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Agricultural Nutrient Management - Employing the Concept of Ecological Goods and Services

Karen Ageson
Department of Agricultural Economics
University of British Columbia

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DEPARTMENT OF RESOURCE ECONOMICS
AND ENVIRONMENTAL SOCIOLOGY

Growing Forward

Agricultural Nutrient Management Employing the Concept of Ecological Goods and Services

By Karen Ageson, www.karenageson.com
B.A. Environmental Studies, University of British Columbia
M.Sc. Agricultural Economics, University of British Columbia

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Economic Value of an Ecological Service

$181 Million

The value of additional water supply services in Abbotsford, BC.

I estimate this value by calculating the cost of adding Stave Lake, a surface water feature, to Abbotsford's drinking water system.

Based on the cost of tapping Stave Lake the Abbotsford-Sumas aquifer represents $181 million worth of water supply services that the city is willing to pay for, were the aquifer not contaminated with nitrate.

If the cost to reduce nitrate and the cost of adding ground water wells falls below $181 million the city could accrue net benefits.

$168 Million

The value of improvements to Abbotsford-Sumas aquifer ground water quality.

I estimate this value by calculating the difference in cost between adding Stave Lake to Abbotsford's drinking water system and the cost of adding ground water wells.

By subtracting the partial cost to deliver ecological water supply services (the cost of adding wells) from the value of additional water supply services I find how much the City of Abbotsford is willing to pay to improve ground water quality: $168 million.

$13 Million

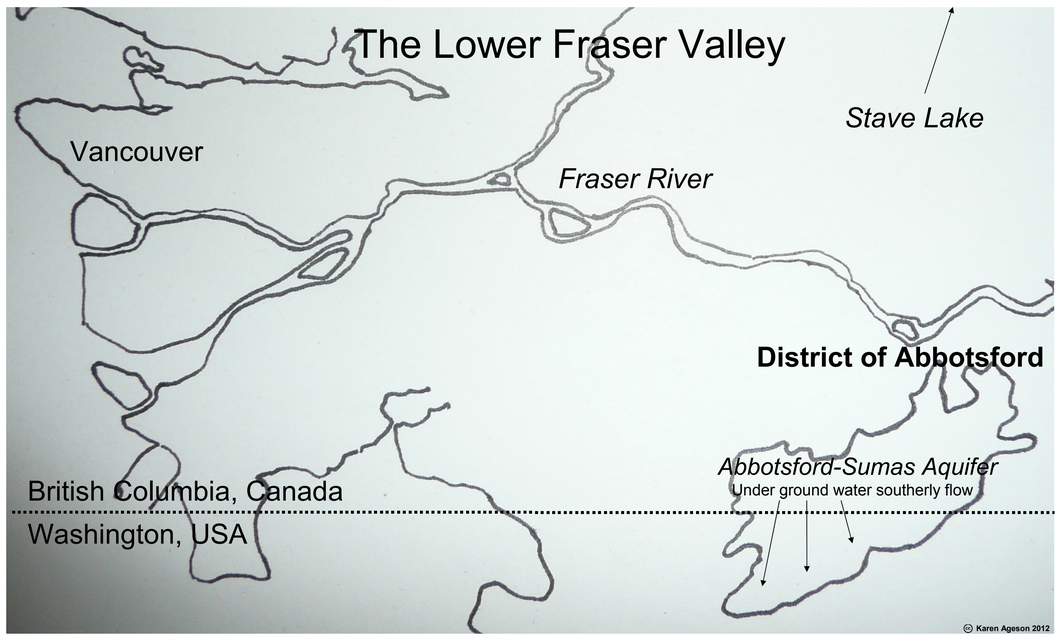
The cost of adding wells.

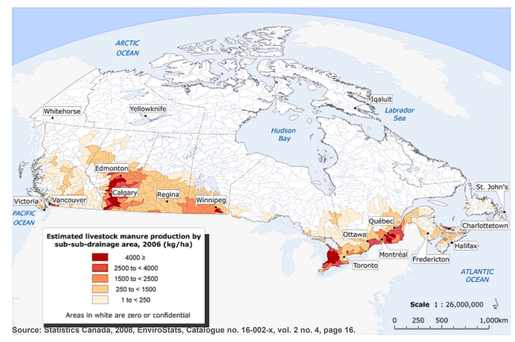
Nitrate Contamination of a Drinking Water Aquifer

The Lower Fraser Valley boasts a prominent agricultural industry that shares a bioregion with the urban metropolis of Metro Vancouver in the south west of British Columbia (BC). It hosts some of the most fertile land in Canada and ranks amongst the highest concentrated agricultural activity in the country.

There is measurable environmental impact that links increased agricultural intensity in the region to nitrate pollution of the Abbotsford-Sumas aquifer.[1] Recent decades have seen a surge in poultry and raspberry production above the aquifer.[2] Nitrate content of poultry manure is high and nitrate is applied to fields to increase crop yields.

The City of Abbotsford plans to build a new surface water system to increase the quantity and ensure the quality of drinking water available to residents.[3] In as much as the Abbotsford-Sumas ground water aquifer is being avoided as a significant future drinking water source due to nitrate contamination, the willingness to pay (WTP) for improvements to ground water quality can be inferred from planned expenditure on a new surface water system.





Source: Statistics Canada, 2009, EnviroStats, Catalogue no. 16-002-x, vol. 2 no. 4, page 16.

Research Objectives and Methods

This research provides some preliminary exploration into how the concept of ecological goods and services (EGS) can be used by policy makers to address externalities arising from British Columbian agriculture.

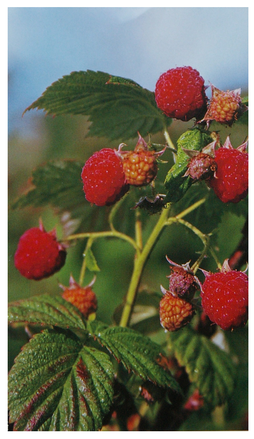
With an EGS program in mind I identify the City of Abbotsford as a potential ecological service buyer and establish economic value for improvements to water quality in the Abbotsford-Sumas aquifer. I use a replacement cost approach based on present value cost analysis of a proposed surface water system.

Market Based Management Mechanisms and Policy

Currently in BC, voluntary measures and regulations are used to mitigate agricultural impact on the environment but to unsatisfactory effect. Recent nitrate management incentives have not been shown to effectively reduce nitrate pollution of ground water. Regulations in place to protect drinking water from agricultural pollutants are under enforced.

The establishment of a market for a non-market good, such as payments for ecological goods and services (PES), is a kind of market based management mechanism used to internalize externalities. Market based mechanisms are adaptive and reflective of localized conditions.[4] Market creation relies on accurate valuation of non-market goods.

The concepts of EGS and payments for environmental services (PES) move away from a 'polluter pays' principle towards a 'beneficiary pays' principle.



Glossary of Terms

Aquifer: An under ground water reserve formed by a layer of water bearing permeable rock below ground.

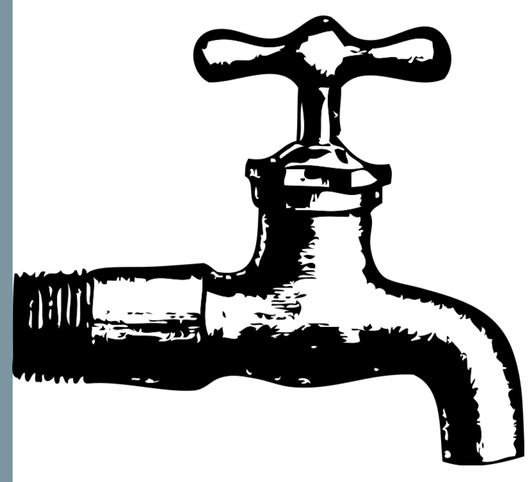
Ecological Goods and Services (EGS): Goods and services supplied through ecological function such as improved water quality rendered by the water filtration of wetlands. EGS are typically under valued or not valued by existing commodity markets (in other words they are non-market goods) and are therefore undersupplied.

Payments for Ecological Goods and Services (PES): A transaction between an ecological service buyer and ecological service supplier for a well-defined environmental service or a land use likely to secure that service.

Replacement Cost: A valuation methodology based on costs incurred to replace ecological function with built infrastructure. For example, the cost of building a water filtration plant to perform the function of a wetland infers an economic value of the wetland.

Valuation: The measurement of people's utility based value for goods and services.

Willingness to Pay (WTP): A measure of people's utility based value of goods and services obtained through market observation or estimated from responses to surveys.



Results

Valuation	Period of Analysis	Present Value of Estimated Costs	Annualized Values	Annualized Values by Abbotsford household
	(years)	(million)	(million/ year)	(household/ year)
WTP for water supply services (adding Stave Lake)	38	$181	$15	$438
Partial cost of aquifer water supply services (adding wells)	38	$13	$1	$31
WTP minus Partial Cost	*38*	*$168*	*$14*	*$407*

Discussion and Conclusions

My results suggest that if nitrate remediation and/ or nitrate management practices improve water quality and the costs fall below $168 million there are potential net benefits to the City of Abbotsford.

To put this value into perspective, Stave Lake drinking water is more expensive than wells and a nitrate filtration plant combined. If a filtration plant was installed, similar to the plant in Irvine Ranch, California, I estimate that net benefits to the city could be $126 million over 38 years.

This value could form the basis for a city program or EGS trading scheme to encourage farmers to place a higher priority on water quality in their land management practices. To illustrate, a market wherein the City of Abbotsford pays farmers to farm an environmentally benign crop, like pasture, could be created.

A key finding is that lack of information on the degree to which nitrate contamination constrains well field development limits the ability to conclusively evaluate the net benefits and proceed with an EGS program at this time.

References

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