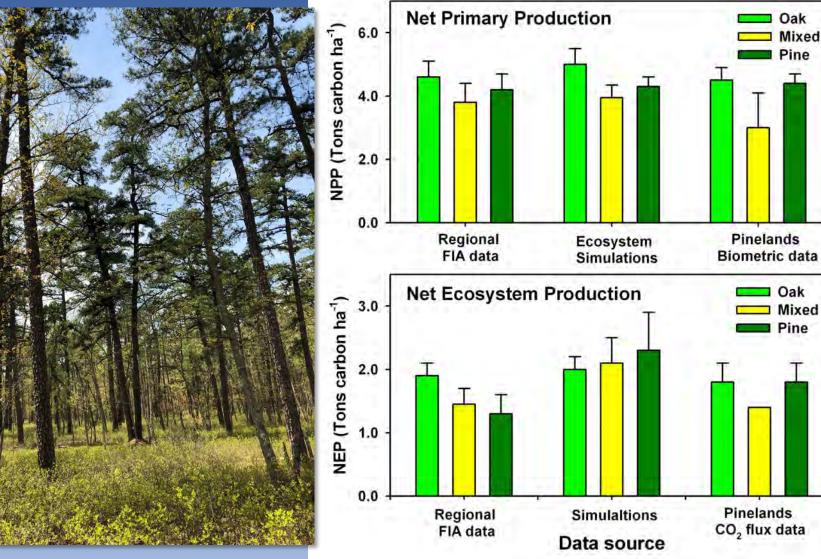
#### Mitigation Options and Management: Prescribed Fire and Climate Change in the Pineland National Reserve



# Productivity of undisturbed forests in the mid-Atlantic region

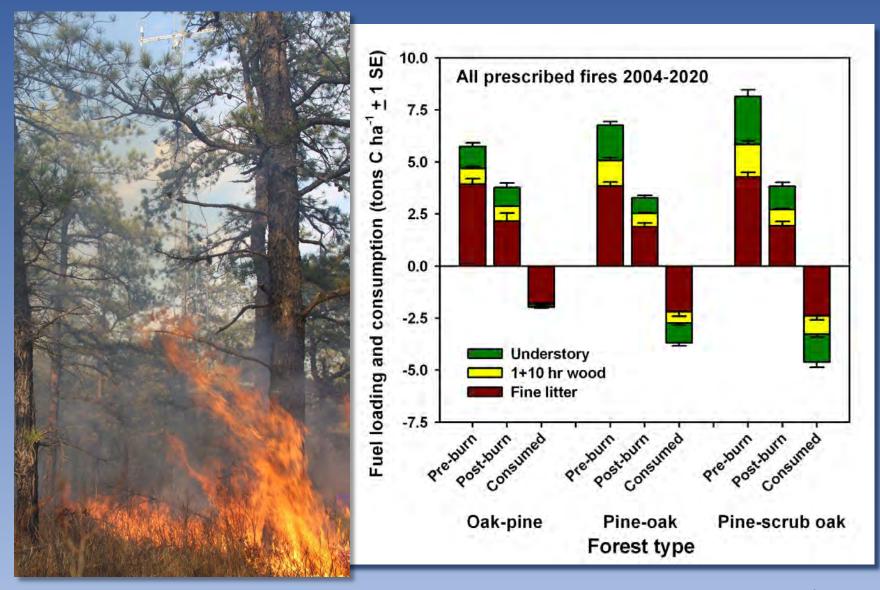


Pinelands Science Forum on Climate Change May 19th 2023

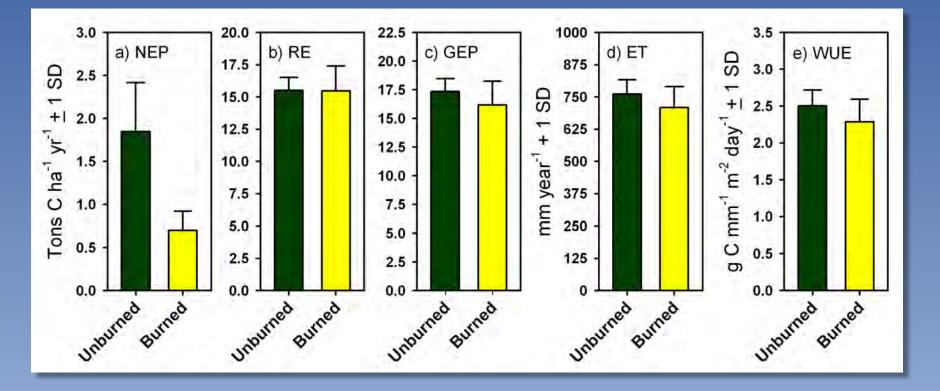
#### Carbon flux towers in upland forests in the Pinelands



#### Carbon release during prescribed burns



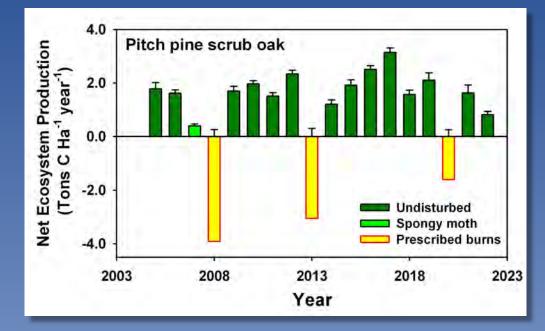
## Annual carbon and hydrologic fluxes at the pitch pine – scrub oak stand

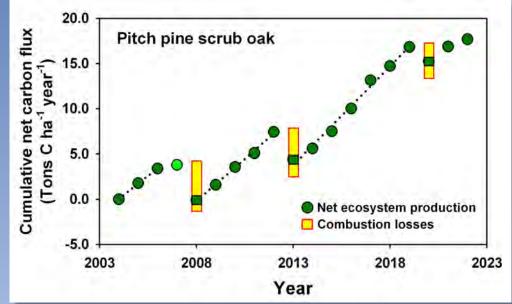


Values are net ecosystem production (NEP), ecosystem respiration (RE), gross ecosystem production (GEP; tons C ha<sup>-1</sup> yr<sup>-1</sup>), evapotranspiration (ET, mm year<sup>-1</sup>), and e) ecosystem water use efficiency during the summer months (WUE, g C mm  $H_2O^{-1}$  m<sup>-2</sup> day<sup>-1</sup>).

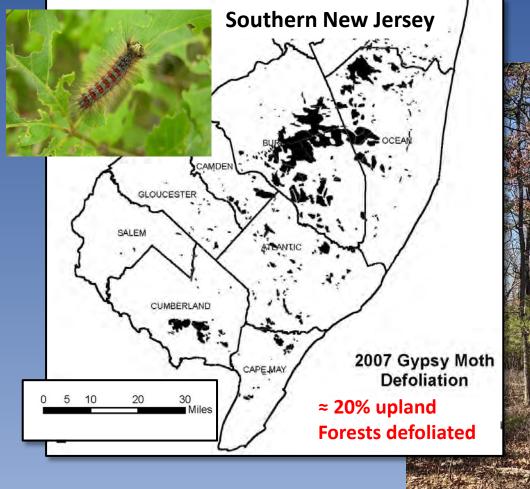
Annual and cumulative carbon fluxes at the pitch pine – scrub oak stand.

Positive CO<sub>2</sub> sequestration occurs with 5-to-8-year prescribed burn rotations





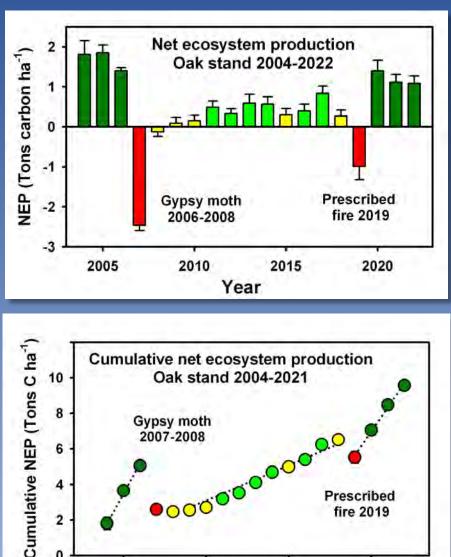
### Spongy moth infestations in mid-Atlantic forests





## **Cumulative annual** net ecosystem production at the oak stand





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2010

2015

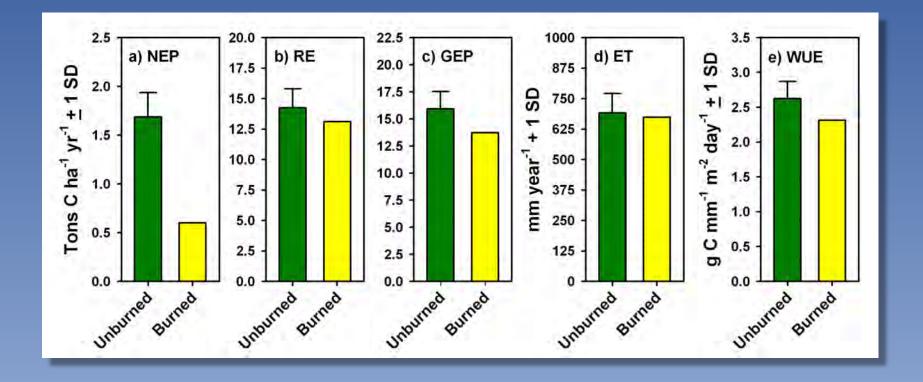
Year

2020

0

2005

### Annual carbon and hydrologic fluxes at the oak stand



Values are net ecosystem production (NEP), ecosystem respiration (RE), gross ecosystem production (GEP; tons C ha<sup>-1</sup> yr<sup>-1</sup>), evapotranspiration (ET, mm year<sup>-1</sup>), and ecosystem water use efficiency during the summer months (WUE, g C mm  $H_20^{-1}$  m<sup>-2</sup> day<sup>-1</sup>).

#### A few conclusions...

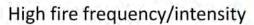
- Prescribed fires are releasing 1 to 3 years of accumulated C, primarily from consumption of the forest floor and understory vegetation
- "Carbon neutrality" is achieved within 3 years; burning at 5 to 8-year intervals results in positive C accumulation and reduces wildfire risk
- Can prescribed burning be used to restore ecosystem functioning in insect damaged stands?

Conceptual model of disturbance and persistence of mixedwood stands in the Pinelands National Reserve, New Jersey



Low fire frequency/intensity

**Oak-dominated stands** 



**Pine-dominated stands** 



Gypsy moth infestations

Oak mortality

Pine beetle infestations

**Pine mortality** 



Pine seedling and sapling release Pulse of pine regeneration

Delaying succession



Oak release and regeneration (Uplands) Hardwood release and regeneration (Lowlands)

Accelerating succession



Moderate fire frequency/intensity

#### Mixed composition, uneven age stands

Moderate insect infestations