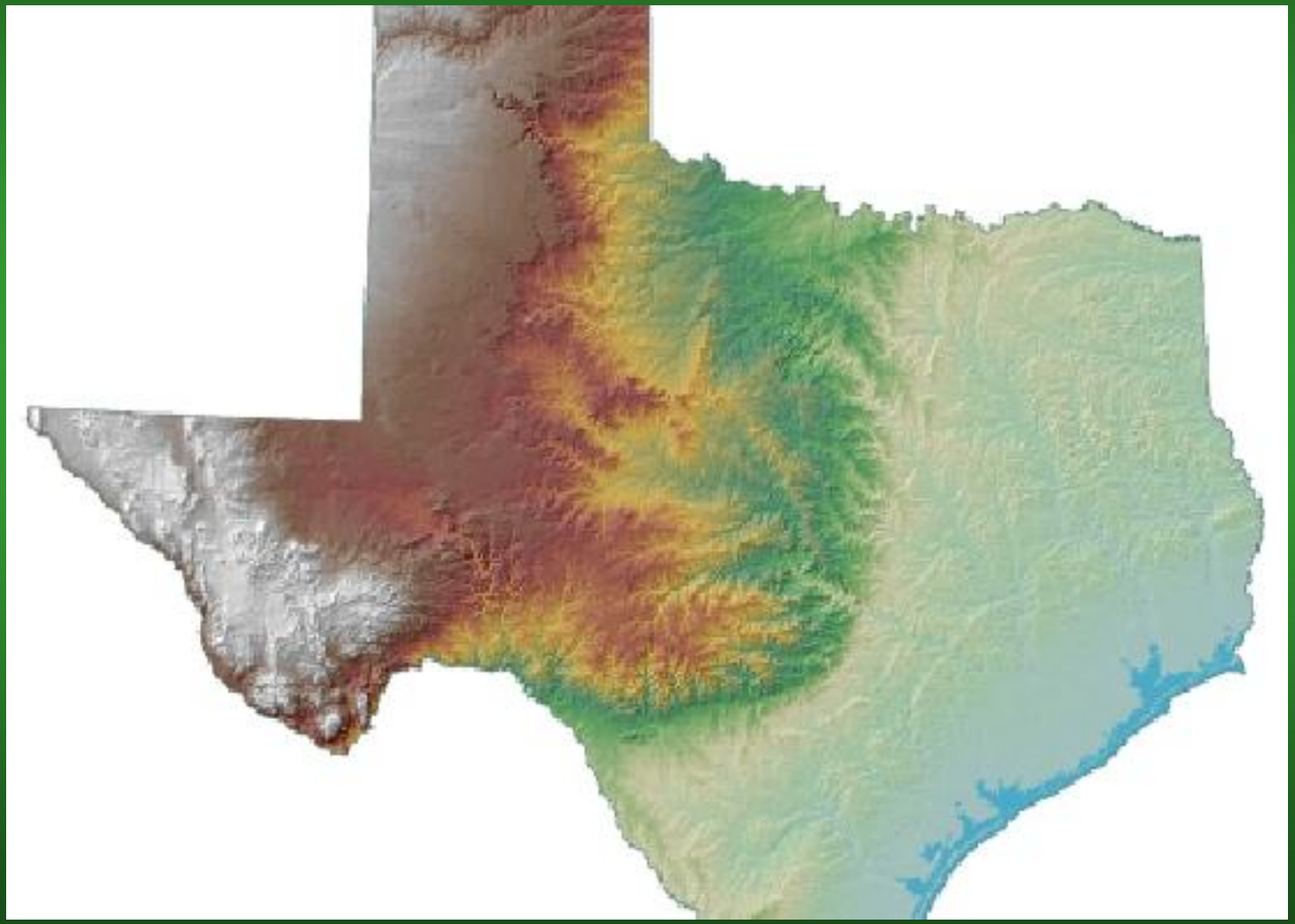
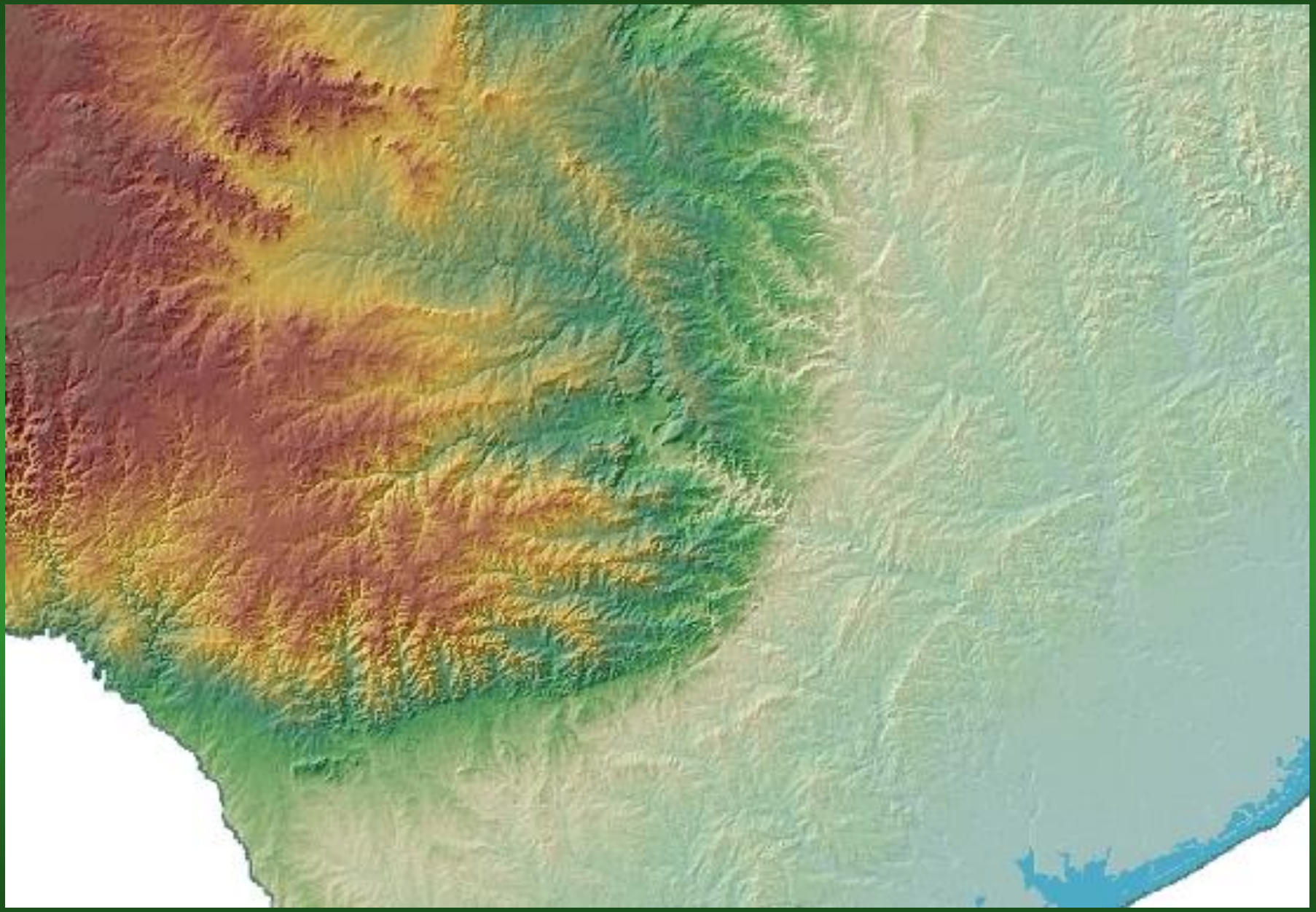
Dillo Dirt

Hornsby Bend Biosolids Management Plant

Turning Urban Wastes into Restoration Resources

- Urban settlements are part of their surrounding ecosystem – inputs and outputs



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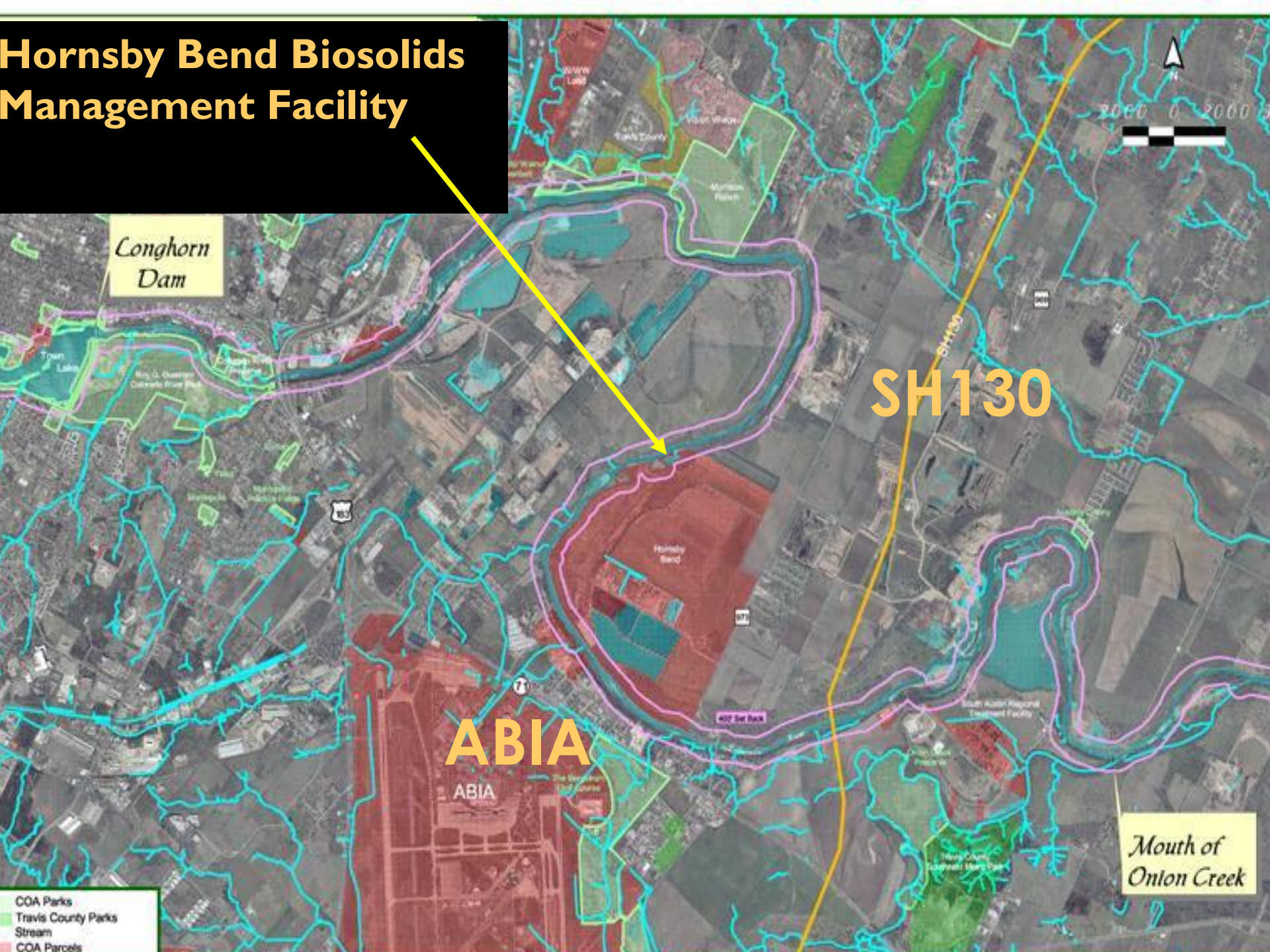
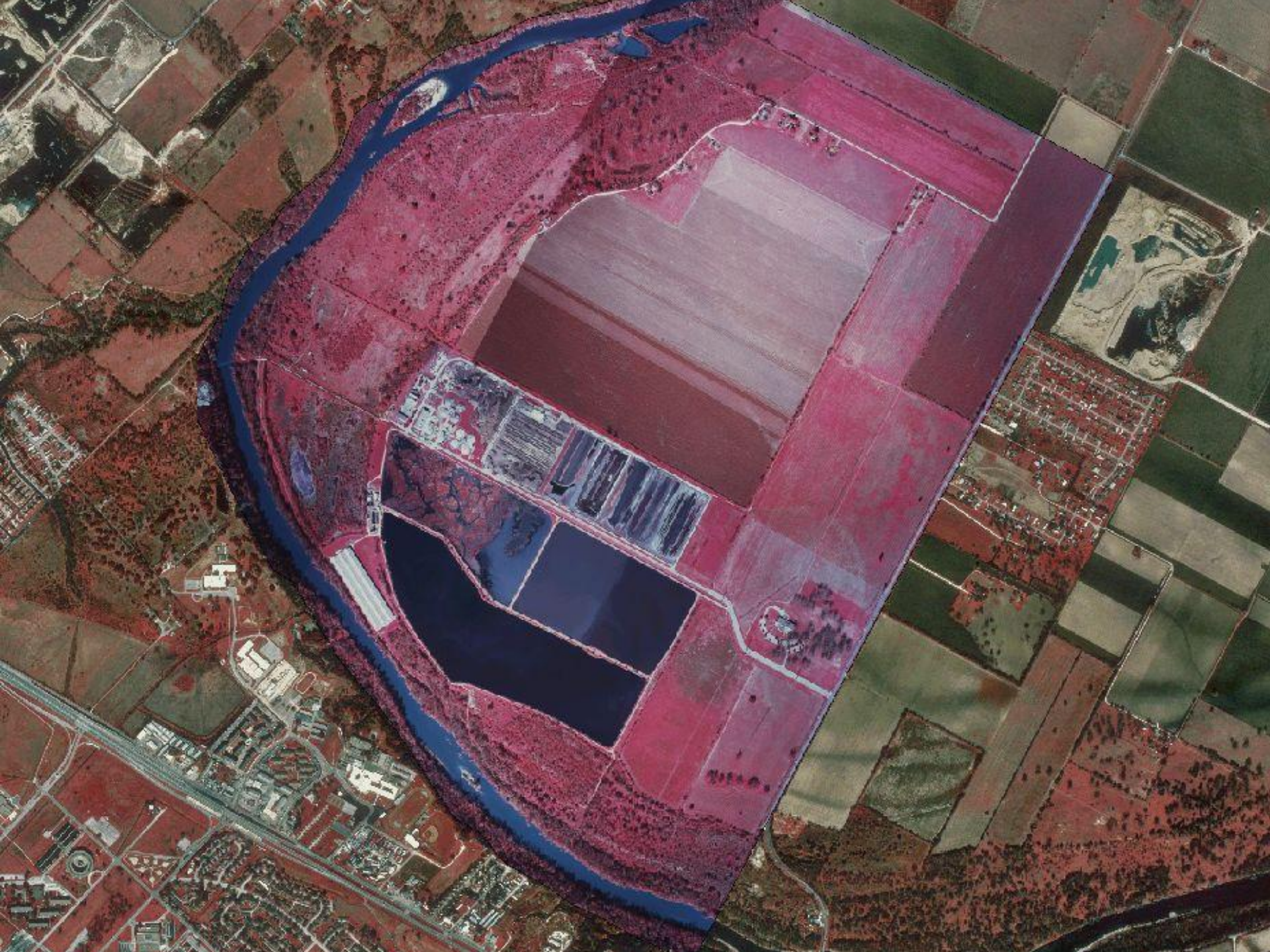

Hornsby Bend Biosolids Management Facility
Longhorn Dam
SH130
ABIA
ABIA
Mouth of Onion Creek
COA Parks
Travis County Parks
Stream
COA Parcels



“Sustainability”

- “meets the needs of the present without compromising the ability of future generations to meet their own needs.”

- The Brundtland Report

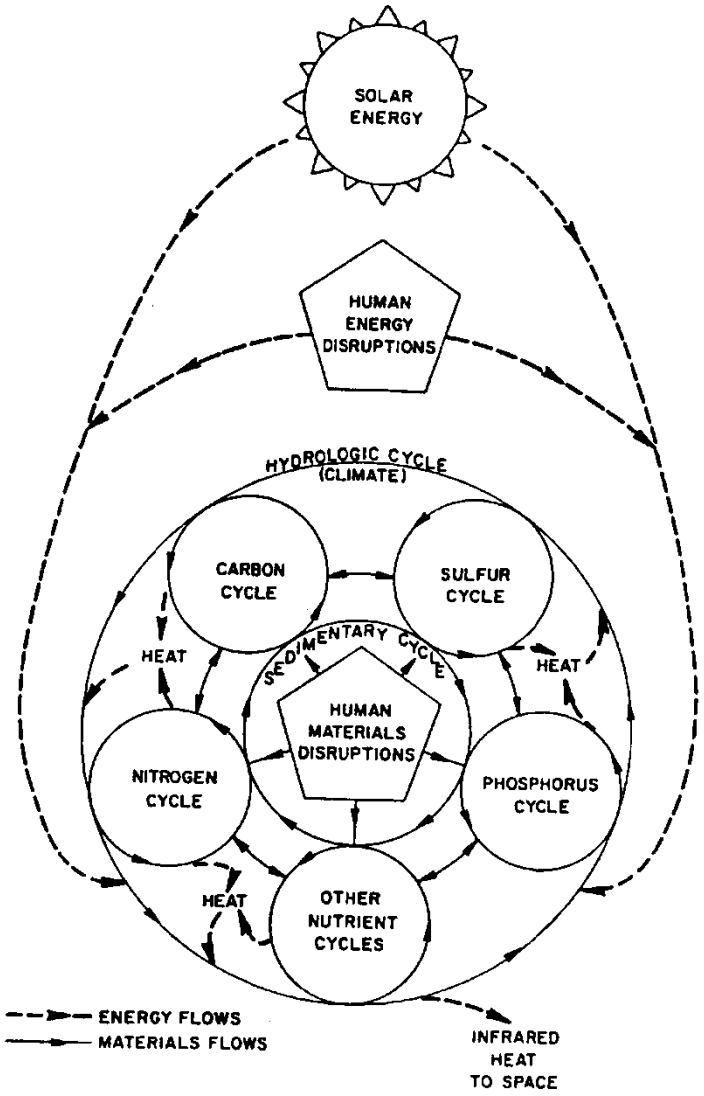


Figure 5.1. Climate and life are linked by a complex web of interconnected cycles. Life on earth depends on the cycling of nutrients through air, water, soil, and living things. The climate mediates the flow of materials through these global cycles. Solar energy degrades to heat at each stage of the cycling process and is eventually returned to space as infrared radiation. The composition of the earth's atmosphere regulates the radiative balance on earth between absorbed solar energy and emitted infrared energy, which, in turn, controls the climate.

Source: Schneider and Morton 1981.

Ecosystem Cycles

[Biogeochemical Cycles]

- Carbon cycle – yard waste
- Nitrogen cycle – sewage
- Phosphorus cycle – sewage
- Other trace minerals and metals
- Water cycle – wastewater
- Short-circuiting Cycles
- **Recycling?**

City “Inputs”

- Food
- Water
- Air (oxygen)
- Wood
- Paper
- Fuel and electricity
- Etc…

City “Outputs”

- Carbon dioxide
- Air Pollution
- Water Pollution
- Water
- Trash
- Sewage Sludge
- Organic wastes

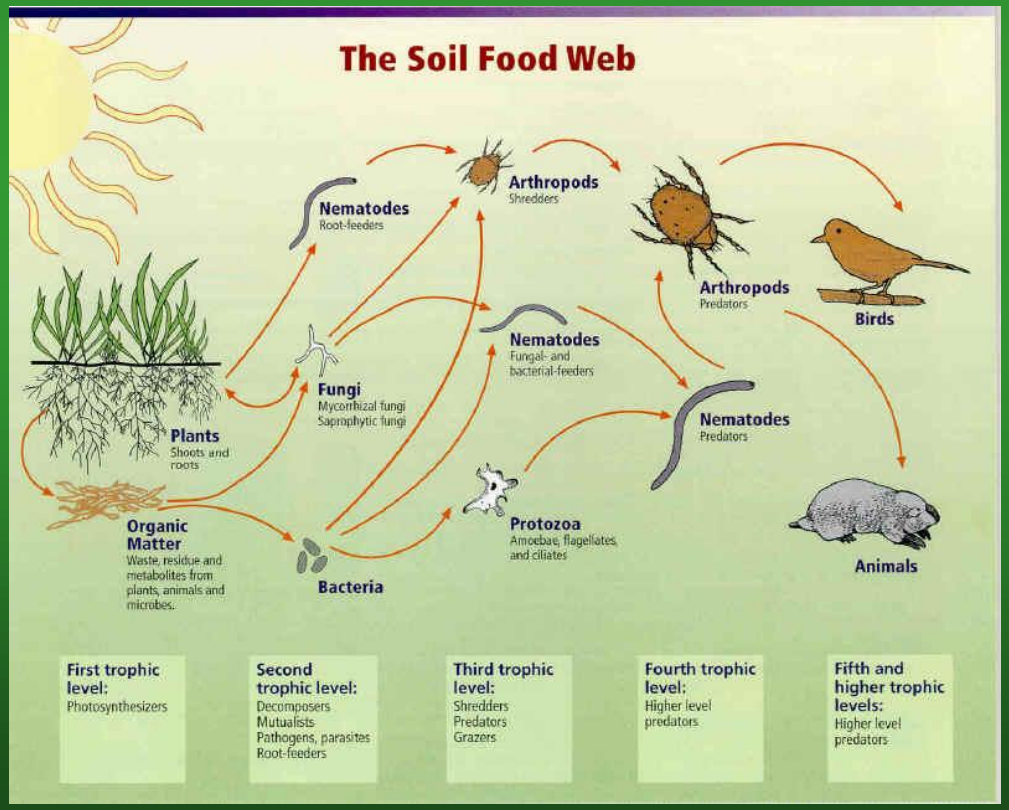
Inputs - drawn from soils – food, landscaping

Outputs - nutrient rich “wastes” and carbon “wastes”

Urban sustainability?

Ecosystem Cycles

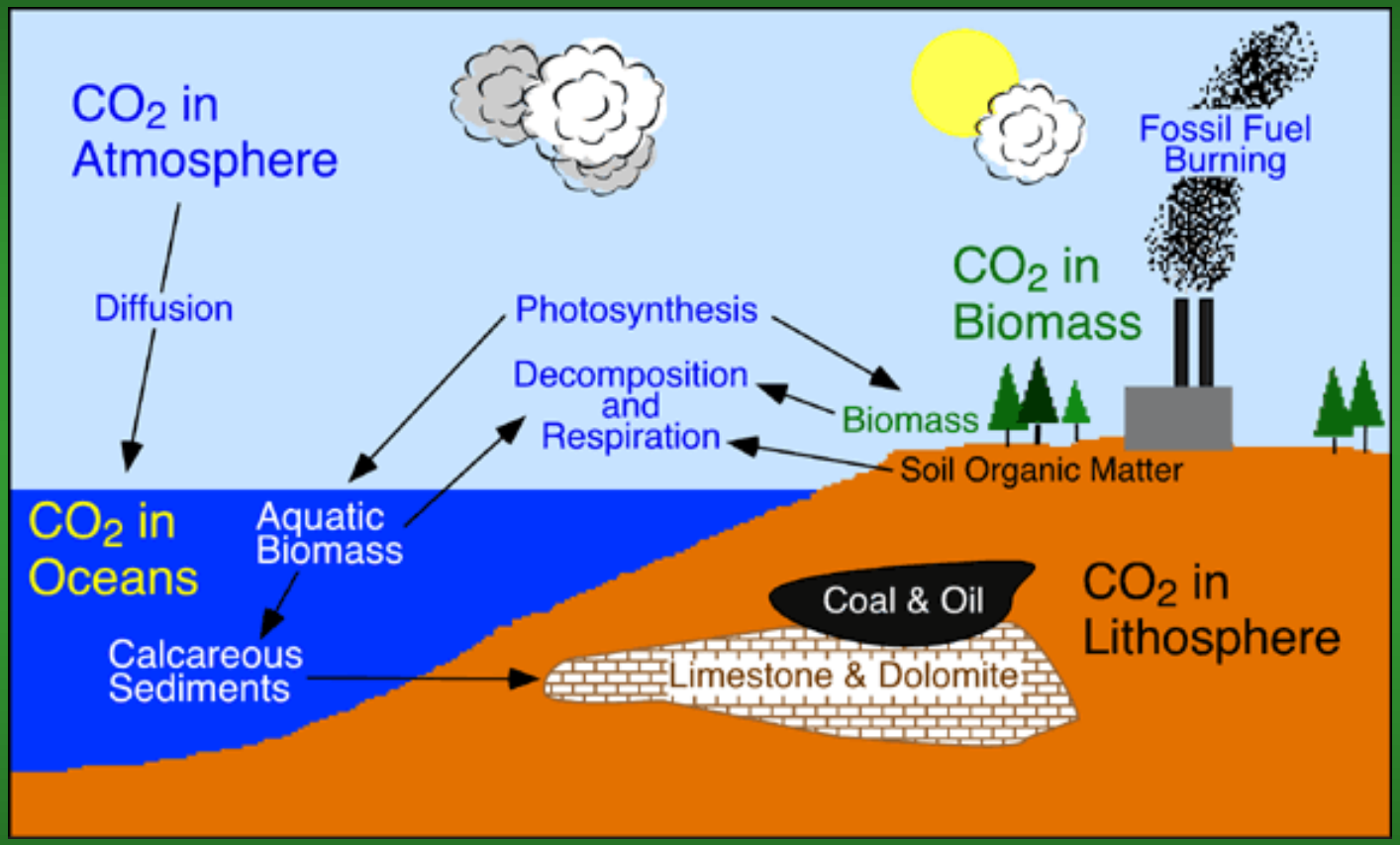
- N cycle - sewage
- C cycle – yard trimmings
- Water cycle
- Short circuiting cycles
- Recycling?



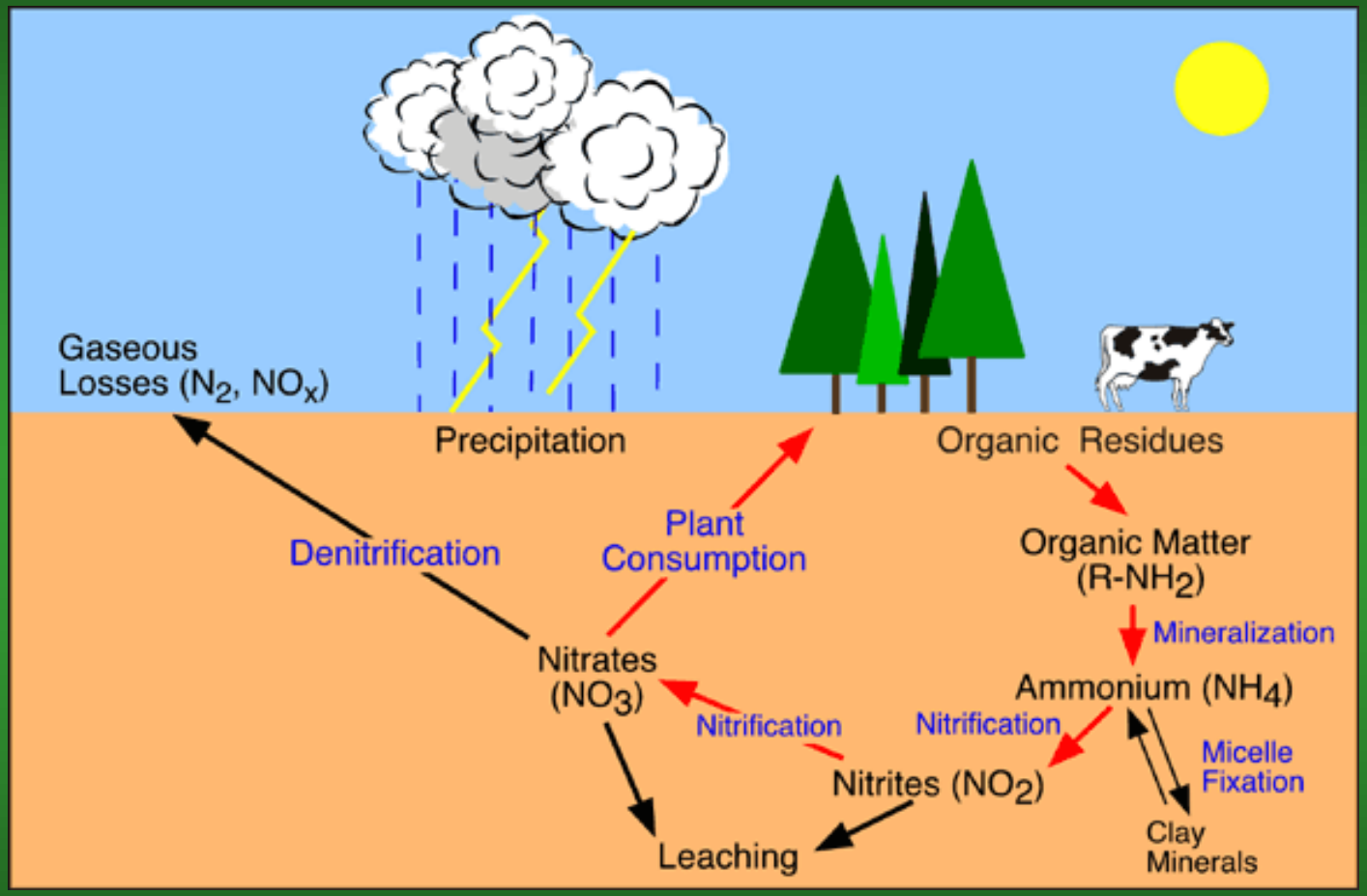
Why Carbon and Nitrogen?

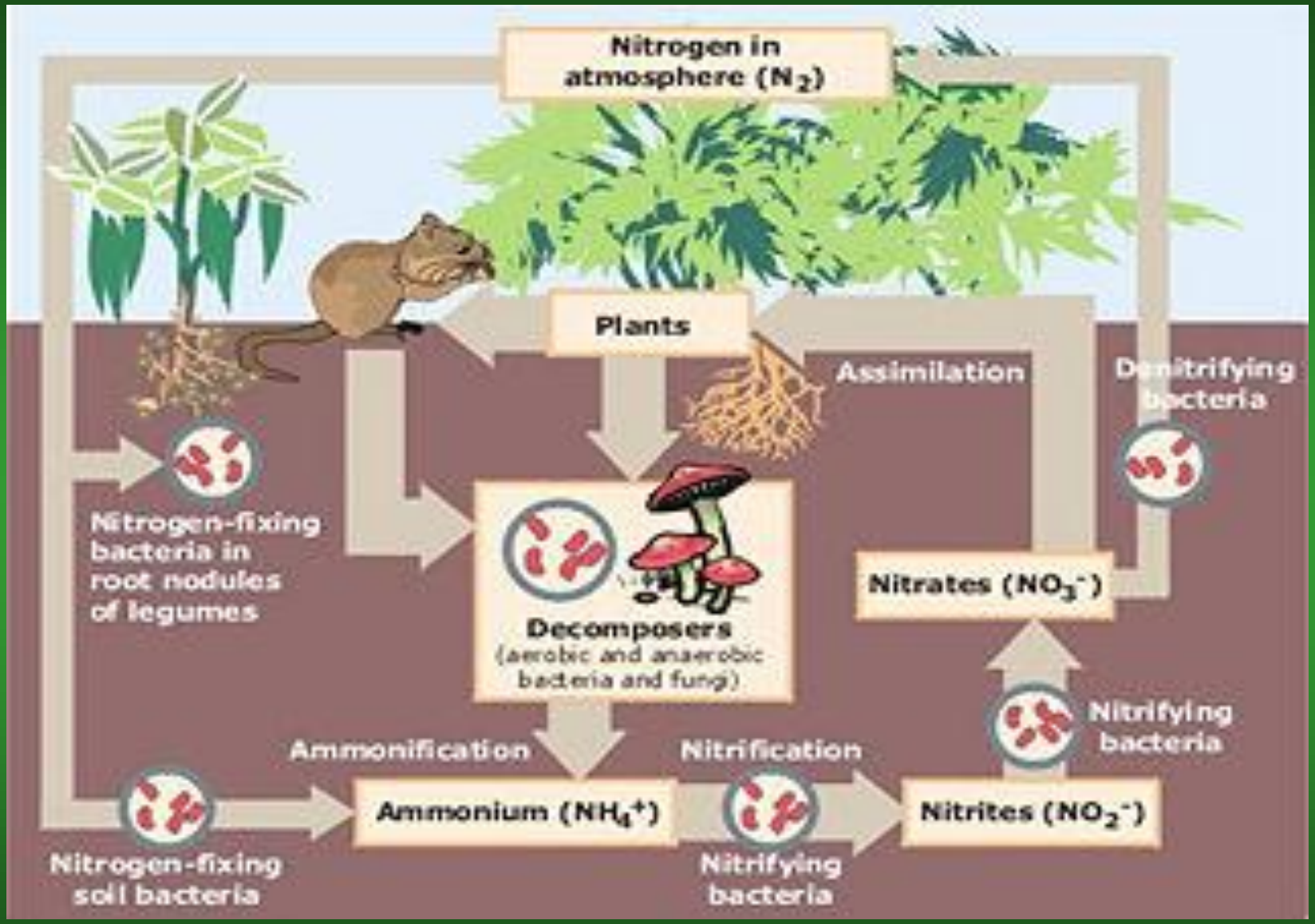
- Carbon: carbohydrates from photosynthesis
- Nitrogen: amino acids, proteins, nucleic acids

The Carbon Cycle

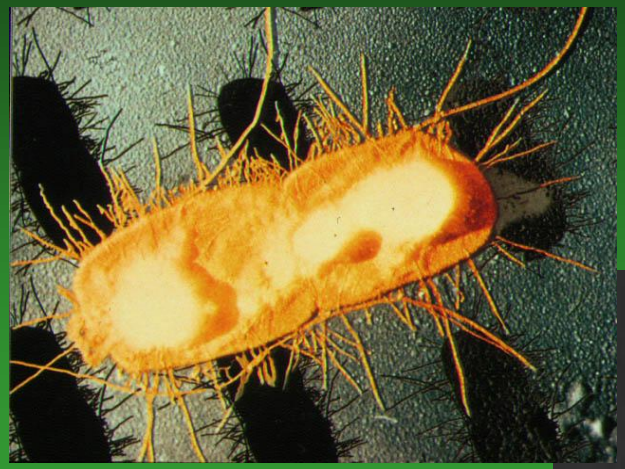


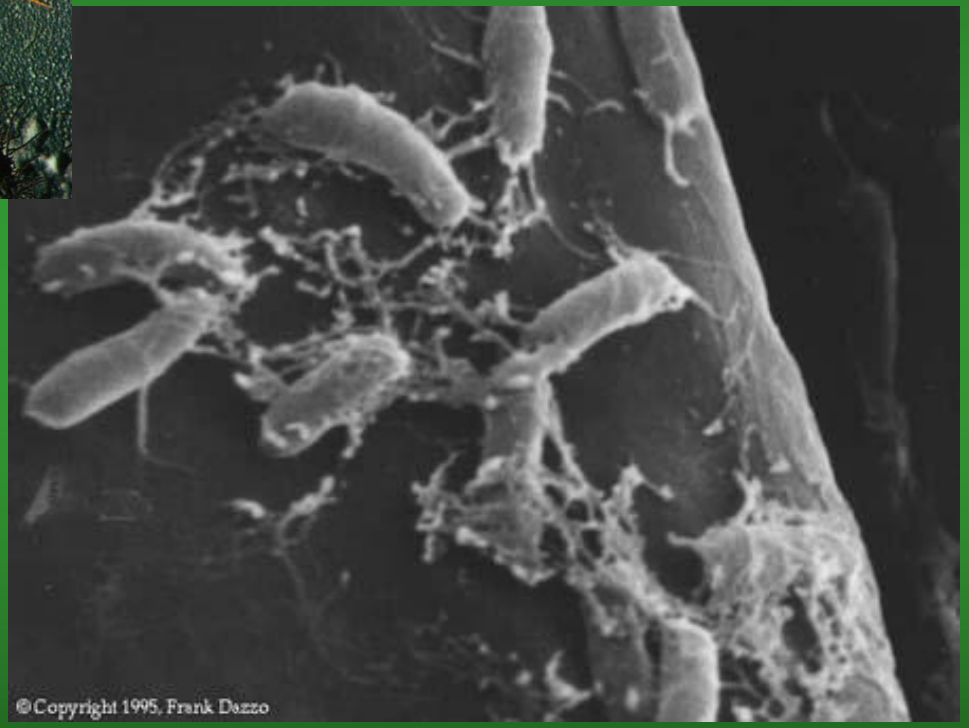
The Nitrogen Cycle




Nitrogen in atmosphere (N_2)
Plants
Assimilation
Denitrifying bacteria
Nitrogen-fixing bacteria in root nodules of legumes
Decomposers
(aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrogen-fixing soil bacteria
Nitrifying bacteria

Soil Biodiversity





Bacterial cells on clay particles; from Soil Science Soc. of America

Populations of Soil Organisms

Organisms	Number/ yd^2	Number/ oz
Bacteria	Trillions	Millions +
Actinomycetes	Trillions	Millions
Fungi	Billions	Thousands +
Algae	Billions	Thousands
Protozoa	Billions	Thousands
Nematodes	Millions	Tens +
Earthworms	30 – 300	

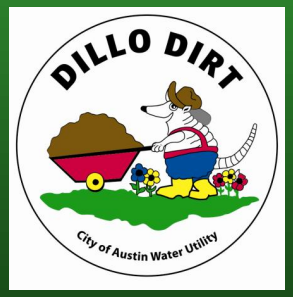
City “Outputs”

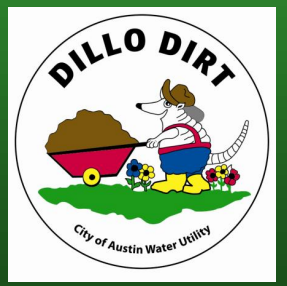
- Carbon dioxide
- Air Pollution
- Water Pollution
- Water
- Trash
- Sewage Sludge
- Organic wastes

Austin Water Utility
Hornsby Bend Biosolids Management Plant

Biotechnology for Recycling and Reuse - Working with Ecosystem Cycles

- Biosolids
- Yard Trimmings
- Tree Trimmings





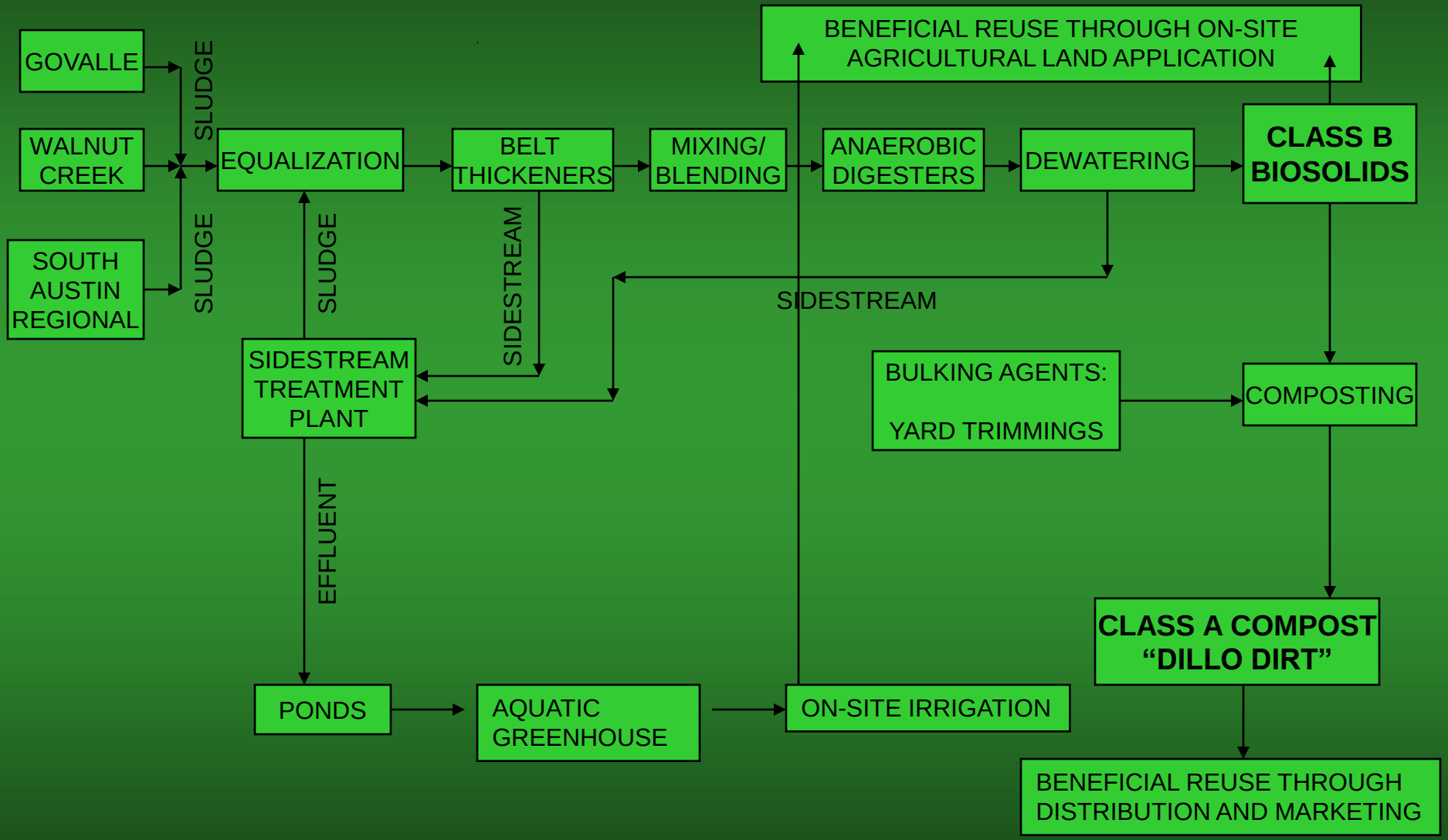
All of Austin's Sewage Sludge – 1 million gallons per day

Yard Trimmings
10%+ of Austin's Solid Waste

Curbside Yard and Tree Trimmings

100,000+ cubic yards per year

HORNSBY BEND BIOSOLIDS MANAGEMENT PLANT



Water - Treatment Ponds 185 acres

- Water moves by gravity
- Pond Ecosystem treats water
- All water recycled

Water - Aquatic Greenhouse

-5 acres

-Zero discharge

-Water recycled for irrigation

Irrigation

all water from treatment

Hay Production

Recycles nutrients from biosolids and water

Solids - Anaerobic Digesters

- habitat for anaerobic bacteria
- 90% + pathogen reduction = Class B
- Treated sludge = biosolids
- By-product Biogases

Biogas reuse

- 875 kW cogenerator
- Electricity and Heat
- Net Zero energy facility

Biosolids Land Application

Onsite 600 acre farm

Composting
"Dillo Dirt"

Composting:
nitrogen
carbon
water
air

Composting – aerobic process – 130 - 170 degrees F

Kills pathogens, weed seeds, breaks down chemical compounds

“Scarab”

windrow turner

Composting – 130 - 170 degrees F

Kills all pathogens, weed seeds, breaks down chemicals

Dillo Dirt safe for unrestricted use

COMPOSTING

Curing 3-6 Months

DILLO DIRT

City of Austin Water and Wastewater Utility

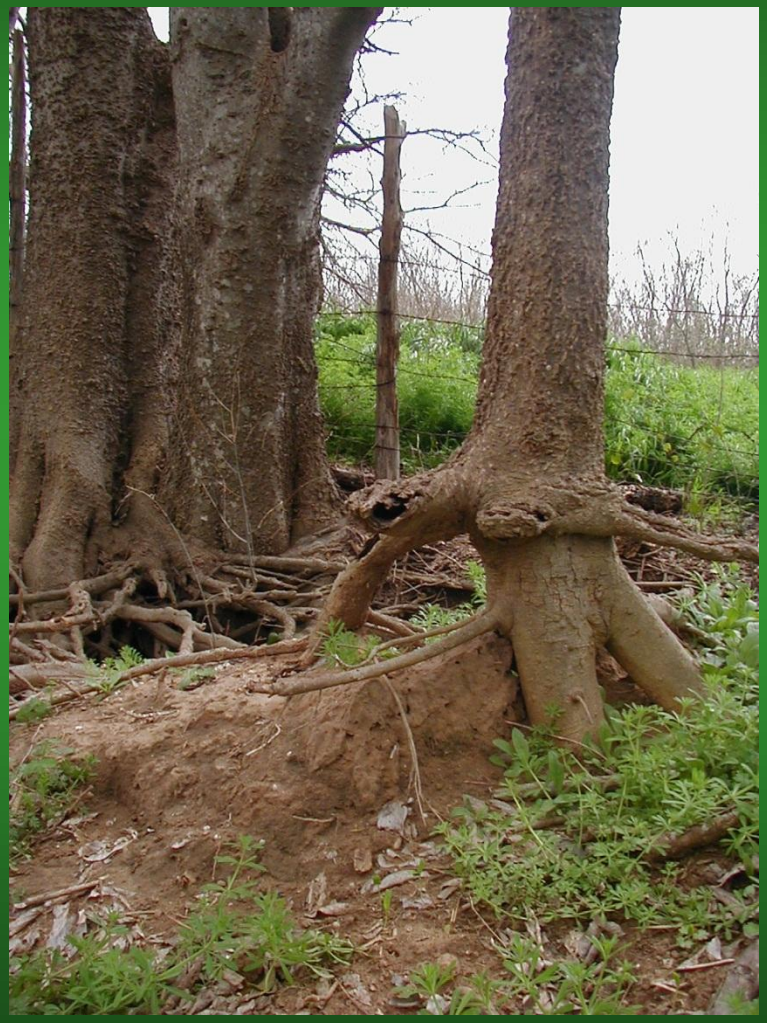
First Biosolids Composting Program in Texas 1987

Twice honored with EPA National First Place Award

Compost Screening

Sales to Area Vendors

Impoverished Soil Ecosystems of Texas



Farmland

Rangeland

Wild land / Greenspace

Urban

Restoration Tools

Compost – urban soils and wild lands

Restoration Tools

Land Application – farmland, rangeland and forest

Benefits of Compost

- Increase organic matter
- Increased water penetration
- Increased water holding capacity
- Mulching effect
- Long break-down time

Uses of Compost

Moisture Holding Capacity

75% to 200% by weight

Soil Mixes

- 10 to 50% compost
- 20 – 30% compost most common

Turf Establishment

- 1 to 2 inches compost
- Incorporate in top 5 to 7 inches

Planting Bed Establishment

- Apply 1 to 2 inches compost
- Incorporate in top 6 to 8 inches of soil

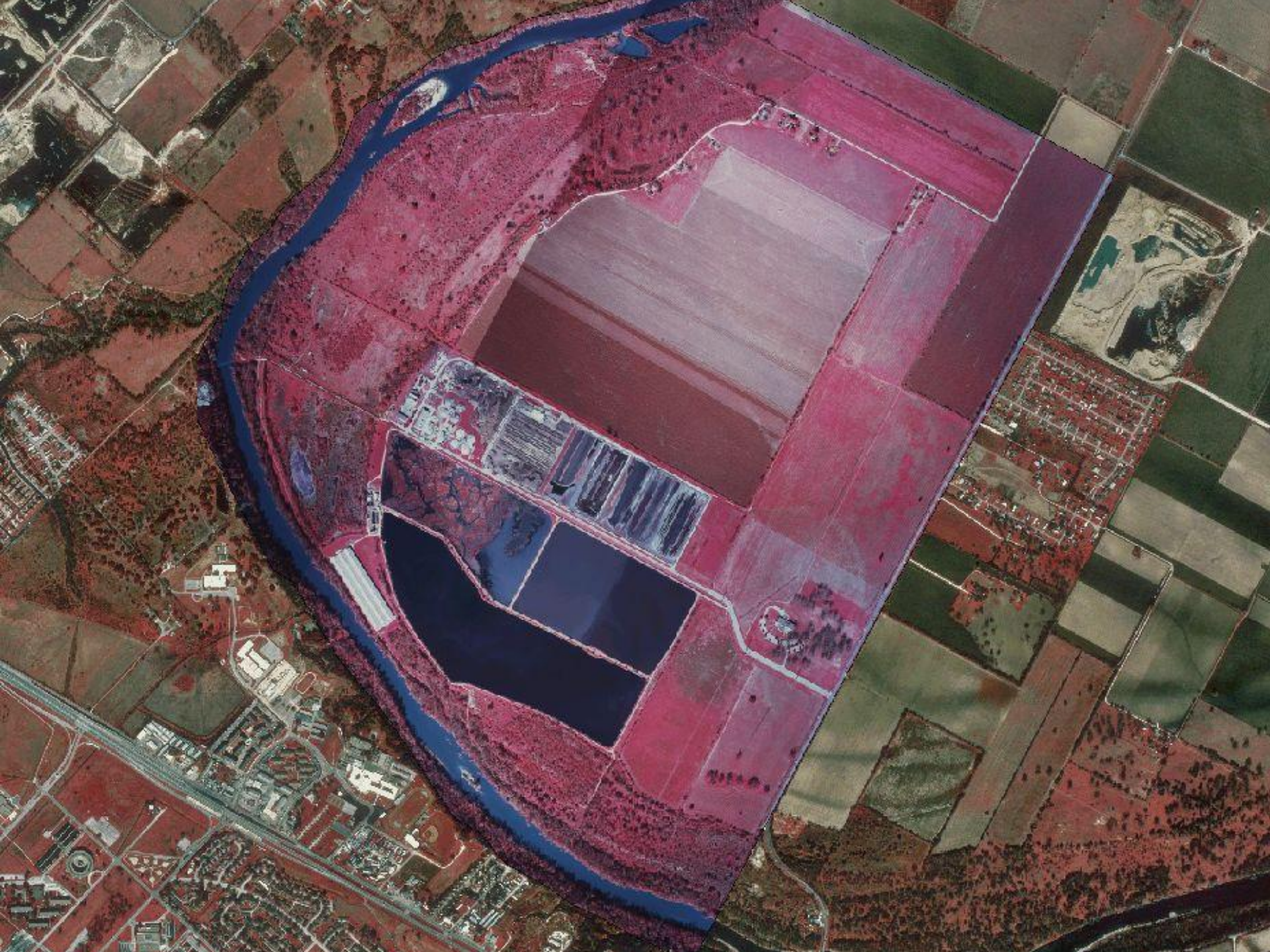
Top Dressing Lawns

- ¼ inch compost
- Don’t smother grass
- Aerate if possible

General Compost Use Guide

Per 1,000 square feet

- ¼ inch layer = ¾ cubic yard (34 yards/acre)
- 1 inch layer = 3 cubic yards (134 yards/acre)
- 2 inch layer = 6 cubic yards (269 yards/acre)



The Center for Environmental Research

MISSION

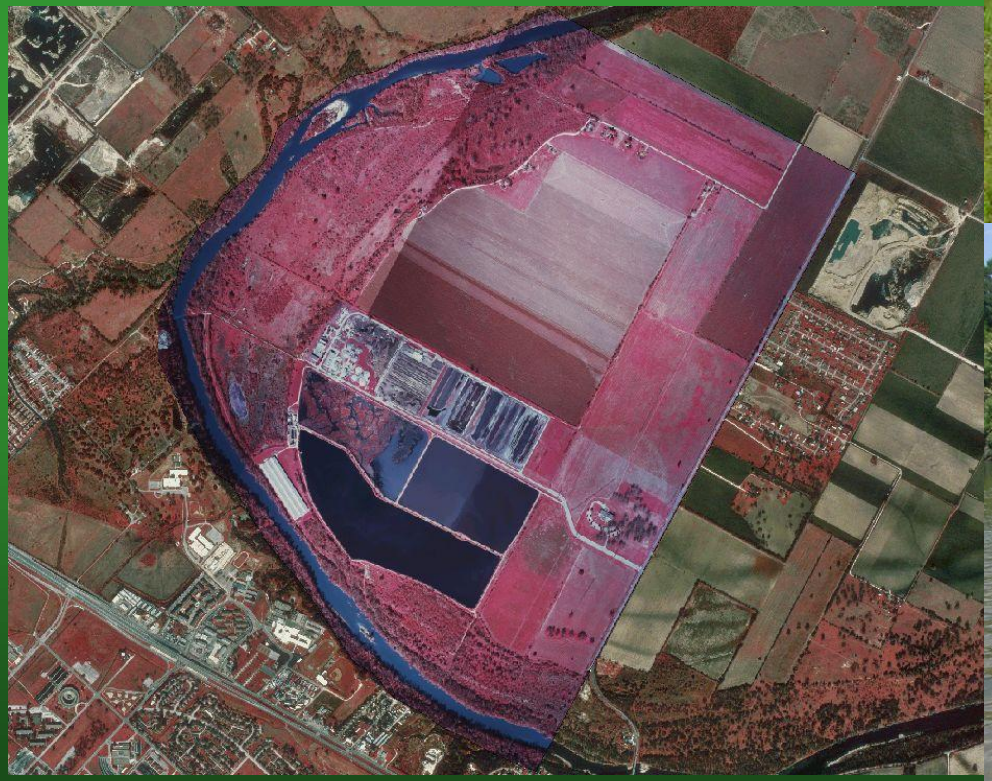
- Urban Sustainability and Ecology
- Research and Education

PARTNERS

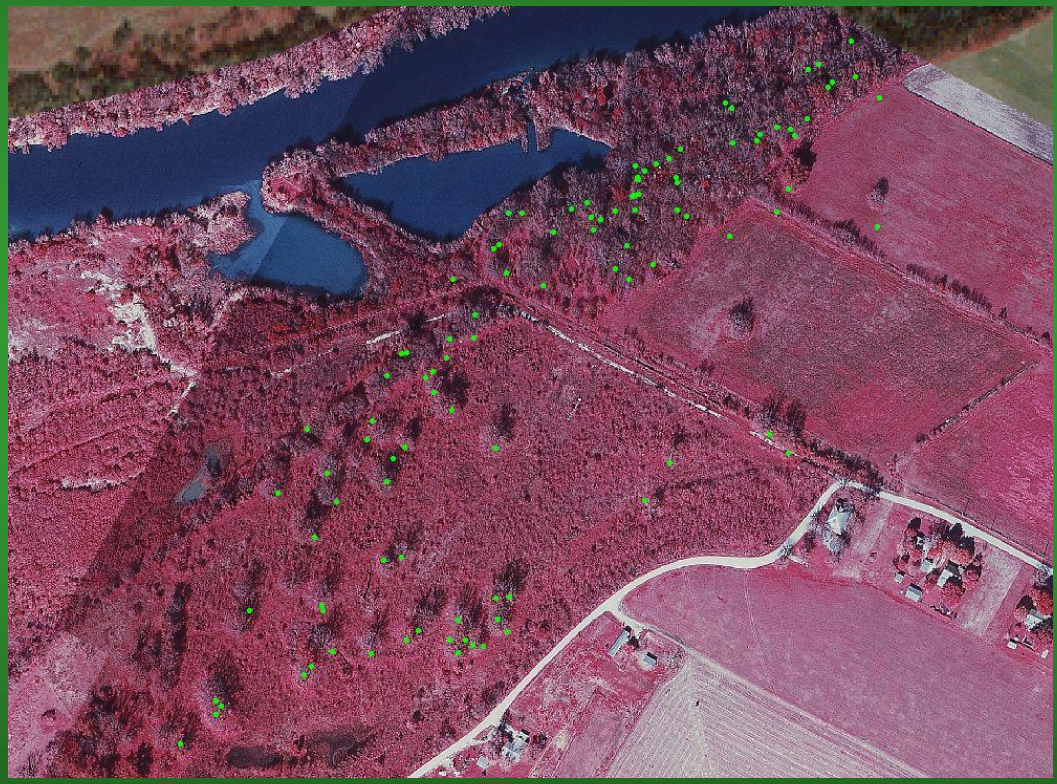
- The City of Austin Water and Wastewater Utility
- University of Texas
- Texas A&M University

Hornsby Bend

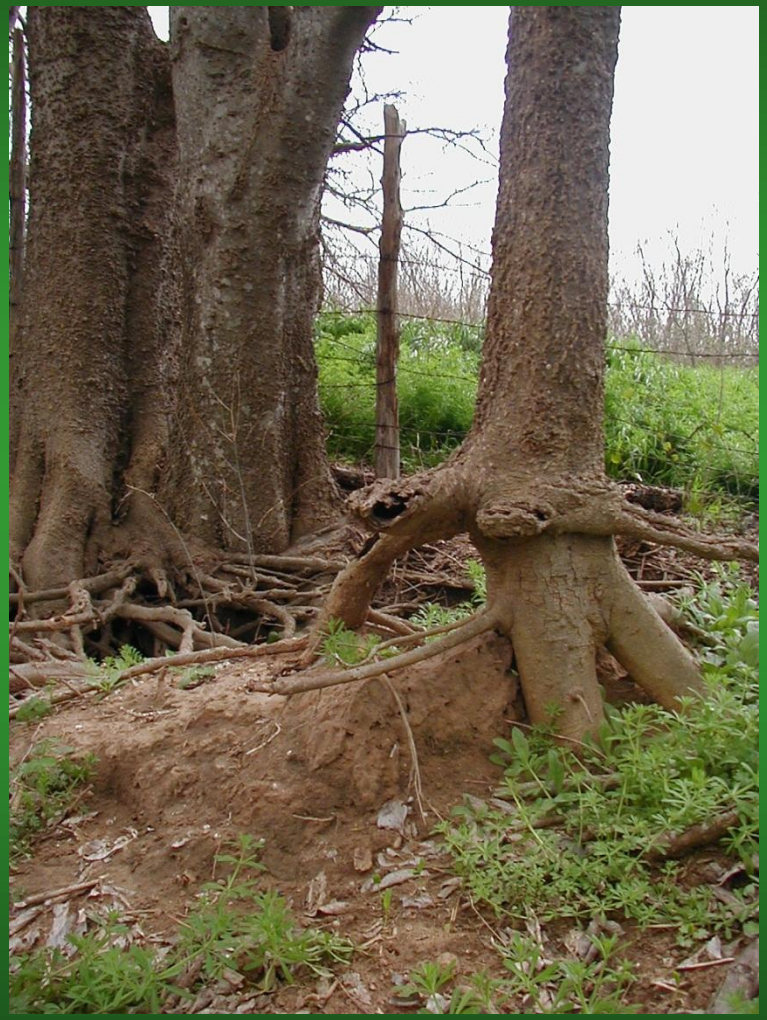
Land Management and Research



Research – Riparian Ecology



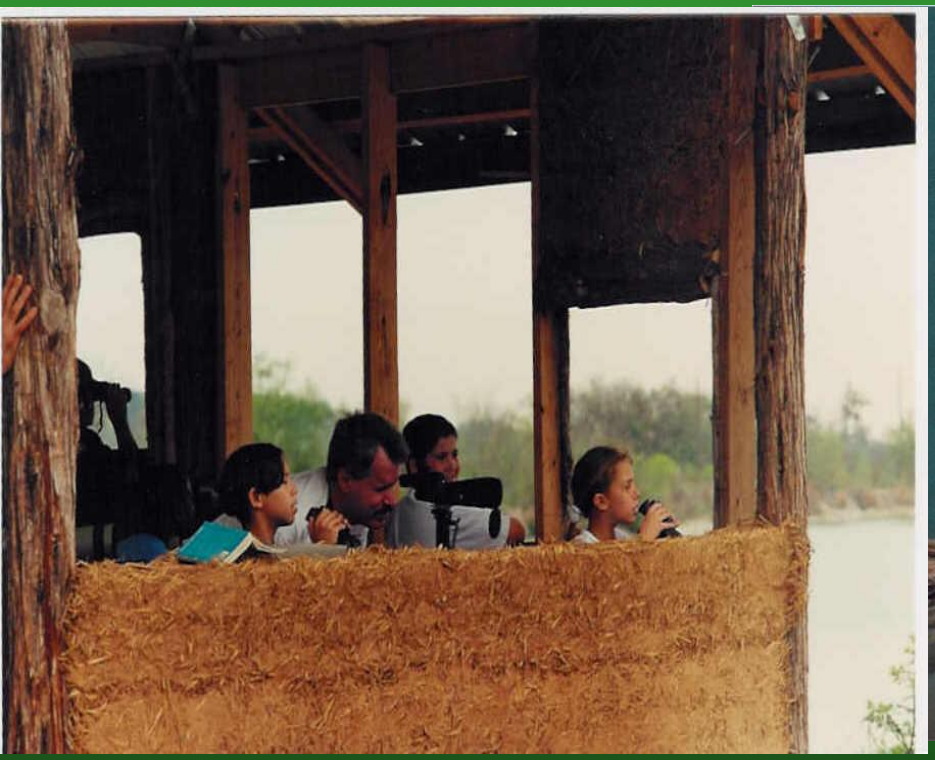
Research – Riparian Restoration



Hornsby Bend Bird Observatory

A cooperative partnership promoting the study and understanding of birds in Central Texas

Funded by the Travis Audubon Society



Citizen Science

- Bird Survey
- Bird Monitoring
- Hawkwatch
- Bird Banding
- Workshops
- Classes

HBBO Web – www.hornsbybend.org

Hornsby Bend Ecological Mentorship Program – UT Academic Internships

- Environmental career mentoring
- Individual-team research projects
- University of Texas - Undergraduates


PLANT OPEN TO VISITORS
SUN UP TO SUN DOWN
GATES WILL BE CLOSED
DURING OTHER HOURS
NO UNAUTHORIZED PERSONS
ARE ALLOWED ON THE
GROUNDS AT NIGHT
HORNSBY
BEND
TRAILS

Dillo Dirt in Landscaping

- Grass Establishment ½ - 2” incorporated
- Grass Maintenance 1/10 – ¼”
- Shrub and Tree Planting ½” – 2” (surface)
- Shrub, Tree Maintenance 1/10 – ¼” (surface)
- Potting mixes – no more than 1/3 by volume

How To Become a Dillo Dirt Vendor

Sign up online for free at

http://www.austintexas.gov/department/dillo-dirt-vendor-information

Dillo Dirt is currently $12.65 per cubic yard

Helpful Contact Info

Jody Slagle, Compost Manager
(512) 972-1954
jodyslagle@austintexas.gov

- Hornsby Bend receptionist 972-1950

DILLO DIRT CONSTITUENTS
2012

Constituent	Max Measured	Avg Measured	TCEQ/EPA "Unrestricted Use"#
N		2.80%	-
P		0.91%	-
K		0.55%	-
Arsenic	5.2 Mg/Kg	4.4 Mg/Kg	41 Mg/Kg
Cadmium	0.85 "	0.70 "	39 "
Chromium*	17.8 "	14.8 "	1200 "
Copper*	235 "	204 "	1500 "
Lead	23.6 "	20.7 "	300 "
Mercury	0.57 "	0.41 "	17 "
Molybdenum*	12.9 "	6.65 "	-
Nickel*	14.1 "	12.7 "	420 "
Selenium*	5.9 "	4.7 "	36 "
Zinc*	466 "	422 "	2800 "

*(These elements are known to be micronutrients for plants and/or animals)
#("Unrestricted Use" is an "Exceptional Quality" biosolids product considered safe enough even for vegetable gardens if desired. The City of Austin recommends its use primarily for lawns and flower gardens.)