AN INTRODUCTION TO

WATER QUALITY CREDIT TRADING

IN THE BEAVER CREEK WATERSHED

ECOLOGICAL CREDIT TRADING PILOT STUDY FOR THE BEAVER CREEK WATERSHED
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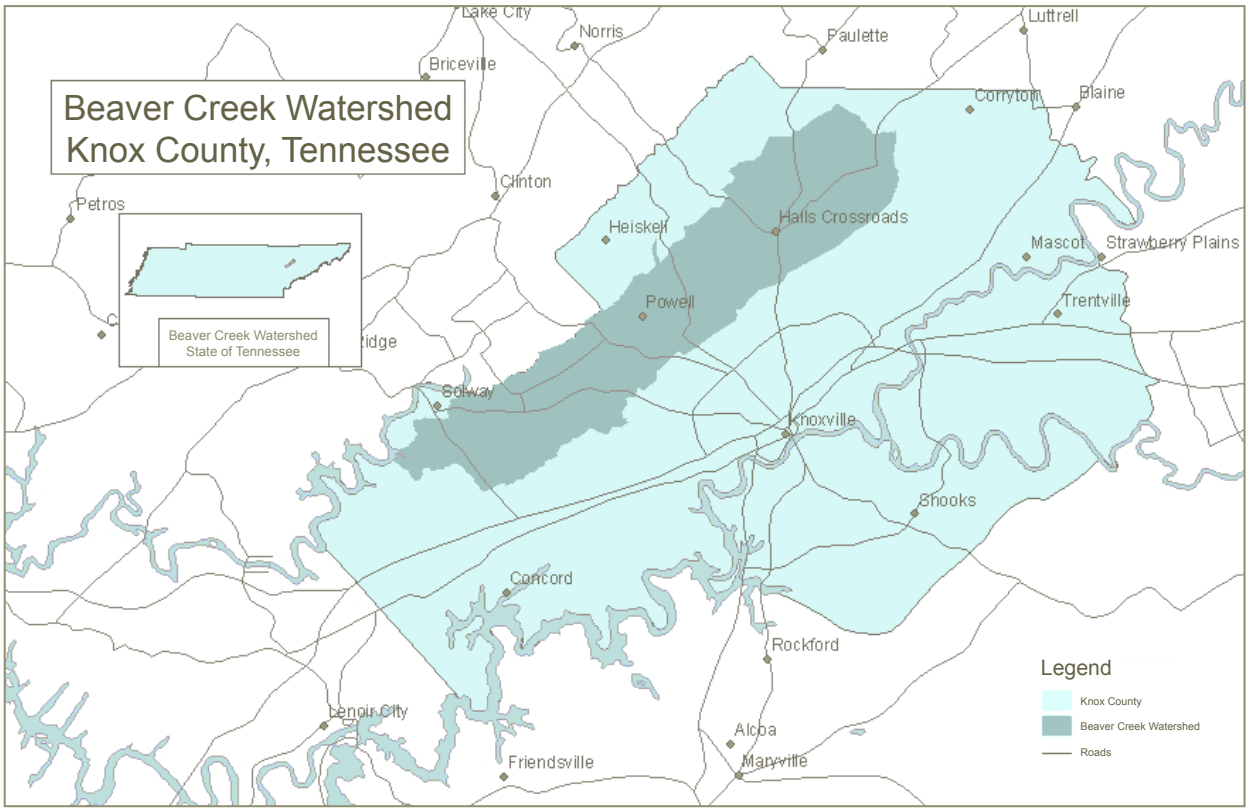
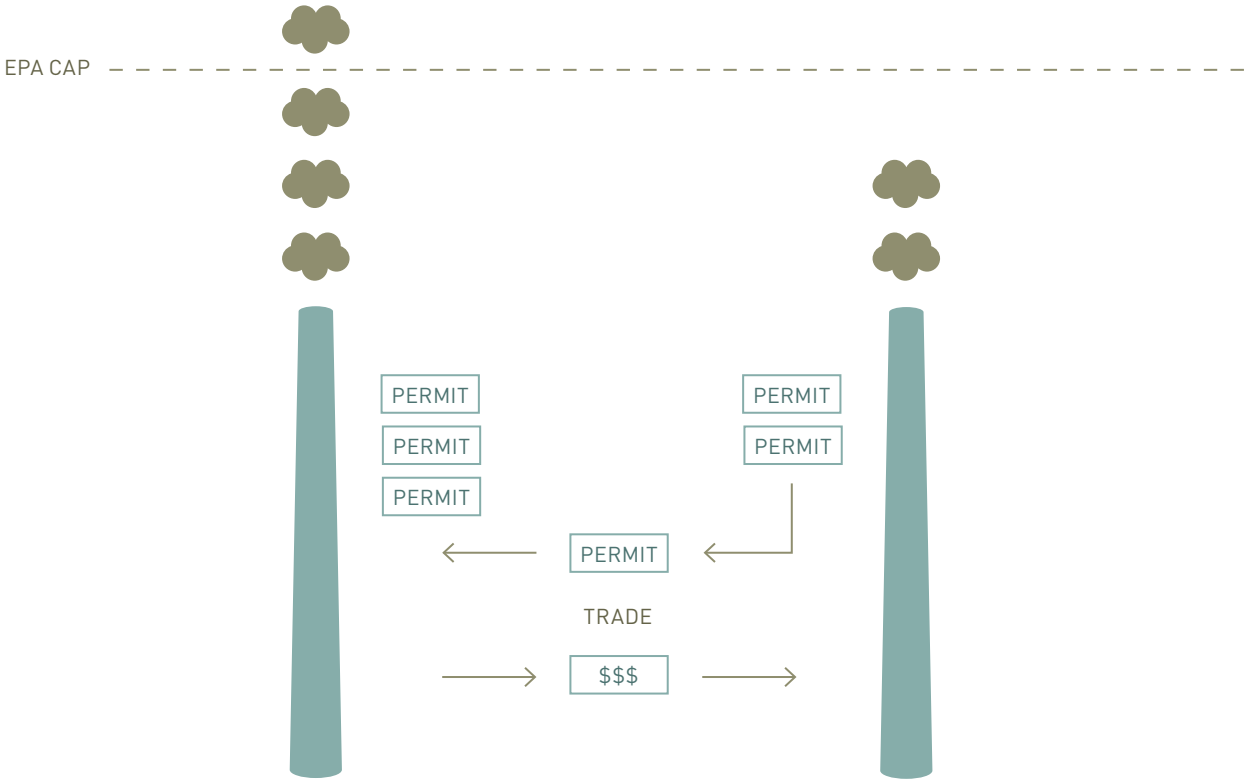
From 2006–2009 Knox County, TN conducted an EPA funded pilot study for an ecological water pollution credit trading program in the Beaver Creek Watershed. The study concluded that credit trading for sediments could be a useful tool for developers now required to meet more stringent regulations in the new Knox County Storm Water Ordinances for post–construction runoff on development sites. In order to understand the concepts presented in the final report, the reader may want to become familiar with the basics of credit trading. At the end of this very basic document a link is provided to the final report for the Ecological Credit Trading Pilot Study for the Beaver Creek Watershed.



BACKGROUND

The pollution credit trading concept had its origins in the United States with a program initiated by the 1990 Clean Air Act to address acid rain. It is based upon "cap and trade", a market–based approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants.



Under this system EPA sets a limit or cap on the amount of a pollutant that can be emitted. The limit or cap is allocated or sold to firms in the form of emissions permits which represent the right to emit or discharge a specific volume of the specified pollutant. Firms are required to hold a number of permits (credits) equivalent to their emissions. The total number of permits cannot exceed the cap, limiting total emissions to that level. Firms that need to increase their emission permits must buy permits from those who require fewer permits. The transfer of permits is referred to as a trade. In effect, the buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions. Thus, in theory, those who can reduce emissions most cheaply will do so, achieving the pollution reduction at the lowest cost to society.

EMISSIONS VS. WATER QUALITY

Following their success with the trading program used for controlling acid rain emissions, the EPA begin experimenting with credit trading for water quality. The primary similarity between "cap and trade" programs for emissions and water quality credit trading is that they are both market–based approaches. However, emissions disburse into the atmosphere and can affect large geographic areas where as water pollution is confined to a specific watershed. Some watersheds are very big and cover tens of thousands of square miles but most water pollution credit trading programs are constructed on a much smaller scale to show improvements to a localized area.

Additionally, in "cap and trade" programs for air quality, a set number of permits or credits are arbitrarily created for the market. In water quality, trading credits are created by positive actions taken by individual entities that exceed a pollution removal rate set by a regulatory agency.

EMISSIONS	WATER QUALITY
market–based approach	market–based approach
can affect large geographic areas	confined to a specific watershed
set number of permits arbitrarily created	credits created by positive actions that exceed a pollution removal rate

WATER POLLUTION SOURCES & TYPES

Water pollution is generally categorized by source:

POINT SOURCE

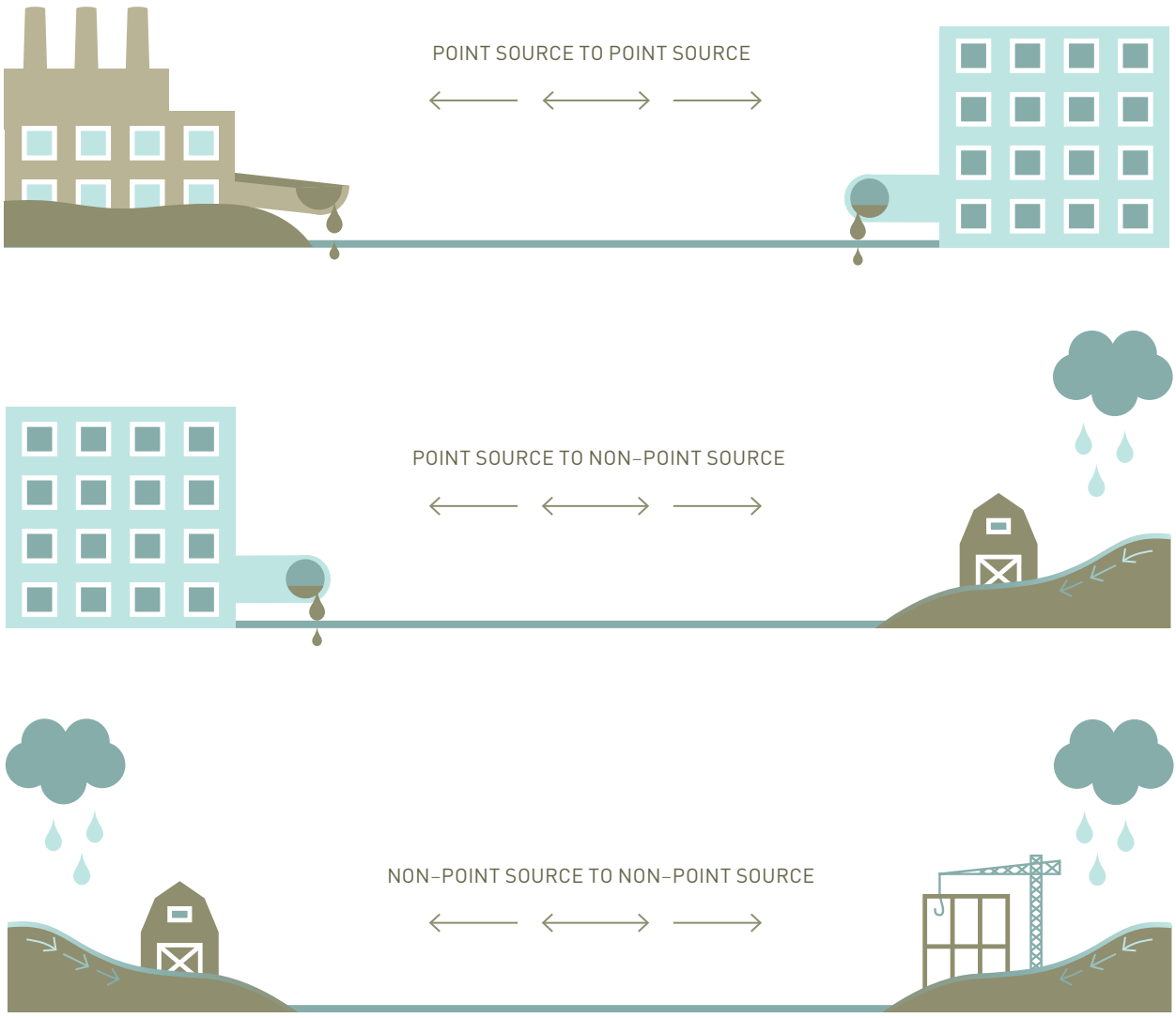
The EPA defines Point Source pollution as "any single identifiable source of pollution from which pollutants are discharged such as a pipe or ditch." Common point sources are wastewater treatment plants and factories. In the Beaver Creek Watershed there are two wastewater utilities that discharge directly to the creek at a specific location through a pipe.

NON–POINT SOURCE

Non–Point source pollution comes from diffuse sources and is primarily associated with stormwater runoff and has no readily identifiable source. Examples in the Beaver Creek Watershed include; runoff from agricultural areas, urban runoff from impervious surfaces such as roads, rooftops, and parking lots, and runoff from construction sites.

WATER POLLUTION SOURCES & TYPES

Water quality pollutant trading is identified using these two source definitions. This sets the stage for three potential trading markets:



The Ecological Credit Trading study in the Beaver Creek Watershed examines all three trading scenarios for viability.

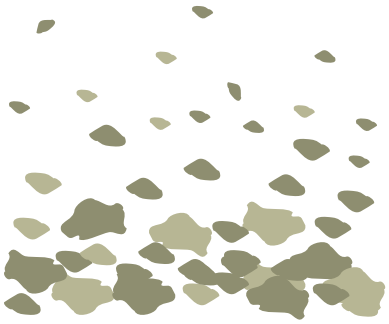
WATER POLLUTION SOURCES & TYPES

The EPA Credit Trading Policy recommends that the primary pollutants in a trading program be limited to nutrients and sediments. However, they do recognize that, under certain conditions and in specific locations, other pollutants such as thermal impacts and flow may be viable for trades. The Beaver Creek study looked at nutrients, sediments, and flow.

NUTRIENTS

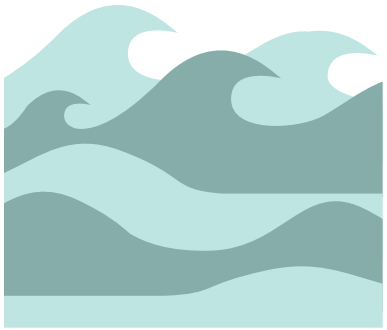
Nutrients traditionally found in trading programs include phosphorus and nitrogen. Excess levels of nutrients in waterbodies promote algal growth which leads to depleted levels of dissolved oxygen. Primary sources of nutrients include over fertilizing in both agricultural and residential settings and wastewater treatment plants. Nutrients can come from both point source and non–point source locations.

SEDIMENTS



Sediments are soils that enter waterbodies usually from non–point sources such as construction sites, barren lands, and poorly maintained pasture. Sediments can be classified as those that remain suspended in the water column and those that have particles large enough to settle to the bottom in slower moving water. The sediment type used in the Beaver Creek study is suspended sediment and is measured as the sum total of all suspended solids, thus Total Suspended Solids or TSS. Some nutrients such as nitrogen bond with the smaller suspended sediment particles and are carried downstream. Since most sediment comes from non–point sources the Beaver Creek study looked at a non–point source to non–point source trading scenario.

FLOW



Flow is another pollutant considered in the Beaver Creek study. In any given rain storm event a certain amount of runoff reaches creeks and rivers. This increases the flow rate in the waterbody. As flow increases so does the energy or force of the water as it flows downstream. At some point it reaches a maximum force which is called the peak flow. As impervious surfaces (roads, rooftops, driveways, parking lots) in a watershed increase the amount of runoff reaching the stream also increases. This additional amount of water increases the peak flow causing streambanks and stream bottoms to erode and contribute to sediment pollution. The Beaver Creek study looked at the feasibility of non–point source to non–point source flow trading.

PRIMARY REGULATORY DRIVERS FOR CREDIT TRADING

The EPA Credit Trading Policy only applies to watersheds that are under a Total Maximum Daily Load (TMDL) restriction or to satisfy the requirements of a National Pollutant Discharge Elimination System (NPDES) permit.

TOTAL MAXIMUM DAILY LOADS

Total Maximum Daily Loads set a "budget" for a watershed on pollutant sources to achieve the reductions necessary for an impaired stream to achieve water quality standards. For point sources this is achieved by setting numeric limits on specific pollutants. For example, a wastewater treatment plant may have a numeric limit on how much of a certain pollutant, such as phosphorus, it may discharge. This is called a Waste Load Allocation (WLA). Non–point sources are assigned a load allocation by category.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

National Pollutant Discharge Elimination System permits are required for both point source and non–point source polluters. Wastewater Utilities have NPDES permits which set limits on pollutants for their collection systems and treatment plants. In order to achieve these limits, these utilities must address problems with sewer overflows, leaking pipes, and treatment facilities. Non–point NPDES permits are issued to cities and counties and are commonly called Stormwater Permits. These permits address pollutants than are carried in stormwater runoff. The most common pollutant addressed in stormwater permits is sediment carried in stormwater runoff from construction sites.

WATER POLLUTION CREDIT TRADING BASICS

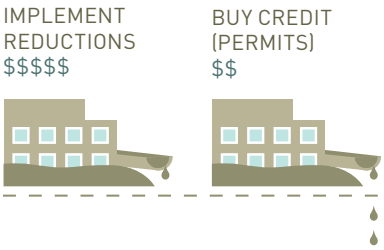
Water quality trading is similar to cap and trade in that an entity with a costly pollution reduction cost can buy equivalent pollution reductions from another source. It is market driven, can be cost effective, and operates within existing programs. The key point is that there has to be a "marketplace" for trades to take place. The "value" of a pollution credit is created by placing a limit on the total amount of pollution allowed.

COMPONENTS OF A TRADING PROGRAM

MARKET DRIVER

First there has to be a market driver. The driver is usually a regulatory requirement stemming from a TMDL. The commodity to be traded and a limiting area are set within these parameters. For example, the 86 square mile Beaver Creek Watershed is the limiting area. The commodity to be traded is sediment as reductions of this pollutant are required by a TMDL for the Lower Clinch Watershed which includes Beaver Creek.

COST DIFFERENTIAL

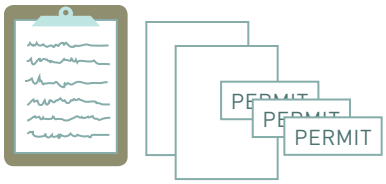


There must be a cost differential between what it would cost an entity to implement reductions on their own as opposed to buying credits. This differential must also be able to absorb transaction costs.

ABILITY

The ability to trade must be evident. It must be technical feasible and there must be an adequate supply of credits. In other words supply and demand must align.

OPPORTUNITY



Finally there must be an opportunity for the trades to take place. This means that the tools for trading must be in place. The Ecological Credit Trading Program in the Beaver Creek Watershed lays out the tools necessary for trading.

LIMITING FACTORS

In 2003 the EPA issued a policy statement to guide trading programs. This policy lays out elements common to all credible trading programs.

- All trading programs must be consistent with the Clean Water Act.
- There must be clear legal authority and mechanisms, i.e. legislation or rulemaking, for trading to take place. Trading can also be written in NPDES permits, TMDLs, or watershed plans.
- Clearly defined units of trade are necessary for trading to occur.
- Credits should be generated during the same period as they are used.
- Standardized protocols are necessary to quantify pollutant loads, load reductions, and credits. In the case of non–point trades uncertainty must be accounted for. This is usually accomplished by requiring a credit ratio of greater than 1:1.
- Compliance and enforcement provisions must be a part of the trading protocol. Compliance may include record keeping, reporting, monitoring, and inspection. Sources that buy credits are responsible for the permitted load reduction if the credits bought fail.
- Periodic assessments of environmental and economic effectiveness must be conducted. Trading cannot impair existing uses and cannot create “hotspots” where pollution is greater in a particular spot because of trading.

EXAMPLES OF BASIC CREDIT TRADES

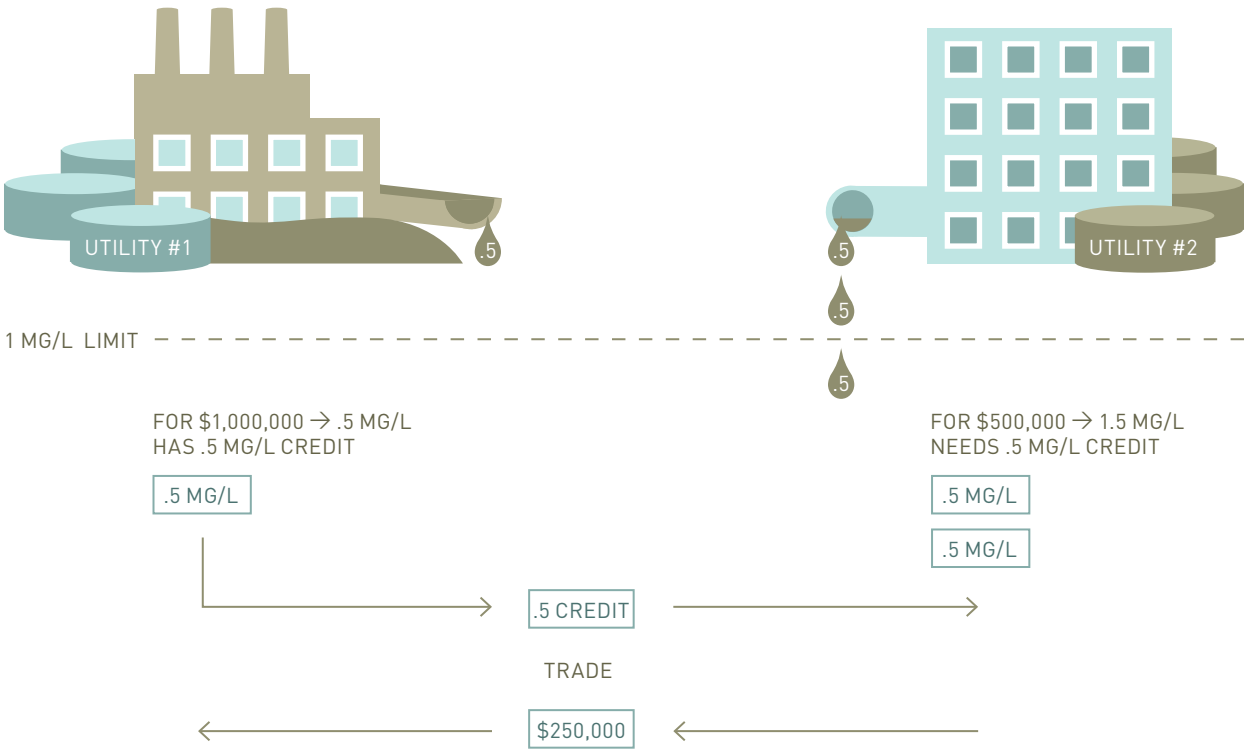
The following cases are not reflective of actual trades, but are simplified examples for informational purposes only.

POINT SOURCE TO POINT SOURCE

Wastewater treatment plants are an example of point source discharge as the treated water is discharged from a pipe into a waterbody. There are two utilities that have wastewater treatment plants that discharge into Beaver Creek.

Although Tennessee currently has set no limit on phosphorus discharge from these plants, it will set limits in the next few years. The treatment plants will then have to install technology to remove phosphorus during treatment to meet the limit. Suppose a limit has been set at 1 milligram per liter (1mg/l). Utility #1 installs technology in their treatment plant that removes phosphorus to the .5mg/l level at a cost of $1,000,000. Under a trading program that would give Utility #1 a credit of .5 mg/l. Utility #2 is smaller and cannot afford to install the same equipment. It can install technology to remove phosphorus to the 1.5mg/l level for $500,000. Utility #2 can buy the credit generated by Utility #1 at a cost of $250,000, for example, and the overall level of phosphorus removal will be at the limit set by the state of 1mg/l.

Both utilities save their ratepayers money and Utility #1 has the advantage of higher treatment levels already in place if the discharge limit is lowered in the future.



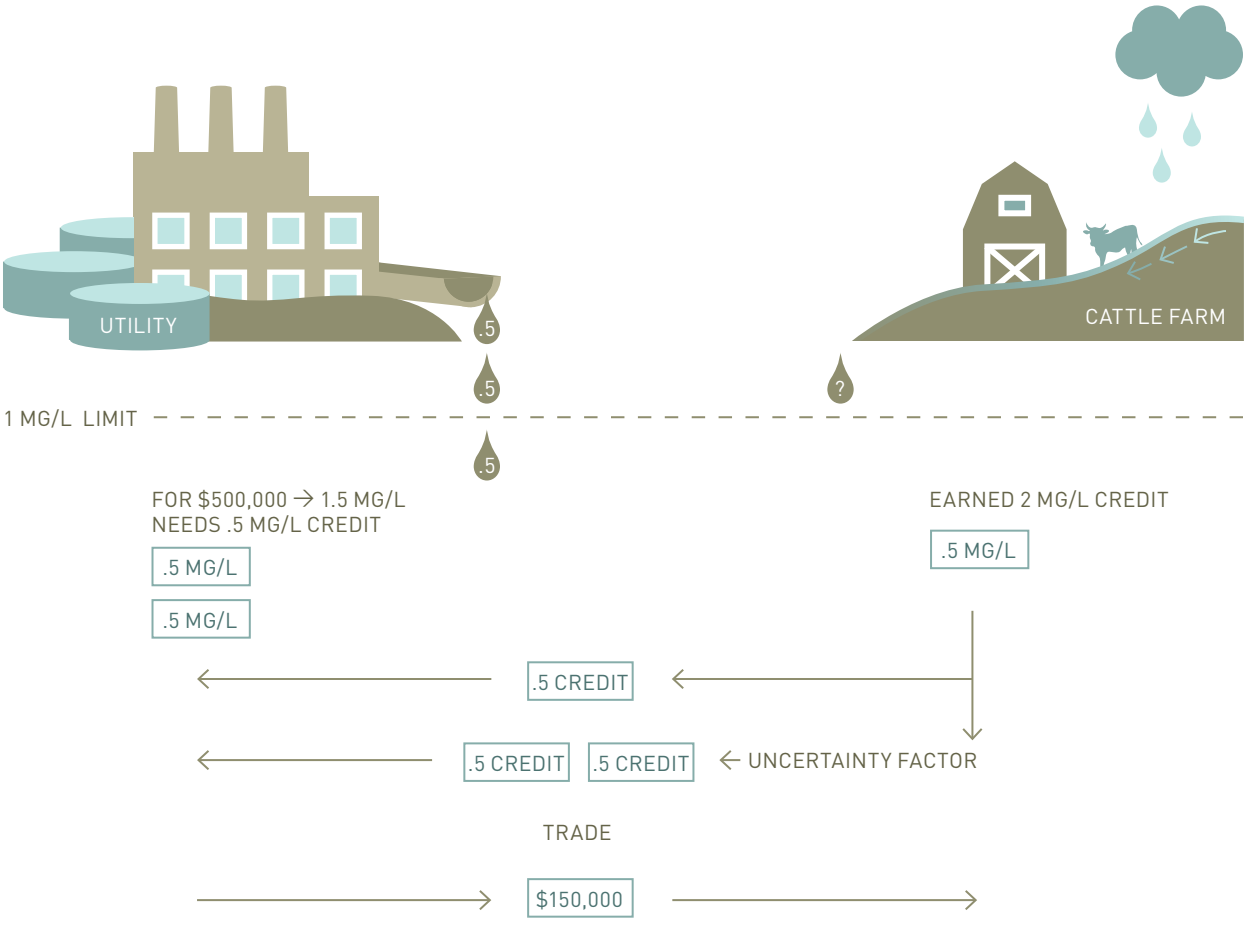
POINT SOURCE TO NON–POINT SOURCE

In this example we will use our wastewater treatment plant as our point source and a cattle farm as our non–point source. Once again we will use phosphorus as the pollutant to be traded and our reduction goal 1mg/l.

The cattle farmer has decided to upgrade his operation and has installed exclusion fencing to keep livestock out of the creek, a rotational grazing system, a heavy use area pad for winter feeding, and other practices that reduce his phosphorus contribution to Beaver Creek. According to the trading plan he has earned four phosphorus credits at .5mg/l.

The wastewater utility installs technology to reduce phosphorus in its treatment to 1.5mg/l for $500,000. In order to comply with the state standard of 1mg/l, the utility has to buy three credits from the farmer at $50,000 per credit. The reason the utility has to buy three credits is because of the uncertainty factor. There is no way to directly measure the amount of phosphorus reaching the creek in runoff from the farm. In order to assure that the utility is meeting the state standard it must buy 2 additional credits.

There are benefits to both parties. The utility saves by not having to buy very expensive treatment technology. The sale of the credits helps the farmer defray the cost of installing the best management practices. Additionally, the farmer has one credit left for sale.

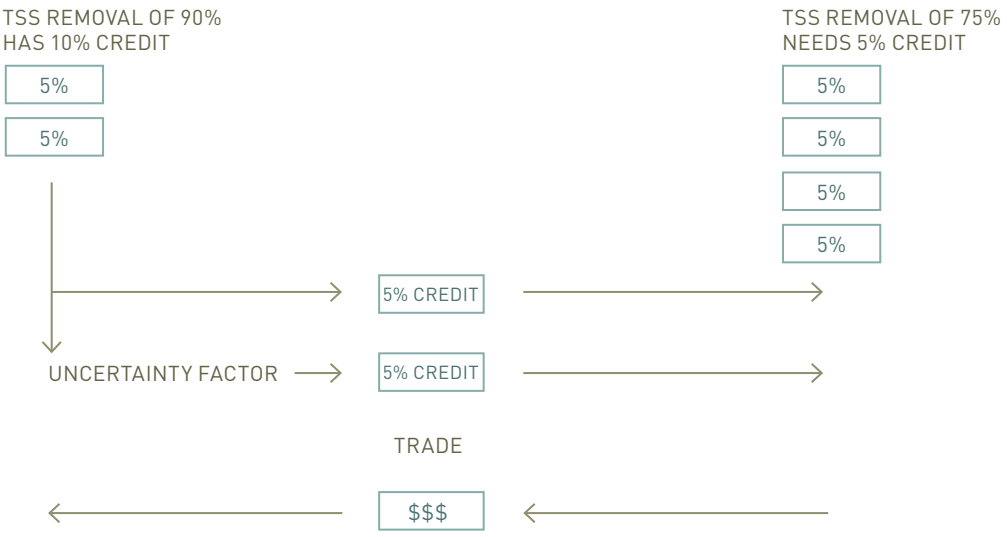


NON–POINT SOURCE TO NON–POINT SOURCE

For this example we will use two development companies, Company A and Company B, as non–point source contributors and sediment as the pollutant of concern. Each development company is building a subdivision in Beaver Creek. Each must comply with Knox County's stormwater regulation which calls for a post construction 80% TSS removal. What this means is that total suspended solid runoff after construction can be no more than 20% greater than pre–construction levels.

Company A has a very good site and is able to achieve a post construction TSS removal of 90%. Under a trading program this creates 2 credits. Company B has a much more difficult site to develop and determines that to achieve an 80% TSS removal if will have to use 2 lots for stormwater controls. This cuts into their profit margin. However, Company B can achieve a 75% TSS removal rate without the two additional lots. Company B buys Company A's two credits to achieve their 80% TSS removal requirement. Once again, they have to buy 2 credits instead of just 1 to account for the uncertainty factor.

Company A reduces the overall cost of their project by selling credits. Company B gets to build on the 2 additional lots, thus increasing its profit.



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To read the full report, please click on the link below:
Ecological Credit Trading Pilot Study for the Beaver Creek Watershed

Click Here

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