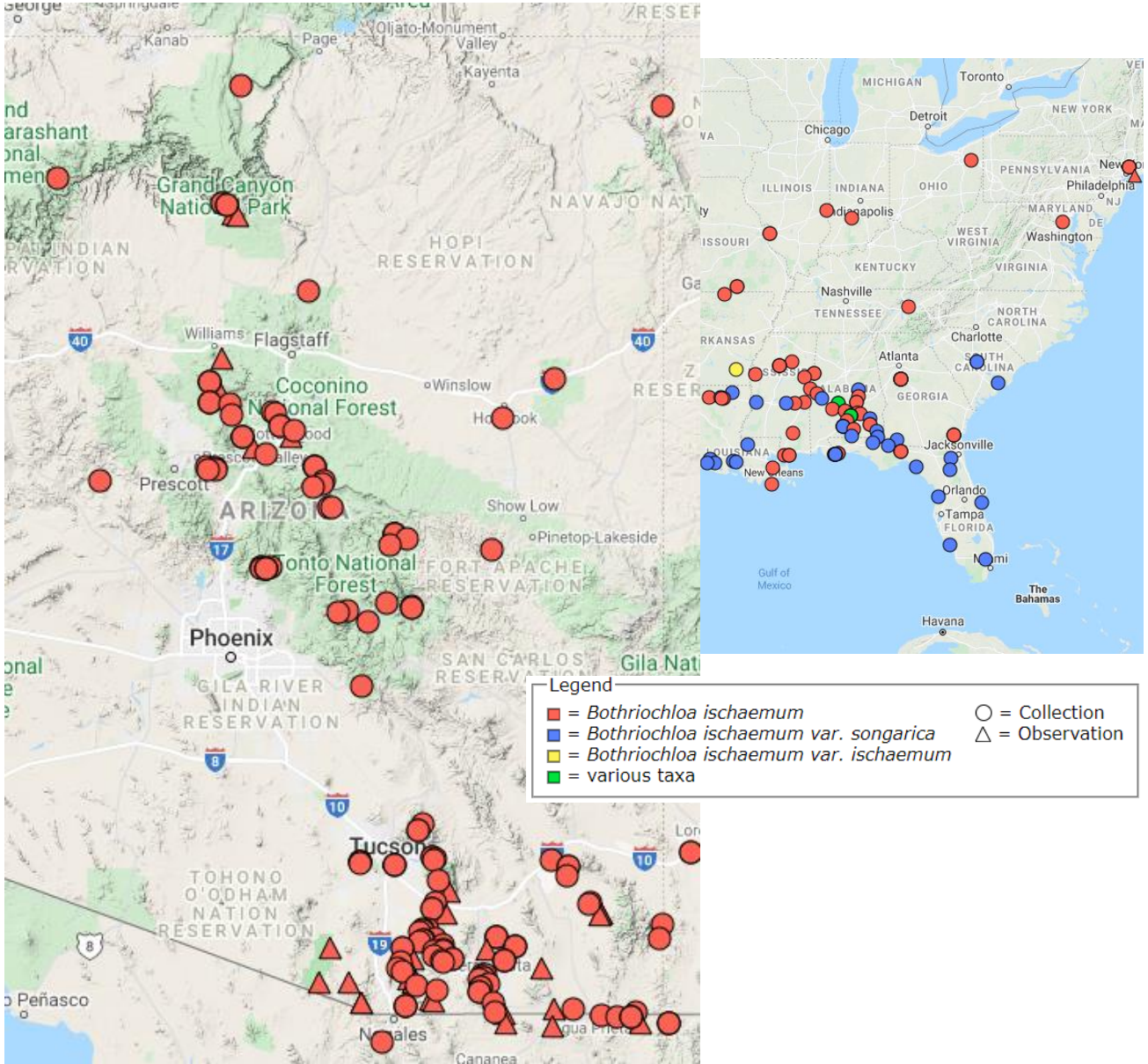
Presentation Outline

- How to ID Yellow Bluestem
- Environmental Impacts
  - Soil Health
  - Biodiversity
  - Gila County and Yellow Bluestem
- Control Measures
- Native Species ID
- What Can You Do?

Yellow Bluestem (*Bothriochloa ischaemum*)

- Native to Europe, Northern Africa and Asia
- Brought to the Great Plains in the 1920s for use as forage grass and to control erosion
- Yellow Bluestem was planted millions of hectares of marginal rangelands
- Has now spread to natural areas through seed and roots
- Found near disturbed roadsides, cultivated fields, high-quality grassland, or pinyon-juniper habitats up to 4,000ft (but being found above)



Sources: Celarier and Harlan, 1955; Harmoney et al., 2004

Identification of Yellow Bluestem

- Perennial, bunch grass stems up to 4 ft. tall, reproduces through seed and occasionally rhizomes

- Leaves mostly basal with blades 2-10 in long. Leaves become shorter further along stem
- Inflorescence fan-shaped panicle, (2-4 in), often with 2-8 erect branches (4-5in) turns reddish purple
- Blooms late June to July, earlier than native bluestems

Source: https://swbiodiversity.org

Further ID of Yellow Bluestem

- Parallel veins along the leaf blade
- Swollen, brownish red nodes
- Hairs at ligule and sometimes along leaf blade
- Sheath rounded

Environmental Impacts – Soil Health

- Documented to show an alteration to mycorrhizal associations in the soil

- One study showed Yellow Bluestem may gain a competitive advantage through allelopathic biochemicals
- More research needed to determine directly hinder competitors or indirectly hinder through alterations in soil microbial communities
- Study found reductions in germination of native seeds which supports direct effects

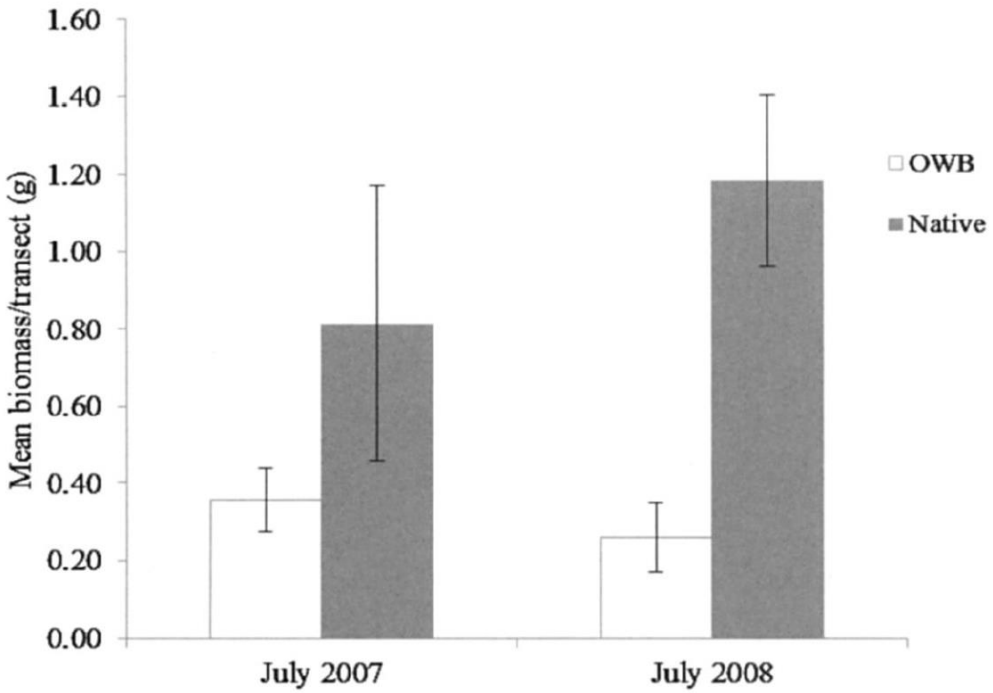
Sources: Wilson et al., 2012; Endresz et al., 2013; Greer et al., 2014

Environmental Impacts – Biodiversity

- Three studies found significantly lower bird abundance and species richness in YB pastures than native pastures.

- Tied to significantly less arthropod biomass (food) in YB than native pastures.

Treatment	Bird species richness	Bird abundance
Native	3.67 ± 0.56^{a}	13.6 ± 0.15^{a}
CRP	3.28 ± 0.59^{ab}	14.2 ± 0.13^{a}
OWB	2.57 ± 0.18^{b}	9.5 ± 0.15^{b}



- Rodent abundance also decreases in monoculture

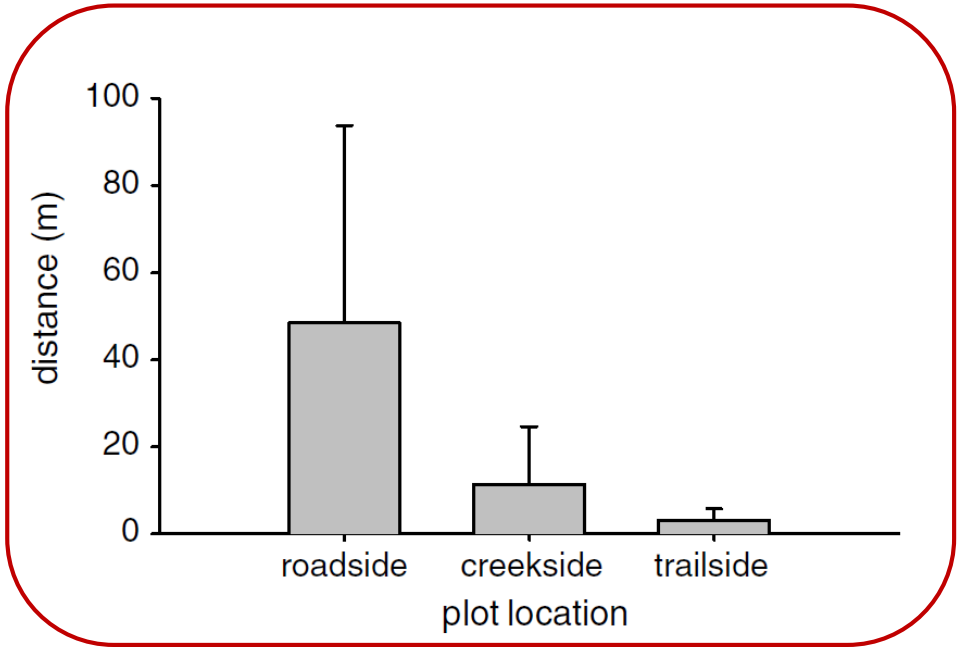
Sources: McIntyre et al., 2003; Sammon and Wikins, 2005; Hickman et al., 2006; George et al., 2013

Environmental Impacts – Biodiversity

	Mean, *B. ischaemum*–dominated plots	Mean, plots without *B. ischaemum*	
All species			
Species richness	3.68	5.28	***
Simpson diversity index	1.30	2.40	***
Shannon diversity index	0.38	0.92	***
Grass species only			
Species richness	3.15	4.55	***
Simpson diversity index	1.32	2.35	***
Shannon diversity index	0.41	0.91	***

***$P < 0.0001$ in a paired t-test comparing plots with and without *B. ischaemum*

- Areas dominated by YB had significantly lower species richness and lower diversity
- Areas dominated by YB also had significantly lower grass species richness and grass species diversity

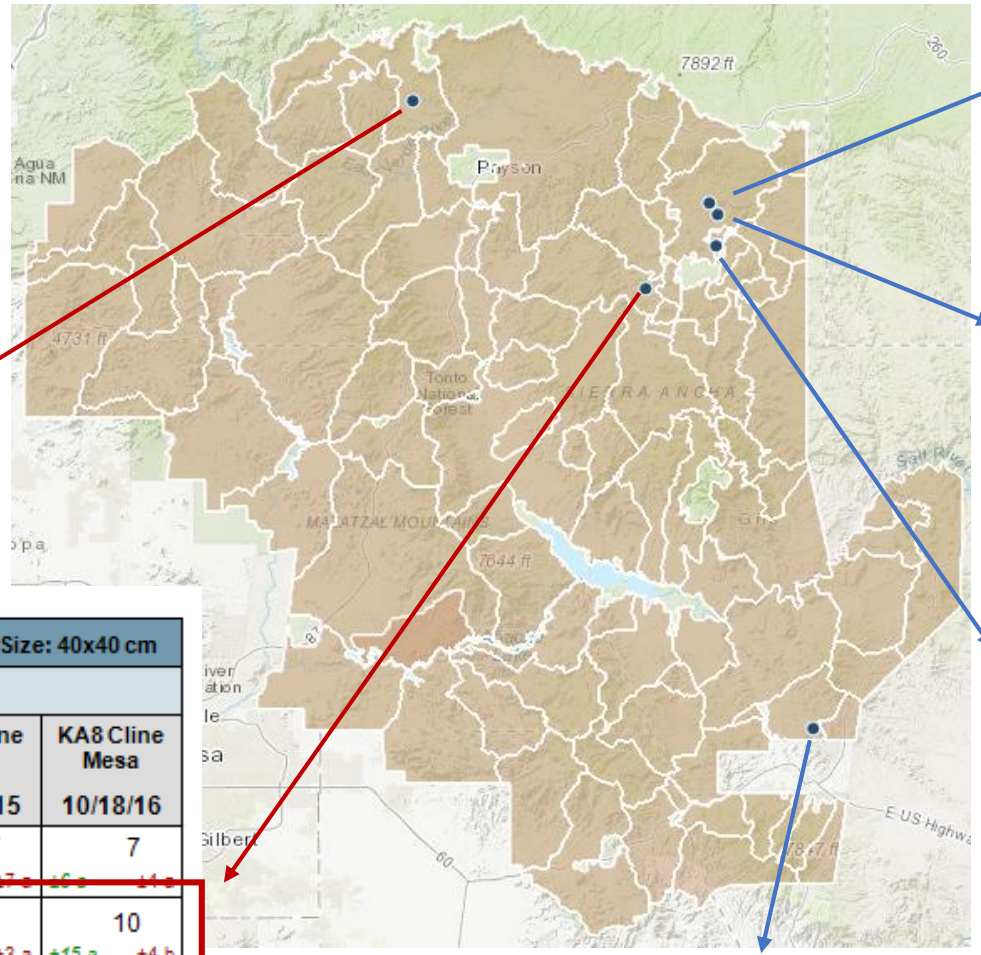


Source: Gabbard and Fowler, 2007

Gila County & Tonto NF Encroachment

% Frequency		Quadrat Size: 40x40 cm		
Species		Events		
		KA1 Red Hills 09/23/11	KA1 Red Hills 11/01/14	KA1 Red Hills 02/13/18
yellow bluestem	BOIS	5 ±9 a ±3 a	19 ±11 ab ±5 b	29 ±7 b ±6 b
sideoats grama	BOCU	31 ±6 a ±6 a	26 ±10 a ±6 a	23 ±9 a ±6 a
blue grama	BOGR2	51 ±8 a ±7 b	35 ±22 a ±6 a	38 ±19 a ±6 ab
hairy grama	BOHI2	1	0	0

% Frequency		Quadrat Size: 40x40 cm				
Species		Events				
		KA8 Cline Mesa 10/16/12	KA8 Cline Mesa 10/02/13	KA8 Cline Mesa 09/18/14	KA8 Cline Mesa 10/22/15	KA8 Cline Mesa 10/18/16
ragweed	AMBRO	11 ±2 ab ±1 a	10 ±1 ab ±1 a	13 ±1 ab ±5 a	17 ±2 b ±7 a	7 ±6 a ±1 a
yellow bluestem	BOIS	1 ±3 a ±2 a	0 ±2 a	1 ±3 a ±2 a	1 ±3 a ±3 a	10 ±15 a ±4 b
sideoats grama	BOCU	31 ±13 a ±6 b	30 ±16 a ±6 b	33 ±8 a ±6 b	22 ±24 a ±8 ab	18 ±10 a ±5 a
blue grama	BOGR2	63 ±23 b ±6 b	65 ±26 b ±6 b	70 ±33 b ±6 b	59 ±21 b ±9 b	28 ±9 a ±6 a



Monitoring began in 2008, YB not detected until 2018 (pulled)

Monitoring began in 2008, YB detected then but has remained at 1%. Last monitoring occurred in 2018 (pulled)

Monitoring began in 2013, YB detected then but has remained at 3%. Last monitoring occurred in 2017

Monitoring began in 2018, YB detected then and plant was pulled, no plants detected in 2019

Environmental Impacts – Fire

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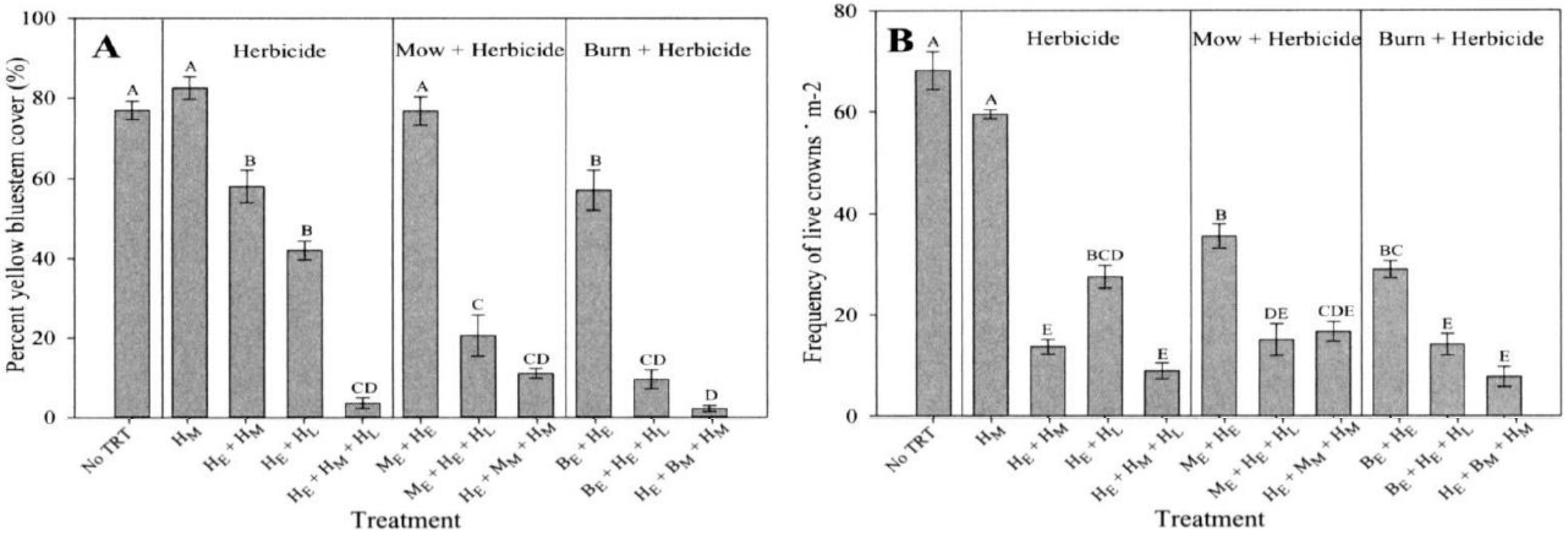
- Throughout AZ non-native species are driving fire
- Especially when we have extremely variable years
- With Yellow Bluestem now adding increased biomass into the mix, potential for hotter, faster moving fires

Other Impacts to Rangelands

- Does not provide adequate nutrition for livestock
- Some reports of cattle and horses grazing early in the growing season, before other species green up
- Livestock tend to avoid Yellow Bluestem after accumulation of standing dense tissue, particularly at the end of the growing season
- Grazing intensity seems to have little effect on the distribution of Yellow Bluestem, because they tend to avoid it and seek out natives

Control Measures

- Yellow Bluestem can be very difficult to eradicate once established
- Combining burning or mowing with herbicide applications provided effective control than any individual herbicide applications



Source: Robertson et al., 2013

Eleven different treatment combinations involving herbicide (H), burning (B), and mowing (M) were applied either once, twice, or three times during the growing season: early (subscript E=18 May), middle (M=2 August), late (L=1 September).

Control Measures

- Pulling/digging up, bagging, and removing from site

- Although none of the herbicides resulted in complete eradication, multiple applications of have provided some control:
  - Imazapic – Plateau
  - Glyphosate - Roundup, Rodeo
  - Sulfometuron - Oust and Spyder Broad
  - Bromacil - Borea, Bromax 4G, Bromax 4L
  - Imazapyr - Arsenal, Chopper, and Stalker

Be aware of regulations/registration of pesticides in your state.

If unsure of use contact Dept. of Ag. to determine which products are legally allowed for use in your area.

Read entire product label

Wear all recommended PPE gear and clothing.

Always follow mixing and application instructions

Sources: Harmoney et al., 2004; Mittelhauser et al., 2011; Ruffner and Barnes, 2012; Robertson et al., 2013

Control Measure – Research Needed

- YB can be very difficult to eradicate once established
- Further research is needed to determine the best management practices for successful eradication
- Restoration efforts following eradication can also be difficult due to effects on soils. There is some research on allelopathy and other species, but limited info on YB.

Cane beard Grass - *Bothriochloa barbinodis*

- Similar growth structure with tall, erect stalks, nodes aren't as pronounced
- More compact panicle, that remains surrounded by stem
- White and "fluffy"
- Ligule has notched margin (YB rounded smooth)

Green Sprangletop – *Leptochloa dubia*

Patrick Alexander
SEINet

- No awns, no hairs on the seed
- Stems are flat

Jose Hernandez, hosted by the USDA-NRCS PLANTS Database

Julie Luetzelschwab
SEINet

Little Bluestem - *Schizachyrium scoparium*

- Awns, white hairs
- Leaves and stems reddish

- Spike, not panicle

Plains Lovegrass - *Eragrostis intermedia*

Tobosagrass - *Pleuraphis mutica* and Galleta - *Pleuraphis jamesii*

- Single Spike, with awns
- Turns reddish purple later in the growing season

What Can *You* Do?

- Clean boots, clothing, bikes and vehicles if possible when recreating
- Certified weed free hay
- If you see plants, consider recording the observation using SEINet
- Get involved: Southwest Vegetation Management Association, AZ Native Plant Society, AZ Wilderness Society, AZ Game and Fish Dept., AZ Dept. of Fire and Forestry Management, Friends of the Tonto, local Extension, BLM or FS office and many others

Preventing invasive species in general....

- Clean your boat thoroughly before transporting it to another body of water
- Don't release aquarium fish and plants, live bait or other exotic animals into the wild

Help educate others about the threat of invasive species!

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