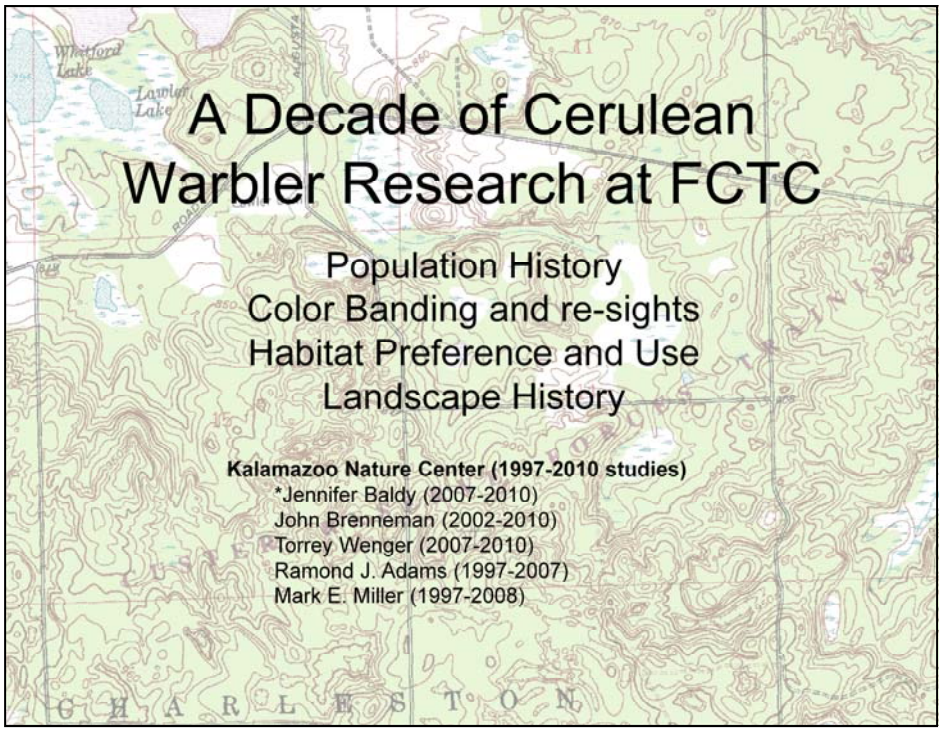
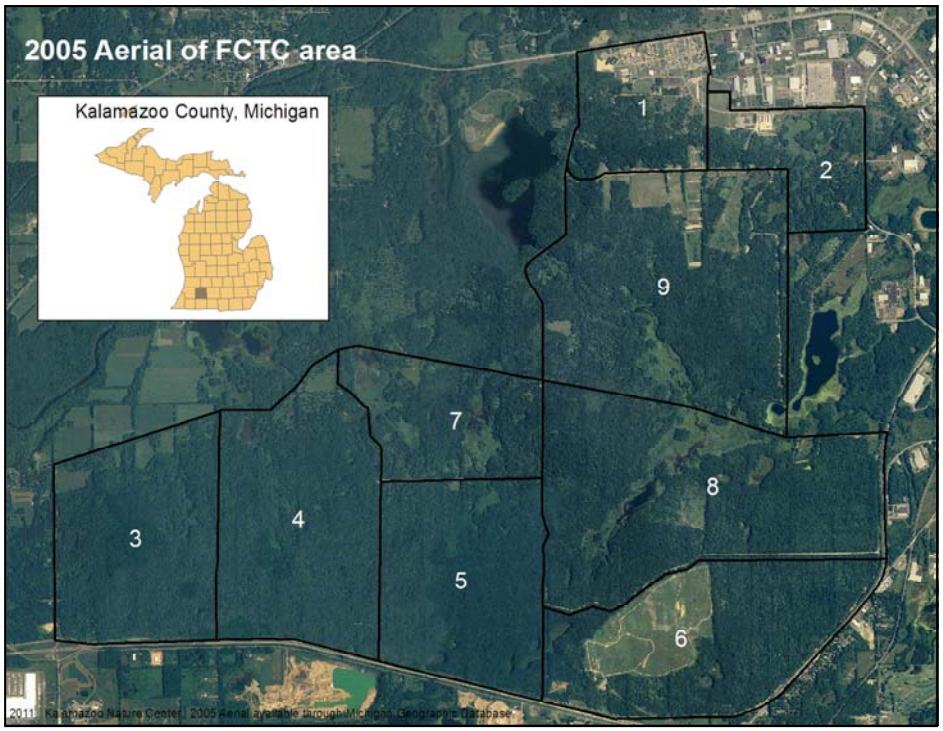
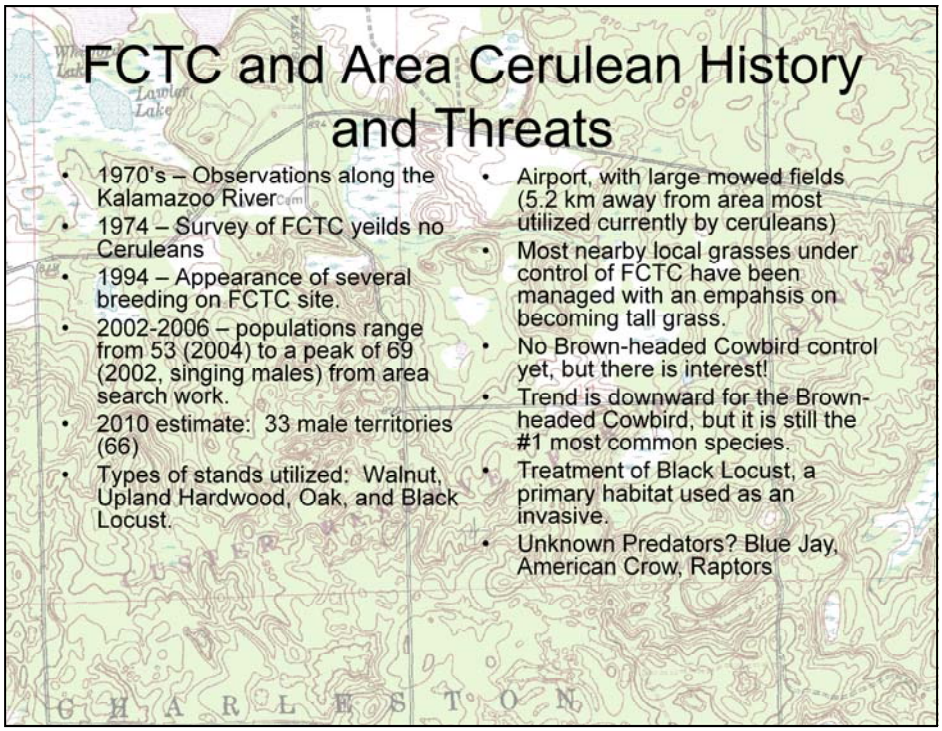
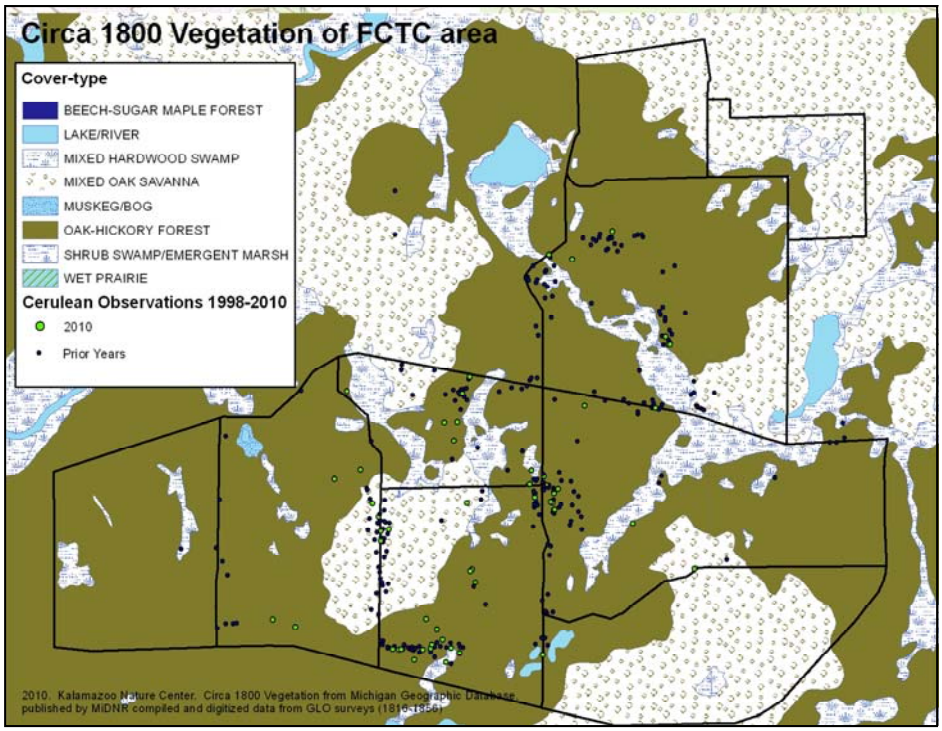

Whitford Lake
Lawton Lake
A Decade of Cerulean Warbler Research at FCTC
Population History
Color Banding and re-sights
Habitat Preference and Use
Landscape History
Kalamazoo Nature Center (1997-2010 studies)
*Jennifer Baldy (2007-2010)
John Brenneman (2002-2010)
Torrey Wenger (2007-2010)
Ramond J. Adams (1997-2007)
Mark E. Miller (1997-2008)
CHARLESTON


2005 Aerial of FCTC area
Kalamazoo County, Michigan
1
2
9
7
8
3
4
5
6
2011 Kalamazoo Nature Center | 2005 Aerial available through Michigan Geographic Database



Circa 1800, Oak-Hickory Forest was the second most common forest type. This forest type grew on sandy and loamy moraine edges. Species list: white oak, black oak, red oak, pignut hickory, also to lesser extent: white ash, red maple, tulip tree, black cherry, American beech, Shagbark Hickory. This type was primarily converted to farm land (supported by 1946 photo, also true of FCTC Area) Problems with regeneration include a conversion to Beech/Maple (These species are more shade tolerant and cover the forest floor) Fire resistant Oak forest was believed to have been maintained using low intensity wild-fires (a practice that has only recently returned to management practices)

The second primary vegetation type, mixed Oak Savanna was also heavily dependent on fire. These areas should have richer soils, and would not return to savannah without the influence of fire.



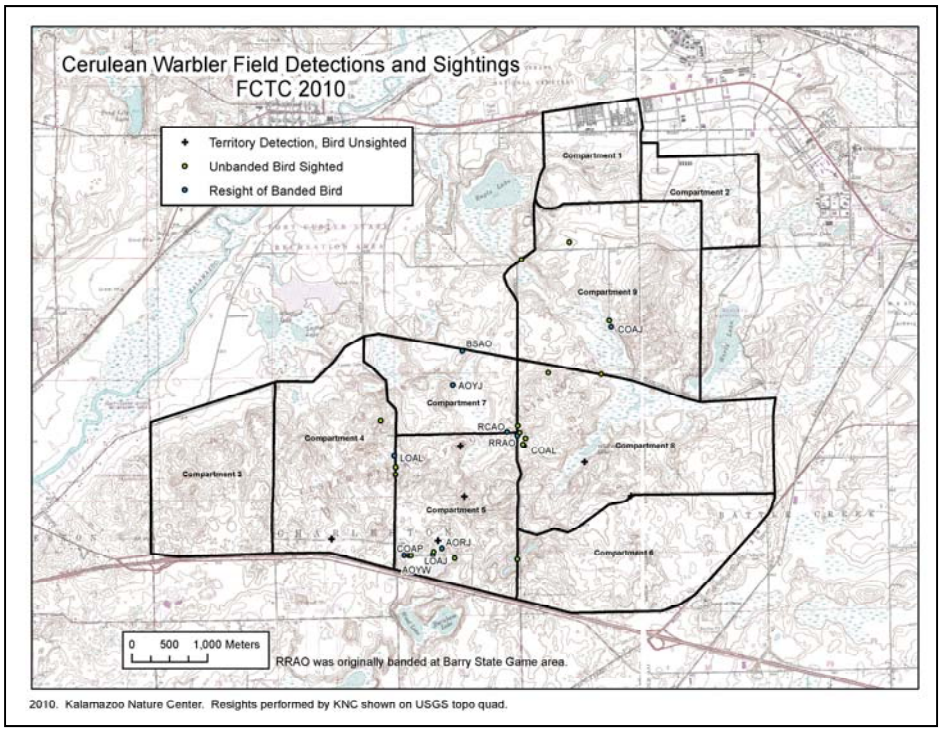
Most observations were originally Oak-Hickory Forest, sharing a boundary with mixed oak savannah, the boundary between these two types probably varied with the fire regime.

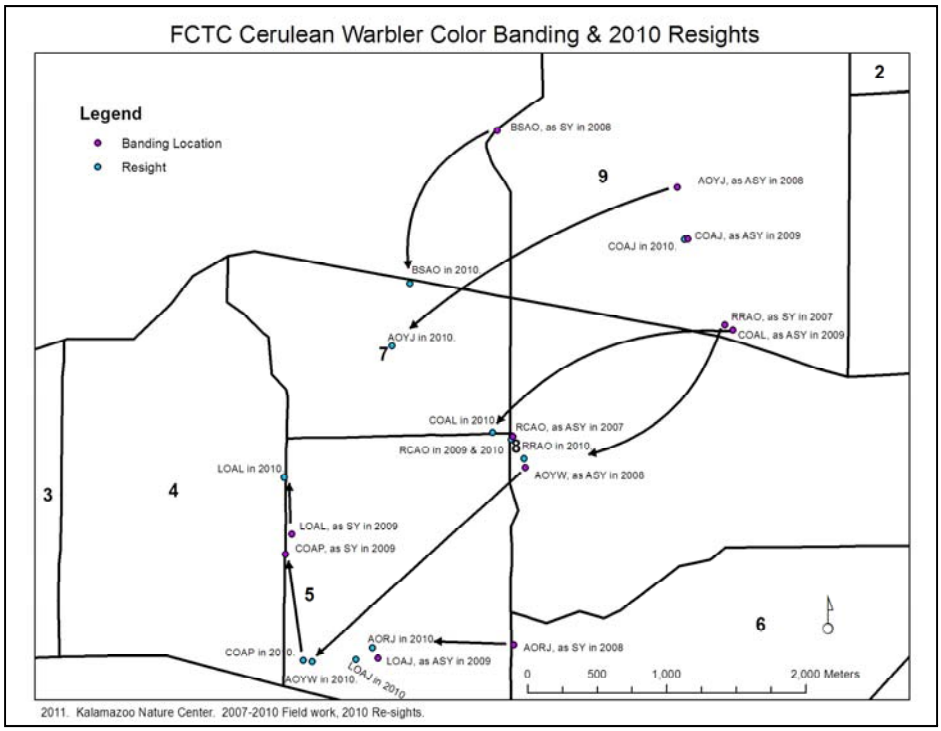
Soils

- Soils – used by Ceruleans are the same soils that dominate the site. Sandy Loam, Loamy Sand, and Loam. Few observations fall in the a "muck" category, but they are at the periphery of these areas. They are outwash plains and moraines, which is the dominant type of the site in general.

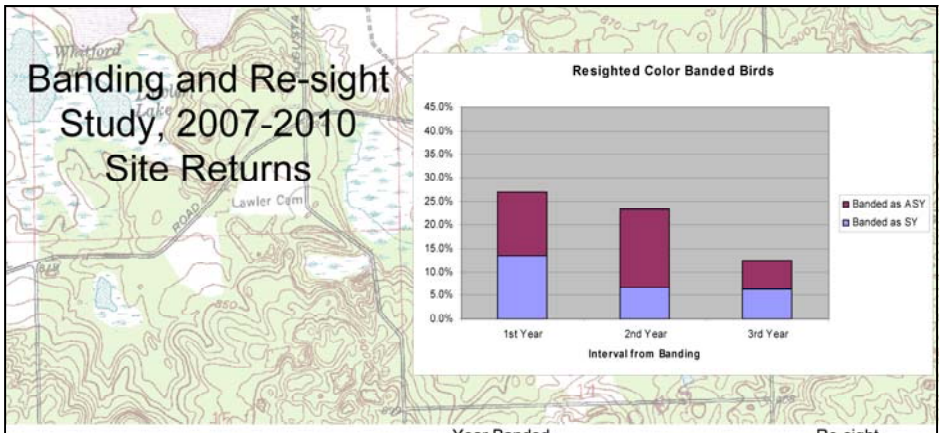
- http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
OsC	Oshtemo sandy loam, 6 to 12 percent slopes	1,359.80	22.00%
OsB	Oshtemo sandy loam, 1 to 6 percent slopes	1,263.00	20.40%
StE	Spinks-Coloma loamy sands, 18 to 35 percent slopes	675.1	10.90%
OsE	Oshtemo sandy loam, 18 to 35 percent slopes	520.8	8.40%
SpD	Spinks loamy sand, 12 to 18 percent slopes	487.7	7.90%
OsD	Oshtemo sandy loam, 12 to 18 percent slopes	415.4	6.70%
Hn	Houghton muck	396.1	6.40%
KaB	Kalamazoo loam, 2 to 6 percent slopes	320.4	5.20%
W	Water	245.5	4.00%
SpC	Spinks loamy sand, 6 to 12 percent slopes	193.3	3.10%
KaC	Kalamazoo loam, 6 to 12 percent slopes	131.4	2.10%
SpB	Spinks loamy sand, 0 to 6 percent slopes	79.2	1.30%
Gn	Glendora sandy loam	32.7	0.50%
Hs	Houghton and Sebewa soils, ponded	25.6	0.40%
Gd	Gilford sandy loam	11.1	0.20%
Ad	Adrian muck	5.9	0.10%
Aq	Aquents and Histosols ponded	7.9	0.10%
PfB	Plainfield loamy sand, 0 to 6 percent slopes	5	0.10%
Totals for Area of Interest		6,175.90	100.00%


Cerulean Warbler Field Detections and Sightings
FCTC 2010
Territory Detection, Bird Unsighted
Unbanded Bird Sighted
Resight of Banded Bird
Compartment 1
Compartment 2
Compartment 9
COAJ
BSAO
AOYJ
Compartment 7
RCAO
RRAO
COAL
Compartment 8
Compartment 4
LOAL
Compartment 3
Compartment 5
AORJ
COAP
LOAJ
AOYW
Compartment 6
0 500 1,000 Meters
RRAO was originally banded at Barry State Game area.
2010. Kalamazoo Nature Center. Resights performed by KNC shown on USGS topo quad.

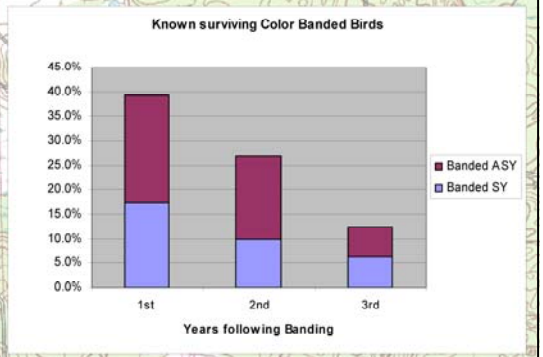


2011. Kalamazoo Nature Center. 2007-2010 Field work, 2010 Re-sights.

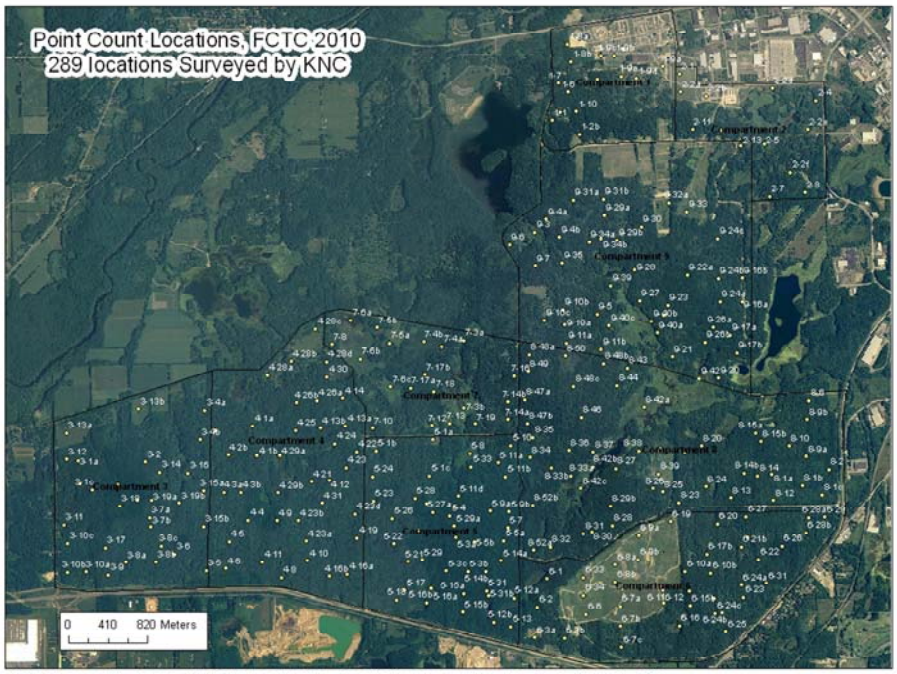


	Year Banded						Re-sight	
Banded	2005	2006	2007	2008	2009	Total	n	Percentage
Total Banded each year	**14**	**7**	**9**	**21**	**16**	**67**	-	-
Banded as SY	4	3	3	11	5	26	-	-
Banded as ASY	10	4	6	10	11	41	-	-
1st Year Following Banding	*	*	*	**5**	**5**	**10**	**37**	**27.0%**
Banded as SY	*	*	*	3	2	5	16	31.3%
Banded as ASY	*	*	*	2	3	5	21	23.8%
2nd Year Following Banding	*	*	**3**	**4**	*2011*	**7**	**30**	**23.3%**
Banded as SY	*	*	0	2	*2011*	2	14	14.3%
Banded as ASY	*	*	3	2	*2011*	5	16	31.3%
3rd Year Following Banding	*	**0**	**2**	*2011*	*2012*	**2**	**16**	**12.5%**
Banded as SY	*	0	*1*	*2011*	*2012*	1	6	16.7%
Banded as ASY	*	0	1	*2011*	*2012*	1	10	10.0%

Banding and Re-sight Study, 2007-2010, Known Survivors



	Year Banded						Known Surviving	
Banded	2005	2006	2007	2008	2009	Total	n	Percentage
Total Banded	**14**	**7**	**9**	**21**	**16**	**67**	-	-
Banded as SY	4	3	3	11	5	26	-	-
Banded as ASY	10	4	6	10	11	41	-	-
1st Year Status	*	*	***4***	**9**	**5**	**18**	**46**	**39.1%**
Banded as SY	*	*	*1*	5	2	8	19	42.1%
Banded as ASY	*	*	*3*	4	3	10	27	37.0%
2nd Year Status	*	*	**4**	**4**	*2011*	**8**	**30**	**26.7%**
Banded as SY	*	*	1	2	*2011*	3	14	21.4%
Banded as ASY	*	*	3	2	*2011*	5	16	31.3%
3rd Year Returns	*	**0**	**2**	*2011*	*2012*	**2**	**16**	**12.5%**
Banded as SY	*	0	*1*	*2011*	*2012*	1	6	16.7%
Banded as ASY	*	0	1	*2011*	*2012*	1	10	10.0%



2010. Kalamazoo Nature Center. 2005 Orthophoto in Michigan Georef with point count data and locations performed by KNC.

ANOVA results, proximity to edge (Road, Water, and Tank Range)

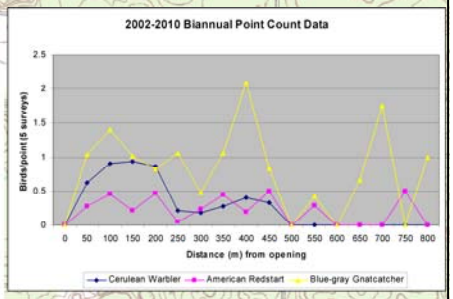
Anova: Single Factor CERW

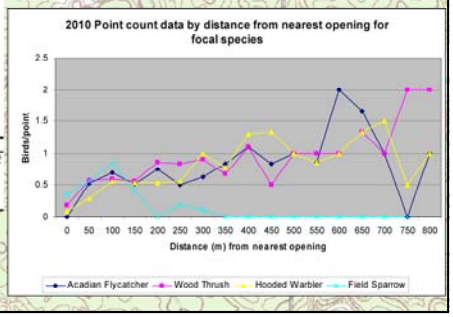
Cerulean Warbler

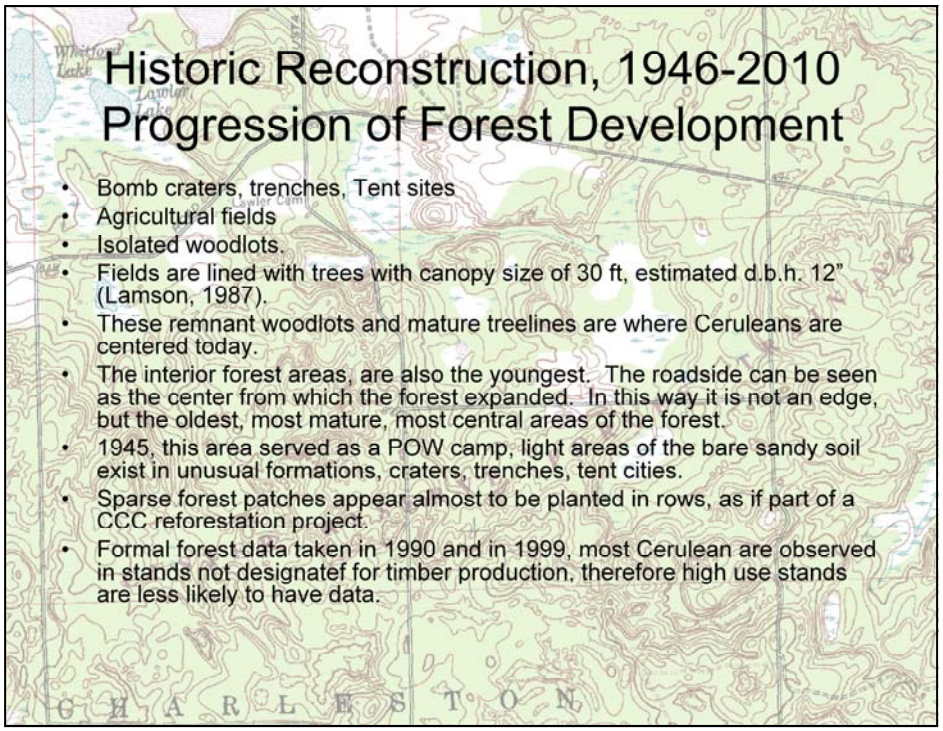
Meters from Opening	Count	Sum	Average	Variance
Open Areas	11	0	0.000	0.000
1-50	50	31	0.620	1.547
51-100	61	55	0.902	2.990
101-150	47	44	0.936	5.061
151-200	28	24	0.857	3.905
201-250	18	4	0.222	0.301
251-300	21	4	0.190	0.262
301-350	18	5	0.278	0.330
351-400	10	4	0.400	0.711
401-450	6	2	0.333	0.267
451-500	1	0	0.000	
501-550	7	0	0.000	0.000
551-600	1	0	0.000	
601-650	3	0	0.000	0.000
651-700	4	0	0.000	0.000
701-750	2	0	0.000	0.000
751-800	1	0	0.000	

ANOVA

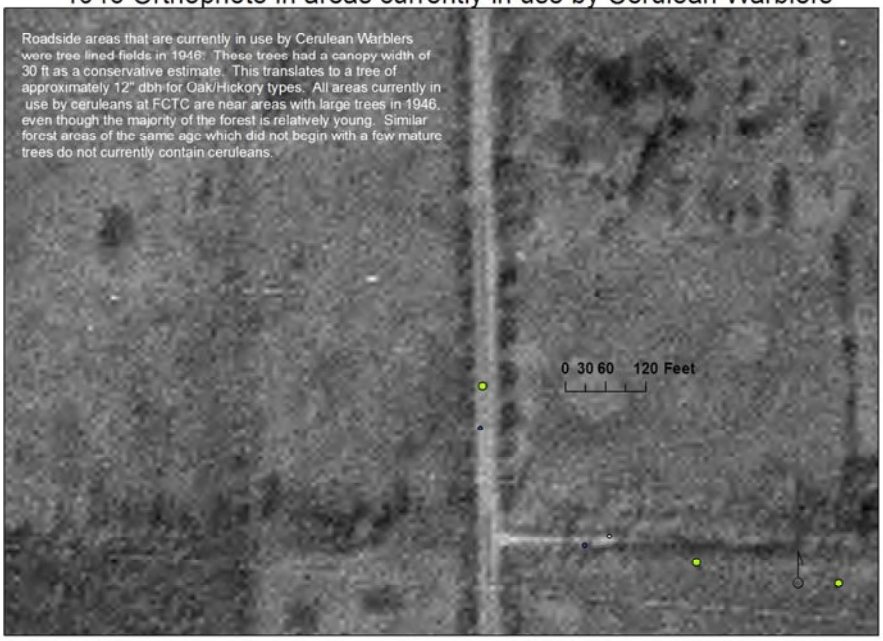
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	32.31888	16	2.01993	0.890298	0.580976	1.680802
Within Groups	617.1206	272	2.268826			
Total	649.4394	288				



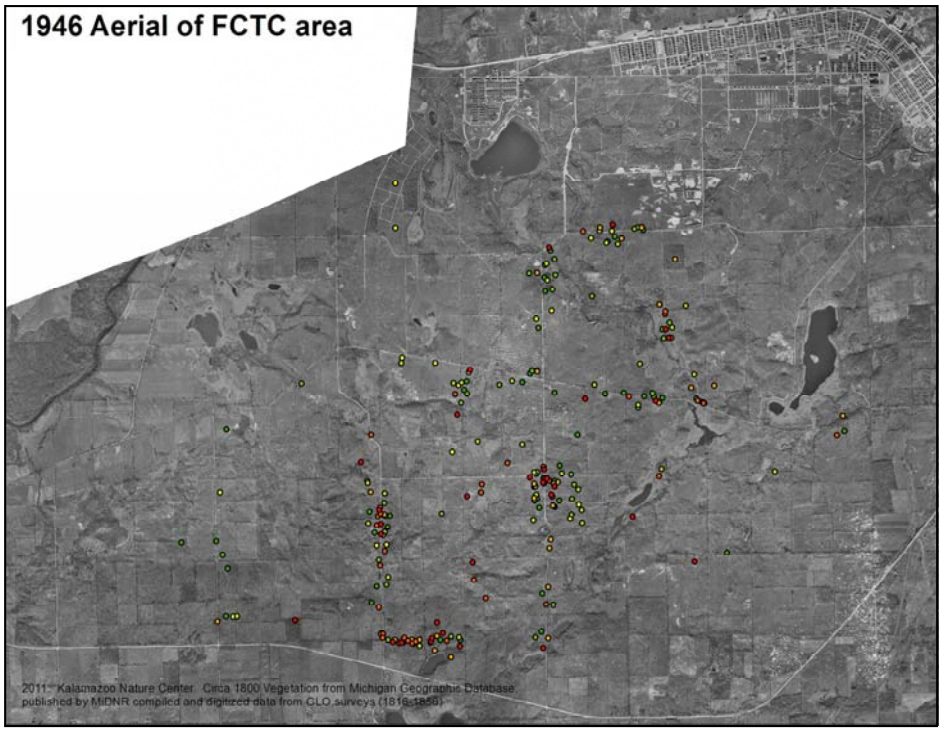


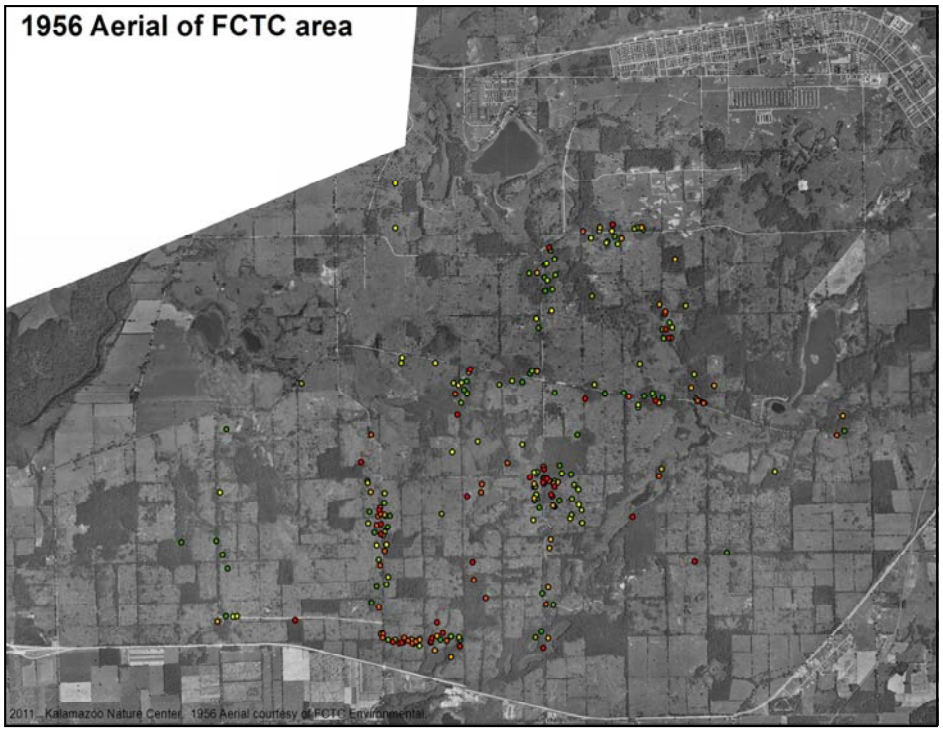

Historic Reconstruction, 1946-2010
Progression of Forest Development
• Bomb craters, trenches, Tent sites
• Agricultural fields
• Isolated woodlots.
• Fields are lined with trees with canopy size of 30 ft, estimated d.b.h. 12" (Lamson, 1987).
• These remnant woodlots and mature treelines are where Ceruleans are centered today.
• The interior forest areas, are also the youngest. The roadside can be seen as the center from which the forest expanded. In this way it is not an edge, but the oldest, most mature, most central areas of the forest.
• 1945, this area served as a POW camp, light areas of the bare sandy soil exist in unusual formations, craters, trenches, tent cities.
• Sparse forest patches appear almost to be planted in rows, as if part of a CCC reforestation project.
• Formal forest data taken in 1990 and in 1999, most Cerulean are observed in stands not designatef for timber production, therefore high use stands are less likely to have data.
C H A R L E S T O N

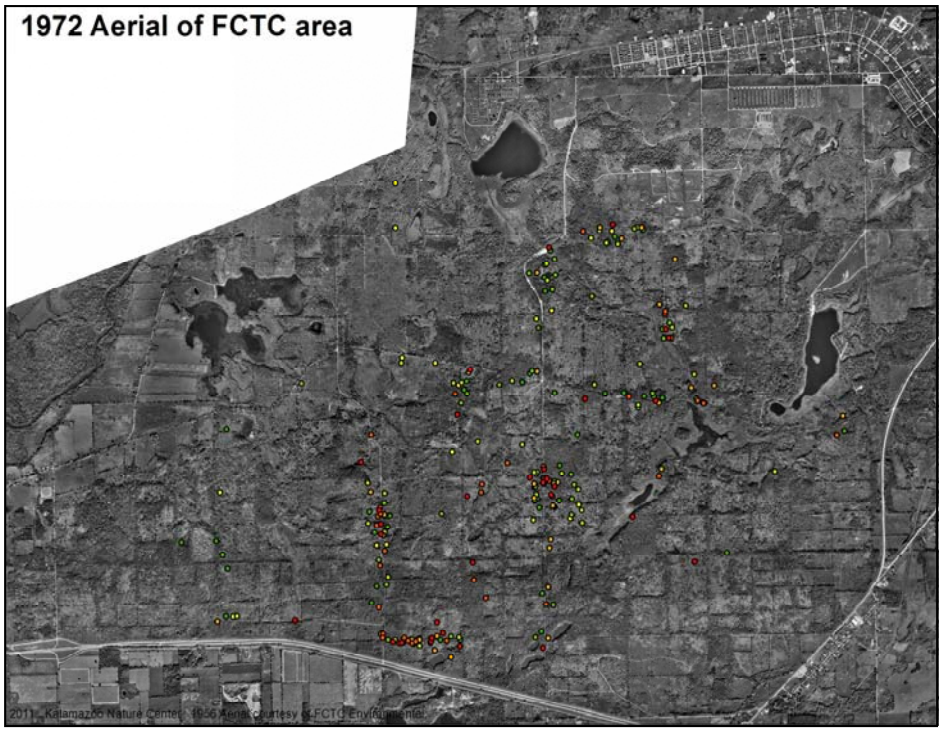
1946 Orthophoto in areas currently in use by Cerulean Warblers

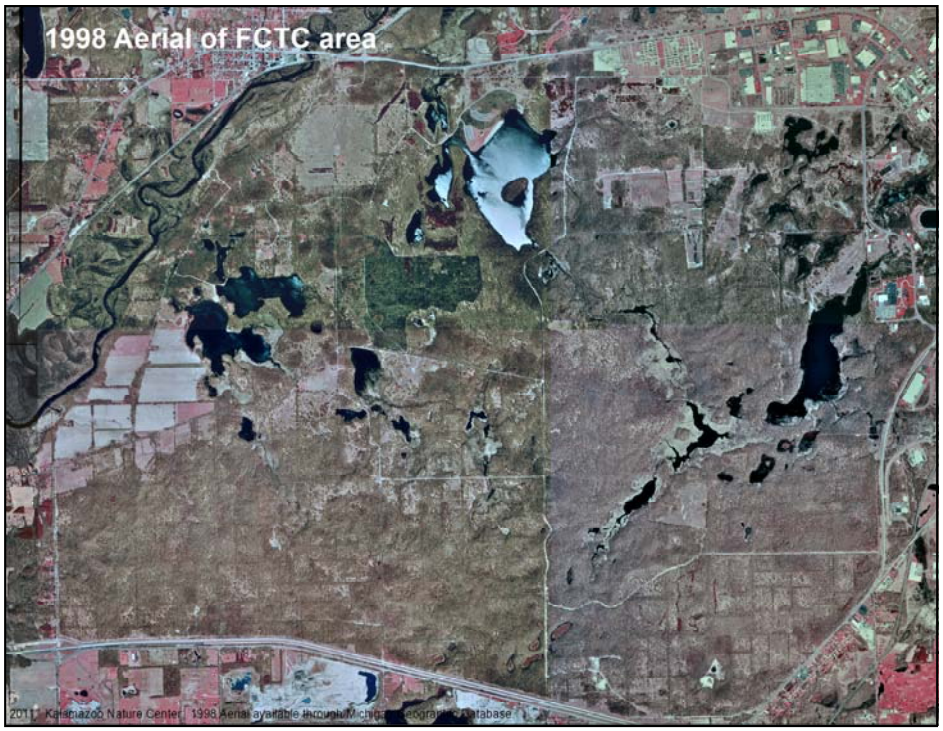


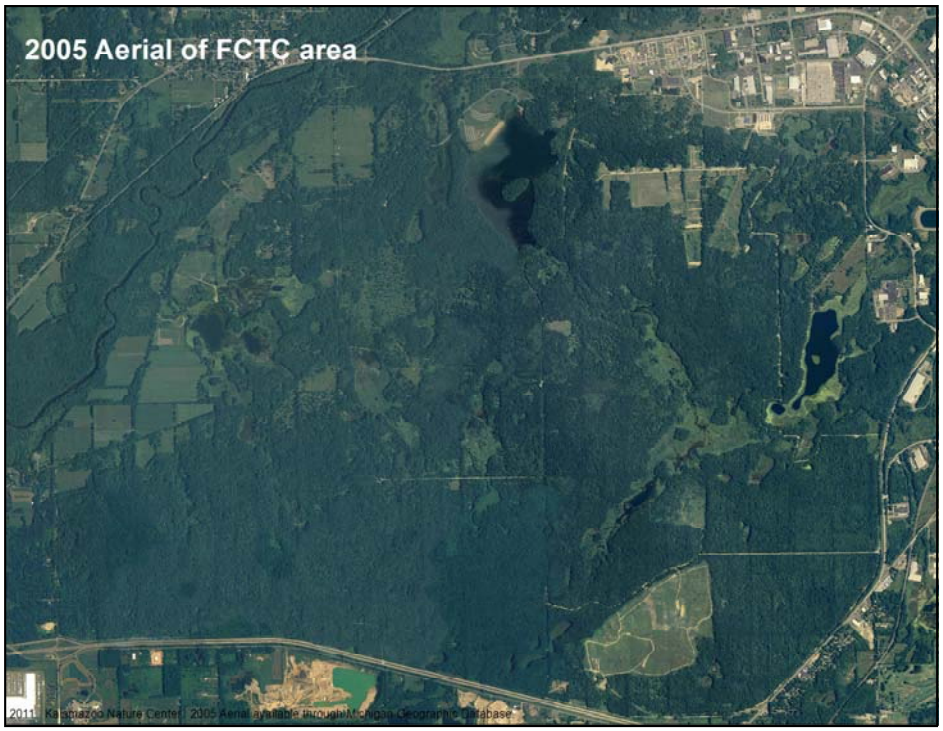
2011. Kalamazoo Nature Center. Cerulean Location determined by GPS with 1946 Orthophotography available from Michigan Geographic Data Library.

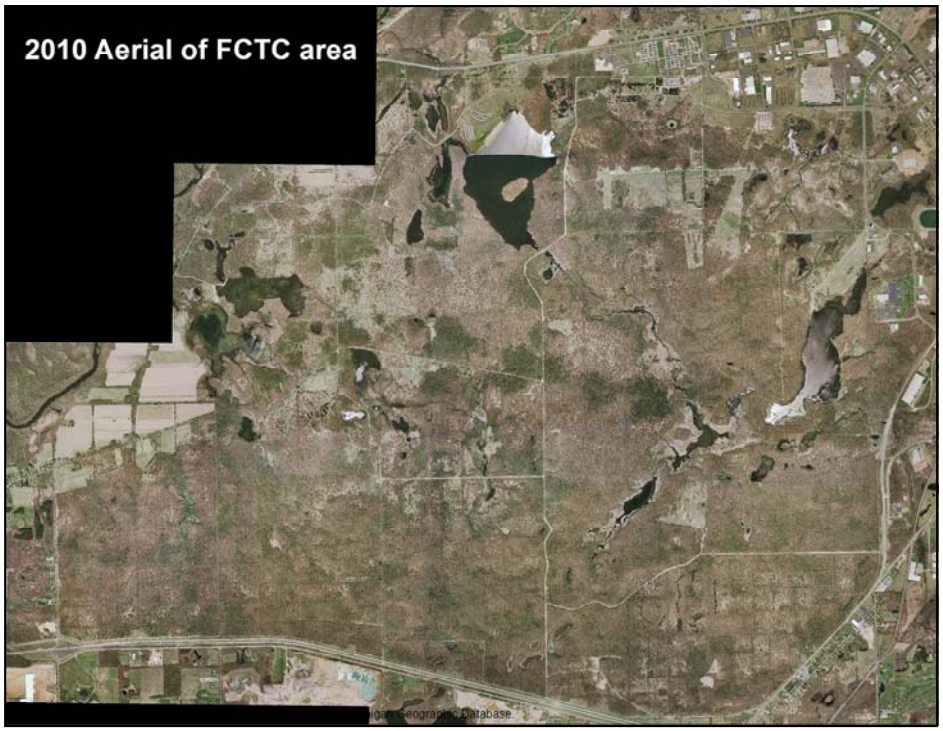

1946 Aerial of FCTC area
2011 - Kalamazoo Nature Center. Circa 1800 Vegetation from Michigan Geographic Database
published by MiDNR compiled and digitized data from GLO surveys (1816-1856)

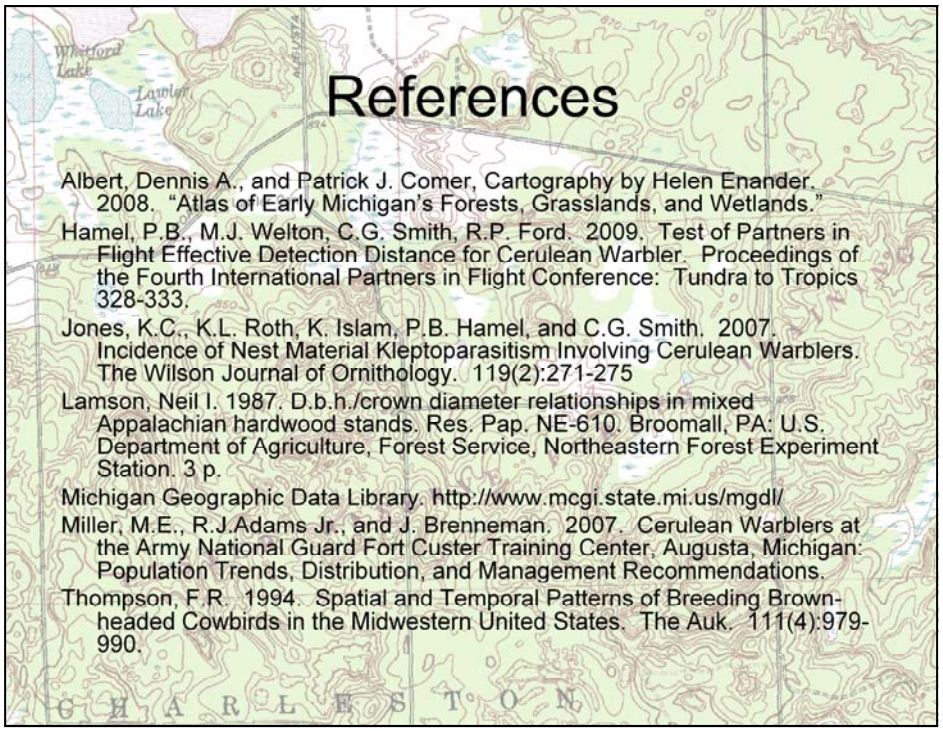

1956 Aerial of FCTC area
2011 Kalamazoo Nature Center. 1956 Aerial courtesy of FCTC Environmental


1972 Aerial of FCTC area


1998 Aerial of FCTC area
2011 Kalamazoo Nature Center 1998 Aerial available through Michigan Geographic Database


2005 Aerial of FCTC area
2011 Kalamazoo Nature Center 2005 Aerial available through Michigan Geographic Database


2010 Aerial of FCTC area



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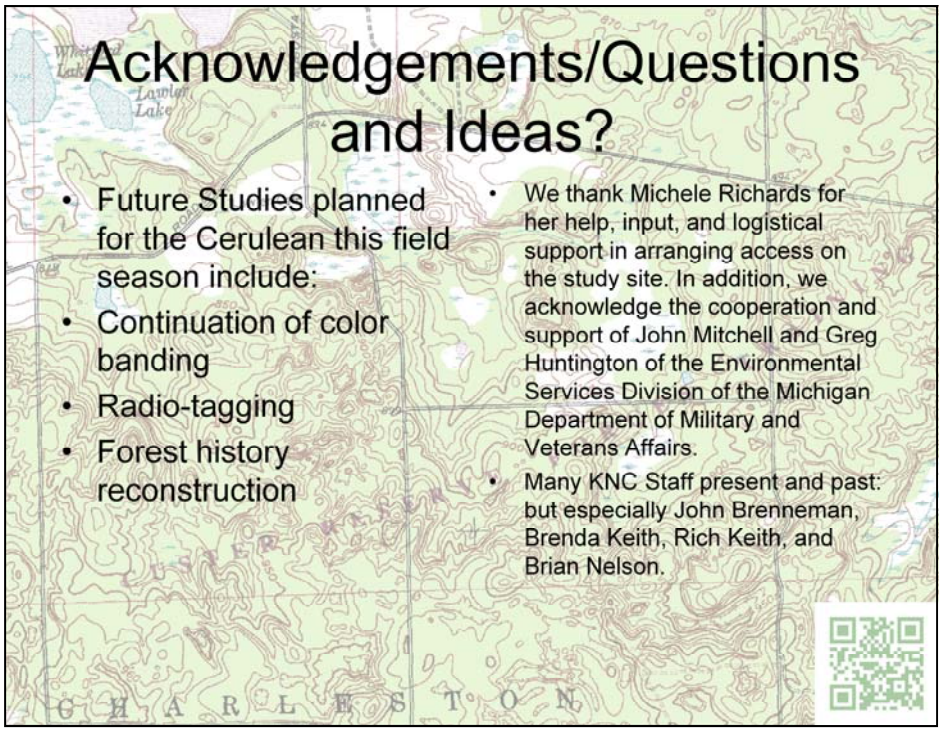
Acknowledgements/Questions and Ideas?
• Future Studies planned for the Cerulean this field season include:
• Continuation of color banding
• Radio-tagging
• Forest history reconstruction
• We thank Michele Richards for her help, input, and logistical support in arranging access on the study site. In addition, we acknowledge the cooperation and support of John Mitchell and Greg Huntington of the Environmental Services Division of the Michigan Department of Military and Veterans Affairs.
• Many KNC Staff present and past: but especially John Brenneman, Brenda Keith, Rich Keith, and Brian Nelson.
CHARLESTON