Monitoring Deer Impacts in Ann Arbor:

A Pilot Study of Red Oaks as Sentinel Seedlings November 2015–September 2016

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How are deer affecting natural areas in Ann Arbor?

- Need for site-specific local baseline data
- For 2015-2016, sentinel* seedling method selected to offer standardized comparison
- Method used for 3+ years in other studies
- Trillium study set up; preliminary data 2017

* Experimental indicators of browse intensity

Why use sentinel* seedlings?

(Blossey/Cornell 2014; Latham/Swarthmore 2012; etc.)

- Standardized indicator across sites, years
- Clear metric: % of seedlings browsed by deer
- Quick baseline; can be repeated annually or biannually to gauge trends

* Experimental indicators of browse intensity

Why use red oaks as sentinels?

- Naturally occur in ALL city natural areas assessed
- Represents
  - **key ecological community** (oak/hickory forest)
  - **key ecological functions** (forest regeneration, food & habitat for many species)
  - → barometer of a range of ecological impacts
- Declining oak regeneration of concern in MI, Northeast US
- Michigan genotype nursery stock, acorns readily available
- *Intermediate* deer browse preference

How does deer browsing affect red oak seedlings?

- Plants can tolerate moderate browsing BUT…
  - Deer typically browse buds ➔ key growing portions
  - Browse damage makes seedlings more susceptible to drought, insects, shading
  - Repeated or intensive browse can lead to mortality
- Forest regeneration declines if deer browse intensity is too high
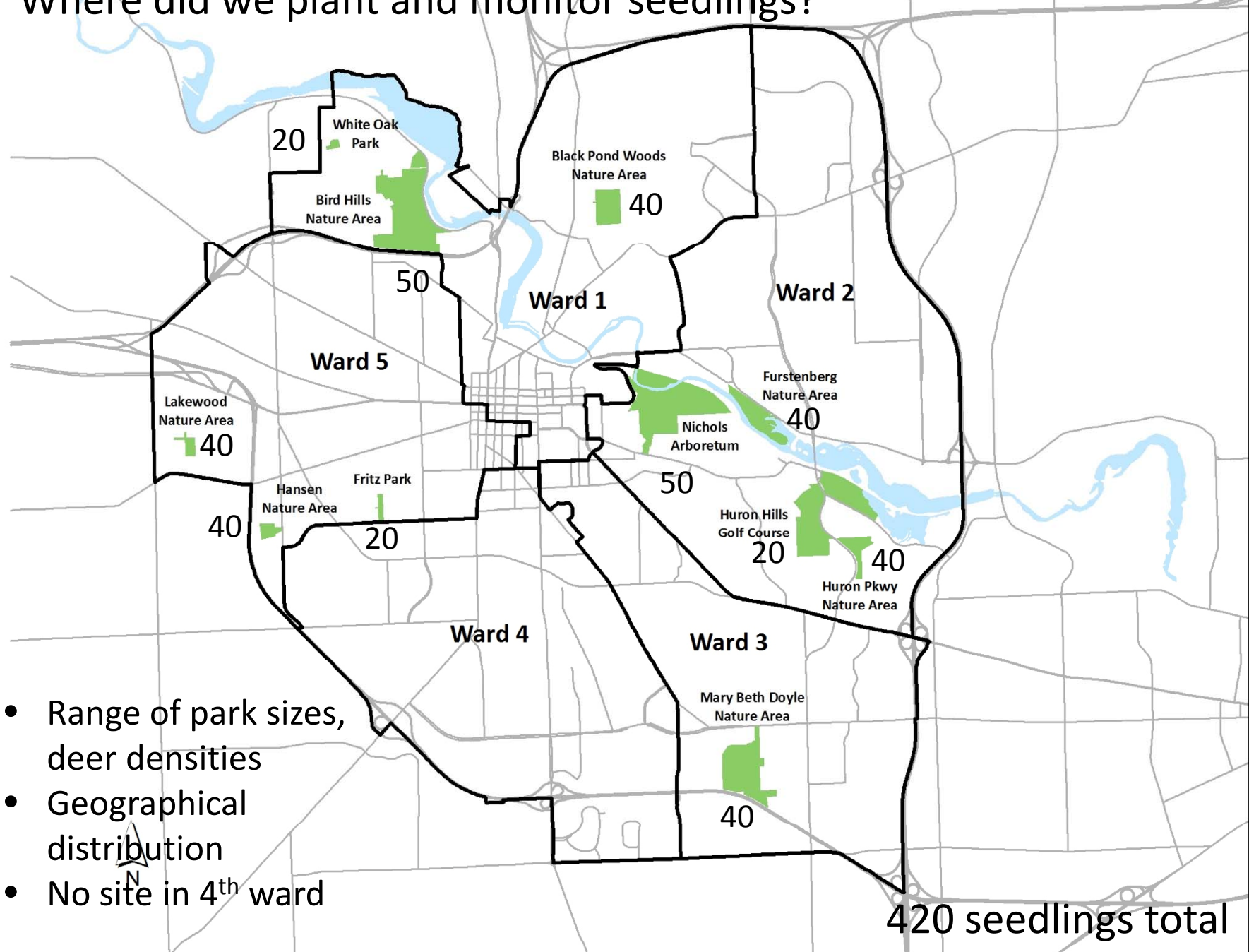
How high is too high?
What are sustainable levels of deer browsing?

- Blossey (2014) :

  An individual oak seedling may need 10–20 years to grow out of reach of a deer under a forest canopy, and even longer to get into the canopy. In many instances, seedlings/saplings need to spend extended periods in the understory waiting for their chance to grow should the overstory be damaged (or harvested). Considering this early life history, more than an occasional browsing event on oak sentinels (damage to [15% of] seedlings) in any given year would indicate deer populations in the area are too high to achieve forest regeneration.

Where did we plant and monitor seedlings?

20 White Oak Park

Black Pond Woods Nature Area 40

Bird Hills Nature Area

50

Ward 1

Ward 2

Ward 5

Furstenberg Nature Area 40

Lakewood Nature Area 40

Nichols Arboretum

50

Hansen Nature Area

Fritz Park

40

20

Huron Hills Golf Course 20

40

Huron Pkwy Nature Area

Ward 4

Ward 3

Mary Beth Doyle Nature Area

40

- Range of park sizes, deer densities
- Geographical distribution
- No site in 4th ward

N

420 seedlings total

Methods

- Planted seedlings in mature oak forest, 15+ feet from paths, in open understory
  - ½ seedlings fenced to assess survival without deer; this presentation focuses on unfenced seedlings only
- Linear but randomized to avoid discernible patterns
- Unfenced seedlings not marked or tagged to minimize cues to deer
- Location, data, photos linked on ArcGIS collector
- Monitored for condition, browse damage, browser identity 4 times, 5th to come.

How can you distinguish deer browse from browse by other animals?

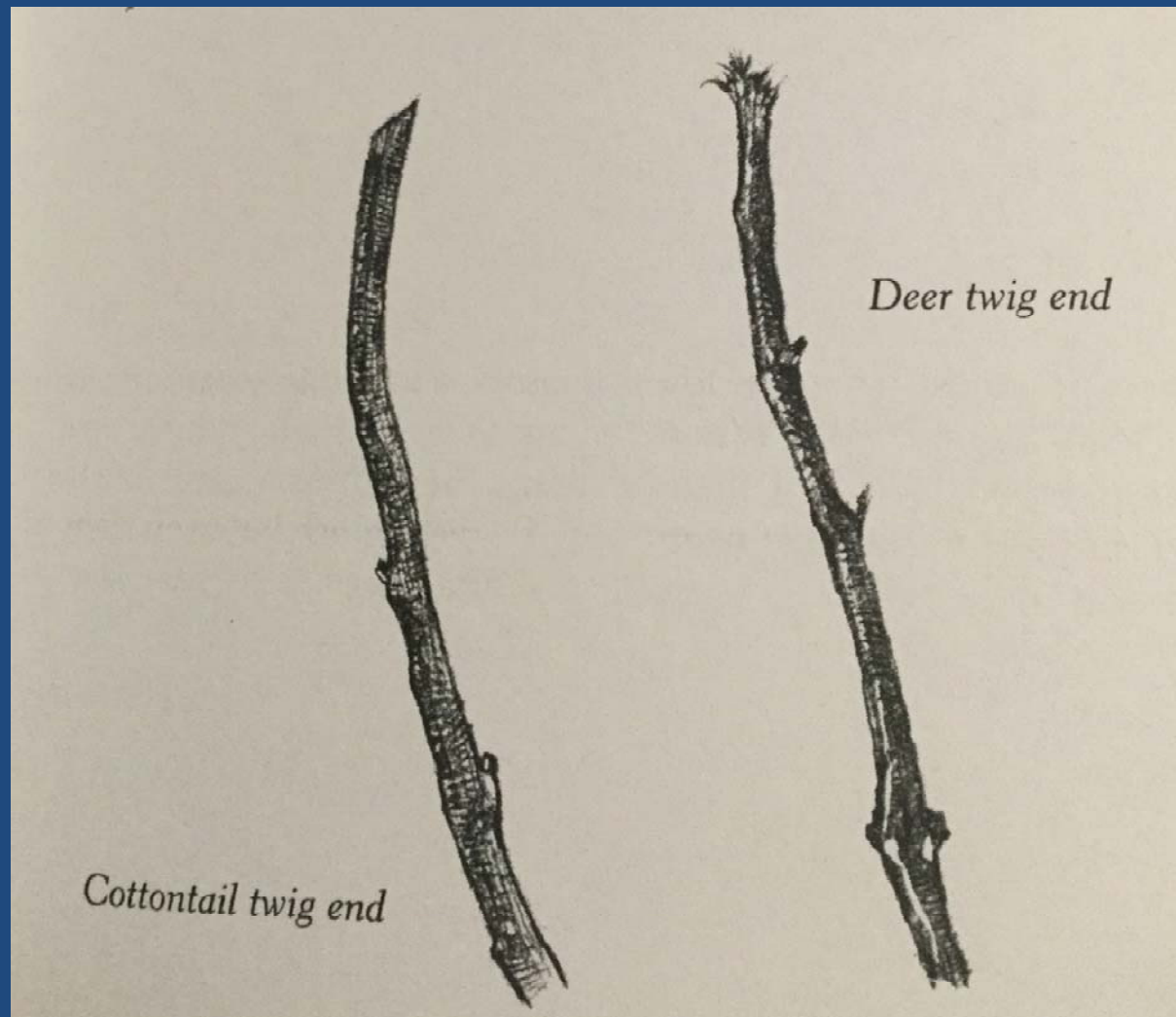**DEER BROWSE**

RABBIT BROWSE

VOLE CHEWING

Deer: No incisors; edges are shredded, not cleanly angled
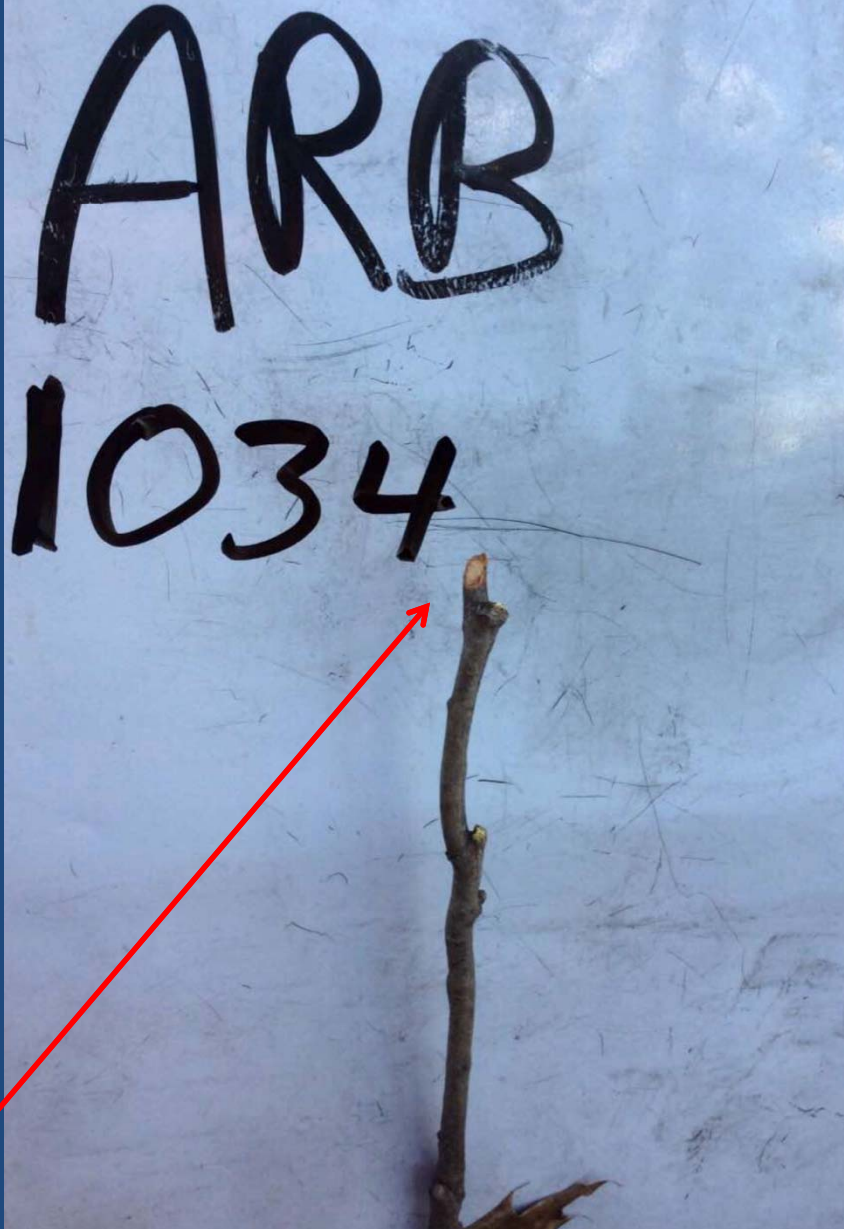
Rabbit: Incisors leave cleanly angled mark, 45°

Vole: Small toothmarks (1 mm) , bark gnawed or stem chewed through

Rabbit vs. deer browse marks

Deer twig end

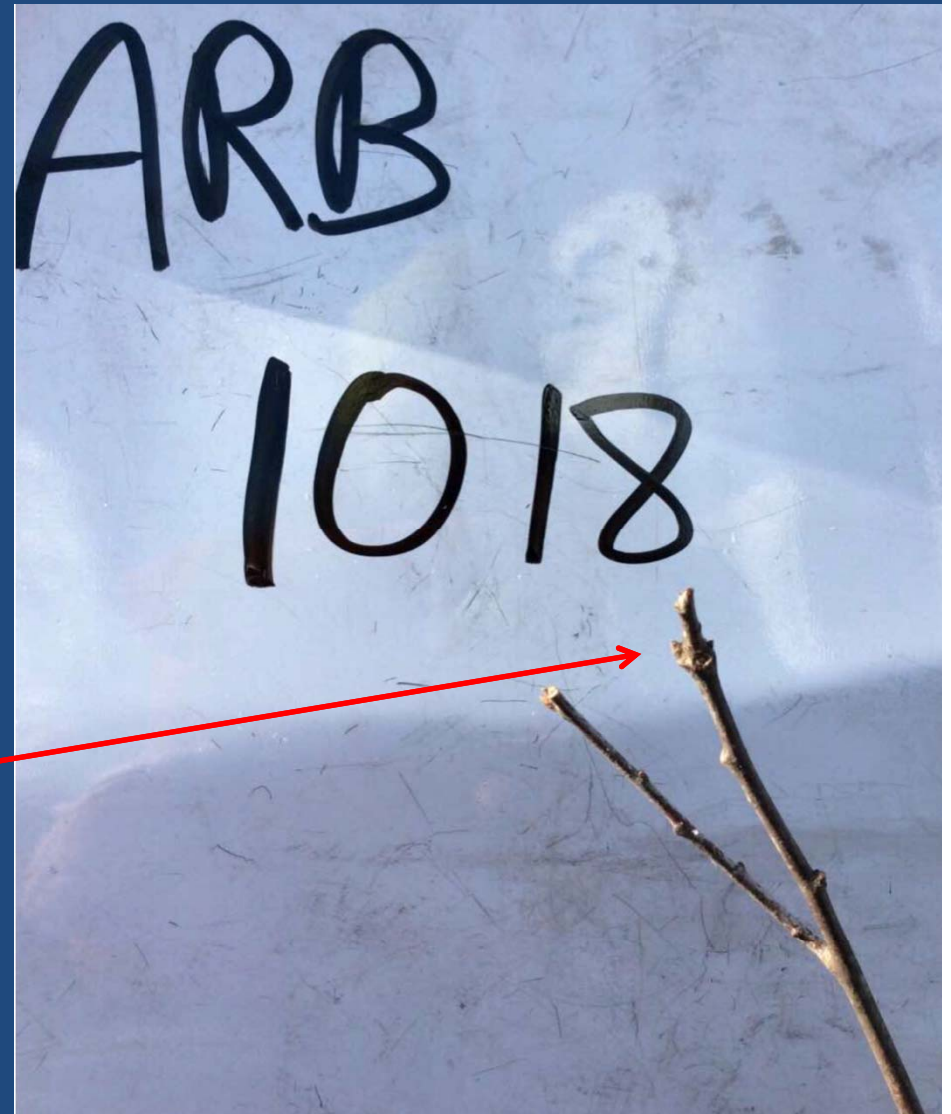Cottontail twig end

ARB 1038N

ARB 1034

Deer browse: shreddy

Rabbit browse: angled

Before and after deer browse

What proportion of seedlings were browsed by deer?

- 54% of seedlings were browsed by deer
- Deer browse proportion ranged from 20%–90% of seedlings
- Half of the sites had 60% or more seedlings browsed
- Some seedlings browsed repeatedly (further analysis in final report)

What proportion of seedlings were browsed by deer?

Ward 1   Ward 2   Ward 3   Ward 5
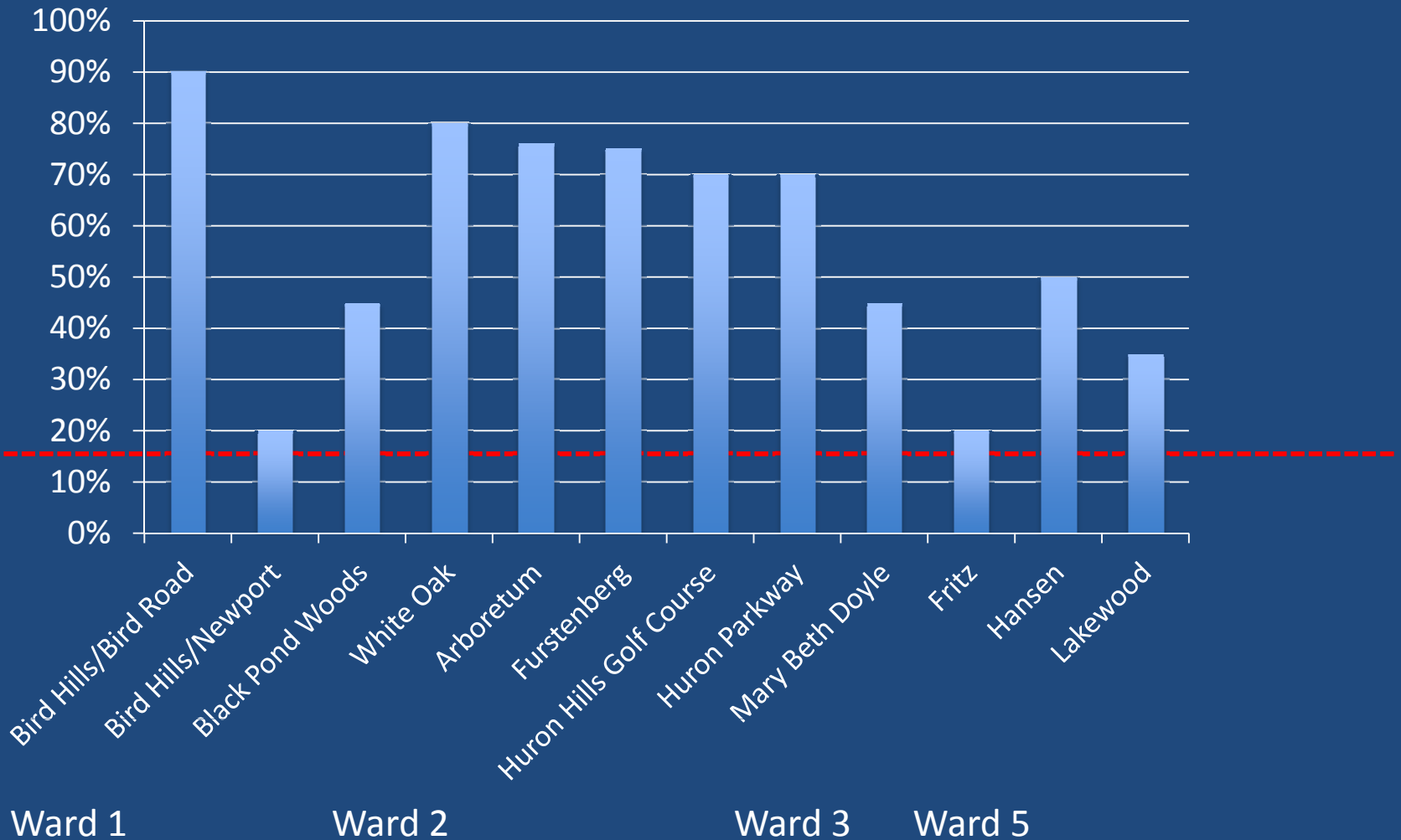
What proportion of seedlings were browsed by deer compared to small mammals?

Browser identity	# seedlings browsed	% of all browsed seedlings
Deer only	100	76%
Deer + small mammal	14	11%
Small mammal only	12	9%
Other/not clearly identifiable	5	4%
Total seedlings browsed (of 210)	131	
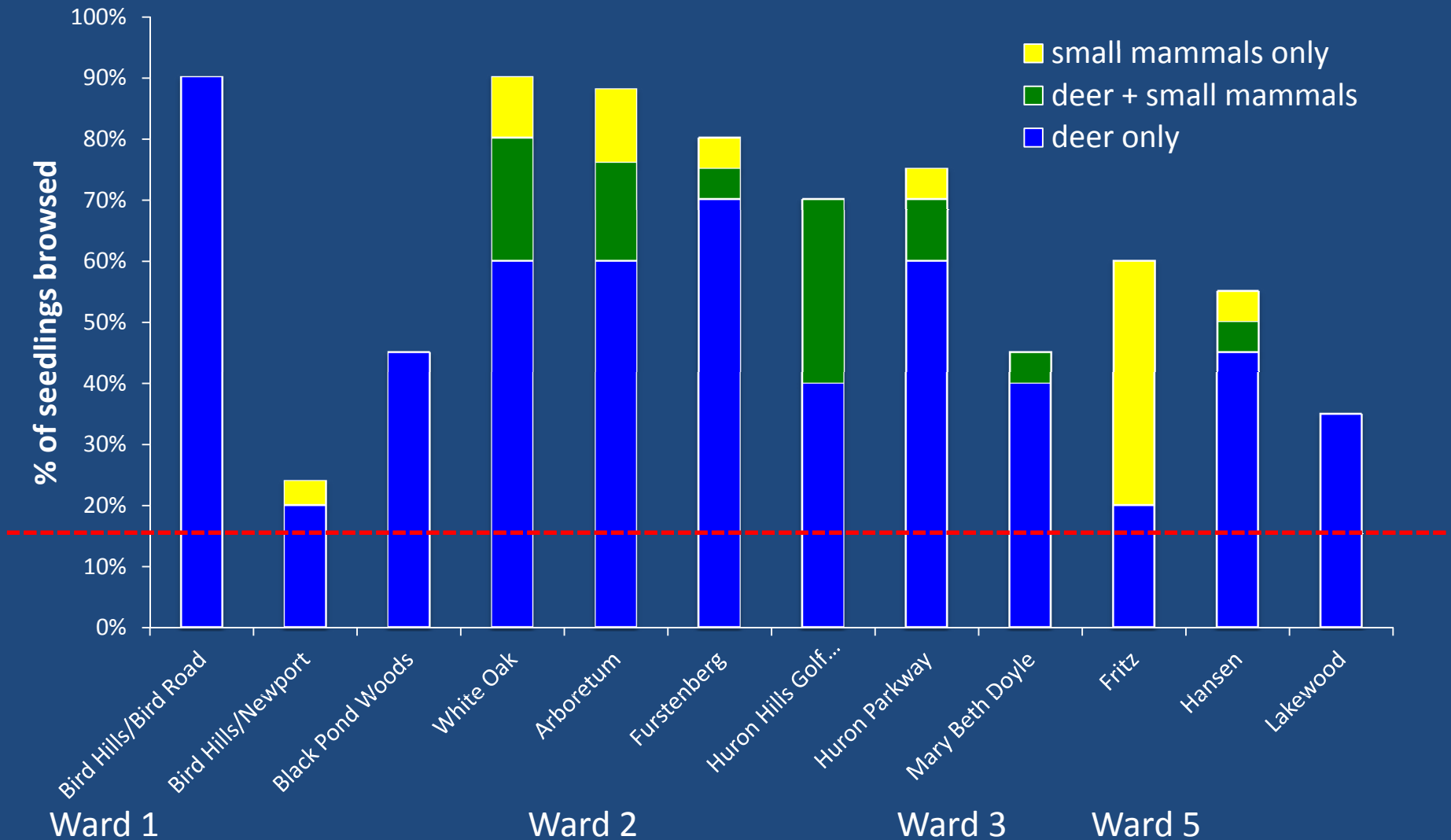
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