AEDIS User's Guide
(January 28, 2004)

https://rsgis.crrel.usace.army.mil/aedis/

Introduction

The Alaska Engineering Design Information System (AEDIS) is an engineering resource that utilizes a toolkit and intelligent display methods to access a broad array of geospatial terrestrial and atmosphere environmental data to derive engineering parameters. Data and derived parameters are selected for direct application to practical engineering problems. The AEDIS presently has many useful data layers and tools (Tables 1 and 2), but is still under development and new data, tools, and Geographic Information System (GIS) improvements will be added as they become available.

The AEDIS data, stored and managed using a GIS, and toolkit-derived parameters are delivered via the internet. This mode of delivery allows planners, designers, builders, and operators of Alaska infrastructure throughout the state to use a common resource to estimate environmental and derived engineering conditions. Internet delivery of the AEDIS provides updates to data, tools, and derived parameters as soon as they are implemented.

The AEDIS is intended to provide essential information for building sites and transportation corridors, to select optimum transportation routes, to design constructed works, and to program facility maintenance, repair, and replacement. The AEDIS is being developed by the US Army ERDC-Cold Regions Research and Engineering Laboratory in collaboration with the University of Alaska with sponsorship and guidance from the U.S. Army and the Alaska Department of Transportation and Public Facilities.

Table 1. Summary list of AEDIS data

Data Layers	
Base Layers	Vegetation classes Slope Aspect Ecoregions Geology Land ownership Permafrost distribuion Physiographic divisions (Major) Precipitation Soils Latitude/Longitude
Other Layers	Contours Forest damage (2000) 1964 earthquake geomorphic displacement Water features Glaciers Moraines Roads & transitways Trails Trans-Alaska pipeline Railways Towns USGS quad indexes Township/Section Grids Hydrologic units
Climate data	
Western Regional Climate Center (WRCC)	Summary climate data including temperature, precipitation, and snow fall. Daylight and Includes derived freezing, thawing, and heating degree indices are also given.
Unified Climate Access Network (UCAN)	Climate data from National Weather Service (NWS) and Cooperative station installations for the period of operation. Includes derived freezing, thawing, and heating degree indices.
Snow data	Snow depth and ground load data and recurrence interval statistics for snow depth and ground snow load based on NWS and USDA Soil Conservation Service data.

Table 2. AEDIS Engineering tools and derived data parameters

Engineering Tools	
Soil Freeze/Thaw Calculator	The modified Berggren equation is used to calculate seasonal freezing depth in thawed material or seasonal thawing depth in permafrost.
PRISM Data	Uses physical models and statistical methods to interpolate temperature and precipitation monthly and annual means from weather station data to a selected location.
Sunset/Sunrise Calculator	Calculates solar information for a selected location.
Solar Position Calculator	Calculates solar position for a selected location.
Wind Rose Calculator[1]	Creates a wind rose for first order weather station data and calculates wind statistics.
Derived Parameters	
Degree Day Indices	Freezing, thawing, and heating degree indices.
Snow Load/Depth statistics	Recurrence interval statistics for snow depth and ground snow load.

[1]This feature is in the developmental version of AEDIS.

Map Basics

AEDIS is a map-based, point and click system, so it is useful to examine some of the tools on the main page.

Start by moving the cursor across the map. Note that the latitude/longitude of the cursor position are shown in the bottom left corner of the screen. The scale of the map or any portion of the map displayed is also shown at the lower left corner of the map. These will automatically change if a particular area of the map is enlarged for viewing.

Changing the Displayed Area Using Mapping Functions

There are several ways to move around the map and change the area being displayed. To recenter the map, simply click on the location that you would like to be in the center. Selecting the pan symbol from the map functions at the bottom serves the same purpose. The default mode of the cursor is the pan mode.

The location of the map within the screen can also be changed by clicking on the arrows at the borders of the page, though the movements are large especially if the entire State is displayed.

Zooming in or Zooming out is accomplished by choosing the respective magnifying glass from Map Functions , . Note that the map will recenter at the cursor click location after the zoom function is selected. Once the desired area of interest is shown, the pan mode should be selected to move or recenter the map.

Changing the Displayed Area by Dragging a Box

By far the most efficient method of displaying an area of interest is to click and drag on the map to enlarge a particular region. Simply draw a box on the map with the mouse (or however you control the cursor) holding the left button down. When the button is released, the screen will be refreshed with a new map of the area that was outlined in the box. The new map scale is shown at the bottom left corner of the map. It may be easier to find the area of interest by selecting Latitude, longitude from the Base Layers Menu and/or Towns from the Other Layers menu, then clicking on Refresh Map at the bottom of the menu.

Reset Map

Another heavily used function is the Reset Map selection at the lower right of the map screen. Clicking on this selection deletes all layers and restores the State map to the original scale. In other words, it returns the user to the home page. This feature is used extensively to set up the map for a new AEDIS study.

Map Mode: View or Query

The Map Mode function at the bottom of the map screen allows the user to select the View function (the default mode) or the query or inquiry mode, . The View mode is used for the basic map functions such as moving around the map, recentering and viewing a particular region. The inquiry mode is used to display data for displayed stations or layers which have stored data (Climate Data Stations, Snow Data, PRISM data). The user must return to the View mode to again pan or zoom on the map (but not to examine data from another station), once the data display window has been closed.

Menu Selections

Other selections are available at the top of the screen.

Home contains three selections: Reset Map, About AEDIS, and Helpful Links. The Reset Map function is straightforward – it returns the user to the home page, the same as the reset map function at the bottom right of the map. About AEDIS contains a brief description of AEDIS as well as links to the CRREL RS/GIS center and the University of Alaska School of Engineering. Helpful Links currently contains a description of the climate of Alaska.

Engineering Tools contains several useful tools. A sunset/sunrise calculator determines the sunset/sunrise for any of a selectable number of sites in Alaska or a location's coordinates specified by the user. The default date is the current day, which can be changed by the user.

A solar position calculator calculates the solar position for any of a selectable number of sites in the State or a location's coordinates specified by the user. As with the sunset/sunrise calculator the default date is the current day or one specified by the user.

A soil/freeze thaw calculator determines the annual maximum freeze depth or thaw depth in the case of permafrost using a modified Berggren method. The user specifies the freezing and thawing indices (mean annual freezing and thawing degree days), n factors for the soil, the soil dry density, the soil moisture content and the type of soil (coarse or fine). This tool is described in more detail in a later section.

All engineering tools display results on a separate screen, which can be closed by the user after completing the calculation.

Map Tools contains a tool to get a printable PDF map of the current map screen.

Help contains a basic set of instructions that demonstrate a variety of AEDIS applications. It also contains links to e-mail questions to the developers and other basic information regarding the map tools.

Using AEDIS Layers

To learn the full utility of AEDIS, we have prepared several short demonstrations. Some of the notes preceding and contained within the demo instructions repeat what has been described above but in the context of working with the system.

Notes on Demo commands:

1. To show a map layer, click on any of the following tabs to the right of the main map area: Climate Data, Snow Data, PRISM Data, Base Layers or Other Layers. Check a box next to a layer and click on **Refresh Map** below the checkboxes. This will load your selection onto the main map. A number of boxes may be checked from one or different layers, but Refresh Map needs only to be clicked once. Layers will overwrite, however, so care must be exercised when selecting more than a single layer.

2. The  symbol indicates inquiry or query mode and allows the user to point to a data station on the map and right click to bring up stored data.

3. To view the legend, click on the "LEGEND" tab to the right of the main map area (nested in with the map layer tabs).

4. To print the main map area, place your mouse over "Map Tools" above the main map area. A "Printable Map" selection will appear. Click on this item to open a PDF window with the current map displayed.

5. Note that some of the more robust data layers take longer to load (e.g. PRISM data). Please wait for the "Fetching Map..." label at the bottom status bar of your web browser to finish. When the map has finished loading, the status bar will say "Done".

Demo 1: Climate Summary Data

Shows a summary of climate data and printable PDF page for a selected station.

- Click on the "Climate Data" tab, to the right of the main map area. (Note: The tab is selected by default when AEDIS is refreshed.)
- Check the box next to "WRCC Climate Summary Stations" and click "Refresh Map". This shows the available climate summary stations.
- Holding down left mouse button, drag a box on the map in the center of the state. This enlarges an area of interest (one could also click on the zoom tool , then click on the map area of interest).
- Click  at the bottom of the map to get information about one of the stations.
- Click on the dot for any station.
- Answer yes to security note. Now you have a summary climate information page for the station. You can arrange this screen for the best display by enlarging or shrinking the individual frames (dragging at the margins).
- For better display, click "here" at the top of the screen to produce a printable PDF page.
- Close the PDF page.
- Close the station page. Now you have returned to the station location map.
- Try another station.

- Answer yes to security.
- Close the station page.
- Click "Reset Map" at the bottom right of the main map area. This resets the entire screen.

While you are in Query Mode, all clicking that you perform on the main map area will attempt to search for results. If you would like to resume **basic map functions**, such as **zooming in**, **zooming out** or **panning**, you **must** switch the map mode back to Viewing Mode.

Demo 2: PRISM Precipitation Display

Displays extrapolated data from point information using physical extrapolation algorithms.

- Select the "PRISM Data" tab.
- Draw a box anywhere in the state.
- Choose a Monthly or Annual precipitation and click on "Refresh Map" at the bottom of the tab area. These layers take a while to load, especially for the entire state. Wait for "Fetching Map..." on the window's bottom status bar to be replaced with "Done".
- Click .
- Click anywhere on the map. The precipitation amount for that location is given on a separate screen.
- Close that screen.
- Click on the "Other Layers" tab. Let's add more information to the display.
- Check Towns, click "Refresh Map" at the bottom of the tab area.
- Click on the "Base Layers" tab.
- Check Lat / Long, click on "Refresh Map" at the bottom of the tab area.
- Click on the "LEGEND" tab. This command is used only to display a legend with the map on the display.
- Click "Printable Map" from the "Map Tools" top menu. This shows the map with all layers selected with the legend.
- Close that page.

- Reset Map.

Demo 3: Display Permafrost Map and Add Other Information Layers

- Click on the "Base Layers" tab to the right of the main map area.
- Check Permafrost, click "Refresh Map" at the bottom of the tab area.
- Draw smaller box in the center of the State.
- Click on the "Other Layers" tab to the right of the main map area.
- Check Roads and Transitways.
- Check Towns, click "Refresh Map" at the bottom of the tab area.
- Click "Printable Map" from the "Map Tools" top menu. This shows the map with all layers selected with the legend.
- Close that page.
- Reset Map.

Demo 4: Display Snow Depth for Specified Sites in the State and Generate Snow Load Statistics Used For Building Snow Load Calculations

- Click on the "Snow Data" tab to the right of the main map area.
- Check "Snow Data Stations", click "Refresh Map" at the bottom of the tab area. The light blue are SCS (NCRS) and the navy blue are NWS stations (You can see this if you click on the "LEGEND" tab).
- Draw a Box anywhere in the state. Try southcentral.
- Under the "Annual Depth" section, check "Arithmetic Mean"(about in the center of the list), click "Refresh Map" at the bottom of the tab area. NWS stations show data.
- Click on the "LEGEND" tab. You can now see the range of depths for the different size dots.
- Click .
- Click on one of the colored stations. This shows snow load statistics for that site; if there is too little data for calculating statistics, no recurrence intervals will be shown. Close the page and try another.

- Close the query results page.
- Reset Map.

Demo 5: Calculate Soil Freezing/Thaw Depth.

Try this example to calculate the freezing depth of a coarse soil in the Fairbanks area. This modified Berggren method considers the soil without a snow cover.

- Select Soil/Freeze Thaw Calculator from the Engineering Tools Menu
- Type these values in:

Air freezing index: 6000
Air Thawing index: 3000
n factor, freezing: 0.9
n factor, thawing: 2
Soil dry density: 110
Soil moisture content %: 5
Soil type: coarse (the default)

- Select Submit

The results show that this soil will freeze to a depth of 14.3 feet.

- Close the Results box

End of Demos -- Try experimenting with layers and dragging zoom boxes with your mouse. The more you use AEDIS, the more comfortable you will become with the map tools and functionality.

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Soil freeze/thaw calculator

The soil/freeze calculator allows the user to determine the depth of thaw, in permafrost, or the freezing depth, in material that was initially thawed, that occurs during one year's temperature cycle. This is the seasonal active layer of a soil. In permafrost the seasonal active layer is the layer depth that is thawed over the summer (thaw depth) and in temperate regions the active layer is the layer depth that is frozen over the winter (freezing depth). The calculator uses annual freezing degree day (FDD) and thawing degree day (TDD) indices, surface n-factors, soil texture, soil density, and soil moisture content to calculate the depth of freezing or thawing.

The mean annual soil surface temperature determines whether the site is in a seasonal frost area or permafrost area. The annual soil temperature is estimated from the difference between the surface soil freezing and thawing indices. The n factors are used to relate the air freezing and thawing indices to surface freezing and thawing indices. If the resulting temperature is less than freezing, the site is a permafrost area and the depth of thaw will be determined in the calculation. Otherwise, it is an area of seasonal frost and the annual freezing depth is determined. The proper interpretation of the calculator output is:

1. Thaw depth

When the calculator result is a value for thawing depth and a zero for freezing depth then the soil was permafrost with an active seasonal thaw layer equal to the thaw depth. The zero value for the freezing depth simply indicates that the soil is permafrost.

2. Freeze depth

When the calculator result is a value for freezing depth and a zero for thawing depth then the soil was initially thawed with an active seasonal freezing layer equal to the freeze depth. The zero value for the thaw depth simply indicates that the soil is initially thawed, not permafrost.

The soil/freeze calculator is based on the modified Berggren equation as implemented by Dr. John Zarling. The Berggren equation was initially developed to estimate the seasonal depth of freeze in a moist soil, including the effects of phase change of water (Berggren, 1943). The modified Berggren equation incorporates the use of FDD and TDD to determine soil freezing and thawing, removing the need for an explicit time variable (Aldrich and Paynter, 1953). The modified Berggren equation is given by

$$Z = \lambda\sqrt{2k \times I \times n / L}$$

where Z is the depth of thaw or freeze, k is the thermal conductivity, I is the degree day index, n is the parameter relating the air degree day index with the ground surface degree day index, and L is the latent heat associated with the moisture contained in the soil. The λ parameter is related to the heat flux in the medium. Each of these parameters has a different result for frozen and thawed materials because the thermal properties of water change dramatically upon freezing.

A detailed discussion of the Berggren equation and methods to calculate FDD and TDD can be found in Lunardini (1991). Further discussions of the Berggren equation and FDD/TDD calculation methods and the application of the Berggren equation to ground freezing and thawing engineering problems are given in Berg and Aitkien (1973), Andersland and Anderson (1978), U.S. Army and Air Force TM 5-818-2 (1985), and Freitag and McFadden (1997).

Equations used to estimate thermal properties of soils

The thermal properties of Alaskan soils used in the AEDIS freezing/thawing calculator are estimated using empirical equations developed by Kersten (1949). These equations were developed using Kersten's extensive set of measured thermal properties for Alaskan soils.

To predict thermal conductivity, soils are divided into two groups, coarse (sands, gravels) and fine (silts, clays). The line of division is based on the silt and clay content where soils with 50% or more of silt and clay are in the fine textured group. The thermal conductivity also differs according to whether the soil is frozen or not. The four thermal conductivity equations are:

1. Fine (silt and clay) soils unfrozen

$$K_u = ([0.9 \, Log_{10}(m) - 0.2]10^{0.1\rho})/12$$

2. Fine (silt and clay) soils, frozen

$$K_f = (0.01(10^{0.022\rho}) + 0.085(10^{0.008\rho}) \, m)/12$$

3. Coarse (sand and gravel) soils unfrozen

$$K_u = ([0.7 \, Log_{10}(m) - 0.4]10^{0.1\rho})/12$$

4. Coarse (sand and gravel) soils, frozen

$$K_f = (0.076(10^{0.013\rho}) + 0.032(10^{0.0146\rho}) \, m)/12$$

Where m is the moisture content of the soil in percent of soil dry weight and ρ is the soil dry density in pounds per cubic feet. The units of thermal conductivity are BTU/hr-ft-F where BTU are British thermal units, hr is time in hours, ft is length in feet, and F is temperature in degrees Fahrenheit.

Kersten's measurements of specific heat for soils indicated little variation with soil type, but exhibited some temperature sensitivity with values varying from 0.19 Btu/(lb-F) at 140 °F to 0.16 BTU/(lb-F) at 0°F. Kerten's formula for calculating specific heat for a moist soil is given by

$$C_{sm} = (100C_s + m)/(100 + m)$$

Where C_{sm} is the specific heat of moist soil and C_s is the specific heat of dry soil in units of Btu/(lb-F). Kersten's basic equation is modified for use in the freeze/thaw depth calculator to represent frozen and thawed soils separately as:

1. Thawed soils

   $S_{smt} = \rho(0.17 + 1.0\ m/100)$

2. Frozen soils

   $S_{smf} = \rho(0.17 + 0.5\ m/100)$

Where S_{smt} and S_{smf} are the specific heats of moist soil in the thawed and frozen state in units of Btu/(ft^3-F). The dry soil specific heat, C_s, was selected to be 0.17 as intermediate in the temperature range.

n-factor values for freezing and thawing calculations

The n-factor is the relation between the air freezing or thawing index and the surface freezing or thawing index. It is commonly used in calculating the total seasonal depth of freezing or thawing and is necessary because freeze/thaw depth calculations require information about the surface index, but most sites have information only for the air index. A through discussion of the physical basis for the n-factor can be found in Lundardini (1978).

The n-factor increases with latitude because of differences between the intensity of solar radiation reaching the ground surface. Snow-covered surfaces are highly reflective, resulting in a high n-factor on freezing. During snow melting the temperature of the snow is a constant value. Turf and other organic surface covers result in variable heat flow to and from the surface with corresponding variations in n-factor values. N-factor values can also be affected by variability in weather factors like wind, rainfall, evaporation, and radiation. A selected set of measured n-factor values for general surfaces for northern latitudes is presented in Table A1 and a listing of typical n-factor values for different surfaces is given in Table A2.

Table A1. n-factor values for general surfaces (Lundardini, 1978)

Surface Type	Freezing n-factor	Thawing n-factor	Location of measurement
Spruce trees, brush, moss over peat soil	0.29	0.37	Fairbanks, AK
Brush & treescleared, moss in place, peat soil	0.25	0.73	Fairbanks, AK
Vegetation & 16 inches of soil stripped clean	0.33	1.22	Fairbanks, AK
Turf	0.5	1.0	Alaska & Greenland
Snow	1.0	-	Alaska & Greenland
Sand & gravel	0.9	2.0	Alaska & Greenland
Gravel	0.6—1.0	1.4—2.01	Alaska (Fairbanks & Chitna)
Elevated building		1.0	Fairbanks, AK
Pavement without snow	0.9	-	Fairbanks, AK
Pavement north of 45°N	0.9	-	Alaska
Gravel colored dark		1.27—1.40	Alaska (Fairbanks & Chitna)

Table A2. n-factor values for general surfaces (Freitag and McFadden, 1997)

Surface Type	Freezing n-factor	Thawing n-factor
Snow surface, clean	1.0	—
Portland cement, concrete	0.75	1.5
Asphalt pavement	0.70	1.6
Asphalt pavement, with intense solar radiation	0.70	2.0
Bare soil	0.70	1.4
Bare soil, with intense solar radiation	0.70	2.0
Turf	0.50	0.8
Tree-covered	0.3	0.4
Shaded surfaces, all types	0.9	1.0

Prism Data

All PRISM data were provided by The Climate Source and are used by permission. Copyright ©2002 The Climate Source (www.climatesource.com). All rights reserved.

PRISM (**P**recipitation-elevation **R**egressions on **I**ndependent **S**lopes **M**odel) is an analytical model that distributes point measurements of monthly and annual precipitation to regularly space grid cells in midlatitude regions. PRISM uses a digital elevation model (DEM) to estimate the "orographic" elevations of precipitation stations. PRISM groups stations onto topographic "facets" to account for sharply-defined climate regimes delineated by terrain features to prevent mixing data from stations with windward and leeward exposures. Precipitation and temperature at a DEM grid cell is estimated using a regression of precipitation versus elevation. Generally, data do not span the range of elevation in an area requiring that data be extrapolated to higher elevations. A linear function, weighted for elevation, is used for the extrapolation (Daly et al., 1994).

PRISM uses a trajectory model that runs straight line trajectories from the coast in the direction of prevailing winds over terrain to determine relatively wet and dry regions for the Alaska coastal mountains. As air parcels encounter terrain that blocks flow a rainout factor is applied; the more terrain blocking encountered, the more moisture is lost. A similar rainout factor is applied for down slope flow. The Alaskan default assumption is that precipitation increases with elevation to about 6500 ft and then decreases (Simpson et al., 2002).

For Alaska, PRISM uses about 455 stations to model precipitation and about 316 stations for its surface temperature model (Simpson et al., 2002). PRISM data provides the best available spatial coverage for Alaska at present, however, it does have some serious limitations, especially for precipitation. The sparse precipitation data network suffers from errors and inhomogeneities (i.e., data stations are not evenly distributed spatially). Interpolation of irregular station data is difficult and bias corrections require extensive station data that is not available. Studies of PRISM accuracy in the Rocky Mountains indicates that errors can exceed 15% (Simpson et al. 2002). Alaskan users of PRISM data who are familiar with local precipitation amounts have reported discrepancies with PRISM estimates.

The AEDIS implementation of PRISM data for Alaska provides color shaded maps of monthly and annual mean precipitation and temperature for the state. The colors are tied to a legend indicating the estimated magnitudes. In addition, the cursor can be used to select any grid within the state to produce a window displaying the selected precipitation or temperature value along with the latitude and longitude information.

Wind Rose Calculator

The wind rose calculator is an implementation of software developed at the University of Alaska Anchorage by Joshua Rogers (Smith, et al., 2004). The calculator uses data from National Weather Service first order stations, which are displayed on the map of Alaska when this tool is selected. The current implementation allows the user to select the years, months, and days over which the wind rose and wind statistics data can be calculated. The wind speed interval for wind statistics calculations To start the calculation press the submit button at the bottom of the page after selecting the time period over which to calculate the wind rose and wind statistics. The calculator will produce a wind rose showing wind direction and the percentage of time the wind blows at a specified speed interval. The calculator will also produce a table of wind statistics data to allow the user to asses the data record quality.

The wind rose calculator uses the National Weather Service first order station wind data.

The user should use caution when selecting more than about three years of data as it may result in long calculation times.

Appendix B. Explanation of Primary Data Sources

Western Regional Climate Center (WRCC)

The WRRC is part of the Desert Research Institute and supports a three-partner national climate services program that includes the National Climatic Data Center (NCDC), the Regional Climate Centers (RCC's), and the State Climate Offices. To learn more about the WRCC and their data view http://www.wrcc.dri.edu/.

Unified Climate Access Network (UCAN)

The following description of UCAN was taken from the Department of Agriculture Natural Resources Conservation Service National Water and Climate Center WEB site http://www.wcc.nrcs.usda.gov/bbook/bb20.html

UCAN is a consortium of federal and state agencies that have joined together to unify access and availability of climate data and information for natural resource management.

UCAN will provide users with "virtual access" via the Internet to climate datasets collected by federal, state, and county networks. UCAN will provide a networked computer and data storage infrastructure that will allow users to access climate information faster, easier, and more efficiently than previously possible.

In addition to new datasets, users will be able to run a wide variety of climate applications specifically tailored to meet their needs. These include, but are not limited to, statistical averages, frequency analyses, spatial mapping, risk analyses, and modeling applications that require specialized climatic information.
UCAN Goals:

* Provide national leadership in climate technology.
* Support a national, on-line climate database accessible via the Internet.
* Provide appropriate climatic data and analysis products directly supported by the on-line database.
* Provide a seamless, national distribution network for climatic products via the Internet.
* Provide error free, serially complete, spatially representative and timely climatic data.

Provide training, educational materials and workshops to improve the use of climatic information in all sectors of the user community.

Snow Data

Snow data consists of depth, ground load, and recurrence interval statistics for depth and ground load. Data sources include the National Weather Service (NWS) and the Natural Resources Conservation Service (NRCS) [formerly called the Soil Conservation Service].

Snow data is displayed in two ways:

1. Snow Station display
   Selecting the snow data button from the Climate Data menu displays the NWS and NRCS snow data stations (select the legend to identify the station source). Selecting the inquiry mode in AEDIS and then selecting one of the stations (refer to Map Basics section) displays a table of snow data that includes:
   a. Station information, maximum and minimum snow depth, and recurrence statistics for snow depth and snow ground load for the NWS data.
   b. Station information, maximum snow depth and ground snow load, and 50 year recurrence snow load.
2. Snow map display
   Selecting one of the choices for snow data, annual depth, or annual load under the snow data menu produces a map display of different sized markers for the selected data. The size of the marker is related to the magnitude of the data value, which is defined in the legend (select the legend feature). The range of values available for snow data information is currently limited in AEDIS so that interior snow covers may all be shown by only one marker size (this problem is currently being addressed to increase the resolution of the marker definitions). To obtain more detailed information about the depth of the station of interest select the inquiry mode and then select the station of interest to display the table of snow data. Only one data selection, besides the snow data stations, should be chosen at a time because the data is displayed at the station location. When a second data selection is made its markers will overlay the previous set of markers hiding that information. In addition, the markers defined in the legend are identical irrespective of what data source is selected making it impossible to differentiate the different data sets.

   Only select the snow data stations box and one additional data record box at a time in the snow data menu to avoid overwriting your information on the data display.

Appendix C. List of Contributors

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