

Ecosystem Services and Environmental Health

Authors: Spence, Porchè L., Floyd, Minnjuan Flournoy, Howard, Joniqua, and Simmons, Candice

Source: Environmental Health Insights, 9(s2)

Published By: SAGE Publishing

URL: <https://doi.org/10.1177/EHI.S38845>

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Ecosystem Services and Environmental Health

■ Porchè L. Spence

Howard Hughes Medical Institute Post-Doctoral Fellow, Center for Science, Math and Technology Education at North Carolina Central University.

■ Minnjuan Flournoy Floyd

Social Science Analyst, US Department of Health and Human Services, Substance Abuse and Mental Health Services.

■ Joniqua Howard

Instructor and Provost Post-doctoral Fellow, University of South Florida.

■ Candice Simmons

Visiting Assistant Professor and Acting Director, Savannah River Environmental Science Field Station, South Carolina State University.

Supplement Aims and Scope

This special issue of *Environmental Health Insights* will be designed to explore the interrelated – and rapidly changing – issues of ecosystem services and environmental health. There are many challenges to ecosystem services which, in turn, threaten human health. These include the rapid process of urbanisation; the increased concentrations of poverty and pollution in the urban periphery; climate change and new patterns of ecosystem services; agricultural intensification and extractive mining industries. At the same time, ecosystem services perform many diverse and under-recognised roles in relation to human health, including as a source of ingredients for indigenous and other health, the provision of livelihoods and wellbeing, nutrient supplementation and so forth. The risks of ecosystem degradation and the benefits of ecosystem services are not always readily apparent and may only be fully realised many years down the line.

Yet, in many developed and undeveloped parts of the world, consequences of these interrelated processes and the risks and hazards that they pose to both human health and ecosystems remain underexplored. This special issue of the *Environmental Health Insights* will draw seek draw on new, empirical research which examines the nexus between ecosystem services and environmental health in the context of a rapidly changing world.

Environmental Health Insights aims to provide environmental health practitioners, researchers and the general public with online, open access to scholarly articles on environmental health hazards and associated risks. The journal aims to explore how these hazards and risks can be eliminated or limited or prevented to help protect human health and our environment.

In a field where the literature is ever-expanding, practitioners and researchers increasingly need to have ready access to up-to-date, high-quality scholarly articles on areas of ongoing interest in environmental health. This supplement aims to address this need by presenting contemporary articles by leading scholars, allowing readers to distinguish the signal from noise. We hope that through this effort practitioners and researchers will be aided in finding answers to some of the most complex and pressing issues of our time.

The essentials to life, from the air we breathe and the water we consume to the outdoor recreational activities we enjoy, all depend on healthy, natural ecosystems. Natural ecosystems (eg, wetlands, streams, estuaries, and forests) are indispensable for the survival of all species on Earth,^{1,2} because they are critical for regulating and maintaining the ecological processes essential

for providing the ecosystem services required to sustain human health.² Ecosystem services are goods and services provided directly or indirectly by nature.³ These services are classified as provisioning, regulating, cultural and supporting. Provisioning services are products created by ecosystems for humans to use such as food, freshwater, fiber and fuel. Regulating services control the ecological processes occurring in ecosystems such as climate regulation, water purification, pollination, natural hazard regulation and waste treatment. Cultural services provide non-material opportunities for spiritual and inspirational, educational, and recreational activities. Supporting services are processes required for the production of all ecosystem services such as nutrient cycling and soil formation.³⁻⁵ The supply and variety of ecosystem services differs at local, regional and global scales.⁴



The Millennium Ecosystem Assessment Report (2005) identified freshwater, food, raw materials, medicines, nutrient cycling, wastewater treatment, regulation of infectious disease and climate, cultural and recreational activities as the main ecosystem services linked to public health. Recreational ecosystem services have a direct impact on mental and physical health because people enjoy spending time outdoors relaxing or participating in activities (eg, fishing, swimming, boating, etc.) in healthy ecosystems. Food, clean air, freshwater, medicine and the regulation of diseases are services that minimize threats to human health.⁶

With our biosphere rapidly becoming unbalanced due to climate change, the protection of natural ecosystems and biodiversity in conjunction with sustainable management of natural resources is advantageous for maintaining economic growth, environmental health, and access to ecosystem services.⁷ Human activities (eg, deforestation, agricultural expansion, burning of fossil fuels, and spread of invasive species) disrupt the stability within natural ecosystems by simultaneously exposing them to multiple stressors which threaten ecosystem services and environmental health.⁷ For example, freshwater is declining in many areas around the world, which jeopardizes the food supply and the availability of clean water needed for drinking, bathing, and cooking. Impaired freshwater systems are common in agricultural and urbanized areas. People whose diet consists mainly of local food sources are experiencing a decline in their food supply due to a decline in biodiversity and agricultural intensification. Furthermore, impaired natural ecosystems suffering from habitat alteration, transfer of pathogens from one location to another, decline in biodiversity or human-driven genetic changes contribute to increased risk of human exposure to vectors and outbreaks of parasitic diseases.⁴

As natural resources become overexploited, degraded, or extinct, the value and demand for ecosystem services increases.^{8,9} It is challenging to maintain a balance between economic growth, sustainable environments and public health. There is a recognized need to evaluate both biogeochemical and socio-economic indicators in order to better conserve natural ecosystems and protect the ecosystem services needed to sustain public health.¹⁰ Linking human health to ecosystem services is complex because it involves several socio-economical, biological and environmental factors.^{4,6}

The aim of this Special Issue of Environmental Health Insights is to explore issues involving ecosystem services and environmental health. The articles in this supplement address specific tools for improvement of current ecosystem assessment practices or monitoring applications that directly affect public health. Some challenges for evaluating the relationships between ecosystem services and environmental health highlighted in this supplement include the need for: (a) new approaches in environmental quality and exposure assessments; (b) identification of the relationships between ecosystem services and environmental health; and (c) improvements in the integration of monitoring ecosystem services and its interconnectivity between

the environment and public health. Jordan and Benson (2015) discuss the term “watershed epidemiology” and the importance of integrating environmental and human health data to provide a more comprehensive approach and understanding of the relationship between the environmental stressors, water quality, ecosystem services and human well-being at a watershed scale.¹¹ Murry et al., (2015) conduct an exploratory study to evaluate the relationship between aquatic recreational activities and human health by surveying 197 recreational users of the Anacostia River to determine to potential risk of exposure to water, however, this study did not include routine water quality monitoring.¹² Spence (2015) identifies practical improvements to current watershed monitoring practices through a demonstration of the use of caffeine as a chemical indicator for domestic waste water.¹³ Huff et al., (2015) provide an improvement in the technology used to track the evolution of wildfires, provide advanced warning for evacuations and fire suppression efforts and monitor the transport of smoke plumes by providing an online near real time visualization tool. This technology allows air quality forecasters and fire management officials to use satellite observations to complement ground-based and aircraft measurements of wildfire activity.¹⁴

Each of these articles emphasizes the need for integrating ecological and human health data to explore the influences of ecosystem changes on environmental health and ecosystem services. Establishing complete datasets and employing new environmental assessment and monitoring tools to improve our understanding of the complex interactions between ecosystems and human health are currently emerging. Educating the general public about the potential risk of environmental contaminants, getting citizens involved with reducing the pollutants reaching their local and regional ecosystems, and effectively communicating the threats of altering natural ecosystems are needed sustain human well-being and ecosystem services.

REFERENCES

1. Corvalan C, Hales S, McMichael A. *Ecosystem and Human Well-Being: Health Synthesis*. France: World Health Organization; 2005.
2. Groot RSd, Wilson MA, Boumans RMJ. A Typology for the Classification, Description and Valuation of Ecosystem Functions, Goods and Services. *Ecological Economics*. 2002;41:393–408.
3. Costanza R, d'Arge R, de Groot R, et al. The value of the world's ecosystem services and natural capital. *Nature*. 05/15/print 1997;387(6630):253–60.
4. Confalonieri UEC, Effen MA. Overview of How Ecosystem Changes Can Affect Human Health. In: Nriagu JO, ed. *Encyclopedia of Environmental Health*. Burlington: Elsevier; 2011:291–9.
5. Assessment ME. *Ecosystems and Human Well-being: Wetland and Water Synthesis*. Washington DC: World Resource Institute; 2005.
6. Henke JM, Petropoulos GP. A GIS-based Exploration of the Relationships Between Human Health, Social Deprivation and Ecosystem Services: The Case of Wales, UK. *Applied Geography*. 2013;45:77–88.
7. Environment Department, Bank TW. Convenient Solutions to an Inconvenient Truth: Ecosystem-based Approaches to Climate Change. Washington DC: The World Bank; 2009.
8. Jordan SJ, Hayes SE, Yoskowitz D, et al. Accounting for Natural Resources and Environmental Sustainability: Linking Ecosystem Services to Human Well-Being. *Environmental Science and Technology*. 2010;44:1530–6.
9. Brauman K, Daily GC, Duarte TKe, Mooney HA. The Nature and Value of Ecosystem Services: An Overview Highlighting Hydrologic Services. *Annual Review of Environmental and Resources*. 2007;32:67–98.

10. John Cairns Jr, McCormick PV, Niederlehner BR. A proposed framework for developing indicators of ecosystem health. *Hydrobiologia* 1993;263:1–44.
11. Jordan SJ, Benson WH. Sustainable Watersheds: Integrating Ecosystem Services and Public Health. *Environmental Health Insights*. 2015;9(S2):1–7.
12. Murray R, Wilson S, Dalemarre L, Chanse V, Phoneix J, Baranoff L. Should We Put Our Feet in the Water? Use of a Survey to Assess Recreational Exposures to Contaminants in the Anacostia River. *Environmental Health Insights*. 2015;9(S2):19–27.
13. Spence PL. Using Caffeine as a Water Quality Indicator in the Ambient Monitoring Program for Third Fork Creek Watershed, Durham, North Carolina. *Environmental Health Insights*. 2015;9(S2):29–34.
14. Huff AK, Kondragunta S, Zhang H, Hoff RM. Monitoring the Impacts of Wildfires on Forest Ecosystems and Public Health in the Exo-Urban Environment Using High-Resolution Satellite Aerosol Products from Visible Infrared Imaging Radiometer Suite (VIIRS). *Environmental Health Insights*. 2015;9(S2):9–18.

Lead Guest Editor Dr Porchè L. Spence

Porchè L. Spence, Ph.D. is currently a Howard Hughes Medical Institute Post-Doctoral Fellow for the Center for Science, Math and Technology Education at North Carolina Central University. In her current position, she conducts science education research by assisting with the curriculum development and the integration of research into undergraduate general biology courses. She teaches a general biology course along with the traditionally designed biology lab and teaches biology research infused labs to undergraduate biology majors using a peer team teaching approach. Dr. Spence has a broad educational background with a PhD in Soil Science from North Carolina State University and a MS in Earth Science and BS in Environmental Science with a concentration in Biology from North Carolina Central University. Prior to her current position, she worked at US Environmental Protection Agency as an ORISE Post-Doctoral Fellow in the Gulf Ecology Division of National Health and Environmental Effects Research Laboratory. She taught undergraduate geology and physical geography courses as an adjunct instructor at North Carolina Central University. Dr. Spence has published articles on various topics related to the impacts of nitrogen on freshwater wetland ecosystem services, the effects of residential lawn management practices on nutrient losses via overland runoff and nitrous oxide losses, the presence of organic contaminants in urban streams and aquatic nitrous oxide emissions from streams draining various land cover types.



plspence@nccu.edu,
porchespence@yahoo.com
<http://www.nccu.edu/directory/details.cfm?id=plspence>

Guest Editors

MINNJUAN FLOURNOY FLOYD

Dr. Minnjuan Flournoy Floyd, PhD, MPH, MBA is a social science analyst with the US Department of Health and Human Services at the Substance Abuse and Mental Health Services Administration in the Center for Behavioral Health Statistics and Quality in Rockville, Md. In her current position, she serves as a resident expert in evaluation for a number of grants and programs in the Center for Substance Abuse Prevention, the Center for Substance Abuse Treatment, and the Center for Mental Health Services. Minnjuan was selected to represent the Center for Behavioral Health Statistics and Quality on the SAMHSA Evaluation Team, which provides recommendations on all evaluations and data collections for approval by the agency administration. Additionally, she was selected to serve on the Internal Operating Strategy Grants and Contracts Team, which examines SAMHSA's resource investments. She is a contracting officer representative and regularly serves on technical and business proposal review panels for evaluation contracts. Dr. Flournoy Floyd's current research foci include health services evaluation, technology assisted behavioral health care, behavioral health disparities affecting vulnerable populations, and substance abuse prevention and treatment for minorities living with HIV.



minnjuan@gmail.com
www.samhsa.gov



JONIQUEA HOWARD

Dr. Joniqua Howard received her PhD from the University of South Florida. Prior to assuming her current role as an instructor and provost postdoctoral fellow, Dr. Howard held several different prominent roles within US and Belizean governmental agencies and universities. Her research interest principally focuses on the nexus of environmental pollutants (eg, heavy metals and organic solvents) human health, and STEM education as well as helping to develop sustainable healthy communities. She has published and presented on various topics related to human health in urban and rural locations, impacts of environmental pollutants on public health and the economy, as well as methods to strengthening the K-12 STEM pedagogy. Dr. Howard holds editorial appointments within books published by IGI Global.



jahoward@uta.edu

<http://www.uta.edu/profiles/joniqua-howard>

CANDICE SIMMONS

Dr. Candice Simmons is a Visiting Assistant Professor and Acting Director at the Savannah River Environmental Science Field Station, South Carolina State University. She completed her PhD at the University of South Florida and has previously worked at Hillsborough Community College and the University of South Florida. She now works primarily in soil science, water quality, and earth science. Dr. Simmons has extensive experience with geoscience education, and research, and has presented at several national and regional conferences.



atcsimmon4@scsu.edu

<http://cnrt.scsu.edu/fieldstation/>

MELANIE H. OKORO

Dr. Melanie Harrison Okoro received her PhD from the University Of Maryland Baltimore County before working as natural resource specialist for the National Oceanic and Atmospheric Administration (NOAA). She began working as water quality specialist with NOAA Fisheries in 2011 and in 2014 accepted the Aquatic Invasive species Coordinator position NOAA's West Coast Region. Her research interest include, the impacts of water pollution (eg, nutrients) and aquatic invasives species on coastal ecosystems and endangered and threaten species. Over the last 5 years, she has published on various topics related to nutrient cycling in urban ecosystems, impacts of eutrophication on coastal communities, and policies related to nutrient management in urban ecosystems.



melanie.okoro@noaa.gov

www.noaa.gov

SUPPLEMENT TITLE: Ecosystem Services and Environmental Health

CITATION: Spence et al. Ecosystem Services and Environmental Health. *Environmental Health Insights* 2015:9(S2) 35–38 doi: 10.4137/EHI.S38845.

TYPE: Editorial

FUNDING: Authors disclose no external funding sources.

COMPETING INTERESTS: Authors have disclosed no potential conflicts of interest.

COPYRIGHT: © the authors, publisher and licensee Libertas Academica Limited. This is an open-access article distributed under the terms of the Creative Commons CC-BY-NC3.0 License.

CORRESPONDENCE: plspence@nccu.edu, porchespence@yahoo.com

All authors have provided signed confirmation of their compliance with ethical and legal obligations including (but not limited to) use of any copyrighted material, compliance with ICMJE authorship and competing interests disclosure guidelines.