

Stanford



Peter Vitousek

Clifford G. Morrison Professor of Population and Resource Studies and
Professor of Earth System Science, Emeritus

Biology

Bio

ACADEMIC APPOINTMENTS

- Professor, Biology
- Emeritus Faculty, Acad Council, Earth System Science
- Senior Fellow, Stanford Woods Institute for the Environment

PROGRAM AFFILIATIONS

- Center for East Asian Studies
- Center for Latin American Studies

LINKS

- My Lab Site: <https://web.stanford.edu/group/Vitousek/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Please see 'Short research description.'

Teaching

COURSES

2024-25

- Island Ecology: MLA 383 (Win)

2023-24

- Island Ecology: ESS 16N (Aut)

2022-23

- Biology and Global Change: BIO 117, EARTHSYS 111, EARTHSYS 217, ESS 111 (Win)
- Ecology of the Hawaiian Islands: BIO 116, SUSTAIN 116 (Aut)

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)

Publications

PUBLICATIONS

- **Changes in belowground biodiversity during ecosystem development** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Delgado-Baquerizo, M., Bardgett, R. D., Vitousek, P. M., Maestre, F. T., Williams, M. A., Eldridge, D. J., Lambers, H., Neuhauser, S., Gallardo, A., Garcia-Velazquez, L., Sala, O. E., Abades, S. R., Alfaro, et al
2019; 116 (14): 6891–96
- **Changes in belowground biodiversity during ecosystem development.** *Proceedings of the National Academy of Sciences of the United States of America*
Delgado-Baquerizo, M., Bardgett, R. D., Vitousek, P. M., Maestre, F. T., Williams, M. A., Eldridge, D. J., Lambers, H., Neuhauser, S., Gallardo, A., Garcia-Velazquez, L., Sala, O. E., Abades, S. R., Alfaro, et al
2019
- **Restoration of 'Aina Malo'o on Hawai 'i Island: Expanding Biocultural Relationships** *SUSTAINABILITY*
Lincoln, N., Rossen, J., Vitousek, P., Kahoonei, J., Shapiro, D., Kalawe, K., Pai, M., Marshall, K., Meheula, K.
2018; 10 (11)
- **Soil fertility response to Ulex europaeus invasion and restoration efforts** *BIOLOGICAL INVASIONS*
Bateman, J., Vitousek, P. M.
2018; 20 (10): 2777–91
- **Combining spectroscopic and isotopic techniques gives a dynamic view of phosphorus cycling in soil** *NATURE COMMUNICATIONS*
Helfenstein, J., Tamburini, F., von Sperber, C., Massey, M. S., Pistocchi, C., Chadwick, O. A., Vitousek, P. M., Kretzschmar, R., Frossard, E.
2018; 9: 3226
- **Policy distortions, farm size, and the overuse of agricultural chemicals in China** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Wu, Y., Xi, X., Tang, X., Luo, D., Gu, B., Lam, S., Vitousek, P. M., Chen, D.
2018; 115 (27): 7010–15
- **Response: Commentary: Rain, Sun, Soil, and Sweat: A Consideration of Population Limits on Rapa Nui (Easter Island) before European Contact** *FRONTIERS IN ECOLOGY AND EVOLUTION*
Puleston, C. O., Ladefoged, T. N., Haoa, S., Chadwick, O. A., Vitousek, P. M., Stevenson, C. M.
2018; 6
- **Plant acclimation to long-term high nitrogen deposition in an N-rich tropical forest** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Lu, X., Vitousek, P. M., Mao, Q., Gilliam, F. S., Luo, Y., Zhou, G., Zou, X., Bai, E., Scanlon, T. M., Hou, E., Mo, J.
2018; 115 (20): 5187–92
- **Soil nutrients and pre-European contact agriculture in the leeward Kohala field system, Island of Hawai'i** *ARCHAEOLOGY IN OCEANIA*
Ladefoged, T. N., Preston, A., Vitousek, P. M., Chadwick, O. A., Stein, J., Graves, M. W., Lincoln, N.
2018; 53 (1): 28–40
- **Convergence and contrast in the community structure of Bacteria, Fungi and Archaea along a tropical elevation-climate gradient.** *FEMS microbiology ecology*
Peay, K. G., von Sperber, C., Cardarelli, E., Toju, H., Francis, C. A., Chadwick, O. A., Vitousek, P. M.
2017; 93 (5)
- **Controls of nitrogen cycling evaluated along a well-characterized climate gradient.** *Ecology*
von Sperber, C., Chadwick, O. A., Casciotti, K. L., Peay, K. G., Francis, C. A., Kim, A. E., Vitousek, P. M.
2017
- **Parent material and pedogenic thresholds: observations and a simple model** *BIOGEOCHEMISTRY*
Vitousek, P., Dixon, J. L., Chadwick, O. A.
2016; 130 (1-2): 147-157

- **Climate-driven thresholds for chemical weathering in postglacial soils of New Zealand** *JOURNAL OF GEOPHYSICAL RESEARCH-EARTH SURFACE*
Dixon, J. L., Chadwick, O. A., Vitousek, P. M.
2016; 121 (9): 1619-1634
- **The soil and plant biogeochemistry sampling design for The National Ecological Observatory Network** *ECOSPHERE*
Hinckley, E. S., Bonan, G. B., Bowen, G. J., Colman, B. P., Duffy, P. A., Goodale, C. L., Houlton, B. Z., Marin-Spiotta, E., Ogle, K., Ollinger, S. V., Paul, E. A., Vitousek, P. M., Weathers, et al
2016; 7 (3)
- **Evidence for a Historic Change Occurring in China.** *Environmental science & technology*
Liu, X., Vitousek, P., Chang, Y., Zhang, W., Matson, P., Zhang, F.
2016; 50 (2): 505-6
- **Evidence for a historic change occurring in China** *Environmental Science and Technology*
Liu, X., Vitousek, P., Chang, Y., Zhang, W., Matson, P., Zhang, F.
2016; 50: 505-506
- **Nitrogen fixation during decomposition of sugarcane (*Saccharum officinarum*) is an important contribution to nutrient supply in traditional dryland agricultural systems of Hawai'i** *INTERNATIONAL JOURNAL OF AGRICULTURAL SUSTAINABILITY*
Lincoln, N. K., Vitousek, P.
2016; 14 (2): 214-230
- **Identification and evaluation of risk factors related to provincial food insecurity in China** *JOURNAL OF RISK RESEARCH*
Qi, X., Vitousek, P. M., Liu, L.
2015; 18 (9): 1184-1202
- **Using plant functional traits to restore Hawaiian rainforest** *JOURNAL OF APPLIED ECOLOGY*
Ostertag, R., Warman, L., Cordell, S., Vitousek, P. M.
2015; 52 (4): 805-809
- **Integrated reactive nitrogen budgets and future trends in China.** *Proceedings of the National Academy of Sciences of the United States of America*
Gu, B., Ju, X., Chang, J., Ge, Y., Vitousek, P. M.
2015; 112 (28): 8792-8797
- **Provincial food security in China: a quantitative risk assessment based on local food supply and demand trends** *FOOD SECURITY*
Qi, X., Vitousek, P. M., Liu, L.
2015; 7 (3): 621-632
- **Long-Term Effects of Compost and Cover Crops on Soil Phosphorus in Two California Agroecosystems** *SOIL SCIENCE SOCIETY OF AMERICA JOURNAL*
Maltais-Landry, G., Scow, K., Brennan, E., Vitousek, P.
2015; 79 (2): 688-697
- **Variation in Rapa Nui (Easter Island) land use indicates production and population peaks prior to European contact** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Stevenson, C. M., Puleston, C. O., Vitousek, P. M., Chadwick, O. A., Haoa, S., Ladefoged, T. N.
2015; 112 (4): 1025-1030
- **Grassland ecology: Complexity of nutrient constraints.** *Nature plants*
Vitousek, P. M.
2015; 1: 15098-?
- **Producing more grain with lower environmental costs** *NATURE*
Chen, X., Cui, Z., Fan, M., Vitousek, P., Zhao, M., Ma, W., Wang, Z., Zhang, W., Yan, X., Yang, J., Deng, X., Gao, Q., Zhang, et al
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- **Producing more grain with lower environmental costs.** *Nature*
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- **Fertilizer nitrogen recovery efficiencies in crop production systems of China with and without consideration of the residual effect of nitrogen** *ENVIRONMENTAL RESEARCH LETTERS*
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2014; 9 (9)
- **Resilience against exotic species invasion in a tropical montane forest** *JOURNAL OF VEGETATION SCIENCE*
Tweiten, M. A., Hotchkiss, S. C., Vitousek, P. M., Kellner, J. R., Chadwick, O. A., Asner, G. P.
2014; 25 (3): 734-749
- **Indicators of soil fertility and opportunities for precontact agriculture in Kona, Hawai'i** *ECOSPHERE*
Lincoln, N., Chadwick, O., Vitousek, P.
2014; 5 (4)
- **Litter quality versus soil microbial community controls over decomposition: a quantitative analysis** *OECOLOGIA*
Cleveland, C. C., Reed, S. C., Keller, A. B., Nemergut, D. R., O'Neill, S. P., Ostertag, R., Vitousek, P. M.
2014; 174 (1): 283-294
- **Pedogenic Thresholds and Soil Process Domains in Basalt-Derived Soils** *ECOSYSTEMS*
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2013; 16 (8): 1379-1395
- **The global nitrogen cycle in the twenty-first century** *PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES*
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Vaughan, M. B., Vitousek, P. M.
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- **Long-term effects of agriculture on soil carbon pools and carbon chemistry along a Hawaiian environmental gradient** *4th Conference on the Mechanisms of Organic Matter Stabilization and Destabilization (SOM) - Organic Matter Stabilization and Ecosystem Functions*
Cusack, D. F., Chadwick, O. A., Ladefoged, T., Vitousek, P. M.
SPRINGER.2013: 229-43
- **Irrigated taro (*Colocasia esculenta*) farming in North Kohala, Hawai'i sedimentology and soil nutrient analyses** *JOURNAL OF ARCHAEOLOGICAL SCIENCE*
McCoy, M. D., Ribeiro, A. T., Graves, M. W., Chadwick, O. A., Vitousek, P. M.
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- **Enhanced nitrogen deposition over China** *NATURE*
Liu, X., Zhang, Y., Han, W., Tang, A., Shen, J., Cui, Z., Vitousek, P., Erismann, J. W., Goulding, K., Christie, P., Fangmeier, A., Zhang, F.
2013; 494 (7438): 459-462
- **Biological nitrogen fixation: rates, patterns and ecological controls in terrestrial ecosystems.** *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*
Vitousek, P. M., Menge, D. N., Reed, S. C., Cleveland, C. C.
2013; 368 (1621): 20130119-?
- **Traditional Ecological Values, Knowledge, and Practices in Twenty-First Century Hawai'i** *14th Cary Conference on Linking Ecology and Ethics for a Changing World*
Vitousek, P., Beamer, K.
SPRINGER.2013: 63-70
- **Framing Sustainability in a Telecoupled World** *ECOLOGY AND SOCIETY*
Liu, J., Hull, V., Batistella, M., DeFries, R., Dietz, T., Fu, F., Hertel, T. W., Izaurrealde, R. C., Lambin, E. F., Li, S., Martinelli, L. A., McConnell, W. J., Moran, et al
2013; 18 (2)

- **Fungal endophyte communities reflect environmental structuring across a Hawaiian landscape** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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- **Long-term carbon storage through retention of dissolved aromatic acids by reactive particles in soil** *GLOBAL CHANGE BIOLOGY*
Kramer, M. G., Sanderman, J., Chadwick, O. A., Chorover, J., Vitousek, P. M.
2012; 18 (8): 2594-2605
- **Mineralogical controls on soil black carbon preservation** *GLOBAL BIOGEOCHEMICAL CYCLES*
Cusack, D. F., Chadwick, O. A., Hockaday, W. C., Vitousek, P. M.
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- **Introduced Canopy Tree Species Effect on the Soil Microbial Community in a Montane Tropical Forest** *PACIFIC SCIENCE*
Lynch, H. B., Epps, K. Y., Fukami, T., Vitousek, P. M.
2012; 66 (2): 141-150
- **The Ahupua'a of Puanui: A Resource for Understanding Hawaiian Rain-Fed Agriculture** *PACIFIC SCIENCE*
Kagawa, A. K., Vitousek, P. M.
2012; 66 (2): 161-172
- **The Climate Benefits of Better Nitrogen and Phosphorus Management** *ISSUES IN SCIENCE AND TECHNOLOGY*
Townsend, A. R., Vitousek, P. M., Houlton, B. Z.
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- **Cyanolichens: a link between the phosphorus and nitrogen cycles in a Hawaiian montane forest** *JOURNAL OF TROPICAL ECOLOGY*
Benner, J. W., Vitousek, P. M.
2012; 28: 73-81
- **Agricultural potential and actualized development in Hawai'i: an airborne LiDAR survey of the leeward Kohala field system (Hawai'i Island)** *JOURNAL OF ARCHAEOLOGICAL SCIENCE*
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- **Are patterns in nutrient limitation belowground consistent with those aboveground: results from a 4 million year chronosequence** *BIOGEOCHEMISTRY*
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- **Dependence of Forest Structure and Dynamics on Substrate Age and Ecosystem Development** *ECOSYSTEMS*
Kellner, J. R., Asner, G. P., Vitousek, P. M., Tweiten, M. A., Hotchkiss, S., Chadwick, O. A.
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- **Integrated soil-crop system management for food security** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Chen, X., Cui, Z., Vitousek, P. M., Cassman, K. G., Matson, P. A., Bai, J., Meng, Q., Hou, P., Yue, S., Roemheld, V., Zhang, F.
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- **Vegetation Effects on Soil Organic Matter Chemistry of Aggregate Fractions in a Hawaiian Forest** *ECOSYSTEMS*
Stewart, C. E., Neff, J. C., Amatangelo, K. L., Vitousek, P. M.
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- **Cellulose delta O-18 is an index of leaf-to-air vapor pressure difference (VPD) in tropical plants** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Kahmen, A., Sachse, D., Arndt, S. K., Tu, K. P., Farrington, H., Vitousek, P. M., Dawson, T. E.
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- **Agriculture in Brazil: impacts, costs, and opportunities for a sustainable future** *CURRENT OPINION IN ENVIRONMENTAL SUSTAINABILITY*
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- **Understanding ecosystem retrogression** *ECOLOGICAL MONOGRAPHS*
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- **Erosion, Geological History, and Indigenous Agriculture: A Tale of Two Valleys** *ECOSYSTEMS*
Vitousek, P. M., Chadwick, O. A., Hilley, G., Kirch, P. V., Ladefoged, T. N.
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- **Soil nutrient analysis of Rapa Nui gardening** *ARCHAEOLOGY IN OCEANIA*
Ladefoged, T. N., Stevenson, C. M., Haoa, S., Mulrooney, M., Puleston, C., Vitousek, P. M., Chadwick, O. A.
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- **Top-Down Analysis of Forest Structure and Biogeochemistry across Hawaiian Landscapes** *PACIFIC SCIENCE*
Vitousek, P. M., Tweiten, M. A., Kellner, J., Hotchkiss, S. C., Chadwick, O. A., Asner, G. P.
2010; 64 (3): 359-366
- **Significant Acidification in Major Chinese Croplands** *SCIENCE*
Guo, J. H., Liu, X. J., Zhang, Y., Shen, J. L., Han, W. X., Zhang, W. F., Christie, P., Goulding, K. W., Vitousek, P. M., Zhang, F. S.
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- **Terrestrial phosphorus limitation: mechanisms, implications, and nitrogen-phosphorus interactions** *ECOLOGICAL APPLICATIONS*
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- **Prevalence of Tree Regeneration by Sprouting and Seeding Along a Rainfall Gradient in Hawai'i** *BIOTROPICA*
Busby, P. E., Vitousek, P., Dirzo, R.
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- **Landscape-level variation in forest structure and biogeochemistry across a substrate age gradient in Hawaii** *ECOLOGY*
Vitousek, P., Asner, G. P., Chadwick, O. A., Hotchkiss, S.
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- **Opportunities and constraints for intensive agriculture in the Hawaiian archipelago prior to European contact** *JOURNAL OF ARCHAEOLOGICAL SCIENCE*
Ladefoged, T. N., Kirch, P. V., Gon, S. M., Chadwick, O. A., Hartshorn, A. S., Vitousek, P. M.
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Chadwick, O. A., Derry, L. A., Bern, C. R., Vitousek, P. M.
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- **Sources of nutrients to windward agricultural systems in pre-contact Hawai'i** *ECOLOGICAL APPLICATIONS*
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- **Contrasting Predictors of Fern versus Angiosperm Decomposition in a Common Garden** *BIOTROPICA*
Amatangelo, K. L., Vitousek, P. M.
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- **Nitrogen in Agriculture: Balancing the Cost of an Essential Resource** *ANNUAL REVIEW OF ENVIRONMENT AND RESOURCES*
Robertson, G. P., Vitousek, P. M.
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- **Stoichiometry of ferns in Hawaii: implications for nutrient cycling** *OECOLOGIA*

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- Amatangelo, K. L., Vitousek, P. M.
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- **A unifying framework for dinitrogen fixation in the terrestrial biosphere** *NATURE*
Houlton, B. Z., Wang, Y., Vitousek, P. M., Field, C. B.
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 - **Invasive plants transform the three-dimensional structure of rain forests** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Asner, G. P., Hughes, R. F., Vitousek, P. M., Knapp, D. E., Kennedy-Bowdoin, T., Boardman, J., Martin, R. E., Eastwood, M., Green, R. O.
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 - **Amplified temperature dependence in ecosystems developing on the lava flows of Mauna Loa, Hawai'i** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Anderson-Teixeira, K. J., Vitousek, P. M., Brown, J. H.
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 - **Morella cerifera invasion and nitrogen cycling on a lowland Hawaiian lava flow** *BIOLOGICAL INVASIONS*
Kurten, E. L., Snyder, C. P., Iwata, T., Vitousek, P. M.
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 - **Precontact vegetation and soil nutrient status in the shadow of Kohala Volcano, Hawaii** *26th Binghamton Geomorphology Symposium on Geomorphology and Ecosystems*
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 - **Development of a diverse epiphyte community in response to phosphorus fertilization** *ECOLOGY LETTERS*
Benner, J. W., Vitousek, P. M.
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Meyer, M., Ladefoged, T. N., Vitousek, P. M.
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 - **Phosphorus fertilization increases the abundance and nitrogenase activity of the cyanolichen Pseudocyphellaria crocata in hawaiian montane forests** *BIOTROPICA*
Benner, J. W., Conroy, S., Lunch, C. K., Toyoda, N., Vitousek, P. M.
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 - **Resource-use efficiency and plant invasion in low-resource systems** *NATURE*
Funk, J. L., Vitousek, P. M.
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 - **Uplift, erosion, and phosphorus limitation in terrestrial ecosystems** *ECOSYSTEMS*
Porder, S., Vitousek, P. M., Chadwick, O. A., Chamberlain, C. P., Hilley, G. E.
2007; 10 (1): 158-170
 - **Risky business: Temporal and spatial variation in preindustrial dryland agriculture** *HUMAN ECOLOGY*
Lee, C. T., Tuljapurkar, S., Vitousek, P. M.
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 - **Interactive effects of fire, elevated carbon dioxide, nitrogen deposition, and precipitation on a California annual grassland** *ECOSYSTEMS*
Henry, H. A., Chiariello, N. R., Vitousek, P. M., Mooney, H. A., Field, C. B.
2006; 9 (7): 1066-1075
 - **Vegetation-climate interactions among native and invasive species in Hawaiian rainforest** *ECOSYSTEMS*
Asner, G. P., Martin, R. E., Carlson, K. M., Rascher, U., Vitousek, P. M.
2006; 9 (7): 1106-1117
 - **Prehistoric agricultural depletion of soil nutrients in Hawai'i** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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- Hartshorn, A. S., Chadwick, O. A., Vitousek, P. M., Kirch, P. V.
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- **Business strategies for conservation on private lands: Koa forestry as a case study** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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Matson, P. A., Vitousek, P. M.
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Porder, S., Clark, D. A., Vitousek, P. M.
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 - **Temperature influences carbon accumulation in moist tropical forests** *ECOLOGY*
Raich, J. W., Russell, A. E., Kitayama, K., Parton, W. J., Vitousek, P. M.
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 - **Consensus on climate change** *TRENDS IN ECOLOGY & EVOLUTION*
Walther, G. R., Hughes, L., Vitousek, P., Stenseth, N. C.
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 - **Interactive effects of elevated CO₂, N deposition and climate change on extracellular enzyme activity and soil density fractionation in a California annual grassland** *GLOBAL CHANGE BIOLOGY*
Henry, H. A., Juarez, J. D., Field, C. B., Vitousek, P. M.
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 - **Ground-based and remotely sensed nutrient availability across a tropical landscape** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Porder, S., Asner, G. P., Vitousek, P. M.
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 - **Ca cycling and isotopic fluxes in forested ecosystems in Hawaii** *GEOPHYSICAL RESEARCH LETTERS*
Wiegand, B. A., Chadwick, O. A., Vitousek, P. M., Wooden, J. L.
2005; 32 (11)
 - **The influence of nutrient availability on soil organic matter turnover estimated by incubations and radiocarbon modeling** *ECOSYSTEMS*
Torn, M. S., Vitousek, P. M., Trumbore, S. E.
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 - **Responses of extracellular enzymes to simple and complex nutrient inputs** *SOIL BIOLOGY & BIOCHEMISTRY*
Allison, S. D., Vitousek, P. M.
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 - **Short-term controls over inorganic phosphorus during soil and ecosystem development** *SOIL BIOLOGY & BIOCHEMISTRY*
Olander, L. P., Vitousek, P. M.
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 - **Remote analysis of biological invasion and biogeochemical change** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Asner, G. P., Vitousek, P. M.
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