



Sustainable harvest of *Actaea racemosa* from Appalachian Forests

Jim Chamberlain<sup>1</sup> & Tom Hammett<sup>2</sup>

<sup>1</sup>USDA Forest Service

<sup>2</sup>Virginia Polytechnic Institute

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# Presentation Outline

- Who is involved
- What is the study
  - What is black cohosh
- Where is the study?
- Why do this study
- When did it start, when does it occur
- What are the challenges, implications
- Where does it go from here

**Southern Appalachians – A Diversity of Habitats supports numerous botanical forest products**



# Botanical Description



- Herbaceous perennial
- 3 to 8' tall, 2' spread
- Leaves 3-pinnately compound, with sharply toothed edges
- Flowers on long raceme; blooms July to October
- Seed pods remain through winter
- Increasing demand due to FDA ban on HRT



# THE PARTNERS

PCA,  
MPWG,USFWS  
Coordination

USDA Forest Service  
Research

Garden Club of  
America  
Volunteers

# The Plant Conservation Alliance



## *MISSION*

*"To protect native plants by ensuring that native plant populations and their communities are maintained, enhanced, and restored"*

- **Approach**
  - On-the-ground conservation projects
  - Targeted public outreach
- **Consortium**
  - 10 federal agencies
  - over 250 non-federal Cooperators
- **Working groups**
  - Alien Plants
  - Medicinal Plants
  - Restoration and Outreach
- **Since 1994**
  - awarded over \$7,000,000 in federal funds and matching non-federal contributions
  - more than 160 projects for on-the-ground conservation and restoration projects
  - administered by the National Fish and Wildlife Foundation.
- **Hosts 5 list serves**
- **Visit: [www.nps.gov/plants](http://www.nps.gov/plants)**

# The PCA – Medicinal Plant Working Group

## MISSION

*To forge partnerships with industry, government, academia, tribes and environmental organizations to facilitate the sustainable use and the conservation of medicinal plants.*

- **Projects are:**
  - Generating and sharing information;
  - Promoting conservation measures;
  - Promoting sustainable production;
  - Increasing participation in plant conservation; and
  - Encouraging participation by Tribes and other holders of traditional knowledge.
- **8 committees**
  - Conservation
  - Elder's circle
  - Ethnobotany
  - Financial support
  - Industry
  - Information
  - Participation
  - Sustainable production.
- **Visit:** [www.nps.gov/plants/medicinal](http://www.nps.gov/plants/medicinal)



# The Garden Club of America



## Partners for Plants

1. A grassroots volunteer initiative
2. Focus on threatened or endangered plants, invasive exotics and medicinal plants on federal or state lands.
3. Joint project of the Horticulture and Conservation Committees of the GCA.
4. Partners include areas managed by:
  - Bureau of Land Management
  - National Park Service
  - US Forest Service
  - State Parks

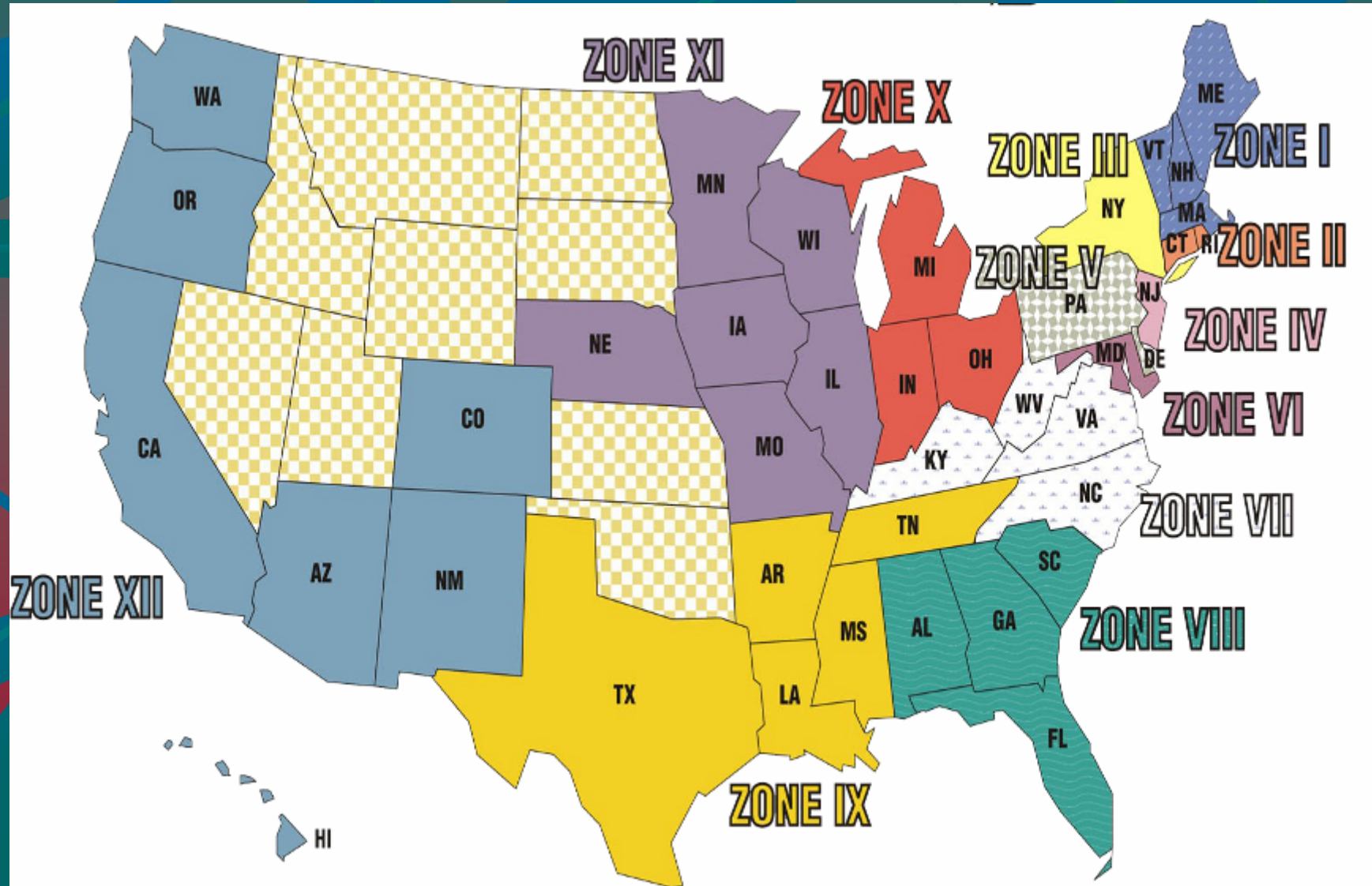
# HOW DID THE PROJECT GET STARTED?

- 2000 Partners meet to discuss conservation issues and possible actions
- Decision made to focus on Black cohosh
- 2001 North Carolina study site initiated
- Objectives
  - Census of Black cohosh
  - Random harvest at two intensity levels
    - 33% -- light harvest
    - 66% -- heavy harvest

# What is the study

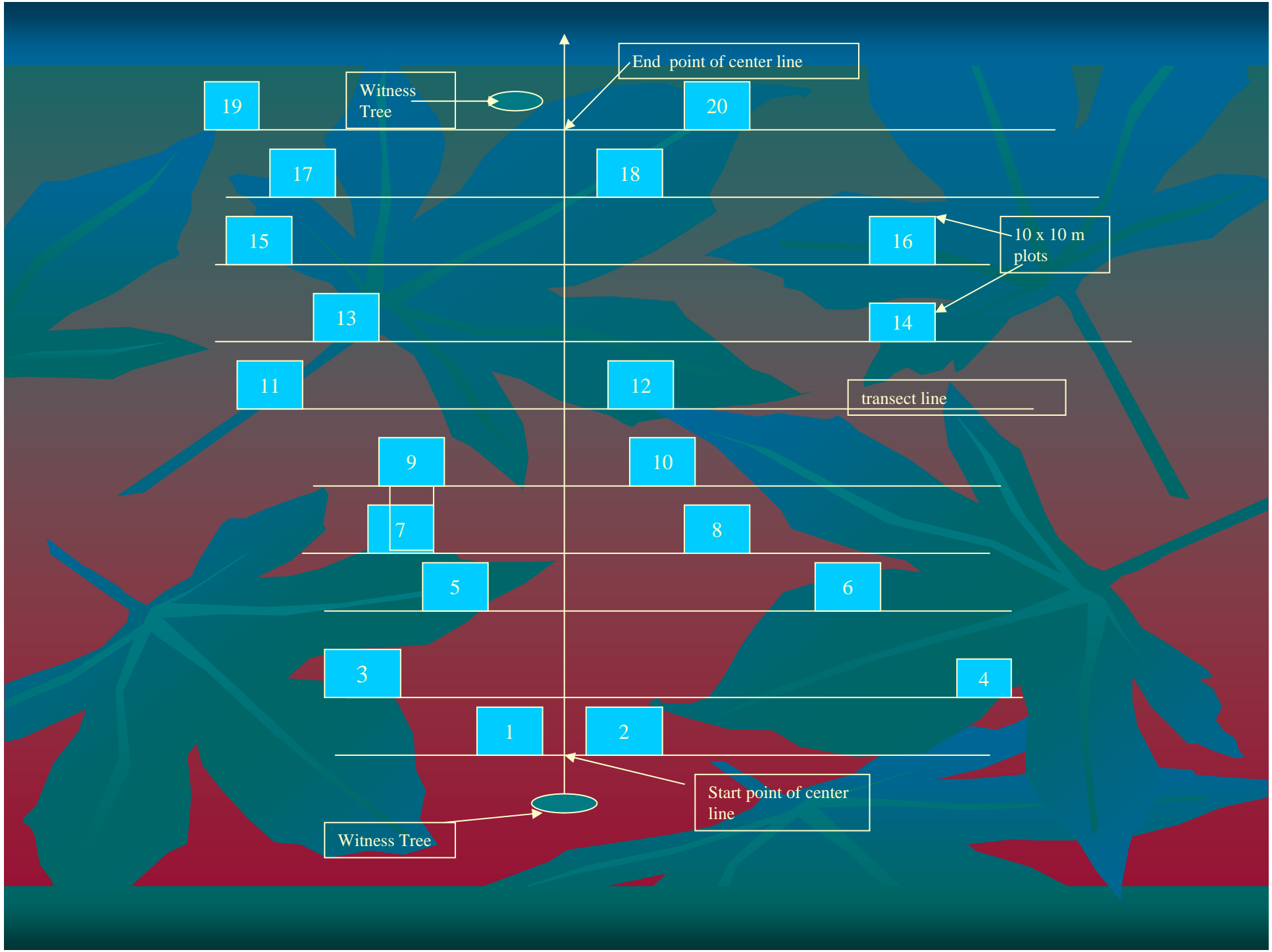
- The plant
  - Description
  - Forest type
  - Distribution
- Objectives
  - Original
  - Modifications
- Study sites
  - NC, VA
- Study layout
  - Design
  - Measurements taken

# PROJECT LOCATIONS



# Forest Type – Rich Cove





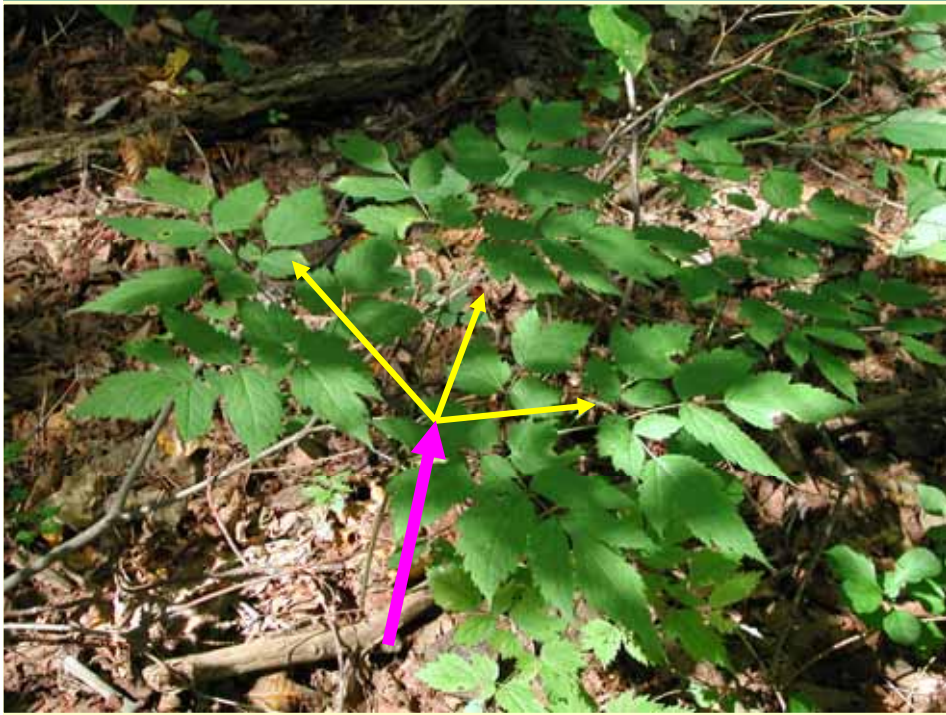


Ann Jennings

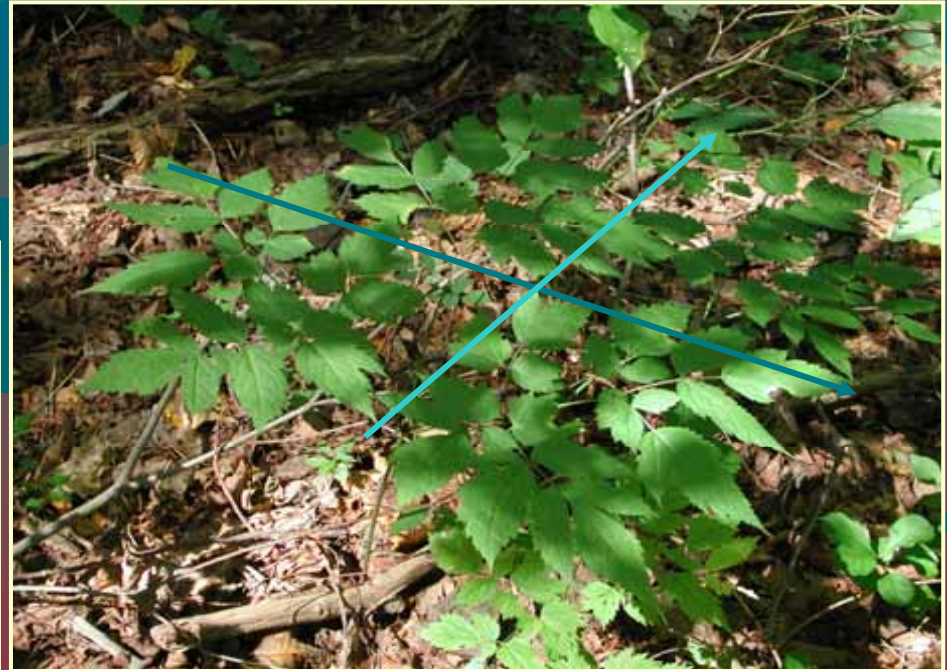


Ready for Action





**Stem Height**



**Crown Diameter**



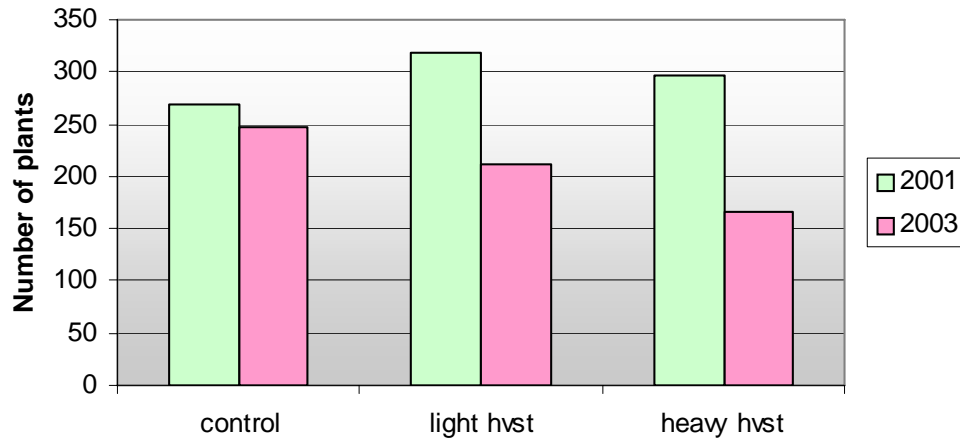
# HARVEST INTENSITIES

- 33 % -- Light
- 66 % -- Heavy
- 0 % -- Control



# Number of Cohosh plants per harvest type

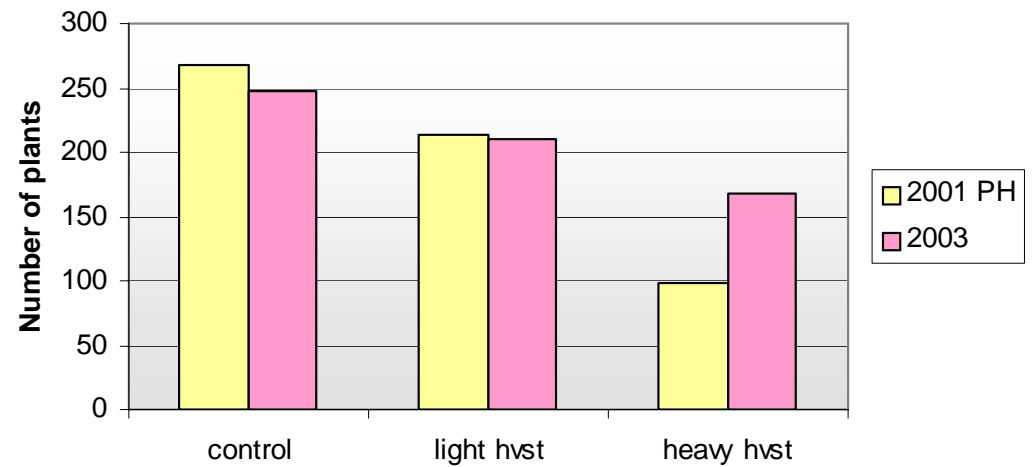
### Cohosh Counts 2001 and 2003



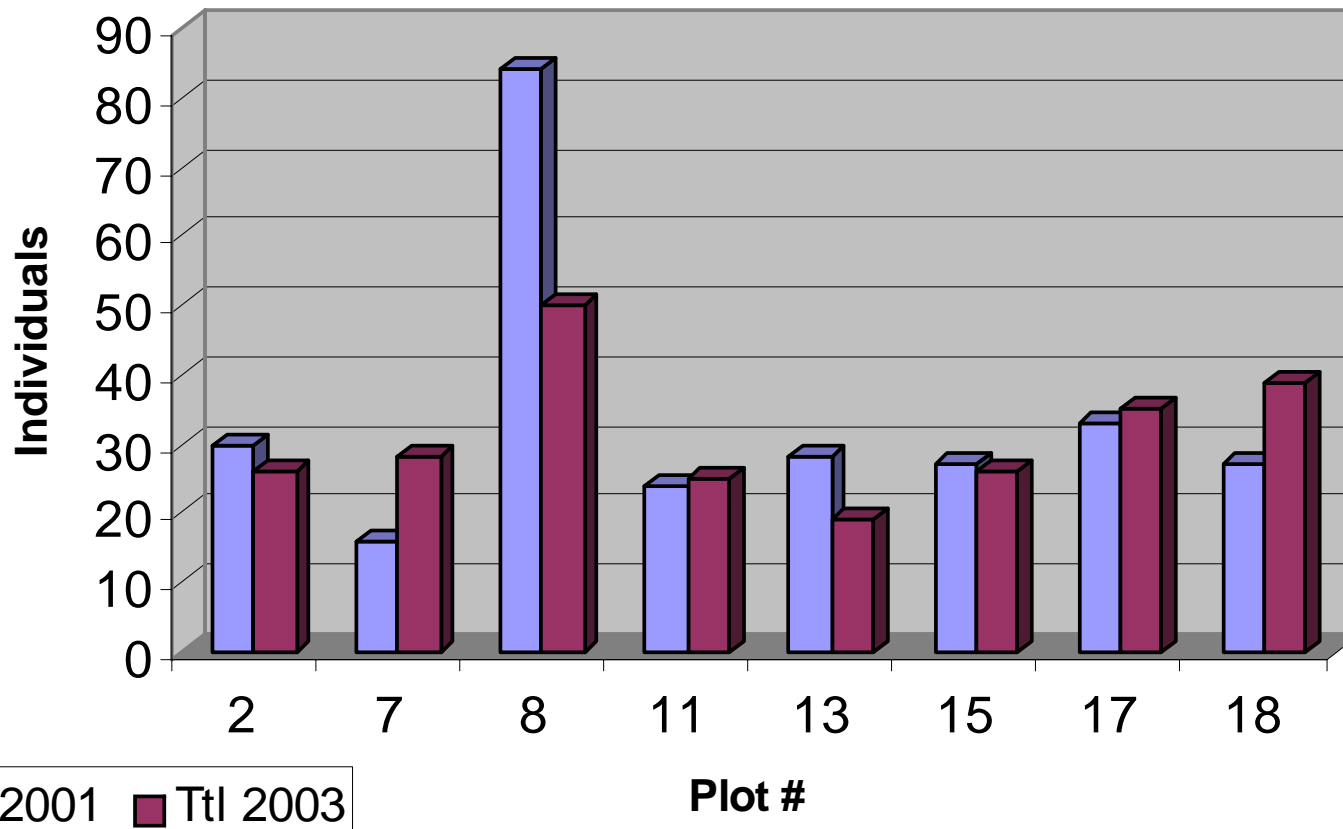
← Before Harvest

Post Harvest →

### Cohosh Counts 2001 (PH) and 2003



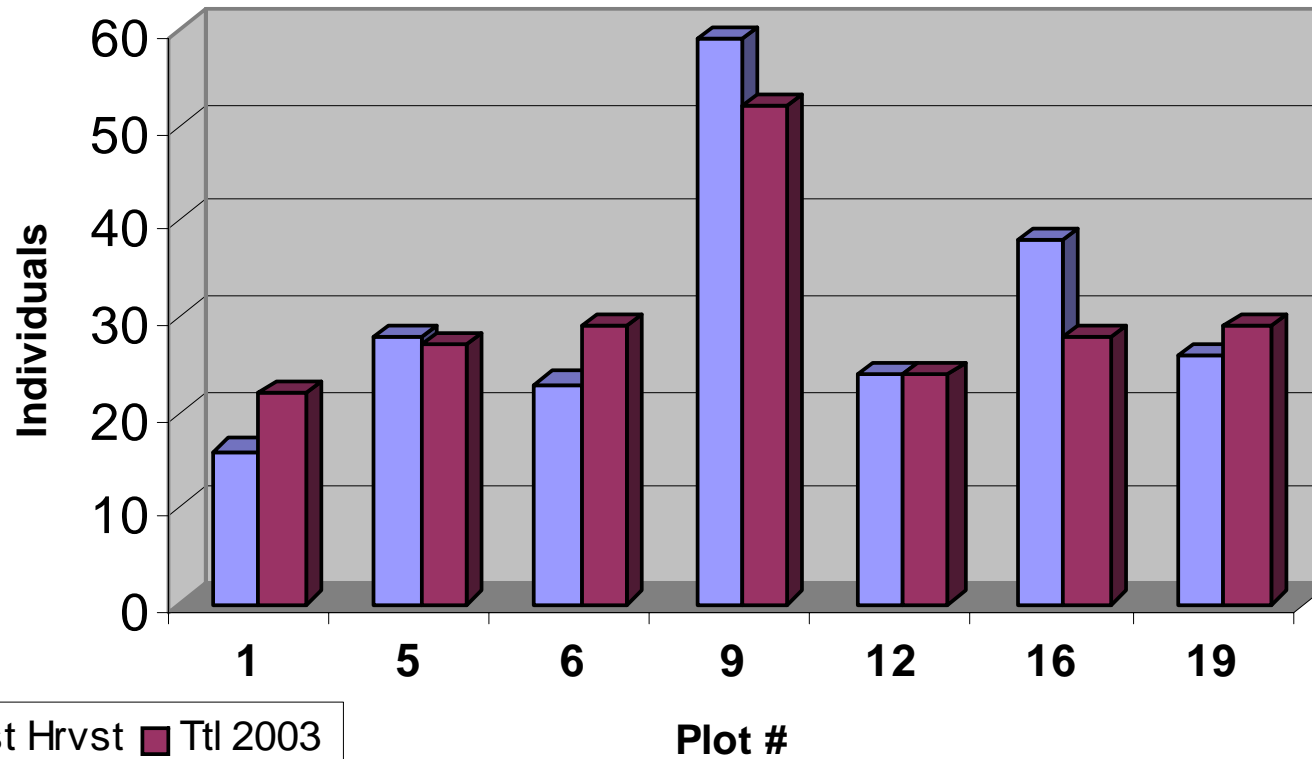
## Cohosh Population Change in Control Plots



- With Plot 8 absolute numbers indicate a decline from 269 to 248 individuals during the 2 sampling periods
- By excluding questionable Plot 8 the remaining 7 plots support an increase in cohosh numbers form 185 to 198

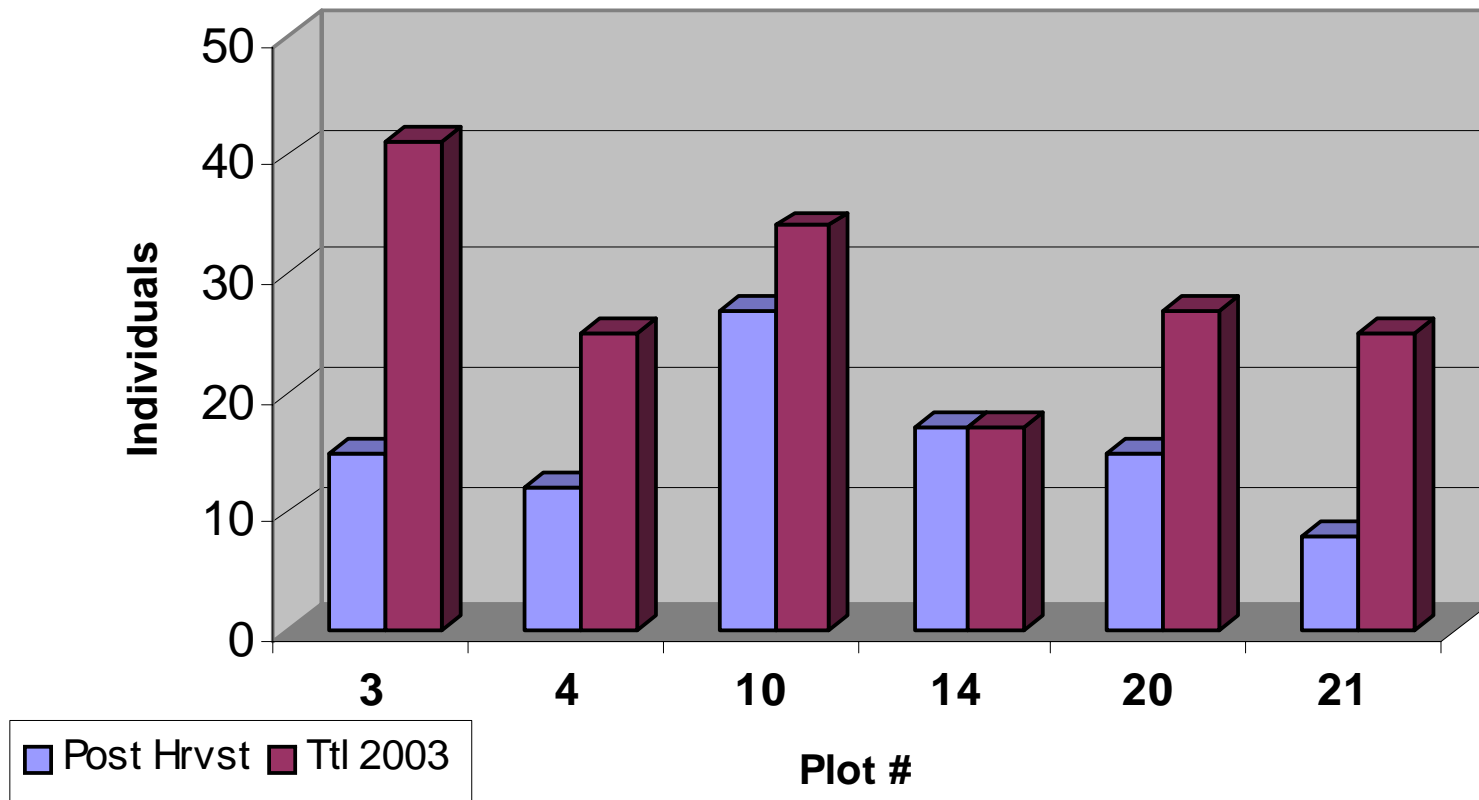
# Change of Light Harvest

Total Cohosh Change 2001 Post Light Harvest - 2003

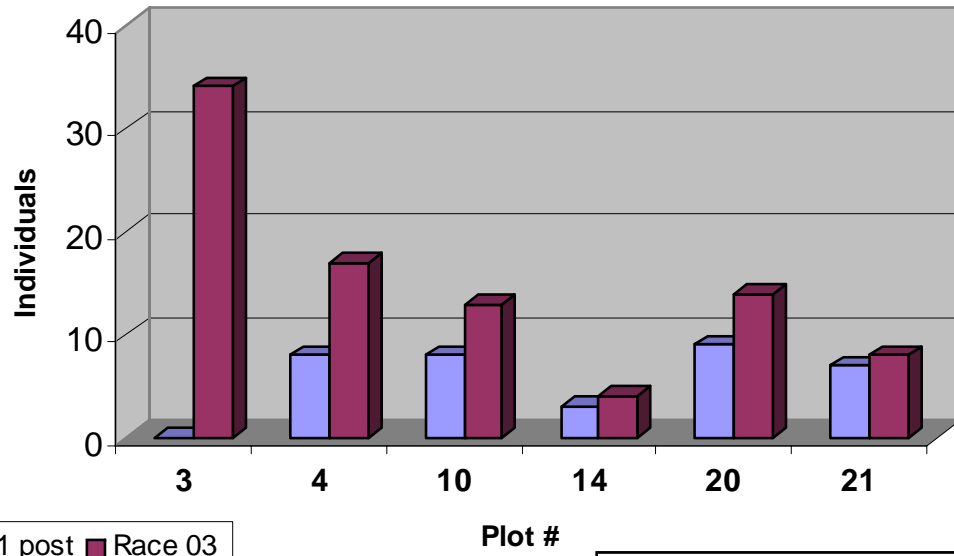


# Change from Heavy Harvest

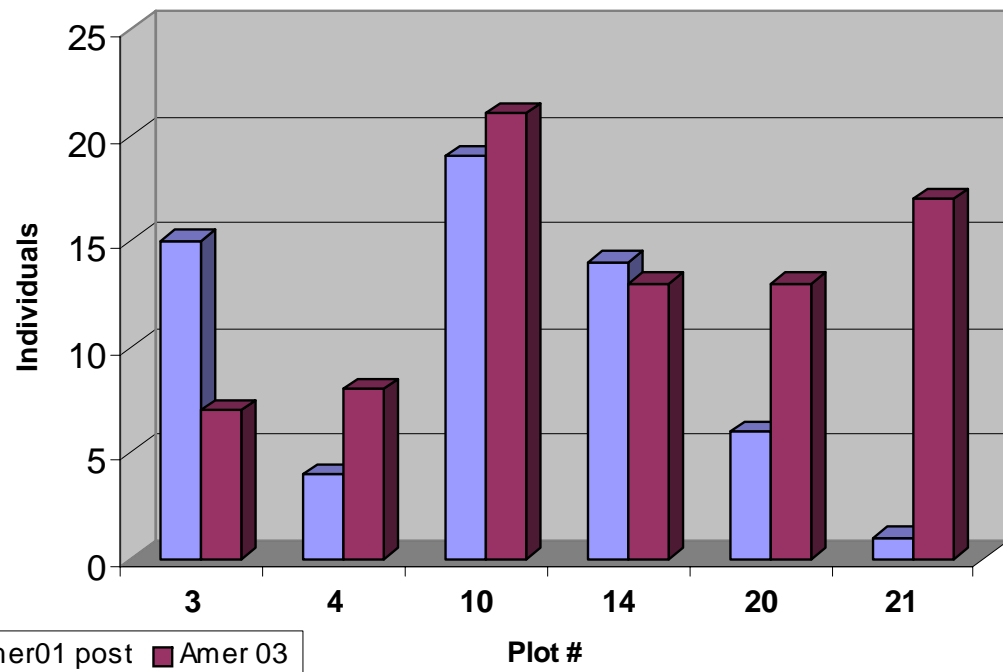
Total Cohosh Change 2001 Post Heavy Harvest - 2003



Back Cohosh Change 2001 Post Heavy Harvest - 2003

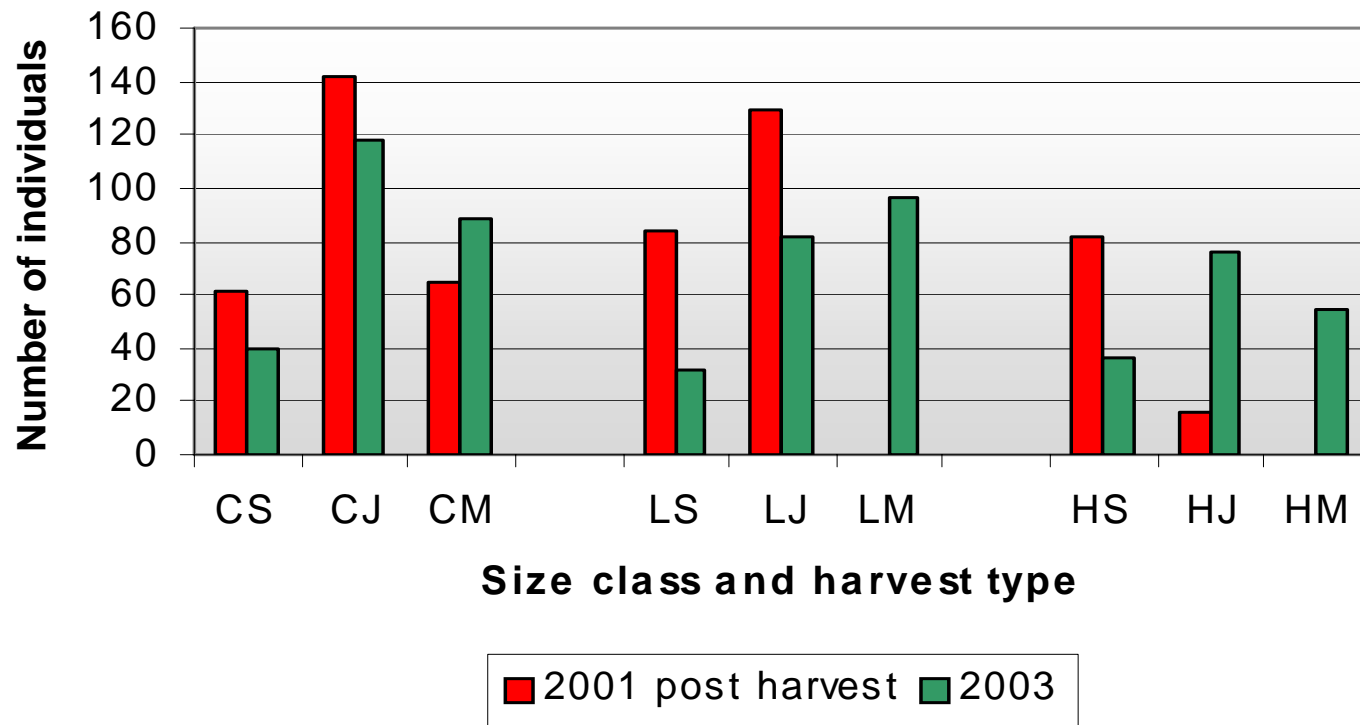


American Cohosh Change 2001 Post Heavy Harvest - 2003



# Plant Distribution Changes

Absolute Numbers of 2001 and 2003



**C** Control plot  
**L** Light harvest  
**H** Heavy harvest

**S** Seedlings: 0 – 20 cm stem height  
**J** Juveniles: 21 – 30 cm stem height  
**M** Mature plants: >30 cm stem height

### **Control plots:**

- The number of seedlings decreased, suggesting that there is less regeneration in 2003, the number of juveniles decreased as well.
- Both former seedlings and juveniles could have developed into mature plants over the course of 2 years, but the number of mature plants did not increase as much as seedlings and juveniles decreased.
- “Loss” of 21 plants altogether

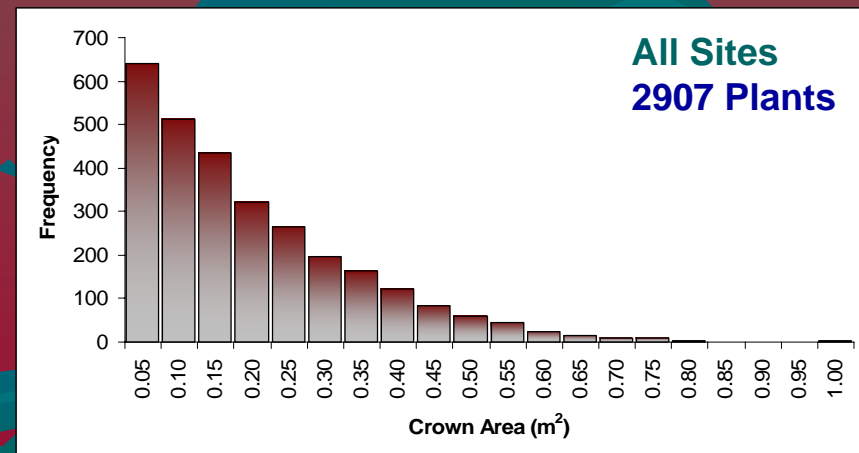
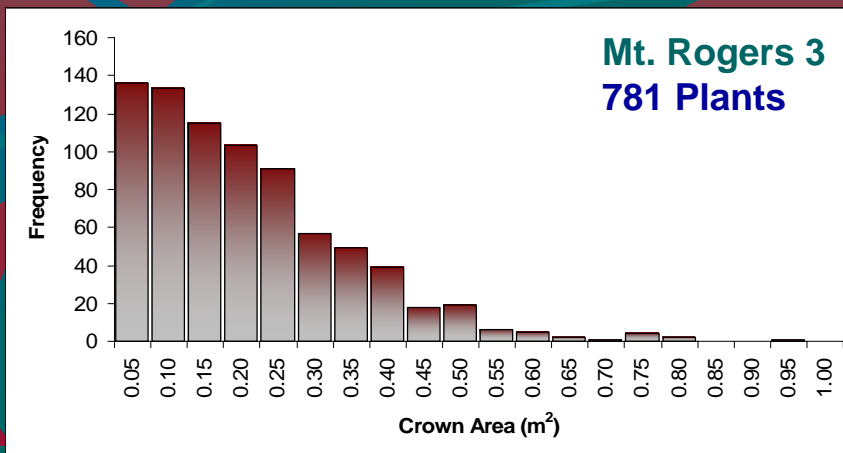
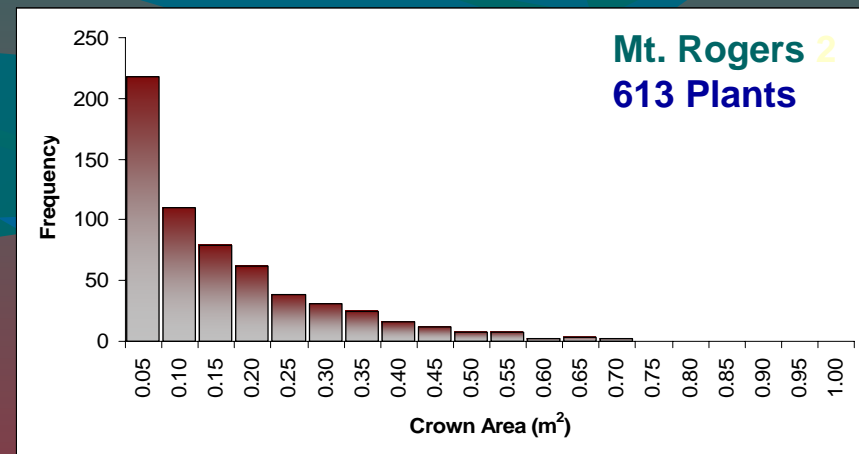
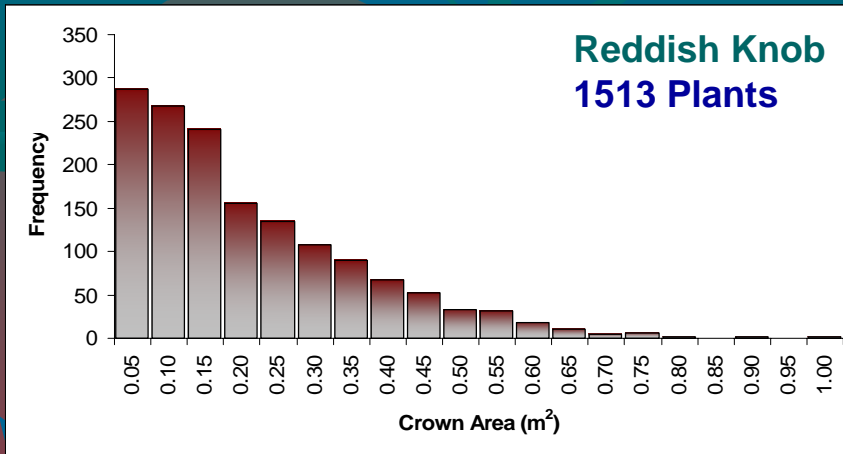
### **Light harvest plots:**

- Most of the former seedlings and juveniles seem to have developed into mature plants.
- The number of seedlings in 2003 is significantly lower than in 2001, which may be explained by the harvest of all mature plants and therefore taking away seed producing plants.
- “Loss” of 2 plants

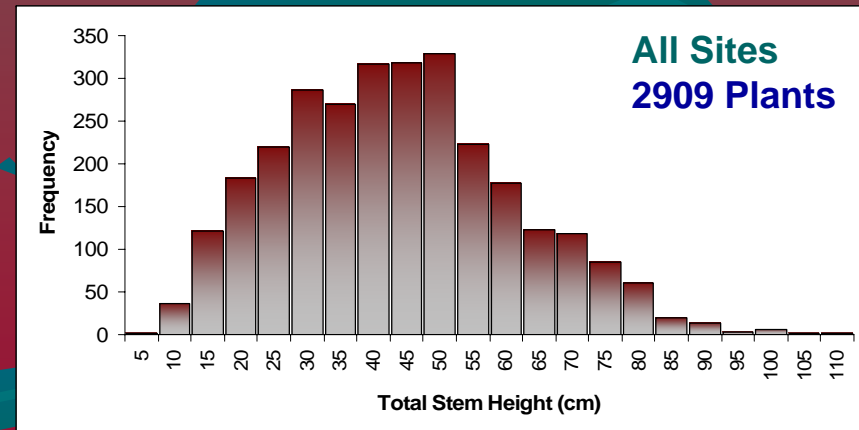
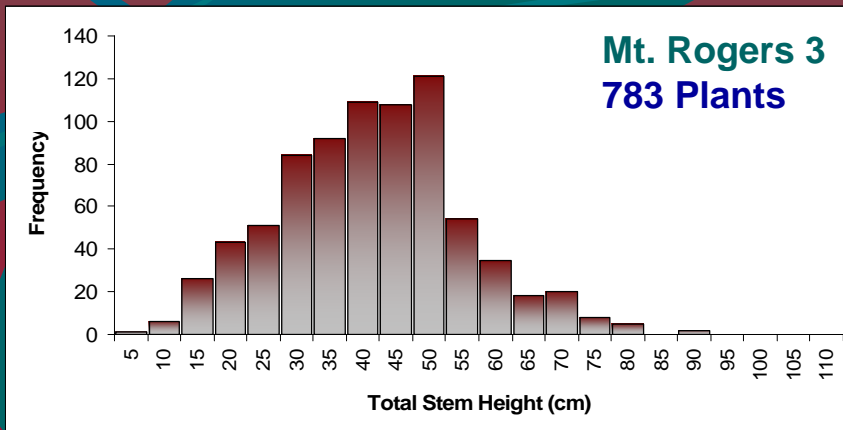
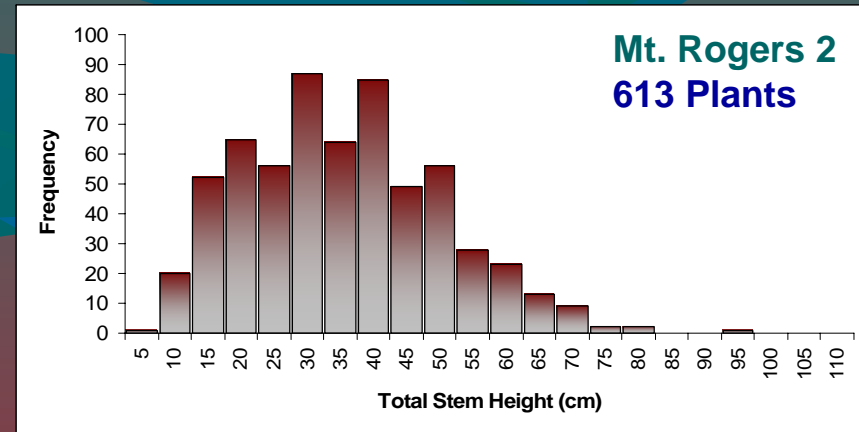
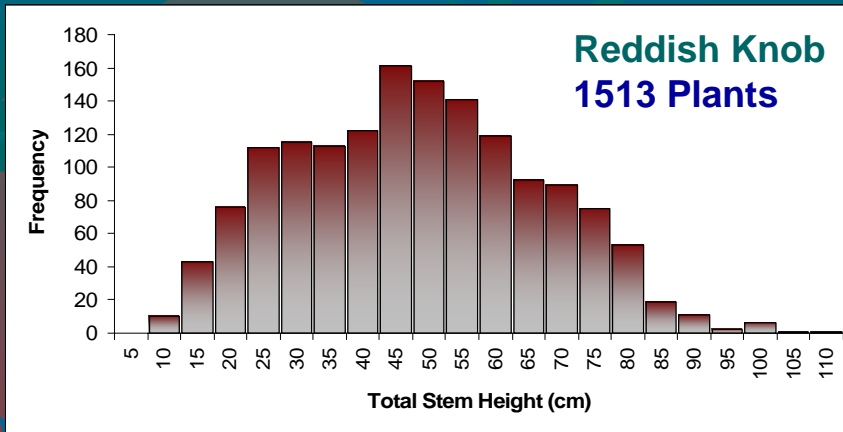
### **Heavy harvest plots:**

- Seedlings of 2001 (and probably some of 2002) developed into juveniles and mature plants.
- As in control and light harvest plots, the number of seedlings in 2003 is much lower than in 2001. This could be explained by the harvest of mature plants, if the complete number of plants had decreased. This is NOT the case. There are 69 new plants!

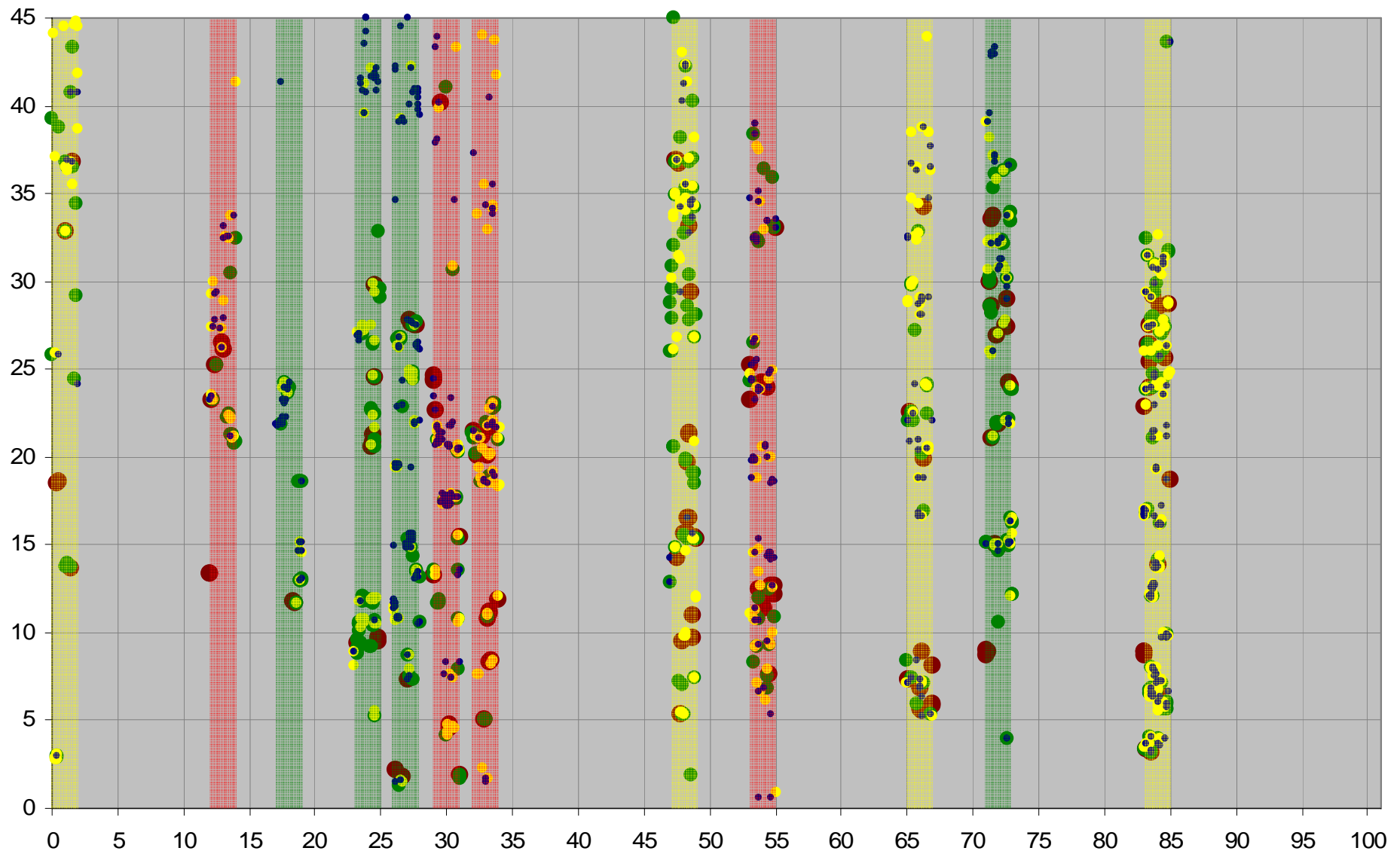
# Individual Plant Crown Area Distribution



# Individual Plant Total Stem Height Distribution



# Reddish Knob Site Plot




 Control


 33% Harvest


 66% Harvest

Crown Area (m<sup>2</sup>)

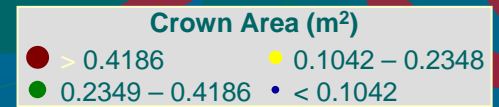
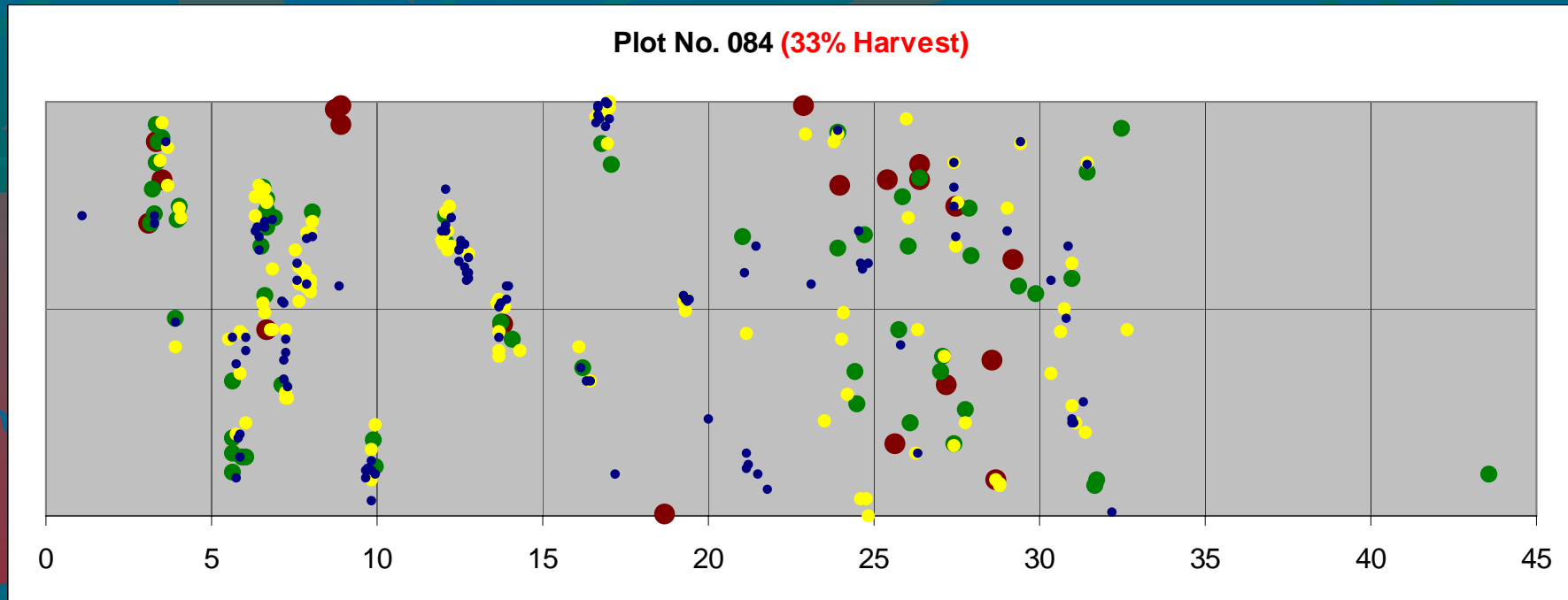
 > 0.4186

 0.1042 - 0.2348

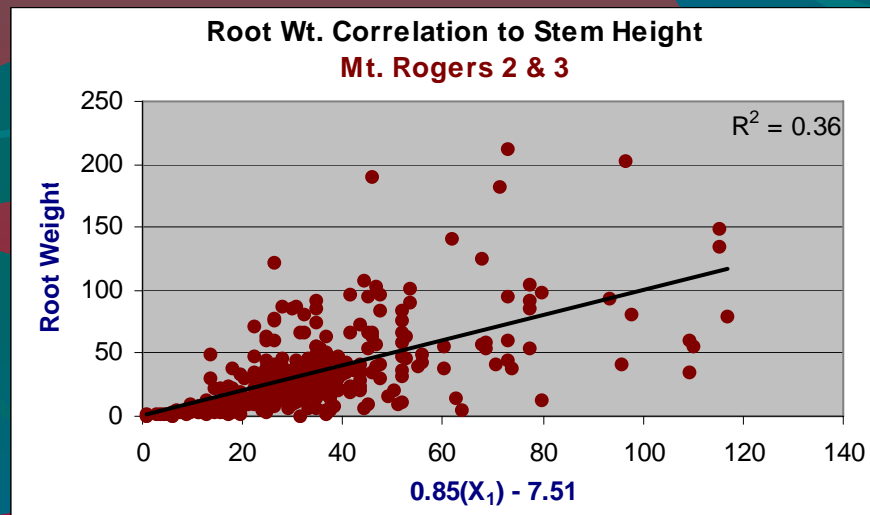
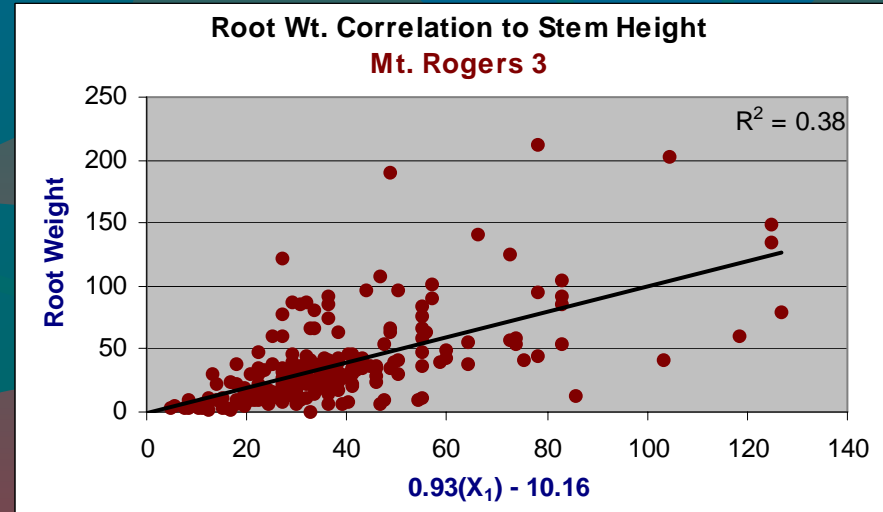
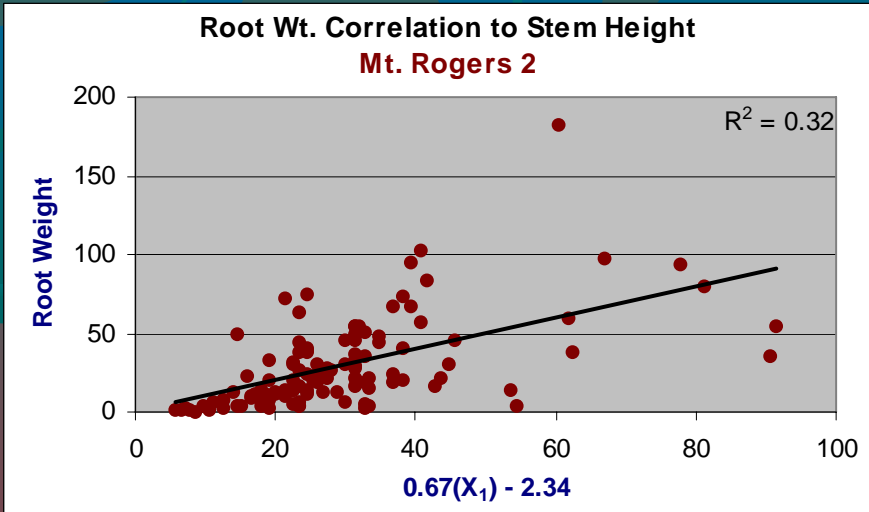
 0.2349 - 0.4186

 < 0.1042

# Plot Map Example – Reddish Knob

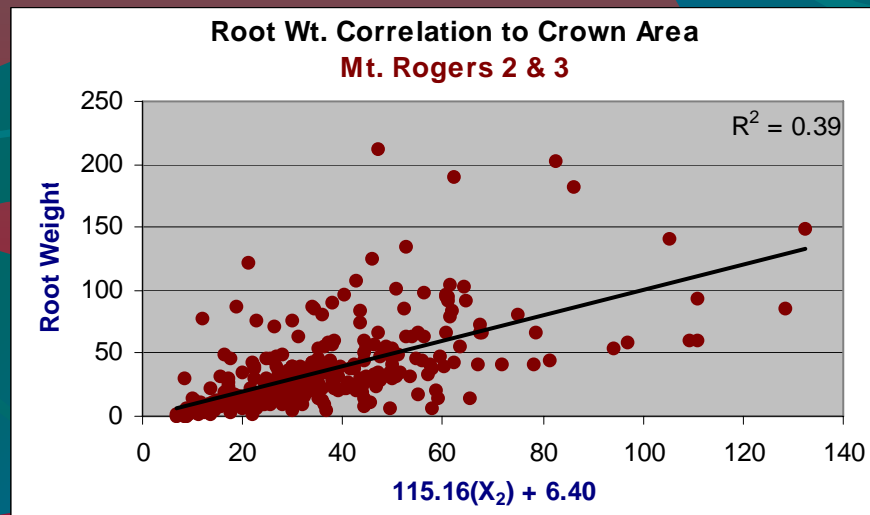
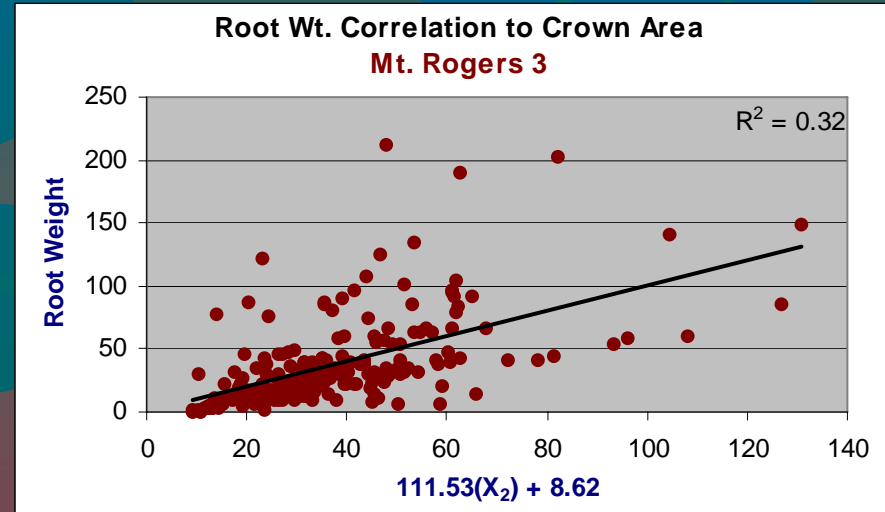
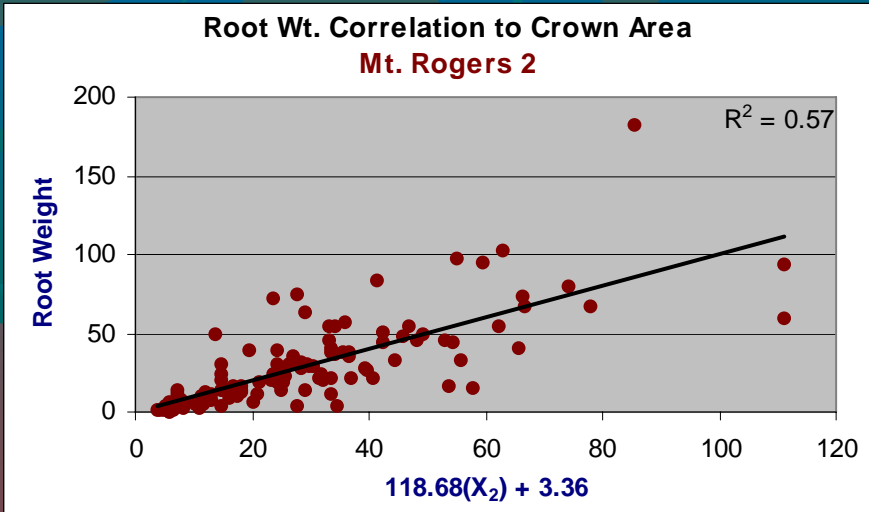


# Root Weight Correlation to Stem Height



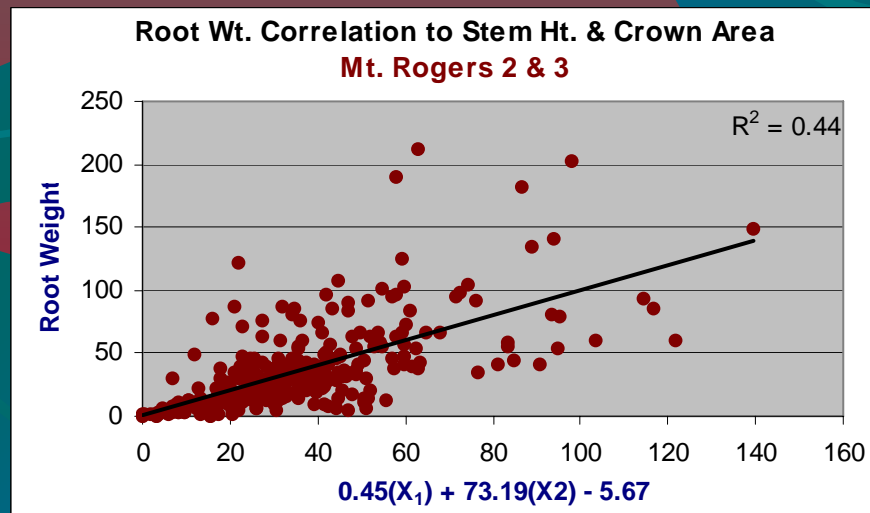
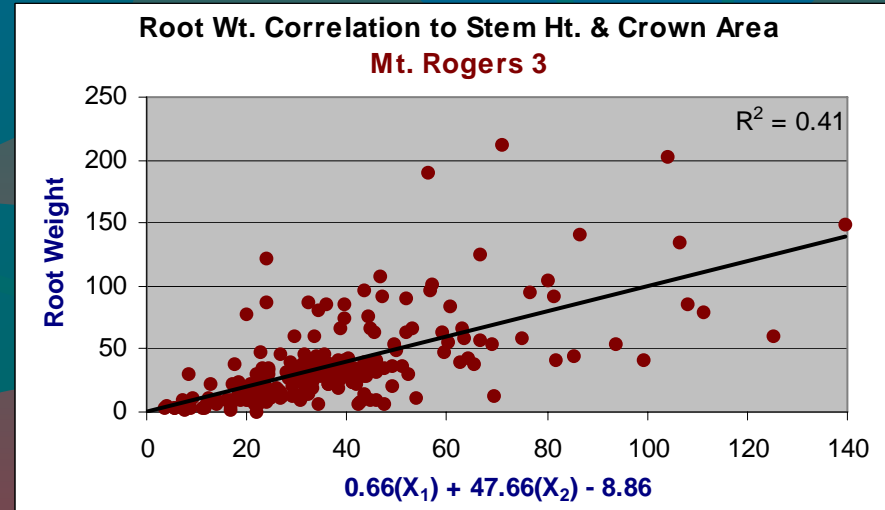
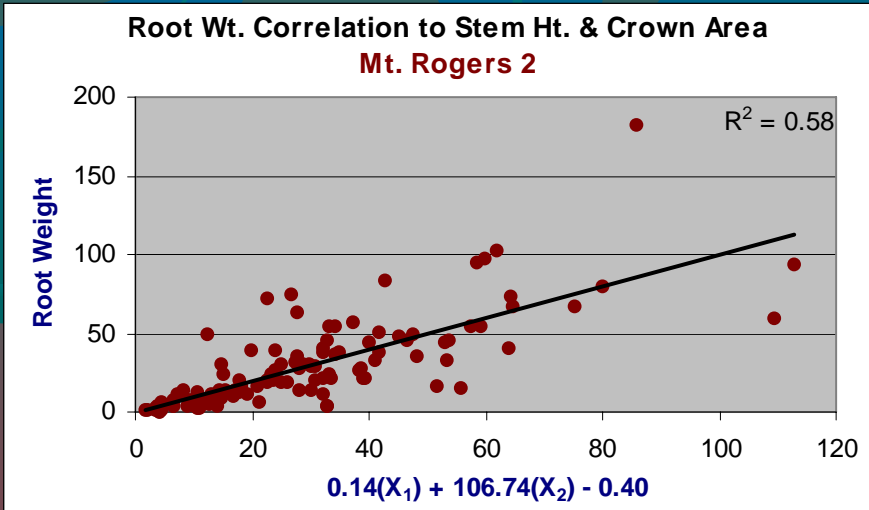
$X_1 = \text{Sum of Total Stem Height}$

# Root Weight Correlation to Crown Area



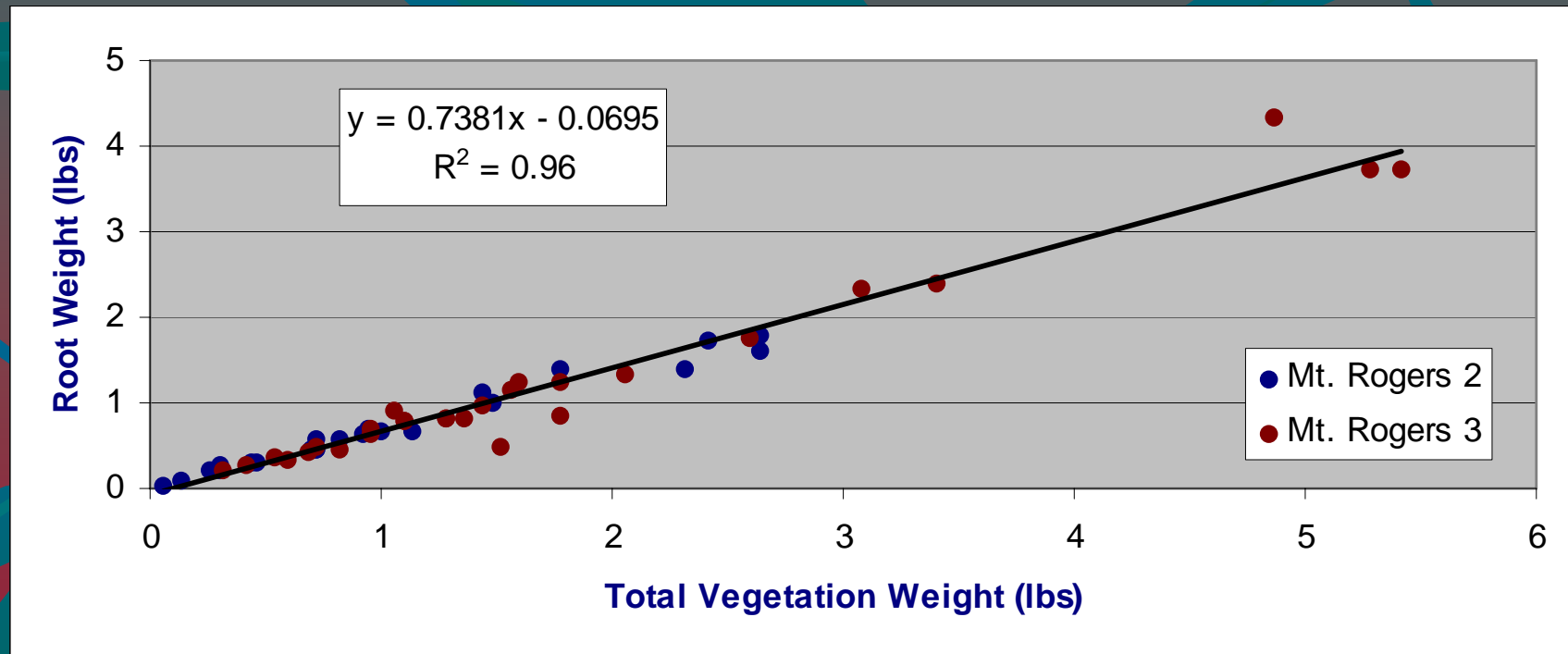
$X_2$  = Sum of Crown Area

# Root Weight Correlation to Stem Height and Crown Area



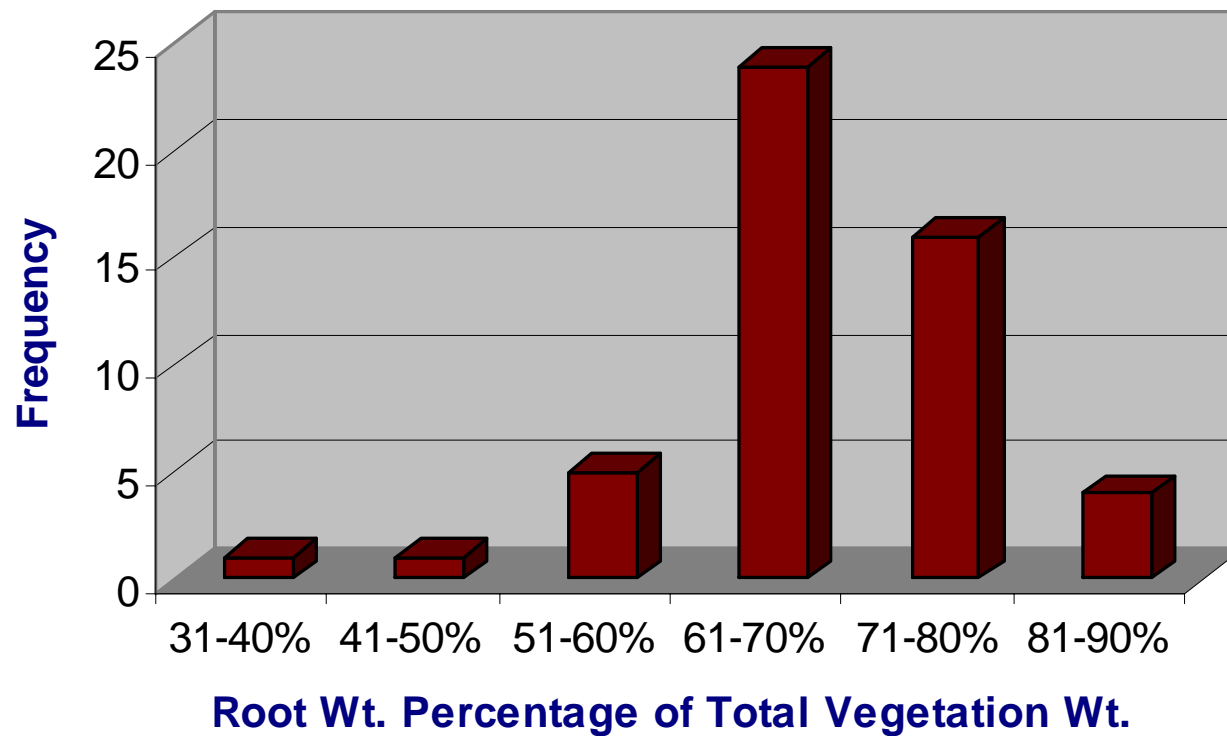
$X_1$  = Sum of Total Stem Height  
 $X_2$  = Sum of Crown Area

# Correlation Between Total Vegetation Weight and Root Weight per Plot



# Total Root Weight as a Percentage of Total Vegetation Weight

## Mt. Rogers 2 & 3



**Average = 68%**  
**Median = 68%**  
**Mode = 71%**

# Challenges

- Keeping volunteers motivated
- Getting volunteers to come back
- Scientific rigor vs. volunteers
- Institutional support
  - Other duties take priority
  - Lack of commitment
- Replications and power
- Generalization across broad geographic

# Challenges

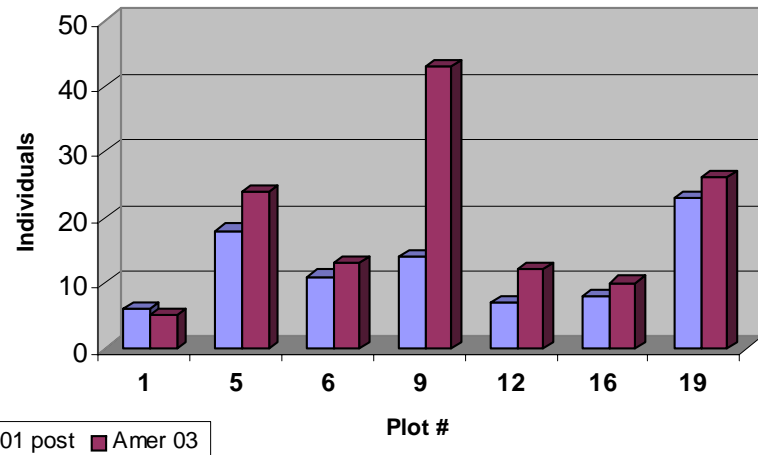
- Species identification



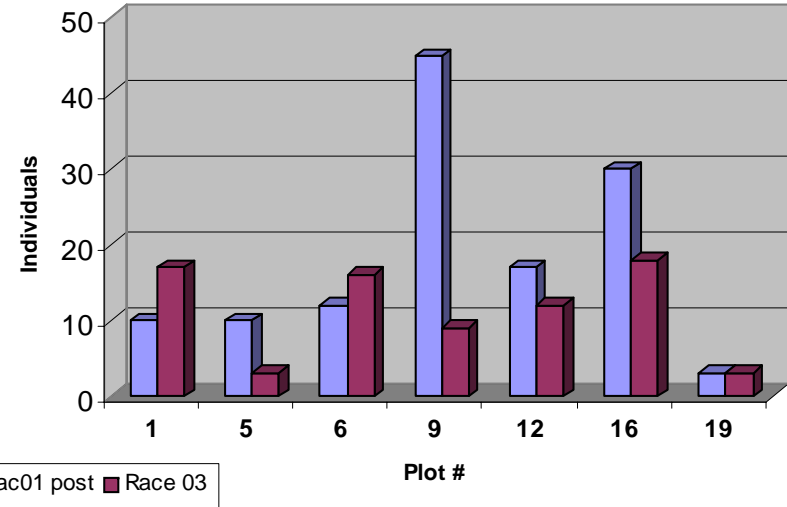
Black Cohosh

*Actaea racemosa*

**American Cohosh Change 2001 Post Light Harvest - 2003**



**Black Cohosh Change 2001 Post Light Harvest - 2003**



**Total Cohosh Change 2001 Post Light Harvest - 2003**

