Microclimate Effects of Wetland Wildfire

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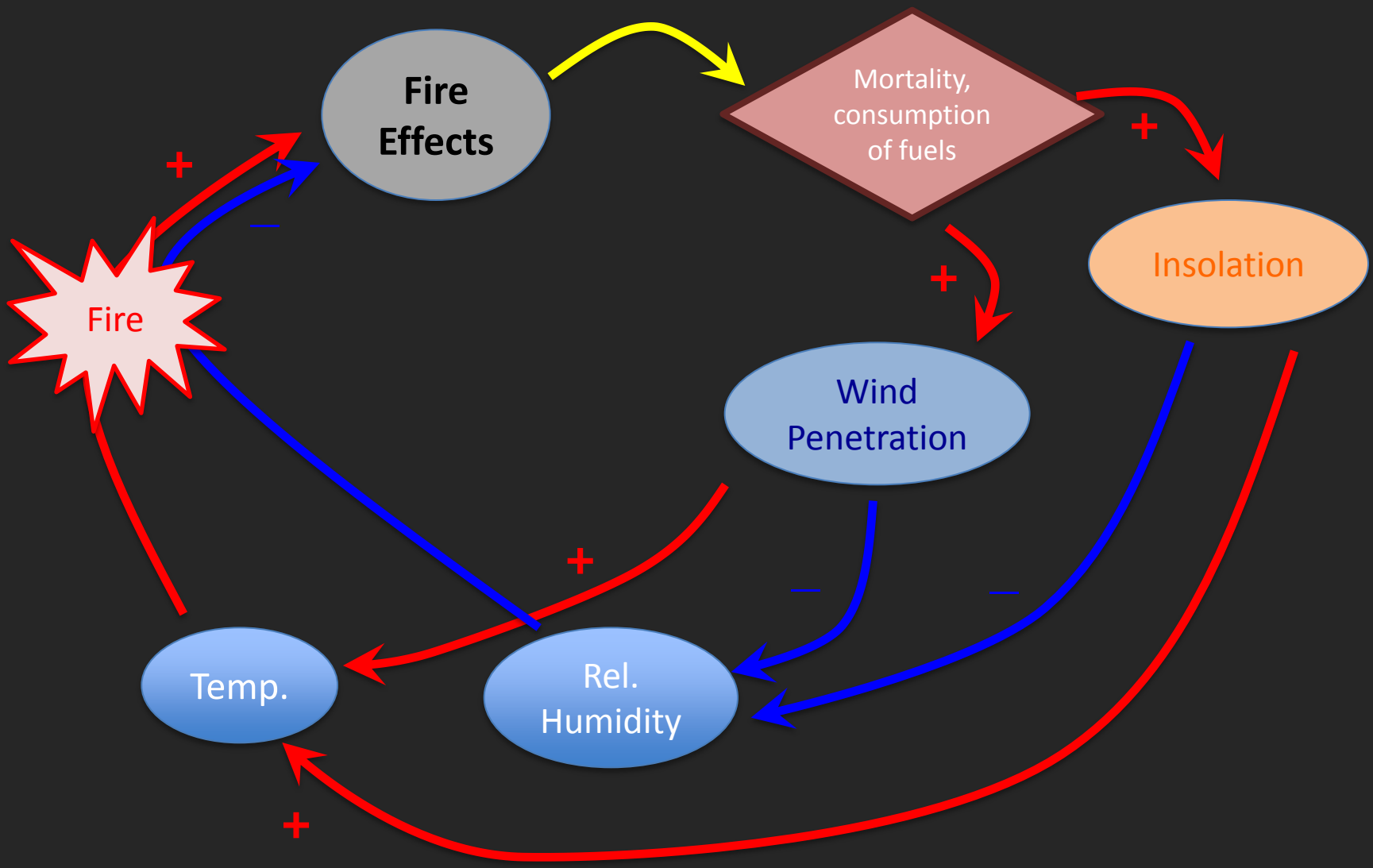
Hypothesis:
Post-fire feedbacks increase microclimate-driven effects of future fires



Questions:

Do edge effects on microclimate exist in wetland forest patches?

Do fires in desiccated wetland patches change microclimate & increase effects of future fires?

Hypotheses:

1. Edge effects on microclimate during dry conditions.
   - increasing DFE → decreased temperature, increased RH compared to exteriors.

2. Inundation degrades these relationships:
   - loss of relationship between DFE and microclimate during wet season.

3. Wildfire causes loss of edge influence:
   - higher temperatures, lower humidity in burned domes vs. unburned domes.

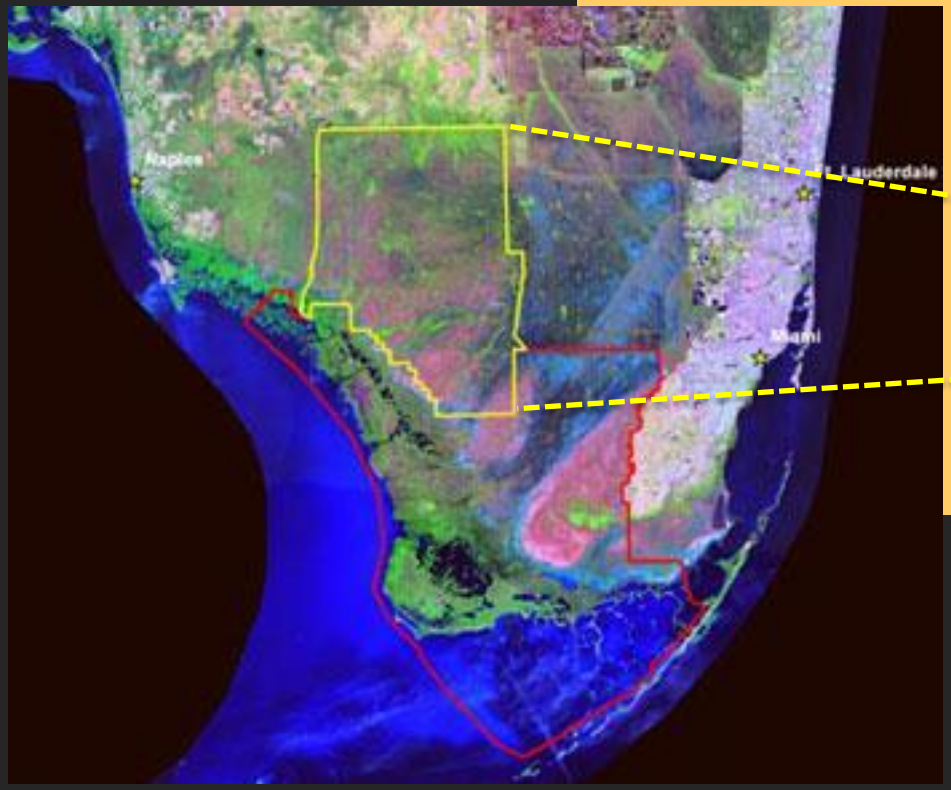
Big Cypress National Preserve

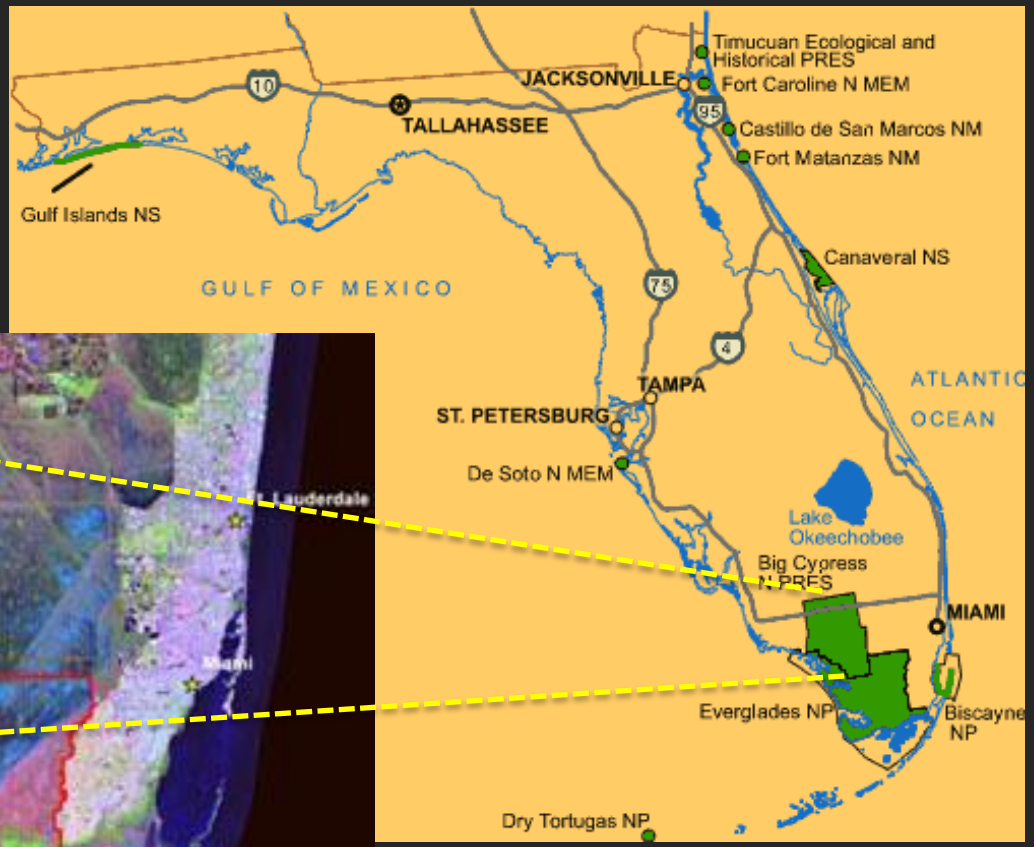
-300,000 ha (720,000 ac)

-Range of habitat types

(e.g., pine uplands, cypress swamps)

-Largest NPS Rx burn program





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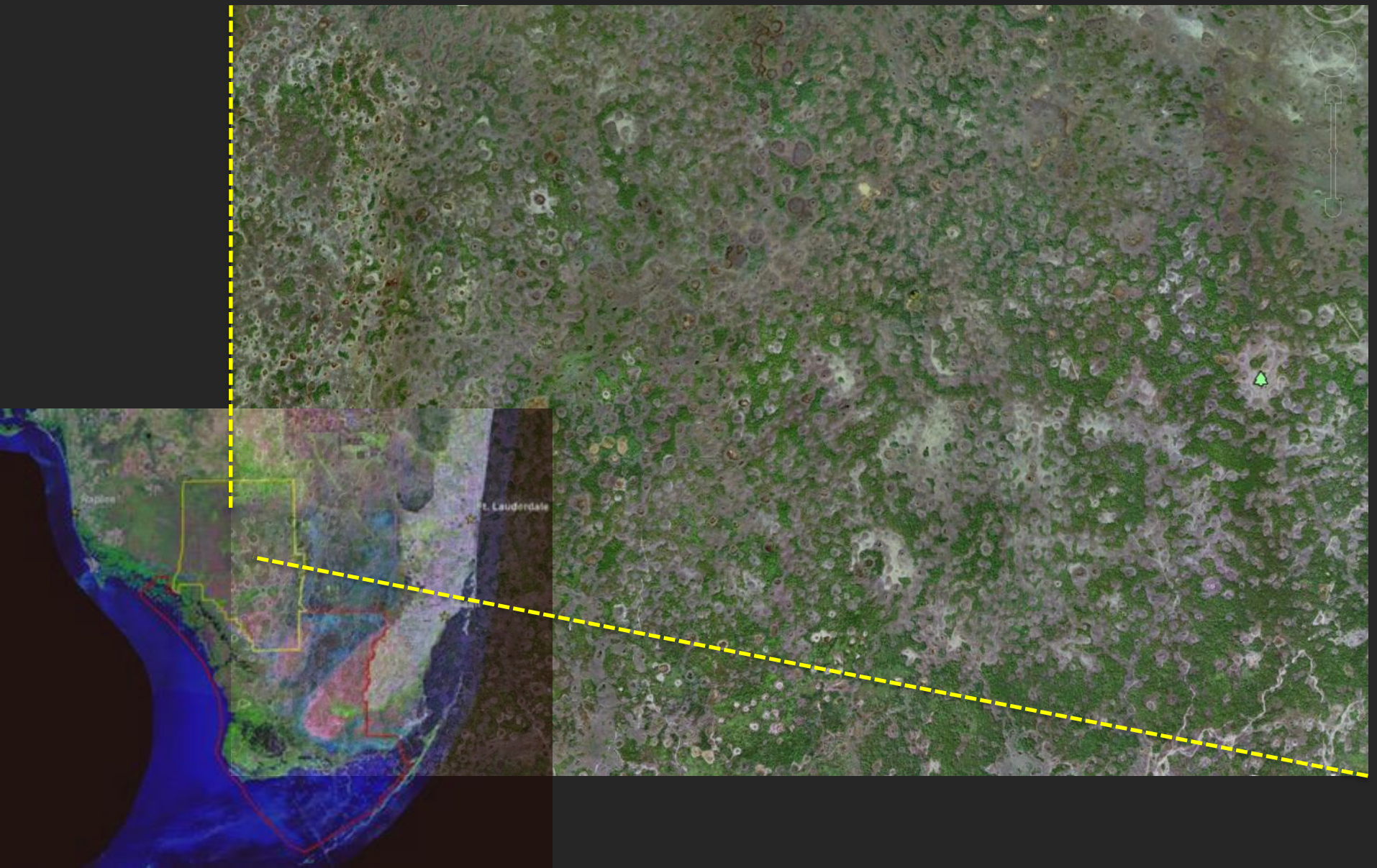
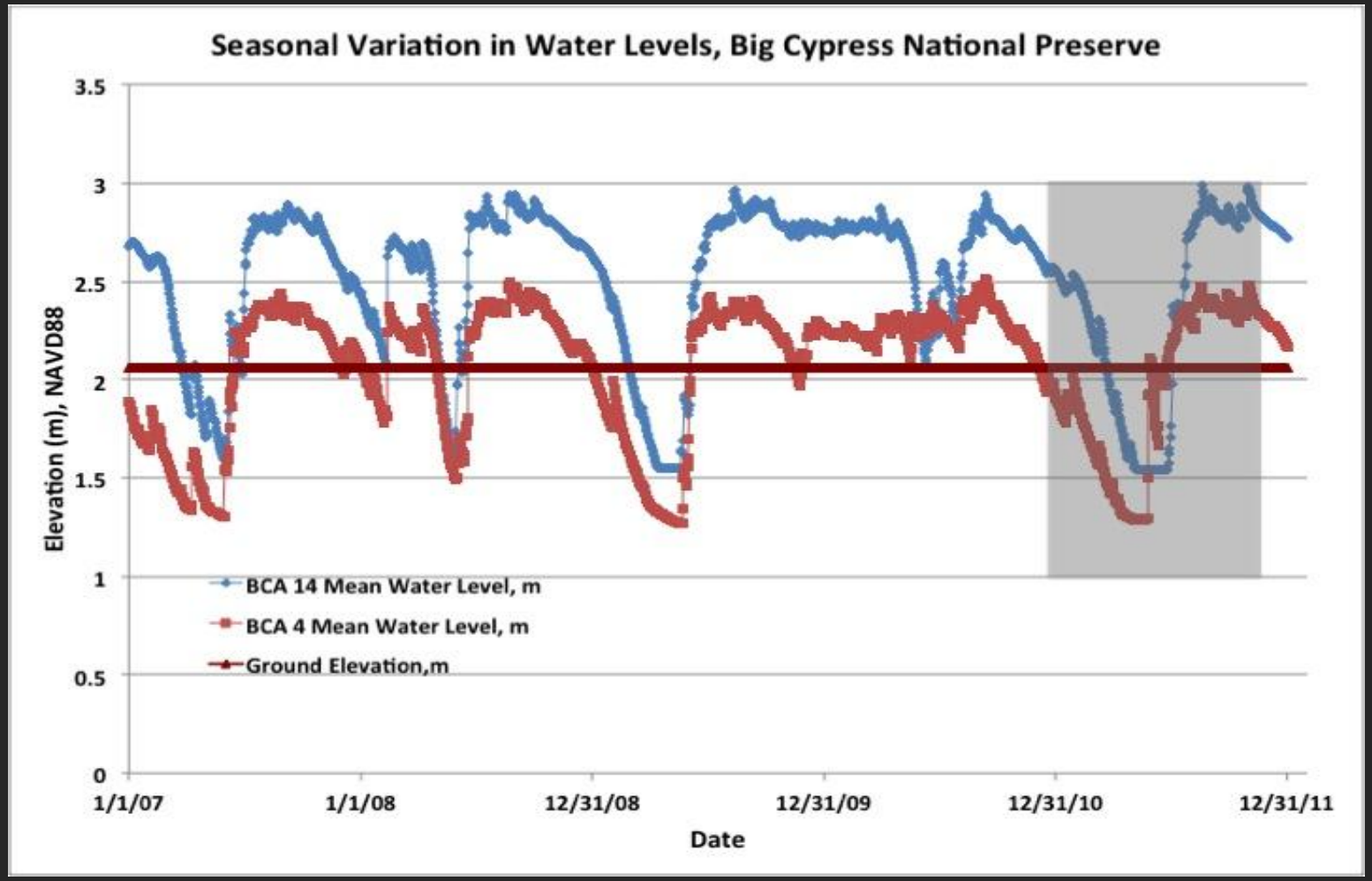
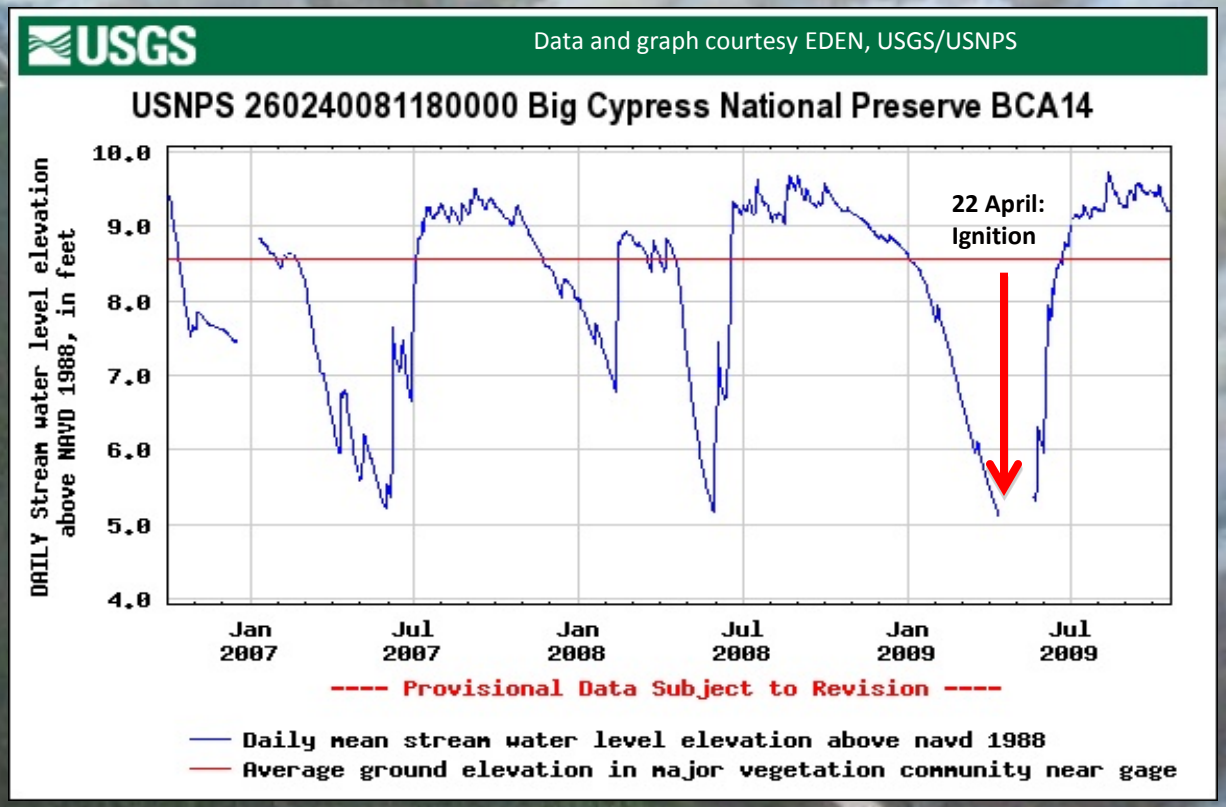


Hydrologic variability:



2009 Deep Fire

-Lightning-initiated, end of dry season (↓)
-Extensive; burned through dry wetlands



Deep Fire photo: www.wildfirelessons.net

Microclimate Study Design

25-50m

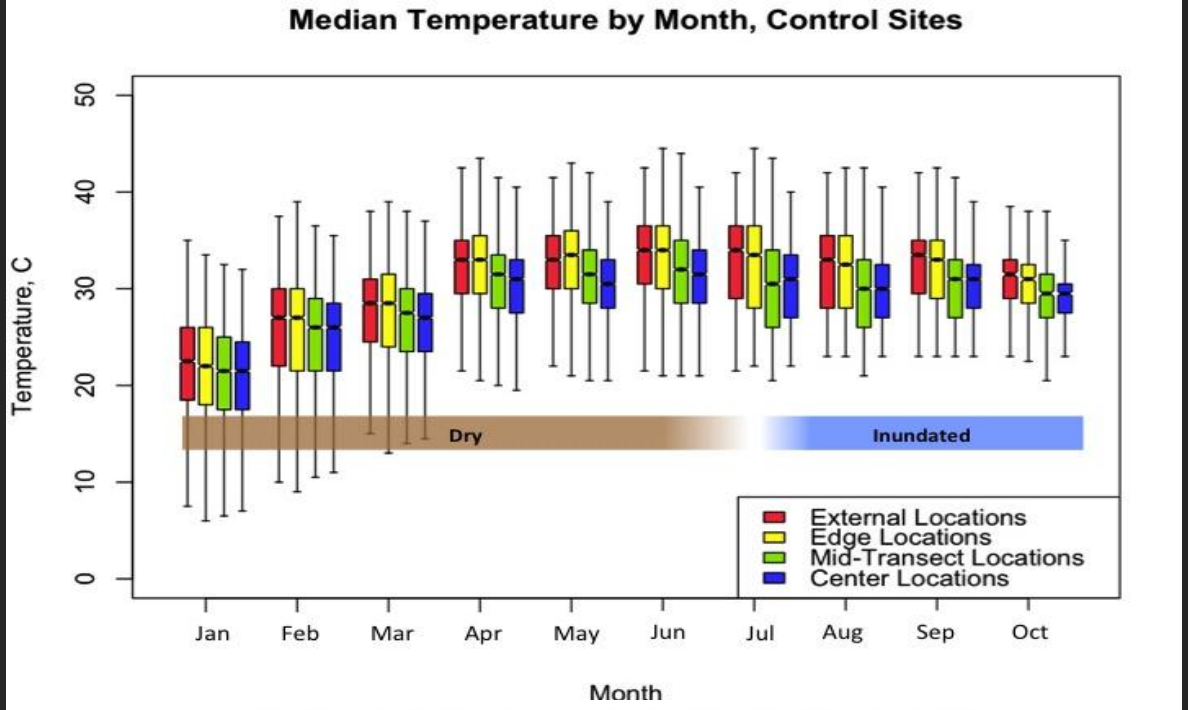
Center

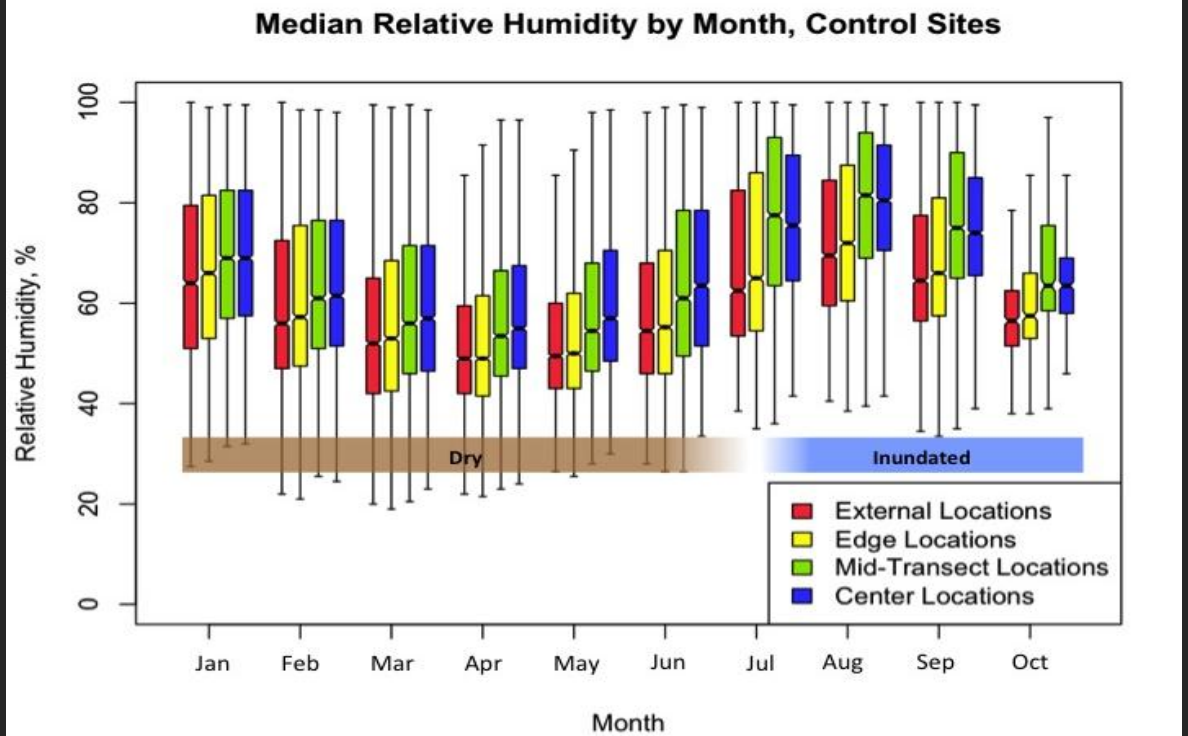
Mid

Edge

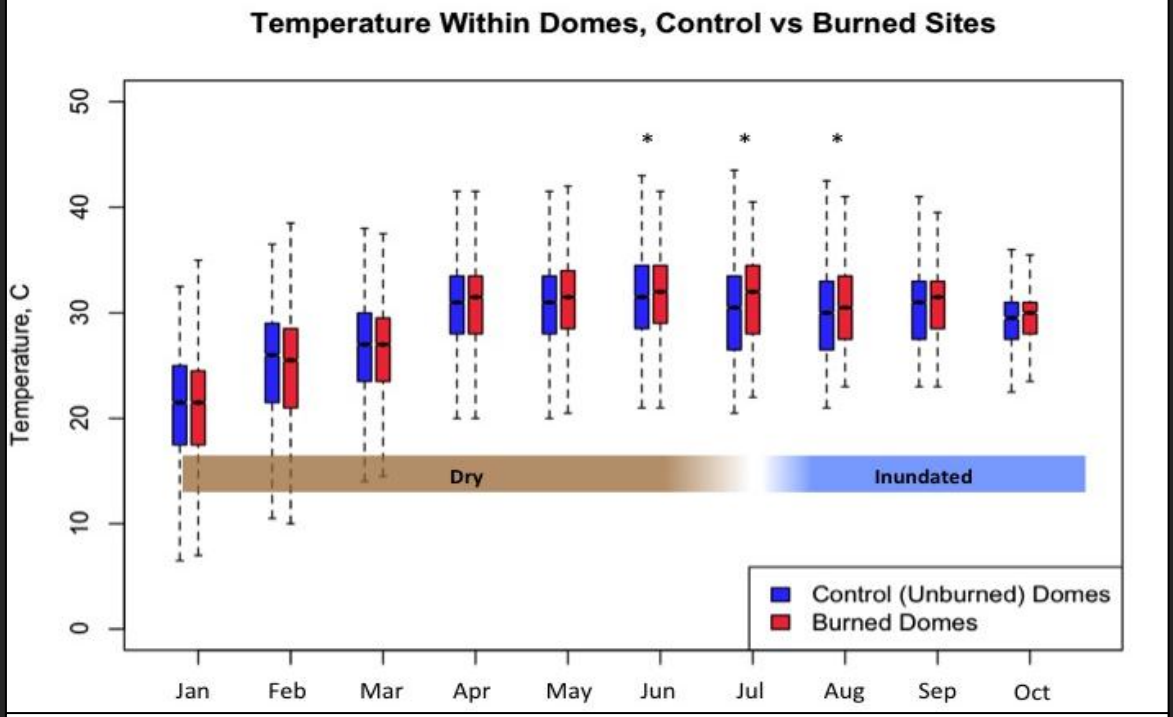
External

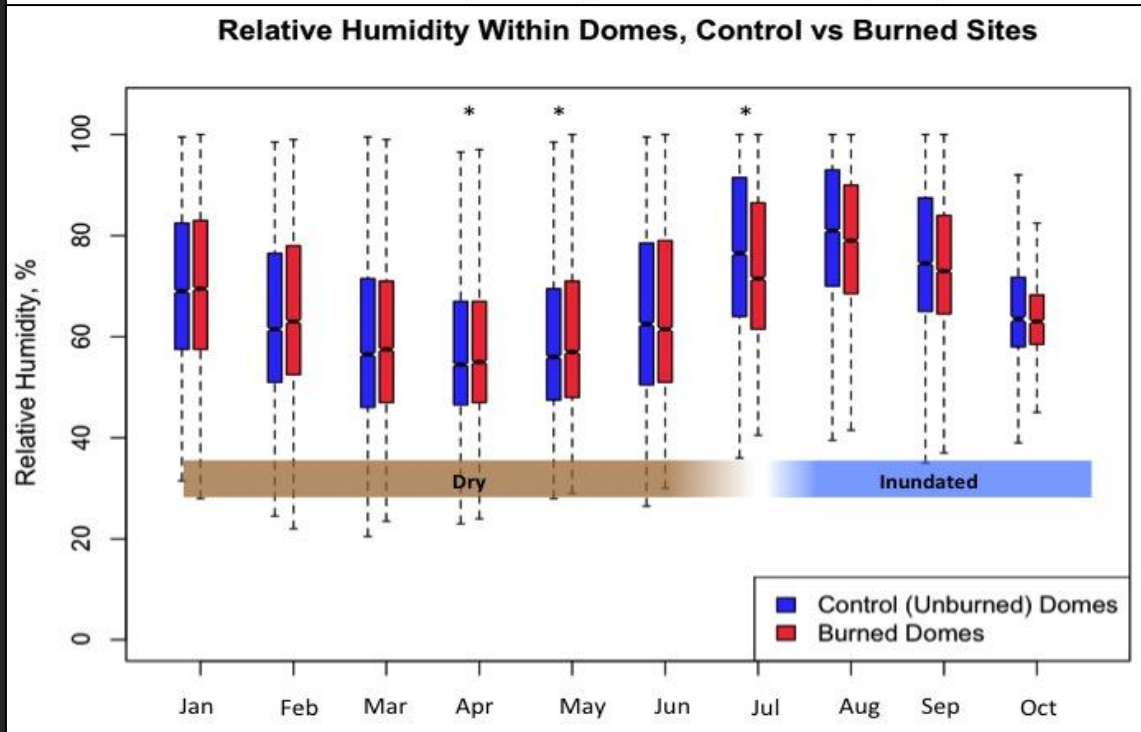
Results I.


Median Temperature by Month, Control Sites
Temperature, C
0
10
20
30
40
50
Dry
Inundated
External Locations
Edge Locations
Mid-Transect Locations
Center Locations
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Month

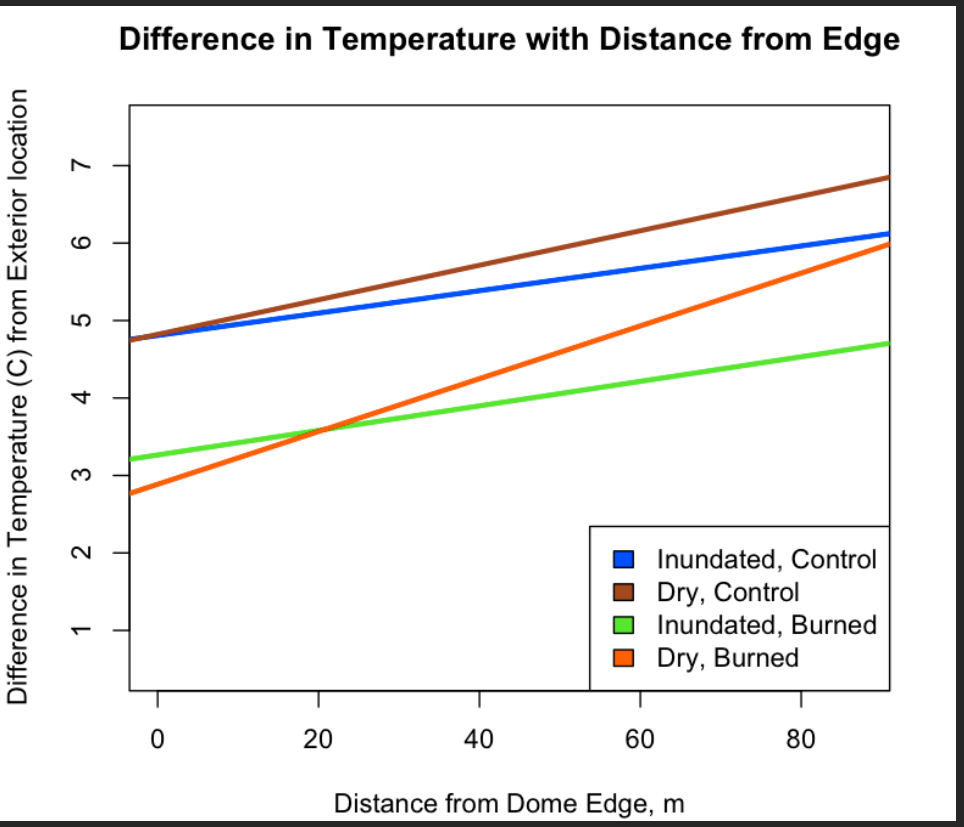

Median Relative Humidity by Month, Control Sites
Relative Humidity, %
0
20
40
60
80
100
Dry
Inundated
External Locations
Edge Locations
Mid-Transect Locations
Center Locations
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Month

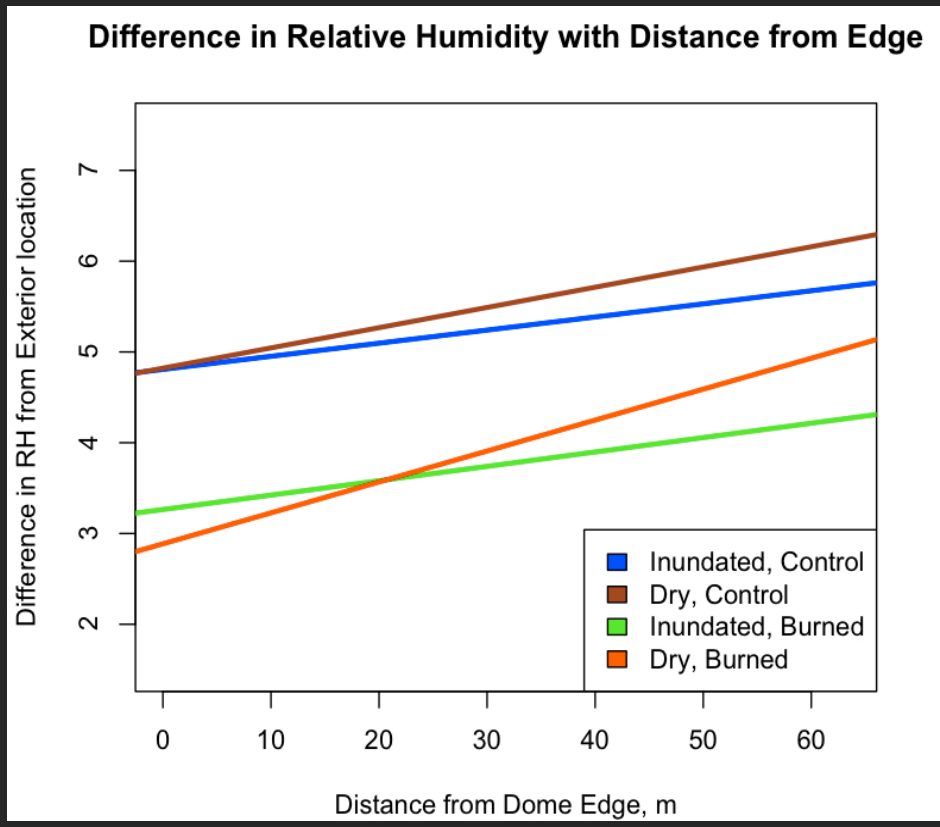
Results II.


Temperature Within Domes, Control vs Burned Sites
Temperature, C
0
10
20
30
40
50
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Dry
Inundated
Control (Unburned) Domes
Burned Domes


Relative Humidity Within Domes, Control vs Burned Sites
Relative Humidity, %
0
20
40
60
80
100
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Dry
Inundated
Control (Unburned) Domes
Burned Domes

Results III.


Difference in Temperature with Distance from Edge
Difference in Temperature (C) from Exterior location
1
2
3
4
5
6
7
0
20
40
60
80
Distance from Dome Edge, m
Inundated, Control
Dry, Control
Inundated, Burned
Dry, Burned


Difference in Relative Humidity with Distance from Edge
Difference in RH from Exterior location
2
3
4
5
6
7
0
10
20
30
40
50
60
Distance from Dome Edge, m
Inundated, Control
Dry, Control
Inundated, Burned
Dry, Burned

Findings Summary:

H1. Edge effects on microclimate during dry conditions.

- Clear effect of edge distance on microclimate during dry periods.

H2. Inundation degrades these relationships:

- Reduced strength of edge effect during wet season, both treatments.

H3. Wildfire causes loss of edge influence:

- Lack of support and even some evidence to contrary.

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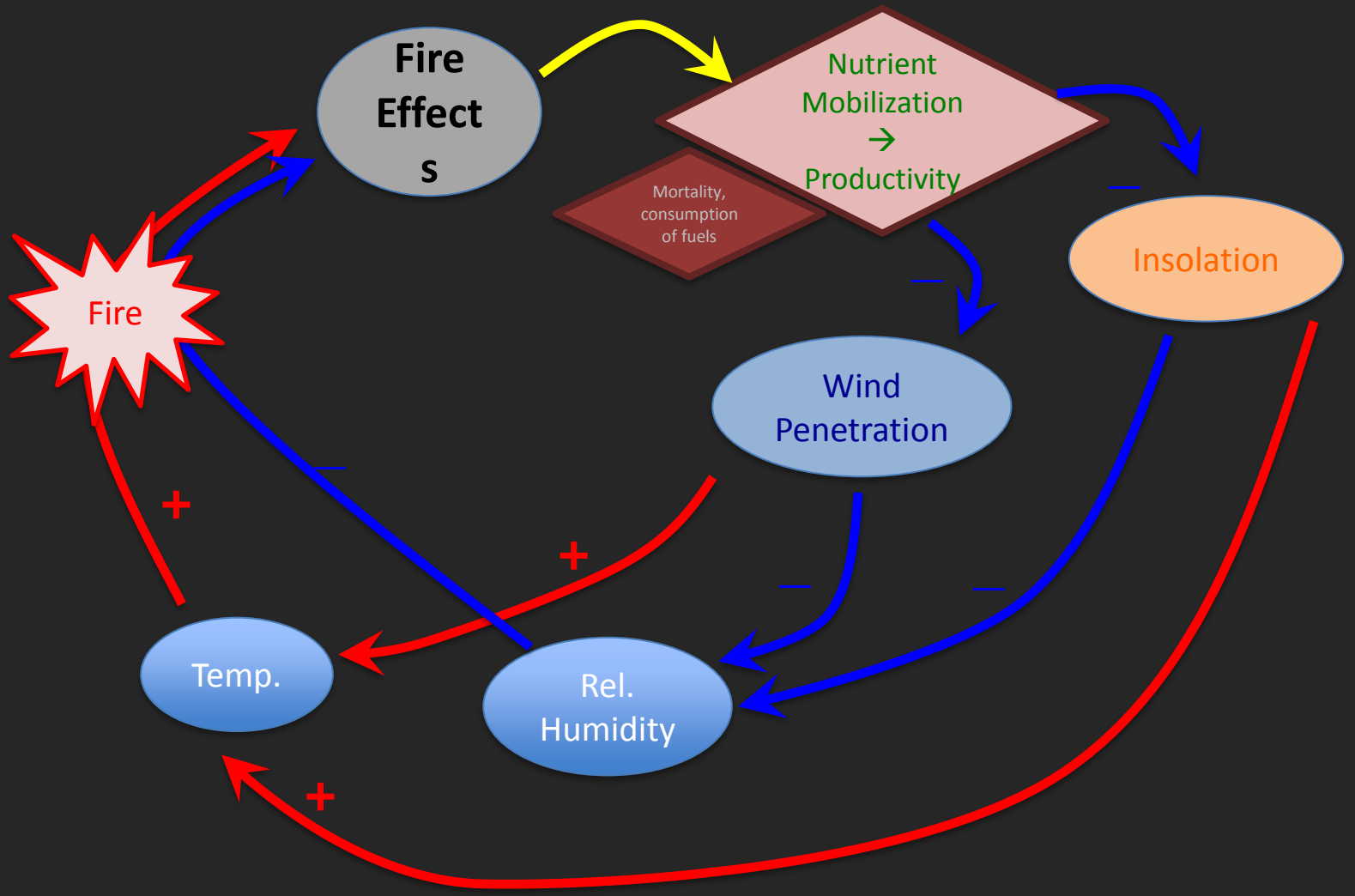
Revised H:
Increase in productivity creates inhibitive feedbacks to microclimate-driven effects of future fires (in the short term)



Conclusions II.
& future steps…

Microclimate:

-Small patches: Structural changes → positive feedbacks to fire effects.
-Large patches: Predicted effects secondary to inhibitory feedback

-Future:
a. Length of signal?
b. Test nutrient-pulse hypothesis.

-Implications: Edge effects as proxy for future fire scenarios?
IF future fires in desiccated wetlands become more severe,
feedbacks to fire effects may shift from negative feedbacks (inhibitory)
to positive feedbacks

Acknowledgments

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