

Fire Needs Assessment for Portfolio Areas within Michigan

Jack McGowan-Stinski, Doug Pearsall, Steve Sobaski

28 Aug 2008

Updates: August 2009, December 2009, May 2010



Fire Charter Project Deliverables

- 1. Fire Needs Assessment (FNA) (for MI)**
 - Coarse filter analysis
- 2. Strategy Development for increasing ecological biodiversity determined by Fire Needs Assessment**
 - Fine filter analysis to determine % of acres in each fire dependent community to maintain
 - Determine reasons fire is no longer a process (barriers)
- 3. Expansion of Fire Operations and Planning as part of Strategy Implementation**
 - Work with partners to develop similar strategies and fire activities and determine if geographically-focused
 - Determine future cultural fire regimes based on
- 4. Continue to Implement Strategies (Maintenance)**

**Top
Down**

**Bottom
Up**

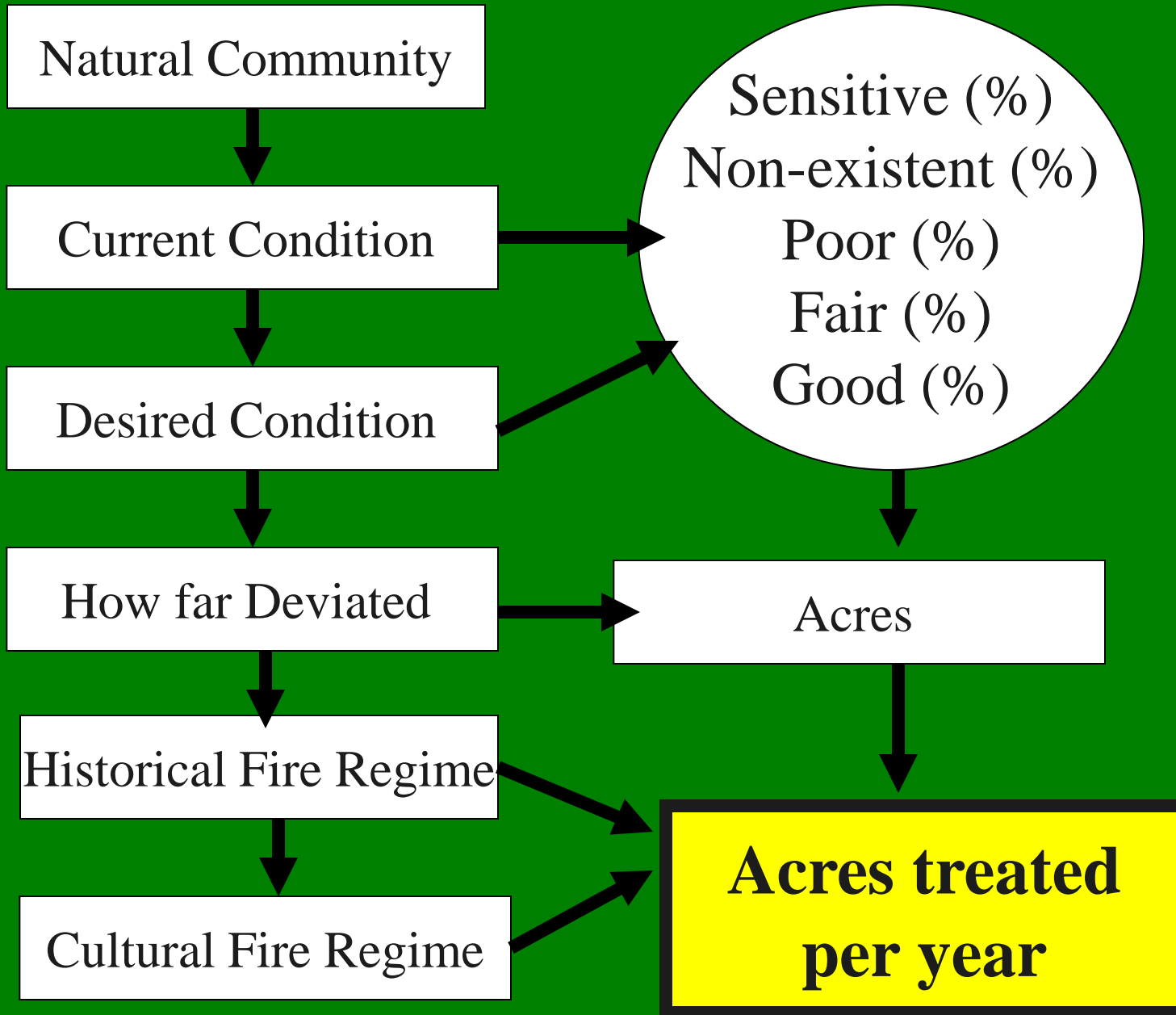




"Goal is not the flames,
but what the flames do..."

Where in your State?





The Math

If have 100,000 acres of oak savanna in poor condition...

And determine every acre needs fire an average of once every 5 years =

20,000 acres treated a year = **STARTING POINT**



Lack of Fire is threat to fire-dependent communities

Do Fire Needs Assessment (FNA)

Do MATH
for priority areas
from FNA

Determine barriers
to implementation

Develop Site Fire Plans
i.e. portion of CAPs

Develop unit plans

DO the BURNING
Burn units of
fire-dependent communities
in rotation, i.e. fire regime,
in multiple portfolio areas

Current and future fire operations

Training, crew, equipment

Science:
Monitor
and research

Demonstration Sites

Strategy development and implementation

Acres per year
(Mechanical or fire)

ownership

ownership

ownership

ownership

ownership

Barriers to Implementation

capacity

policy

**Public perception
Social attitude
education**

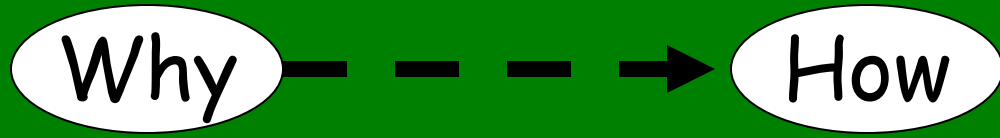
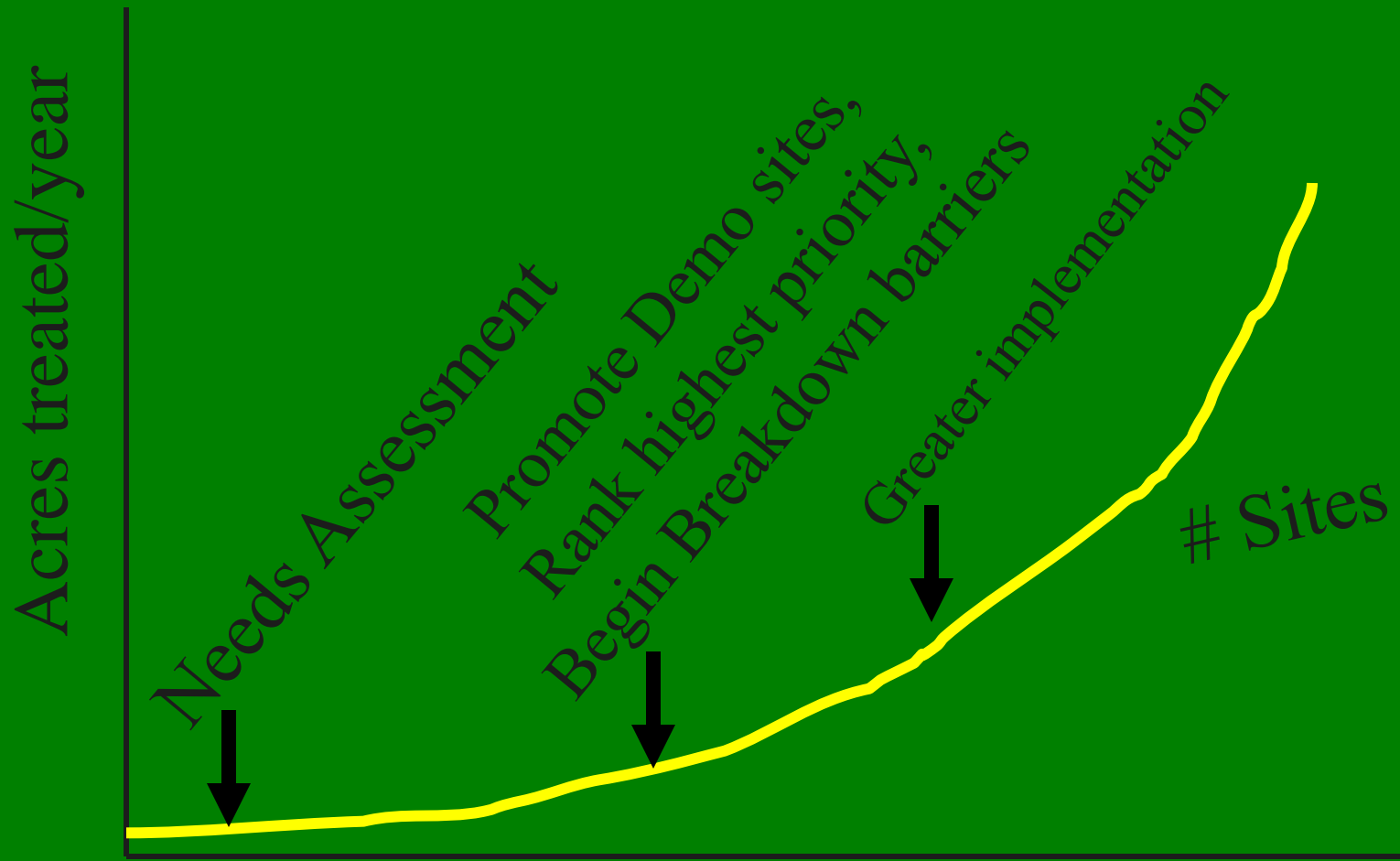
Smoke mgmt

WUI

Rare spp. restrictions

Acres per year
(Mechanical or fire)





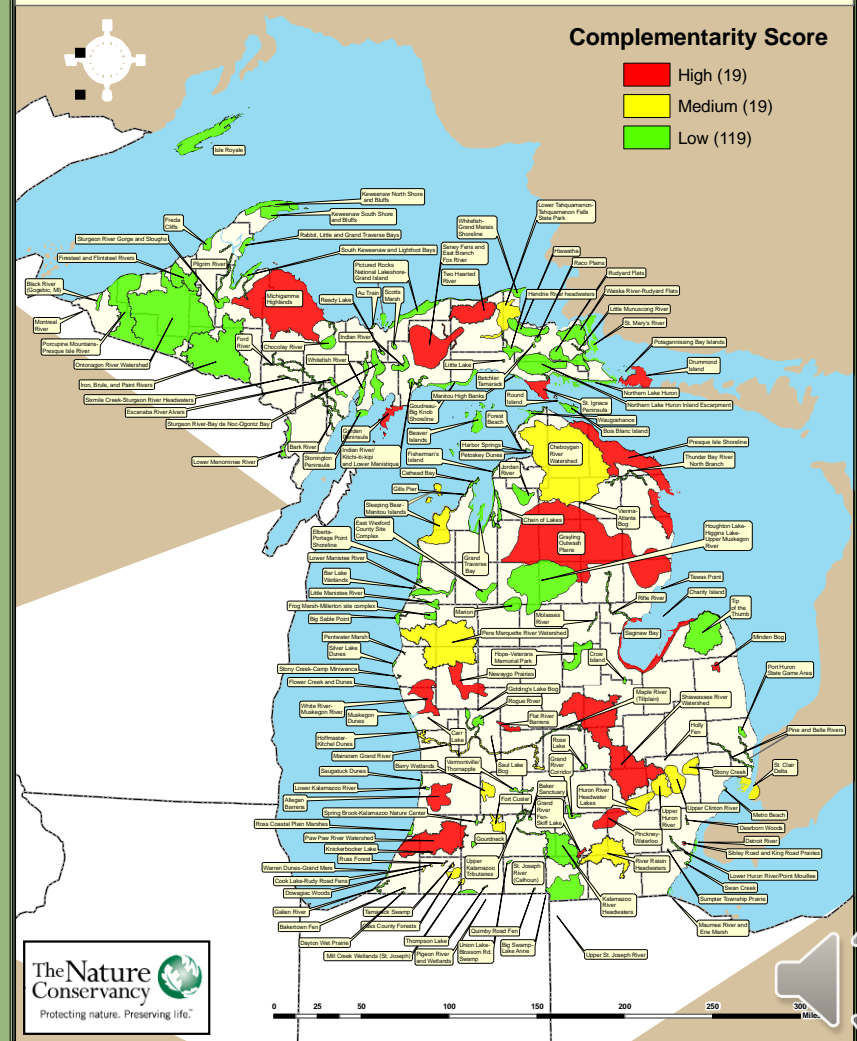
Complementarity Criterion

HIGH – Site is only known site in ecoregion or is best known site for a highly imperiled fire-dependent conservation target.

MEDIUM – Site is only one in ecoregion where landscape of fire-dependent representatives of communities and species can be conserved or has extraordinary concentration of fire dependent elements.

LOW – Site meets neither of the above criteria.

DRAFT Michigan Portfolio Priorities for Fire Management based on Action Site Rankings of Fire Dependent Conservation Targets



Conservation Value Criterion

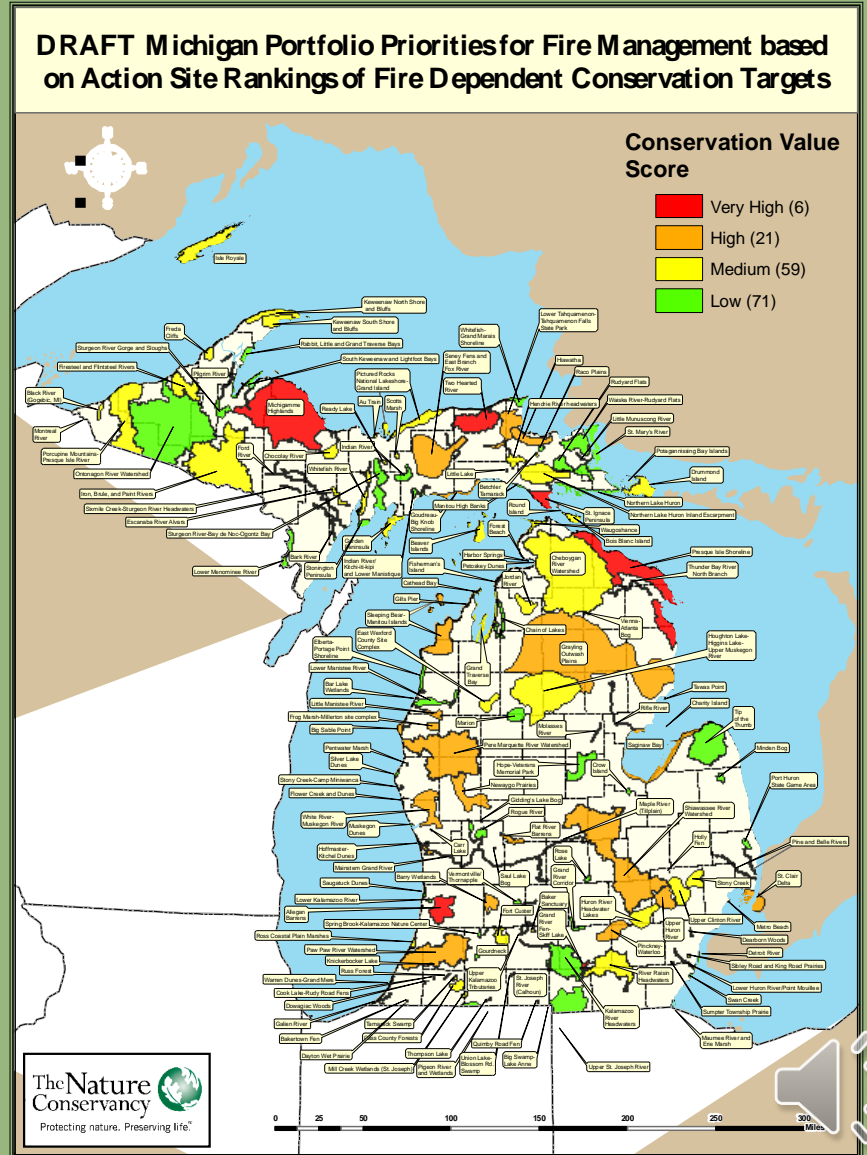
Three Components –

I. Number/Diversity of Targets Index.

1. Number of occurrences of viable, fire-dependent natural community conservation targets in site.
2. Number of different kinds of these fire-dependent conservation targets.

II. Bio-Diversity Health of Fire Dependent Conservation Targets.

Rated as very good, good, or fair/poor based on the biodiversity health of targets given their size, condition, and landscape context.



Conservation Value Scoring Matrix

Number and Diversity of Targets	Biodiversity Health		
	High (1) Very good	Medium (2) Good	Low (3) Fair/poor
Very High (1) - more than 15 target element occurrences or more than 8 different kinds of targets.	1	2	2
High (2) – more than 7 target EOs or more than 3 different kinds of targets	1	2	3
Medium (3) – more than 2 target EOs or more than 1 different kind of targets	2	3	4
Low (4) – none of the above criteria were met	3	4	4



Threat/Feasibility Criterion

Two Components –

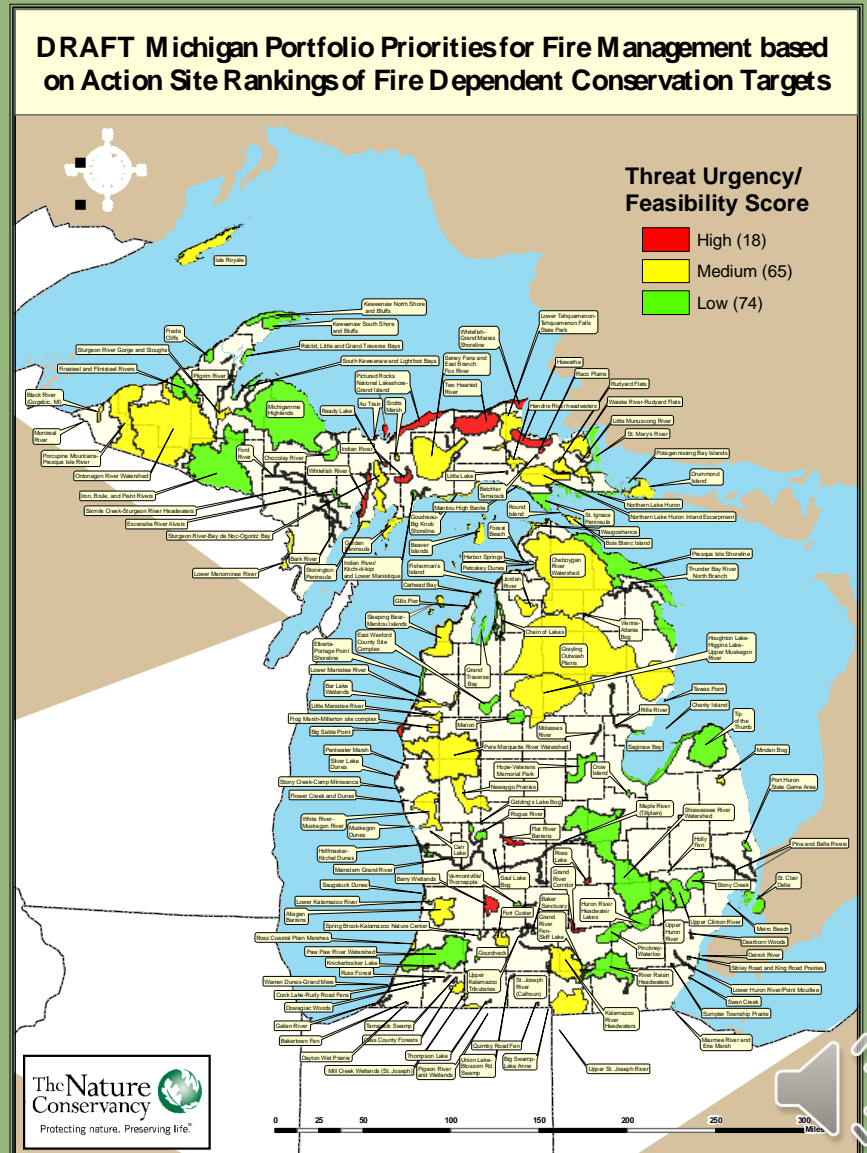
I. Urgency of Threat.

1. Fire Regime Condition Class
2. Mean Fire Return Interval

II. Feasibility or Probability of Conservation

- reflects ownership patterns (small vs. large tracts/single vs. many owners) and barriers to implementation.

 1. Road density
 2. Percent Urban/Developed Land
 3. Percent land in Conservation



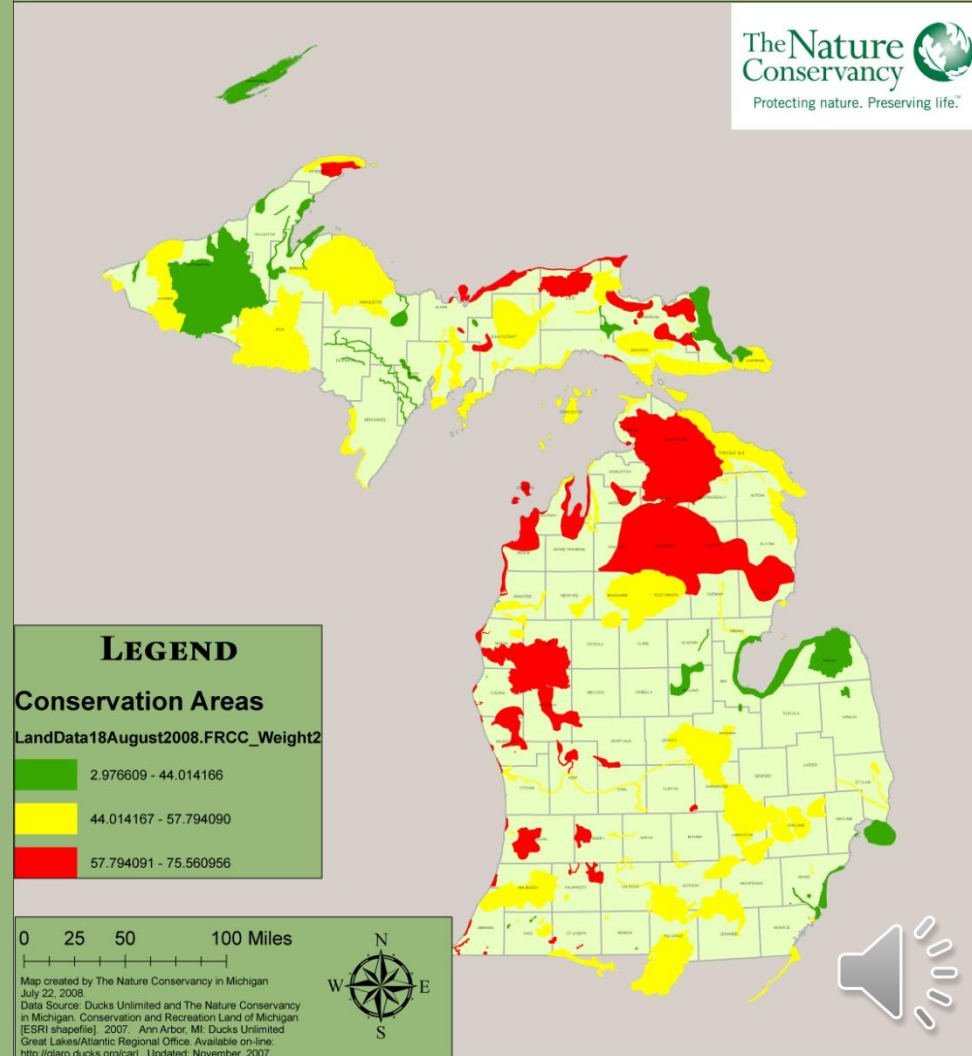
Urgency of Threat - Landfire Fire Regime Condition Class (FRCC) Departure Index

The Fire Regime Condition Class (FRCC) Departure Index data product uses a range from 0 to 100 to depict the amount that current vegetation has departed from simulated historical vegetation reference conditions. This departure results from changes to species composition, structural stage, and canopy closure.

Historical vegetation reference conditions are simulated using the vegetation and disturbance dynamics model (LANDSUM). Current vegetation conditions are derived from a classification of LANDFIRE layers of existing vegetation type, cover, and height derived from LANDSAT satellite imagery, soil, climate, and topography data.

Weighted Departure Index calculated for each conservation area.

FRCC WEIGHTED SCORE (SECOND VERSION) IN CONSERVATION AREAS IN MICHIGAN



Urgency of Threat - Landfire Mean Fire Return Interval

The Mean Fire Return Interval layer quantifies the average period between fires under the presumed historical fire regime. This frequency is derived from vegetation and disturbance dynamics simulations using LANDSUM (Keane and others 2002, Hann and others 2004).

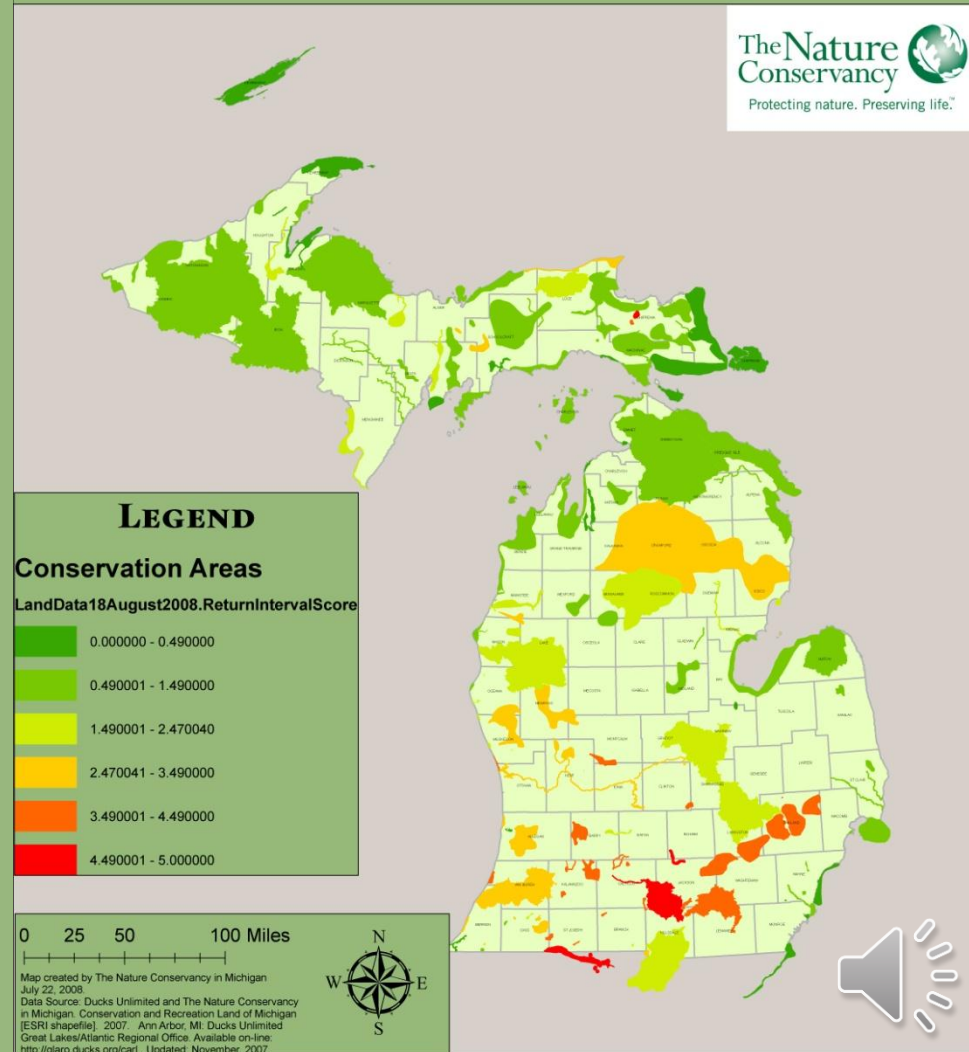
This layer is intended to represent one component of the presumed historical fire regimes within landscapes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context

22 categories reclassified into 6 classes:

- | | |
|------------|--------------|
| 0-15 years | 51-80 years. |
| 16-30 yrs. | 81-150 yrs. |
| 31-50 yrs. | > 150 yrs. |

Weighted average calculated per site.

AVERAGE FIRE RETURN INTERVAL CATEGORY IN CONSERVATION AREAS IN MICHIGAN



Threat Scoring Matrix

FRCC Values	Fire Return Interval Classes (years)					
	1 (1-15)	2 (16-30)	3 (31-50)	4 (51-80)	5 (81-150)	6 (>150)
3 (highly departed)	H	H	M	M	M	L
2 (mod. departed)	H	M	M	M	L	L
1 (low departure)	M	M	M	L	L	L

HIGH—ecological fire management should be implemented within 10 years

MEDIUM— ecological fire management should be implemented within 11-50 years

LOW— ecological fire management can be delayed at least 50 years



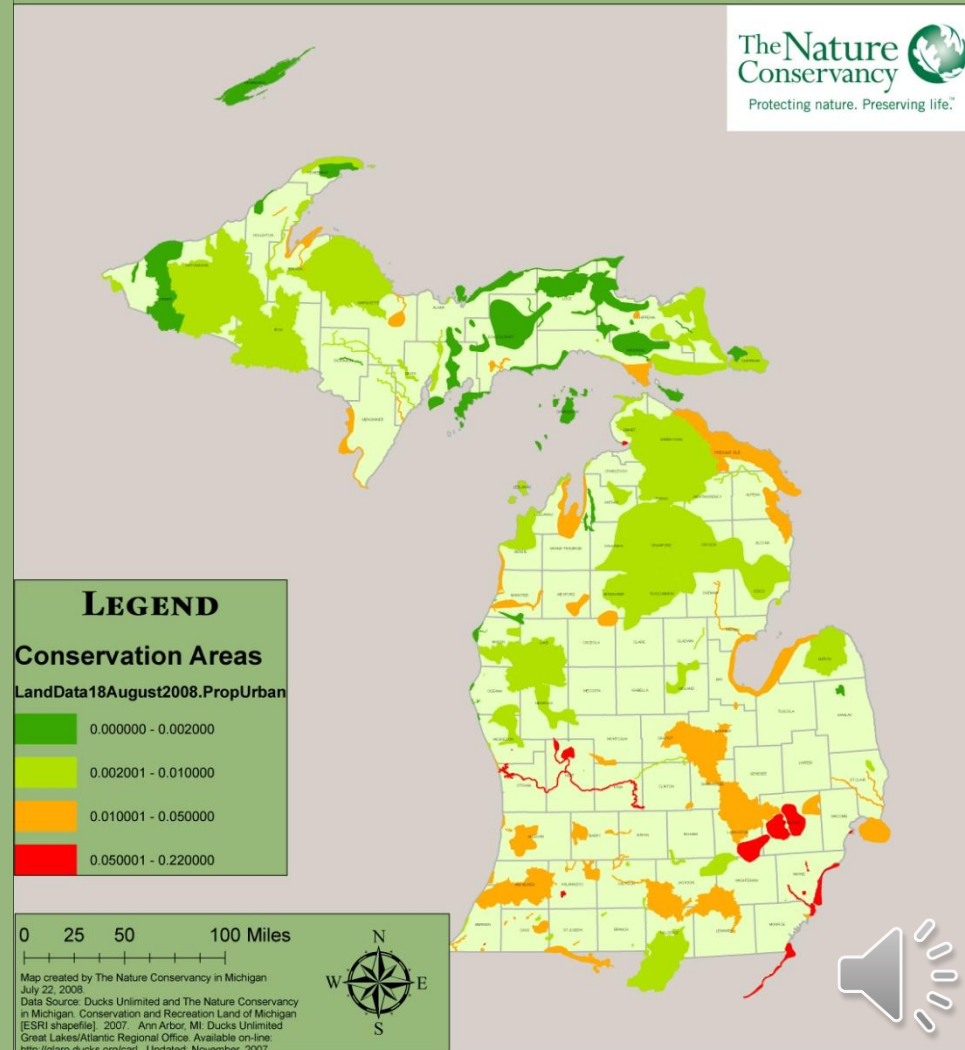
Feasibility – Proportion Urban/Developed Land

IFMAP Landcover data set was analyzed for each conservation area, specifically for the extent of Low Density and High Density Urban land cover as well as airports.

Each site was then scored as follows:

% Urban or Developed Land	Category	Point Value
>5	Very High	4
>1 – 5	High	3
>0.2 – 1	Medium	2
0 – 0.2	Low	1

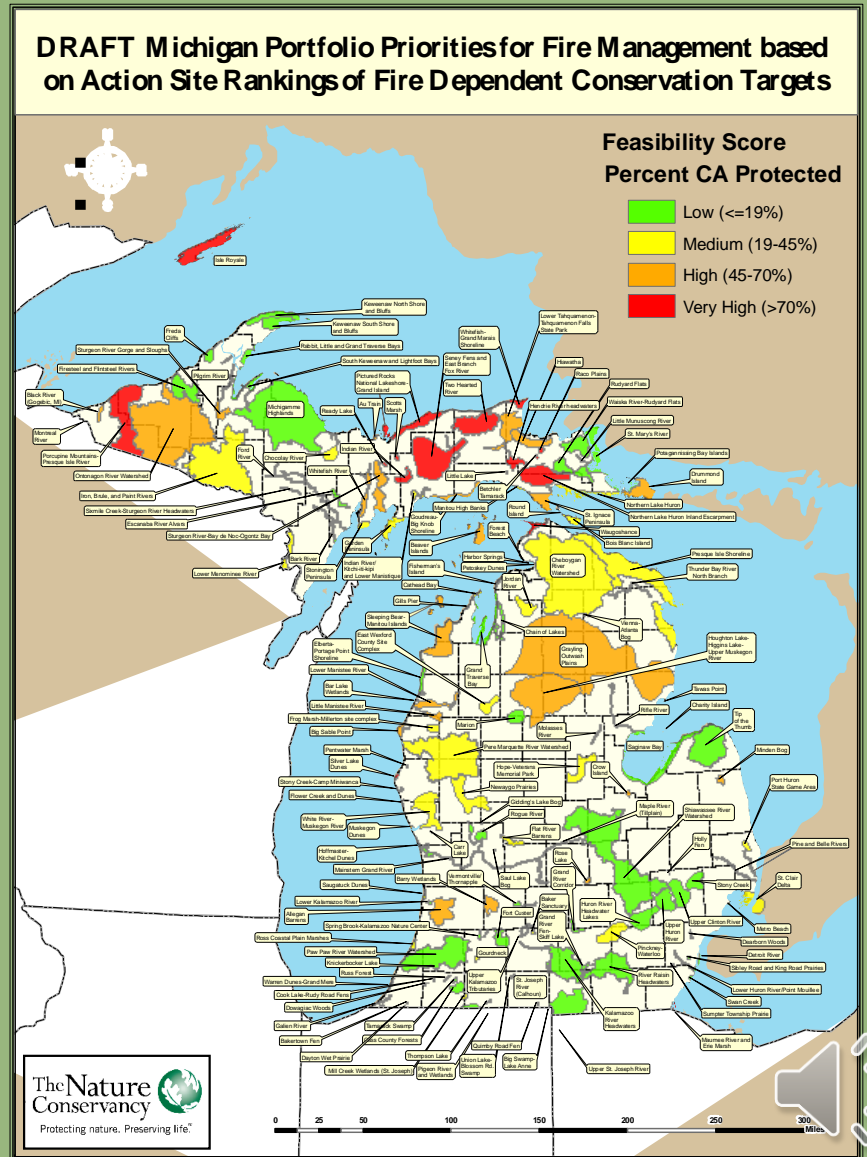
PROPORTION OF URBAN LAND USE IN CONSERVATION AREAS IN MICHIGAN



Feasibility – Proportion of Protected Land

The CARL database was analyzed for each conservation area, specifically to determine the extent of conservation lands (GAP 1,2, or 3 categories)
Each site was then scored as follows:

Total % Protected	Category	Point Value
>70	Very High	1
>45 – 70	High	2
>19 – 45	Medium	3
0 – 19	Low	4

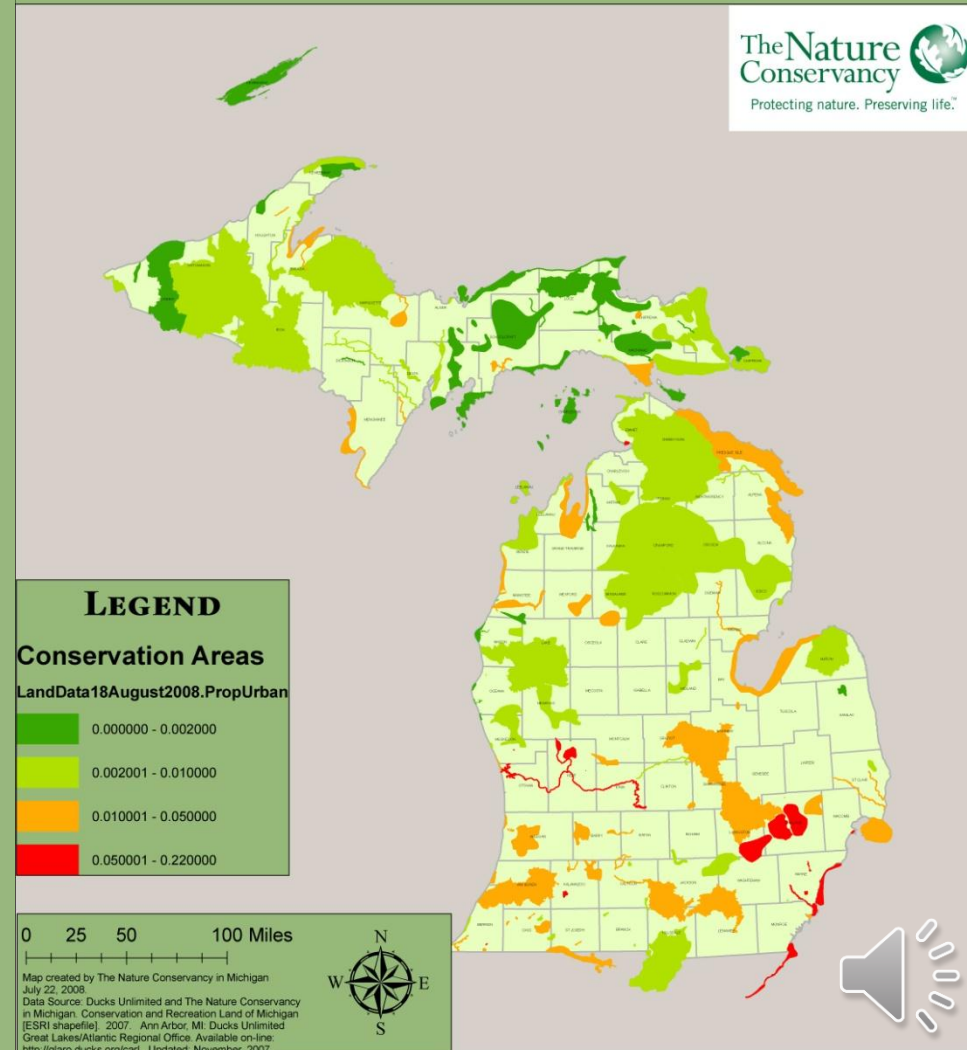


Feasibility –Barriers – Road Density within each Conservation Area

The Michigan road network shapefile (MCGI, 2008) was used to calculate the total miles of all roads within each site. The road density was then scored as follows:

Road Density (mi/mi ²)	Category	Point Value
>3.4	High	3
>1.7 – 3.4	Medium	2
0 – 1.7	Low	1

PROPORTION OF URBAN LAND USE IN CONSERVATION AREAS IN MICHIGAN



Assigning Feasibility Score

Feasibility is then classified using the sum of scores for
 $\% \text{Urban Land} + \% \text{Protected Land} + \text{Road Density}$.

Categories are assigned as follows:

HIGH – Site total feasibility score = 3-5

MEDIUM – Site total feasibility score = 6-8

LOW – Site total feasibility score = 9-11



Threat/Feasibility Scoring Matrix

		Feasibility Rank		
		High	Medium	Low
Urgency Rank	High	1	1	2
	Medium	1	2	3
	Low	2	3	3

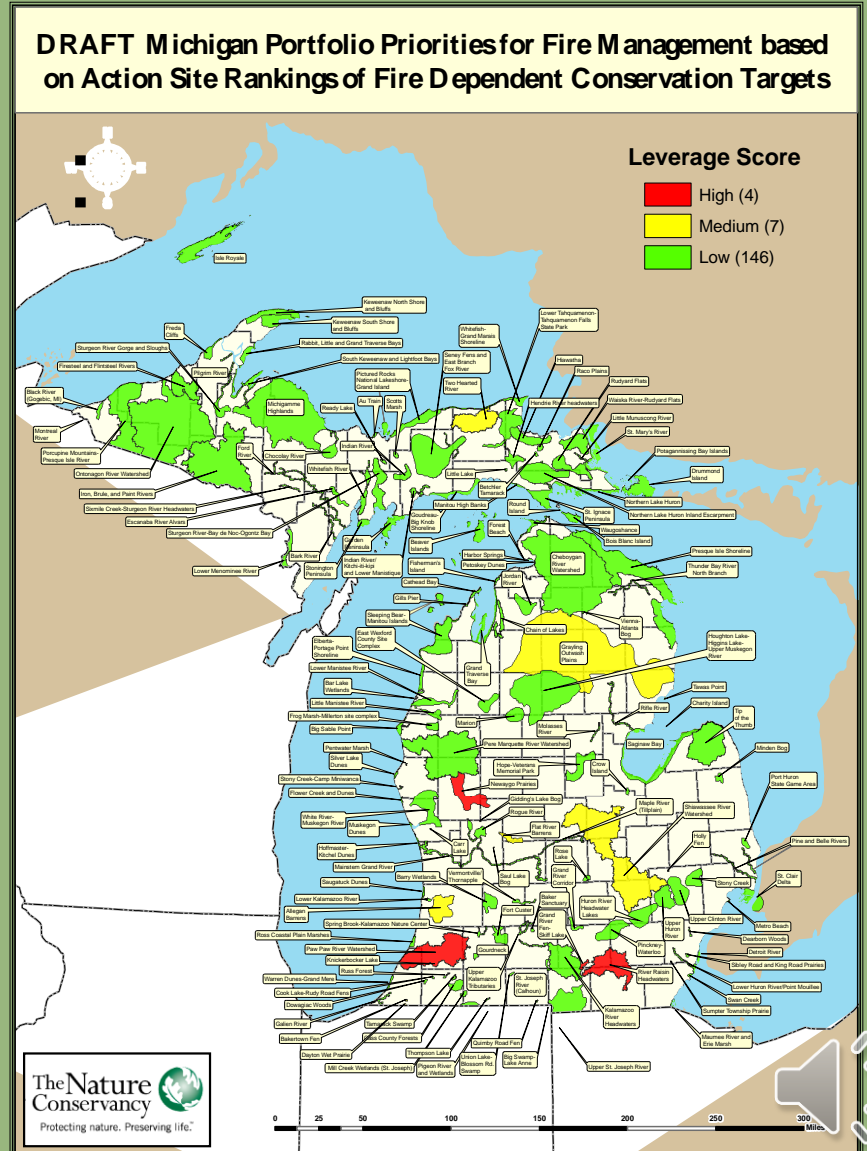


Leverage Criterion

Each Conservation Area was ranked as High, Medium, Low depending on the relationship of those sites to local, state, and regional fire management strategies.

Scoring criteria are as follows:

- HIGH (Tier 1)** – site affords clearly specified, demonstrable high leverage for building partnerships, tools, or funding to advance or improve fire mgmt. in other conservation areas (e.g., Paw Paw, Grand River Fen)
- MEDIUM (Tier 2)** – Site affords clearly specified potential high leverage. (Two Hearted, Shiawassee, Allegan Barrens)
- LOW (Tier 3)** – Site has no clearly specified, demonstrable, high leverage.



Overall Priority Score

Overall Priority Score = Complementarity Score (1-3) + Conservation Value Score (1-4) + Threat/Feasibility Score (1-3) + Leverage Score (1-3)

- All four criteria are weighted equally in the calculation of the overall priority score
- Minimum score possible is 4, maximum score is 13
- The LOWEST score equates to the HIGHEST priority for fire management.
- All portfolio site priority scores were then classified into four categories in ArcMap using Jenks Natural Breaks method, producing the following results:

Breaks Point Categories:	Summed Point Value	Count
Very High	5-7	10
High	8-9	10
Medium	10-11	57
Low	12-13	80

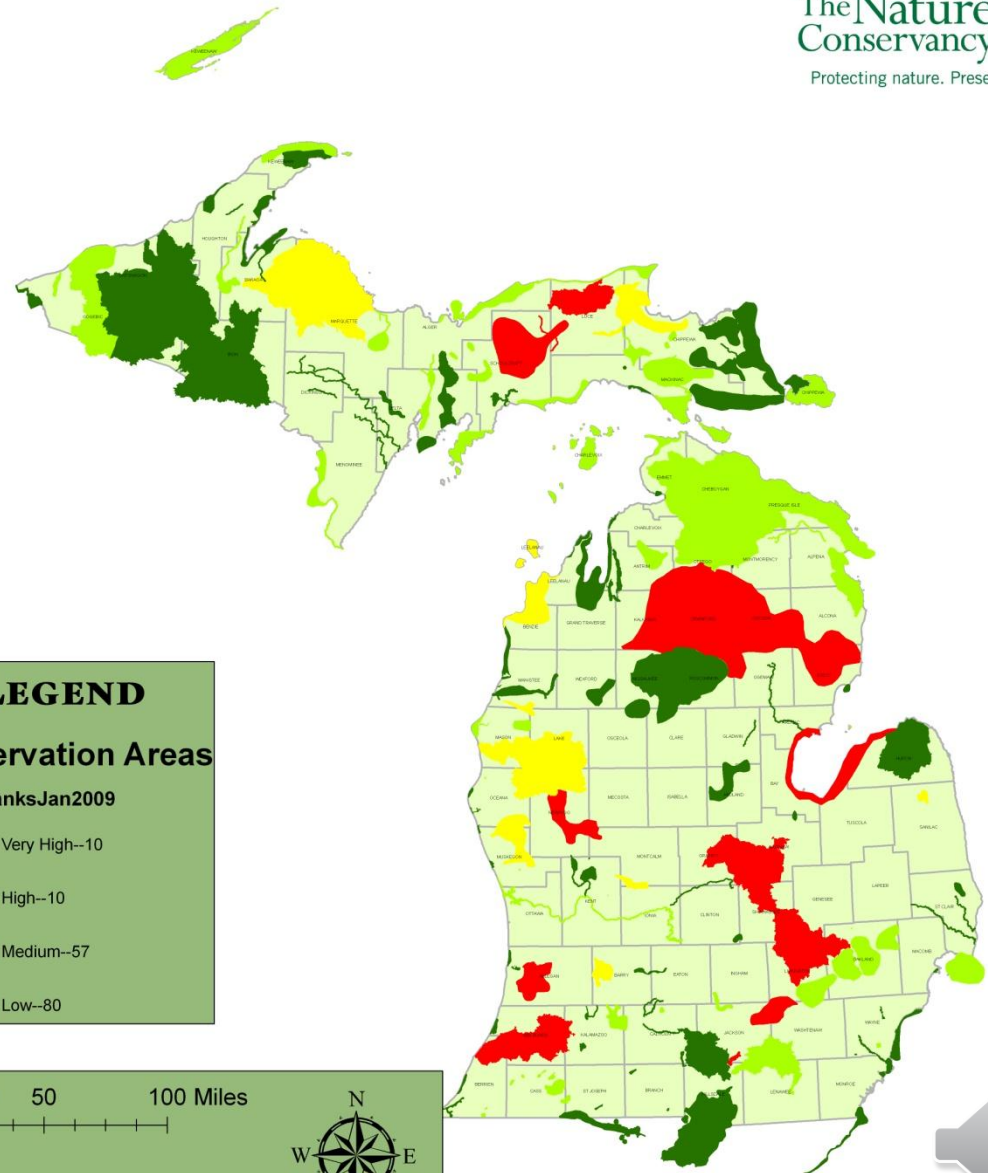


PRIORITY FOR FIRE MANAGEMENT AMONG CONSERVATION AREAS IN MICHIGAN



The Statewide Fire Needs Assessment indicates that at least 2/3 of our conservation portfolio areas contain fire-dependent communities.

We cannot effectively conserve these communities unless we can get fire back on the ground at scale; success means restored functioning fire-dependent communities with associated species.



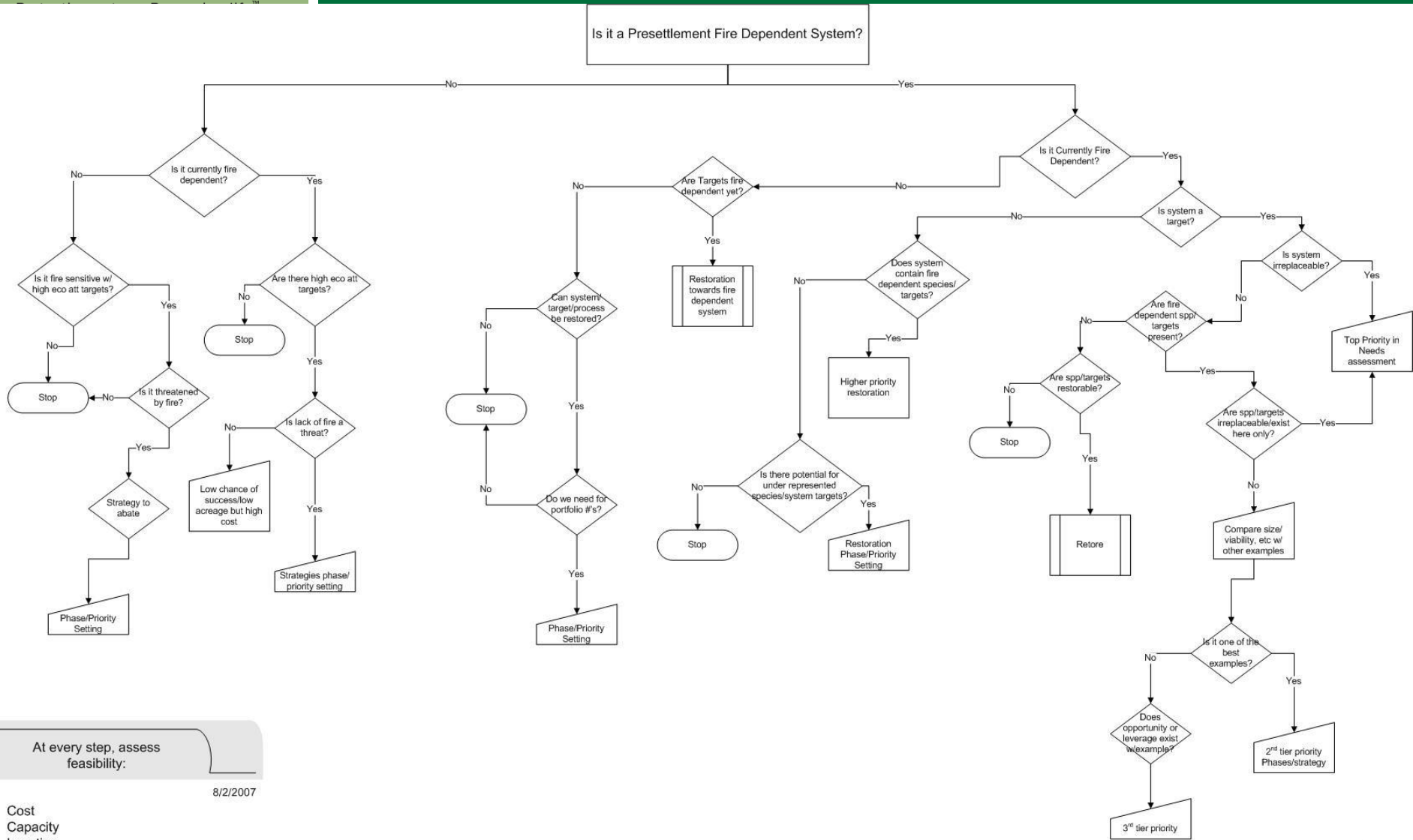
The Math

“Restoration Treatments” (Fire or Fire-Surrogate)

	Priority LANDSCAPE Sites		Total
	VERY HIGH (10)	HIGH (10)	VH + H (20)
Fire Return Interval	3,317,567 ac	1,767,659 ac	5,085,227 ac
10 year	331,757 ac/yr	176,766 ac/yr	508,523 ac/yr
25 year	132,703 ac/yr	70,706 ac/yr	203,409 ac/yr
40 year	82,939 ac/yr	44,191 ac/yr	127,131 ac/yr



Fire Needs Assessment Decision Tree



At every step, assess feasibility:

8/2/2007

- Cost
- Capacity
- Location
- Barriers to implement fire or mechanical
- Politics
- Legal
- T & E restrictions
- Species viability



Is it a Presettlement Fire Dependent

