

**Geographic Information Systems and Remote Sensing
for Natural Resource Management
FW3540
Lecture 29**

Modeling in GIS and Links to Interpolation

Most field data is collected as samples or points.

GIS analysis can benefit from continuous surface.

Create or model the surface from field data use interpolation.

Interpolation vs. extrapolation



In addition to locating and marking Township, Range, and affiliated Section corners, the early Public Land Surveyors were charged with collecting information about features on the landscape. Fire information was one feature for which data was collected

Enter Fire Enter Fire and Wind

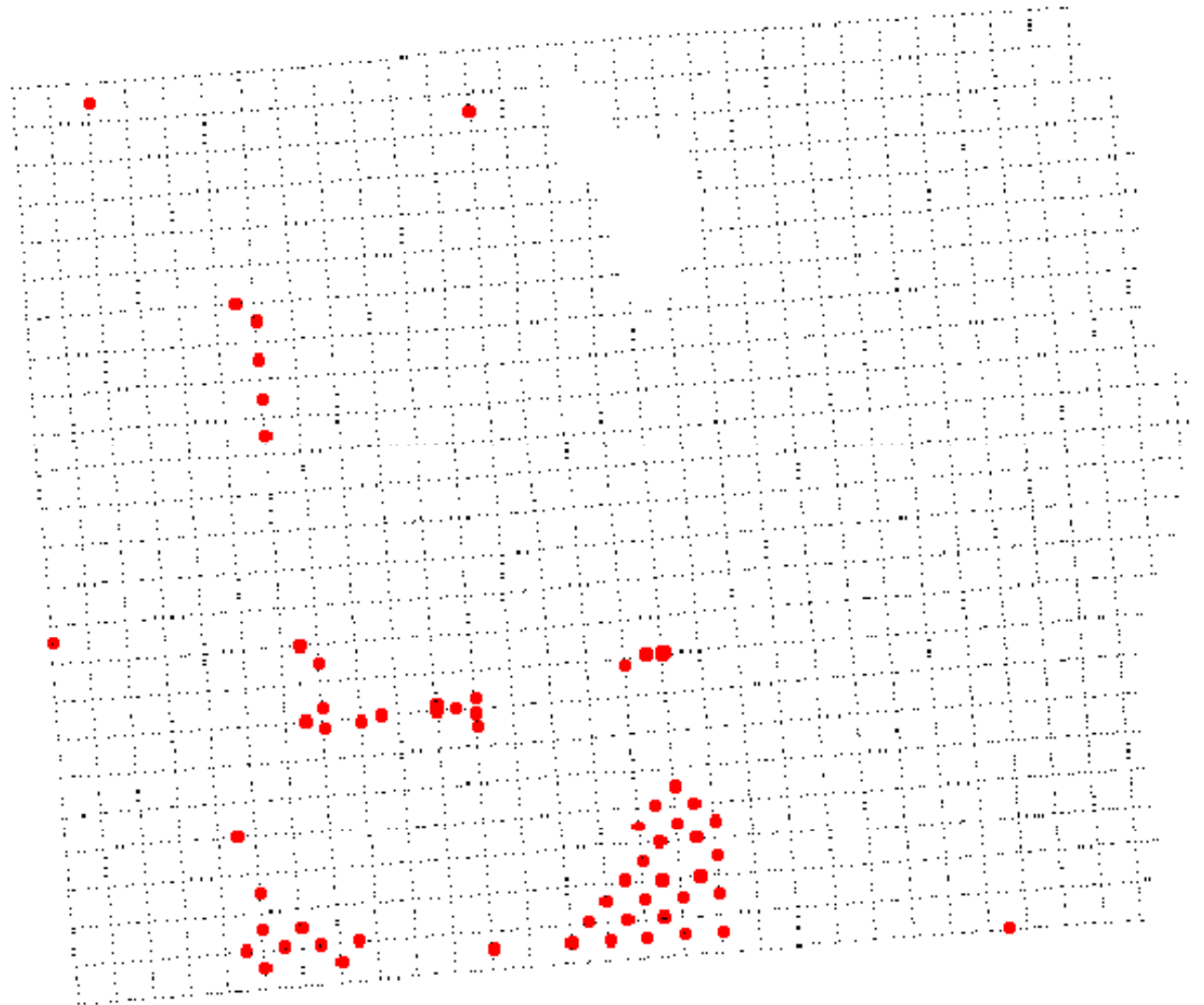
Leave Fire Leave Fire and Wind

Visible Burn Visible Fire and Wind

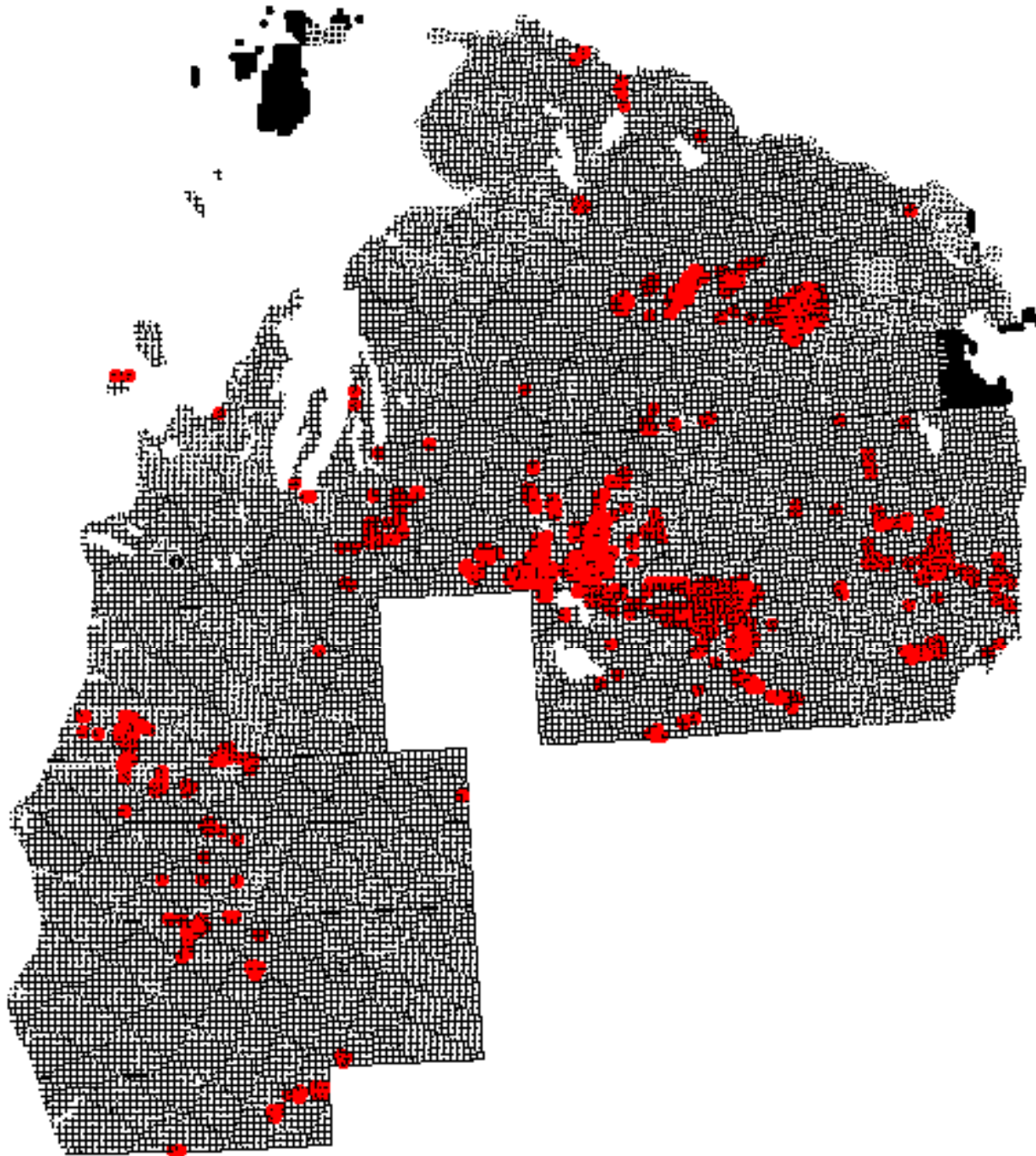
Dead timber- burned

This information is extremely valuable in looking at pre-European settlement landscape conditions.

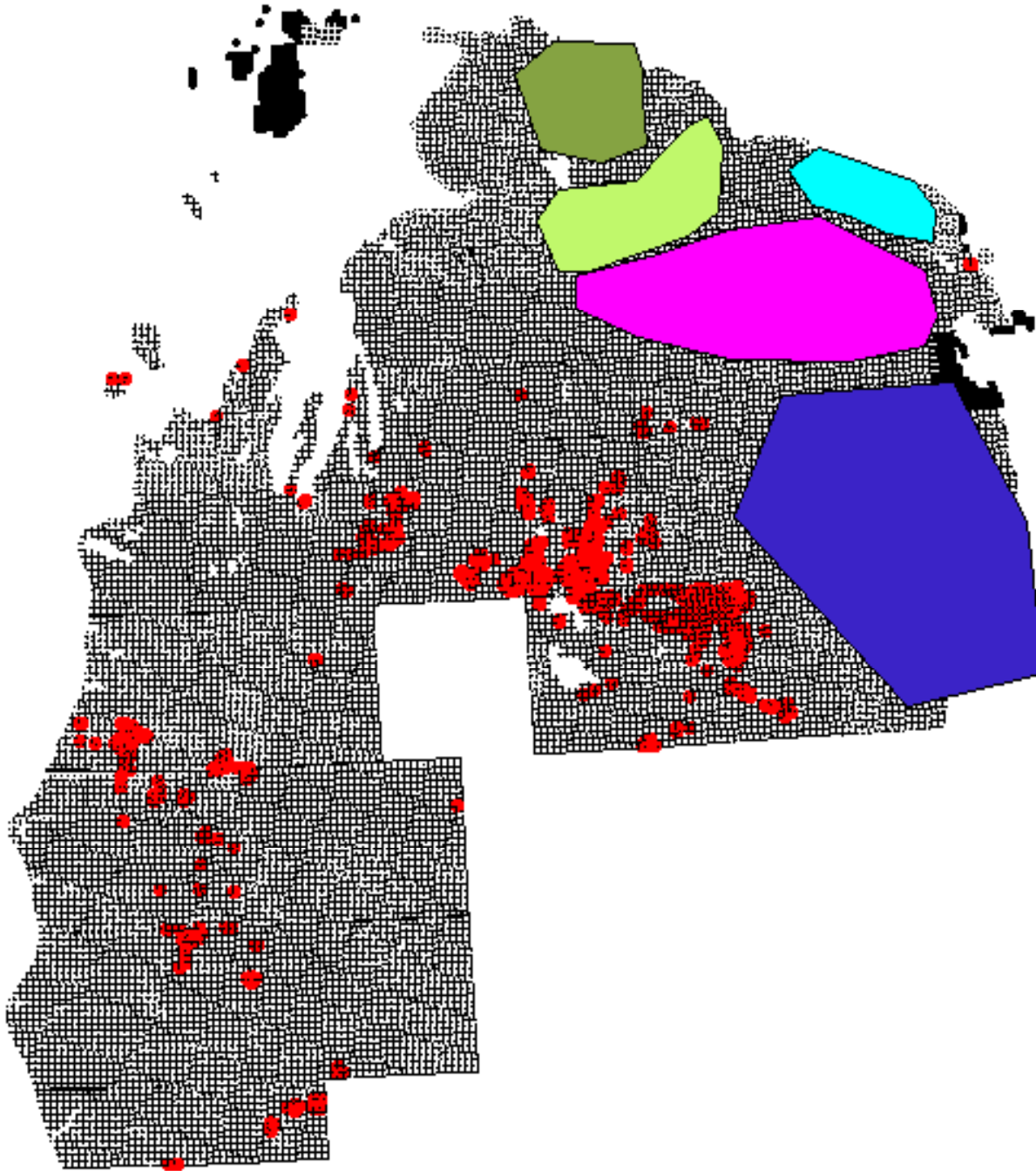
GIS technology has made it possible to translate the surveyors' notes from a written record to spatial data which can be registered to a geographic coordinate system



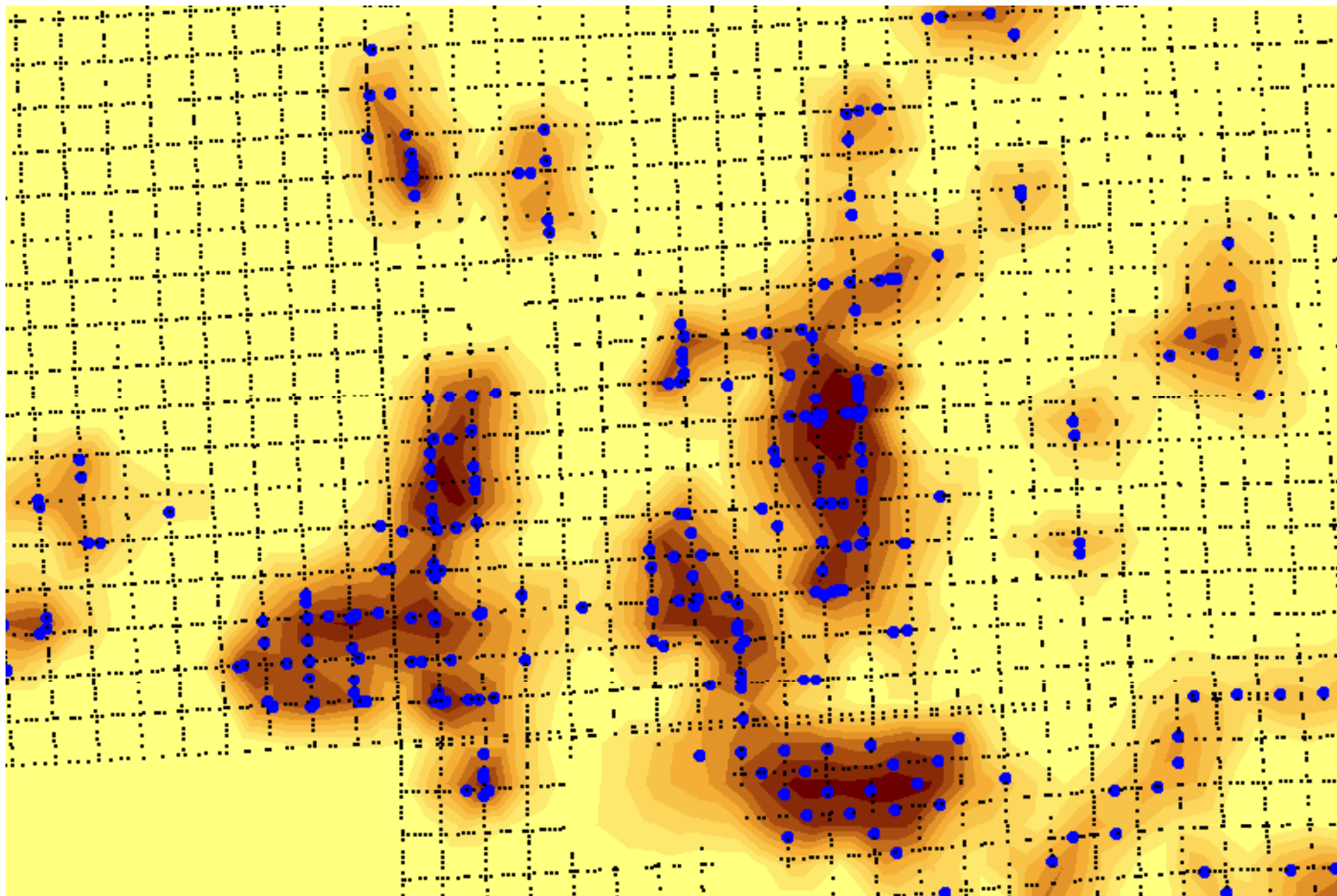
Location of fire points, Alcona CO., Michigan



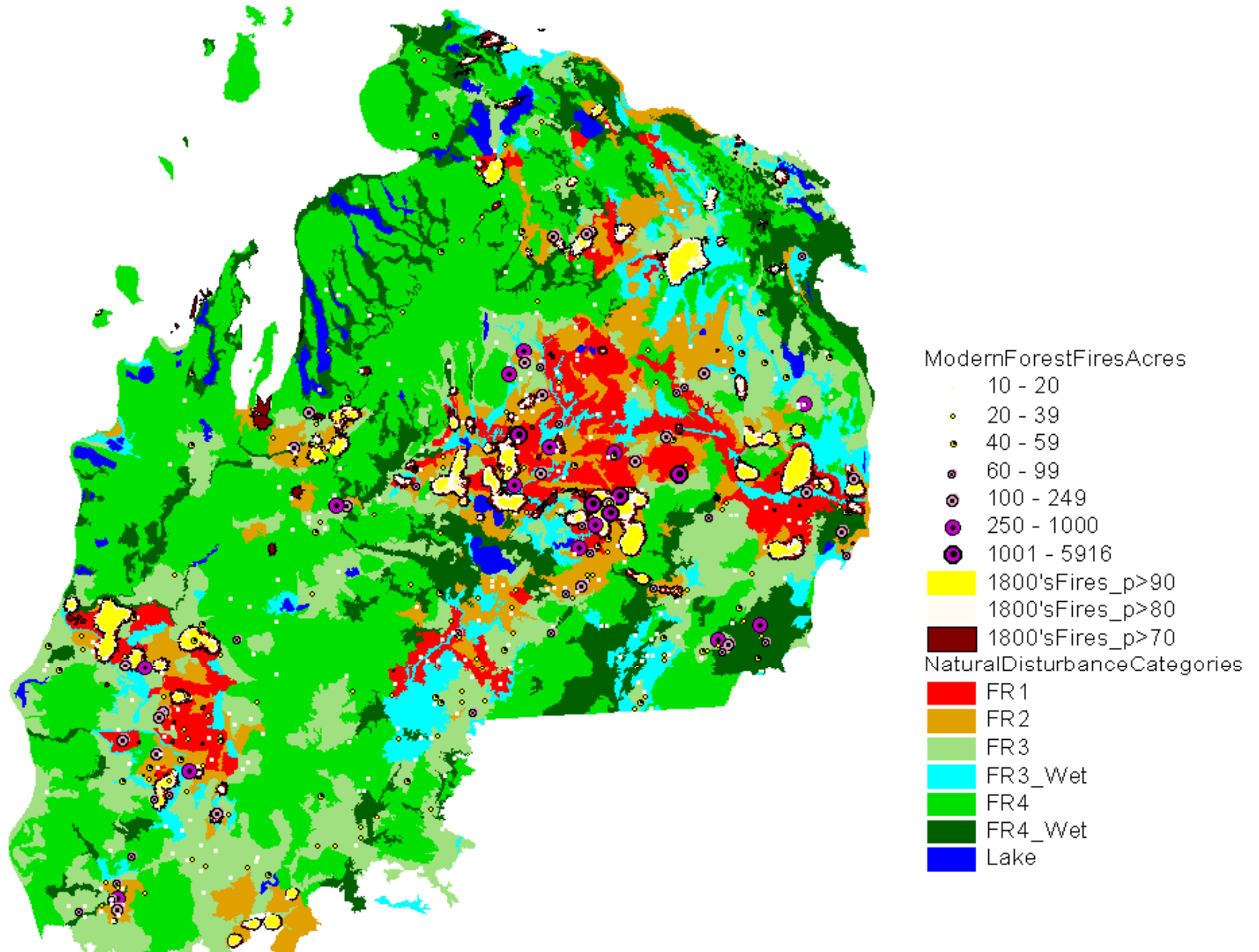
Fire locations were naturally grouped into neighborhoods across the region due in part to the fact that certain vegetation types, such as jack pine, are more susceptible to fire.

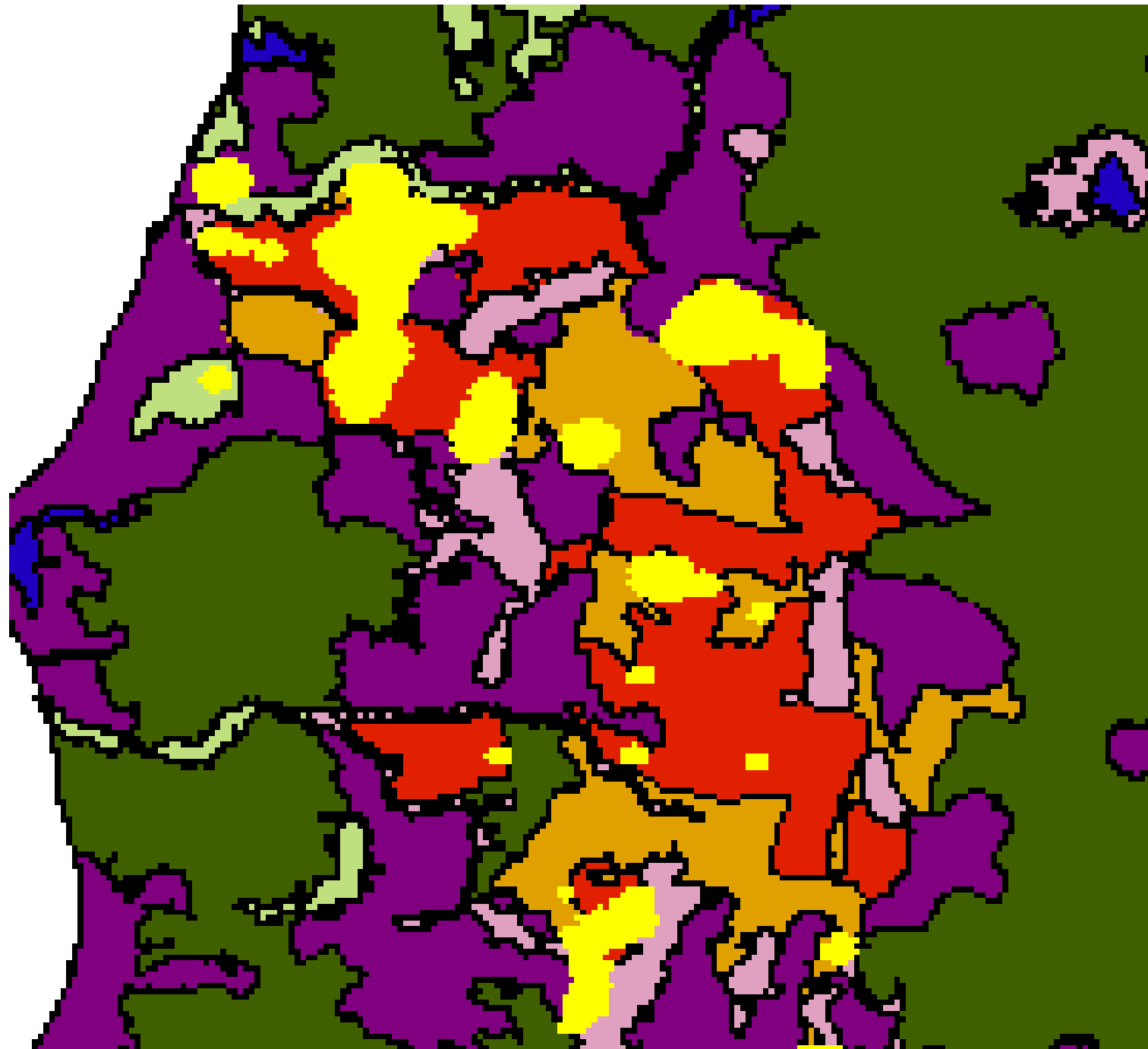


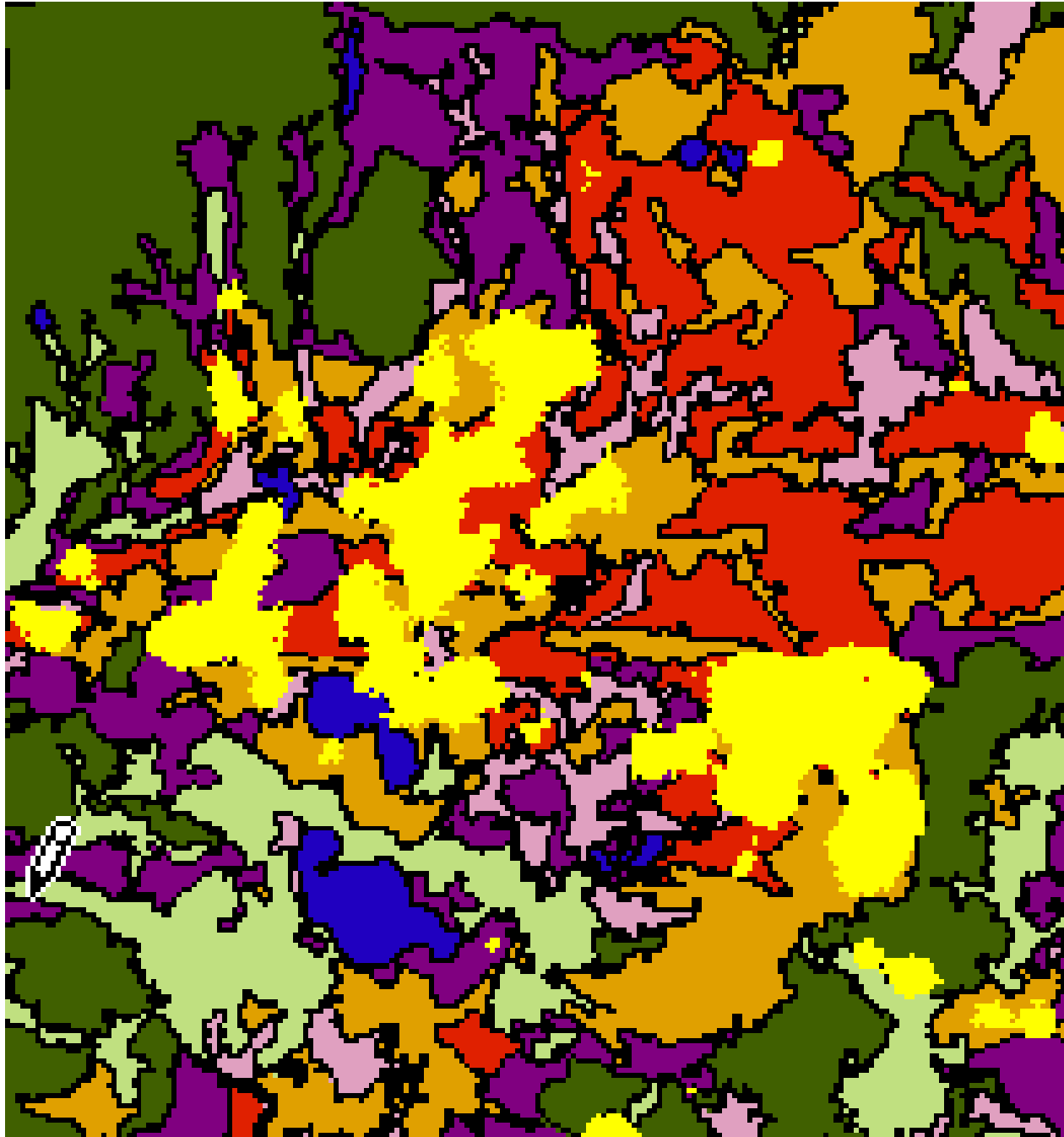
Points were subset into these neighborhoods, and each neighborhood interpolated or modeled independently



Natural Disturbance Regime Map with Modern and Historical Fire Locations







Fire rotation - Length of time necessary for an area equal to the entire area of interest (i.e. the study area) to burn (syn. fire cycle). Size of the area of interest must be clearly specified. This definition does not imply that the entire area will burn during a cycle; some sites may burn several times and others not at all.

Fire frequency- Number of fires per unit time in a specified area. Also referred to as fire occurrence.

Historical and Modern Fire Rotations in Northern Lower Michigan

Historical (1800's) Fires		P>70%	Acres	Fire
LTA Grouping	Fire Regime	Unit size	burned	rotation
Xeric LTA's dominated by jack pine and barrens	FR1	836,192	193,486	65
Less xeric LTA's dominated by white-red pine	FR2	1,029,138	125,722	123
Dry-mesic LTA's dominated by hemlock-white pine	FR3	1,652,410	44,397	558
Wetland LTA's adjacent to fire-prone LTA's	FR3W	494,638	46,761	159
Mesic LTA's dominated by northern hardwoods	FR4	3,771,745	28,720	1,970
Wetland LTA's adjacent to mesic hardwood LTA's	FR4W	958,232	11,928	1,205
Average fire rotation interval	291 years	Total	8,742,355	451,014

Modern (1985-2000) Fires			Acres	Fire
LTA Grouping	Fire Regime	Unit size	burned	rotation
Xeric LTA's dominated by jack pine and barrens	FR1	902,052	15,552	870
Less xeric LTA's dominated by white-red pine	FR2	1,066,009	13,766	1,162
Dry-mesic LTA's dominated by hemlock-white pine	FR3	2,052,353	7,219	4,264
Wetland LTA's adjacent to fire-prone LTA's	FR3W	845,278	1,763	7,192
Mesic LTA's dominated by northern hardwoods	FR4	4,340,305	3,402	19,137
Wetland LTA's adjacent to mesic hardwood LTA's	FR4W	1,325,801	2,103	9,456
Average fire rotation interval	2,381 years	Total	10,531,798	43,805

Key Findings

The most fire-prone category of landscape ecosystems (FR1) represents only 9.5% of the study area, but 43% of the acres burned prior to fire suppression occur in this type, as well as 36% of the modern fire (1985-2000) acres. This landscape ecosystem had a historic fire rotation of 65 to 88 years, and currently has a fire rotation of 870 years. Fire suppression efforts have effectively reduced the extent of wildfires between 90 and 93%.

The second most fire-prone category of landscape ecosystems (FR2) represents 11.7% of the study area. 28% of the total acres burned prior to fire suppression occur in this type, and 31% of the modern day fires. FR2 had a historic fire rotation of 123 to 202 years, and currently has a fire rotation of 1,162 years. Fire suppression has effectively reduced the extent of wildfires by 83% to 90%.

Combined, the FR1 and FR2 landscape ecosystem categories represent 20% of the land area in northern lower Michigan, yet account for 71% of historical acres burned and 67% of modern day fire acreage. The potential for a major conflagration exists within these fire-prone landscape ecosystems due to similar coniferous vegetation as that of pre-European settlement.

Fires greater than 10,000 acres have continued to occur in the most fire-prone systems every 3 decades during the 20th century despite fire suppression efforts. Conversely, the FR4 category has had only one forest fire larger than 100 acres in the past 16 years.

Fire-prone landscape ecosystems experienced fires tens of thousands of acres in a single event prior to fire suppression, as opposed to the FR4 “asbestos” forest category that historically had a fire rotation of 1,970 years, and currently has a fire rotation of 19,137 years.