



Appalachian Landscapes Protection Fund

Definitions and Data Guide (October 2022)

INTRODUCTION

This document provides instructions used to assess a project's contribution to the climate resilience and carbon mitigation goals of the Appalachian Landscapes Protection Fund (ALPF). We have also defined key terms referenced in the application.

DATA GUIDE

Below are step by step instructions for answering questions about climate resilience and carbon mitigation on the ALPF application. *Note that OSI has reduced the number of required science questions in this grant round. Assessments indicated as "Optional" indicate information that applicants do not need to provide as part of the grant application.* We explain the full set of science considerations evaluated by OSI so that applicants can understand how OSI will assess projects.

Before applying, please confirm that your project lies partly or entirely within one of the Fund focus areas using [OSI's ALPF Focus Areas Screening Tool](#)

All other questions can be answered using The Nature Conservancy's (TNC) [Resilient Lands Mapping Tool](#).

Neither of these tools requires GIS or mapping expertise. If you have questions or need assistance, please contact the field coordinator for your region.

1. Project Shapefile Upload

- a) Put your project boundary shapefile in a .zip folder. Include all components (.dbf, .shp, .shx, .sbn, .sbx, .prj) in your zipped shapefile.
- b) In an internet browser, navigate to the [Resilient Lands Mapping Tool](#).
- c) Scroll down on the "Welcome to the Resilient Land Mapping Tool" box and press "Enter".
- d) Check the "Assess Carbon Data?" option at the bottom of the "Analyze" box to ensure your project is analyzed for resilience and carbon. This must be checked before you upload your shape file.

- e) Under “Analyze” on the righthand side of the tool, select “Upload Zipped SHP” and navigate to the .zip folder containing your project boundary.
- f) Once you press “open,” the viewer will zoom-in to the appropriate scale and will automatically begin the resilience and carbon analysis.

2. **Resilience Assessment.** The “Resilience Results” tab will display the information necessary to answer the resilience questions in the application:

- **Resilience:** Note on the application the “project’s overall” score for “Average Terrestrial Resilience with Polygon”. *If your project’s resilience score 0 SD or lower, your project may not be eligible for funding. If you are planning restoration to native cover or other restoration that may increase the project’s resilience and/or if you believe that the data is incorrect, please contact OSI staff for your region.*
- **Resilience Characteristics:** Data layers are available to answer the question about “characteristics” in the “Explore Component Data” sidebar, which includes details on landforms, geology, and connectedness.
- **Geophysical Settings - Optional:** *OSI evaluates projects’ Geophysical Settings, however applicants are not required to supply this information as part of the application. Here are instructions if you wish to do this analysis yourself:*
Indicate on the application the three most prominent geophysical settings listed in the “Resilient Land Summary.” If the project has additional settings, turn on the “Geology and Soils” layer under the “Explore Component Data” box. Click on “Resilient Sites” and select “Geology and Soils.” Geophysical setting information is available by clicking on the map. Note if any of these less prominent settings are listed in the “OSI Underrepresented Settings” table included at the end of this guide.

3. **Carbon Assessment – Optional:** *OSI evaluates projects’ carbon storage and sequestration potential, however applicants are not required to supply this information as part of the application. Here are instructions if you wish to do this analysis yourself:*

- Click the “Carbon Results” tab at the top of the “Resilient Land Summary” box.
- **Forest Ecosystem Carbon:** Use the information under “Forest Carbon” to report the “Total Forest Ecosystem Carbon” and the “Average Forest Ecosystem Carbon” for both 2010 and 2050.
- **Comparison to Focus Area Average:** Using the table below, determine if the **2050** carbon storage per acre values are within, below or above the average for the focus area where your project resides.

FOCUS AREA	LOW (mtC02/acre)	HIGH (mtC02/acre)
Northern Appalachians: Vermont/New Hampshire	106	116
Northern Appalachians: Maine/New Hampshire	84	102
Kittatinny	95	105
Western/Central Pennsylvania	97	109
Cradle of Southern Appalachia	80	92

Note: The ranges for low and high values are 0.5 standard deviations above and below the mean for each focus area.

CARBON STORAGE AND SEQUESTRATION DEFINITIONS

Carbon Storage: Forest ecosystems store carbon in the roots, trunks, branches, dead wood, forest litter and soil. Permanent protection and management of forestland can avoid release of stored carbon back into the atmosphere from development and heavy cutting, while sustainable forest management can contribute to protection of carbon stores from insects and fire.

The “forest ecosystem carbon” storage data provided in the TNC Resilience tool provides a summary of the carbon stored aboveground, belowground, and in coarse woody debris for all forest classes. Non-forested acres are excluded from the analysis.

The TNC data is available for 2010 and 2050, based on models developed by Dr. Christopher Williams and colleagues at Clark University using U.S. Forest Service Forest Inventory Analysis. More information on the data source is available [here](#).

Carbon Sequestration: Carbon sequestration is the rate of carbon captured by the forest ecosystem per acre per year. Planting new forests, improving soil health, and implementing best practices for forest management can contribute to increased rates of sequestration.

The forest ecosystem carbon data provided in the TNC tool for 2050 provides an estimate of how much carbon would be sequestered assuming no active management of the forest and is useful for estimating capacity of the land for carbon storage by 2050.

TERRESTRIAL RESILIENCE DEFINITIONS (adapted from [TNC’s Resilient Sites for Terrestrial Conservation](#))

Resilience: The degree to which a place can sustain a variety of species and maintain ecological processes despite a changing climate. A resilient place offers a better than average combination of Landscape Diversity and Local Connectedness (both defined below).

Note that the TNC data does not determine that any site is “resilient” in absolute terms, but rather the resilience analysis measures a place’s Resilience relative to other similarly situated places. The Resilience score is relative compared to other places with the same type of Geophysical Setting (defined below) and in the same ecoregion.

Geophysical Settings: A Geophysical Setting describes two characteristics of a place: (1) elevation zone; and (2) dominant geology type. TNC’s resilience analysis assigns one of 65 different Geophysical Settings to each place. For example, one type of Geophysical Setting is “low elevation calcareous.” Because biological diversity is dependent upon the availability of quality habitat on a variety of different geology types at different elevations, Geophysical Settings are a critical part of evaluating Resilience. By conserving high quality examples of each Geophysical Setting, the broad spectrum of biodiversity can be protected. The terrestrial resilience analysis identifies and directs conservation towards the most resilient examples of each Geophysical Setting within the same ecoregion. Each place is compared against only those places with the same Geophysical Settings. For example, low elevation calcareous areas are only compared against other low elevation calcareous places and not against high elevation granite.

Landscape Diversity: Landscape diversity is a measure of a place’s above-ground landform and elevation variety. Landform categories include slopes, cliffs, valleys, coves, and moist flats, as well as the directional orientation of some features.

This variation creates diverse microclimates that allow species to moderate moisture and temperature locally. Some geology types are naturally less complex than others because of their rate of or stage in weathering. To ensure equal representation of each geology type, Landscape Diversity identifies the most complex examples for each Geophysical Setting and compares these examples only against places in the same ecoregion.

Local Connectedness: Local Connectedness is measure of a place’s ability to allow the movement of organisms and the operation of ecological processes. Using road, railroad, and land cover data to identify transitions between natural, semi-natural, and developed areas, the resilience analysis predicts the degree to which these different types of transitions create potential barriers. Local Connectedness is essential to providing species with access to different nearby microclimates resulting from Landscape Diversity.

Connectedness is scored relative to Geophysical Settings and ecoregions. Note that Local Connectedness (1) it is not based on the needs of any particular species but provides a general framework for measuring the “permeability” of a place for species movement and ecosystem function; (2) it measures “connectedness” within a three-kilometer (3 km) radius of any given point location; and (3) the model scores each point location based on all barriers occurring within the 3 km radius.

Underrepresented Setting: An Underrepresented Setting is a Geophysical Setting with 1) a relatively low percentage conserved and 2) a relatively high percentage converted out of natural land cover. For instance, over 95% of Very High Elevation Granite/Mafic lands in the northeast are protected. In contrast, less than 5% of Low Elevation Calcareous lands are protected, while over 50% are developed or converted to agricultural uses. Since conserving high quality habitat in all Geophysical Settings is critical to ensure a broad range of biodiversity, focusing protection on Underrepresented Settings aims to protect the best examples of these “at-risk” settings.

OSI has identified 20 Underrepresented Settings using an assessment that considered representation in conservation, existing conversion, and importance to biodiversity. For detailed methods on selection of these settings, see the Appendix A.

OSI Underrepresented Settings

Elevation Class	Very Low	Low	Mid
Moderately calcareous	x	x	x
Silt/Clay	x	x	x
Calcareous	x	x	
Coastal plain loam over limestone	x	x	
Coastal plain silt and clay over limestone	x	x	
Acidic shale	x	x	
Ultramafic	x	x	
Loam	x	x	
Coastal plain sand over limestone	x		
Mafic	x		

Regional Flow: Regional Flow identifies potential pathways for directional movements by species at a larger scale than Local Connectedness. Regional Flow data uses models that identify multiple options for movement that could be significant for species range shifts, migrations, or other dispersal patterns in response to climate change.

Regional Flow highlights where land use patterns are likely to concentrate species movements because limited surrounding options exist, as well as places where many options exist. This measure is useful for identifying the linkage areas important to maintaining permeability across the whole region.

APPENDIX A: - Selection of Underrepresented Settings

Overview

OSI's Appalachian Landscapes Protection Fund gives preference to places that overlie geophysical settings (geology and elevation classes) that are either not well represented in conservation and/or that are heavily converted out of natural cover. OSI's selection of underrepresented settings for the eastern US and Canada is based on the Nature Conservancy's [*Resilient Sites for Terrestrial Conservation in Eastern North America*](#). TNC's dataset includes 65 settings.

This document describes OSI's process for determining underrepresented settings based on:

- 1) relative underrepresentation in conservation,
- 2) the amount of the setting converted out of natural cover as compared to the amount secured, and
- 3) the relative biological importance of the settings.

1) Underrepresentation

Of the 65 settings, 12 settings are less than 15% secured in their geology, elevation and across all the ecoregions in which they occur. These settings, listed in Table 1, are the most underrepresented settings in the east and are therefore priorities for future conservation.

Table 1: Underrepresented (< 15% secured) for geology, elevation, and ecoregion.

Elevation Class	Coastal	Very Low	Low	Mid
Calcareous	x	x	x	
Coastal plain loam over limestone		x	x	
Coastal plain silt and clay over limestone		x		
Loam		x		
Moderately calcareous		x	x	x
Silt/Clay		x	x	

2) Conversion to Securement Ratio

Some geophysical settings may be well represented in conservation but are at risk due to high conversion into agriculture and development relative to the amount secured.

To incorporate these settings, we reviewed the conversion to secured ratio (C:S) for all 65 settings (see page 82 of TNC's [Resilient Sites for Terrestrial Conservation](#)). We sought to include settings where securement was less than 15% AND conversion was greater than securement across the region (i.e., ratio greater than 1).

All the settings listed in Table 1 had a C:S ratio greater than one. Very few settings in the Mid, High or Very High elevation classes have high conversion to securement ratios, emphasizing the importance of conservation of Low, Very Low and Coastal settings. In addition to the settings in Table 1, the following settings are underrepresented **and** had a conversion to securement ratio of greater than 1:

- Acidic granitic at very low elevation
- Acidic sedimentary at very low elevation
- Acidic shale at very low and low elevation
- Coastal plain loam over limestone at very low and low elevation
- Coastal plain sand over limestone at very low elevation
- Coastal plain silt and clay over limestone at very low and low elevation
- Mafic at very low elevation
- Silt/Clay at mid and high elevation (at high elevation the setting includes sand and loam)
- Loam at very low and low elevation
- Ultramafic at very low and low elevation

We removed acidic sedimentary and acidic granitic from consideration because they are the two most common geologies in the east, covering over 75 million acres together, and because the absolute amount of conserved land for this setting is relatively high (over 2 million acres for acidic granitic and over 5 million for acidic sedimentary).

We also removed coastal settings from the list because sea level rise requires the coastal region to be evaluated with different parameters than those incorporated into the terrestrial resilience analysis and datasets.

The other settings were added due to the high amounts of conversion.

3) **Biological Importance**

Some geology types have a greater capacity to support higher numbers of rare and/or common species due to their fertility or unique traits. TNC's previously published analysis of species richness and rarity for eastern settings indicates that calcareous, sand and silt/loam support the greatest numbers of species (see Anderson and Ferree, 2010 [here](#)).

Ultramafic and shale also create unique habitat conditions that support rare species.

Final Settings

Based on the amount of the setting that has been secured, the ratio of conversion to securement, and biological relevance of the settings, OSI selected the settings in Table 2 as the 20 underrepresented settings for use in the Fund.

Table 2: Final Underrepresented Settings

Elevation Class	Very Low	Low	Mid
Moderately calcareous	x	x	x
Silt/Clay	x	x	x
Calcareous	x	x	
Coastal plain loam over limestone	x	x	
Coastal plain silt and clay over limestone	x	x	
Acidic shale	x	x	
Ultramafic	x	x	
Loam	x	x	
Coastal plain sand over limestone	x		
Mafic	x		