



United States Department of Agriculture

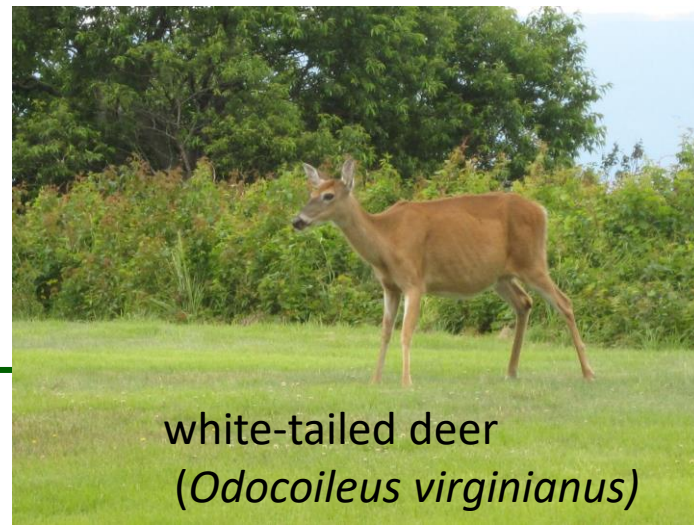
Deer as a natural disturbance that supports landscape and herbaceous plant diversity

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white-tailed deer
(*Odocoileus virginianus*)



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Deer are considered overabundant and destructive, a native invasive species

“Deer have expanded their range and increased dramatically in abundance worldwide in recent decades. They inflict major economic losses in forestry, agriculture, and transportation and contribute to the transmission of several animal and human diseases. Their impact on natural ecosystems is also dramatic but less quantified.” abstract of Côté et al. 2004

“Due to chronic high densities and preferential browsing, white-tailed deer have significant impacts on woody and herbaceous plants. These impacts have ramifications for animals that share resources and across trophic levels. High deer densities result from an absence of predators or high plant productivity, often due to human habitat modifications, and from the desires of stakeholders that set deer management goals based on cultural, rather than biological, carrying capacity. Success at maintaining forest ecosystems require regulating deer below biological carrying capacity, as measured by ecological impacts.” abstract of McShea 2012



But deer populations probably within historical bounds

Historical white-tailed deer (*Odocoileus virginianus*) densities were estimated by Seton (1928) at around 8 deer per km² in eastern North America, where white-tailed deer are most abundant

Totaling 24 million deer in the eastern U.S.

Current population at about 21 million animals in the eastern U.S.



Loss of megaherbivores

Most large megafauna, became extinct about 13,000 to 11,000 years ago following arrival of humans in the eastern U.S.

Llama, peccary, horse, tapir, pronghorn, ground sloth, muskox, zebra, another bison, and proboscideans (i.e., mammoth, mastodon, gomphothere)

Recent extirpation of American bison (*Bison bison*) and elk (*Cervus canadensis*) following Euro-American settlement in the eastern U.S.

The influence of large herbivores on vegetation likely has diminished in correspondence extinctions and extirpations of large herbivores



Damaging and destructive?

Reduced tree density by browsing is almost universally interpreted as ecological degradation and a forest health problem

Counterview: Some historical ecosystems were open forests (savannas and woodlands) with low tree densities, which allowed greater diversity and abundance of the herb layer

Restoration and management require control of small diameter trees to allow growing space for herbaceous species

Plus fuel reduction for fire prevention

Deer provide critical ecosystem services

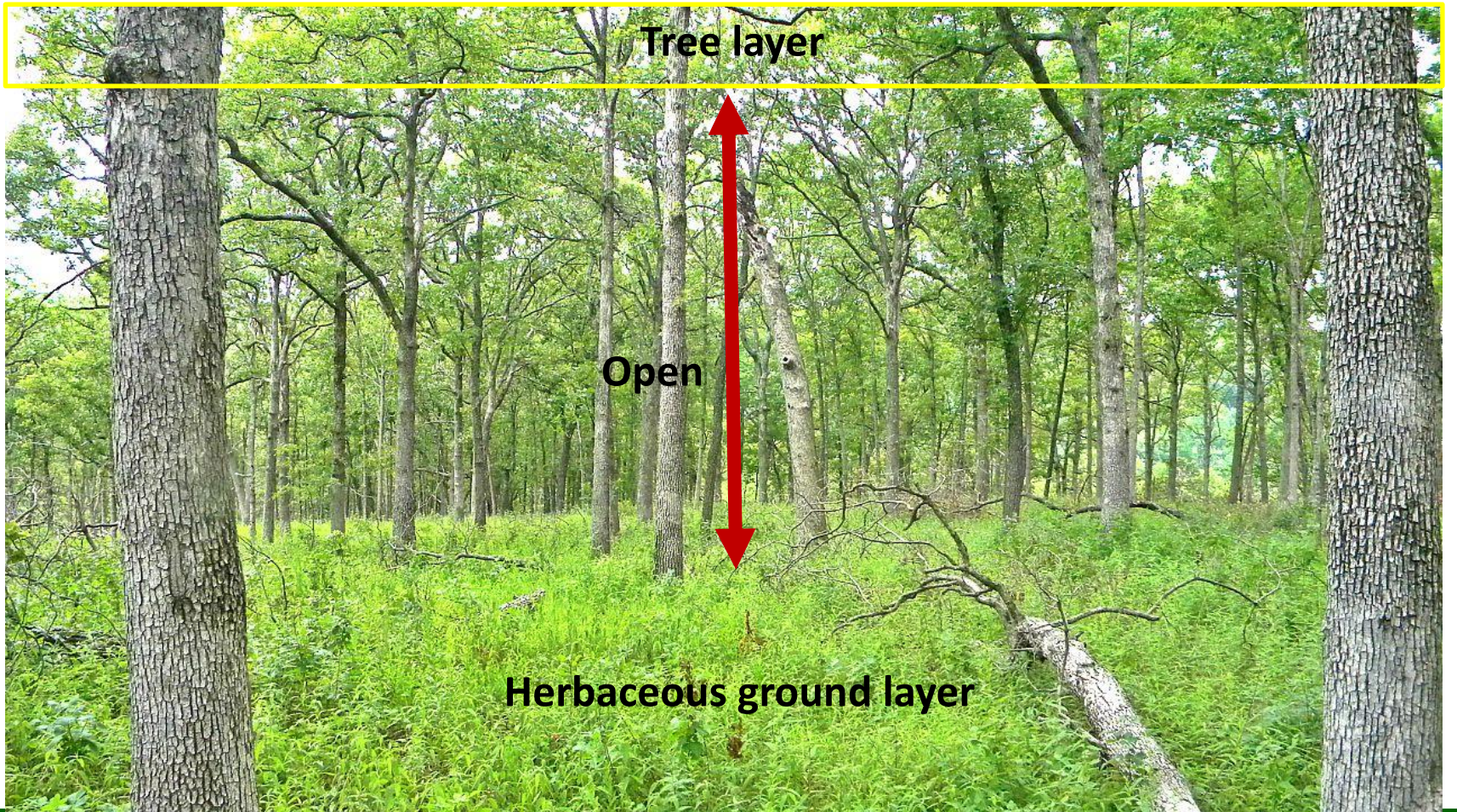


Plants have co-existed with herbivore pressure for millions of years.

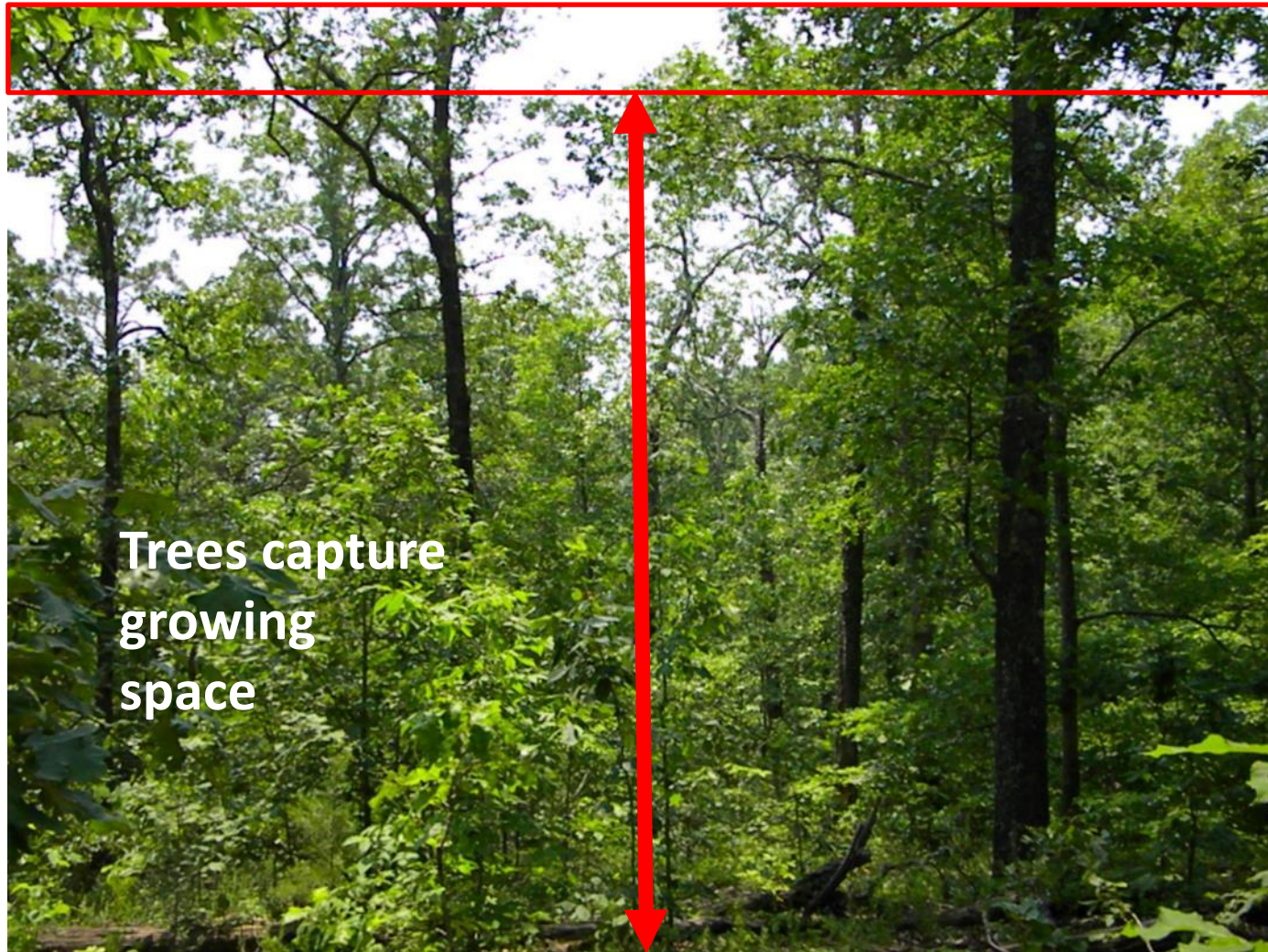
The historical open longleaf pine forest of the southeastern U.S. was an herbaceous diversity hotspot, while other open oak and pine forests also had great herbaceous richness, despite browsing pressure



Open, low tree density forest = Overstory layer, open midstory, herbaceous ground layer



Closed, high density forests = all trees, no herbs



Trees capture
growing
space



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Missouri, control; C. Kinhead

Natural understory disturbances can control tree densities, allowing growing spaces for forbs and grasses





Browsers such as deer feed preferentially on woody plants and forbs, and physically damage trees



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Disturbance regimes

Similarly to other disturbances, deer disturbance 'regimes' vary in severity across different habitats and landscapes

Landscape diversity



However...

In today's modified landscapes, with closed forests full of trees plus invasive species, deer pressure is an additional stress upon isolated rare species

Deer have not been able to reduce tree densities enough to generate open forests in the absence of fire



Socioeconomic benefits



Deer hunting >\$20 billion and 150,000 jobs (U.S.)

Funds state wildlife agencies

Deer are important culturally

Flags, logos

Connection with nature



Silvicultural services for pine plantations

Pines are not preferred by deer

Pine plantations typically receive herbicide applications to control broadleaf tree species

Thinning also is a common treatment

Plus stands can be leased for hunting



However...

Deer cause more agricultural damage than any other species of wildlife in the United States

Agricultural fields are not preferred by deer

About 120 to 440 people per year are killed in motor vehicle collisions with deer in U.S.

Similar numbers of deaths by lawnmowers and livestock

Car and motorcycle safety practices (seatbelts, helmets) would reduce mortality



Conclusions

We are only beginning to appreciate in aggregate the ecological benefits of deer browsing

Deer are the last standing large herbivore in the eastern U.S.

Browsing pressure probably less severe than in the past

Browsers provide ecosystem services and a visible representation of ecosystems

Localized areas with poor tree regeneration due to chronic deer browsing are opportunities for open forest restoration, rather than closed forest failures.

Many threatened species, including herbaceous plants, beetles and butterflies, and birds are associated with loss of 'high light' or open forest environments, in contrast to the classical consensus that 'high' or closed forest is the desirable economic and ecological goal that is harmed by large herbivores



Questions? Comments?

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