




Dr. Beth A. Fisher
Assistant Professor of geology and soil science
Minnesota State University, Mankato



Combination of
cover crop + no till
provides co-benefits to
increase soil carbon, fertility,
and improve water quality.

e.g. cover crop + no till

<https://doi.org/10.1016/j.geosus.2020.09.003>

<https://doi.org/10.1016/j.agrformet.2020.108090>

<https://doi.org/10.2136/sssaj2010.0430>

<https://doi.org/10.1016/j.geoderma.2018.10.016>

Soil CO₂ is much higher than atmosphere



<https://doi.org/10.1088/1748-9326/8/1/015014>
<https://doi.org/10.1016/j.jenvman.2020.110261>
<https://doi.org/10.1016/j.agrformet.2004.01.013>

Photo: Millennial Farmer

Highest atmospheric CO₂ in the spring

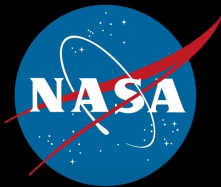
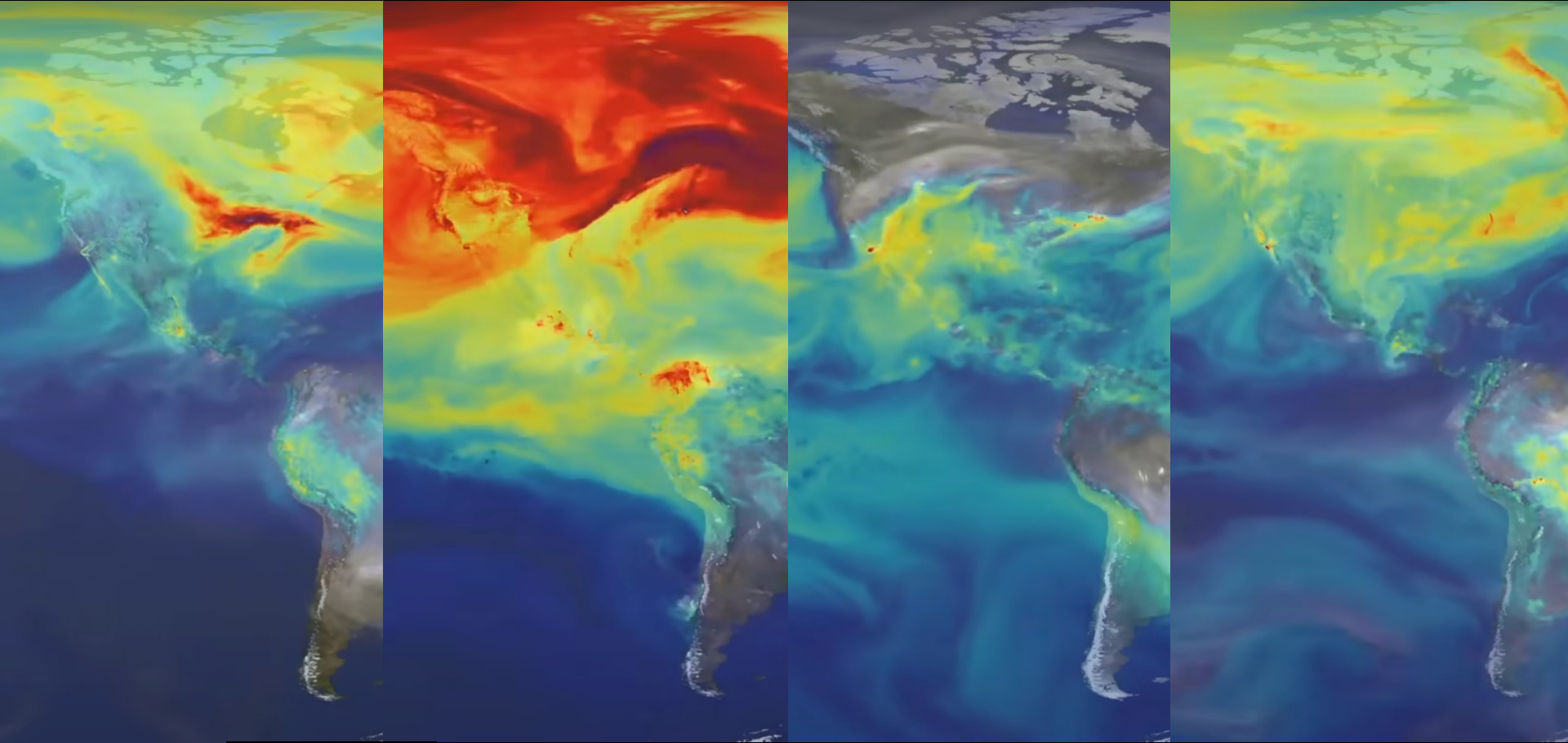
NASA | A Year in the Life of Earth's CO₂

JANUARY

APRIL

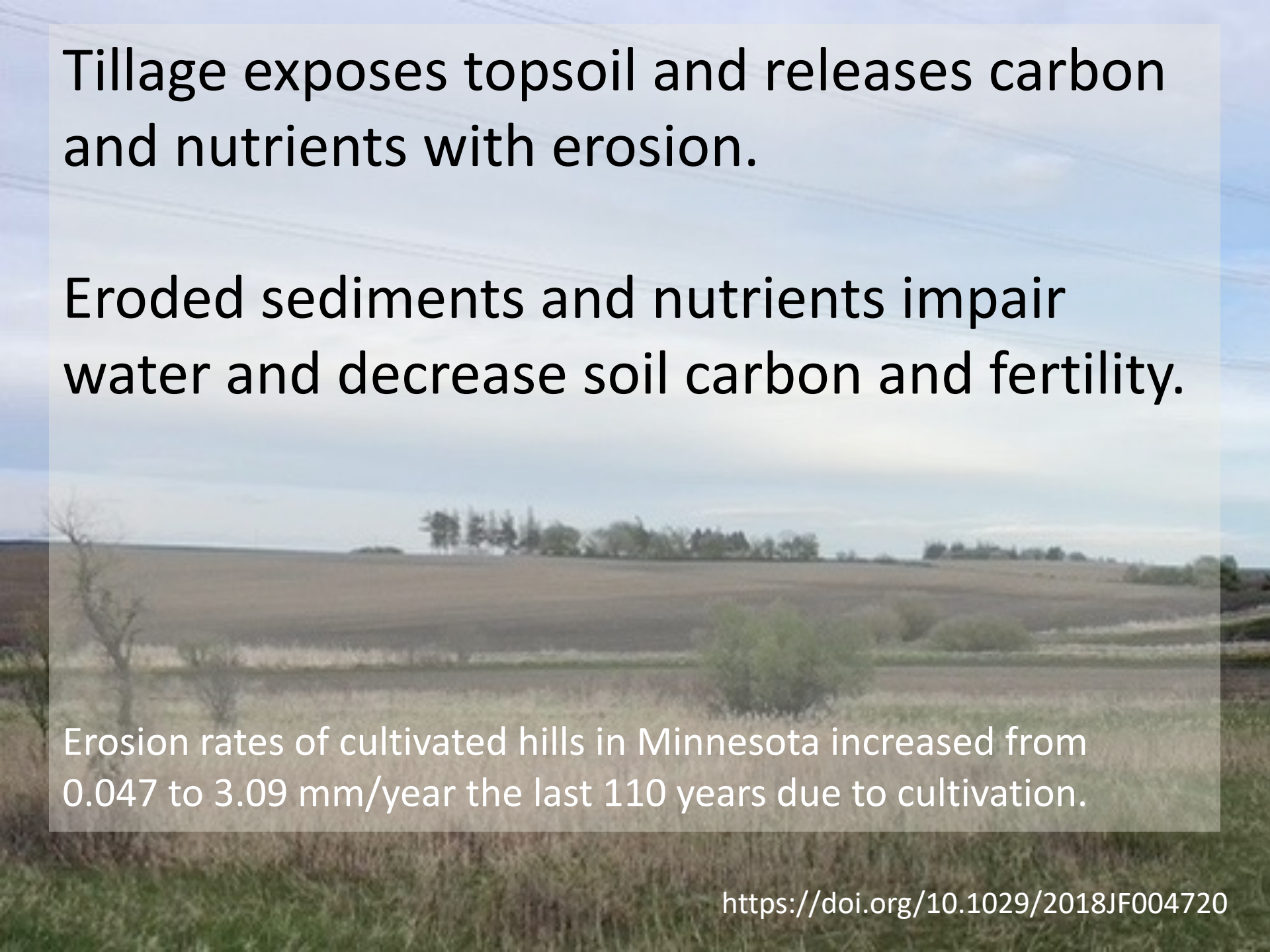
JULY

OCTOBER



Carbon Dioxide Column Concentration [ppmv]

377 379 381 383 385 387 389 391 393 395



Tillage exposes topsoil and releases carbon and nutrients with erosion.

Eroded sediments and nutrients impair water and decrease soil carbon and fertility.

Erosion rates of cultivated hills in Minnesota increased from 0.047 to 3.09 mm/year the last 110 years due to cultivation.

Cover Crops alone have variable benefits




Reduced Tillage alone has minimal benefits



50 studies, 1588 observations, agevidence.org US Corn Belt

Photo: Millennial Farmer



Combination of
cover crop + no till
provide co-benefits to
increase soil carbon, fertility,
and improve water quality.

e.g. cover crop + no till

<https://doi.org/10.1016/j.geosus.2020.09.003>

<https://doi.org/10.1016/j.agrformet.2020.108090>

<https://doi.org/10.2136/sssaj2010.0430>

<https://doi.org/10.1016/j.geoderma.2018.10.016>