

2020 CERSA Virtual Workshop

Incorporating the Benefits of Vegetative Filter Strips into Risk Assessment and Risk Management of Pesticides

September 8-10, 2020

Background & Description of the Workshop

In December 2018, a multi-stakeholder workshop on incorporating Vegetative Filter Strips into the Risk Assessment and Risk Management of pesticides was held in Raleigh North Carolina under the auspices of North Carolina State's Center of Excellence for Regulatory Science in Agriculture (CERSA). Scientists from academia, government, and industry along with conservation experts and producers came together. Plenary presentations from this workshop are available on the [NC State](#) website.

Overall goals of the 2018 workshop were to:

- Provide a path forward towards incorporating the use of VFS in risk assessment and risk management of pesticides;
- Lead to improved cooperation and collaboration among stakeholders to leverage available data and information regarding the design, effectiveness, and implementation of VFS and other runoff mitigation measures for various crops and regions; and,
- Support the development of strategies to increase producer engagement and adoption of VFS and other runoff mitigation measures to protect soil and water resources.

The 2018 workshop was partially successful in that improved cooperation and collaboration among stakeholders was achieved and working groups were formed which have continued to move discussions forward.

Since then, scientific advances in modeling VFS function and data to validate the model VFSSMOD has been generated. Regulatory authorities in the US and Canada have begun to consider how to utilize VFSSMOD or other tools to incorporate VFS into their risk assessment/risk management process. Therefore, CERSA will convene a follow up workshop.

Overall objectives of the 2020 CERSA Virtual workshop:

1. **Organize an update on scientific research and regulatory developments relative to VFS**
2. **Examine and compare approaches to incorporate VFS into the risk assessment of pesticides.**
3. **Review and examine potential strategies for the implementation of VFS in the field with producers.**

Desired Outcomes:

- A series of plenary and poster presentations providing updates on the latest scientific and regulatory development relative to VFS.
- Utilizing best available science, develop robust interim approach to incorporate VFS into the risk assessment process
- Strategies for field implementation to address regional differences in climate and production systems where alternative mitigation measures may be more practical.
- Workshop summary paper published in peer-reviewed literature. Other publications as needed.

Scientific Program Committee:

Amy Blankinship, US EPA; Rafael Carpena, Univ Florida; Kevin Costello, US EPA; Giulio Ferruzzi, USDA-NRCS; Garey Fox, NC State; Tony Hawkes, NOAA NMFS; Eric Henry, BASF; Monisha Kaul, US EPA; Timothy Kiely, US EPA; Yuzhou Luo, CA EPA, DPR; Jane Tang, Bayer Crop Science; Clint Truman, Syngenta; Tammy Veith, USDA-ARS; Steven Wente, US EPA; Mélanie Whiteside, PMRA; Yongping Yuan, US EPA

Organizing Committee

Kevin Armbrust, LSU; Danesha Seth Carley, Director CERSA, NC State; Susanne Kjemtrup, Phyta BioTech Consulting; Laura McConnell, Bayer Crop Science; Geoff Bock, NC State



Workshop Format and Program

The workshop will consist of plenary and poster presentations conducted in the days prior to start of the formal workshop program. All presentations will be recorded, and recordings will be made available to all workshop participants.

Please see the meeting website for all materials and the latest information: <https://cersavfs2020.wordpress.ncsu.edu/>

Plenary Presentations

Date	Time (Central Daylight Time)	Title	Presenter
Aug 31, 2020	10:30 AM	Opening Remarks	
	10:35 AM	Advances in VFS Modeling	Rafa Carpena, University of Florida
	11:10 AM	Continuous modeling of vegetative filter strip (VFS) for pesticide removal under Pesticide in Water Calculator (PWC) scenarios	Yuzhou Luo, California Department of Pesticide Regulation
	11:45 AM	USDA-NRCS Perspective on Runoff Mitigation from Irrigated and Rainfed Agriculture	Giulio Ferruzzi US Department of Agriculture-Natural Resources Conservation Service
	12:20-12:30 PM	Final Q&A Wrap-Up	
Sept 1, 2020	11:00 AM	Opening Remarks	
	11:05 AM	Proposed Approach to Incorporate VFS into the Canadian Regulatory Framework	Mélanie Whiteside, PMRA
	11:40 AM	Overview of VFSMOD explorations conducted to date by PMRA	Johnny Westgate, PMRA
	12:15-12:30 PM	Final Q&A Wrap-Up	
Sept 2, 2020	11:00 AM	Opening Remarks	
	11:05 AM	Farmers and Conservation Practice Adoption	Deanna Osmond, North Carolina State University
	11:40 AM	Summary of Field Study to Validate VFSMOD	Clint Truman, Syngenta
	12:15-12:30 PM	Final Q&A Wrap-Up	
Sept 8, 2020	~10:00 AM (Day 1 of Workshop)	EPA Perspective on VFS	Kevin Costello, Amy Blankinship, and Steve Wentz, US Environmental Protection Agency

Formal Workshop Schedule

September 8

Time (Central Daylight Time)	Duration (hour:min)	Focus: Objective 1-Regulatory Assessment
10:00	0:10	Settling in
10:10	0:20	Opening remarks: Danesha Seth Carley, Laura McConnell, Susanne Kjemtrup
10:30	0:35	EPA Perspective on VFS – Kevin Costello, Amy Blankinship, and Steve Wentz, US Environmental Protection Agency
11:05	0:30	Breakout 1: Ice breaker
11:35	0:10	Break
11:45	1:15	Objective 1,3 Approaches to quantify VFS function for regulatory assessment: Slide in 5/10 min discussion each
		1. Run-off Mitigation – Regulatory Status in the EU/Robin Sur, Bayer Crop Science
		2. Advances in VFS Modeling/Rafa Carpena, University of Florida
		3. Overview of VFSMOD explorations conducted to date by PMRA/Johnny Westgate, PMRA
		4. Proposed Approach to Incorporate VFS into the Canadian Regulatory Framework/Mélanie Whiteside, PMRA
5. Continuous modeling of vegetative filter strip (VFS) for pesticide removal under Pesticide in Water Calculator (PWC) scenarios/Yuzhou Luo, California Department of Pesticide Regulation		
13:00	0:10	Break
13:10	1:00	Breakout 2: VFSMOD in EPA risk assessment: Look up table; factor approaches; other approaches
14:10	0:20	Reconvene and share
14:30	1:30	Extended Break
16:00	1:00	Virtual Reception: Poster Discussion

September 9

Time (Central Daylight Time)	Duration (hour:min)	Focus: Objective 2-Field Implementation
10:00	0:10	Settling in
10:10	0:10	Review Yesterday's accomplishments
10:20	0:30	VFS Definition discussion
10:50	0:45	Objective 2 Field approaches slide in 5/10 discussion
		1. Summary of Field Study to Validate VFSSMOD/Clint Truman, Syngenta
		2. USDA-NRCS Perspective on Runoff Mitigation from Irrigated and Rainfed Agriculture/Giulio Ferruzzi US Department of Agriculture-Natural Resources Conservation Service
		3. Farmers and Conservation Practice Adoption/Deanna Osmond, North Carolina State University
11:35	0:10	Break
11:45	0:45	Breakout 3: Factors that can hinder or support VFS field implementation
12:30	0:30	Reconvene and share
13:00	0:10	Break
13:10	1:00	Breakout 4: Decision tree or point system: flexibility for the grower
14:10	0:20	Reconvene and share; end of day synthesis
14:30	1:30	Extended Break
16:00	1:00	Virtual Reception: "The Meeting After the Meeting"

September 10

Time (Central Daylight Time)	Duration (hour:min)	Focus: Grower's perspective and synthesis
10:00	0:10	Settling in
10:10	0:30	Review progress: outstanding issues?
10:40	1:00	Panel: Grower's perspective/Clint Truman, Syngenta, moderator
11:40	0:10	Break
11:50	0:15	Reconvene: outstanding issues tied with grower's perspectives
12:05	0:45	Breakout 5: Consensus statement
12:50	0:10	Break
13:00	0:20	Reconvene, share and refine consensus statements
13:20	1:00	Outline workshop summary manuscript.
14:20	0:10	Closing remarks
14:30		End of Workshop

Posters

Title	Authors
Definition of a VFS (Vegetative Filter Strip) for CERSA's (Center of Excellence for Regulatory Science in Agriculture) 2018 Workshop on Innovation and Regulation in Agriculture	Giulio Ferruzzi, USDA-NRCS
Effectiveness of vegetative filter strips based on modeling with VFSSMOD or fixed reduction percentages from European regulatory framework	Robin Sur, Bayer AG, S. Reichenberger, knoell Germany GmbH, H. Meyer, Bayer AG, C. Kley Bayer AG
Identification of Transport Processes, Herbicide Source Area Variability, and VFS Effectiveness in a High Agricultural Intensity Catchment	Michael Winchell, Stone Environmental, Hendrik Rathjens, Stone Environmental, Robin Sur, Bayer Crop Science, Dirk Beats, Bayer Crop Science, David Lembrich, Bayer Crop Science, Florian Krebs, Knoell Consulting
Identifying NEMO: An application of crop modeling for strategic nitrogen recommendations adapted to given soil and climate	Morteza Mesbah, Elizabeth Pattey, Guillaume Jégo, and Kristen Murchison, Agriculture and Agri-Food Canada
Incorporating vegetative filter strip (VFS) in the US regulatory environmental exposure assessment	Jessica Chen, Bayer Crop Science, Dean Desmarteau, Waterborne Environmental, Amy Ritter, Waterborne Environmental, and Jane Tang, Bayer Crop Science
Regulatory implementation of VFS as a mitigation for transport of pesticides via runoff and erosion: the European "Reduction Efficiency Factor" approach	Eric Henry, BASF, Beate Erzgräber, BASF, Jane Tang, Bayer Crop Science, Robin Sur, Bayer Crop Science
Results of a 2018 multi-stakeholder workshop on incorporating the benefits of vegetative filter strips into aquatic risk assessment and risk management of pesticides	Laura McConnell, Bayer Crop Science; Danesha Seth Carley, North Carolina State University, Jane Tang, Bayer Crop Science
The importance of temporal inequality in quantifying vegetative filter strip removal efficiencies	Heather E. Preisendanz (Pennsylvania State University (PSU)), Daniel Schultz (PSU), Tamie Veith (USDA-ARS), Sarah Goslee (USDA-ARS), Alfonso Mejía (PSU), Ciaran J. Harman (Johns Hopkins University), Cibin Raj (PSU), and Paul Patterson (PSU)
Use of remote sensing data (OpTIS) to monitor adoption of conservation practices	David Gustafson, Conservation Technology Information Center
Vegetative filter strips for the protection of surface waters from pesticide runoff	Ross Breckles, Tim MacDonald, and Mélanie Whiteside, PMRA, Health Canada
VFS Factsheet from PMRA, Health Canada	Ross Breckels and Shannon Ing, PMRA, Health Canada



List of Participants

Clara Wandenkolck Silva Aragão, IBAMA, Environmental Analyst, clara.aragao@ibama.gov.br

Kevin Armbrust, Louisiana State University, Chair, Dept Environmental Sciences, armbrust@lsu.edu

Professor and Chair - Environmental Chemist/toxicologist in the Department of Environmental Sciences at Louisiana State University. His expertise and research interests include assessments of the fate and effects of pesticides and other chemicals in and upon Louisiana watersheds, wetlands and coastal areas especially as they impact the regulatory sciences, as well as risks associated with chemical contaminants in manufactured and retail food.

Edward Barnes, Cotton Incorporated, Senior Director, ebarnes@cottoninc.com

For the last eighteen years Dr. Barnes has managed agricultural engineering related research projects, including programs on: precision farming, ginning, conservation tillage, cotton harvest systems and water management. He has also served as a team member in documenting cotton's progress in reducing its environmental footprint and currently serves on the Science Advisory Council of Field to Market, The Alliance for Sustainable Agriculture.

Amy Blankinship, US EPA, OPP, EFED, Branch Chief, Environmental Risk Branch 2, blankinship.amy@epa.gov

She has over 10 years of experience in conducting ecological risk assessments for pesticide registrations and has been a member of several international expert groups on topics such as endocrine disruption, aquatic toxicology, and issues related to spray drift.

Ross Breckels, PMRA, Environmental Risk Assessor, ross.breckels@canada.ca

Scientific Evaluator at PMRA - Biologist and regulatory scientist. His expertise is in aquatic biology and he is involved in several technical teams pertaining to mitigation and ecosystem health, such as vegetative filter strips, drift mitigation, and water monitoring.

Greg Bartley, Pulse Canada, Director Crop Protection & Crop Quality, gbartley@pulsecanada.com

Geoff Bock, NC State, Project Manager and Interim Director of Operations, NC Plant Sciences Initiative, grbock@ncsu.edu

Geoff serves as the Project Manager and Interim Director of Operations for the North Carolina Plant Sciences Initiative (NC PSI), an effort to establish North Carolina as the world leader in plant sciences research and innovation. Geoff has been involved with CERSA since its establishment, and he is serving this VFS workshop as a member of the Organizing Committee as well as managing workshop communications and logistics.

Daneshia Seth Carley, NC State, Director, CERSA, dqseth2@ncsu.edu

Director for the Southern IPM Center, and the new Center of Excellence for Regulatory Science in Agriculture (CERSA). As an Associate Professor in Horticultural Science at NC State, her research, and outreach programs focus on sustainable managed landscapes. Recent projects include the restoration of historic Pinehurst No. 2 and No. 4 Golf Courses, and pollinator protection and habitat conservation.

Rafael Muñoz-Carpena, University of Florida, Professor, carpena@ufl.edu

Full Professor in Hydrology and Environmental Modeling at the Agricultural and Biological Department, University of Florida, Gainesville. His expertise is in hydrological, water quality and environmental modeling. He is author of VFSSMOD, the vegetative filter strips (VFS) modeling system, a mechanistic numerical model to calculate the VFS reduction efficiency of surface runoff, sediment, and chemicals under realistic field conditions.

Jessica Chen, Bayer Crop Science, Environmental Safety, jessica.chen@bayer.com

Environmental modeling scientist at Bayer in Chesterfield, MO. Her areas of expertise include hydrology, exposure and risk assessment of agrochemicals, environmental modeling, vegetative filter strip as a runoff mitigation practice, and statistical analysis.

Kevin Costello, US EPA, OPP, PRD, Branch Chief, Risk Management and Implementation Branch II, costello.kevin@epa.gov

Branch Chief, Risk Management and Implementation Branch 2. With 14 years each of ecological risk assessment and risk management experience, he has expertise in several aspects of pesticide regulation. He took part in the 2017 and 2018 CERSA workshops.

Cristiane Oliveira Silva Dias, IBAMA, Environmental Analyst, cristiane.dias@ibama.gov.br

Giulio Ferruzzi, USDA-NRCS-WNTSC, Conservation Agronomist, giulio.ferruzzi@usda.gov

Conservation Agronomist- Agronomist serving our agency's state-level agronomists in the thirteen western states and territories. Providing assistance in the delivery of our nutrient and pest management conservation practices as well as support for Highly Erodible Land Compliance (HELC), Organic Agriculture and other conservation practices to support sound resource management on our nation's farms and minimum impacts on the surrounding areas.

Garey Fox, NC State, Professor and Department Head, Biological and Agricultural Engineering, gafox2@ncsu.edu

Professor and Department Head of Biological & Agricultural Engineering at North Carolina State University. He has participated in a number of field, laboratory, and numerical modeling studies related to the fate and transport of pesticides in the environment, including the development of efficiency equations for vegetative filter strips and modeling with VFSSMod investigating the influence of concentrated flow, shallow groundwater tables, and preferential flow.

Megan Guevara, US EPA, OPP, EFED, Physical Scientist, Guevara.megan@epa.gov
Physical scientist in the Environmental Fate and Effects Division (EFED) of the US EPA. She recently joined EFED and the US EPA and brings with her over 10 years of experience as an environmental fate modeler specializing in regulatory exposure modeling of agricultural chemicals.

Dave Gustafson, Conservation Technology Information Center (CTIC), Project Director, gustafson@ctic.org
Dave Gustafson is an independent scientist serving as a project director with CTIC, drawing upon his experience in environmental modeling and data analysis. Educated as a chemical engineer, Dave holds a B.S. from Stanford and a Ph.D. from the University of Washington. He brings past agribusiness experience with Monsanto, Rhône-Poulenc and Shell, as well as current research with the Agriculture & Food Systems Institute and Washington State University.

Lindsay Haines, USDA-NRCS-WNTSC, Pest Management - Detail to FSA, lindsay.haines@wdc.usda.gov
National Pest Management and Organic Systems Specialist with USDA-NRCS. Responsible for updating/developing national technical standards and technical resources relating to Pest Management and Organic Agricultural Systems.

Sara Hanson, Bayer, Residue Coordinator, Environmental Affairs, sara.hanson@bayer.com
Residue scientist within the Environmental Affairs and Regulatory Science team at Bayer Crop Science Canada in Saskatchewan. With a M.Sc. in aquatic toxicology her expertise is in fate and exposure of pesticides within Canadian aquatic environments, with focus on prairie environments and Ontario greenhouse regions.

Cameron Harrington, Syngenta, Technical Lead, Environmental Safety, cameron.harrington@syngenta.com Technical Leader within the Environmental & Product Safety group at Syngenta Canada in Guelph, Canada. His expertise is in pesticide environmental fate and exposure in the Canadian environment.

Tony Hawkes, NOAA NMFS, Office of Protected Resources, Ecotoxicologist, tony.hawkes@noaa.gov

Jamie Hewitt, Agriculture and Agri-Food Canada, Deputy Director, Environment Policy Division, Strategic Policy Branch, jamie.hewitt@canada.ca. BSc. in Environmental Science from the University of Manitoba. Has 20 years of experience with Agriculture and Agri-Food Canada, helping to design and deliver various soil and water conservation programs. Including working with provincial and territorial governments to design and deliver on-farm programs that support the adoption of beneficial management practices.

Eric Henry, BASF, Exposure Assessment Scientist, Global Environmental Fate, eric.henry@basf.com
Exposure assessment scientist and member of the Environmental Fate group at BASF in Research Triangle Park. He conducts modeling and provides regulatory support for plant protection products in the US and Europe.

Jeff Jenkins, Oregon State University, Environmental and Molecular Toxicology, Professor, Jeffrey.Jenkins@oregonstate.edu
Professor and Extension Specialist, Oregon State University. My Extension and research interests are issue based – primarily focused on chemical use in agriculture and forestry – working with producers to balance production and environmental protection goals, with state and federal agencies charged with regulatory oversight, and with a cross section of stakeholders concerned about adverse impacts of chemical technology.

Monisha Kaul, US EPA, OPP, BEAD, Branch Chief, Biological Analysis Branch, kaul.monisha@epa.gov

Susanne Kjemtrup, Phyta BioTech Consulting, Principal, kjemtrup@icloud.com
Susanne applies her extensive technical and leadership background in AgTech R&D to drive innovation management and strategic planning in both the public and private sectors.

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Yuzhou Luo, CA EPA, DPR, Research Scientist, Yuzhou.Luo@cdpr.ca.gov
In DPR since 2009, Yuzhou has provided environmental modeling support to pesticide registration, mitigation, and regulation. He is developing a consistent and transparent system for evaluating environmental fate of pesticides in surface water, and modeling tools for pesticide runoff from agricultural fields, rice paddies, and urban areas.

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Laura McConnell, Bayer Crop Science, Principal Scientist, Regulatory Scientific Affairs laura.mcconnell@bayer.com
brings 25 years of experience in environmental and agricultural science research, previously serving as a research chemist and lead scientist in the U.S. Department of Agriculture's Agricultural Research Service. At Bayer, McConnell focuses on communication, collaboration and engagement with the scientific community on topics relevant to the regulation of agricultural technologies.

Erin McGregor, Syngenta, Stewardship and Policy Manager erin.mcgregor@syngenta.com
Stewardship and Policy Manager within Regulatory Affairs group at Syngenta Canada in Guelph, Canada. Her background is in ecotoxicology and environmental risk assessment and her expertise is in regulatory affairs and product stewardship.

Morteza Mesbah, Agriculture and Agri-Food Canada, Research Scientist, Sustainable Production Systems, morteza.mesbah@canada.ca

An early career agro-ecosystem modeller and data scientist, with a background in environmental engineering. He joined AAFC in 2014 as a postdoc and 2017 as a scientist. He works with agro-ecosystem models, environmental models, and mathematical and economic instruments and develops tools to evaluate the performance of various policies and beneficial management practices.

Deanna Osmond, NC State Extension, Associate Department Head & Department Extension Leader, deanna_osmond@ncsu.edu

Professor and Department Extension Leader and Associate Head in the Crop and Soil Sciences Department at NC State University. She has worked at the interface of nutrient management, conservation practices, and water quality for over 25 years, with a particular emphasis on riparian buffers, watersheds, and soil fertility.

Tim Palmer, National Association of Conservation Districts, President, tim-palmer@nacdn.org

President of the National Association of Conservation Districts. NACD represents the 17000 locally elected or appointed conservation district officials that work with producers to solve conservation and water quality concerns. Tim is a row crop and cattle farmer from SC Iowa and is a board member of Ecosystem Services Market Coalition.

Heather Preisendanz, Pennsylvania State University, Associate Professor, heg12@psu.edu

Heather is an associate professor in the Department of Agricultural and Biological Engineering at Penn State. Her research efforts are primarily focused on the fate and transport of contaminants of emerging concern. Recently, her research has expanded to include modeling evaluations of riparian buffer designs based on stakeholder feedback (focus group meetings), as well as the role that concentrated flow pathways play in contaminant transport through riparian buffer zones.

Curtis Rempel, Canadian Canola Council, VP Crop Production and Innovation, rempecl@canolacouncil.org

Patricia Rice, BASF, Regulatory Technical Stewardship Manager, patricia.rice@basf.com

Regulatory Technical Stewardship Manager - a member of the Development Regulatory Strategy / Stewardship group at BASF in Research Triangle Park. Her expertise is in the environmental fate and stewardship of pesticides, ecotoxicology, exposure assessments, and sustainable agriculture.

Amy Ritter, Waterborne Environmental, Principal Engineer, rittera@waterborne-env.com

Principal Engineer at Waterborne Environmental, Inc. She has over 25 years working in the field of environmental fate and transport modeling and risk assessment. She has been a co-developer on several water quality models that are used globally.

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Jane Tang, Bayer Crop Science, Manager, Environmental Exposure Assessment, jane.tang@bayer.com

Manager and Senior Principal Scientist, Environmental Exposure Assessment of Environmental Safety group at Bayer in Research Triangle Park. Her expertise is in hydrological/water quality models in exposure and risk assessment of agrochemicals, and integration with spatial analysis techniques.

Clint Truman, Syngenta, Technical Leader, Environmental Fate & Exposure Team, Clint.Truman@syngenta.com

Technical Leader within the Environmental & Product Safety group at Syngenta Crop Protection in Greensboro, NC. His expertise is in surface water hydrology, erosion and sedimentation, agricultural BMPs, and pesticide fate and transport.

Tamie Veith, USDA-ARS, Agricultural Engineer, tamie.veith@usda.gov

Lead scientist of "Sustainable intensification of crop and integrated crop-livestock systems at multiple scales" research project. She has extensive expertise in watershed modeling, with a specific emphasis on understanding the effectiveness of agricultural Best Management Practices for reducing nutrients and sediments. Recently she has been collaborating on projects looking at the design and effectiveness of riparian and field-edge buffers as well as the potential co-benefits of agricultural Best Management Practices in mitigating pesticides, hormones, and antibiotics.

Mark Walker, Canadian Canola Growers Association, Manager, Policy Development, markw@ccga.ca

Steve Wentz, US EPA (wentz.stephen@epa.gov). Senior scientist in the Office of Pesticides Programs (OPP), Environmental Fate and Effects Division (EFED). He has a PhD from Purdue University. His expertise is in pesticide fate and environmental modeling.

Johnny Westgate, PMRA, Modeller, Environmental Exposure Modelling, john.westgate@canada.ca

Water modeller and technical team member in drift mitigation and vegetative filter strips. Environmental chemist with expertise in the modelling of indoor human exposure to consumer products, and the long-range atmospheric transport and mountain cold-trapping of pollutants.

Mélanie Whiteside, PMRA, Head, Environmental Exposure Modelling, melanie.whiteside@canada.ca

Head of Environmental Exposure Modelling at PMRA – Biologist and regulatory scientist. Her expertise is in the integration of the various components of pesticide risk assessments, including water modelling, fate characterization and risk mitigation.

Mike Winchell, Stone Environmental, Vice President, Senior Environmental Modeler, mwinchell@stone-env.com

Vice President and Senior Environmental Modeler, leads the Environmental Systems Modeling group at Stone Environmental. His expertise is in the development and application of water quality models and the integration of spatial analysis-based parameterization approaches, including fate and transport modeling of agrochemicals.

Yongping Yuan, US EPA-ORD, Research Hydrologist, yuan.yongping@epa.gov

Yongping Yuan, Research Hydrologist - Integrated Environmental Modeling Branch; she has been extensively working on watershed hydrology and water quality monitoring and modeling to explore complex water quality dynamics and find innovative strategies to protect water quality from non-point source pollution.