# *Plant Community Prediction Tool for Site Restoration*

PA Aquatic Resource Restoration Conference 2026


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naturalheritage.state.pa.us


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Pennsylvania Natural Heritage Program

PNHP

# *PA Natural Heritage Program*

*Gathers and provides information on the location and status of important plants, animals, natural communities and geologic features to inform environmental and conservation decisions*

Western Pennsylvania Conservancy

PENNSYLVANIA GAME COMMISSION 1895

pennsylvania DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

PENNSYLVANIA FISH & BOAT COMMISSION

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**In Cooperation With**

U.S. FISH & WILDLIFE SERVICE DEPARTMENT OF THE INTERIOR

**www.naturalheritage.state.pa.us**

# *Natural Heritage Network*

- 90+ independent member programs
- Focus on at-risk species and ecosystems
- Standard data collection and management


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# *Trusted • Accurate • Up-to-Date*

## *…best source for conservation science and species protection information*

- avoid impacts
- minimize costs
- access to information
- education and outreach

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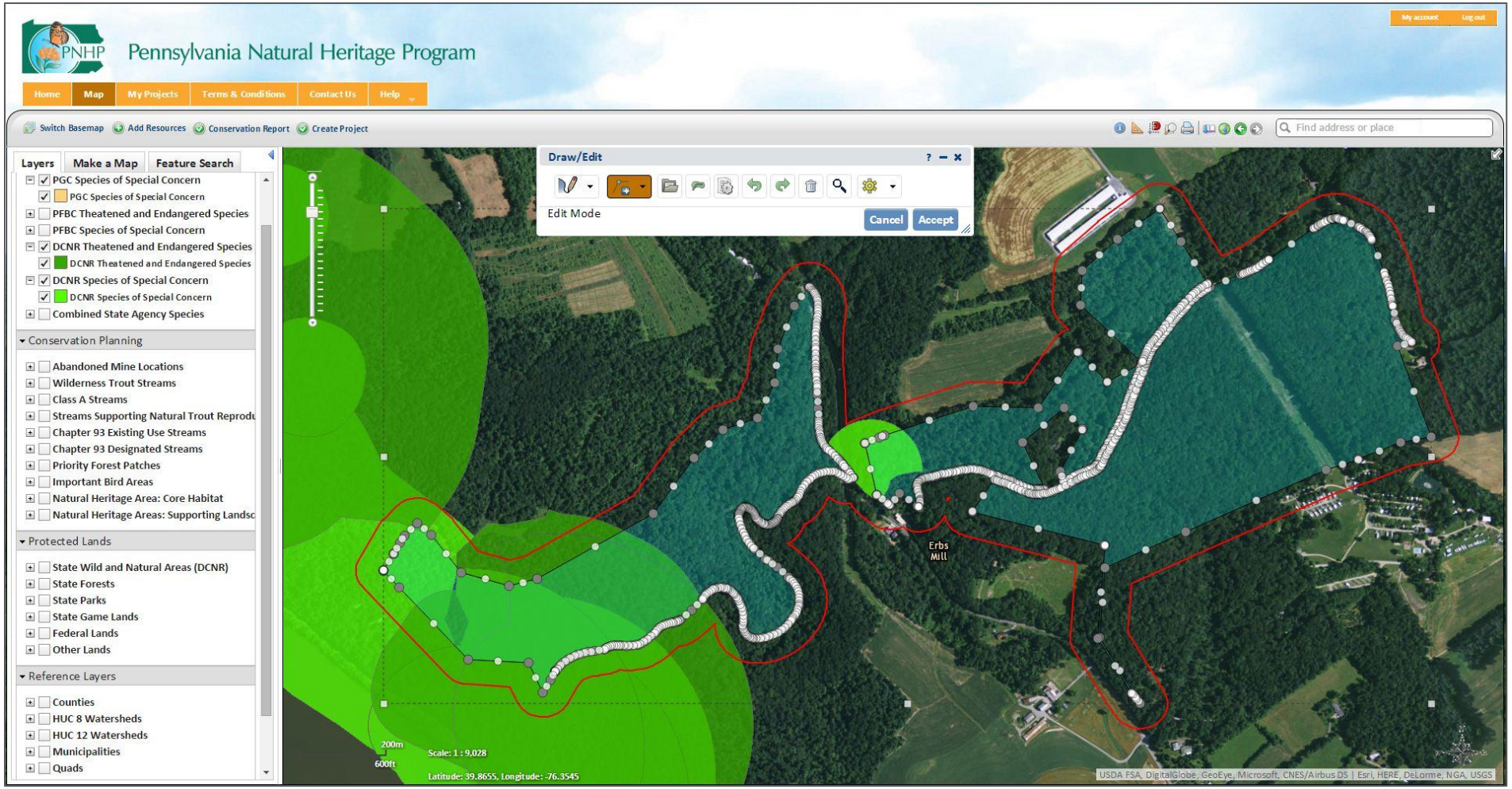
# PA Conservation Explorer

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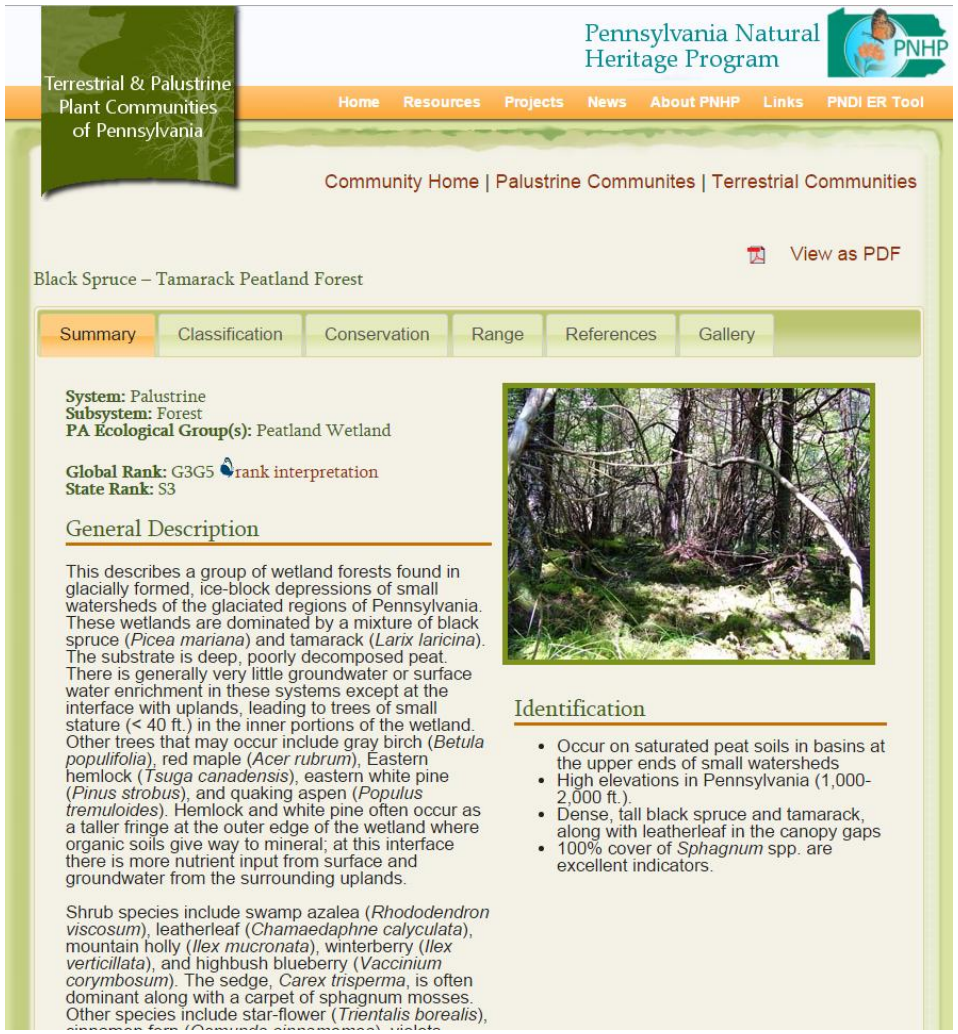
# *Plant Communities in PA*

# *Why Do We Care About Communities?*

- "Mappable" units of the landscape
- Provide a valuable framework for conservation
- Conservation actions that protect communities also protect the rare species within them
- Efficient, identifiable starting point for biological surveys
- Repeating patterns in vegetation tell you something about the ecological conditions at a site
- Allows us to communicate with others using a common terminology

# *Pennsylvania Community Classification*


https://www.naturalheritage.state.pa.us/Communities.aspx

# *Community Classification Key*

## FOREST GROUP

1. Relative cover of coniferous species for combined canopy and subcanopy is greater than 25%.

    2. Relative cover of coniferous species for combined canopy and subcanopy is between 25% and 75%. The deciduous portion of the canopy may be a combination of yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), sourgum (*Nyssa sylvatica*), black ash (*Fraxinus nigra*), and/or gray birch (*Betula populifolia*).

        3. Canopy cover for coniferous species is dominated by red spruce (*Picea rubens*). Other conifers, such as eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), American larch/tamarack (*Larix laricina*), or balsam fir (*Abies balsamea*) may also be present at lower coverage.

        **Red Spruce – Mixed Hardwood Palustrine Forest**

        3. Canopy cover for coniferous species is dominated by eastern hemlock (*Tsuga canadensis*) and/or eastern white pine (*Pinus strobus*). Other conifers, such as red spruce (*Picea rubens*), American larch/tamarack (*Larix laricina*), and balsam fir (*Abies balsamea*) may also be present at lower coverage.

        **Hemlock – Mixed Hardwood Palustrine Forest**

    2. Relative cover of coniferous species for combined canopy and subcanopy is greater than 75%.

        4. Relative cover for combined canopy and subcanopy is greater for eastern hemlock (*Tsuga canadensis*) and/or eastern white pine (*Pinus strobes*) than spruce (*Picea* spp.) and American larch/tamarack (*Larix laricina*). Community typically has a hummock and pool micro-topography. Rosebay (*Rhododendron maximum*) typically forms a dense shrub layer.

        **Hemlock Palustrine Forest**

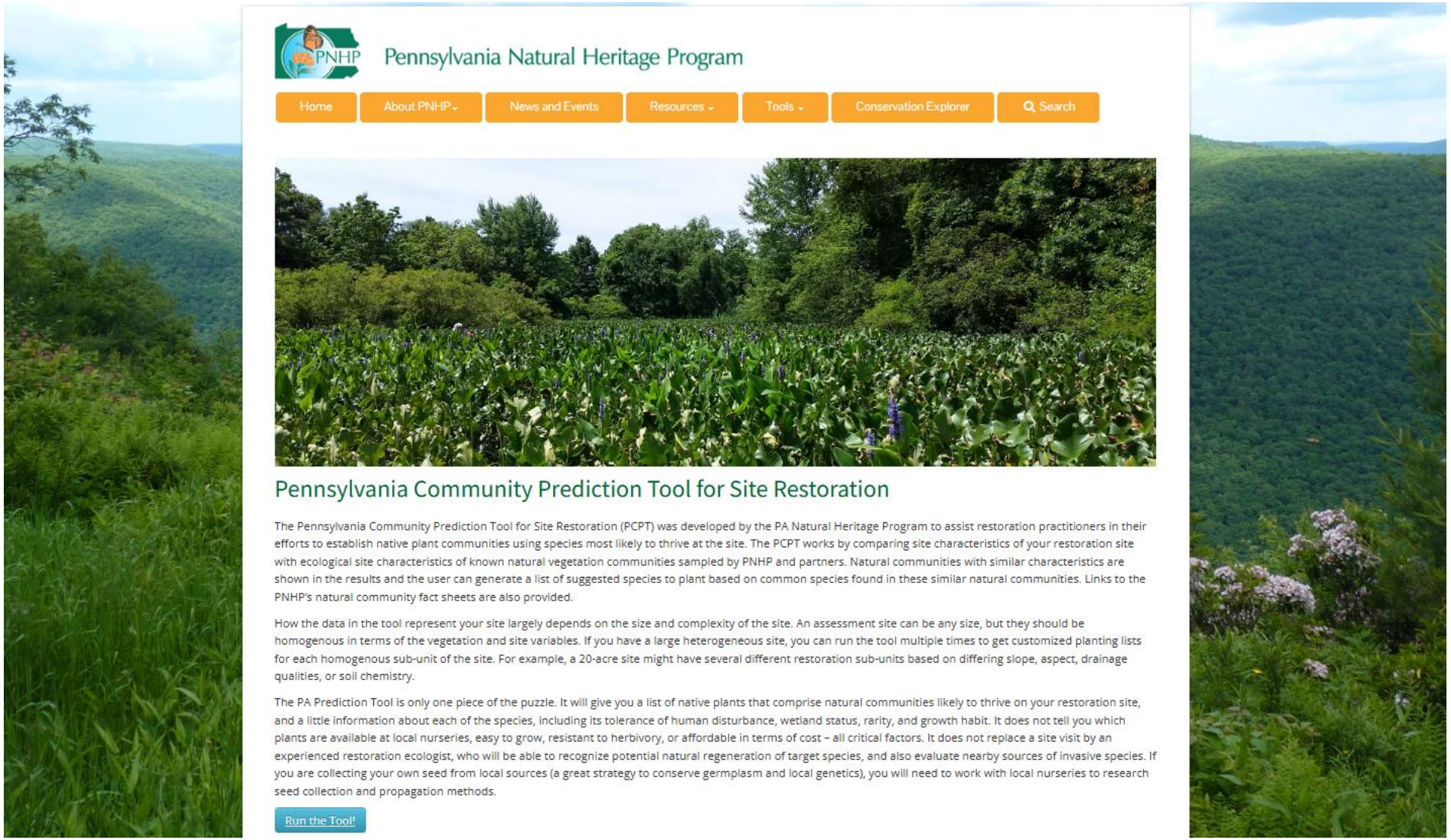
        4. Relative cover for combined canopy and subcanopy is greater for either red spruce (*Picea rubens*), black spruce (*Picea mariana*), or American larch/tamarack (*Larix laricina*) than relative cover for eastern hemlock (*Tsuga canadensis*) and/or eastern white pine (*Pinus strobus*).

            5. Relative cover for combined canopy and subcanopy is dominated or co-dominated by red spruce (*Picea rubens*) and/or American larch/tamarack (*Larix laricina*). The substrate is typically either shallow organic soils or mineral soils with substantial surface accumulation of organic material (*histic epipedon*).

            **Red Spruce Palustrine Forest**

            5. Relative cover for combined canopy and subcanopy is dominated by black spruce (*Picea mariana*) and/or American larch/tamarack (*Larix laricina*). The substrate consists of peat

# *Pennsylvania Community Prediction Tool for Site Restoration*

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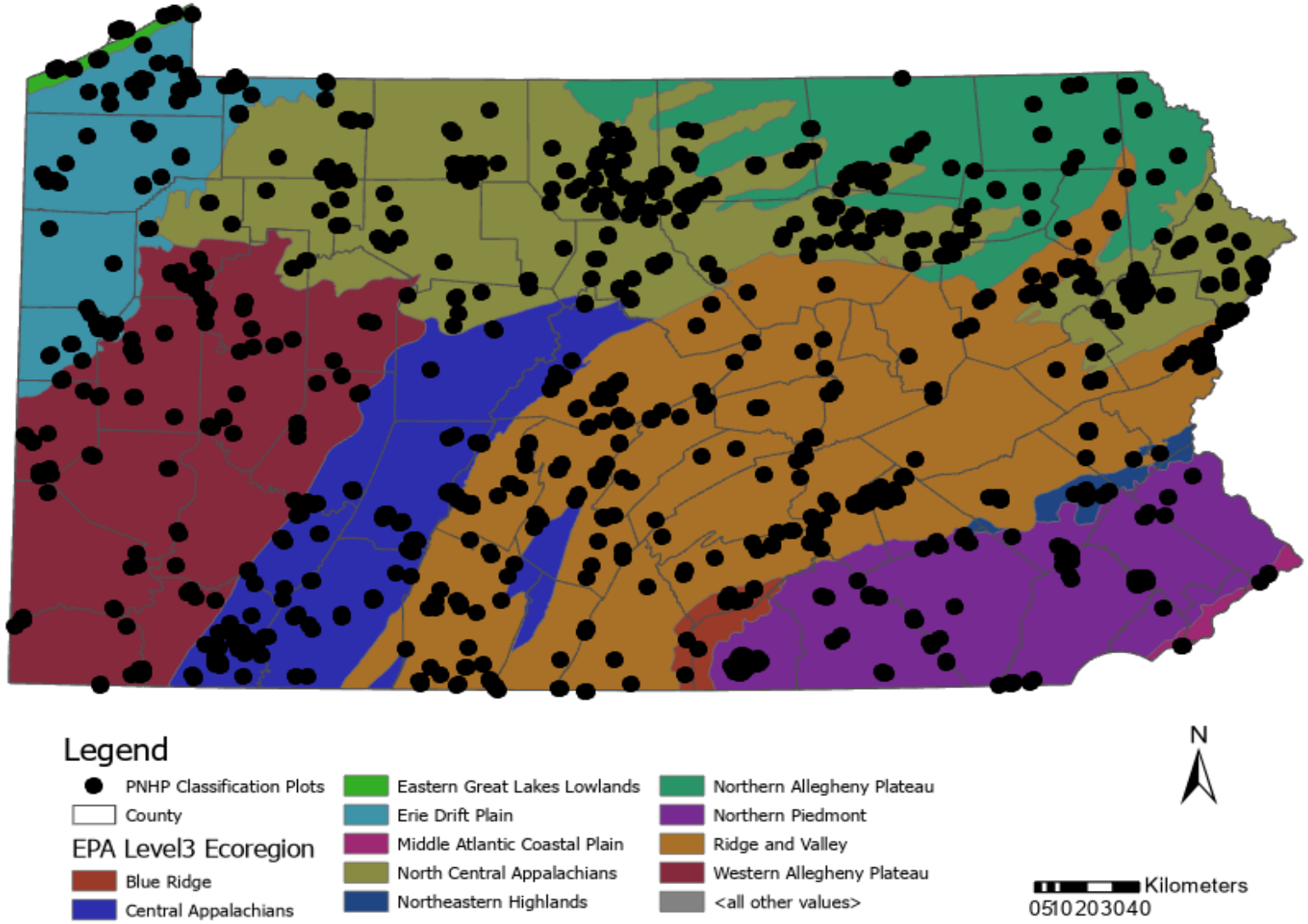
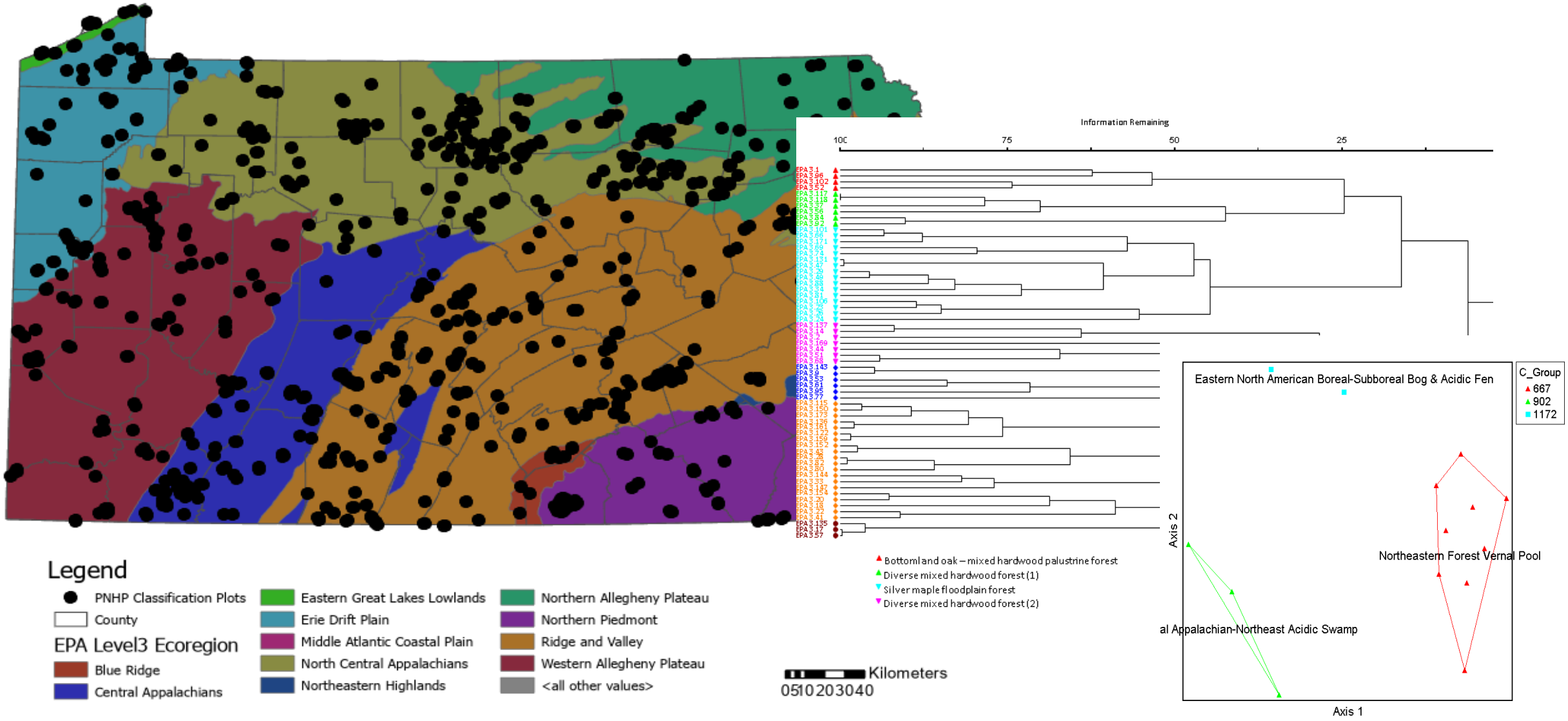
# *Pennsylvania Community Prediction Tool for Site Restoration*

- Plot Data

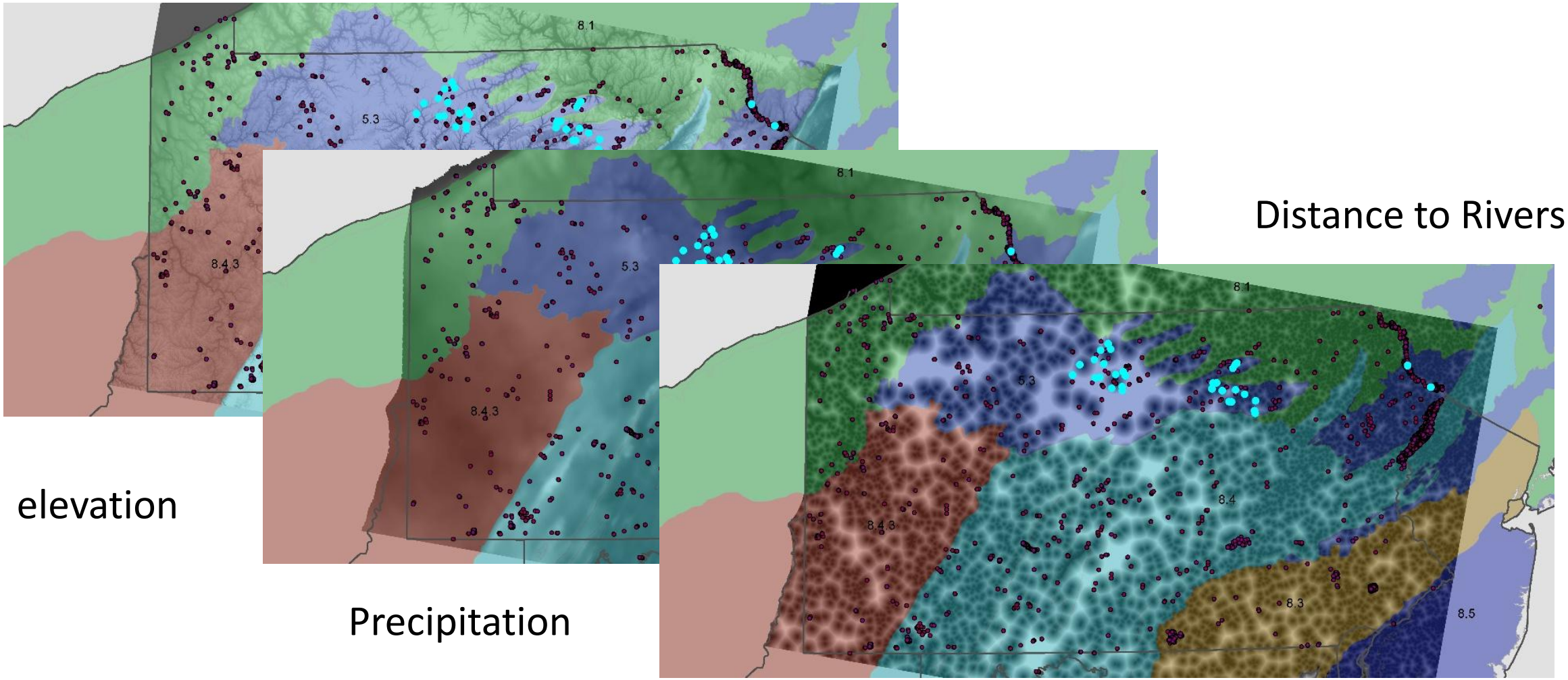


# Pennsylvania Plots Database



# *Pennsylvania Community Prediction Tool for Site Restoration*

- Modeled ecological data

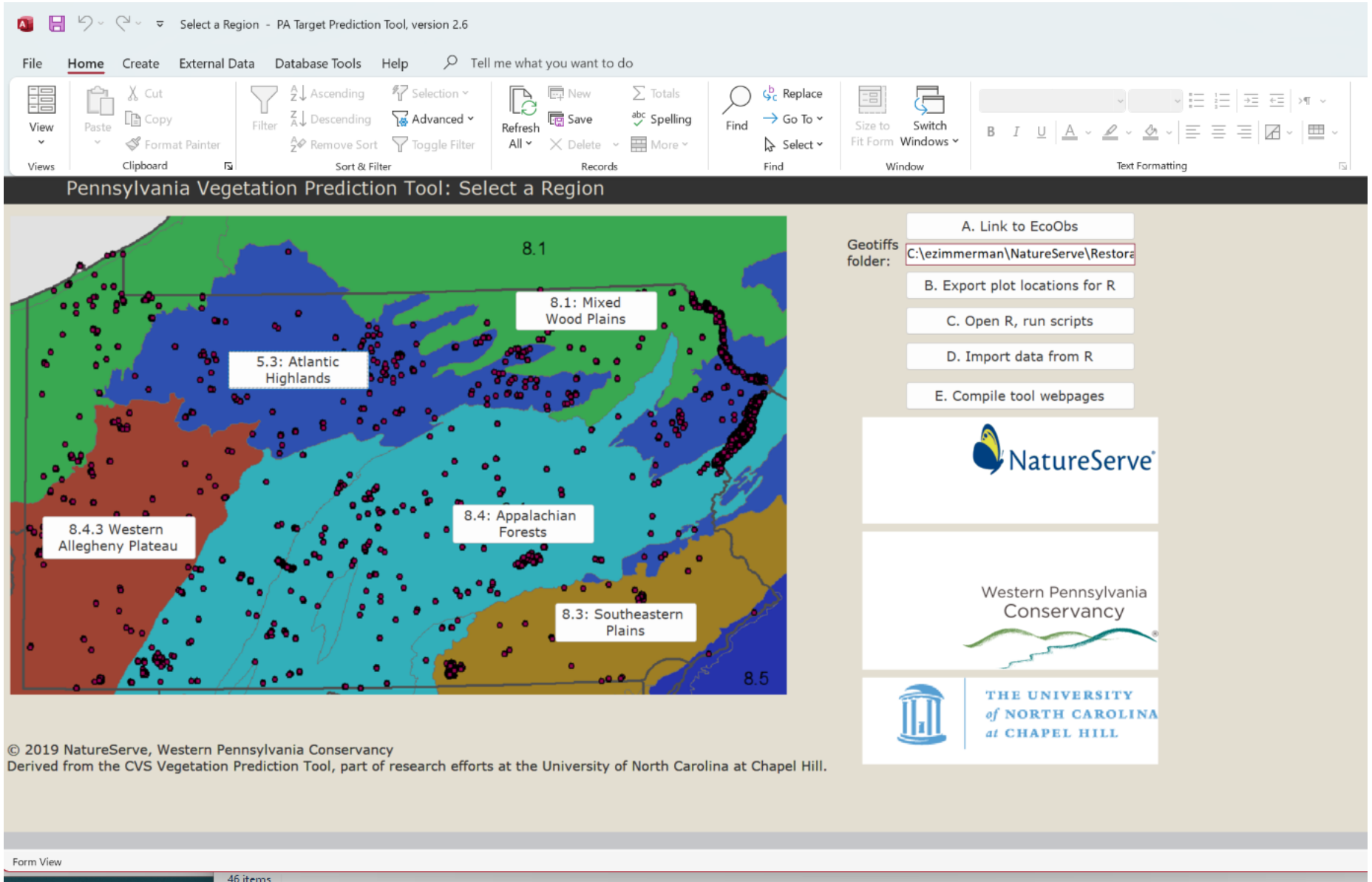



Distance to Rivers

elevation

Precipitation

# *Pennsylvania Community Prediction Tool for Site Restoration*



# *Pennsylvania Community Prediction Tool for Site Restoration*

Vegetation Type

Eco Variables

## Matrix of vegetation types and variables

| ecoregion | vegtype | AnnMn Temp | beersx1000 | crvplax100 | crvprox100 | crvslpx100 | distcstwat | distestury | distinlwat | distlake | distlakriv | distocean | distpond |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.3 | CEGL001474 | 0.491 | 0.500 | 0.582 | 0.729 | 0.278 | 0.146 | 0.146 | 0.030 | 0.106 | 0.005 | 0.162 | 0.160 |
| 5.3 | CEGL006445 | 0.465 | 0.001 | 0.624 | 0.711 | 0.307 | 0.116 | 0.116 | 0.030 | 0.176 | 0.005 | 0.118 | 0.142 |
| 5.3 | CEGL006575 | 0.689 | 0.144 | 0.459 | 0.825 | 0.150 | 0.056 | 0.056 | 0.000 | 0.095 | 0.072 | 0.000 | 0.402 |
| 5.3 | CHWNPES000 | 0.545 | 0.500 | 0.595 | 0.714 | 0.293 | 0.095 | 0.095 | 0.017 | 0.116 | 0.003 | 0.107 | 0.192 |
| 5.3 | CHWPGSS000 | 0.912 | 0.317 | 0.574 | 0.713 | 0.287 | 0.058 | 0.058 | 0.339 | 0.163 | 0.107 | 0.070 | 0.117 |
| 5.3 | CHWPHFS000 | 0.490 | 0.500 | 0.624 | 0.701 | 0.315 | 0.146 | 0.146 | 0.000 | 0.107 | 0.000 | 0.162 | 0.164 |
| 5.3 | CHWPWWS000 | 0.600 | 0.500 | 0.598 | 0.706 | 0.301 | 0.026 | 0.026 | 0.000 | 0.066 | 0.000 | 0.037 | 0.278 |
| 5.3 | CPFBSMH000 | 0.657 | 0.439 | 0.588 | 0.716 | 0.288 | 0.008 | 0.008 | 0.037 | 0.165 | 0.007 | 0.021 | 0.147 |
| 5.3 | CPFBSMM000 | 0.816 | 0.881 | 0.619 | 0.544 | 0.439 | 0.113 | 0.113 | 0.084 | 0.060 | 0.024 | 0.006 | 0.021 |
| 5.3 | CPFCHMH000 | 0.379 | 0.500 | 0.608 | 0.711 | 0.301 | 0.996 | 0.996 | 0.089 | 0.121 | 0.241 | 1.000 | 0.261 |
| 5.3 | CPSBASP000 | 0.291 | 0.500 | 0.591 | 0.713 | 0.293 | 0.274 | 0.274 | 0.140 | 0.062 | 0.080 | 0.140 | 0.080 |
| 5.3 | CPSBBBS000 | 0.229 | 0.500 | 0.585 | 0.722 | 0.282 | 0.502 | 0.502 | 0.077 | 0.069 | 0.133 | 0.335 | 0.280 |

# *Pennsylvania Community Prediction Tool for Site Restoration*

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## Pennsylvania Community Prediction Tool for Site Restoration

The Pennsylvania Community Prediction Tool for Site Restoration (PCPT) was developed by the PA Natural Heritage Program to assist restoration practitioners in their efforts to establish native plant communities using species most likely to thrive at the site. The PCPT works by comparing site characteristics of your restoration site with ecological site characteristics of known natural vegetation communities sampled by PNHP and partners. Natural communities with similar characteristics are shown in the results and the user can generate a list of suggested species to plant based on common species found in these similar natural communities. Links to the PNHP's natural community fact sheets are also provided.

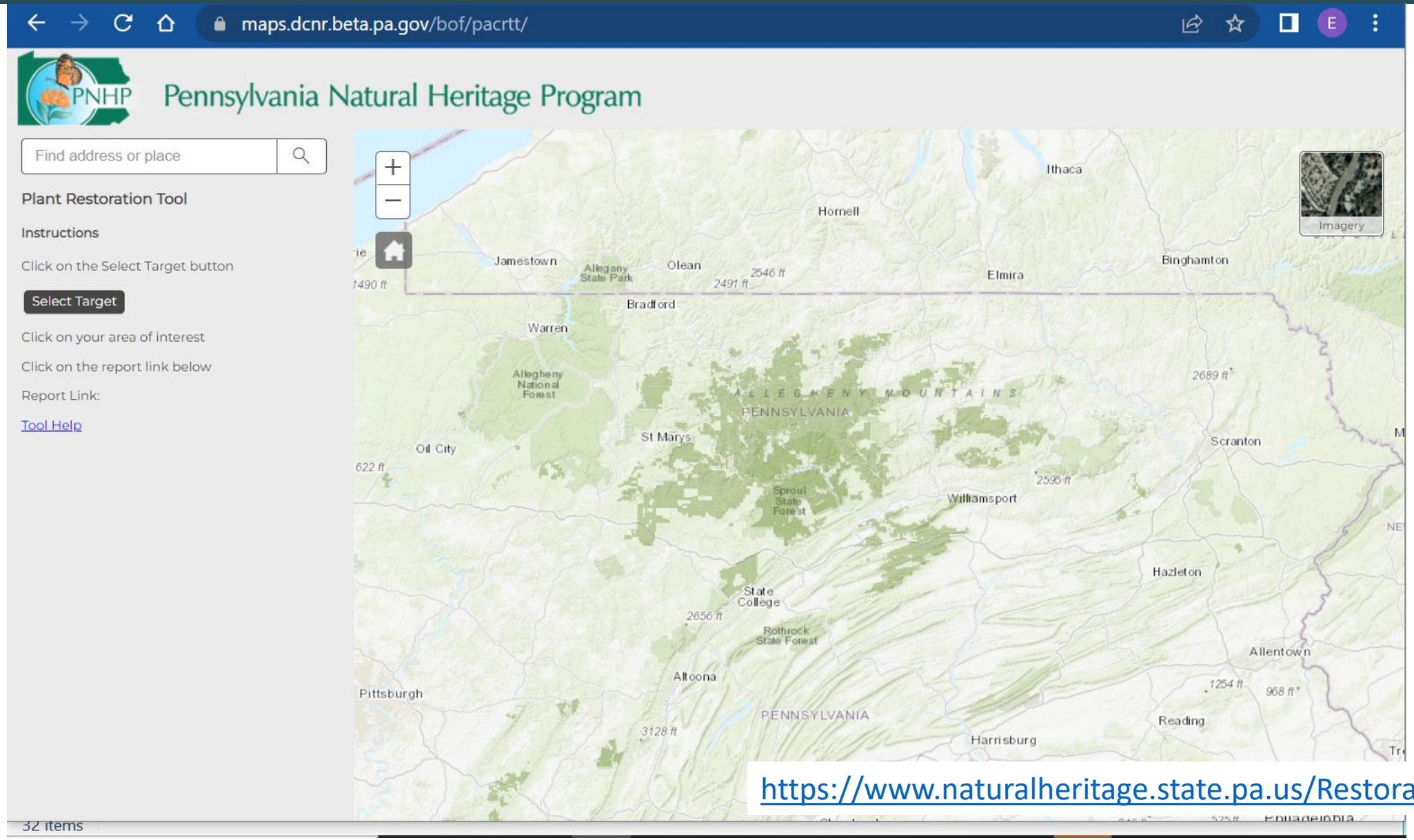
How the data in the tool represent your site largely depends on the size and complexity of the site. An assessment site can be any size, but they should be homogenous in terms of the vegetation and site variables. If you have a large heterogeneous site, you can run the tool multiple times to get customized planting lists for each homogenous sub-unit of the site. For example, a 20-acre site might have several different restoration sub-units based on differing slope, aspect, drainage qualities, or soil chemistry.

The PA Prediction Tool is only one piece of the puzzle. It will give you a list of native plants that comprise natural communities likely to thrive on your restoration site, and a little information about each of the species, including its tolerance of human disturbance, wetland status, rarity, and growth habit. It does not tell you which plants are available at local nurseries, easy to grow, resistant to herbivory, or affordable in terms of cost – all critical factors. It does not replace a site visit by an experienced restoration ecologist, who will be able to recognize potential natural regeneration of target species, and also evaluate nearby sources of invasive species. If you are collecting your own seed from local sources (a great strategy to conserve germplasm and local genetics), you will need to work with local nurseries to research seed collection and propagation methods.

Run the Tool!

https://www.naturalheritage.state.pa.us/RestorationTool.aspx

# *Pennsylvania Community Prediction Tool for Site Restoration*




https://www.naturalheritage.state.pa.us/RestorationTool.aspx

# *Pennsylvania Community Prediction Tool for Site Restoration*

## Compare the variables of your site to the variables of vegetation type

| ecoregion | vegtype | AnnMn Temp | beersx1000 | crvplax100 | crvprox100 | crvslpx100 | distcstwat | distestury | distinlwat | distlake | distlakriv | distocean | distpond |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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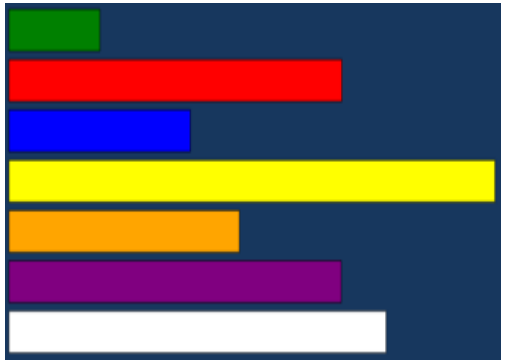
# *Pennsylvania Community Prediction Tool for Site Restoration*

Calculating similarity (Bray-Curtis) between your site, then matching sets of ecological variables of known plant communities



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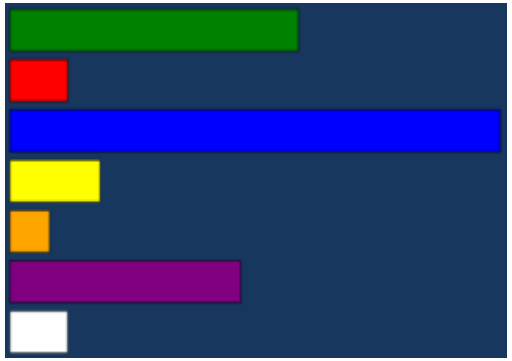

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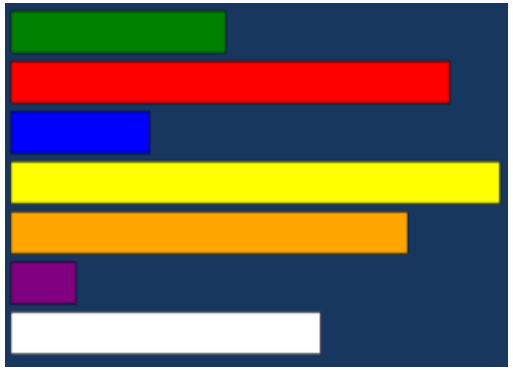

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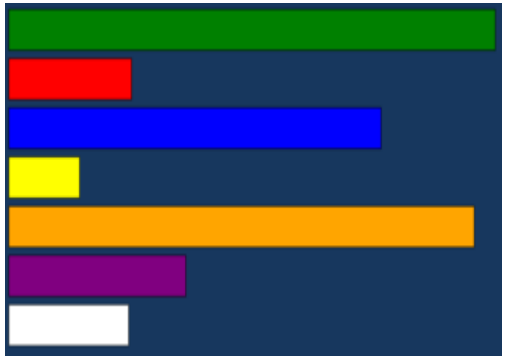
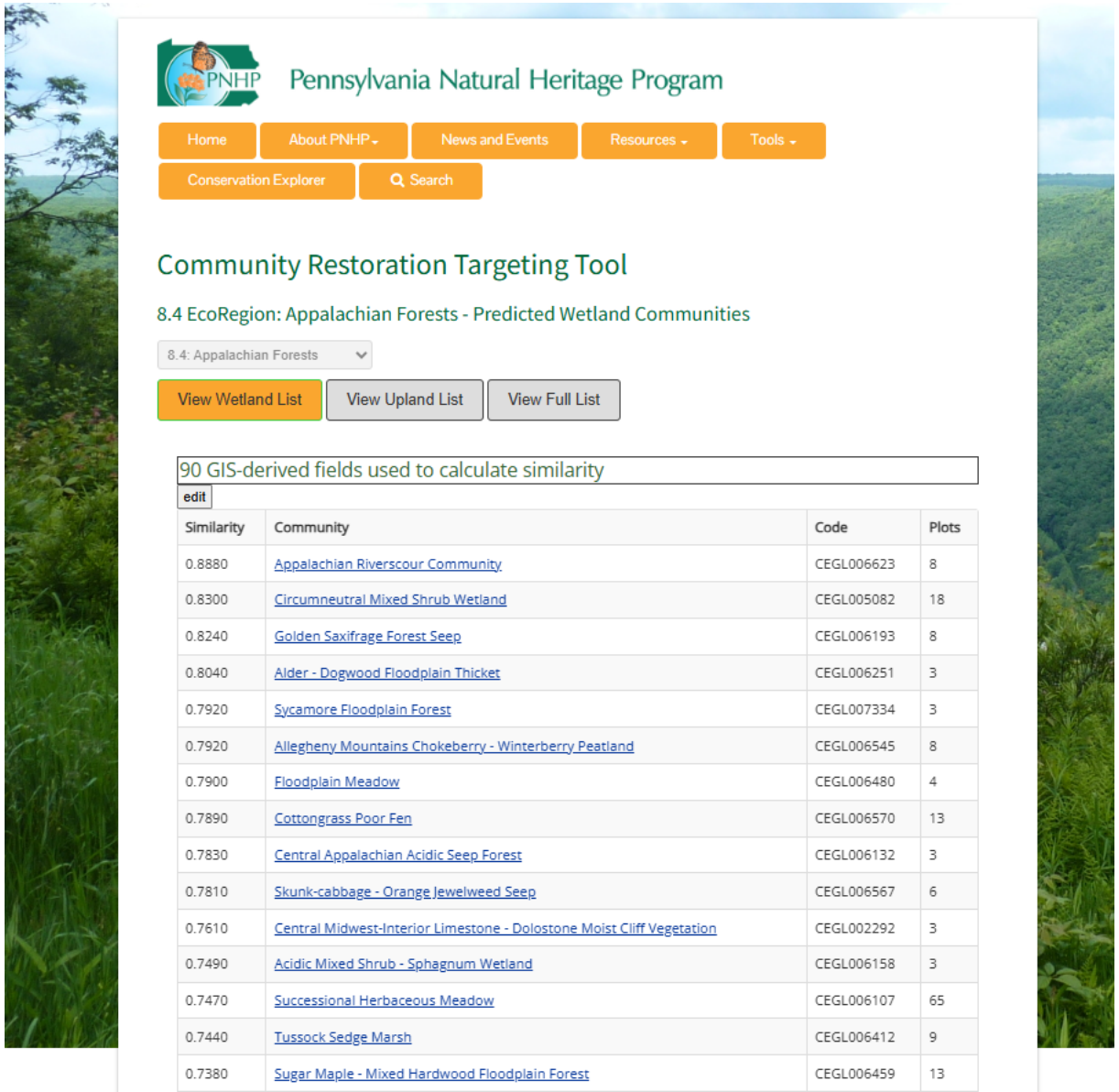


and targets:

# *Pennsylvania Community Prediction Tool for Site Restoration*

The communities that are most similar to the restoration site are identified



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## Community Restoration Targeting Tool

8.4 EcoRegion: Appalachian Forests - Predicted Wetland Communities

8.4: Appalachian Forests

View Wetland List | View Upland List | View Full List

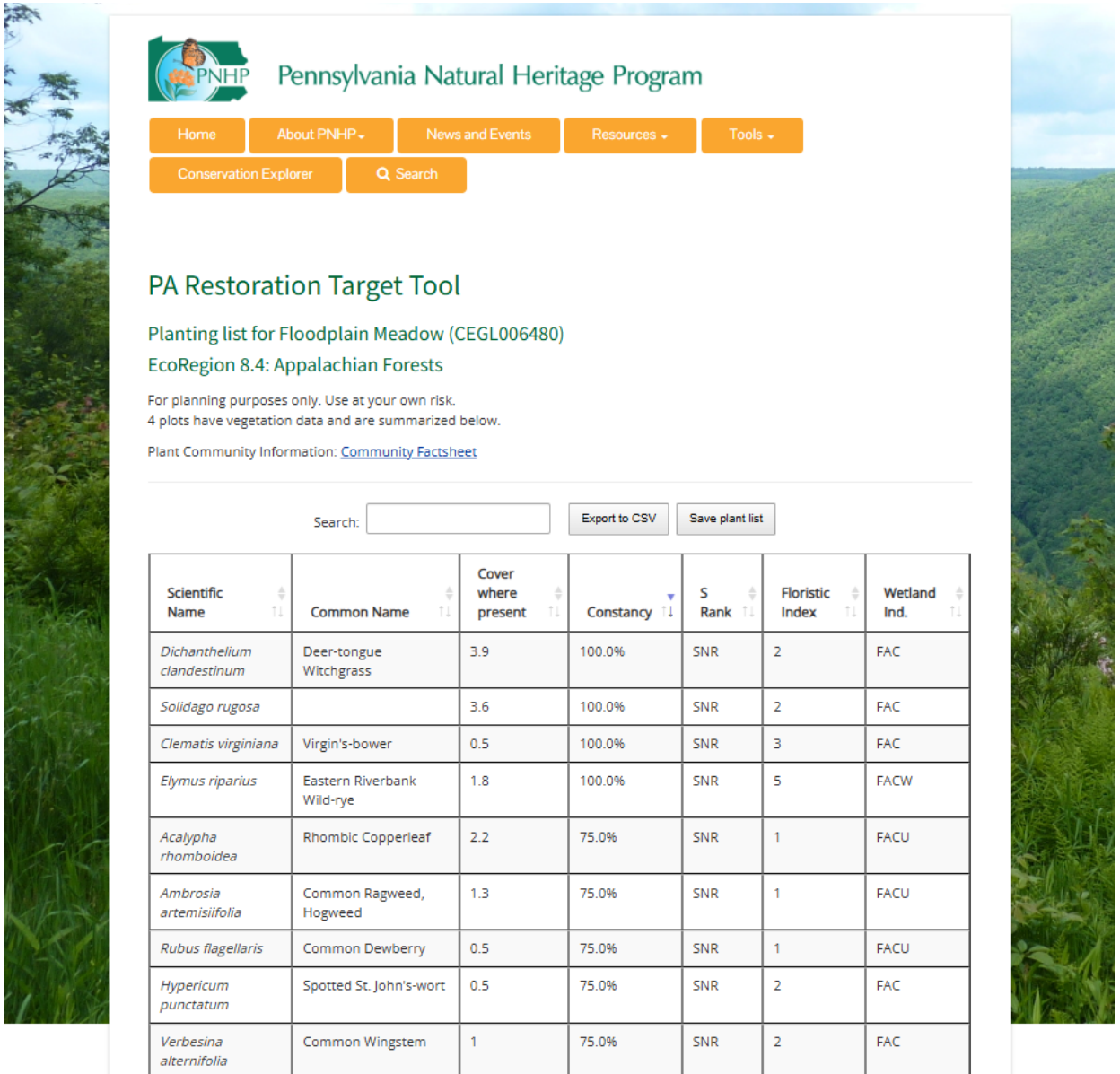
90 GIS-derived fields used to calculate similarity

edit

| Similarity | Community | Code | Plots |
|---|---|---|---|
| 0.8880 | Appalachian Riverscour Community | CEGL006623 | 8 |
| 0.8300 | Circumneutral Mixed Shrub Wetland | CEGL005082 | 18 |
| 0.8240 | Golden Saxifrage Forest Seep | CEGL006193 | 8 |
| 0.8040 | Alder - Dogwood Floodplain Thicket | CEGL006251 | 3 |
| 0.7920 | Sycamore Floodplain Forest | CEGL007334 | 3 |
| 0.7920 | Allegheny Mountains Chokeberry - Winterberry Peatland | CEGL006545 | 8 |
| 0.7900 | Floodplain Meadow | CEGL006480 | 4 |
| 0.7890 | Cottongrass Poor Fen | CEGL006570 | 13 |
| 0.7830 | Central Appalachian Acidic Seep Forest | CEGL006132 | 3 |
| 0.7810 | Skunk-cabbage - Orange Jewelweed Seep | CEGL006567 | 6 |
| 0.7610 | Central Midwest-Interior Limestone - Dolostone Moist Cliff Vegetation | CEGL002292 | 3 |
| 0.7490 | Acidic Mixed Shrub - Sphagnum Wetland | CEGL006158 | 3 |
| 0.7470 | Successional Herbaceous Meadow | CEGL006107 | 65 |
| 0.7440 | Tussock Sedge Marsh | CEGL006412 | 9 |
| 0.7380 | Sugar Maple - Mixed Hardwood Floodplain Forest | CEGL006459 | 13 |

# *Pennsylvania Community Prediction Tool for Site Restoration*

- Obtain a species list for the selected community
- Export the planting list with the relevant stats for each species
- Export multiple lists and combine in Excel



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## PA Restoration Target Tool

Planting list for Floodplain Meadow (CEGL006480)

EcoRegion 8.4: Appalachian Forests

For planning purposes only. Use at your own risk.
4 plots have vegetation data and are summarized below.

Plant Community Information: Community Factsheet

Search: Export to CSV Save plant list

| Scientific Name | Common Name | Cover where present | Constancy | S Rank | Floristic Index | Wetland Ind. |
|---|---|---|---|---|---|---|
| *Dichanthelium clandestinum* | Deer-tongue Witchgrass | 3.9 | 100.0% | SNR | 2 | FAC |
| *Solidago rugosa* | | 3.6 | 100.0% | SNR | 2 | FAC |
| *Clematis virginiana* | Virgin's-bower | 0.5 | 100.0% | SNR | 3 | FAC |
| *Elymus riparius* | Eastern Riverbank Wild-rye | 1.8 | 100.0% | SNR | 5 | FACW |
| *Acalypha rhomboidea* | Rhombic Copperleaf | 2.2 | 75.0% | SNR | 1 | FACU |
| *Ambrosia artemisiifolia* | Common Ragweed, Hogweed | 1.3 | 75.0% | SNR | 1 | FACU |
| *Rubus flagellaris* | Common Dewberry | 0.5 | 75.0% | SNR | 1 | FACU |
| *Hypericum punctatum* | Spotted St. John's-wort | 0.5 | 75.0% | SNR | 2 | FAC |
| *Verbesina alternifolia* | Common Wingstem | 1 | 75.0% | SNR | 2 | FAC |

# *Pennsylvania Community Prediction Tool for Site Restoration*

Evaluation Site

Eco Variables

| ecoregion | vegtype | AnnMn Temp | beersx1000 | crvplax100 | Crvprox100 | Crvslpx100 | distcstwat | distestury | distinlwat | distlake | distlakriv | distocean | distpond |
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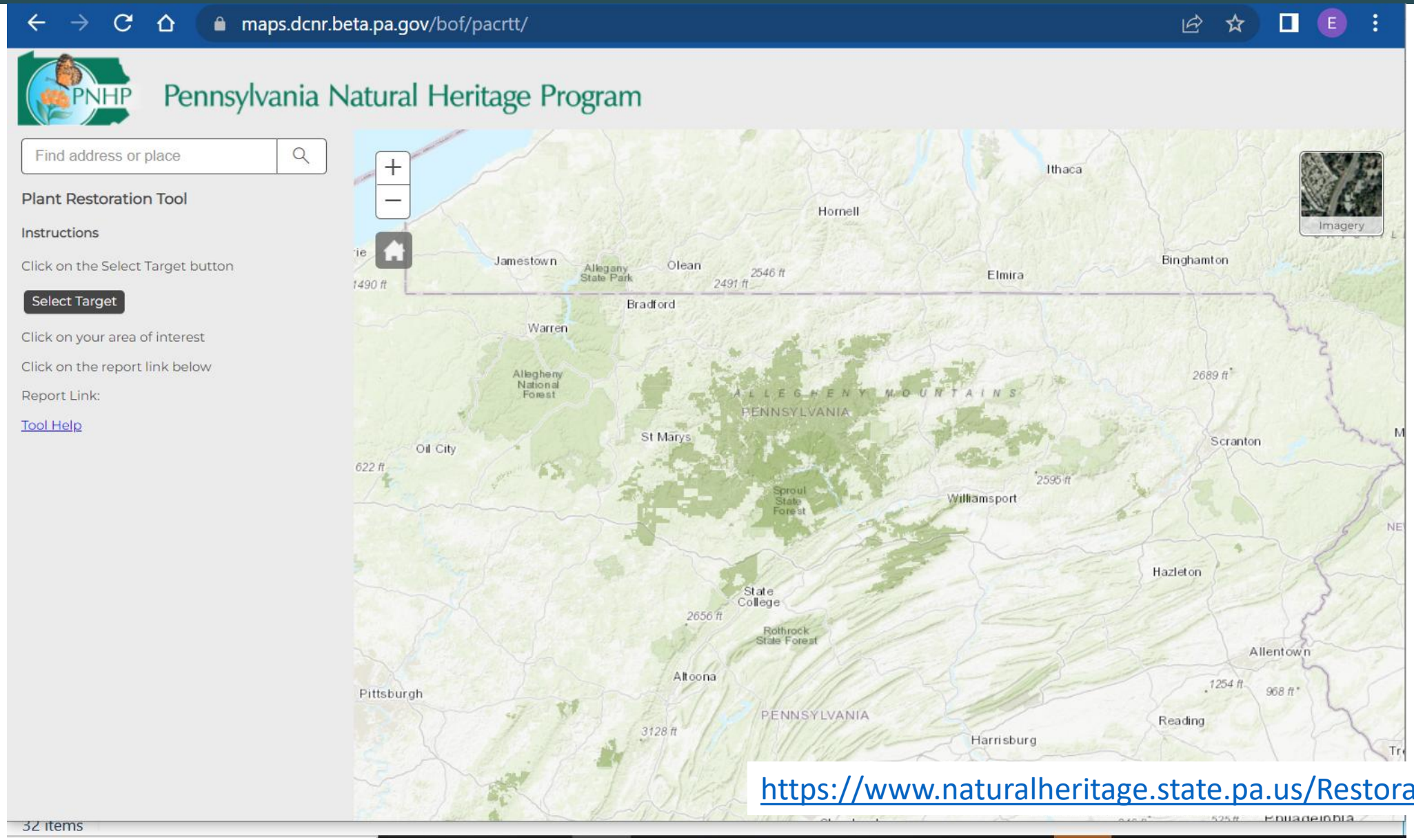
| 5.3 | User site 1 | 0.371 | 0.312 | 0.821 | 0.324 | 0.671 | 0.813 | 0.001 | 0.006 | 0.141 | 0.005 | 0.062 | 0.341 |

restoration site

target reference communities

# *Pennsylvania Community Prediction Tool for Site Restoration*

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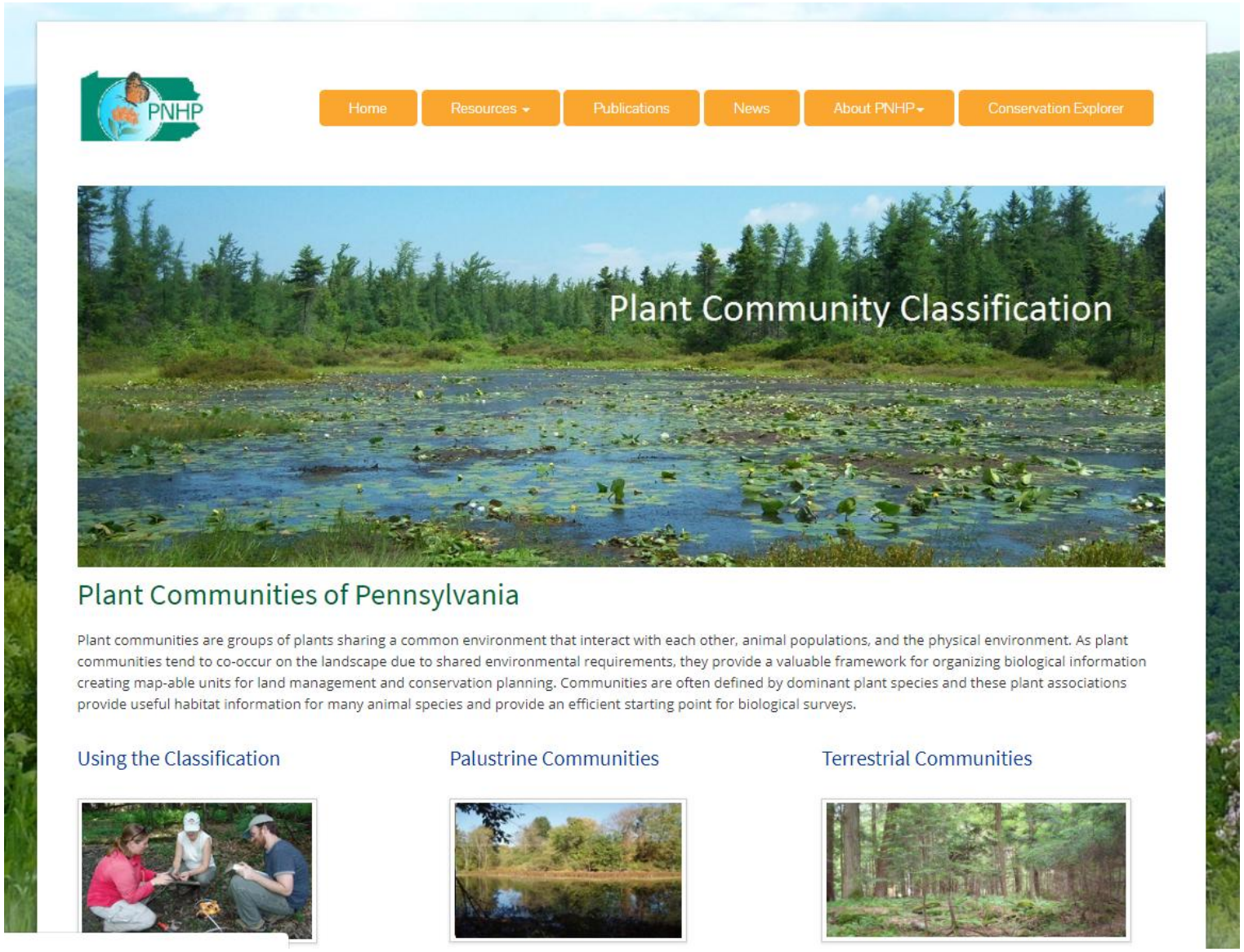
# *Thanks!*




- Original tool developed at University of North Carolina by Michael Lee, Liz Matthews, and Bob Peet (2011-2012)
- Data from the Carolina Vegetation Survey
- Funded by NC Ecosystem Enhancement Program (now Department of Mitigation Services)
- West Virginia Division of Natural Resources funded West Virginia version (2013)
- EPEA Wetland Program Development Grants/PA Department of Environmental Protection funded Pennsylvania version with NatureServe (2018-)
- Data from PNHP obtained through projects funded by PA DCNR, PA DEP, PA Game Commission, National Parks Service, USFWS.
- Environmental data from Species Modeling Working Group (NatureServe)