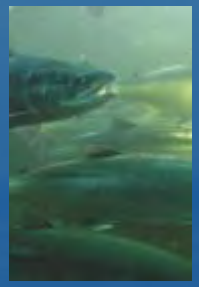
CH2MHILL

Water Quality Credit Trading in Washington and Puget Sound: One Tool in the Toolbox



AWRA 2011 Annual Conference: Washington Section
Seattle University, 4-October-11

Sherrill Nelligan-Doran, PG

Agenda

- Trading in Washington and Puget Sound
- Trading 101
- Two Relevant Case Studies:
  - Chesapeake Bay
  - Clean Water Services, Oregon
- Lessons Learned for Puget Sound

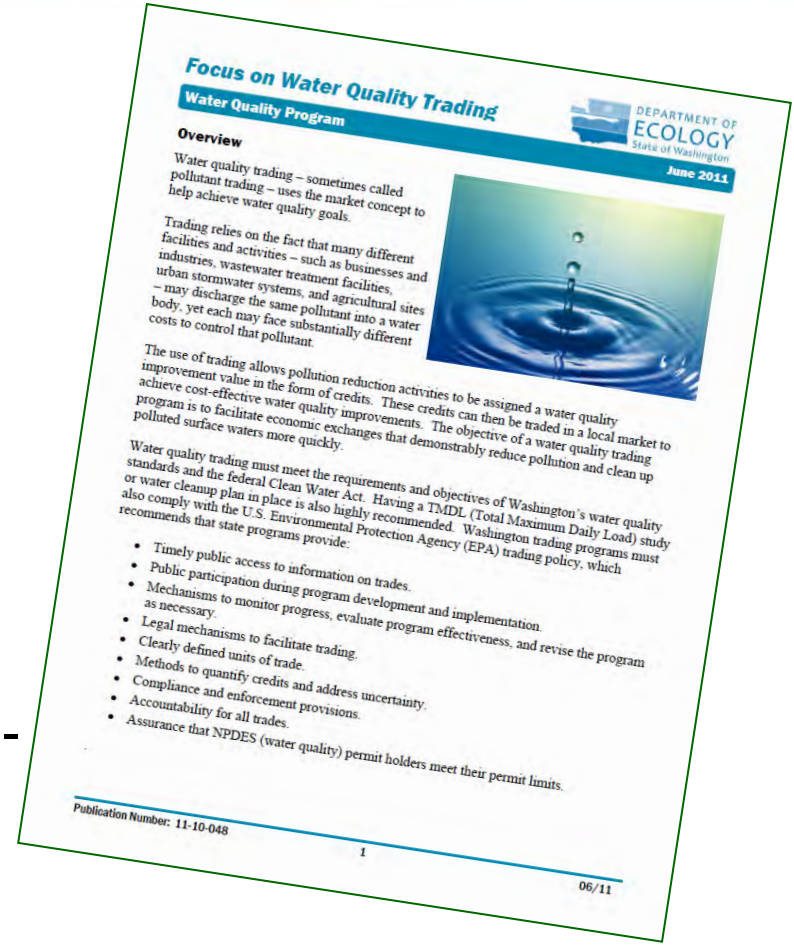
Trading in Washington and Puget Sound

Trading and Washington State

- Within Washington State, water quality credit trading has been evaluated in the Chehalis, Puyallup, Yakima, and Spokane areas
  - All freshwater
  - Drivers included nutrient issues (phosphorus, BOD, ammonia)
- Spokane River process farthest along
  - TMDL process for Long Lake
  - Includes point and non-point source trading

Ecology's Water Quality Trading Framework

- (2009-2011) = ongoing evolution based on Spokane as a test case
- Timing:
  - Applies to post-TMDL situations
  - Allows pre-TMDL trading so long as it makes significant progress toward meeting standards
- Application:
  - Limited to meeting TMDLs / NPDES (phosphorus/nitrogen and other oxygen-related pollutants, and sediments)
  - No toxics or fecal coliform
  - "Ecosystem services" seen as secondary benefit



Focus on Water Quality Trading

Water Quality Program

DEPARTMENT OF ECOLOGY State of Washington

June 2011

Overview

Water quality trading – sometimes called pollutant trading – uses the market concept to help achieve water quality goals.

Trading relies on the fact that many different facilities and activities – such as businesses and industries, wastewater treatment facilities, urban stormwater systems, and agricultural sites – may discharge the same pollutant into a water body, yet each may face substantially different costs to control that pollutant.

The use of trading allows pollution reduction activities to be assigned a water quality improvement value in the form of credits. These credits can then be traded in a local market to achieve cost-effective water quality improvements. The objective of a water quality trading program is to facilitate economic exchanges that demonstrably reduce pollution and clean up polluted surface waters more quickly.

Water quality trading must meet the requirements and objectives of Washington's water quality standards and the federal Clean Water Act. Having a TMDL (Total Maximum Daily Load) study or water cleanup plan in place is also highly recommended. Washington trading programs must also comply with the U.S. Environmental Protection Agency (EPA) trading policy, which recommends that state programs provide:

- Timely public access to information on trades.
- Public participation during program development and implementation.
- Mechanisms to monitor progress, evaluate program effectiveness, and revise the program as necessary.
- Legal mechanisms to facilitate trading.
- Clearly defined units of trade.
- Methods to quantify credits and address uncertainty.
- Compliance and enforcement provisions.
- Accountability for all trades.
- Assurance that NPDES (water quality) permit holders meet their permit limits.

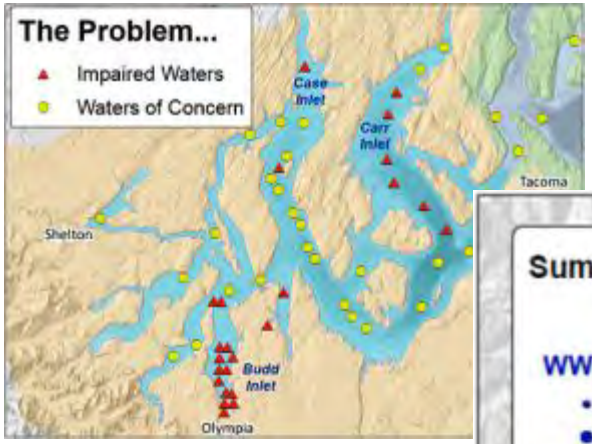
Publication Number: 11-10-048 1 06/11

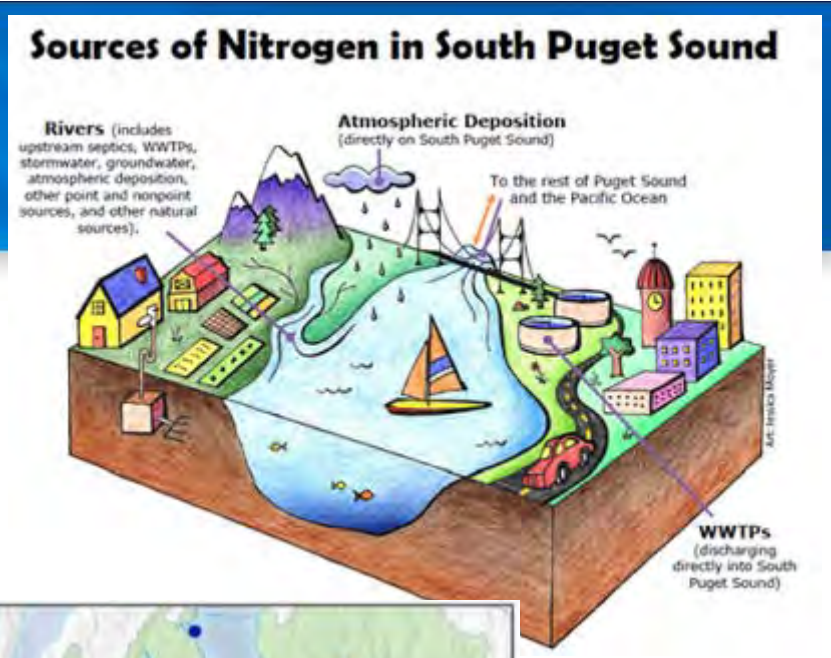
Trading and Puget Sound

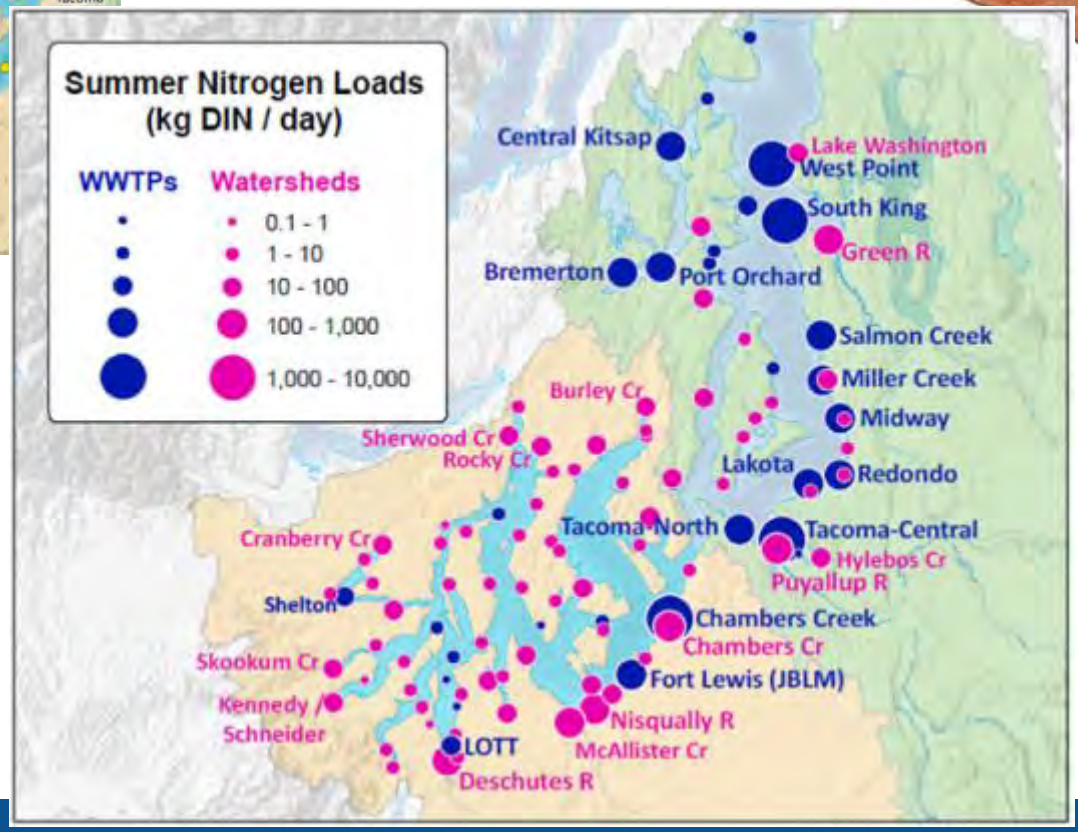
- So far, trading has not been a major part of the discussion for Puget Sound cleanup efforts
- Why?
  - WQ problems complex technically
    - Point and non-point sources
    - Freshwater and estuarine
    - Multiple regulatory drivers, including ESA
  - Numerous sources with varying responsibilities/mandates and jurisdictions
  - Numerous agencies with varying responsibilities/mandates and jurisdictions
  - Uncertainty in future regulatory requirements
- More stringent water quality standards and fewer resources are part of our future

Nitrogen and Dissolved Oxygen in Puget Sound

- South sound is impaired





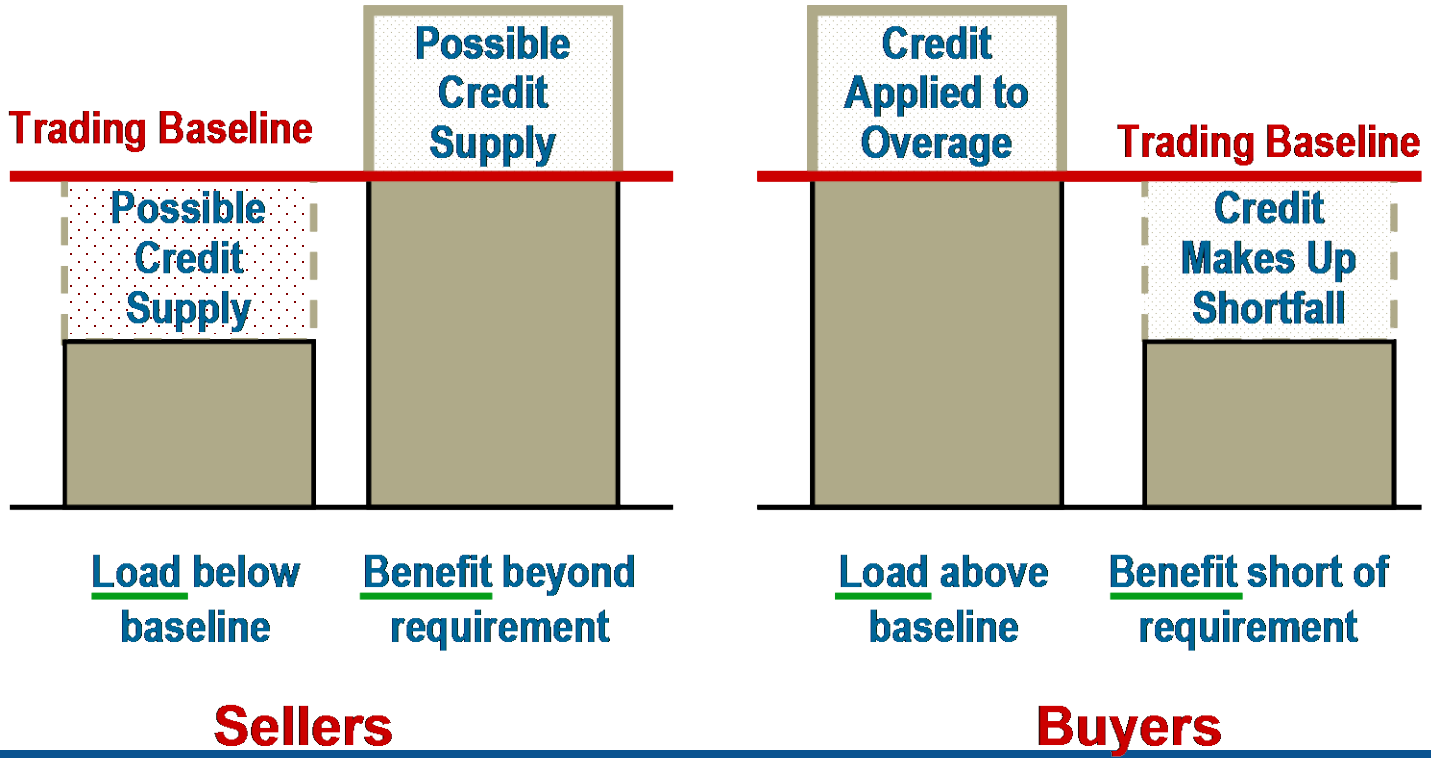


Graphics from Ecology (2011)

Trading 101

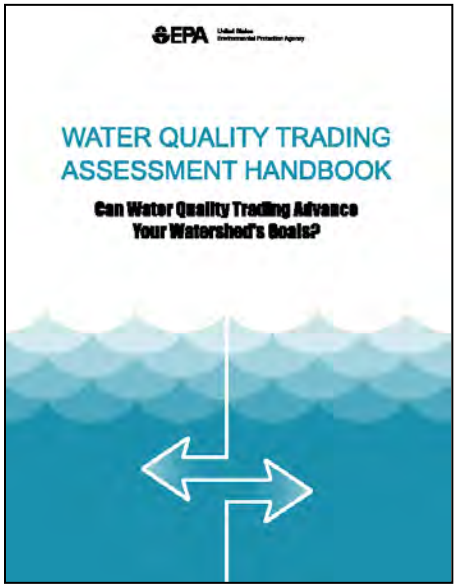
Trading 101: What are Water Quality Credits?

- Water quality credits are created when sources (sellers) perform better than required – buyers can apply to offset exceedences or shortfalls



Trading is Not New Anymore

- National guidance and resources clarify preferred approaches and detail options

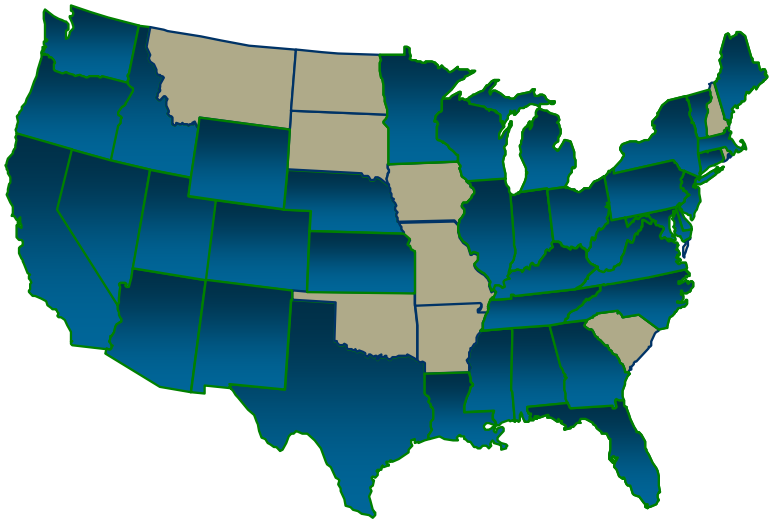


"The United States Environmental Protection Agency believes that market-based approaches such as water quality trading provide greater flexibility and have potential to achieve water quality and environmental benefits greater than would otherwise be achieved under more traditional regulatory approaches."

Final Water Quality Trading Policy, January 2003

Trading is Not New Anymore

- Real initiatives showcase alternative market development processes, transaction models, and strategic lessons



Pollutants being traded or considered:

Nitrogen
Phosphorus
Dissolved Oxygen
BOD/CBOD
Sediment
Temperature
Flow
Copper
Mercury
Selenium

Trading Offers Important Benefits

- Cost-Effectiveness
  - Compliance more cost-effective, when credits less expensive than on-site options
  - Credit purchases let buyers optimize sizing and scheduling their own projects
- Targeting Improvements
  - Can encourage pollutant reductions in priority locations where they might not otherwise occur
  - Can create incentives for desired projects that might not otherwise be economical
- Speeding Results
  - Helps regulated parties and voluntary actors produce load reductions and water quality improvements on faster schedule than without trading
  - Creditable projects can have shorter permitting and/or construction schedule and/or require less financial investment
- Leverage State Funds
  - Helps optimize state investments in public programs via cost-share for credit generation, or direct credit purchases

Cost-effectiveness and Cost-savings Key Drivers for Most Programs

Point-point examples

P - P

- Virginia municipal and industrial phosphorus and nitrogen credit exchange
  - $2.2B no trading
  - Save $410M with trading
- Connecticut POTW nitrogen exchange:
  - Estimated savings = $300M to $400M (33% original basis)

Point-nonpoint examples

P - NP

- Clean Water Services temperature:
  - $50M+ effluent cooling
  - $4M riparian shading
- Lower Boise River phosphorus control
  - POTWs $5-200/lb
  - Agriculture $5-50/lb

Basic Conditions for Water Quality Credit Trading Opportunities and Success

1. **Driver for action**: desired or required water quality improvements
2. **Understanding of water quality**: knowledge about causes, sources, and relative load contributions
3. **Alternative feasible solutions**: more than one combination of enhanced treatment, best management practices, and/or restoration projects
4. **Greater cost-effectiveness**: sufficient differences in relative cost-effectiveness across the various options among the feasible solutions
5. **Market warrants investment**: scale and scope of the expected credit market and potential cost-savings sufficient to warrant proportional investment development and operation
6. **Equal or better results**: science-based assessments and program rules ensure net benefits compared to not trading
7. **Stakeholder-endorsed framework**: if 1-6 met, regulatory, policy, administrative framework for trading can be developed and implemented

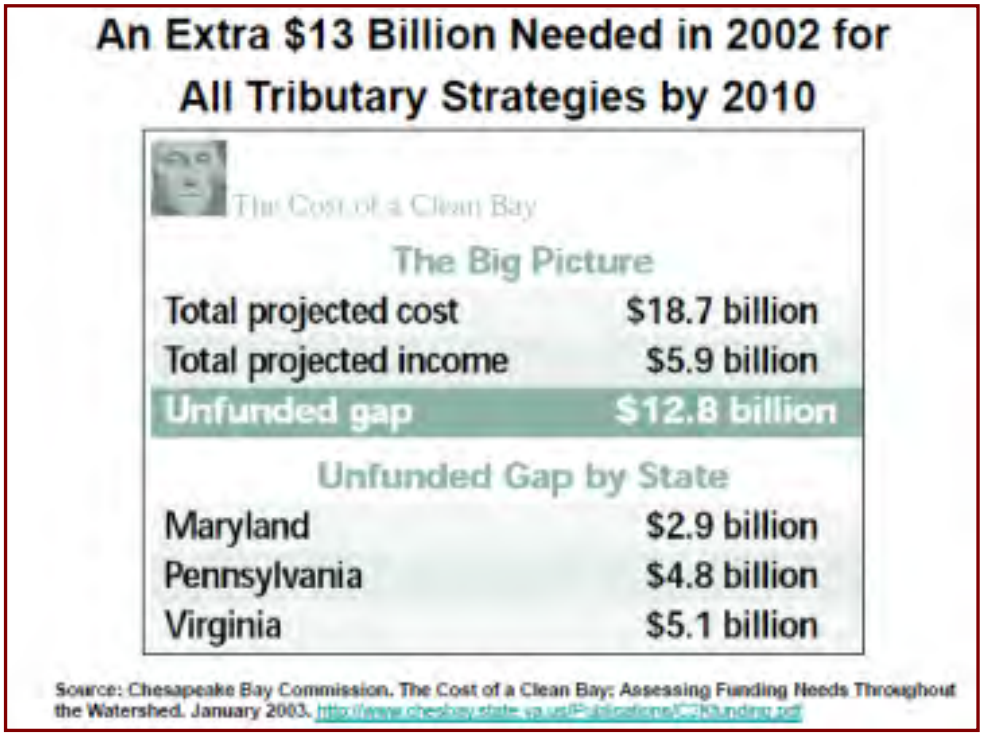
Two Relevant Case Studies

Chesapeake Bay

- 4 state trading programs in Chesapeake Bay
- Separate trading areas in each state:
  - Virginia 5
  - Maryland 3
  - Pennsylvania 2
  - West Virginia 1

Graphics from USGS (2006)

Chesapeake Bay



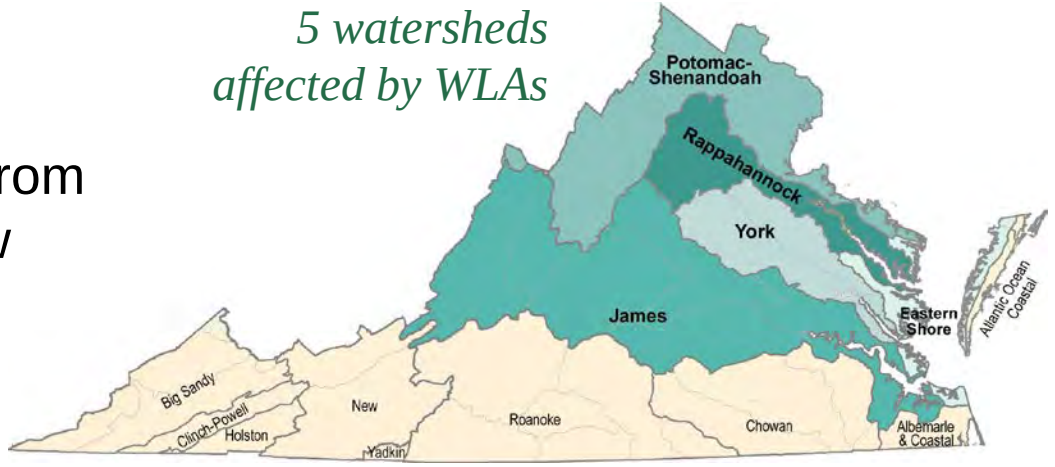
- TMDL incorporated nutrient trading provisions to accommodate growth, incorporate cost-effective and affordable actions, and provide backstop provisions

Virginia Nutrient Credit Exchange

- Drivers
  - State implementation of regional Chesapeake Bay Program nutrient reduction goals
  - New N and P limits for major point sources depending on watershed
    - N range = 3 mg/l – 8 mg/l
    - P range = 0.18 – 1 mg/l
  - Individual WLAs derived from new limits and design flow

Basin	#	MGD
Potomac/Shenandoah	43	405
Rappahannock	22	46
York	11	108
James	39	581
Eastern Shore	5	2
	120	1,142

120 facilities in 5 watersheds affected by WLAs

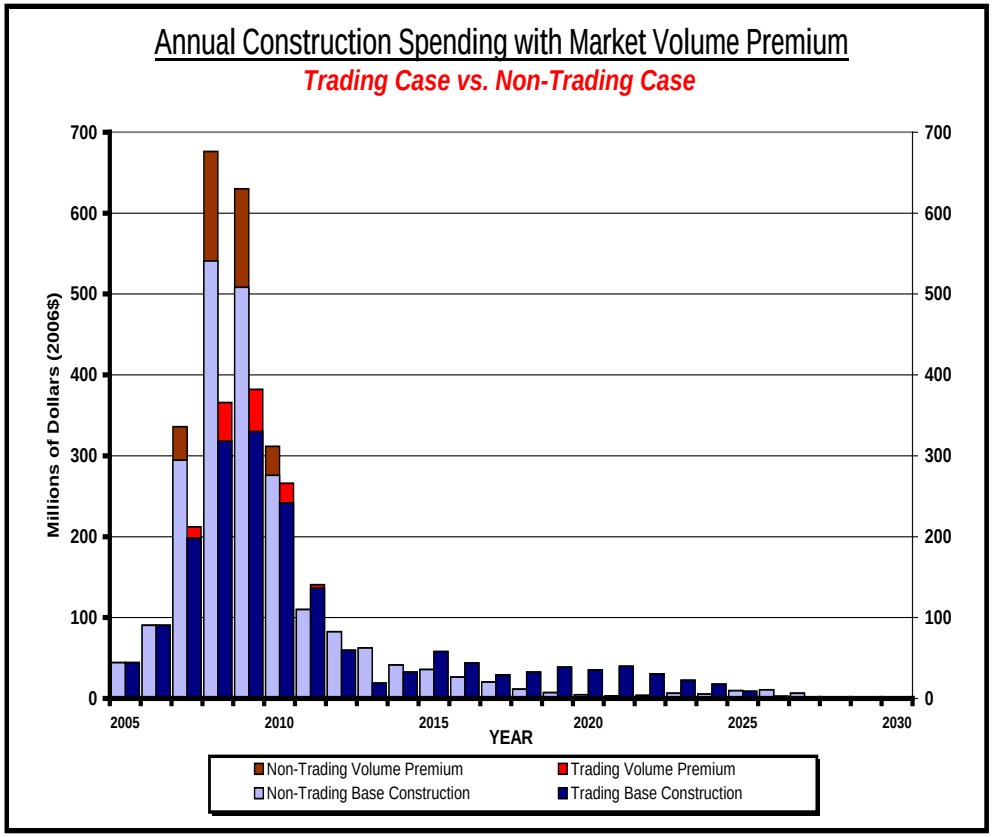


Virginia Nutrient Credit Exchange

P - P

- Discharger Education and Recruitment Process
  - Membership/trading participation voluntary
  - New concept for many
  - Critical to explain benefits and obligations
  - Multiple meetings/workshops

- Compliance Plan Options Analysis and Constructability Evaluation
  - Estimated compliance costs with and without trading
  - Additional savings/ avoided premiums associated with construction market peak impacts without trading



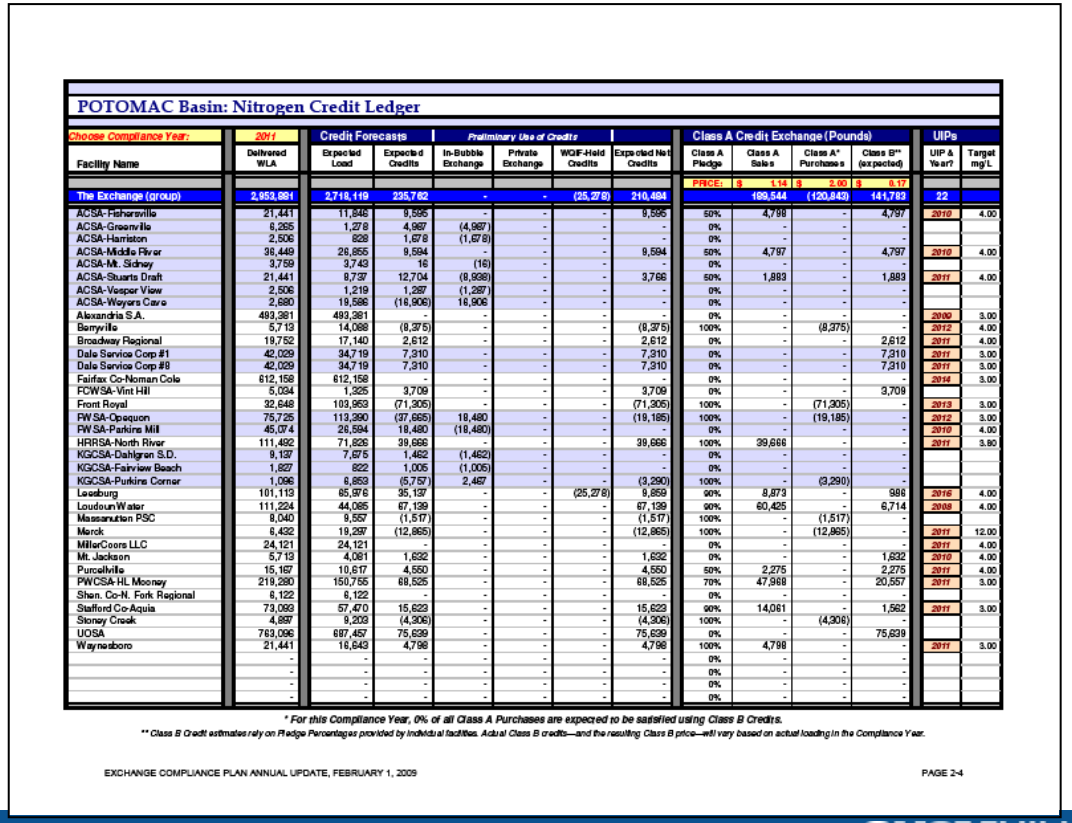
Savings with trading estimated at >$410M

Virginia Nutrient Credit Exchange

P - P

- Trading began 2011
- Credits normalized to Bay Pounds
- Credit Exchange Policy and Member Services Agreement spell out rules and obligations
- Credit prices set annually on rolling 5-yr basis
- Prospective trading ledgers project rolling 5-yr basis

Compliance Year	Reconciliation Year	Class A Credit Purchase Price: *Nitrogen*	*Phosphorus*	Price Status
2011	2012	$2.00	$4.00	Firm
2012	2013	$2.00	$4.00	Firm
2013	2014	$2.15	$4.30	Firm
2014	2015	$2.65	$4.60	Firm
2015	2016	$3.05	$4.93	Firm
2016	2017	$3.50	$5.27	Estimate



POTOMAC Basin: Nitrogen Credit Ledger

Choose Compliance Year:	2011	Credit Forecasts		Preliminary Use of Credits				Class A Credit Exchange (Pounds)				UIPs	
Facility Name	Delivered WLA	Expected Load	Expected Credits	In-Bubble Exchange	Private Exchange	WQIF-Held Credits	Expected Net Credits	Class A Pledge	Class A Sales	Class A* Purchases	Class B** (expected)	UIP & Year?	Target mg/L
								PRICE:	$ 1.14	$ 2.00	$ 0.17		
The Exchange (group)	2,953,881	2,718,119	235,762	-	-	(25,278)	210,484		199,544	(120,843)	141,783	22	
ACSA-Fishersville	21,441	11,846	9,595	-	-	-	9,595	50%	4,798	-	4,797	2010	4.00
ACSA-Greenville	8,255	1,278	4,997	(4,997)	-	-	-	0%	-	-	-		
ACSA-Harriston	2,506	828	1,678	(1,678)	-	-	-	0%	-	-	-		
ACSA-Middle River	38,449	28,855	9,594	-	-	-	9,594	50%	4,797	-	4,797	2010	4.00
ACSA-Mt. Sidney	3,759	3,743	16	(16)	-	-	-	0%	-	-	-		
ACSA-Stuarts Draft	21,441	8,737	12,704	(9,938)	-	-	3,766	50%	1,883	-	1,883	2011	4.00
ACSA-Vesper View	2,506	1,219	1,287	(1,287)	-	-	-	0%	-	-	-		
ACSA-Weyers Cave	2,680	19,586	(16,906)	16,906	-	-	-	0%	-	-	-		
Alexandria S.A.	493,381	493,381	-	-	-	-	-	0%	-	-	-	2000	3.00
Berryville	5,713	14,088	(8,375)	-	-	-	(8,375)	100%	-	(8,375)	-	2012	4.00
Broadway Regional	19,753	17,140	2,612	-	-	-	2,612	0%	-	-	2,612	2011	4.00
Dale Service Corp #1	42,029	34,719	7,310	-	-	-	7,310	0%	-	-	7,310	2011	3.00
Dale Service Corp #8	42,029	34,719	7,310	-	-	-	7,310	0%	-	-	7,310	2011	3.00
Fairfax Co-Noman Cole	612,158	612,158	-	-	-	-	-	0%	-	-	-	2014	3.00
FCWSA-Vint Hill	5,034	1,325	3,709	-	-	-	3,709	0%	-	-	3,709		
Front Royal	32,648	103,953	(71,305)	-	-	-	(71,305)	100%	-	(71,305)	-	2013	3.00
FWSA-Opequon	75,725	113,390	(37,665)	18,480	-	-	(19,185)	100%	-	(19,185)	-	2012	3.00
FWSA-Parkins Mill	45,074	26,594	18,480	(18,480)	-	-	-	0%	-	-	-	2010	4.00
HRRSA-North River	111,492	71,826	39,666	-	-	-	39,666	100%	39,666	-	-	2011	3.80
KGCSA-Dahlgren S.D.	9,137	7,675	1,462	(1,462)	-	-	-	0%	-	-	-		
KGCSA-Fairview Beach	1,827	822	1,005	(1,005)	-	-	-	0%	-	-	-		
KGCSA-Purkins Corner	1,096	8,853	(5,757)	2,467	-	-	(3,290)	100%	-	(3,290)	-		
Leesburg	101,113	85,976	35,137	-	-	(25,278)	9,859	90%	8,873	-	986	2016	4.00
LoudounWater	111,224	44,085	67,139	-	-	-	67,139	90%	60,425	-	6,714	2008	4.00
Massanutten PSC	8,040	9,557	(1,517)	-	-	-	(1,517)	100%	-	(1,517)	-		
Merck	6,432	19,297	(12,865)	-	-	-	(12,865)	100%	-	(12,865)	-	2011	12.00
MillerCoors LLC	24,121	24,121	-	-	-	-	-	0%	-	-	-	2011	4.00
Mt. Jackson	5,713	4,081	1,632	-	-	-	1,632	0%	-	-	1,632	2010	4.00
Purcellville	15,167	10,617	4,550	-	-	-	4,550	50%	2,275	-	2,275	2011	4.00
PWCSA-HL Mooney	219,280	150,755	68,525	-	-	-	68,525	70%	47,968	-	20,557	2011	3.00
Shen. Co-N. Fork Regional	8,122	8,122	-	-	-	-	-	0%	-	-	-		
Stafford Co-Aquia	73,093	57,470	15,623	-	-	-	15,623	90%	14,061	-	1,562	2011	3.00
Stoney Creek	4,897	9,203	(4,306)	-	-	-	(4,306)	100%	-	(4,306)	-		
UOSA	763,096	687,457	75,639	-	-	-	75,639	0%	-	-	75,639		
Waynesboro	21,441	16,643	4,798	-	-	-	4,798	100%	4,798	-	-	2011	3.00
	-	-	-	-	-	-	-	0%	-	-	-		
	-	-	-	-	-	-	-	0%	-	-	-		
	-	-	-	-	-	-	-	0%	-	-	-		
	-	-	-	-	-	-	-	0%	-	-	-		

** For this Compliance Year, 0% of all Class A Purchases are expected to be satisfied using Class B Credits.*

*** Class B Credit estimates rely on Pledge Percentages provided by individual facilities. Actual Class B credits—and the resulting Class B price—will vary based on actual loading in the Compliance Year.*

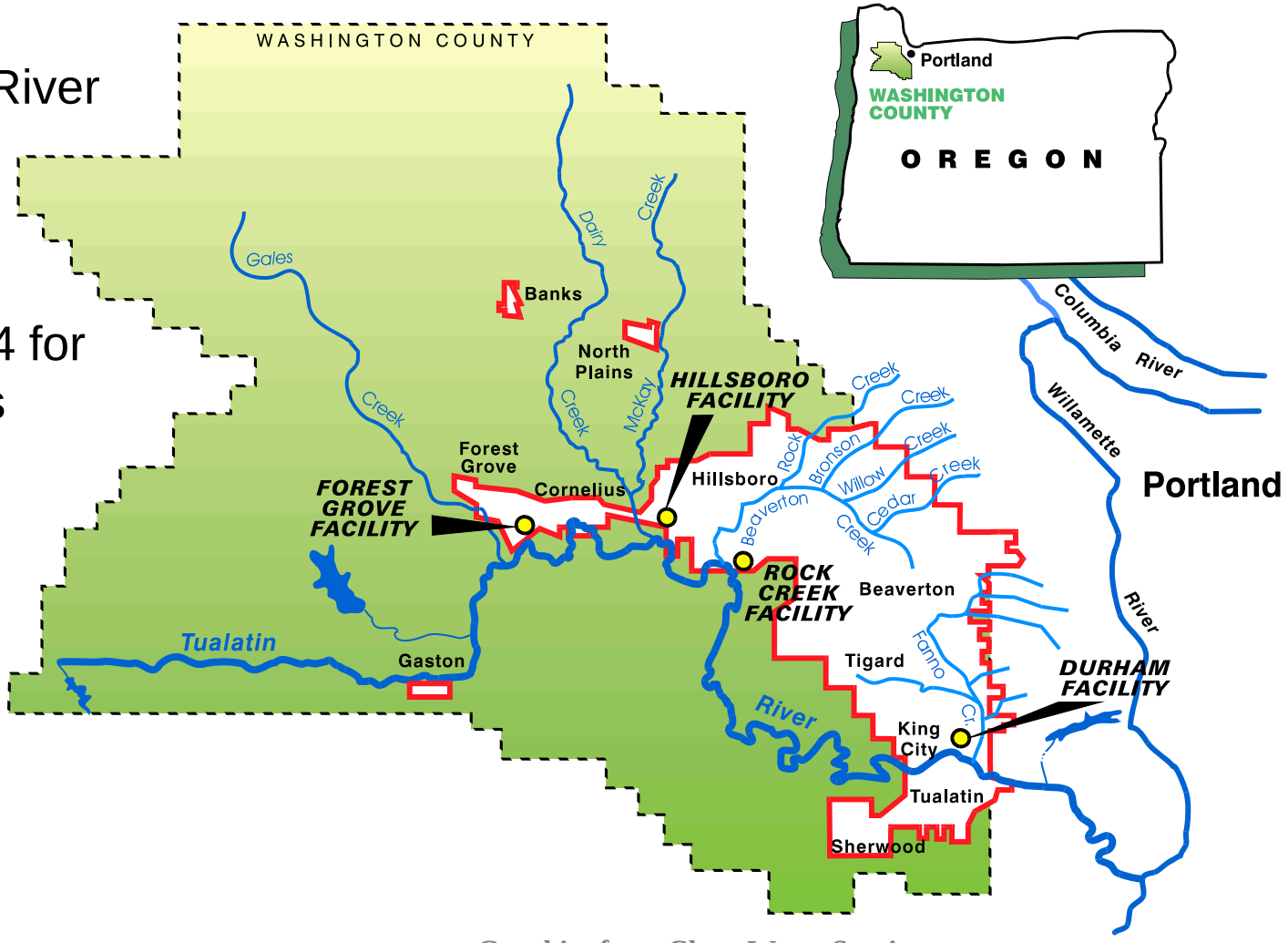
EXCHANGE COMPLIANCE PLAN ANNUAL UPDATE, FEBRUARY 1, 2009 PAGE 2-4

CH2MHILL.

Clean Water Services: First in the Nation Watershed Permit

P - P P - NP

- 4 WWTPs with River Discharge
- Stormwater for WWTPs
- Stormwater MS4 for 13 Communities



Graphics from Clean Water Services

Point-Nonpoint Trading: Temperature Compliance Alternatives

P - NP

- Reduce influent wastewater temperature
  - No viable options
- Remove discharge from Tualatin
  - Would result in greatly reduced summer flows (50-66%)
  - Significant negative WQ impacts
- Chill/Refrigerate discharge
  - High capital cost, $50 million
  - High energy cost, $1-2 million/yr
  - No ancillary environmental benefits, in fact creates negative environmental impacts because of higher carbon footprint

Temperature Trading

P - NP

- CWS' point-nonpoint trading program science-based
  - Need 332 M kcal/day in shade credits
  - Use DEQ "Shade-a-lator" model to calculate effective shade
  - Apply 2:1 trading ratio (accounts for time to maturity)
- Coordinated through local Soil and Water Conservation District via "Enhanced CREP"
- Can also offset thermal load with river flow augmentation and effluent reuse

Table 4

Shade Benchmarks

Permit Year	Annual Shade Credit Benchmark	Estimated Stream Miles Planted[14]
2004	10%	3.5
2005	20%	7.0
2006	30%	10.5
2007	20%	7.0
2008	20%	7.0
Shade Credit Goal	100%	35

Permit required 30 miles planted over 5 years: CWS beat that target.

THERMAL CREDIT FOR SHADE — YEAR: 2006

Summary

Total miles stream:	8.66	mi
Thermal load blocked :	1.5E+08	kcal/d
Thermal credit this year:	7.6E+07	kcal/d
Average load blocked per ft:	1.4E+03	kcal/d/ft

URBAN PLANTING	
Feet	20600
Miles	3.90
RURAL PLANTING	
Feet	25100
Miles	4.75

Restoration/Protection Record

Project	Stream Length (ft)	Thermal Load Blocked in 20 yrs (kcal/d)	Thermal Credit (kcal/d)	Credit per Length (kcal/d/ft)
Council Creek-Beal Pond	1400	1.05E+06	5.27E+05	377
Banks Elementary	500	2.85E+05	1.42E+05	285
Beaverton-Downing St. and 125th	700	2.46E+05	1.23E+05	176
Tigard-Hiteon Creek	800	1.53E+06	7.66E+05	958
Catlin Gabel	700	1.57E+05	7.84E+04	112
Butternut-194th Ct.	200	3.59E+05	1.80E+05	899
Butternut-Butternut Elementary	400	2.16E+06	1.08E+06	2699
CREP-Alexander	1800	1.46E+07	7.30E+06	4053
CREP-Duyck	2400	3.21E+06	1.61E+06	670
CREP-Licorice Lane	6300	3.30E+07	1.65E+07	2620
CREP-Krueger	2600	9.22E+06	4.61E+06	1774
CREP-Vandehey	1300	5.19E+05	2.59E+05	199
Willow Creek @ Beaverton Confluence	600	2.84E+06	1.42E+06	2367
Bronson Creek-W. Union to Laidlaw	1100	2.88E+06	1.44E+06	1307
Stella Olsen	1100	3.39E+06	1.69E+06	1539
Beaverton Creek-153rd to St.Marys	5100	1.90E+07	9.51E+06	1864
Fanno Creek-Englewood Park (left only)	2500	2.75E+06	1.37E+06	550
Dairy Creek-Davis Tool (left only)	4900	2.42E+07	1.21E+07	2468
Johnson Creek-Hart Lowami Woods	600	1.16E+06	5.82E+05	970
NRCS - Hutchinson	10700	2.99E+07	1.49E+07	1396

CWS reports kilocalorie credits in an annual report.

Anticipated Implementation Process for Updated TMDLs

- Temperature TMDL
  - Adds Forest Grove and Hillsboro WWTFs
  - Trading extended and updated
- Includes NTS: Reduces temperature with emergent vegetation

- Oxygen-Demand/TP TMDL
  - Adds Forest Grove and Hillsboro WWTFs
  - Bubble permit with trading:
    - BOD and Ammonia
    - Total Phosphorus
- Includes Natural Treatment Systems: Further polishing

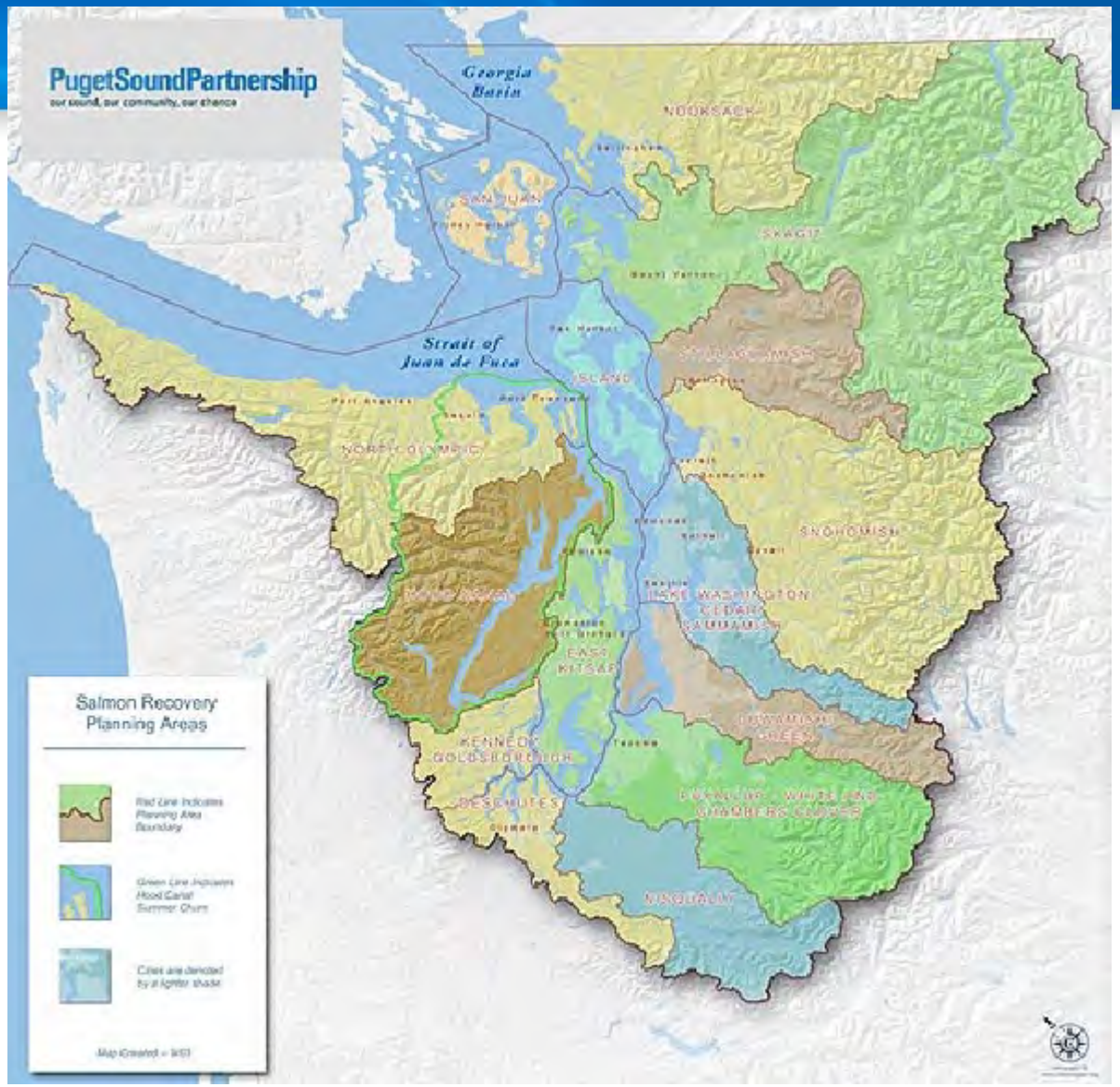
Lessons Learned for Puget Sound: Can it Work Here?

Lessons Learned

- Each involves mostly the same basic building blocks and design elements, just assembled differently
  - Baselines, credit definitions
  - Reconciliation periods, ratios
  - Trading rules and policies
- They represent a varied set of arrangements and market structures
  - Bi- and multi-lateral
  - Managed or free(r) market
  - Centralized, decentralized
  - Facilitator and broker roles
- At their inception, or by implementation, they had important conditions for success
  - Drivers, knowledge, opportunity
  - Benefits, stakeholder endorsement

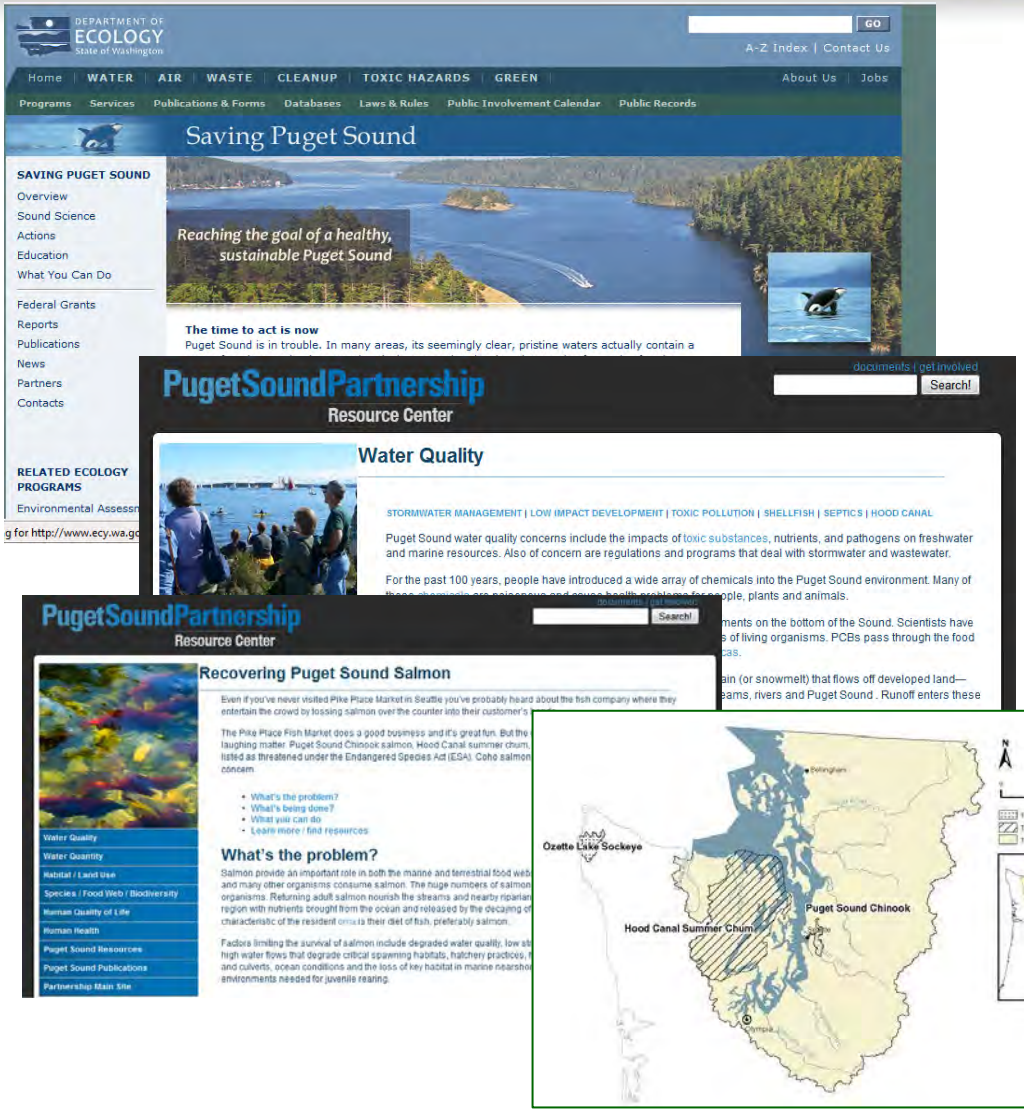
Can it Work Here?

1. **Driver for action**
2. **Understanding of water quality**
3. **Alternative feasible solutions**
4. **Greater cost-effectiveness**
5. **Market warrants investment**
6. **Equal or better results**
7. **Stakeholder-endorsed framework**



Graphics from Puget Sound Partnership

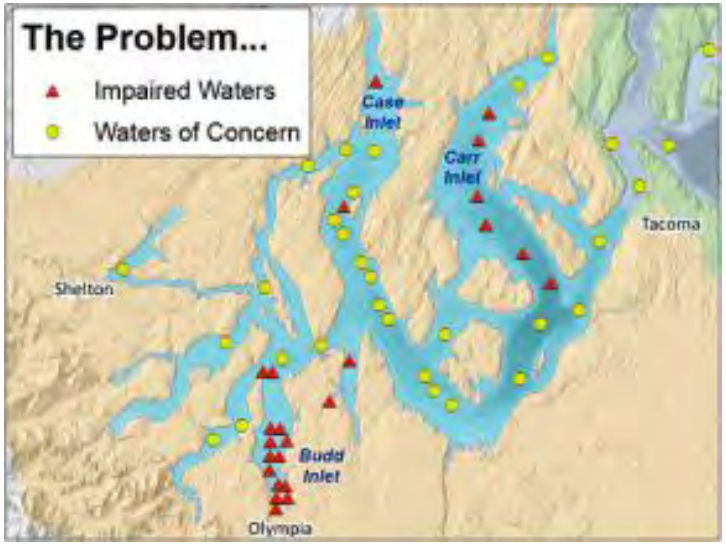
Drivers for Action

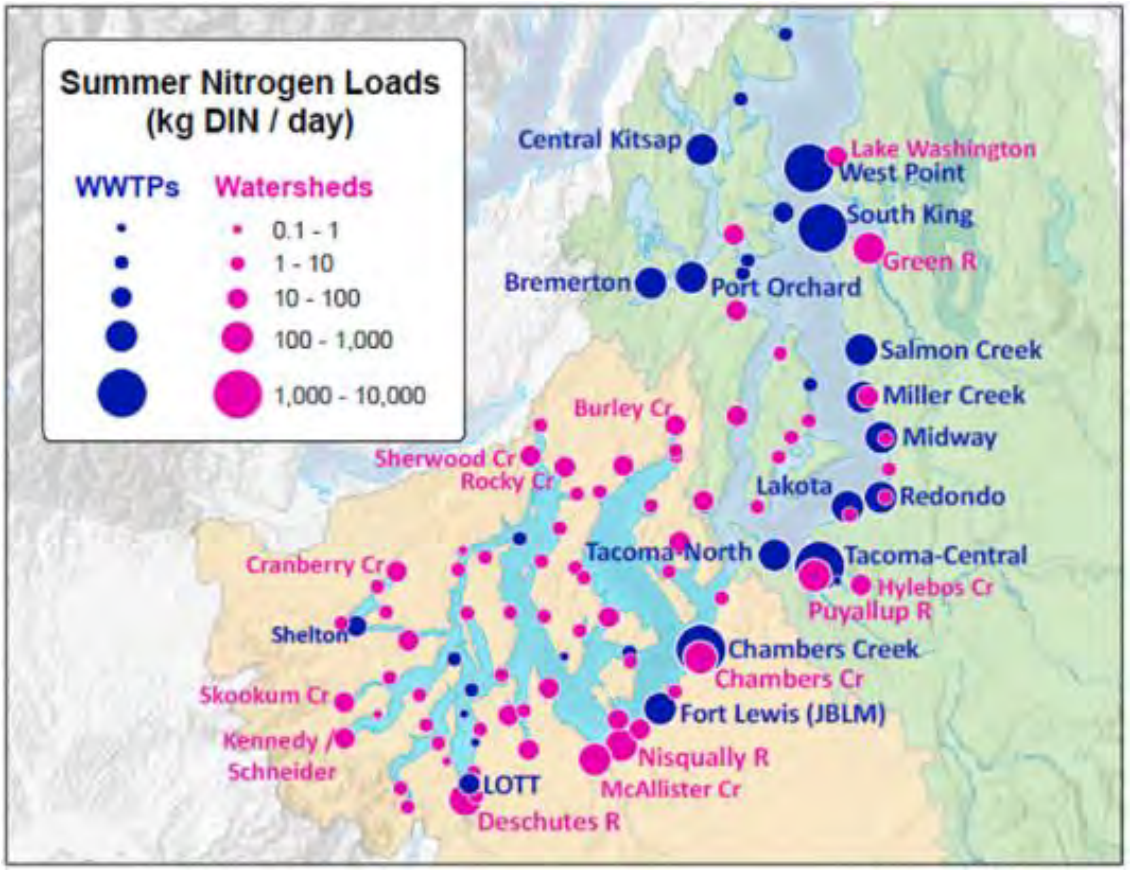


- Pollutant load reductions mandated by on-going TMDLs for Puget Sound WRIAs
- WWTF permit requirements for wastewater
- MS4 permit requirements for pollutant reduction in urban storm water
- ESA requirements for salmonid population improvements

Understanding Water Quality

- Ecology studies
- USGS studies
- EPA studies
- NMFS studies





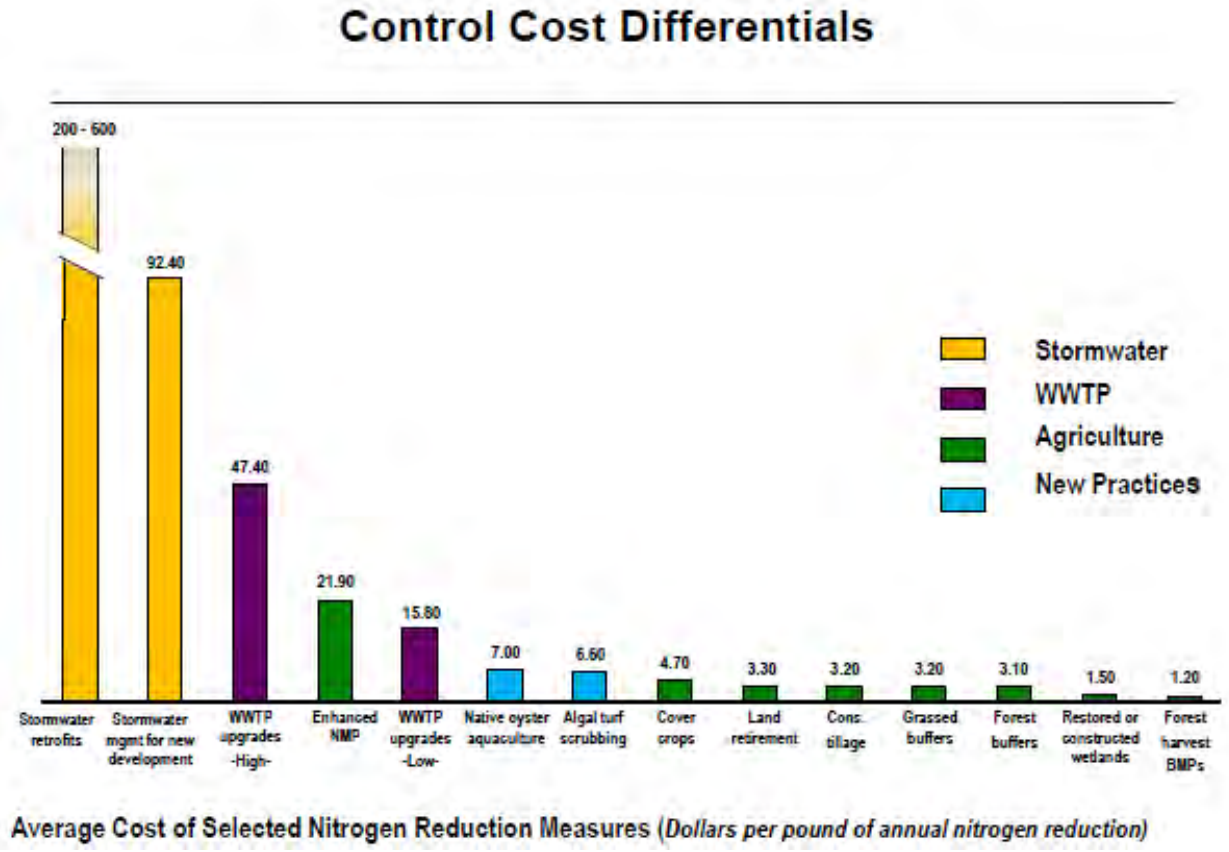
Graphics from Ecology (2011)

Alternative Feasible Solutions

- Multiple permitted WWTPs
- Multiple MS4 regulated communities
- Significant loads of nitrogen from point sources, urban areas, and rural sub-watersheds offer a variety of ways to reduce phosphorous loading
  - This is usually one of the tasks in the assessment of a potential credit trading market

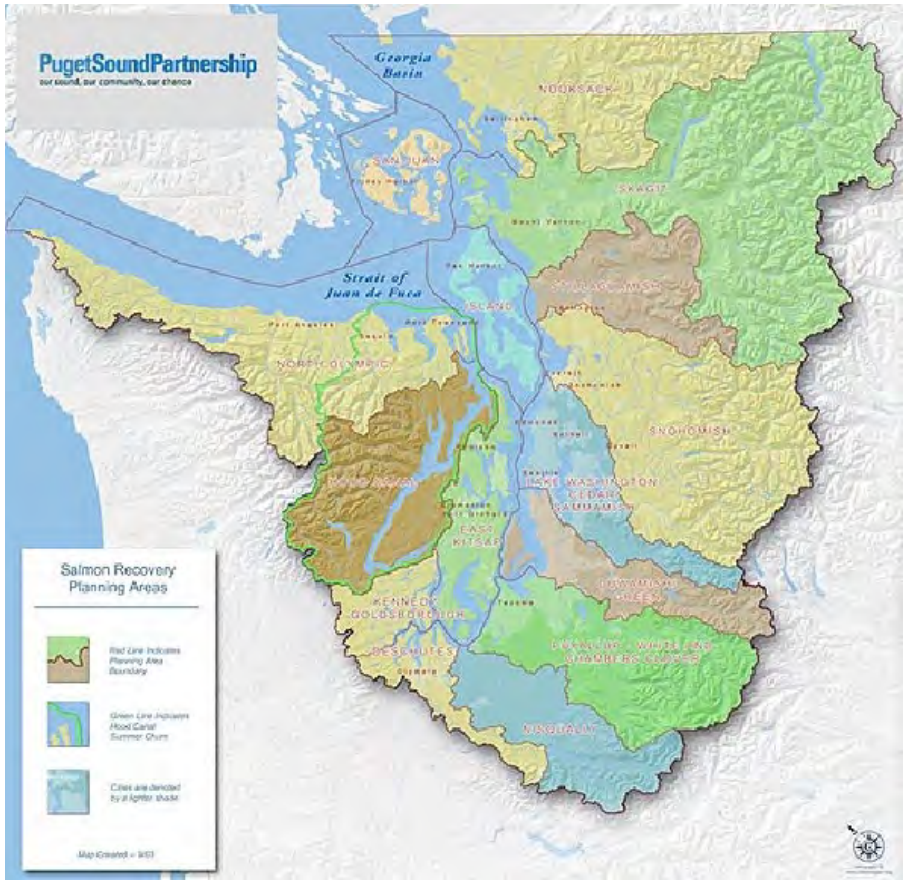
Greater Cost Effectiveness

- Are there sufficient differences in cost effectiveness for pollutant removal among or within the source categories (P-P, P-NP) to attract buyers and sellers?
- This is usually one of the tasks in the assessment of a potential credit trading market



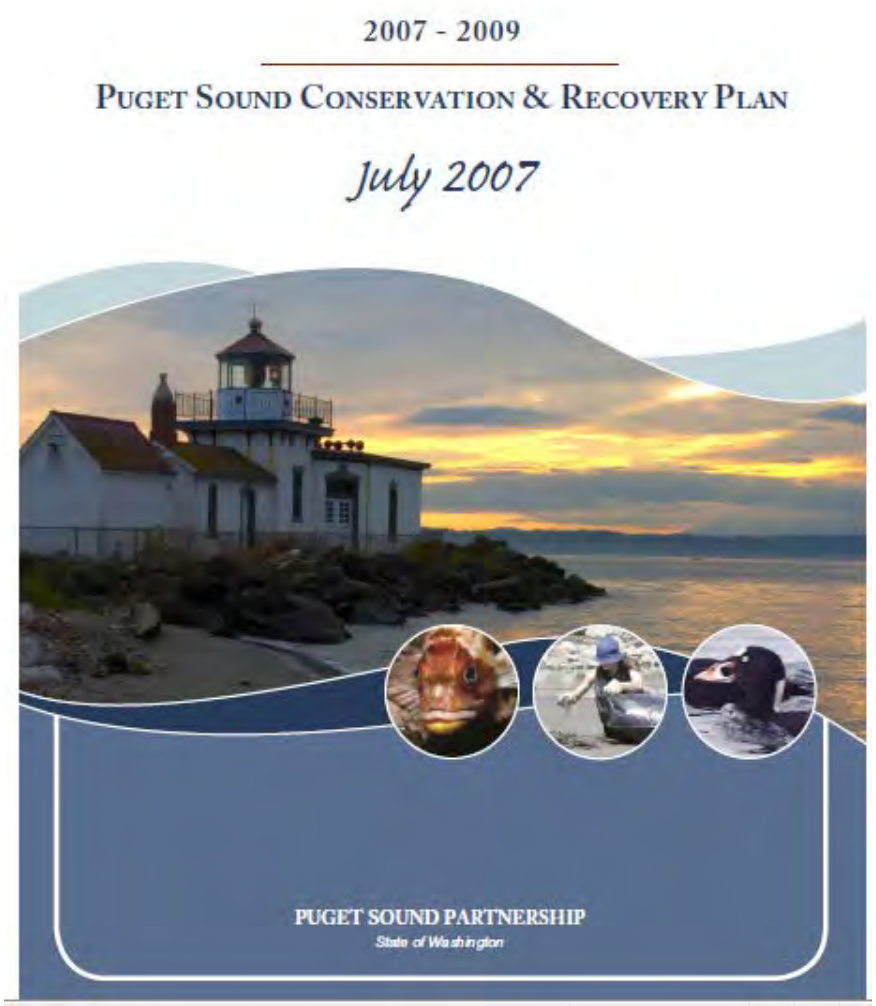
Market Warrants Investment

- The scale of the cost savings is sufficient to warrant the development and operation of the credit market – there will be transactional costs.
- The physical and demographic scale of the market is favorable. The Puget Sound watershed is 2,458 square miles with 14 major sub-watersheds.
- Plus, there are 3.5 million people in the Puget Sound region.



Graphics from Puget Sound Partnership

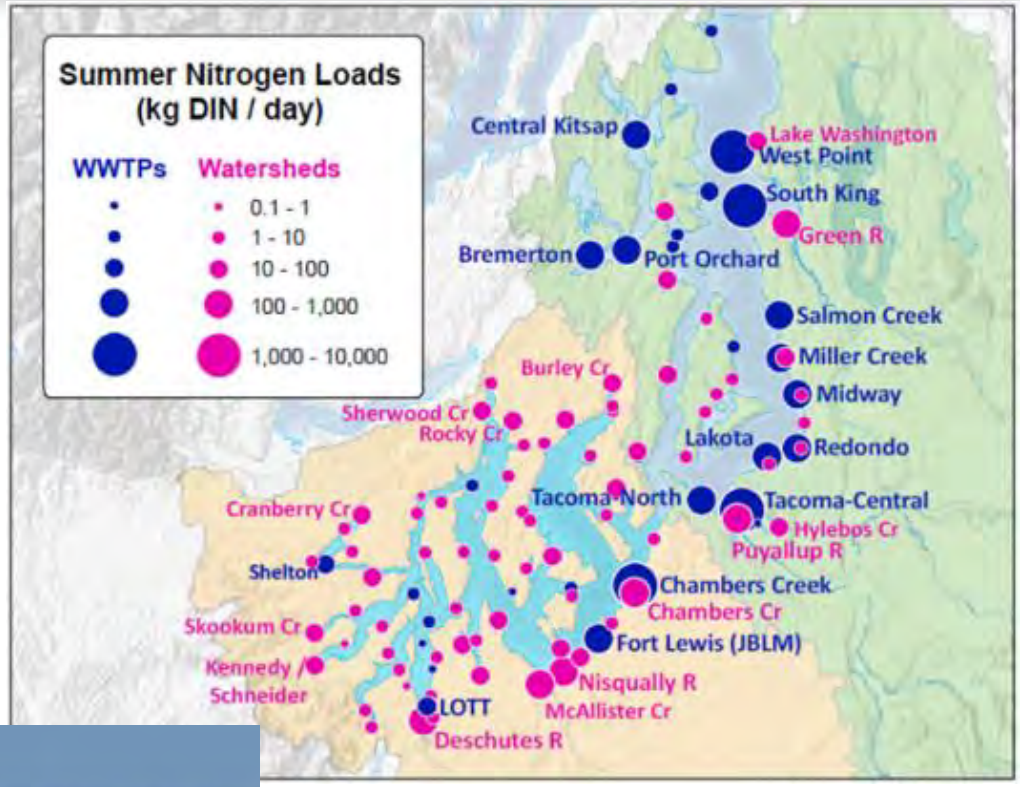
Equal or Better Results



- Program rules need to be developed for the credit trading market to ensure a net benefit to the environment relative to not trading
- This is usually accomplished with trading ratios
- “Puget Pounds?”

Stakeholder-Endorsed Framework

- Consistent with the existing missions to improve the integrity of Puget Sound through education, community outreach, WQ monitoring and implementation of conservation and restoration practices.

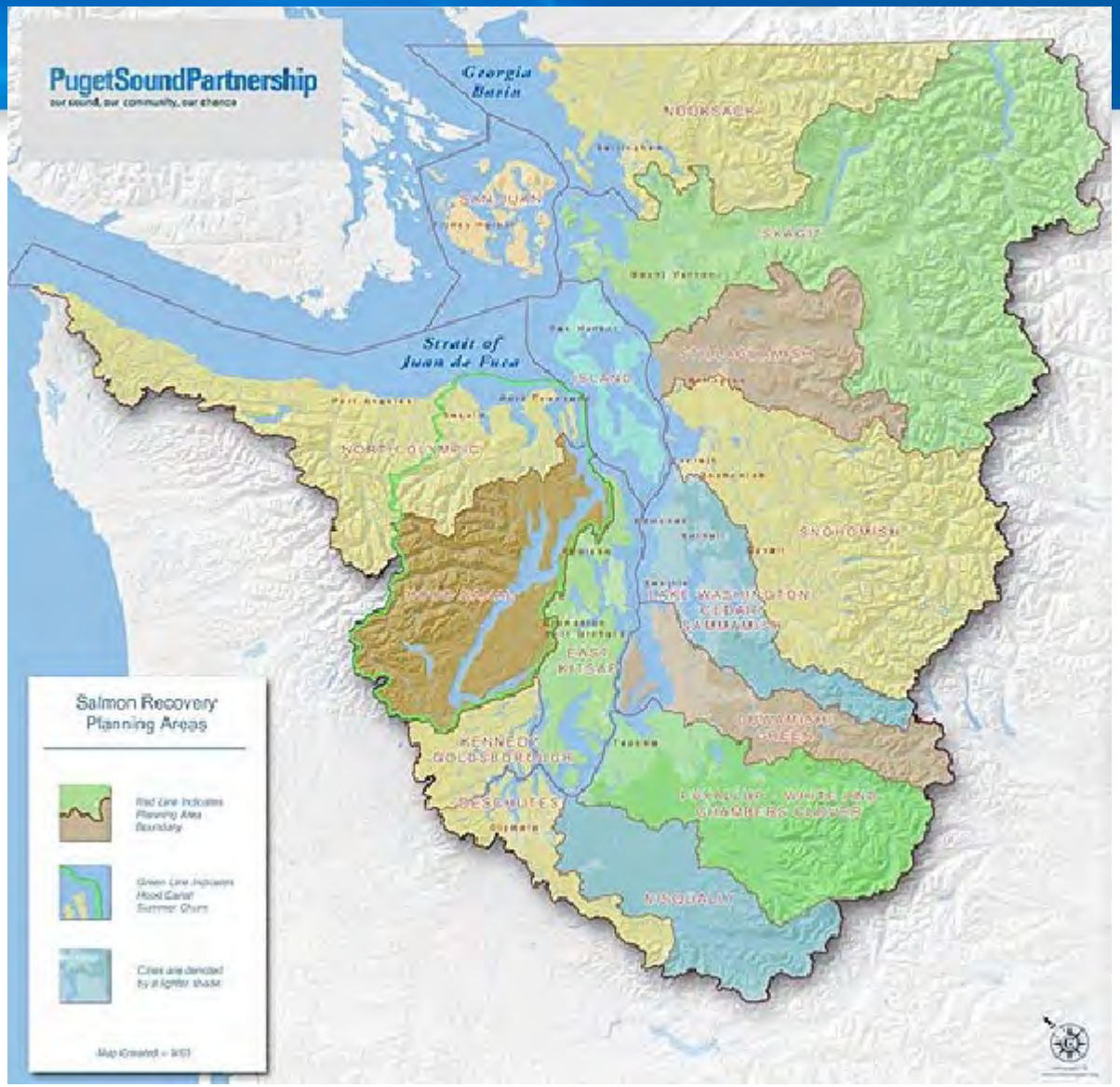


PugetSoundPartnership
our sound, our community, our chance

Northwest Regional Office
NOAA's National Marine Fisheries Service

Can it Work Here?

- ✓ **Driver for action**
- ✓ **Understanding of water quality**
- ✓ **Alternative feasible solutions**
- ✓ **Greater cost-effectiveness**
- ✓ **Market warrants investment**
- ✓ **Equal or better results**
- ✓ **Stakeholder-endorsed framework**



Graphics from Puget Sound Partnership

Discussion