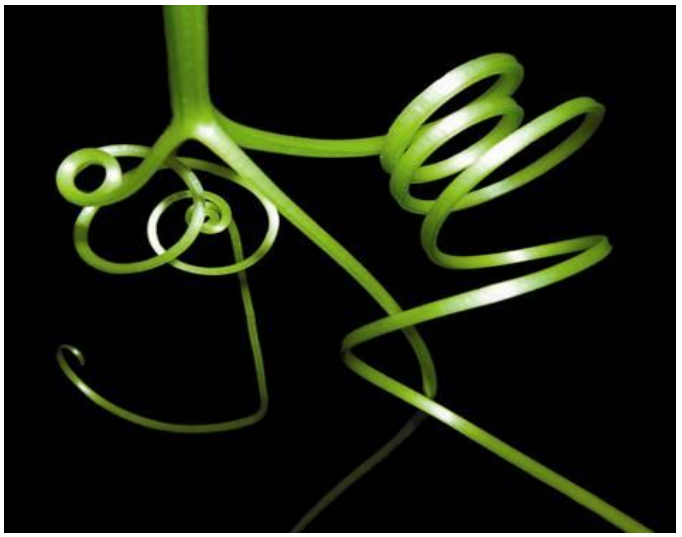
Land Trusts: On the Front Lines of Nature-Based Solutions to the Climate Crisis

for an Earth Restored -
Carbon Rich, Wet and Wild

Sharon McGregor
Biodiversity for a Livable Climate
www.bio4climate.org



“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

***Paris climate agreement*:**

- 195 nations
- 9 major decisions focused on emissions reductions
  - Affirmed goal of limiting global temperature increase well below 2 degrees Celsius
  - Binding commitments by all parties to make Nationally Determined Contributions of emissions reductions
- 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

Where we stand…

Solutions

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

- Emissions reductions
- Renewable energy development
- Energy efficiencies

add in “The 4 per 1000 Plan”

Defined:

Launched by France

25 countries

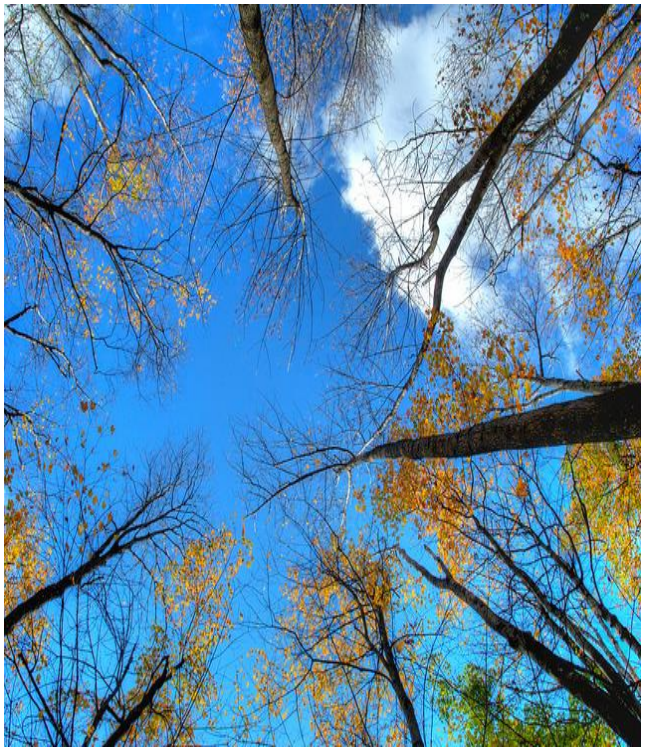
The voluntary pledge of a 0.4 percent annual growth rate in soil carbon content, through carbon farming practices.

Carbon is 58% of organic matter in soil, central to soil fertility and water holding capacity.

Photosynthesis drives the draw down of atmospheric carbon.

The world’s cultivated soils have lost between 50 and 70% of their original carbon stores.

But what do we do about the CO2 levels in the atmosphere, the "legacy" carbon, which, though stabilized, will continue to drive climate change?



Absent from climate discussions/actions:

the power of biology to draw down

"legacy" carbon

We harness this power of biology at the continental, regional and local scales by:

(1) Restoring nature
(2) Protecting the nature that remains

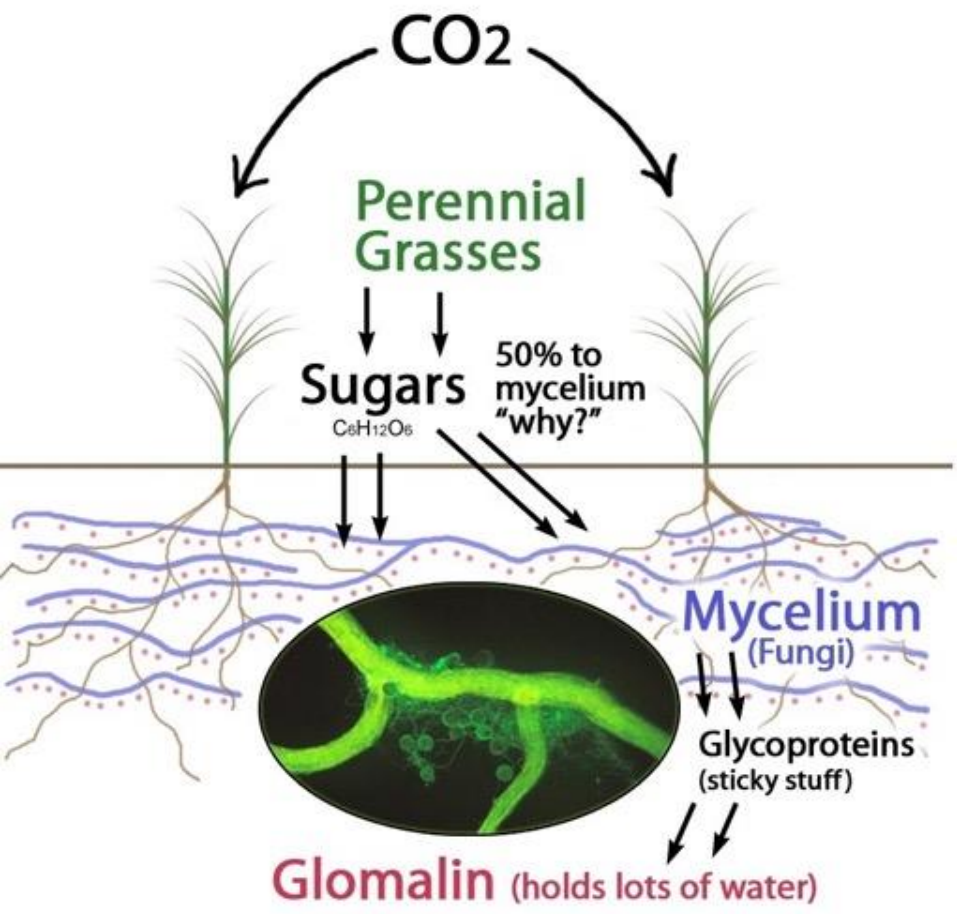
…to *reverse* climate change, not just moderate it.

The power of biology explained

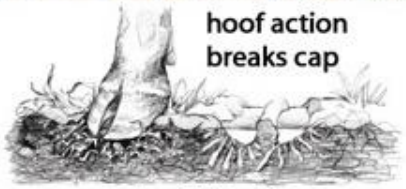
Two categories of restoration action needed:

1. Restore *ecosystems* that are primary carbon sinks (5 types)
2. Restore *small water cycles*

Make Soil - End Global Warming



Mega Herds of Buffalo
or
well-timed pulsed grazing of livestock



Animal Impact Enriches Soil

water infiltration

dung

urine

Carbon Farmers in Vermont

Dung beetles bury tons of manure several feet deep.

Humus
(carbon rich "bug poop")

Jim Laurie, jimlaurie7@gmail.com,781-698-9746
http://www.planet-tech.com | http://groups.google.com/group/soil-age

The *power of biology* explained

For any ecosystem, including grasslands…

Restoration =

healthy carbon, water, and nutrient cycles

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

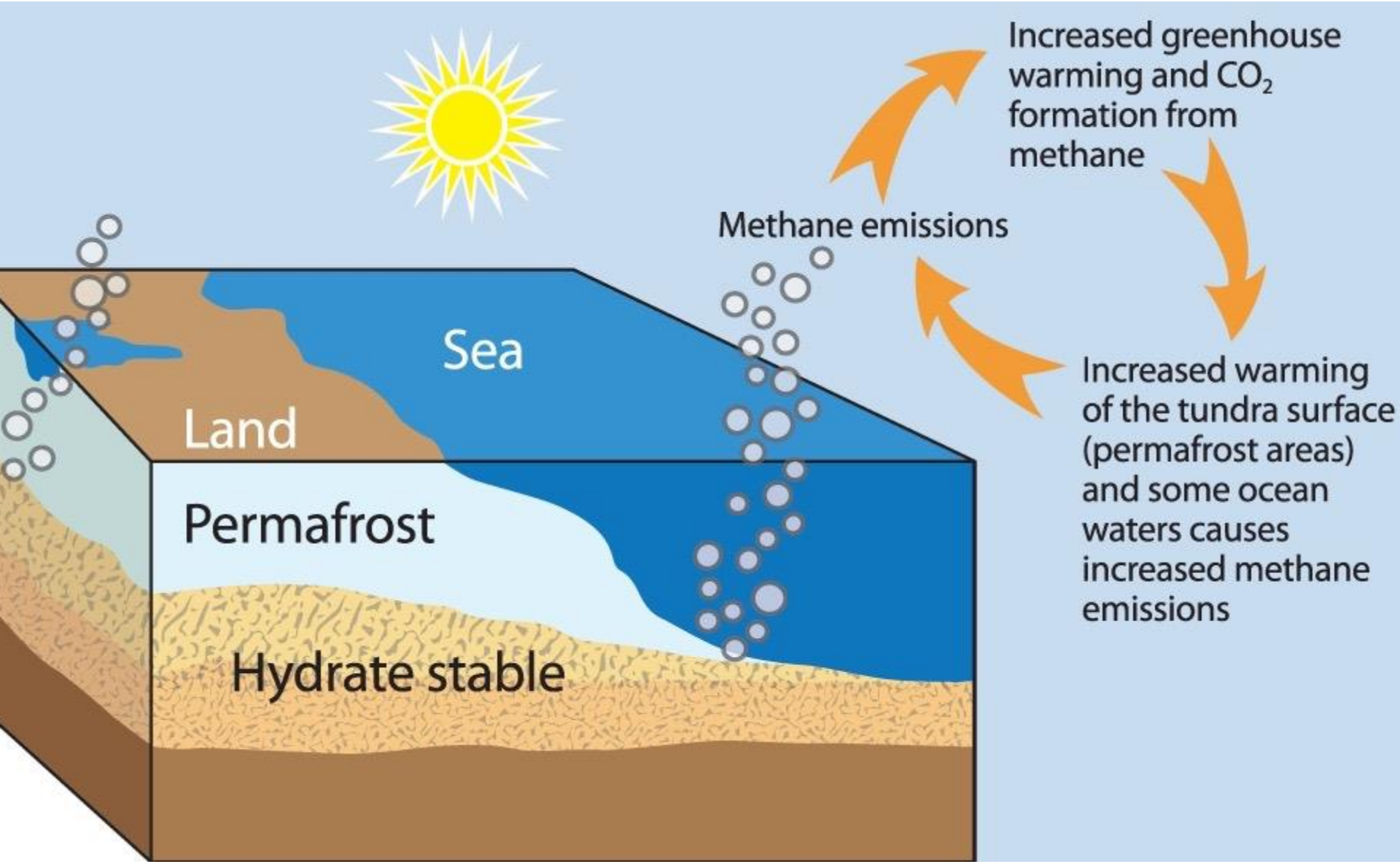
Pick your habitat to re-establish and make healthy again, and there will be –

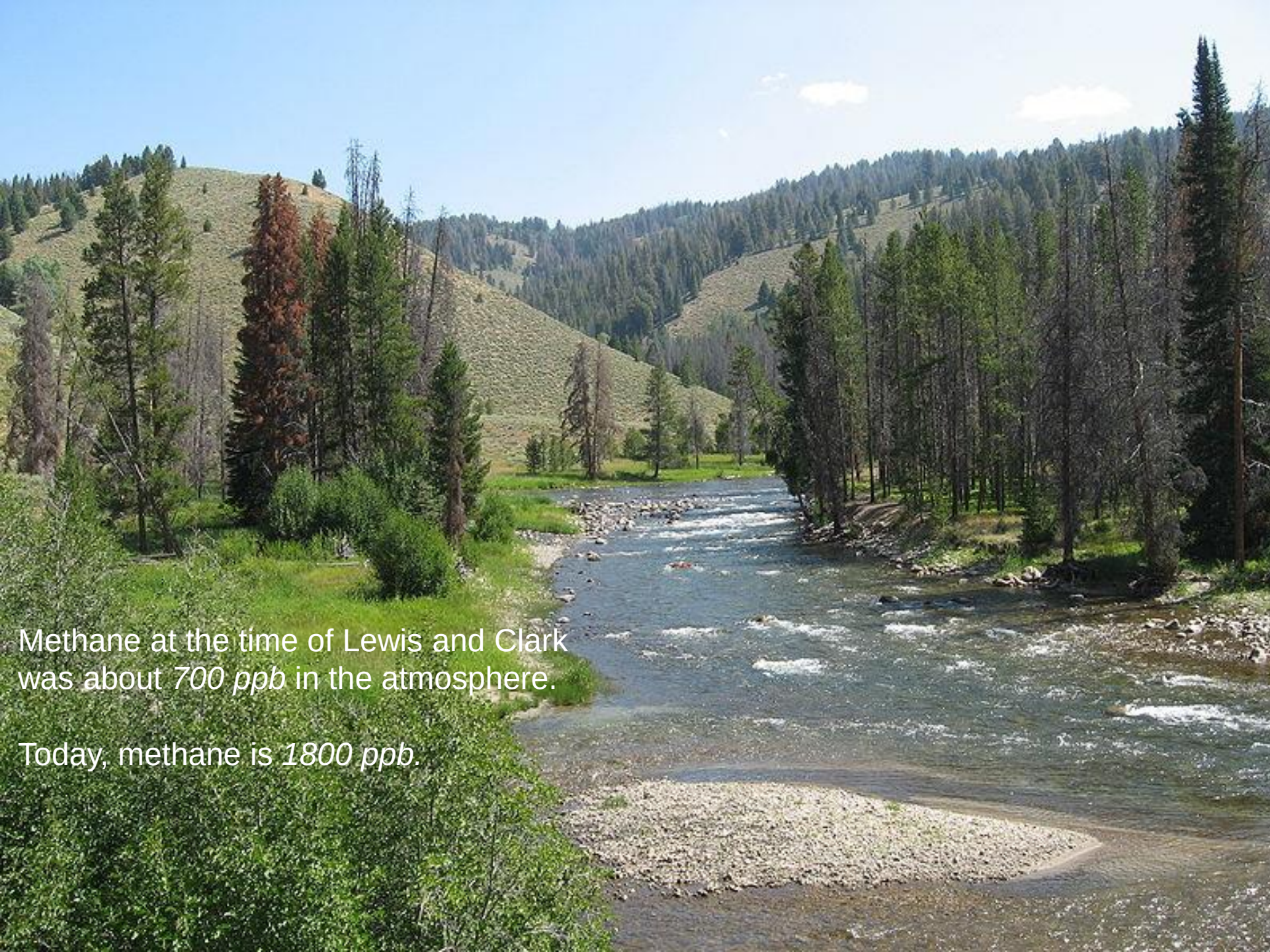
- soil biology
- water cycle
- Keystone species/predator-prey relationships
- photosynthetic processes

that need to be restored.

The key ingredient in the “recipe” for restoring high carbon sink habitats is water.

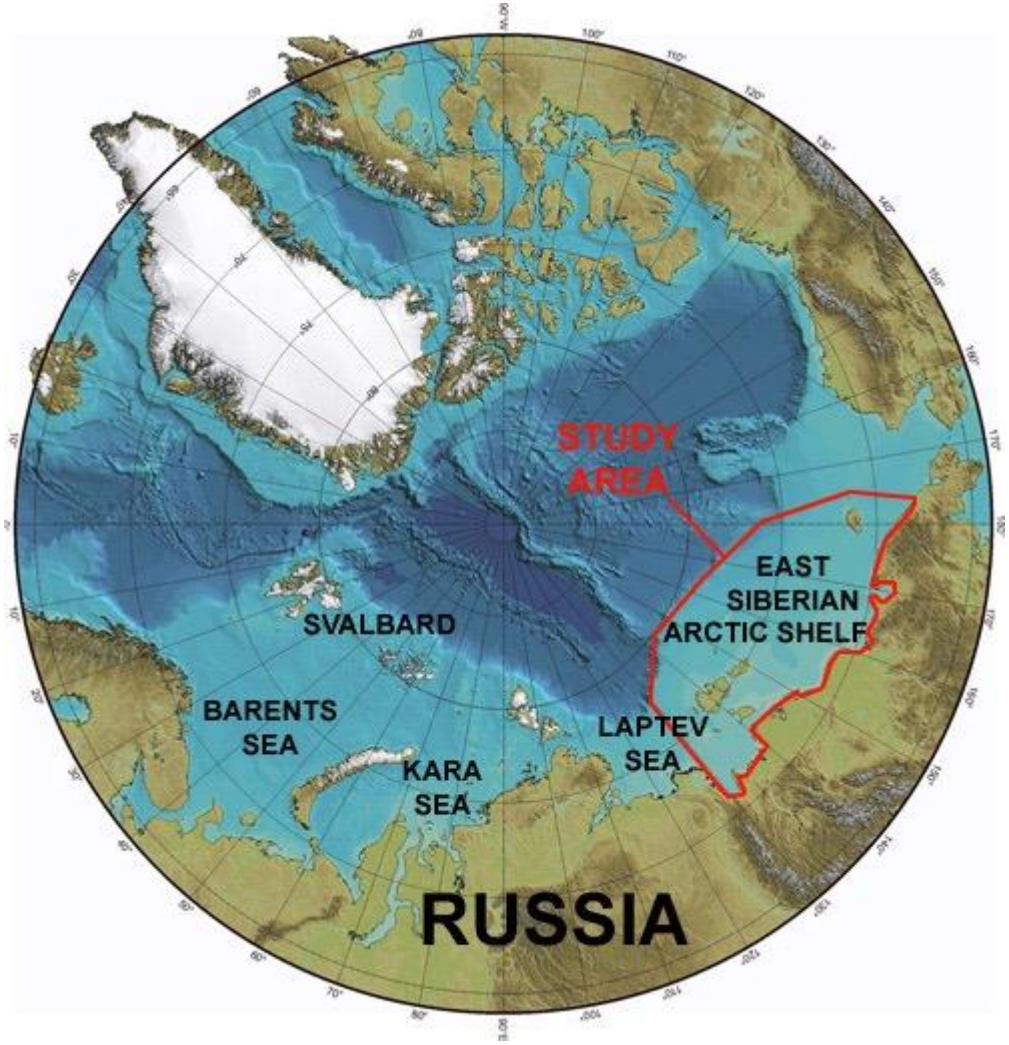
Water, or more precisely, the water cycle, figures prominently in reversal of climate change.

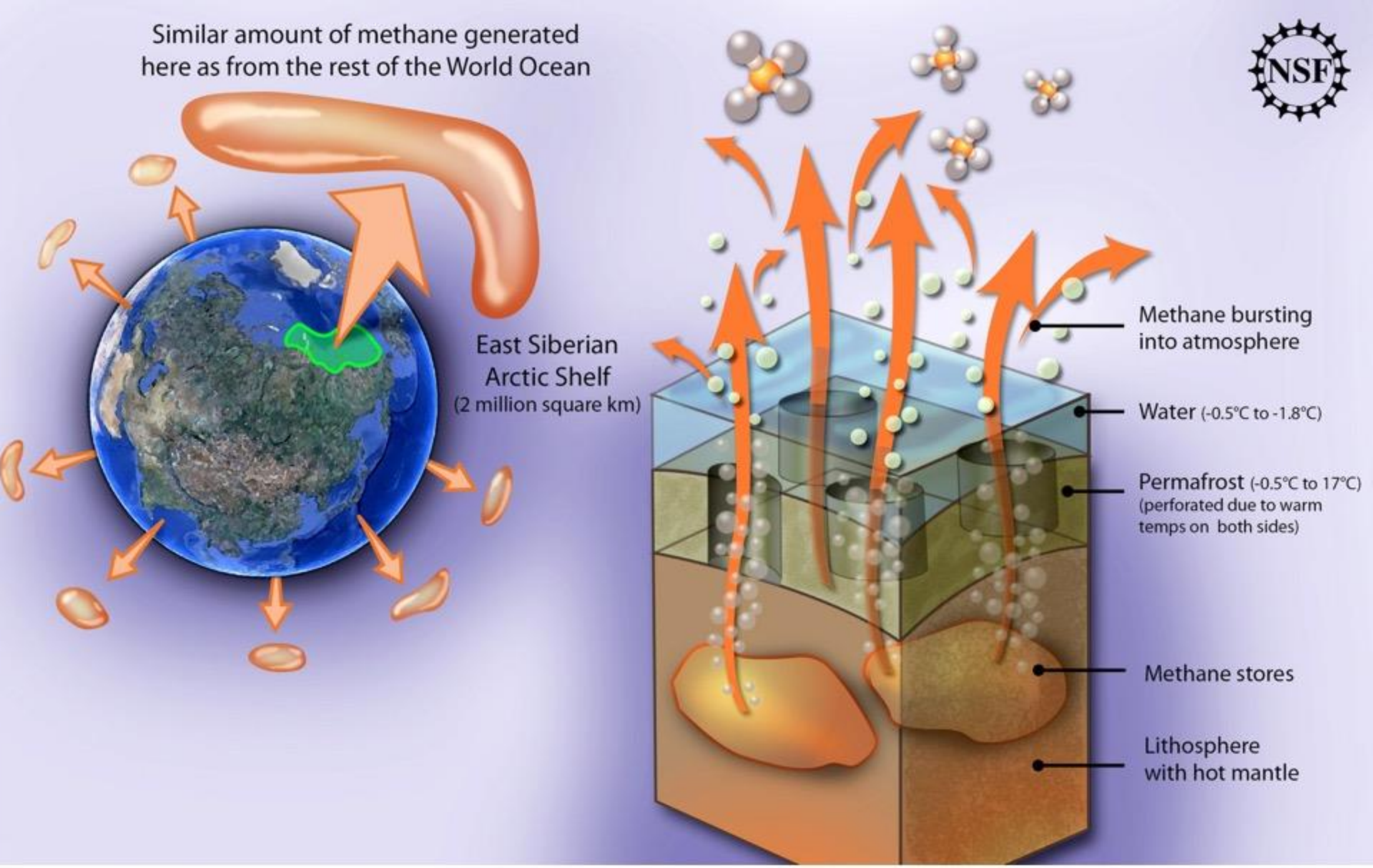

Increased greenhouse warming and CO_2 formation from methane
Methane emissions
Increased warming of the tundra surface (permafrost areas) and some ocean waters causes increased methane emissions
Sea
Land
Permafrost
Hydrate stable



Methane at the time of Lewis and Clark was about *700 ppb* in the atmosphere.

Today, methane is *1800 ppb*.


STUDY AREA
EAST SIBERIAN ARCTIC SHELF
SVALBARD
BARENTS SEA
KARA SEA
LAPTEV SEA
RUSSIA



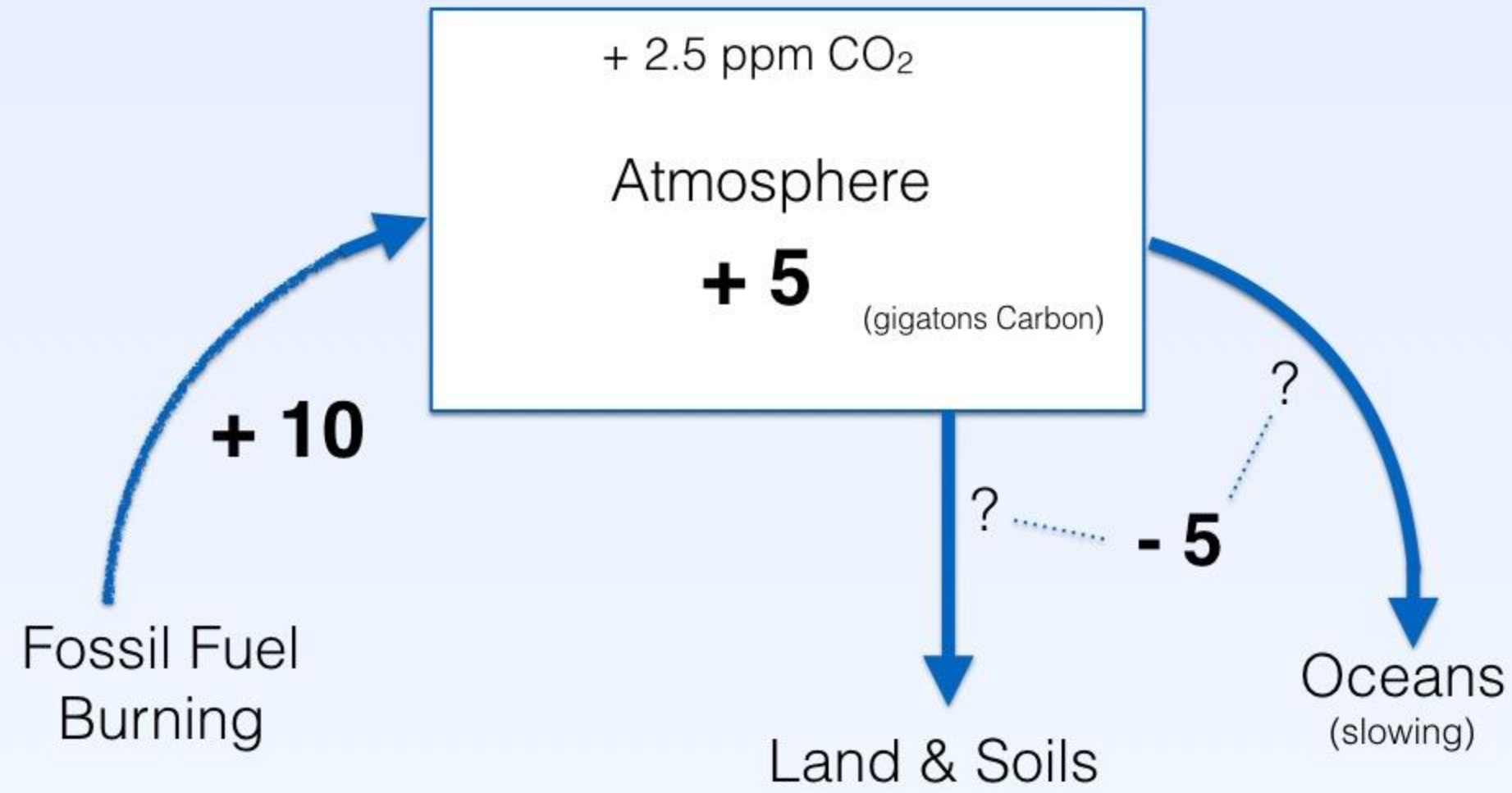
he permafrost of the East Siberian Arctic Shelf (an area of about 2 million kilometers squared) is more porous than previously thought. The ocean on top of it and the heat from the antle below it warm it and make it perforated like Swiss cheese. This allows methane gas stored under it under pressure to burst into the atmosphere. The amount leaking from this cale is comparable to all the methane from the rest of the world's oceans put together. Methane is a greenhouse gas more than 30 times more potent than carbon dioxide.
na Deretsky, National Science Foundation

The East Siberian Arctic Shelf: towards further assessment of permafrost-related methane fluxes and role of sea ice
Natalia Shakhova, Igor Semiletov et al.
The East Siberian Arctic Shelf: towards further assessment of permafrost-related methane fluxes and role of sea ice. Published 7 September 2015.DOI: 10.1098/rsta.2014.0451

What we have in 2017.

(407 ppm CO_2)

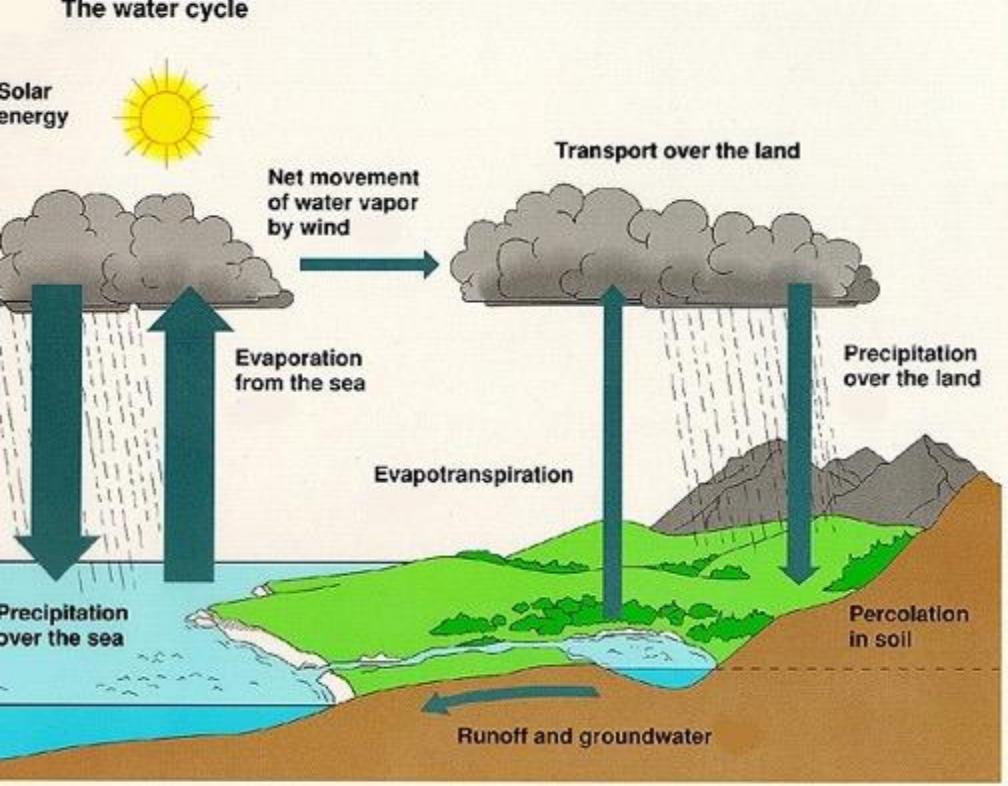
(1 ppm atmospheric CO2 contains ~ 2 gigatons of carbon)



EARTH's SITUATION IN 2017 IS CRITICAL

- Atmospheric CO_2 407 ppm
- Rising temperatures (2016 now the warmest year on record)
- Weather extremes, severe storms on the rise
- Major extinction in progress (loss of biodiversity)
- Soil erosion > 75 billion tons annually
- Land desiccation and fires (water tables dropping)
- 400 Dead Zones (anoxic regions) in the ocean
- Coral reefs bleaching and dying around the world
- Arctic Ocean almost free of summer ice

Not to worry…



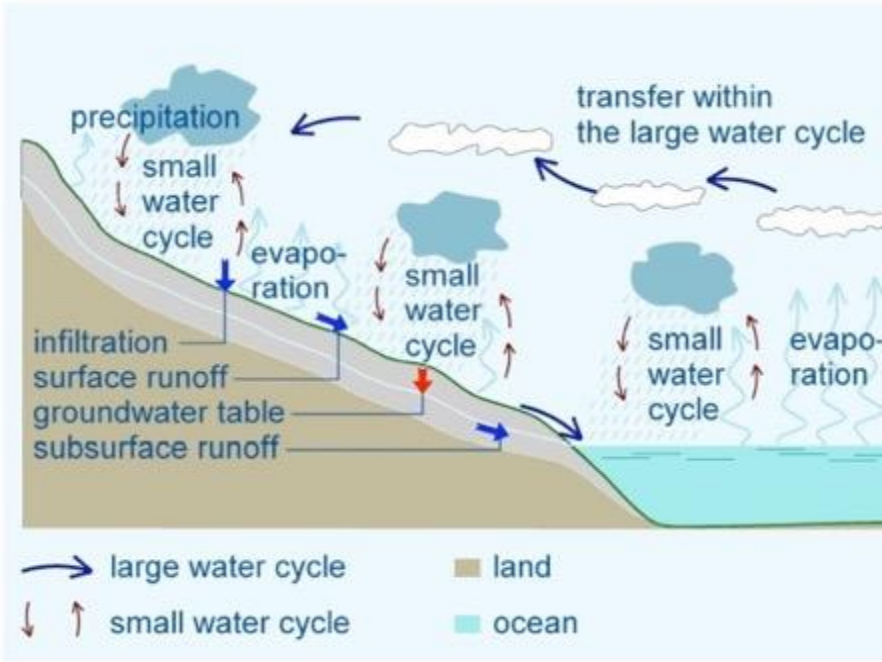


Fig. 1 **The large and small water cycles on land**

Water for the Recovery
of the Climate
- A New Water Paradigm

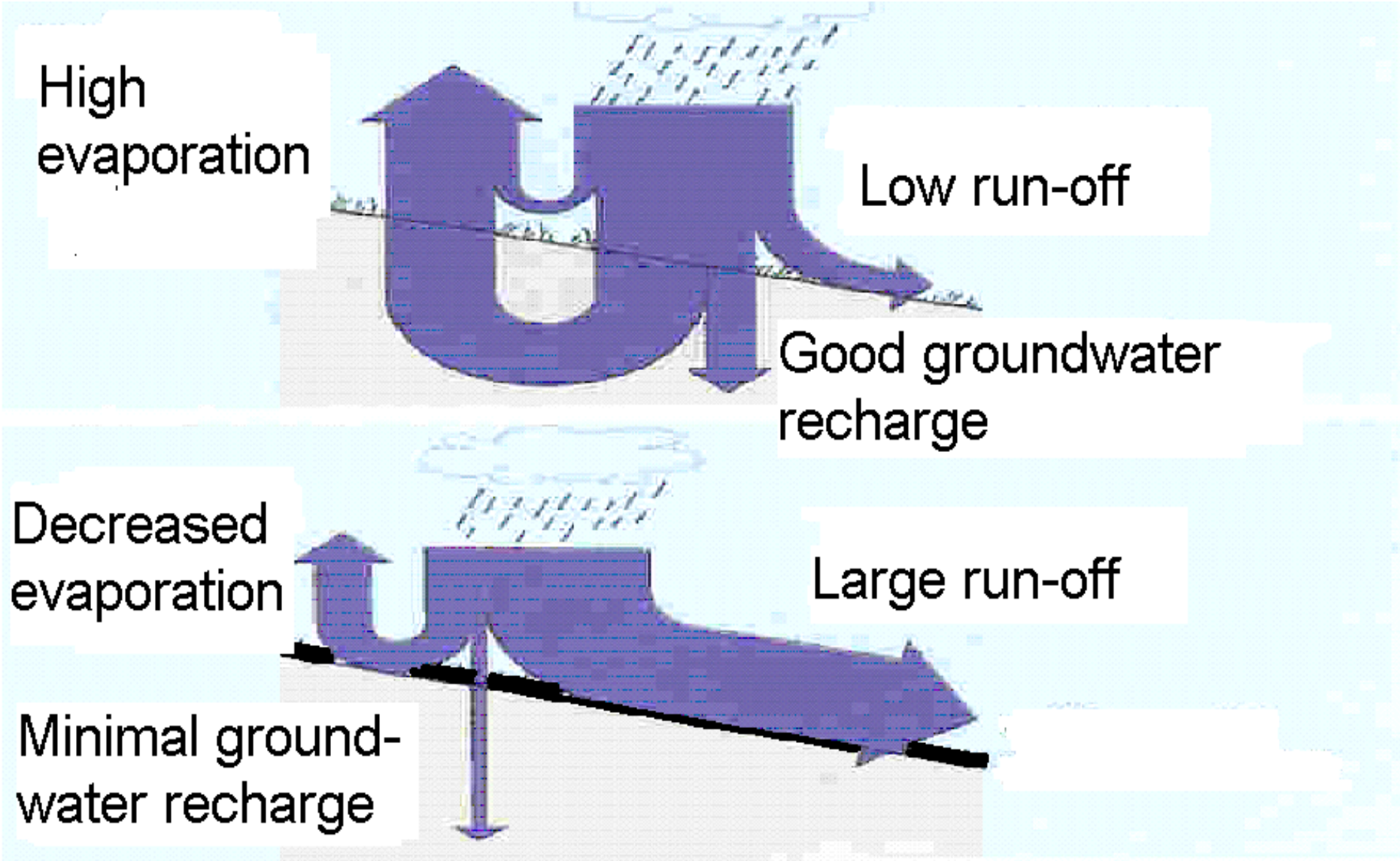
by M.Kravčík, J.Pokorný, J.Kohutiar,
M.Kováč, E.Tóth

Michal Kravčík - Slovakia

Causes of the loss of small water cycles

- destruction of native landscapes -- on house lots and other development sites, including trees and native plants with invaluable evapotranspiration function;
- excavation of native soils -- for sale to nurseries, etc. and replacement with biologically impoverished, invasive-seed infested, non-native soils that can't absorb water (the water just runs off to streams and rivers rather than recharge soils and groundwater);
- sewering of densely developed lands -- which returns water to the environment great distances from the source;
- chemical fertilizer and pesticide application -- that destroys soil biology, notably the Mycorrhizal fungi network that has a 10-fold or higher water absorption rate over soils without healthy microfungi;
- historic loss of beavers as keystone species -- now returning in abundance to MA, helping us to weather drought;
- loss of wetlands in terms of acreage and/or function.

NEW WATER PARADIGM MANAGEMENT



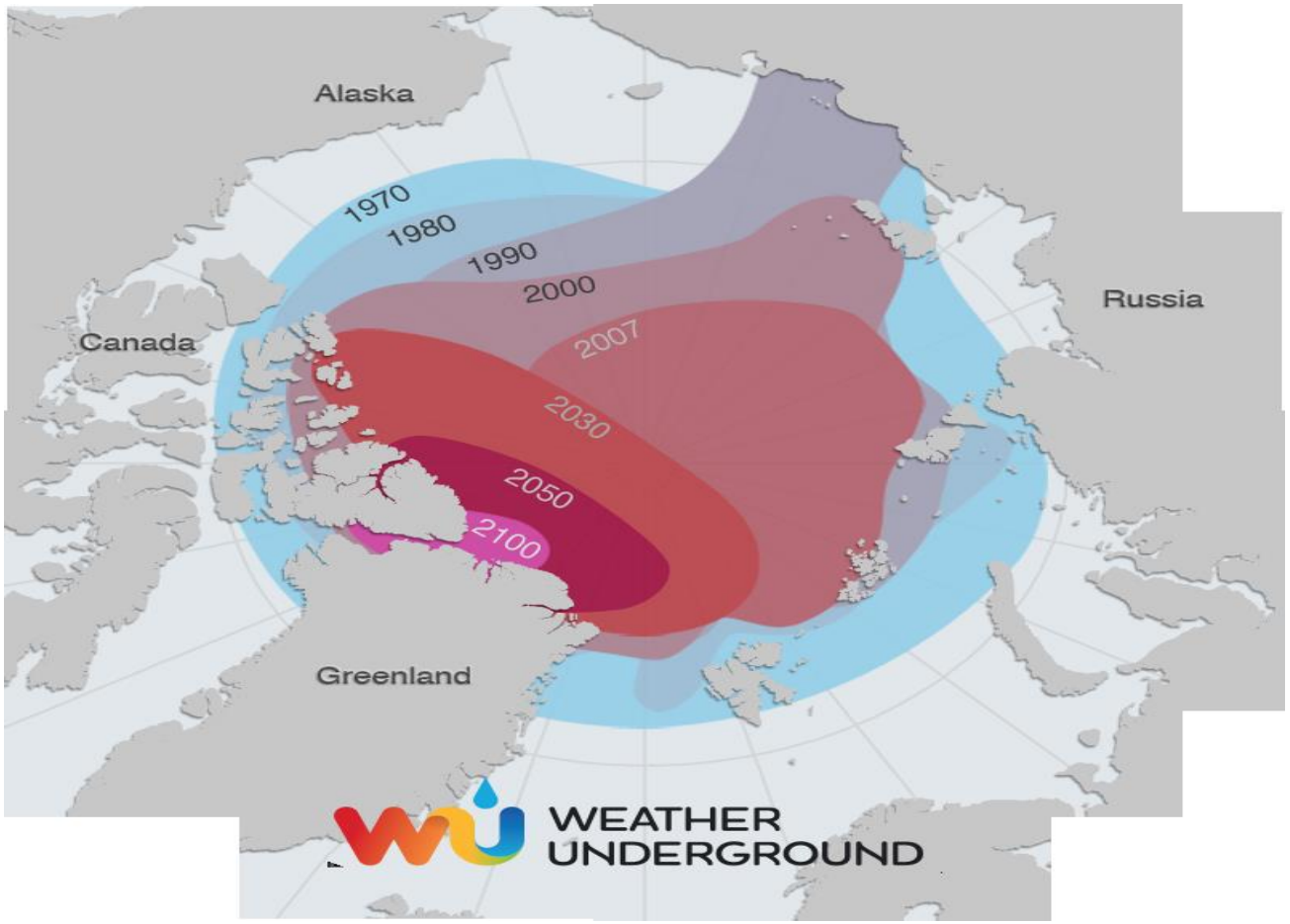
If we rehydrate the continents, we can restore

our climate!

Carbon follows the water…

Azolla
(Water Fern)
created soils
25 feet deep
which became
the permafrost

In present time, a well hydrated and vegetated earth can cool the climate and regrow ice in the Arctic, setting us back on course for a "Just Right" planet again.



We humans evolved in an ice age; now we are in a desiccation age. Without **biodiversity** – in the soils and throughout the Biosphere -- the land can't hold water. Without **water retention** on the landscape, we can't sustain *healthy photosynthesizing vegetation* and the attendant **carbon drawdown**, evapotranspiration, and nutrient cycling that sustain *us*.

Carbon follows the Water that follows the Biodiversity.

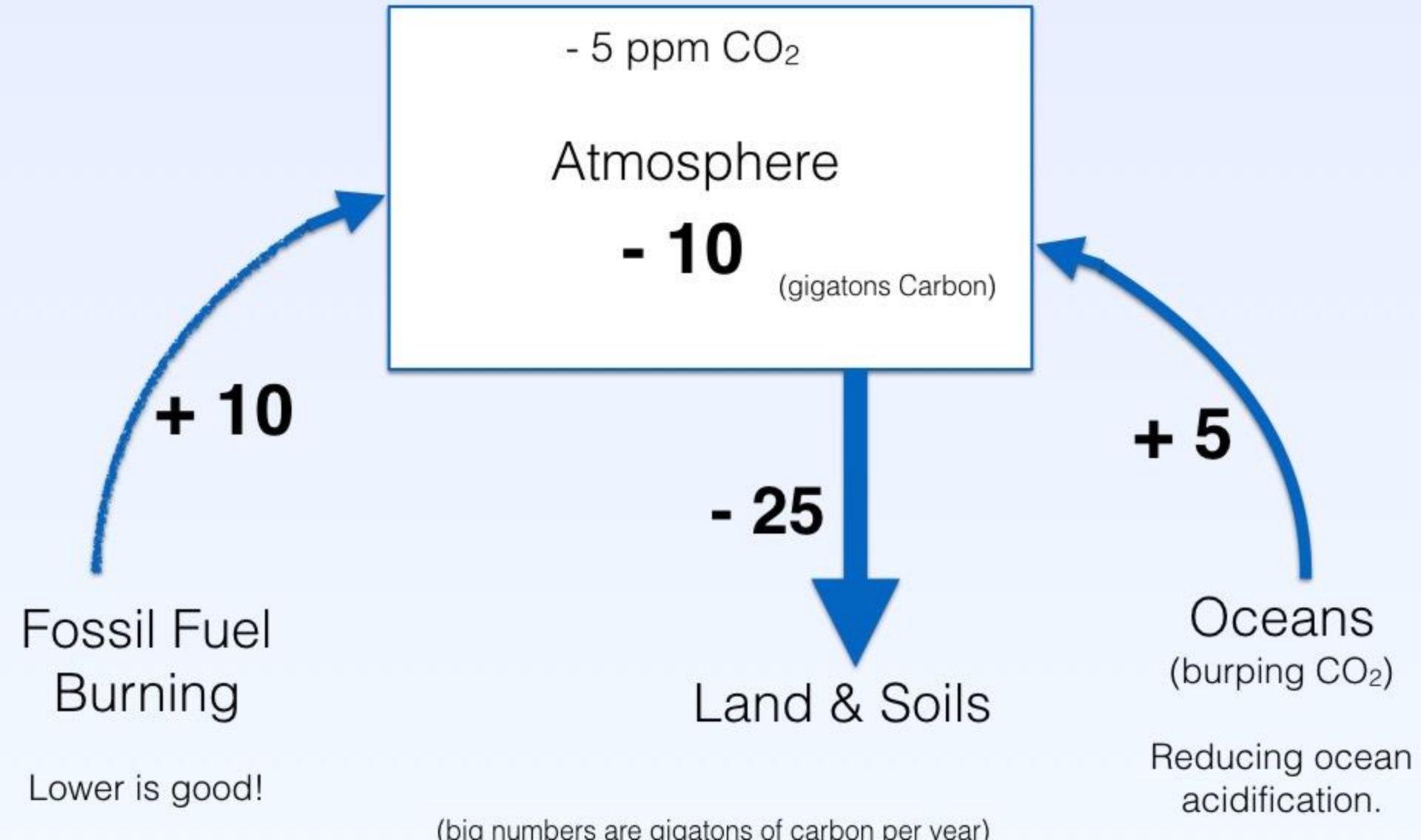
Without biodiversity we can't restore our climate.

Road Map to 300 - Several Pathways.

Ecosystem Land Type	Billions of Acres	Yearly Carbon Capture (tons/acre)	Billion Tons (per year)
Grasslands - Deserts	10	1	10
Regenerative Farms Permaculture	5	2	10
Forests	5	2	10
Wetlands	2	8	16
Living Shorelines (Rising Sea Levels)	1	4	4
Arctic Permafrost (Azolla and Grazing Herds)	1	2	2
Total	24		52 GT C

Goal: 300 ppm CO_2 by 2061

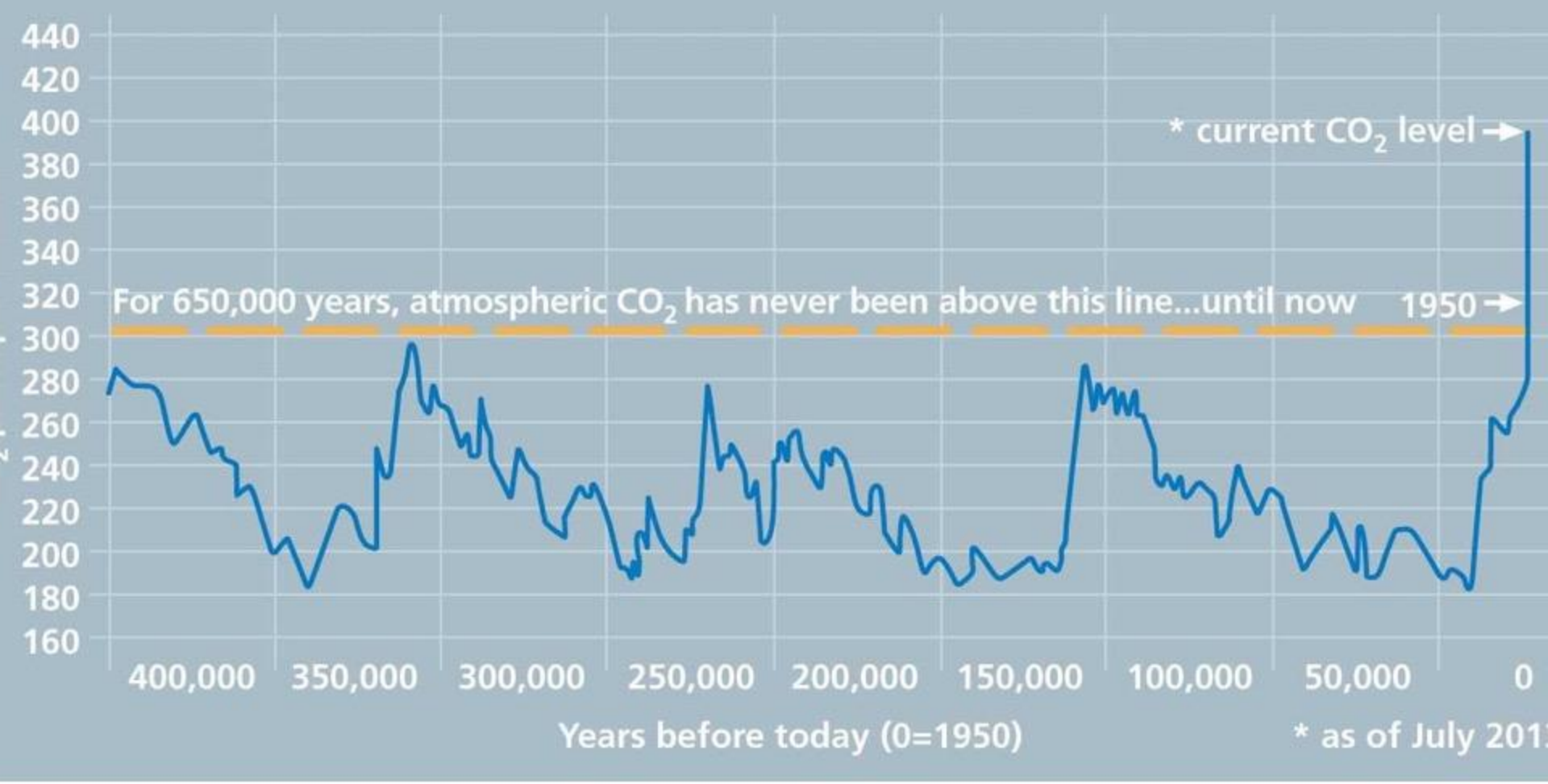
(1 ppm atmospheric CO2 contains ~ 2 gigatons of carbon)



(big numbers are gigatons of carbon per year)

Scenario 300 Step Up - 4 Decades

Decade	Fossil Fuels (gt / yr)	Land Use (gt / yr)	Oceans (gt / yr)	Net Total (gt /yr)	Decade Total (gigatons)	Decade Total (ppm CO_2)	Atmospheric CO_2 - End of Decade
2019	10	-5	-3	2	x	x	410 ppm
2020's	10	-10	-2	-2	-20	-10	400 ppm
2030's	10	-15	1 burps begin	-4	-40	-20	380 ppm
2040's	10	-20	3	-7	-70	-35	345 ppm
2050's	10	-25	5 acidity down	-10	-100	-50	295 ppm
2061	World Celebrations Watching the Comet in July Where now? 300? 280? 260?						New Goal Decision



- 300 ppm 1st Time in 650,000 years.
- 400 ppm Now - 1st Time in ~ 2 million years?
- 500 ppm by 2061? (the year of Halley's Comet)
- 600 ppm by 2100?
- 200 ppm How long ago?

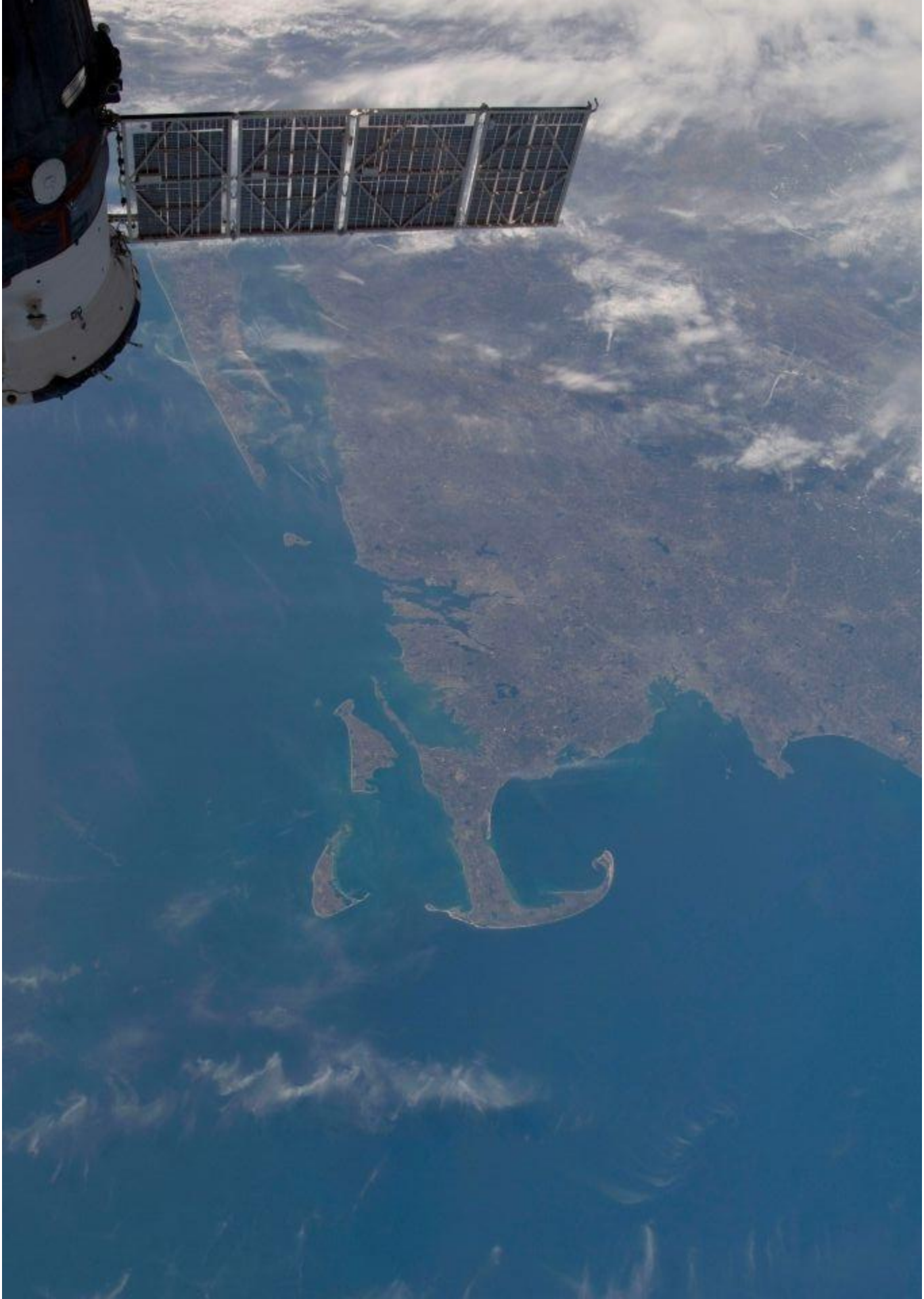
Which shall we choose?

Scenario 500: "Business as usual" will take us to CO_2 levels exceeding 500 ppm by the return of Haley's Comet in 2061.

Scenario 300: "Nature's potential realized" through protection of intact ecosystems, ecological restoration of lost/damaged ecosystems, water retention on the landscape and recovery of small water cycles.

Scenario 300 - 300 ppm by 2061 will cool the continents & eventually the oceans.

1. **The Big Picture** - Danger in the Arctic. Cool the planet through biodiversity and symbiosis.
2. **Grasslands** – Reverse desertification with grazing herds, perennials, & deep soils.
3. **Freshwater Systems** - Return Beaver w/ Trout, Salmon, & Freshwater Mussels. Clean water in wetlands and other natural systems.
4. **Forests** - Amplify the water cycle. Develop Mycelium networks.
5. **Restorative Agriculture** - Permaculture, regenerative agriculture, agroecology
6. **Salt Water Ecosystems return as the Oceans Rise** - Mangroves, Seagrasses, Corals, Spartina Marshes, Invertebrates, and Forage Fish



Biodiversity for a Livable Climate

Restoring Ecosystems to Reverse Global Warming

Contact

Sharon McGregor

sharon.mcgregor@bio4climate.org

info@bio4climate.org

www.bio4climate.org

Visit us on Facebook,

www.facebook.com/bio4climate/

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)

- 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, rehydrate the landscape, draw down carbon from the atmosphere, and help reverse global warming."

Discussion Points:
A Role/Funding Opportunity for Land Trusts in Healing the Climate

- Potential for land trust lands to increase regenerative/restoration practices (biodiversity/ecosystem restoration, water retention, and carbon drawdown) on farms, forests and wetlands, and to serve as a model for managers of other/adjacent lands (multiplier benefit)
- Agricultural Soils bill filed by Rep. Paul Schmid will assist in regenerative agriculture practices on land trust properties: *House 3713*.
- Land trusts current $ for land acquisition vs. regenerative/restoration practices, compared with desired $ for regenerative/restoration practices?
- As regenerative/restoration practices become more widely recognized as an effective carbon sequestration technique, donors of both program funds and parcels of land will be attracted to land trusts that recognize/utilize the power of biodiversity/ecosystem restoration, water retention and carbon drawdown.
- MLTC/land trust interest to help secure funding for regenerative/restoration practices on land trust lands?
- MLTC partnership with *Biodiversity for a Livable Climate, NOFA* and others in this endeavor

Opportunities for municipalities simultaneously define the town you want to be *and* model climate restoring practices

Understanding that Carbon follows the Water that follows the Biodiversity, consider opportunities in the following primary areas:

- *Protect the biodiversity and ecosystems you have and help them to flourish*
- *Ecological restoration* of high carbon sink habitats
- *Water retention* on the landscape
- *Carbon draw-down* into the soils

Areas where municipal governments and residents can have maximum impact

Town:

- ✓ include nature solutions in the job descriptions of the Planning Director, Conservation and Energy directors, DPW Director, and others;
- ✓ make Earth Removal and Wetlands bylaws the best they can be;
- ✓ adopt a strong, effective Tree Protection bylaw;
- ✓ protect and restore more land (your local “Half Earth”; including with CPA funds directed to protecting and restoring native landscapes);
- ✓ preserve native trees, vegetation, and soils with EVERY action;
- ✓ stop using pesticides, chemical fertilizers on Town lands;
- ✓ as you increase local food production, save meadows for grassland species; and
- ✓ **assess decision points and incorporate biodiversity and ecosystem considerations:**
  - **in ALL Town decisions, including department and board/committee actions, Town Meeting warrant articles, general town administration;**
  - **in all your (residents) decisions.**

Specific to the Conservation Commission (in partnership with land trusts):

- ✓ Preserve remaining natural areas, and their attendant biodiversity, as intact healthy ecosystems -- everywhere possible.
  - Landscaping that seeks to destroy, radically alter, or compromise natural processes and ecosystem function should become a thing of the past.
  - Land management that restores and maintains natural processes and ecosystem function should become the new norm.
- ✓ Maintain vegetation in general.
  - all vegetation, especially old growth trees.
  - Where there are invasives, remove or knock them back as much as possible and replace with natives.
- ✓ Restore high carbon sink habitats (soils, grasslands, forests, wetlands) to healthy ecosystem function.
  - on Town properties at the local scale, link with regional scale;
  - also at the small private property, backyard scales.
- ✓ Restore small water cycles by retaining water on the landscape.