

Afforested Bottomlands: Managing the Middle Years

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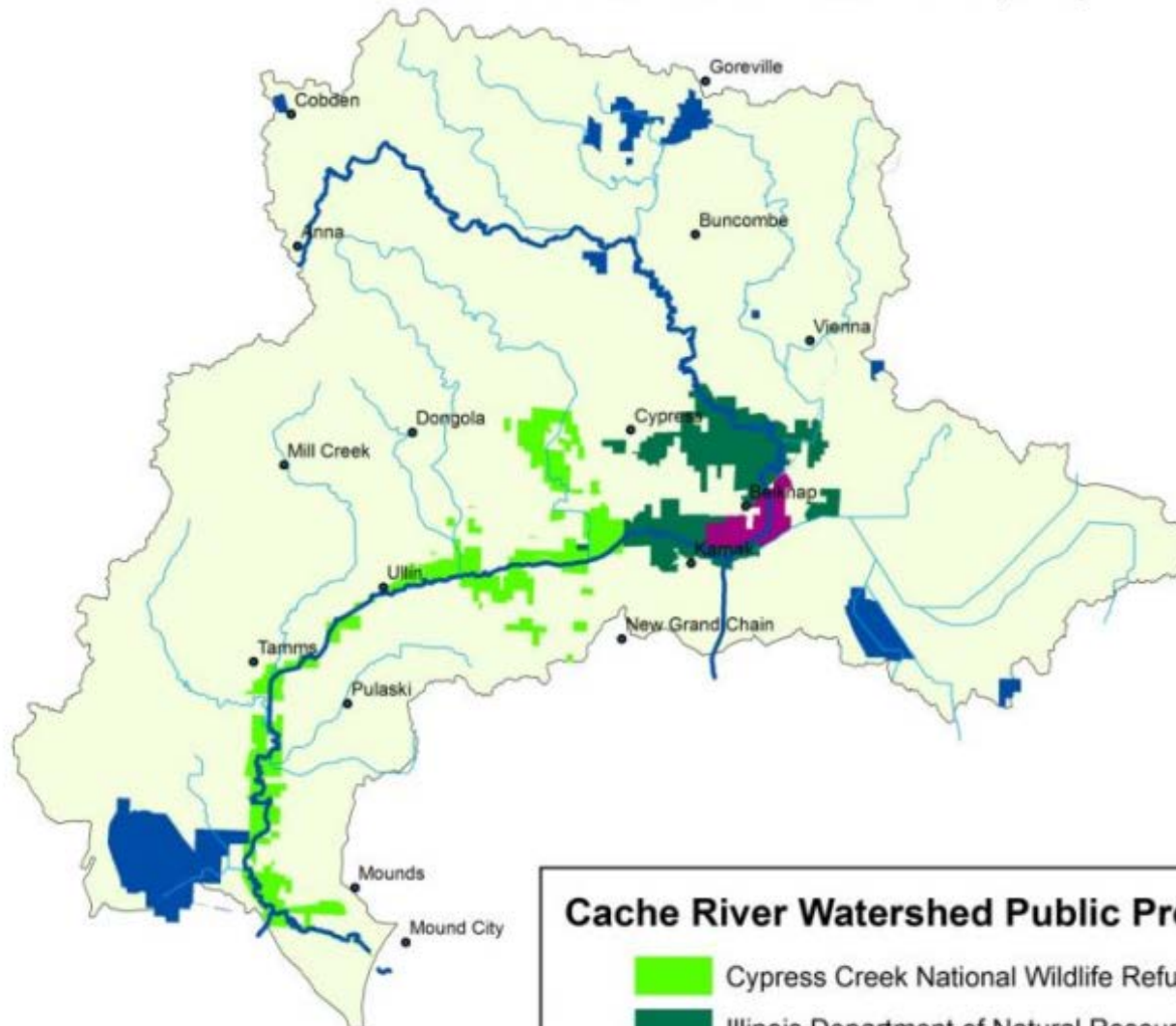
Department of Forestry

Southern Illinois University

Mississippi River Basin




Cache River Watershed Public Property



0 2.5 5 10 Miles



Cache River Watershed Public Property

-  Cypress Creek National Wildlife Refuge
-  Illinois Department of Natural Resources
-  The National Conservancy
-  State Owned Property
-  Cache Watershed

Expectations

- Protect water quality
- Restore natural conditions, including underlying hydrology changed by agricultural expansion
- Improve wildlife habitat



- Establishment
- Early stand development
- Are patterns natural?



Early stem exclusion



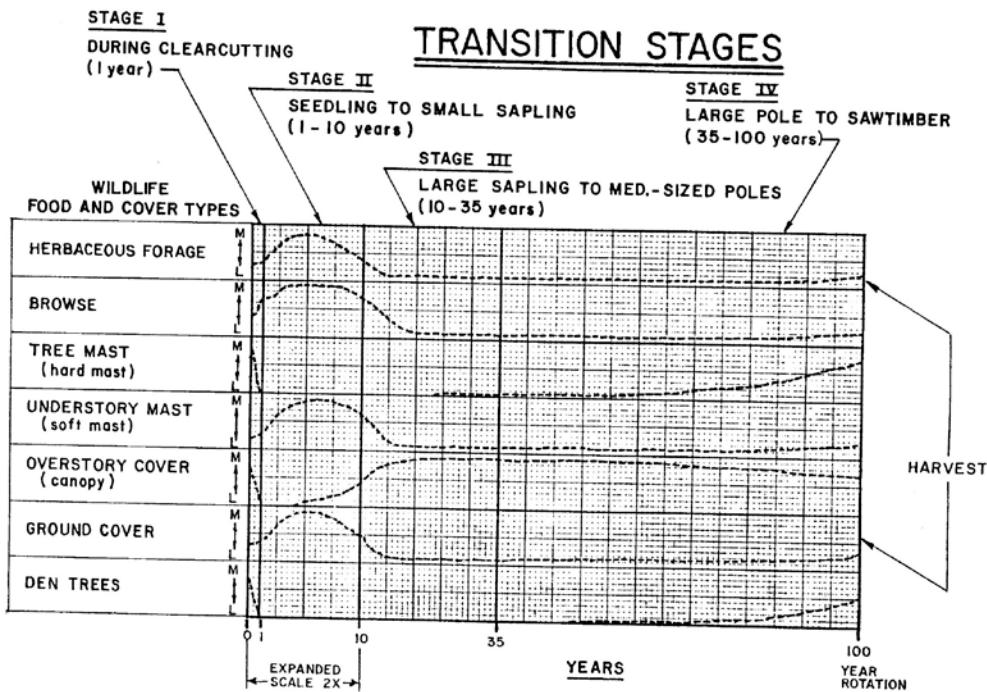


- Thinning to accelerate stand development and create horizontal structure
- Understory re-initiation
- Flooding regimes





BLH ecosystem function changes over time: The middle years



- Canopy development
- Species composition changes
- Development of horizontal structure
- Internal hydrologic changes
- Development of mast producers

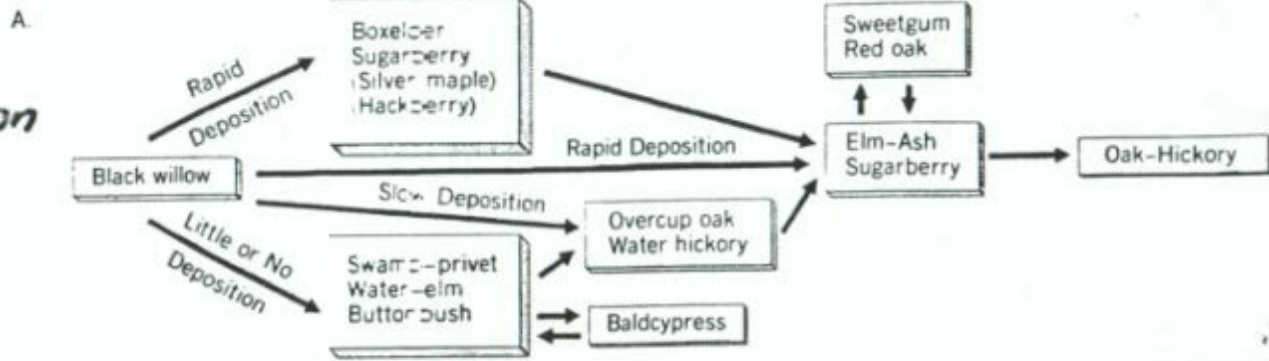
Multiple possible outcomes

- Disturbances
 - Flooding/sedimentation
 - Vegetation establishment patterns within a field

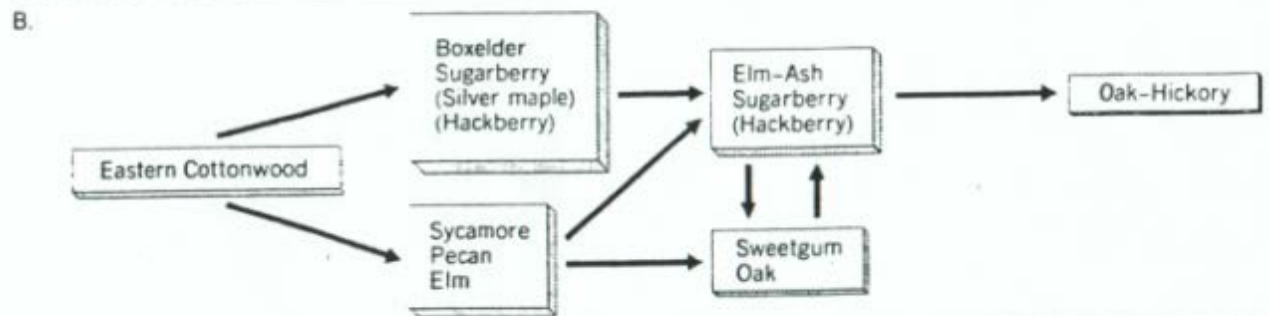


Multiple possible outcomes

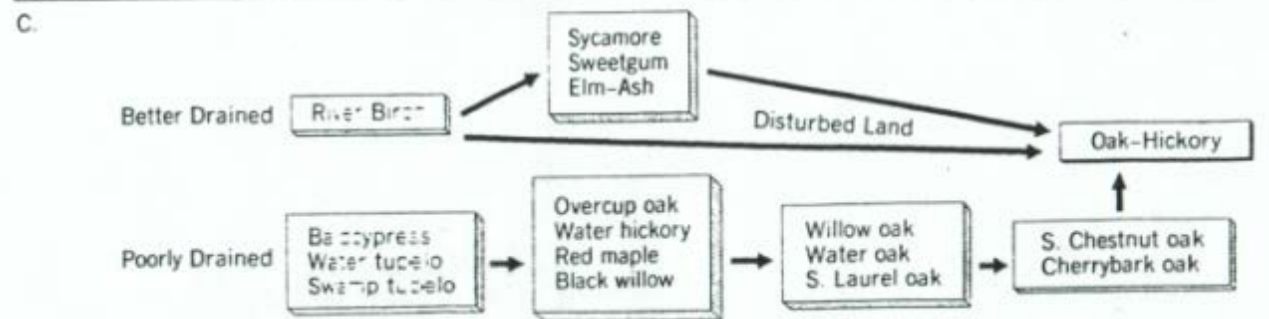
Beginning on poorly drained, low elevation sites on major bottoms



Beginning on better-drained, higher elevation sites on major bottoms



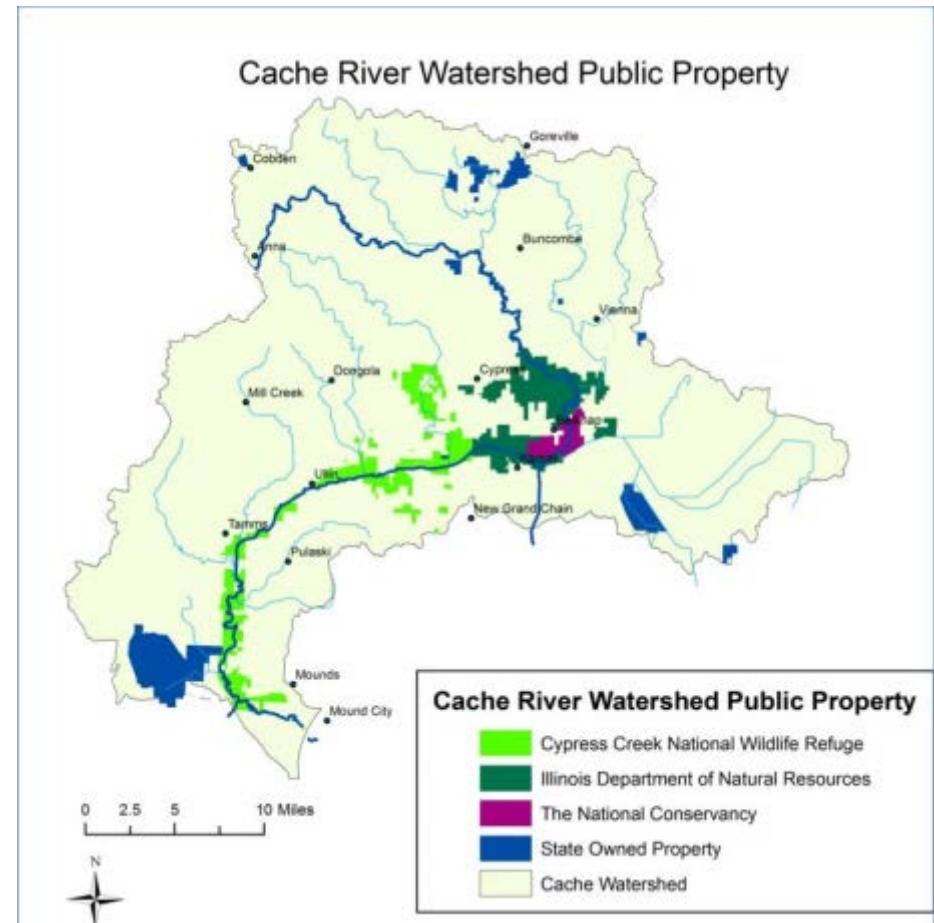
Succession on minor bottoms



Hodges, J.D 1997. Development and ecology of bottomland hardwood sites. Forest Ecology and Management 90:117-125.

Multiple possible outcomes

- Lands available for afforestation
- Pre-afforestation vegetation
- Legacy of fire as an agricultural tool
- Invasive species



Pre-afforestation vegetation

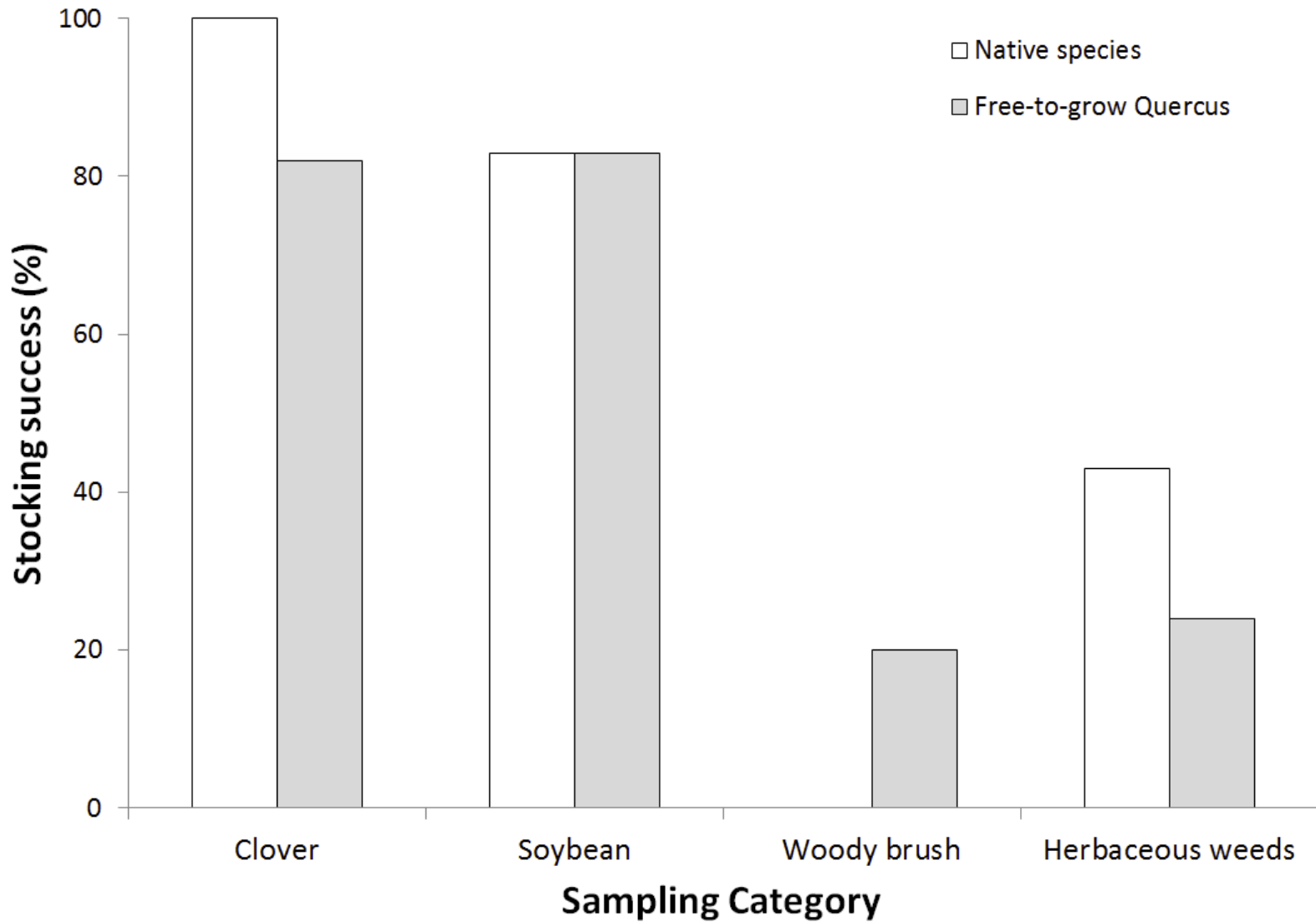


Table 1. Management, disturbance chronology, and vegetation response for Mermet Lake Conservation Area, Illinois, USA.

| Primary disturbance | Period | Fire regime ^a | Vegetation response |
|--|------------------------|--|--|
| <u>Pre-Euro-American settlement</u> | | | |
| Flooding | <1850 ^a | Infrequent, 35–100 yr interval of mixed severity intensity during decadal droughts | Maintenance of cypress-giant cane |
| <u>Post-Euro-American settlement</u> | | | |
| Agricultural clearing of forest land | >1900 ^a | Frequent, 0–35 yr interval, low severity (MFI 2.67 yrs) | Reduction of midstory cover and selective removal of merchantable stems |
| Row Cropping | 1910–1957 ^a | Frequent (MFI 1.42 yrs) | Maintained disturbance-dependent vegetation |
| Drainage of bottomlands | >1919 ^a | Increased (MFI 1.37 yrs) | Drier landscape, abundant fine fuels and selection for fire tolerant species |
| <u>Traditional conservation management</u> | | | |
| State ownership initiated | >1950 ^b | Complete suppression | Little recruitment of disturbance-dependent species; development of shade-tolerant, fire-intolerant understory/midstory |
| Ditch plugging | >1957 ^b | N/A | Wetter landscape, selection for mesophytic species |
| Hunter access | >1957 ^b | N/A | Roads and trail maintenance provide hunter access and hasten spread of invasive species |
| Tornado | 2003 | N/A | Promoted recruitment of disturbance-dependent species, released advance reproduction, increased biodiversity |
| <u>Active Conservation Management</u> | | | |
| Salvage Logging | >2003 | N/A | Promoted recruitment of disturbance-dependent species. Created microsites that increase habitat heterogeneity and diversity |

^a Determined from Massac County tax records.

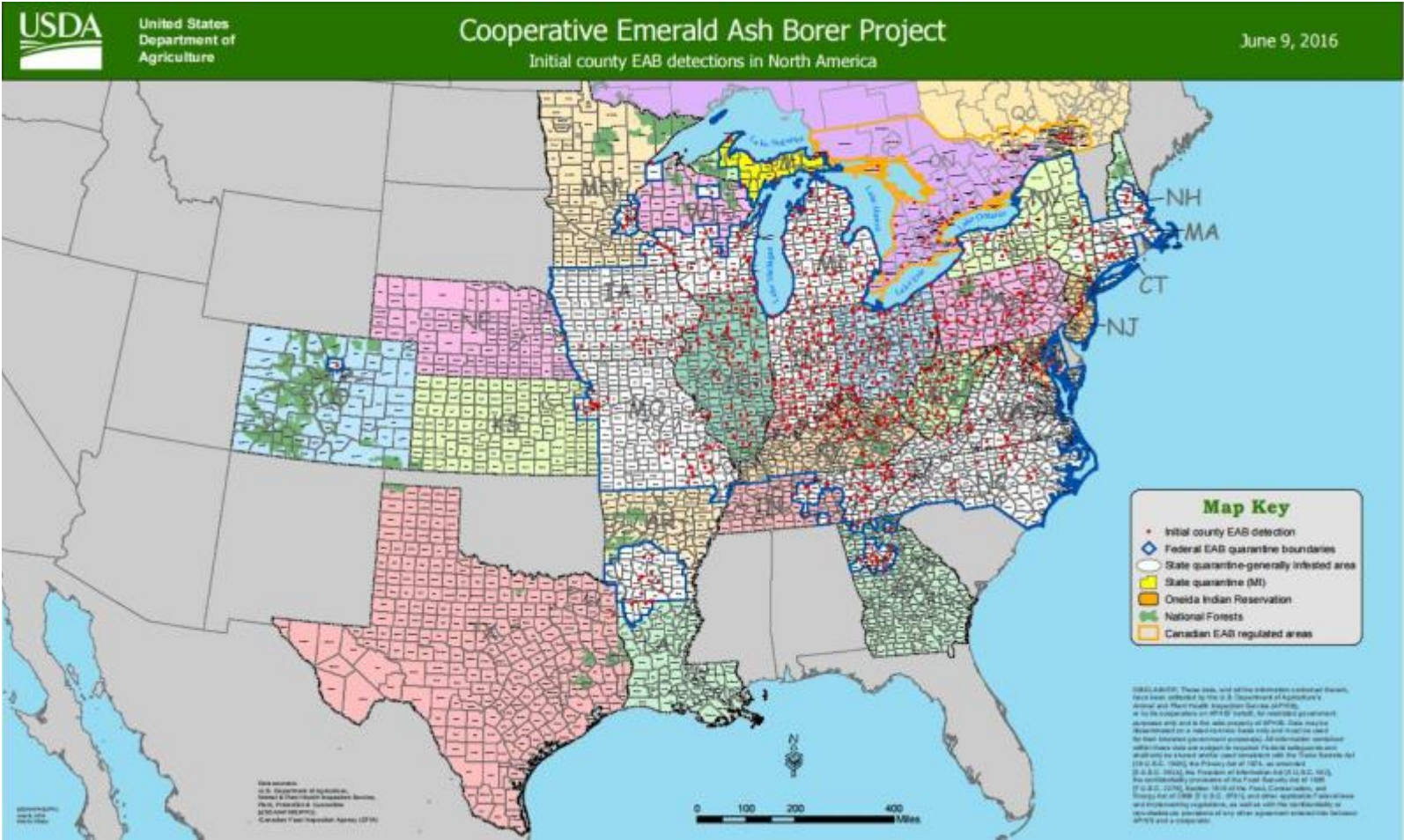
^b Determined from IDNR records.

^c Adapted from Nelson et al. 2008b.

Nelson, J.L., J.W. Groninger, C.M. Ruffner, and L.L. Battaglia. 2009. Past land use, disturbance regime change, and vegetation response in a southern Illinois bottomland conservation area. *Journal of the Torrey Botanical Society* 136:242-256.



<http://na.fs.fed.us/fhp/eab/>



Stand Composition- Age 7

- Dominated by green ash, box-elder, sweetgum, and sycamore
- Planted oak was the only tree in 15% of plots
- Green ash was the only tree in 13% of plots



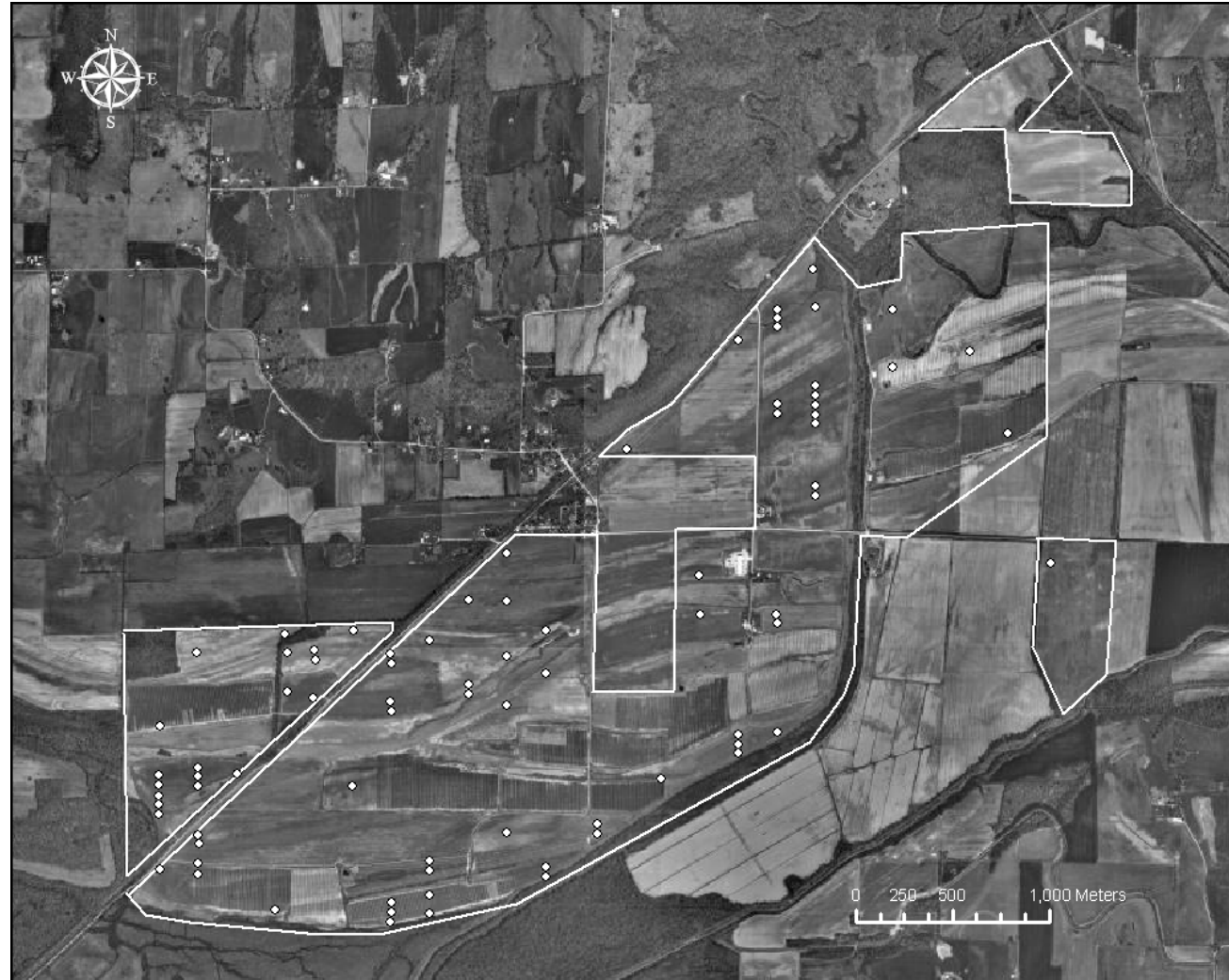
Anticipating Emerald Ash Borer



Japanese Honeysuckle at Grassy Slough

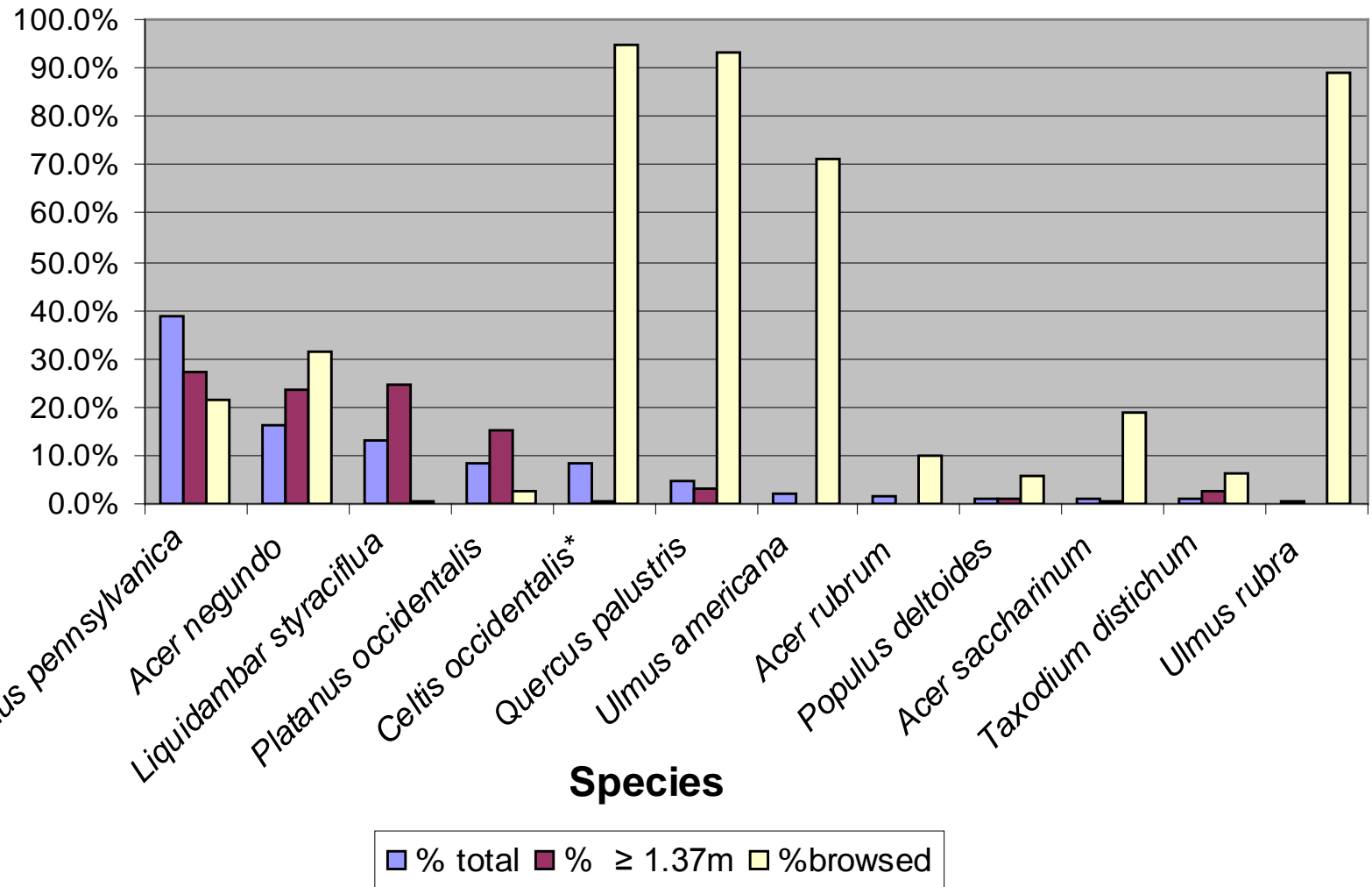


-Long Forestry Consult.



Ruzicka, K.J., J.W. Groninger, and J.J. Zaczek. 2010. Deer browsing, forest edge effects, and vegetation dynamics following bottomland forest restoration. Restoration Ecology 18:702-710.

Stocking and Deer Browsing





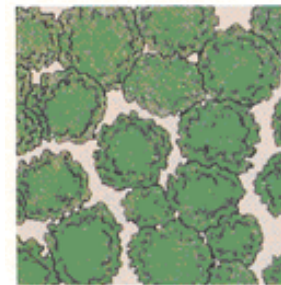
Active management
considerations:
Invasive species

Canopy status of oak



- Planted oak competing with volunteer associates
 - Seedling oak vs sprouts
 - Post-agricultural weeds

Crown Touching Release

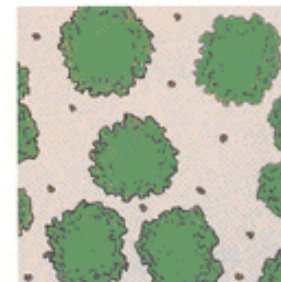


View from above



View from side

BEFORE
TREATMENT



View from above



View from side

AFTER
TREATMENT

What constitutes a successfully managed BLH landscape?

- Restoring hydrologic connectivity
- Wildlife



Swamp Rabbits as Indicators

- Evolved in BLH ecosystem
 - Obligate specialist
- Habitat
 - Diverse community types
 - Terrestrial and aquatic habitat
 - Diverse stand structures
- Easy to monitor (fecal pellets)



Swamp Rabbit Ecology (2005 – 2015)

- Positively associated with large, contiguous patches of BLH and a range of contiguity in upland cover (Scharine et al. 2009, 2011, Crawford et al. 2012, Robinson et al. 2015)
- Occupy areas less than 200m away from a semi-permanently flooded wetland (Crawford et al. 2012)
- Benefit from canopy gaps, thick understory vegetation, and fallen logs (Scharine et al. 2009)
- Occupy a large percentage of young afforested patches (Crawford et al. 2012)
- Exist as metapopulations with limited dispersal due to habitat fragmentation (Roy Nielsen et al. 2008, Berkman et al. 2015)

Anticipated Benefits: Swamp Rabbits as Indicators

- Additional Key Wildlife Species
 - Forest Interior Songbirds
 - Herpetofauna
 - Bats
 - Wild Turkey
 - White-tailed Deer



Key Forest Wildlife Species

| Variable | | Forest Int. Songbird | Herps. | Bat | Turkey | Deer | Swamp Rabbit |
|--------------------------------------|----------------------------|-------------------------|--------|-----|--------|------|-----------------|
| Landscape Position Requirement | Wetland/Aquatic /Upland | | W A | W | | | W A U |
| Additional Cover Use | Open/Canebrake | C | C | | O | O | C |
| Stand Develop. | Young/Mature | Y M | Y M | Y M | M | M | Y M |
| Structure | Canopy Gaps | x | | x | | | x |
| | Cavity Trees | x | | x | | | |
| | CWD | x | x | | | | x |
| | Dead/Stressed | | | x | | | |
| | Herbaceous | | | | x | x | x |
| | Dense Woody | | | | | | x |
| Impact of Forest Continuity | Abundance | x | x | x | x | | x |
| | Distribution | | | | | | x |
| | Migration | | x | | | | |
| | Predation | x | | | | | x |
| | Dispersal | | | x | | | x |

Swamp rabbit as an ecosystem performance indicator

- Relate swamp rabbit habitat use to specific age, structure, composition of vegetation in BLH stands
- Create a model that links structure and composition from stand to landscape levels
- Develop a framework to evaluate the balance of habitat values associated with maturing stands with those of young regenerating stands



The role of giant cane



Some characteristics of restored bottomland hardwood forests

- Dominant Species, Structure, Dynamics
 - Many possible stand development pathways
 - A tendency toward convergence in the absence of disturbance
 - New and important forces are shaping vegetation composition and structure
 - Consider both stand and landscape-level dynamics
 - Pursue active management