

Objectives: Determine effects of supplemental forage on honey bee:

- 1) Nutrition, health, and queen quality
- 2) Brood production
- 3) Gut microbiome
- 4) Interactions between all these factors



Supplemental rapini forage plot.

### Methods

- 40 colonies
- 2 forage and 2 non-forage plots in AZ
  - mid January
- Moved to Almonds
  - mid February



### Methods

- Constant monitoring
  - Temperature and weight
- Nutrition, health, and queen quality
  - Lipids, proteins, and amino acids in food and bees
  - Queen mandibular pheromone
- Microbiome
  - Worker and queen gut microbiome via DNA sequencing

### Results: colony weights

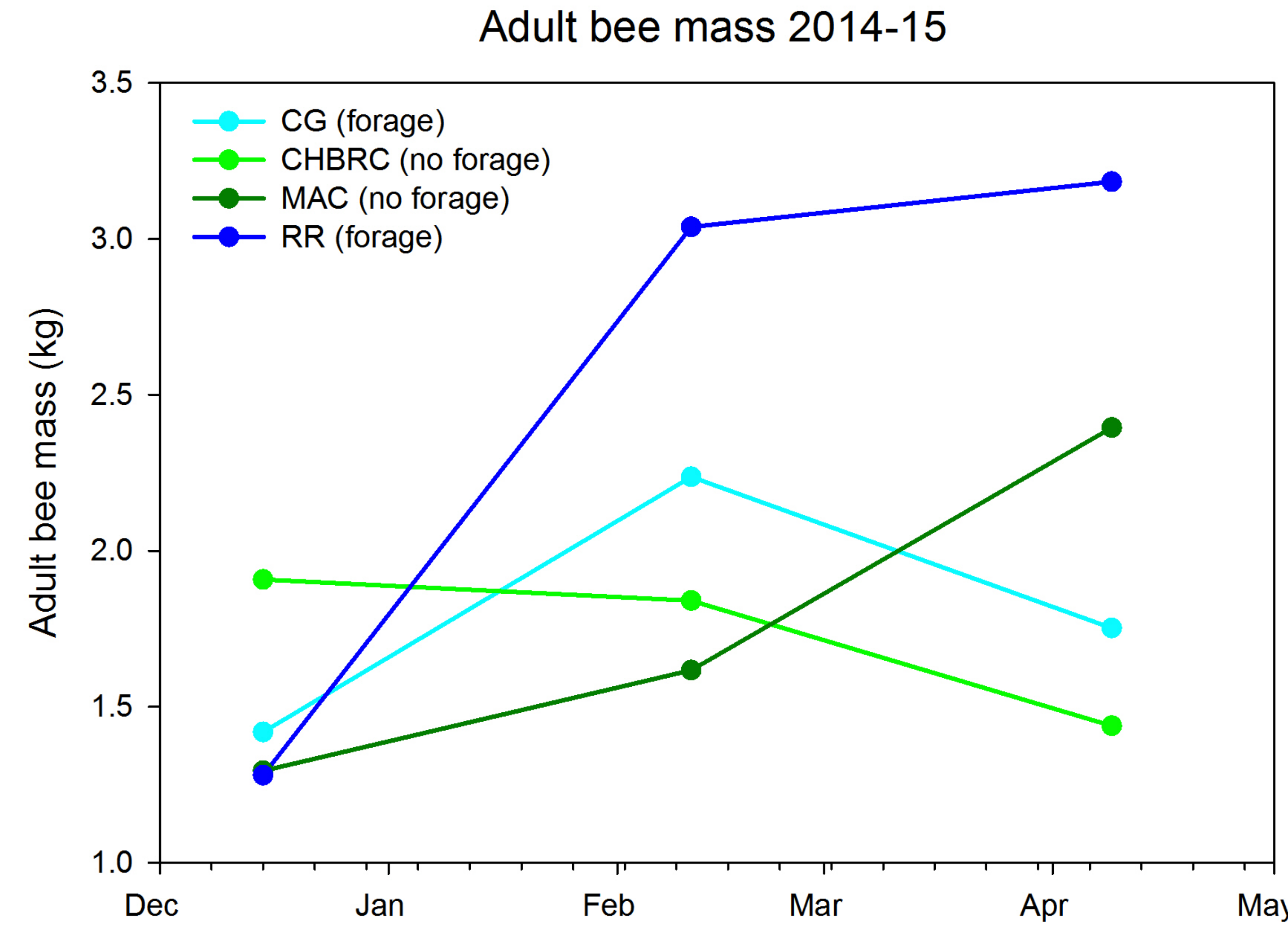


Fig 1. Adult bee mass across the experiment. Blue points represent colonies kept at two forage plots while green points represent non-forage plots. Ten colonies were placed at each plot.

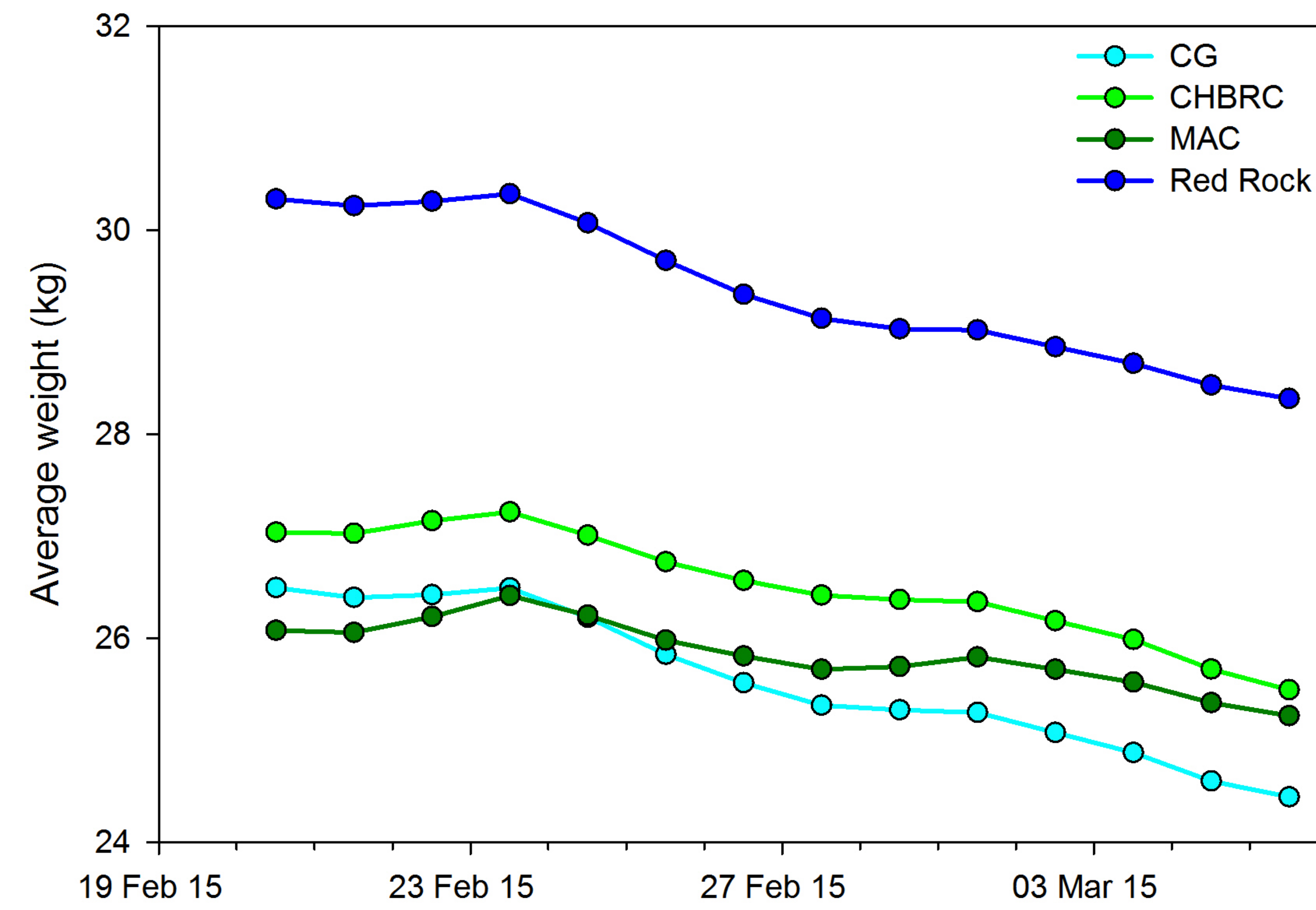


Fig 2. Average colony weight during almond pollination. Colonies initially increased in weight, then began to lose weight, likely as the almond bloom tapered off.

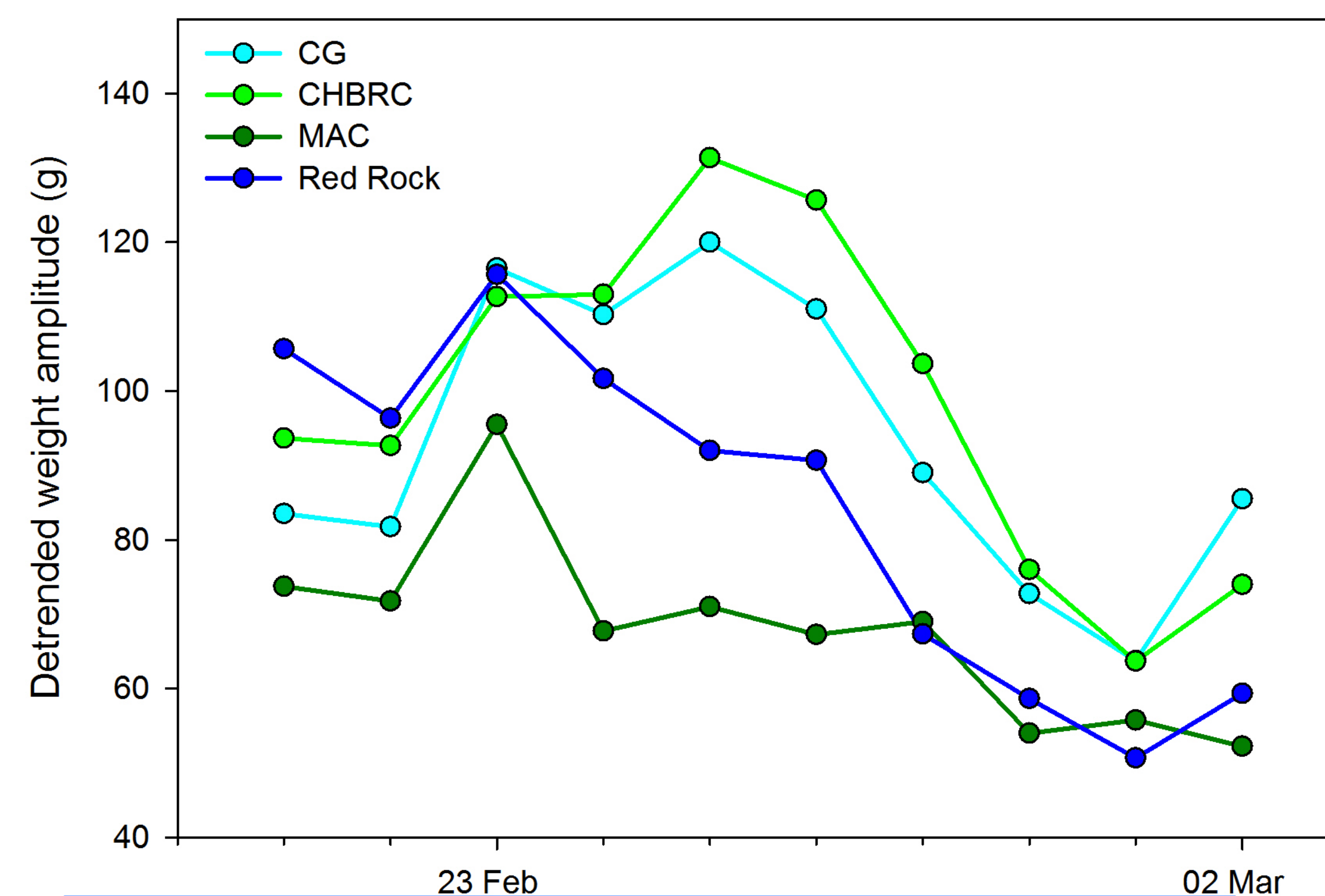


Fig 3. Daily variation in colony weight during almond pollination. Larger values indicate greater foraging.

### Results: colony temperature

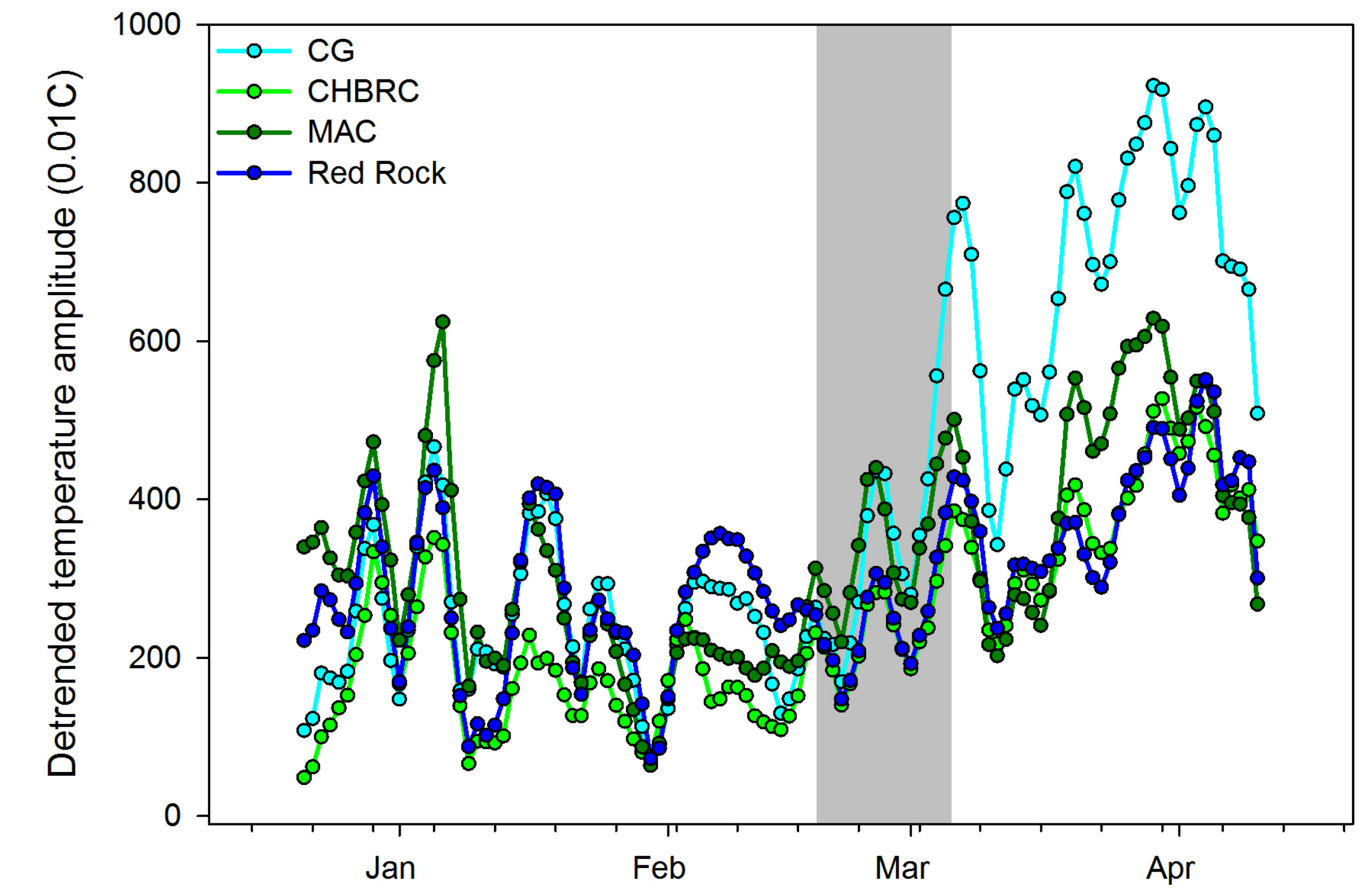


Fig 4. Within day variation in temperature. Greater variation (higher points) indicates less brood rearing. Grey bar indicates almond pollination.

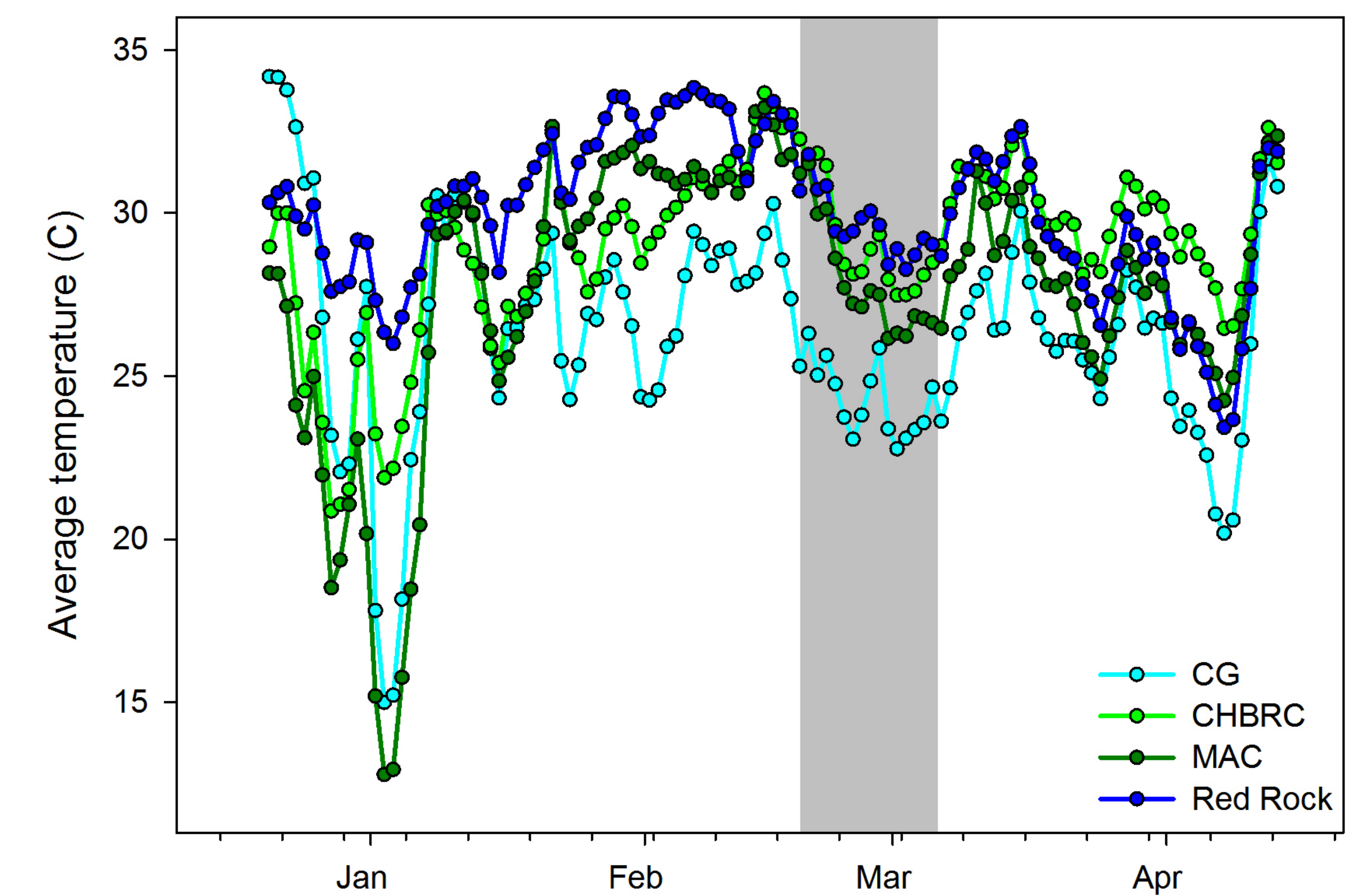


Fig 5. Average in-colony temperature, taken outside the brood cluster. Grey bar indicates almond pollination.

### CONCLUSIONS

- Forage treatment did not increase weight
  - Caveats
    - Non-forage sites had pollen coming into hives
    - Forage treatment not as long as planned
- Site matters
  - Red Rock colonies had more foragers and greater weight
- Nutrition and gut microbe work ongoing
  - 1,100 honey bees dissected
  - ~200 samples awaiting sequencing
  - Queen quality

Thanks to Milagra Weiss, Nick Brown, Jason Rothman, and Wonderful Farms for logistical support, and the California Almond Board for funding.