Services of the Wyoming Seed Laboratory

Presented by Gil Waibel, Seed Lab Director
April 3, 2012

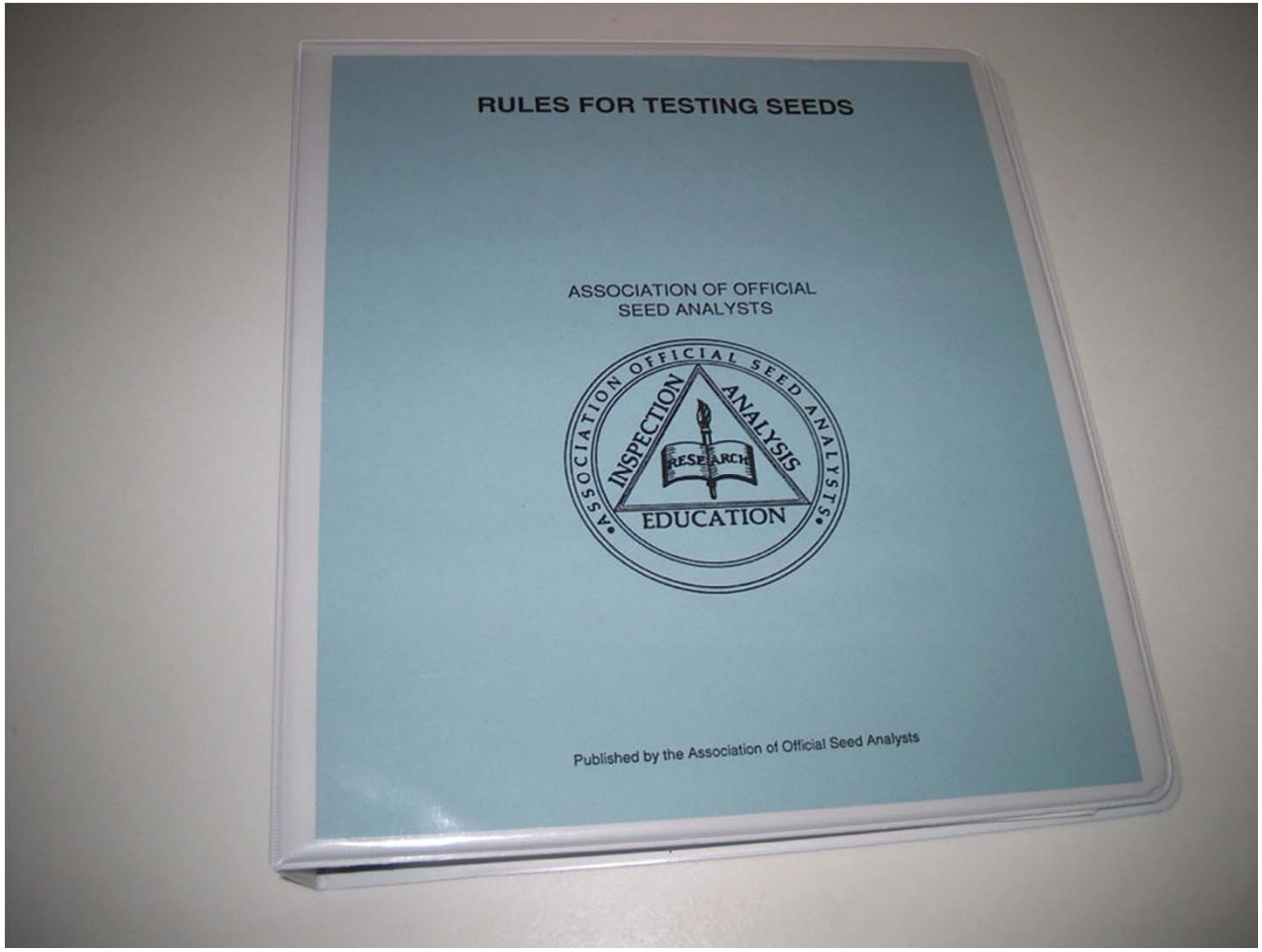
UNIVERSITY OF WYOMING

Wyoming Seed Analysis Lab History

Functions of Seed Laboratory

- Help Wyoming seed industry grow
- Test regulatory samples for Wyoming Dept. of Agriculture
- Test service samples for Certified Seed Standards, Seed Growers, Seed Companies, and Consumers
- State, Regional and National Involvement
- Research New Testing Methods
- Work with University professors and students on seed-related research projects

AOSA Rules for Testing Seed



Laboratory Personnel

- Gil Waibel – R.S.T., Seed Lab Director
- R. Denny Hall – R.S.T.
- Jill Rice – Lab Assistant
- Crystal May – Lab Assistant
- Tonya Espinosa – Lab Assistant
- Debra Churchill – Call-In
- Erin Johnson – Call-In

Sampling

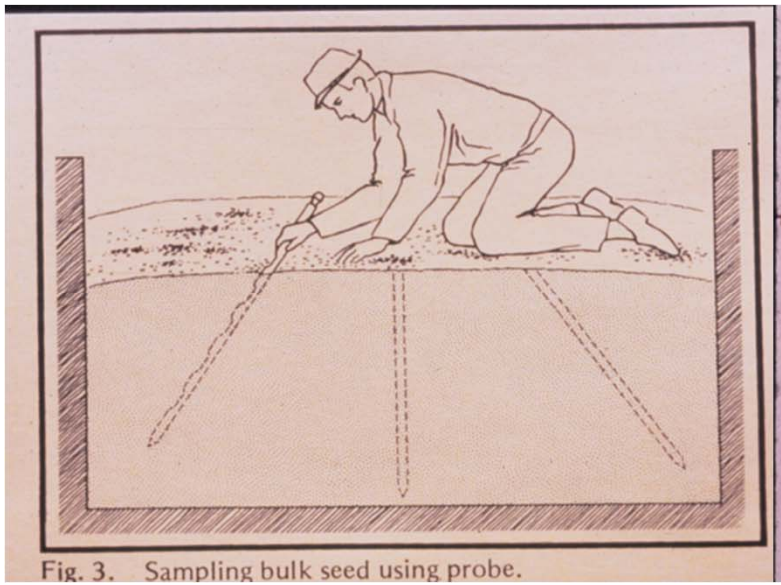
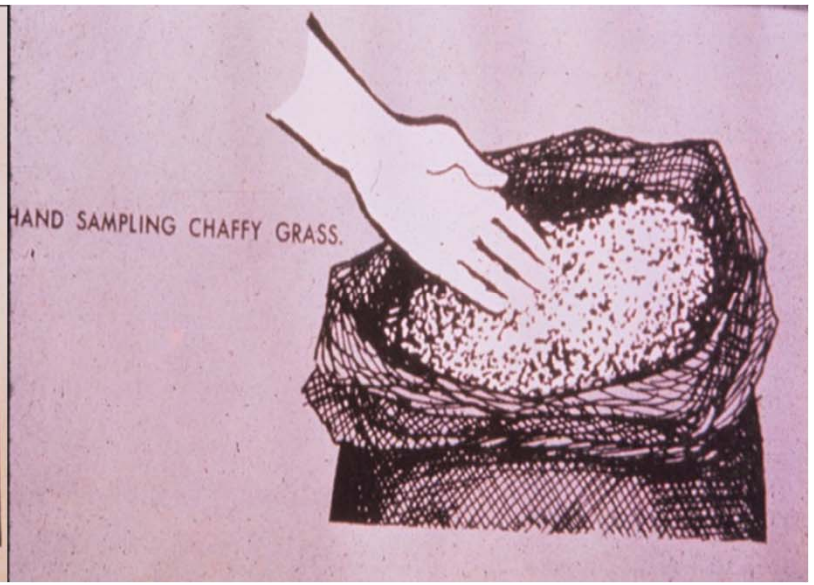


Fig. 3. Sampling bulk seed using probe.

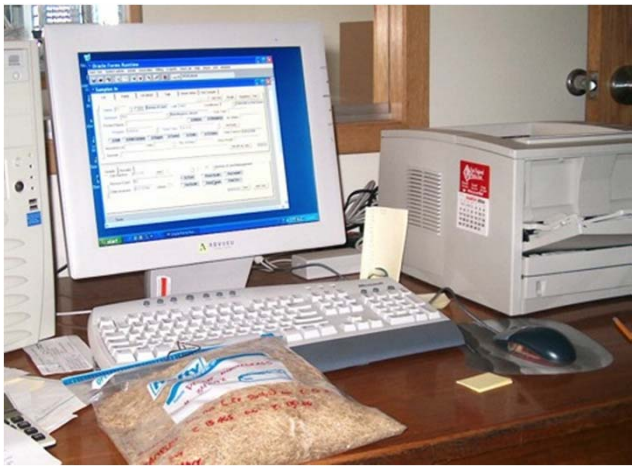


HAND SAMPLING CHAFFY GRASS.

- Representative Sample = Meaningful Test

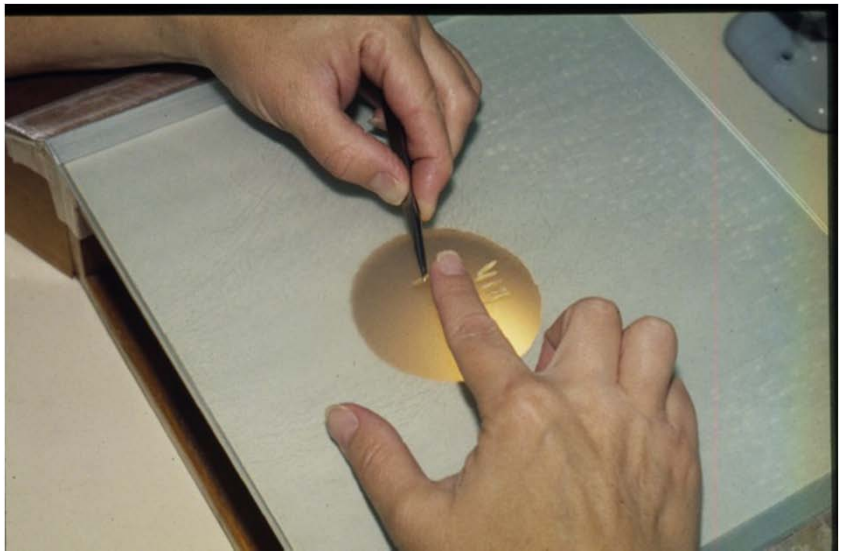
Proper Handling of Sample

- Enter Sample into Computer
- Divide to Working Weights

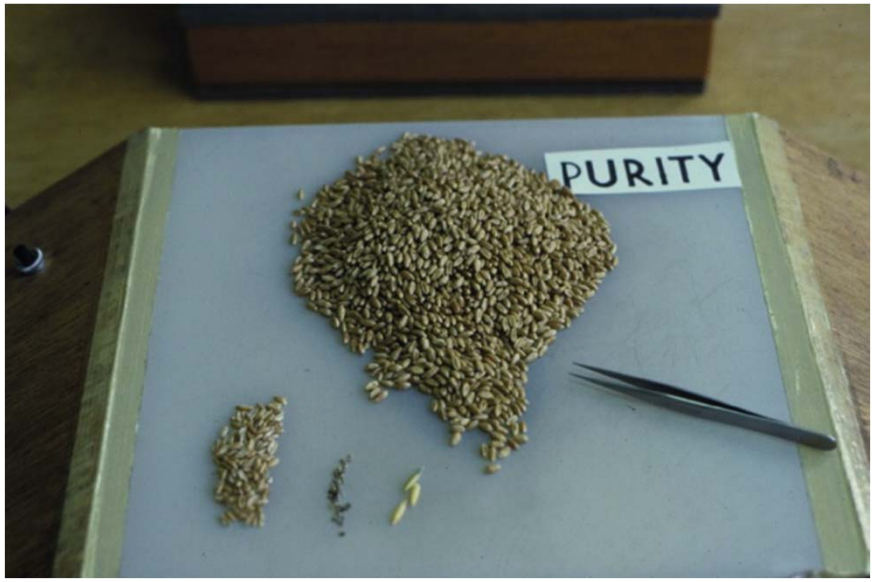


Types of Seed Testing

- Purity
- Noxious Weed Seeds
- Germination
- Tetrazolium
- Seed Counts
- Moisture



Purity Testing



- Test about 2,500 seeds
- Separate into four component
  - Pure Seed
  - Other Crop Seed
  - Weed Seed
  - Inert Material

Purity Testing

- A purity sample can be exasperating
  - Very Chaffy
  - A Mixture
  - Contaminated by other species

Purity Testing

- Correct Seed Identification is Important!

Species in the AOSA Rules

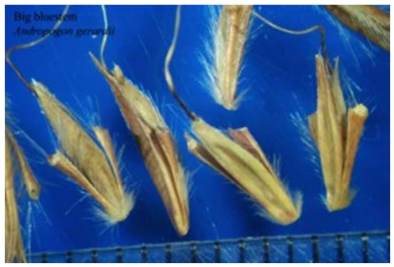
"some degree of endosperm development"

Fescues
Bluestems
Wheatgrasses
Creeping foxtail
Blue grama *
Sideoats grama *
Bluegrass*
Wildryes
Switchgrass

*Uniform blowing procedure

Purity Challenges

Big bluestem



Indiangrass

Little bluestem

Cannot look at over a diaphanoscope – light does not shine through the lemma and palea. Have to use slight pressure to detect presence of caryopsis in seed unit.

Noxious Weed Seed Exam

- 25,000 seeds tested
- Test could be for:
  - Wyoming
  - Another State
  - Regional (Western)
  - All States
  - Canadian
  - Other Countries
- Downy brome
  - Not noxious

Germination Test

- 400 Seed Test
- Four Reps. of 100 seeds to Sixteen Reps. of 25 seeds
- Reported as percentage
- Optimal Conditions
- Rules usually apply by Plant Family or Sometimes by species groups

Germination Test

- Seedlings are Classified as:
  - Normal
  - Abnormal

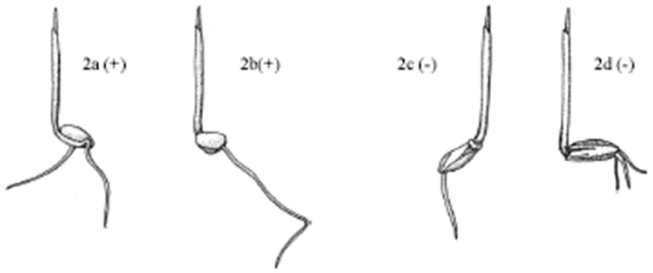


Fig. 2 Root defects.

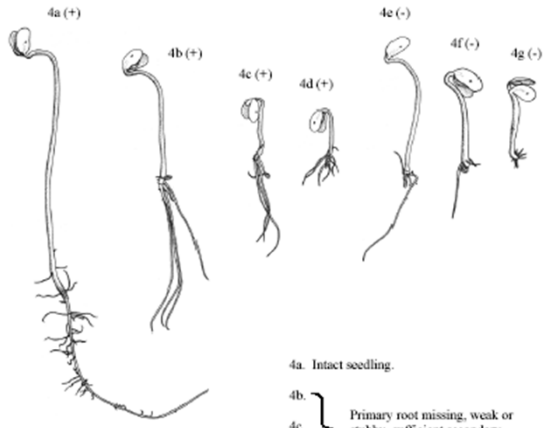
2a. Two strong seminal roots.

2b. One strong seminal root.

2c. Less than one strong seminal root.

2d. Less than one strong seminal root.

Fig. 4 Root defects.



4a. Intact seedling.

4b. 4c. 4d. Primary root missing, weak or stubby, sufficient secondary roots.

4e. 4f. 4g. Primary root missing, weak or stubby, insufficient secondary roots.

Germination Test

- Dormancy Issues
  - Hard Seeds
  - Firm seeds that have not germinated at the end of the test.
  - Use tetrazolium to determine viability
  - Germination% + Hard or Dormant seeds = Total Viable Seeds

Germination Test

- Many different media and conditions
  - Paper Towels
  - Blotters
  - Pleated Paper
  - Sand
  - Light or Dark
  - Temperature
  - Duration

Germination Test

Tetrazoium (TZ) Testing

TZ tests help estimate seed viability
TZ test is a rapid method of estimating germination potential (<24 hours)

Tetrazolium tests can be useful in determining the following:

- Gives estimated value of the lot as seed
- A quick basis for buying or selling a seed lot
- Can expedite shipping while waiting for germination confirmation
- Qualitative evaluation of seeds quality (conditioning process, vigor, frost damage, etc.)
- A valuable research technique.

Tetrazolium (TZ) Testing

- TZ solution - goes into seed
  - colorless
    - TZ + H+ -----> Formazan (carmine red color)
  - Diffusible - will go through cell walls, membranes, and some seed coats
  - Formazan produced is non-diffusible (fixed)

Illustration of Reaction - 9 embryo cells from root tip, plumule or cotyledon (8 living, 1 dead cell)

Slide courtesy of Dr. Brent Turnipseed, South Dakota State University

H^+	H^+	H^+
H^+	Dead	H^+
H^+	H^+	H^+

Tetrazolium (TZ) Testing

ASSOCIATION OF OFFICIAL SEED ANALYSTS

2004

FAMILY: FABACEAE I

Post Staining Notes: Cut longitudinally, bisecting embryo axis to evaluate conducting tissue of radicle/hypocotyl. Examine internal cotyledon surfaces and epicotyl.

3. EVALUATION:

VIABLE (NORMAL STAINING)
- entire embryo evenly stained, turgid, and unfractured
- unstained, dark red, or fractured radicle, including tip of central conducting tissue, acceptable
- superficial unstained or darkly-stained watery areas acceptable throughout embryo except at juncture of cotyledons and embryo axis (see notes)
- plumule is lightly stained or is live and unstained
- inner portions of embryo axis and cotyledons are usually unstained, but firm and white to yellow in color (greenish-white to greenish-yellow in *Arachis*)

NON-VIABLE (ABNORMAL OR NO STAINING)
- embryo completely unstained with flaccid tissue
- unstained, darkly-stained, fractured, or necrotic tissue at juncture of cotyledons and embryo axis
- radicle/hypocotyl unstained, dark red, or broken above tip of central conducting tissue
- unstained, darkly-stained, fractured, or necrotic tissue resulting in less than half of cotyledons remaining attached to embryo axis
- unstained, darkly-stained, fractured, or necrotic tissue in cotyledons comprising half or more of cotyledons or, on embryo axis, extending into central conducting tissue
- unstained, darkly-stained, fractured, or necrotic tissue in plumule comprising more than half of plumule area
- insect damage

OTHER TISSUE/NOTES

Bisect and examine axis to determine whether defects extend into central conducting tissue.

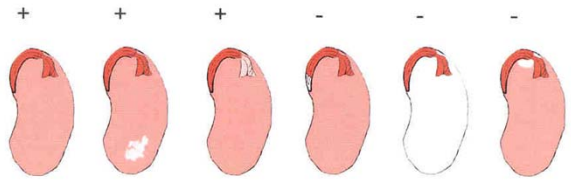


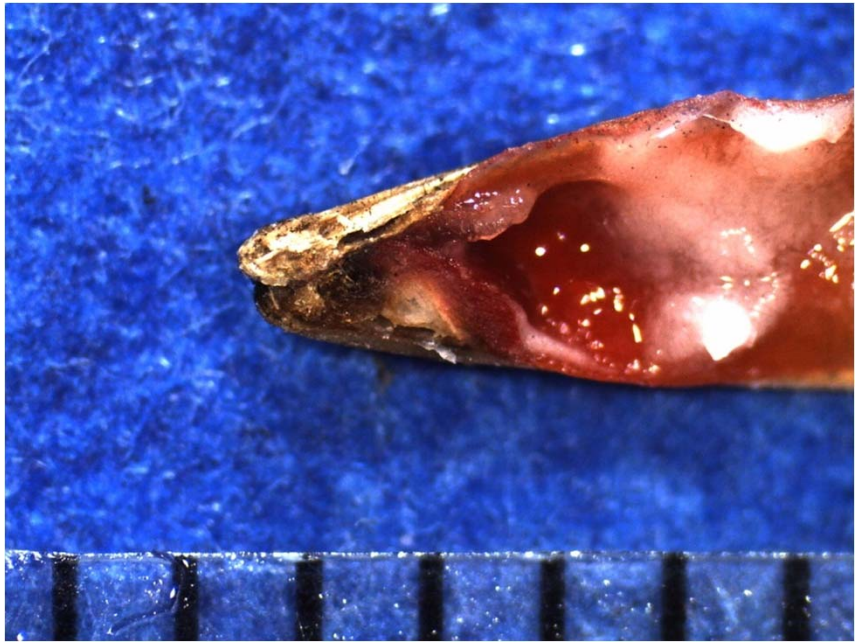
Fig 4 Seed stain evaluation

REFERENCES: 1, 2, 6, 9, 11

Tetrazolium (TZ) Testing

From TZ Test

Dormancy check at end of Germination Test



Species Not in Rules

- How do you test a species when it is not in the *AOSA Rules for Testing Seeds*?
  - Consider rules for similar species
  - Check with other seed labs
  - Experiment

Species not in the Rules

Grasses
Prairie sandreed
Prairie cordgrass
Meadow barley
Tufted hairgrass
Idaho fescue
Black grama

Other species
Purple prairie clover
Bulrush
Leadplant
Creosote bush
Globemallow
Monkeyflower
Elderberry
Greasewood

Creosote bush *Larrea tridentata*

Family: Zgophyllaceae

Winterfat *Krascheninnikovia lanata*

Family: Chenopodiaceae

Tanglehead *Heteropogon contortus*

Family: Poaceae

Squaw carpet *Ceanothus prostatus*
Family: Rhamnaceae

Longspur lupine *Lupinus arbustus*

Family: Fabaceae

Nebraska sedge *Carex nebrascensis*

Cyperaceae

Greasewood *Sarcobatus vermiculatus*

Family: Chenopodiaceae

California poppy *Escheholtzia californica*

Family: Papaveraceae

Venus penstemon *Penstemon venustus*

Scrophulariacea

Skunkbush sumac *Rhus triobata*

Family: Anacardiaceae

Cattle saltbush *Atriplex polycarpa*

Family: Chenopodiaceae

Snowberry *Gaultheria spp.*

Family: Ericaceae

Desert bitterbrush *Purshia glandulosa*

Family: Rosaceae

Whitethorn *Ceanothus cordulatus*

Family: Rhamnaceae

Rocky Mountain beeplant *Cleome serrulata*

Family: Capparaceae

Baltic rush *Juncus balticus*

Family: Juncaceae

Triangle bur ragweed *Ambrosia deltoidea*

Family: Asteraceae

Rubber rabbitbrush *Chrysothamnus nauseous*

Family: Asteraceae

Slender cinquefoil *Potentilla gracilis*

Family: Rosaceae

Wax currant *Ribes cereum*

Family: Grossulariaceae

Blue fescue *Festuca glauca*

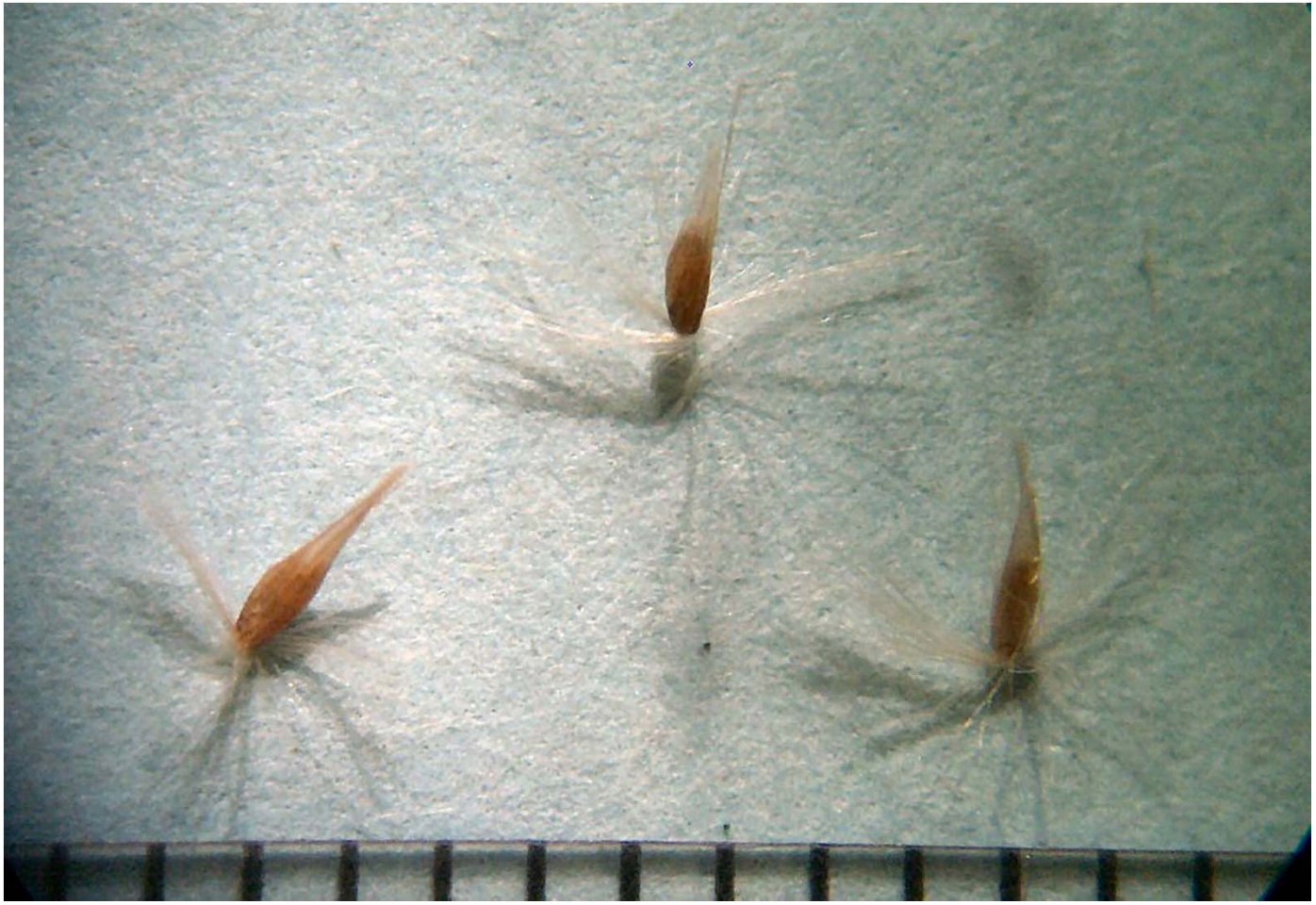
Family: Poaceae

Oregon grape *Mahonia aquifolium*

Family: Berberidaceae

Bluejoint reedgrass *Calamagrostis canadensis*

Family: Poaceae



Desert olive *Forestiera shrevei*

Family: Oleaceae

Goldenhills *Encelia fainose*

Family: Asteraceae

Firecracker penstemon *Penstemon eatonii*

Family: Scrophulariaceae

Tufted hairgrass *Deschampsia caespitosa*

Family: Poaceae

Rosarypea *Abrus praecatorius*

Family: Fabaceae

Come visit us!

- Learn and/or teach us about seeds
- Research opportunities
- We live way out in Powell – we like company!