



## Seney National Wildlife Refuge

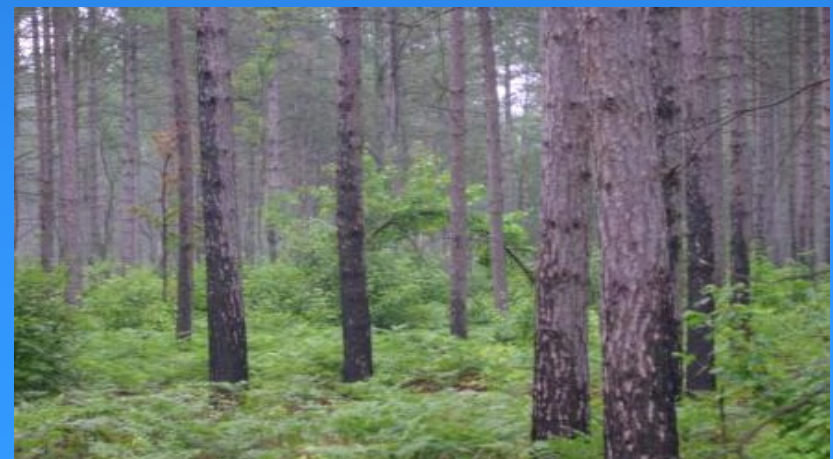
# Research-Management Partnerships and Fire-Dependent Ecosystem Restoration: Case Studies from Seney National Wildlife Refuge, Upper Michigan

**Greg Corace**  
*Seney National Wildlife Refuge*

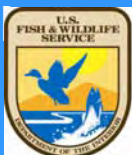
**Charles Goebel**  
*The Ohio State University*

**Dan Kashian**  
*Wayne State University*

**Tom Pypker**  
*Michigan Technological University*

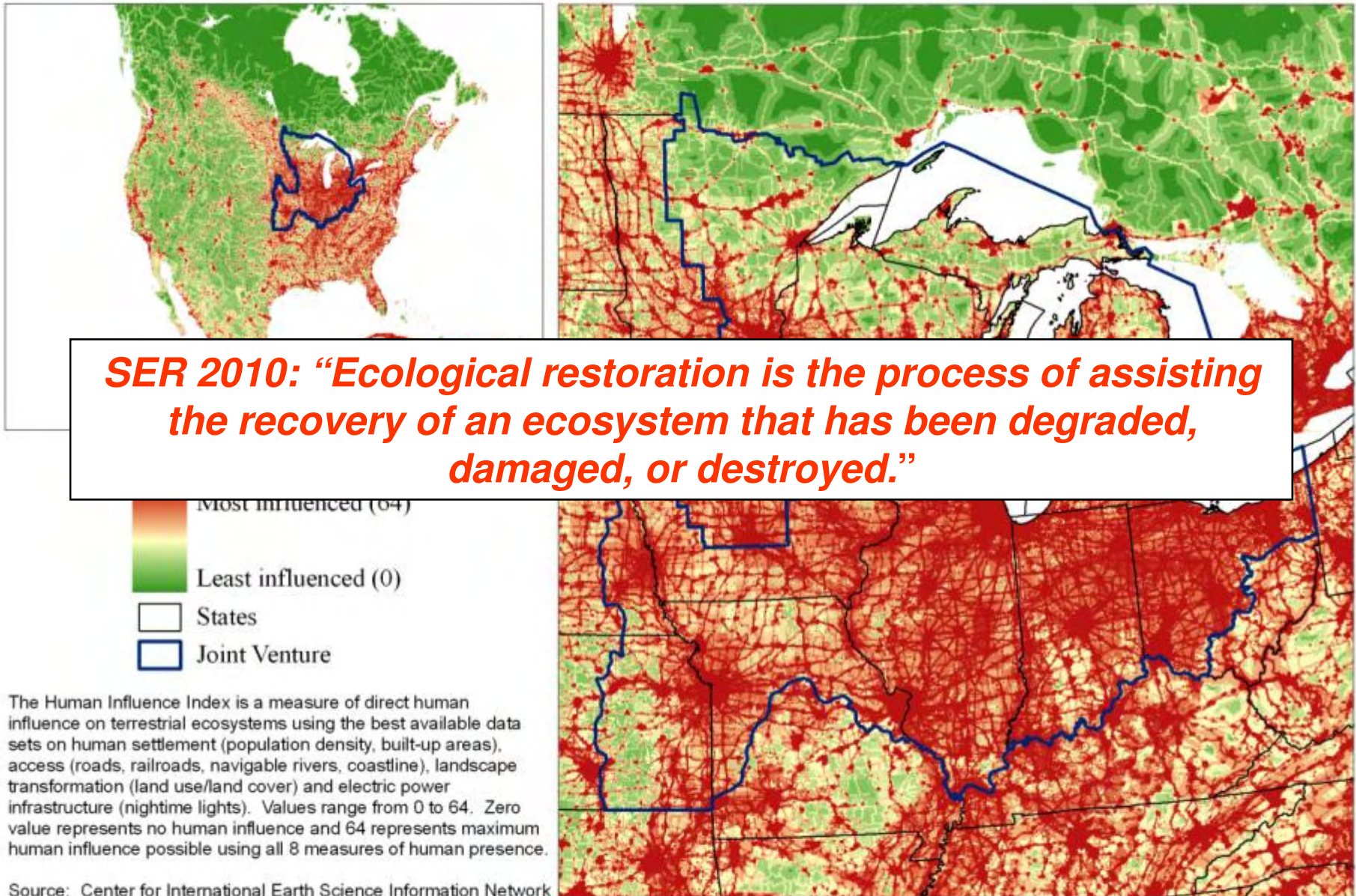


[www.fws.gov/midwest/seney/research.htm](http://www.fws.gov/midwest/seney/research.htm)

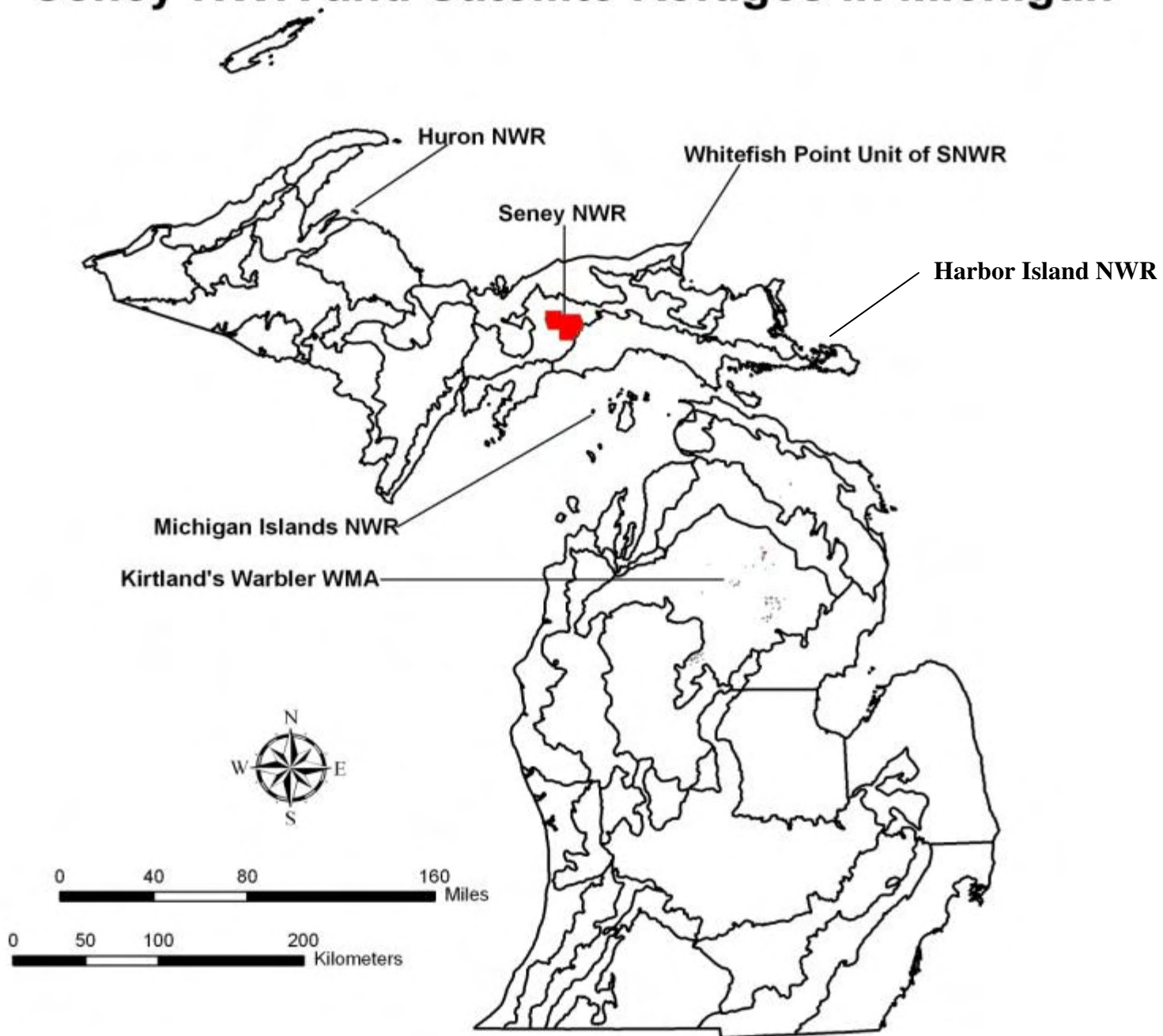




## The Human Influence Index



# Seney NWR and Satellite Refuges in Michigan













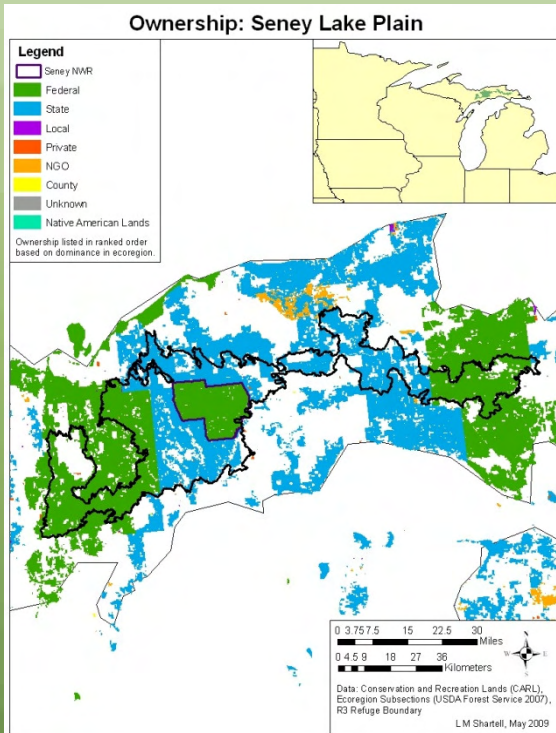
# Refuge Land Management

## Refuge System Policy- Refuge Legislation

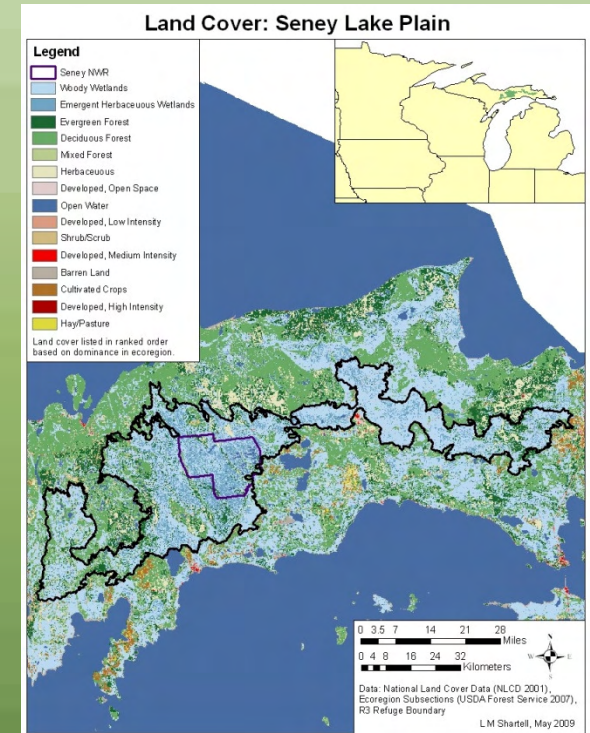
### Ownership

### Land Cover

Planning  
&  
Mgmt.



Corace et al. *In Press. EnvMgmt.*



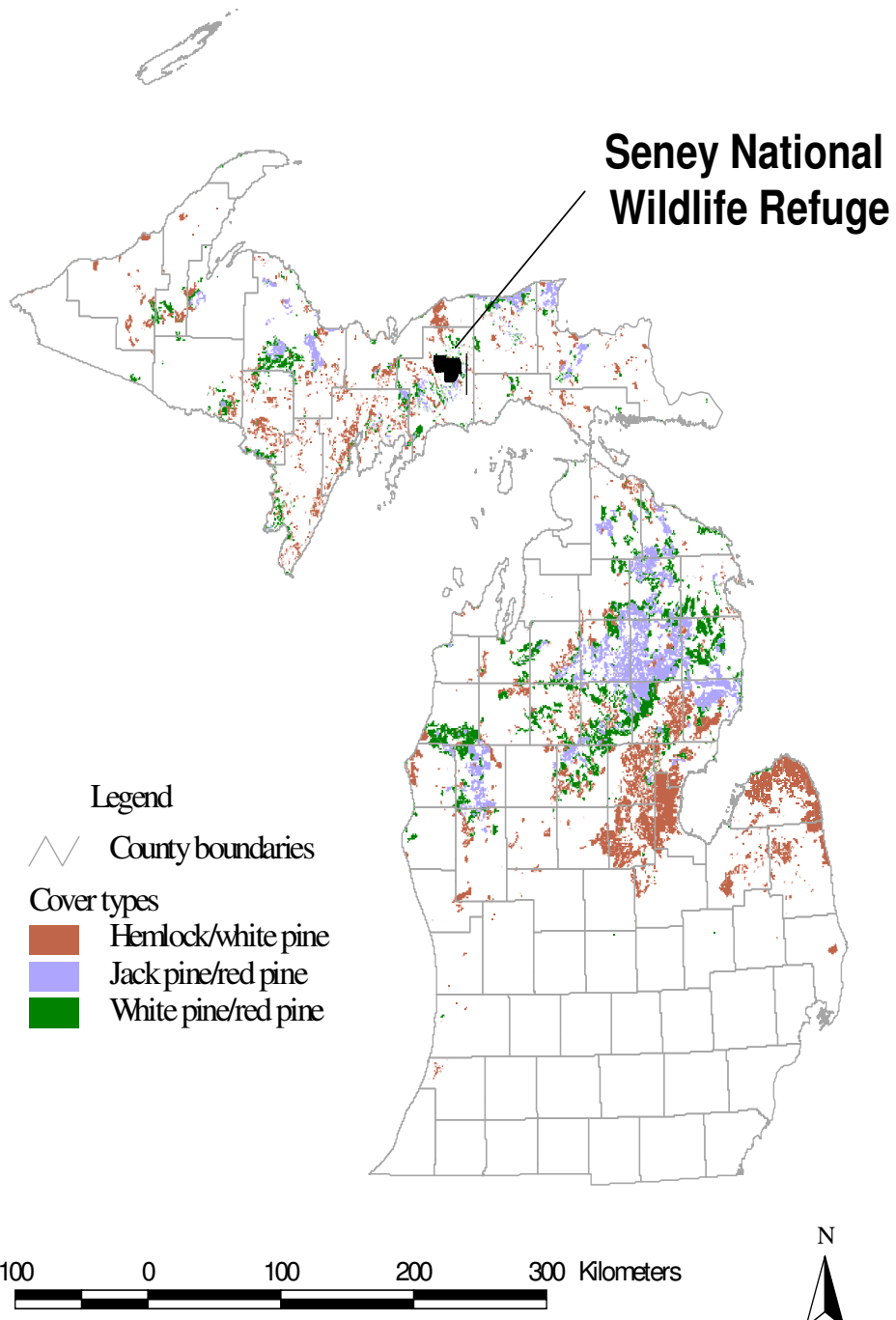
Corace et al. *In Press. EnvMgmt.*



## Ecosystem Capabilities-Disturbance Patterns

Drobyshev et al. 2008a,b *CJFR* and *FEM*



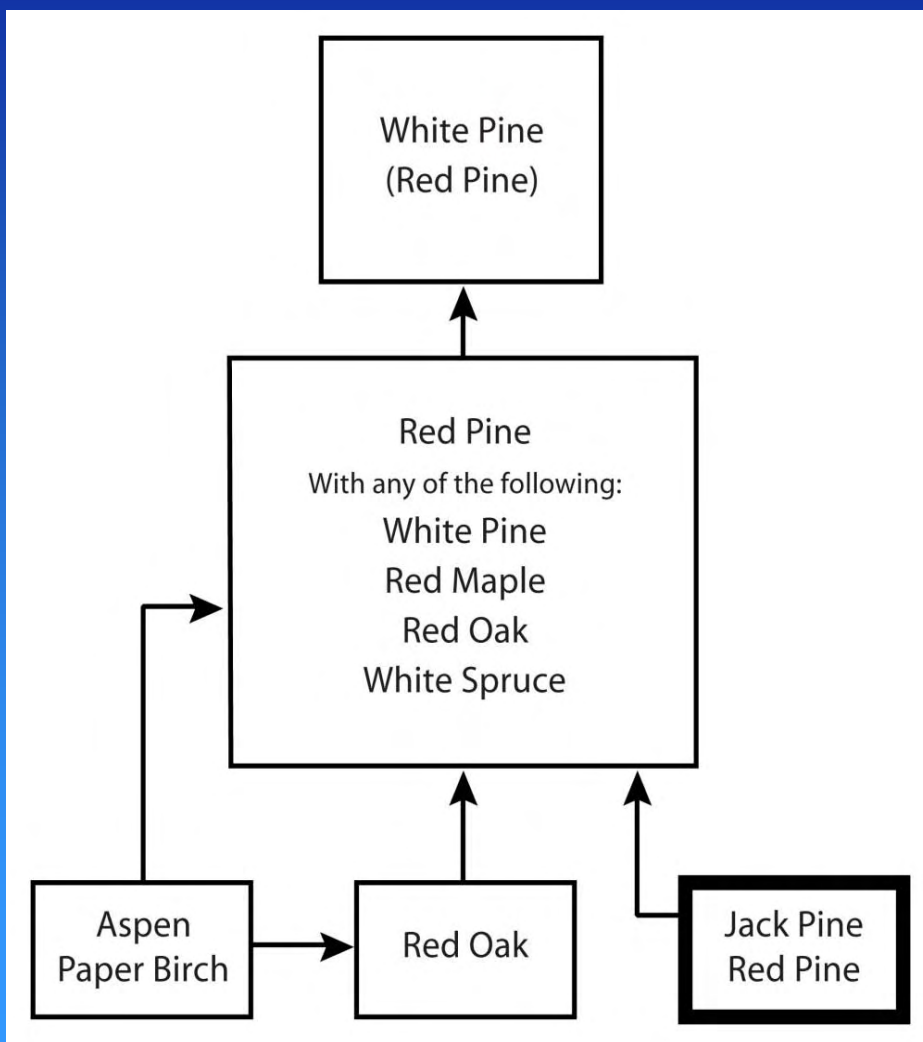




## Seney National Wildlife Refuge

# Ecological Considerations for Mixed-Pine Management Based on Soils and Disturbances

*Pinus strobus/Vaccinium angustifolium-Epigaea repens (PVE) Habitat Type<sup>1</sup>*



<sup>1</sup>Burger and Kotar. 2003. Forest community and habitat types of Michigan.



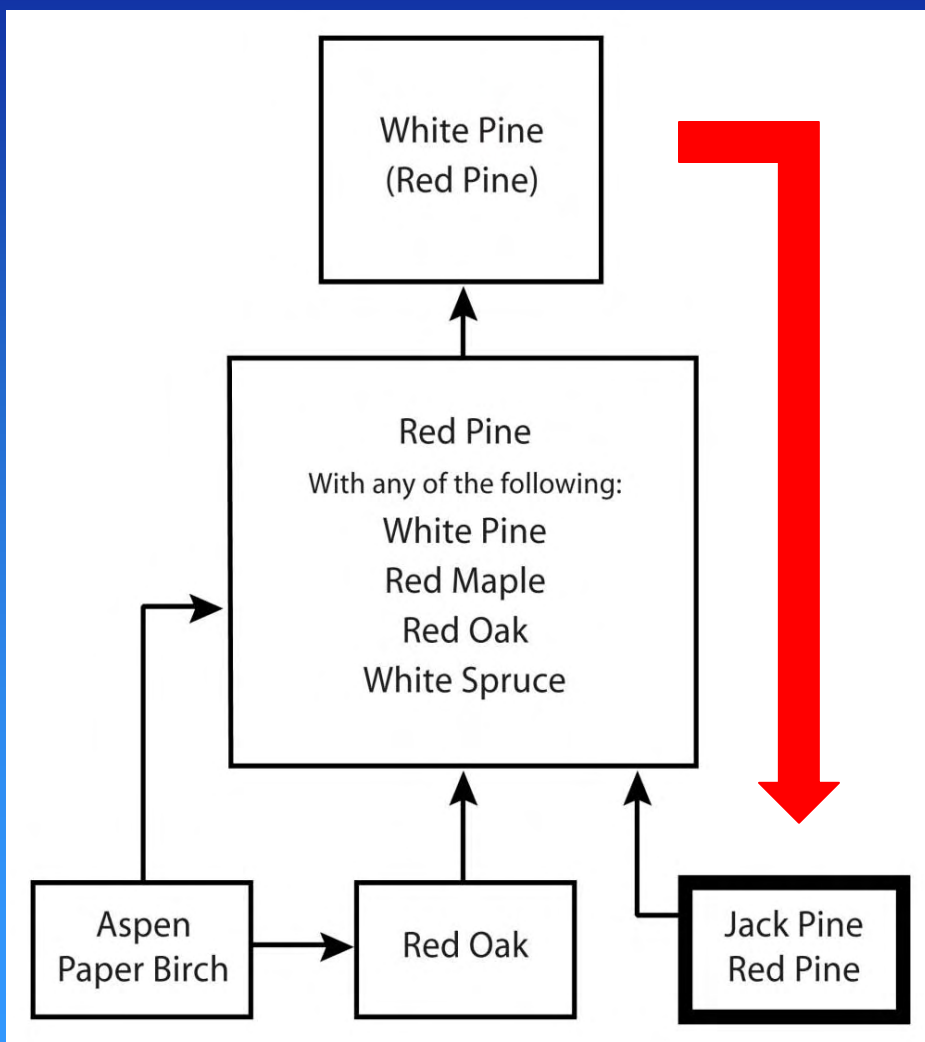


## Seney National Wildlife Refuge

### Ecological Considerations for Mixed-Pine Management Based on Soils and Disturbances

*Pinus strobus/Vaccinium angustifolium-Epigaea repens (PVE) Habitat Type<sup>1</sup>*

- Major and/or frequent ecological disturbances (e.g., crown fire) may push stands to earlier seral stages



<sup>1</sup>Burger and Kotar. 2003. Forest community and habitat types of Michigan.

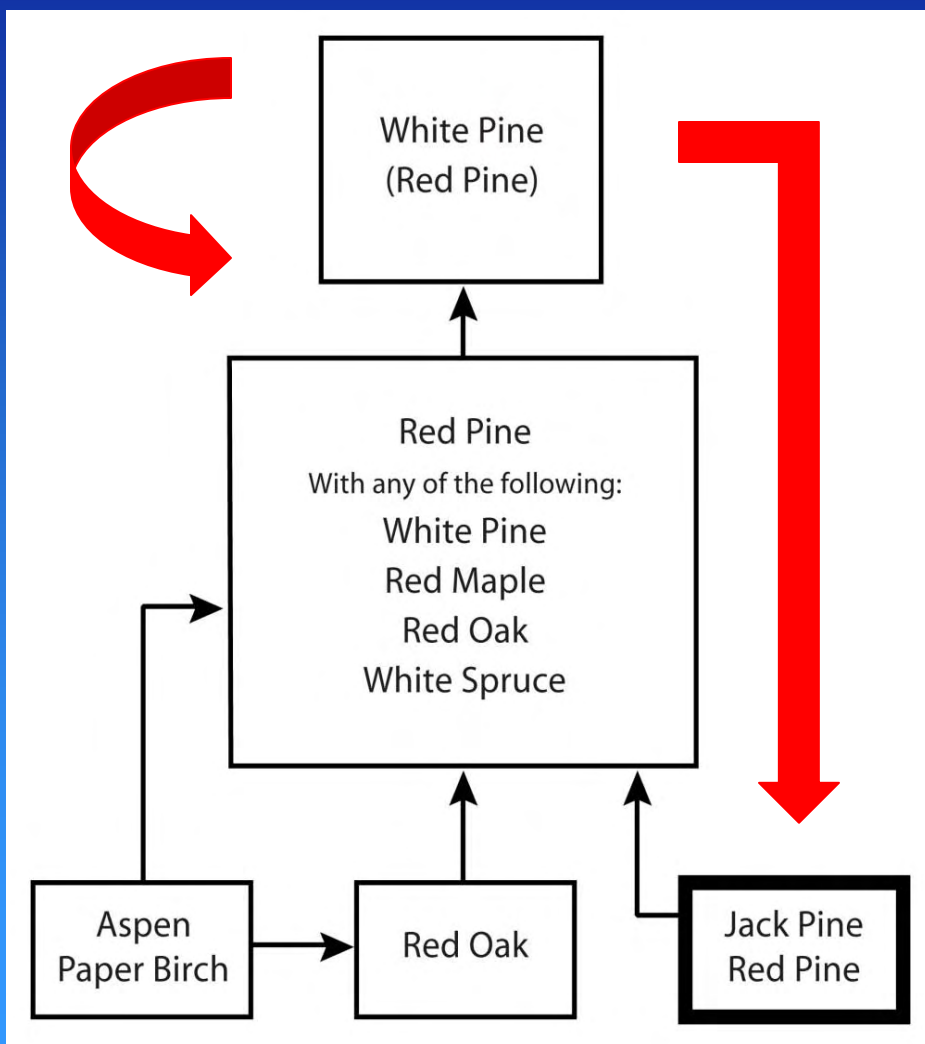


## Seney National Wildlife Refuge

### Ecological Considerations for Mixed-Pine Management Based on Soils and Disturbances

*Pinus strobus/Vaccinium angustifolium-  
Epigaea repens (PVE) Habitat Type<sup>1</sup>*

- Major and/or frequent ecological disturbances (e.g., crown fire) may push stands to earlier seral stages
- Minor and/or infrequent disturbances (e.g., surface fire) may maintain existing conditions.



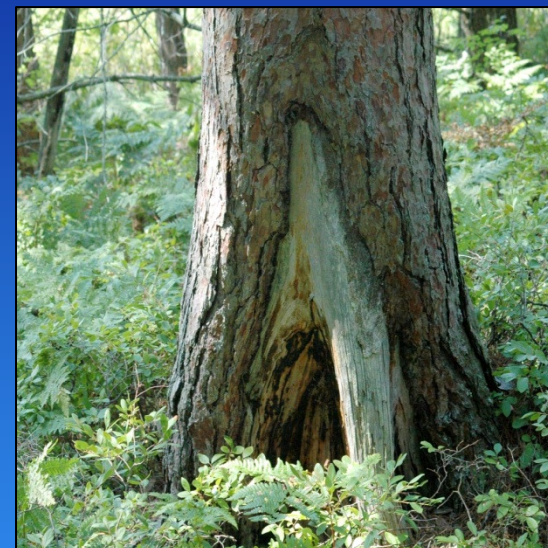
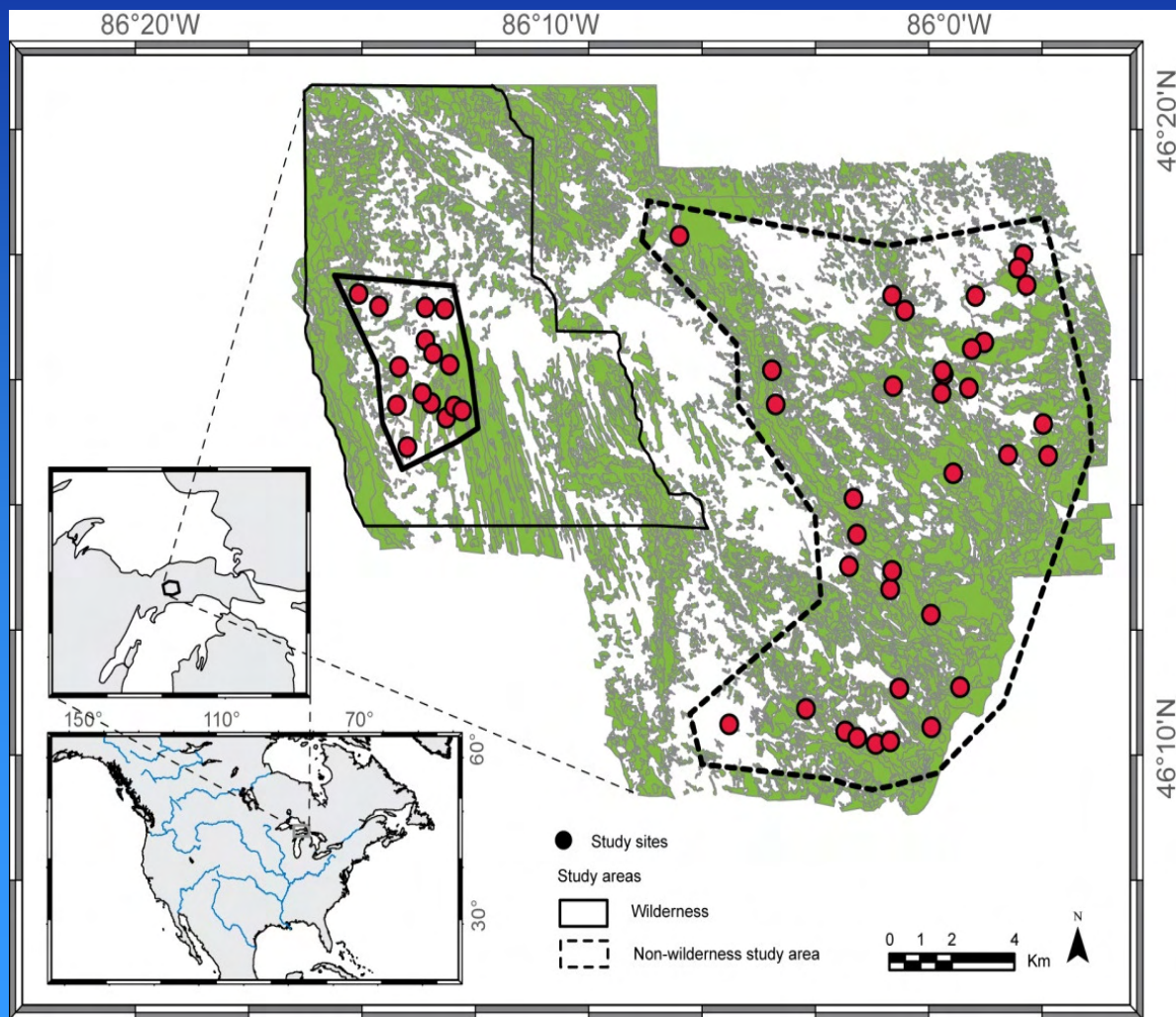
<sup>1</sup>Burger and Kotar. 2003. Forest community and habitat types of Michigan.





# Seney National Wildlife Refuge

## Methods





## Seney National Wildlife Refuge

### Restoration-Based Findings

- Fire history reconstructed for ~325 years
- Fire regime: differed among three time periods studied (pre-European, <1860; Great Cutover, 1860-1935; post-Refuge establishment, >1935)
- Fire frequency: 14 – 33 years overall, but Great Cutover fires significantly more frequent than the ~50-60 years pre-European
- FRI of large fire events mean 37 years, range 19 – 73 years (1754, 1791, 1864, 1891, 1910, 1976)
- Seasonality: natural fires occurred in early, mid- and late-season, but large fires were late season events
- Structural variation: fires affect abundance of red pine (positively) and variability in dbh distributions (negatively), reduce stand spp. diversity by excluding shade-tolerant/fire intolerant spp. (red maple, etc.)









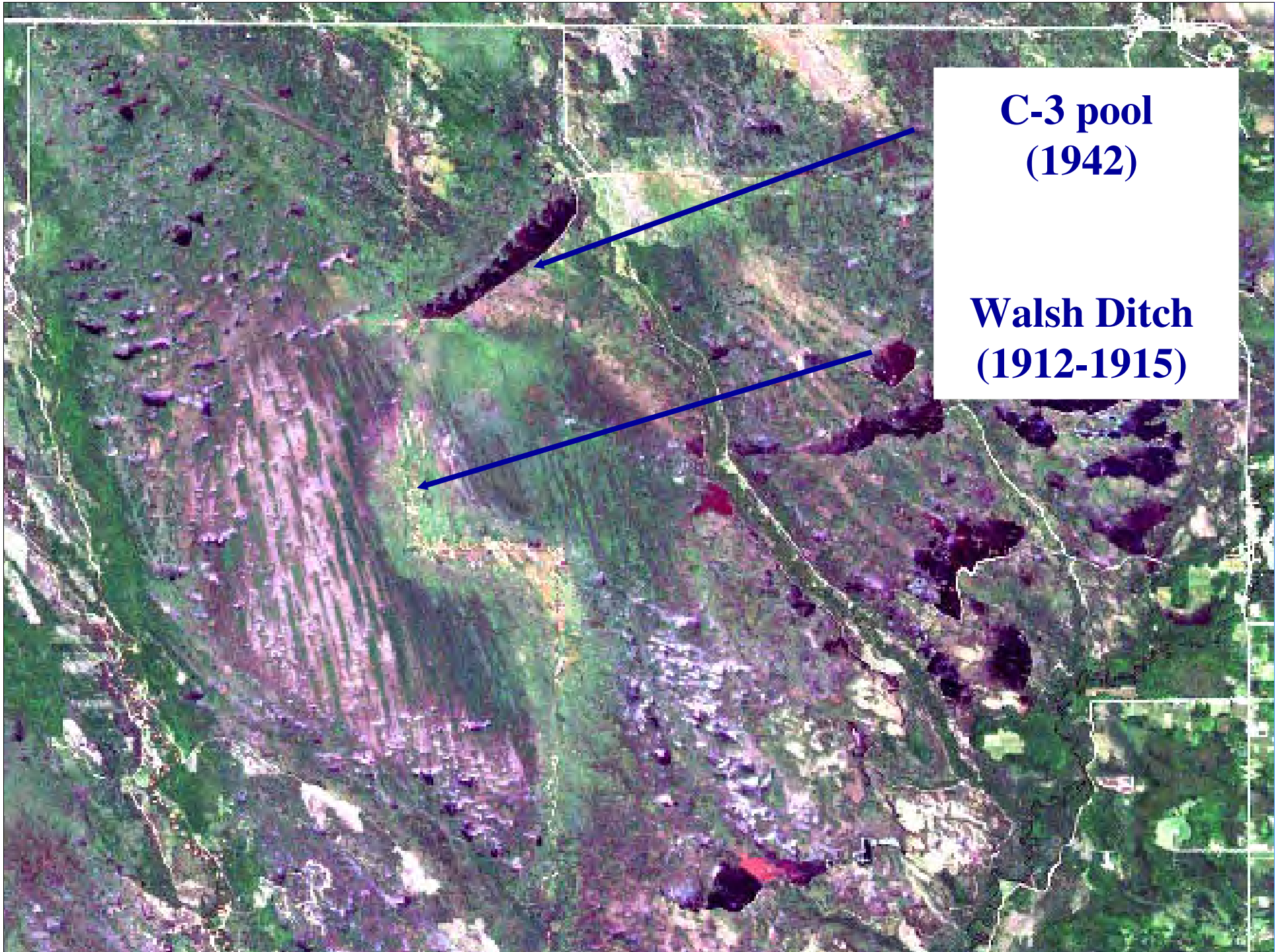






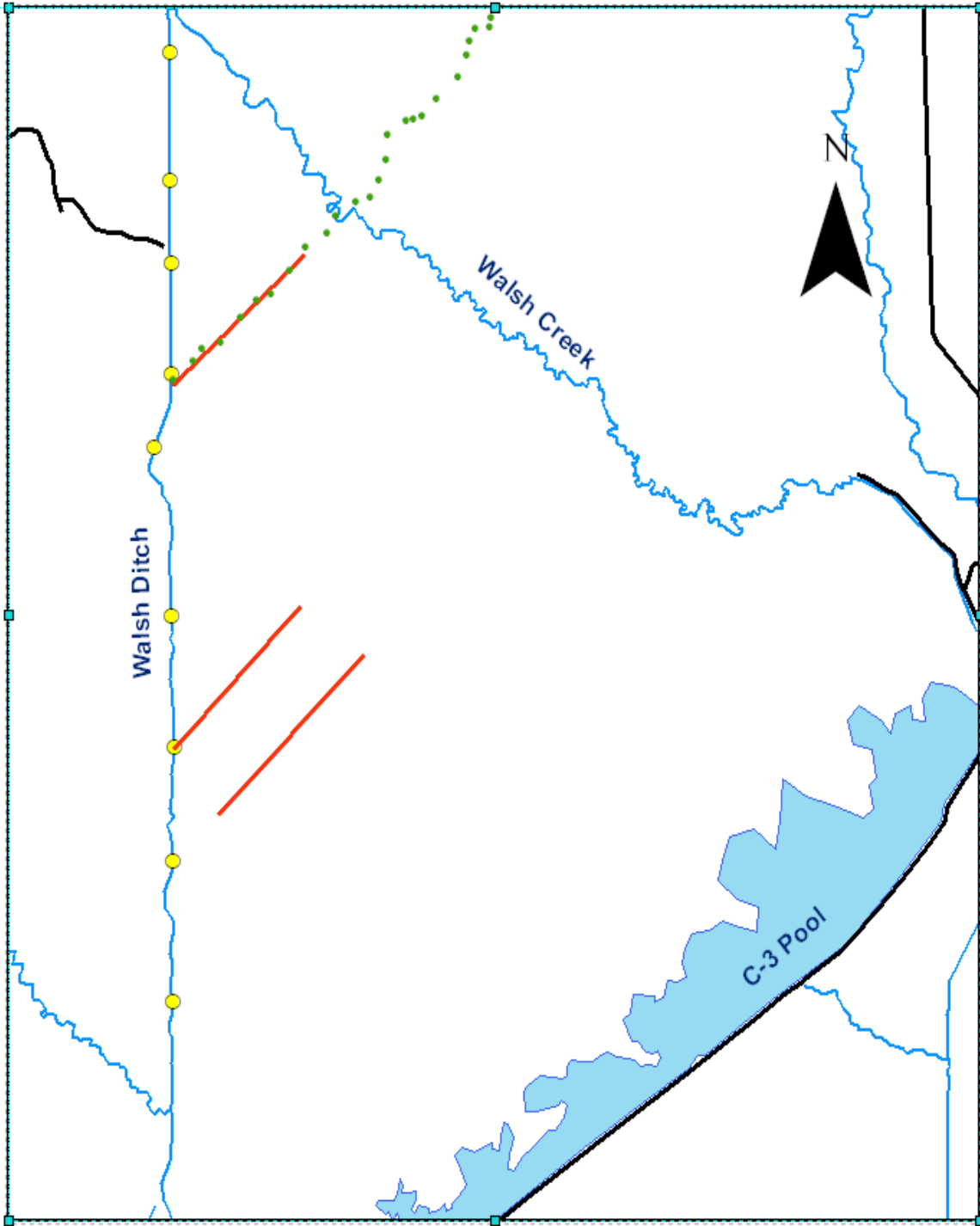




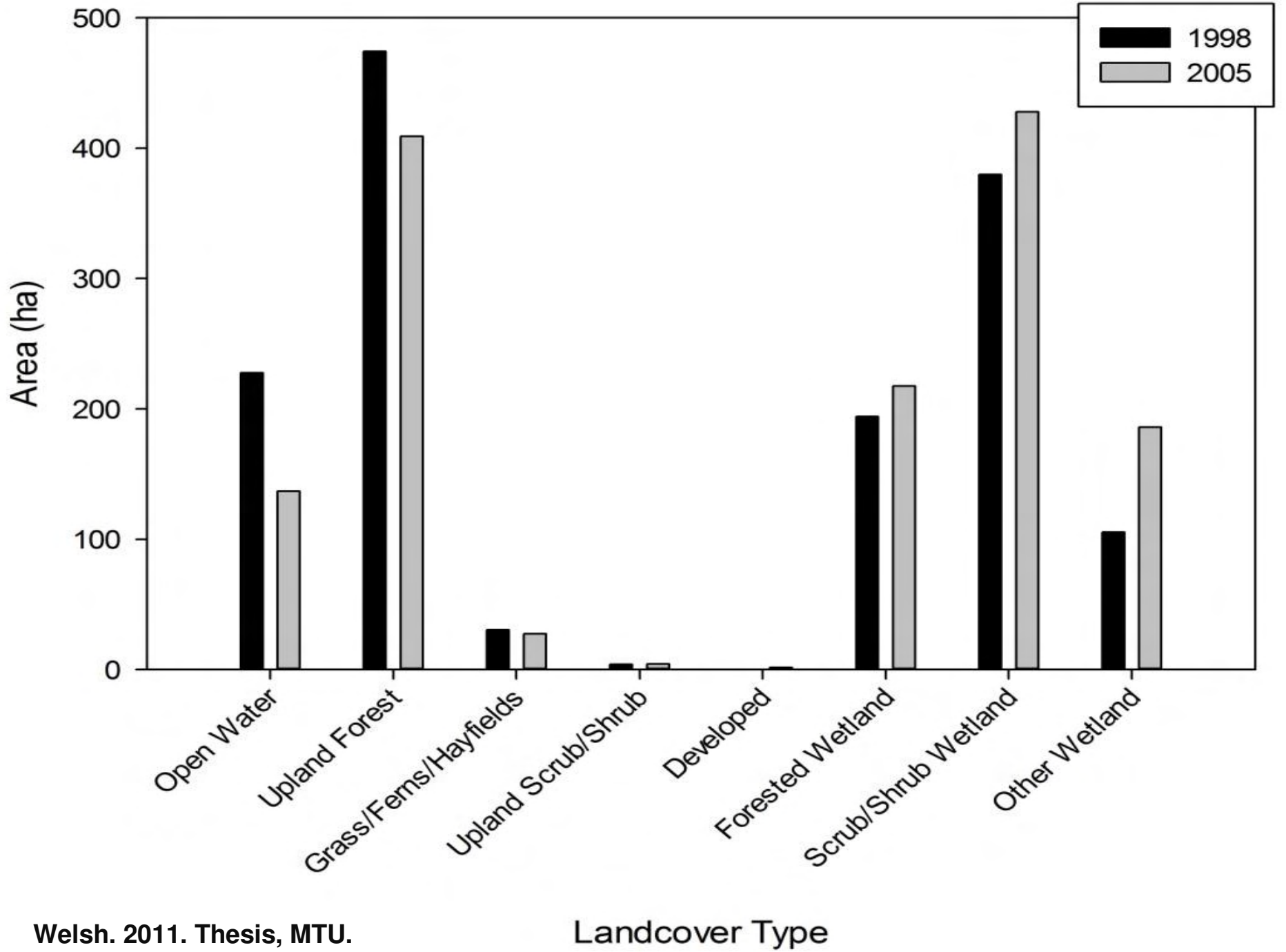


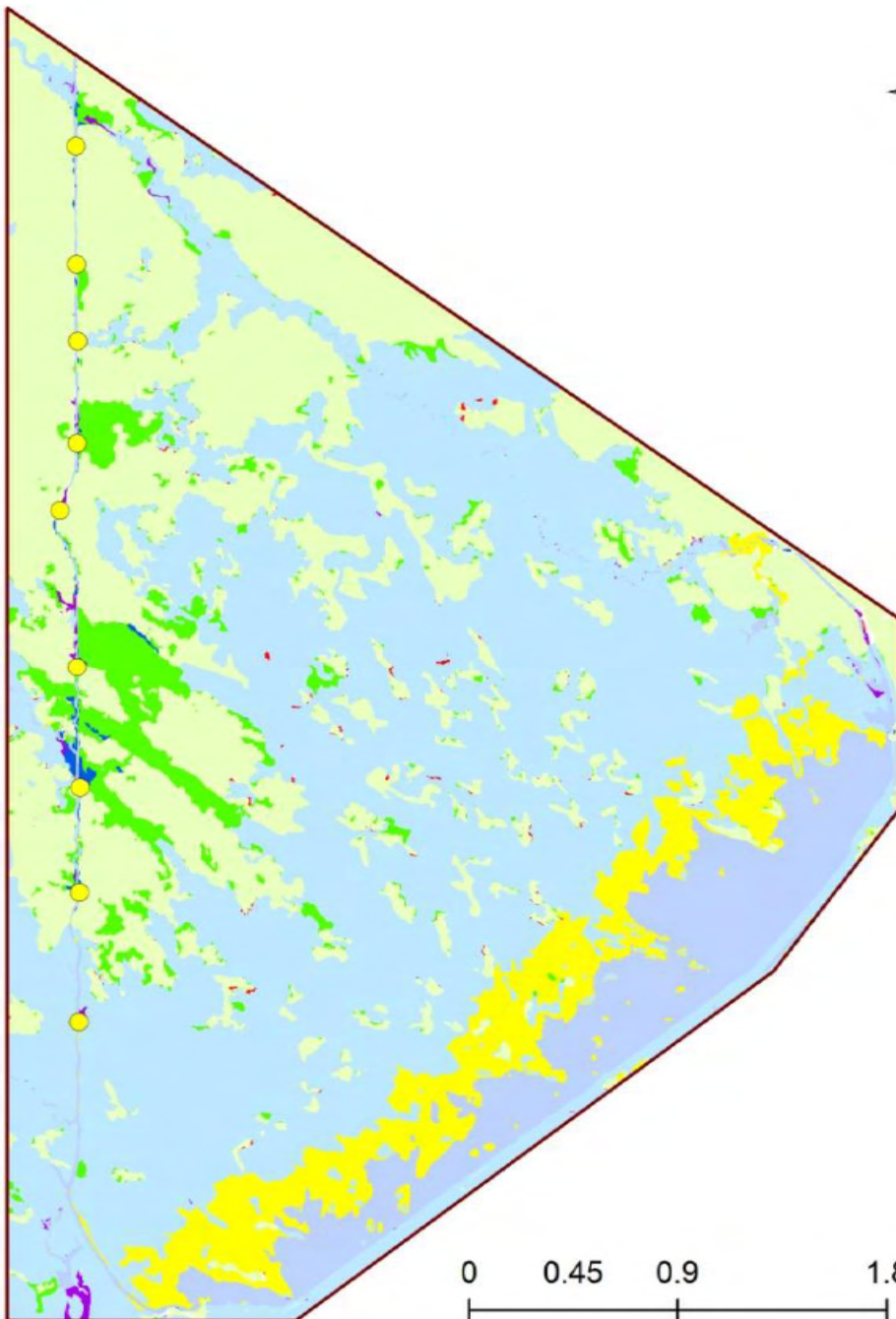
**C-3 pool  
(1942)**

**Walsh Ditch  
(1912-1915)**





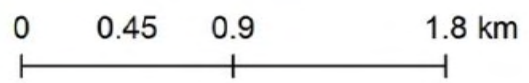




Welsh. 2011. Thesis, MTU.

**Change in Landcover**

- Wetland to Upland
- Open Water to Wetland
- Wetland to Open Water
- Upland to Wetland
- Upland to Open Water
- Open Water to Open Water
- Wetland to Wetland
- Upland to Upland
- Walsh Ditch Plugs

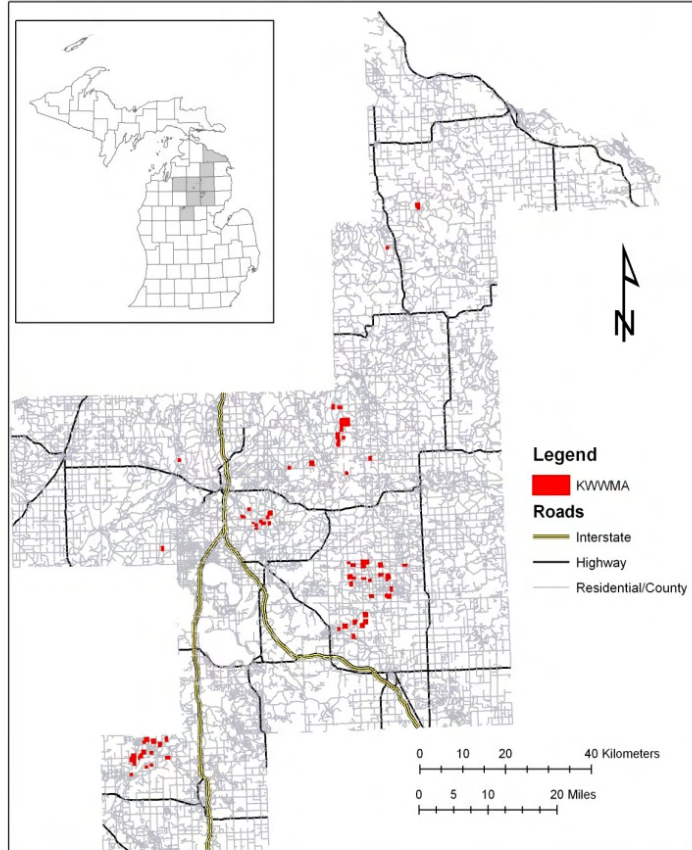






# Seney National Wildlife Refuge

## Kirtland's Warbler Wildlife Management Area



•Focus on “fine-filter” management of jack pine (*Pinus banksiana*) habitat and Brown-headed Cowbird (*Molothrus ater*).

•<10% of birds on USFWS lands, most evenly split on USFS-MDNR lands



Image from: M. DeCapita, USFWS





















Corace et al. 2010. N.J. Applied For.





## Seney National Wildlife Refuge

# Quantifying “Stringers”

- Large, stand-replacing wildfire events leave long, unburned strips of trees.
- These legacies of the pre-fire forest provide post-fire heterogeneity.

**No Pablo Fire 2000**







## Seney National Wildlife Refuge

# General Stringer Metrics

(For stringers mapped in 11 wildfires)

- ***Percent of burned landscape:*** 5 – 10% in first decade after fire
- ***Mean patch size:*** 0.5 - 3.1 ha (1.25 – 7.7 ac)
- ***Patch density:*** Variable (13 – 80 patches/100 ha, or 5 – 32/100 ac)
- **Found stringers in 18 of 54 wildfires**
- **67% of stringers in fires < 500 ha (1235 ac)**
- **All fires > 1000 ha (2470 ac) had stringers in them**
- **No smaller fires had stringers**



## Seney National Wildlife Refuge

# Stringer Summary

Stringers are composed of many small patches arranged close together to form long, linear strips rather than large, contiguous strips of trees. (Exception is Mack Lake – large, few patches)

Stringers are very common in very large fires and common *but not always* present in large fires. Particular fire behavior is necessary!











## Seney National Wildlife Refuge

### Lessons Learned

- **Broaden partnerships**
- **Integrate management-research-monitoring**
- **Integrate research with undergraduate and graduate studies**
- **Be judicious**
- **Clearly communicate**







## Seney National Wildlife Refuge

# Research-Management Partnerships and Fire-Dependent Ecosystem Restoration: Case Studies from Seney National Wildlife Refuge, Upper Michigan

## Acknowledgements

•Funding: Joint Fire Science Program, Seney NWR, The Ohio State University, Wayne State University, Michigan Technological University, Seney Natural History Association

•Post-Docs and Grad. Students: Igor Drobyshev, Shawna Welsh, Lindsey Shartell, Stephen Rist, Priscilla Nyamai

[www.fws.gov/midwest/seney/research.htm](http://www.fws.gov/midwest/seney/research.htm)

