The Science of Natural Climate Solutions

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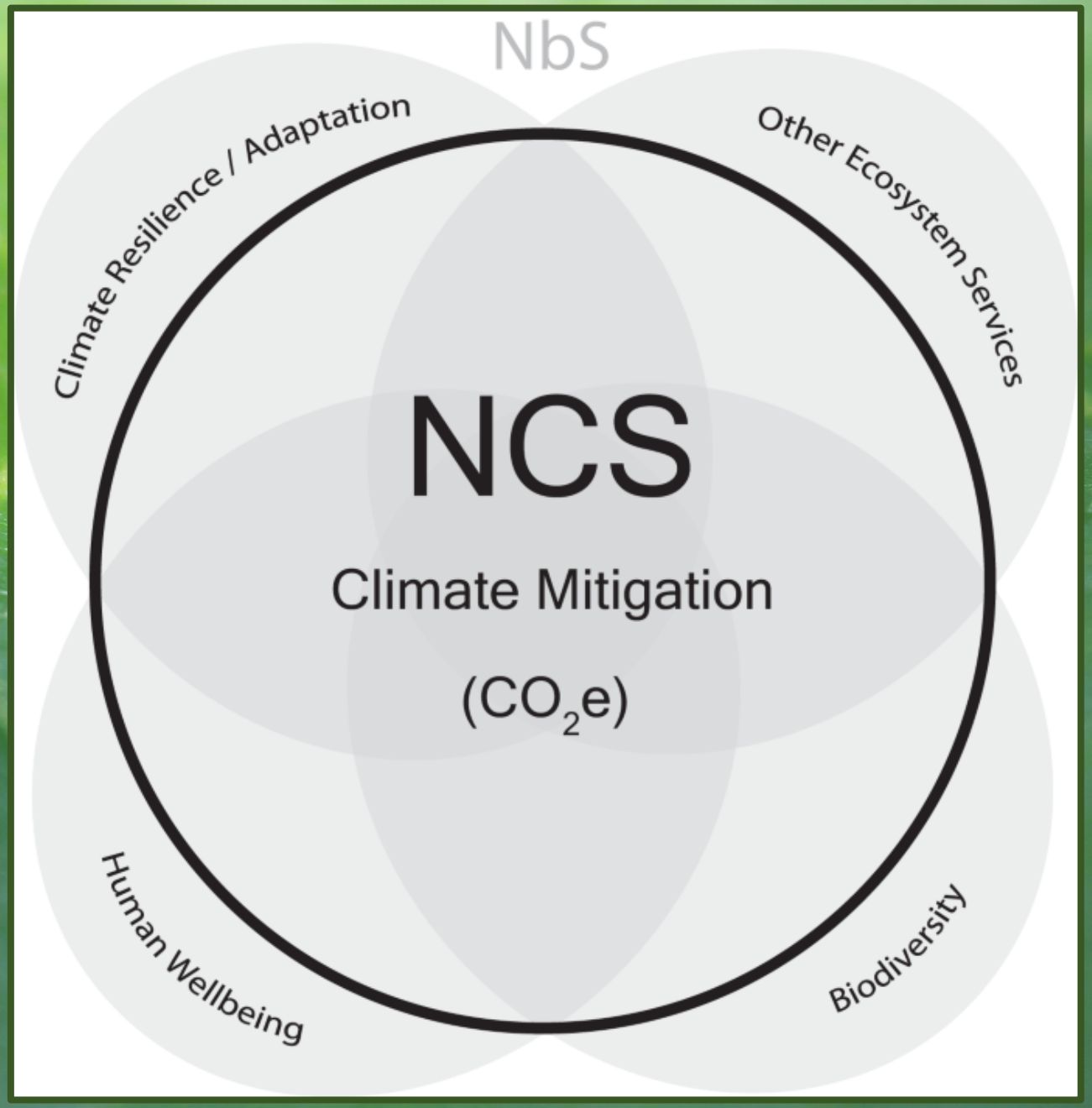
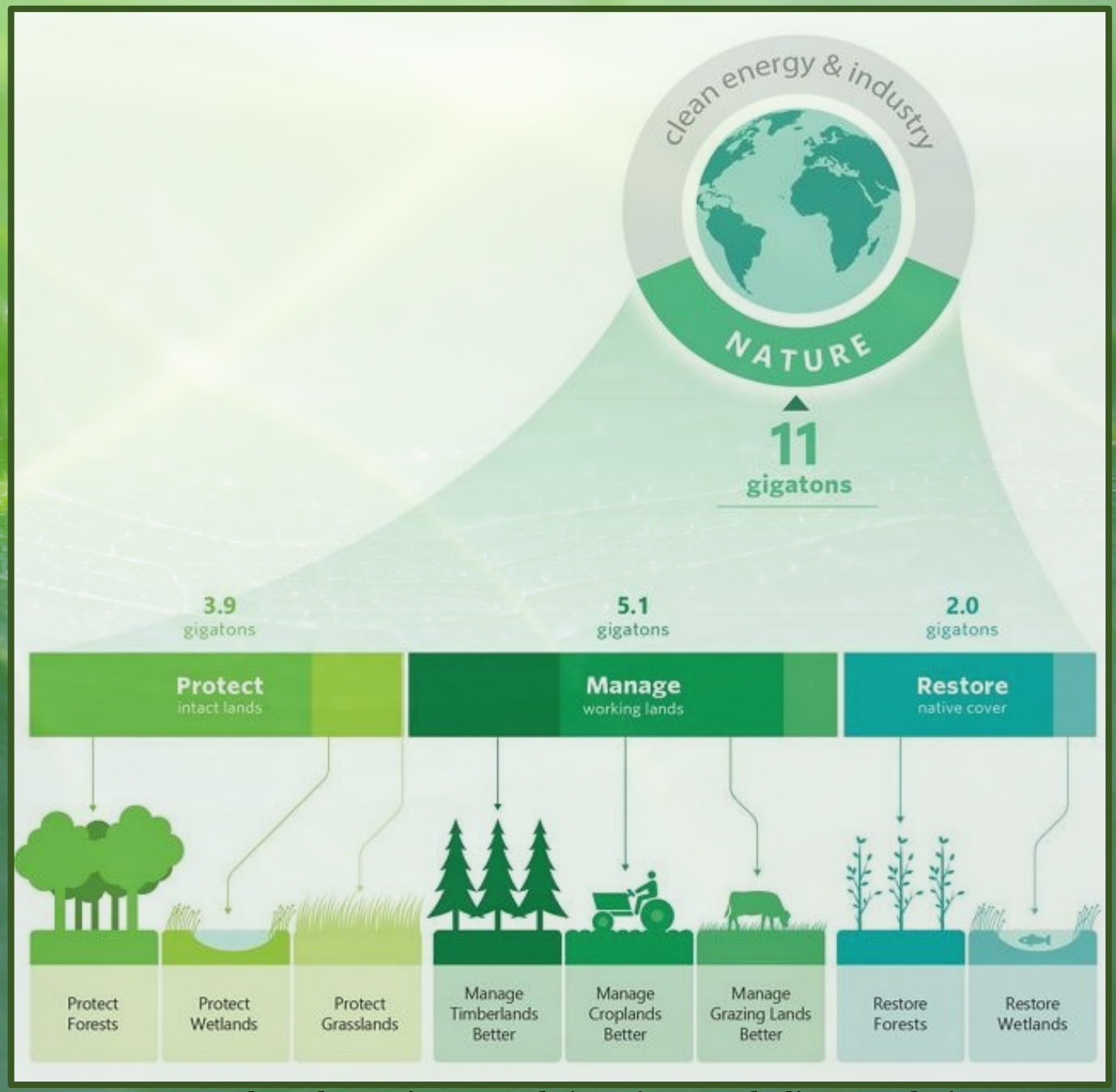
The Nature Conservancy

Natural Climate Solutions are actions to protect, better manage, or restore ecosystems to reduce greenhouse gas emissions and store carbon.



Ellis et al. (2024) The Principles of NCS. Nature Communications.

Natural Climate Solutions can provide globally significant climate mitigation through avoiding emissions or increasing carbon sequestration.



based on Griscom et al. (2017) Natural Climate Solutions. PNAS.

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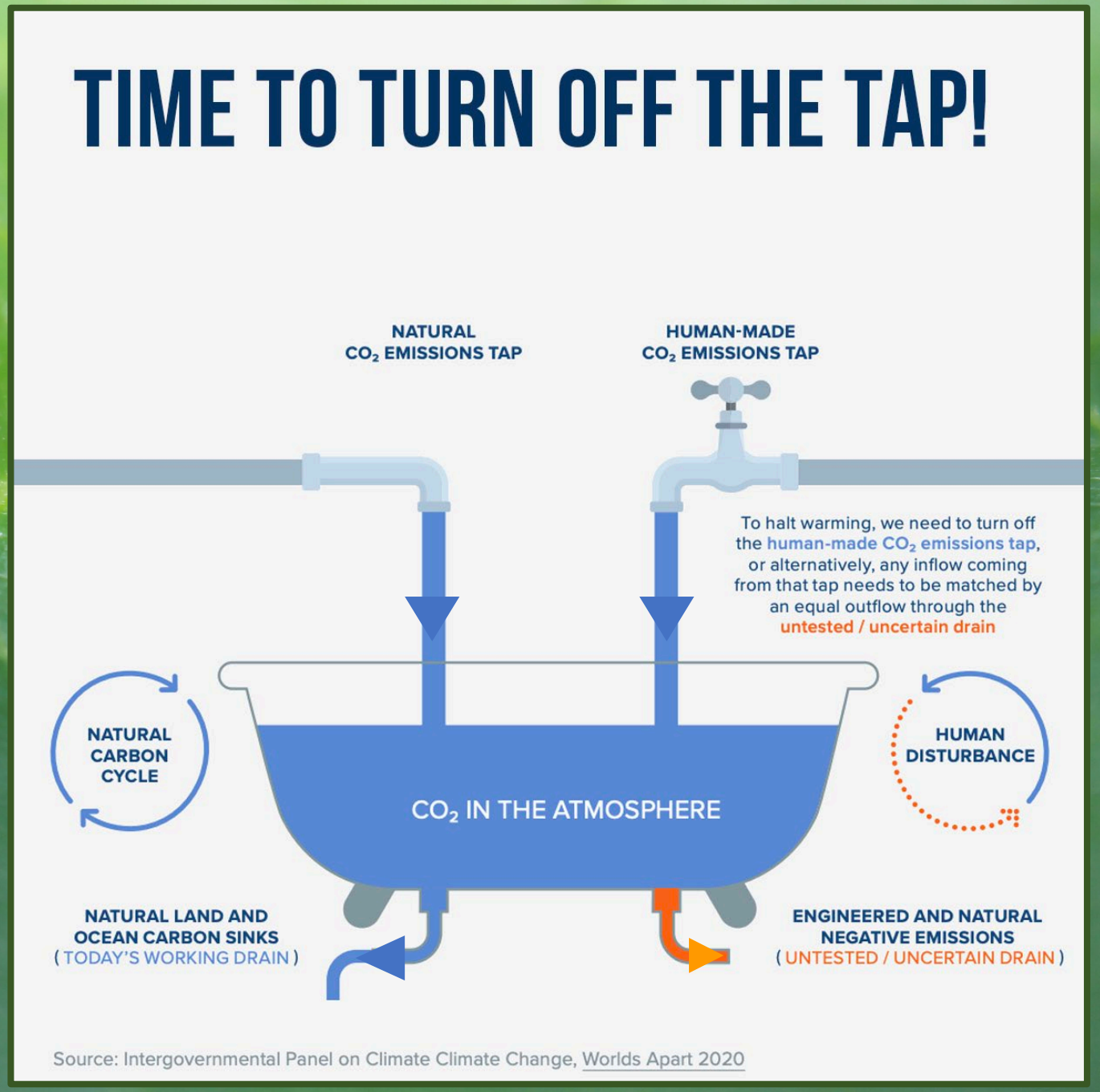
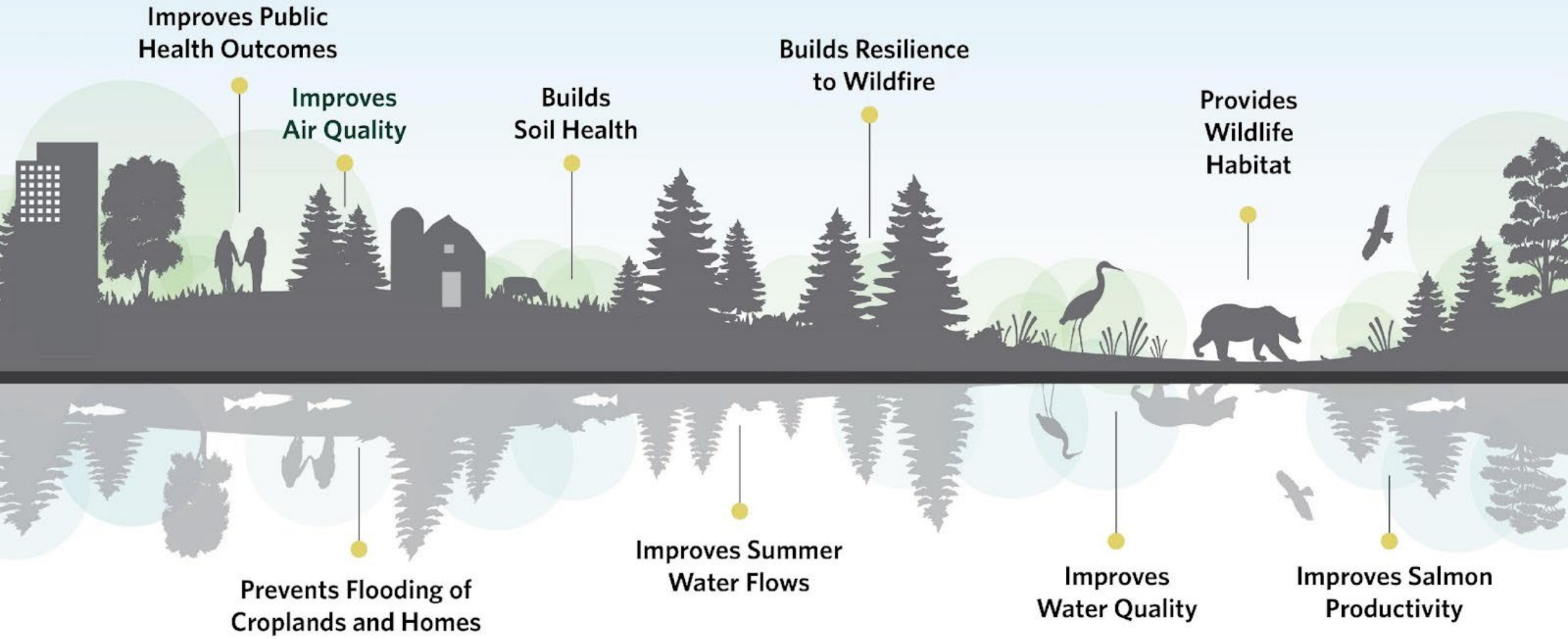


Natural Climate Solutions Co-benefits for People and Nature



Slide credit: Erica Sloniker

Natural Climate Solution implementation scenarios included **avoided conversion, improved land management,** and **restoration activities**.

Three scenarios represented Low, Moderate, and Ambitious changes relative to current baseline.

REDUCE FOREST & GRASSLAND CONVERSION

SAGEBRUSH-STEPPE: INCREASE RESTORATION & REDUCE CONVERSION

INCREASE FOREST HARVEST ROTATIONS

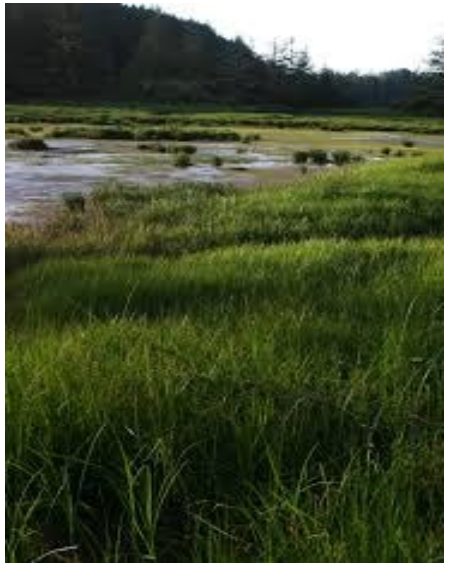
REDUCE N-FERTILIZER EMISSIONS

INCREASE COVER CROP & NO-TILL ACRES

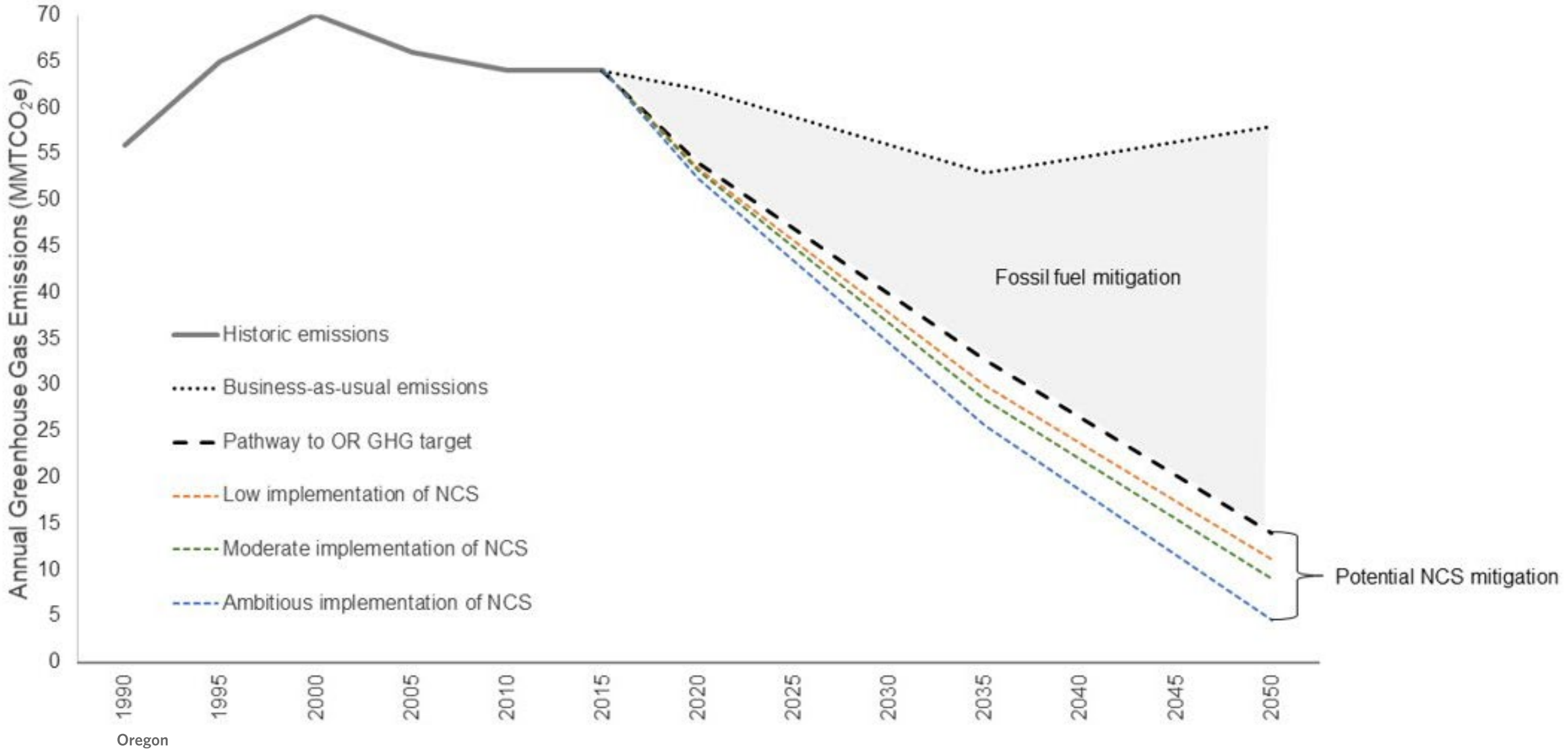
INCREASE RIPARIAN FOREST REPLANTING

INCREASE POST-FIRE REPLANTING ON FEDERAL FORESTS

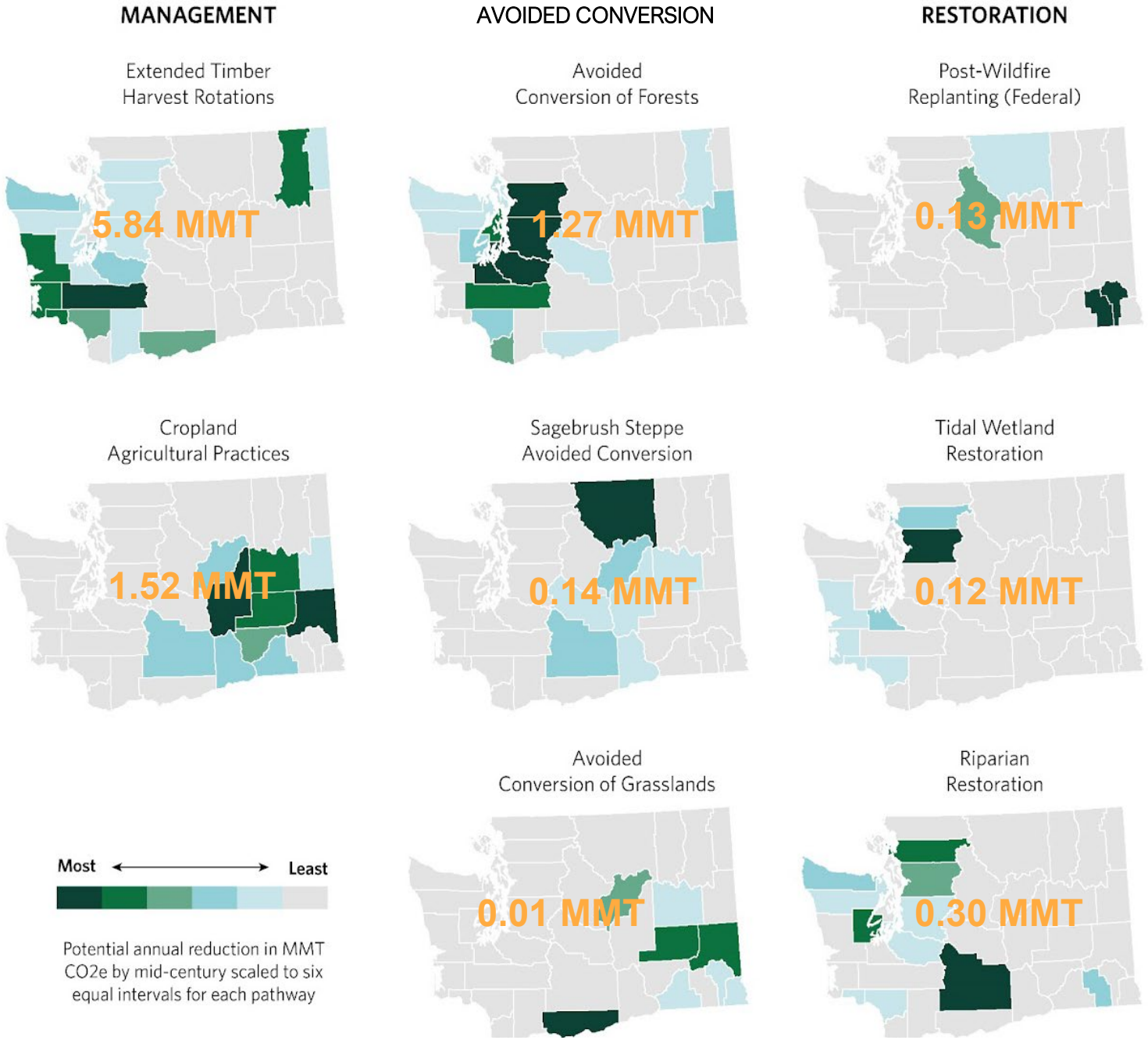
INCREASE TIDAL WETLAND RESTORATION

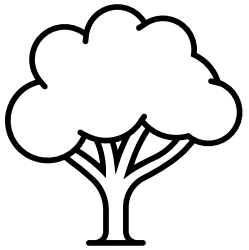


Nature can make a meaningful contribution to greenhouse gas mitigation goals in PNW.



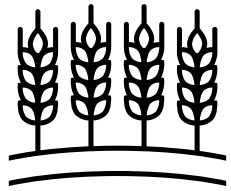
Graves, et al. (2020) Potential greenhouse gas reductions from Natural Climate Solutions in Oregon, USA. PLoS ONE





Forest management, protection, and restoration (including restoration of riparian forest cover) have the highest potential climate mitigation benefits.

Tidal wetland conservation and restoration have high per unit area climate mitigation benefits.



Agriculture and rangeland management practices could provide climate mitigation benefits.

Robertson, et al. (2021) Leveraging the potential of nature to meet net zero GHG emission in WA. PeerJ.

Some terms to know

Carbon Stocks
The absolute amount of carbon stored in a carbon pool at a specific point in time and in a specific area

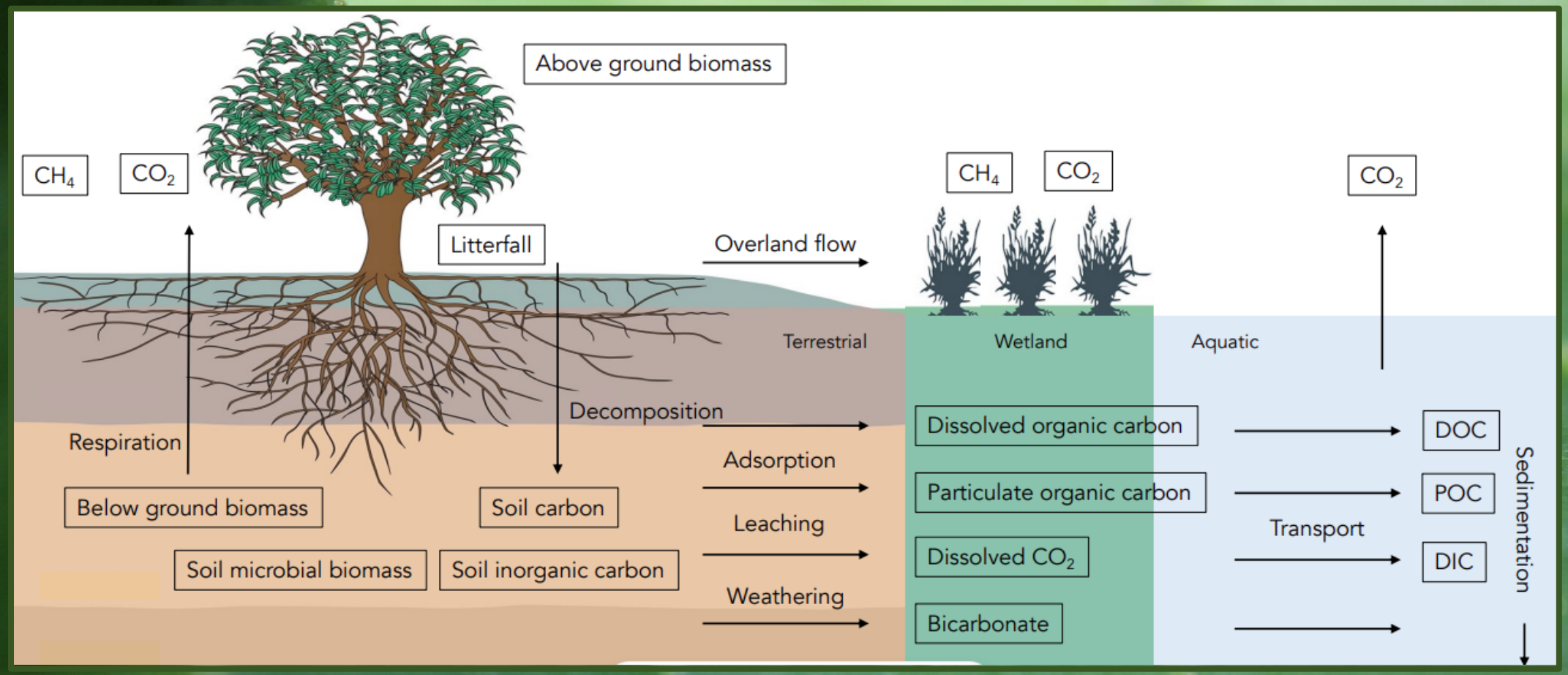
Carbon Sequestration
The process of capturing & storing carbon dioxide (CO_2) in a carbon pool

Greenhouse Gas Flux
The amount of GHG exchanged between different pools at a point in time (CO_2e)

Net Sequestration
The net balance of GHG fluxes at a given time (CO_2e)

Four important dimensions to Natural Climate Solutions

- Quantifying (and conserving) existing carbon stocks
- Measuring (and enhancing) natural carbon sequestration
- Measuring (and reducing) GHG emissions like methane
- Determining how carbon moves among ecosystems (lateral flux)



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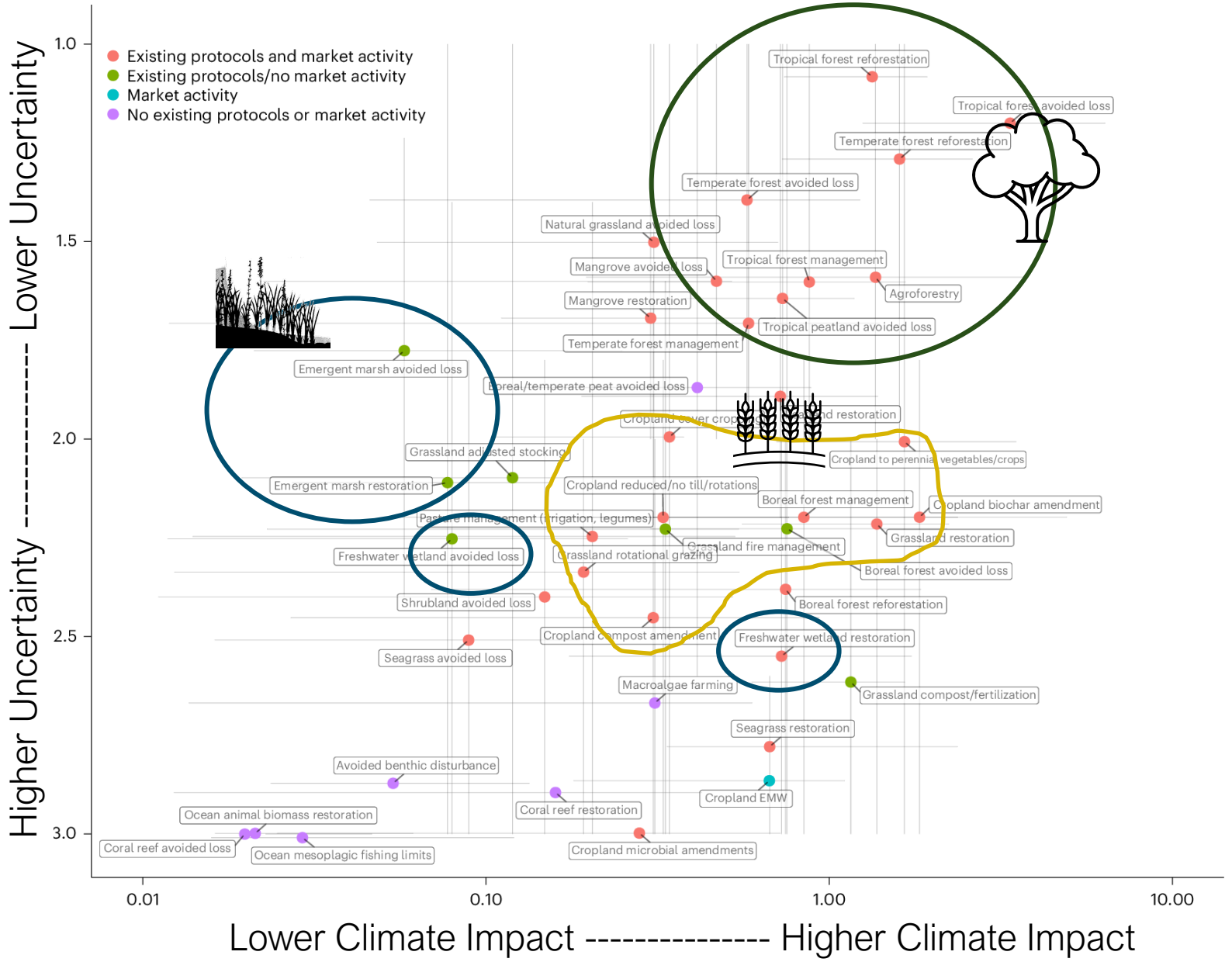
Uncertainty varies among NCS pathways



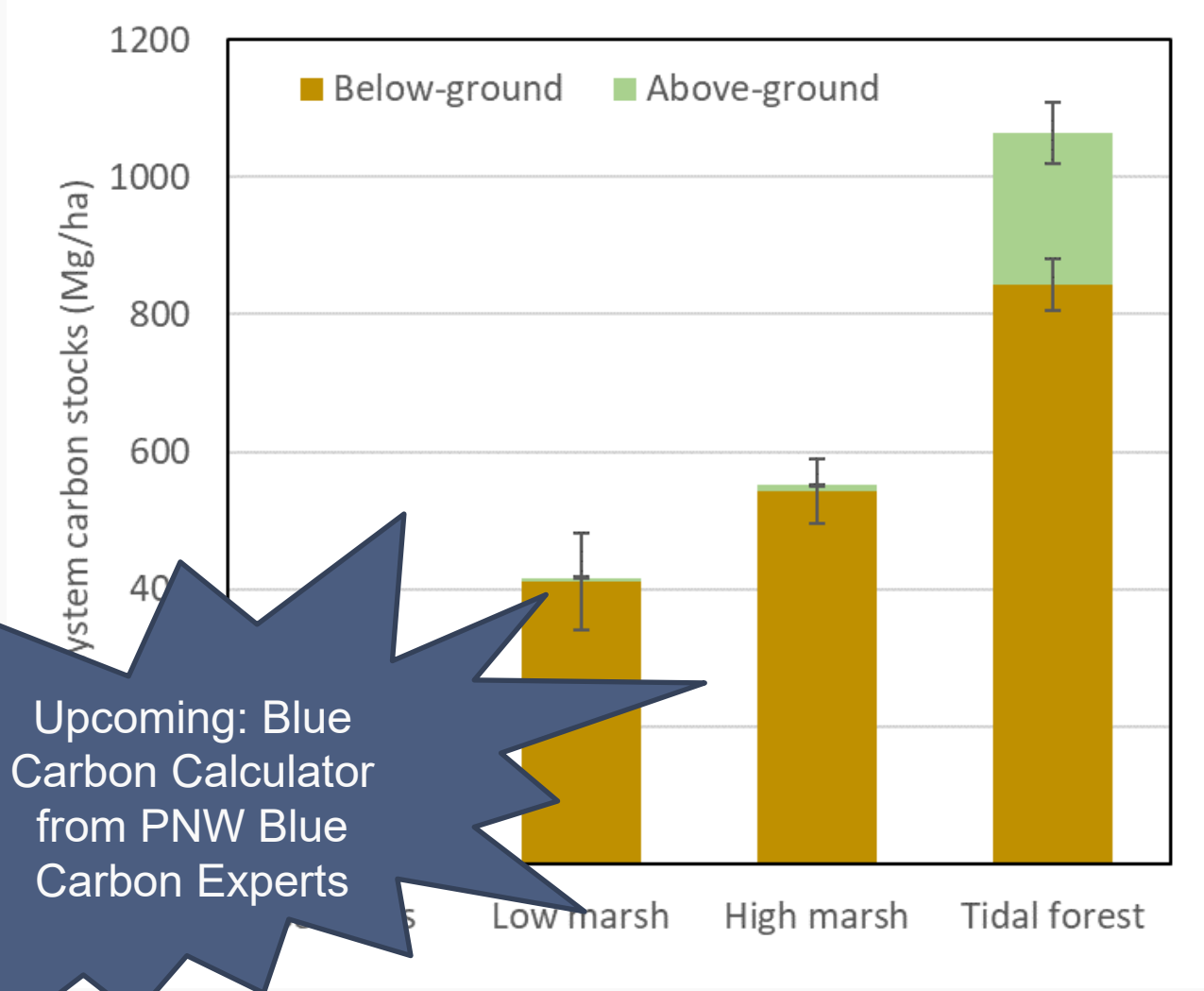
Buma et al. 2024. Expert review of the science underlying nature-based climate solutions. Nature.

What do we know?

- ✓ Natural Climate Solutions provide critical climate mitigation when coupled with reduction of fossil fuel emissions.
- ✓ For some activities, the magnitude of climate mitigation is still uncertain.
- ✓ NCS science is evolving to better understand how these benefits vary by location and over time.

Climate mitigation: Blue Carbon Ecosystems

- Most of the carbon is in the soils.
- Blue carbon ecosystems along the Pacific Coast play an important role in climate regulation.
- Blue carbon ecosystems can have relatively complex and fluctuating GHG exchanges and, depending on their location and management, can be either GHG sinks or sources.



Upcoming: Blue Carbon Calculator from PNW Blue Carbon Experts

Slide credit: C. Janousek

Janousek et al. in prep; Kauffman et al. 2020

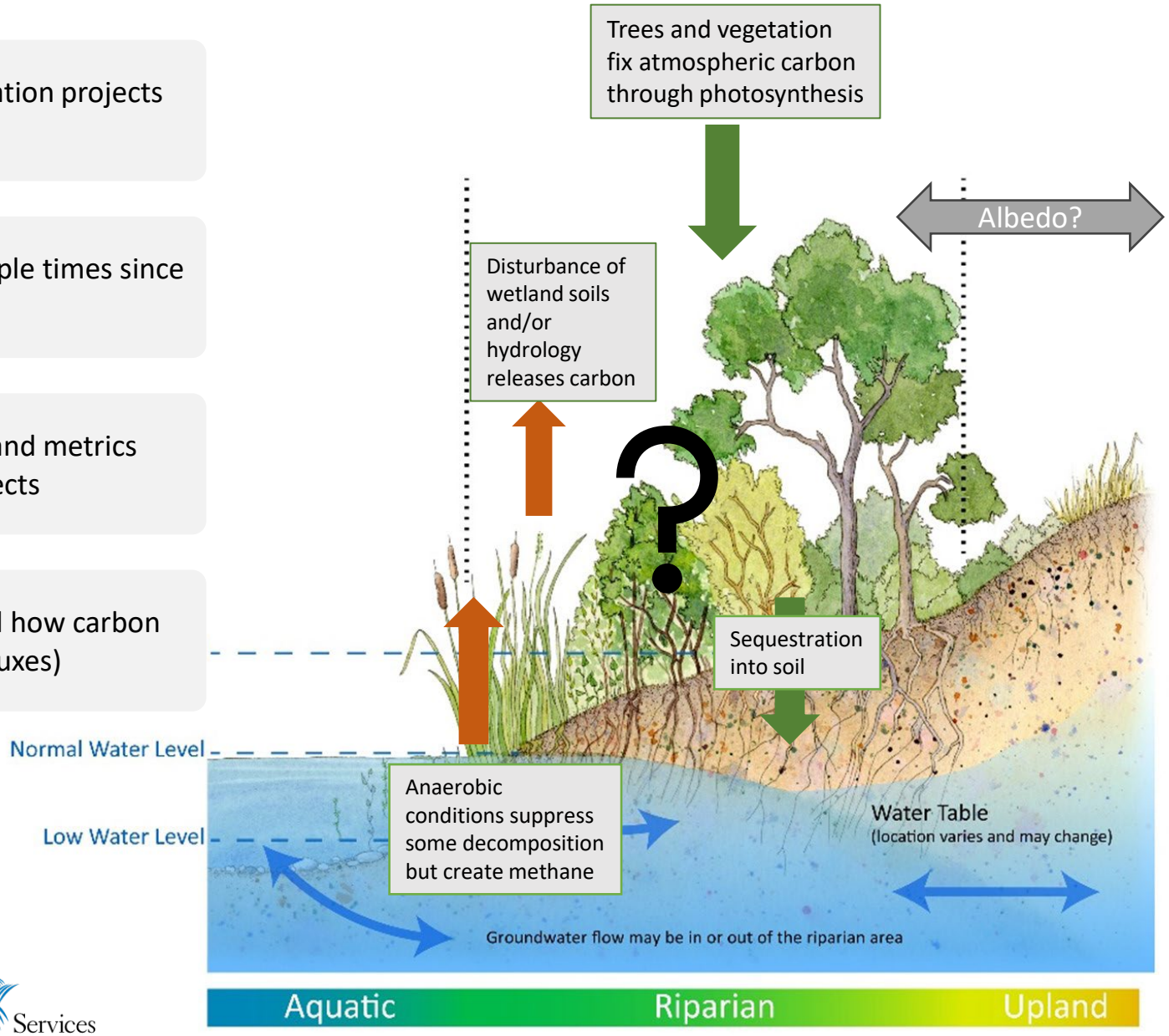
Climate mitigation: Restoration of riparian forest cover

- Potentially large impact

- ☑ Ecological Benefits
- ☑ Adaptation & Resilience
- ☑ Economic Benefits
- ? Climate mitigation

Climate mitigation: Restoration of riparian forest cover

- Data from on-the-ground riparian forest cover restoration projects (~50 sites)
- Evaluate aboveground and soil carbon stocks at multiple times since planting
- Support the development climate mitigation targets and metrics associated with riparian forest cover restoration projects
- Gaps remain regarding GHG emissions (methane) and how carbon moves from riparian systems to other pools (lateral fluxes)



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NCS Practices for Climate Mitigation

Recommended Practices	• Forest Carbon Management • Conservation of riparian forest ecosystems • Restoration of riparian forest ecosystems* • Freshwater wetland conservation • Tidal wetland conservation • Tidal wetland restoration* • Seagrass conservation
Emerging Practices	• Seagrass restoration • Kelp & seaweed protection and restoration • Enhancing tidal wetland resilience to sea level rise*

time, salinity, inundation/flooding frequency are important variables that likely impact the magnitude of climate benefit!

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