

Ohio River Basin Water Quality Trading Project

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KASMC Annual Meeting
Louisville, KY
12-12-19



Project Collaborators & Advisory Groups

Organizations:

- Electric Power Research Institute
- American Farmland Trust
- Ohio Farm Bureau Federation
- ORSANCO
- Tennessee Valley Authority
- American Electric Power
- Hoosier Energy
- Duke Energy

States:

- Ohio
- Indiana
- Kentucky



Agencies:

- USEPA
- USDA

External Advisory Groups:

- Electric Power Industry
- Environmental Groups
- Municipal Wastewater Treatment Plants
- Agriculture

EPRI's Unique Role in Addressing Nutrient Pollution

Independent

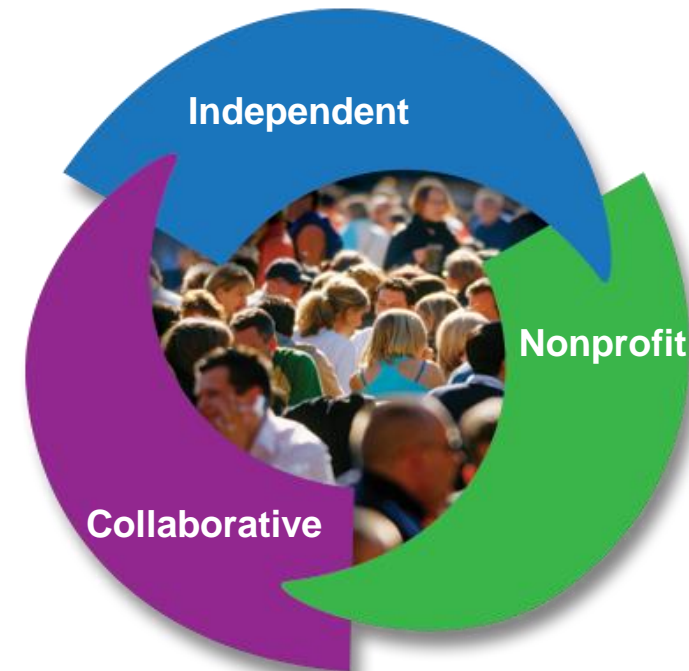
Objective, scientifically based results address reliability, efficiency, affordability, health, safety and the environment

Nonprofit

Chartered to serve the public benefit

Collaborative

Bring together scientists, engineers, academic researchers, industry experts



Farm installs best management practice to generate credit



Permitted source buys credit to meet regulatory requirement



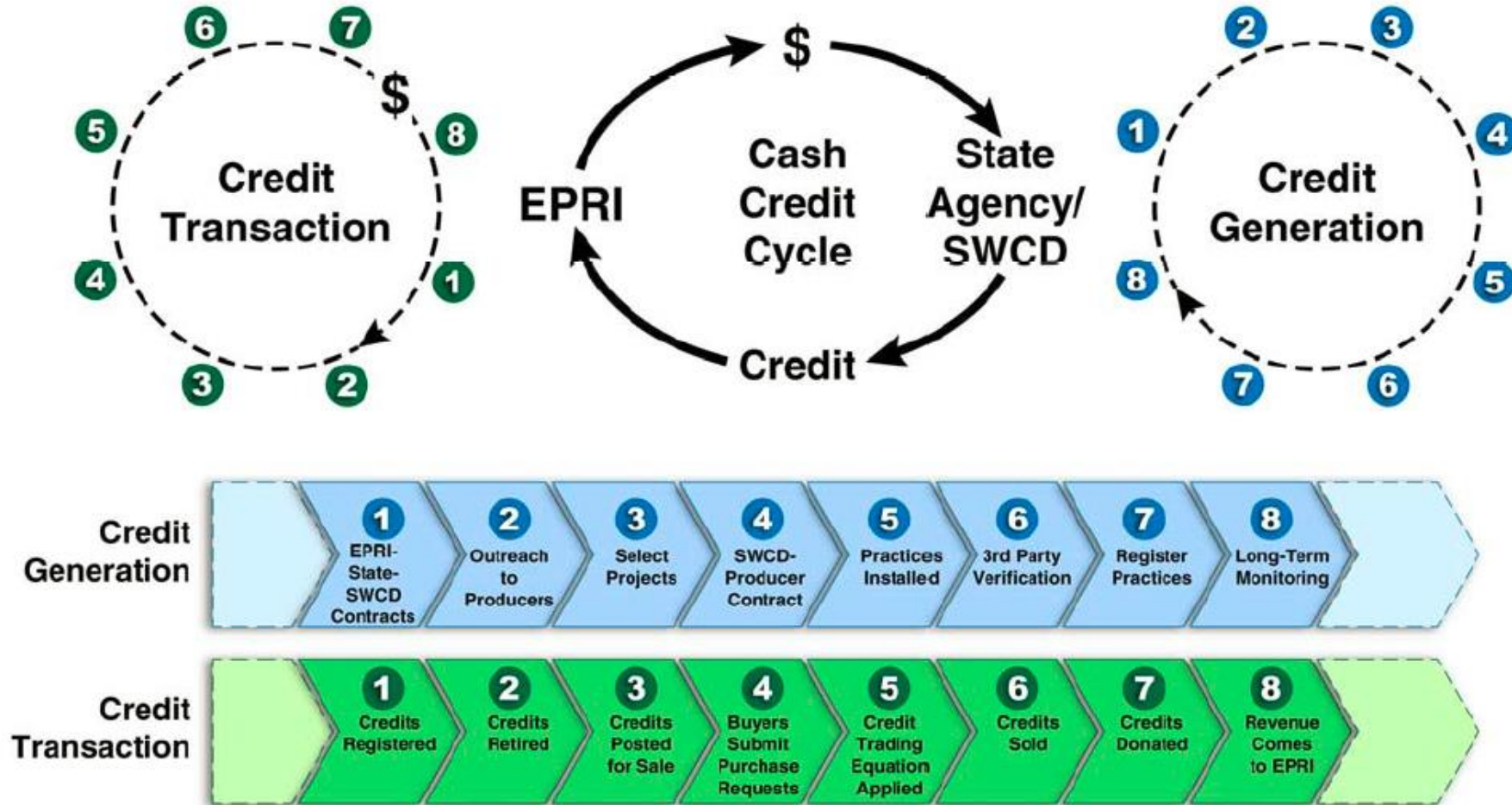
Nutrient Reduction at Lower Cost

Ohio River Basin Water Quality Trading Project Timeline 2007 - 2015

- 2007 – Initial efforts begin
- 2008 – Initial efforts begin
- 2012 – OH, IN, & KY sign the trading plan
- 2014 – 1st transactions
- 2015 – Project team wins US Water Prize



Components: Credit Tracking Process



Components: Credit Trading Registry

The screenshot displays the Markit Environmental Registry interface. At the top, there is a navigation bar with icons for Store, Registry, BOAT, Dividends, Source, CDS & Bonds, RED, Loan Pricing, and Indices. A user profile for 'Ufe Test1' is visible in the top right corner. Below the navigation bar is a search bar and a list of tabs: Home, All Units (selected), Projects/Issuances, RFI, Bids/Offers, User Admin, and Activity Log.

The main content area shows a table of units with the following columns: Project, Account, Vintage, Origin, Holdings, Measurement, and Status. The table lists various units from 'Angel Mounds' and 'Lexington Plain' projects, all associated with 'American Farmland Trust' accounts. The units are categorized by vintage (2012-2013 or 2012) and origin (United States). The measurement units are in lbs/year, and the status varies between 'RFI Listed', 'Active', and 'Retired'.

| Project | Account | Vintage | Origin | Holdings | Measurement | Status |
|-----------------|---|-------------|---------------|----------|-------------|------------|
| Angel Mounds | American Farmland Trust Ohio River Basin Interstate Trading Program - Nitrogen reduction/removal ORB-BAW-US-100000000001275-01102012-30092013-2051-2060-MER-0-P | 2012 - 2013 | United States | 10 | lbs/year | RFI Listed |
| Angel Mounds | American Farmland Trust Ohio River Basin Interstate Trading Program - Nitrogen reduction/removal ORB-BAW-US-100000000001275-01102012-30092013-2061-2310-MER-0-P | 2012 - 2013 | United States | 250 | lbs/year | RFI Listed |
| Angel Mounds | American Farmland Trust Ohio River Basin Interstate Trading Program - Nitrogen reduction/removal ORB-BAW-US-100000000001275-01012012-31122012-4101-4134-MER-0-P | 2012 | United States | 34 | lbs/year | Active |
| Angel Mounds | American Farmland Trust Sub-Account Ohio River Basin Interstate Trading Program - Nitrogen reduction/removal ORB-BAW-US-100000000001275-01102012-30092013-2556-2650-MER-0-P | 2012 - 2013 | United States | 95 | lbs/year | Active |
| Lexington Plain | American Farmland Trust Ohio River Basin Interstate Trading Program - Nitrogen reduction/removal ORB-BAW-US-100000000001276-01102012-30092013-3301-4100-MER-0-P | 2012 - 2013 | United States | 800 | lbs/year | Active |
| Lexington Plain | American Farmland Trust Ohio River Basin Interstate Trading Program - Phosphorus reduction/removal ORB-BAW-US-100000000001276-01102012-30092013-3052-3250-MER-0-P | 2012 - 2013 | United States | 199 | lbs/year | Active |
| Lexington Plain | American Farmland Trust Ohio River Basin Interstate Trading Program - Phosphorus reduction/removal ORB-BAW-US-100000000001276-01102012-30092013-2951-2951-MER-0-P | 2012 - 2013 | United States | 1 | lbs/year | RFI Listed |
| Lexington Plain | American Farmland Trust Ohio River Basin Interstate Trading Program - Phosphorus reduction/removal ORB-BAW-US-100000000001276-01102012-30092013-2952-3051-MER-0-P | 2012 - 2013 | United States | 100 | lbs/year | Retired |
| Lexington Plain | American Farmland Trust Ohio River Basin Interstate Trading Program - Nitrogen reduction/removal ORB-BAW-US-100000000001276-01102012-30092013-3251-3300-MER-0-P | 2012 - 2013 | United States | 50 | lbs/year | Active |

At the bottom of the table, there is a pagination control showing 'Page 1 of 1' and a 'Less Details' link. The status 'Displaying 1 - 9 of 9' is shown in the bottom right corner.

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Components: Calibrated Watershed Models (WARMF)

U.S. ENVIRONMENTAL PROTECTION AGENCY
Ecosystems Research Division

Recent Additions | Contact Us | Search: All EPA This Area

You are here: EPA Home » athens » wwqts » html » Watershed Analysis Risk Management Framework (WARMF)

Watershed Analysis Risk Management Framework (WARMF)

To facilitate TMDL analysis and watershed planning, WARMF was developed under sponsorship from the Electric Power Research Institute (EPRI) as a decision support system for watershed management. The system provides a road map to calculate TMDLs for most conventional pollutants (coliform, TSS, BOD, nutrients). It also provides a road map to guide the development of an implementation plan. The scientific basis of the model has undergone several peer reviews by independent experts and is now compatible with the data extraction and watershed management systems (MS). WARMF is organized into five (5) linked modules under a user interface (GUI). It is a very user friendly tool suitable for expert and non-expert stakeholders.

WWQTCs Info

- WWQTCs Home
- Technical Support
- Tools

EPRI REPORT:
3002011868

Nov 2017

ENVIRONMENTAL
Science & Technology

Article
pubs.acs.org/est

Attenuation Coefficients for Water Quality Trading

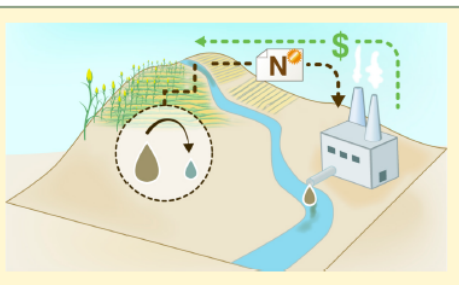
Arturo A. Keller,^{*,†} Xiaoli Chen,[†] Jessica Fox,[‡] Matt Fulda,[†] Rebecca Dorsey,[†] Briana Seapy,[†] Julia Glenday,[†] and Erin Bray[†]

[†]Bren School of Environmental Science and Management, University of California, Santa Barbara, California 93106-5131, United States

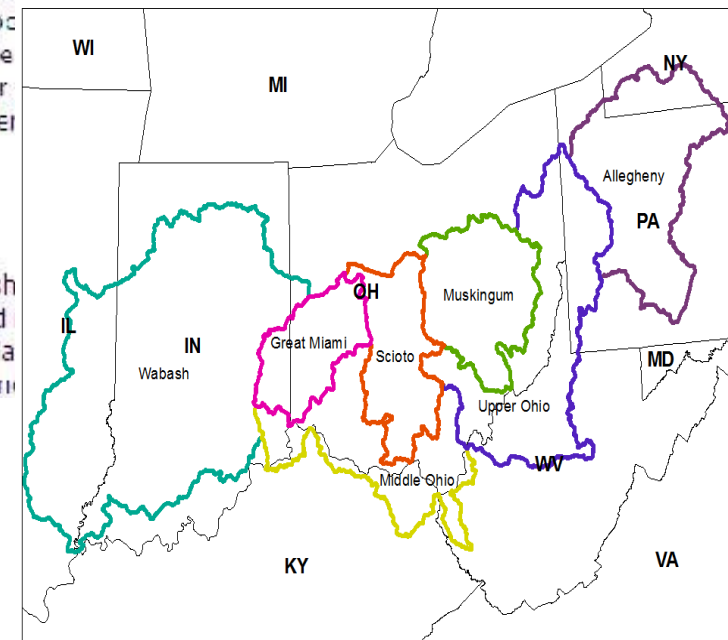
[‡]Electric Power Research Institute, Palo Alto, California 94304, United States

Supporting Information

ABSTRACT: Water quality trading has been proposed as a cost-effective approach for reducing nutrient loads through credit generation from agricultural or point source reductions sold to buyers facing costly options. We present a systematic approach to determine attenuation coefficients and their uncertainty. Using a process-based model, we determine attenuation with safety margins at many watersheds for total nitrogen (TN) and total phosphorus (TP) loads as they transport from point of load reduction to the credit buyer. TN and TP in-stream attenuation generally increases with decreasing mean river flow; smaller rivers in the modeled region of the Ohio River Basin had TN attenuation factors per km, including safety margins, of 0.19–1.6%, medium rivers of



GIS-based watershed model that calculates daily runoff, stream flow, and water quality of a river basin. A river basin is divided into sub-basins (including canopy and soil layers), stream segments, and land use. The model is used for water quality simulations. Land surface is characterized by land



2017 - \$1.5 M: US Endowment of Forestry and Communities

EPRI Team will:

- Fund landowners in OH, IN, KY for Forestry-focused projects.
- Conduct science/modeling to quantify WQT credits from Forests.
- Register WQT credits in the name of US Endowment for sale.
- Demonstrate landowner benefits to maintain forests.



**SUSTAINING FORESTS;
INVIGORATING COMMUNITIES**

A graphic for a funding opportunity notice. It features three circular images at the top: a green globe, a row of young trees in a field, and a cow in a field. The text is centered on a white background with a blue border. The title is "FUNDING OPPORTUNITY NOTICE \$600,000" in bold, with the amount in green. Below it, it says "PRIVATE LANDOWNERS & PRODUCERS IN OHIO, INDIANA, AND KENTUCKY UNDER THE OHIO RIVER BASIN WATER QUALITY TRADING PROJECT". The main text describes the project and the funding amount. At the bottom, it provides a URL and the logos for EPRI and American Farmland Trust.

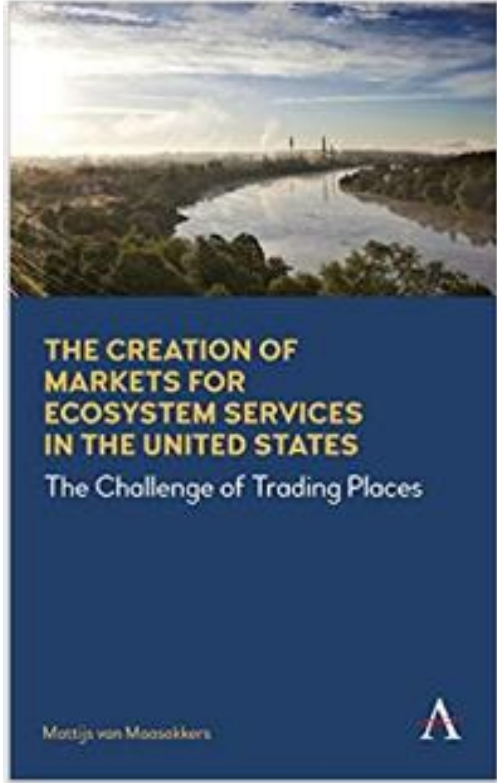
FUNDING OPPORTUNITY NOTICE \$600,000
PRIVATE LANDOWNERS & PRODUCERS IN OHIO, INDIANA, AND KENTUCKY
UNDER THE OHIO RIVER BASIN WATER QUALITY TRADING PROJECT

The Electric Power Research Institute (EPRI), American Farmland Trust and a team of collaborators have been working since 2012 with the support of the States of Ohio, Indiana, and Kentucky to install best management practices that generate "water quality credits" to achieve broader water quality improvements. Under this funding opportunity, EPRI is releasing \$600,000 across Ohio, Indiana, and Kentucky to plant trees and complimentary agricultural BMPs. Funding applications will be ranked first by the cost per pound of nitrogen and phosphorus runoff avoided, and secondarily by the related positive benefits to the environment and community.

Go to <http://wqt.epri.com> for the full notice and watch videos from landowners who have previously received funding.

EPRI | ELECTRIC POWER RESEARCH INSTITUTE
American Farmland Trust

Provides important ecosystem services benefits



NATIONAL GEOGRAPHIC | NOS PROGRAMMES | NOS CHAÎNES | PERPETUAL PLANET

ENVIRONNEMENT

Comment améliorer la qualité de l'eau ? En plantant (beaucoup) d'arbres

Des chercheurs américains ont fait le lien entre reboisement et amélioration de la qualité des eaux. Ils appellent aujourd'hui les installations polluantes à reboiser davantage leurs terres. | vendredi 5 juillet 2019

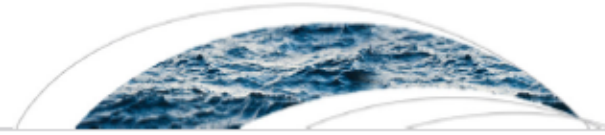
Keller AA & Fox J (2019) **Giving credit to reforestation for water quality benefits.**

PLoS ONE 14(6): e0217756.



University of Connecticut Collaboration

Dr. Pengfei Liu and Professor Stephen Swallow



Water Resources Research

RESEARCH ARTICLE

10.1002/2015WR018130

Key Points:

- We incorporate public co-benefits value to purchase WQ credits
- Individuals reveal the lowest value with a real choice under incentive compatibility treatment
- Incorporating public co-benefits value leads to a substantial welfare improvement

Integrating cobenefits produced with water quality BMPs into credits markets: Conceptualization and experimental illustration for EPRI's Ohio River Basin Trading

Pengfei Liu¹ and Stephen K. Swallow²

¹Department of Agricultural and Resource Economics, University of Connecticut, Storrs, Connecticut, USA, ²Center for Environmental Sciences and Engineering and Department of Agricultural and Resource Economics, University of Connecticut, Storrs, Connecticut, USA

“Our results suggest the presence of cobenefits can significantly increase individuals’ willingness to pay for a water quality credit.”

NEXT: 3 year USDA grant to apply lessons from EPRI WQT Project to informing willingness to pay for ecosystem services.



| | | |
|---------------------------------------|---|---|
| | | |
| 1-100 Water Quality Credits | 101-500 Water Quality Credits | >500 Water Quality Credits |
| \$14,00 | \$13,00 | \$12,00 |

PURCHASE NOW



The first buyers get a free t-shirt!



The CEO Water Mandate

Credits in Ohio River Basin Water Quality Trading Project Go International!

USEPA RFP - APPROACHES TO REDUCE NUTRIENT LOADINGS FOR HARMFUL ALGAL BLOOMS MANAGEMENT

Water Quality Trading to Reduce Harmful Algal Blooms in the Ohio River Basin: Pilot Study – East Fork of the Little Miami River (OH)

1. Apply the Ohio River Basin WQT framework to realize rapid and effective nutrient reductions in local and regional waterbodies.
2. Model the conditions that lead to HABs to prioritize WQT activities incorporating spatial analysis of watershed and farm-level conditions.
3. Measure the effectiveness of certain BMPs using robust edge-of-field and instream monitoring designs
4. Conduct spatial analysis of farm-level conditions to optimize WQT activities
5. Demonstrate the usefulness of remote sensing and satellite imagery to determine the presence of certain agricultural BMPs

Activities

1. High resolution modeling in the Ohio River Basin to guide management actions to cost-effectively reduce the likelihood of harmful algal blooms
2. Conduct land-owner surveys to determine the adoption of agricultural BMPs
3. Coordinate with landowners in the EFLMR Basin to implement 10 BMP projects
4. Conduct edge-of-field and instream monitoring to confirm nutrient reductions estimated by models
5. Use remote sensing technology (e.g., satellite imagery) to determine presence of agricultural BMPs and relieve burden of annual on-field verifications

<http://wqt.epri.com>

The screenshot shows the website for the Ohio River Basin Trading Project. At the top, the EPRI logo and 'ELECTRIC POWER RESEARCH INSTITUTE' are visible, along with 'EPRI.com | Contact Us'. The main heading is 'Ohio River Basin Trading Project'. Below this is a navigation bar with links for 'Home', 'About the Project', 'EPRI Research', 'Reference Staff', and 'Buy Credits'. The central focus is a banner for the '2018-2019 FUNDING OPPORTUNITY NOTICE' featuring a photograph of a farm with cows and sheep. Below the banner, there are three columns of content: 'Key Resources' with links to research reports, 'Credits for Sale' with details about water quality credits and a 'LEARN MORE AND PURCHASE CREDITS' link, and 'In the News' with various media mentions.

Together...Shaping the Future of Electricity

Jeff Thomas

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APPENDIX

Communications

WaterWorld.

EPRI @EPRINews · Oct 23

Replying to @EPRINews

Farmers, like the owners of Coyote Run Farm, are reducing nutrient runoff on their farmland to generate credits that dischargers can purchase. #WaterQuality #MondayMotivation



Hague and Miller committed to preserving acreage

Coyote Run Farm operates, essentially, as a privately owned ecological field station in the heart of a bustling suburb. Owners David Hague and Ta...



National Public Radio Spot – 2016-2017



Twitter Results:

- Impressions: 43,862
- Media Views: 1066
- Media Engagements: 94
- Likes: 91



EPRI @EPRINews · Oct 26

Regenerating forests play an important role in improving #WaterQuality. Today, we planted 3 of more than 3,000 trees that will be planted at Coyote Run Farm to help reduce nutrient runoff into watersheds.

Ohio EPA, ODA and Indiana Dept of Ag

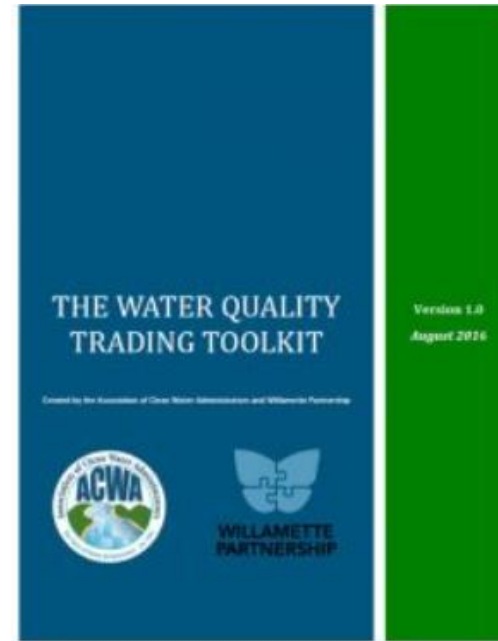
From the Field: Candid Comments from our Farmers

“My grandpa used to catch catfish in the area. The only thing I’ve seen was a little minnow. I know that someday I’m not gonna be here and somebody else will deal with whatever I leave them. This is a much better way to leave my legacy than some people in the past have done.”



A Few National WQT Resources

- National Network on Water Quality Trading
 - <http://nnwqt.org/>
- National Alliance on Water Quality Trading
 - <http://www.wqtalliance.com/>



- Water Environment Federation Book

