

**E. Kneale Dockstader Foundation  
2019 Grant Final Report - Submitted June 17, 2020**

**General Information**

Organization Name: White Clay Watershed Association (WCWA)

Project Title: Community Green Stormwater Infrastructure (GSI) Projects for White Clay Creek

Grant Amount: \$7500

Geographical Area Serviced: West Grove Borough, Southern Chester County, PA

Grant Period: July 1, 2019 – June 30, 2020

**Program Implementation & Impact**

The White Clay watershed is 107 square miles and includes parts of Chester County, Pennsylvania and New Castle County, Delaware. Unlike most National Wild and Scenic Rivers which are federally owned and managed, the White Clay Creek is a Partnership River where most of the land is privately owned and locally managed. Therefore, the White Clay Watershed Association (WCWA) must work cooperatively with watershed municipalities and private land owners to implement the watershed management plan. In 2016, the Dockstader Foundation supported a new program spearheaded by the Brandywine Conservancy and the White Clay Watershed Association called Catch the Rain. The Catch the Rain program educates, encourages, and provides monetary incentives for voluntary implementation of green stormwater practices such as rain gardens and tree plantings. In 2019, we applied for additional funding to specifically help a local municipality, West Grove borough, develop a green stormwater infrastructure plan for the entire borough, and implement a Catch the Rain demonstration project in a public space. The implemented project will assist the municipality with attaining water quality standards mandated by the states through their Total Maximum Daily Load (TMDL) permits while also serving as a public demonstration practice for the Catch the Rain program.

The Rutgers Cooperative Extension Water Resources Program (RCE – WRP) was contracted to conduct the engineering and design work for the Borough study. The Rutgers Program was chosen because of its long term (established in 2002) and active involvement working with New Jersey municipalities to identify opportunities to reduce the impacts of stormwater runoff. It is an award-winning statewide program dedicated to solving New Jersey's water resources issues. A long-term goal of the West Grove pilot, is to help in-state organizations establish similar water resource programs which currently do not exist in the state of Pennsylvania.

In partnership with West Grove and the White Clay Watershed Association, the Rutgers Program prepared an impervious cover assessment and green infrastructure study for the borough of West Grove. The plan identifies opportunities to reduce the impacts of stormwater runoff using green infrastructure practices. The plan specifically identified fourteen green infrastructure opportunities in the Borough including conceptual drawings for all fourteen projects. After further conversation the Rutgers team prepared engineering designs for three of the fourteen identified projects, one of which was selected for implementation, a rain garden located in front of the Avon Grove Library/West Grove Municipal Building. All work

conducted by the Rutgers team was closely coordinated with the Borough of West Grove and the White Clay Watershed Association. The project was completed in June 2020.

The following activities were undertaken during the grant period:

1. Preparation of green infrastructure feasibility plans for the Borough of West Grove.
2. Implementation of one demonstration project, the Avon Grove Library rain garden.
3. One public outreach event on March 4, 2020.
4. Water quality monitoring at a location exiting the borough to follow long term trends in water quality and quantity during the grant period.

This report summarizes the steps taken above including lessons learned and predictions of the future impact of the project.

### 1. Green Infrastructure Feasibility Plans (Attachment A)

During the study process, projects were identified in both subwatersheds contained in the borough. Initially, aerial imagery was used to identify potential project sites that contain extensive impervious cover. Field visits were conducted to determine if these were viable options. During the site visits, appropriate green infrastructure practices for each potential site were determined. Fourteen locations were identified throughout this process. Conceptual plans for each identified location are included in the report, and engineering designs for three committee selected locations were also included in the final report. The plans provide a blueprint (or action plan) for the municipality to implement all 14 practices throughout the borough over time. Two of the projects are shovel ready. Rutgers also provide the borough with a 'greening' master plan for the town square.

### 2. Project Implementation (Photos – Attachment B)

During the plan review one site was selected to be used as a Catch the Rain demonstration practice. The project selected was an approximately 800 square foot rain garden installed at the front entrance of the municipal building which also houses the Avon Grove Library. The garden collects rain water previously piped to the storm sewer system from approximately 1300 square feet of impervious cover collected from the roof of the municipal building. The project was constructed over a two-week period with in-kind assistance from the West Grove Public Works Department under the direction of the Rutgers team. The garden was planted on June 1, 2020. This garden will serve as a rain garden model to borough residents, public works and municipal staff, and library patrons. Furthermore, the Avon Grove library is a prime location for future Catch the Rain workshops which will now have a demonstration rain garden on site.

### 3. Public Outreach (Presentation – Attachment C)

On March 4, 2020 the Rutgers team gave a presentation at the West Grove Borough Council meeting. Ideally, a Catch the Rain program workshop in conjunction with the project

implementation would have occurred, however; due to the COVID-19 restrictions in place this workshop had to be postponed. A workshop is currently being planned for the fall (2020) on the project process, construction, and maintenance with the focus audience of municipal staff and public works departments throughout the larger Brandywine-Christina watershed.

#### 4. Water Quality Monitoring Baseline Data (Attachment D)

A remote water quality sensor was placed at the corner of Welcome and Rosehill roads in an unnamed tributary to the East Branch of White Clay Creek exiting the borough near its southeast corner. The sensor was installed in August of 2019 and takes continuous readings of conductivity, water temperature, and water depth. An intern from the University of Delaware takes monthly water samples to be analyzed at the Brandywine Science Center for Orthophosphate (OP), Nitrate (NO<sub>3</sub>N), Total Suspended Solids (TSS), and Chloride (CL). While we don't expect to see results from the implementation of one rain garden upstream from this location, we do hope to see positive trends over time as more projects are implemented throughout the borough. This initial monitoring data (2019-2020) will provide us with baseline information to measure future progress against.

**Beneficiaries:** White Clay Creek watershed, West Grove Borough

**Financials:** (See Budget -Attachment E, and Invoices Attachment F)

The E. K. Dockstader Foundation's \$7500 grant award funded part of the contractual work provided by the Rutgers Water Resources Team. The total contracted amount was \$10500 (see attached invoice). The White Clay Watershed Association provided the additional \$3000 to cover these expenses, plus the costs of the plants and water quality monitoring. West Grove Borough provide \$3500 towards other required construction materials, soil disposal fees, asphalt removal, mulch, bioretention mix, piping, rock, and other miscellaneous supplies). The project was also supported by approximately 300 hours of in-kind service from the following organizations: White Clay Watershed Association, Brandywine Conservancy, West Grove Borough staff, and Chester County Conservation District.

#### **Attachments:**

Attachment A: West Grove Impervious Cover Assessment and Reduction Plans

Attachment B: Photos from the West Grove Rain Garden Implementation Project

Attachment C: Public Outreach

Attachment D: Water Quality Monitoring Baseline Data

Attachment E: Budget

Attachment F: WCWA Invoices

**Attachment A: West Grove Impervious Cover Assessment and Reduction Plans.**

Due to the size of these documents I am attaching live links to all the plans on our website:

[Green Infrastructure Feasibility Study](#)

[Avon Grove Library Plan](#)

[Harmony Park Proposal](#)

[Ruffini Barber Shop Proposal](#)

[West Grove Town Square Master Plan](#)

[West Grove Borough Master Plan](#)

Link to project page on website: <http://whiteclay.org/west-grove-gsi-study-and-rain-garden>

**Attachment B: West Grove Borough Hall/Avon Grove Library Rain Garden Photos**





## **Attachment C: Public Outreach**

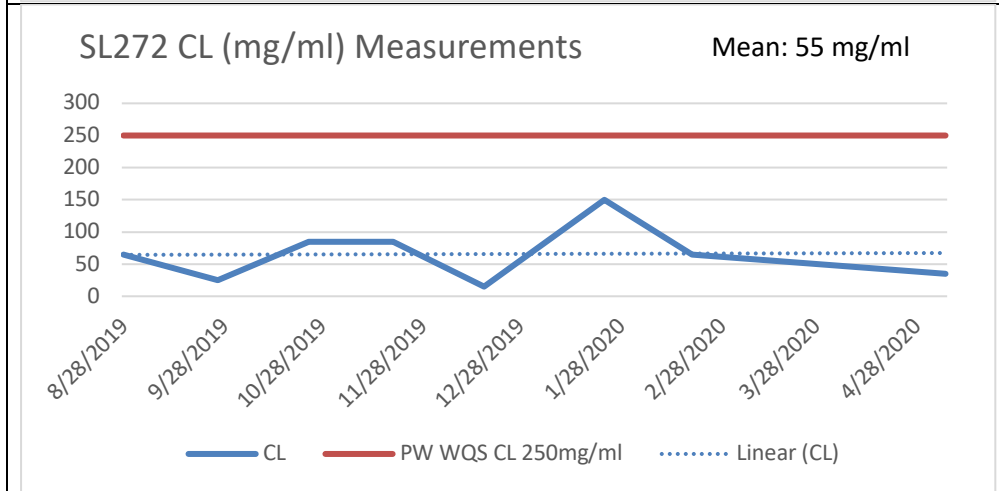
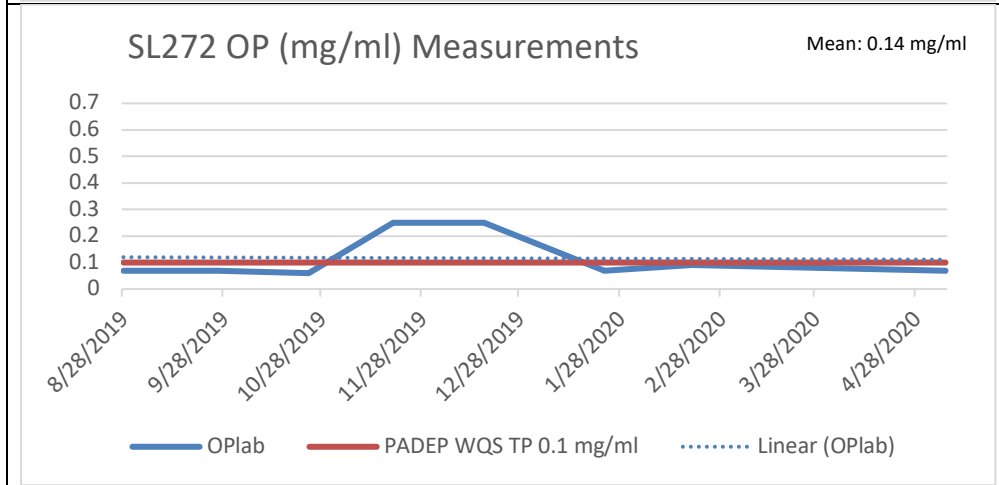
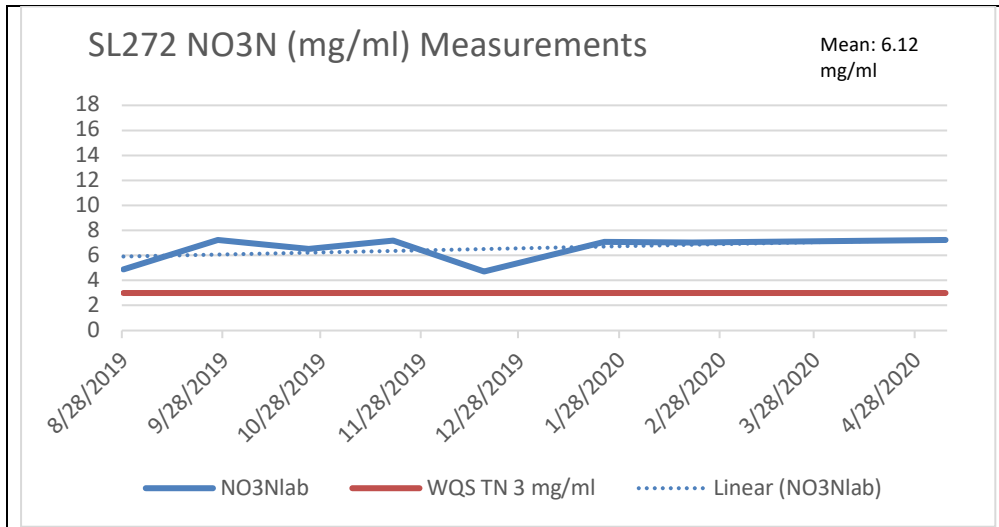
Due to the size of this attachment I am attaching a live link to the presentation provided by Rutgers at the West Grove Borough Council Meeting on March 4, 2020:

[GSI Presentation to Borough Council March 4, 2020](#)

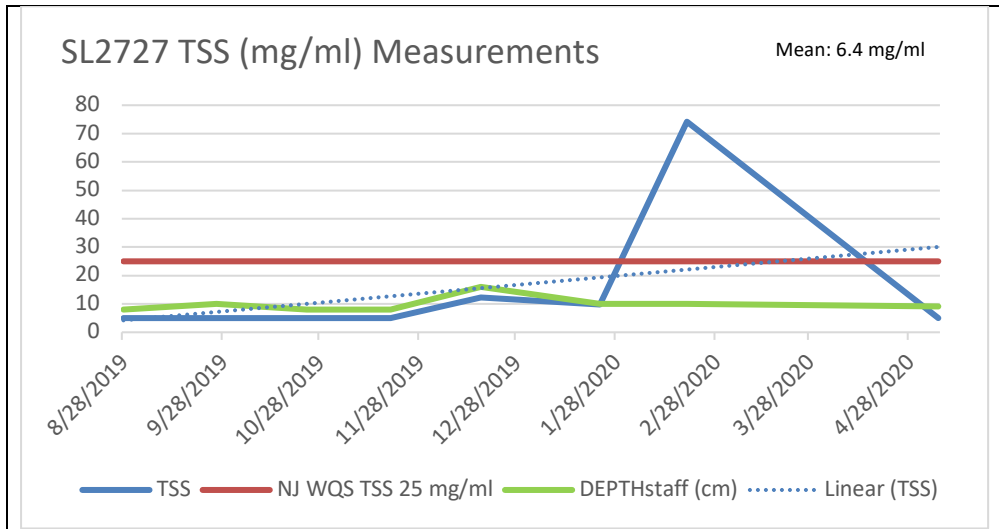
Link to project outreach page on website:

<http://whiteclay.org/west-grove-gsi-study-and-rain-garden>

**Attachment D: Water Quality Monitoring Baseline Data (August 2019 – May 2020)**

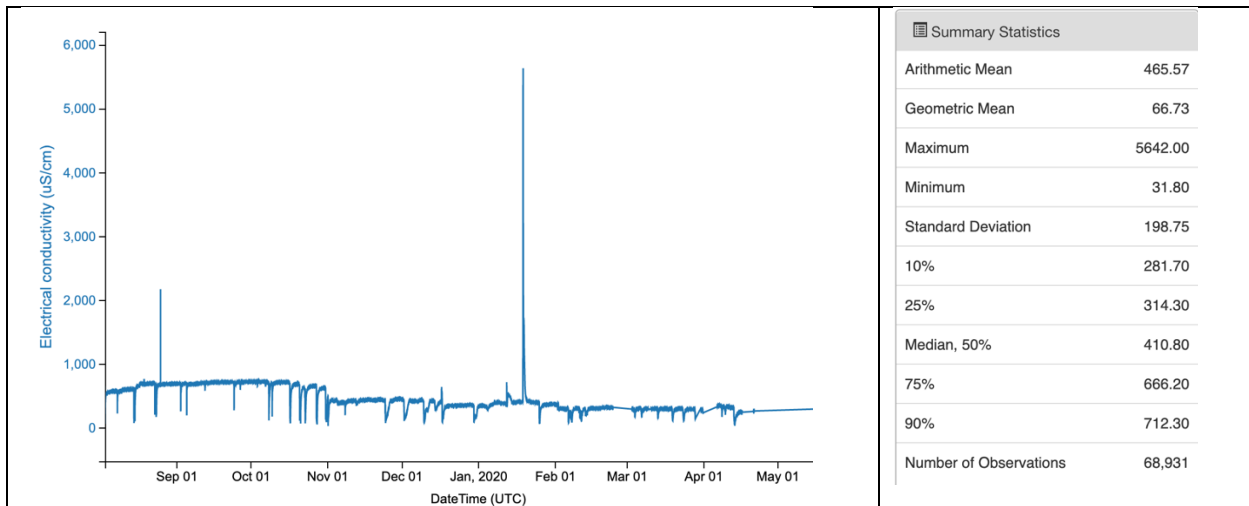


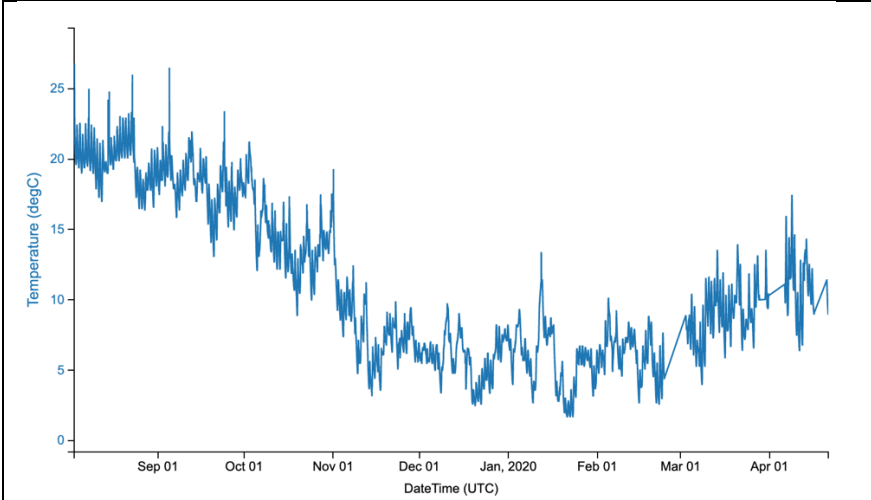




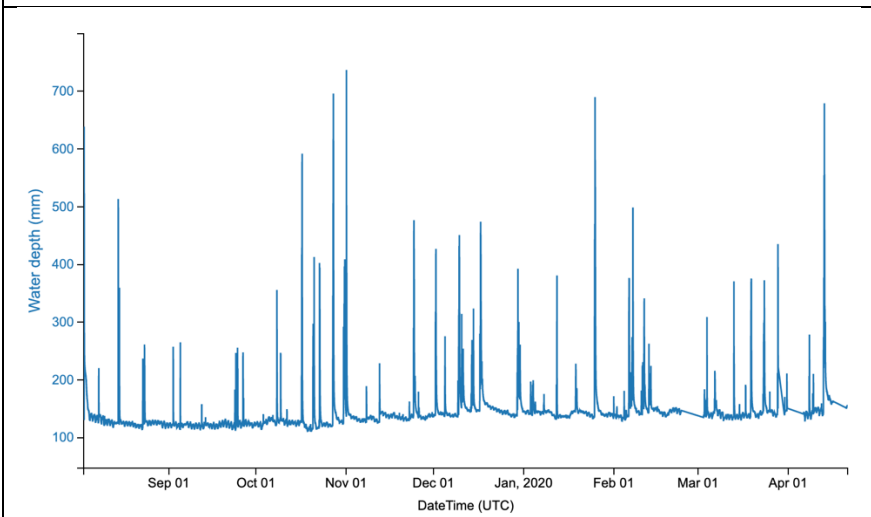
Link to online continuous sensor. Data collected on conductivity, water temperature, and depth. Note while values for turbidity are listed, the sensor is not set up for taking turbidity readings due to the shallow nature of the stream:

<https://monitormywatershed.org/sites/BCWC12S/>





Summary Statistics	
Arithmetic Mean	10.95
Geometric Mean	4.75
Maximum	26.80
Minimum	1.70
Standard Deviation	5.66
10%	12.40
25%	17.70
Median, 50%	3.40
75%	6.70
90%	8.10
Number of Observations	68,602



Summary Statistics	
Arithmetic Mean	142.95
Geometric Mean	30.79
Maximum	737.00
Minimum	110.00
Standard Deviation	35.37
10%	121.30
25%	127.00
Median, 50%	137.50
75%	145.50
90%	156.30
Number of Observations	68,602

## Attachment E: Budget

### White Clay Watershed Association

#### Community Green Infrastructure Project, West Grove Borough, White Clay Creek Watershed

#### Detailed Budget:

Rutgers Cooperative Extension (RCE) Water Resources Program (IA assessment, design and engineering work, construction supervision)	\$10,500	cash	\$7500 EKD, \$3000 WCWA
White Clay Watershed Association- Project Coordination	\$3,500	in-kind	WCWA
Staff time of coordinating agencies	\$4,800	in-kind	Brandywine Conservancy, Chester County Conservation Distirct, West Grove Borough
Educational materials and supplies for public outreach (printing, signage)	\$200	in-kind	temporary sign provided inkind by WCWA, printing covered by Rutgers (RCE)
Construction costs for demonstration project (plants), planting tools	\$1,142	cash	WCWA
Construction costs for demonstration project (soil ammendents, pipe, downspout connections, rock, mulch, soil disposal, other misc. project supplies)	\$3,500	cash	West Grove Borough
Construction costs for one demonstration project (equipment, labor, engineering time - aproximately 7 days over a two week period)	\$15,000	inkind	West Grove Borough Public Works Department, Rutgers (RCE) staff, and WCWA
Water quality monitoring for one year (sensor purchase, installation & management, cell plan for real time data, grab sample analysis NO3N, OP, TSS, CL, bacteria)	\$6,700	cash	WCWA/NPF Streamwatch Funds
<b>Total</b>	<b>\$45,342</b>		

**Attachment F: WCWA Invoices**



Christopher C. Obropta, Ph.D., P.E.  
Extension Specialist, Water Resources

<http://www.water.rutgers.edu>  
[obropta@envsci.rutgers.edu](mailto:obropta@envsci.rutgers.edu)

Rutgers New Jersey Agricultural Experiment  
Station Cooperative Extension  
Rutgers, The State University of New Jersey  
14 College Farm Road  
New Brunswick • New Jersey 08901

908-229-0210

**INVOICE #0001**

**May 15, 2020**

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**TO:** Shane Morgan  
Watershed Coordinator  
White Clay Wild & Scenic River Program  
mpc@whiteclay.org

**Project: Green Infrastructure Planning and Implementation for the Borough of West Grove, Pennsylvania**

**Invoice Total: \$10,500**

**Description:** Completed impervious cover assessment (ICA), Impervious Cover Reduction Action Plan (RAP), Green Infrastructure Feasibility Study, three conceptual green infrastructure designs, one master plan for the entire Borough, one full-engineering design for rain garden at the library, and assisted with installation of the rain garden at the library. Also, conducted an educational presentation to the Borough on March 4<sup>th</sup>.

**Please make the check payable to 'Christopher C. Obropta.' The check should be mailed to:**

Dr. Christopher C. Obropta  
Rutgers University  
Department of Environmental Sciences  
14 College Farm Road  
New Brunswick, NJ 08901-8551

Thank you.



# Invoice 107840

388 North Creek Road · Landenberg · Pennsylvania · 19350  
 610.255.0100 p | 610.255.4762 f  
 Order Pick up: 124 Wedgewood Road · Oxford · Pennsylvania · 19363

www.northcreeknurseries.com | info@northcreeknurseries.com

Order Date	Customer #	Customer PO #
03/13/2020	4905	Vest Grove Rain Garder

## Great Plants Start Here!

### Sold To:

The Giving Garden  
 Shane Morgan  
 182 Sawmill Road  
 Landenberg PA 19350  
 Ph: (484) 716-6836  
 thegivinggarden@mac.com

### ShipTo:

The Giving Garden  
 Shane Morgan  
 182 Sawmill Road  
 Landenberg PA 19350  
 Ph: (484) 716-6836  
 mpcwhiteclay@gmail.com

SHIP WEEK	SHIP VIA	TERMS	SALESPERSON			TRACKING		
05/19/2020	CPU	Credit Card	Fisher, Scott					
Description	Size	Quantity Ordered	Quantity Canceled	Quantity Confirmed	Royalty Fee	Price per Flat	Discount %	Extension Price
Aster lat. 'Lady in Black' PU TUES 10-1	50	2	0	2	\$0.00	\$40.00	0.00	\$80.00
Deschampsia cespitosa	LP50	4	0	4	\$0.00	\$62.50	0.00	\$250.00
Echinacea pur. 'Ruby Star'	72	1	0	1	\$0.00	\$52.56	0.00	\$52.56
Eupatorium d. 'Little Joe' PP16122	LP32	2	0	2	\$9.60	\$42.56	0.00	\$94.72
Lobelia cardinalis	LP50	1	0	1	\$0.00	\$62.50	0.00	\$62.50
Lobelia siphilitica Substitution - 05/12/2020 Liatris	LP50	1	0	1	\$0.00	\$62.50	0.00	\$62.50
Packera aurea	LP50	2	0	2	\$0.00	\$67.50	0.00	\$135.00
Penstemon digitalis 'Husker Red'	LP50	1	0	1	\$0.00	\$65.00	0.00	\$65.00
Pycnanthemum muticum	LP50	3	0	3	\$0.00	\$62.50	0.00	\$187.50

Receipt ID: 13F-E8E  
 Receivable: RCV-78836  
 Status: Paid  
 Date Paid: 5/20/2020  
 Credit Card ending with: 7085  
 Total Amount Charged: \$1,048.59

Royalty Subtotal: \$9.60  
 Taxable Subtotal: \$980.18  
 Tax: \$58.81  
 Invoice Total: \$1,048.59  
 PrePayment: \$0.00  
 Total Amount Due: \$0.00

**PAID IN FULL**



### Final Details for Order #113-4581836-7455456

[Print this page for your records.](#)

**Order Placed:** May 12, 2020  
**Amazon.com order number:** 113-4581836-7455456  
**Order Total: \$93.24**

**Shipped on May 14, 2020**

**Items Ordered**

	<b>Price</b>
4 of: HAUSHOF Hori Hori Garden Knife, Weeding & Digging Tool, 7" Blade, Full Tang, Wood Handle Gardening Knife with Leather Sheath	\$21.99
Sold by: GreatStar Tools ( <a href="#">seller profile</a> )	

Condition: New

**Shipping Address:**

Shane A. Morgan  
182 SAWMILL RD  
LANDENBERG, PA 19350-9302  
United States

**Shipping Speed:**

One-Day Shipping

### Payment information

**Payment Method:**

Amazon.com Store Card | Last digits: 7190

Item(s) Subtotal:	\$87.96
Shipping & Handling:	\$0.00
-----	

**Billing address**

Shane A. Morgan  
182 SAWMILL RD  
LANDENBERG, PA 19350-9302  
United States

Total before tax:	\$87.96
Estimated tax to be collected:	\$5.28
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**Grand Total: \$93.24**

To view the status of your order, return to [Order Summary](#).

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