Good morning!

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Nature has its' own way of cycling things

Energy from the sun is used to 'fix' atmospheric CO_2 via photosynthesis. Plants take up nutrients from soils

The plant matter is used as food by a wide range of animals including microorganisms

A portion of the carbon and nutrients remain fixed (soil organic matter animal biomass) and the remainder decomposes aerobically and returns to the atmosphere as CO_2

When you have this many ‘Bears’

Uses in agriculture [edit]

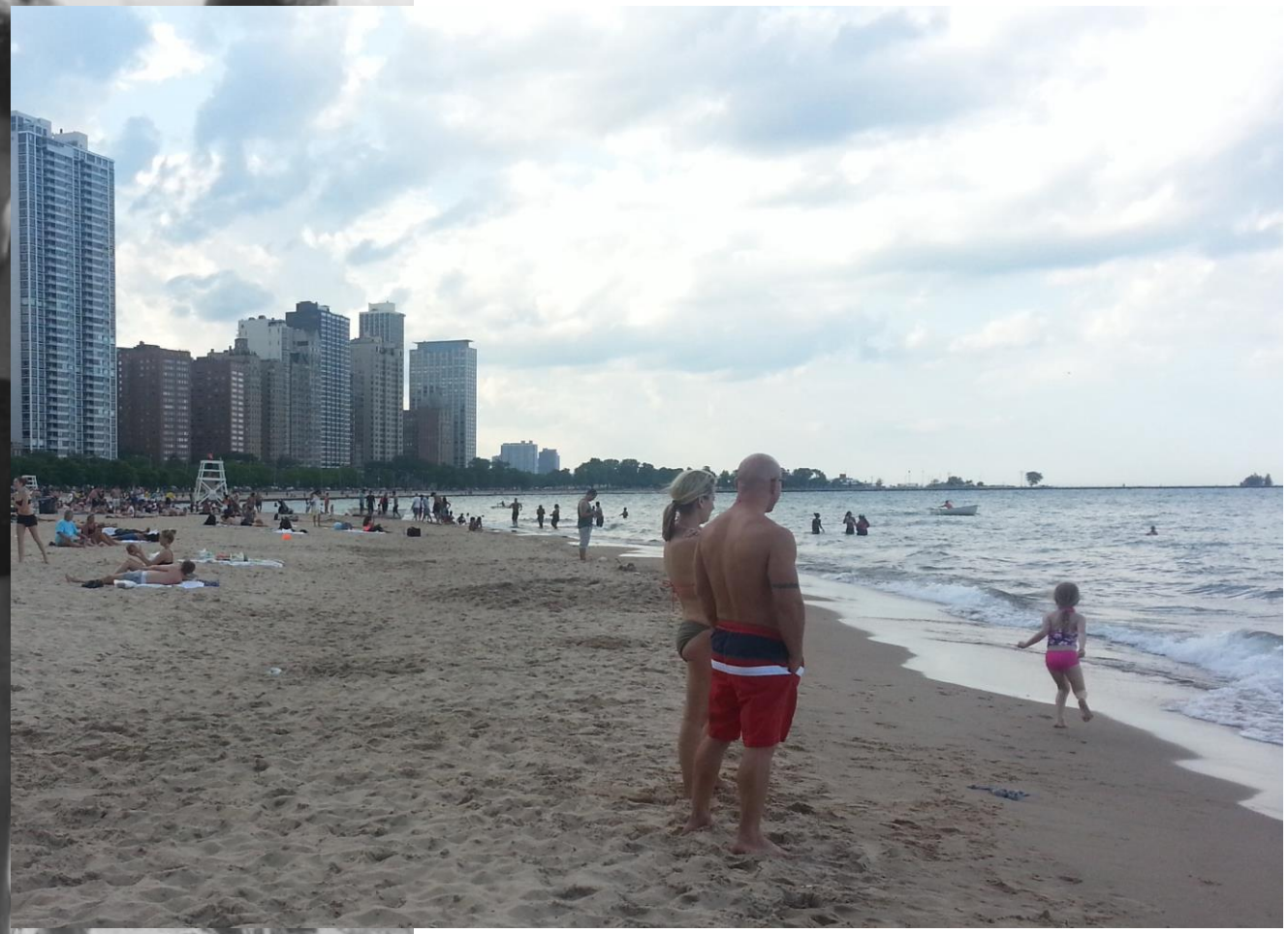
Further information: Reuse of excreta

Human excreta may be attractive as fertilizer because of the high demand for fertilizer and the relative availability of the material to create night soil. In areas where native soil is of poor quality, the local population may weigh the risk of using night soil.

The use of unprocessed human feces as fertilizer is a risky practice as it may contain disease-causing pathogens. Nevertheless, in some developing nations it is still widespread. Common parasitic worm infections, such as ascariasis, in these countries are linked to night soil use in agriculture, because the helminth eggs are in feces and can thus be transmitted from one infected person to another person (fecal-oral transmission of disease).

Way back- Night soil
So what can go wrong?

Then came



Lake Washington- in the mid 1960s

Phase III

Photo courtesy of King County Wastewater Treatment Division

INFRASTRUCTURE TRANSFORMATION

WASTEWATER TREATMENT FACILITIES AS RENEWABLE RESOURCE CENTERS

One of the great public health triumphs of the last century —wastewater treatment — is poised for transformation into a community sustainability centerpiece.

Sally Brown

the environment. Feeding this water to lakes and streams was more than they could handle. The problem wasn't too much metals or terrible toxic pollution (though there was some of that for sure). Rather it was too much food, too many nutrients. Adding this much extra carbon, nitrogen and phosphorus to lakes and streams caused algal blooms as aquatic organisms chowed down on the new taste treats, depleting oxygen and causing fish kills. These nutrients that can build soils and help to grow plants

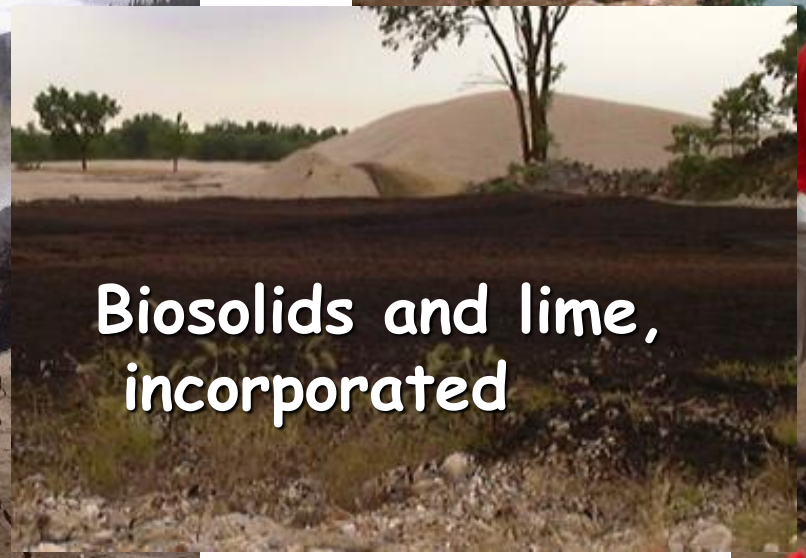
All of this gives us more biosolids
Biosolids-A little bit of you in every batch

Biosolids = gold for the soil
For example


Surface application of biosolids and wood ash


Biosolids sugar beet lime, CaO


Surface application of compost and wood ash


Biosolids and lime, incorporated


Lime stabilized biosolids + Fe

You guys were the pioneers in this work

Even works for contaminated soils in urban areas

Residuals based amendments

- Significant source of carbon credits for land application (1-3 Mg CO_2 Mg)
- Can increase yields
- May dilute soil Pb
- May alter mineral form of Pb, potentially decreasing bioaccessibility

Urban Agriculture

Soils

- Use of fertilizers and composts may reduce bioaccessibility of Pb
- Active plant cover reduces potential for dust and makes access more difficult for children and toddlers

Vegetables and fruits

- Insignificant source of lead in diet
- Benefits associated with food security and improved nutrition

And not just contaminated sites!

Biosolids to dryland wheat

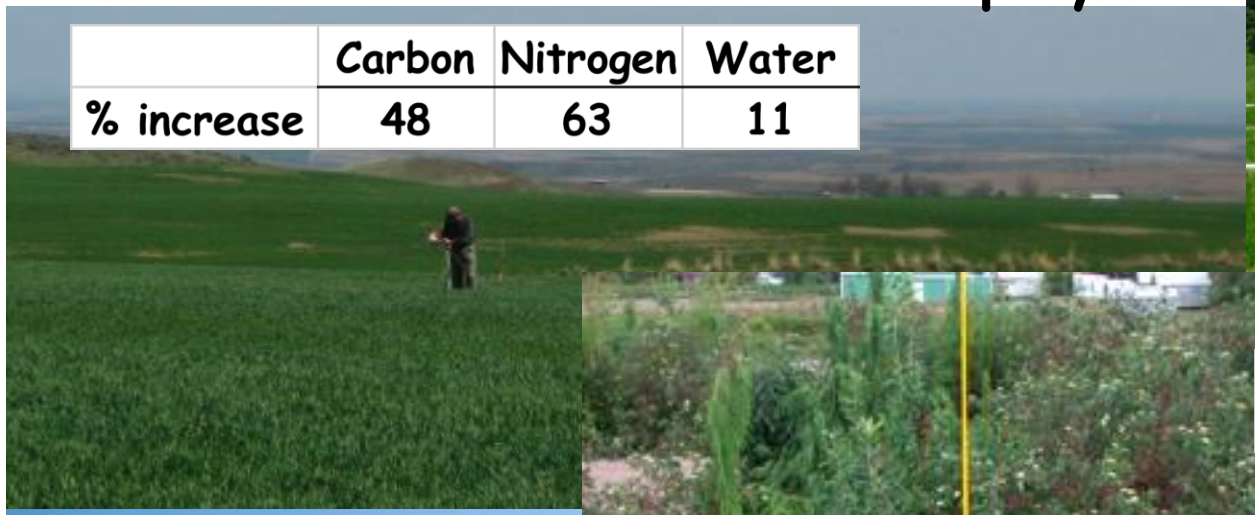
Composts and biosolids to turf grass

Composts to landscape

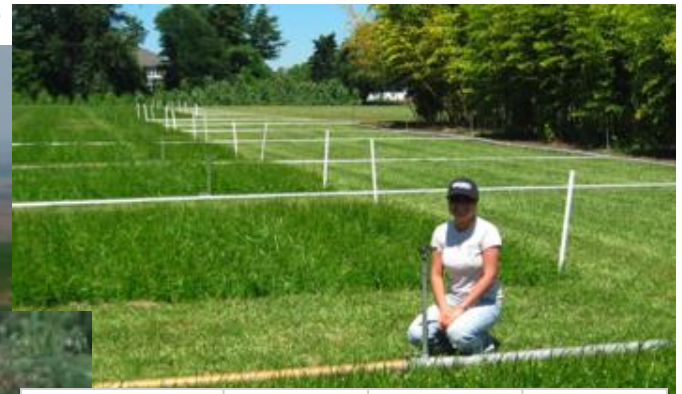
Compost to orchards

Biosolids and composts to roadside

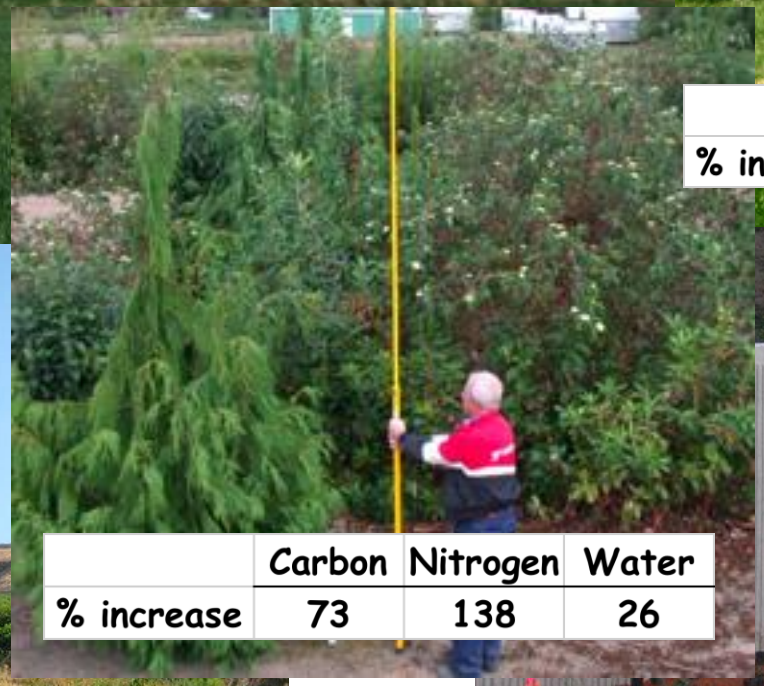
+ Higher yields, + most cost effective for rate payers



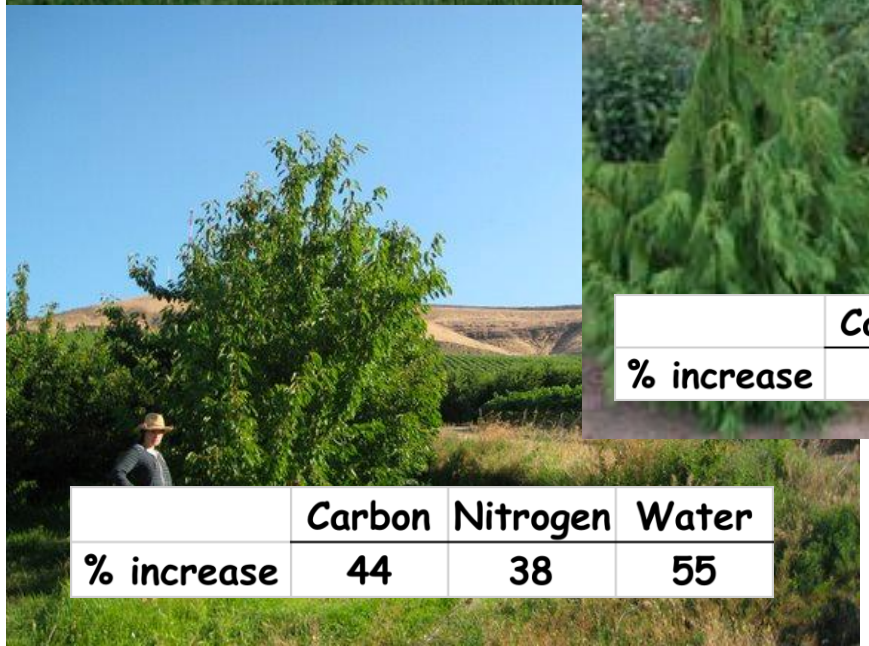
	Carbon	Nitrogen	Water
% increase	48	63	11



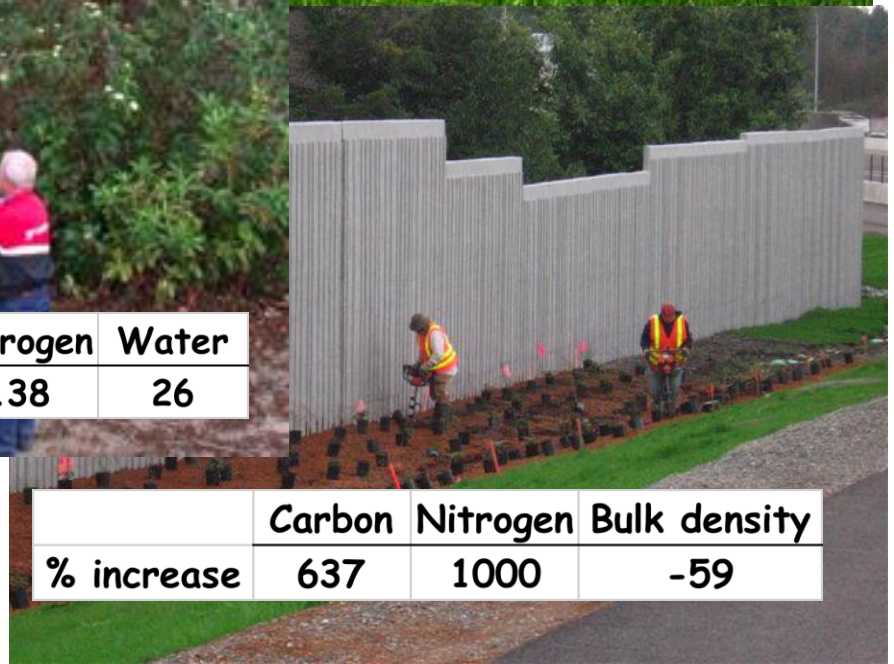
	Carbon	Nitrogen	Water
% increase	24	33	28



	Carbon	Nitrogen	Water
% increase	73	138	26

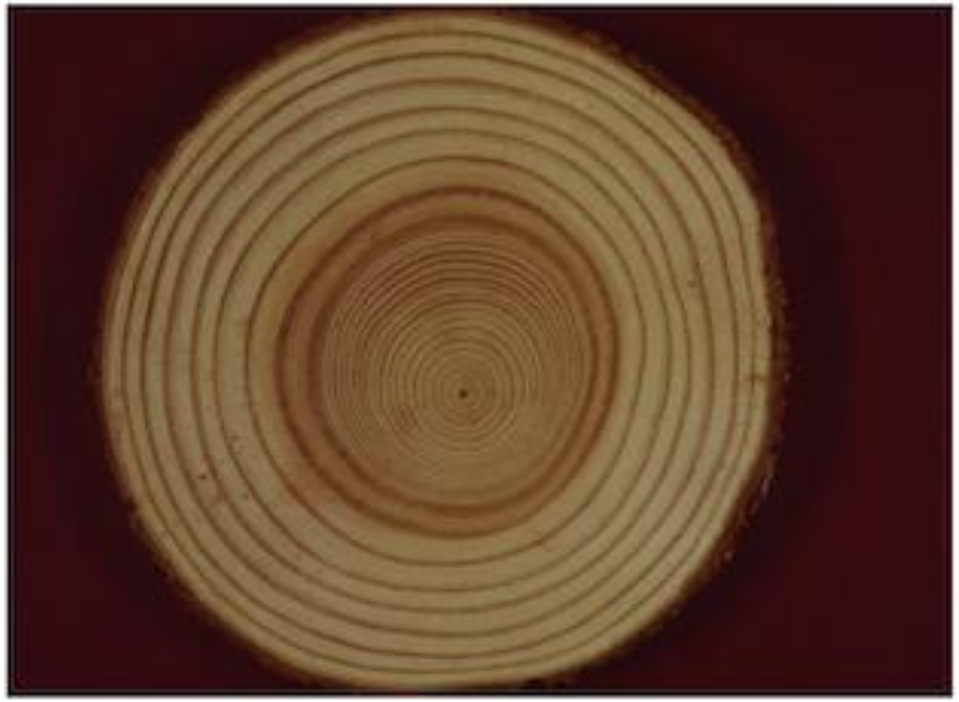


	Carbon	Nitrogen	Water
% increase	44	38	55



	Carbon	Nitrogen	Bulk density
% increase	637	1000	-59

You get bigger and healthier trees and bigger and healthier broccoli



Just ask Albert

Plus you save the planet

Transport and application
- 224 km haul distance
- 30 ton capacity truck
- Application by self loading vehicle

0.05 Mg CO_2 per dry ton

Soils
- Fertilizer value of material
  - **-0.245 Mg CO_2 per dry ton**
- Increase in soil carbon
  - **-5.15 Mg CO_2 per dry ton Tokul soil**
  - **No change Klaus soil**

Above ground biomass
- Increase in tree growth
- Commercial plantation
  - **40 year rotation**
  - **Does not qualify**

Tokul soil balance = 0.05- 0.245- 5.15 = -5.3 Mg CO_2 per dry ton biosolids
Klaus soil balance = 0.05-0.245 = -0.2 Mg CO_2 per dry ton biosolids

With a tool like this

- Don’t let unrealistic fears stop you from using it as widely as possible