

TURF:

Is it really a Green Desert?

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Why are we so vertebrate oriented?

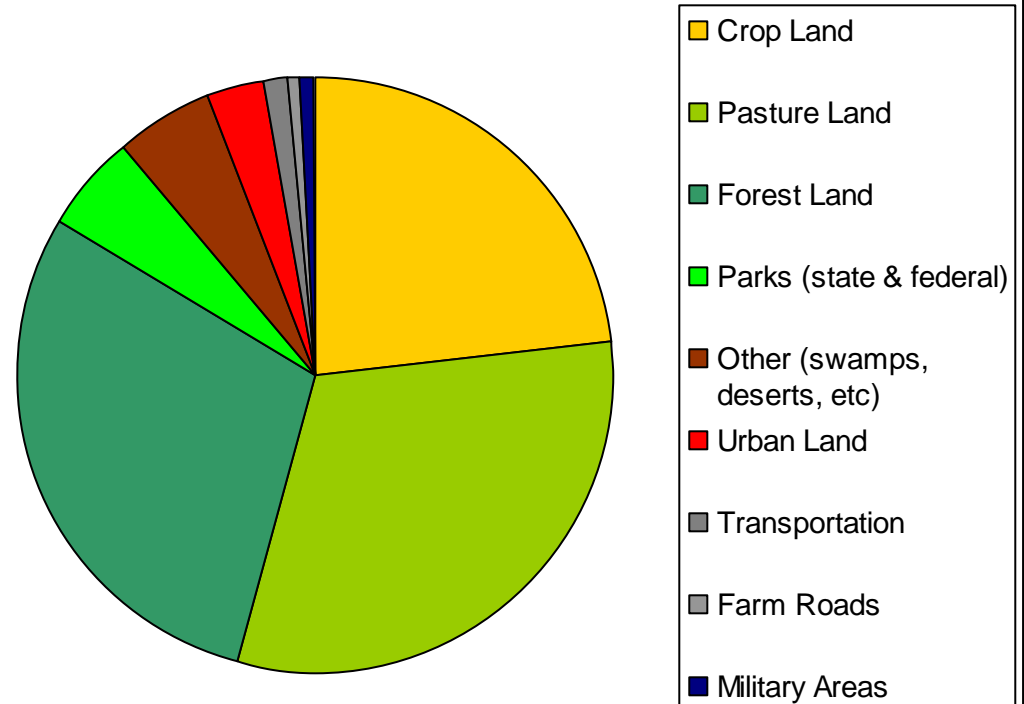


We can all agree that rainforests are biodiverse!

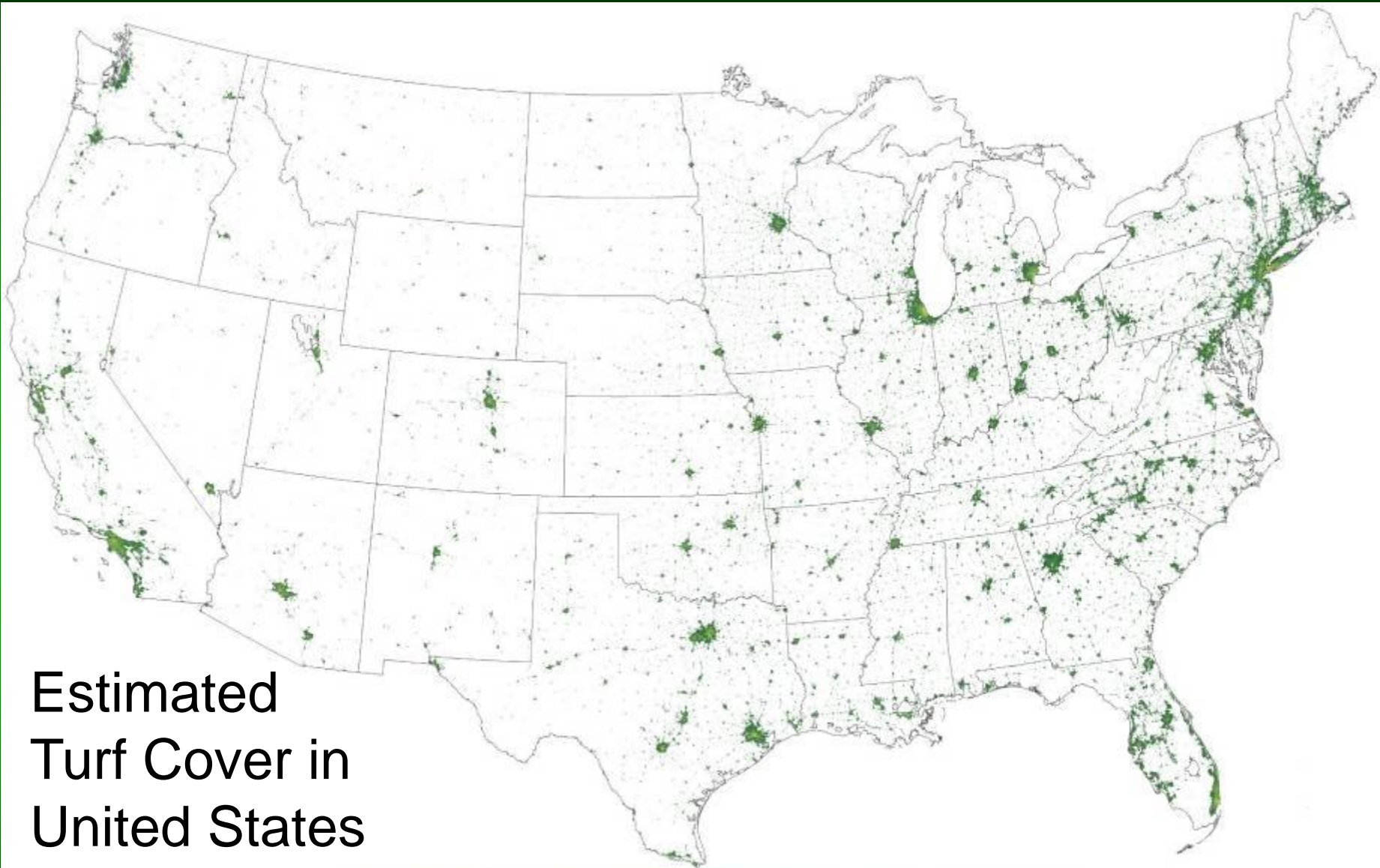


Crop Land	441,273,000
Pasture Land	584,224,000
Forest Land	559,135,000
Parks (state & federal)	100,329,000
Other (swamps, deserts, etc)	97,201,000
Urban Land	59,193,000
Transportation	26,913,000
Farm Roads	10,758,000
Military Areas	14,776,000

Land Use in U.S. 48 States in 2002 (acres)



From: USDA, ERS, 2007



Estimated Turf Cover in United States



From NASA maps, 2007

Biodiversity

Traditional Definitions: species diversity and species richness.

Modern Definition: totality of genes, species, and ecosystems of a region.

Are turfgrass habitats
biodiverse?

Human Urbanized Landscapes

An aerial photograph of a suburban residential area. The landscape is characterized by a dense, repetitive pattern of winding roads and small, uniform houses. The roads are light-colored, and the houses are mostly light-colored with dark roofs. There are some green spaces, including a golf course in the center-right, and a few larger buildings or commercial areas. The overall appearance is one of a highly planned and structured human-made environment.

**Obviously highly structured and
not natural!**

But, does it lack biodiversity?

Recent Studies of Lawn Arthropods



Digman/Shetlar - Ohio

Dr. Sophie Rochefort – Quebec

Dr. Dan Peck – New York

Common Turfgrass Non-Target Organisms

- Acari (mites)
- Collembola (springtails)
- Coleoptera (beetles – adults & larvae)
- Myriapods (millipedes, centipedes, symphylans)
- Formicidae (ants)
- Hemiptera
- Mollusca (snails-slugs)
- Annelida (earthworms)
- Diptera
- Protura
- Etc.



Materials & Methods



- Samples: standard golf course cup cutter (14.19 inch² / 0.0092 m²)
- Samples were subjected to Berlese funnel extraction.
- Arthropods were sorted, counted and tabulated.



Arthropod Abundance 2002 Data

- Abundance ranged from 21,246 arthropods per m² in July 2002 to 30,785 per m² in October 2002 in untreated plots.
- Acari (mites) comprised > 73%
- Collembola (springtails) > 18%
- Coleoptera larvae ~ 2%
- Coleoptera adults ~ 2%
- Diplura ~ 2%
- The remaining groups (i.e. Symphyla, Formicidae, Myriapoda, Aranae, Isopoda and Hemiptera) comprised < 3% of total animals observed



Arthropod Abundance 2005 Data

- Abundance ranged from 27,942 arthropods per m² in July to 45,559 per m² in late August in untreated plots.
- Acari (mites) comprised > 64%
- Collembola (springtails) > 29%
- Symphyla > 5%
- Diplura < 1%

Rocheport Studies – Quebec 2003-2005

- **Used two lawn areas**
 - **Newly established & 10-year-old**
 - **Four management types**
- **Pitfall Samples & Core Samples**
 - **Most intense evaluation of
Collembola and Carabidae**

Rochefort Studies – Quebec 2003-2004

Collembola Diversity

- 21 species, 17 genera & 9 families found (compared to 27 in Michigan & Illinois tall-grass prairies & 23 in dry grasslands in Australia)
- Tremendous fluctuations during season
- Ranged from 1K to nearly 80K collembolans per m² during two seasons!
- Higher total numbers in managed lawn than in low-maintenance lawn.

Peck Studies – New York 2002-2009

Peck (2009a) [July – October, 2001 & 2002]

47.7K arthropods/m² in 2001

27.1K arthropods/m² in 2002

Peck (2009b) [2001, 2002, 2003, 2004, 2005]

25.6K arthropods/m² in 2001

14.6K arthropods/m² in 2002

7.5K arthropods/m² in 2003

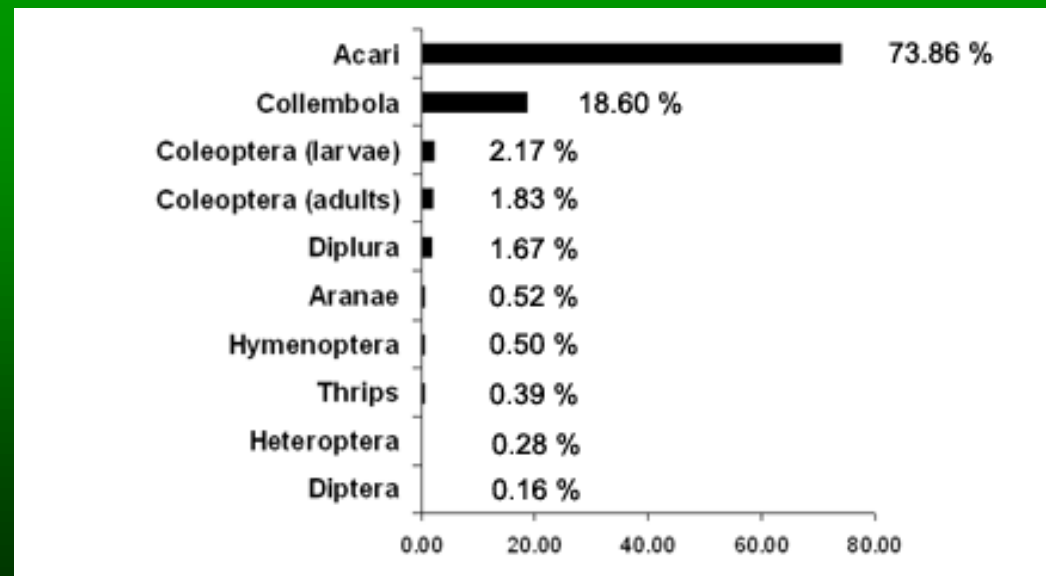
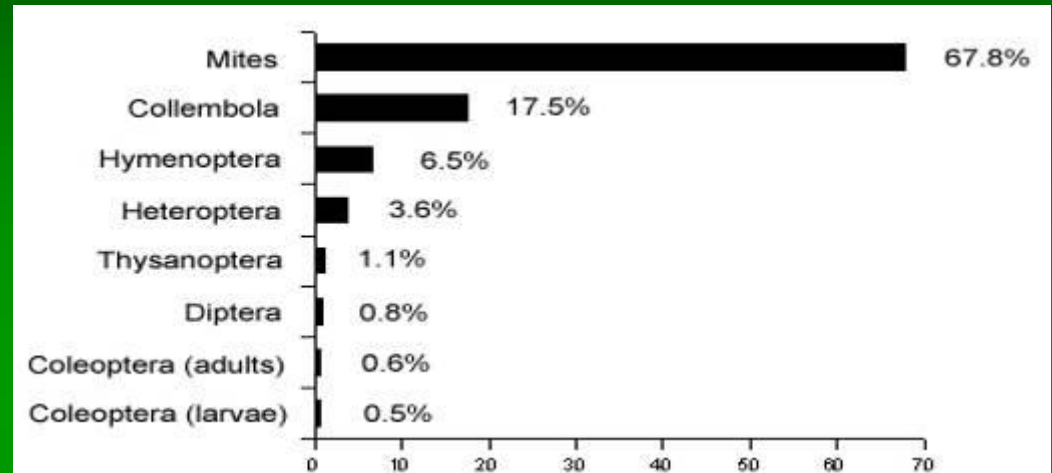
8.8K arthropods/m² in 2004

14.9K arthropods/m² in 2005

Mixed lawn ~ 38% fine fescue, 23% perennial ryegrass, 38% broadleaf weeds

Abundance Comparison

- Peck 2001-02
Key Taxa Data
New York (27-47K arthropods per m²)
- Digman 2002
Key Taxa Data
Ohio (21-30K arthropods per m²)



Turfgrass Nematode Biodiversity

Grewal et al. Lab in Ohio

Cheng, Richmond, Salminen & Grewal (2008a) –

- 205-413 nemas/20gm soil
- No significant difference between no-input lawn, DIY & professional
- Food Webs – highly enriched & moderately structured.

Turfgrass Nematode Biodiversity

Grewal et al. Lab in Ohio

Cheng, Grewal, Stinner, Hurto, Hamza (2008b) –

- 41-460 nemas/20gm soil
- No significant difference in nematode populations between 9 turf management practices!
- Food Webs – maturity index low and enrichment index high in higher fertility treatments.

Turfgrass Nematode Biodiversity

Grewal et al. Lab in Ohio

<u>Nematode Genera Types</u>	<u>2008a</u>	<u>2008b</u>
Bacterivores	13	14
Fungivores	2	2
Predators	1	1
Omnivores	4	5
Plant Parasites	14	16



Herbivores



Notice anything about where the major herbivores live?

Turfgrass herbivores

Crambid Sod Webworms ~20 species



Peck's Skipper





Weevils (billbugs & stem weevils)

Turfgrass herbivores

Mites



Scarabs (white grubs)



Springtails



Predators?

“Lions, Tigers & Bears, Oh My!”

Turfgrass Arthropod predators





Where did turf come from?

Is turfgrass a “green desert?”

Even without going to the gene level, turfgrass is proving to be an incredibly biologically active ecosystem at all trophic levels that is inhabited by diverse animals, though they are admittedly small!