## ****Quantifying Climate Mitigation Potential: A Science-Based Approach to Land-Based Solutions****

To meaningfully contribute to climate action, land-based solutions must go beyond slogans and symbolic gestures. Effective climate mitigation depends on clear, science-based targets, precise measurement, and transparent monitoring. This section outlines a framework for quantifying the climate, ecological, and social benefits of natural climate solutions, ensuring that every acre of restored land or planted forest delivers measurable, equitable results.

### Core Strategies and Actions

Use peer-reviewed research to define carbon sequestration potential.  
Scientific studies such as Griscom et al. (2017), Fargione et al. (2018), and the IPCC’s Sixth Assessment Report (AR6) provide robust estimates of how much carbon can be mitigated through natural climate solutions. These include reforestation, avoided forest conversion, improved forest management, wetland and grassland restoration, riparian buffer restoration, and urban forestry expansion. These data serve as the foundation for setting evidence-based climate targets at local, regional, and national scales.

Establish a precise baseline using authoritative geospatial datasets.  
Quantifying current land cover and carbon stocks is essential to identifying opportunities and gaps. This includes mapping forest carbon, wetland extent, urban canopy, cropland patterns, impervious surfaces, and population densities using sources like the National Land Cover Database (NLCD), Forest Inventory and Analysis (FIA), National Wetlands Inventory (NWI), USDA Cropland Data Layer, NOAA Heat Vulnerability Index, and EPA EJSCREEN. A robust baseline allows planners to identify where the biggest gains and equity improvements can be achieved.

Map and prioritize zones for restoration and reforestation.  
Priority areas should be selected using multi-criteria geographic analysis that overlays carbon potential, ecosystem services, feasibility, and social equity. This includes evaluating climate co-benefits (such as flood reduction and heat mitigation), assessing land ownership and zoning constraints, and identifying communities disproportionately burdened by environmental hazards. This ensures that climate interventions deliver both environmental and social benefits.

Set science-based acreage and mitigation targets.  
National and regional sequestration goals should be translated into specific acreage targets for each intervention, informed by the best available science. For example, restoring millions of acres of degraded forest or expanding urban tree canopy by specific percentages can be linked to quantifiable annual carbon reductions. Importantly, targets must be spatially explicit, time-bound, and aligned with biodiversity, water, and equity goals.

Integrate ecosystem service modeling alongside carbon accounting.  
Beyond carbon, restored landscapes offer multiple benefits, including stormwater retention, flood mitigation, improved air quality, and enhanced wildlife habitat. Tools like the InVEST suite, i-Tree software, EPA’s SWMM, and The Nature Conservancy’s Restoration Opportunities Atlas help quantify these co-benefits, supporting decisions that maximize multifunctional outcomes.

Develop robust monitoring, reporting, and verification systems.  
Effective climate action requires strong accountability frameworks. Monitoring systems will combine high-resolution satellite imagery, LiDAR, field-based sampling, and citizen science contributions. Publicly accessible dashboards will track progress by location and intervention type, ensuring transparency and enabling adaptive management over time.

Align interventions with global decarbonization pathways.  
Local and national land-based actions must fit into broader net-zero strategies compatible with limiting warming to below 1.5 to 2 degrees Celsius. This means coordinating nature-based solutions with deep emissions cuts in energy, transportation, and industry, rather than treating them as offsets or substitutes.

### Why This Matters for Climate, Biodiversity, and Environmental Justice

Natural climate solutions can deliver up to one-third of the global mitigation needed by 2030 to meet the Paris Agreement targets. In the U.S., up to 1.2 billion metric tons of CO₂-equivalent could be mitigated annually through land-based actions. However, unlocking this potential requires careful spatial planning, community engagement, and safeguards to avoid unintended consequences such as biodiversity loss, land tenure conflicts, or water shortages.

A science-informed approach ensures that climate interventions are not only effective but also equitable and resilient. It prioritizes resources where they are most impactful, safeguards human and ecological systems, and builds public trust in environmental policy.

### Supporting Evidence

* Griscom, B. W., et al. (2017). Natural climate solutions. Proceedings of the National Academy of Sciences, 114(44), 11645–11650.
* Fargione, J. E., et al. (2018). Natural climate solutions for the United States. Science Advances, 4(11), eaat1869.
* IPCC AR6 (2022). Working Group III: Mitigation of Climate Change.
* National Land Cover Database (NLCD)
* Forest Inventory and Analysis (FIA)
* EPA EJSCREEN and CDC Social Vulnerability Index