Cogongrass Eradication Research in Alabama

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ALABAMA COOPERATIVE Extension SYSTEM
Your Experts for Life

USDA

AUBURN UNIVERSITY

Cogongrass (*Imperata cylindrica* (L.) Beauv.)

- Warm season rhizomatous grass
- Native to Southeast Asia
- Introduced at Grand Bay, AL in ~1910
- Tested as a forage in the 1920's-1940's
- Considered to be one of the greatest invasive plant threats to much of the Southeastern United States


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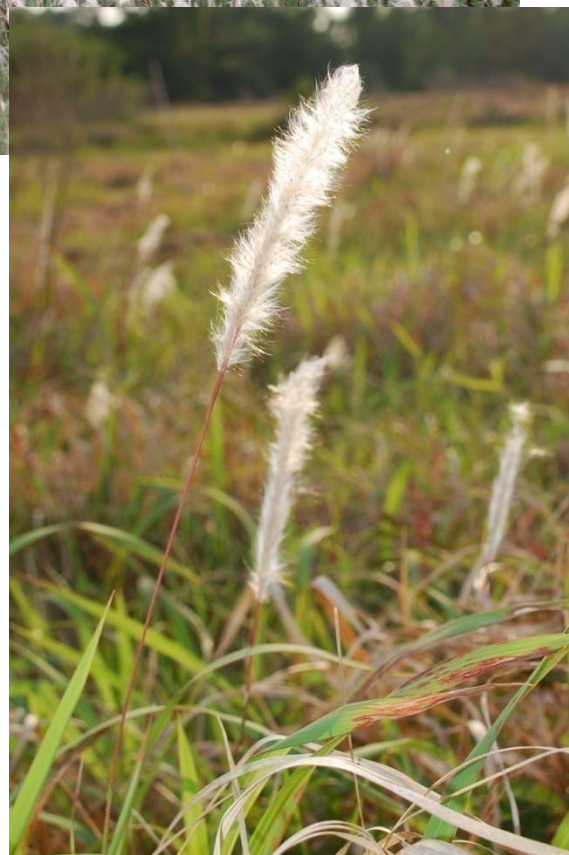



UGA1197016

It is all coming together…

- 2007 Cogongrass Conference
- 2008 AL Cogongrass State Task Force
  - MOU
  - Strategic Plan

- What was missing? $$$$$$$$$$$$$

Alabama Forestry Commission

- American Recovery and Reinvestment Act of 2009
  - 6.3 million dollar cogongrass grant
  - 3 year period
- Goals of grant
  - Create jobs
  - Stimulate economy
  - Get it done on the ground!
- www.forestry.alabama.gov

Cogongrass ERADICATION?!??!

- What does that mean?

Eradication Definition (Part 1)

- The complete elimination of ALL living propagules, including sexual and asexual…
  - Seeds
  - Rhizomes
  - Shoots
  - Roots
  - Corms
  - Tubers
  - Crowns

Cogongrass Seed

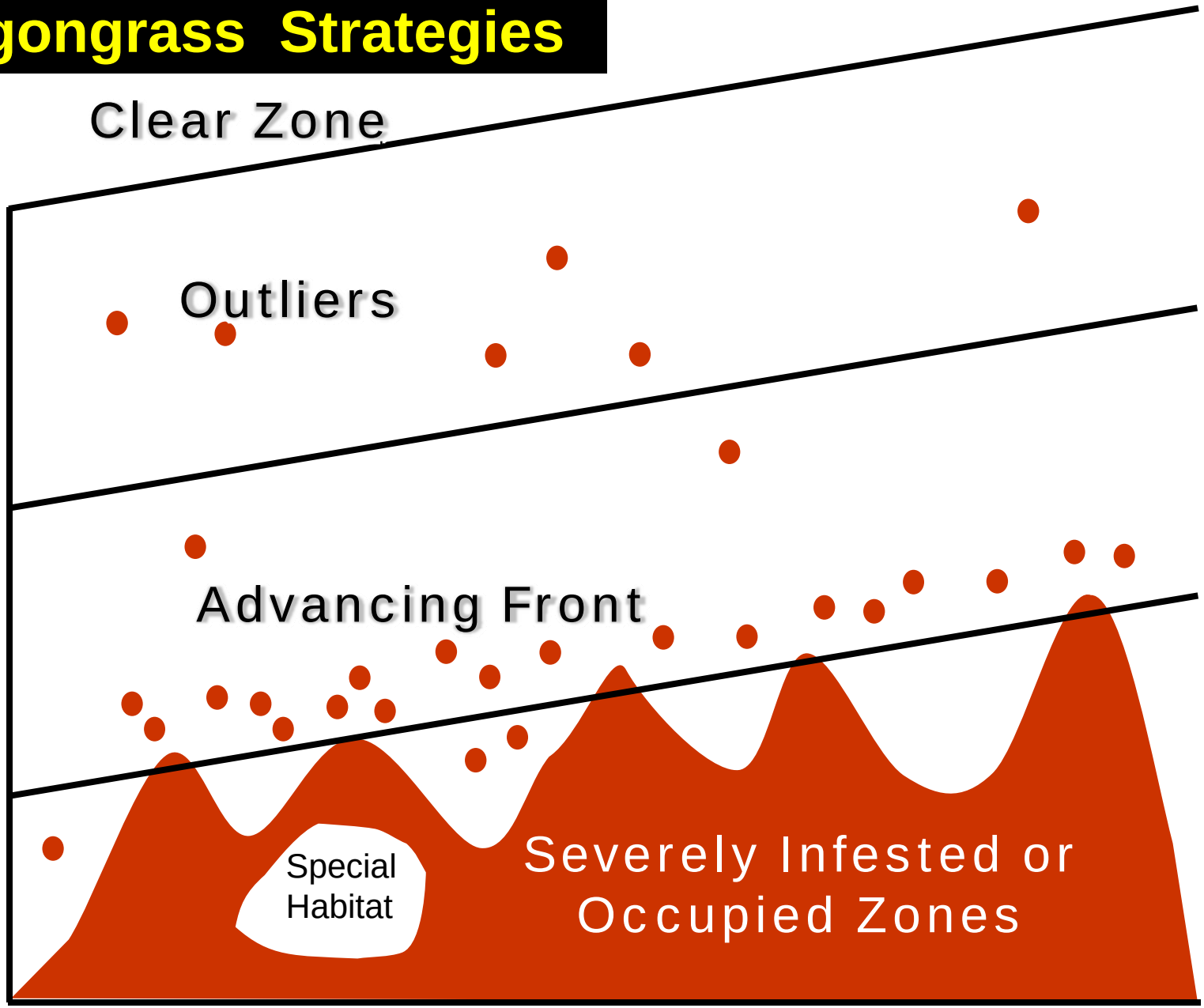
- No seed dormancy mechanisms have been found
- Complete loss of viability after 12 months

Cogongrass Rhizomes

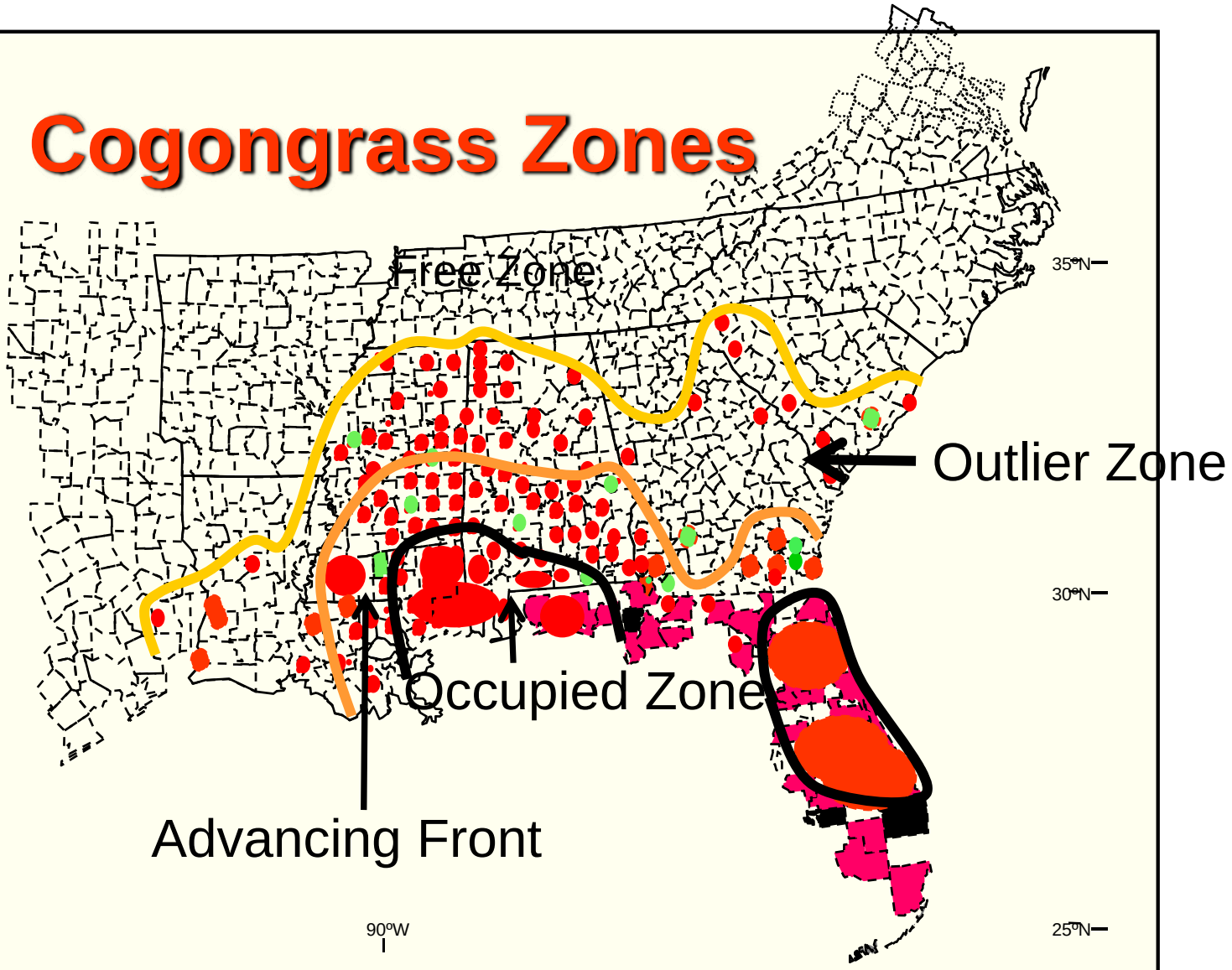
Eradication definition (Part 2)

- The complete elimination of ALL living propagules, including sexual and asexual…
- …within a defined boundary
  - Single patch
  - Watershed
  - County
  - State
  - National
  - Continental
  - Private, Federal or State lands

Cogongrass Strategies



Cogongrass Zones



How to do it?

What have we learned?

Cogongrass Eradication Studies? Non-crop situations

- Published “control” studies have focused on achieving at least 80% control for 12-24 months after treatment
  - No single application of a herbicide or combination of herbicides has resulted in 100% rhizome kill in any published study
  - No published studies have followed a repeated treatment series until rhizome control is 100%
  - Much observational evidence of eradication

Cogongrass Eradication Studies? Agricultural Situations

- Cogongrass does not tolerate many conventional farming practices
  - Repeated deep tillage
  - Glyphosate tolerant crops
- No published studies documenting cogongrass eradication with agronomic methods

Cogongrass Eradication Studies? Forestry Situations

- Good data for cogongrass control and pine establishment but no eradication studies

Why the lack of data?

- "Control" studies are easier to do than eradication studies
  - Funding for most studies that have been done is typically on an annual basis
- Available data on other weeds from NC, CA, and Australia have shown eradication to be extremely expensive and nearly impossible for many situations
  - CAVEAT: Deeply rooted species with long-lived seedbanks

Research Questions

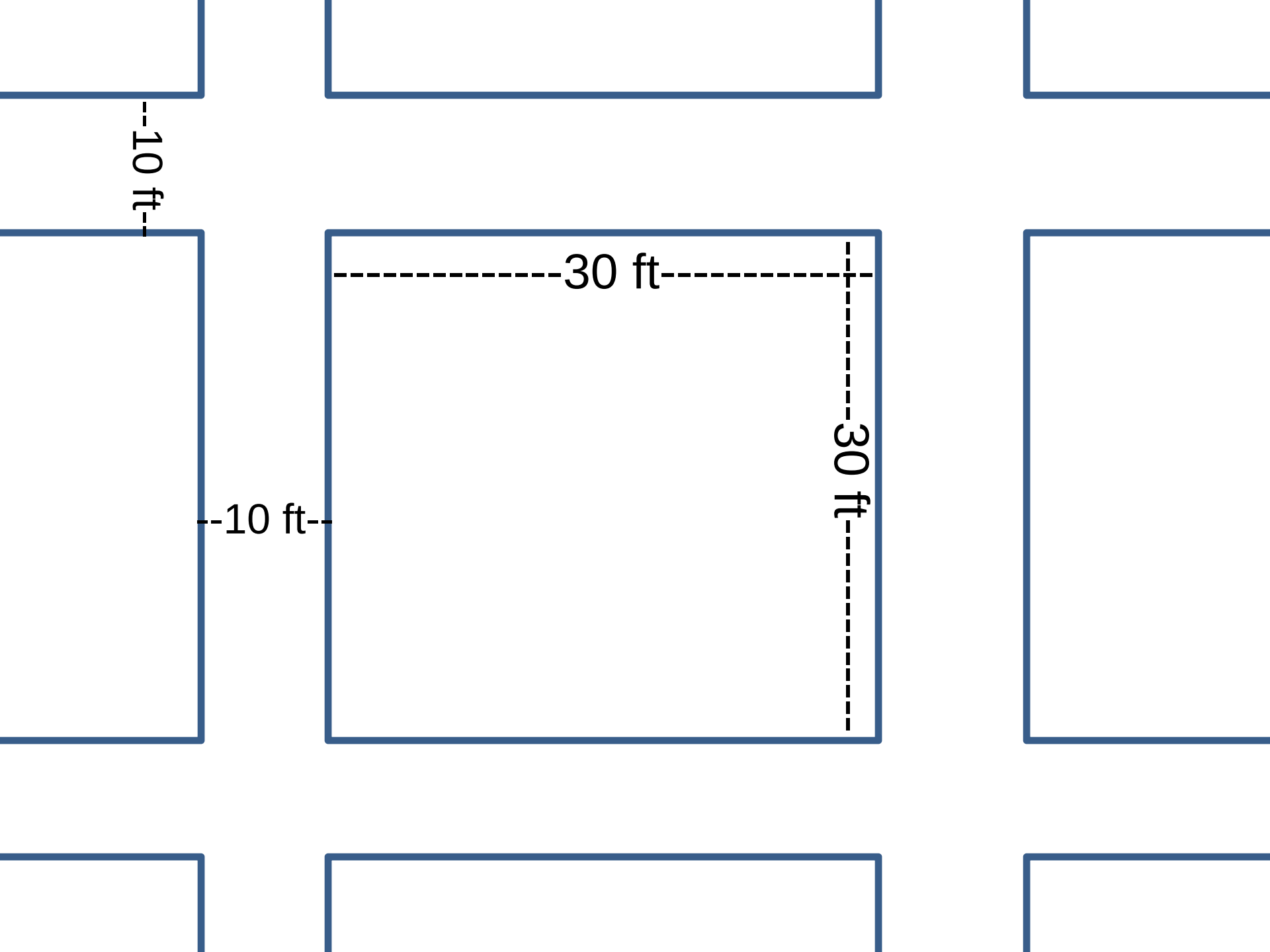
- Can cogongrass patches be eradicated?
  - Should you use glyphosate, imazapyr, or both?
  - Does the spray timing matter?
    - Spring, summer or fall?
  - Is any one timing/herbicide approach faster or better than another?
- How does treatment impact cogongrass rhizome energy reserves?

Experimental Design

- 2 locations
  - Evonik Degussa site near Tilman's Corner, AL
  - State Lands site near Bayou La Batre, AL
- Plots arranged in a randomized complete block design with four replicate plots per treatment

Experimental Design Cont.

- Herbicides
  - Glyphosate 4 lb/A
    - Accord Concentrate
  - Imazapyr 0.75 lb/A
    - Chopper Gen2
  - Glyphosate (4 lb/a) + Imazapyr (0.75 lb/a)
- Annual Treatment Timings
  - May 2008, 2009, …
  - August 2008, 2009, …
  - October 2008, 2009, …


10 ft
30 ft
30 ft
10 ft

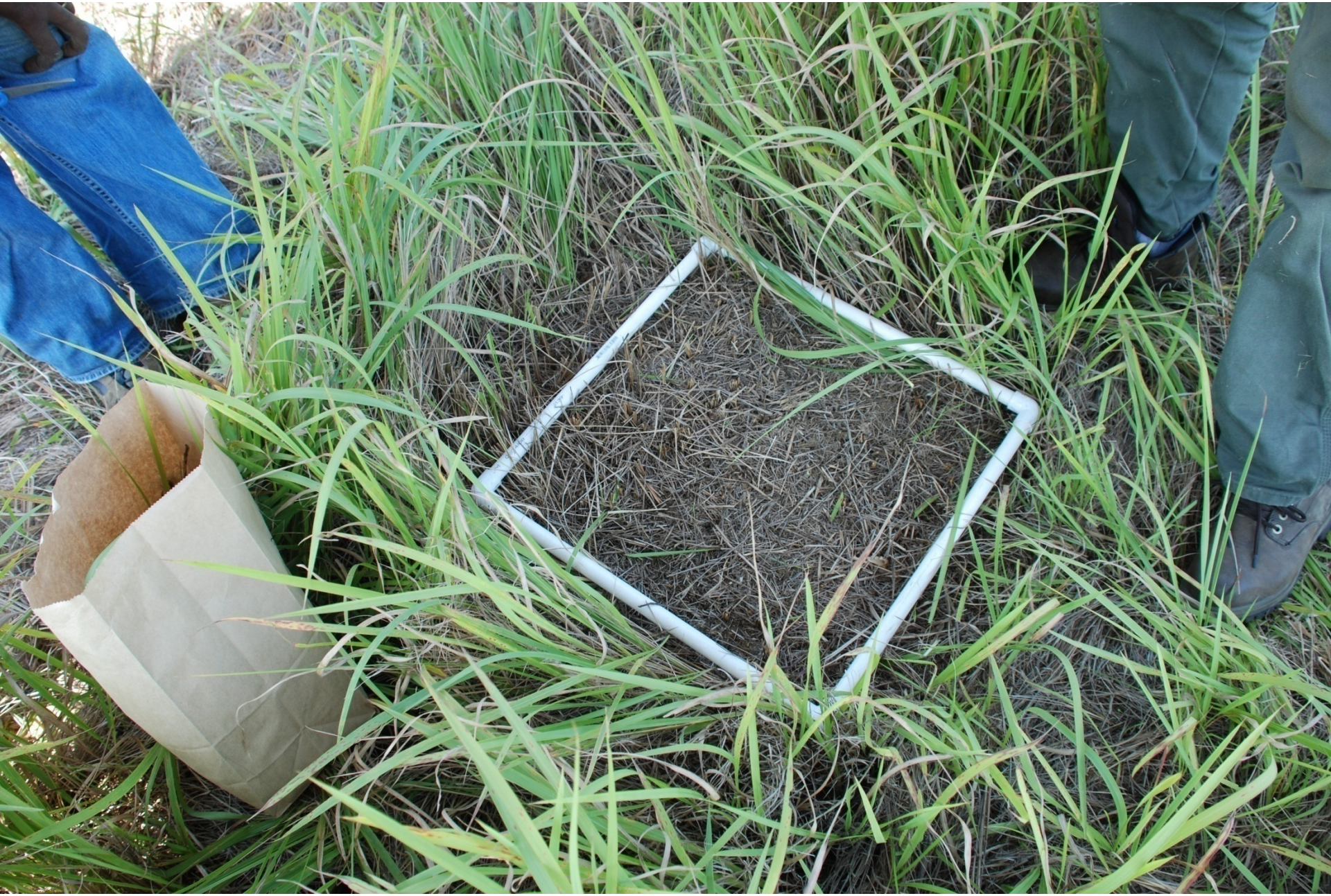
Methods

- Herbicides broadcast applied at 20 GPA
- NIS added to glyphosate (0.5%v/v)
- MSO added to imazapyr (1 qt/A)

- At both sites, rhizome depth is less than 8 inches and mostly in the top 4-6 inches
- Rhizome depth corresponds with the A (topsoil) horizon and some rhizomes run horizontally at the A-B horizon interface
  - Excavated ~200 holes so far-**NO** rhizomes any deeper

Data collection

- In May, July, and October each year
- Visual % control
- Vegetative cover
- Shoot biomass
- Rhizome biomass
- Rhizome TNC content




GREATEST
EMPEX


TRUE TEMPER

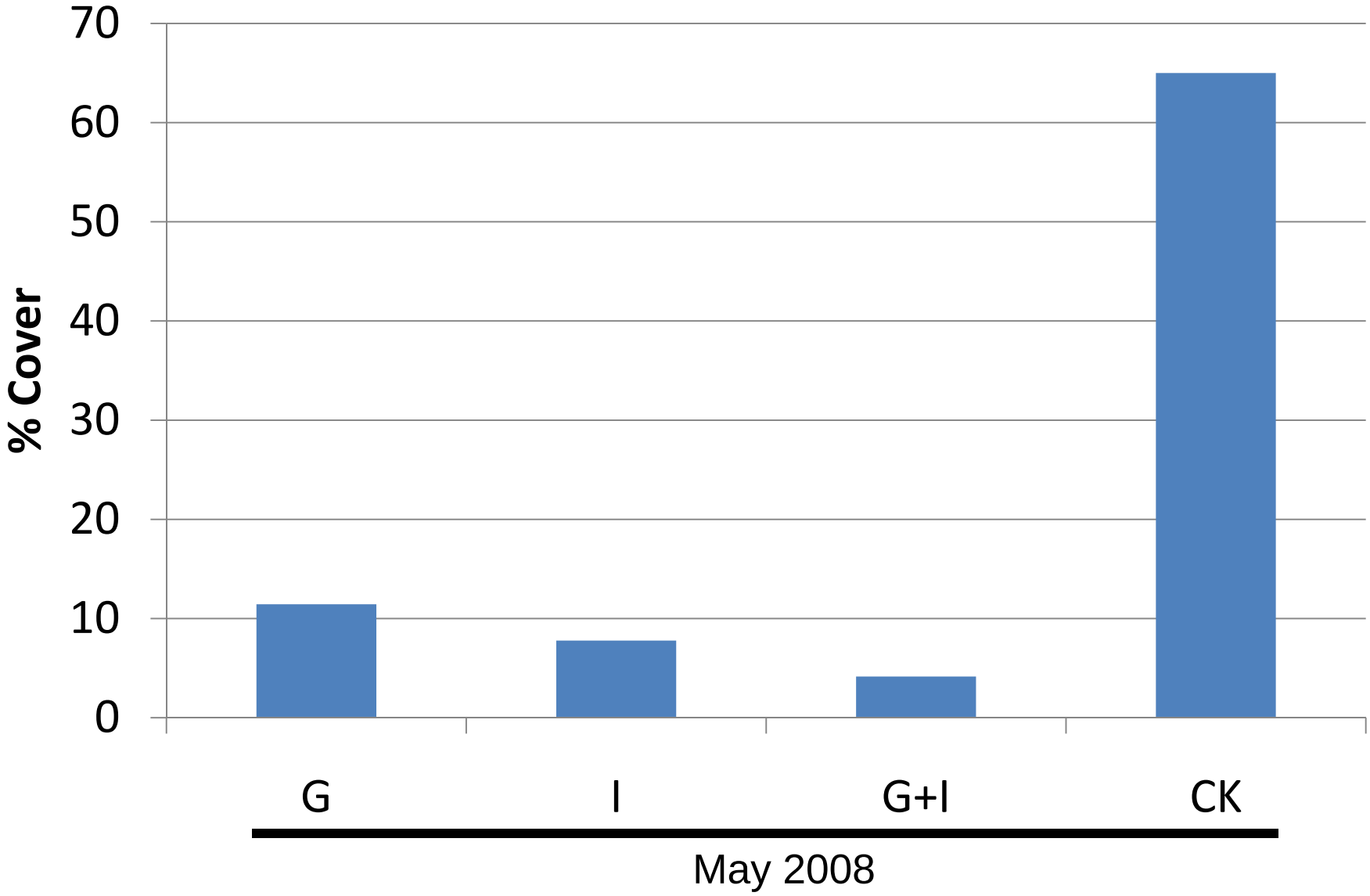
Lab Work

- Total Nonstructual Carbohydrate (TNC) content in the rhizomes
- Individual healthy rhizomes selected from each sample, freeze dried, and analyzed for TNC

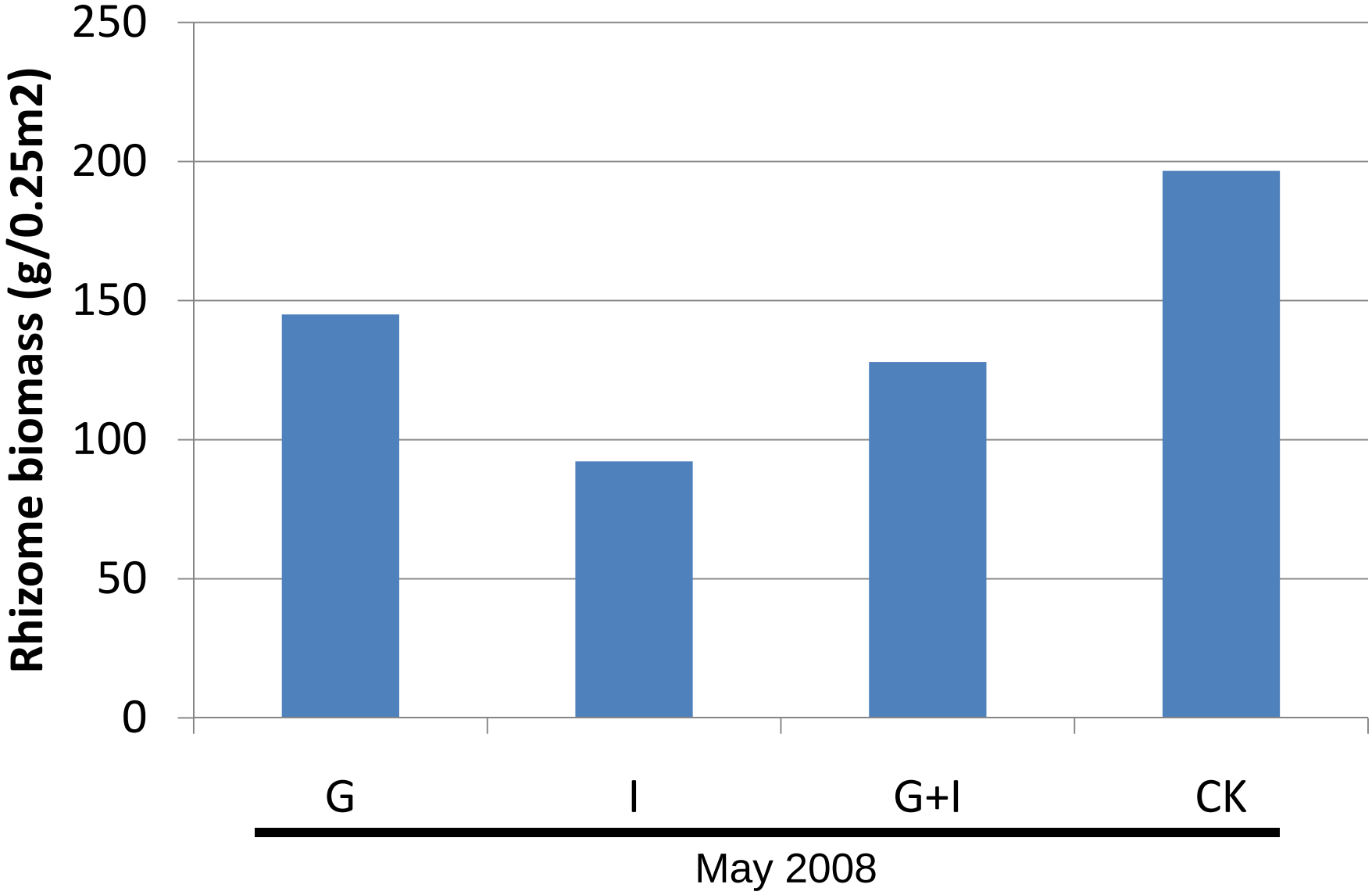
Results

What we have found so far!

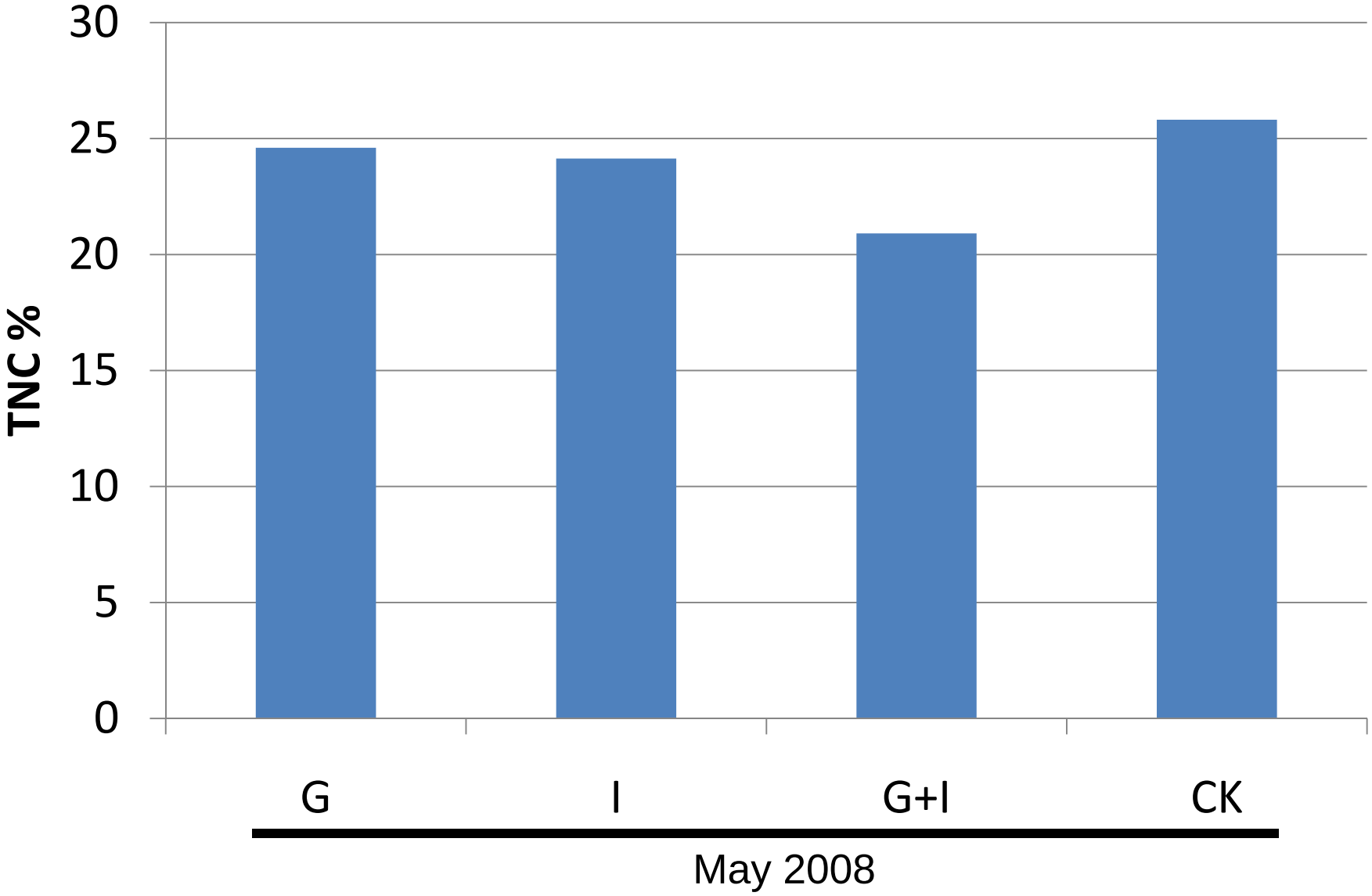
Degussa % Vegetative Cover
Sample Date: July 2008

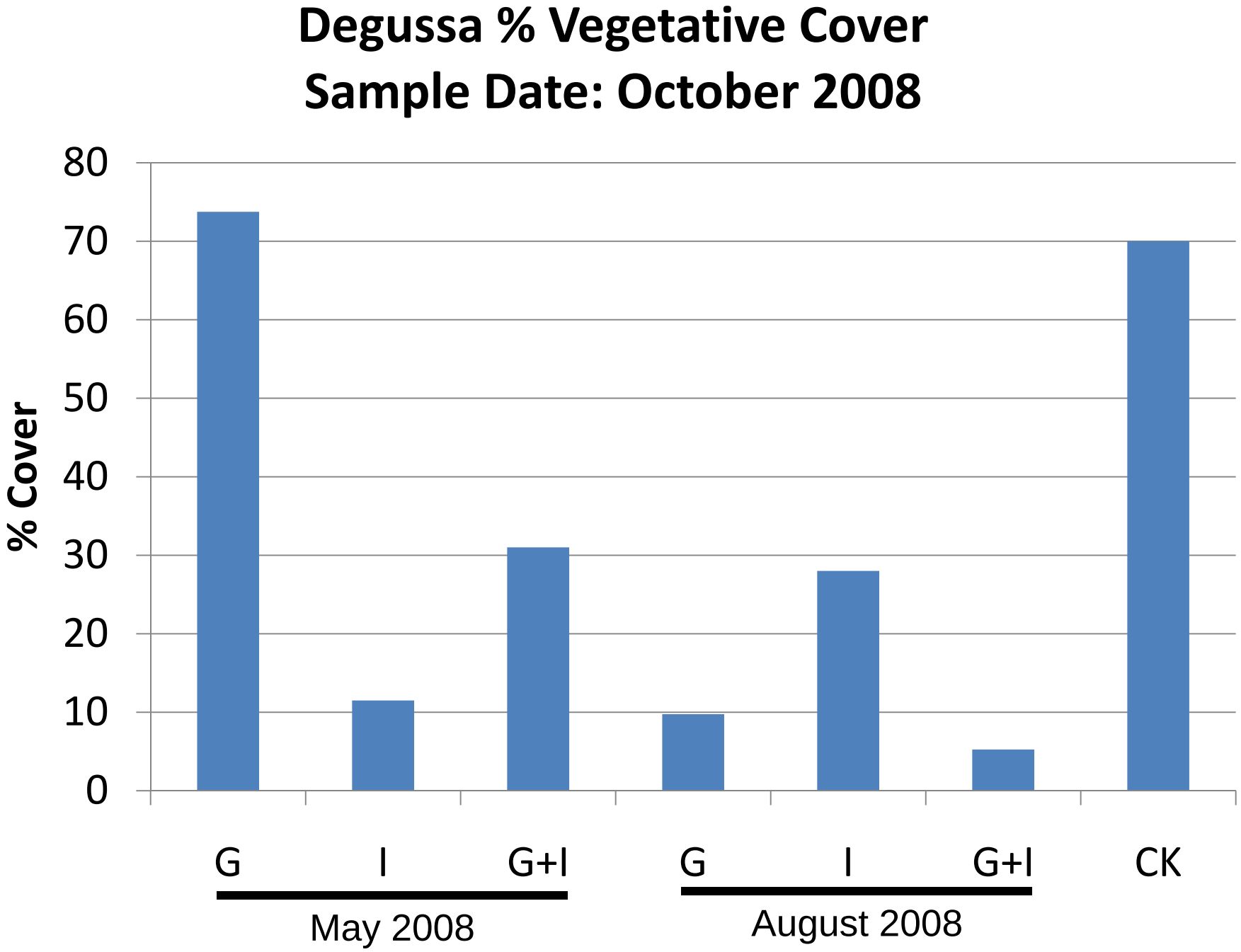


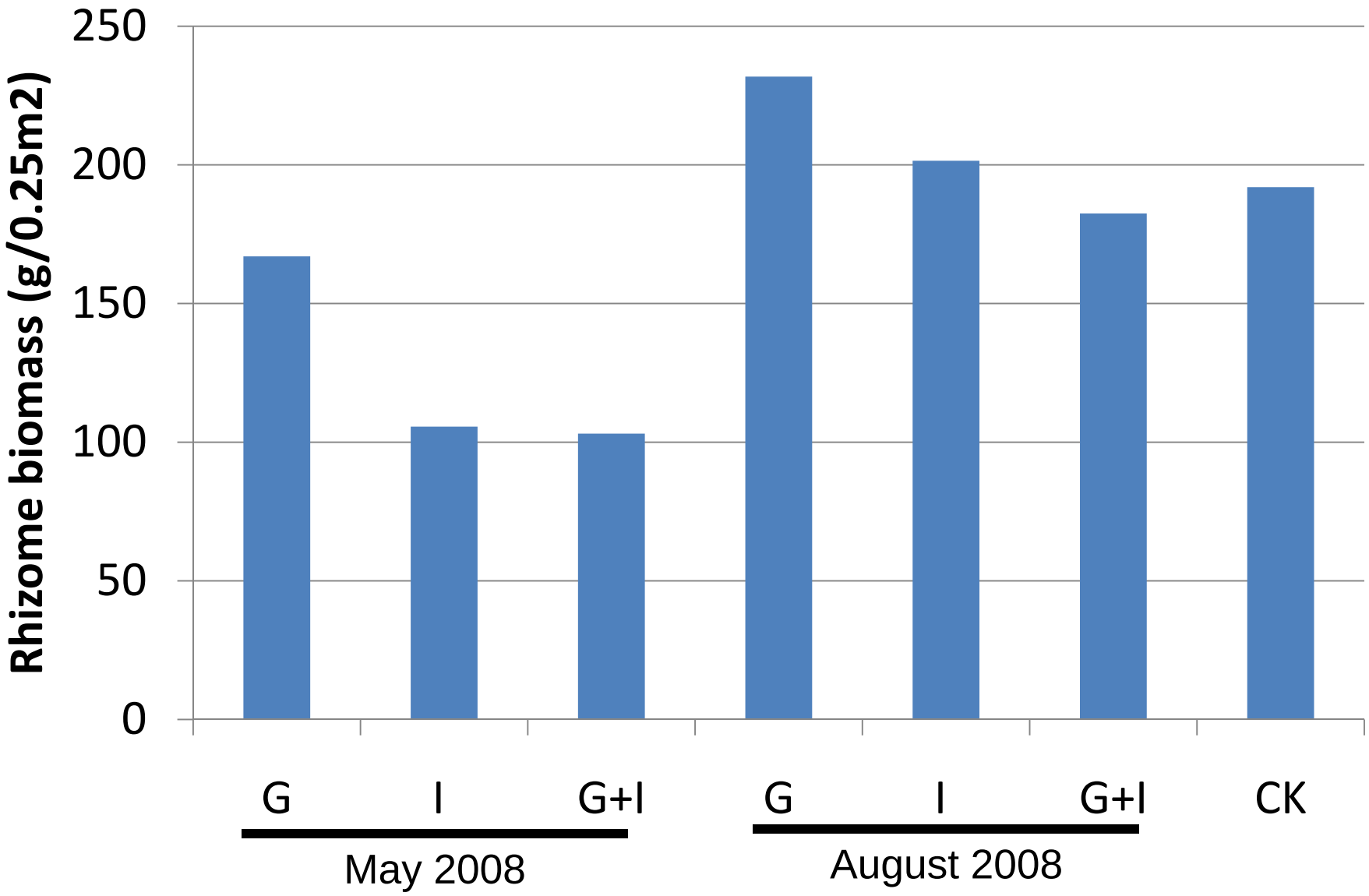
Degussa Rhizome Biomass
Sample Date: July 2008



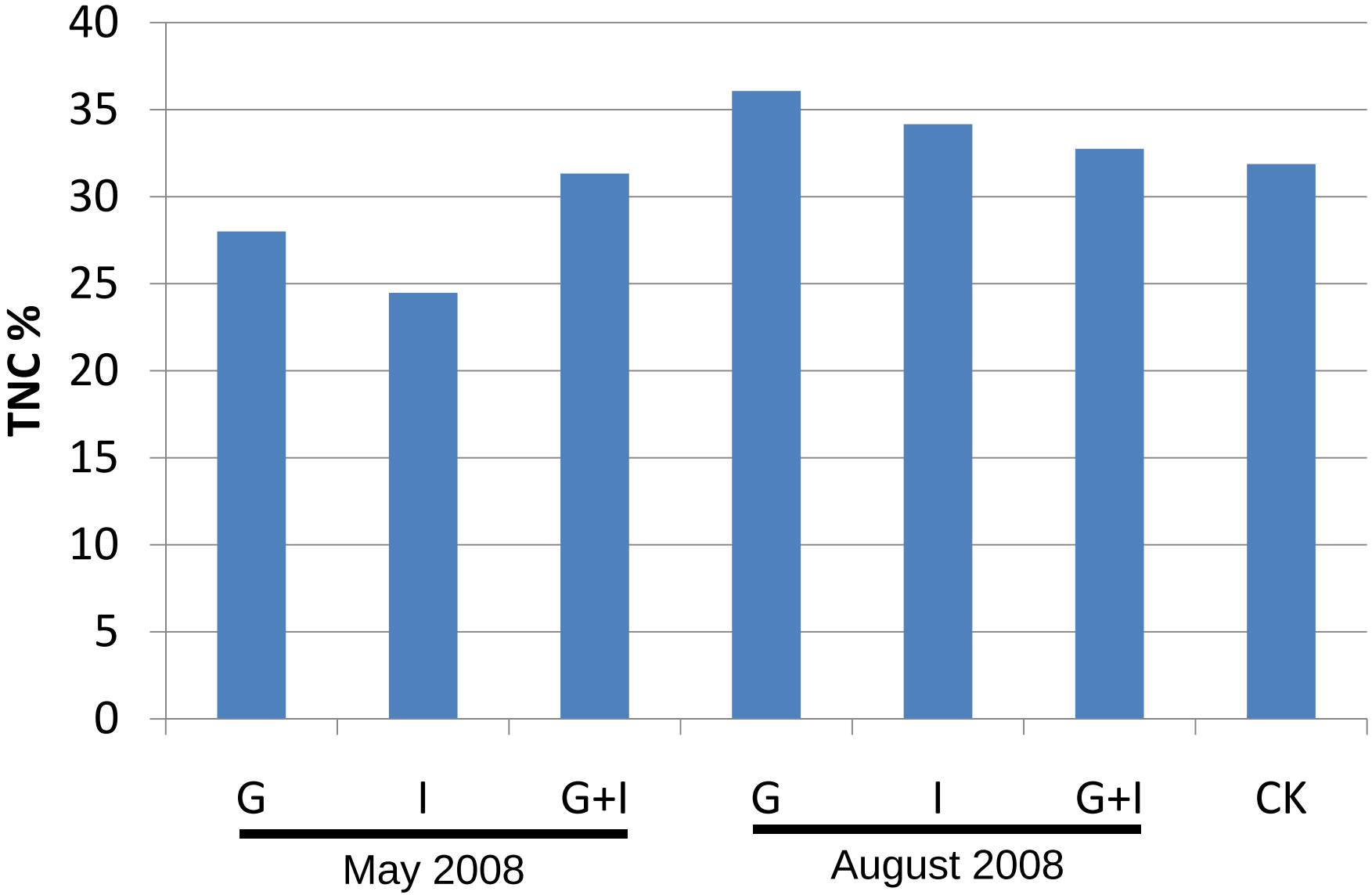
Degussa Total Nonstructural Carbohydrates
Sample Date: July 2008




Degussa % Vegetative Cover
Sample Date: October 2008
% Cover
80
70
60
50
40
30
20
10
0
G
I
G+I
G
I
G+I
CK
May 2008
August 2008


Degussa Rhizome Biomass
Sample Date: October 2008
Rhizome biomass (g/0.25m2)
250
200
150
100
50
0
G
I
G+I
G
I
G+I
CK
May 2008
August 2008

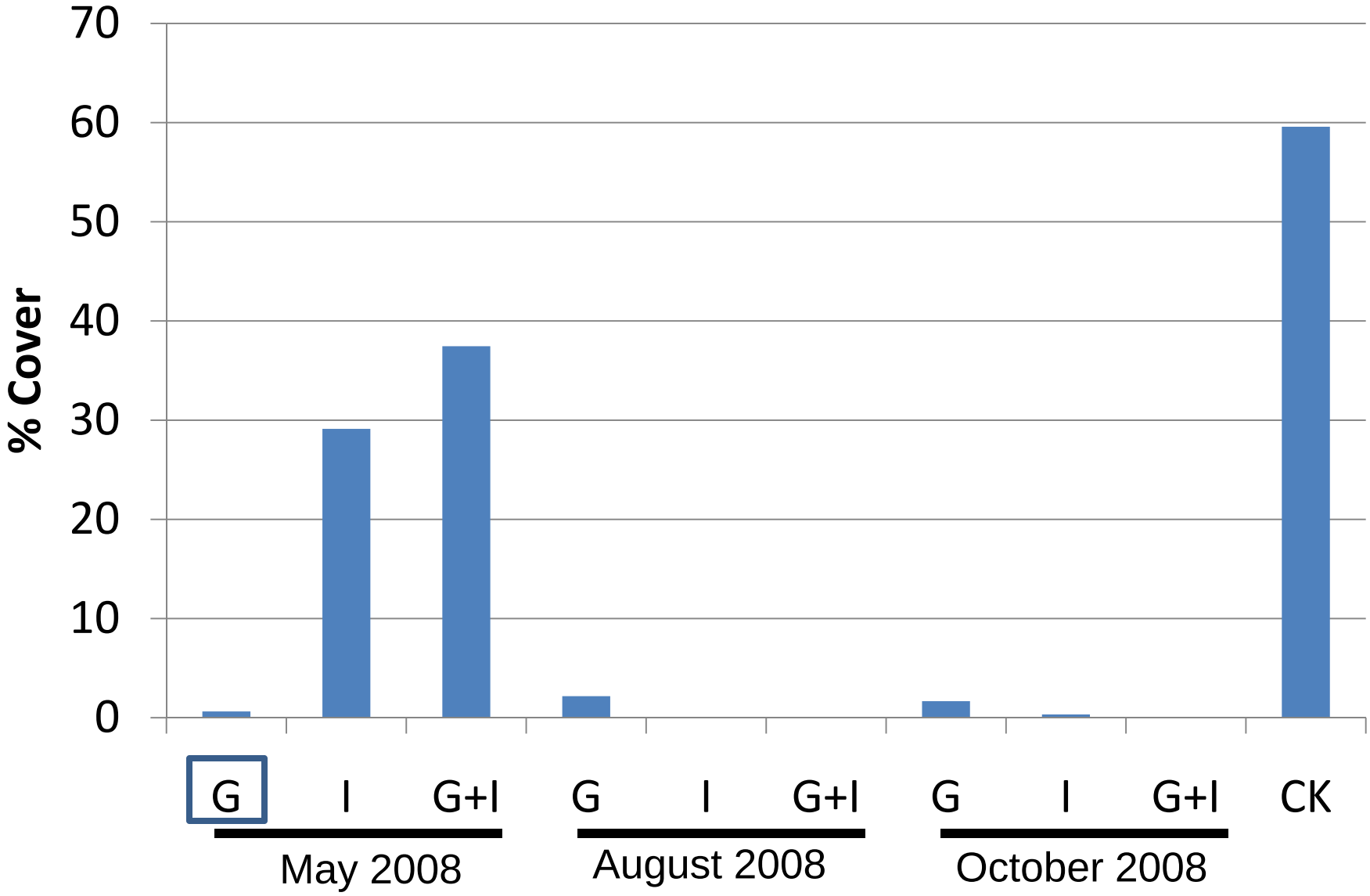
Degussa Total Nonstructural Carbohydrates
Sample Date: October 2008



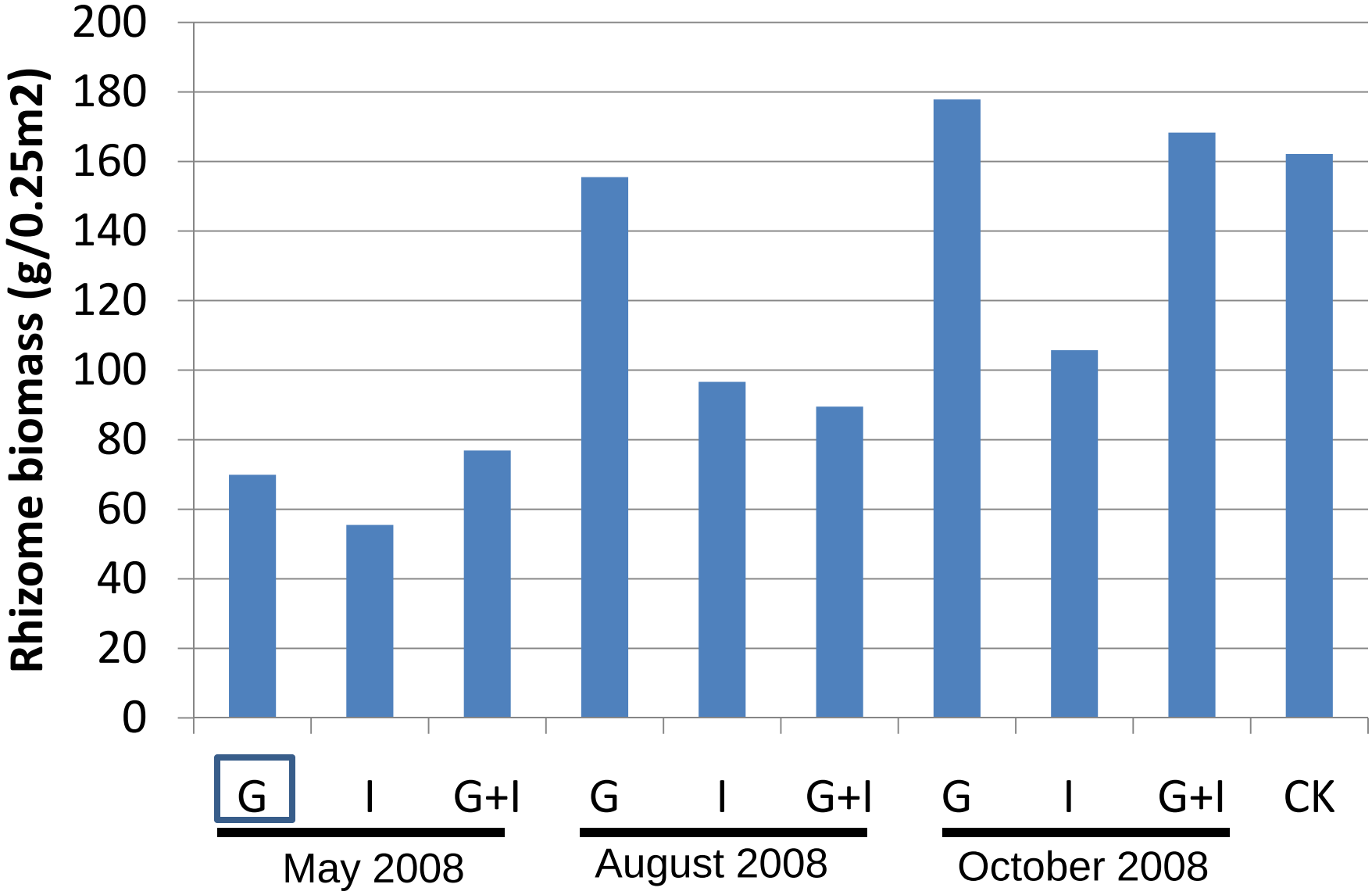
Change of Plan!

- Glyphosate treatment applied in April had failed by October, so we retreated only that treatment!

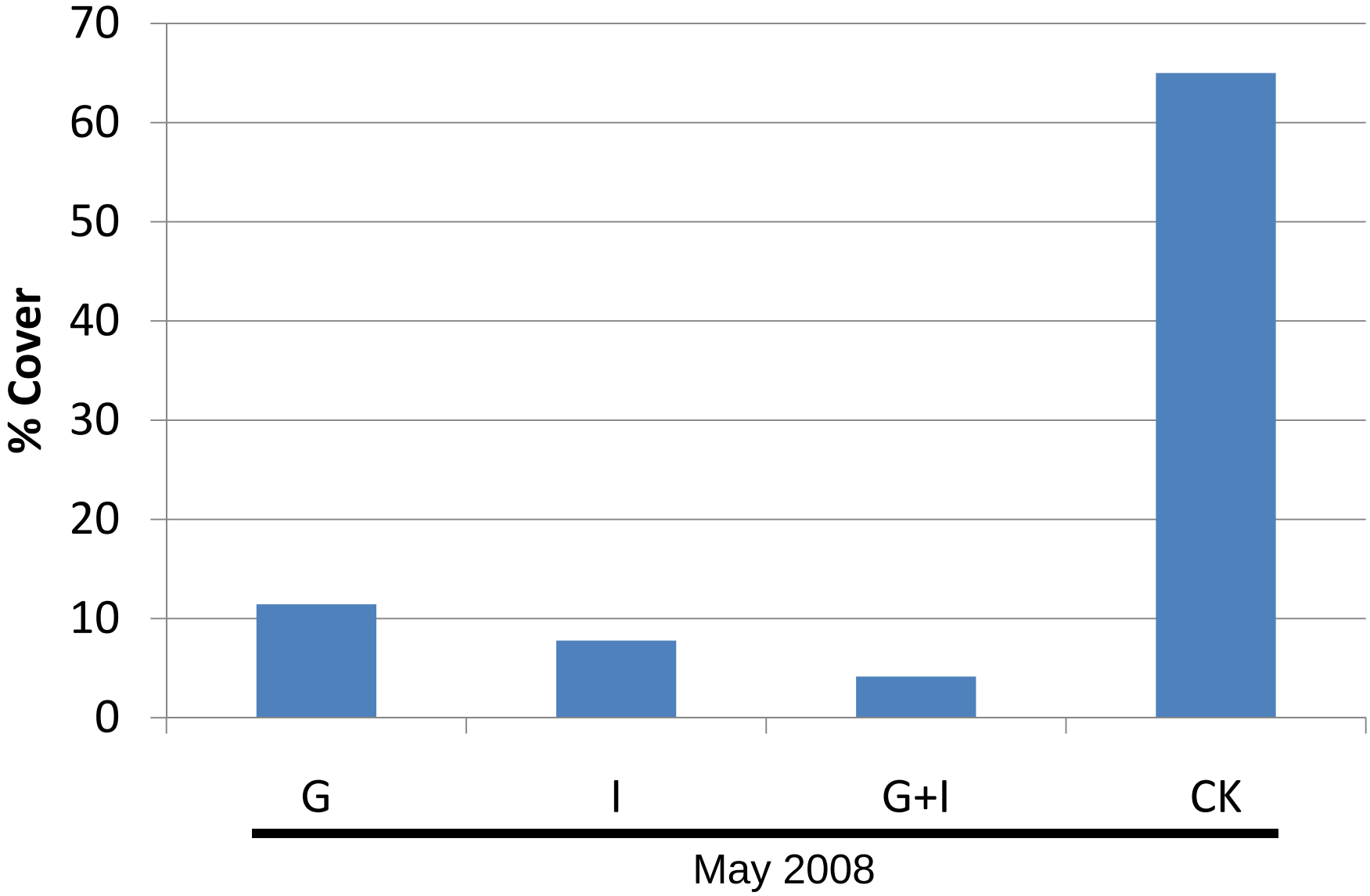
Degussa % Vegetative Cover
Sample Date: April 2009



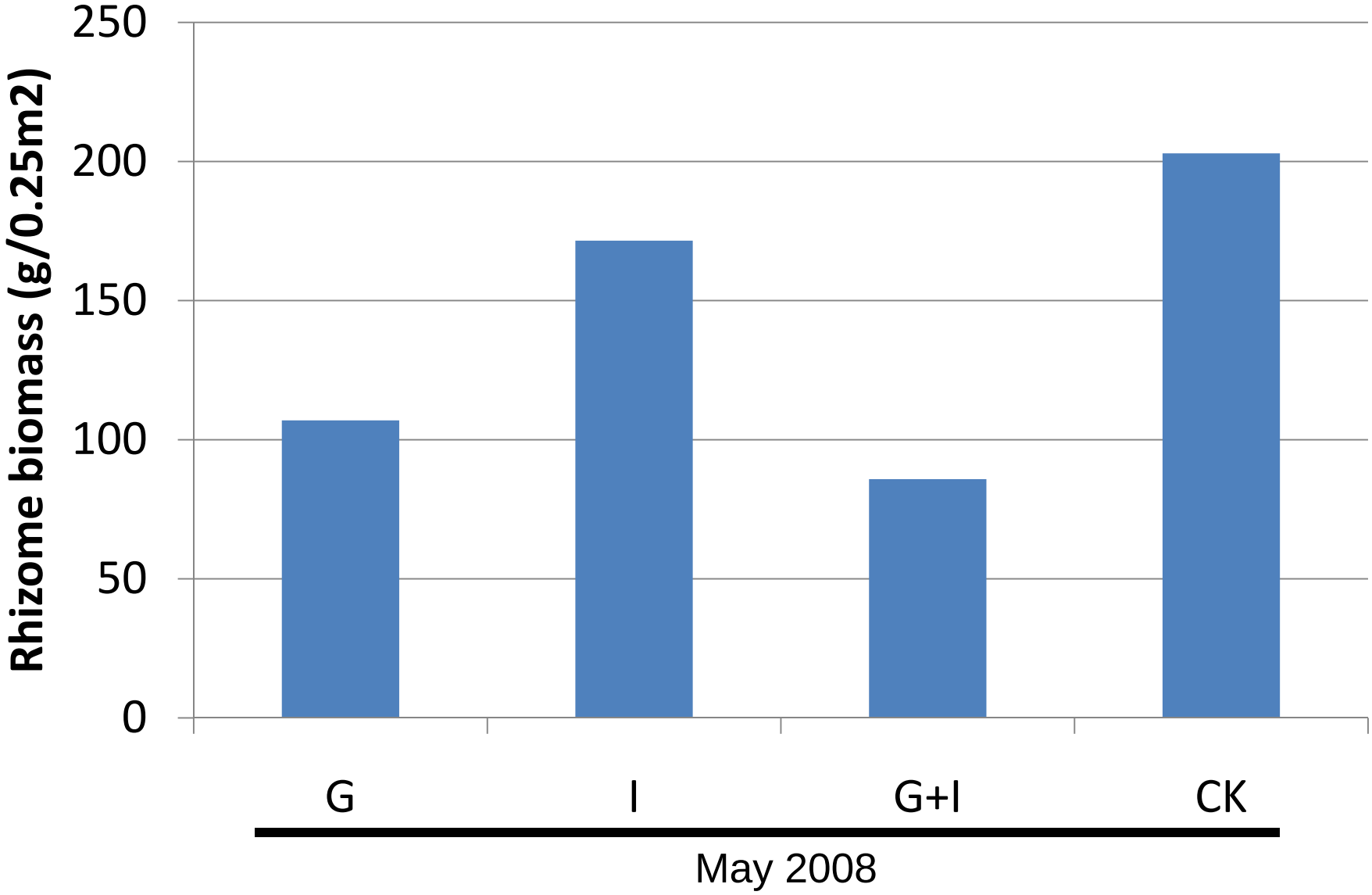
Degussa Rhizome Biomass
Sample Date: April 2009



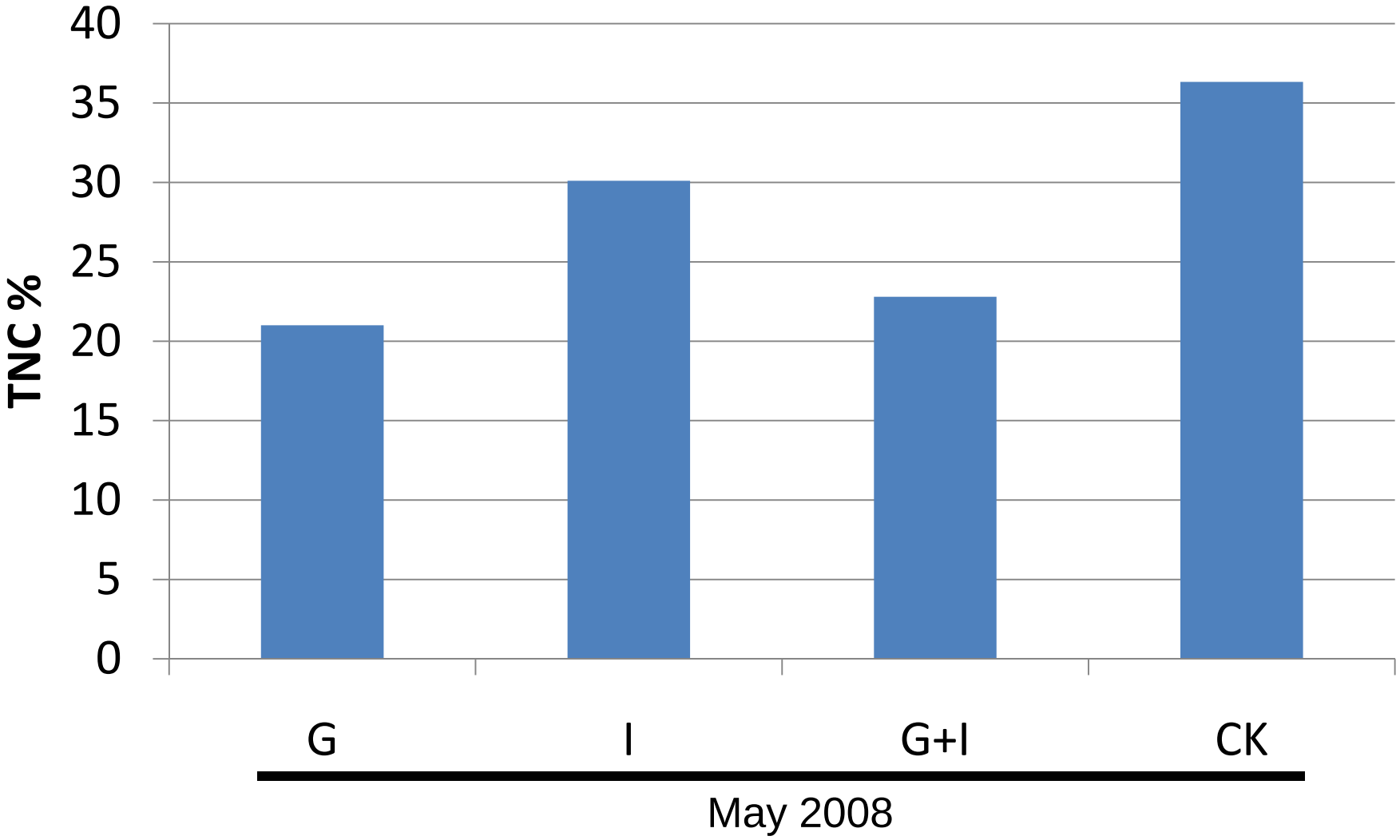
Bayou La Batre % Vegetative Cover
Sample Date: July 2008

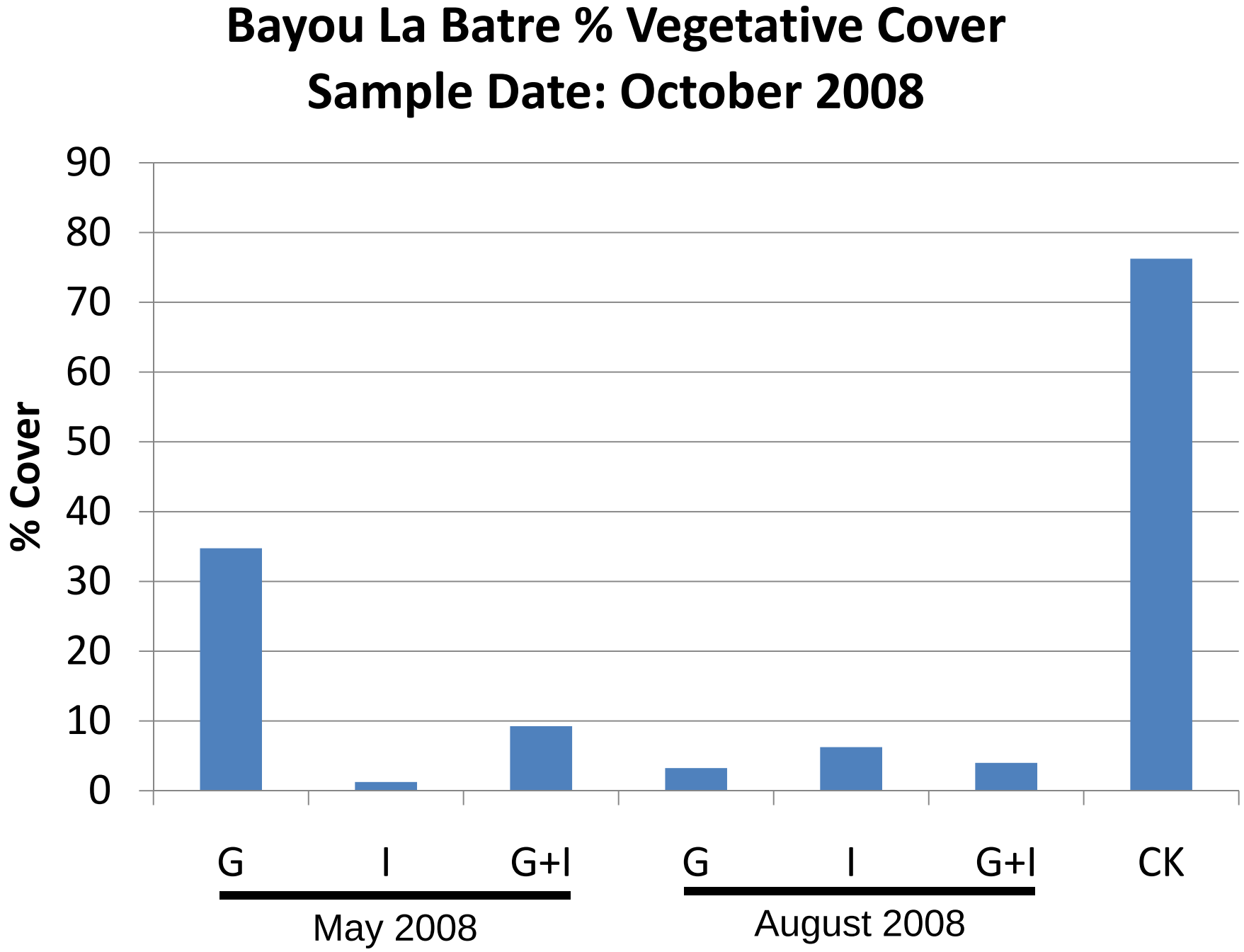


Bayou La Batre Rhizome Biomass
Sample Date: July 2008

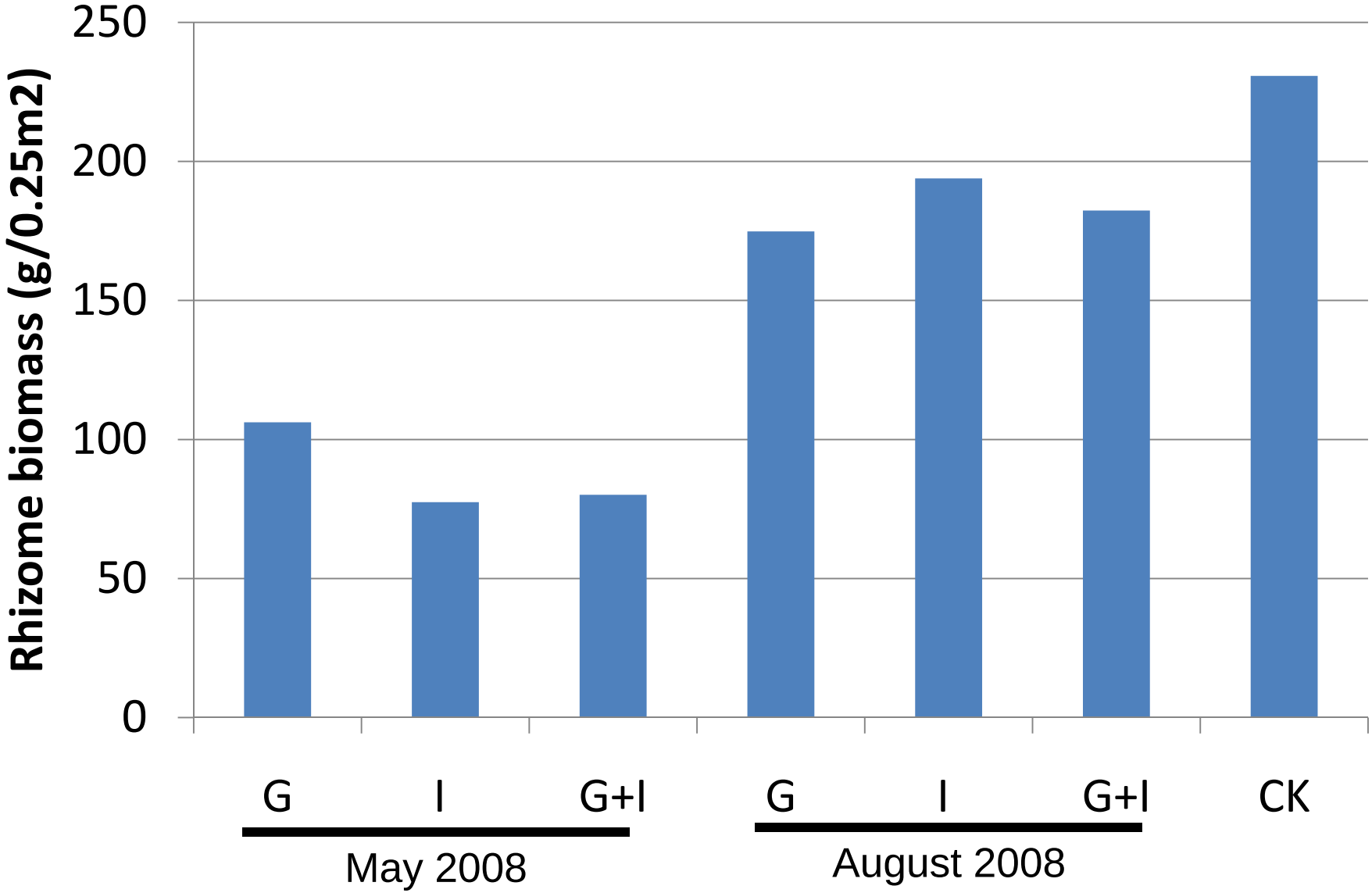


Bayou La Batre Total Nonstructural Carbohydrates
Sample Date: July 2008

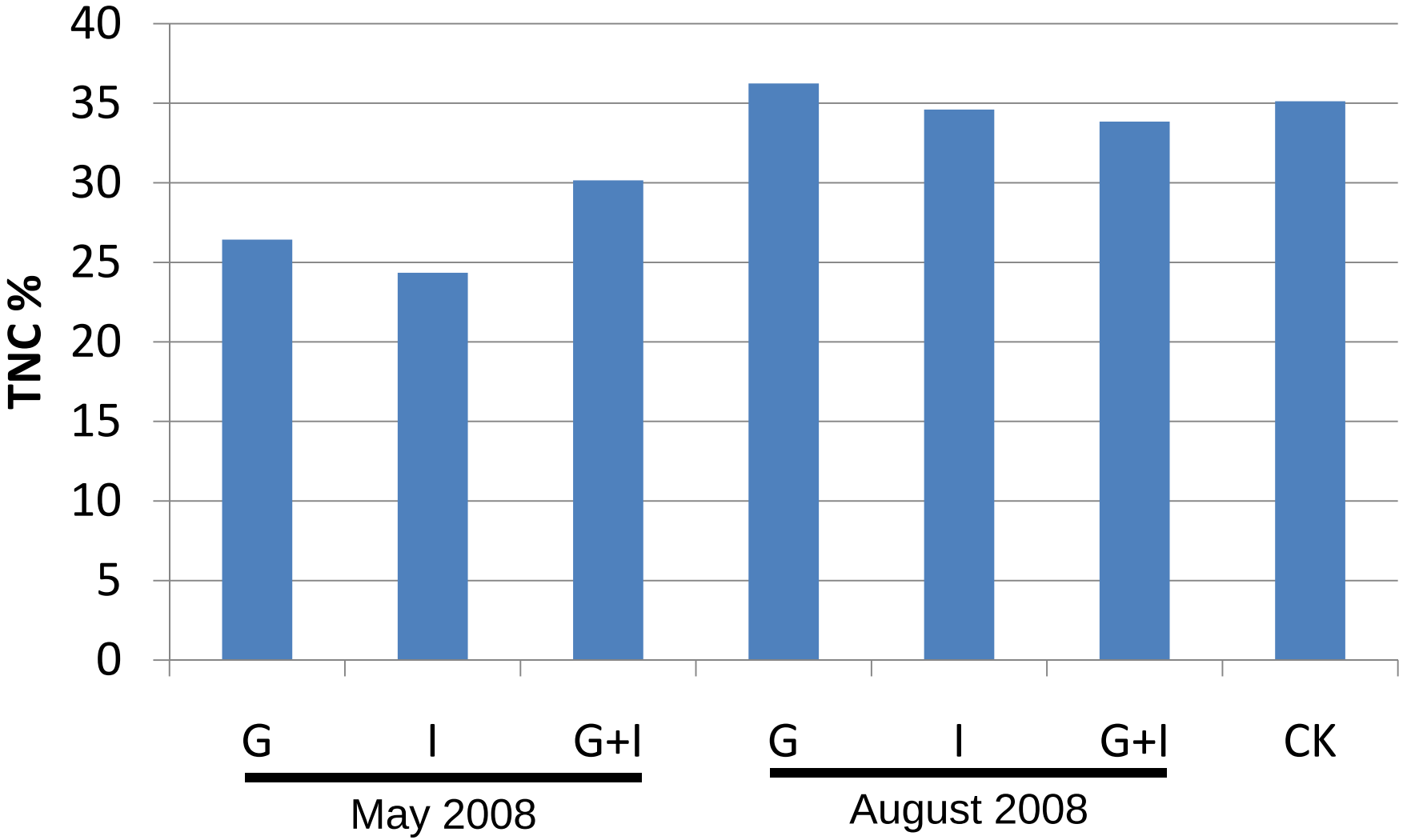



Bayou La Batre % Vegetative Cover
Sample Date: October 2008
% Cover
90
80
70
60
50
40
30
20
10
0
G
I
G+I
G
I
G+I
CK
May 2008
August 2008

Bayou La Batre Rhizome Biomass
Sample Date: October 2008



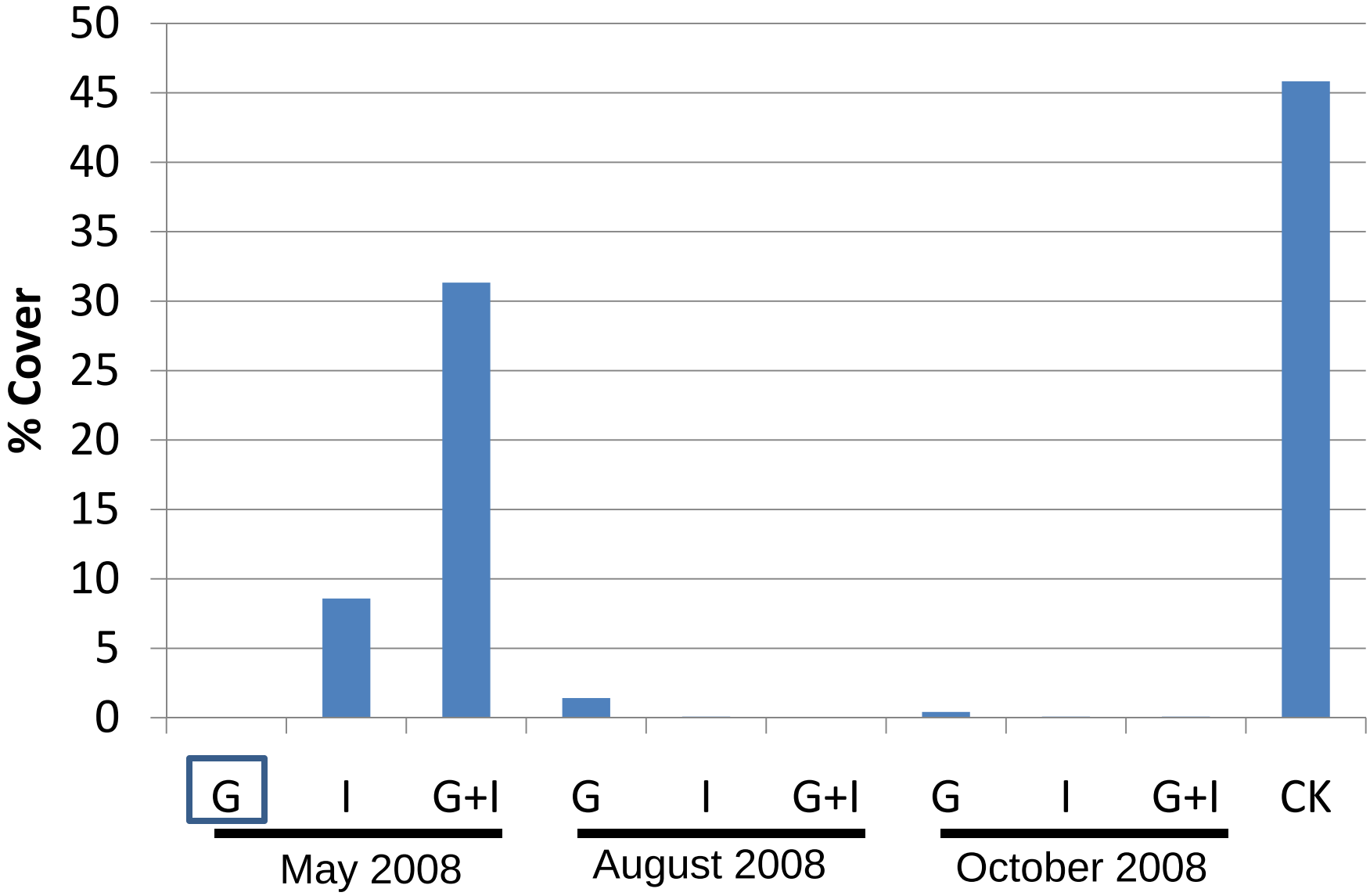
Bayou La Batre Total Nonstructural Carbohydrates
Sample Date: October 2008



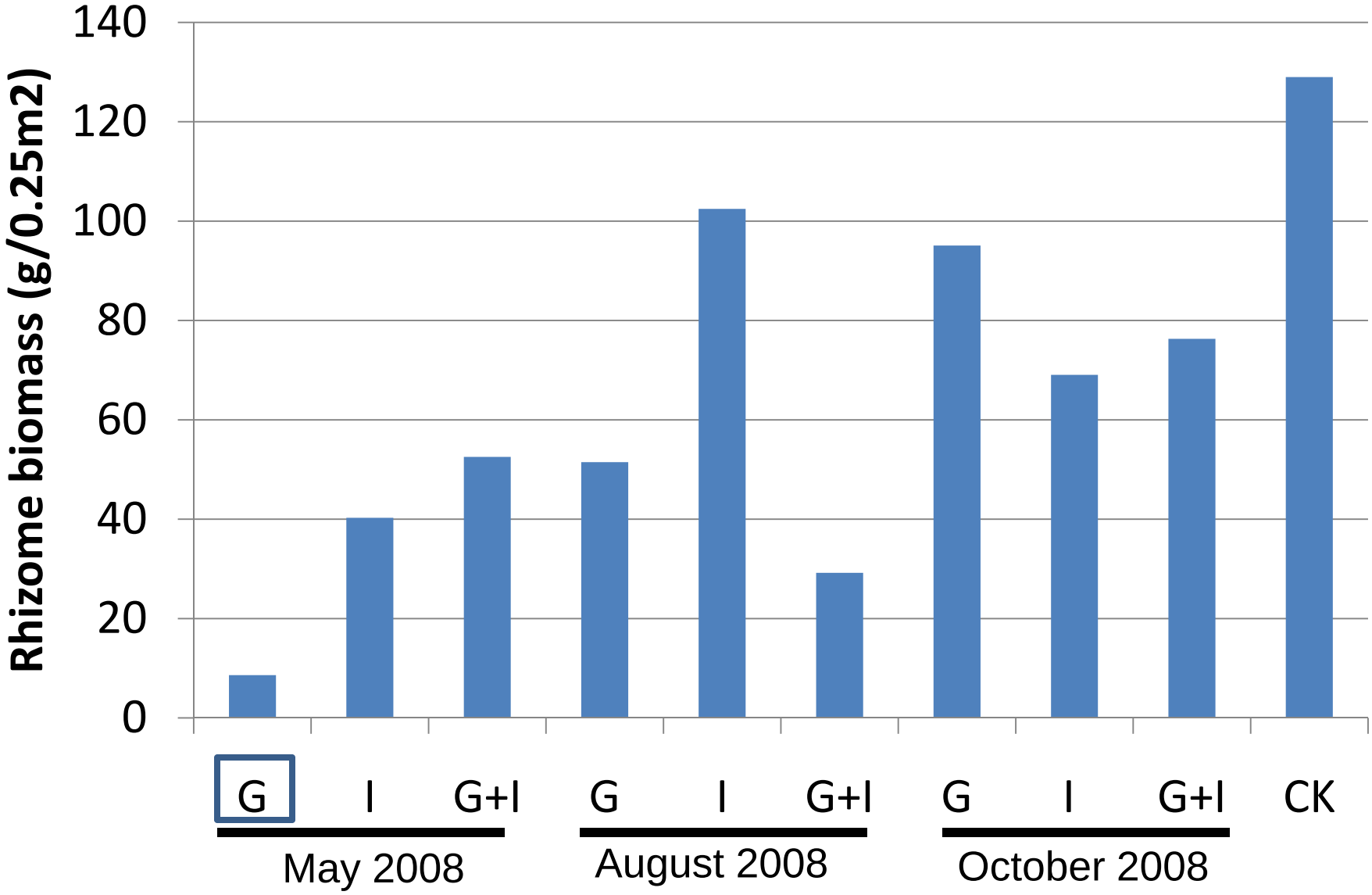
Change of Plan!

- To be consistent with the Degussa site, the glyphosate treatment applied in April was also retreated in October

Bayou La Batre % Vegetative Cover
Sample Date: April 2009



Bayou La Batre Rhizome Biomass
Sample Date: April 2009



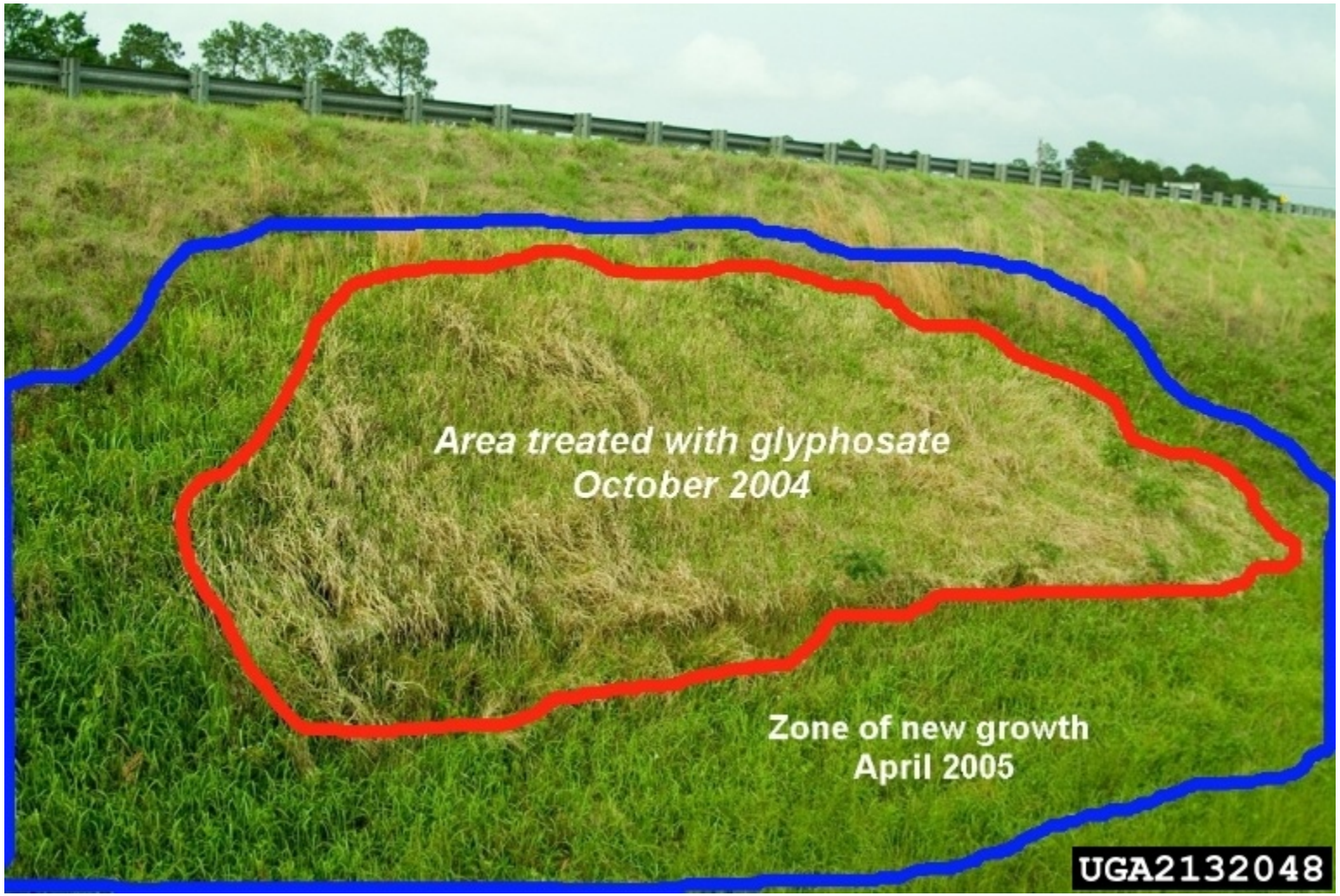
Summary to date

- Variation in efficacy across sites
- All herbicide treatments are negatively impacting cogongrass rhizomes
- TNC reserves not greatly impacted in first year by any treatment/timing
- Still too early to determine if treatment/timing is critical for eradication success

Future questions that are screaming to be asked!

- Why is there variation between sites?
  - Genotypes?
  - Rhizome depth?
    - When and where are they deeper?
    - Does that impact treatment efficacy?

What about the halo effect?



- What about restoration / revegetation during the treatment process?

Eradication Study Sponsors

- USDA Forest Service Southern Research Station (Thank you Jim Miller!)
- Alabama Agricultural Experiment Station
- Auburn University
- Alabama Cooperative Extension System
- Evonik Degussa (formerly Degussa)
- Alabama Department of Conservation and Natural Resources State Lands Division

ALIPC Educational Grants Program

- New for 2009
- Mission: To provide funding for educational efforts on invasive plants in Alabama
- Program announced in early January
- Proposals were due March 31
- 9 Proposals received

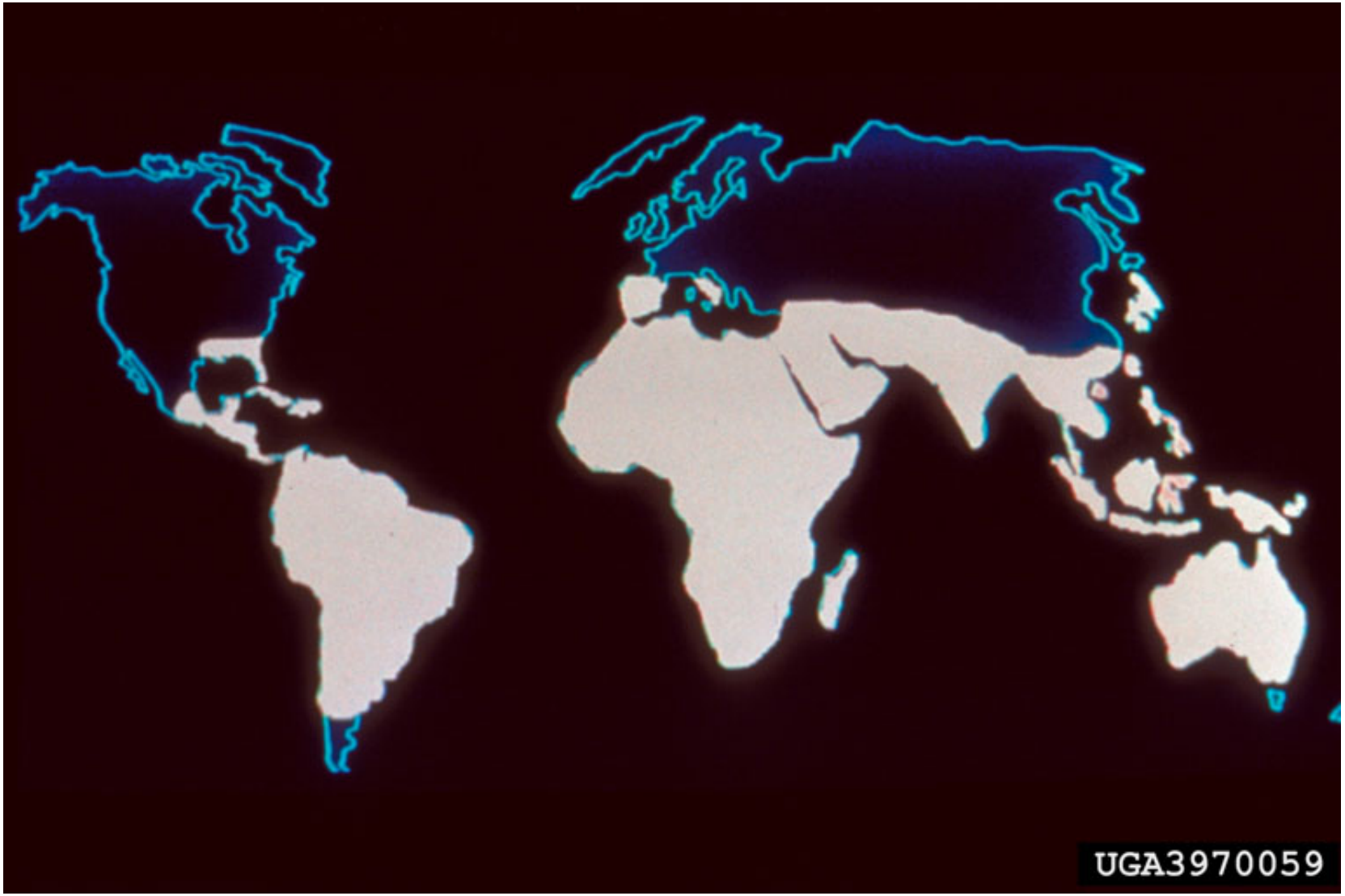
Winner(s)

- Stephanie Chance
  - Urban Forestry
  - City of Montgomery

“Alien Invasion”

Winner(s)

- Don Collier, Calhoun Community College
  - Wheeler Wildlife Refuge Association
- Proposal title Wheeler Wildlife Refuge Invasive Plant Guide



"Cosmopolitan species" occupying an estimated 500 million ha worldwide

Impacts on Systems Worldwide

- Plantation crops in Asia
  - Tea, rubber, pineapple, coconut, oil palm, teak
- Mega “imperata sheet” grasslands in Indonesia
- Agronomic crops in Africa
  - Cassava, cotton, maize, peanut, upland rice, yams
- Forestry, pasture, ROW’s, natural areas in Southeastern USA

Southeast Exotic Pest Plant Council
Early Detection and Distribution Mapping System

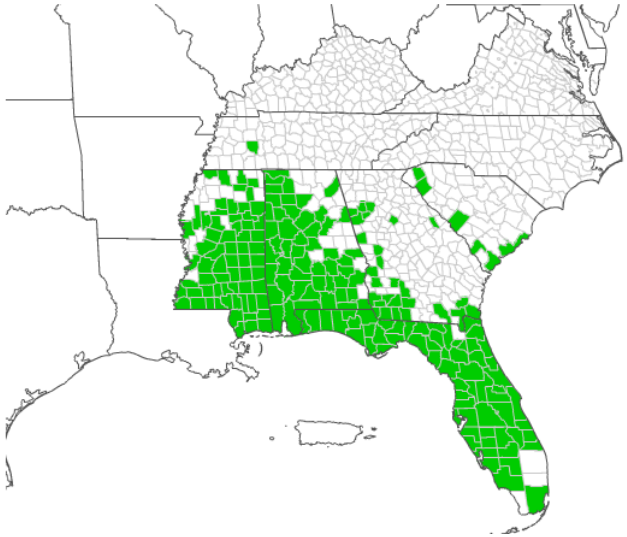
EDDMapS
Early Detection & Distribution Mapping System

cogongrass
Imperata cylindrica (L.) Beauv.

USDA PLANTS Database Symbol: IMCY
Invasive.org Images & Information

Distribution Maps: State / County / Points on Google Maps

County Distribution by State: Choose One

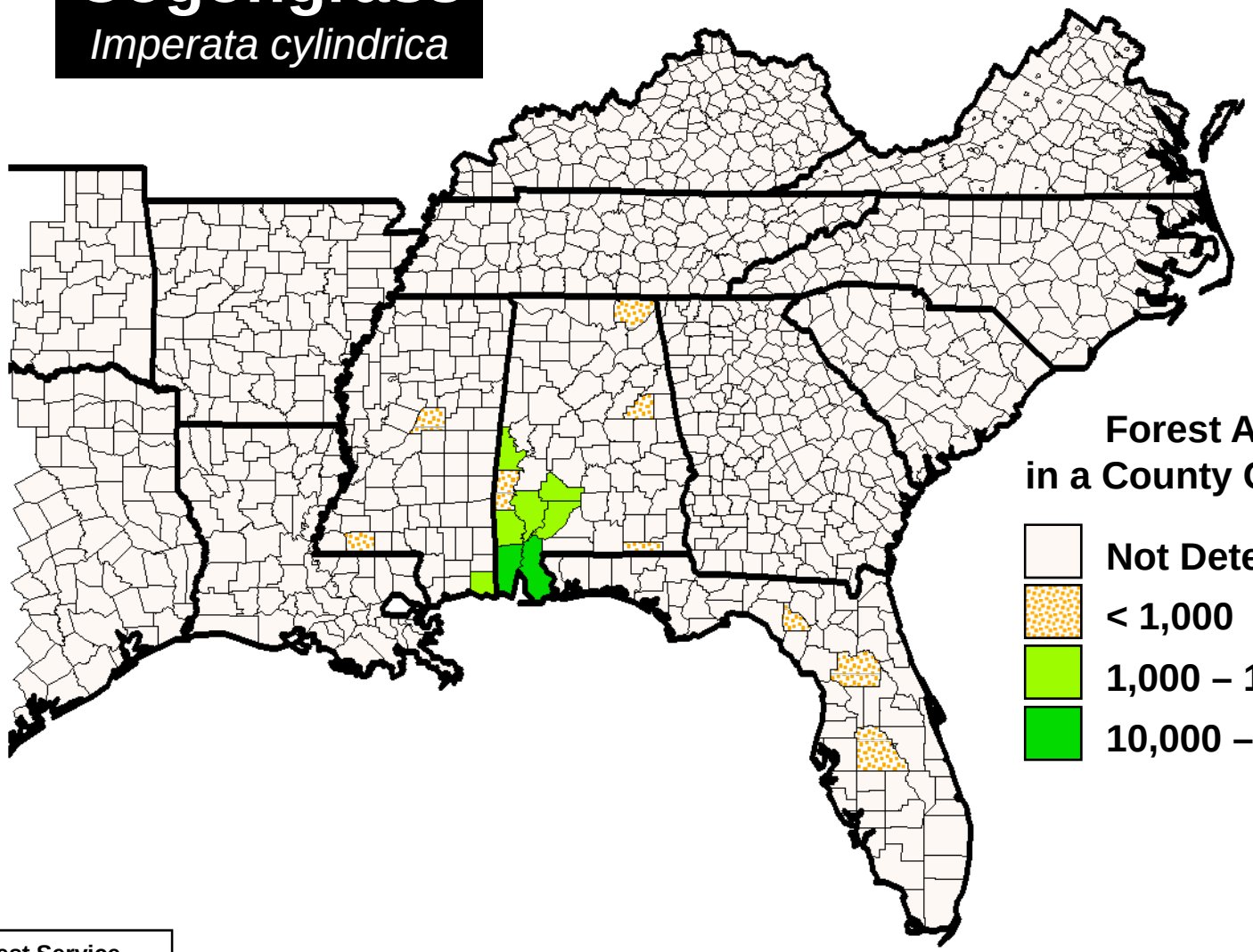


flashmaps

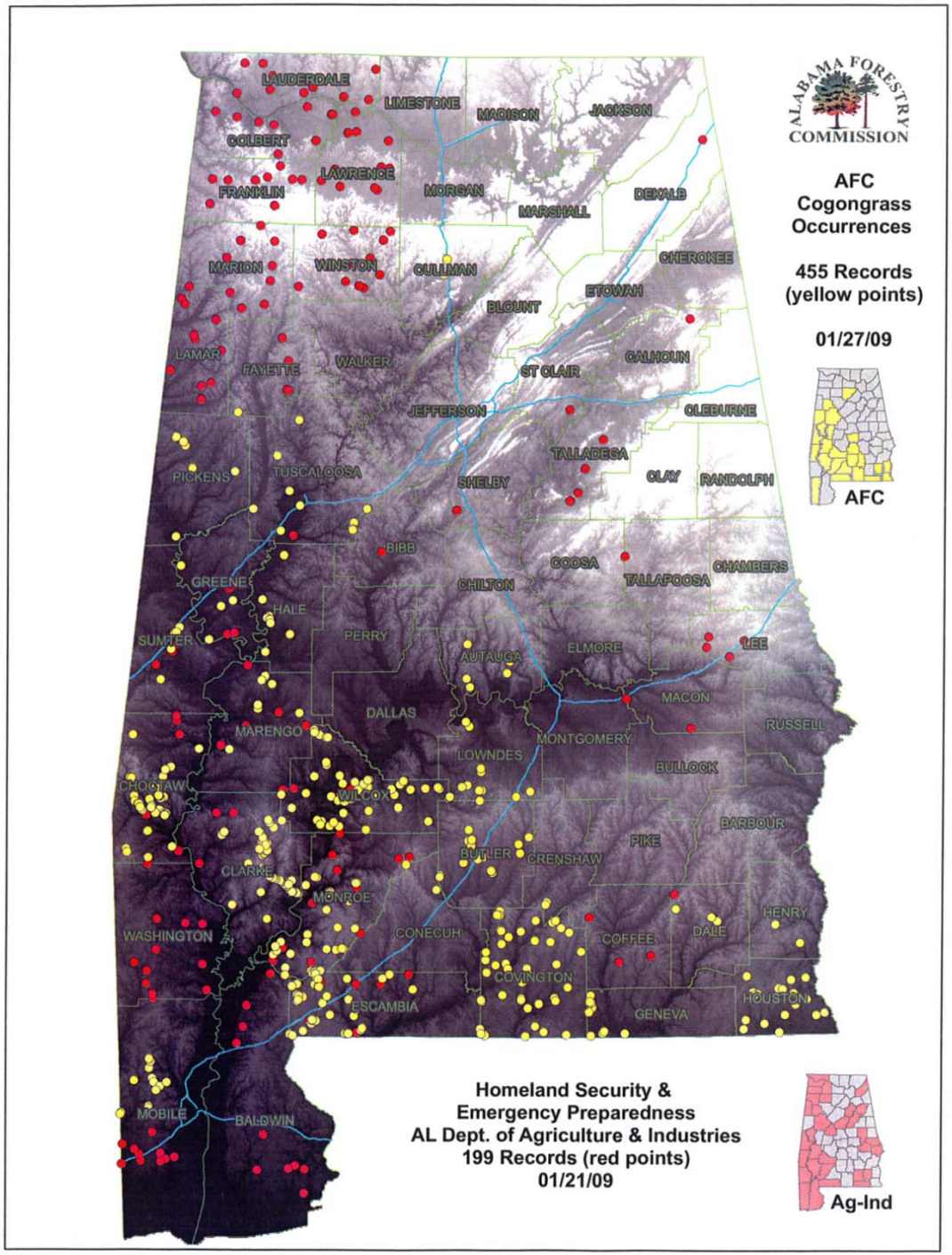
http://www.se-eppc.org/eddMapS/

Cogongrass

Imperata cylindrica



USDA Forest Service
SRS FIA database March 2008 Miller and Chambliss, Auburn


LAUDERDALE
LIMESTONE
MADISON
JACKSON
COLBERT
LAWRENCE
FRANKLIN
MORGAN
DEKALB
MARSHALL
MARION
WINSTON
CULLMAN
CHEROKEE
ETOWAH
BLOUNT
LAMAR
FAYETTE
WALKER
ST CLAIR
CALHOUN
JEFFERSON
CLEBURNE
TALLADEGA
PICKENS
TUSCALOOSA
SHELBY
CLAY
RANDOLPH
BIBB
COOSA
CHAMBERS
GREENE
CHILTON
TALLAPOOSA
HALE
SUMTER
PERRY
AUTAUGA
ELMORE
LEE
MACON
DALLAS
RUSSELL
MARENGO
MONTGOMERY
LOWNDES
BULLOCK
CHOCTAW
WILCOX
BARBOUR
PIKE
BUTLER
CRENSHAW
CLARKE
MONROE
HENRY
WASHINGTON
CONECUH
COFFEE
DALE
COVINGTON
HOUSTON
ESCAMBIA
GENEVA
MOBILE
BALDWIN
ALABAMA FORESTRY COMMISSION
AFC
Cogongrass
Occurrences
455 Records
(yellow points)
01/27/09
AFC
Homeland Security &
Emergency Preparedness
AL Dept. of Agriculture & Industries
199 Records (red points)
01/21/09
Ag-Ind


UGA0908094

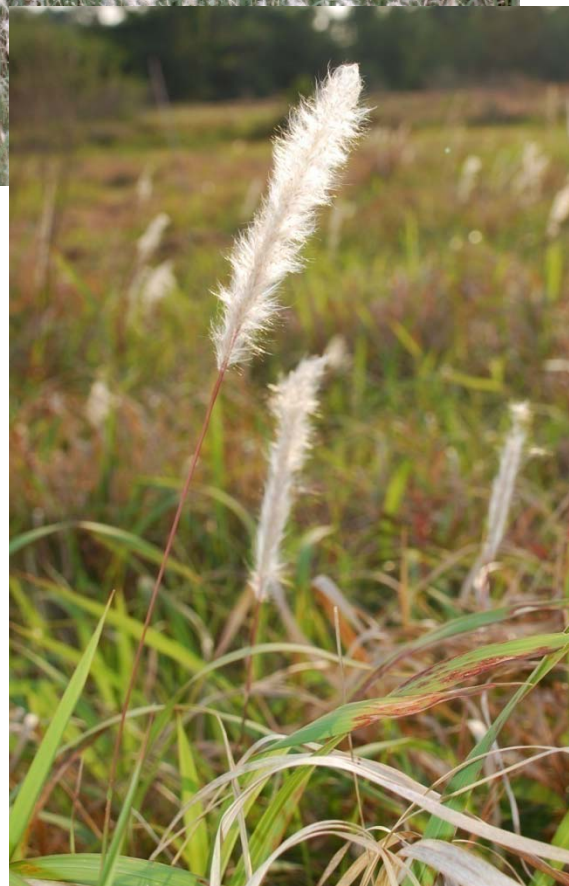

UGA2132087


UGA1334120


UGA2131090


UGA1237048


UGA1380040



Cogongrass Flowering in Alabama

- Southern populations tend to flower earlier (March-May)
- As you move northward, flowering time may be later than expected
  - New Talladega population: Full flower mid May
  - New Tuscaloosa and Cullman populations recently found flowering in early-mid June
- NOTE: New report of Jefferson Co. population flowering in late Feb 2009 on southern exposure by RR!


03/05/2008

Potential ID Confusion

- Silver Beardgrass (*Bothriochloa laguroides)*
- Flowers from June-August

How to tell them apart

http://www.cogongrass.org/cogongrassid.pdf

- Cogongrass
  - Clear offset midvein
  - No apparent stems
  - Thick rhizome mat in ~top 8 inches of soil
  - Rhizomes very stiff and sharply pointed
  - Leaves margins very finely serrated
- Silverbeardgrass
  - Midvein is neither pronounced nor offset
  - Leaves clearly originate on stems
  - No rhizomes
  - Leaf margin smooth

Cogongrass

Johnsongrass

Impacts

- Bad for roadsides
- Bad for forestry
- Bad for wildlife
- Bad for pastures
- Bad for homes, property
- Bad for conservation tillage systems???

For more information … http://www.cogongrass.org

Herbicides that have been tested that do not work as well as glyphosate and imazapyr

Trade Name	Common Name	Rate(s) lb ai/A
Asulox	asulam	3.3, 5.0
Velocity SP	bispyribac-sodium	0.03
Accent Herbicide	nicosulfuron	0.03, 0.06
Beacon Herbicide	primisulfuron	0.04, 0.07
Finale, Ignite, Liberty	glufosinate	0.34, 0.67
Escort XP	metsulfuron	0.02, 0.04
Oust XP	sulfometuron	0.12, 0.23
Drive 75 DF Herbicide	quinclorac	0.5, 1.0
Maverick, Outrider	sulfosulfuron	0.06
Bladex and CyPro	cyanazine	2.0, 4.0
Karmex	diuron	1.0, 2.0
Sencor + MSMA	metribuzin + msma	0.375 + 1.8
Hyvar X and X-L	bromacil + diuron	1.6 + 1.6
Glean	chlorsulfuron	0.5, 1.0
Velpar L	hexazinone	1.5, 3.0
Cadre, Plateau	imazapic	0.2

Trade Name	Common Name	Rate(s) lb ai/A
Achieve	tralkoxydim	0.52
Shark	carfentrazone	0.4
Raptor	Imazamox	0.06
Callisto	mesotrione	0.65
Clincher	cyhalofop	0.55
Define	flufenacet	0.44
Envoke	trifloxysulfuron	0.04
Harmony	thifensulfuron + tribenuron	0.06 + 0.035
Katana	flazasulfuron	0.1
Lightning	imazethapyr + imazapyr	0.09 + 0.02 lb ae/A
Option	foramsulfuron	0.035
Monitor	sulfosulfuron	0.125
Premit	halosulfuron	0.125
Velocity SP	bispyribac-sodium	0.1
Staple	pyrithiobac-sodium	0.11
Steadfast	nicosulfuron + rimsulfuron	0.06 + 0.035
Valor	flumioxazin	0.18

Auxin type herbicides are not effective on cogongrass

- Triclopyr
- Clopyralid
- Aminopyralid
- Picloram
- 2,4-D
- Dicamba
- BUT…Current Research on aminocyclopyrachlor (KJM44) (Dupont) shows some promise

Cogongrass Control With Tillage

- Repeated, frequent tillage that breaks up the rhizome mass followed by glyphosate is effective
  - Dig to find rhizome depth
- Infrequent tillage spreads cogongrass rhizomes and seed
- Clean equipment after tillage to prevent spread
  - Especially in wildlife food plots

Cogongrass and Mowing

- Mowing is for suppression only!
- Avoid mowing during and just after flowering in the spring
- Mow when cogongrass is greening up, but before cogongrass bloom

Cogongrass spread by mowing in the spring

Cogongrass and grazing: suppression only

BEWARE of the Baron!
Japanese blood grass ‘red baron’ is a cultivar of cogongrass

AL Cogongrass Task Force Created May 2008

- Purpose: establish a mutually agreeable framework for collaboratively combating the short- and long-term negative effects of the grass within the state
- All parties agree it is to their mutual benefit and the natural environment of the state to work cooperatively to educate, train, and share technology between partners and the general public about the serious impacts of cogongrass

AL Cogongrass Task Force

- By signing the agreement, the partners committed to facilitating a voluntary and cooperative effort in providing a means of control, suppression, or eradication of this pest species across Alabama.

AL Cogongrass MOU as of Dec ‘08

- Alabama Forestry Commission
- Alabama Department of Agriculture and Industries
- Alabama Department of Transportation
- Alabama Division of Wildlife and Freshwater Fisheries
- Alabama Cooperative Extension Service
- Alabama Soil and Water Conservation Committee
- Alabama Invasive Plant Council
- Auburn University
- Alabama Cattleman's Association
- Alabama Forestry Association
- Alabama Farmers Federation (ALFA)
- Alabama Wildlife Federation
- Resource Management Service, LLC
- USDA Farm Service Agency
- USDA NRCS
- USDA Animal and Plant Health Inspection Service, PPQ
- USDA Forest Service Forest Health Protection, Southern Region
- USDA Forest Service National Forests in Alabama
- USDA Forest Service, Southern Research Station
- US Army Corps of Engineers
- Custom Air and Herbicides Plus, LLC
- UAP Distribution, Inc.
- Mobile Bay Audubon Society
- Alabama Chapter of the National Wild Turkey Federation
- Alabama A&M University
- Alabama TREASURE Forest Association
- Wildlife Trends

Current Task Force Efforts

- Development of a statewide management plan
- Establish Committees to focus on the following areas
  - Fundraising
  - Detection and Mapping
  - Research
  - Extension

Cogongrass

Threatening Alabama

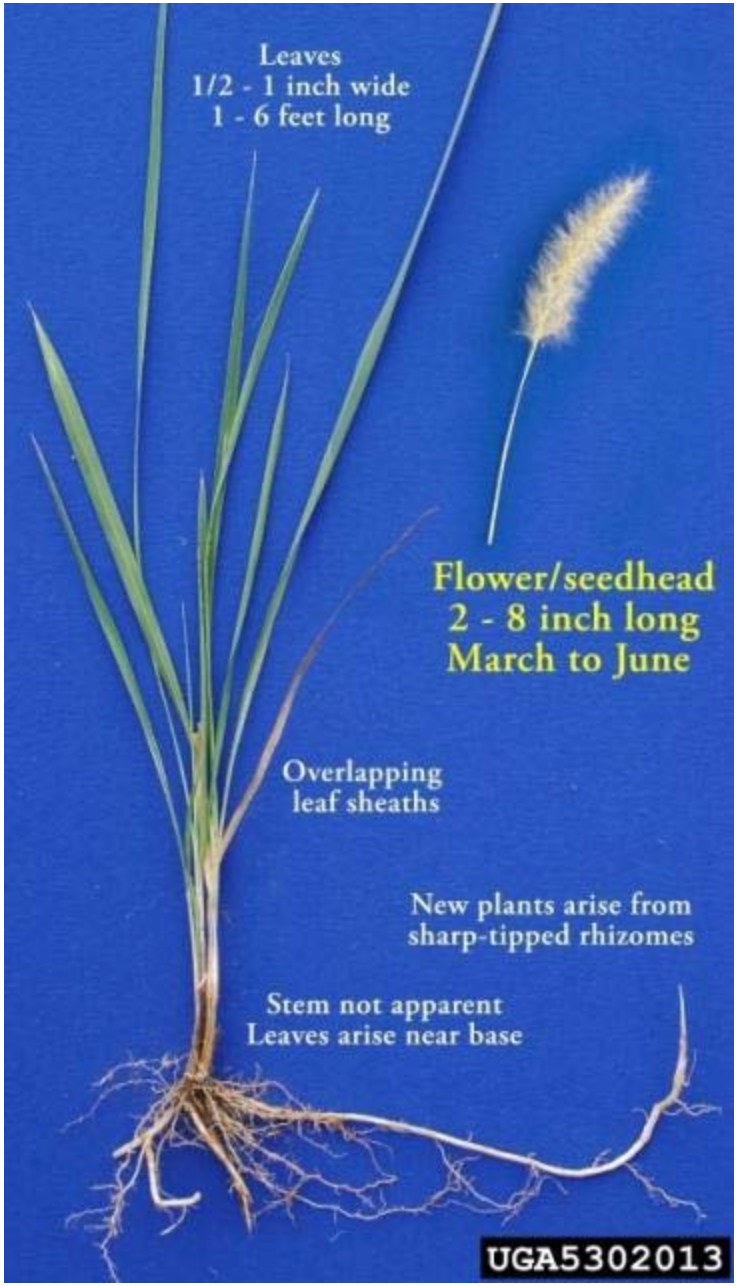
Use this guide to identify and report suspected infestations.

Report Cogongrass to

334-240-9363

www.cogongrass.org

Key Identification Features:



Circular infestation, yellow-green color

Segmented roots, dense root mats

Sharp rhizome tips

To Report a Suspected Infestation

Call 334-240-9363

Or contact your local Cooperative Extension Agent, County Forester or NRCS office

Information needed:

- Site Location (City and County, Nearest Road, Mile Marker, and/or GPS coordinates)
- Approximate size of Infestation
- Is it in flower?
- Your contact information

Prepared by Nancy Loewenstein, ... after brochure by D. Moorhead, et al. (wwww.cogongrass.org)
Photos by: C. Evans, M. Atwater, N. Loewenstein , W. Faircloth

Food for thought…

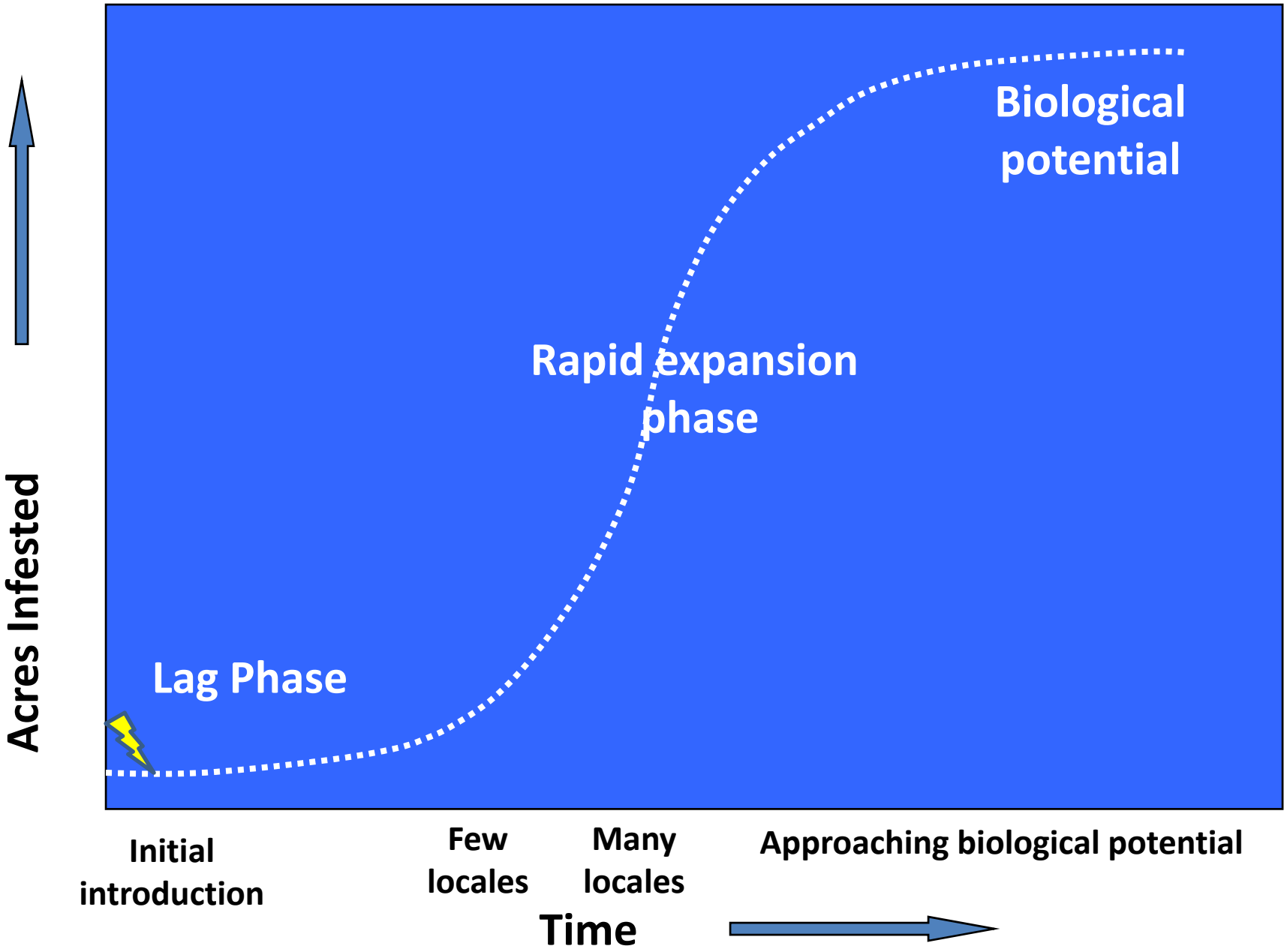
- Cogongrass is not going away by itself
- Cogongrass may not yet be interfering with your management goals but should you wait until it does?
- AVMS and the task force: What role should AVMS play in the cogongrass situation in Alabama?

Web Sites

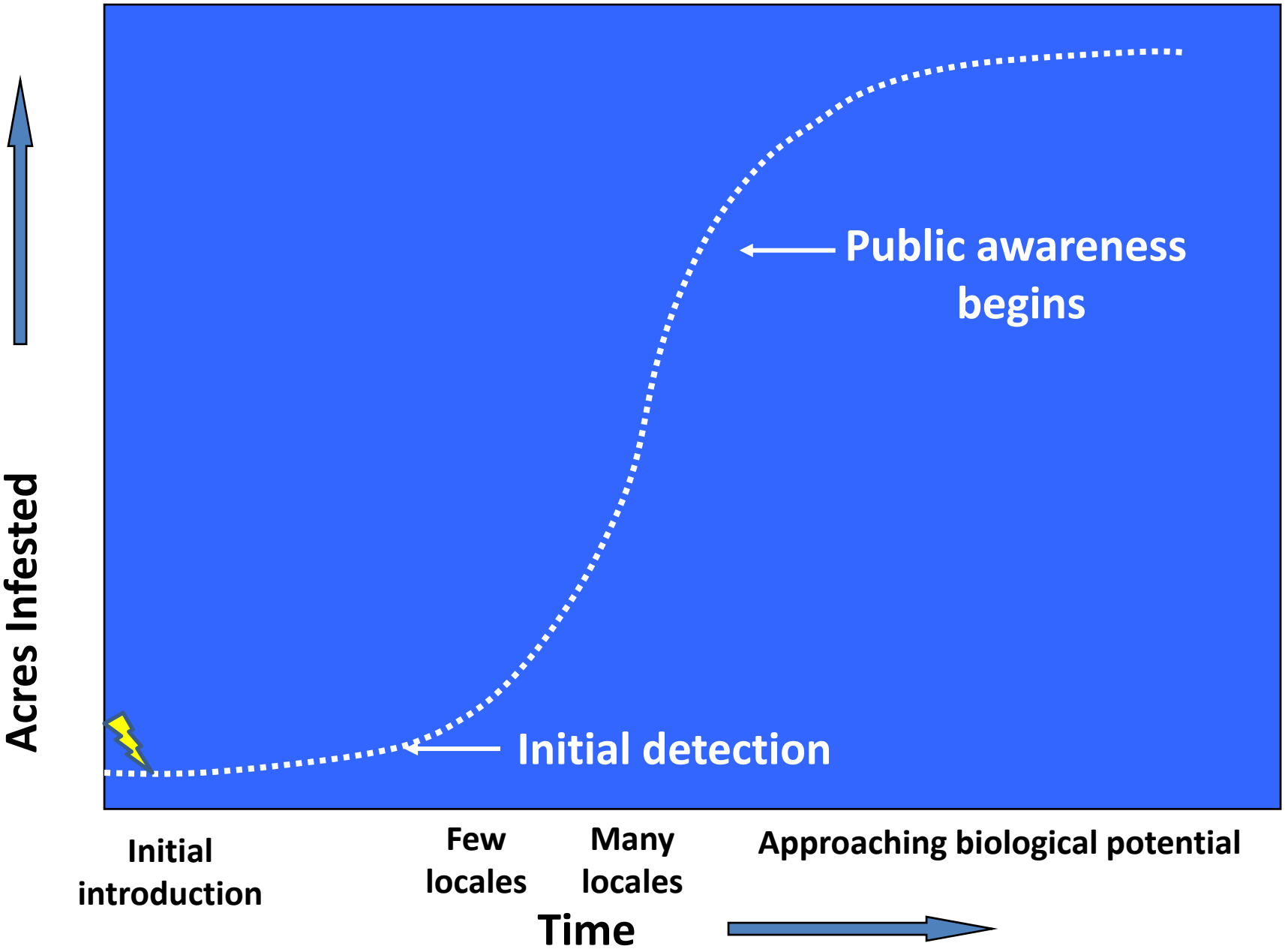
- www.cogongrass.org
  - Clearing house of information on cogongrass
- www.se-eppc.org
  - Southeast Exotic Pest Plant Council
- www.se-eppc.org/alabama/
  - Alabama Invasive Plant council
- www.aces.edu
  - Alabama Cooperative Extension System

- The following three slides document the process of invasion by many species, human detection issues, and management issues

Weed Increase Over Time



Weed Increase Over Time



Cogongrass Control Glyphosate Strategies

- Spot treatment:
  - 2.5% v/v in spring to prevent seed production
  - 2.5%v/v retreatments as new shoots emerge in the late summer or fall
  - Or follow spring treatment with glyphosate (2% v/v) + imazapyr (1%v/v) in late summer/early fall
- Broadcast :
  - 3-4 lb ai/A applied in late summer (September) while cogongrass is still green
- Repeat Applications Needed for ~3 years

Cogongrass Control Imazapyr Strategies

- Forestry
- Spot treatment:
  - 1% v/v Arsenal AC
  - 2% v/v Chopper, Chopper Gen2
- Noncrop, ROW
  - Arsenal (2% v/v)
- Broadcast treatment: imazapyr (0.75-1 lb/A)
- Do not use under hardwoods you want to keep!

Herbicide Surfactant Issues

- Always add the surfactant specified by the label
  - Non ionic surfactant (NIS) with glyphosate
  - NIS or Methylated sed oil (MSO), depending on the imazapyr used
- What about Cogon-X and Dyne-a-pak?
  - Research underway for both products, no conclusions yet

Weed Increase Over Time