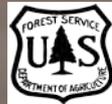


Fuel Characteristics and Consumption--RxCADRE

Roger Ottmar, Robert Vihnanek, Clint Wright, Joe Restaino, John Dvorak

4th Fire Behavior and Fuels Conference
Raleigh, NC

February 20, 2013



6 Disciplines Targeted at Small and Large Scales

- **Fuels (R. Ottmar-PNWRS)**
- **Meteorology (C. Clements-SJSU)**
- **Fire Behavior (B. Butler-RMRS)**
- **Heat Balance (M. Dickinson-NRS)**
- **Smoke (B. Potter-PNWRS)**
- **Fire Effects (J. O'Brien-SRS)**



Fuels (R. Ottmar)

Objectives:

- Measure the physical characteristics, loading, composition, distribution, and condition of each fuelbed category before and after each fire
- Place fuels data and metadata in repository for 2012, 2011, and 2008
- Build FCCS fuelbeds



Burn Blocks and Fuelbeds



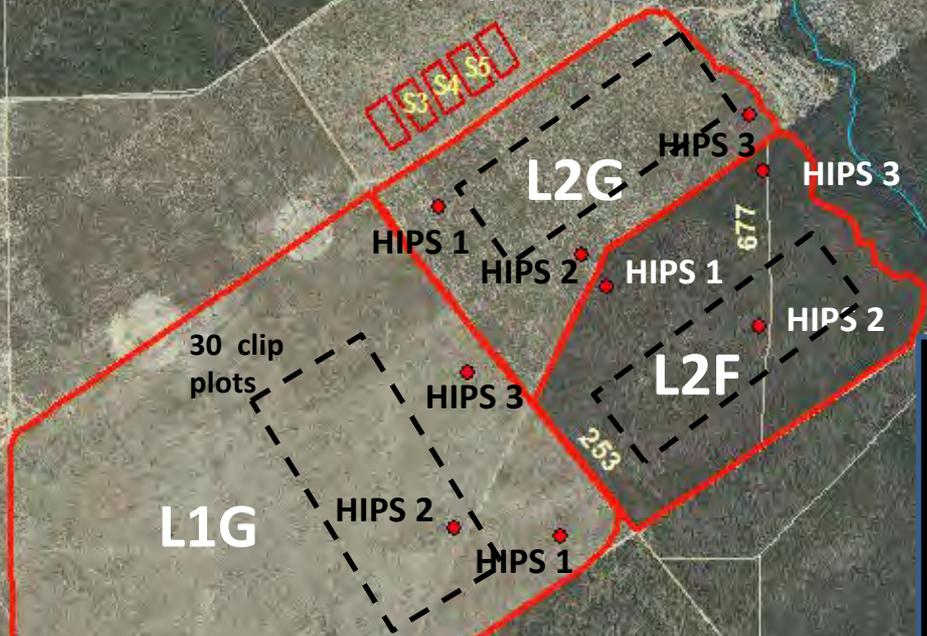
Unit Location:

B-70 Range—Eglin AFB

Nov 2012

S3, S4, S5

S7, S8, S9



- 2 replicates of three (100 X 200 m) Grass/light shrub
- 1 large operational burn (400 ha) Grass
- 1 large operational burn (200 ha) Grass/light shrub
- 1 large operational burn (200 ha) Long Leaf forest with oak, partially managed plantation



Burn Blocks/Fuelbeds

S3, S4, S5 Grass



S7, S8, S9 Grass/Shrub



L1G Grass



L2G Grass/Shrub



L2F Forest



Variables Collected



Variables Measured

► Pre-burn

- Shrub loading, height, % cover
- Grass & forb loading, height, % cover
- Woody biomass loading by size class
- Litter depth and loading
- Duff depth and loading
- Cone counts and loading
- Photos

► Day of Burn

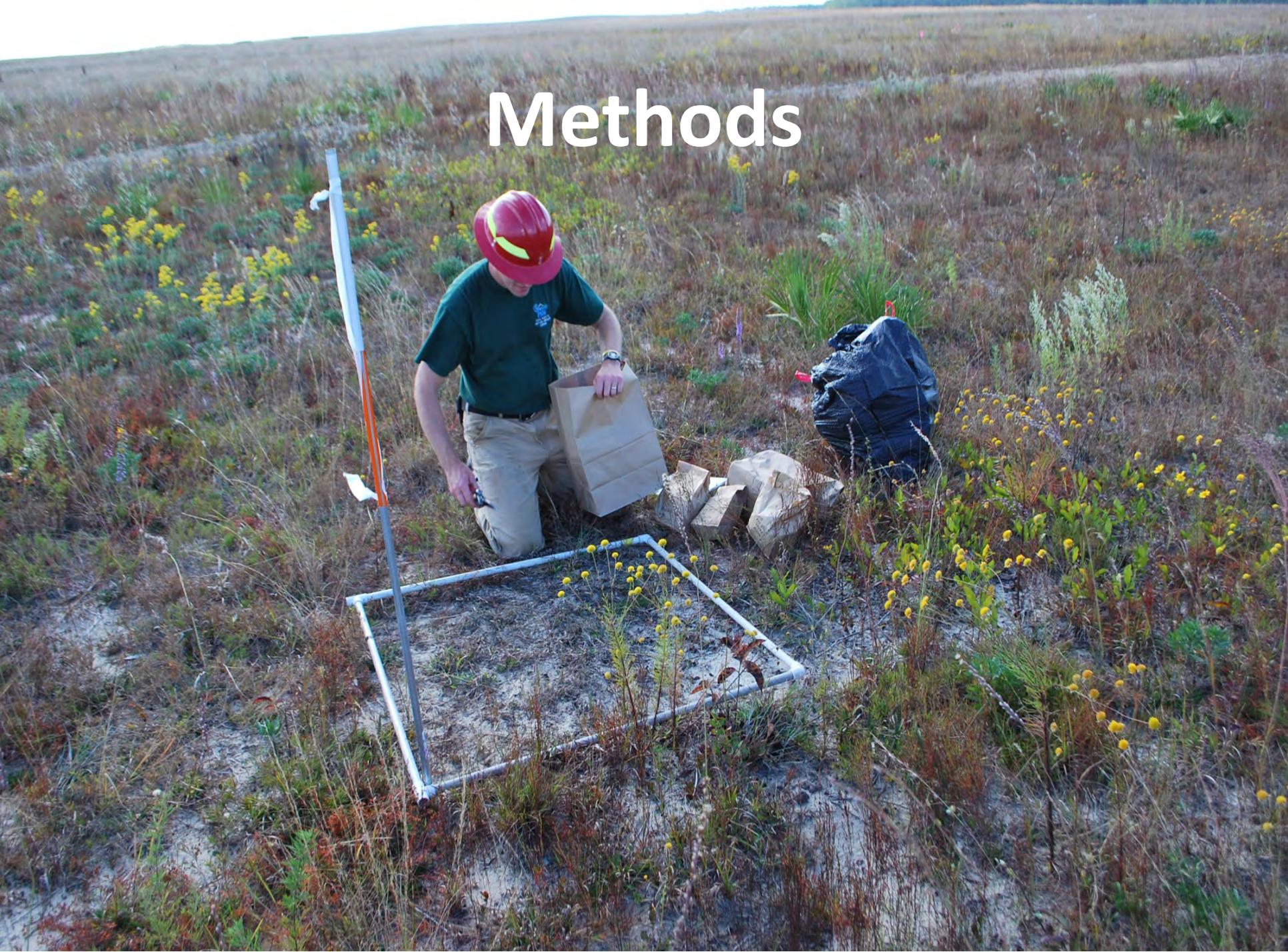
- Shrub fuel moisture (stems and leaves)
- Grass fuel moisture
- 1, 10, 100, 1000-hour fuel moisture
- Litter fuel moisture
- Duff fuel moisture

► Post-burn

- Biomass loading remaining by category
- Photos

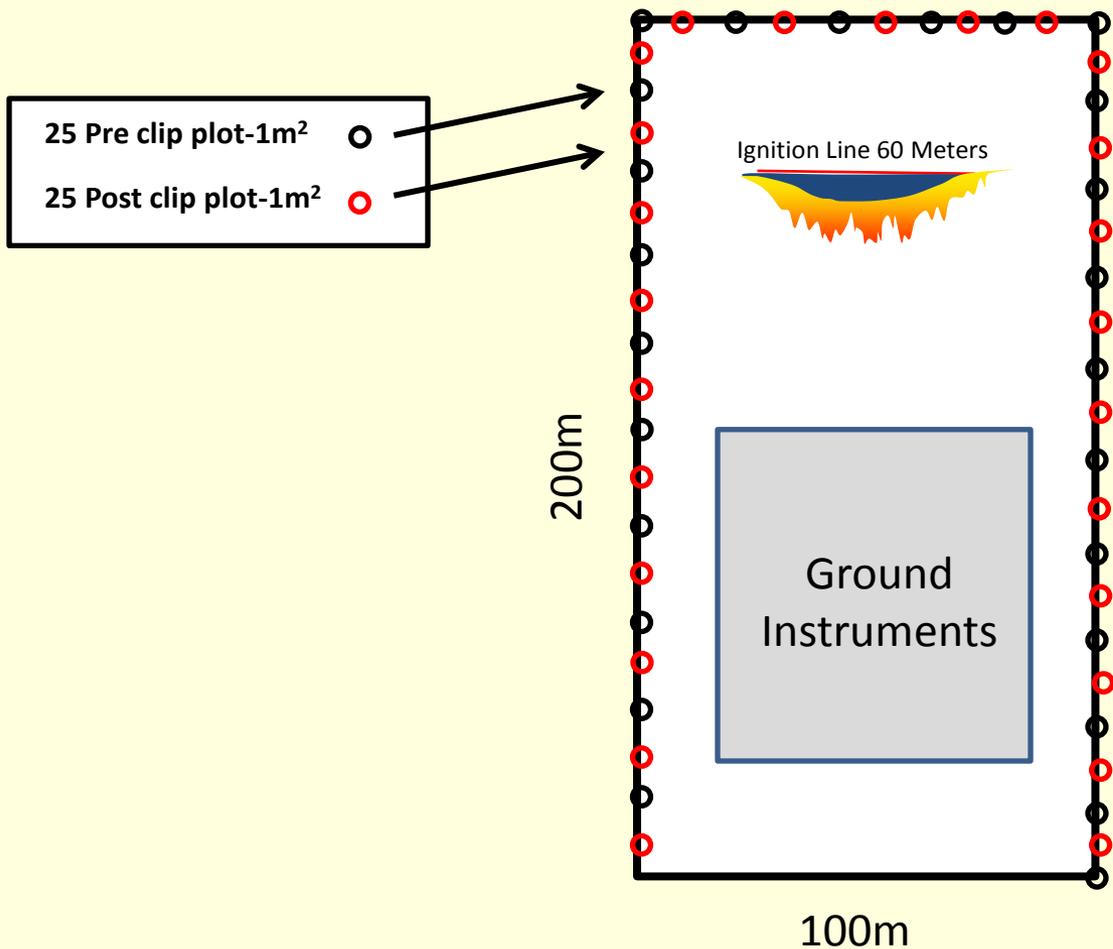


Methods

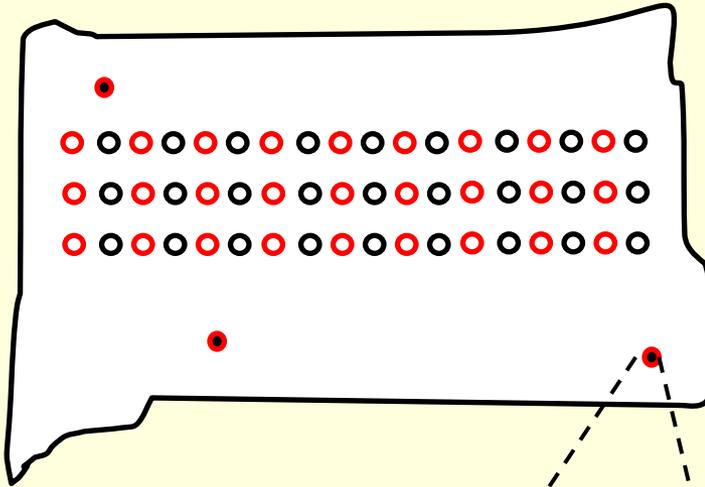


Small Block Replicates (S3, S4, S5, S7, S8, S9)

Total: 300 1-m² clip plots



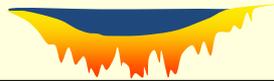
400-1,000 acres



30 Pre clip plot-1 m² ○
30 Post clip plot-1 m² ○

9 Pre clip plot-0.25m² ○
9 Post clip plot-0.25m² ○

HIPs



20m

Ground
Instruments

20m

Large Operational Block (L1G, L2G, L2F) and HIPs

(Total: 180 1-m² ; 162 0.25 m² clip plots)



Fuel Characteristics, Composition, and Distribution

Measurements
Visual assessment
Clipping
Line intersect inventory



Fuel Condition



Post-Fire Fuel Characteristics, Composition, & Distribution

Measurement
Visual assessment
Clipping
Line intersect inventory

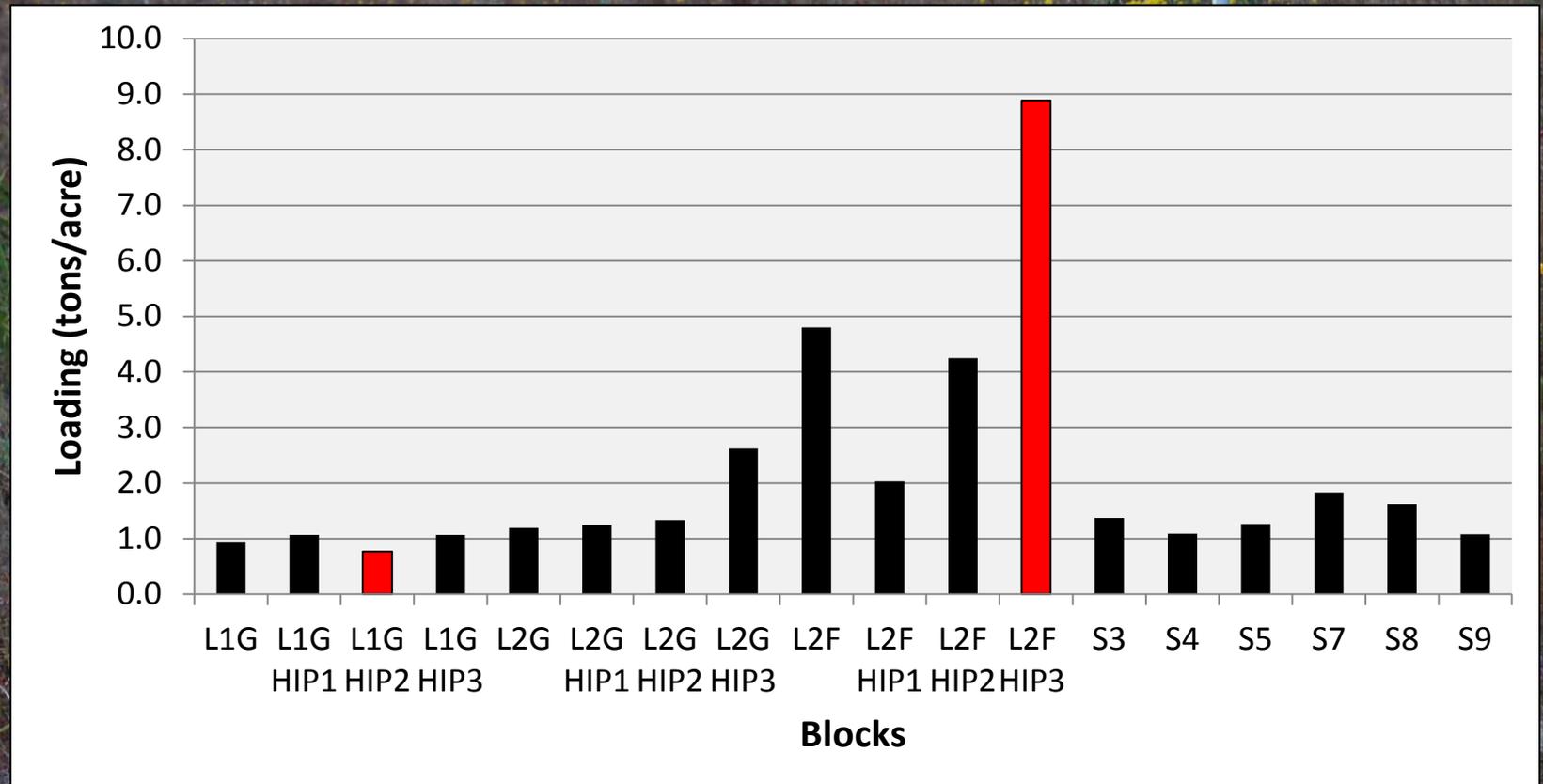
605A
SE
02/02/2011
#457
Lithv



Results



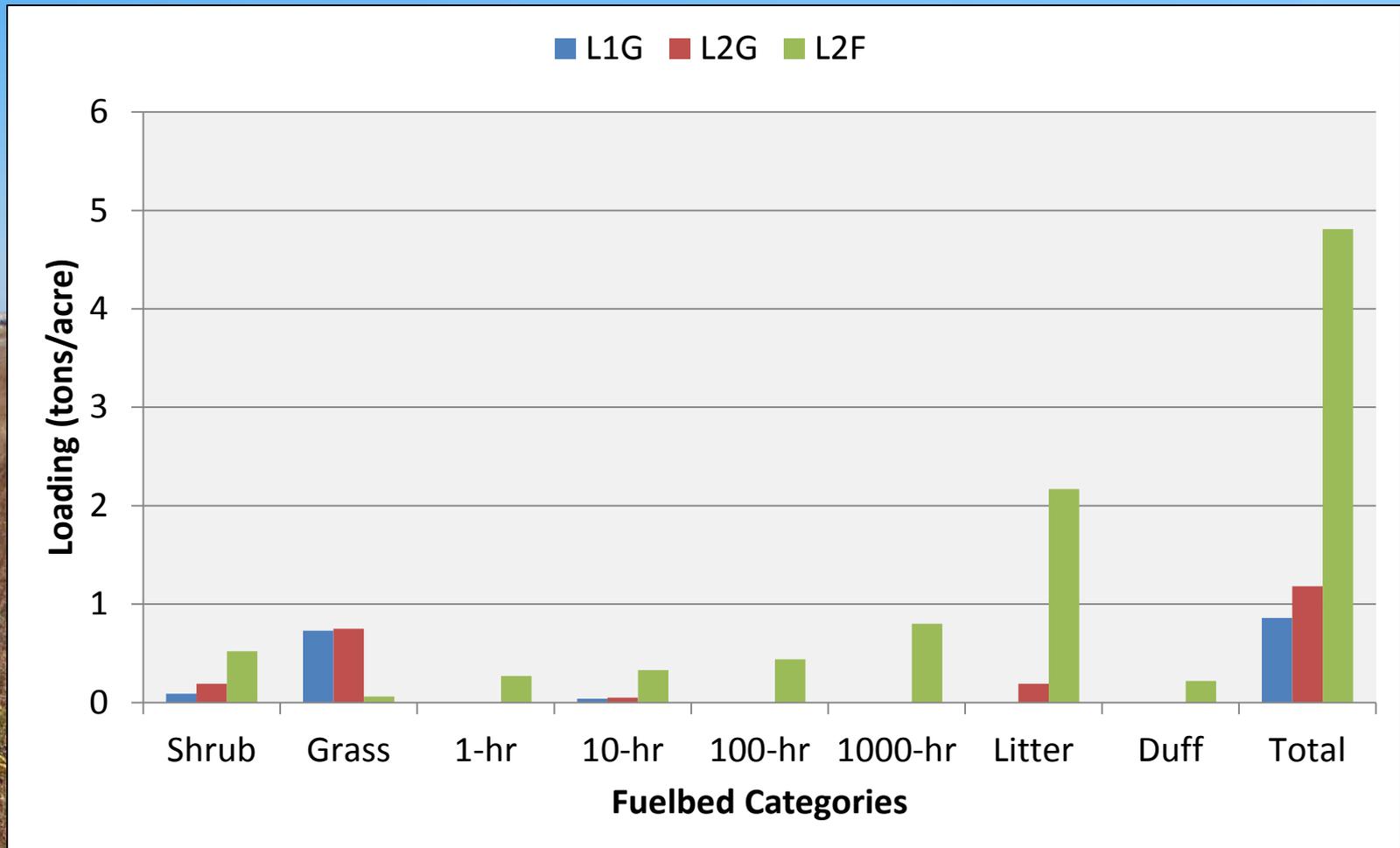
Total Loading



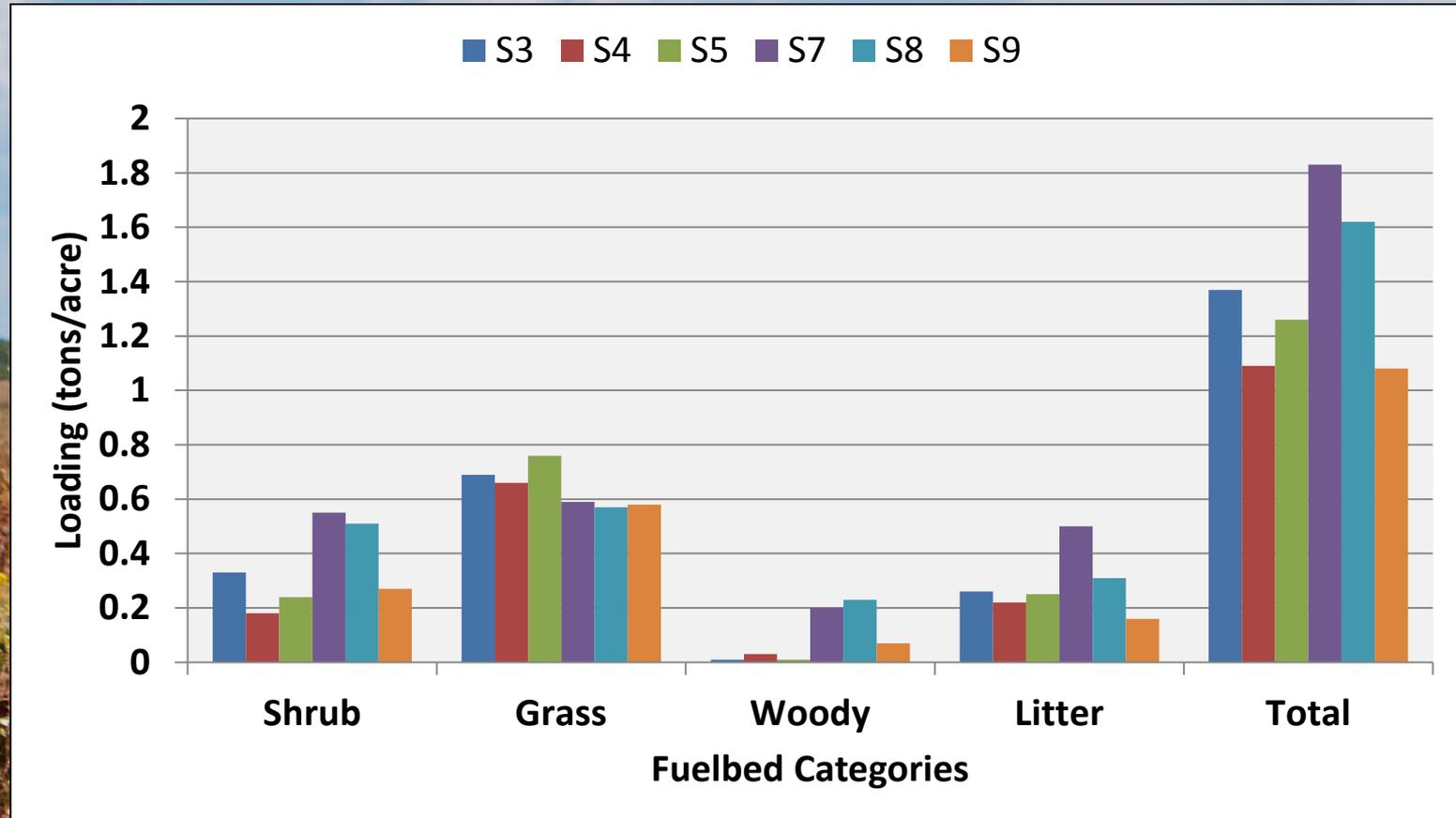
Fuel loading ranged from 0.8 t/a in L1G HIP2 to 9 t/a in the L2F HIP3



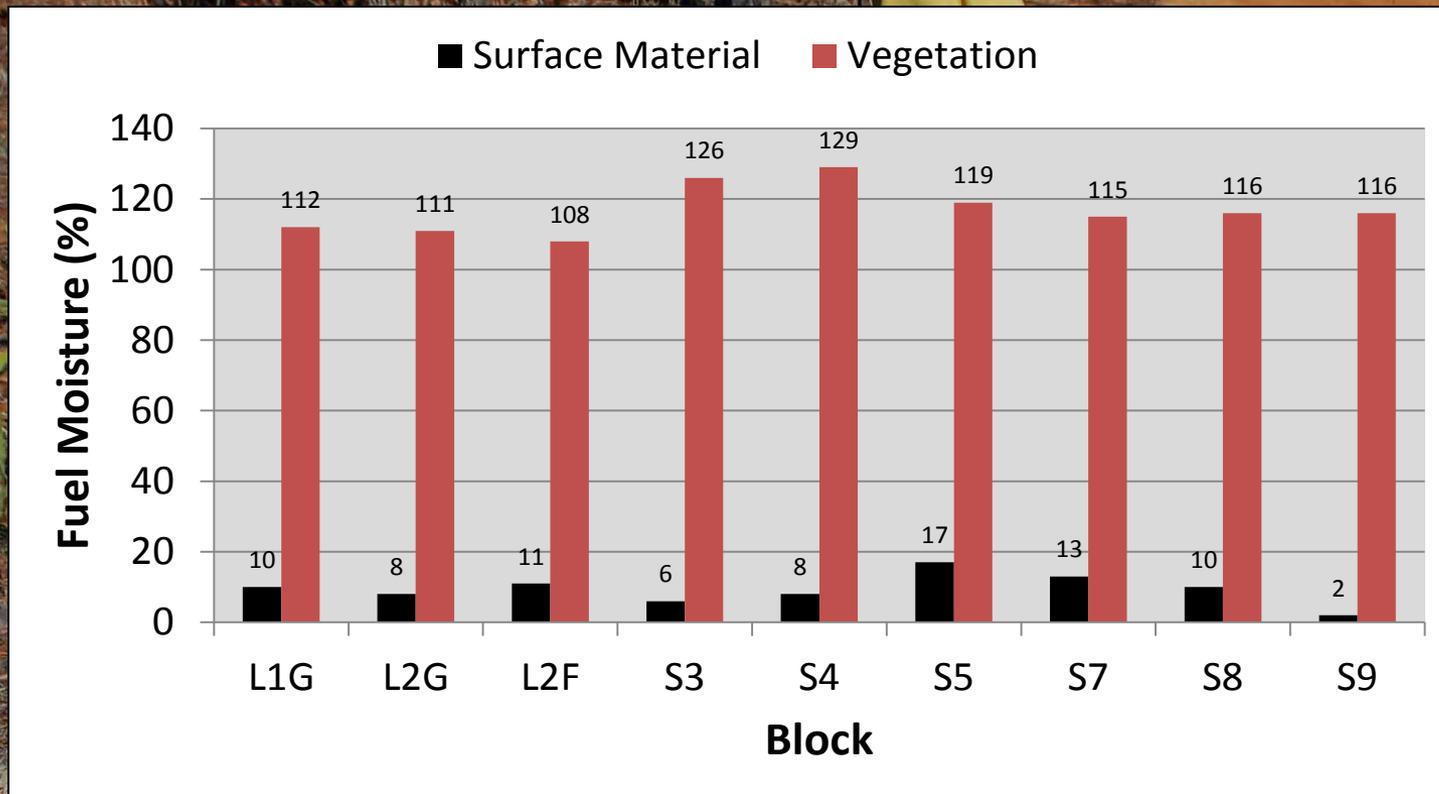
Loading by Fuelbed Category: L Units



Loading by Fuelbed Category: S Units



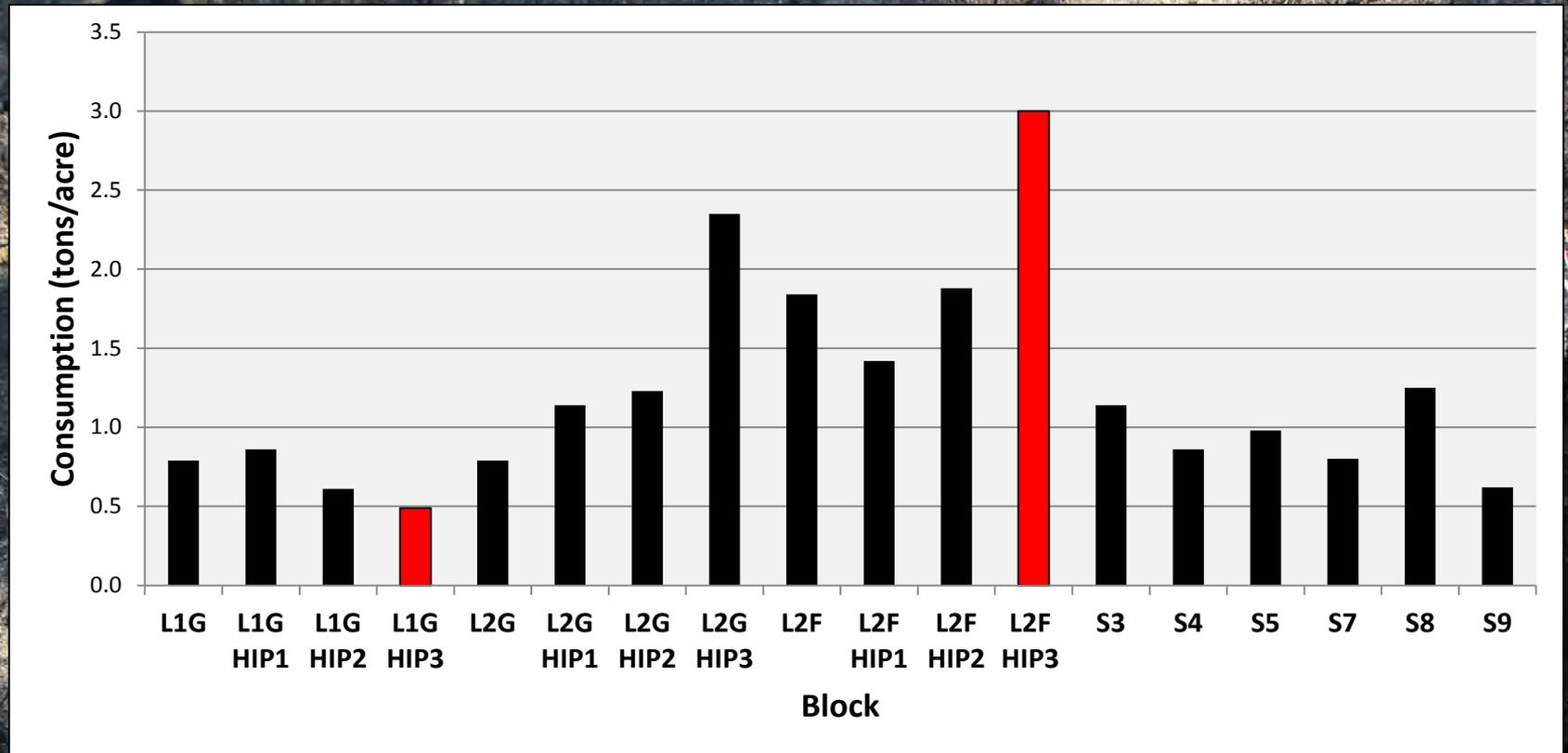
Fuel Moisture



Fuel moisture ranged from 108 to 129 percent for vegetation and from 2 to 17 for the surface material



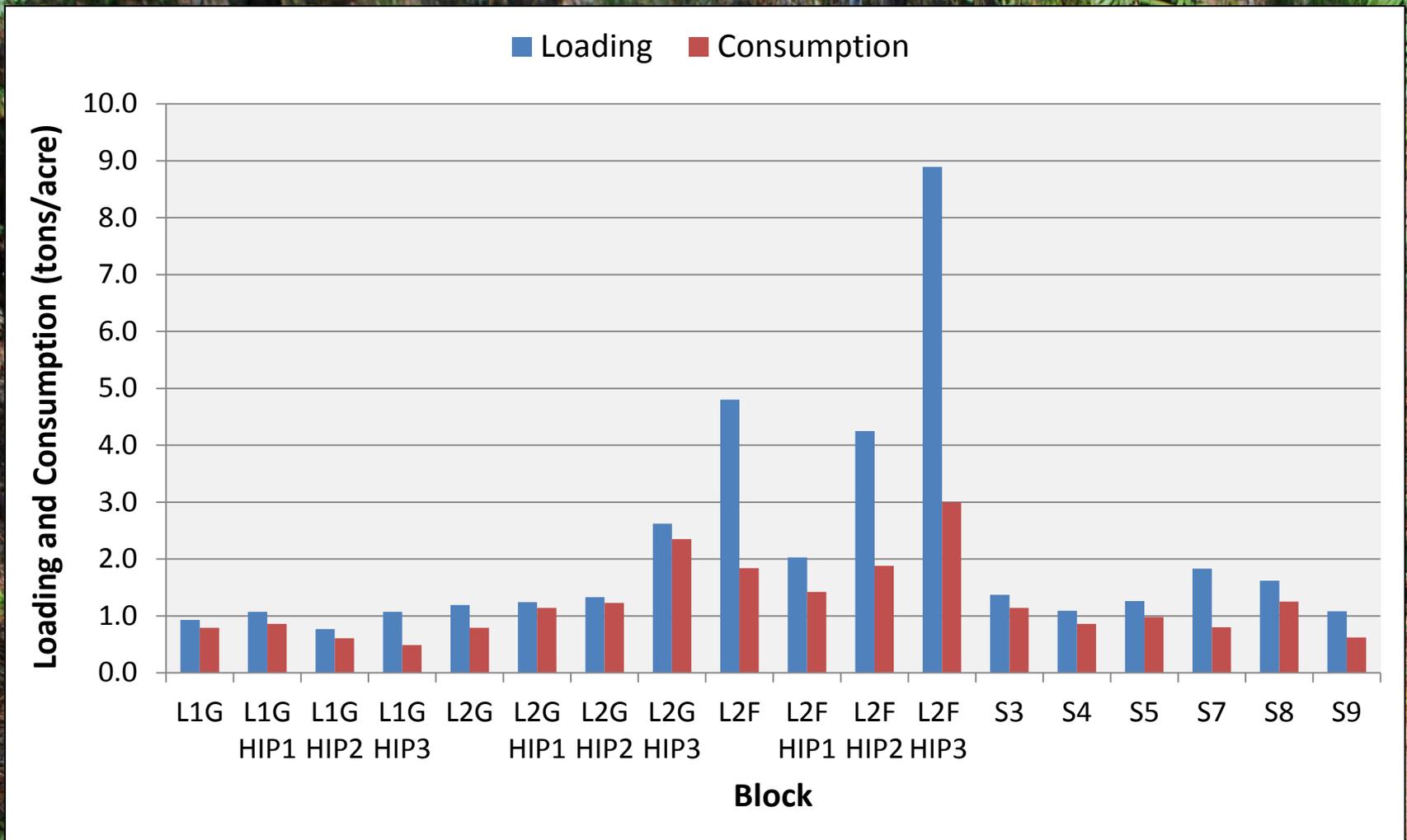
Total Consumption



Total Consumption ranged from 0.5 (L1G HIP3) to 3 tons/acre (L2F HIP3)



Total Loading and Consumption



Data Reduction and Repository

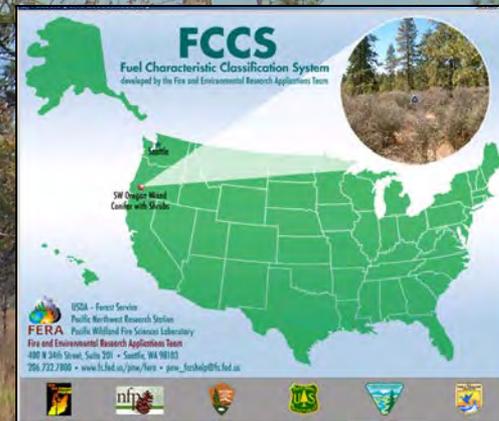
- **Three levels**
 - Raw data
 - Plot
 - Block
- **Metadata**



Using the RxCADRE Data for Evaluation of Fire Models



Fuel Characteristic Classification System (FCCS)



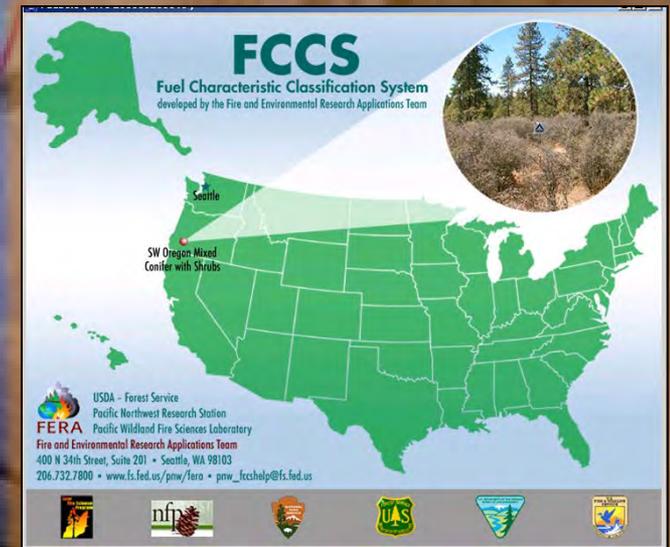
A system to build and characterize all components of a fuelbed and to classify the fuelbed for its potential flammability and fire hazard.



What are the specifics of the FCCS?

Composed of 3 elements:

- Fuel beds
 - FCCS fuelbeds
 - Customized fuelbeds
- Calculation of physical characteristics
- Calculation of:
 - FCCS fire potentials
 - Fire behavior prediction
 - Fuel model crosswalk



Click for Information:

Search term

Include in search

Ecoregions

Subtropical-230



Vegetation forms

Conifer Forest



Structural classes

Old-Forest Single Story



Cover types

SAF 100: Pondcypress



Change agents

Avalanche



Natural fire regimes

1



FRCC

Class 1



Introduction

Search for Fuelbed

- or -

Select Fuelbed by filename

FCCS Fuelbed (FCCS 191—Long leaf pine (prescribed fire, 2-year rough))

Ecoregion: Subtropical-230

Vegetation form: Conifer Forest

Structural class: Old-Forest Single Story

Cover type: SAF 83: Longleaf Pine-Slash Pine, SAF 71: Longleaf Pine-Scrub Oak, SRM 812: North Florida Flatwoods

Change agent: Prescribed Fire

Natural fire regime: 1

Condition class: Class 1

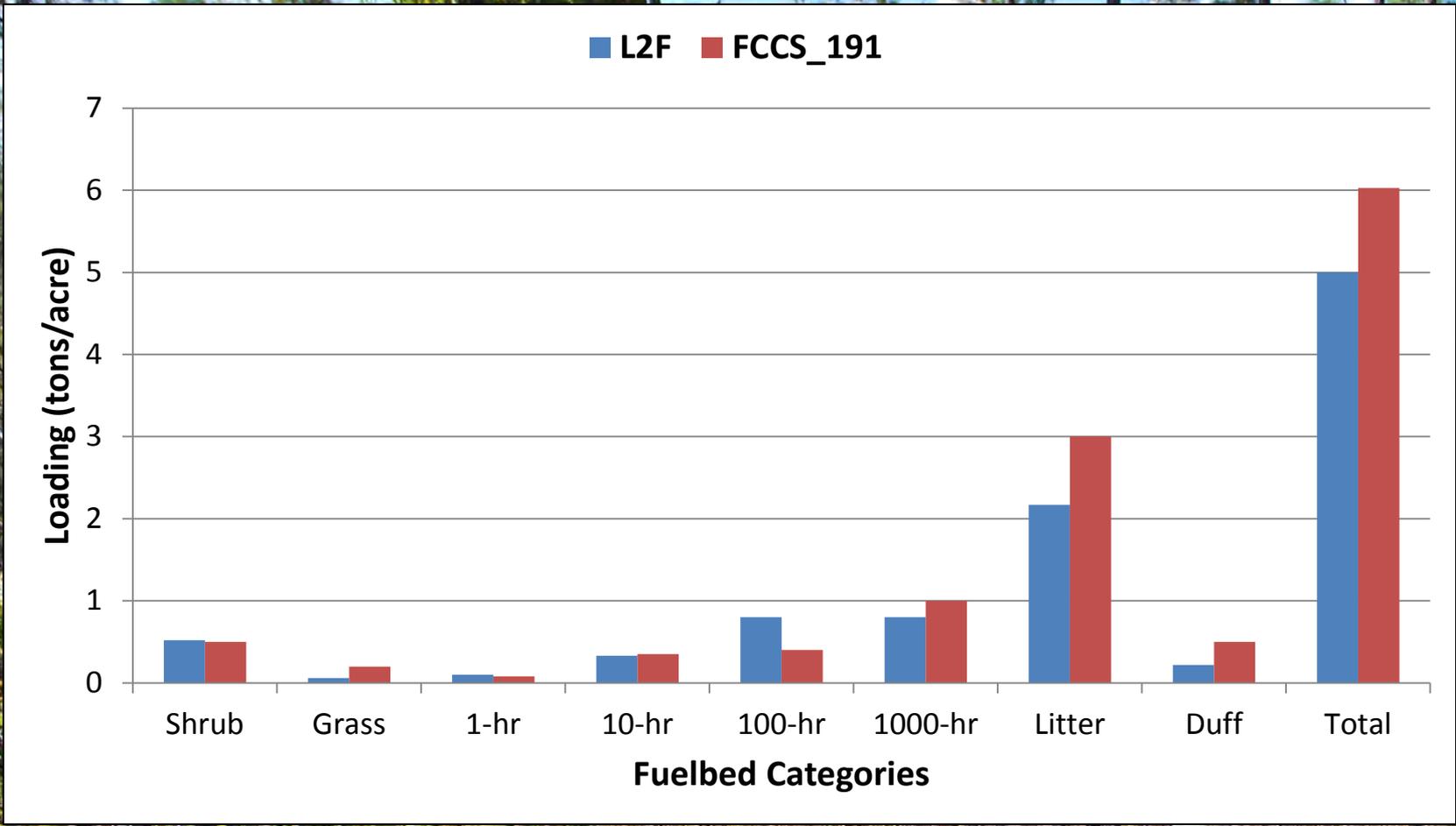
Site description: This forest is found throughout the Southeast coastal plain from Virginia south to Florida and west to into Texas, and is characterized by an open overstory of longleaf pine with occasional slash pine. The shrub layer is moderate to very dense with clumps of gallberry (*Ilex glabra*). The herbaceous layer is sparse and dominated by wiregrasses (*Aristida* spp.) or bluestem (*Andropogon* spp.). Prescribed fire is used every 2-3 years to maintain an open structure and reduce shrub density.

Filename: C:\FCCS\conf\fuelbeds\FB_0191_FCCS.xml

Click a fuelbed for details

Loblolly pine -- slash pine forest (None)
 Loblolly pine -- slash pine forest (Thinning (thin from below))
 Loblolly pine / bluestem forest (None, Clearcut)
 Loblolly pine forest (None)
 Longleaf pine -- loblolly pine forest (Windthrow)
 Longleaf pine -- loblolly pine forest (Prescribed Fire) 
 Longleaf pine -- slash pine / gallberry forest (Prescribed Fire)
 Longleaf pine -- slash pine / saw palmetto -- gallberry forest (Fire Exclusion)
 Longleaf pine -- slash pine / saw palmetto forest (Fire Exclusion)
 Longleaf pine / three-awned grass -- pitcher plant savanna (Fire Exclusion)
 Pine / holly -- privet forest (Clearcut, None)
 Pond pine forest (None)

 English units Metric units



FCCS Fuelbed 191 Fire Behavior

FM:D2L2; 4mph winds; 0% slope

Author: FCCS National Fuelbed

Date/Time: Nov 30 2009 - 04:48 PM

Fuelbed Name: Longleaf pine -- slash pine / gallberry forest

Fuelbed Number: 191

File Name: C:\focs\conf\fuelbeds\fuelbed_191.xml

Data quality ranking: 4

Original Original FBPS fuel model (13)*:7

Standard fuel model (40)*:SH3

Awaiting data for evaluation

Description: This forest is found throughout the Southeast coastal plain from Virginia south to Florida and west to into Texas; and is characterized by an open overstory of longleaf pine with occasional slash pine. The shrub layer is moderate to very dense with clumps of gallberry (*Ilex glabra*). The herbaceous layer is sparse and dominated by wiregrasses (*Aristida* spp.) or bluestem (*Andropogon* spp.). Prescribed fire is used every 2-3 years to maintain an open structure and reduce shrub density.

Moisture Scenarios

Output Variable	Default	User-defined	Optional	Definitions
Moisture scenario name	D2L2C3			
Moisture scenario description	Dry dead FM, 2/3 cured nonwoody; used in crosswalk to fuel models.			Fuel moisture scenario descriptions (Behave Plus, Andrews 2005)
Reaction Intensity (BTU/ft ² /min)	5040			The rate of heat release, per unit area of the flaming front (BTU/ft ² /min).
Flame Length (ft)	4.0			The distance between the flame tip and middle of the flame base (ft).
Rate of Spread (ft/min)	5.6			Distance per unit of time of the flaming front (feet per minute).

Evaluation of Consume and FOFEM



Equations for predicting biomass consumption during combustion stages are widely available in two major software packages:

Consume

First Order Fire Effects



Consume v3.0
developed by the Fire & Environmental Research Applications Team

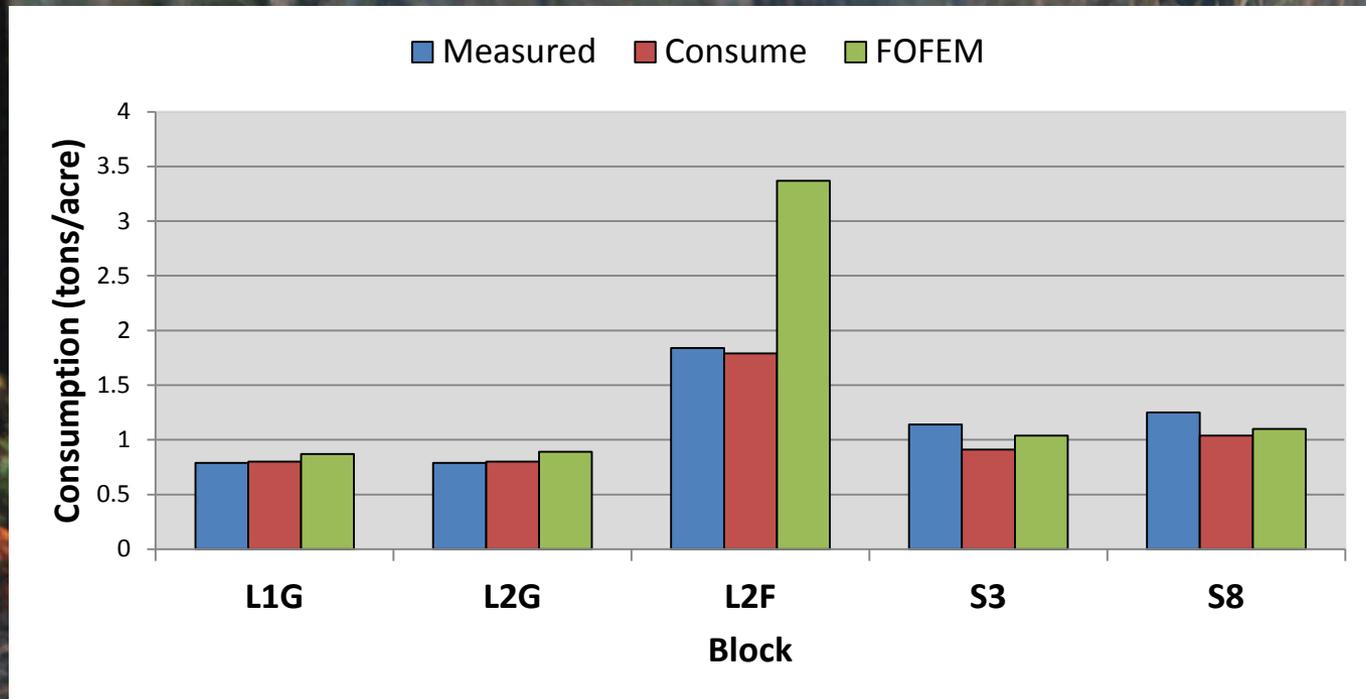
USDA - Forest Service
Pacific Northwest Research Station
FERA Pacific Wildland Fire Sciences Laboratory
Fire and Environmental Research Applications Team
400 N 34th Street, Suite 201 • Seattle, WA 98103
206.732.7800 • www.fs.fed.us/pnw/fera • pnw_fccshelp@fs.fed.us

Loblolly Pine
Central Georgia

The slide features a map of the United States with a red star in the Pacific Northwest. An inset image shows a forest fire. At the bottom, there are logos for the Fire Research Institute, nfp, and other agencies.



Measured vs Predicted



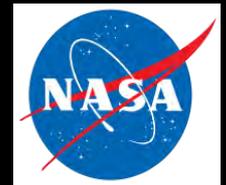
Conclusions

- Measured fuel characteristics and condition of each fuelbed category before and after each fire
- Provided fuels data for other scientists
- Preliminary assessment:
 - FCCS fuelbed match
 - Consume and FOFEM generally predicted consumption reasonably well
- Fuels data and metadata from 2012, 2011, and 2008 will be placed in repository



Leverage

- Funding assistance with partners
- More data acquired with partners



Questions?

