Introduction

Ecosystems provide many nature-based goods and services that are beneficial to society. There is a large body of research linking these ecosystem services to improvements in human health. The ecosystem services that are most relevant to human health can be broadly categorized as: air filtration; biodiversity conservation; climate stabilization; habitat maintenance; natural hazard mitigation; food, fuel and fiber production; water filtration; water regulation; and the provision of aesthetic environments and recreational opportunities. A review article summarizing this work was recently published in IJPH (doi: 10.1007/s00381-013-0482-1).

Objectives

1. Identify literature focused on the relationship between ecosystem services and human health.
2. Design an interactive, web-based tool highlighting the weight of evidence.
3. Make the information accessible to a wide audience.

Methods

Stage 1: Google Scholar search terms

- Health terms: health, well-being, environmental health
- Ecosystem terms: natural environment, ecosystem services, green space
- Subject area terms: mental health, physical health

Stage 2: Pubmed & Science Direct search terms

- Health + Green space + Natural environment
- Mental health + Ecosystem services
- Wellbeing + Outdoor

Stage 3: Targeted journals

- Journal of Epidemiology and Community Health
- Journal of Environmental Psychology
- Environment and Behavior
- American Journal of Preventive Medicine
- Landscape and Urban Planning

Screening Articles for the Browser

A four stage systematic review focused on ecosystem services and human health was conducted (see left).

- The literature search was limited to peer-reviewed journal articles published from 1 January 1990 to 31 December 2012.
- Gathered articles were then screened for inclusion in the Browser.
- Preference was given to articles that were published after 2000, with objectively measured variables, and quantitative results.

Search results from the systematic review and screening for The Browser

Results: Systematic Review

Number of relevant articles returned from the systematic review from 1990 to 2012:

- 344 potentially relevant articles were collected for further review.
- Results suggest an increase in attention to the subject area, as the annual publication of articles increased substantially from 0 to 75 from 1990 to 2012 (see left).

Journals publishing the most articles identified in review of ecosystem services and human health 1990-2012

- Several journals published multiple articles; between 4 and 17 articles were found in 12 journals (see right).
- The majority of articles focused on either buffering or health-promotional services.

Results: The Eco-Health Browser

The Eco-Health Relationship Browser

There are four ecosystems in the Browser:

- Forests
- Urban Ecosystems
- Wetlands
- Agro-Ecosystems

Ecosystem Services

- Health promotional services
- Aesthetics and Engagement with Nature
- Recreation and Physical Activity

Buffering Services

- Clean Air
- Clean Water
- Heat Hazard Mitigation
- Water Hazard Mitigation

Browser Pop-Up Box

- Pop-up appears when user hovers over “+”.
- Article summaries capture the state of the science on the selected link.
- Includes citations, sample sizes, and study locations.
- Summaries allow reader to distinguish between speculative and more established results.

Discussion: Mechanisms for Observed Health Outcomes

Prevailing Mechanistic Theories

- Stress Reduction (Ulrich, 1989)
- Attention Restoration (Kaplan and Kaplan, 1989)
- Nature Appreciation (Bratman et al., 2012)
- Improved mood and mental health (Bratman and Iverson, 2010; Van der Laan et al., 2015)
- Increased social cohesion (Carr, 2008; Hargreaves and Hopkins, 2012)

An Example of Integrating Mechanistic Theories into the Browser

- Attention Restoration (Kaplan and Kaplan, 1989)
- Nature Appreciation (Bratman et al., 2012)
- Stress Reduction (Ulrich, 1989)
- Directed attention (Attention compared in children with ADHD and control children)
- Attentional filtering (Attentional functioning in children with ADHD)
- Academic achievement
- ADHD symptoms
- Feelings of confusion

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