

WATERSHED SCIENCE BULLETIN



Journal of the Association of Watershed & Stormwater Professionals
A program of the Center for Watershed Protection, Inc.

FALL 2010

Total Maximum Daily Loads (TMDLs)
Innovations and Implementation

TABLE OF CONTENTS

FEATURED CONTENT

Exploring Alternatives to Pollutant-Based TMDLs

Responding to the First Impervious Cover-based TMDL in the Nation / **11**

Chester L. Arnold, Christopher Bellucci, Kelly Collins, and Rich Claytor

TMDLs: Improving Stakeholder Acceptance with Science-based Allocations / **19**

Jason A. Hubbart, John Holmes, and Georganne Bowman

Integrating TMDLs and MS4 Permits

Collaboration, Clean Water Act Residual Designation Authority, and Collective Permitting:
A Case Study of Long Creek / **25**

Dave Owen, Curtis Bohlen, Peter Glaser, Zach Henderson, and Christopher Kilian

Tracking Watershed Restoration in Montgomery County, Maryland / **35**

Nick L. Lindow, Steven P. Shofar, and Meosotis C. Curtis

Adaptive Implementation of TMDLs

Adaptive Management and Effective Implementation of Sediment TMDLs in the Lake Tahoe Basin, USA / **42**

Mark E. Grismer, Kevin M. Drake, and Michael P. Hogan

Center for Watershed Protection Feature

Monroe County, New York, Field Tests the Watershed Treatment Model 2010 Beta Edition / **49**

Paula Smith, Andy Sansone, and Deb Caraco

Vignettes

Reducing DDT and Sediment Loads in the Yakima River: A Success Story / **55**

Thermal Load Trading in the Tualatin River Basin: A Watershed-based NPDES Permit / **56**

Optimizing Resources To Achieve Pollutant Reductions in Wisconsin / **57**

Lake Clarity Crediting Program for Lake Tahoe: An Adaptive Management Approach for Water Quality Credits / **59**

BULLETIN DEPARTMENTS

Bulletin Board

From the Editor's Desk / **5**

Overview: The ABCs of TMDLs / **7**

Ask the Experts

Xavier Swamikannu, retired, chief of the Stormwater Permitting Program for the Los Angeles Regional Water Board / **61**

Rick Parrish, senior attorney, Southern Environmental Law Center / **63**

Michael Bateman, deputy bureau chief, Resource Regulation, Northwest Florida Water Management District / **65**

Watershed Spotlight

AWSPs Photolog Contest Winner / **34**

Nominate a "Watershed Superstar" / **66**

Latest News from AWSPs

Membership Information / **67**

Next Issue / **67**

Upcoming Events / **67**

Sponsorship / **67**

Book Review

Up River: A Novel of Attempted Restoration by George Ivey / **33**

WATERSHED SCIENCE BULLETIN



Journal of the Association of Watershed & Stormwater Professionals
A program of the Center for Watershed Protection, Inc.

8390 Main St. 2nd Floor • Ellicott City, MD 21043 • 410-461-8323 (phone)
410-461-8324 (fax) • www.awsp.org • Bulletin@awsp.org

Watershed Science Bulletin (ISSN: 2156-8545) is the journal of the Association of Watershed and Stormwater Professionals (AWSPs), and is published semi-annually by the Center for Watershed Protection, Inc. (CWP).

KEY CONTACTS:

Co-Editors-in-Chief

Karen Capiella (kc@cwsp.org)
Neely Law (nll@cwsp.org)

Associate Editor

Lisa Fraley-McNeal (bulletin@awsp.org)

Sponsorship Coordinator

Erin Johnson (etj@cwsp.org)

AWSPs Membership

(membership@awsp.org)

MISSION: The mission of the *Watershed Science Bulletin* (the *Bulletin*) is to synthesize research and experience from the numerous disciplines that inform watershed management and transmit this valuable information to researchers, regulators, practitioners, managers, and others working to protect and restore watersheds everywhere.

COPYRIGHT © 2010 by the Center for Watershed Protection, Inc.

All rights reserved. No part of this periodical may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or an information storage and retrieval system, without written permission.

DISCLAIMER: Opinions and conclusions expressed by authors are their own and should not be considered those of AWSPs or CWP or its staff, members, or sponsors. Sponsorships in this publication do not constitute an endorsement of any product or service. Mention of any trade name in the *Watershed Science Bulletin* does not constitute an endorsement by AWSPs or CWP and does not imply its approval to the exclusion of other products or services that may also be suitable.

POSTMASTER: Please send address changes to the Watershed Science Bulletin address listed above.

SUBSCRIPTIONS AND BACK ISSUES: Subscription is included for AWSPs members as part of member dues. The subscription rate for non-members is \$89/year. Single copies and back issues can be purchased for \$49 each. For a complete listing of back issues or to purchase a subscription, please visit www.awsp.org.

SUBMISSION: To submit an article, please visit www.awsp.org.

Graphic Design by Down to Earth Design, LLC (d2edesign.com)

Copyediting by Elizabeth Stallman Brown

Printed by the YGS Group, York, PA.

Cover photo courtesy of Bryan Seipp (www.btseippphotography.com),
Watershed Manager, Center for Watershed Protection

This photo was taken along Pocono Creek in Monroe County, PA, near Camelback Mountain. Like many streams in Pennsylvania, it is dominated by a forested watershed and provides critical habitat for trout populations. Some tributaries in the Pocono Creek watershed qualify for the highest level of water quality protection under Pennsylvania regulations. Population growth and the resulting urbanization and hydrologic changes are a threat to the health of the watershed.

EDITORIAL COMMITTEE

Chester Arnold

Water Quality Educator and Associate Director
University of Connecticut Center for Land Use Education and Research

Roger Bannerman

Water Resources Management Specialist
Wisconsin Department of Natural Resources

Derek B. Booth, Ph.D., PE, PG

President (Stillwater) and Affiliate Professor (UW)
Stillwater Sciences and University of Washington

Eric Eckl

Environmental Communication Consultant
Water Words that Work, LLC

Bill Frost, PE, D.WRE

Senior Associate
KCI Technologies, Inc., Water Resources Practice

Bill Hunt, Ph.D., PE

Assistant Professor and Extension Specialist
North Carolina State University

Joseph MacDonald, Ph.D., AICP

Program Development Senior Associate
American Planning Association

Tracie-Lynn Nadeau, Ph.D.

Environmental Scientist
U.S. Environmental Protection Agency, Region 10

Bill Selbig

Hydrologist
U.S. Geological Survey, Wisconsin Water Science Center

Kevin Sellner, Ph.D.

Executive Director
Chesapeake Research Consortium

Neal Shapiro, MMP

Watershed Section Supervisor and Watershed Management Coordinator
City of Santa Monica Office of Sustainability and the Environment

Lisa Shipek

Executive Director
Watershed Management Group, AZ

Don Wayne

Nonpoint Source Coordinator, Outreach and CZARA
U.S. Environmental Protection Agency Office of Wetlands, Oceans, and Watersheds

GUEST REVIEWERS

Helen Rueda

U.S. Environmental Protection Agency, Region 10

CENTER FOR WATERSHED PROTECTION STAFF CONTRIBUTORS

Hye Yeong Kwon, *Executive Director*

Sadie Drescher, *Watershed Planner*

Dave Hirschman, *Program Director*

Laurel Woodworth, *Stormwater and Watershed Planner*

Reducing DDT and Sediment Loads in the Yakima River: A Success Story

The Yakima River valley in central Washington State is a major agricultural region producing corn, hops, orchard fruits, grapes, and mint. Fish sampled in this river in the 1980s had some of the nation's highest concentrations of DDT, a pesticide banned in 1972 because of its toxic effects on humans and wildlife. As a result, the Washington State Department of Health issued a fish consumption advisory for the river. In 1994, the Washington State Department of Ecology (Ecology) began work on a total maximum daily load (TMDL) for DDT in the lower Yakima River.

The Yakima River valley is one of the most intensively irrigated areas of the nation and, in the mid-1990s, many growers in the area used inefficient rill and furrow irrigation methods. Irrigation returns were laden with suspended eroded soil, and legacy pesticides, such as DDT from historic application, were attached to the soil particles.

Because of the difficulty and expense of DDT analysis, Ecology found a surrogate contaminant that could be more easily monitored. Ecology scientists found strong correlations between DDT and total suspended sediment (TSS), and between TSS and turbidity. The 1998 TMDL set allocations for DDT, TSS, and turbidity, requiring TSS reductions of 89% to 98% within ten years. The numeric targets were a key component in the success of this reduction effort; earlier, less focused attempts to reduce DDT and sediment in the basin had failed.

Two of the valley's irrigation districts, the Roza and Sunnyside Valley Irrigation Districts, operating as the Roza Sunnyside Board of Joint Control, adopted policies requiring farmers to achieve turbidity goals, which became more stringent each year to meet the TMDL allocations' ten-year time frame. The districts established a laboratory to test irrigation return waters. Growers whose returns exceeded the turbidity goal were required to write short-term and long-term plans

to address the problem to avoid the penalty of reduced irrigation flow.

Ecology provided the Roza and Sunnyside Valley Irrigation Districts with \$10 million from the Clean Water State Revolving Fund for loans to upgrade irrigation systems. It also provided staff to the districts to assist with water quality sampling and to advise farmers in the selection of best management practices (BMPs) for remediation plans. The Natural Resources Conservation Service, Washington State University Extension Service, and the conservation districts were also key participants, providing outreach and education on the benefits of the BMPs.

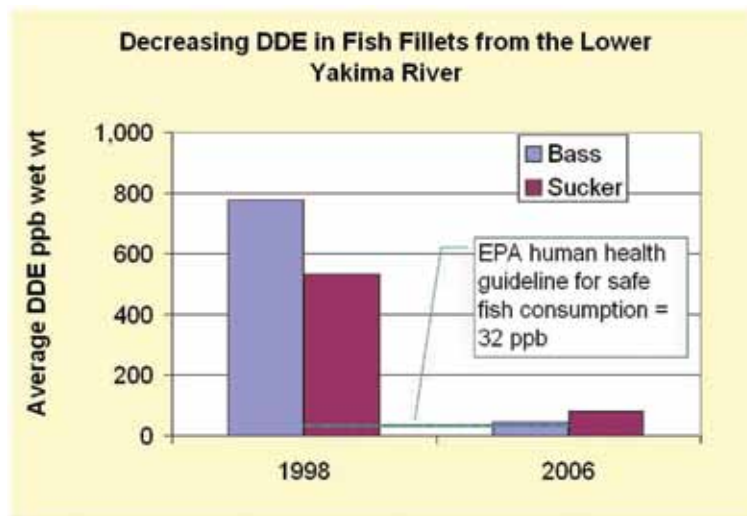


Figure 1. Decreasing DDE (the most persistent metabolite of DDT) in Fish Fillets from the Lower Yakima River

The North Yakima Conservation District implemented a demonstration project with drip irrigation on hop fields in the Moxee Drain. The advantages and cost savings of this type of irrigation became apparent to area growers. As a result, 100% of the hop fields there were converted to permanent drip irrigation, leading to a 90% decrease in sediment loading to Moxee Drain recorded between 1998 and 2003.

In the first four years after the TMDL was adopted, the Roza and Sunnyside Valley Irrigation Districts recorded an 80% reduction in daily sediment loading. Ecology's fish tissue monitoring in 2006 showed a large reduction of DDT in fish tissue, allowing the Department of Health to lift the DDT fish consumption advisory (Figure 1). The Yakima River fish advisory for DDT is the first in the nation to be removed as a result of a TMDL and subsequent reduction measures.

All of this was done without shutting off a single farmer's water. Leadership on the part of the irrigation districts was crucial to success. The Yakima TMDL is a model for DDT reduction in areas where soil erosion from agriculture is a major source of DDT to streams.

List of Sources

Johnson, A., K. Carmack, B. Era-Miller, B. Lubliner, S. Golding, and R. Coots. 2010. *Yakima River pesticides and PCBs total maximum daily load: Volume 1. Water quality study findings*. Publication no. 10-03-018, April. Olympia, WA: Washington State Department of Ecology.

Joy, Joe, and Barbara Patterson. 1997. *A suspended sediment and DDT total maximum daily load evaluation report for the Yakima River*. Publication no. 97-321, July. Olympia, WA: Washington State Department of Ecology.

National Association of Conservation Districts. No date. *TMDL case study: Washington*. <http://www.nacd.info/policy/environment/water/tmdl/casestudies/washington.phtml>

Rinella, Joe F., Pixie A. Hamilton, and Stuart W. McKenzie. 1993. *Persistence of the DDT pesticide in the Yakima River basin Washington*. Circular 1090. Reston, VA: US Geological Survey.

Roza–Sunnyside Board of Joint Control. 2009. *Water quality improvements in RSBOJC irrigation return waterways, 1997–2008*. March. Sunnyside, WA: Roza–Sunnyside Board of Joint Control.

Washington State Department of Ecology. 2008. *Water Quality Program*. Publication no. 08-10-023, April. Olympia, WA: Washington State Department of Ecology.

For More Information

For more information, contact Ryan Anderson, Environmental Specialist, Washington State Department of Ecology, at rand461@ecy.wa.gov.

Case Study Contributors

Contributors to this case study include Helen Rueda, US Environmental Protection Agency Region 10; Ryan Anderson, Washington State Department of Ecology; Chris Coffin, Washington State Department of Ecology; Joe Joy, Washington State Department of Ecology; Mike Tobin, North Yakima Conservation District; Jim Trull, Sunnyside Irrigation District.

Thermal Load Trading in the Tualatin River Basin: A Watershed-based NPDES Permit

The low-gradient Tualatin River, located primarily in Washington County just west of Portland, Oregon, is part of the larger Willamette River basin. Roughly one-third of the watershed has been in agricultural use since the early 20th century, and the lower third of the watershed has been significantly impacted by urbanization. In particular, water temperatures have increased measurably over the past several decades. Warm rivers and streams constitute a major limiting factor for the recovery of salmonids, many species of which are listed in Oregon under the Endangered Species Act. In 2001, the Oregon Department of Environmental Quality (DEQ) issued a total maximum daily load (TMDL) for temperature in the Tualatin River, primarily to address salmonid recovery needs.

Clean Water Services (CWS), a special purpose district utility, provides wastewater collection and treatment and stormwater management services to over 500,000 residents in Washington County. The TMDL included a wasteload allocation to CWS wastewater treatment facilities that mandated a nearly 95% reduction in thermal loads (from 9×10^8 kcal/day down to 4.4×10^7 kcal/day), requiring the effluent temperature to decline from 72°F to nearly 62°F. During the summer months, discharged effluent from CWS facilities can make up over 50% of the flow in the river. The TMDL

showed that approximately 40% of the thermal energy input into the Tualatin River comes from the sun's thermal energy reaching the river in altered urban and rural landscapes—essentially a loss of shade.

CWS estimated capital and operational costs of \$150 million to install and operate chillers at its wastewater facilities to meet the TMDL requirement. At the same time, it recognized the opportunity to deliver greater ecological benefits by restoring streams and, with the cooperation of DEQ, chose to implement nonstructural methods by developing a thermal load trading program (shade credits) coupled with the release of stored water from two reservoirs to add cool water to the river.

The flexibility to take this approach was provided by CWS' 2004 watershed-based National Pollutant Discharge Elimination System (NPDES) permit, the first in the nation to allow temperature trading (point to nonpoint thermal load reduction credits) to comply with permit requirements. Key elements of the program include a capital improvement program, a Tree-For-All program for cities, and an Enhanced Conservation Reserve Program for rural areas. In the latter, CWS pays farmers with annual riparian land lease payments. This allows CWS, working through local soil and