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# Case studies on Remuneration of Positive Externalities (RPE)/ Payments for Environmental Services (PES)

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*This payment for environmental services (PES) project incentivizes corn and soybean farmers to implement conservation practices that return water to nature.*

*The PES scheme initiated by Coca-Cola and partners offers a solid framework for a new solution to an old problem. Instead of subsidizing farmers by the acre (without knowing the environmental benefit) farmers are subsidized by actual outcomes, allowing for program choices when appropriate.*

*The Paw Paw River Watershed project illustrates that such a concept must build on substantial groundwork completed by local actors.*

## Ensuring groundwater recharge in a sensitive Michigan watershed through PES

### Overview

The Paw Paw River Watershed has suffered from a 50 percent loss of wetlands since the 1800s and a loss of the functions those wetlands once provided. Threats include surface runoff with excessive loads of sediment and nutrients from agricultural lands and overdrawing of the aquifer for irrigation. Traditional conservation programs offered by the USDA via the U.S. Farm Bill have experienced challenges in this region due to slow adoption rates, low reimbursement payments, long waits for reimbursement and rigid rules, regulations and paperwork requirements.

TNC partnered with the local agricultural conservation district in Van Buren County (VBCD) to connect with farmers in priority locations to encourage implementation of buffer strips and reduced tillage practices and no-till. In 2012, Coca-Cola enabled the project team to test a new aspect of incentivizing farmers: PES. The VBCD technician offered farmers a per-gallon incentive payment for the amount of groundwater recharge increase predicted to occur from implementation of conservation practices. Rather than setting a goal of new BMP acres implemented under the program each year, the VBCD was responsible for implementing new practices that would collectively add 100 million gallons (378.5 million liters) of increased groundwater recharge to the Paw Paw River over a three-year period. By paying per gallon, farmers had an incentive to implement the most beneficial practices and the VBCD had an incentive to target farmers whose lands would produce the greatest groundwater recharge benefits in order to project goals.

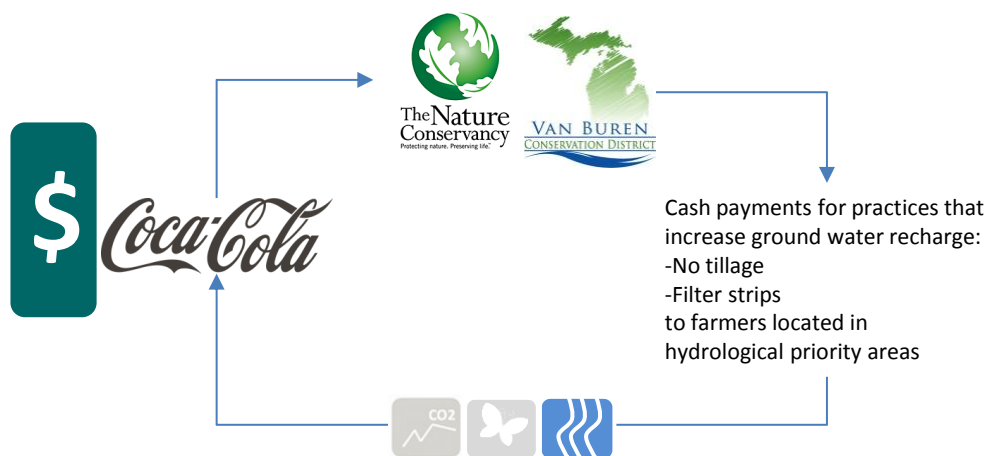


Figure 1: Schematic diagram of the key roles

## Background

The Coca-Cola Company has a goal to 'give back' an amount of water equivalent to what it uses in all of its products and their production by 2020. To achieve its water stewardship goal, the company is focusing efforts to improve its water-use efficiency; treat all wastewater from its manufacturing operations and return it to nature at standards that support aquatic life; and replenish water in communities and nature through the support of healthy watersheds and community water programs.

Since 2005, Coca-Cola has engaged in 468 projects with partners such as [WWF](#), [USAID](#), [The Nature Conservancy](#), [Water for People](#), [UN-HABITAT](#), and the [United Nations Development Programme \(UNDP\)](#). These projects include watershed protection, community water access, rainwater harvesting, reforestation and agricultural water use efficiency. Between 2005 and the end of 2012, Coca-Cola balanced 52 percent of the water used in its finished.

In 2008, Coca-Cola contacted TNC to develop a water offset pilot project in the Paw Paw River watershed. Coca-Cola's bottling plant located close to the Paw Paw River uses groundwater as its source water. Naturally functioning flow patterns for the river, high water quality surface and groundwater resources are paramount to ensure water protection for the plant and the community. Watershed protection is vital to Coca-Cola source water protection efforts.

In 2009, The Coca-Cola Company and WWF identified intensive corn production across Coca-Cola's supply chain as a sustainability risk. Coca-Cola is working to improve BMPs with its suppliers. The collaboration with TNC and the VBCD on corn sustainability in the Paw Paw River Watershed is an example of how industry suppliers may encourage BMPs in their sourcing regions. The initiative is being implemented across 2,000 acres of cropland to reduce soil loss, increase groundwater recharge, and build soil organic matter to create more fertile fields and sequester carbon.

To compare these practices with traditional farming, the Coca-Cola/WWF Global Partnership to conserve freshwater resources has funded VBCD to use the Field to Market Fieldprint Calculator, a free online tool for growers to voluntarily and securely analyze how their management choices impact natural resources and operational efficiency. The VBCD has run more than 50 farmers through the Fieldprint Calculator. Participating farmers were rewarded by paying only half of the rental rate for the John Deere 1750 no-till corn planter that Coca-Cola donated to TNC (figure 2).



Figure 2. No-till planter demonstration by VBCD staff

## Improving ES provision in corn and soybean farms

Working with the local conservation district and Michigan State University (MSU), The Nature Conservancy (TNC) was able to identify farmland areas that are prime for groundwater recharge in the Paw Paw River Watershed of southwest Michigan (figure 3). It then used this metric as a basis for the Coca-Cola-funded PES program.

In the initial years of the project, TNC scientists worked with MSU to identify the key areas of farmland where agricultural best management practices (BMPs) would provide the most benefit to groundwater recharge, examining groundwater recharge change potential, groundwater withdrawal susceptibility and high risk erosion areas (Legge et al. 2013). The results were combined to provide two related tools:

- A map identifying locations where implementation of BMPs provide the greatest improvement in water quality and quantity (figure 3); and
- An Online Groundwater Recharge Calculator, a tool which uses models to predict what amount of improved groundwater flow, in gallons, will occur from the implementation of a BMP on a specific plot of land.

The Groundwater Recharge Calculator supplies recharge estimates for specific farm fields in the watershed based on the impact of various conservation efforts. Specifically, the calculator allows users to select a specific farm field within the watershed and specify a land cover change or BMP that will be implemented, such as buffer strips, cover crops, or no-till farming. The calculator then estimates a subsequent decrease in annual runoff to nearby streams and then runs calculations to determine what portion of that runoff is not evapotranspired and instead infiltrates to groundwater. The tool is available free to the public online and has not been made proprietary.

Local corn and soybean farmers are the providers and sellers of groundwater recharge in the Paw Paw River Watershed. In the early 1800s, much of the forested land was cleared and wetlands were drained to allow for agricultural communities to grow and thrive. This land conversion quickly reduced the rate of groundwater recharge in the watershed. Many traditional farming practices in the region encourage surface water runoff and drainage as quickly as possible to avoid water ponding or flooding areas of the farm field.

The goal of the groundwater recharge program is to encourage farmers to adopt conservation management practices in their farming system that help build the soil structure and increase the rate of groundwater recharge by decreasing the amount of surface water runoff. The practices that are eligible under this program are no-till, reduced tillage, and filter strips. Farmers are only paid by the number of gallons of recharge that each practice returns to nature. The subsidy rates are \$0.00025/gallon for tillage practices and \$0.0010/gallon for filter strips.

Farmers are required to fund the implementation of the practice themselves in accordance with NRCS standards, sign and comply with the requirements of a three-year contract and cooperate with the annual verification process conducted by the VBCD.



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## Targeting corn and soybean farms to maximize hydrological impact

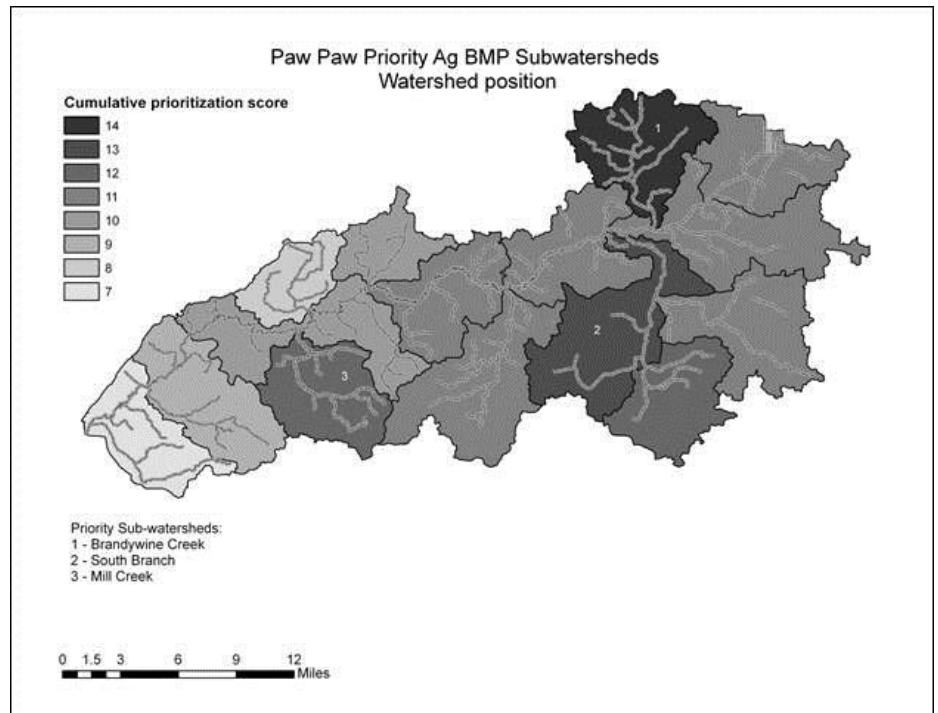
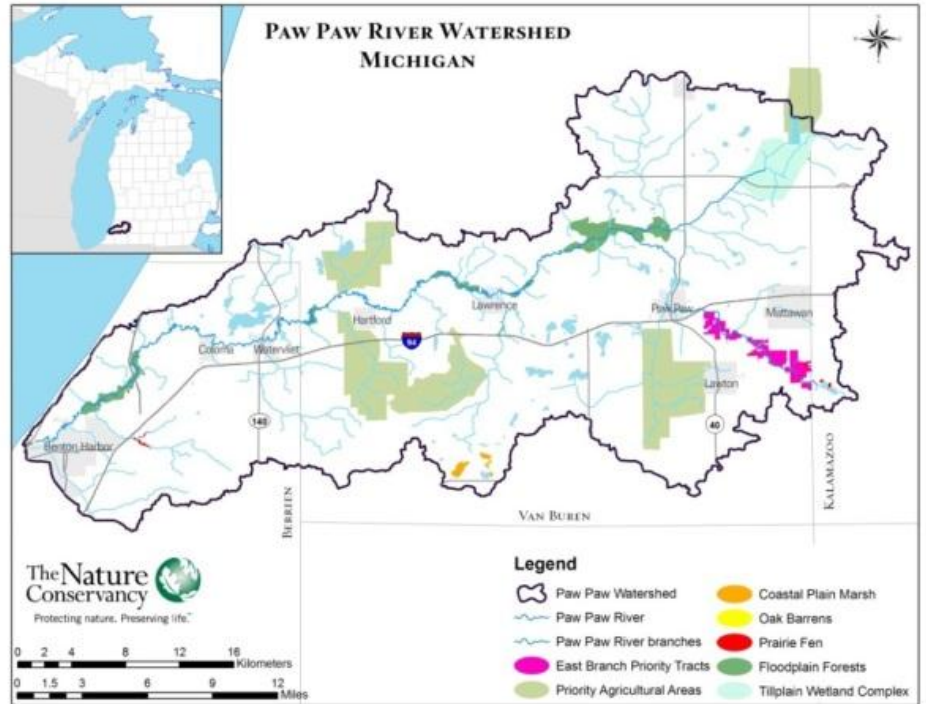


Figure 3. (above) Priority areas for groundwater recharge in the Paw Paw watershed

Figure 4. (below) Potential for improvement in water quality and quantity by adopting BMP package

## Improving ES provision in corn and soybean farms

The PES scheme used in this project is ultimately driven by Coca-Cola's Groundwater Replenishment Goals for the Paw Paw River Watershed. Coca-Cola works directly with TNC to set overarching program goals and yearly funding levels to meet project objectives. TNC then translates these goals into a specific work plan, develops models or tools to address new challenges and contracts with the VBCD to collaborate directly with local farmers. VBCD works to achieve project goals by convincing farmers to implement eligible BMPs and sign three-year contracts. Ultimately, VBCD holds the responsibility to enforce contract requirements and make payments to landowners (see Figure 5).

While many environmental benefits may result from the implementation of agricultural conservation practices, the focus of this project is **groundwater recharge**, measured in gallons, with the help of an online tool that was developed by MSU (see <http://35.9.116.206/tnc/map.asp>). The online mapping tool gives an aerial view of the Paw Paw River Watershed and requires the user (in this case the VBCD technician) to draw a boundary around a specific field where the practice will be implemented. The user would then indicate the *current* land use or land cover and the *proposed* land use or land cover. The Groundwater Recharge Calculator would then run calculations based on land use/cover changes from the Soil and Water Assessment (SWAT) Model and display the increase or decrease in groundwater recharge resulting from the proposed changes.

The contract agreement for this project is a two-page document developed by the VBCD. The document requires the farmer to commit to the agreed-upon practice for the obligated time period and requires that the landowner NOT receive other cost share money from other programs on those fields enrolled in the program. When working with farmers who intend to enroll into the program but do not own the land, VBCD requires them to inform the actual landowner about this program and obtain approval for renting the land for the obligated time period. Otherwise they may risk losing the subsidy payments.

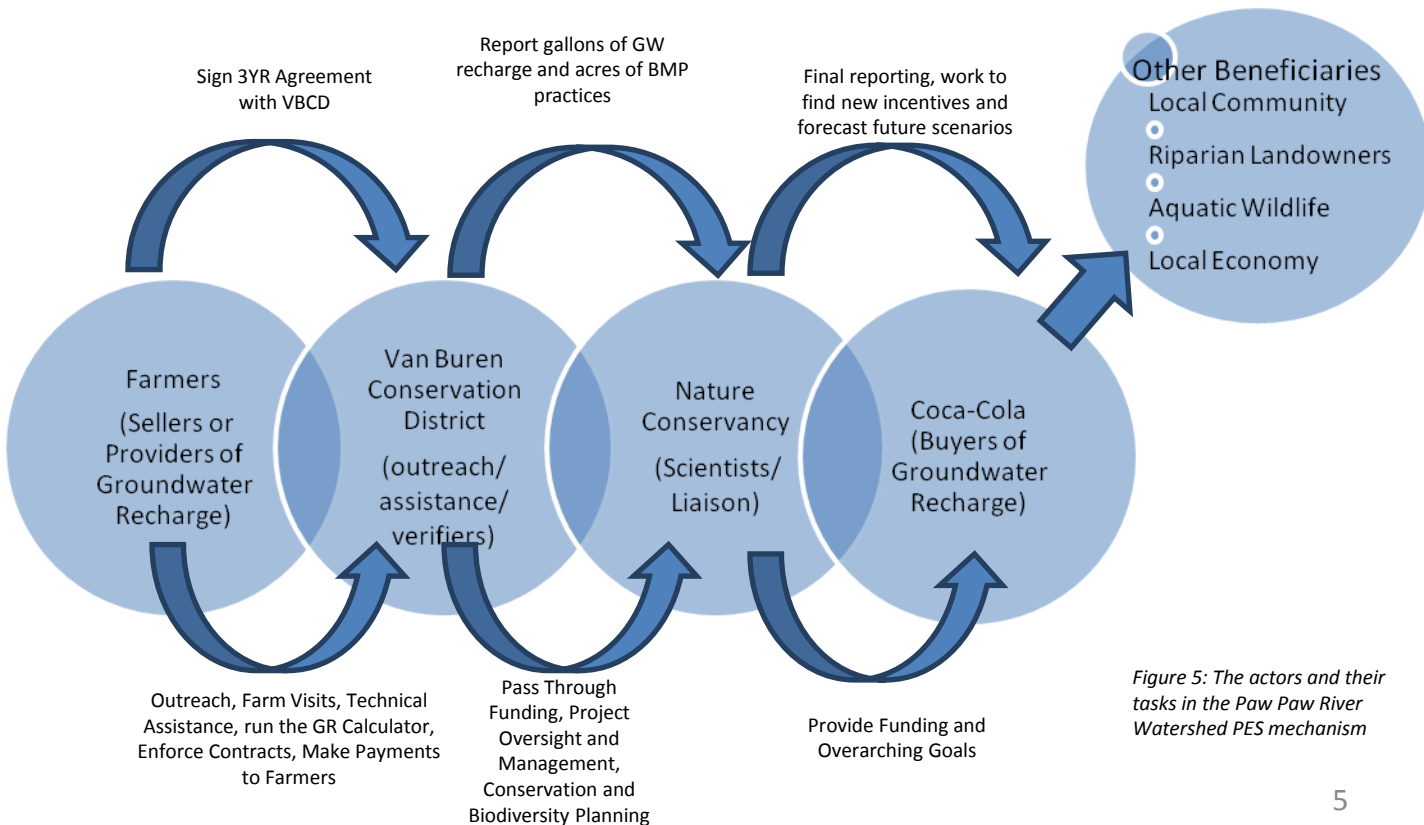


Figure 5: The actors and their tasks in the Paw Paw River Watershed PES mechanism

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Public-Private

*The Nature Conservancy – Project management, facilitator and biodiversity targeting*

*Van Buren Conservation District – Outreach and technical assistance to local farmers*

*Farmers – Landowners and implementation of on-the-ground best management practices*

*Michigan State University – Watershed modeling and developing of groundwater recharge calculator*

*World Wildlife Fund (WWF) – Funding Field printing with Coca-Cola/WWF Global Partnership funds*

*Coca-Cola – Funding for payment to farmers, TNC/VBCD outreach, and no-till drill rig.*

*BUDGET: Coca-Cola has provided \$240,000 to date (2002-2013)*

## Main operators and their roles

### **The buyer of improved groundwater recharge**

Coca-Cola Refreshments (CCR), the largest bottler in North America, operates the Minute Maid bottling plant in the Paw Paw River Watershed. The Coca-Cola Company is pursuing a goal of water neutrality in its global operations, defined as mitigating potential impacts of its use of water in production through on-site water conservation and support of off-site watershed improvements. The Coca-Cola Foundation and Coca-Cola North America have provided support for targeted outreach, recruiting priority landowners for PES. Coca-Cola has provided the major source of funding that has supported the project in its entirety and the only source of funding (\$41,600) that goes directly to subsidizing farmers for implementing conservation practices in the Paw Paw River Watershed.

**TNC and the VBCD play an important role in facilitating cooperation and providing technical assistance.** This ensures that the PES scheme continues to function and meet its annual goals. Many of the specific duties of these institutions are described in the first paragraph. Overall, TNC is essential for bringing scientific credibility to the project and a continued focus on achieving ecological outcomes that are detectable within the Paw Paw River Watershed. TNC's major focus in its agricultural strategy is determining how much conservation is enough to achieve ecological outcomes and providing the scientific basis to understand the scope of these answers before investments are incorrectly targeted.

**The project between TNC and VBCD has sparked another opportunity for the VBCD to work with other agencies that have similar goals.** The Southwest Michigan Planning Commission approached the VBCD with a grant project to reduce the amount of sediment from eroding off of farm land into water bodies. This Sediment Reduction Grant is similar to the Groundwater Recharge Program in that there are incentive monies for landowners to implement conservation practices on their land. A similar calculator, the Sediment Calculator (which was also developed by MSU for the VBCD's specific project, <http://www.iwr.msu.edu/sedcalc/>), was developed to identify fields that are most susceptible to sediment erosion. The VBCD uses this calculator to rate fields based on their loading rates, which helps determine which growers should be enrolled in contracts.

The VBCD uses the Fieldprint Calculator as an initial step to familiarize themselves with the farmers and their current land management. The other main use for this tool is to run the farmer's current practice scenarios against practices that are considered more sustainable to show the savings in energy use, sediment loss, organic matter loss, as well as irrigation use, if applicable. This tool is the "conversation starter" used to determine which program would best suit the inquiring farmer. Between the three calculators being used by the VBCD, there is a better understanding of the types of management of the crops grown, how farmers respond to different fields, philosophies of farming styles and which areas are the hot spots that need conservation practices implemented. They are the tools that have advanced the VBCD in their abilities to assess farm land and give solutions to farmers willing to work with them. The VBCD is essential in its ability to communicate with local farmers, build trusting relationships, provide technical assistance and enforce these agreements over the life of the contract.

### **Achievements**

To date, the project has exceeded the initial goal of achieving 100 MG of groundwater recharge over a three-year period by contracting with just seven farmers who adopted conservation practices (e.g., no-till, reduced till, filter strip practices) on approximately 776 acres of land. Although Coca-Cola is the only buyer of groundwater recharge as an ecosystem service, there are many beneficiaries including members of the local community, other farmers who are depending on groundwater for irrigation, riparian landowners, tourists, the local economy and the aquatic habitat. The building of soil organic matter for improved soil conservation, farm productivity and potential carbon impact mitigation are also benefits of no-till.

## Challenges and Opportunities



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The Paw Paw River Watershed PES project has shown tremendous promise. The online tool, developed by MSU, was so successful that it led to the development of a second online tool, the Sediment Calculator. These tools are now being adapted for use in the Saginaw Bay Watershed, the largest in Michigan. Commercialization of these tools would be useful to reduce monitoring, reporting and verification costs substantially, but currently they are being employed on a small scale.

A major complicating factor of the project was farm ownership of the land. The VBCD found that some interested farmers, who only rented their land, didn't have the flexibility to enter into the program because many lease agreements are made on a year-to-year basis. Therefore, they could not enter into the mandatory three-year contract. Conversely, some landowners may also have been interested in participating in the program but the VBCD found that some tenants strongly discouraged participation because they were not interested in participating or didn't have the proper equipment. In addition, when verifying some contracts the VBCD found that weather and unpredictable situations can cause unexpected breaches of contract.



Ownership

The PES program, as currently being conducted under this project, is not regulated by Michigan and/or governed by any policies of Michigan. While local governmental funding from the state for this PES scheme is absent, private funding allows TNC to target areas to generate strong environmental outcomes. Due to the private source of funds, the project partners were able to determine the project guidelines, subsidy rates and terms of contract. The conservation practices are implemented in accordance with U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) guidelines. The land enrolled in the program goes through an annual verification process conducted by the VBCD's technicians.

The project builds upon the strong positive relationship that TNC and VBCD have created with farmers as well as their expertise in conservation practices. Moreover, it benefits from the strong scientific and technological expertise of MSU in groundwater modeling and the building field calculators. However, the system could benefit by a stronger partnership from the Michigan NRCS. Currently, the NRCS does not allow these farmers to enter into traditional conservation programs once they enter into the PES system. The NRCS could learn from this project as a better way to target funding toward outcome based strategies. Also, stronger collaboration between entities may mean that practices remain on the ground longer and that groundwater recharge and other ecosystem benefits occur longer as well.

**Finally, long-term sustainability is the ultimate goal. Once Coca-Cola purchases groundwater recharge services, they want to be confident that the investment will bring long-term benefits.** In this case, farmers are only obligated to implement the practices for three years assuming that they will continue with these practices in view of the expected payoff in sustaining yields resulting from better soils with less management inputs of time and energy. This assumption cannot be taken for granted once farmers stop receiving subsidies or don't get help purchasing or converting to new tillage equipment. Continued assistance from VBCD may help prevent this situation. NRCS has based their cost share models off of those from NRCS's program. Federal funding is available for growers, but there is usually a long waiting list as well as a point system for enrollment approval. VBCD partnership with TNC and Coca-Cola provides a more flexible alternative to NRCS's program. In addition to VBCD programs, growers are directed toward numerous USDA NRCS BMP programs.

### References

Legge et al. 2013. *From model outputs to conservation action: prioritizing locations for implementing agricultural best management practices in a Midwestern watershed. Journal of Soil and Water Conservation Vol. 68, No. 1*

*Coca-Cola Replenish Report 2011*

*Coca-Cola Replenish Report 2012*

*TNC, Quantifying Replenish Benefits in Community Water Partnership Projects, Report to Coca-Cola 2012*

[www.fielddtomarket.org](http://www.fielddtomarket.org)

## Future Outlook

### INNOVATIVE ASPECTS

This project is innovative because the project team has managed to execute a water conservation strategy on prime, productive agricultural land in an ecologically significant watershed by developing a framework that is non-threatening and voluntary for farmers. The crux of the strategy was to first rely on scientific data to identify those areas of the Paw Paw River Watershed that would have the highest groundwater recharge potential. TNC and MSU staff completed analyses described in Legge et al. 2013 that mapped these important by combining models for three factors: groundwater recharge change potential, groundwater withdrawal susceptibility, and high risk erosion areas. The outputs were combined to determine field-scale priorities. TNC then factored in local conditions to identify priority subwatersheds for implementation using placement within the watershed, conservation priority and connectivity to the Paw Paw River, (Legge et al 2013). The outcome of this process was shown on the map in the introduction. Farmers located in the priority areas are paid a per gallon premium for any recharge benefits from practices that are implemented on their farms although the program is available to any farmer in the watershed.

### OUTLOOK

The outreach portion of this project is near completion with almost the entire farmer subsidy funding having been allocated. If all pending contracts are executed, there will be 170,037,254 gallons of water recharged to the aquifer, which is on track and likely will surpass the recharge goal by over 70 million gallons. There are hopeful stories with this program; three of the 10 landowners in the program have purchased their own no-till planter. There has been indication that more landowners hope to purchase their own planters in upcoming years, meaning long-term recharge from these landowners.

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