

**OCEAN ACIDIFICATION:  
UNDERSTANDING THE OTHER  
CLIMATE CRISIS**

*A handbook on the development of ocean  
acidification science, policy, and law*

A special issue of the  
**WASHINGTON JOURNAL OF  
ENVIRONMENTAL LAW & POLICY**  
VOLUME 6, ISSUE 2, JUNE 2016

---

Published by students of the  
University of Washington School of Law



# WASHINGTON JOURNAL OF ENVIRONMENTAL LAW & POLICY

VOLUME 6, ISSUE 2, JUNE 2016

---

Published by students of the  
University of Washington School of Law

---

## CONTENTS

### PART I: THE REALITY OF OCEAN ACIDIFICATION

- Commentary: Ocean Acidification as a Problem in  
Systems Thinking*  
*Terrie Klinger & Jan Newton* 207
- Ocean Acidification: The Other CO<sub>2</sub> Problem*  
*Scott C. Doney, Victoria J. Fabry, Richard A. Feely, &  
Joan A. Kleypas* 212  
ANNU. REV. MAR. SCI. 2009. 1:169–92.
- Ocean Acidification Through the Lens of Ecological  
Theory*  
*Brian Gaylord et al.* 252  
ECOLOGY. 2015. 96:3–15

### PART II: OCEAN ACIDIFICATION AND CURRENT LAW

- Ten Ways States Can Combat Ocean Acidification  
(and Why They Should)*  
*Ryan P. Kelly & Margaret R. Caldwell* 287  
37 HARV. ENVTL. L. REV. 57 (2013)
- Ocean Acidification: Legal and Policy Responses to  
Address Climate Change's Evil Twin*  
*Eric V. Hull* 348  
20 N.Y.U. ENVTL. L.J. 507 (2014)

- Dealing with Ocean Acidification: The Problem,  
The Clean Water Act, and State and Regional  
Approaches  
*Robin Kundis Craig* 387  
90 WASH. L. REV. 1517, 1583 (2015)

### PART III: TRIBAL RIGHTS TO A HEALTHY OCEAN

- Commentary: Federal Treaty and Trust  
Obligations, and Ocean Acidification*  
*Robert T. Anderson* 473
- “Fed” Up with Acidification: “Trusting” the Federal  
Government to Protect the Tulalip Tribes’  
Access to Shellfish Beds  
*Jacqueline M. Bertelsen* 495

### PART IV: NEW LAW FOR A NEW NORMAL

- Commentary: The Revival of Climate Change  
Science in U.S. Courts*  
*William H. Rodgers, Jr. & Andrea K. Rodgers* 533
- Continuing to Lead: Washington State’s Efforts to  
Address Ocean Acidification  
*Amanda M. Carr* 542
- Using the Clean Water Act to Tackle Ocean  
Acidification: When Carbon Dioxide Pollutes the  
Oceans  
*Miyoko Sakashita* 599
- Ocean Acidification and the UNFCCC: Finding  
Legal Clarity in the Twilight Zone  
*Ellycia R. Harrould-Kolieb* 612
- Atmospheric Trust Litigation and the Constitutional  
Right to a Healthy Climate System: Judicial  
Recognition at Last  
*Mary Christina Wood & Charles W. Woodward, IV* 633

**Washington Journal of Environmental Law & Policy**

University of Washington School of Law

William H. Gates Hall, Box 353020

Seattle, WA 98195-3020

(206) 543-8838; [wjelp@uw.edu](mailto:wjelp@uw.edu)<http://www.law.washington.edu/WJELP/>

The *Washington Journal of Environmental Law & Policy* (ISSN 2160-4169) is peer-reviewed and published semiannually by students of the University of Washington School of Law.

**Mission:** The *Washington Journal of Environmental Law & Policy* is a student-run organization that advances legal and interdisciplinary scholarship in the field of environmental law. The Journal provides a forum for students, scholars, and practitioners to examine interdisciplinary environmental issues facing the Pacific Northwest and beyond.

**Submissions:** We invite authors, including professionals and law students from the University of Washington and other law schools, to submit scholarly legal articles and essays on topics of environmental interest to the Pacific Northwest region, including British Columbia, Montana, Wyoming, Idaho and Alaska. We also invite authors to submit scholarly articles and essays on environmental topics that do not have a regional focus but nonetheless impact the Pacific Northwest region. We accept submissions at the address below:

Washington Journal of Environmental Law &amp; Policy

Attn: Articles Department

University of Washington

William H. Gates Hall

Box 353020

Seattle, WA 98195

[wjelp@uw.edu](mailto:wjelp@uw.edu)

**Citation:** WASH. J. ENVTL. L & POL'Y

**Permission to Copy:** The Articles in this issue may be reproduced and distributed by nonprofit institutions for education purposes, provided that the copies are distributed at or below cost and identify the author, *Washington Journal of Environmental Law & Policy*, the volume, the number of the first page and the year of the article's publication.

# WASHINGTON JOURNAL OF ENVIRONMENTAL LAW & POLICY

VOLUME 6, ISSUE 2, JUNE 2016

---

## Editor-In-Chief

Zyanya Breuer

**Associate  
Editor-In-Chief**  
Christie Lundquist

**Associate  
Editor-In-Chief**  
Frederic Sawyer

**Chief  
Managing Editor**  
Bridgette Cooper

**Executive  
Managing Editors**  
Katherine Brennan  
Kendall Hamilton  
Melissa Malstrom

**Executive Notes &  
Comments Editors**  
Christina Elles  
Andrew Fuller

## Editorial Staff

Mathias Deeg  
Collin Glantz  
Kirstin Gruver  
Taylor Halperin  
Kira Johal  
Sawyer Margett  
Steven McKeveatt

Douglas McManaway  
Gregory Porter  
Michelle Su  
Gina Topp  
William Trondsen  
Natan Tubman  
Zoe Wong

## EXTERNAL ADVISORY BOARD

**Chair:** Dr. Todd Wildermuth, *University of Washington*  
Professor Gregory Hicks, *University of Washington*  
Tyson Kade, *VanNess Feldman*  
Paul Kampmeir, *Washington Forest Law Center*  
Ryan Kelly, *University of Washington*  
Professor Sanne Knudsen, *University of Washington*  
Brad Marten, *Marten Law*  
Mickey Moritz, *Center for Biological Diversity*  
Vickie Patton, *Environmental Defense Fund*  
Todd True, *Earthjustice*

## University of Washington School of Law 2015–2016

### OFFICERS OF ADMINISTRATION

Kelly Y. Testy, B.A., J.D., Toni Rembe Dean & Professor of Law  
 Patricia C. Kuszler, B.A., M.D., J.D., Vice Dean, Professor of Law  
 Mary A. Hotchkiss, B.A., M.S.L.S., J.D., LL.M., Senior Associate Dean for Students & Academic Life, Senior Law Lecturer  
 Kimberly Eckstein, B.A., Assistant Dean for Advancement  
 Michele Storms, B.A., J.D., Assistant Dean for Public Service, Executive Director William H. Gates Public Service Law Program  
 Anita K. Krug, B.A., M.A., J.D., Ph.D., Associate Dean for Faculty Research and Development, Associate Professor of Law  
 Mathiew Le, B.A., J.D., Assistant Dean for Admissions and Financial Aid  
 Kojay Pan, M.P.A., Assistant Dean for Finance and Operations  
 Pontus Niklasson, M.A., Assistant Dean for Academic Services & Registrar

### FACULTY EMERITI

William R. Andersen, B.S.L., LL.B., LL.M.  
 Robert H. Aronson, B.A., J.D.  
 James H. Hardisty, A.B., LL.B.  
 Roland L. Hjorth, A.B., LL.B.  
 Linda Hume, B.A., J.D.  
 John Huston, B.A., J.D., LL.M.  
 John M. Junker, B.A., J.D.  
 John R. Price, A.B., LL.B.  
 Roy L. Prosterman, B.A., J.D.  
 Marjorie D. Rombauer, B.A., J.D.  
 Charles Z. Smith, B.S., J.D.  
 Frank W. Smith, B.A., J.D., LL.M.  
 Philip A. Trautman, B.A., J.D.  
 Louis Wolcher, B.A., J.D.

### FACULTY OF LAW

Craig H. Allen, B.S., J.D., LL.M., Professor of Law  
 Kimberly D. Ambrose, B.A., J.D., Senior Law Lecturer  
 Helen A. Anderson, B.A., J.D., Professor of Law  
 Robert T. Anderson, B.A., J.D., Professor of Law, Director of Native American Law Center  
 Thomas R. Andrews, B.A., M.A., J.D., Professor of Law  
 William Bailey, B.A., J.D., Law Lecturer  
 Karen E. Boxx, B.A., J.D., Professor of Law  
 Steve P. Calandrillo, B.A., J.D., Professor of Law  
 Ryan Calo, B.A., J.D., Assistant Professor of Law, Co-director of the Center for Advanced Study and Research on Intellectual Property  
 Thomas D. Cobb, B.A., M.A., M.A., J.D., Senior Law Lecturer  
 Molly M. Cohan, B.A., J.D., Law Lecturer  
 William Covington, B.A., J.D., Senior Law Lecturer  
 Dwight J. Drake, B.S., J.D., Associate Professor of Law  
 Melissa J. Durkee, B.A., J.D., Assistant Professor of Law  
 Jonathan A. Eddy, B.A., J.D., Professor of Law, Manager of Afghanistan Legal Educators Project  
 Jennifer Fan, A.B., J.D., Managing Director, Entrepreneurial Law Clinic & Law Lecturer  
 Mary D. Fan, B.A., J.D., M.Phil., Professor of Law  
 Daniel Foote, A.B., J.D., Professor of Law, Co-Director Asian Law Center  
 Julia Gold, B.A., J.D., Principal Law Lecturer  
 Robert W. Gomulkiewicz, B.A., M.A., J.D., Professor of Law, Faculty Director, IP LLM, Co-director of the Center for Advanced Study and Research on Intellectual Property  
 Ben Halasz, B.A., J.D., Law Lecturer  
 Michael Hatfield, B.A., M.A., J.D., Professor of Law  
 Penny A. Hazelton, B.A., J.D., M.L.L., Professor of Law  
 Gregory A. Hicks, B.A., J.D., Professor of Law  
 Mary A. Hotchkiss, B.A., M.S.L.S., J.D., LL.M., Senior Associate Dean for Students & Academic Life, Senior Law Lecturer  
 Maureen A. Howard, B.A., J.D., Associate Professor of Law  
 Stewart M. Jay, A.B., J.D., Professor of Law  
 Sarah Kaltsounis, B.S., M.Ed., J.D., Senior Law Lecturer  
 Lisa Kelly, B.A., J.D., Professor of Law, Director of Children & Youth Advocacy Clinic  
 Alan Kirtley, B.A., J.D., Associate Professor of Law  
 Sanne Knudsen, B.S., M.S., J.D., Assistant Professor of Law  
 Anita K. Krug, B.A., M.A., J.D., Ph.D., Associate Dean for Research and Faculty Development, Associate Professor of Law  
 Patricia C. Kuszler, B.A., M.D., J.D., Vice Dean, Professor of Law  
 Clark B. Lombardi, B.A., M.A., J.D., Ph.D., Associate Professor of Law, Adjunct Associate Professor of Law in International Affairs  
 Lisa Manheim, B.A., J.D., Assistant Professor of Law  
 Deborah Maranville, B.A., J.D., Professor of Law, Director of Clinical Law Program  
 Anna C. Mastroianni, B.S., B.A., J.D., M.P.H., Professor of Law  
 Shannon McCormack, B.A., J.D., LL.M., Associate Professor of Law  
 Kathleen M. McGinnis, B.A., J.D., Senior Law Lecturer

Jacqueline McMurtrie, B.G.S., J.D., Professor of Law, Director of Innocence Project Northwest  
 Theodore A. Myhre, B.A., M.A., M.A., J.D., Senior Law Lecturer  
 Peter Nicolas, B.A., M.P.P., J.D., Professor of Law  
 Sean O'Connor, B.A., M.A., J.D., Professor of Law, Chair of the Center for Advanced Study and Research on  
 Intellectual Property, Boeing International Professor  
 Kathleen O'Neill, B.A., J.D., Professor of Law  
 Elizabeth Porter, B.A., M.Ed., M.A., J.D., Assistant Professor of Law  
 Anita Ramasastry, B.A., M.A., J.D., Professor of Law  
 Jeffrey Riedinger, B.A., J.D., M.A., Ph.D., Professor of Law, Vice Provost for Global Affairs  
 Beth Rivin, B.A., M.D., M.P.H., Research Associate Professor of Law  
 William H. Rodgers, B.A., J.D., Professor of Law  
 Zahr Said, B.A., J.D., Ph.D., Assistant Professor of Law, Co-director of the Center for Advanced Study and  
 Research on Intellectual Property  
 Lauren Sancken, B.A., J.D., Law Lecturer  
 Sallie Thieme Sanford, B.A., J.D., Associate Professor of Law  
 Eric Schnapper, B.A., M.A., B.Phil., LL.B., Professor of Law  
 Scott A. Schumacher, B.A., J.D., LL.M., Professor of Law, Director of Federal Tax Clinic, Director of  
 Graduate Program in Taxation  
 Toshiko Takenaka, B.A., LL.M., Ph.D., Professor of Law  
 Kellye Y. Testy, B.A., J.D., Toni Rembe Dean & Professor of Law  
 Anna Tolin, B.A., J.D., Law Lecturer  
 Michael E. Townsend, B.A., M.A., Ph.D., J.D., Associate Professor of Law  
 Lea B. Vaughn, A.B., J.D., Professor of Law  
 Walter J. Walsh, B.C.L., LL.M., S.J.D., Associate Professor of Law  
 Kathryn Watts, B.S., J.D., Professor of Law  
 Todd Wildermuth, B.S., M.S., Ph.D., Law Lecturer  
 Brenda Williams, B.A., M.P.A., J.D., Law Lecturer  
 Jane K. Winn, B.Sc., J.D., Professor of Law, Co-director of the Center for Advanced Study and Research on  
 Intellectual Property  
 Lara Zarowsky, J.D., Law Lecturer  
 Dongsheng Zang, LL.B., LL.M., LL.M., S.J.D., Associate Professor of Law, Co-Director Asian Law Center  
 David Ziff, A.B., J.D., Law Lecturer

#### ADJUNCT AND VISITING FACULTY

Betsy Baker, B.A., J.D., LL.M., Counsel to the Dean - Alaska Programs & Affiliate Professor of Law  
 Gad Barzilai, B.A., LL.S., LL.B., M.A., Ph.D., Adjunct Professor of Law  
 Katherine Beckett, B.A., M.A., Ph.D., Adjunct Professor, Law Societies and Justice Program, Sociology  
 Andrew Benjamin, J.D., Ph.D., Affiliate Professor of Law  
 Sharan E. Brown, B.A., M.A., J.D., Ed.D., Adjunct Research Associate Professor of Law  
 Angelica Chazaro, B.A., J.D., Visiting Assistant Professor  
 Christine Cimini, B.A., J.D., Visiting Professor  
 Denise Dudzinski, Ph.D., MTS, Adjunct Professor, Bioethics and Humanities  
 John Haley, Professor of Law  
 Thomas Hazlet, B.S., Pharm.D., Dr.P.H., Adjunct Associate Professor, Pharmacy  
 Nancy S. Jecker, B.A., M.A., M.A., Ph.D., Adjunct Professor of Law  
 Sang Jo Jong, Visiting Professor  
 Michael McCann, B.A., M.A., Ph.D., Adjunct Professor of Law  
 Arzoo Osanloo, B.A., J.D., Ph.D., Adjunct Associate Professor of Law, Law, Societies and Justice Program  
 Saadia Pekkanen, B.A., M.I.A., Ph.D., M.S.L., Adjunct Associate Professor of Law  
 Clare Ryan, B.S., M.S., Ph.D., Adjunct Professor, School of Environmental and Forest Sciences  
 Thomas Schoenbaum, B.A., J.D., Visiting Professor  
 Hugh D. Spitzer, B.A., J.D., LL.M., Acting Professor of Law  
 Susan Whiting, B.A., Ph.D., Adjunct Associate Professor of Law  
 Richard O. Zerbe, Jr., A.B., Ph.D., Adjunct Professor of Law

#### GALLAGHER LAW LIBRARY STAFF

Crystal Alberthal, B.A., M.L.I.S., Library Specialist, Serials  
 Karen Ballard, B.A., Library Specialist, Cataloging  
 Rob Britt, B.A., M.A., M.A., East Asian Law Library Services Coordinator  
 Judy Davis, B.A., M.L.I.S., Librarian, Resource Sharing  
 Anna Endter, B.A., J.D., M.L.I.S., Librarian, Reference  
 Flora Escarez, B.S., Library Specialist, Cataloging  
 Grace Feldman, B.A., J.D., M.L.I.S., Librarian, Reference  
 Jonathan Franklin, A.B., A.M., J.D., M.L.I.S., Interim Director of Library and Computing Services, Associate  
 Law Librarian  
 Sharon Hall, Library Specialist Supervisor, Cataloging  
 Tricia Hart, B.A., M.L.I.S., Librarian, Cataloging  
 Ingrid Holmlund, A.B., J.D., M.L.I.S., CILP Co-Editor  
 Peggy Jarrett, B.A., M.S.L.I.S., Librarian, Collection Development & Reference  
 Richard Jost, B.A., M.A., M.A., Information Systems Coordinator  
 Choong Kim, B.A., Fiscal Specialist, Washington Law Review, Washington International Law Journal  
 Kaden Mack, B.A., Library Technician, Circulation  
 Ann Nez, B.A., M.L.I.S., Librarian, Technical Services Coordinator  
 Vickie Northington, B.A., Library Supervisor, Circulation  
 Cheryl Nyberg, B.A., M.S.L.I.S., Librarian, Reference  
 Nikki Pike, Information Specialist, CILP  
 Patty Roberts, B.A., Library Technician Lead, Evening Circulation Supervisor  
 Tania Schriwer, B.A., J.D., M.L.I.S., CILP Co-Editor  
 Dave Tawatao, Senior Computer Specialist  
 Reba Turnquist, B.A., M.L.I.S., Librarian, Collection Development  
 Mary Whisner, B.A., J.D., M.L.I.S., Librarian, Coordinator of Reference Services  
 Alena Wolotira, B.A., J.D., M.L.I.S., Librarian, Reference; CILP Co-Editor  
 Quan (John) Zhang, B.A., M.A., Ph.D., Library Specialist, Acquisitions