Metropolitan Water Reclamation District of Greater Chicago

WELCOME

TO THE MARCH EDITION

OF THE 2018

M&R SEMINAR SERIES

BEFORE WE BEGIN

- SAFETY PRECAUTIONS
  - PLEASE FOLLOW EXIT SIGN IN CASE OF EMERGENCY EVALUATION
  - AUTOMATED EXTERNAL DEFIBRILLATOR (AED) LOCATED OUTSIDE
- PLEASE SILENCE CELL PHONES OR SMART PHONES
- QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION
- PLEASE FILL EVALUATION FORM
- SEMINAR SLIDES WILL BE POSTED ON MWRD WEBSITE (www. MWRD.org: Home Page ⇒ Reports ⇒ M&R Data and Reports ⇒ M&R Seminar Series ⇒ 2018 Seminar Series)
- STREAM VIDEO WILL BE AVAILABLE ON MWRD WEBSITE (www.MWRD.org: Home Page ⇒ MWRDGC RSS Feeds)

Cy Jones

- Cy Jones has had a 36 year career as an environmental engineer in the water sector, first with the Washington Suburban Sanitary Commission in Maryland and then with the World Resources Institute in Washington, D.C., where he retired earlier this year as a Senior Fellow. In his career, Cy specialized in planning and management; regulatory compliance; the development and implementation of watershed restoration and water quality management policies, nonpoint source pollution reduction; and water quality trading *nationally and internationally*.

- B.S. in Zoology and M.S. in Environmental Engineering from the University of Iowa.

- Cy has been an advocate for the development and implementation of water quality trading programs since the mid-1990s. His trading activities in the U.S. have included early outreach about the potential benefits of water quality trading; providing analysis, policy recommendations, trading program proposals, and technical support to Maryland and Virginia; providing technical support to the Virginia Nutrient Credit Exchange Association; evaluating the feasibility and potential benefits of nutrient trading in the stormwater sector in Maryland and Virginia; and developing policy recommendations for interstate nutrient trading in the Chesapeake Bay watershed.

Trading as A Useful Tool for Nutrient Management at Watershed Scale

Cy Jones

World Resources Institute (Retired)

Metropolitan Water Reclamation District of Greater Chicago

March 23, 2018

Overview of Presentation

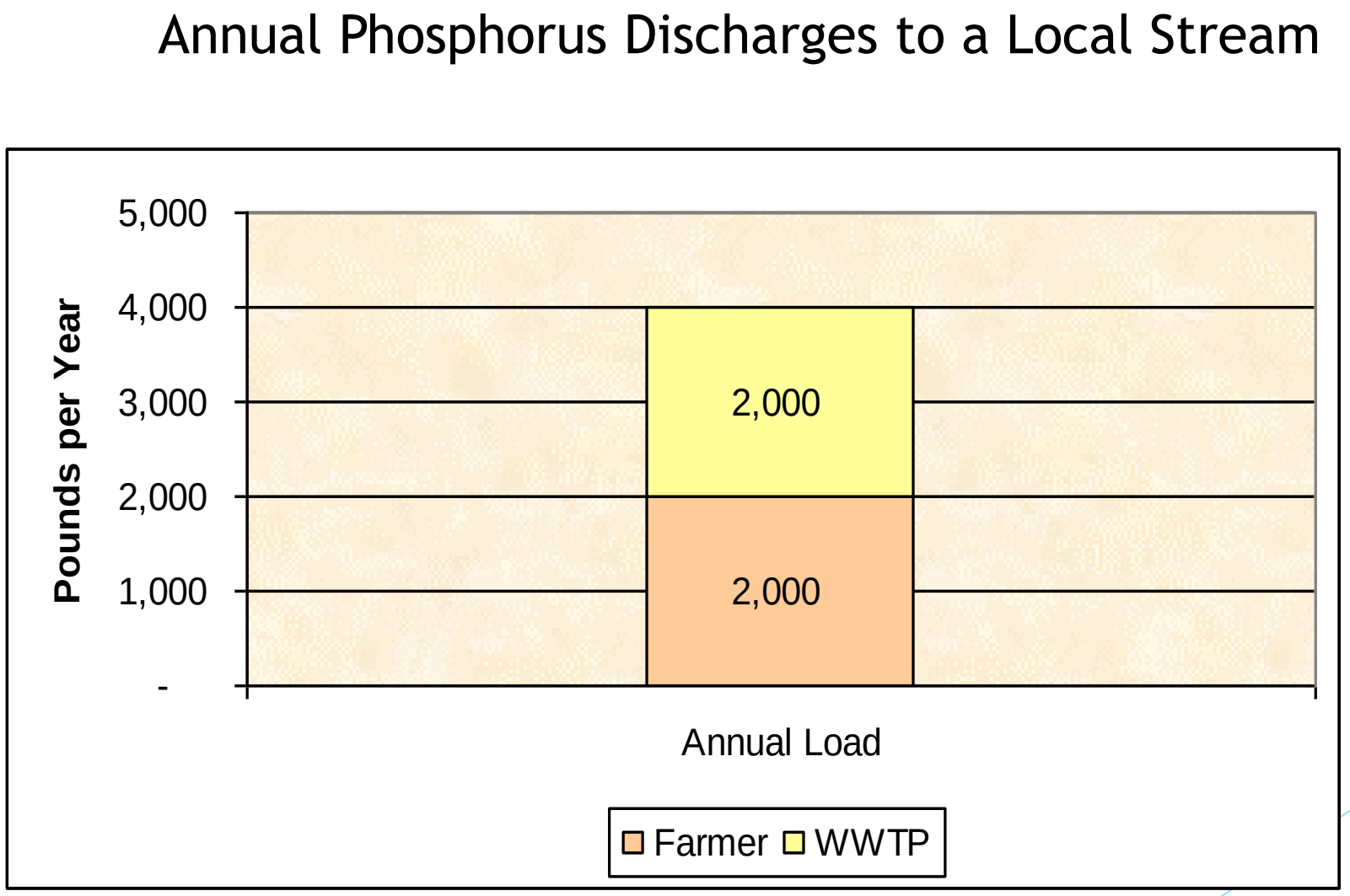
- Introduction to Water Quality
- Trading Program Design Considerations
  - Prerequisites
  - Fundamental Principles
  - Criteria for Program Design
  - Necessary Elements
  - Trading rules
  - Types of Trading Programs
- Challenges and Barriers
- Existing Trading Programs
  - United States
  - International
- WRI Mississippi River Basin Trading Study
- Illinois

What is Water Quality Trading?

An Exchange of “Discharge Allowances”

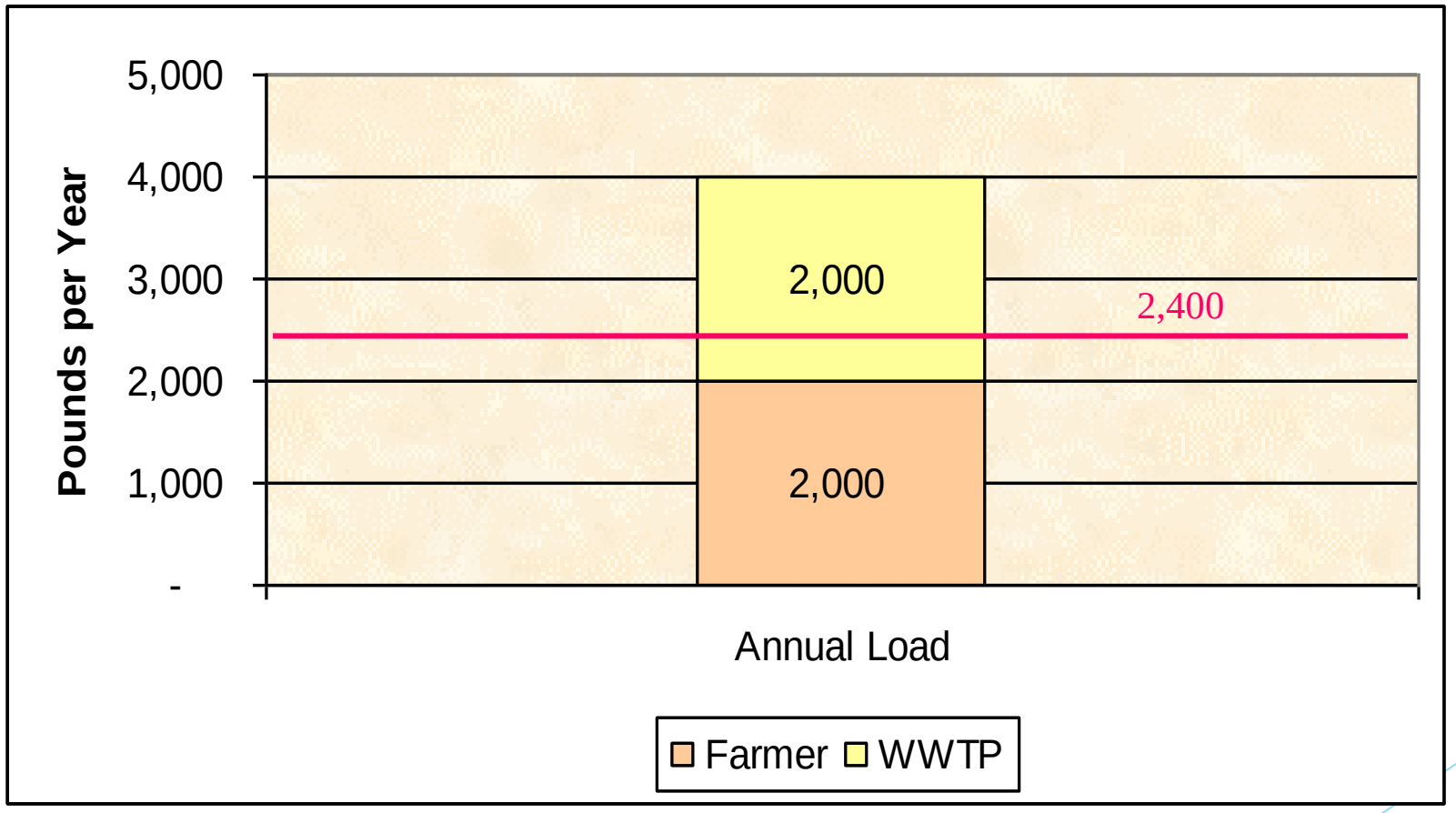
A (seemingly) simple example

A Simple Trading Example

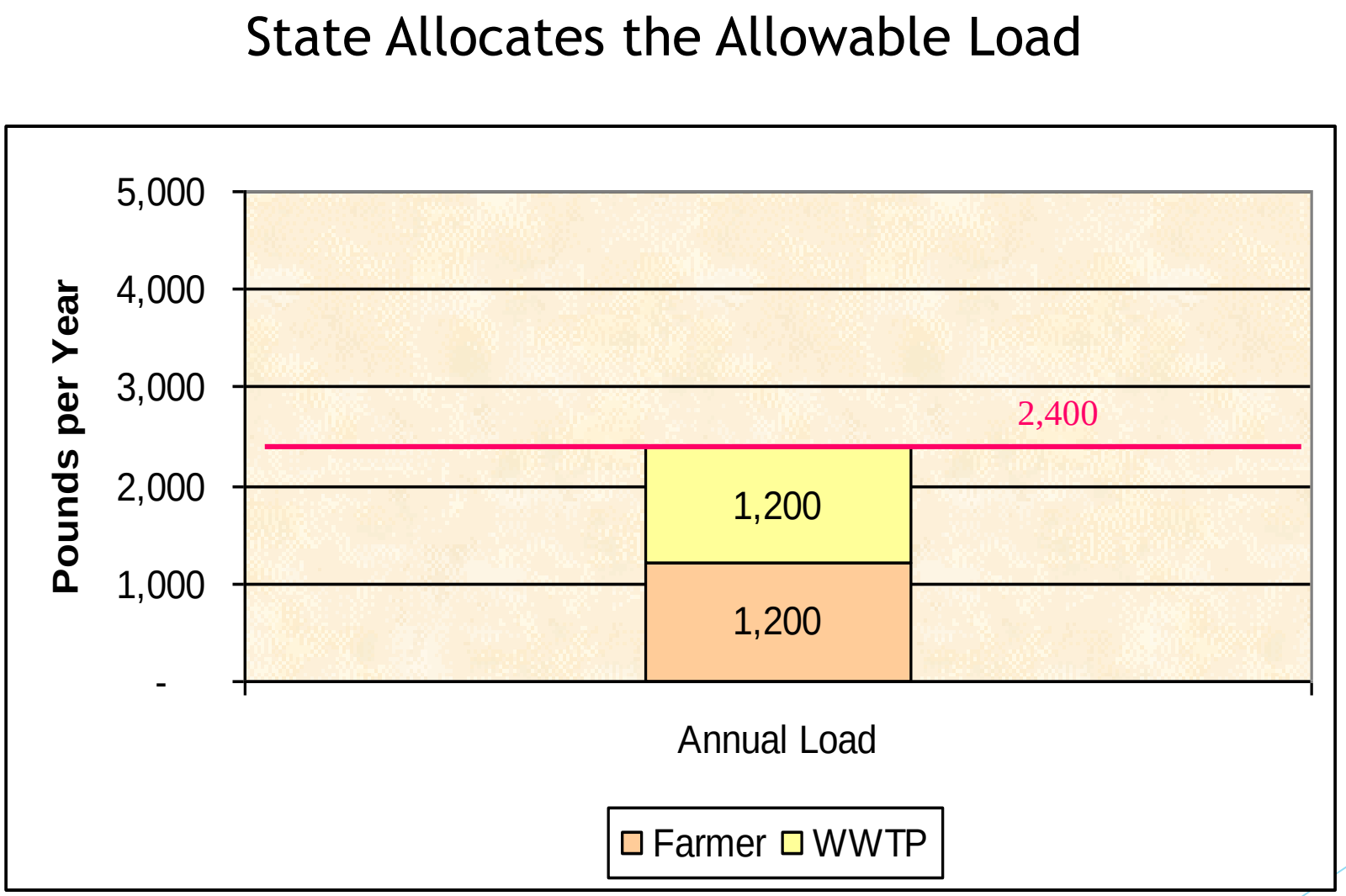


A Simple Trading Example

State Imposes a Phosphorus Cap in the Watershed

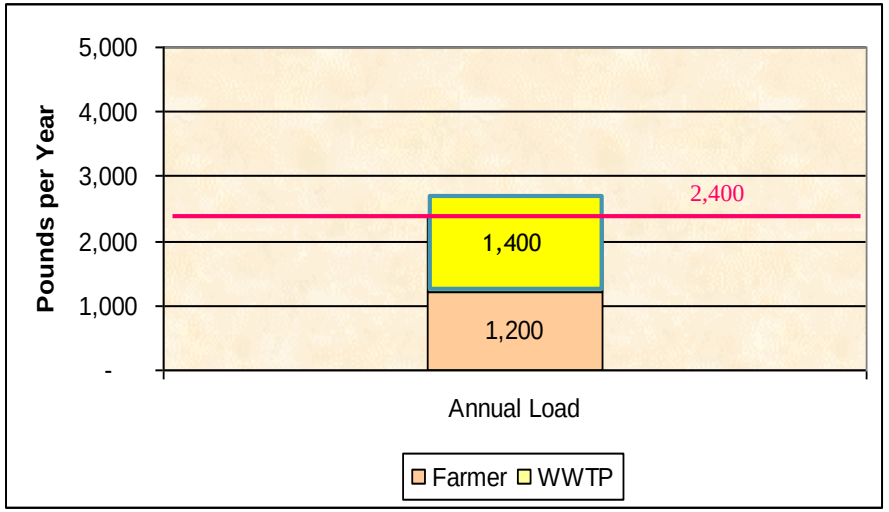


A Simple Trading Example



A Simple Trading Example

WWTP Can Get Down to 1,400 lbs at Moderate Cost.



Next 200 lbs Would Be Very Expensive (Effluent Filters)

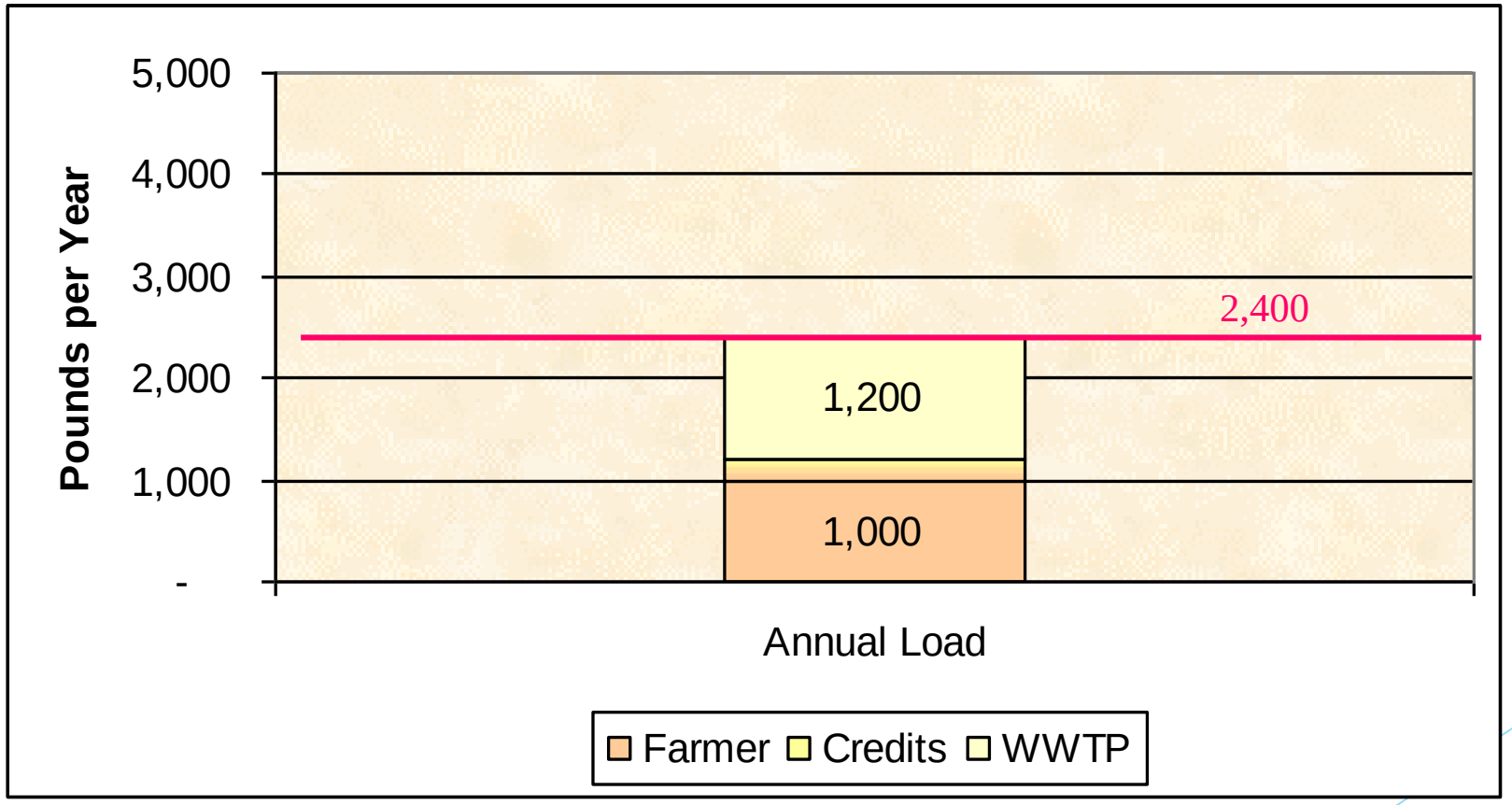
Farmer Can Get State Cost-Share Money to Help Get Down to 1,200 lbs

Farmer Can Get Down to 1,000 lbs at Some Additional Cost to Himself.

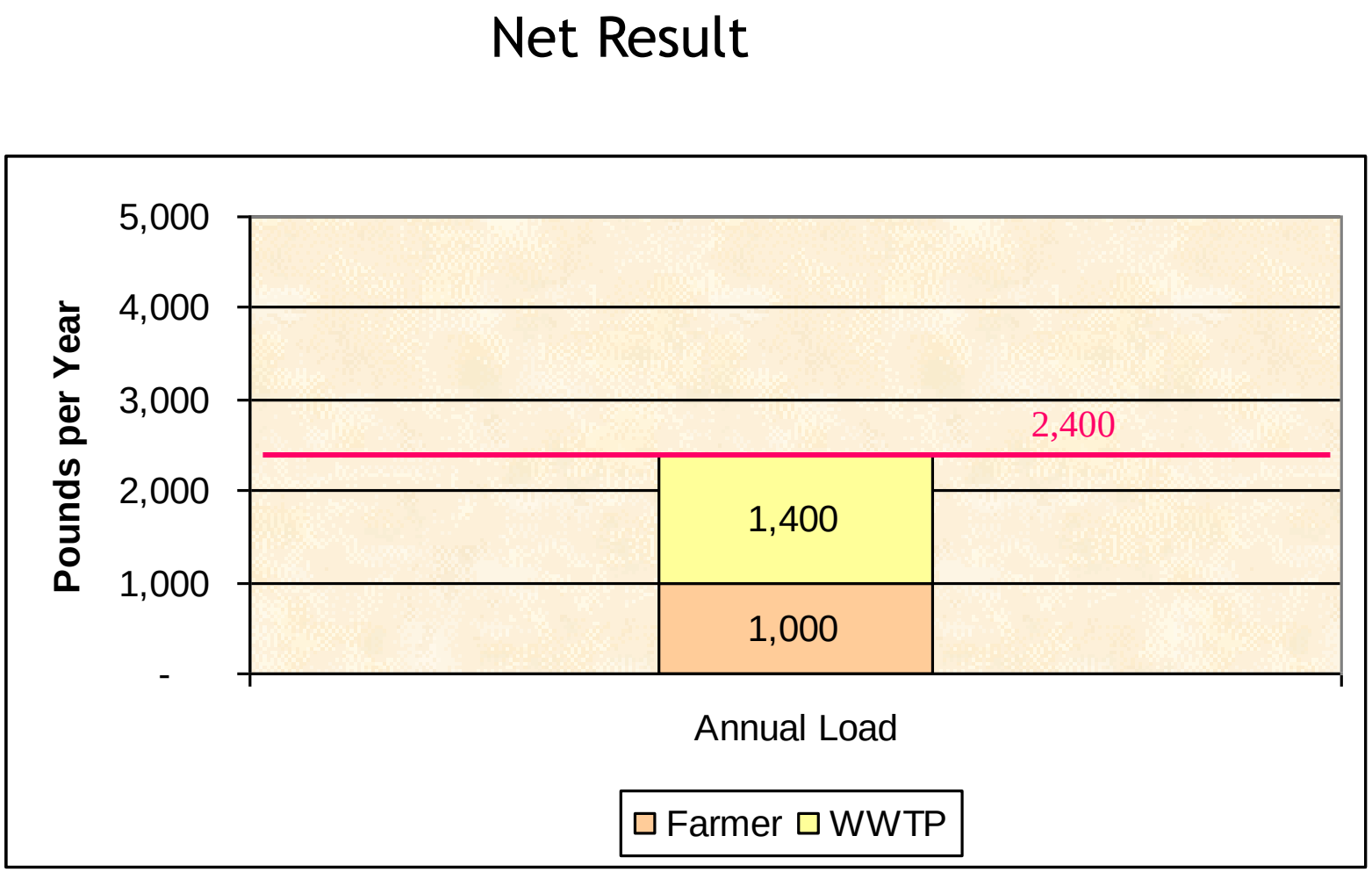
A Simple Trading Example

Farmer Gets Down to 1,000 and Sells 200 Credits to WWTP

(If the Price Is Right.)



A Simple Trading Example



A Simple Trading Example

Benefits of This Trade

WWTP Complies with Its 1,200 lb Cap at Lower Cost than Building Filters

The Farmer Has Complied With His Cap and Made Money by Going Below the Cap and Selling Credits

The Water-Quality Goal Has Been Met

A Win-Win-Win Result

Potential Benefits of Water Quality Trading

- Environmental Benefits
  - Quicker achievement of water quality goals
  - Creates financial incentives for unregulated sources to meet water body caps
  - Can create ancillary environmental benefits (e.g., habitat restoration, sediment reduction, carbon sinks) from nonpoint source best management practices
  - A method for offsetting increased loadings due to growth
- Benefits to Dischargers
  - Provides flexibility and new tools for achieving meeting regulatory requirements
  - More cost-effective approach than treatment upgrades only
  - Creates a new source of revenue for dischargers that reduce more than required

Potential Benefits of Water Quality Trading

- Community Benefits
  - Can build relationships between all stakeholders in the Watershed
  - Allows for future growth and economic development
- Benefits to Regulatory Agency
  - More streamlined and efficient permitting process
  - Increased stakeholder support

Water Quality Trading Design Considerations

Prerequisites

- Clearly defined geographic boundary, such as a watershed
- Tradable pollutant
- Clearly identified sources of pollution
- The ability of pollution sources to reduce discharges at differential costs
- Demand for water quality credits (usually regulatory requirements)
- Supply of water quality credits
- Administering agency with clear legal authority to issue and enforce allowances
- Clearly defined objectives

Water Quality Trading Design Considerations

Fundamental Principles

- Environmental equivalence
  - The mass load reduction produced by the credit seller must have equivalent environmental benefit to a mass load reduction produced by the credit buyer
- Additionality
  - The mass load reduction produced by the credit seller must be in addition to any reductions that would occur in the absence of trading, and remain
  - No "leakage"—additionality must be maintained throughout the life of the trade
- Accountability
  - Mechanisms that ensure that equivalence and additionality requirements are met

Water Quality Trading Design Considerations

Criteria for Program Design

- Water quality trading programs must
  - Be based on sound science
  - Effectively accomplish regulatory and environmental goals
  - Be consistent with the water pollution prevention and control regulatory frameworks
  - Not cause localized water quality impairments
  - Provide sufficient accountability, transparency, accessibility, and public participation

USEPA 2003 Trading Policy

Water Quality Trading Design Considerations

Necessary Elements of a Trading Program

- Credit definition
  - A pound or kilogram of the pollutant of concern delivered to the point of impairment in the water body per unit time, e.g. pound per year of delivered load
  - Not end-of-pipe or edge-of-field load
- Credit certification and verification for nonpoint sources
  - Credit seller must get preapproval for proposed credit-generating activity
  - Annual inspection of structural BMP or farm practice to verify that credits are being produced

Water Quality Trading Design Considerations

Necessary Elements of a Trading Program

- WWTP approval and reporting
  - NPDES permit limits and special conditions
  - Discharge monitoring reports
- Trading mechanisms
  - How the trading market is structured and functions
  - Several options
    - Bilateral trading
    - Credit banks or exchanges
    - Compliance associations

Water Quality Trading Design Considerations

Necessary Elements of a Trading Program

- Compliance and enforcement mechanisms
  - Clean Water Act enforcement actions for WWTPs and other point sources
  - Nonpoint sources more challenging
    - Default provisions in contracts between buyers and sellers
    - State sanctions for credit default
  - CWA liability remains with WWTP that buys nonpoint source credits
    - Trading programs must have risk management elements

Water Quality Trading Design Considerations

Trading Program Rules

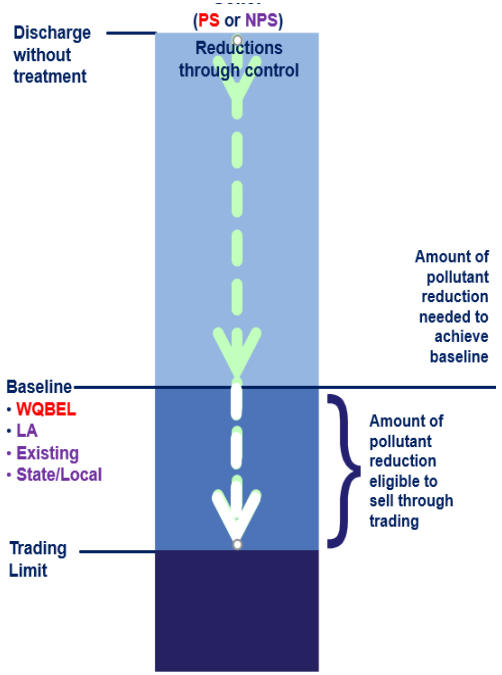
- Trading Eligibility
  - Buyers
    - Meet minimum level of treatment at the facility
    - Be in full compliance with permit
    - Good compliance history
  - Sellers
    - Be in full compliance with permit (point sources)
    - Good compliance history (point sources)
    - Farm meets state requirements for farming practices (nonpoint source)

Water Quality Trading Design Considerations

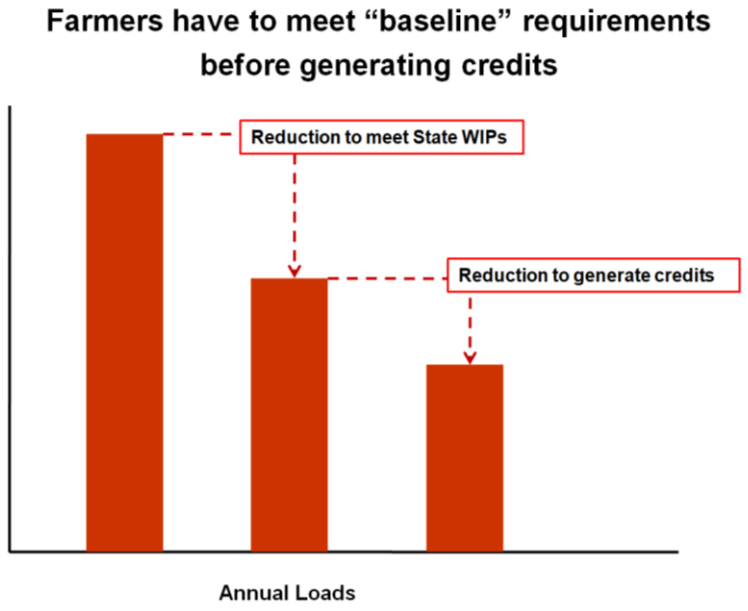
Trading Program Rules

Trading Baselines for Sellers

Point Sources



Nonpoint Sources



Water Quality Trading Design Considerations

Trading Program Rules

Application of Trading Ratios	
Ratio type	Description
Uncertainty	Compensates for scientific uncertainty in nonpoint source loads and efficiency of control measures
Reserve	A portion of credits sold are set aside in a reserve pool and are available to buyers or sellers in the event of credit generation failures
Retirement	A portion of credits sold are permanently retired to accelerate water quality improvements
Delivery	Accounts for the buyer and seller being at different locations in the watershed with differences in what percentage of their discharged loads reach the point of concern in the water body
Equivalency	Accounts for differences in impact from different forms of the same pollutant, or in cross-pollutant trading

Water Quality Trading Design Considerations

Trading Program Rules

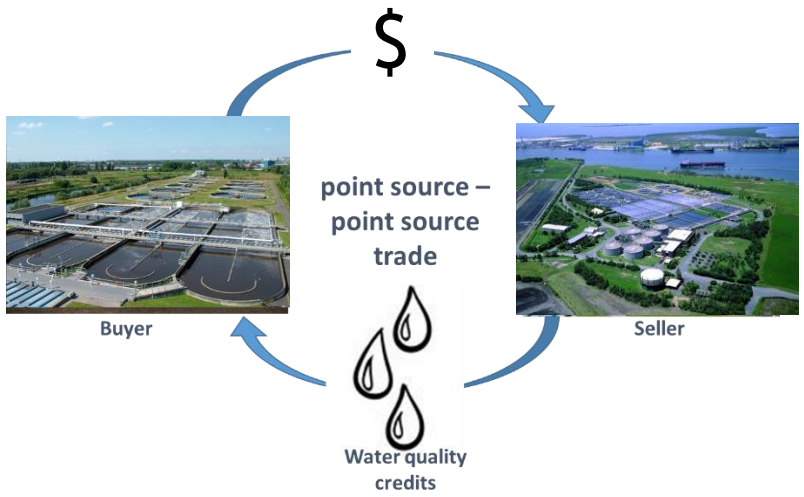
Risk Management

- CWA liability for permit violation cannot be transferred to nonpoint source credit supplier

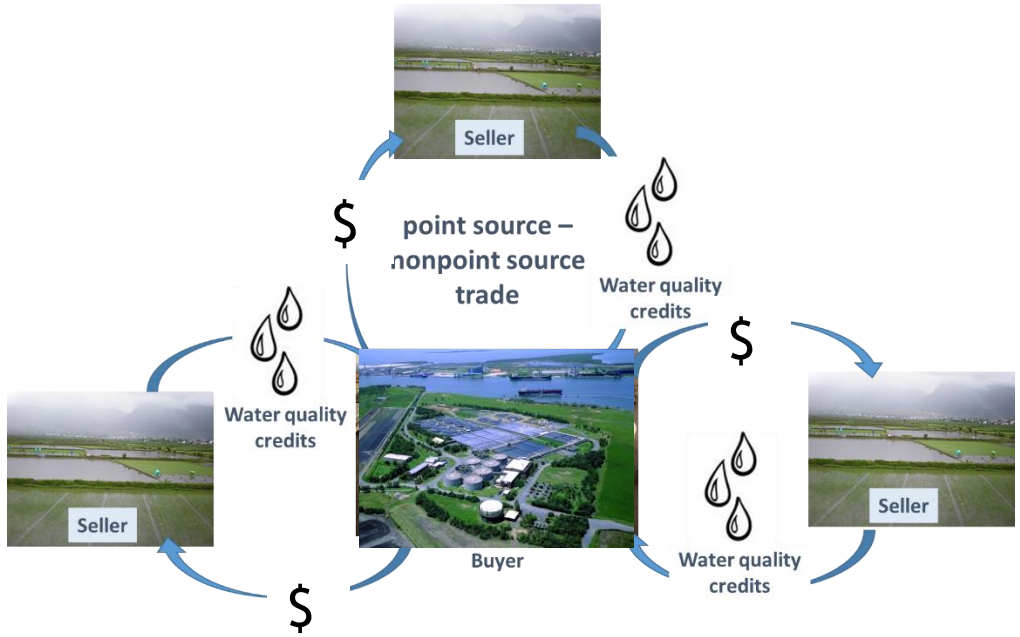
- Point source credit buyers need protection
  - Credit insurance pools, coupled with a
  - "True-up" period after end of compliance year to provide time to acquire credits to cover shortfalls
  - Use of credit aggregators that maintain reserve or excess supplies of credits and compensate for shortfalls

Water Quality Trading Design

Types of Trading Programs



Point Source – Point Source



Point Source – Nonpoint Source

Challenges and Barrier to Water Quality Trading

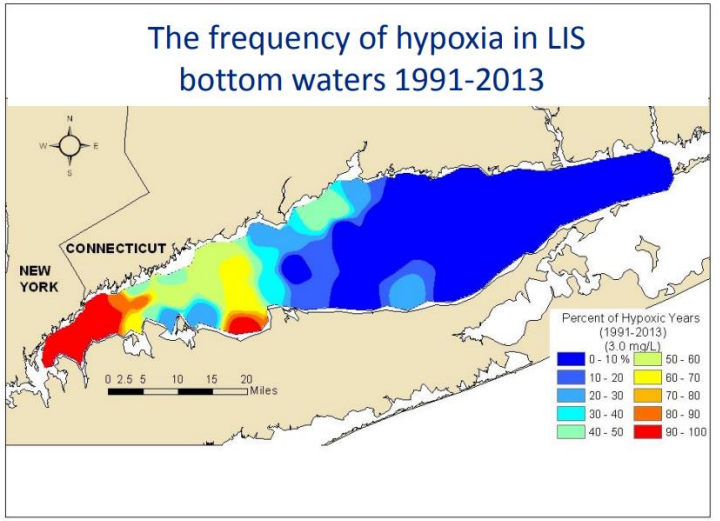
- Scientific uncertainty nonpoint source loads and efficiencies of control measures
- The complexity of creating a trading program (every watershed is different)
- Potential for creation of pollution “hot spots” in credit buyer’s receiving waters
- Concerns over the balance between privacy and transparency for market participants
- Inequity for new and expanded point source who are frequently left out of initial allocations
- Point source risk aversion
- Regulatory inertia at the state level

Challenges and Barrier to Water Quality Trading

- Adamant opposition by some environmental groups, e.g.
  - Food and Water Watch
  - Some Riverkeepers
- Adverse public perceptions
  - Buying credits is just paying someone else so you can continue to spew pollution
  - Buying credits is not doing your share
  - Everyone everywhere should reduce their pollution discharges—buying credits is not doing your share
  - The purpose of trading is to force point sources (urban populations) to pay for nonpoint source (farmers) pollution reductions
- Achieving public support

Active Water Quality Trading Programs

Connecticut Long Island Sound Nitrogen

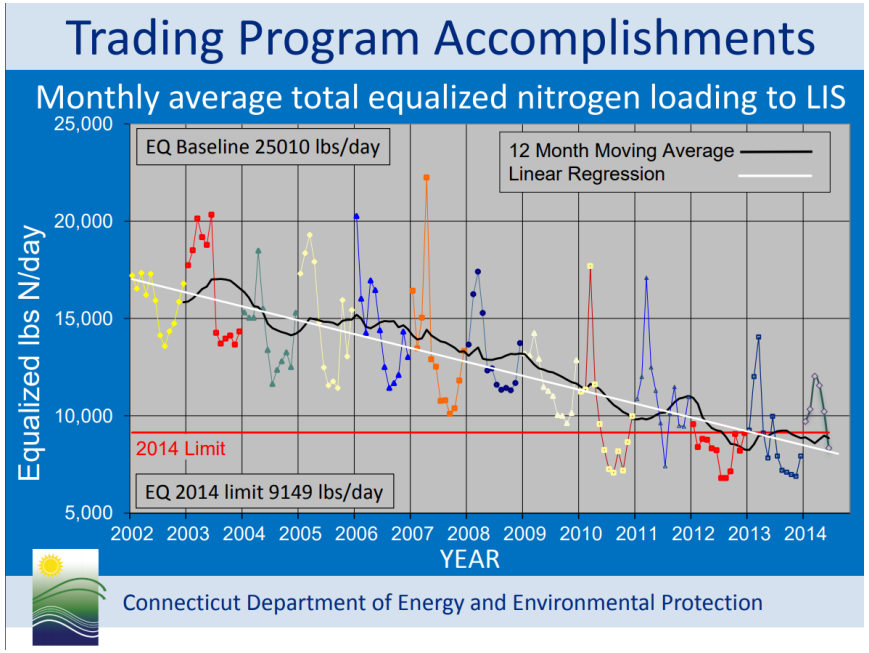


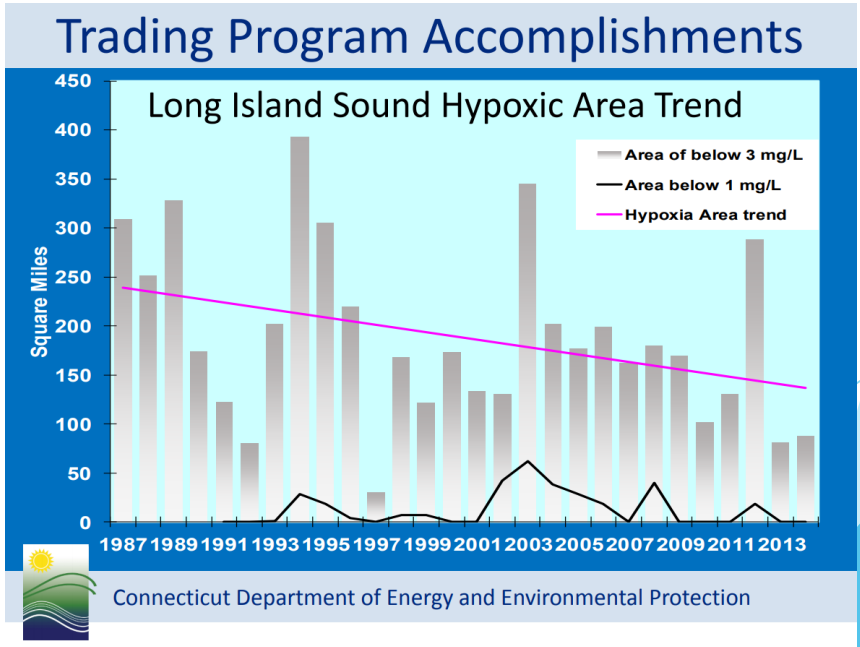
- Driver
  - Long Island Sound nitrogen TMDL. 79 WWTPs must reduce TN discharges by 64% in incremental steps between 2002 and 2014
- Program Design
  - General permit for point source nitrogen discharges
  - Group compliance through the Nitrogen Credit Exchange
  - The annual aggregate load of the 79 WWTPs is used to determine compliance with the TMDL
  - WWTPs that upgrade supply credits sold through the Exchange to those that don't
  - Credit price based on cost to produce the credit
  - $450 million in state grants and loans for the upgrades

Active Water Quality Trading Programs

Connecticut Long Island Sound Nitrogen

- Results
  - Point source loads decreased by 65% between 2002 and 2014, meeting TMDL requirement
  - Estimated cost saving of $300-$400 versus having all WWTPs upgrade
  - LIS hypoxic zone decreased in size





Active Water Quality Trading Programs

North Carolina Nutrient Sensitive Waters Management Strategy

- Driver
  - Nutrient Sensitive Waters Management Strategies with adopted nitrogen and phosphorus target rates and discharge limits for point sources
  - Management Strategies contain rules for controlling excessive nutrients from point and nonpoint sources
  - Neuse, Tar-Pamlico, (Cape Fear) Jordan Lake, and (Neuse) Falls Lake
- Program Design
  - Point sources can meet limits or join a group compliance association that collectively meets nutrient load allocations
  - Compliance associations exist in the Tar-Pamlico and Neuse basins
  - Tar-Pamlico Trading Association
    - Formed in 1989, predating the rules
    - 14 WWTPs joined
    - No internal credit exchanges

Active Water Quality Trading Programs

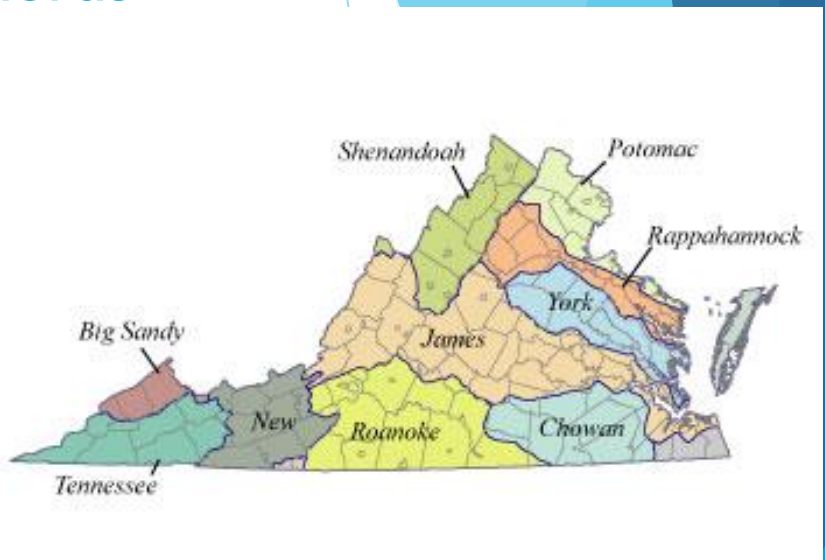
North Carolina Nutrient Sensitive Waters Management Strategy

- Program Design
  - Neuse River Compliance Association
    - Similar in function to Tar-Pamlico Trading Association
    - General permit sets aggregate permit limit but also permit limits for individual WWTPs
    - No individual compliance issues unless the aggregate limit is violated
- Results
  - Both Associations have remained in compliance with load limits

“Active” Water Quality Trading Programs

Virginia Chesapeake Bay Nitrogen and Phosphorus

- Driver
  - The Virginia Association of Municipal Wastewater Agencies, concerned about the upcoming Chesapeake Bay TMDL, asked the Va. General Assembly to authorize a nutrient trading program
  - 2005 Legislation authorized a watershed general permit for the discharge of nitrogen and phosphorus in the Chesapeake Bay Watershed and authorized nutrient trading
  - Chesapeake Bay TMDL adopted in 2010 set river basin annual nitrogen and phosphorus load limits
- Program Design
  - The Virginia Nutrient Credit Exchange Association (“the Exchange”) created in 2006
  - A private, nonprofit corporation for the purpose of coordinating and facilitating nutrient trading and compliance with the with the general permit by its members.



Chesapeake Bay Watershed
Potomac/Shenandoah
Rappahannock
York
James
Eastern Shore

“Active” Water Quality Trading Programs

Virginia Chesapeake Bay Nitrogen and Phosphorus

- Program Design
  - The Exchange is governed by a Board of Directors elected by its members
  - It currently has 107 municipal and industrial WWTP members
  - The Exchange functions as a compliance association
  - The Exchange submits annual compliance plan updates for each river basin showing how the aggregate load limits will be met for the next five years
  - Members who have completed nutrient removal upgrades provide credits
  - The Exchange buys all credits and sells them to members that need them
  - As long as the member’s aggregate river basin caps are met, all members are in compliance
  - The Exchange keeps credit prices very low

“Active” Water Quality Trading Programs

Virginia Chesapeake Bay Nitrogen and Phosphorus

- Results
  - Exchange members have met the aggregate caps every year since the TMDL went into effect in 2010.
  - Estimated from spreading out expensive WWTP upgrades over a much longer period of time are in the tens of millions of dollars

Active Water Quality Trading Programs

Oregon Temperature

- Driver
  - Temperature TMDLs to protect endangered salmon fish populations
  - Oregon DEQ authorized the use of water quality markets in 2005 to meet temperature reduction targets
- Program Design
  - Municipal wastewater and industrial dischargers can participate can use markets to purchase thermal credits generated by the restoration of shade in streamside forests
  - Clean Water Services works directly with local farmers and partners to implement thermal credit projects
  - Metropolitan Wastewater Management Commission, City of Medford, and Port of St. Helens have contracted with a third party aggregator, The Freshwater Trust, to secure credits
  - The Willamette Partnership acts as a third party verifier to monitor the performance of projects and ensuring conformance with market rules and procedures

Active Water Quality Trading Programs

Oregon Temperature

- Results
  - Effluent chillers would have cost Clean Water Services $60-$150 million. Instead, CWS has spent $4-$6 million in planting more than 56km of shade trees and increasing stream flow
  - The city of Medford would have spent $16 million on a technology solution, but will spend $6-8 million in planting shade trees

Active Water Quality Trading Programs

Great Miami Watershed Phosphorus

- Driver
  - Proactive interest in 2006 from point sources in the Great Miami River basin to invest in pollutant reductions ahead of an expected Total Maximum Daily Load limit.
  - Ohio intention to establish water quality criteria for nutrients
- Program Design
  - Ten WWTPs participate and provide the funding for credit purchases
  - The Great Miami Conservancy—a special government district—acts as a broker and clearinghouse
  - GMC acquires credits by soliciting bids from farmers (a reverse auction)
  - Soil and water conservation districts serve as third party aggregators to consolidate multiple farm sellers
  - Between 2006 and 2010, the WWTPs invested $1.2 million in the program.

Active Water Quality Trading Programs

Great Miami Watershed Phosphorus

- Results
  - Between 2006 and 2010, the WWTPs invested $1.2 million in the program
  - Six rounds of credit auctions were held between 2006 and 2014
  - More than 1.14 million nutrient credits were purchased from 397 on-farm projects at a cost of $1.6 million
  - The MCD estimates that the program could save point sources $300 million over the next 20 years if fully implemented
  - The program's future is uncertain due to Ohio EPA ambivalence

Active Water Quality Trading Programs

Minnesota Phosphorus

- Driver
  - The Minnesota River Assessment Project in 1994 linked phosphorus to low D.O.
  - MRAP resulted in phosphorus allocations for point sources
  - Minnesota established numeric nutrient criteria for more than 12,000 lakes
  - Minnesota intends to establish nutrient criteria for its 93,000 miles of rivers and streams
- Program Design
  - Minnesota has incorporated trading in National Pollutant Discharge Elimination System (NPDES) permits since 1997
  - Point-point and point-nonpoint trading approaches have been implemented
  - Two industrial point-nonpoint trading permits have been issued, Rahr Malting Company and Southern Minnesota Beet Sugar Cooperative

Active Water Quality Trading Programs

Minnesota Phosphorus

- Program Design
  - Rahr Malting
    - Withdrew from a municipal system with the intention of building its own WWTP
    - No allocation available for CBOD discharge under Minnesota River TMDL
    - After negotiations, Rahr was issued an NPDES permit in 1997 that allowed some CBOD discharge and required upstream measures to reduce nonpoint source loads
    - MPCA established equivalency ratios between CBOD, nitrogen, phosphorus, and sediment
    - Rahr executed four contracts with upstream land owners
      - Two for conversion of flood-plain agricultural land to natural vegetation
      - One for streambank stabilization
      - One for streambank stabilization coupled with livestock exclusion

Active Water Quality Trading Programs

Minnesota Phosphorus

- Results
  - Rahr Malting meets all permit requirements
  - Estimated cost savings from the nonpoint trades estimated at $300,000 per year for 30 years

Active Water Quality Trading Programs

Lake Taupo, New Zealand Nitrogen

- Driver
  - Lake Taupo impaired by nitrogen from beef, sheep and dairy farms
  - Controllable nitrogen loads are capped by policy
  - Individual farms given an initial discharge allocation
  - Farmers support protecting water quality in the lake
- Program Design
  - World's first agricultural nonpoint source water-quality cap and trade scheme
  - Only nonpoint source-nonpoint source trading program
  - Farms are allowed to trade allocations among themselves
  - Publicly-funded Lake Taupo Protection Trust funds land conversions and retirement of farm land to help achieve water quality goals

Active Water Quality Trading Programs

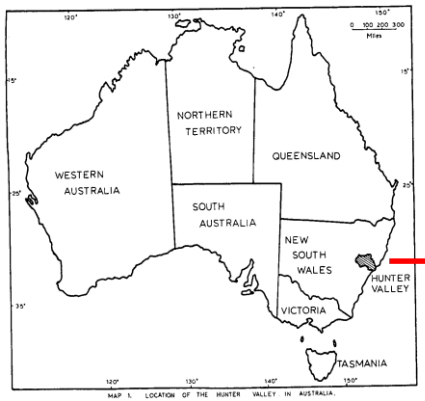
Lake Taupo, New Zealand Nitrogen

- Results
  - The cap effectively limited nitrogen discharges
  - 32 trades totaling 186,000 pounds of nitrogen, accounting for 16 percent of the cap
  - The cap imposed economic and social costs on farmers
  - Some farmers sold their farms and left the catchment
  - Some farmers found ways to increase profit while staying within their nitrogen allocation
  - Farmer acceptance has increased

Active Water Quality Trading Programs

Hunter River, Australia Salinity

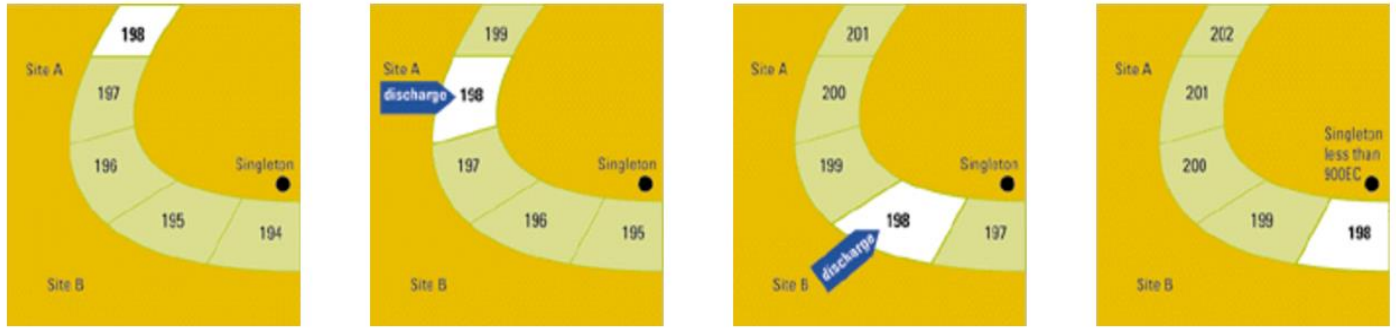
- Driver
  - The Hunter River has naturally-occurring high salinity levels
  - Power stations and mining operations contribute 10% of the salinity load
  - Salinity concentrations vary with river flow; very high during low flow
  - Viability of irrigation reduced; agricultural impacts
  - New South Wales set a cap for salinity discharges and implemented discharge scheduling requirements
  - Credit holders can trade among themselves

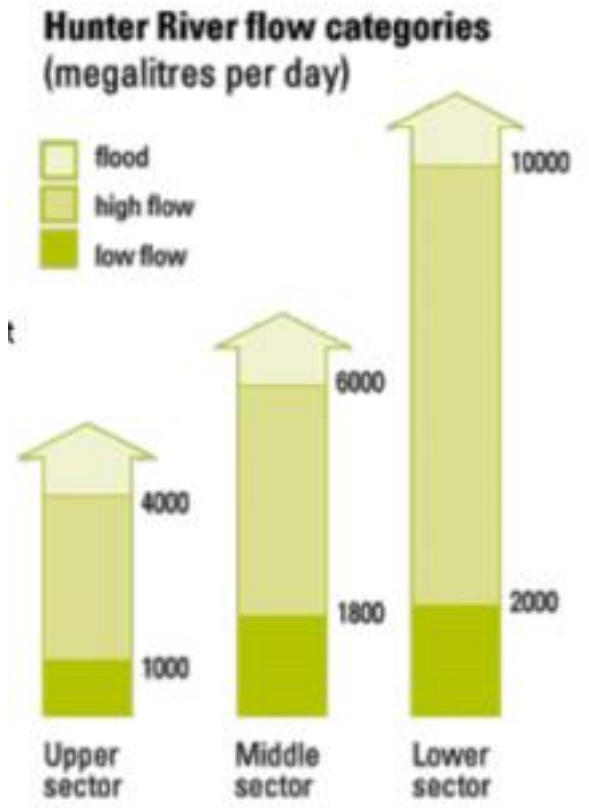


Active Water Quality Trading Programs

Hunter River, Australia Salinity

- Program Design
  - Allowable discharges depend on river flow and ambient salinity levels
  - A total of 1,000 salinity credits are available and sold by auction by NSW
  - Credits have 10-year lifespans
  - Every two years, 200 credits expire and another 200 credits are sold
  - Credit holders can trade among themselves





Active Water Quality Trading Programs

Hunter River, Australia Salinity

- Results
  - River salinity fairly consistently meets the salinity target concentrations
  - Occasional exceedances are mainly due to natural diffuse sources
  - The program accommodated new dischargers
  - Credits have become increasingly more valuable

Other Water Quality Trading Programs or Activity

Pennsylvania
Maryland
Florida
California
Idaho
Ohio River Basin
South Nation, Ontario
China

Nutrient Trading in the Mississippi River Basin

A Feasibility Study for Using Large-Scale Nutrient Trading in the Mississippi River Basin to Help Address Hypoxia in the Gulf of Mexico
2008

- Study Participants
  - World Resources Institute
  - Metropolitan Water Reclamation District of Greater Chicago
  - Sanitation District No. 1 of Northern Kentucky
  - University of Arkansas
  - Mississippi State University
  - U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
  - Symbiont

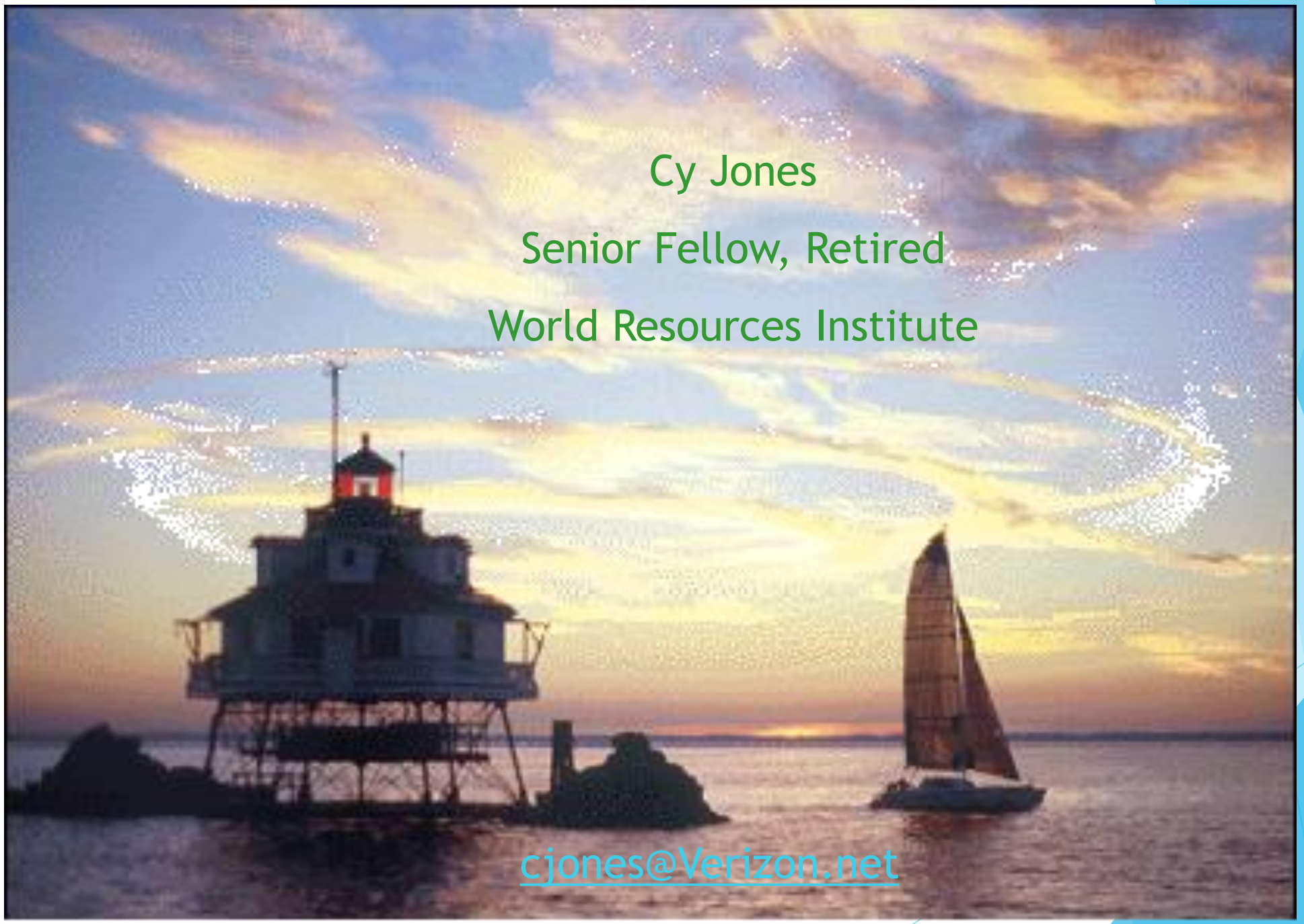
Could large-geographic scale interstate nutrient trading in the Mississippi River Basin can be an economically and environmentally feasible tool for reducing hypoxia in the Gulf of Mexico?

Large-geographic scale trading theoretically could benefit upstream dischargers due to advantageous delivery factors ratios, percentage of discharged nutrient loads from buyer and seller locations actually reaching the Gulf

Can if large-geographic scale interstate nutrient trading in the Mississippi River Basin can be an economically and environmentally feasible tool for reducing hypoxia in the Gulf of Mexico?

Answer: Yes, but not relevant to current situation

Illinois


Cy Jones
Senior Fellow, Retired
World Resources Institute
cjones@Verizon.net