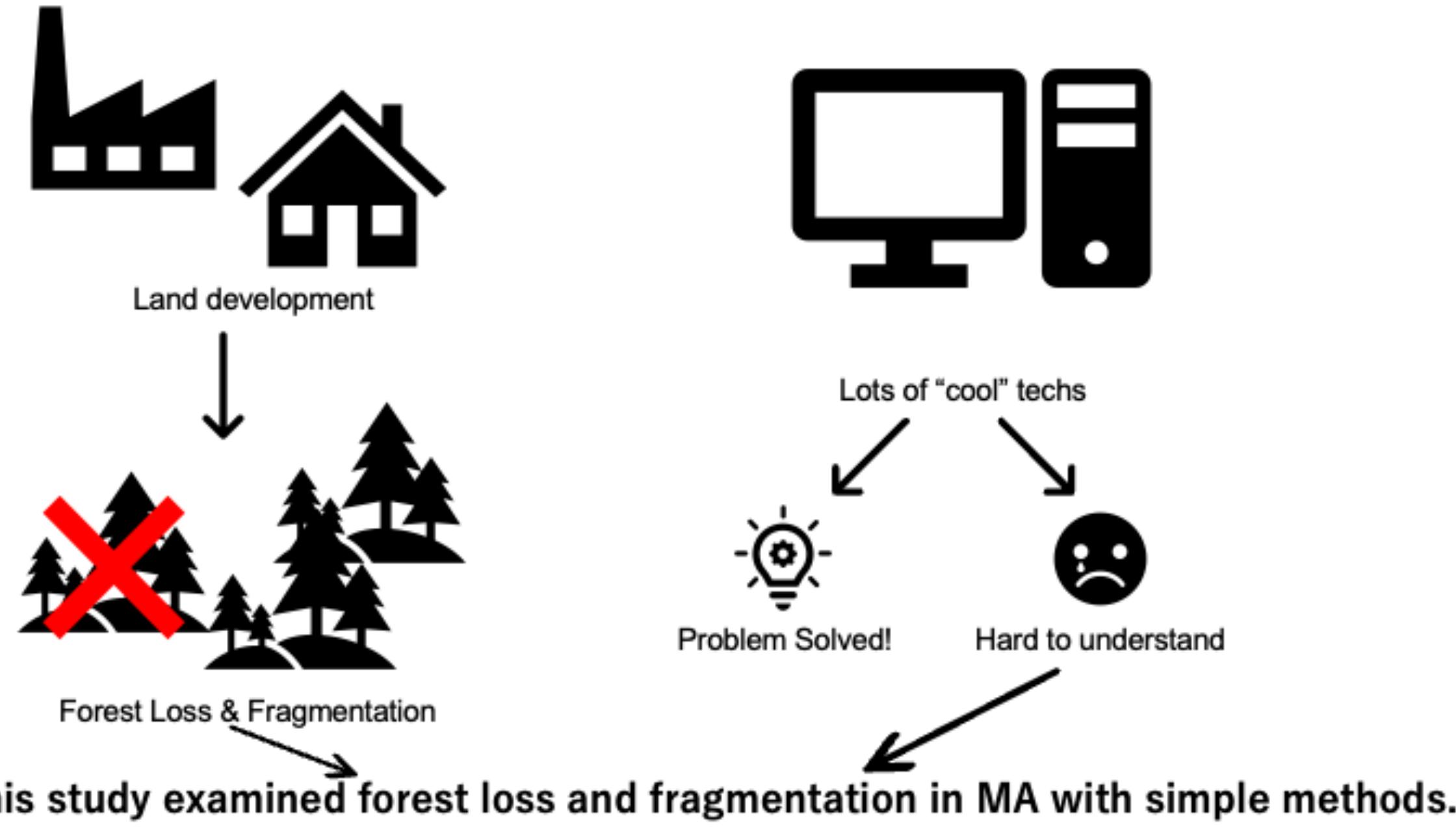


Basic mathematics revealed forest dynamics in MA

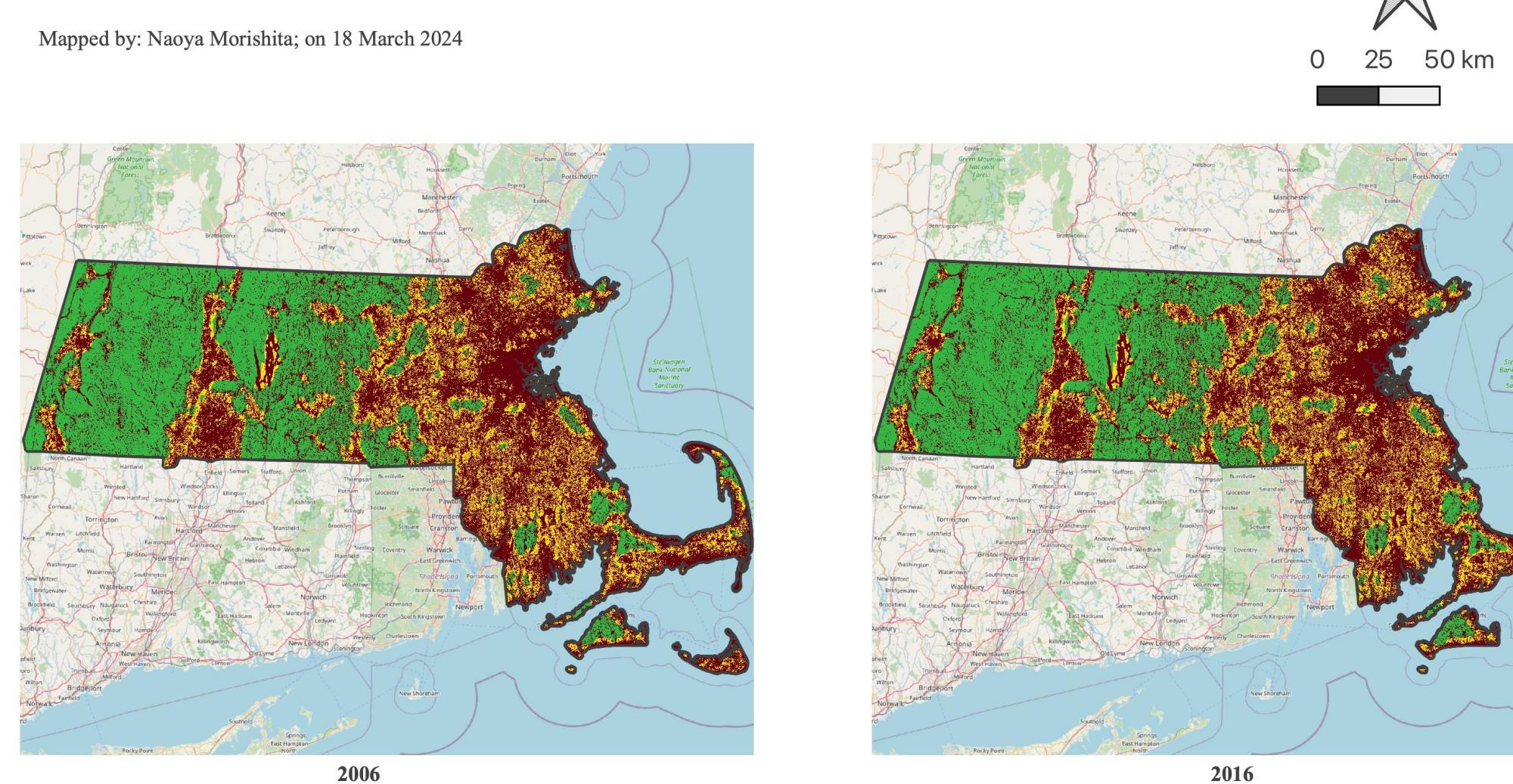
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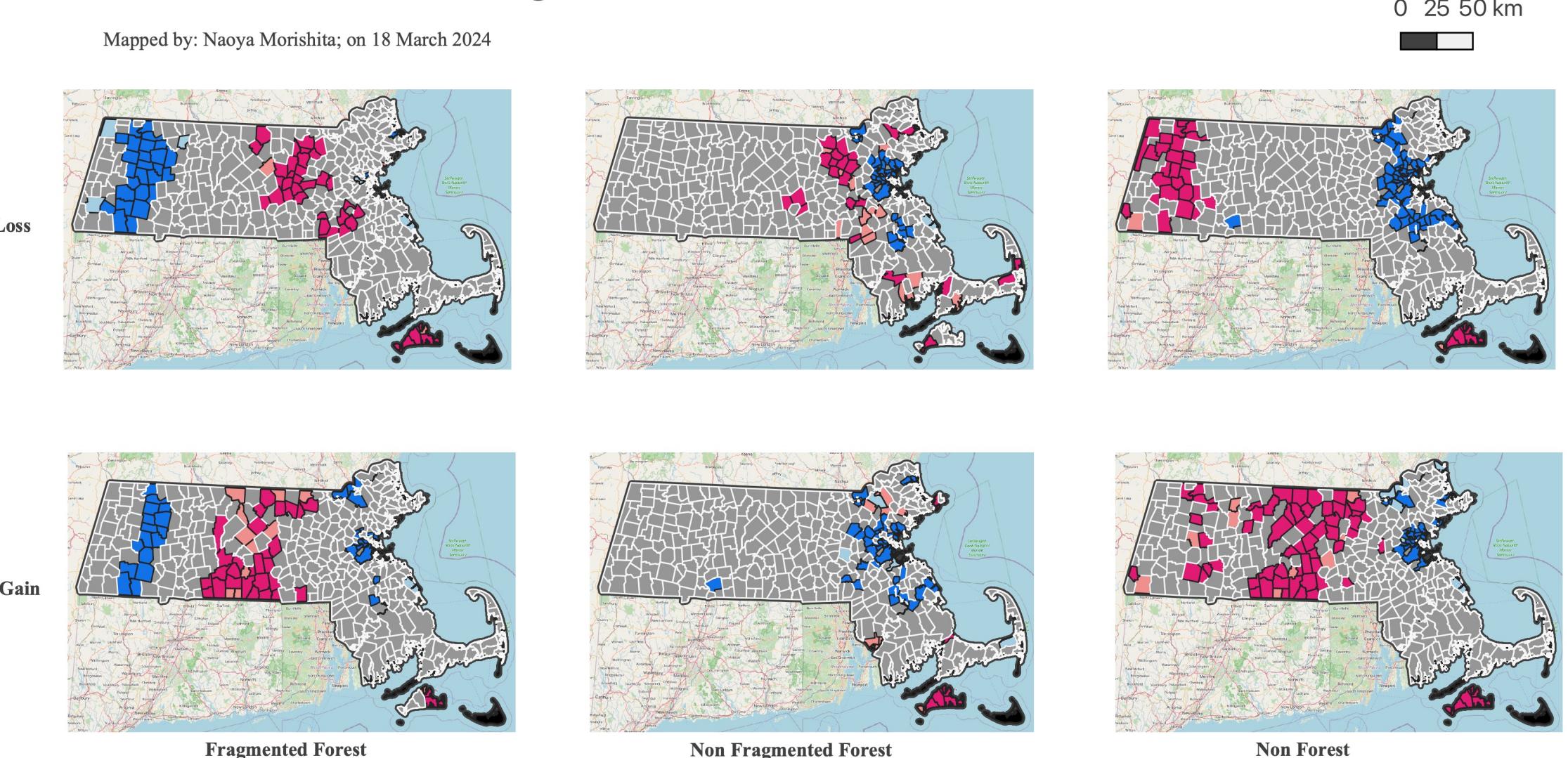
0zh4772g325515u64@gmail.com



Forest Category at the Time Points



Local Moran's I on Change Intensities



Key Equations^{[1][2]}

$$FAD = \# \text{ of Foreground Pixels} / \text{Total} \# \text{ of Pixels}$$

$$\text{Gain Intensity for a Category} = \text{Gain Size} / \text{Category Size at 2nd Time Point}$$

$$\text{Loss Intensity for a Category} = \text{Loss Size} / \text{Category Size at 1st Time Point}$$

$$\text{Change Intensity} = \text{Change Size} / \text{Extent}$$

$$\text{Gain Quantity for a Category} = \text{MAXIMUM}(\text{Gain Size} - \text{Loss Size}, 0)$$

$$\text{Loss Quantity for a Category} = \text{MAXIMUM}(\text{Loss Size} - \text{Gain Size}, 0)$$

$$\text{Gain Quantity Intensity for a Category} = \text{Category's Gain Quantity} / \text{Category Size at 2nd Time Point}$$

$$\text{Loss Quantity Intensity for a Category} = \text{Category's Loss Quantity} / \text{Category Size at 1st Time Point}$$

Key Findings & Discussion

1. Fragmented forest intensively gained in central MA.

- The clusters overlaps with those of non- forest gains
- It may indicates that forest losses and fragmentation often occurred simultaneously.

2. Change intensities were extensive in central MA and in Martha's Vineyard.

- Nonetheless, Worcester, 2nd largest areas belonged to the high- low spatial outlier.
 - This implies that its intensity was significantly dissimilar with and lower than its neighbors.

3. "Outskirts of Boston" belonged to low clusters of quantity intensities of non- forest gain.

- This disagrees with a study^[4], arguing that the area lost forests extensively.
- High intensity clusters was found in Worcester COUNTY, but Worcester CITY was an outlier.**
 - Solar panels had widely installed to the County.^[5]
 - These low cluster and outlier may no longer face intensive net non- forest gains (= forest losses).
 - These areas may have been developed extensively by the time point of 2005.

4. High clusters was in south- central MA of the quantity gain intensities of fragmented forest.

- A study^[6] argued that forest in and around populous city experienced fragmentation
- However, towns further away from Worcester also belonged to the cluster.

Potential Research Questions in the Future

- How do parameters and MAUP affect the result?
- How do other land covers affect connectivity among habitats?
- What are potential drivers of forest losses and fragmentation in MA?
- How do fragmentation and forest loss affect actual behaviors of wildlife?

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