

Pennsylvania Department of Transportation Voluntary Prelisting Pollinator Conservation Program 2020 Annual Report

APRIL 2021

pennsylvania
DEPARTMENT OF TRANSPORTATION

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Introduction

This is the 2020 annual report for the Pennsylvania Department of Transportation (PennDOT) Voluntary Prelisting Pollinator Conservation Program. The program is a voluntary, non-regulatory, pro-active conservation endeavor pursued with the intent of preventing pollinator species of special concern from requiring federal protection under the Endangered Species Act (ESA). The pro-active sentiment of conserving species in advance of regulatory needs is common with the objectives of the 2015–2025 Pennsylvania Wildlife Action Plan, which addresses these terrestrial invertebrate species regardless of the absence of an identified state regulatory agency for their protection.

The program is developed as a living document with associated updates and resources accessible to the public at 2020 PennDOT Voluntary Prelisting Pollinator Conservation Program. The program was developed in conjunction with the interagency and stakeholder PennDOT Pollinator Work Group[1] who will continue to review and advise on program changes.

The Federal Highway Administration (FHWA), the lead federal agency for transportation actions in Pennsylvania, has encouraged the development of and fully supports the program. If federal protection under the ESA is determined warranted for species identified in the program and a species is listed as federally threatened or endangered, the program provides for offsetting credits that may be utilized by the FHWA and PennDOT in ESA consultations to mitigate the effects of transportation actions. The program was developed in accordance with USFWS *Policy Regarding Voluntary Pre- Listing Conservation Actions*, Fish and Wildlife Service Manual at Part 735 (5/31/2018). PennDOT administers the program and self-certifies available credits with review and oversight of the PennDOT Pollinator Work Group[1].

PennDOT proposed and established goals for voluntary pollinator conservation efforts on rural road miles focused on three principal approaches that within PennDOT's overall programs held the greatest potential for increasing habitat for the monarch butterfly and pollinator habitat in general:

1. Increased implementation of conservation mowing seasons and methods,

2. Continued implementation of daylighting rural routes to promote milkweed and nectar producing plant growth; and

3. Implementation of planted pollinator sites through PennDOT, PennDOT partners and Adopt and Beautify groups.

Progress in achieving these conservation measures is reported for 2020. Also, where the analysis of the 2020 efforts provides evidence for adjusting future goals and approaches, adaptive management modifications to the program are documented in this report.

[1] A technical advisory board.

PennDOT Pollinator Work Group 2019/2020 Active Members

Darren Altemose	PennDOT Engineering District 6-0
Drew Ames[2]	PennDOT Bureau of Project Delivery
Raymond Boronyak	PennDOT Engineering District 5-0
James Cessna	PennDOT Engineering District 8-0
Sarah Cordek	PennDOT Bureau of Project Delivery
Lucas Crawford	PennDOT Bureau of Maintenance and Operations
Jonathan Crum	Federal Highway Administration
Joseph Demko	PennDOT Bureau of Maintenance and Operations
Andrea Ebur	Federal Highway Administration
Christina Grozinger	Pennsylvania State University, Center for Pollinator Research
Michael Heitzenrater	PennDOT Engineering District 2-0
Steve Hichens	PennDOT Bureau of Project Delivery
Joseph Hovis	Pennsylvania Project Wingspan Coordinator
Jeffrey Jodon	Pennsylvania State University, PennDOT Roadside Project
Jennifer Kagel	United States Fish and Wildlife Service, Pennsylvania Field Office
Autumn Kelley	PennDOT Engineering District 1-0
Betsy Leppo	Western Pennsylvania Conservancy
Trilby Libhart	Pennsylvania Department of Agriculture
Dr. Carolyn Mahan	Pennsylvania State University, ROW Wildlife Research
Victoria Pocius	Pennsylvania State University, Center for Pollinator Research
Megan Pulver	Pennsylvania Department of Conservation and Natural Resources
Nicole Ranalli	United States Fish and Wildlife Service, Pennsylvania Field Office
Michael Retterer	Pheasants Forever, Ohio Pollinator Initiative, Project Wingspan
Karen Roccasecca	Pennsylvania Department of Agriculture
Bryon Ruhl	PennDOT Bureau of Project Delivery
Jesse Sabitsky	PennDOT Bureau of Project Delivery
Constance Schmotzer	PSU Extension, Master Gardeners
James Spatz	PennDOT Bureau of Project Delivery
Hannah Stout	PSU Contract Entomologist
Ryan Succheralli	PennDOT Engineering District 10-0
Carl Wesneski	PennDOT Bureau of Maintenance and Operations
Cyrille Whitson	Gannet Fleming, Inc.
Cheryl Wimer	PennDOT Engineering District 1-0
Thomas Yocum	PennDOT Engineering District 9-0

[2] PennDOT Pollinator Work Group Coordinator

2020 Accomplishments

A summary of accomplishments that occurred during 2020 for the voluntary prelisting pollinator conservation program were identified at the PennDOT Pollinator Work Group during their November 12, 2020 meeting with opportunity for input and discussion. The following are the notable accomplishments that occurred during the 2020 calendar year.

- The Pollinator Work Group met on March 19 and November 12, 2020 to provide technical expertise and oversight for the program.

- PennDOT continued work on pollinator habitat establishment on three pilot Adopt & Beautify/Keystone Pollinator Habitat (A&B/KPH) sites.

- PennDOT staff have continued to partner with Project Wingspan, a non-profit group working to increase pollinator plant species for the benefit of pollinator insects like the monarch butterfly. Four PennDOT staff members went out to collect two types of seeds (buttonbush and common milkweed) from 3 different sites. Two of those sites were owned by PennDOT (Old Crow wetland in Huntingdon County and the Haines-Seville wetland in Fulton County). The third site was along Rattlesnake Pike in Black Moshannon State Forest.

  Three of the four PennDOT staff members were trained in seed collection through Project Wingspan in 2020. The seed collection was conducted in October 2020 with seed sent to Mason State University in Illinois to be cleaned. The expectation is that some of that seed will then be sent back (and hopefully some live plug plants) to be used by PennDOT for habitat projects.

  In October 2020, a Project Wingspan representative, Elizzabeth Kaufman, met with roadside specialists from District 1-0, 5-0, and 8-0 to discuss future potential pollinator sites in Venango, Warren, Dauphin, and Northampton counties.

- Research funding was secured for the following research tasks that will be completed by the Pennsylvania State University between 2020-2022:

  Review and test pollinator habitat assessment protocols at ten sites from July to August 2020.

  Three rapid assessment protocols were tested, which will result in a protocol recommendation that can best be applied by PennDOT staff, Adopt & Beautify, or citizen scientist volunteers. The three protocols for testing are in use in other states.

  - The NCHRP Roadside Monarch Habitat Evaluator.
  - Ohio DOT (ODOT) Pollinator Program Scorecard; and
  - Rights-of-Way as Habitat Working Group Pollinator Habitat Scorecard – this is the one PennDOT will use for future monitoring.

  150 m x 10 m plots were chosen for each site. All sites were current “conservation mowing” sites and were evaluated in July and August of 2020. The Point Intercept Method was used to determine plant species richness and percent cover. Additionally, invertebrate species

were collected to create a voucher collection at the Frost Entomological Museum at Penn State University. The vegetation data has been tabulated and a protocol recommendation was made in 2021, based on the voucher collection. Future work to be done by Penn State consists of assessing and describing flowering plant species richness and pollinator habitat at daylit and non-daylit sites in central and northwestern Pennsylvania. This second component of the study will involve the study of thirty pairs of daylit versus uncut control sites. Invertebrate voucher specimens will be taken during the study.

- An evaluation of PennDOT mowing practices was completed. In 2020 Publication 113, Maintenance Foreman Manual, was updated to include the conservation mowing assembly, and updated mowing guidance along with pollinator meadow guidance. The conservation mowing assembly is performed beyond the clear zone and allows for native species to propagate themselves. Mowing height should be 10-12 inches, but most of the equipment available to PennDOT can only be set at 6 to 8 inches high at most. Mowing should be done no more than once per year or every other year prior to May 1st or after October 1st (June 20th – July 10th is another potentially available window of time if needed).

  The assembly for pollinator meadow establishment directs how maintenance shall maintain meadow sites over the course of several years. This would be done differently than A&B sites. These types of areas could be done by maintenance. The assembly describes how to select sites, prepare them, then spray, then mow as natives are being established.

  However, due to the spread of COVID-19 and social distancing requirements established by Governor Wolf (2020), training was not conducted for this new mowing regime and the Conservation Mowing Assembly was not implemented. Bureau of Maintenance and Operations is developing training with regards to these updates for the County Roadside Specialists, which will then be disseminated to the County Maintenance personnel and expect implementation of the new Assembly in 2022-2023.

- An updated A&B/KPH application form was drafted and published to the A&B/KPH Program webpage in 2020.

- The A&B/KPH Program webpage was revised to provide additional guidance. The web page provides a link to Sample Plans and Plant Lists, as well as a link to Landscaping with Native Plants, maintained by PA Department of Conservation & Natural Resources (PA DCNR). The PA DCNR provides guidance on planting and seeding, as well as native seed mixes.

- A concurrent effort to evaluate and revise PennDOT Seed Mixes was initiated with a focus on native species. This effort had begun in 2019 and continued through 2020 with agencies and seed mix companies to discuss updates. The Davey Resource Group was hired as a consultant to aid in the process. Draft recommendations have been developed based on comments from members attending the seed mix update meetings. PennDOT Publications will be updated once the new seed mixes, which would enhance and benefit pollinators, are approved. Publications to be updated would include PennDOT Pub 408, Pub 13M (DM2), Pub 461 and Pub 808.

- On December 15, 2020, the U.S. Fish and Wildlife Service announced that listing the monarch as an endangered or threatened under the Endangered Species Act is warranted but precluded by higher priority listing actions. The monarch is now a candidate and the status will be reviewed annually. The service plans to propose the species for listing in 2024 if it is still warranted.

2020 Credit Reporting

The PennDOT Voluntary Prelisting Pollinator Conservation Program estimates and establishes an offsetting pollinator credit goal based on implementation of three principal conservation approaches. These measures hold the greatest potential for increasing habitat in PennDOT ROW for the monarch butterfly, but also provide benefit for other pollinator species, including the yellow banded bumblebee, regal fritillary and frosted elfin. Achieved credits have been calculated for 2020 and are compared to the prior established goal. Offsetting credits may be utilized for future projects and PennDOT maintenance and operation actions that effect these pollinator species if they become listed under the ESA. The conservation efforts utilized for accrual of credits are:

- Implementation of conservation mowing.
- Daylighting rural routes to promote milkweed and nectar producing plant growth; and
- Implementation of planted pollinator sites by PennDOT, PennDOT partners and A&B/KPH volunteer groups.

Table 1 - 2020 Program Goals (original estimates)

Conservation Actions	2020 Goals	
	acres	credits[1]
reduced mowing or increased conservation mowing[2]	4,108	381,428
daylighting	1,000	42,850
planted sites	55	2,357
TOTAL annual beneficial acres	**5,163**	
Credits gained for year		426,635
10% Net Benefit Set Aside		42,663
Annual Credits minus Set Aside		383,972
Annual Effects[3]		371,250
2020 CREDITS AFTER OFFSETTING ANNUAL EFFECTS[4]		12,722
ACRUED CREDITS (Includes accrued credits from 2017-2019)		768,944
ACRUED SET ASIDE (Includes accrued set aside from 2017-2019)		197,290
Monitoring requirement for credit approval[5]	129	

[1] credit = # milkweed stems above baseline or prior condition

[2] 2020 goal was half the average of reduced & conservation mowing achieved in 2016-2018

[3] avg 2019-2022 TIP effect of 23,250 + annual mowing effect of 348,000 used as a constant

[4] monarch and yellow banded bumble bee credits; frosted elfin and regal fritillary credits due to host plant availability are not considered

[5] monitoring goals for 2020 were based on 2016-2018 daylighting; monitoring of planted acres occurs in the year following establishment

Reporting Methods

CONSERVATION MOWING

PennDOT documents in-house and some contract mowing through payroll records entered by its counties. Since the entry of contract mowing is not all inclusive, the results of the conservation mowing analysis err conservatively. In other words, more conservation mowing may have occurred than we are reporting.

All the mowing data was retrieved utilizing our Maintenance IQ system. The PennDOT maintenance code XXX-7711-02 (Mowing - Mechanized) - Completed was utilized, as this is the assembly code that represents our ROW mowing operations. We used a filter to capture only payroll records for the 2020 calendar year and removed duplicate records inherent in the manner daily payroll is reported. Records other than before May 1, between June 20 and July 10 or after October 1 and records for any ROW mowed more than once during the calendar year were removed, as these do not meet the conservation mowing requirements. Since the ROW along our rural 4-digit state routes is narrow, it was assumed that any mowing on these routes was clear zone mowing only; therefore, all four-digit route records were removed from further analysis.

The remaining records for analysis were interstates, other state highways, and two-lane state routes with 3-digit designations. Each record contains the length of the segment mowed. To estimate the conservation mowing, a 40’ mow width (beyond clear zone) was applied to calculate square feet of mowing, which was then converted to acres. Acres of mowing were totaled by county and for all counties combined. The sums by county provided the ability to observe which counties performed the greatest or least amounts of conservation mowing.

Credits are defined as numbers of milkweed stems resulting from conservation measures. To calculate credits a multiplier of 57.15, the conservation measure multiplier derived by Thogmartin, et. al. (2017), was applied to generate credit totals.

DAYLIGHTING

PennDOT also documents in-house, and some contract daylighting through payroll records entered by its counties. Since the entry of contract daylighting is not all inclusive, the results of the daylighting analysis err conservatively. In other words, more daylighting resulting in pollinator conservation benefits may have occurred than we are reporting.

All the daylighting data was retrieved utilizing our Maintenance IQ system. The PennDOT maintenance code XXX-7715-02 (Brush & Select Tree Thin, Trim & Removal - Mechanized) - Completed was utilized as this is the assembly code that represents our daylighting operations. We processed payroll records the same way for daylighting as we did for conservation mowing.

We used only the most extensive tree trimming and removal projects in this analysis- those that result in the most extensive potential for pollinator conservation benefits through the opening of the canopy. All records for less than 10 segment miles (linear miles) were removed. This adds an additional degree of

erring conservatively in the analysis. Segment miles were converted to square miles through the application of a 20' daylighting width, appropriate for the daylighting operations which occur more frequently on rural routes with narrow ROW. The square miles were then converted to acres and credits were calculated utilizing the same 57.15 multiplier (Thogmartin, 2017) as was applied for the conservation mowing analysis.

HABITAT IMPLEMENTATION

Data on habitat implementation was collected in coordination with the PennDOT District Roadside Specialists. Since the Keystone Pollinator Program is a very recent addition to PennDOT's Adopt and Beautify Program, the 2020 reporting includes only three pilot sites that were initiated during 2018 and 2019. During 2020, 15 sites were investigated by Pheasants Forever (PF) as potential future pilot sites. Sites were evaluated utilizing the Statewide Roadside Pollinator Program. Site rankings will be determined based on the evaluations. In addition to assessing potential pilot sites, two PF chapters are developing sites. One site is being managed by the Erie County PF Chapter and is located along I-90 at the SR 8 interchange. The second site is being managed by the Greater Allegheny PF Chapter and is located along Milroy Street in Allegheny County.

Results

Table 2 - 2020 Actual Conservation Credits Achieved

Conservation Actions	2020 Actual	
	acres[1]	credits[2]
A. reduced mowing or increased conservation mowing	13,240	756,666
B. daylighting	6,103	348,786
C. planted sites	7[7]	400
annual beneficial acres (A+B+C)	19,350	
Credits gained for year (A+B+C)		1,105,853
10% Net Benefit Set Aside (10% of previous line)		110,585
Annual Credits - Set Aside (Credits remaining after subtracting 10%)		995,267
Annual Effects[3]		371,250
CREDITS AFTER OFFSETTING ANNUAL EFFECTS[4] (Credits remaining after accounting for annual effects)		624,017

Cumulative Conservation Credits	acres[1]	credits[2]
ACRUED CREDITS (Includes accrued credits from 2017-2019 plus credits remaining after accounting for annual effects)		1,392,624
ACRUED SET ASIDE (Includes accrued set aside from 2017-2019 plus the 10% Net Benefit Set Aside reported for 2020)		319,736
Monitoring completed[5]	25 [6]	

[1] Only Conservation mowing reported - mowed once either before May1, between June 20-July10 or after October 1 only reported; daylighting reported when greater than 10 linear miles (24.24 acres) of cutting occurred.

[2] credits = # milkweed stems above baseline or prior condition

[3] avg 2019-2022 TIP effect of 23,250 + annual mowing effect of 348,000 used as a constant

[4] monarch and yellow banded bumble bee credits; frosted elfin and regal fritillary credits due to host plant availability are not considered

[5] monitoring goals for 2020 had been based on 2016-2018 daylighting; monitoring of planted acres occurs in the year following establishment; actual varies because funding for daylighting research was not be ready for 2020 implementation.

[6] Wingspan Habitat evaluations sites, plus 3 pilot planting sites with initial site prep underway

[7] Denotes cumulative planted acres. Using cumulative numbers here because the planted areas are maintained and continue to provide habitat.

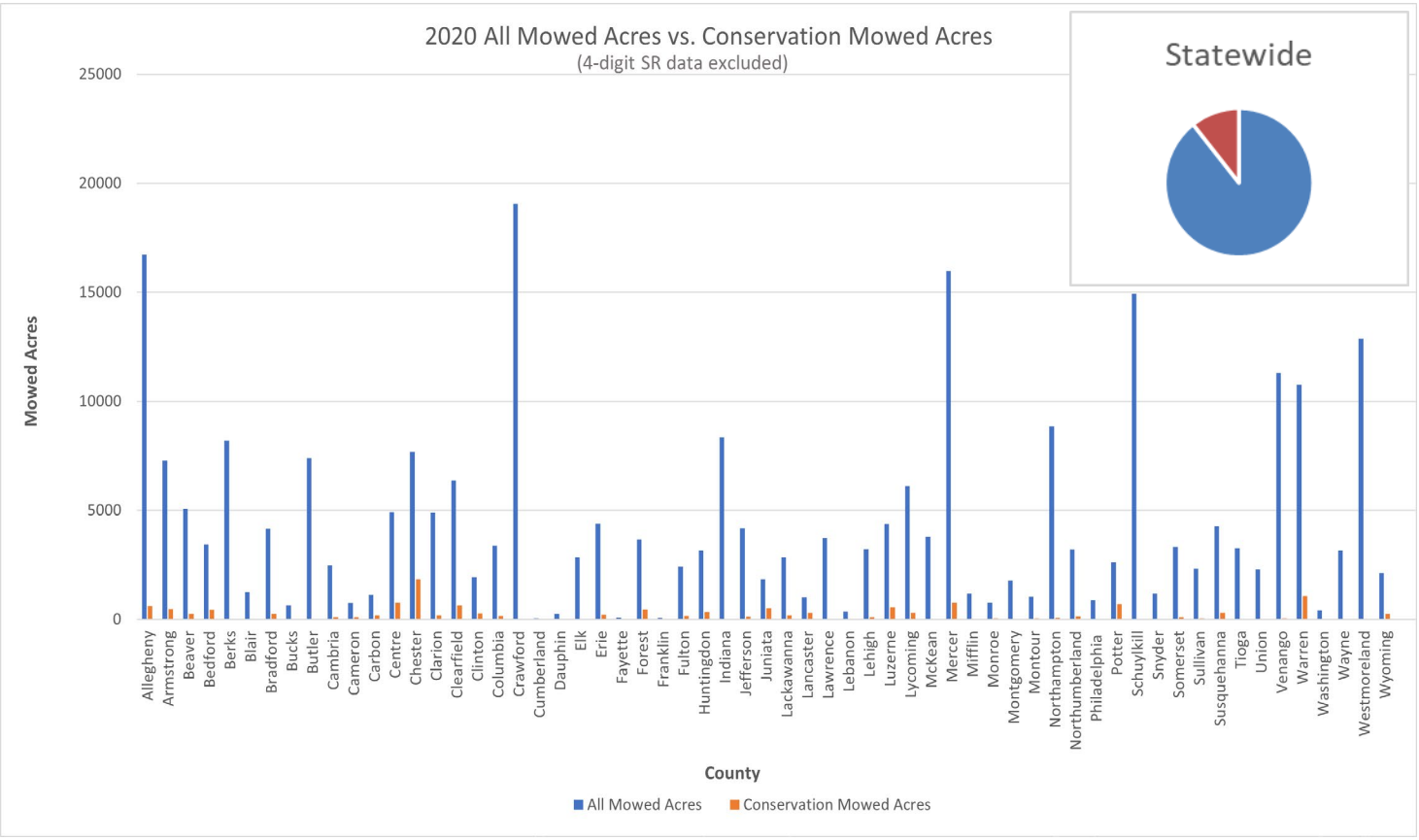
CONSERVATION MOWING

The analysis of the 2020 data reveals that significantly more mowing, 13,240 acres, meeting the conservation mow parameters occurred than the previously established goal of 4,108 acres. This results in a significant increase in pre-listing credits and is a positive result for the overall conservation program. What is not clear, is whether this positive result of additional acres of conservation mowing is accidental or driven in any way by increased awareness of pollinator conservation because of increased awareness within PennDOT. During 2018 and 2019, messaging of the importance of pollinator conservation and opportunity to reduce mowing costs did occur. However, it is suspected that the increase in conservation mowing in 2020 is likely accidental and a result of other variables such as weather or implementation of contractor mowing contracts.

In 2020, the new conservation mowing maintenance assembly was to be implemented. However, due to COVID-19 and social distancing requirements, this implementation was delayed due to the inability to conduct the required training with the county maintenance managers and foreman. Therefore, the 2020 mowing season was completed following the regular mowing guidance. It is important to note that, absent a specific conservation mow assembly for reporting practices, clear zone mowing and mowing in areas where conservation mowing will be targeted in the future are lumped together. To minimize the inclusion of clear zone mowing, all data related to mowing on narrow 4-digit state route (SR) ROW were eliminated from the analysis. Until the conservation mowing protocol and policy are implemented, the timing and frequency of mowing is driven by several variables that include weather conditions, equipment and staff availability, and contract notices to proceed. Additionally, in the current reporting process, contract mowing payroll, is not a required reporting parameter, resulting in an under reporting of contract mowing. In some counties where all mowing is conducted by contractors and reporting was not pursed, no data was available. However, it is likely mowing did occur. Adams County is one example of this. The conservation mowing policy and protocol changes published in early 2020 incorporates requirements that should have improved reporting and will separate all the clear zone mowing from conservation mowing. Should training occur in 2021 for implementation of the new conservation mowing assembly, then changes in credits, either an increase or a decrease, should be observed by the end of 2022 or 2023. It is not anticipated that the new assembly will be implemented in 2021; however, training is planned for the fall and it is anticipated that the conservation mowing assembly will be implemented in 2022.

An analysis of the 2020 mowing results by county revealed that in some counties little conservation mowing occurred due to considerable mowing frequency. In some cases, the frequency of mowing was observed as being monthly. Two to three mows annually were typical. In many instances, the timing of mowing fell out of the conservation mow dates by days. Because of mowing frequency and timing, the percentage of conservation mowing versus all mowing is very low overall (Figure 1). Because of data reporting challenges, data cannot be utilized to compare county effectiveness in achieving conservation mowing, but rather provides only general evidence of how significant the opportunity to increase conservation mowing is overall.

Figure 1. 2020 All Mowed Acres vs. Conservation Mowed Acres



DAYLIGHTING

The analysis of the 2020 daylighting data reveals that more daylighting, 5,951 acres occurred as compared to the program goal of 1,000 acres. The amount of daylighting pursued annually tends to be a function of availability of budgets and implementation of contracts for cutting. This results in a significant increase in pre-listing credits and is a positive result for the overall conservation program.

HABITAT IMPLEMENTATION

The development of pollinator habitat during 2020 was predominantly focused on the establishment of three pilot sites. Mike Retterer, PF, provided and continues to provide technical assistance for these efforts as needed. A job sheet procedure for establishing pollinator meadows was developed as part of this effort.

a. Huntingdon County Maintenance Facility Site. The Huntingdon County Maintenance site has applied two applications of herbicide and seeded with annual seed. Then in 2020, perennial seeding was conducted in the spring. The planted pollinator habitat area is approximately one acre. Future efforts will be established after an assessment is conducted to determine success of planting.

b. The city of Lock Haven Adopt & Beautify site at SR 120 and East Walnut Street in the city of Lock Haven. Removal of a few landscape trees and the fall application of herbicide were completed. As of 2020, seeding with annuals had not occurred. Perennial seeding would occur either as dormant seeding in the winter of 2021/2022 or during the spring of 2022. The potential pollinator habitat area is approximately 4.5 acres.

c. Erie County I-79 McKean to I-90 Interchange. This six-acre site is located at the I-79/I-90 Interchange. PennDOT District 1-0 is pursuing this site through a construction contract that incorporated the Pheasants Forever job sheet and site plan. The initial herbicide treatment occurred in the fall of 2019. Seeding with annuals occurred in 2020. Perennial seeding would occur either as dormant seeding in the winter of 2021 or during the spring of 2021. Future needs will be determined during Fall of 2021. Cheryl Wimer, the District Roadside Specialist is providing on-site construction monitoring for the effort. Public exposure is significant at this Interchange.

Beyond the three pilot sites, because of PennDOT press, media and messaging, new A&B groups expressed interest and additional sites are in the initial coordination and application steps. Presentations at the annual statewide PF meeting have resulted in two PF chapters actively pursuing sites in Allegheny and Erie Counties. An existing A&B group revised their site to add milkweed and other pollinator resource plant species. Early in 2020, the Southwest Pennsylvania Audubon Chapter initiated pursuit of a National Fish and Wildlife Foundation (NFWF) grant to advance the development of 100 acres of pollinator habitat in the ROW of multiple partners. PennDOT is one of these partners with a commitment to provide access to 50 acres of ROW and additional in-kind match for this grant application.

Monitoring

PennDOT did not do any monitoring in 2020, outside of the work done by Penn State as part of their research, and the work done at the pilot sites. The primary reason for the lack of monitoring was the ongoing COVID-19 pandemic. Penn State finished the first task of the research project - evaluating monitoring score cards - in early 2021. We anticipate working through 2021 to develop a monitoring plan.

Adaptive Management

After evaluation of all the 2020 results, we considered if any of the goals established for 2021-2023 required adjustment. In respect to the goals previously established for mowing, daylighting and establishing habitat sites, we find that adjustments in the goals would be premature due to two factors. Due to COVID-19 and mandated social distancing requirements, activities were delayed or forfeited in 2020, and social distancing requirements are being carried into 2021. Therefore, it is unknown when conservation management will be fully implemented. Also, because of COVID-19, PennDOT training for the implementation of the conservation mowing assembly did not occur in 2020 as planned and the assembly was not utilized. Credits achieved once this assembly is employed may significantly decrease. Evaluation of the goals established for monitoring were found to warrant adaptive management adjustment. The revised goals are presented in Table 3.

Table 3 - Adjusted Future Goals

Conservation Action	Goals							
	2021		2022		2023		2024	
	acres	credits[1]	acres	credits[1]	acres	credits[1]	acres	credits[1]
reduced mowing or increased conservation mowing[2]	4,108	381,428	4,108	381,428	4,108	381,428	4,108	381,428
daylighting	1,000	42,850	1,000	42,850	1,000	42,850	1,000	42,850
planted sites	110	4,714	110	4,714	110	4,714	110	4,714
annual beneficial acres	5,218		5,218		5,218		5,218	
Credits gained for year		428,991		428,991		428,991		428,991
10% Net Benefit Set Aside		42,899		42,899		42,899		42,899
Annual Credits - Set Aside		386,092		386,092		386,092		386,092
Annual Effects[3]		371,250		371,250		371,250		371,250
CREDITS AFTER OFFSETTING ANNUAL EFFECTS[4]		14,842		14,842		14,842		14,842
ACRUED CREDITS[6]		783,786		798,628		813,470		828,312
ACRUED SET ASIDE[6]		240,189		283,088		325,987		368,886
Monitoring requirement for credit approval[5]	130		130		52		52	
Adjusted monitoring expectations	100[7]		TBD[8]		TBD[8]		TBD[8]	

[1] credit = # milkweed stems above baseline or prior condition
[2] 2020 - 2023 goals are a constant that is half the average of reduced & conservation mowing achieved in 2016-2018

[3]average 2019-2022 TIP effect of 23,250 + annual mowing effect of 348,000 used as a constant
[4]monarch and yellow banded bumble bee credits; frosted elfin and regal fritillary credits due to host plant availability are not considered.
[5] monitoring goals based on 2016-2018 daylighting; monitoring of planted acres occurs in the year following establishment

[6] Adjusted with actual 2020 reported numbers

[7] 60 PSU daylighting research sites + 40 additional acres
[8]Adjustments to be recommended based on 2021 and 2022 results and reporting