Do People Matter?
Recent Human Impacts on the Fire Regime

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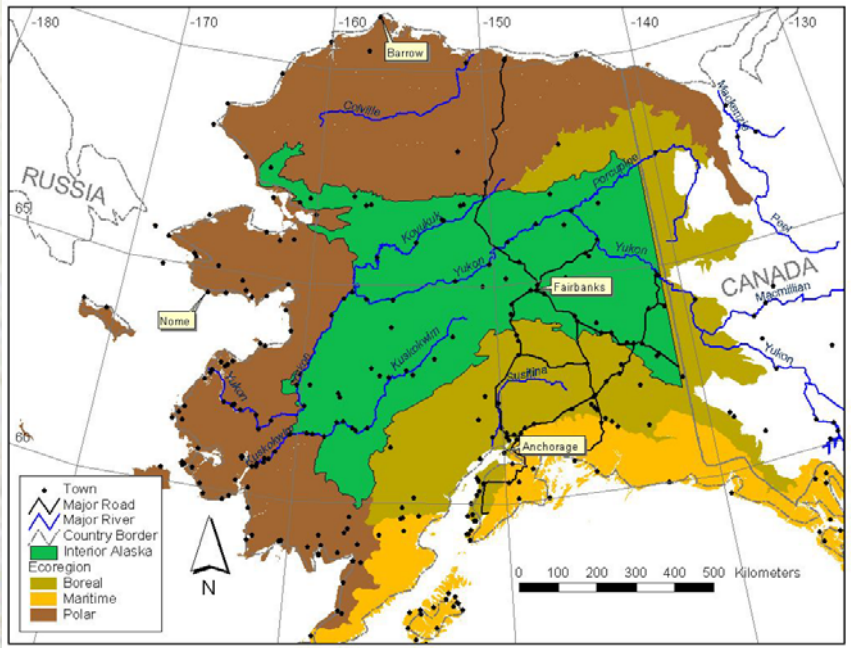
Human Impacts on the Fire Regime

1. Ignition
   a) Ignition with distance from settlements, highways, and major rivers
   b) Area burned with distance from settlements, highways and major rivers
   c) Fire prediction model
2. Suppression
   a) Suppression effect
   b) What causes anomalous fire years?

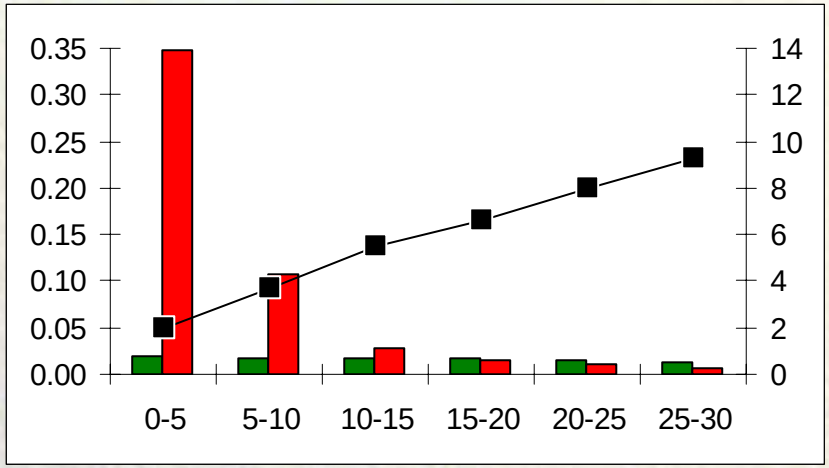
Ignition



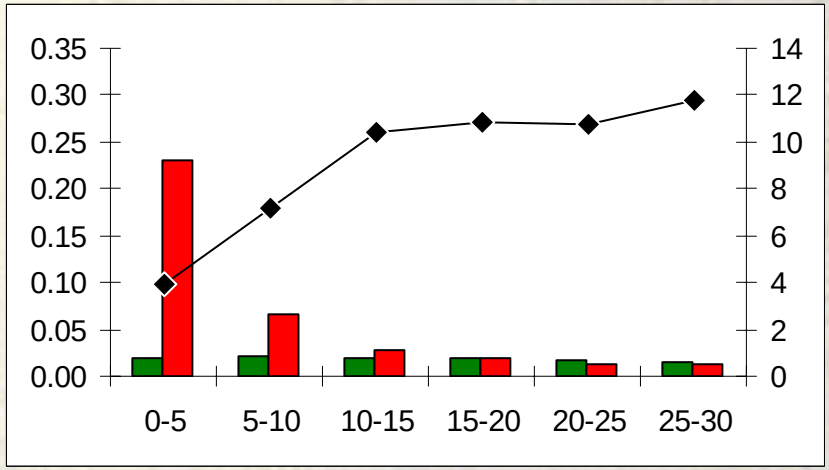
- Interior Alaska
- Large Firescar Database (fire outlines > 100 acres), 1988-2002
- Fire Point locations (with ignition cause), 1956-2000
- 1 km buffers around all settlements, highways and major rivers

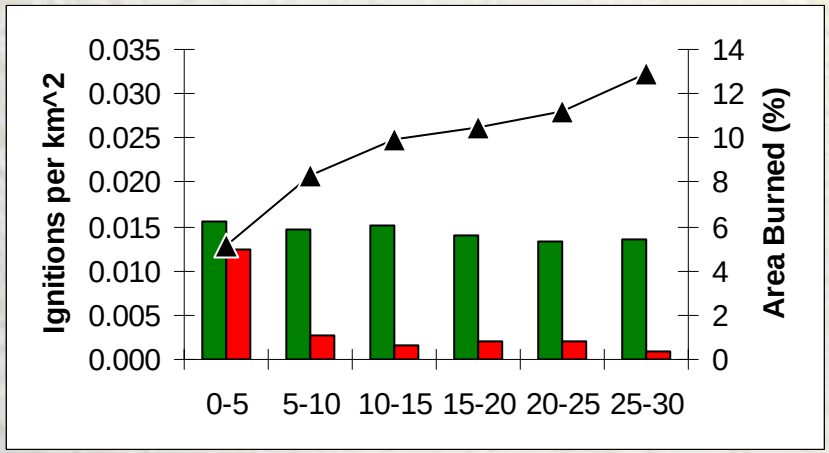
Ignitions vs. Area Burned

Settlements



Highways





Rivers

Human

Lightning

Number of fire ignitions per km^2 from 1956 to 2000 (bars, left y-axis) and percent area burned from 1988 to 2002 (symbols/lines, right y-axis) within 30 km of settlements, highways, and major rivers.

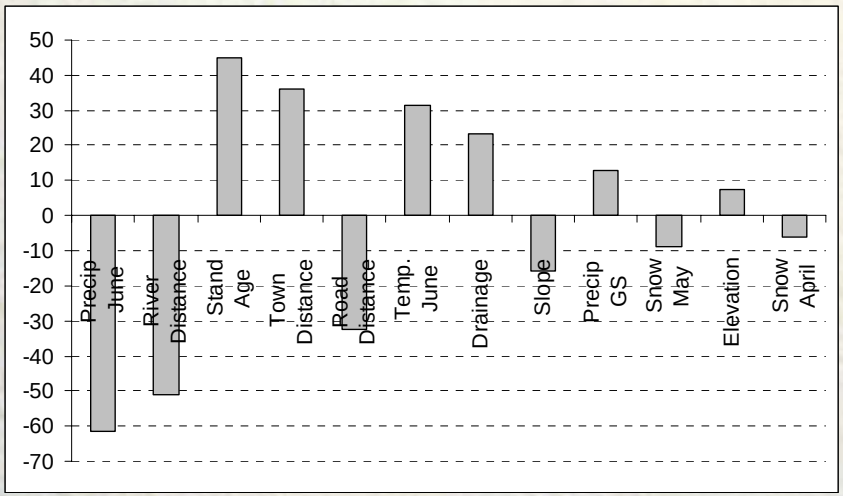
Ignitions vs. Area Burned

- Humans increase number of ignitions per km^2 10 times within 5 km of settlements and highways.
- Human ignitions more than double natural ignitions up to 20 km from settlements and highways (~ $^1/_3$ of Int. AK).
- Area burned is decreased to ¼ to $^1/_3$ within 5 km of settlements and highways, resp.
- Probably result of suppression and land use (fragmentation, fuel removal)

Lightn. Fire Prediction Model

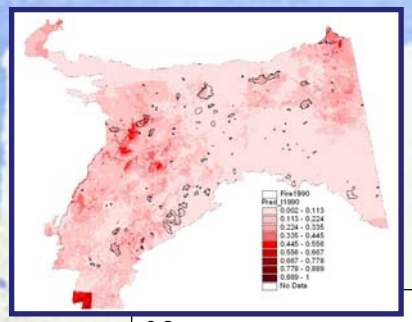
- 1 km pixels
- Logistic regression which predicts probability for an event to occur - that a cell burns
- 21 predictors
- 1990 to 2000

Model Drivers

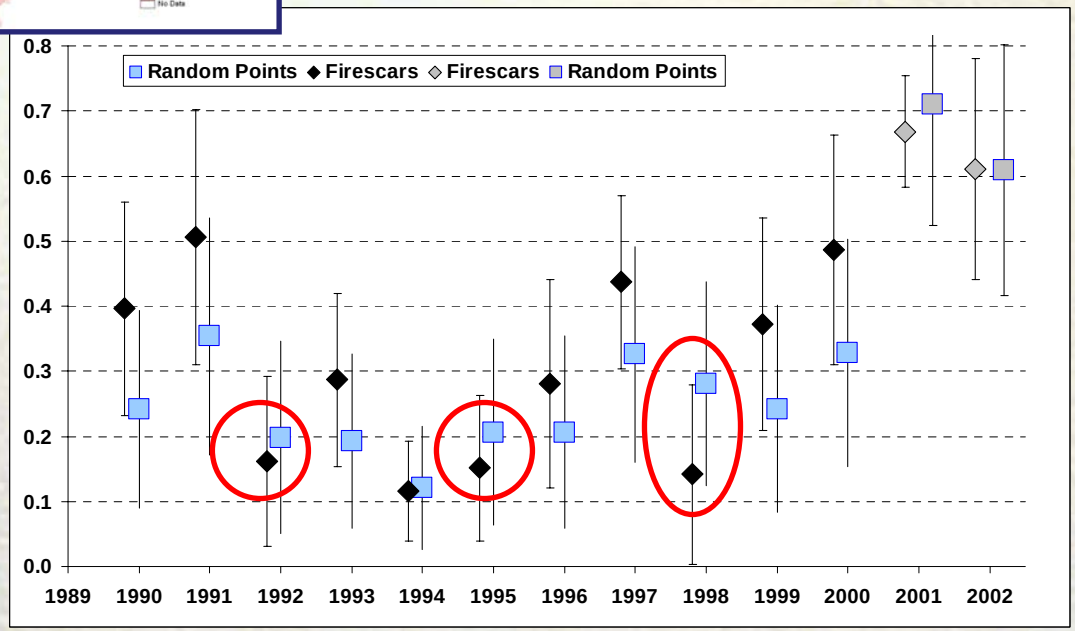


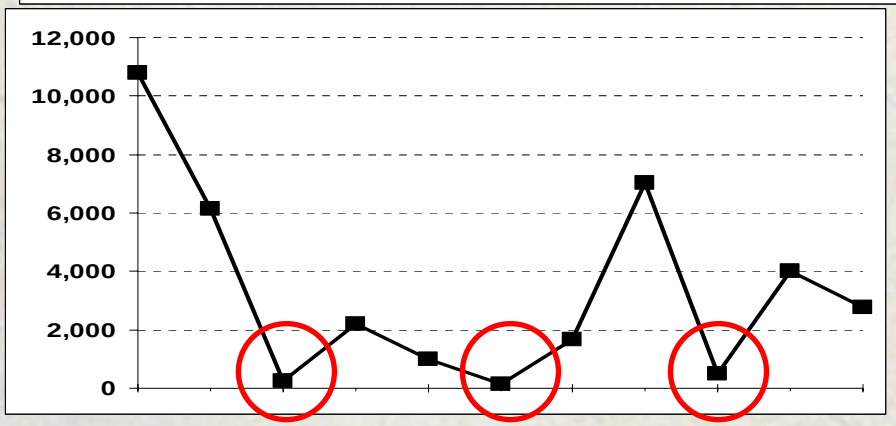
Drivers sorted by absolute t-value

1. June Precipitation (-)
2. River Distance (-)
3. Stand Age (+)
4. Town Distance (+) ~human suppr.
5. Road Distance (-)
6. June Temp. (+)



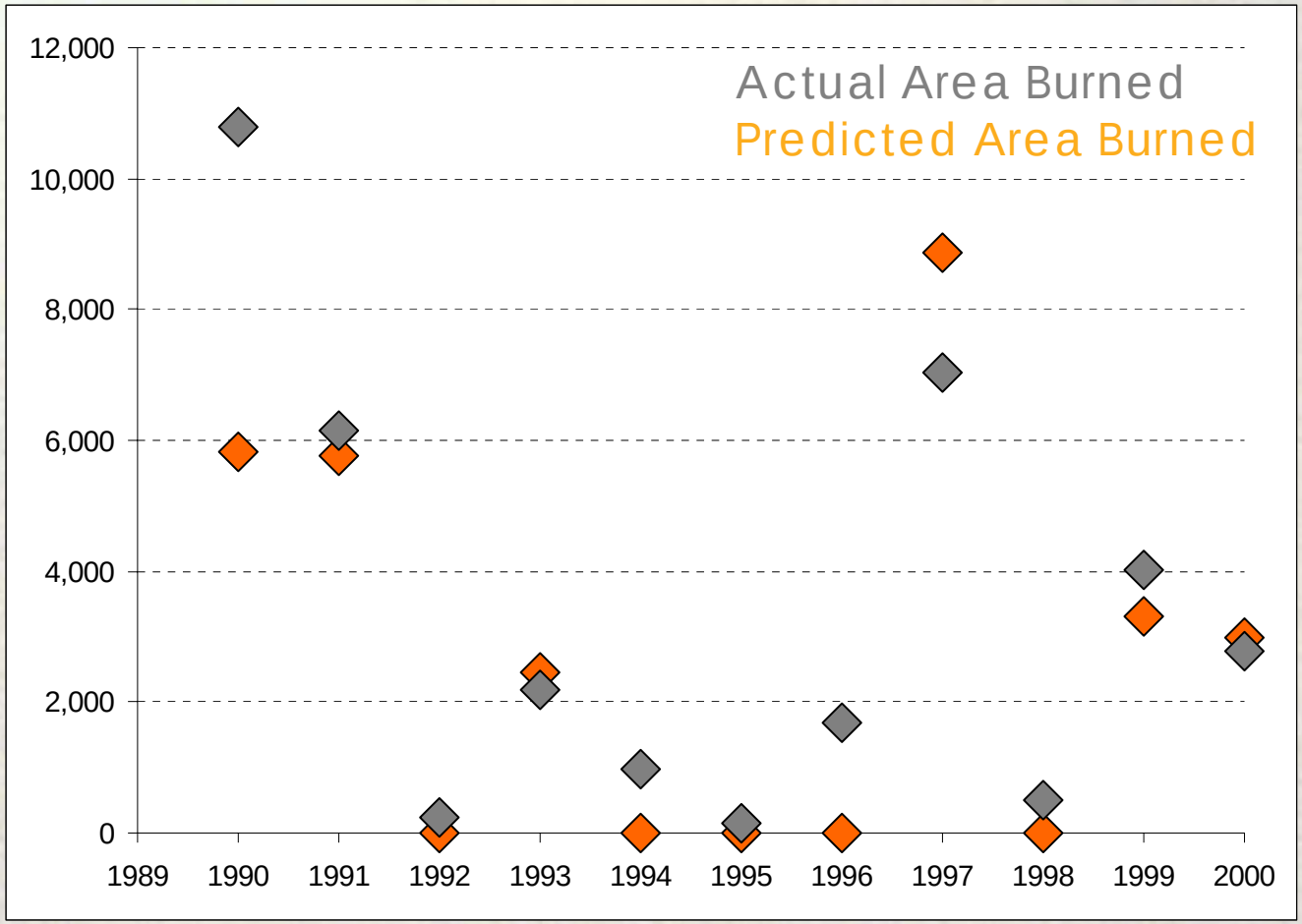
Model Accuracy





- Actual Firescars have higher probability for burning than randomly selected points
- Exceptions are very low fire years 1992, 1995, and 1998
- Model was validated 2001 and 2002 but several input datasets were not available

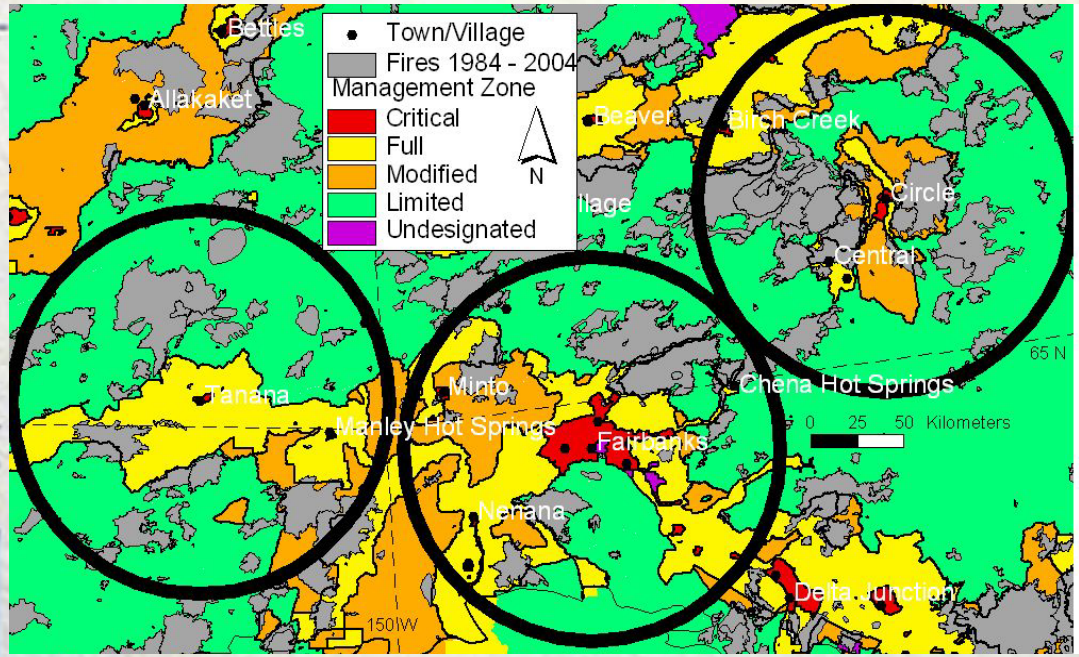
Predicting Annual Area Burned (km^2)



Simulation Model Results

- Model identifies distance to settlements as fourth driver for burn probability (suppression near center)
- Model identifies fire scars (except in very low fire years)
- Model predicts annual area burned fairly accurately (with some exceptions)

Suppression



- 100 km circles around Tanana, Fairbanks, and Circle
- Firescars 1984 to 2004
- FMZ 2000

Fire Characteristics

- Most of area burned & land area is in Lim. and Mod. Zone (83-99%, 66-87%, resp.)
- Most of the area burned can be attributed to two to three years:
  - Circle, 71% = 2004 (43%) + 1993 (15%) + 1988 (13%).
  - Fairbanks, 73% = 2004 (57%) + 2001 (16%).
  - Tanana, 58% = 2000 (31%) + 2004 (15%) + 1990 (12%).

Suppression Effect
(assuming fire regime of Limited zone)

	Critical	Full	Modified
Circle	97	2	1
Fairbanks	24	3	2
Tanana	(893)	2	1
Average	338	2	1

Reflects suppression effort

Years with Area burned > 2-decadal mean ± SD

	Critical	Full	Modif.	Limited
Circle	1994	1996, 2004*	1993*, 2004*	2004*
Fairbanks	1990, 1999	2001*, 2002, 2004*	2002, 2004*	2004*
Tanana	-	2000*	2000*, 2002	2000*, 2004*

*Major fire year

Suppression

- Significantly decreases total area burned in Critical and Full management zones.
- Some of the decrease might be related to fragmentation, fuel removal or natural differences in vegetation and topography.
- We tried to determine if extreme fire in Critical and Full zones are correlated with climate but results are not conclusive (GS temp., GS precip., July temp., Aug precip.)

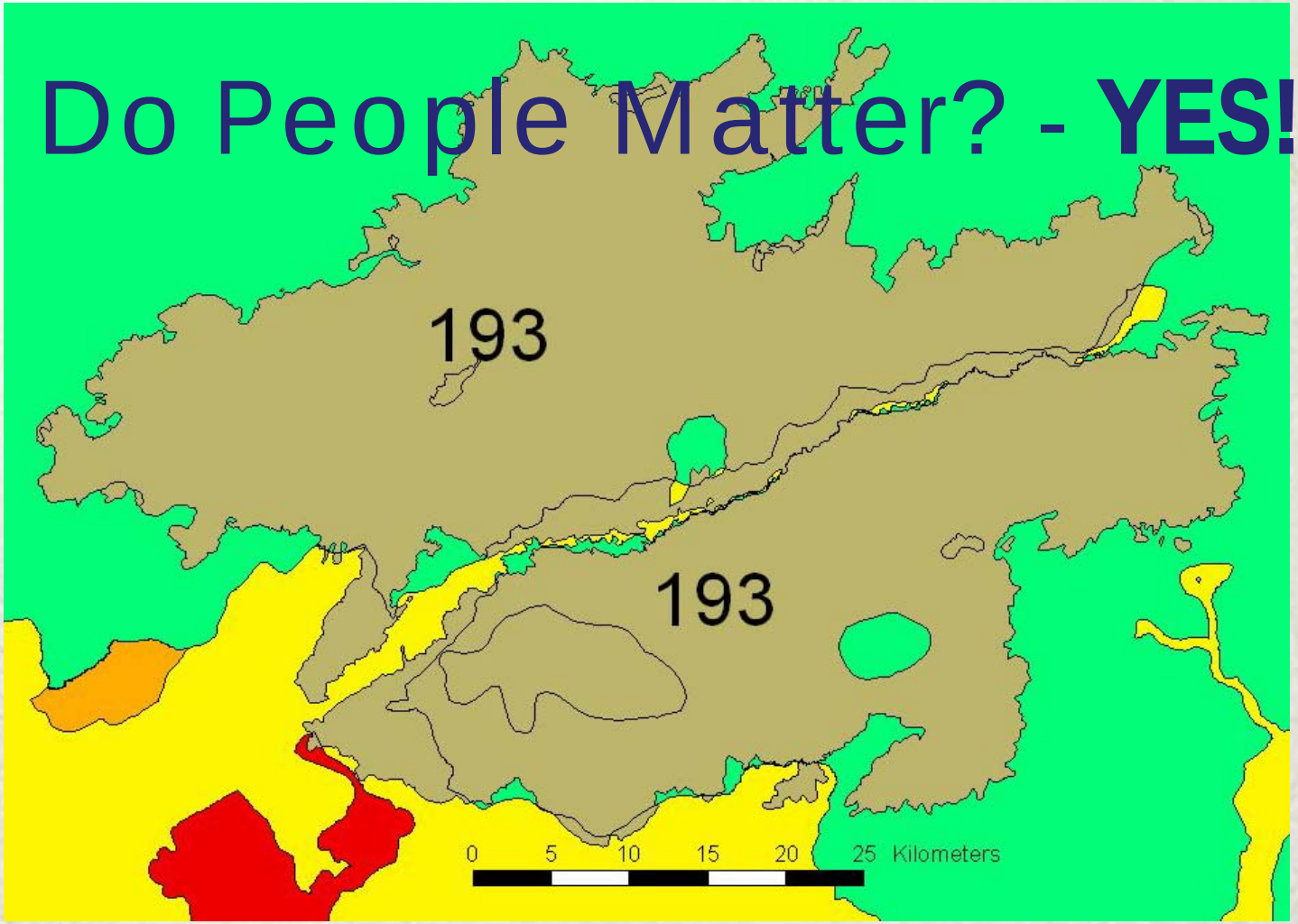
Ecological Significance

- Fire rejuvenates the boreal forest and is a critical part of succession.
- Changes in the fire regime (return interval and severity) can lead to different vegetation assemblages (Johnstone) and the disappearance of some tree species (Le Goff, Lloyd).
- Suppression can increase the abundance of black spruce which is highly flammable (Rupp).

Continued Work

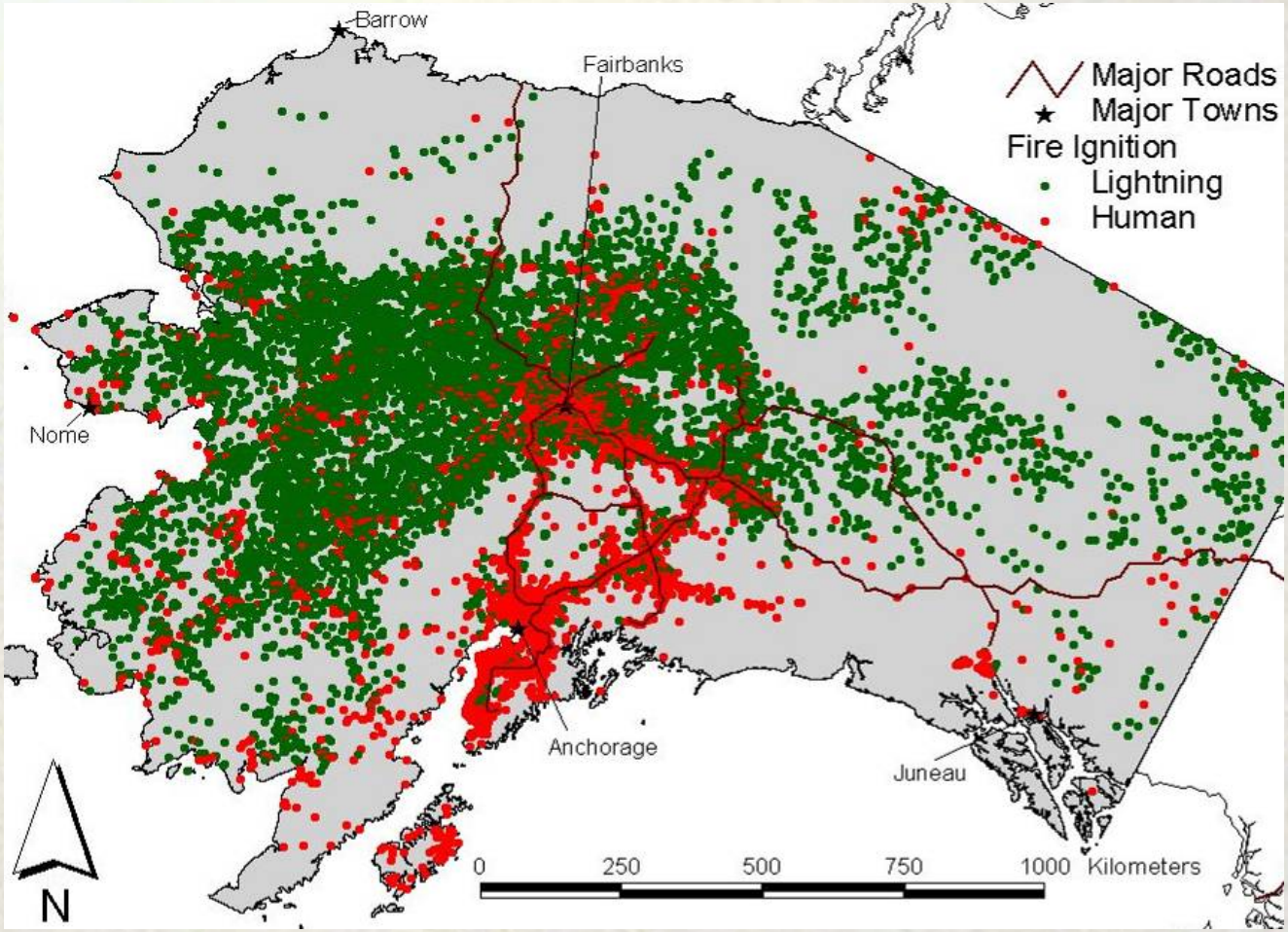
- Create human fire prediction model.
- Identify drivers for anomalous fire years in Critical and Full suppression zones (climate, stand age, suppression history).
- Identify why some fires escape suppression in the Critical and Full zones.

Do People Matter? - **YES!**



Boundary Fire (site 193) burned 2,132 km^2 (527,000 acres) in 2004 near Haystack Mountain; 2nd largest fire in Interior Alaska during 1988 to 2004.

Human vs. Lightning Ignition



Model Predictors

- Temperature - Average monthly for June
- Precipitation - Total monthly for June & total growing season
- Snowpack - Total in April & May
- Dry lightning strikes - Monthly in May-August
- Vegetation type & age - black spruce, white spruce, deciduous forest, tundra
- Elevation, aspect, slope
- Soil drainage type
- Distance to settlements, roads, rivers