Shared Objectives

- **Healthy rangelands**
  - Require sustainable numbers of wild horses and livestock

- **Cost-efficient management**
  - Removing and warehousing wild horses in holding facilities is bad for taxpayers and horses
  - Biologists work cheaper than lawyers
My Personal Vision of Wild Horse Management

**Ecological**: Prevent overgrazing and other environmental damage

**Humane**: Prevent mass starvation and needless suffering

**Ethical**: Allow wild horses to live as freely as possible
Wild Horse Population Management

- Changes in population size depend on the balance between birth rates, death rates, immigration, and emigration.
- For wild horse populations, birth rates are high, and death rates and immigration are low.
- Most emigration = removals.
Removing horses feels right. But...

- Removal ≠ population reduction
- For 45 years: Removals < Births
- That won’t change without reducing birth rates
Porcine Zona Pellucida (PZP) immunocontraceptive vaccine

- Protein extracted from pig ovaries
- Highly Targeted: PZP-vaccinated females produce antibodies that block fertilization.
- Biodegrades quickly: If eaten, PZP is destroyed in digestion.
- No harm to health; treated mares live longer.
- Very modest effects on natural behavior
PZP Preparations

1. “Native PZP” simple emulsion vaccine (ZonaStat-H) requires two initial shots and annual boosters

2. “PZP-22” = native PZP PLUS controlled-release PZP pellets that simulate boosters

3. SpayVac® single-treatment preparation using proprietary liposome packaging of PZP antigen
   - Very promising data on captive horses
   - No published data on free-roaming wild horses or remote delivery
How is PZP delivered?

- Both PZP preparations are effective when delivered by hand-injection or dart
- Includes both primers and boosters
Wild horse herds controlled entirely or in part with PZP

- Assateague Island National Seashore, MD
- Rachel Carson National Estuarine Research Reserve, NC
- Cape Lookout National Seashore, NC
- McCullough Peaks HMA, WY
- Pryor Mountain Wild Horse Range, WY
- Little Book Cliffs HMA, CO
- Spring Creek HMA, CO

...using darting, trapping or both
The challenge is large HMA’s where field-darting free-roaming wild horses is not feasible.
Goals: Examine the population, health, and behavioral effects of PZP-22 application to diverse wild horse populations on western public lands

Study sites:
- Sand Wash Basin HMA, CO
- Cedar Mountains HMA, UT
- Jarita Mesa WHT, NM
Effectiveness of PZP-22 Primers

- **Percent foaling: Hand-injections**

<table>
<thead>
<tr>
<th>Location/Month</th>
<th>Year 0 (control)</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Wash Basin (October)</td>
<td>81%</td>
<td>48%</td>
<td>41%</td>
</tr>
<tr>
<td>Cedar Mountain (December)</td>
<td>65%</td>
<td>26%</td>
<td>56%</td>
</tr>
<tr>
<td>Cedar Mountain (February)</td>
<td>71%</td>
<td>14%</td>
<td>51%</td>
</tr>
</tbody>
</table>

- **Percent foaling: Dart-delivery**

<table>
<thead>
<tr>
<th>Location/Month</th>
<th>Untreated</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarita Mesa (May)</td>
<td>56%</td>
<td>12%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Timing matters!
Effectiveness of PZP Boosters AFTER PZP-22 Priming

**Percent foaling: Hand-injection**

<table>
<thead>
<tr>
<th>Location</th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cedar Mountains</td>
<td>56%</td>
<td>7%</td>
<td>18%</td>
<td>20%</td>
<td>28%</td>
</tr>
</tbody>
</table>

**Percent foaling: Dart-delivery**

<table>
<thead>
<tr>
<th>Location</th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Wash Basin</td>
<td>42%</td>
<td>22%</td>
<td>25%</td>
<td>32%</td>
</tr>
</tbody>
</table>

- PZP boosters delivered by dart at SWB (fall 2010) and by hand at CM (Feb. 2012)
- Boosting mares primed with PZP-22 delivered 3+ additional years of contraception
- PZP-22 and native PZP boosters showed similar effectiveness

Rutberg et al. 2017 *Wildlife Research* 44:174

K. Grams
Cedar Mountains HMA, UT: (A tough place to work)

- 727 km²
- 58% candidate wilderness area
- Elevation: 1400-1640 m
- Water seasonally scarce
- AML: 190-390
- Horses very wary
- Extensive use of adjacent military property
Population Effects at Cedar Mountains, UT

- 2008 gather: 52% of mares left in herd (N=70) treated
- 2012 gather: BLM removed ~100 horses
  - Boosted 55 of the 70 mares
  - Primed 85 new mares with PZP-22

Results:
- 68% of mares left in herd were treated in 2012
- Population stable 2011-2013, with only ~3.5% growth in year after 2012 gather
Population Size and Growth Rate, Cedar Mountain HMA, UT

- Horse Number
- % Increase

Primers
Removals + boosters + primers

Number of Horses

% Annual Growth


Conclusions from Cedar Mountains Study

- Keeping 70% or more of the mares treated will sharply reduce population growth
- There is no rebound effect after contraception
- With current technology, 3 cycles of treatments should achieve population growth targets
- Refining PZP-22 to extend effectiveness will probably cut that to 2 cycles
Final Thoughts

- After 45 years of trying, removals alone have not been enough to achieve AML.

- Achieving AML will require conducting removals AND reducing birth rates.

- Although it sounds sensible to remove first and then apply fertility control, it hasn’t worked because too many untreated mares remain on the range.

- Consider reducing the birth rates FIRST and THEN conducting modest removals to get down to AML.
Thank you to:

- **Science & Conservation Center** (Jay Kirkpatrick, Kim Frank, Robin Lyda)
- John Turner, Irwin K.M. Liu, Doug Flanagan
- **The Humane Society of the United States** (Kayla Grams, Heidi Hopkins, Stephanie Boyles Griffin and multiple field assistants)
- **The Annenberg Foundation**
- **Mt Taylor Mustangs** and Dan Elkins
- **Tufts-Cummings School of Veterinary Medicine and the National Institutes of Health**