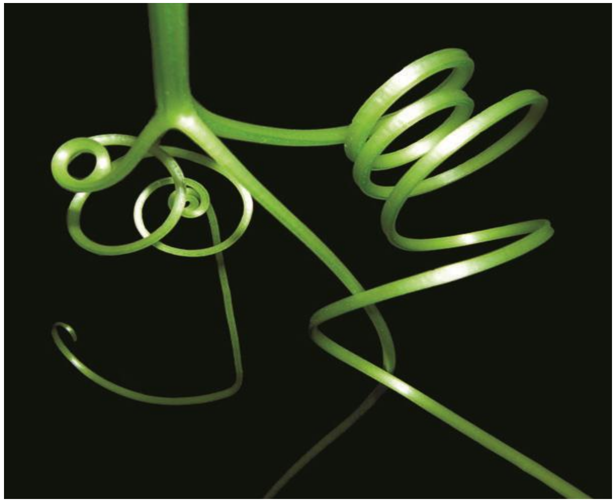
Land Trusts: On the Front Lines of Drawing Down Carbon

Why and How Land Trusts Can Make a Difference



Where we (the global community) stand relative to the climate crisis

The problem

Atmospheric CO_2: pre-industrial 280 ppm → nearly 400 ppm today

Rising Temperatures: 10 warmest years on record (since 1880) have all occurred since 1998

Sea level rise: Sea level has risen about 8 inches in the last 100 years; anticipated to rise 1 to 4 feet

Polar ice: Summer Arctic sea ice shrinking, may be ice-free within a few decades

Weather extremes: Increased frequency and intensity of storms, more heavy downpours, more heat waves

The sixth extinction wave, threats to ecosystems –

- Loss of species
- Animals and plants shifting to higher elevations or latitudes
- Ocean acidification and coral bleaching

Earth's life support system (for humans and all living things) compromised –

- Loss of carbon rich, nutrient rich soils
- Increased incidence and intensity of drought and floods
- Increased agricultural pests and pathogens moving north

“We are the first generation to feel the sting of climate change, and we are the last generation that can do something about it.”

-- Washington State Governor Jay Inslee

Where we stand…

Solutions

U.S. emphasis – domestically, and in global leadership:

- Emissions reductions
- Renewable energy development
- Energy efficiencies

Where we stand…

Solutions

Paris climate agreement:

- 195 nations
- 9 major decisions focused on emissions reductions
  - Affirmed goal of limiting global temperature increase well below 2 degrees Celsius, while urging efforts to limit increase to 1.5 degrees
  - Binding commitments by all parties to make Nationally Determined Contributions of emissions reductions
- The Paris climate agreement goes only so far to reduce anthropogenic greenhouse gas emissions of carbon to the atmosphere
  - May moderate warming
  - Remaining emissions still need to be eliminated

The 4 per 1000 plan

The “4 per 1000 plan” is intended to – and the research seems to confirm it can – sequester the balance of the carbon <u>emissions</u> that we will still be producing and thereby stabilize CO2 levels in the atmosphere

But what do we do about the “legacy” carbon in our atmosphere, which, if it remains, will continue to drive climate change?

Absent from climate discussions/actions: *the* ***power of biology*** *to draw down "legacy" carbon, reverse climate change*

Important actions are needed that use the *power of biology* to pick up where emissions reductions to stabilize CO_2 leave off**:** namely, *ecological restoration* to sequester excess ("legacy") carbon from the atmosphere to *reverse* climate change, not just moderate it.

To *reverse* climate change, let's use the *power of biology* at the continental, regional, and local scales to:

(1) restore nature where we have compromised or destroyed it; and

(2) protect the nature that remains – or the continued destruction will cancel out the climate benefits of restoration.

***Global effort at all levels (national, regional, local)

***E.O. Wilson: "Half-Earth" plea

The power of biology explained

- Sequester excess “legacy” carbon through restoration of ecosystems that are primary carbon sinks (grasslands, temperate and tropical forests, wetlands and coastal habitats).
- In tandem, restore small water cycles to maximize water retention on the land and enhance carbon storage in soils.

The ***power of biology*** explained

Grasslands are key:

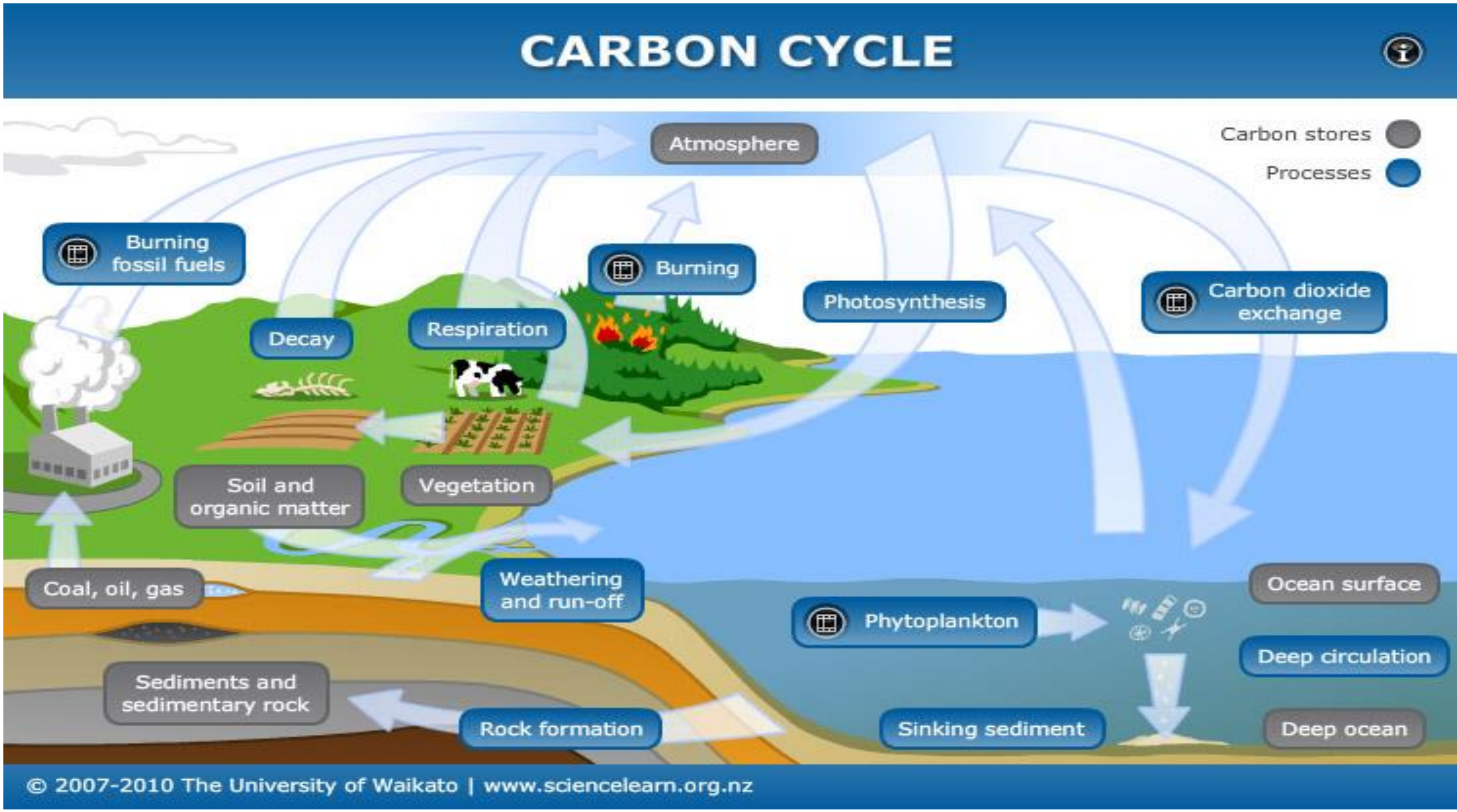
Continental and regional scale restorations will sequester carbon quickly, through restorative management on desertified grasslands (i.e., managed grazing by ruminants to rebuild carbon rich soils, and reintroducing native ruminants where possible)

The *power of biology* explained

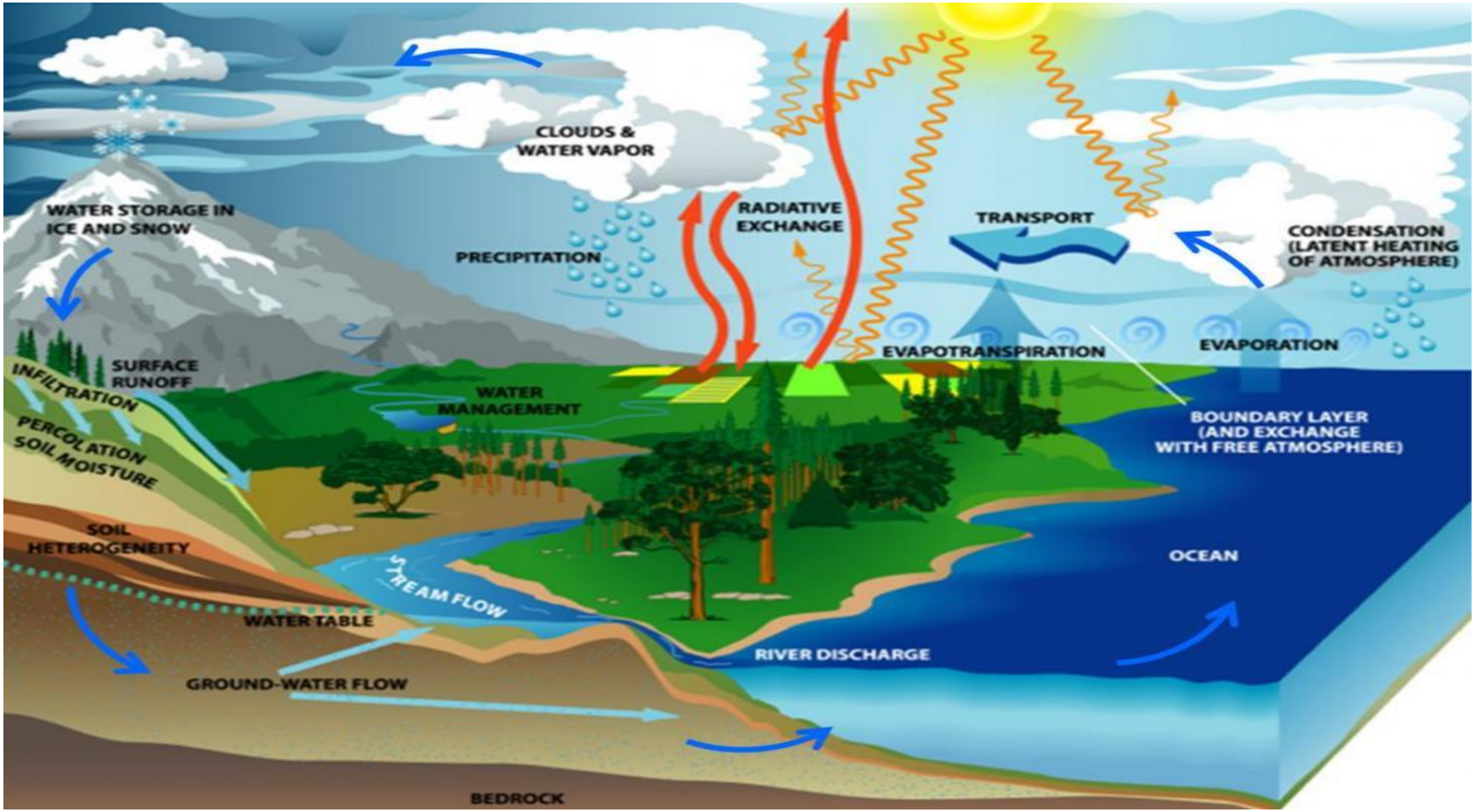
For any ecosystem:

Restoration = **healthy carbon, water, and nutrient cycles**

Carbon Cycle



Water Cycle



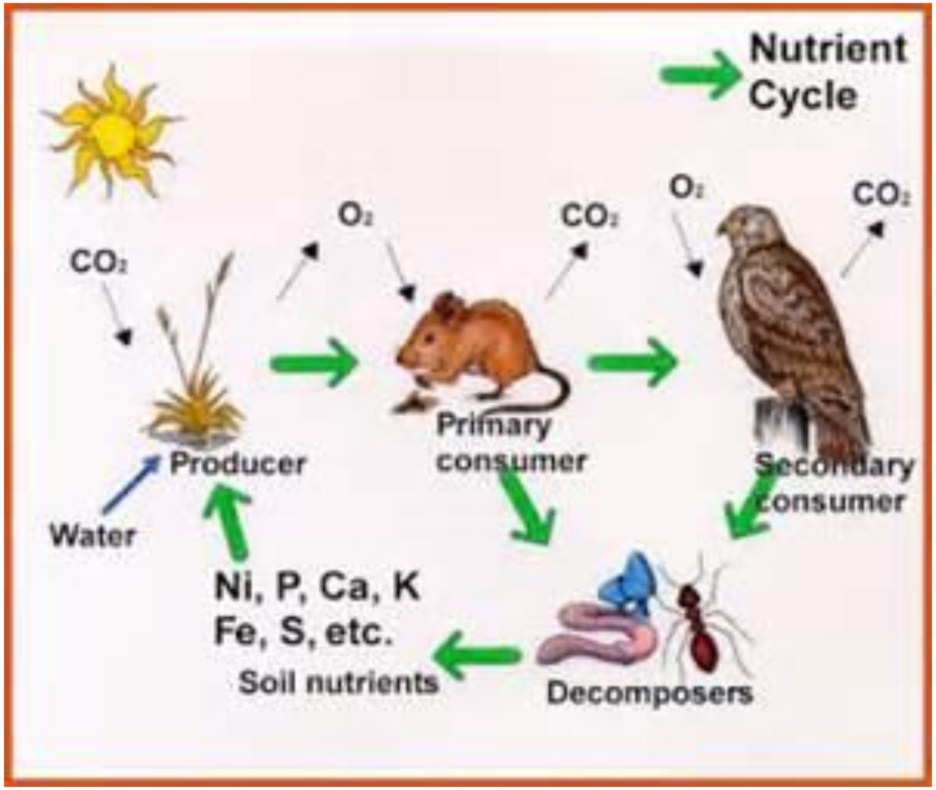
CLOUDS &
WATER VAPOR
WATER STORAGE IN
ICE AND SNOW
RADIATIVE
EXCHANGE
TRANSPORT
CONDENSATION
(LATENT HEATING
OF ATMOSPHERE)
PRECIPITATION
SURFACE
RUNOFF
EVAPOTRANSPIRATION
EVAPORATION
INFILTRATION
WATER
MANAGEMENT
PERCOLATION
SOIL MOISTURE
BOUNDARY LAYER
(AND EXCHANGE
WITH FREE ATMOSPHERE)
SOIL
HETEROGENEITY
OCEAN
STREAM FLOW
WATER TABLE
RIVER DISCHARGE
GROUND-WATER FLOW
BEDROCK

Nutrient Cycle

Nutrient cycling occurs within **ecosystems**. It is the movement or exchange by **biodiversity** of **organic and inorganic matter** (elements and compounds) into the production of living matter.

Organic matter: living, once living organisms; biological in nature; burns; presence of carbon prevents from forming salts; includes gasoline, urea, methane and fertilizers

Inorganic matter: non-living matter; mineral in nature; does not burn; can form salts and dissolve in water; includes water, air, minerals, metals



The *power of biology* explained

For wetland ecosystems:

Restoration = **performance of wetland functions**

private or public water supply
ground water recharge
flood control
storm damage prevention
pollution prevention
protection of land containing shellfish
wildlife habitat
fisheries

Proposal to make carbon sequestration the ninth interest to be protected under the Wetlands Protection Act

Land Trusts' mission and work will benefit from legislation to provide as follows:

Amend Massachusetts General Laws, Chapter 131, Section 40, by inserting in the first sentence of the 18th paragraph of said Section 40 the words "to protection of carbon sequestration," after the words "to prevention of pollution," and in that same sentence insert the words "to protect carbon sequestration;" after the words "to prevent pollution;".

The role of Conservation Commissions in removing "legacy" carbon from the atmosphere, using the power of biology

- Teaching the science in decisions
- Linking land conservation, wetlands protection, and ecological restoration
- Enforcing strict application of:
  1) avoidance of wetlands alteration,
  2) mitigation/replication requirements, and
  3) respect for hydrology
- Long-term monitoring of project sites to ensure the biodiversity and ecosystem processes (including carbon, water, and nutrient cycling) and wetland functions are maintained

Widespread failure to apply these principles

Recent Assessment of Wetland Mitigation Success*:

- Study funded by EPA 2011 Wetland Program Development Grant
- Follow up to *Compensatory Wetland Mitigation in Massachusetts* by Stephen Brown and Peter Veneman - December 1998

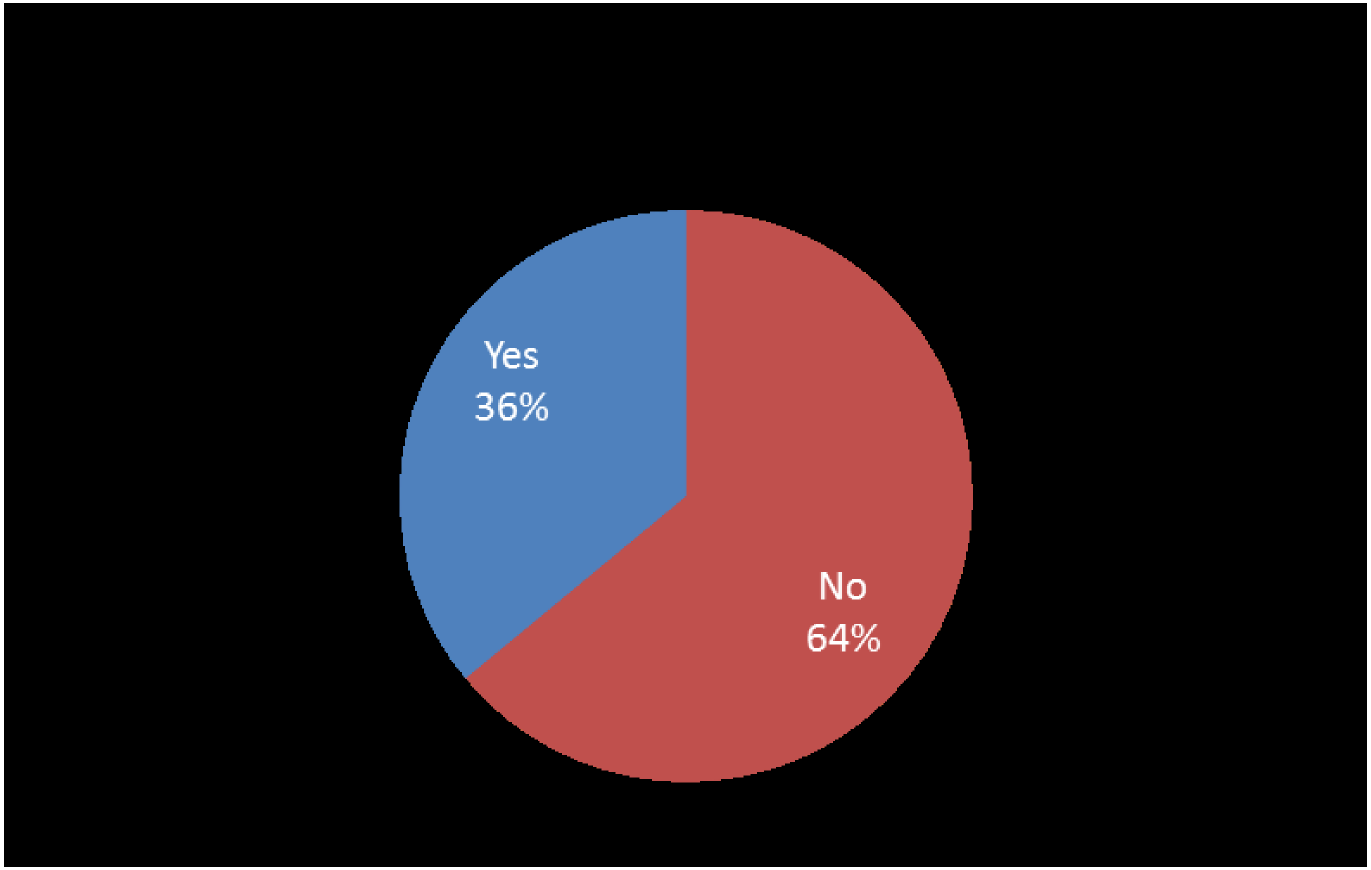
44 Towns Studied

Wetland Replacement areas studied were those that are:

- created from current upland/historic upland
- created from current upland/historic wetland

*****Draft Information excerpted from slides by Lisa Rhodes, MassDEP and Scott Jackson, UMass-Amherst, MACC Fall 2015 conference

Wetland Mitigation Success
(built and regulatory compliant)



Key Observations During Study*

Avoidance, minimization, mitigation hierarchy not demonstrated

Administration: lack of follow-up, 14% of sites not built

Design:

- Many projects failed to i.d. type of BVW (forested, scrub-shrub, emergent) being altered
- Most failed to i.d. the important functions to achieve in the replacement wetland
- Hydrology (seasonal depth to groundwater) not assessed in 90% of projects

Monitoring:

- Lack of experienced monitors
- Conservation Commission must inspect

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Study Draft Recommendations*

Administration:

- Reduce the number of replacement areas that need to be built
  -- Strengthen Avoidance and Minimization
  -- Mitigation truly as a last resort: Redefine which projects require replacement or combine replacement areas
- Created wetlands must meet performance standards (310 CMR 10.55 (4)(b)) and function similar to lost area
  -- No Net Loss (of acreage) – on-site, in-kind, 1:1 replacement

Design:

- Update Technical Guidance
- Develop a New Performance Standard Regarding Hydrology

Environmental Monitor:

- Requirement of EM in Regulations
- Standards for EM
- Clear Scope of Work for EM

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The role of Land Trusts in removing "legacy" carbon from the atmosphere, using the power of biology

- Teach the science to town officials, citizens, land trust members and supporters, and potential funders.
- Acquire lands for protection: acquire, acquire, acquire… $
  - Prioritize high carbon sink habitats for protection
    - Temperate forests
    - Grassland ecosystems
    - Wetlands
    - Coastal habitats
- Restore and manage acquired lands to maximize ecosystem function and carbon sequestration. $

The role of Land Trusts

- Link land conservation, wetlands protection, and ecological restoration, through partnerships:
  - Government and nonprofit land protection organizations
  - Local Conservation Commissions
  - State Division of Ecological Restoration
- Encourage/assist Conservation Commissions in the strict application of:
  1) avoidance of wetlands alteration;
  2) mitigation/replication requirements; and
  3) respect for hydrology
- Monitor, long-term, land trust properties and associated wetland sites to ensure the biodiversity and ecosystem processes (including carbon, water, and nutrient cycling) and wetland functions are maintained. $

The role of Land Trusts

Secure funding support for these climate system and ecosystem-directed actions

Question (on your next grant application): "For what purposes will awarded funds be used?"

Answer: "To protect and restore biodiversity and ecological processes, draw down carbon from the atmosphere and reverse global warming."

Biodiversity for a Livable Climate

Restoring Ecosystems to Reverse Global Warming

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