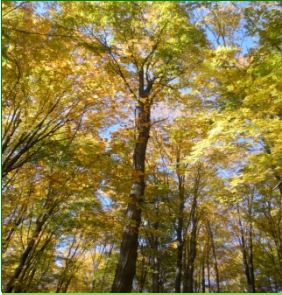


Forest Management on the Two Hearted River Forest Reserve

Matt Kleitch



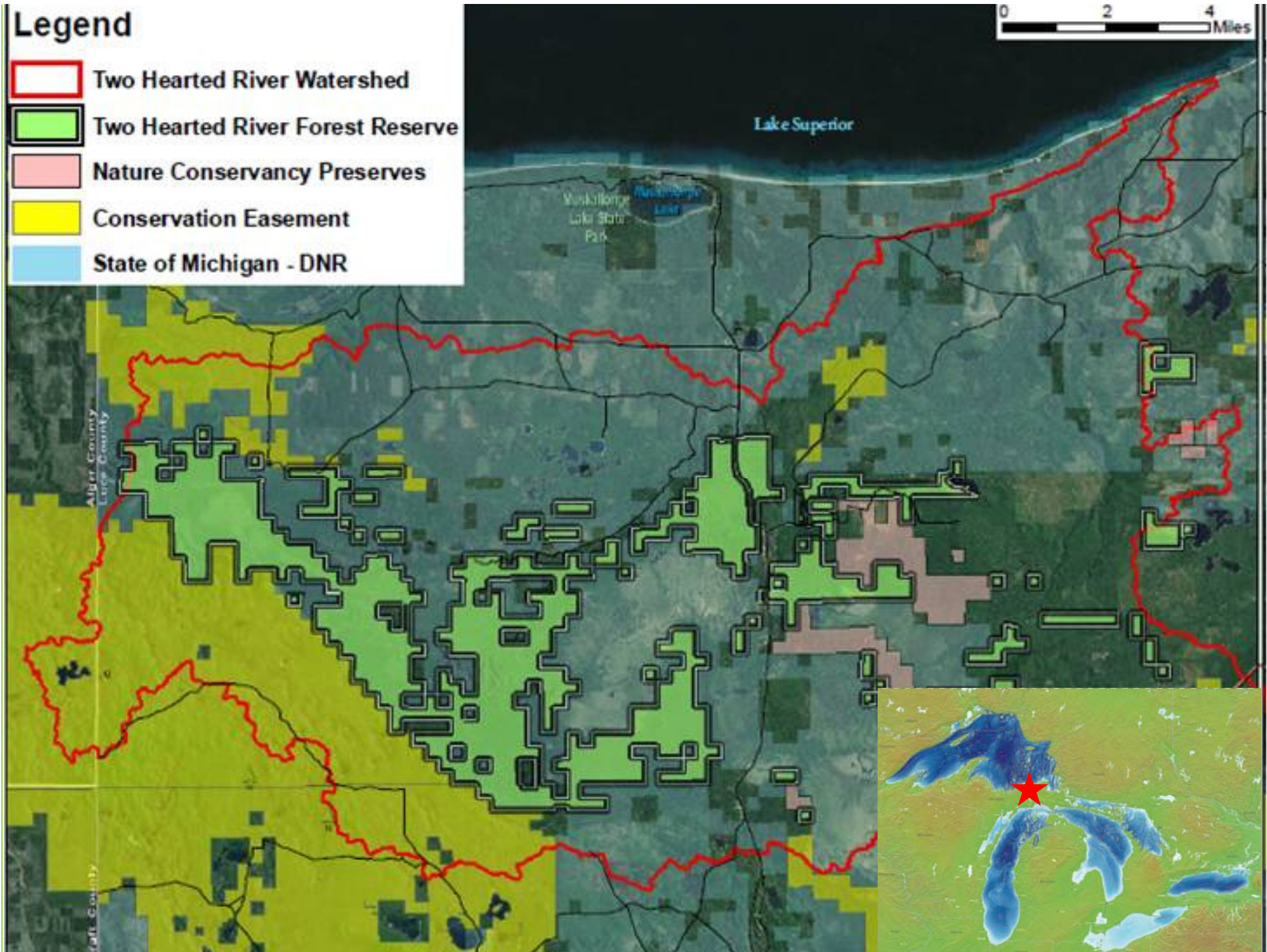


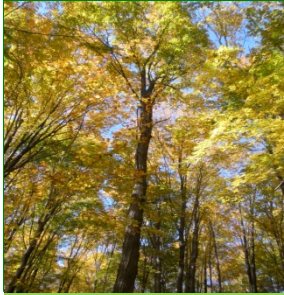
Definitions

- Two Hearted River Forest **Reserve**- ~24,000 acres (TNC)
- **Preserve**- ~3,400 acres (TNC)
- Working Forest Easement- ~270,000 acres (TFG)

Legend

-  Two Hearted River Watershed
-  Two Hearted River Forest Reserve
-  Nature Conservancy Preserves
-  Conservation Easement
-  State of Michigan - DNR





Ownership Timeline

1900's

Cleveland
Cliffs Iron Co.

1991

Benson
Forests

1994

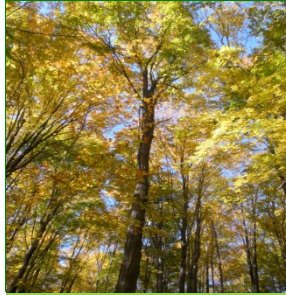
Bishop
Trust

2003

Heartwood
Forestland
Fund

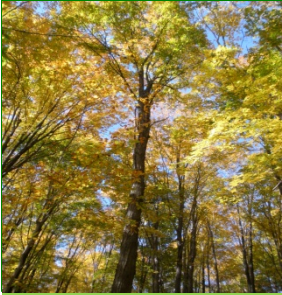
2005

TNC



Goals

- Maintain and enhance biodiversity, water quality, and ecological integrity through long-term, sustainable forest management
- Maintain FSC and CF status
- Foster the sharing of lessons learned
- Maintain positive collaborations with other landowners
- Contribute to the local economy through forest jobs, forest products, and compatible recreation
- Reinvest timber revenue into the Reserve and Watershed



Forest Management Overview

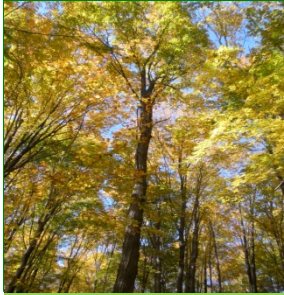
- Compass Land Consultants
(formerly Cold Springs Forestry)
- First harvest in 2009
- Initial focus on Northern Hardwoods



Treatments

- Single Tree Selection
- Group Selection
- Restoration Harvest
- No Harvest





Single Tree Selection (STS)

- Thin to 80 ft² BA
- Max diameter 18in
- Diameter distribution curve $q=1.5$
- Trees with defects and poor growth form selected for harvest



Photo by: Timberline Forestry

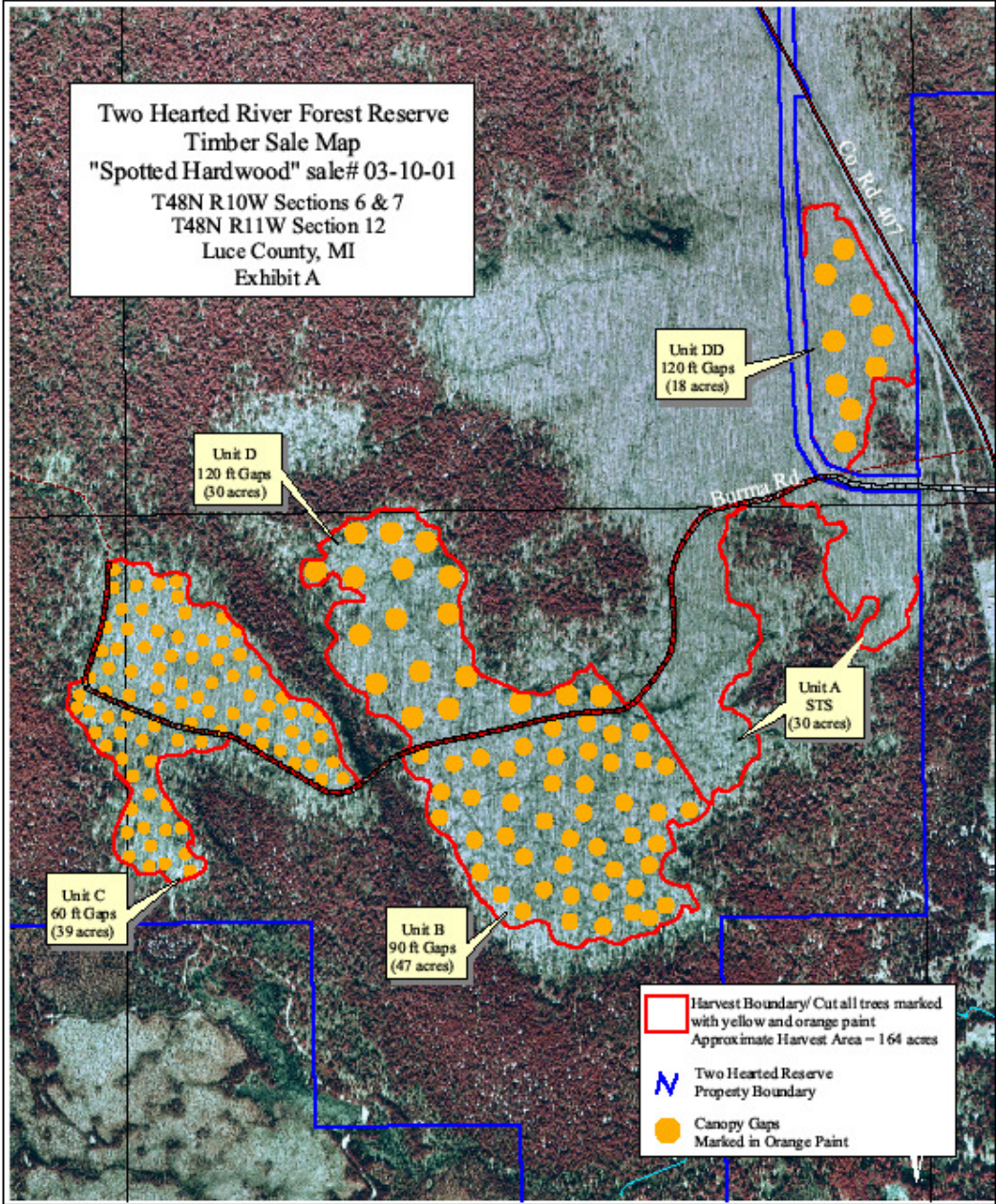


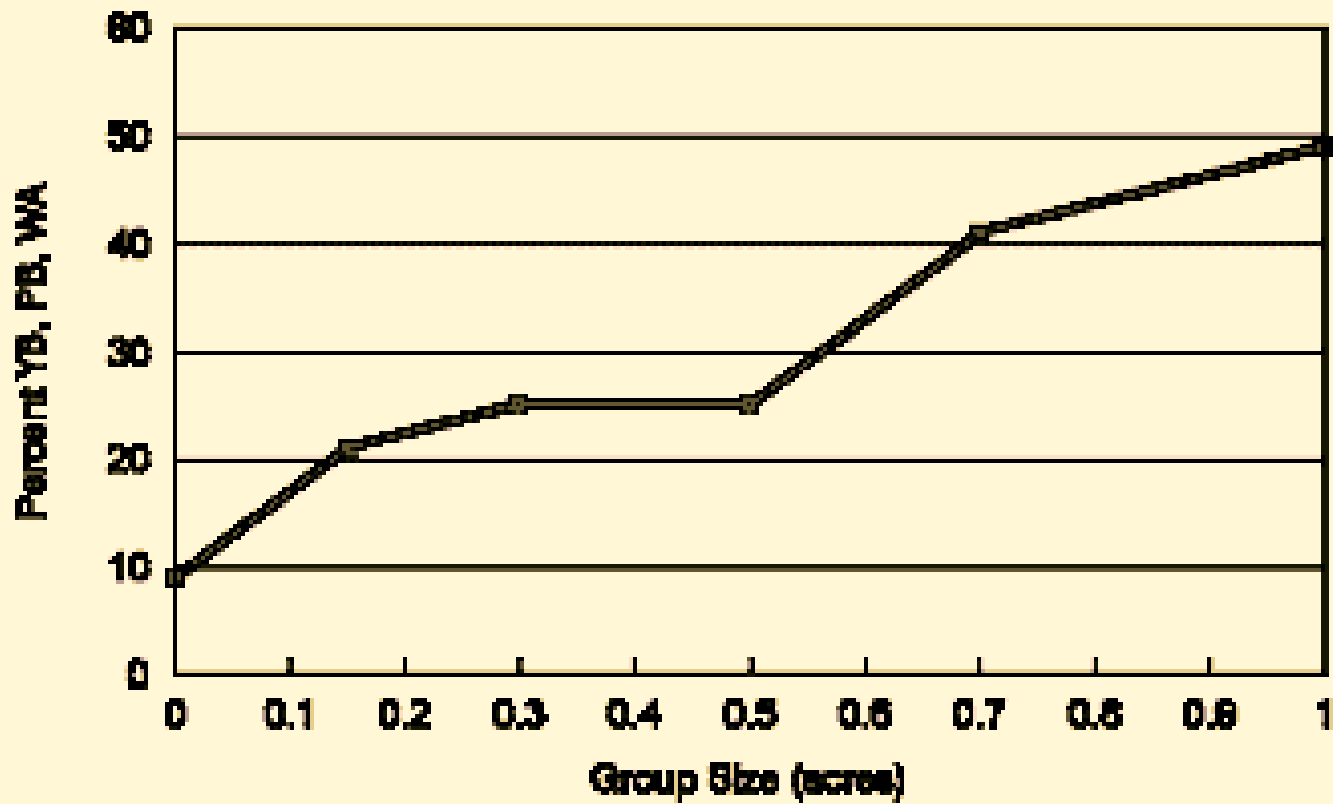
Group Selection Harvest

- Three different gap sizes
 - 60ft, 90ft, and 120ft
- Gaps represent 12% of the stand
- Single tree selection harvest for the rest of the stand not in gaps

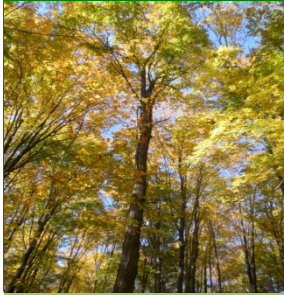


Two Hearted River Forest Reserve
 Timber Sale Map
 "Spotted Hardwood" sale# 03-10-01
 T48N R10W Sections 6 & 7
 T48N R11W Section 12
 Luce County, MI
 Exhibit A





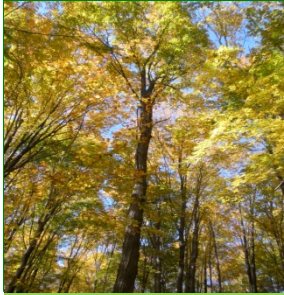
(adapted from data in Leak and Smith 1997, Leak and Wilson 1958, Marquis 1965, and McLure and Lee 1993)



Restoration Harvest

- Thin to 80-90ft² BA
- Max diameter 22in
- Diameter distribution curve $q=1.3$
- Retain large snags and CWD
- Gaps created adjacent to white pine and yellow birch seed trees, soil scarification
- Trees selected to promote overall stand health, spp diversity, and late successional characteristics





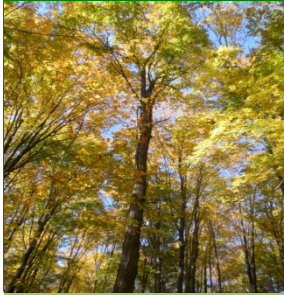
No Harvest

- Used as control for research component
- Will be reassessed in future rotations as monitoring data is analyzed



Treatment	Sale Name	Acres	Yr harvested
STS	Stuart Lake	21	2010
	Byeway	30	2011
		81	
Resto	414	88	2009
	Stuart Lake	22	2010
	Spotted Hardwoods	60	2010
	Byeway	30	2011
		200	
Group Selection			
60ft	Spotted Hardwoods	39	2010
90ft	Spotted Hardwoods	47	2010
120ft	Spotted Hardwoods	48	2010
		134	
No Harvest	Spotted Hardwoods	60	2010
	Stuart Lake	20	2010
		80	

Total	415
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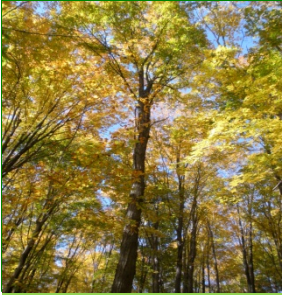
Monitoring

- Forest Inventory
 - Key Ecological Attributes (KEAs)
- Plant monitoring
- Breeding bird



Key Ecological Attributes (KEA's)- Definitions

- % Stocking- percent total stocking for the stand
- Acceptable Growing Stock(AGS)- percent stocking for AGS
- Species Diversity- # of tree species in the stand
- Evenness- Index from 0-1 of the distribution of species across the stand
- Large Live Trees- trees/ acre $>16''$ and $>19''$ DBH
- Coarse Woody Debris- volume/ acre $>13''$ diameter on the large end, ≥ 5 ft length
- Seedlings- per acre $1''$ - $4.5''$ DBH
- % Desirable Seedlings- ratio of total seedlings to desirable seedlings per acre
- Browse Index- visual estimate of browse, 1-5



Key Ecological Attributes

	Composition				Structure				Regeneration		
RATING	% Stocking	AGS	Diversity	Evenness	live>16"	live>19"	snags>= 10"	CWD cu.ft. >13"dia.	seedlings/ acre	% desirable seedlings	Browse Index
POOR	< 40 and > 100	<40	<3	0 to 0.6	0 to 3	<3	0 to 2	0 to 100	0 to 100	<25	4 or 5
FAIR	41 to 60	41 to 53	3 to 6	0.61 to 0.7	4 to 8	4 to 5	3 to 5	101 to 500	101 to 250	26 to 54	3
GOOD	61 to 79	54 to 69	7 to 9	0.71 to 0.8	9 to 16	6 to 12	6 to 8	501 to 999	251 to 400	55 to 74	2
V. GOOD	80 to 100	70+	10+	0.81+	17+	13+	9+	>1000	400+	>75	1

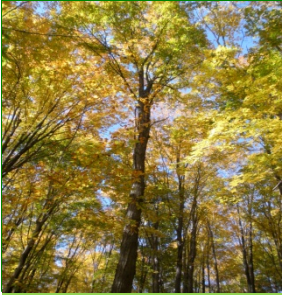
KEA Ranking

Stand	Unit/ treatment	Acres	COMPOSITION				STRUCTURE				REGENERATION		
			Stocking (%)		Tree Species		live>= 16"dbh	live>= 19"dbh	snags>= 10" dbh	CWD cu.ft. >13" dia.	all seedlings	% desirable seedlings	Browse Index
			TOTAL	AGS	Diversity	Evenness							
Spotted Hardwood	A (Resto)	30	80	60.0	7	0.46	9.1	0.3	2.3	13.8	315	na	2
	B (90ft gaps)	47	85	60.0	5	0.21	18.7	4.6	0.5	2.2	137	na	2
	C (60ft gaps)	39	80	55.0	7	0.51	6.9	0.9	3.1	13.4	231	na	2
	D (120ft gaps)	48	90	65.0	7	0.39	9.8	0.7	2.6	9.7	453	na	2
	E (No Harvest)	60	87	65.0	4	0.20	10.3	0.3	1.5	0.5	235	na	2
414	Resto		90	80.0	6	0.37	14.3	1.8	5	12	1022	na	2
Stuart Lake	A (No harvest)	20	75	60.0	7	0.71	13.2	3.0	8.8	8.9	600	na	2
	B (STS)	21	80	65.0	5	0.72	12.3	1.4	1.3	20.9	925	na	2
	C (Resto)	22	85	68.0	5	0.62	14.6	1.2	3.8		350	na	2
Byeway	A (Resto)	29	85	70.0	7	0.48	14.9	0.92	na	na	na	na	2
	B (STS)	34	88	80.0	4	0.57	10.7	0.83	na	na	na	na	2
Average			84	66.2	6	0.48	12.3	1.5	3.2	10.2	474	na	2
			Composition				Structure			Regeneration			
RATING			% Stocking	AGS	Diversity	Evenness	live>16"	live>19"	snags>= 10"	CWD cu.ft. >13"dia.	seedlings/ acre	% desirable seedlings	Browse Index
POOR			< 40 and > 100	<40	<3	0 to 0.6	0 to 3	<3	0 to 2	0 to 100	0 to 100	<25	4 or 5
FAIR			41 to 60	41 to 53	3 to 6	0.61 to 0.7	4 to 8	4 to 5	3 to 5	101 to 500	101 to 250	26 to 54	3
GOOD			61 to 79	54 to 69	7 to 9	0.71 to 0.8	9 to 16	6 to 12	6 to 8	501 to 999	251 to 400	55 to 74	2
V. GOOD			80 to 100	70+	10+	0.81+	17+	13+	9+	>1000	400+	>75	1



Plant Monitoring

- Plot sampling
- Used to track long term changes in ground flora



Bird Monitoring

- Point count sampling
- Focused on breeding birds
- Used to track long term changes in bird communities
- Possibly link bird species as indicators for forest condition



Timber Revenue

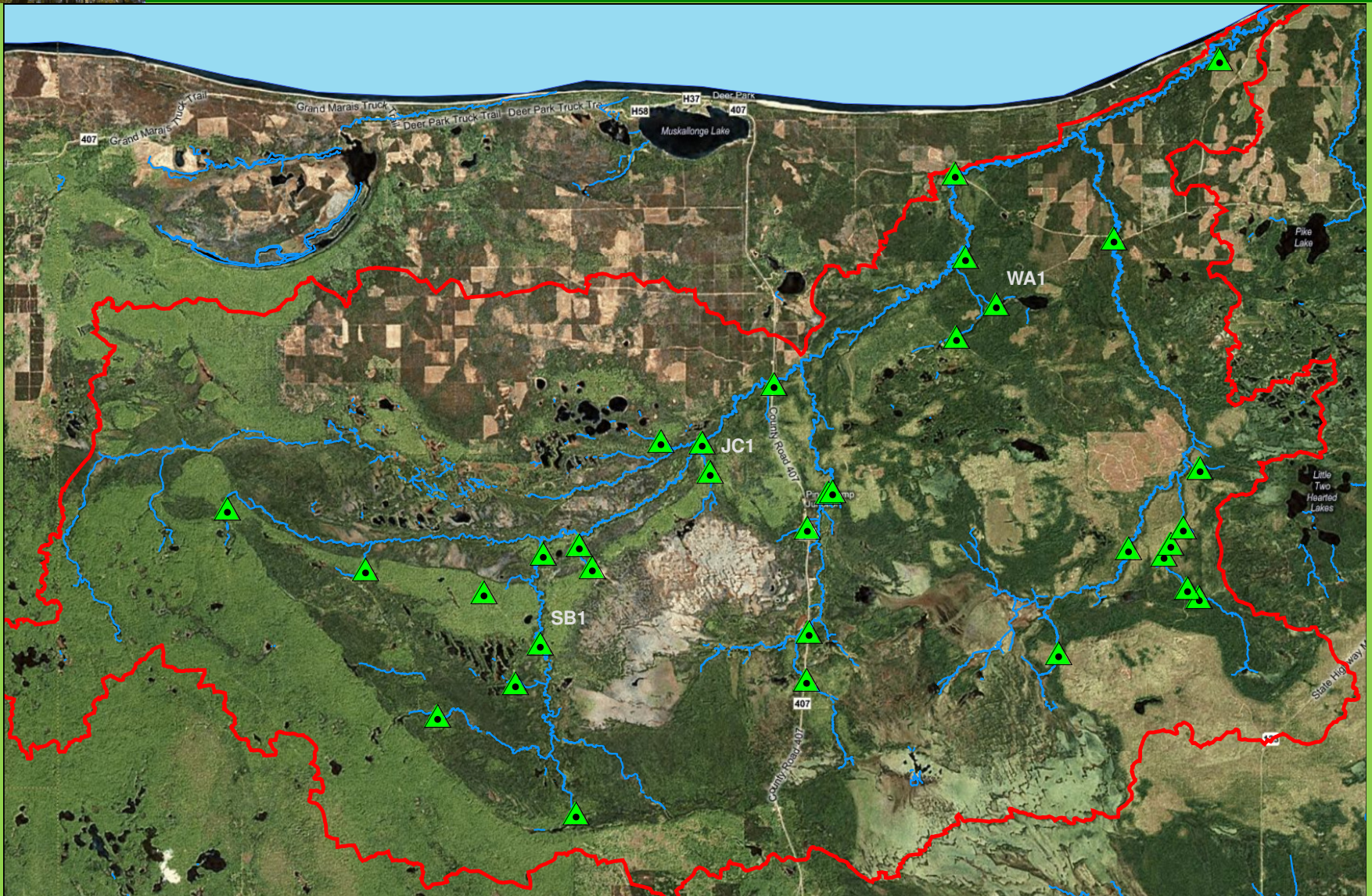
- Support
 - management expenses
 - monitoring
 - Other land management
 - Rd/ Stream crossings
 - Rd improvements





Rd/ Stream Crossings

(1255 tons sediment/ yr)







Road Improvements

- CCI rd 11+ miles
- Partner with TASA and DNR

Questions??

