Historical Background of Degradation

NREM 612
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I. Historical Context of Human-Induced Degradation

A. 21,000 BC: bow & arrow replace spear, central Asian hunters → Europe, Siberia, & N America (Montgomery 2007)

1. Hunter-gatherers small degr. footprint due to low pop density, low growth rates, mobility

Q: How did HGs degrade ecosystems?
2. **8,500 BC ~ HG global pop. of 4 million** (Tillman et al. 2002)
3. Model of land use transitions (& degradation) over time

(Foley et al. 2005)
B. ~ 7,500 BC: Ag. develops in Mesopotamia, China, Mesoamerica (Montgomery 2007)

1. Ag settlements supported ↑ pop growth. Why?
   a. 
   b. 
   c. 

Why?
C. 6,000 BC: Cattle first domesticated in Greece/Balkans (quickly spread to Middle East, Europe, India)

1. Animal husbandry ↑ food prod., ↑ land conversion, ↑ manure for fert.

D. Repeating story: HG societies conquered by Ag. societies (Diamond 2002)

1. ↑ population & land conversion ➔
Model of land use transitions (& degradation) over time

(Foley et al. 2005)
E. Europe: Deforestation, Erosion

a. 900 BC-250 AD: Greek, Roman writers comment on deforestation
   i. Plato wrote of erosion

b. 1180-1220 AD: St. Francis of Assisi witnessed deforestation & voiced concern for nature
   i. Patron Saint of
F. 1750 AD - **Industrial Revolution**: Global pop. 800 million

1. Western societies transform from **Ag.** to **Industrial**

   i. Demographic shift:
2. AG society: Pop. lived among fields that sustained them
   i. Nutrients returned to soil

3. Urbanizing society:
   i. Nutrients drawn from field to cities
   ii. Wastes leave via streams to coasts/sea, not returned to soil
4. Potential for unlimited food production

“The improvements to be made in cultivation & in the augmentations that earth is capable of receiving in the article of productiveness, cannot, as yet, be reduced to any limits of calculation. Myriads of centuries of still increasing population may pass away, & the earth be yet found sufficient for the support of its inhabitants.”

William Godwin in *Political Justice*, 1793
5. 1850 widespread use of steam power fueled by coal

i. engines, ships, trains → Transportation Revolution

ii. ↑ in atmospheric CO₂ concentrations
6. Inexhaustible fisheries & ocean resources

“I believe, then, that the cod fishery, herring fishery, pilchard (sardine) fishery, mackerel fishery, and probably all great sea fisheries, are inexhaustible; that is to say, that nothing we do seriously affects the number of the fish. And any attempt to regulate these fisheries seems consequently, from the nature of the case, to be useless.”

T. Huxley in 1883
G. New attitude emerges

1. 1850-1900: Poets Wordsworth, Blake, Emerson expressed interest in env.
   
   a. Saw “industrial man” as

2. 1872: U.S. estab. Yellowstone as world’s 1st National Park
   
   a. New concept,
3. J. Muir & T. Roosevelt

   a. Muir (1838-1914)
      i. co-founds Sierra Club
      ii. advocate for wilderness &

   b. TR (1858-1919): “Conservation President”
      i. 1901-09: estab. 5 NPs, 4 N. Monuments,

4. **1915 AD** End of Ind. Rev., Global pop. = 1.8 billion
H. 1910-1920 Haber & Bosch?

1. Synthesized NH$_4$ from N$_2$ + H$_2$
   
   a. Haber:
   
   b. Bosh:

2. Facilitates ag intensification
   
   a. humanity no longer relies only on natural sources of N
   
   b. Coastal eutrophication
Model of land use transitions (& degradation) over time

(Foley et al. 2005)
I. U.S. 1930s: **Dust Bowl/Dirty 30s**

1. Dust storms → formation of SCS in 1933, S&W Cons. Districts

   a. Black Sunday
J. 1945 Food & Agriculture Organization (FAO)

1. Becomes agency of UN 1946
   a. HQ in Rome

2. Purpose: food security for all (consults, provides funding, collects data)
   a. focuses on
K. 1950s-Present: **Green Revolution**: global pop. 2.4 billion

1. ↑ in ag production *due to what main factors?*
   a. 
   b. 
   c. 
   d. 

2. **Green Rev** driven by . . .

1. 1962 Rachel Carson, Silent Spring
   a. publicizes effects of chemicals on birds & fish

2. Mar. 21, 1970?

   a. Bridge gap bet theory of ecology & pop biology & cons. practice & policy
4. Gaia hypothesis (Lovelock 1979)?

a.

a. **Establishes principles** for optimum use of world's land resources, for improvement of their productivity, & for conservation for future generations

b. **Calls for commitment of gov’t, internat. orgs, & land users to manage** for long-term

c. Calls for land-use **policies which create incentives** for participation in soil conservation
N. 1992: UNCED Rio

1. Earth Summit: U.N. Conf. on Environment & Development

2. Addressed 3 issues:

   a.

   b.

   c.
O. **2000s**: Advances in Remote Sensing & GIS, RE & EBM

1. RS & GIS improve monitoring of environ. @ various scales

(NASA)
2. Explosive growth of Rest. Ecol. & EBM in 2000s

a. Economic growth based on exploitation ↓; growth based on restoration ↑ (Cunningham 2002)

b. Restoration =

c. Fed. & state agencies, NGOs shift from sectoral, single-species mgmt. to ecosystem-based mgmt
Model of land use transitions (& degradation) over time

(Foley et al. 2005)
II. “Human-Dominated Ecosystems” Concept

A. Focus of Special Issue of Science in 1997

*What did you think of the Vitousek et al. 1997 paper?*
B. Characteristics of HDEs compared to natural ecosystems (NEs)

Fill in this table w/ a partner based on Vitousek paper & your knowledge

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<tr>
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<th>HDEs</th>
<th>NEs</th>
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<td>disturbance regimes (fire, flooding, buffalo migration, etc.)</td>
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III. Geologic Eras:

A. Cambrian, Ordovician, Carboniferous, Triassic, Jurassic, Oligocene, Pleistocene, Holocene, . . .

. . . Anthropocene

B. Paul Crutzen, atmo. chemist, coined term in 2000

C. 2010 human pop. ≈ 6.8 billion

(Zalasiewicz et al. 2008)
Are we now living in the Anthropocene?