

# ABoVE: Ground-based Reflectance Spectra of Vegetation at Multiple Sites Across Alaska

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Dataset Version: 1

## Summary

This dataset includes ground-based reflectance spectra collected using a Spectral Evolution PSR+ spectroradiometer during July and August of 2018 and 2019 as part of the NASA Arctic Boreal Vulnerability Experiment (ABoVE). Ground spectra provide high spectral resolution reference measurements for vegetation and surface targets that occur within or near UAV image footprints and across the broader ABoVE Domain in Alaska. Scans were collected using either a leaf clip or contact probe fiber optic, both equipped with an internal tungsten halogen illumination source that minimizes ambient light contamination and provides a stable illumination geometry. The data are provided in comma separated values (CSV) format.

There is one data file in this dataset in CSV format.

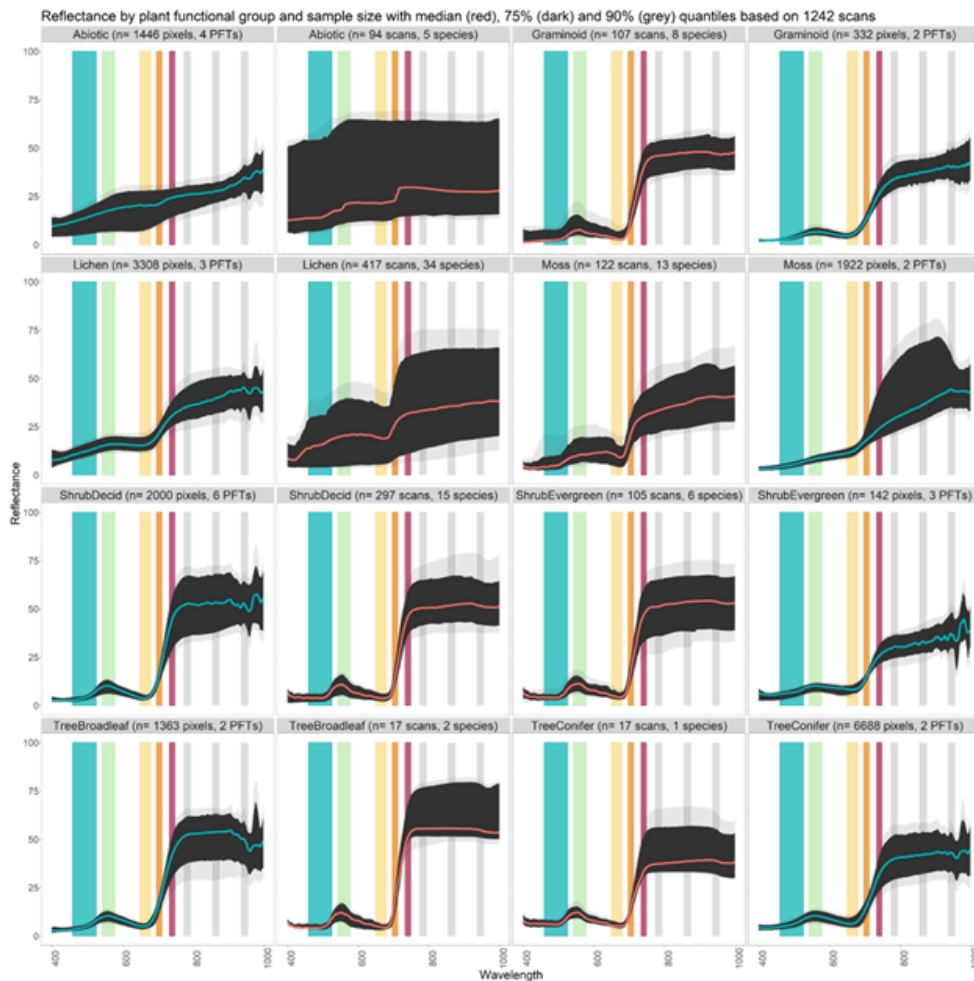


Figure 1. This figure summarizes reflectance by plant functional group and sample size with median and quantile envelopes based on the ground spectra (PSR+). Median (red), 75% quantile(dark), and 90% (gray) quantile based on 1242 scans.

## Citation

Nelson, P.R. 2026. ABoVE: Ground-based Reflectance Spectra of Vegetation at Multiple Sites Across Alaska. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORN LDAAC/1980>

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## 1. Dataset Overview

This dataset includes ground-based reflectance spectra collected using a Spectral Evolution PSR+ spectroradiometer during July and August of 2018 and 2019 as part of the NASA Arctic Boreal Vulnerability Experiment (ABoVE). Ground spectra provide high spectral resolution reference measurements for vegetation and surface targets that occur within or near UAV image footprints (provided in Nelson et al., 2026) and across the broader ABoVE Domain in Alaska. Scans were collected using either a leaf clip or contact probe fiber optic, both equipped with an internal tungsten halogen illumination source that minimizes ambient light contamination and provides a stable illumination geometry.

**Project:** [Arctic-Boreal Vulnerability Experiment](#)

The Arctic-Boreal Vulnerability Experiment (ABoVE) is a NASA Terrestrial Ecology Program field campaign being conducted in Alaska and western Canada, for 8 to 10 years, starting in 2015. Research for ABoVE links field-based, process-level studies with geospatial data products derived from airborne and satellite sensors, providing a foundation for improving the analysis, and modeling capabilities needed to understand and predict ecosystem responses to, and societal implications of, climate change in the Arctic and Boreal regions.

### Related Dataset

Nelson, P.R. 2026. ABoVE: UAV VNIR Imaging Spectroscopy and Derived Plant Functional Types. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2503>

- Imagery collected from a UAV over or near the same study area and same time frame. Ground spectra provided in the current dataset were used to support interpretation, classification, and validation of those UAV imagery-derived PFT products included in Nelson 2026.

## 2. Data Characteristics

**Spatial Coverage:** Multiple locations within the Alaskan Arctic and boreal regions of the NASA ABoVE Domain

### ABoVE Reference Locations

Domain: Core ABoVE

**Spatial Resolution:** point measurements

**Temporal Coverage:** 2018-07-01 to 2019-08-31

**Temporal Resolution:** once

**Study Area:** Latitude and longitude are given in decimal degrees.

| Site   | Westernmost Longitude | Easternmost Longitude | Northernmost Latitude | Southernmost Latitude |
|--------|-----------------------|-----------------------|-----------------------|-----------------------|
| Alaska | -149.26215            | -146.64314            | 65.03301              | 63.88326              |

### Data File Information

Ground spectra are provided as a CSV spectral library file: *Alaska\_veg\_ground\_based\_spectral\_library.csv*.

The file contains 1,334 individual scans representing 98 species and includes taxonomic fields (e.g., species and genus), plant functional group assignments, optional latitude/longitude coordinates, and reflectance values at 1 nm wavelength increments (350 to 2500 nm).

Table 1 contains the variables in the data file. Additional table summaries are provided for the following: the number of scans per area (Table 2), the number of PSR+ scans contributing to functional group 1 (Table 3), and a summary of the number of scans per species (Table 4).

**Table 1.** Variables in *ground\_based\_spectral\_library.csv*. Geographic coordinates (latitude/longitude) are available for 255 scans (~19.1%); scans without coordinates were typically collected from samples measured away from the collection point (e.g., at a central staging location) or without a GPS fix at the time of scanning. The missing data value is -9999

| Variable          | Units | Description                               |
|-------------------|-------|-------------------------------------------|
| ScanID            |       | ScanID-site_#                             |
| Area              |       | Area where scans were made in Alaska      |
| Code_name         |       | Scan code name                            |
| Species_name      |       | Species scanned                           |
| Genus             |       | Genus of the scanned species              |
| Functional_group0 |       | Functional group of the species           |
| Functional_group1 |       | Functional group 1 of the species scanned |
| Functional_group2 |       | Functional group 2 of the species scanned |

| Variable                  | Units           | Description                                                       |
|---------------------------|-----------------|-------------------------------------------------------------------|
| Species_name_Freq         | 1               | Frequency of the species                                          |
| Functional_group1_Freq    | 1               | Frequency of species in Functional group1                         |
| Functional_group2_Freq    | 1               | Frequency of species in Functional group 2                        |
| Latitude                  | decimal degrees | Latitude of the study site                                        |
| Longitude                 | decimal degrees | Longitude of the study site                                       |
| Wavelength (2151 columns) | nm              | Reflectance values at 1 nm wavelength increments (350 to 2500 nm) |

**Table 2.** Number of scans per area. Note: “Big Trail” in the spectra library corresponds to the Big Trail Lake (Clayton Lake) location used for UAV imagery (Nelson et al., 2026). Study Area is the name recorded in this library.

| Study Area                    | Number of scans |
|-------------------------------|-----------------|
| Murphy                        | 341             |
| Murphy Dome                   | 213             |
| Barrow                        | 149             |
| Yukon_Delta                   | 125             |
| Seward_Penn                   | 116             |
| Brooks_Range                  | 104             |
| Fairbanks area                | 69              |
| 12mile                        | 62              |
| Big Trail                     | 61              |
| Eagle Summit                  | 51              |
| Fairbanks Area Spinach Circle | 18              |
| BirchLake                     | 10              |
| Fairbanks Area Vault Road     | 9               |
| Eight Mile                    | 5               |
| Wickersham                    | 1               |

**Table 3.** Summary of the number of PSR+ scans contributing to each functional group.

| Functional_group1 | Number of scans |
|-------------------|-----------------|
| Lichen            | 417             |
| ShrubDecid        | 297             |
| Forb              | 158             |
| Moss              | 122             |
| Graminoid         | 107             |
| ShrubEvergreen    | 105             |
| Abiotic           | 94              |
| TreeBroadleaf     | 17              |
| TreeConifer       | 17              |

**Table 4.** Number of scans per species

| Species_name | Number of scans |
|--------------|-----------------|
| Betula nana  | 62              |

| Species_name             | Number of scans |
|--------------------------|-----------------|
| Dryas sp.                | 58              |
| Alnus sp.                | 57              |
| Petasites frigidus       | 52              |
| Quartz                   | 50              |
| Salix alaxensis          | 47              |
| Eriophorum angustifolium | 36              |
| Rhizocarpon geographicum | 32              |
| Flavocetraria nivalis    | 29              |
| Masonhalea richardsonii  | 28              |
| Arctostaphylos           | 27              |
| Carex aquatilis          | 27              |
| Polytrichum sp.          | 26              |
| Cladonia mitis           | 24              |
| Lupinus sp.              | 23              |
| Nephroma arcticum        | 21              |
| Melanelia sp.            | 21              |
| Pedicularis racemosa     | 20              |
| Cladonia rangiferina     | 20              |
| Salix pulchra            | 20              |
| Rosa acicularis          | 20              |
| Asahinea chrysantha      | 19              |
| Umbilicaria hyperborea   | 19              |
| Cladonia gracilis        | 18              |
| Picea mariana            | 17              |
| Bare Soil                | 17              |
| Salix glauca             | 16              |
| Cladonia stellaris       | 16              |
| Pilophorus acicularis    | 15              |
| Cetraria islandica       | 14              |
| Bare Rock                | 14              |
| Hylocomium splendens     | 13              |
| Betula neoalaskana       | 13              |
| Vaccinium vitis-idea     | 13              |
| Cladonia stygia          | 13              |
| Aulacomnium palustre     | 12              |
| Saxifraga punctata       | 12              |
| Polytrichum juniperinum  | 12              |
| Carex sp.                | 12              |
| Rhytidum rugosum         | 12              |

| Species_name             | Number of scans |
|--------------------------|-----------------|
| Porpidia sp.             | 11              |
| Ledum decumbens          | 11              |
| Peltigera apthosa        | 10              |
| Salix (wooly)            | 10              |
| Alectoria ochroleuca     | 10              |
| Dupontia fisheri         | 10              |
| Salix richardsonii       | 9               |
| Cassiope tetragona       | 9               |
| Cladonia uncialis        | 9               |
| Pleurozium schreberi     | 9               |
| Petasites frigida        | 8               |
| Cladonia amaurocraea     | 8               |
| Loisleuria procumbens    | 8               |
| Sphagnum sp.             | 8               |
| Stereocaulon sp.         | 8               |
| Dead Salix               | 8               |
| Arctocetraria centrifuga | 8               |
| Heracleum lanatum        | 8               |
| Cladonia steallaris      | 8               |
| Aulacomnium turgidum     | 8               |
| Petasites frigidus       | 7               |
| Arctophila fulva         | 7               |
| Toefeldia sp.            | 7               |
| Dactylina arctica        | 7               |
| Equisetum arvense        | 7               |
| Peltigera scabrata       | 7               |
| Eriophorum vaginatum     | 7               |
| Salix ovalifolia         | 6               |
| Empetrum nigrum          | 6               |
| Rubus sp.                | 6               |
| Vaccinium uliginosum     | 6               |
| Cetraria laevigata       | 6               |
| Ceratodon purpureus      | 5               |
| Cladonia cornuta         | 5               |
| Dicranum sp.             | 5               |
| Pices (bark)             | 5               |
| Trapelopsis granulosa    | 5               |
| Arctagrostis latifolia   | 4               |
| Umbilicaria arctica      | 4               |

| Species_name            | Number of scans |
|-------------------------|-----------------|
| Salix lanata            | 4               |
| Tomenthypnum nitens     | 4               |
| Iris sp.                | 4               |
| Salix arbusculoides     | 4               |
| Calamagrostis sp.       | 4               |
| Populus balsamifera     | 4               |
| Plagiomnium sp.         | 4               |
| Peltigera leucophlebia  | 4               |
| Peltigera malacea       | 4               |
| Pedicularis sudetica    | 4               |
| Parmeliopsis ambigua    | 4               |
| Parmelia omphalodes     | 4               |
| Equisetum sylvaticum    | 4               |
| Racomitrium lanuginosum | 4               |
| Salix phlebophylla      | 3               |
| Rhizocarpon sp.         | 3               |
| Cladonia sulphurina     | 3               |
| Arenaria pseudofrigida  | 1               |
| Hieracium sp.           | 1               |

### 3. Application and Derivation

The ground spectra included in this dataset were used to support interpretation, classification, and validation of UAV imagery-derived PFT products (Nelson 2026). These data also support fine-scale vegetation mapping, training and validation of airborne imaging spectroscopy products such as AVIRIS-NG, and ecological research within the NASA ABoVE Domain.

### 4. Quality Assessment

Not provided

### 5. Data Acquisition, Materials, and Methods

The submitted ground spectral library contains 1,334 individual scans representing 98 species. Geographic coordinates (latitude / longitude) are available for 255 scans (~19.1%); scans without coordinates were typically collected from samples measured away from the collection point (e.g., at a central staging location) or without a GPS fix at the time of scanning. The spectra were collected at multiple Alaska field locations within the ABoVE Domain using a Spectral Evolution PSR+ spectroradiometer. Scans were collected using either a leaf clip or contact probe fiber optic, both equipped with an internal tungsten halogen illumination source that minimizes ambient light contamination and provides a stable illumination geometry.

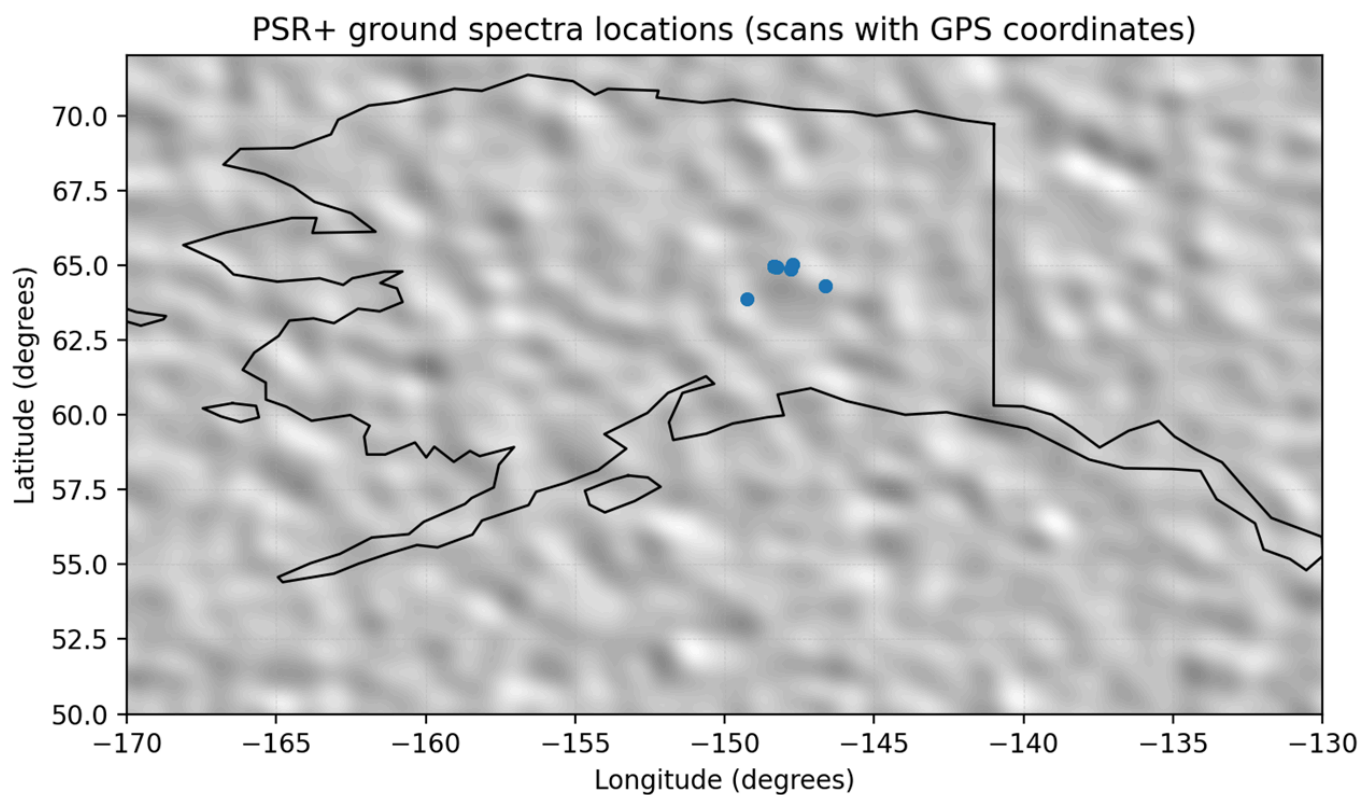


Figure 2. PSR+ ground spectra locations (scans with GPS coordinates). This map only includes those 254 spectra samples with geographic coordinates in five areas: Fairbanks Area Vault Road (9 scans), Murphy Dome (213 scans), Fairbanks Area Spinach Circle (18 scans), BirchLake (10 scans), and Eight Mile (5 scans)

## 6. References

Nelson, P.R. 2026. ABoVE: UAV VNIR Imaging Spectroscopy and Derived Plant Functional Types. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2503>