Cooperator Testing of the NSSC Active Carbon Field Kit

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Participants:

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With support from:

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Participant Affiliations

- Cynthia Stiles, Larry West, Richard Ferguson, Patty Jones, Kathy Newman: **National Soil Survey Center, Lincoln, NE**
- David Hammer and Mark Johnson: **Environmental Protection Agency, Western Ecology Division, Corvallis, OR**
- Joey Shaw and Julie Arriaga: **Auburn University, Auburn, AL**
- Paul McDaniel and Anita Falen: **University of Idaho, Moscow, ID**
- Toby O'Geen: **University of California - Davis, CA**
- Randy Miles: **University of Missouri - Columbia, MO**
- John Galbraith: **Virginia Polytechnic Institute and State University, Blacksburg, VA**
- Lee Burras: **Iowa State University, Ames, IA**

The NSSC Active C Field Kit

Description and purpose

- Compact, fully supplied kit to test up to 10 samples (more with extra supplies) with quality control
- A response to the call for increased analytical capability in Soil Survey MLRA Field Offices
- Based on a method extensively tested by Ray Weil and following a kit design originally proposed in Weil et al. (2003)
- Provides a fairly accurate proxy assessment of a critical soil quality factor – organic matter
- Will be provided to MLRA offices on a request basis

The Active C Field Kit

Why cooperator testing for the AC Field Kit?

- Variety of soil landscapes (mineralogy, management, climatic conditions)
- Develop clear and comprehensive instructions
  - Sample collection and handling
  - Proper use of provided materials and instruments
  - Standard soils for quality control
- Identify problems and propose solutions

How does the AC Kit test work?

- Uses violet-colored $KMnO_4$ solution to oxidize chemically-labile C in soils
- The higher the AC content, the more the color bleaches out
- Kit employs a portable instruments (scale and colorimeter) to most accurately measure soil moisture and AC content
- Includes two pre-weighed standard soils for quality control

Virtual demonstration

Weighing the samples

Virtual demonstration

Critical solutions made up for analysis

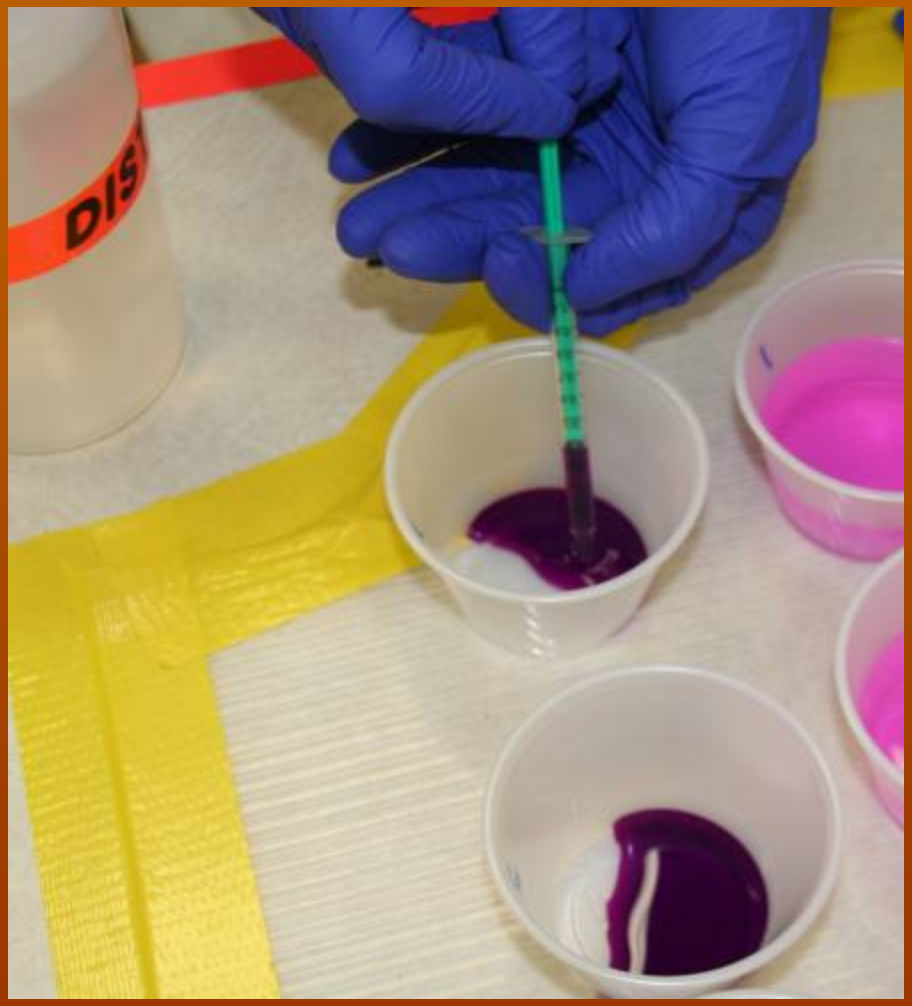
Virtual demonstration

Color development for soils and permanganate solution

Virtual demonstration

Initial filtering of extracting solution

Virtual demonstration



Making the dilution of the extracting solution filtrate in distilled water

Virtual demonstration

Appearance of diluted permanganate extraction solutions

Virtual demonstration

Pocket colorimeter and cuvettes

Virtual demonstration

Preparing solution to determine color density

Virtual demonstration

Taking the color density reading

Virtual demonstration

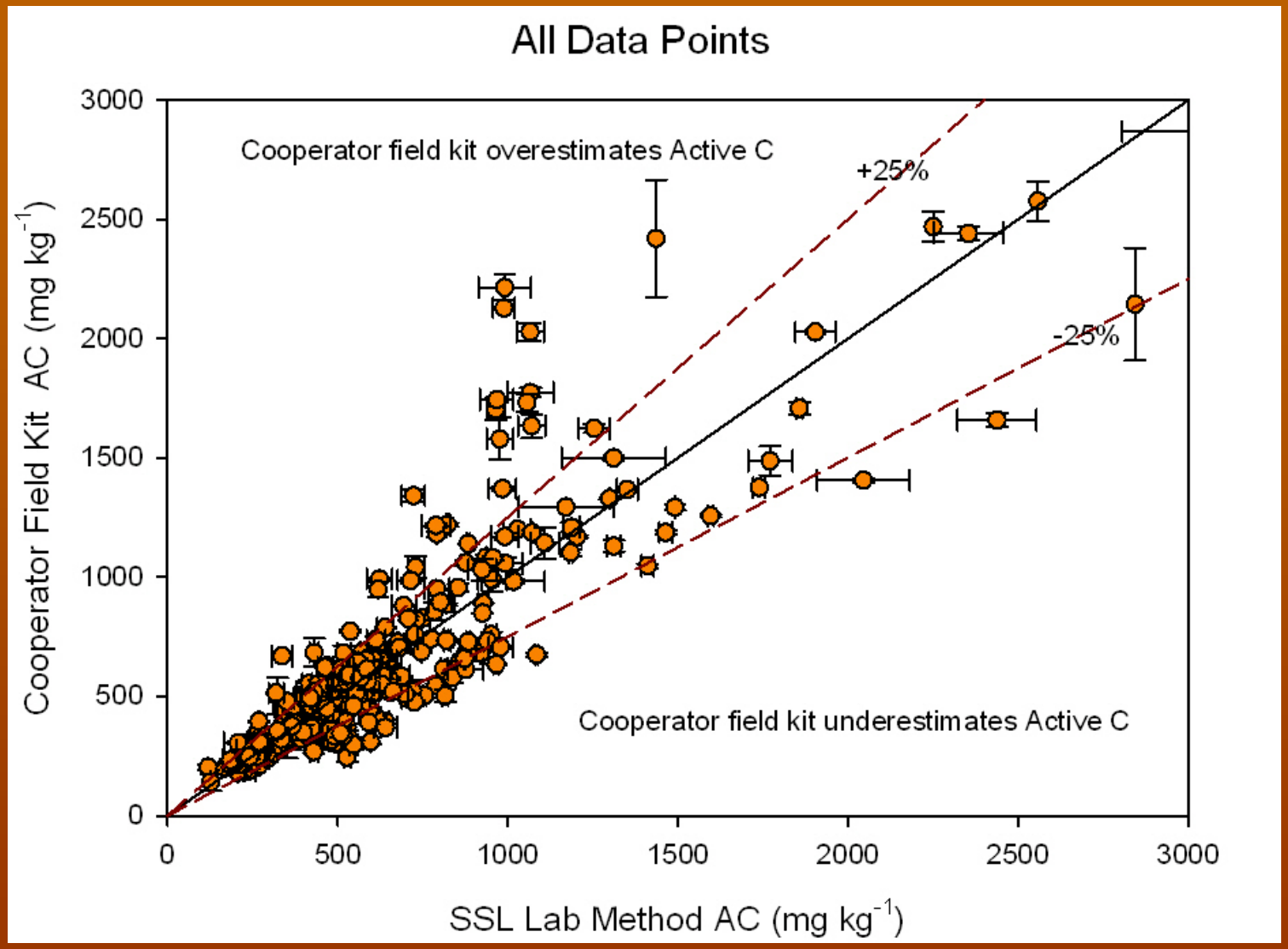
Taking the color density reading

Soils Evaluated by Cooperators and SSL

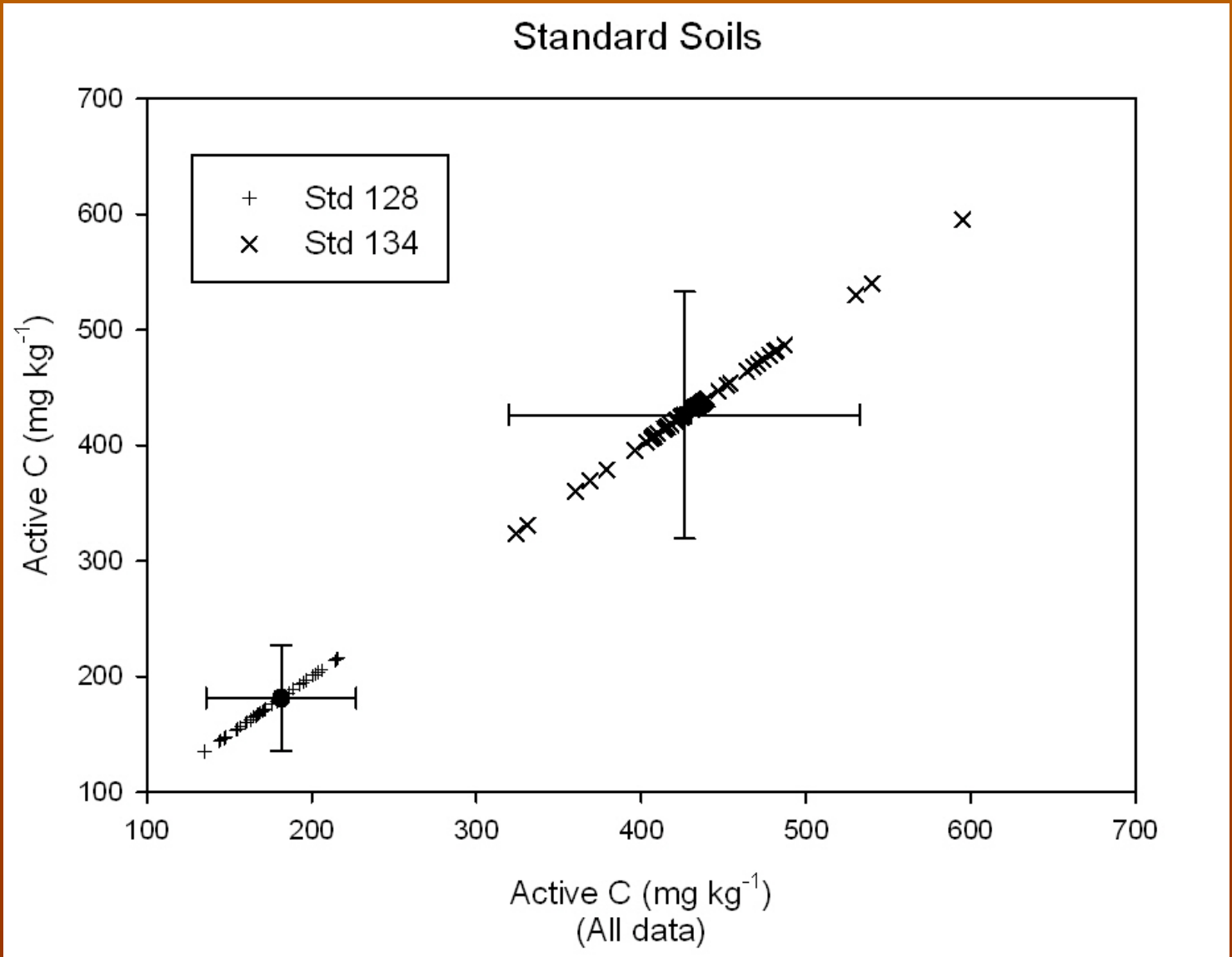
- **Alabama**: Paleudults under conventional and conservation corn-cotton rotation
- **California**: Xeralfs under managed grazing, oak control, fire regime and irrigation
- **Idaho**: Xerolls and Udolls under conventional, conservation management and CRP
- **Iowa**: Udolls under restored prairie, conventional corn and managed pasture
- **Missouri**: Epiaqualfs under no-till and conventional till rotations
- **Oregon**: variety of soil orders under various managed forest communities
- **Virginia**: variety of soil orders under pasture (managed and abandoned) and mature and regrowth forest

Comparative testing method

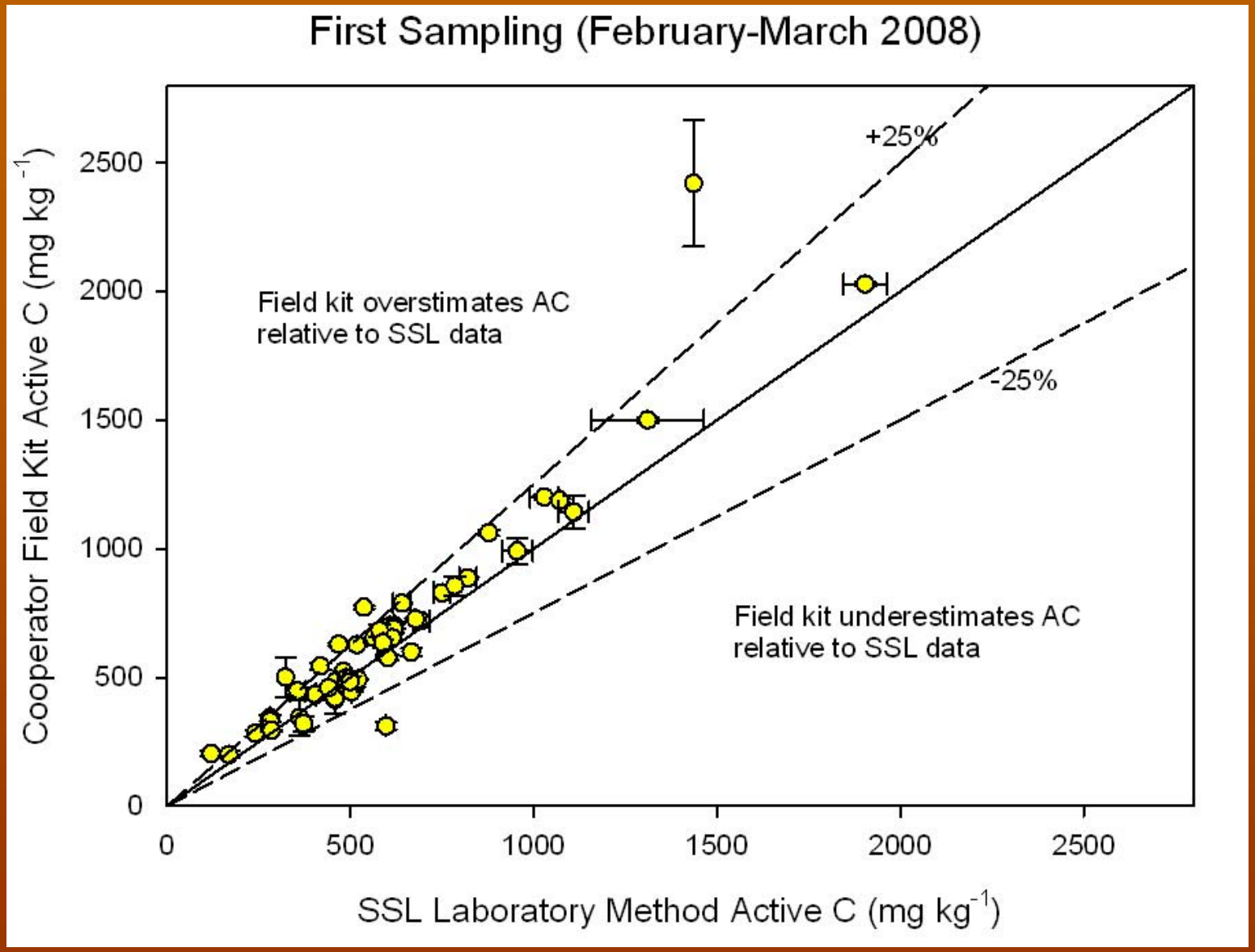
- Samples gathered and processed at cooperator facilities
- Samples returned to SSL and field kit run at approximately the same time
- Additional AC tests run at the SSL to verify AC contents of soils
- Discussion of results and problems held after completion of data collection for each sampling event



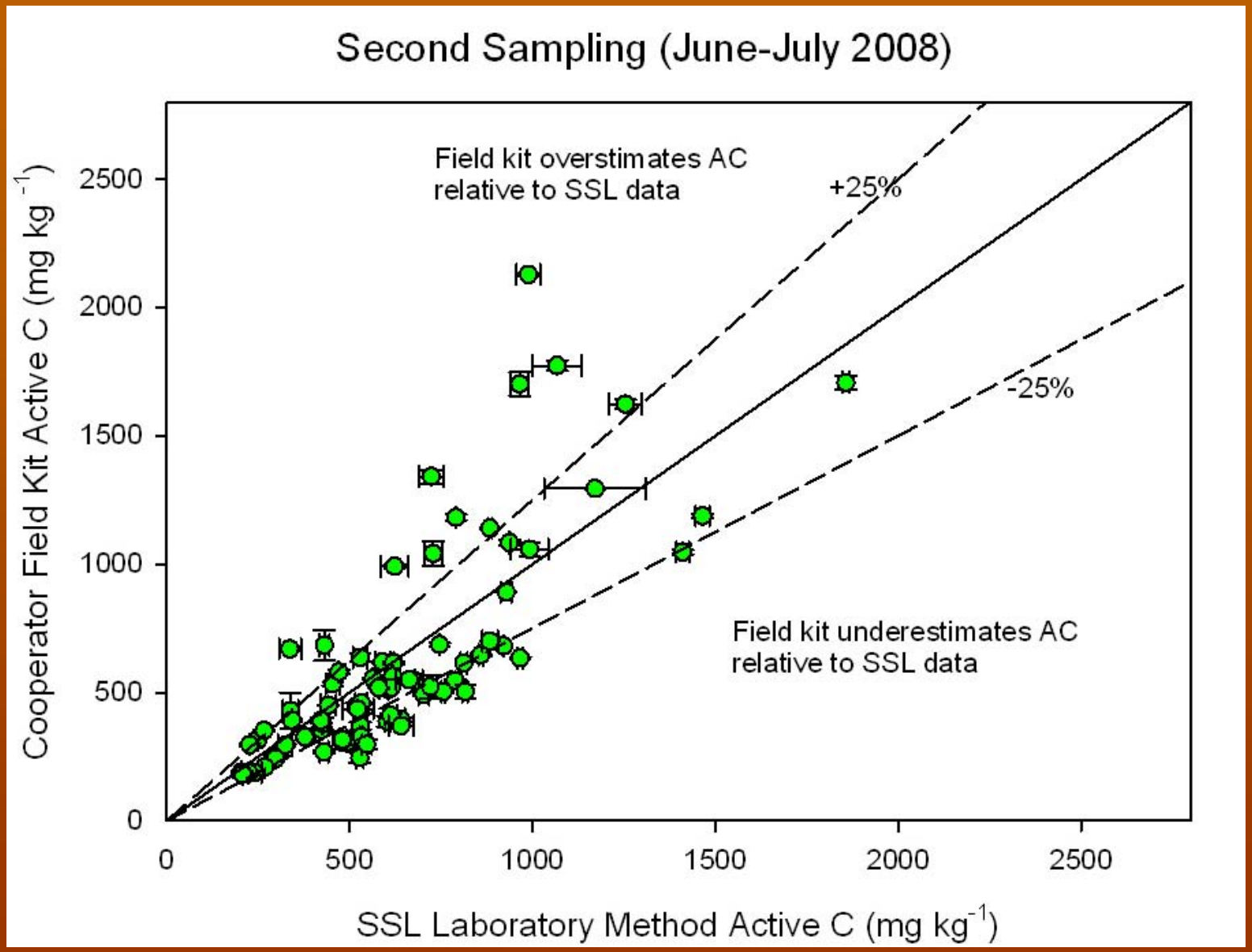
Data from the kit fell within 25% of the SSL data 76% of the time



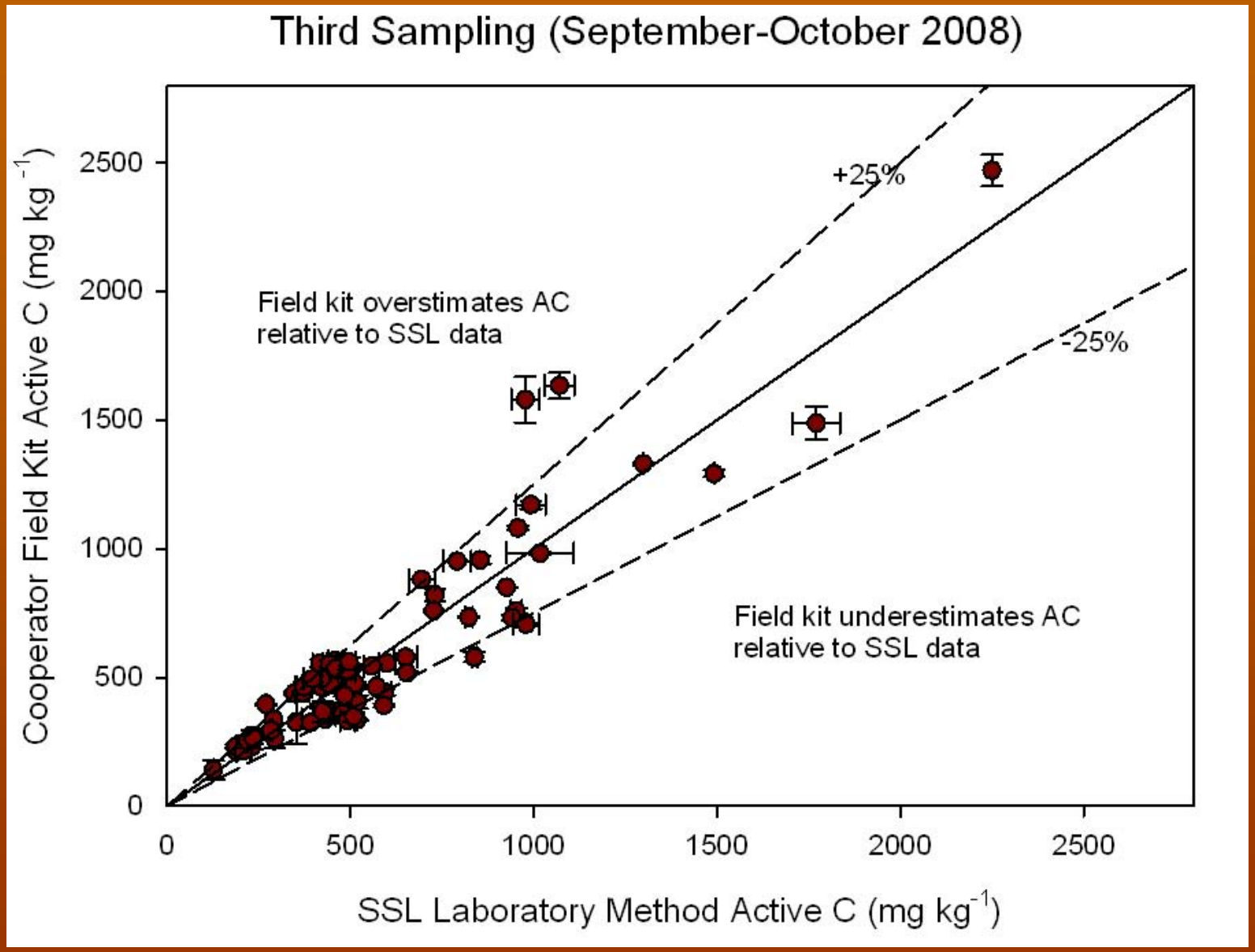
95% of standard soil data fell into a ±25% range around the mean



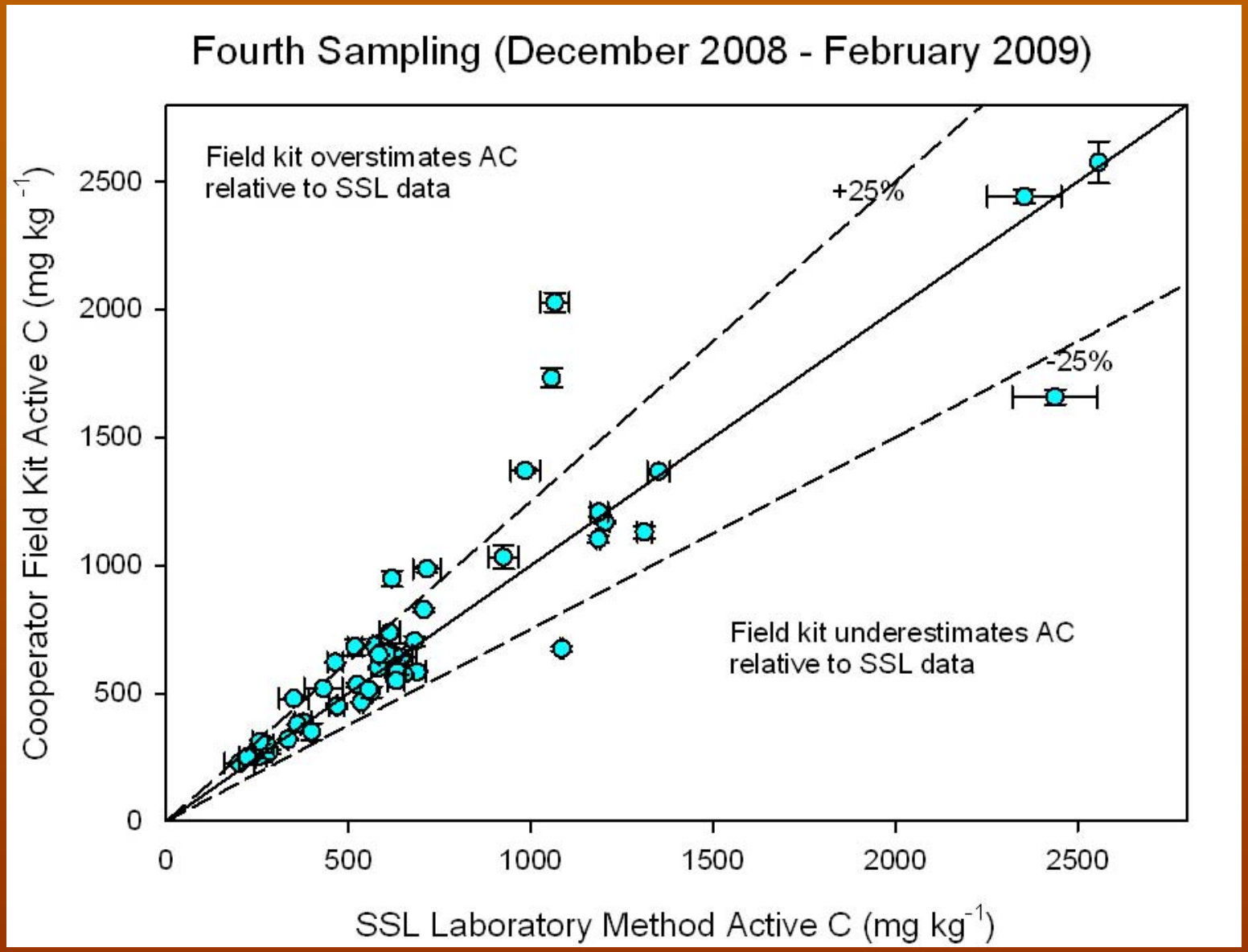
When is the best time to sample for AC? 87% points within range



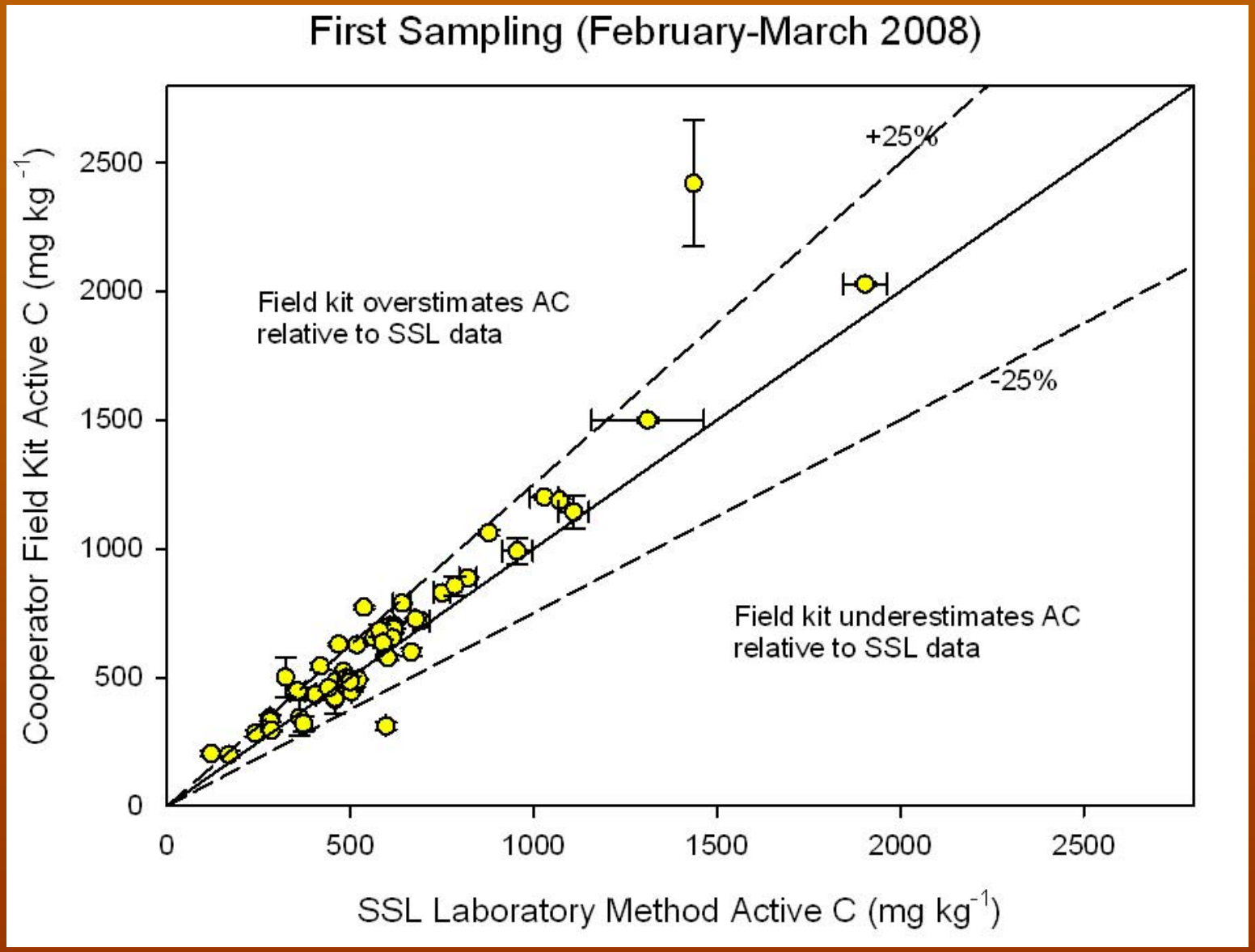
When is the best time to sample for AC? 55.3% points within range



When is the best time to sample for AC? 85.5% points within range



When is the best time to sample for AC? 82.4% points within range



The best time to sample for AC = just before new active growth

What does this mean to the MLRA Field Office?

- Collected samples processed at the field lab
- Data acquisition is quick and relatively accurate
- Quality control is assured by analysis of two standard soils
- Provides data that are important indicators of soil quality
- Support is provided by NSSC personnel

Thanks for your attention!