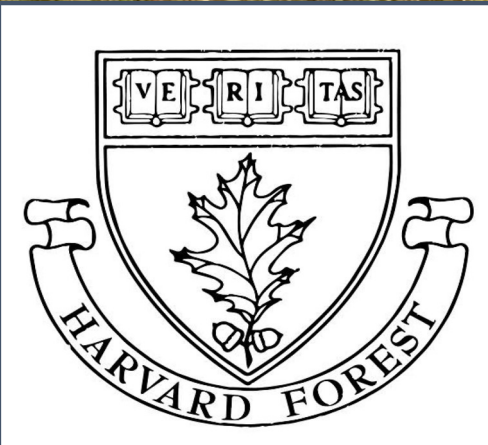


Growing Solar, Protecting Nature

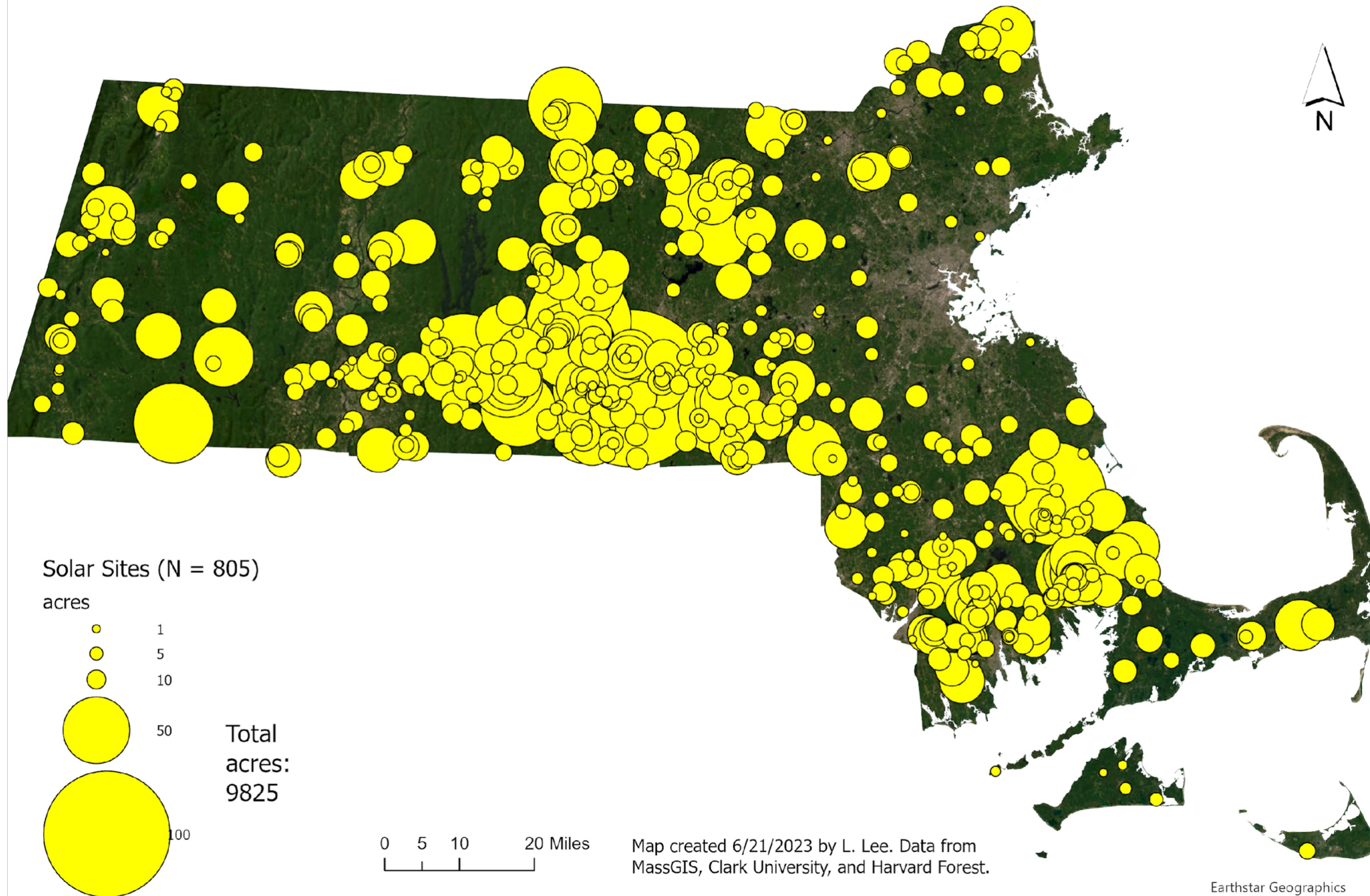


Jonathan Thompson, PhD
Harvard University, Harvard Forest

Presented to: The Vermont House Committee on
Environment & Energy



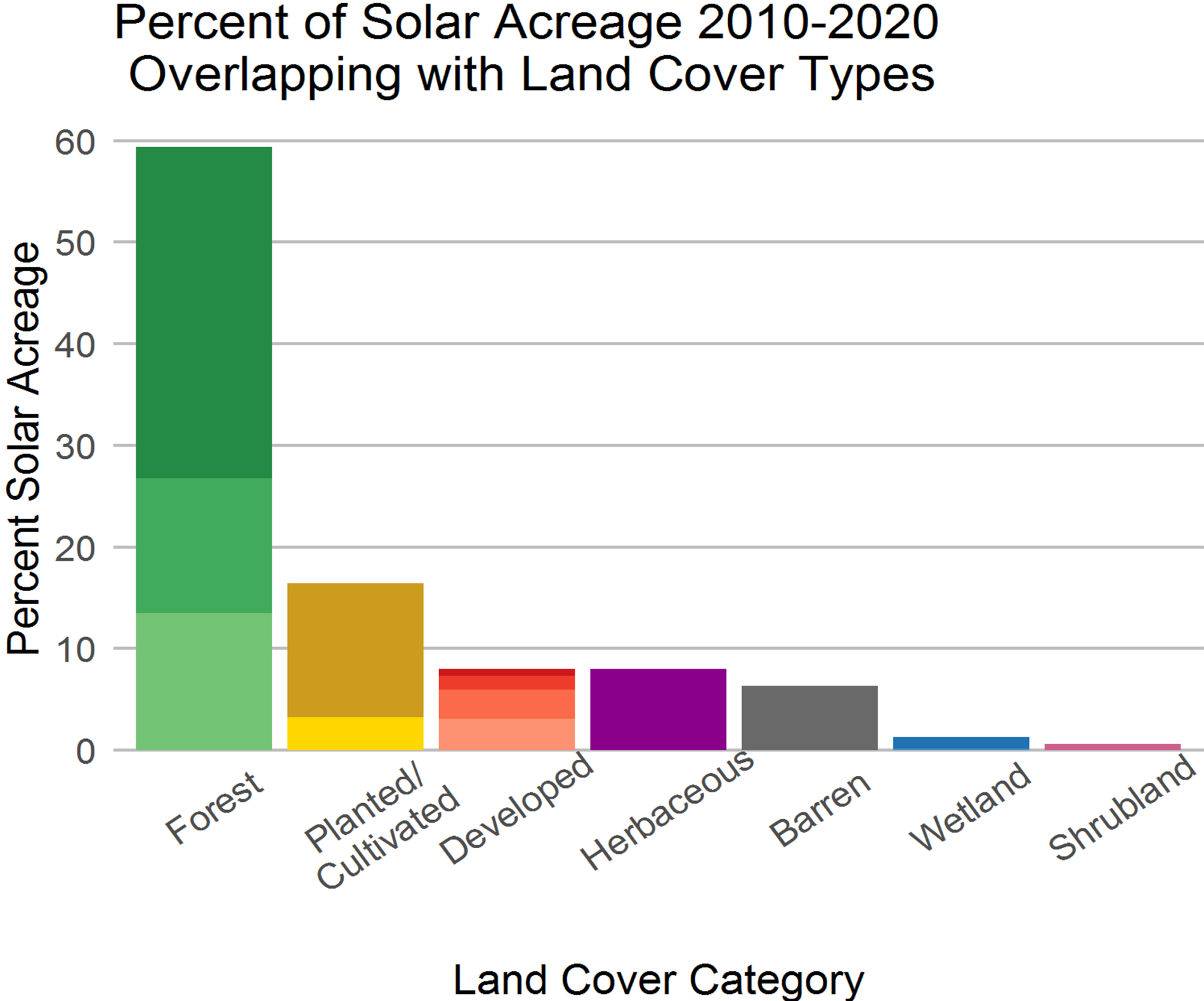
MA Ground Mounted Solar Arrays by Size



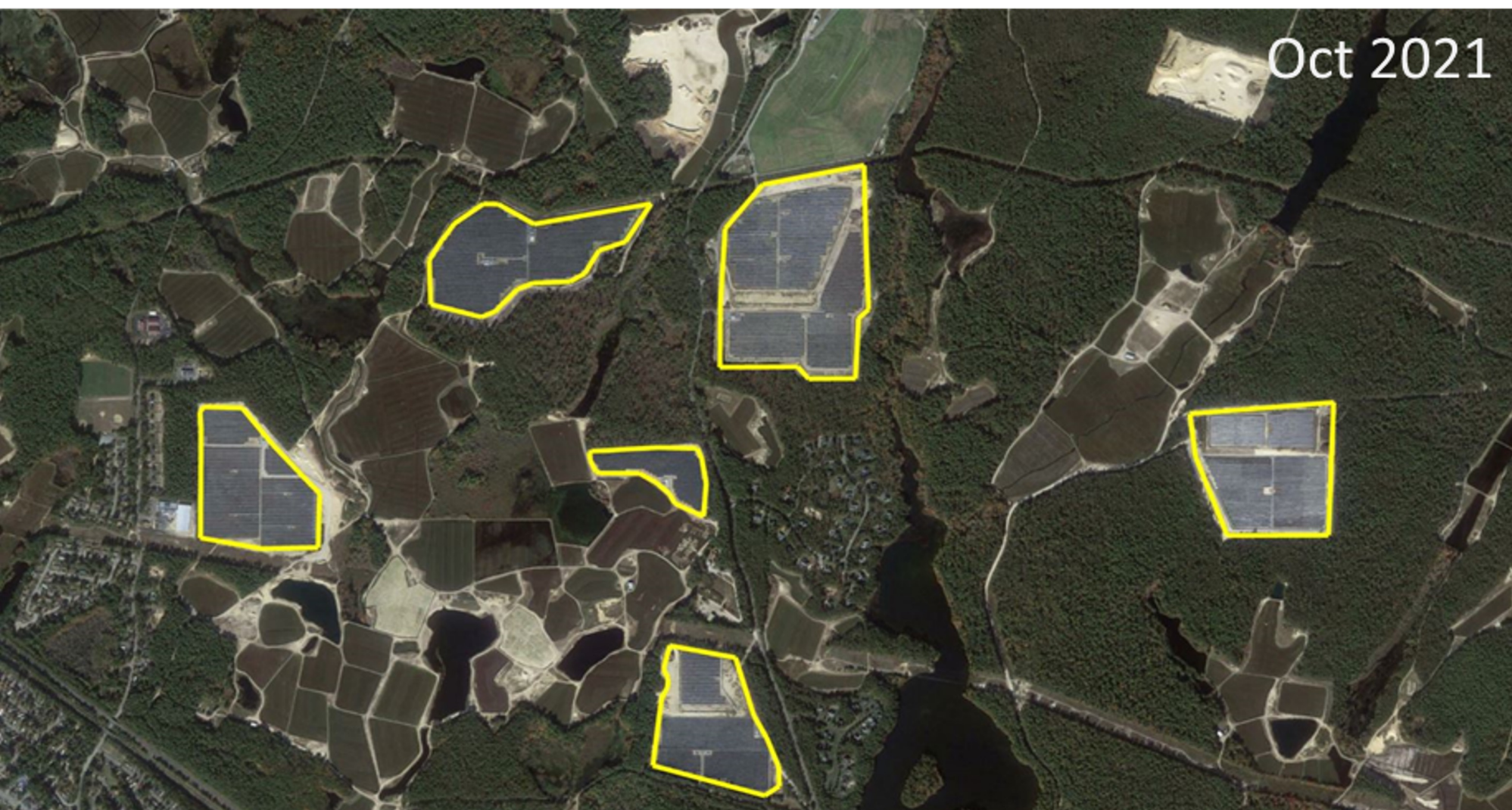
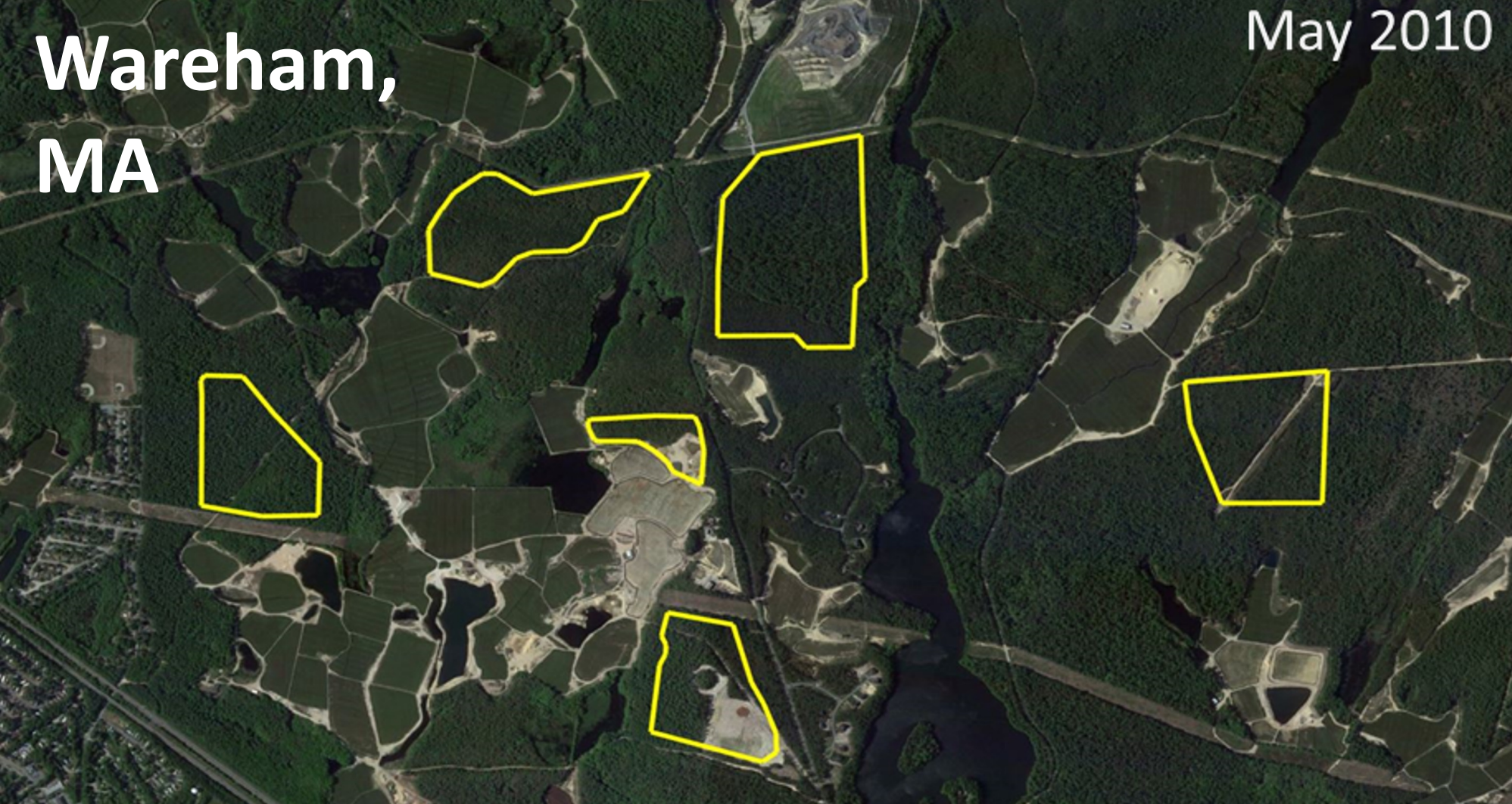
State of Solar in Massachusetts

- Total solar capacity installed in MA: 4.2 GW
 - Distributed solar: ~2.8 GW
 - Ground-mount: ~1.4GW
- State CECP goals and federal incentives will accelerate both ground-mount & distributed solar in years to come
- MA estimates we'll need ~27 GW more solar by 2050 to meet demand

But state incentives and energy markets are also driving negative solar siting outcomes



- 60% of ground-mount solar installed in MA between 2010 & 2020 impacted forests
- Over 15% impacted planted/cultivated lands
- More than 10% of current solar is on BioMap 2 core habitat



Biodiversity and carbon sequestration are at risk from ground-mount solar

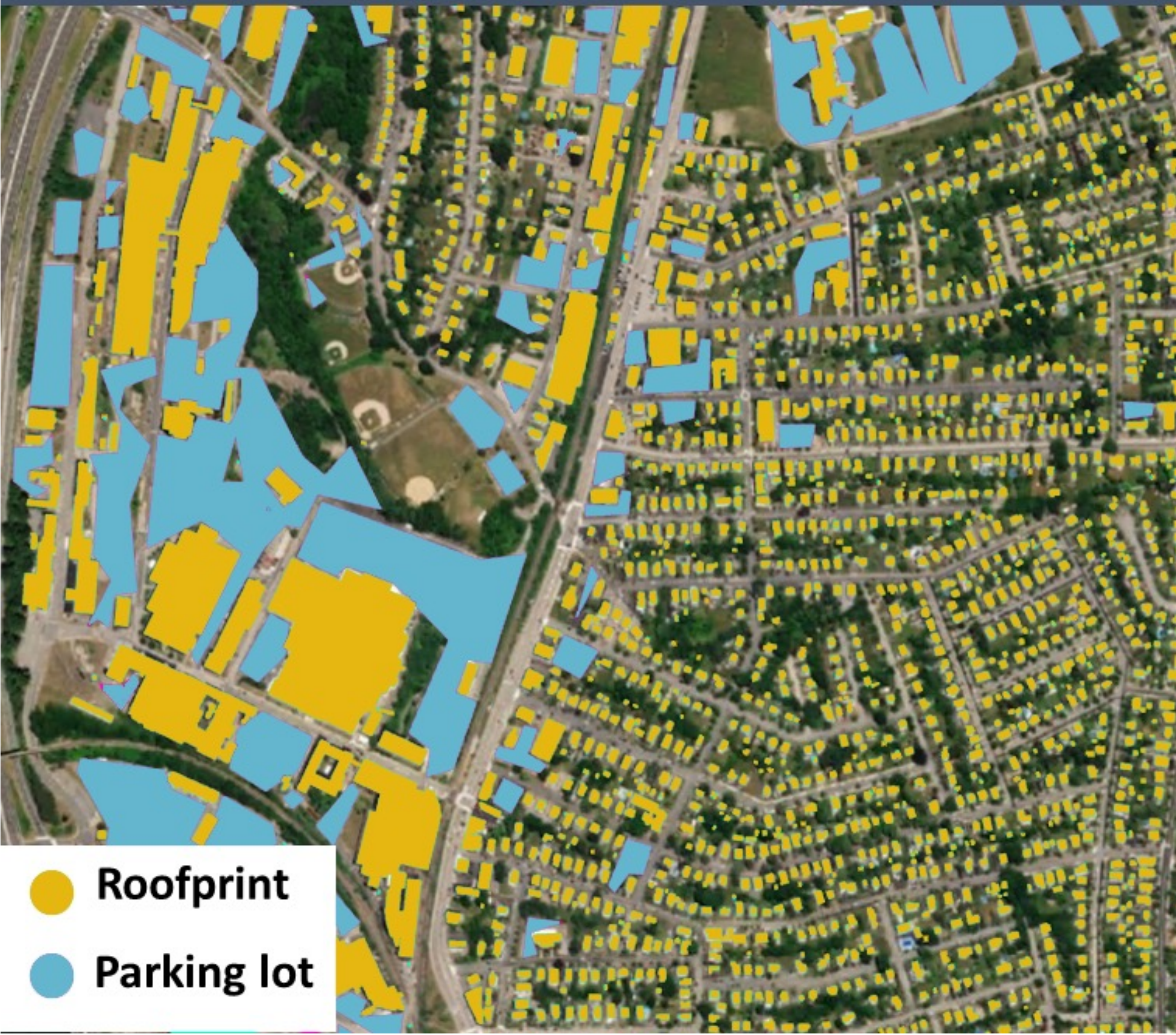
- 3,753 acres of forest were converted to ground-mount solar between 2010-2020
- Carbon emissions from forest loss were ~513,854 MMTCO₂e, roughly equal to annual emissions of 112,000 cars
- Ground-mount development in Southeastern MA overlaps with unique biodiversity resources (>200 state-listed species)

Our Research Approach

Geospatial and energy-economic modeling of 3 scenarios of future solar development

Current Siting Scenario	Protecting Nature Scenario—Mid-Impact	Protecting Nature Scenario—Low-Impact
<ul style="list-style-type: none">• Development continues on all land technically & legally viable for ground-mount solar	<p>Protects:</p> <ul style="list-style-type: none">• Prime farmland• Essential biodiversity/wildlife habitat• Highest forest carbon sites• Lands most valuable for climate resilience	<p>Same protections as Mid-Impact, plus:</p> <ul style="list-style-type: none">• ~99% of forests• Floodplains and hurricane zones• Open space w/limited protection• Historic places

Rooftop/ Canopy Potential: Worcester, MA

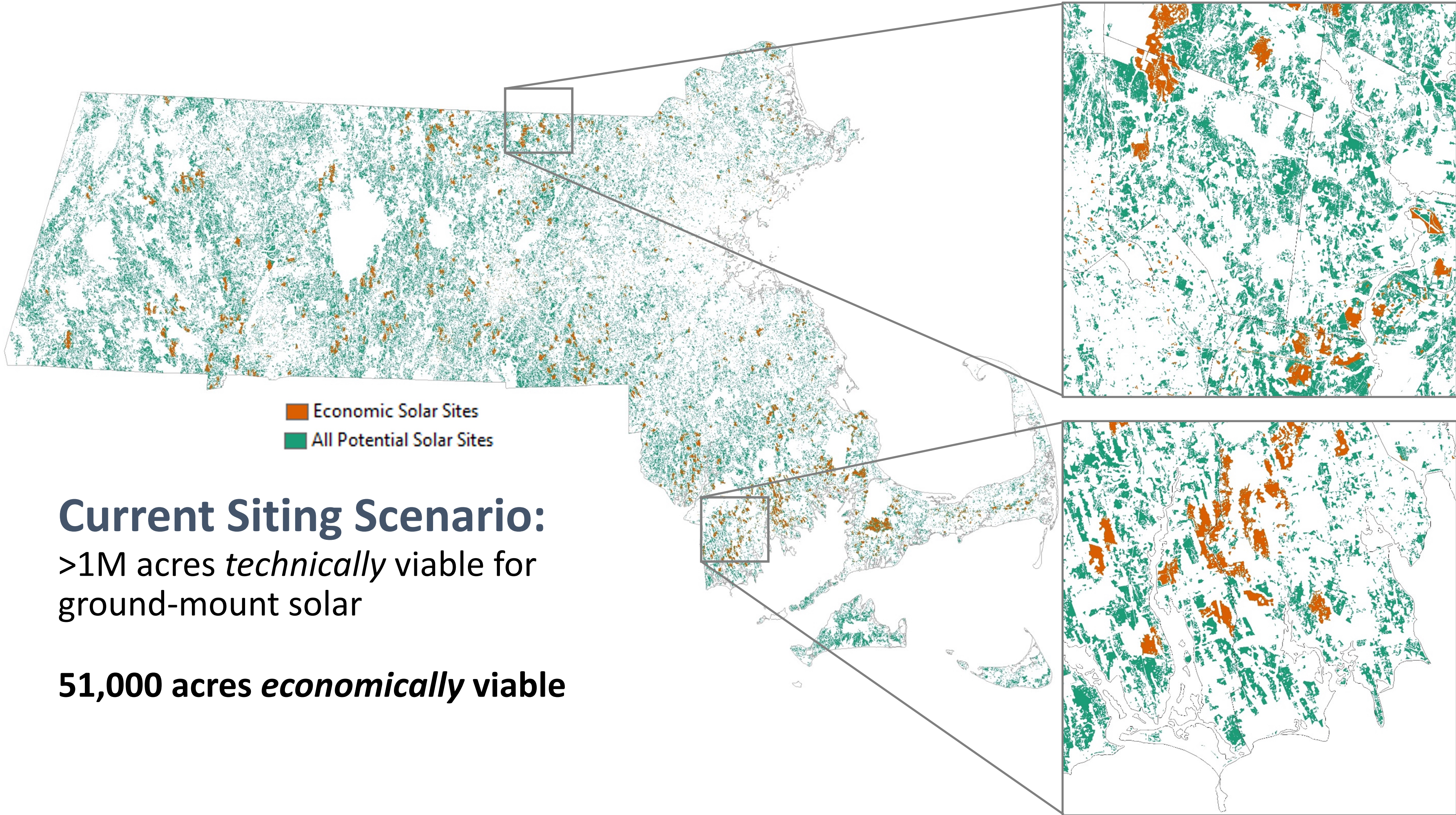


Massachusetts has significant solar potential on rooftops and parking lots

20.6 GW of rooftop potential statewide

9.9 GW of canopy solar potential

*Data sources:
Roofprints - MassGIS 2021,
Parking lots - Dr. Brad Compton*

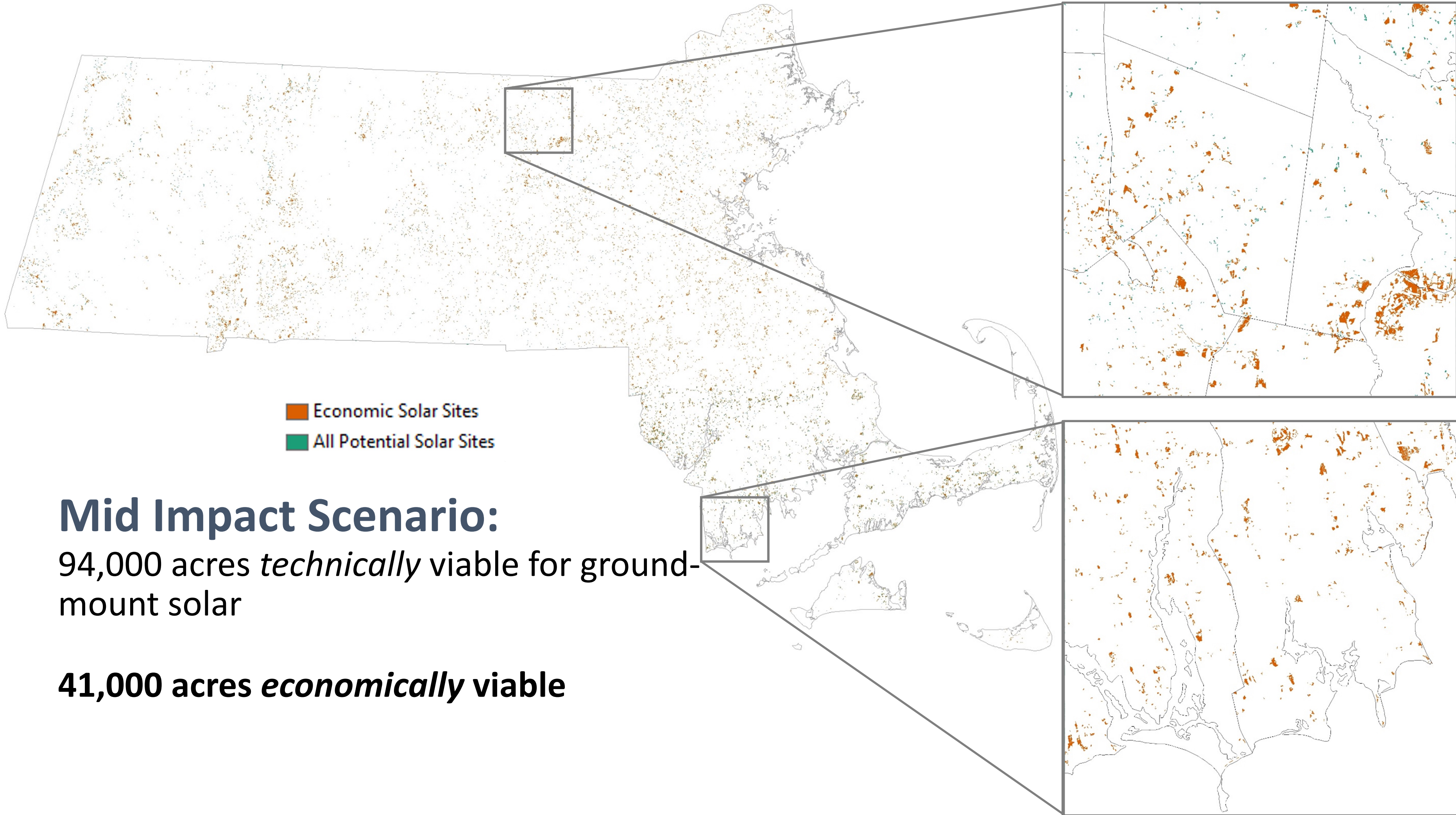


- Economic Solar Sites
- All Potential Solar Sites

Current Siting Scenario:

>1M acres *technically* viable for ground-mount solar

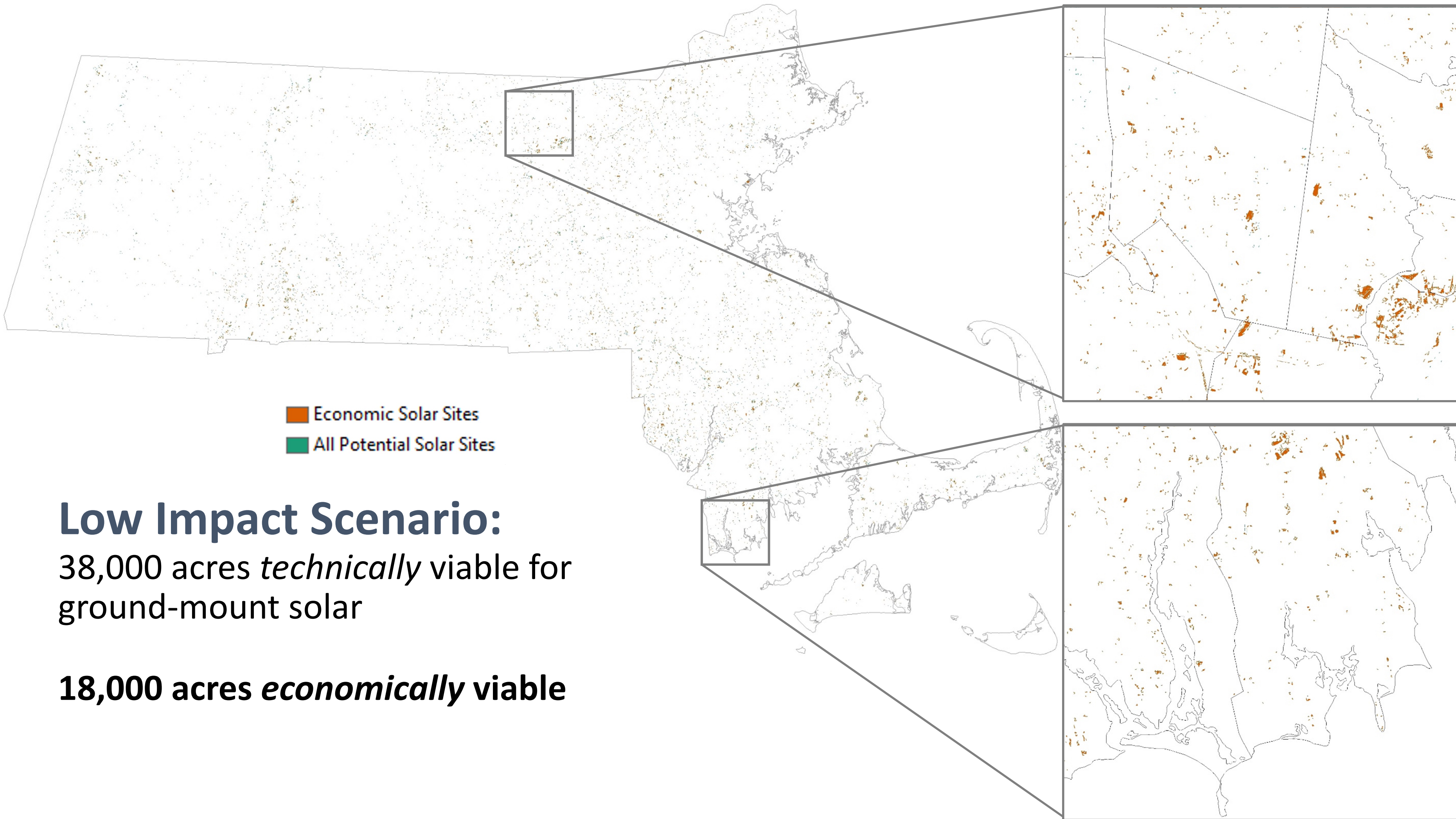
51,000 acres *economically* viable



- Economic Solar Sites
- All Potential Solar Sites

Mid Impact Scenario:
94,000 acres *technically* viable for ground-mount solar

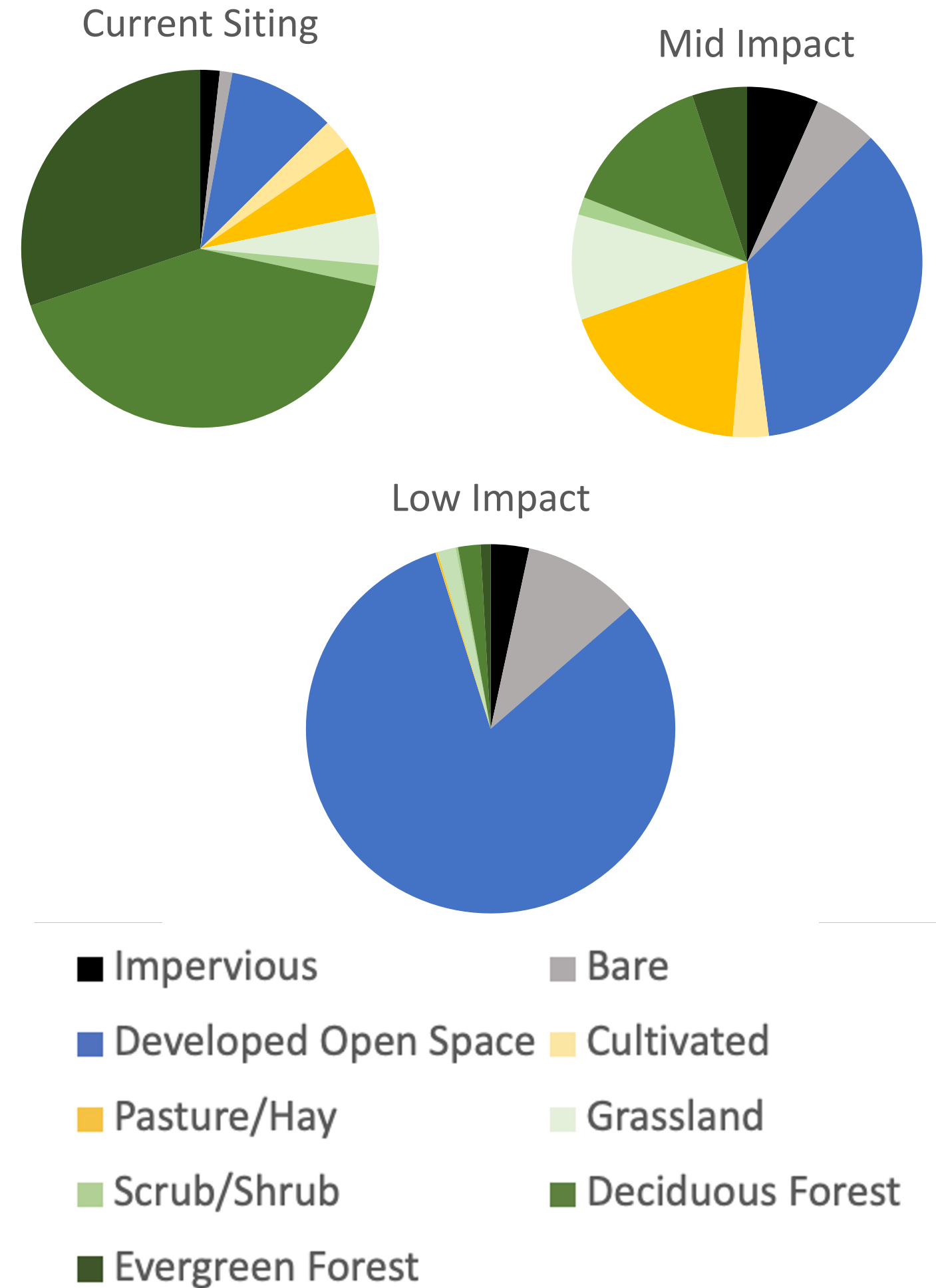
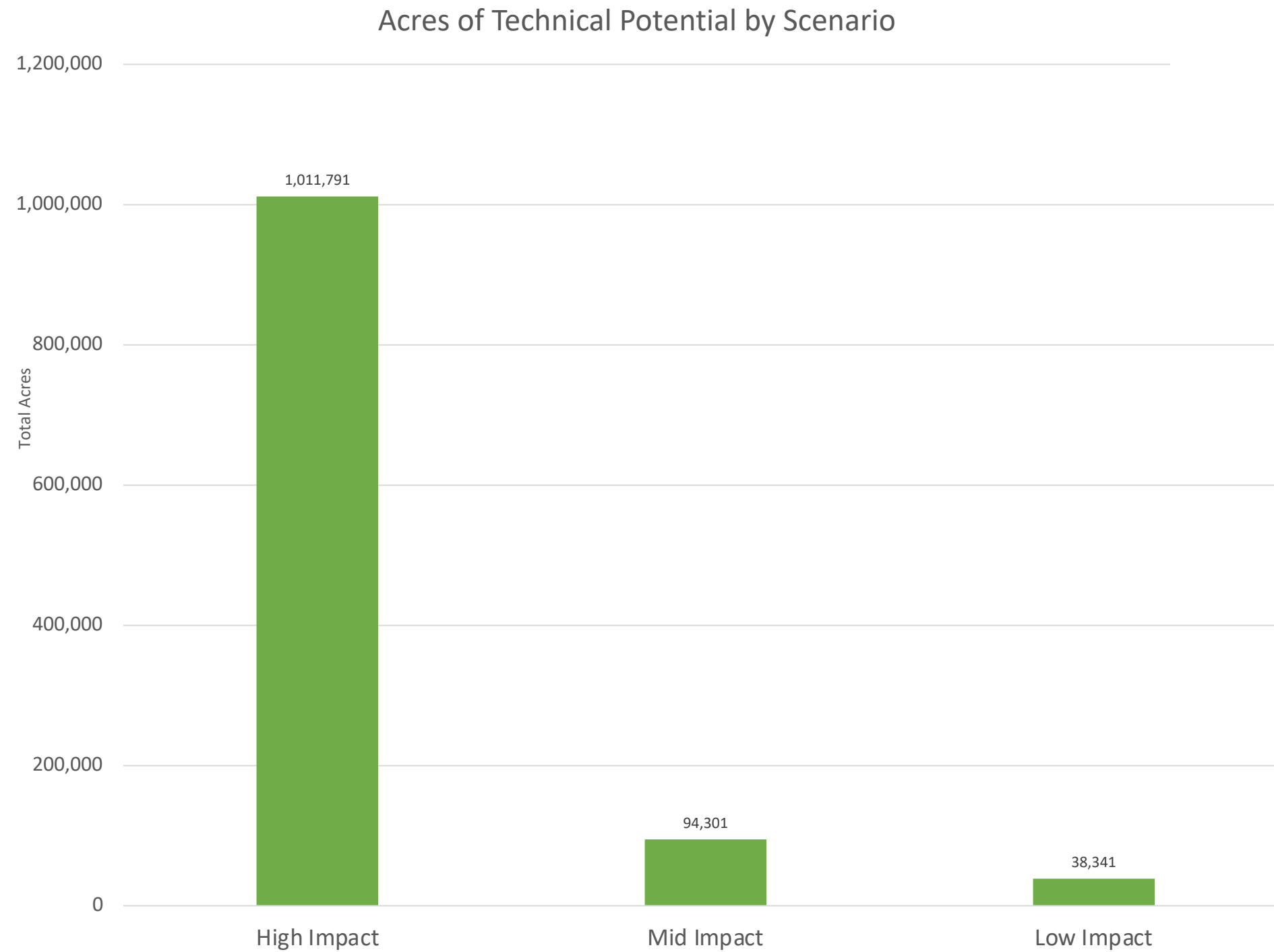
41,000 acres *economically* viable






- Economic Solar Sites
- All Potential Solar Sites

Low Impact Scenario:
38,000 acres *technically* viable for
ground-mount solar
18,000 acres *economically* viable

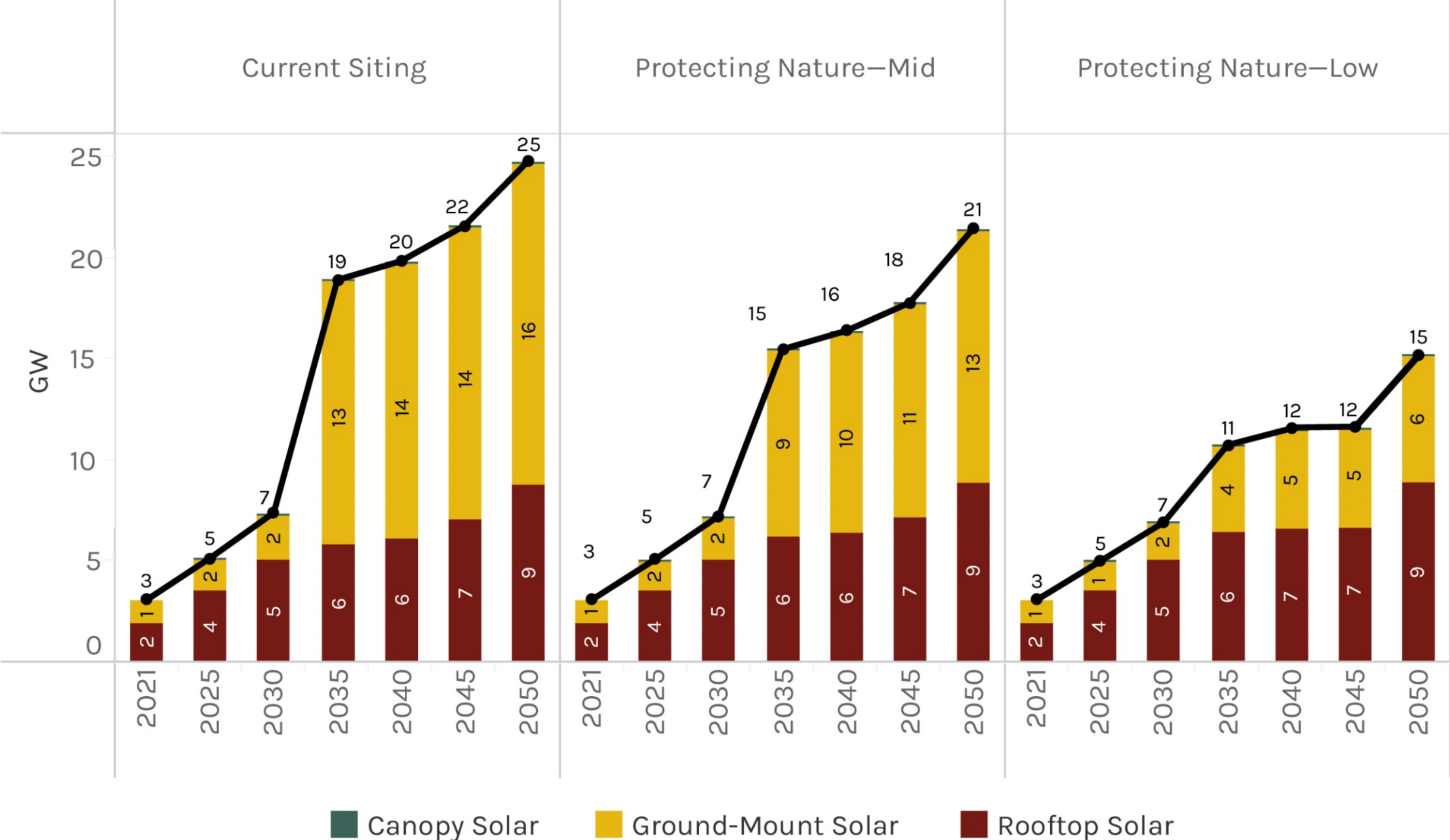
Forests cover over 70% of High Impact solar sites



Our Results: We can protect the nature we have...

	Current Siting	Protecting Nature Scenario- Mid Impact	Protecting Nature Scenario - Low Impact
 Forest Carbon Lost	5.8 Million metric tons	1.1 Million metric tons	0.8 Million metric tons
 Highest Natural Landscape Lost	20,969 Acres	0 Acres	0 Acres
 Prime Farmland Lost	8,119 Acres	0 Acres	0 Acres

Our Results: While building the solar that we need



Cost of Massachusetts Solar Energy

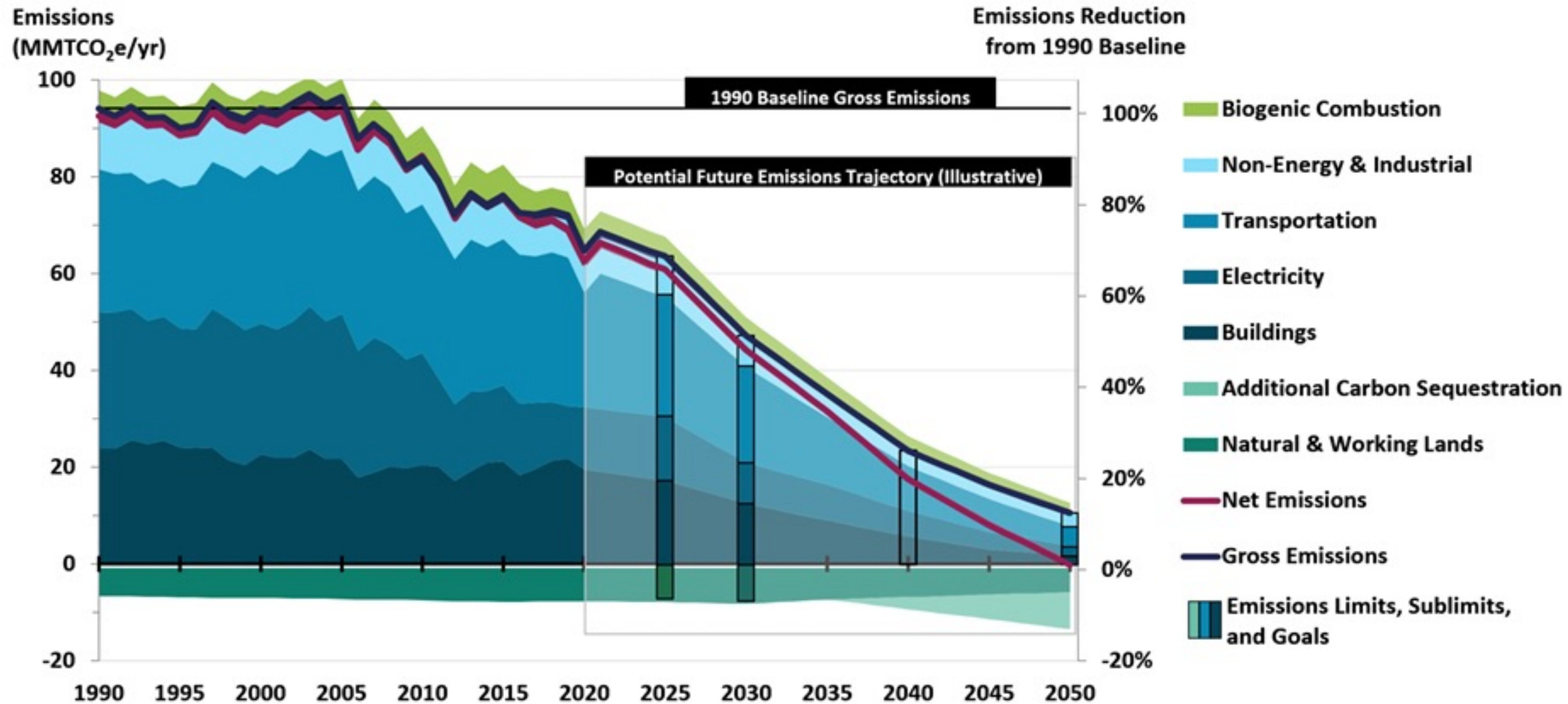
Includes Ground-Mount and Rooftop Solar Capacity



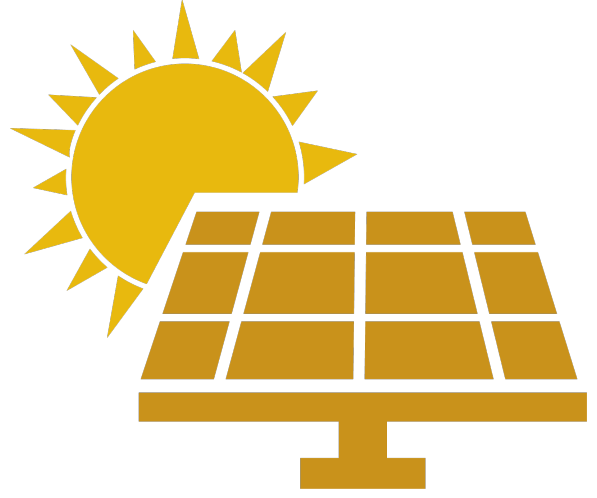
Cost premium between High and Mid Impact scenarios is surprisingly modest

When the true value of carbon removal by forests is included, *Protecting Nature* is lowest cost pathway

FIGURE 3-5. PAST EMISSIONS THROUGH 2020, EMISSIONS LIMITS AND SUBLIMITS, AND ILLUSTRATIVE POTENTIAL EMISSIONS TRAJECTORY THROUGH 2050



Policy Recommendations



Shift Energy Incentives & Programs



Expand Planning & Outreach



Develop Natural & Working Land Incentives

Key Takeaways

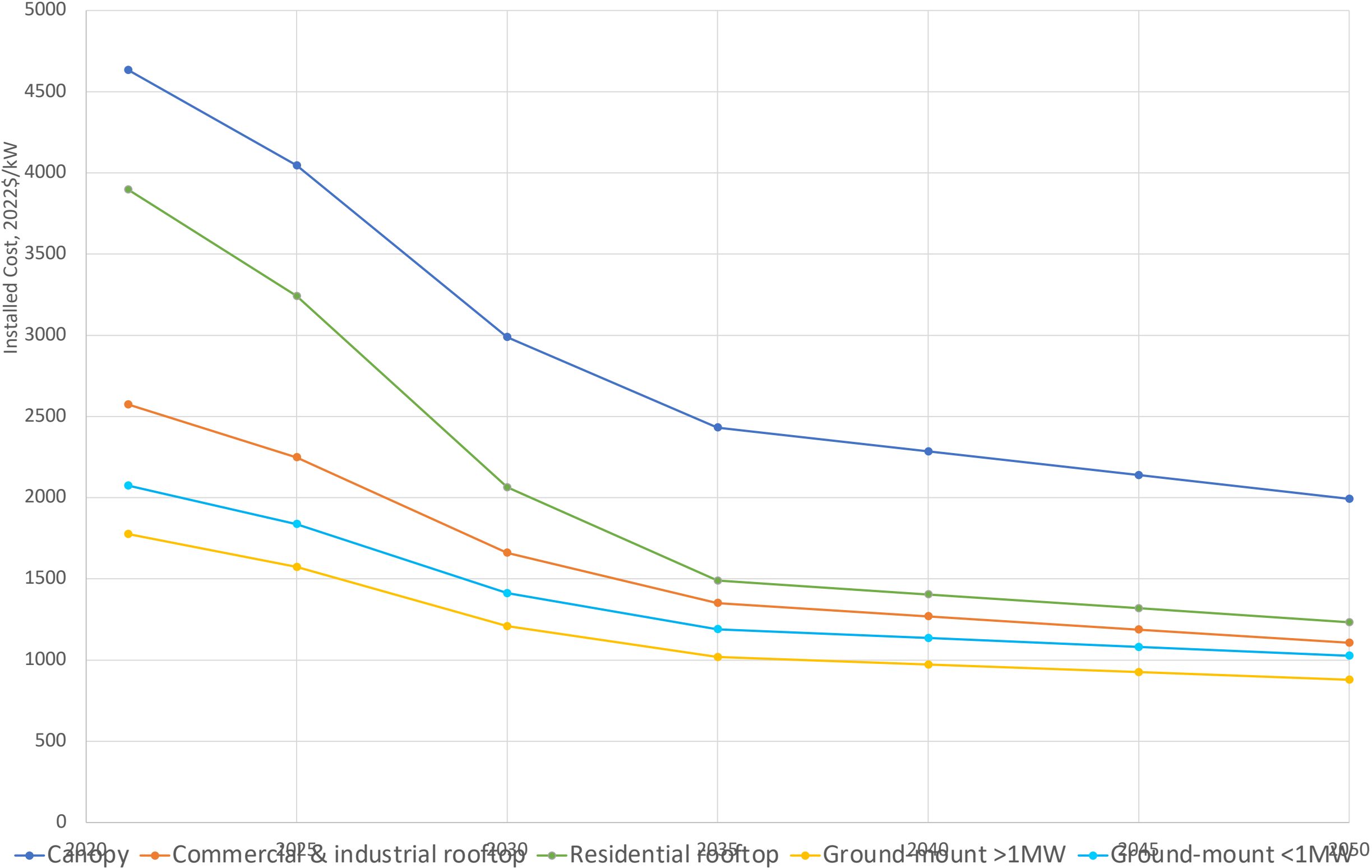
- Current solar siting practices place Massachusetts' 2050 goals for carbon removal, biodiversity & food security at high risk
- We have ample sites to scale solar up *without* ongoing losses to nature
 - Over 30 GW of potential in built environment + ~25 GW on low-impact lands
- State, cities, towns & non-profits have opportunity to lead by example
- When the cost of carbon removal is included, *Protecting Nature* is least-cost path forward
- Capturing the opportunity requires changes to energy and land policies, more support for communities
- We need to start now!

Questions and Discussion



Learn more & get involved:
[Massaudubon.org/policy](https://massaudubon.org/policy)

Solar Capital Cost by Type



Capital costs assumed to be lower for ground-mounted solar, and for larger projects of all types

Source: MassCEC Production Tracking System (2023). Data available at: <https://www.masscec.com/production-tracking-system-pts>. Size-based cost multipliers derived from data from 2016 and later.