# "Integrating DNA Information into Beef Cattle Production Systems"

Project Director:

Dr. Alison Van Eenennaam, University of California, Davis, CA

Collaborators:

Dr. Darrh Bullock, Extension Professor, University of Kentucky, KY

Dr. Leslie "Bees" Butler, Extension Marketing Specialist, UC Davis, CA

Dr. Daniel Drake, UC Cooperative Extension Livestock Advisor, CA

Dr. Dorian Garrick, Professor, Iowa State University, IA

Dr. John Pollak, Professor, Cornell University, NY

Dr. Mark Thallman, US Meat Animal Research Center, Clay Center, NE

# Research objectives of "Integrating DNA information into beef cattle production systems"

- GOAL: Incorporate DNA-based information into estimate of genetic merit
  1. Which of several incorporation methods is best?
  2. Which is feasible for commercial ranches to implement?
  3. Which provides economic benefit?

- **RESEARCH OBJECTIVE**: Compare the current means of genetic prediction (**bEPDs**) with
  1. whole-genome scan genetic predictions (molecular breeding values, **MBVs**),
  2. "commercial ranch" genetic evaluations (**rEPDs**) based on the actual performance of offspring under field conditions.

# UC Davis herd 2006



2006 Sire Prolificacy by Breeding Group

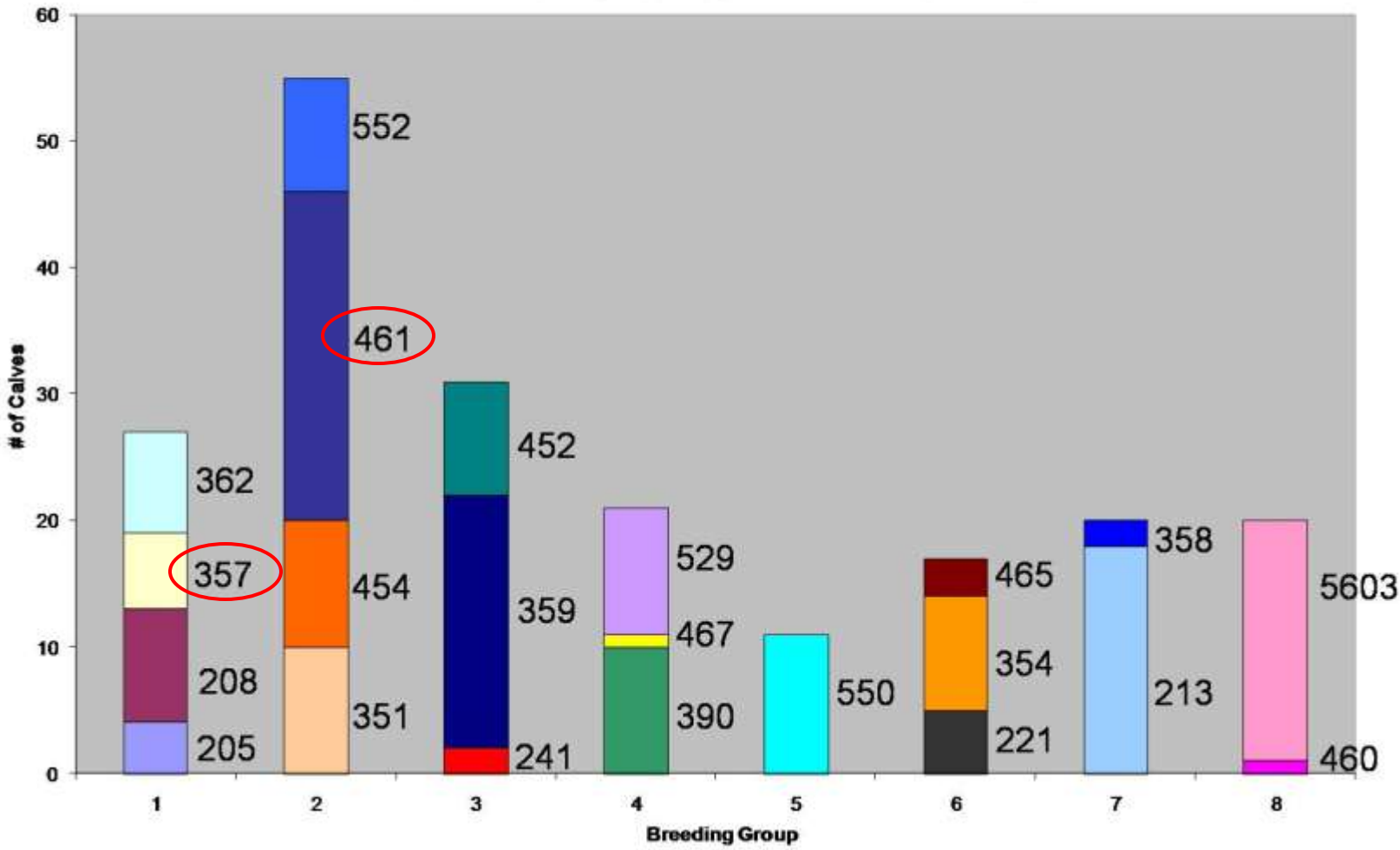(19 bulls; progeny range 0-25 calves per bull)
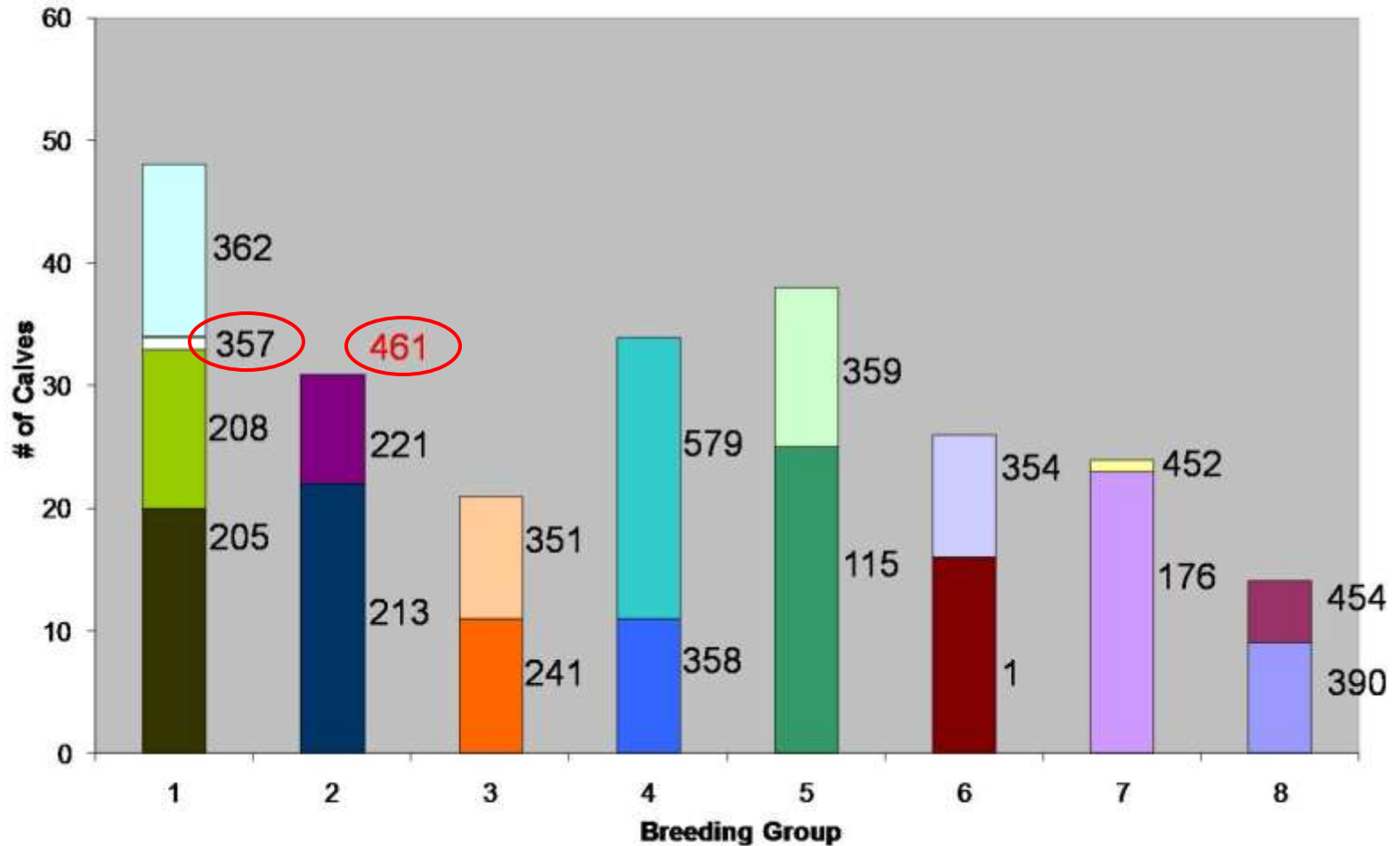
# UC Davis herd 2007



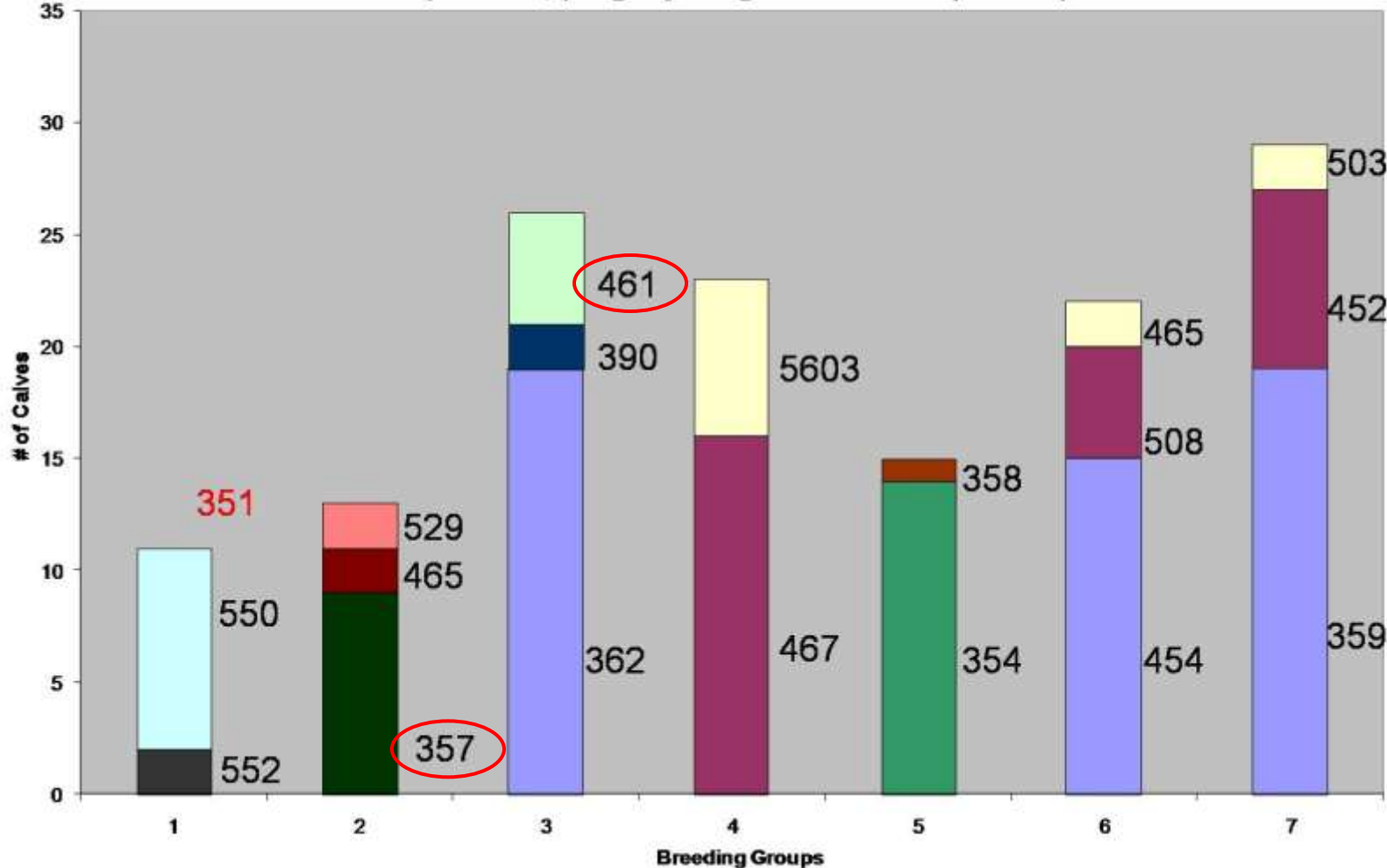2007 Sire Prolificacy by Breeding Group

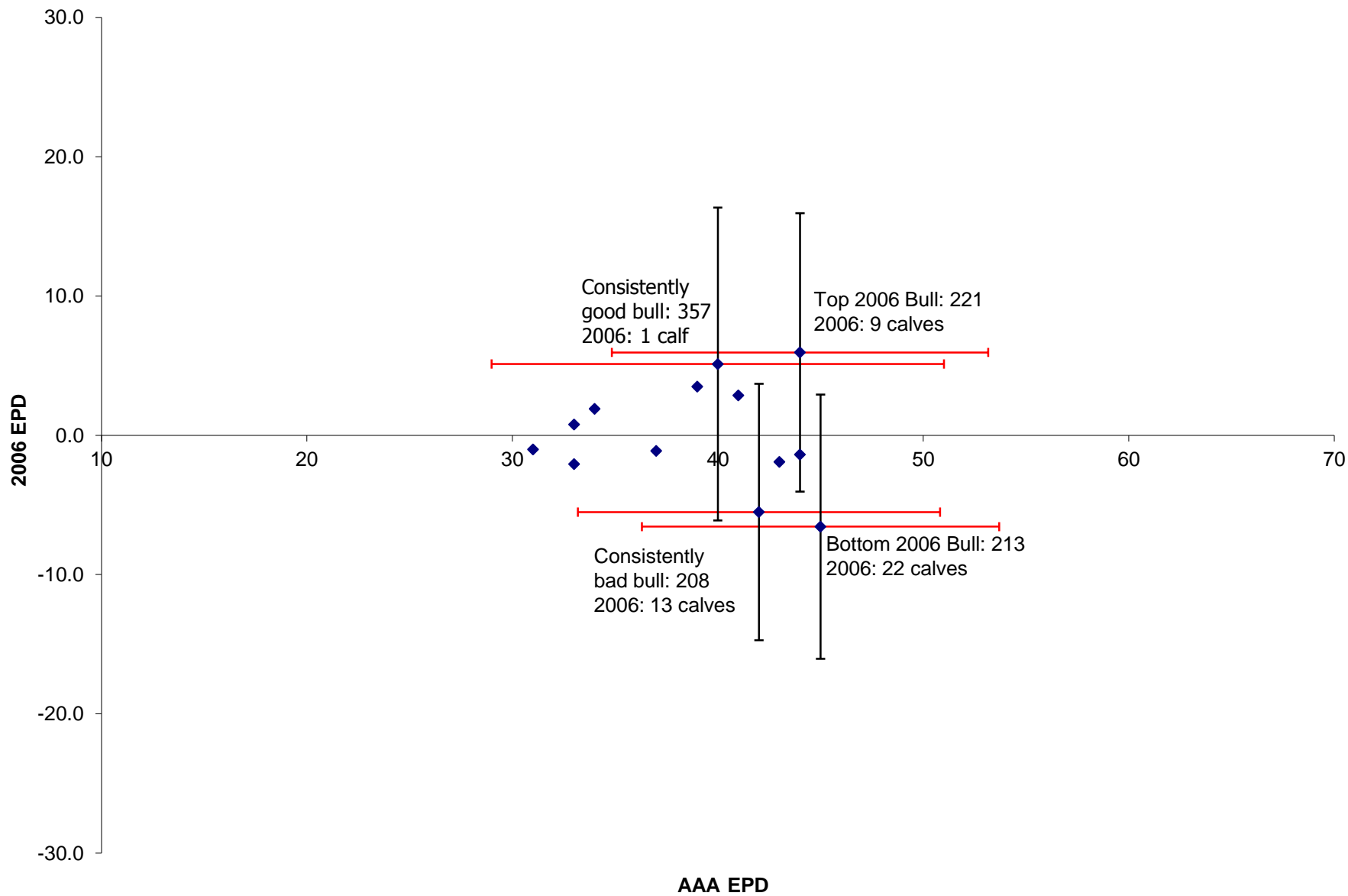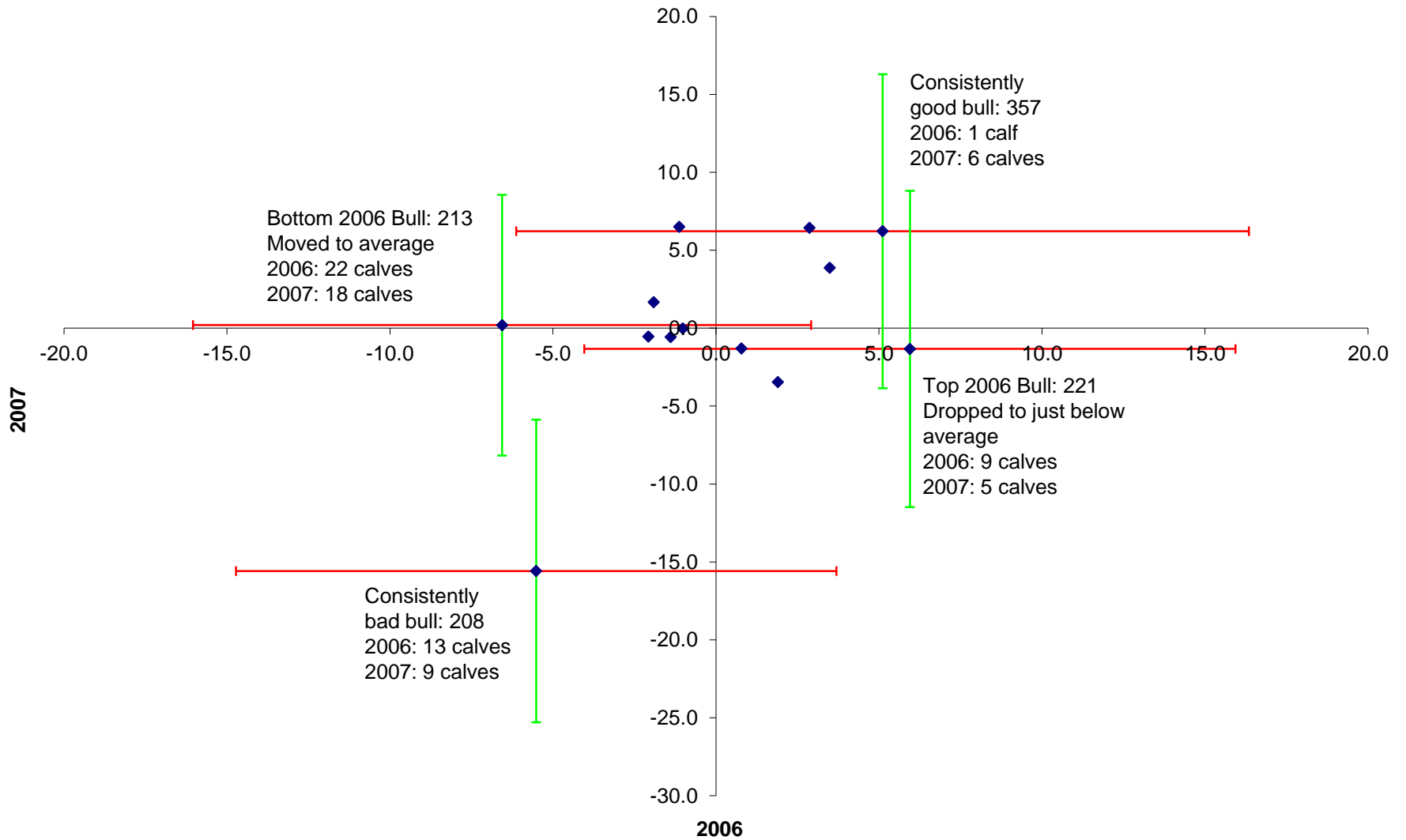(22 bulls; progeny range 1-26 calves per bull)

# UC Davis herd 2008



2008 Sire Prolificacy by Breeding Group

(19 bulls, progeny range 0-19 calves per bull)

Predicting 2007 from 2006

**Predicting 2007 from 2006**
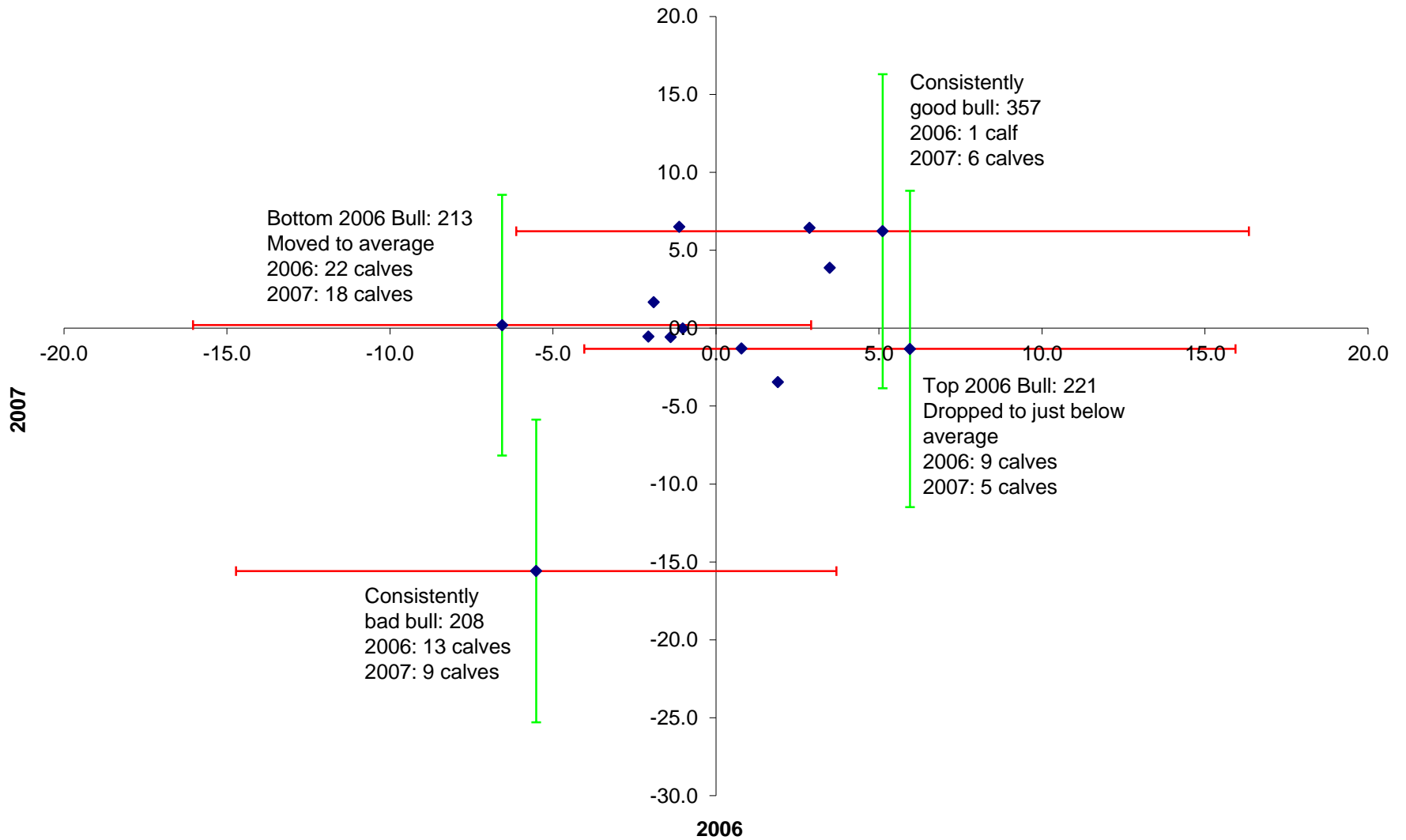
Bull Prolificacy - Number of Calves per Bull per Cohort Group

Legend: SPRING 2006 (N=18), FALL 2006 (N=22), SPRING 2007 (N=22)
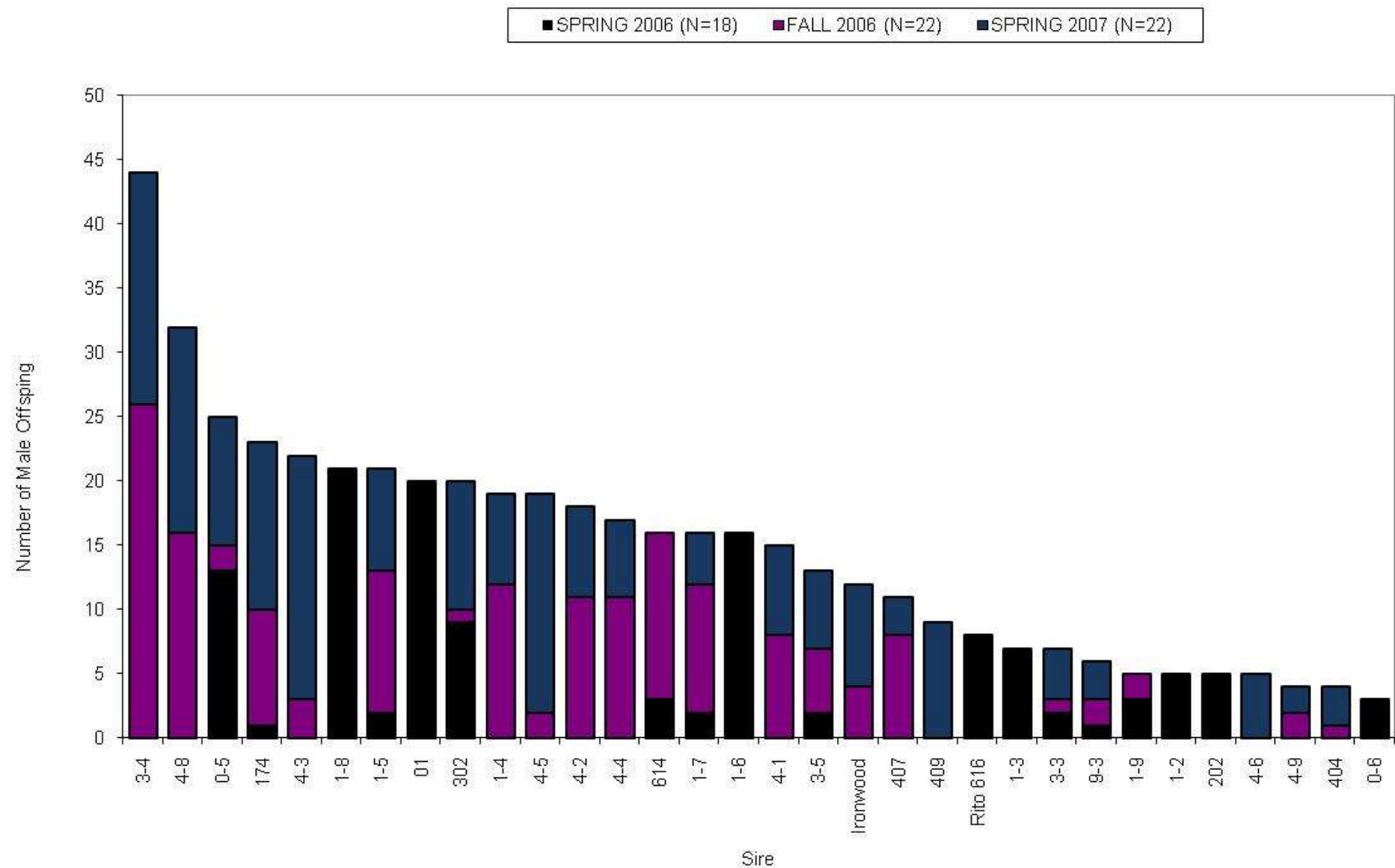
# Ranch resources/collaborators on "Integrating DNA information into beef cattle production systems"

Four ranches on this project (UC Davis and 3 commercial cooperators in Siskiyou)

- Cowley 900 (550 Spring; 350 Fall)      30
- Kuck 500 (200 Spring; 300 Fall)      10
- Mole-Richardson 700 (Fall)      30
- UC Davis 300 (Fall)      10

*Approximately 80 Angus bulls, and 2,400 cows per year on project*

# Happy Cows come from Siskiyou County

Cowley Ranch

Kuck Ranch

Mole-Richardson Ranch

# UC Davis – Sierra foothills

# Work flow and collaborators

- DNA on all bulls goes for whole genome scan – collaboration with Jerry Taylor and John Pollak

- Molecular breeding value (MBV) prediction of genetic merit based on MARC training data set – collaboration with Dorian Garrick and U.S. Meat Animal Research Center

- Ranch data including sire groupings, birth dates and weaning weights on all calves, all EIDed, and "DNAed" for parentage determination – collaboration with Dan Drake and producers

- Steer feedlot in weights, treatments, and carcass traits (Hot weight, grading information and meat sample collected in the processing plant – collaboration with Harris Ranch

- Compile data and compare three sources of genetic estimates: breed EPDs (bEPDs), commercial ranch EPDs (rEPDs), and MBVs

- All data stored on Cornell database for use in validation studies

# Ranch records on ~ 7000 calves, feedlot and carcass records on ~ 3500 steers representing ~ 100 Angus bulls.

| Breeding Season:<br>Calving Season:<br>Weaning/Sampling Season:<br><br>Slaughter : | Spring 2008<br>Spring 2009<br>Fall 2009<br><br>May 2010 | Fall 2008<br>Fall 2009<br>Summer 2010<br><br>January 2011 | Spring 2009<br>Spring 2010<br>Fall 2010<br><br>May 2011 | Fall 2009<br>Fall 2010<br>Summer 2011<br><br>January 2012 | Spring 2010<br>Spring 2011<br>Fall 2011<br><br>May 2012 | Fall 2010<br>Fall 2011<br>Summer 2012<br><br>January 2013 |
|---|---|---|---|---|---|---|

| Weaning Samples | Cowley | Kuck | Parker | Davis | SUM | TOTAL # FOR TRIAL |
|---|---|---|---|---|---|---|
| Fall 2009 | 550 | 200 (September) | | | 750 | |
| Summer 2010 | 350 | 300 (May/June) | 700 (1st week July 2010) | 250 | 1600 | |
| Fall 2010 | 550 | 200 (September) | | | 750 | |
| Summer 2011 | 350 | 300 (May/June) | 700 (1st week July 2011) | 250 | 1600 | |
| Fall 2011 | 550 | 200 (September) | | | 750 | |
| Summer 2012 | 350 | 300 (May/June) | 700 (1st week July 2012) | 250 | 1600 | |
| **TOTAL CALF SAMPLES** | | | | | | **7050** |

| Meat Samples through Harris | | | | | | |
|---|---|---|---|---|---|---|
| Fall 2008 (January 14th, 2009) | 180 (Jan 09) | | | | 180 | |
| Spring 2009 (May) | 244 (May 09) | | | | 244 | |
| Fall 2009 (January , 2010) | 180 (Jan 10) | | | | 180 | |
| Spring 2010 | 250 (May 10) | 100 (July) | | | 350 | |
| Fall 2010 | 175 (Jan 11) | 150 (March/April) | 350 (Jan-late March 11) | | 675 | |
| Spring 2011 | 250 (May 11) | 100 (July) | | | 350 | |
| Fall 2011 | 175 (Jan 12) | 150 (March/April) | 350 (Jan-late March 12) | | 675 | |
| Spring 2012 | 250 (May 12) | 100 (July) | | | 350 | |
| Fall 2012 | 175 (Jan 13) | 150 (March/April) | 350 (Jan-late March 13) | | 675 | |
| **TOTAL HARRIS MEAT SAMPLES** | | | | | | **3679** |

# Extension objectives of "Integrating DNA information into beef cattle production systems"

The **extension objective** is to develop and deliver educational materials to a national audience on the integration of DNA information into beef cattle selection programs.

- Includes the development of fact sheets, national educational programs including program at BIF 2009, brown bagger series, popular press articles, and in year 4 a stakeholder workshop entitled "*Integrating DNA information into beef cattle production systems*"

# "Integrating DNA information into Beef Cattle Production Systems"
## USDA Integrated Grant Collaborators

- Dr. Darrh Bullock, Extension Professor, University of Kentucky, KY
- Dr. Leslie "Bees" Butler, Extension Marketing Specialist, UC Davis, CA
- Dr. Daniel Drake, University of California Cooperative Extension Livestock Advisor, CA
- Dr. Dorian Garrick, Professor, Iowa State University, IA
- Dr. John Pollak, Professor, Cornell University, NY
- Dr. Mark Thallman, US Meat Animal Research Center, Clay Center, NE

Graduate Students

- Kristina Weber, Ph.D. Candidate, UC Davis, CA and Krista Cooprider, MS Candidate, UC Davis, CA

Producer Collaborators:

- Jack Cowley, Cowley Rancher, Siskiyou County, CA
- Dale, Greg, and Richard Kuck, Kuck Ranch, Siskiyou County, CA
- Matt Parker, Mole-Richardson Ranch, Siskiyou County, CA

Processor Collaborators:

- Harris Ranch Beef Company, Coalinga, CA
- Los Banos Abattoir, Los Banos, CA

Software Collaborators:

- Jim Lowe, Cow Sense Herd Management Software, NE

Other Contributors/Collaborators

- Dr. Jerry Taylor, University of Missouri, MO
- Dr. Mike Goddard, University of Melbourne and Victorian DPI, Australia

Animal Biotechnology and Genomics Education