

ECOSYSTEMS

Riparian

as models



for restoring our

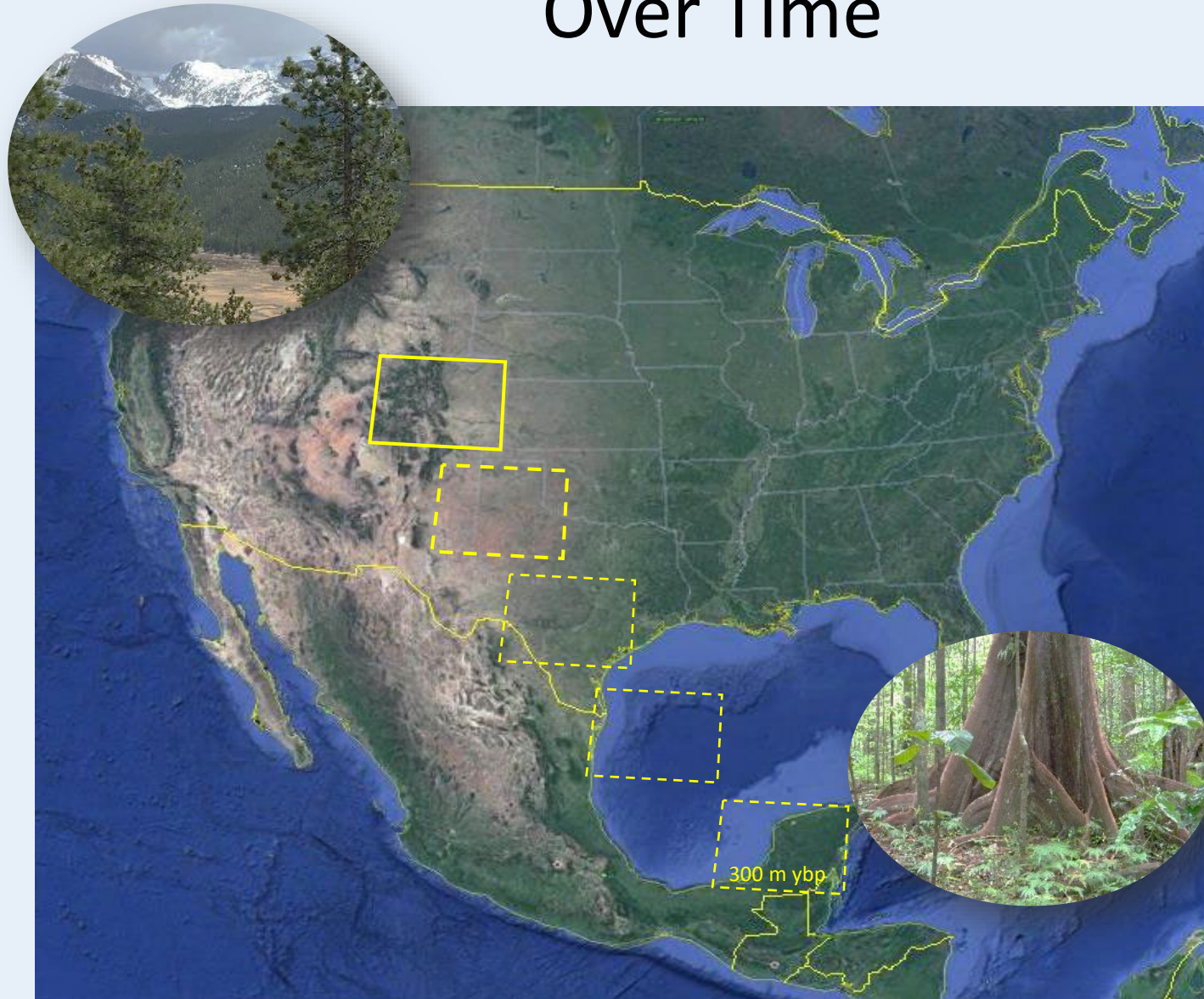
ECONOMIES

Our 21st Century Challenge



*An economy that meets our needs
without jeopardizing the needs of others,
nor the health of the ecosystems we rely upon?*

Ecosystem Resilience & Productivity Over Time



Ice ages came & went

Homo sapiens emerged

Rise of Mammals

Oxygen levels declined

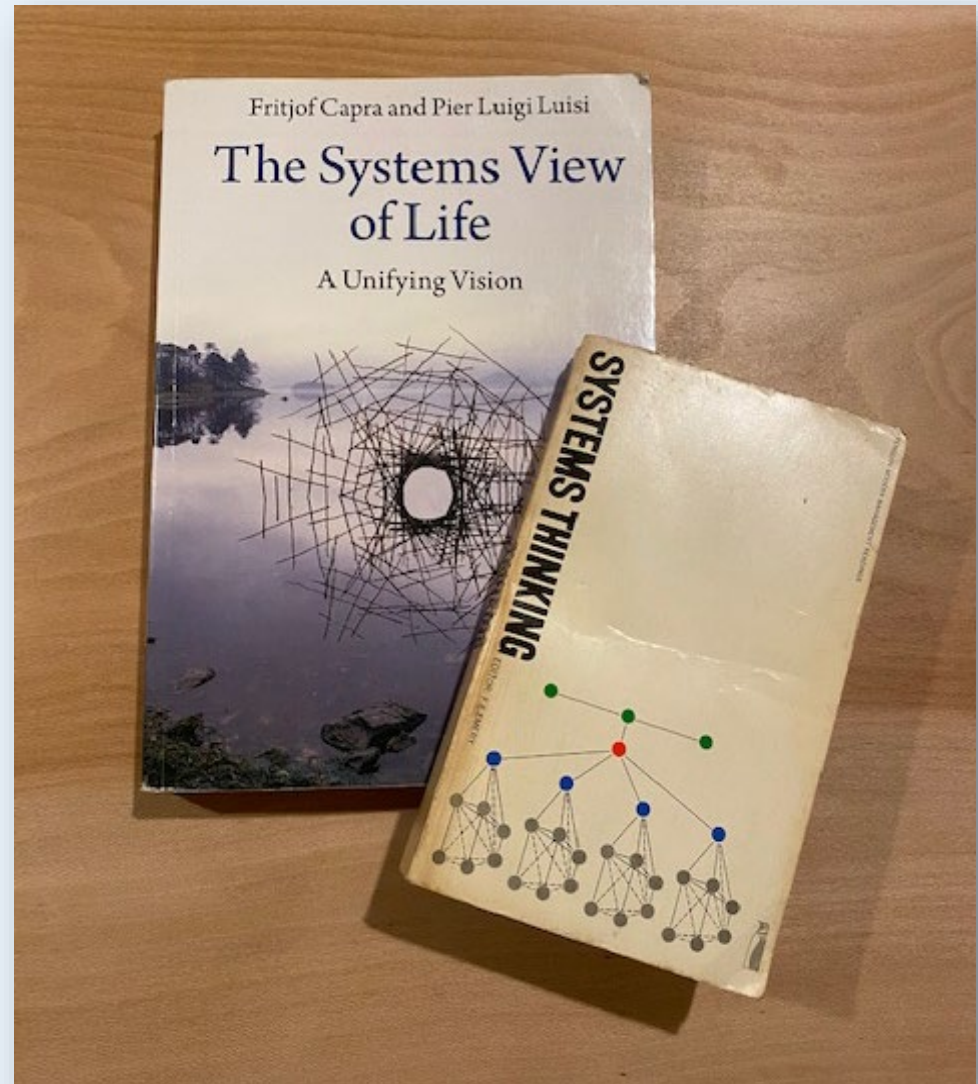
3 of every 4 plants went extinct

End of Dinosaurs

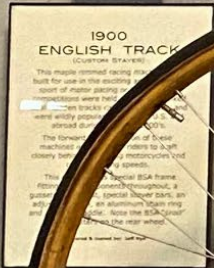
Systems Thinking



*The branch of science
laboring to understand
the structure and
functioning of living and
nonliving systems.*



Closed Systems



Cannot maintain themselves

Require external instructions to work



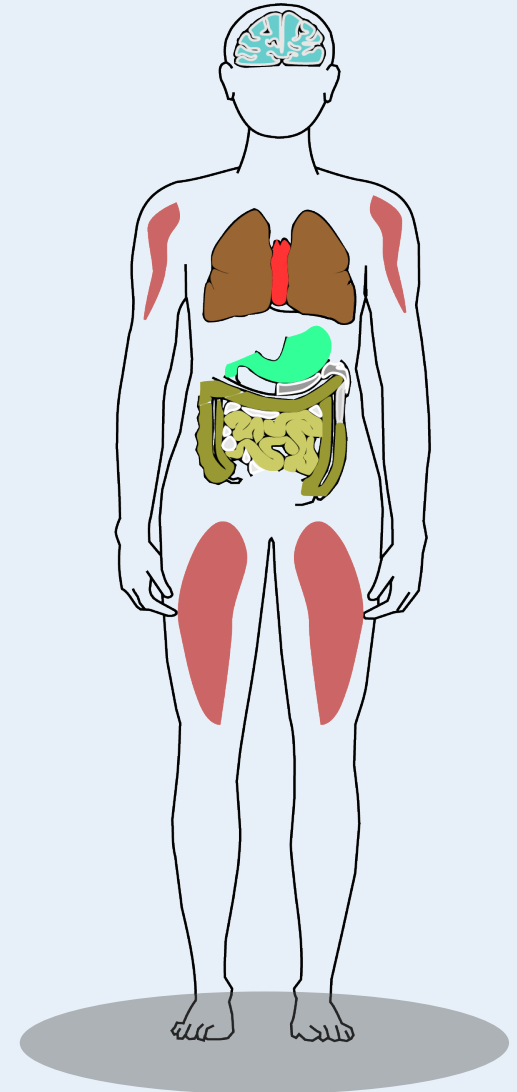
A Self-Regulating System

(Can maintain itself. No external instructions)



Simple: cell, body

Increasing Complexity



Populations to Ecosystems



Increasing Complexity



Complexity – Persistence Principle



The ability for a system to persist over time increases as complexity increases.

Have our Economies Achieved an Adequate Level of Complexity, and at the Right Scale?



Enough wood exported from North America in 2021 to build 37,000 homes

*Painful as it may seem, we must question
if our most important social &
environmental problems can be resolved
without first resolving the economic flaws
responsible for their creation.*

Capitalism

A system for managing the ownership & distribution of resources. Requires that capital—financial resources, factories, materials, etc.—be privately owned.

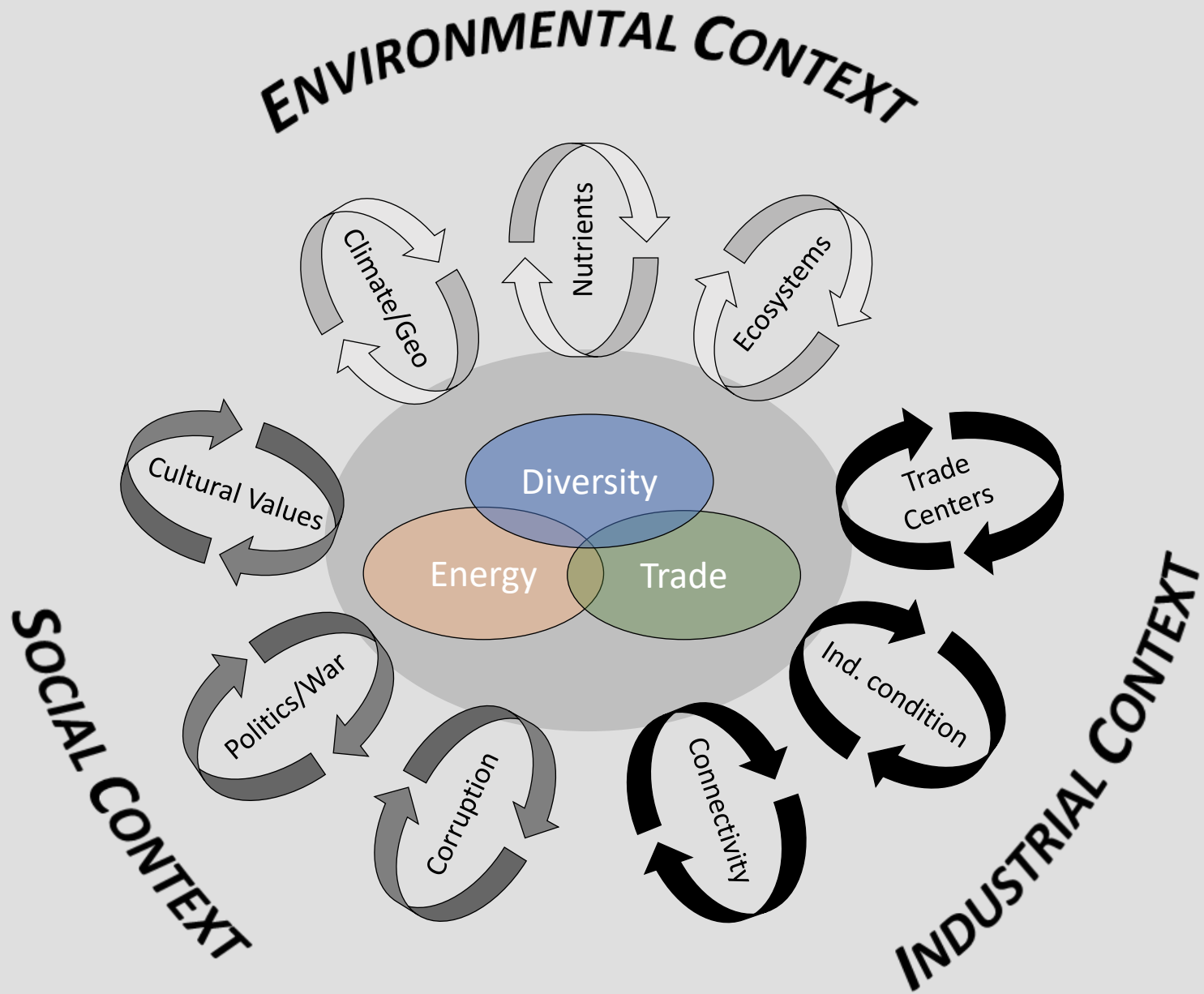


Capitalism allows for a natural & efficient distribution of resources necessary to maintain a thriving economy

When the economy is structured well



*Economics is failing,
because it lack its germ
theory of disease
~ Johnson, MIT (2007)*



GDP = Gross Overestimate of Productivity



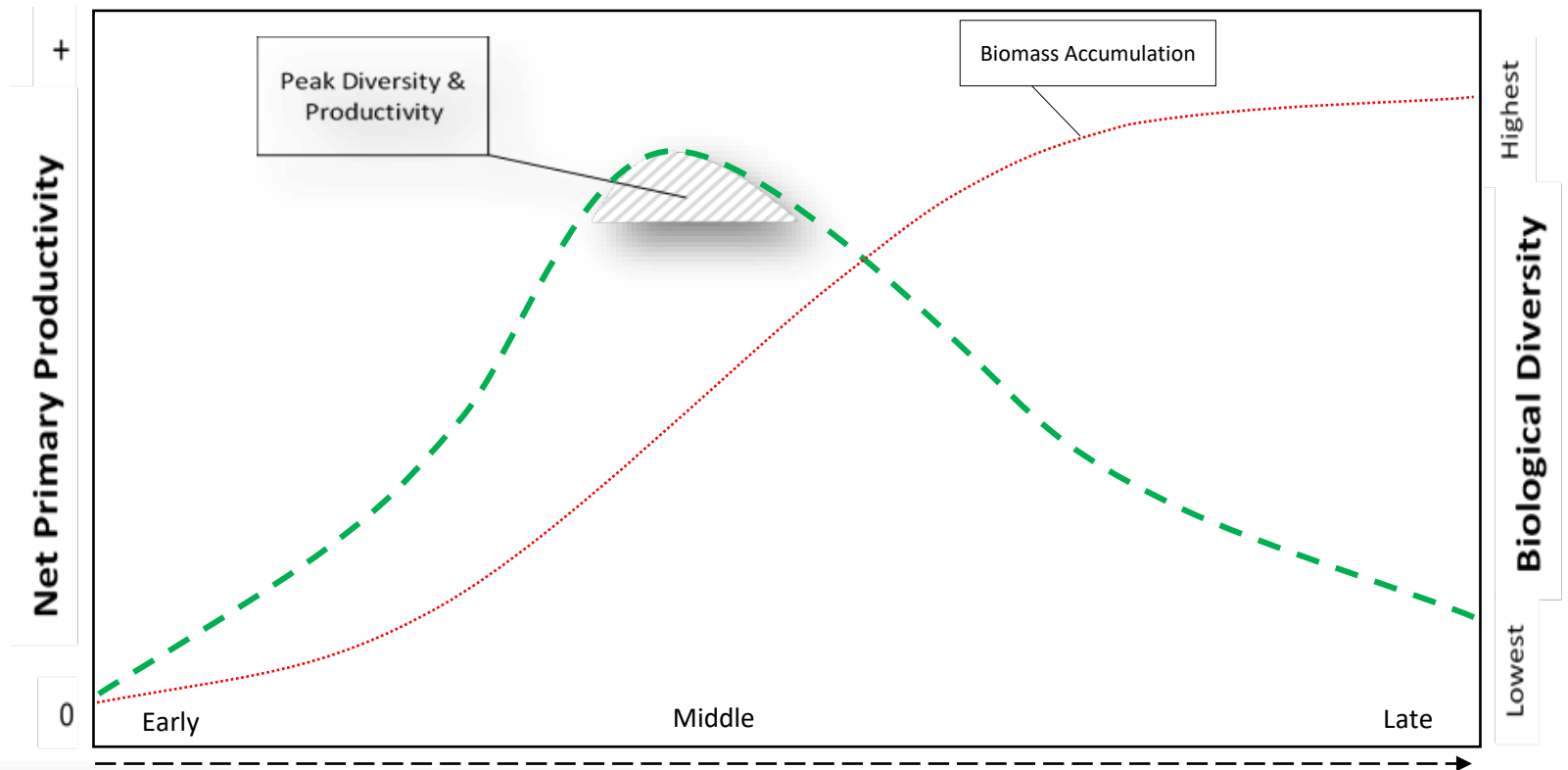
- GDP Doesn't account for depletion of soil, water, people, and other resources.*

\$1,120,000,000,000 (US \$1.1 trillion)

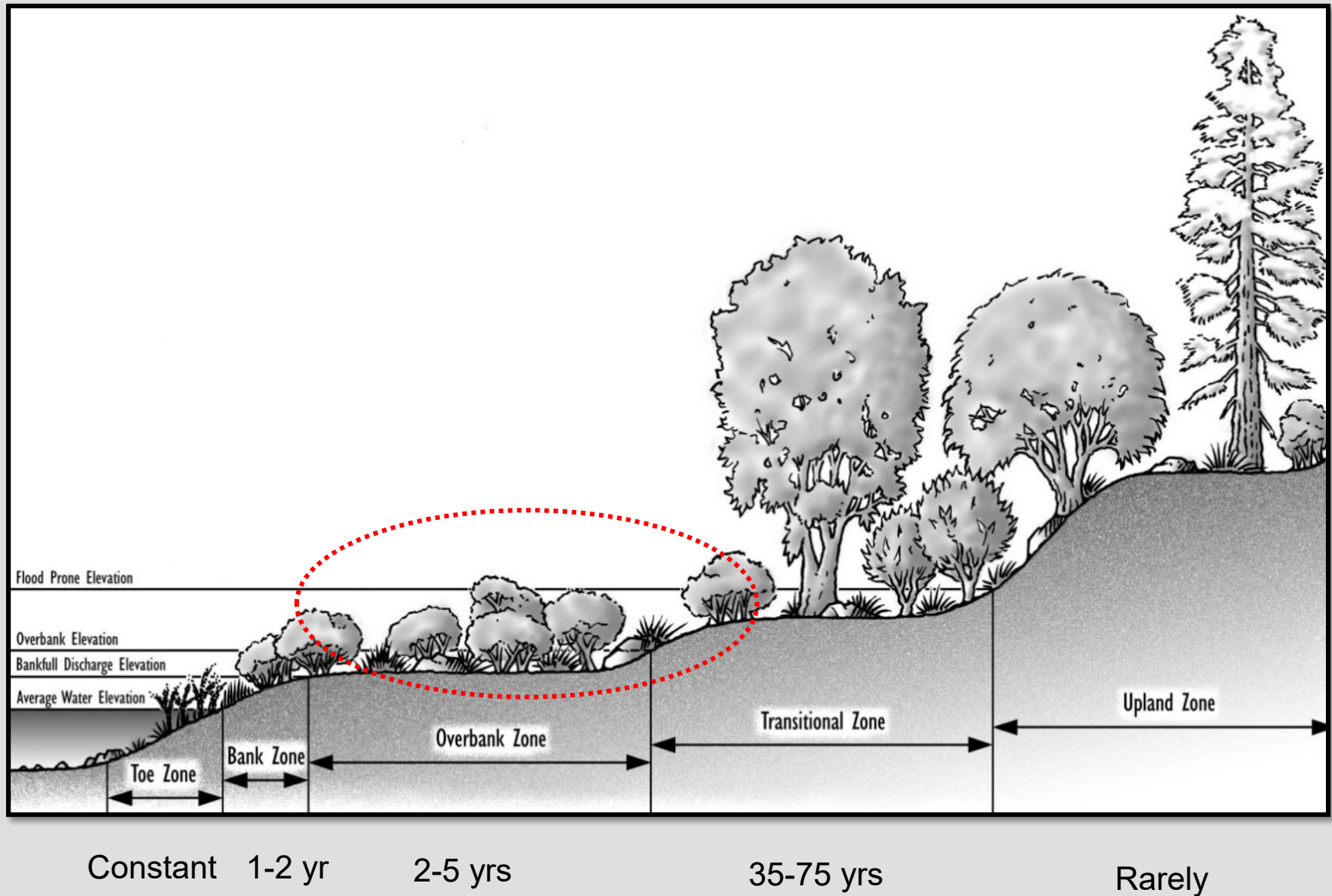


The A horizon is completely gone from ~33 million acres of the corn belt.
($\$2.8$ billion in economic losses per year)

Ecological Succession



Peak Production/Diversity in Floodplains



Diversity Confers Resilience

Floods

Insect outbreaks



Climate Change

Fires

Seven Forms of BioDiversity



Richness

Diversity of Functions

Redundancy of Functions



Intrinsic Benefits of Diversity



- *Increased resistance and resilience to disturbance*
- *Higher net productivity*
- *More even distribution of biomass (capital/wealth) to more individuals*



- *Stronger wages and employment*
- *Increased energy capture*

Tran, H. 2011. "Industrial Diversity and Economic Performance: A Spatial Analysis" (2011).

Felix, A. Industrial Diversity, Growth, and Volatility in the Seven States of the Tenth District.

LaCanne, C.E. and J.G. Lundgren. 2018. Regenerative agriculture: merging farming and natural resource conservation.

Energy



Exogenous Energy

(Originates in a different time/place than where it is consumed)

- Fossil Fuels
- Wind or Solar Power (when imported)

Endogenous Energy

(Originates in the same time/place as where it is consumed)

- Biofuels
- Wind or Solar Power



Energy Transfers in Ecosystems



Primary Producers (plants) = 1st trophic level

Nearly 100% of usable energy is endogenous



Energy's Influence on BioDiversity



Exogenous Energy



BioDiversity



Midolo et al. 2019. *Impacts of nitrogen addition on plant species richness and abundance: A global meta-analysis.*

Soons et al. 2017. *Nitrogen effects on plant species richness in herbaceous communities are more widespread....*

Various works of Dr. Pashke, Ed Redente, and their students (CSU)

Energy Transfers in US Economies



***Nearly 100% of usable energy is
exogenous to regional economies***



Diversity Declines in Agriculture



5 Million farms lost since 1935



1940s - rise in Nitrogen inputs

Decline in Manufacturing

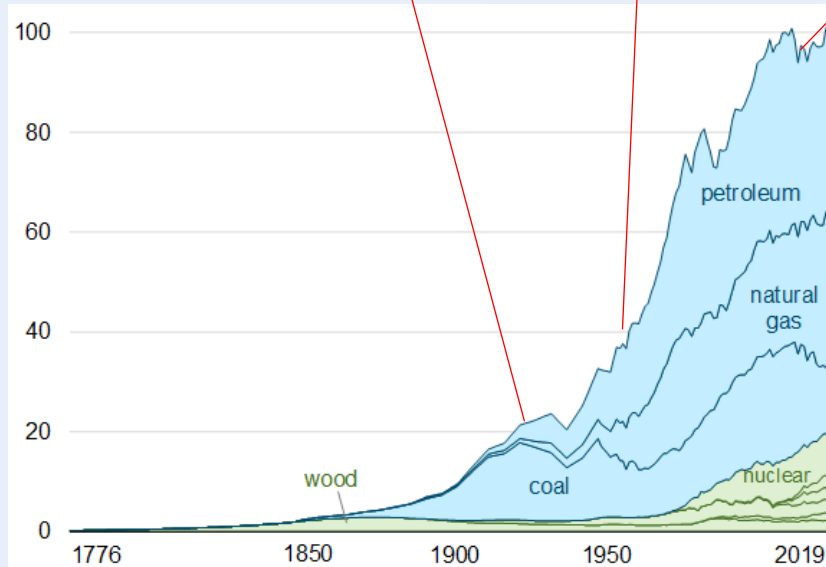


*Loss of 700,000 Manufacturers
from 1900 to 2020*



Detroit, 2020

Decline in Grain Mills



Job Multipliers Cut Two Ways



- *Manufacturing industries create ~ **7.5 jobs** for every 1 direct job.*
- *Retail & service industries create ~ **1.6 jobs** for every 1 direct job.*



Trade

Resource Transfers in US Economy



*About 60% of what
we consume originates
outside our border*

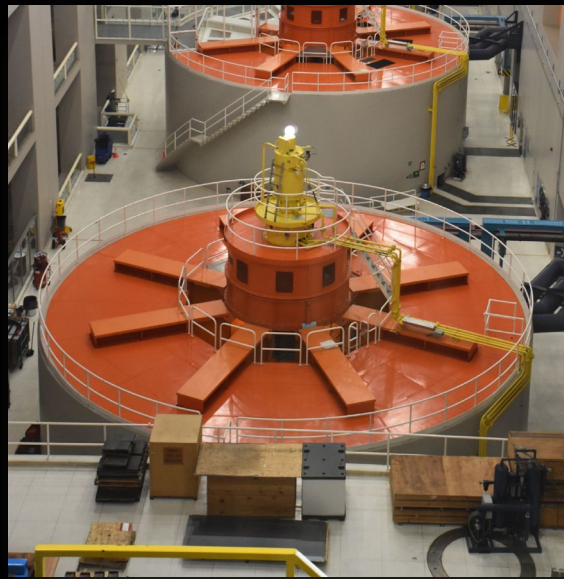
Trade's Influence on Diversity



Transfer of Resources In/Out of Economy

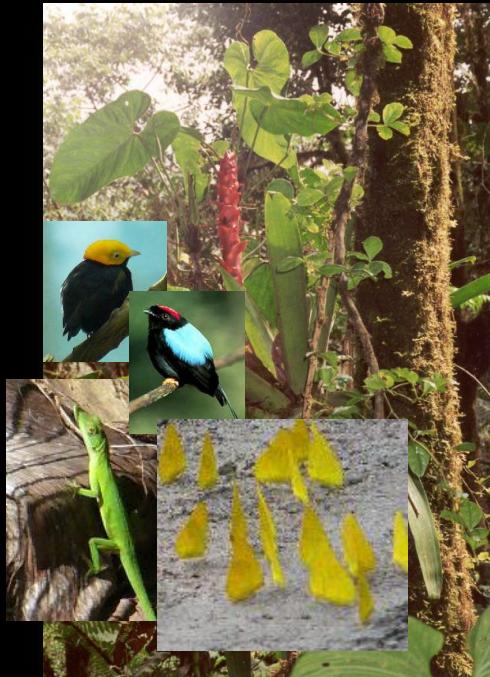


Economic Diversity



Foundation of Foundational Components

Greater Economic Diversity
= More Efficient Energy Capture



Greater Economic
Diversity
= Increased NDP

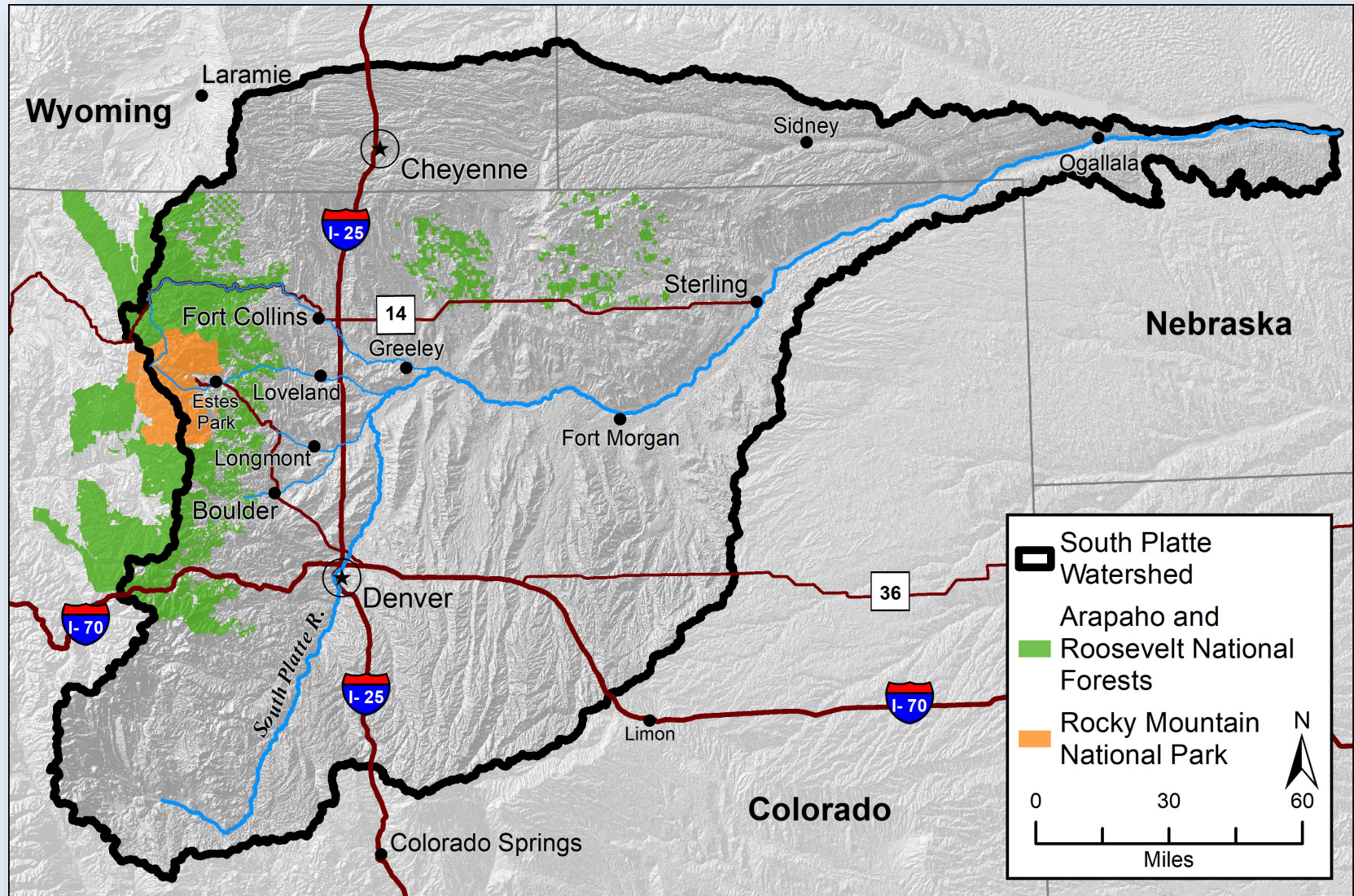


Transfers of **Energy & Resources**
into/out of an Economy
Decrease its Diversity

How Big is Too Big?



Economic Restoration at the Right Scale (regional economy)



Building & Retaining Local Wealth



- Over half of the money spent at independent businesses is recirculated locally
- About 14% of money spent at chain stores is recirculated locally
- Local businesses are more likely to hire local professionals (legal, accounting, etc.)

Evolution Acts on the Community



*Part III – Economic Restoration
(As Informed by Process of Ecological Restoration)*

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www.aloterraservices.com/agriculture

