Unified Ecoregions of Alaska: 2001

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Abstract

Unified Ecoregions of Alaska map portrays major ecosystems of the state of Alaska and neighboring portions of Canada and Russia. The word "Unified" in the title refers to the interdisciplinary, interagency, and international effort to derive this broad-scale ecosystem map. The ecoregions, as portrayed on this dataset, are large ecosystems primarily defined by climate and topography, with refinements from vegetation patterns, lithology, and surficial deposits. Ecoregions are tens of millions of acres in size and correspond to the Province level of Bailey's hierarchy (1980, 1995).

A total of thirty-two ecoregion units were mapped representing the major ecosystems of Alaska. Ecoregions were mapped in their entirety, with some spanning international boundaries to include portions of Canada and Russia. These ecoregions are characterized with written descriptions, tables of environmental variables, and photographs.

Background

Several attempts have been made over the past 50 years to map large ecosystems in Alaska. The first approximation was by L.A. Spetzman, who interpreted terrain and vegetation from black and white air photos to evaluate the feasibility of military vehicular movement during the Cold War. In 1973, these data were reinterpreted by vegetation types, and published as "Major Ecosystems of Alaska" (LUPC 1973). This map was further refined and published in Alaska Regional Profiles (Selkregg 1974-1976). The U.S. space program and the advent of earth imaging satellites in the early 1970's helped changed our perception of our lands with respect to a global context. Throughout the 1980's, remotely sensed data and the growing understanding of ecosystem processes provided impetus for mapping global ecosystems. Various mapping philosophies and derivative maps were published throughout the last twenty years of the twentieth century. Different ecological classification and mapping systems resulted in two separate maps for Alaska (Gallant et al. 1995, Nowacki and Brock 1995). Unfortunately, multiple maps depicting Alaskan ecoregions was awkward and confusing for users and impeded interagency communication. Recognizing this, and concurrent with national efforts to rectify this problem (McMahon et al. 2001), we have used an interdisciplinary group of environmental scientists and managers to unify ecoregion boundaries to benefit users and facilitate interagency work.

The burgeoning fields of remote sensing data analysis and GIS provided new datasets and analysis tools for Alaska during the 1990's. The first statewide vegetation map since Spetzman's 1950 effort was developed (Fleming 1996). Digital topographic data and various statewide images became available. Long-term weather records were interpreted as climatic data (Fleming et al. 2000). Other datasets were digitized for use in GIS analysis, including permafrost (Ferrians 1965), soils (Reiger et al. 1979), surficial (Karlstrom et al. 164) and bedrock geology (Beikman 1980), previous ecosystem maps (Nowacki and Brock 1995, Gallant et al. 1995), and hydrography. Concurrently, several agencies and non-profit organizations in Alaska began to develop their own ecosystem maps for various applications.

Approach

Field and resource specialists representing a variety of organizations (see contributor list) assembled in Anchorage in April 1999 to evaluate ecoregion maps with the benefit of updated resource layers. The degree of similarity between the two core maps (Nowacki and Brock 1995, Gallant et al. 1995) was substantial. Coincident lines and units encapsulating equivalent features were identified and used in the new map.

During this process, line placement was refined using many of the recently developed data. Delineation criteria ultimately included climate, physiography, vegetation, lithology, surficial deposits and glaciation. Several map versions were generated over a period of one year incorporating suggestions received from various ecologists, biologists, soil scientists and geologists from across the state and adjacent Canadian lands. In areas where data were lacking or pattern changes on the land were indistinct, the advice of local experts was used extensively for line placement. The final dataset represents the combined wisdom of 40-50 scientists from many disciplines with hundreds of years of experience in Alaska and nearby country. It closely matches with Canadian mapping along our mutual borders (Smith et al 2001, Demarchi et al 2000). Our mapping philosophy meshes well with adjacent Canada and throughout North America.

Results

Map/Dataset: A total of 32 ecoregions were delineated. Ecoregions were mapped in their entirety and spanned international boundaries where necessary (Russia and Canada). Each ecoregion is described according to its major ecological and geomorphic processes, associated vegetation patterns, dominant wildlife, geologic features and major climatic parameters. Tables and graphs are presented showing prominent patterns of landcover, soils, lithology, surficial geologic materials, dominant geomorphic processes, temperature/precipation regime and surface roughness. Photographs of representative landscapes are shown for each ecoregion.

Digital files of the Unified Ecoregions of Alaska are available at: http://agdc.usgs.gov/data/projects/fhm

Tri-archy: Ecoregions are nested together to form eight groups that possess similar ecological character (patterns and processes). Ecosystems in Alaska are spread out along three major bioclimatic gradients, which are represented by the factors of vegetation (forested to non-forested), climate (temperature and precipitation), and disturbance regime. These bioclimatic regimes grade from one to another across the state, forming the space within the triangle. The corners of the triangle represent polar, boreal, and maritime regimes. When eight broad groups of ecoregions are arrayed along the spatial gradients within a triangle (or tri-archy, rather than a dichotomous hierarchy), clear patterns emerge which accurately reflect distinct climatic-vegetation relationships. This spatial projection allows the natural associations among ecoregion groups to be displayed as they occur on the land without loss of information (i.e., retains the spatial interrelations of the groups). This display fosters interagency use by allowing people to understand and conveniently place these groups and component ecoregions into classifications or frameworks of their choice.

Tabular Data: Various environmental variables were tabulated for each ecoregion, and the top five values for each parameter are listed in the accompanying table. The variables used are: lithology as grouped by D. Brew (1999), soils, surficial geology and surficial geology type and landcover .

Climographs: Annual cycles of average temperature and precipitation are graphed for each ecoregion, which are grouped into the eight groups portrayed on the tri-archy. Each climograph line represents the monthly averages for temperature and precipitation of a given ecoregion. The groupings of ecoregions show similarities of climate, with subtle changes due to latitude, proximity to oceans, and mountains. Points along each climograph represent monthly temperature and precipitation averages. Each line begins with January (1) and sweeps up to warmer summer temperatures (6, 7, 8) and generally greater precipitation, then reverts to winter conditions (12). The Arctic Tundra group shows a pattern of low temperature and precipitation, reflecting the harsh polar desert system near the Beaufort Sea. The Bering Tundra group is slightly warmer in winter months, with more rain during summers, a function of cold maritime conditions of the Bering Sea. The Intermontane Boreal ecoregions all have similar climate patterns with large temperature variation but low precipitation throughout the year. The Coastal Rainforest group shows warmer temperatures and consistently high precipitation caused by moderating influences of the Pacific Ocean.

Terrain Roughness: A surface roughness dataset was calculated for the area as a function of terrain relief/unit area. The points on the graph plot the average surface roughness against average elevation for each ecoregion. Thus ecoregion 1 (Beaufort Coastal Plain) is flat and low elevation. Ecoregion 23 (Copper River Basin) is also flat, but at higher elevations. The Wrangell Mountains ecoregion (24) is the most rugged area of the state.

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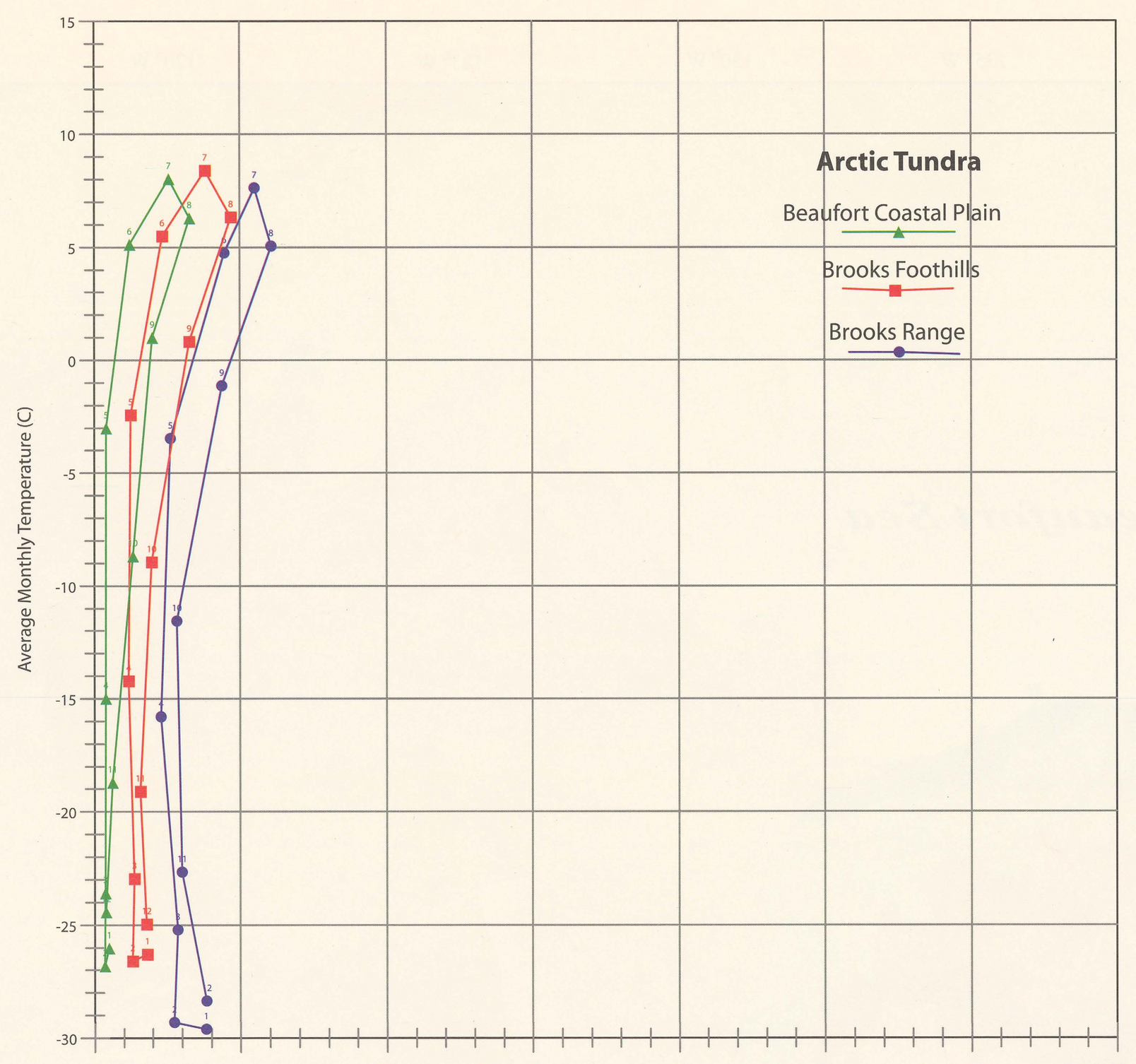
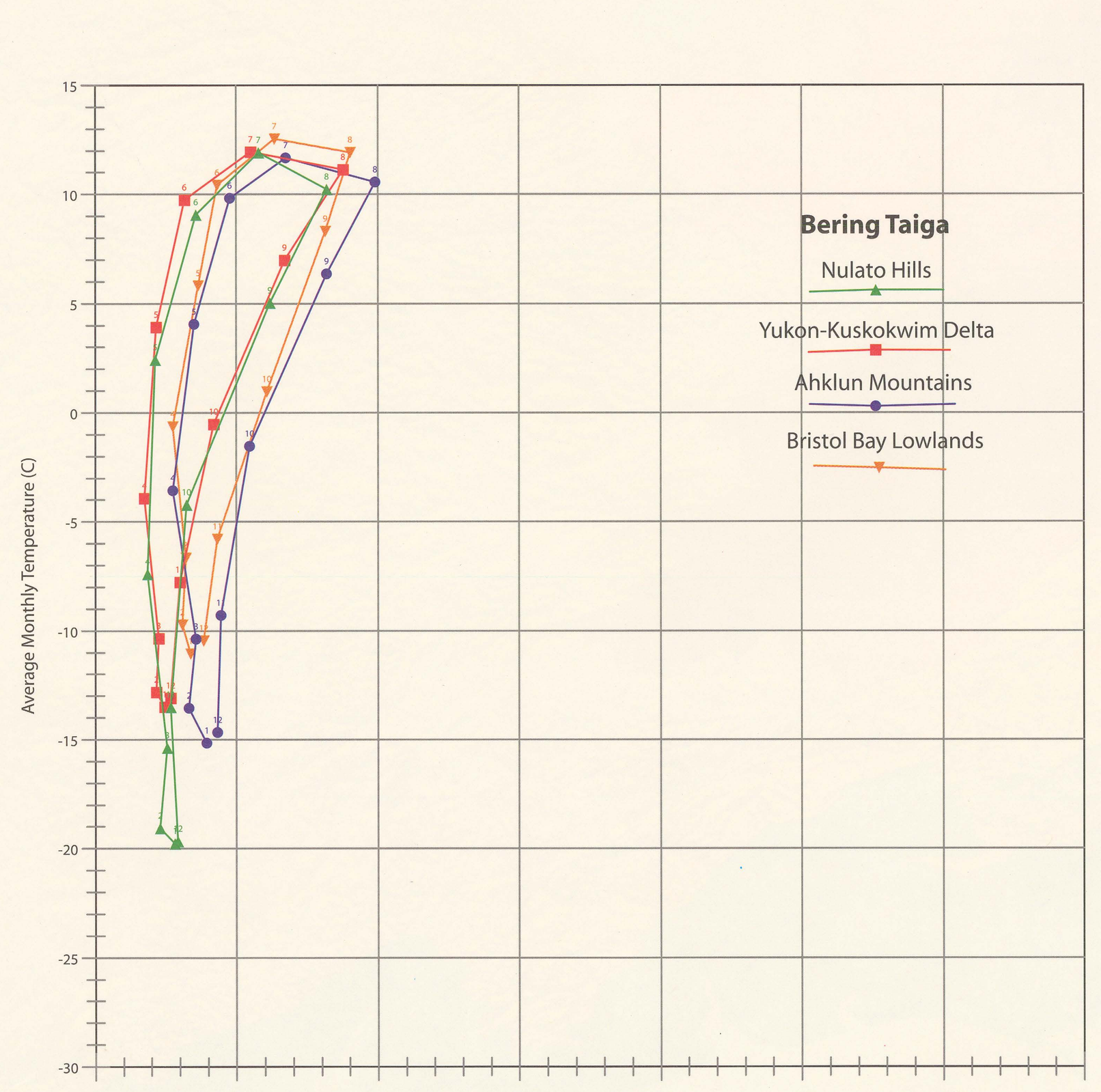
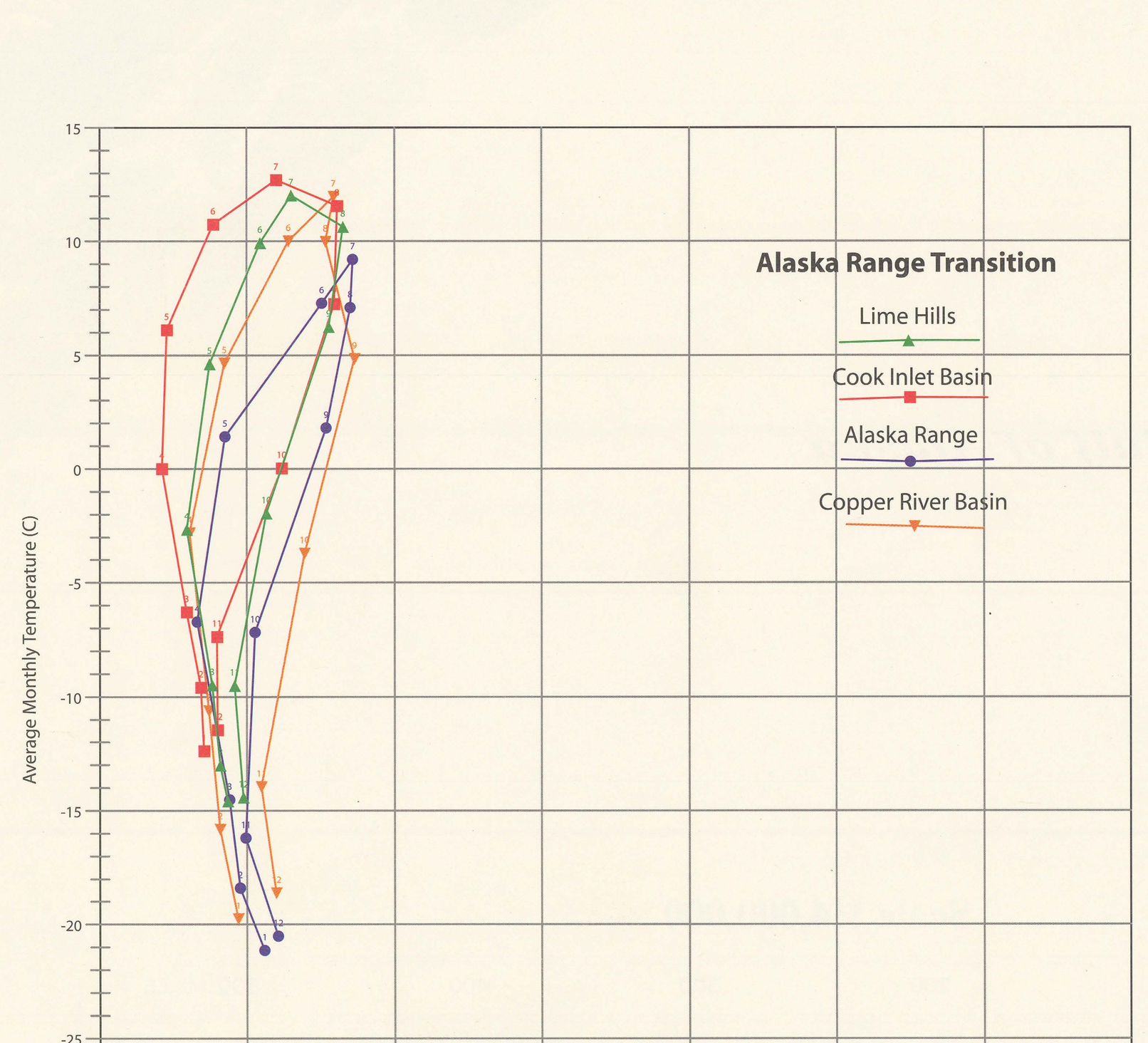
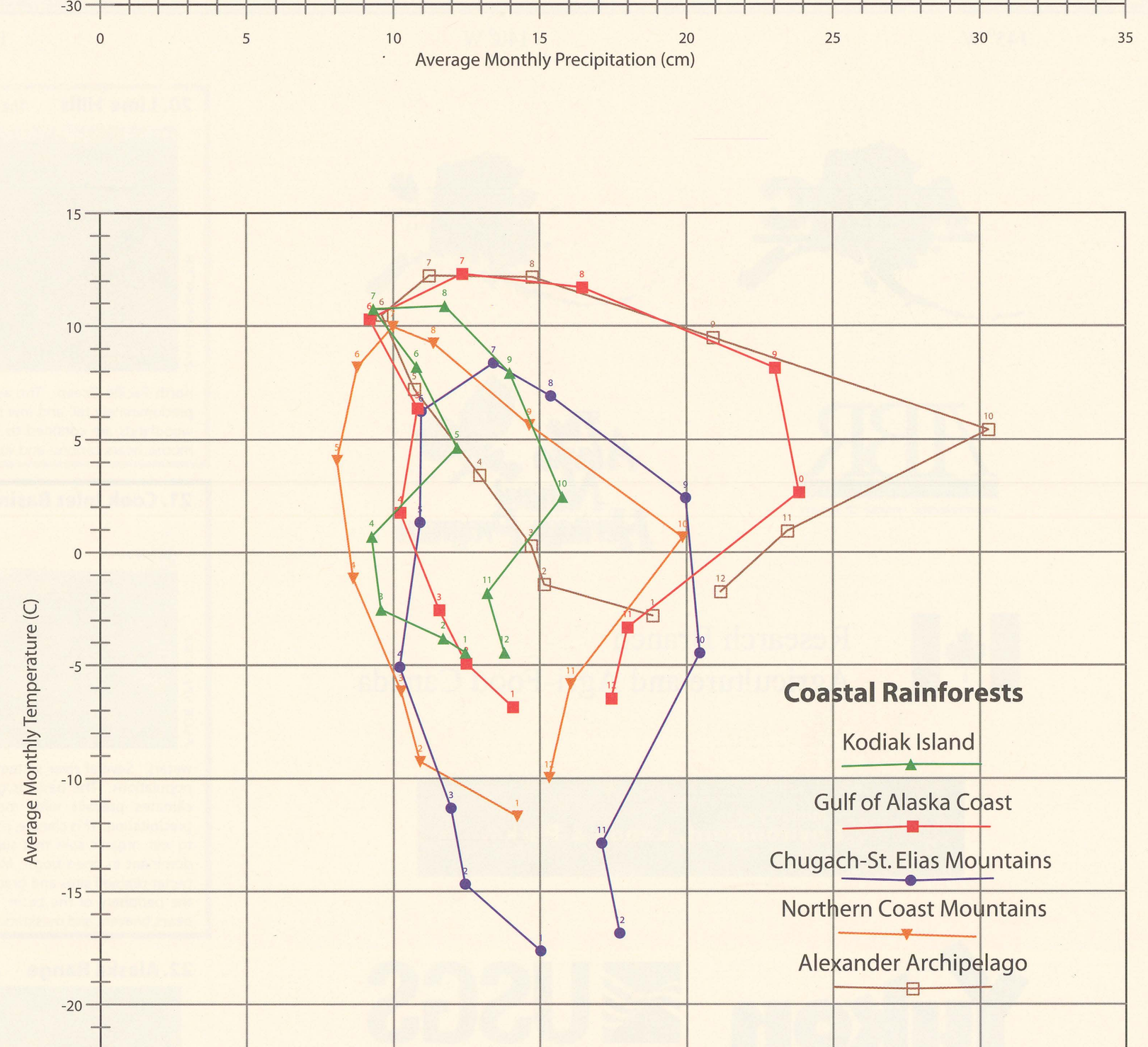








Arctic Tundra

1. Beaufort Coastal Plain	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (97%)	Lakes (1%)	Pelitic Metamorphic (1%)		
Soil Type	Aquepts (88%)	Aquolls (12%)			
Surficial Geology	Coastal (78%)	Water (10%)	Fluvial (7%)	Eolian (2%)	Glacial/Fluvial (2%)
Surfical Geology Type	Old Marine & Alluvium (75%)	Lakes (10%)	Floodplain (5%)	Coastal Delta (2%)	Upland Loess (2%)
Landcover	Wet Sedge Tundra (50%)	Moist Herbaceous/Shrub Tundra (36%)	Neighboring Territories (8%)	Water (3%)	Tussock Sedge/Dwarf Shrub Tundra (2%)

2. Brooks Foothills	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (95%)	Carbonate Sedimentary (4%)	Extrusive Igneous (1%)		
Soil Type	Aquepts (80%)	Borolls (11%)	Aquolls (7%)	Rough Mtn Land (2%)	Umbrepts (1%)
Surficial Geology	Mountain Alluvium & Colluvium (53%)	Eolian (15%)	Glacial Moraines & Drift (9%)	Coastal (9%)	Glacial/Fluvial (8%)
Surfical Geology Type	Fine Rubble (27%)	Coarse & Fine Rubble (20%)	Upland Loess (15%)	Old Marine & Alluvium (9%)	Old Glacial Outwash (8%)
Landcover	Tussock Sedge/Dwarf Shrub Tundra (69%)	Moist Herbaceous/Shrub Tundra (18%)	Dwarf Shrub Tundra (7%)	Tall & Low Shrub (3%)	Alpine Tundra & Barrens (1%)

3. Brooks Range	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (61%)	Carbonate Sedimentary (17%)	Sedimentary/Metamorphic Complex (14%)	Pelitic Metamorphic (3%)	Extrusive Igneous (2%)
Soil Type	Rough Mtn Land (68%)	Aquepts (17%)	Aquolls (8%)	Borolls (7%)	
Surficial Geology	Mountain Alluvium & Colluvium (69%)	Glacial Moraines & Drift (26%)	Undifferentiated Alluvium & Colluvium (3%)	Fluvial (2%)	Glacial/Fluvial (1%)
Surfical Geology Type	Bedrock & Coarse Rubble (63%)	Lightly Modified Moraine (20%)	Coarse & Fine Rubble (6%)	Moderately Modified Moraine (6%)	Undifferentiated Mosaic (3%)
Landcover	Alpine Tundra & Barrens (28%)	Neighboring Territories (18%)	Tussock Sedge/Dwarf Shrub Tundra (13%)	Dwarf Shrub Tundra (13%)	Tall & Low Shrub (8%)

Bering Tundra

4. Kotzebue Sound Lowlands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Sedimentary (54%)	Extrusive Igneous (29%)	Quaternary Extrusive Igneous (5%)	Carbonate Sedimentary (5%)	Noncarbonate Sedimentary (4%)
Soil Type	Aquepts (100%)				
Surficial Geology	Coastal (65%)	Mountain Alluvium & Colluvium (11%)	Glacial Moraines & Drift (8%)	Water (7%)	Fluvial (7%)
Surfical Geology Type	Old Marine & Alluvium (50%)	Coastal Delta (13%)	Volcanic (8%)	Highly Modified Moraine (8%)	Lakes (7%)
Landcover	Tussock Sedge/Dwarf Shrub Tundra (39%)	Moist Herbaceous/Shrub Tundra (35%)	Tall & Low Shrub (14%)	Water (5%)	Open Spruce Forest/Shrub/Bog Mosaic (4%)

5. Seward Peninsula	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Pelitic Metamorphic (35%)	Extrusive Igneous (18%)	Quaternary Extrusive Igneous (18%)	Metacarbonate Metamorphic (9%)	Intrusive Felsic Igneous (7%)
Soil Type	Aquepts (88%)	Rough Mtn Land (7%)	Umbrepts (5%)	Lava Flows (1%)	
Surficial Geology	Mountain Alluvium & Colluvium (40%)	Eolian (26%)	Glacial Moraines & Drift (9%)	Fluvial (9%)	Coastal (8%)
Surfical Geology Type	Upland Loess (25%)	Coarse & Fine Rubble (18%)	Fine Rubble (15%)	Highly Modified Moraine (8%)	Alluvial Terrace (7%)
Landcover	Tussock Sedge/Dwarf Shrub Tundra (35%)	Tall & Low Shrub (34%)	Moist Herbaceous/Shrub Tundra (18%)	Alpine Tundra & Barrens (6%)	Spruce Woodland/Shrub (3%)

6. Bering Sea Islands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Extrusive Igneous (54%)	Intrusive Felsic Igneous (14%)	Extrusive Igneous (14%)	Quaternary Sedimentary (12%)	Carbonate Sedimentary (4%)
Soil Type	Aquepts (75%)	Umbrepts (15%)	Borolls (7%)	Cryands (3%)	
Surficial Geology	Mountain Alluvium & Colluvium (71%)	Coastal (24%)	Water (5%)		
Surfical Geology Type	Volcanic (58%)	Old Marine & Alluvium (24%)	Bedrock & Coarse Rubble (13%)	Lakes (5%)	
Landcover	Moist Herbaceous/Shrub Tundra (75%)	Tall Shrub (6%)	Alpine Tundra & Barrens (6%)	Wet Sedge Tundra (4%)	Dwarf Shrub Tundra (3%)

Bering Taiga

7. Nulato Hills	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Sedimentary/Volcanic Complex (46%)	Noncarbonate Sedimentary (20%)	Extrusive Igneous (20%)	Quaternary Extrusive Igneous (6%)	Quaternary Sedimentary (4%)
Soil Type	Umbrepts (58%)	Aquepts (39%)	Ochrepts (3%)		
Surficial Geology	Mountain Alluvium & Colluvium (71%)	Undifferentiated Alluvium & Colluvium (19%)	Coastal (4%)	Eolian (4%)	Fluvial (1%)
Surfical Geology Type	Coarse & Fine Rubble (67%)	Undifferentiated Mosaic (19%)	Old Marine & Alluvium (4%)	Upland Loess (4%) Volcanic (3%)	
Landcover	Tall & Low Shrub (33%)	Tall Shrub (30%)	Open Spruce Forest/Shrub/Bog Mosaic (13%)	Low Shrub/Lichen Tundra (6%)	Tussock Sedge/Dwarf Shrub Tundra (4%)

8. Yukon-Kuskokwim Delta	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Sedimentary (84%)	Sedimentary/Volcanic Complex (7%)	Quaternary Extrusive Igneous (6%)	Extrusive Igneous (2%)	Intrusive Felsic Igneous (1%)
Soil Type	Aquepts (98%)	Umbrepts (2%)			
Surficial Geology	Coastal (66%)	Water (10%)	Fluvial (9%)	Undifferentiated Alluvium & Colluvium (7%)	Mountain Alluvium & Colluvium (7%)
Surfical Geology Type	Old Marine & Alluvium (62%)	Lakes (8%)	Undifferentiated Mosaic (7%)	Floodplain (6%)	Coastal Delta (5%)
Landcover	Moist Herbaceous/Shrub Tundra (47%)	Low Shrub/Lichen Tundra (22%)	Tall Shrub (11%)	Water (6%)	Tall & Low Shrub (3%)

9. Ahklun Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (59%)	Sedimentary/Volcanic Complex (22%)	Extrusive Igneous (6%)	Intrusive Felsic Igneous (5%)	Quaternary Sedimentary (2%)
Soil Type	Umbrepts (40%)	Orthods (28%)	Aquepts (14%)	Cryands (11%)	Rough Mtn Land (7%)
Surficial Geology	Mountain Alluvium & Colluvium (43%)	Glacial Moraines & Drift (37%)	Glacial/Fluvial (8%)	Water (4%)	Undifferentiated Alluvium & Colluvium (3%)
Surfical Geology Type	Bedrock & Coarse Rubble (37%)	Lightly Modified Moraine (26%)	Moderately Modified Moraine (11%)	Old Glacial Outwash (8%)	Coarse & Fine Rubble (6%)
Landcover	Tall Shrub (53%)	Low Shrub/Lichen Tundra (17%)	Tall & Low Shrub (11%)	Water (4%)	Alpine Tundra & Barrens (4%)

10. Bristol Bay Lowlands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Sedimentary (73%)	Noncarbonate Sedimentary (18%)	Sedimentary/Volcanic Complex (4%)	Extrusive Igneous (2%)	Intrusive Felsic Igneous (2%)
Soil Type	Cryands (42%)	Aquepts (35%)	Fibrists (11%)	Orthods (7%)	Flurents (4%)
Surficial Geology	Glacial Moraines & Drift (55%)	Glacial/Fluvial (17%)	Fluvial (12%)	Coastal (11%)	Water (3%)
Surfical Geology Type	Moderately Modified Moraine (23%)	Lightly Modified Moraine (17%)	Old Glacial Outwash (17%)	Highly Modified Moraine (15%)	Old Marine & Alluvium (11%)
Landcover	Low Shrub/Lichen Tundra (69%)	Tall Shrub (11%)	Moist Herbaceous/Shrub Tundra (10%)	Low & Dwarf Shrub (7%)	Open Spruce Forest/Shrub/Bog Mosaic (1%)

Intermontane Boreal

11. Kuskokwim Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Sedimentary/Volcanic Complex (50%)	Sedimentary/Metamorphic Complex (29%)	Extrusive Igneous (14%)	Noncarbonate Sedimentary (2%)	Quaternary Sedimentary (2%)
Soil Type	Aquepts (79%)	Umbrepts (10%)	Ochrepts (9%)	Cryands (1%)	
Surficial Geology	Mountain Alluvium & Colluvium (58%)	Undifferentiated Alluvium & Colluvium (27%)	Fluvial (7%)	Eolian (3%)	Glacial Moraines & Drift (3%)
Surfical Geology Type	Coarse & Fine Rubble (54%)	Undifferentiated Mosaic (27%)	Bedrock & Coarse Rubble (4%)	Floodplain (4%)	Valley Loess & Alluvium (3%)
Landcover	Open Spruce Forest/Shrub/Bog Mosaic (37%)	Spruce & Broadleaf Forest (27%)	Tall Shrub (14%)	Low Shrub/Lichen Tundra (7%)	Spruce Woodland/Shrub (4%)

12. Yukon River Lowlands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Extrusive Igneous (36%)	Quaternary Sedimentary (24%)	Sedimentary/Volcanic Complex (20%)	Sedimentary/Metamorphic Complex (14%)	Noncarbonate Sedimentary (6%)
Soil Type	Aquepts (94%)	Ochrepts (6%)			
Surficial Geology	Undifferentiated Alluvium & Colluvium (41%)	Fluvial (38%)	Eolian (8%)	Mountain Alluvium & Colluvium (7%)	Water (5%)
Surfical Geology Type	Undifferentiated Mosaic (41%)	Floodplain (31%)	Alluvial Terrace (7%)	Coarse & Fine Rubble (7%)	Sand Dune (7%)
Landcover	Open Spruce Forest/Shrub/Bog Mosaic (43%)	Spruce & Broadleaf Forest (22%)	Open & Closed Spruce Forest (7%)	Tall Shrub (6%)	Low Shrub/Lichen Tundra (6%)

13. Kobuk Ridges and Valleys	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (50%)	Extrusive Igneous (31%)	Carbonate Sedimentary (7%)	Sedimentary/Metamorphic Complex (7%)	Intrusive Felsic Igneous (4%)
Soil Type	Aquepts (76%)	Ochrepts (15%)	Umbrepts (3%)	Rough Mtn Land (3%)	Orthods (1%)
Surficial Geology	Mountain Alluvium & Colluvium (36%)	Glacial Moraines & Drift (22%)	Fluvial (17%)	Undifferentiated Alluvium & Colluvium (13%)	Glacial/Fluvial (4%)
Surfical Geology Type	Coarse & Fine Rubble (24%)	Undifferentiated Mosaic (13%)	Bedrock & Coarse Rubble (13%)	Highly Modified Moraine (12%)	Floodplain (12%)
Landcover	Open Spruce Forest/Shrub/Bog Mosaic (33%)	Tall & Low Shrub (26%)	Tussock Sedge/Dwarf Shrub Tundra (13%)	Spruce Woodland/Shrub (10%)	Open & Closed Spruce Forest (4%)

14. Ray Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Sedimentary/Metamorphic Complex (28%)	Noncarbonate Sedimentary (23%)	Extrusive Igneous (22%)	Intrusive Felsic Igneous (18%)	Sedimentary/Volcanic Complex (4%)
Soil Type	Aquepts (56%)	Ochrepts (41%)	Rough Mtn Land (3%)		
Surficial Geology	Mountain Alluvium & Colluvium (83%)	Undifferentiated Alluvium & Colluvium (6%)	Fluvial (5%) Eolian (3%)	Glacial Moraines & Drift (2%)	
Surfical Geology Type	Coarse & Fine Rubble (73%)	Bedrock & Coarse Rubble (9%)	Undifferentiated Mosaic (6%)	Floodplain (4%)	Valley Loess & Alluvium (3%)
Landcover	Open Spruce Forest/Shrub/Bog Mosaic (39%)	Spruce & Broadleaf Forest (18%)	Tall & Low Shrub (14%)	Open Spruce & Closed Mixed Forest Mosaic (11%)	Open & Closed Spruce Forest (4%)

15. Tanana-Kuskokwim Lowlands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Sedimentary (40%)	Sedimentary/Metamorphic Complex (39%)	Extrusive Metamorphic (5%)	Sedimentary/Volcanic Complex (4%)	Sedimentary Complex (4%)
Soil Type	Aquepts (77%)	Ochrepts (18%)	Orthods (4%)	Rough Mtn Land (1%)	
Surficial Geology	Fluvial (46%)	Eolian (19%)	Glacial/Fluvial (10%)	Mountain Alluvium & Colluvium (9%)	Glacial Moraines & Drift (9%)
Surfical Geology Type	Floodplain (25%)	Alluvial Fan (14%)	Valley Loess & Alluvium (10%)	Old Glacial Outwash (10%)	Sand Dune (8%)
Landcover	Open Spruce Forest/Shrub/Bog Mosaic (37%)	Open & Closed Spruce Forest (24%)	Spruce & Broadleaf Forest (16%)	Low Shrub/Lichen Tundra (6%)	1990 Fires & Gravel Bars (6%)

16. Yukon-Tanana Uplands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Extrusive Metamorphic (42%)	Intrusive Felsic Igneous (23%)	Pelitic Metamorphic (21%)	Noncarbonate Sedimentary (6%)	Extrusive Igneous (3%)
Soil Type	Ochrepts (59%)	Aquepts (39%)	Rough Mtn Land (2%)		
Surficial Geology	Mountain Alluvium & Colluvium (89%)	Eolian (6%)	Glacial Moraines & Drift (2%)	Fluvial (2%)	Undifferentiated Alluvium & Colluvium (1%)
Surfical Geology Type	Coarse & Fine Rubble (76%)	Bedrock & Coarse Rubble (13%)	Valley Loess & Alluvium (5%)	Moderately Modified Moraine (2%)	Floodplain (1%)
Landcover	Neighboring Territories (38%)	Open & Closed Spruce Forest (15%)	Tall & Low Shrub (14%)	Open Spruce Forest/Shrub/Bog Mosaic (10%)	Spruce Woodland/Shrub (8%)

17. Yukon-Old Crow Basin	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Sedimentary (67%)	Sedimentary/Metamorphic Complex (15%)	Noncarbonate Sedimentary (7%)	Extrusive Igneous (5%)	Pelitic Metamorphic (3%)
Soil Type	Aquepts (52%)	Ochrepts (33%)	Flurents (12%)	Borolls (2%)	Orthents (1%)
Surficial Geology	Fluvial (43%)	Eolian (26%)	Mountain Alluvium & Colluvium (19%)	Undifferentiated Alluvium & Colluvium (9%)	Water (3%)
Surfical Geology Type	Floodplain (17%)	Alluvial Fan (16%)	Upland Loess (16%)	Coarse & Fine Rubble (10%)	Valley Loess & Alluvium (10%)
Landcover	Open Spruce & Closed Mixed Forest Mosaic (39%)	Neighboring Territories (22%)	Open & Closed Spruce Forest (17%)	Spruce & Broadleaf Forest (11%)	1990 Fires & Gravel Bars (5%)

18. Davidson Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (31%)	Sedimentary/Metamorphic Complex (30%)	Extrusive Igneous (18%)	Carbonate Sedimentary (14%)	Intrusive Felsic Igneous (4%)
Soil Type	Aquepts (93%)	Ochrepts (4%)	Borolls (2%)	Rough Mtn Land (1%)	
Surficial Geology	Mountain Alluvium & Colluvium (58%)	Glacial Moraines & Drift (26%)	Undifferentiated Alluvium & Colluvium (10%)	Fluvial (3%)	Glacial/Fluvial (3%)
Surfical Geology Type	Coarse & Fine Rubble (54%)	Undifferentiated Mosaic (10%)	Moderately Modified Moraine (10%)	Highly Modified Moraine (10%)	Lightly Modified Moraine (6%)
Landcover	Open Spruce Forest/Shrub/Bog Mosaic (46%)	Open Spruce & Closed Mixed Forest Mosaic (19%)	Open & Closed Spruce Forest (14%)	Neighboring Territories (14%)	Tall & Low Shrub (3%)

19. North Ogilvie Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (58%)	Sedimentary/Metamorphic Complex (24%)	Pelitic Metamorphic (16%)	Extrusive Igneous (1%)	Quaternary Extrusive Igneous (1%)
Soil Type	Ochrepts (54%)	Aquepts (22%)	Orthents (20%)	Rough Mtn Land (3%)	
Surficial Geology	Mountain Alluvium & Colluvium (82%)	Fluvial (11%)	Eolian (4%)	Undifferentiated Alluvium & Colluvium (2%)	Water (2%)
Surfical Geology Type	Coarse & Fine Rubble (78%)	Floodplain (11%)	Valley Loess & Alluvium (4%)	Fine Rubble (3%)	Undifferentiated Mosaic (2%)
Landcover	Neighboring Territories (76%)	Open Spruce Forest/Shrub/Bog Mosaic (7%)	Spruce & Broadleaf Forest (7%)	Open Spruce & Closed Mixed Forest Mosaic (6%)	Open & Closed Spruce Forest (2%)

Alaska Range Transition

20. Lime Hills	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Sedimentary/Volcanic Complex (37%)	Noncarbonate Sedimentary (26%)	Sedimentary/Metamorphic Complex (21%)	Extrusive Igneous (11%)	Intrusive Felsic Igneous (3%)
Soil Type	Aquepts (55%)	Orthods (19%)	Cryands (15%)	Rough Mtn Land (9%)	Fibrists (1%)
Surficial Geology	Glacial Moraines & Drift (42%)	Mountain Alluvium & Colluvium (35%)	Glacial/Fluvial (14%)	Fluvial (5%)	Water (2%)
Surfical Geology Type	Lightly Modified Moraine (37%)	Coarse & Fine Rubble (28%)	Old Glacial Outwash (14%)	Bedrock & Coarse Rubble (7%)	Moderately Modified Moraine (5%)
Landcover	Tall Shrub (34%)	Low Shrub/Lichen Tundra (22%)	Spruce Woodland/Shrub (20%)	Open Spruce Forest/Shrub/Bog Mosaic (8%)	Alpine Tundra & Barrens (5%)

21. Cook Inlet Basin	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (55%)	Quaternary Sedimentary (37%)	Intrusive Felsic Igneous (4%)	Sedimentary/Volcanic Complex (3%)	Lakes (1%)
Soil Type	Orthods (75%)	Cryands (7%)	Flurents (6%)	Aquents (6%)	Fibrists (3%)
Surficial Geology	Glacial Moraines & Drift (41%)	Glacial/Lacustrine (27%)	Fluvial (13%)	Mountain Alluvium & Colluvium (9%)	Glacial/Fluvial (3%)
Surfical Geology Type	Lightly Modified Moraine (21%)	Moderately Modified Moraine (20%)	Proglacial Lake (16%)	Floodplain (11%)	Proglacial Lake over Moraine (11%)
Landcover	Closed Broadleaf & Closed Mixed Forest (36%)	Closed Spruce Forest (18%)	Tall Shrub (16%)	Closed Mixed Forest (16%)	Open Spruce Forest/Shrub/Bog Mosaic (4%)

22. Alaska Range	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (25%)	Intrusive Felsic Igneous (22%)	Extrusive Igneous (13%)	Ice (13%)	Sedimentary/Metamorphic Complex (11%)
Soil Type	Rough Mtn Land (56%)	Orthods (22%)	Aquepts (11%)	Umbrepts (6%)	Cryands (2%)
Surficial Geology	Mountain Alluvium & Colluvium (64%)	Glacial Moraines & Drift (17%)	Ice (11%)	Glacial/Fluvial (3%)	Fluvial (3%)
Surfical Geology Type	Bedrock & Coarse Rubble (53%)	Lightly Modified Moraine (16%)	Glacier (11%)	Coarse & Fine Rubble (8%)	Alluvium over Old Alluvium (3%)
Landcover	Alpine Tundra & Barrens (30%)	Glaciers & Snow (22%)	Tall Shrub (18%)	Tall & Low Shrub (7%)	Spruce Woodland/Shrub (4%)

23. Copper River Basin	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Sedimentary (61%)	Extrusive Igneous (23%)	Sedimentary/Volcanic Complex (10%)	Quaternary Extrusive Igneous (2%)	Noncarbonate Sedimentary (2%)
Soil Type	Aquepts (59%)	Ochrepts (19%)	Orthods (17%)	Umbrepts (4%)	
Surficial Geology	Glacial/Lacustrine (55%)	Glacial Moraines & Drift (24%)	Mountain Alluvium & Colluvium (8%)	Fluvial (7%)	Water (3%)
Surfical Geology Type	Proglacial Lake (55%)	Lightly Modified Moraine (24%)	Alluvial Terrace (7%)	Coarse & Fine Rubble (6%)	Lakes (3%)
Landcover	Spruce Woodland/Shrub (32%)	Open & Closed Spruce Forest (30%)	Open Spruce Forest/Shrub/Bog Mosaic (24%)	1990 Fires & Gravel Bars (3%)	Tall & Low Shrub (3%)

Coastal Mountains Transition

24. Wrangell Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Quaternary Extrusive Igneous (35%)	Ice (32%)	Extrusive Igneous (13%)	Noncarbonate Sedimentary (9%)	Quaternary Sedimentary (4%)
Soil Type	Rough Mtn Land (72%)	Umbrepts (19%)	Aquepts (5%)	Ochrepts (4%)	
Surficial Geology	Mountain Alluvium & Colluvium (56%)	Ice (31%)	Glacial Moraines & Drift (11%)	Glacial/Fluvial (1%)	
Surfical Geology Type	Volcanic (46%)	Glacier (31%)	Lightly Modified Moraine (11%)	Bedrock & Coarse Rubble (10%)	Current Glacial Outwash (1%)
Landcover	Glaciers & Snow (51%)	Alpine Tundra & Barrens (25%)	Tall Shrub (8%)	Spruce Woodland/Shrub (5%)	Open Spruce Forest/Shrub/Bog Mosaic (4%)

25. Kluane Ranges	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (51%)	Quaternary Extrusive Igneous (27%)	Intrusive Felsic Igneous (9%)	Extrusive Igneous (9%)	Ice (3%)
Soil Type	Rough Mtn Land (62%)	Aquepts (38%)			
Surficial Geology	Mountain Alluvium & Colluvium (67%)	Glacial Moraines & Drift (21%)	Glacial/Fluvial (8%)	Fluvial (3%)	Water (1%)
Surfical Geology Type	Bedrock & Coarse Rubble (56%)	Lightly Modified Moraine (21%)	Volcanic (9%)	Current Glacial Outwash (7%)	Coarse & Fine Rubble (3%)
Landcover	Neighboring Territories (76%)	Alpine Tundra & Barrens (7%)	Glaciers & Snow (3%)	Spruce Woodland/Shrub (3%)	Dwarf Shrub Tundra (3%)

Aleutian Meadows

26. Aleutian Islands	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Sedimentary/Volcanic Complex (49%)	Quaternary Extrusive Igneous (38%)	Intrusive Felsic Igneous (10%)	Intrusive Mafic/Ultramafic Igneous (2%)	Ice (1%)
Soil Type	Cryands (55%)	Rough Mtn Land (45%)			
Surficial Geology	Mountain Alluvium & Colluvium (94%)	Fluvial (2%)	Coastal (1%)	Ice (1%)	Glacial Moraines & Drift (1%)
Surfical Geology Type	Bedrock & Coarse Rubble (52%)	Volcanic (38%)	Coarse & Fine Rubble (4%)	Floodplain (2%)	Beach (1%)
Landcover	Low & Dwarf Shrub (66%)	Tall Shrub (15%)	Dwarf Shrub Tundra (9%)	Wet Sedge Tundra (2%)	Tall & Low Shrub (2%)

27. Alaska Peninsula	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (30%)	Quaternary Sedimentary (16%)	Extrusive Igneous (15%)	Quaternary Extrusive Igneous (13%)	Intrusive Felsic Igneous (9%)
Soil Type	Cryands (65%)	Rough Mtn Land (24%)	Fibrists (6%)	Cinder Lands (4%)	Orthods (1%)
Surficial Geology	Mountain Alluvium & Colluvium (43%)	Glacial Moraines & Drift (29%)	Water (9%)	Glacial/Fluvial (7%)	Fluvial (6%)
Surfical Geology Type	Bedrock & Coarse Rubble (30%)	Lightly Modified Moraine (27%)	Lakes (9%)	Volcanic (9%)	Old Glacial Outwash (6%)
Landcover	Low & Dwarf Shrub (32%)	Tall Shrub (22%)	Alpine Tundra & Barrens (15%)	Water (10%)	Glaciers & Snow (9%)

Coastal Rainforests

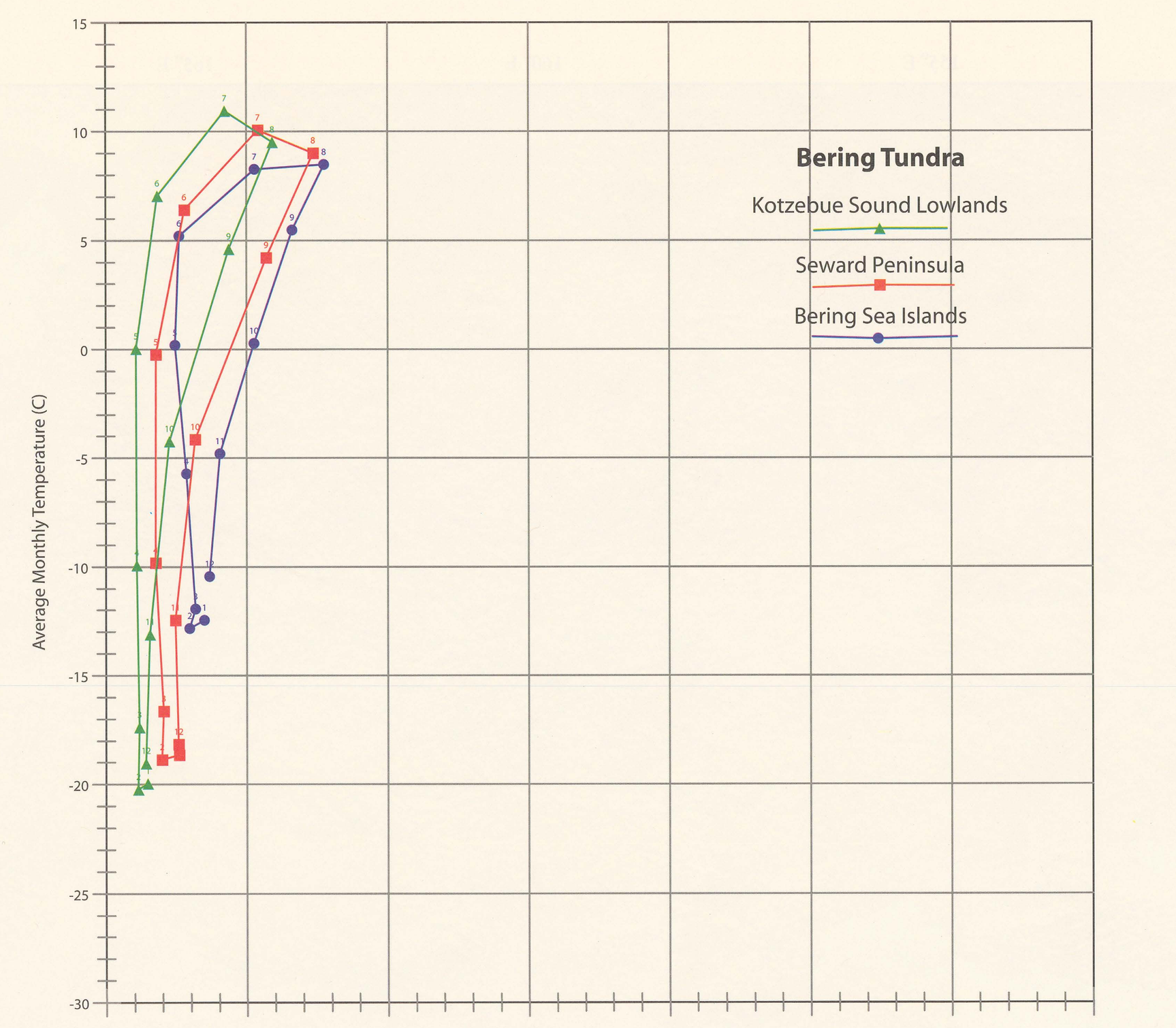
28. Kodiak Island	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (64%)	Sedimentary/Volcanic Complex (22%)	Intrusive Felsic Igneous (9%)	Sedimentary Complex (1%)	Intrusive Metamorphic (1%)
Soil Type	Cryands (100%)				
Surficial Geology	Mountain Alluvium & Colluvium (85%)	Glacial Moraines & Drift (10%)	Glacial/Lacustrine (3%)	Water (1%)	Glacial/Fluvial (1%)
Surfical Geology Type	Bedrock & Coarse Rubble (81%)	Lightly Modified Moraine (10%)	Proglacial Lake (3%)	Alluvium over Old Alluvium (2%)	Lakes (1%)
Landcover	Tall Shrub (69%)	Alpine Tundra & Barrens (10%)	Spruce Woodland/Shrub (10%)	Closed Spruce Forest (3%)	Open Spruce Forest/Shrub/Bog Mosaic (3%)

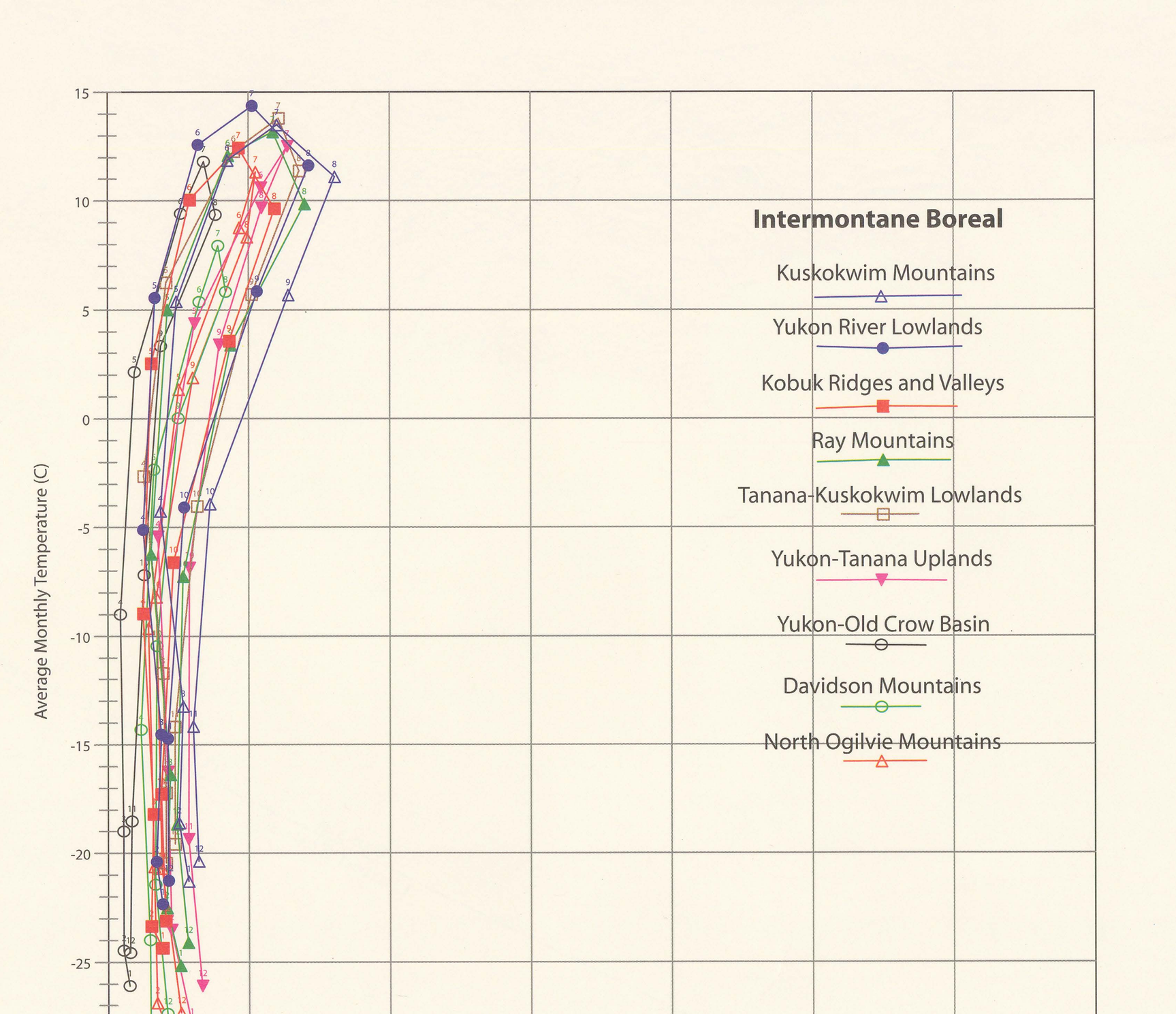
29. Gulf of Alaska Coast	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Sedimentary/Volcanic Complex (43%)	Noncarbonate Sedimentary (33%)	Quaternary Sedimentary (11%)	Extrusive Igneous (6%)	Intrusive Felsic Igneous (4%)
Soil Type	Orthods (38%)	Aquents (33%)	Rough Mtn Land (21%)	Orthents (8%)	
Surficial Geology	Mountain Alluvium & Colluvium (67%)	Coastal (19%)	Glacial/Fluvial (7%)	Glacial Moraines & Drift (3%)	Ice (2%)
Surfical Geology Type	Bedrock & Coarse Rubble (59%)	Old Marine & Alluvium (15%)	Alluvium over Old Alluvium (8%)	Current Glacial Outwash (7%)	Current Moraine (3%)
Landcover	Closed Spruce & Hemlock Forest (59%)	Tall Shrub (14%)	Open Spruce Forest/Shrub/Bog Mosaic (8%)	Alpine Tundra & Barrens (6%)	Water (3%)

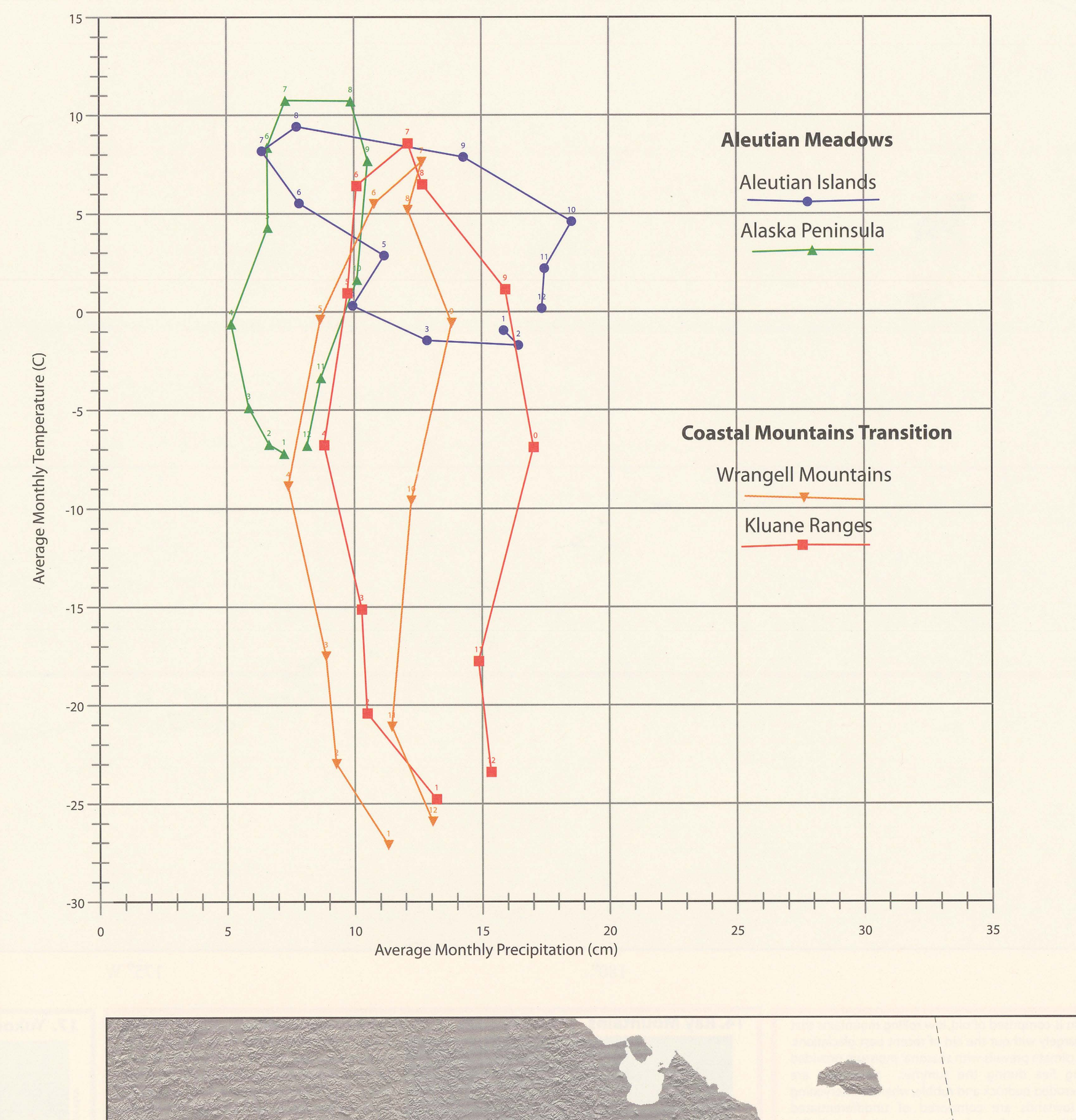
30. Chugach-St. Elias Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Ice (47%)	Noncarbonate Sedimentary (31%)	Extrusive Igneous (8%)	Sedimentary/Volcanic Complex (6%)	Intrusive Felsic Igneous (4%)
Soil Type	Rough Mtn Land (84%)	Orthods (6%)	Umbrepts (6%)	Ochrepts (2%)	Orthents (2%)
Surficial Geology	Ice (48%)	Mountain Alluvium & Colluvium (46%)	Glacial/Fluvial (2%)	Glacial Moraines & Drift (2%)	Fluvial (1%)
Surfical Geology Type	Glacier (48%)	Bedrock & Coarse Rubble (44%)	Current Glacial Outwash (2%)	Alluvium over Old Alluvium (1%)	Lightly Modified Moraine (1%)
Landcover	Glaciers & Snow (51%)	Alpine Tundra & Barrens (16%)	Neighboring Territories (15%)	Tall Shrub (9%)	Closed Spruce & Hemlock Forest (3%)

31. Northern Coast Mountains	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Intrusive Felsic Igneous (53%)	Ice (34%)	Noncarbonate Sedimentary (7%)	Pelitic Metamorphic (4%)	Extrusive Igneous (1%)
Soil Type	Rough Mtn Land (93%)	Orthods (6%)	Aquents (1%)		
Surficial Geology	Mountain Alluvium & Colluvium (68%)	Ice (32%)			
Surfical Geology Type	Bedrock & Coarse Rubble (68%)	Glacier (32%)			
Landcover	Neighboring Territories (53%)	Glaciers & Snow (22%)	Alpine Tundra & Barrens (16%)	Closed Spruce & Hemlock Forest (7%)	Tall Shrub (1%)

32. Alexander Archipelago	1st Ranked	2nd Ranked	3rd Ranked	4th Ranked	5th Ranked
Lithology	Noncarbonate Sedimentary (45%)	Intrusive Felsic Igneous (27%)	Extrusive Igneous (9%)	Sedimentary Complex (7%)	Carbonate Sedimentary (4%)
Soil Type	Orthods (73%)	Rough Mtn Land (23%)	Humods (2%)	Orthents (1%)	Aquents (1%)
Surficial Geology	Mountain Alluvium & Colluvium (97%)	Water (1%)	Glacial Moraines & Drift (1%)	Glacial/Fluvial (1%)	
Surfical Geology Type	Bedrock & Coarse Rubble (97%)	Lakes (1%)	Current Moraine (1%)	Current Glacial Outwash (1%)	
Landcover	Closed Spruce & Hemlock Forest (75%)	Alpine Tundra & Barrens (15%)	Neighboring Territories (5%)	Tall Shrub (2%)	Open Spruce Forest/Shrub/Bog Mosaic (1%)







Major Ecoregion Groups

Arctic Tundra

These open, wind-swept lands are gripped by polar conditions year around. Temperatures fluctuate substantially between seasons, though always cold. Mean monthly temperatures in the summer generally do not surpass 10°C - a threshold that approximately delimits tree growth (Koppen 1931 through Bailey 1995). The cold is reinforced by sea ice that hugs the shorelines through much of the year. The severe atmospheric cold limits water-holding capacity, thus depriving this area of precipitation (<50cm/yr). Even so, ground surfaces are often moist to wet due to thick permafrost that impedes drainage. These high-latitude areas are covered by tundra dominated by tussock sedges, mosses and low shrubs.

	(Area in hectares)	(Area in acres)
1. Beaufort Coastal Plain	(6,334,700 ha)	(15,653,386 ac)
2. Brooks Foothills	(11,517,200 ha)	(28,459,623 ac)
3. Brooks Range	(15,617,200 ha)	(38,590,945 ac)

Bering Tundra

These treeless, wind-swept lands occur in and adjacent to the Bering Sea. Here, the sea has limited influence on the polar climate (slight temperature moderation and increase in summer precipitation) because of its inherent coldness and long presence of sea ice during much of the year. A common Arctic denizen, the polar bear, follows the formation of sea ice into the northern reaches of the Bering Sea (Amstrup et al. 1986). Temperatures are cold year around allowing only low growing tundra vegetation to grow.

4. Kotzebue Sound Lowlands	(1,340,500 ha)	(3,312,448 ac)
5. Seward Peninsula	(4,687,000 ha)	(11,581,830 ac)
6. Bering Sea Islands	(862,600 ha)	(2,131,531 ac)

Bering Taiga

These open coastal areas bordering the Bering Sea are dominated by cold, seasonally-moist, subpolar conditions. During the summer, water evaporated from the adjacent Bering Sea is carried on land by the prevailing westerlies. Summers are sufficiently long and warm enough to allow patches of stunted trees (i.e., taiga) to grow, primarily along rivers and streams. However, summer warming is tempered by the cold prevailing winds off the Bering Sea.

7. Nulato Hills	(5,827,600 ha)	(14,400,314 ac)
8. Yukon-Kuskokwim Delta	(7,551,800 ha)	(18,660,906 ac)
9. Ahklun Mountains	(3,851,900 ha)	(9,518,253 ac)
10. Bristol Bay Lowlands	(3,181,800 ha)	(7,862,400 ac)

Intermontane Boreal

These areas experience extreme seasonal temperature changes from long, cold winters to short, moderately-warm summers. Boreal woodlands and forests cover much of this undulating landscape. The continental climate is fairly dry throughout the year and forest fires rage during summer droughts. This intermontane terrain sandwiched between the Brooks and Alaska Ranges remained largely ice-free during the last ice age, forming part of the "Beringia Corridor" (Pielou 1991).

11. Kuskokwim Mountains	(8,539,600 ha)	(21,101,813 ac)
12. Yukon River Lowlands	(5,170,600 ha)	(12,776,832 ac)
13. Kobuk Ridges and Valleys	(5,510,800 ha)	(13,617,484 ac)
14. Ray Mountains	(5,124,400 ha)	(12,662,669 ac)
15. Tanana-Kuskokwim Lowlands	(6,398,800 ha)	(15,811,780 ac)
16. Yukon-Tanana Uplands	(10,247,600 ha)	(25,322,373 ac)
17. Yukon-Old Crow Basin	(7,273,600 ha)	(17,973,458 ac)
18. Davidson Mountains	(3,373,400 ha)	(8,335,854 ac)
19. North Ogilvie Mountains	(5,218,600 ha)	(12,895,442 ac)

Alaska Range Transition

Boreal forests occur within the basins and troughs fringed by the Alaska Range. This area is considered transitional since some climatic moderation is afforded by the nearby Pacific Ocean (i.e., maritime moisture). Ice sheets heavily scoured this area during the last glaciation and small ice caps and glaciers still exist at high elevations.

20. Lime Hills	(2,870,700 ha)	(7,093,655 ac)
21. Cook Inlet Basin	(2,887,300 ha)	(7,134,674 ac)
22. Alaska Range	(10,323,100 ha)	(25,508,938 ac)
23. Copper River Basin	(1,913,200 ha)	(4,727,621 ac)

Coastal Mountains Transition

The high mountains on the interior-side of the coast mountains are exposed to a peculiar mix of climates. Because of their sheer height, these mountains capture ocean-derived moisture as it passes inland. Yet, due to their proximity to the Interior, these mountains possess a fair degree of seasonal temperature change similar to a continental climate. Climatic influences change with elevation, with maritime conditions on mountaintops (feeding ice caps and glaciers) grading to continental conditions at their base (boreal forests).

24. Wrangell Mountains	(1,431,100 ha)	(3,536,325 ac)
25. Kluane Ranges	(2,091,800 ha)	(5,168,951 ac)

Aleutian Meadows

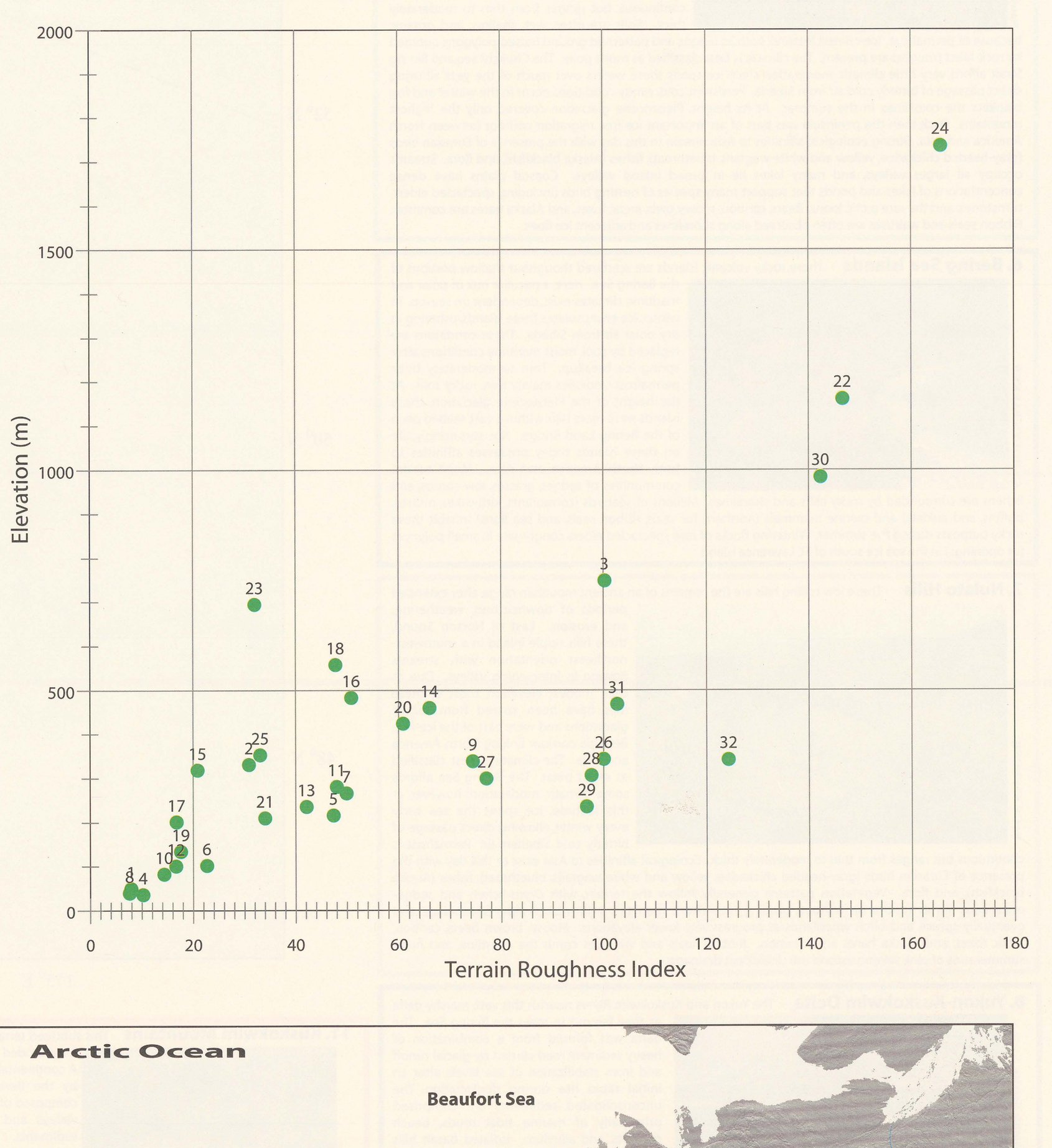
This peninsula and associated island arc divides the cold and stormy waterbodies of the north Pacific Ocean and Bering Sea. Harsh weather conditions prevail over these exposed landscapes including high winds, persistent clouds, rain and fog, and salt spray. This volcanic arc, built along the Pacific Plate Subduction Zone, is one of the most seismically active in the world (Alaska Volcano Observatory 1998). The vegetation is comprised mainly of shrub and herbaceous plants that can tolerate the stressful growing conditions.

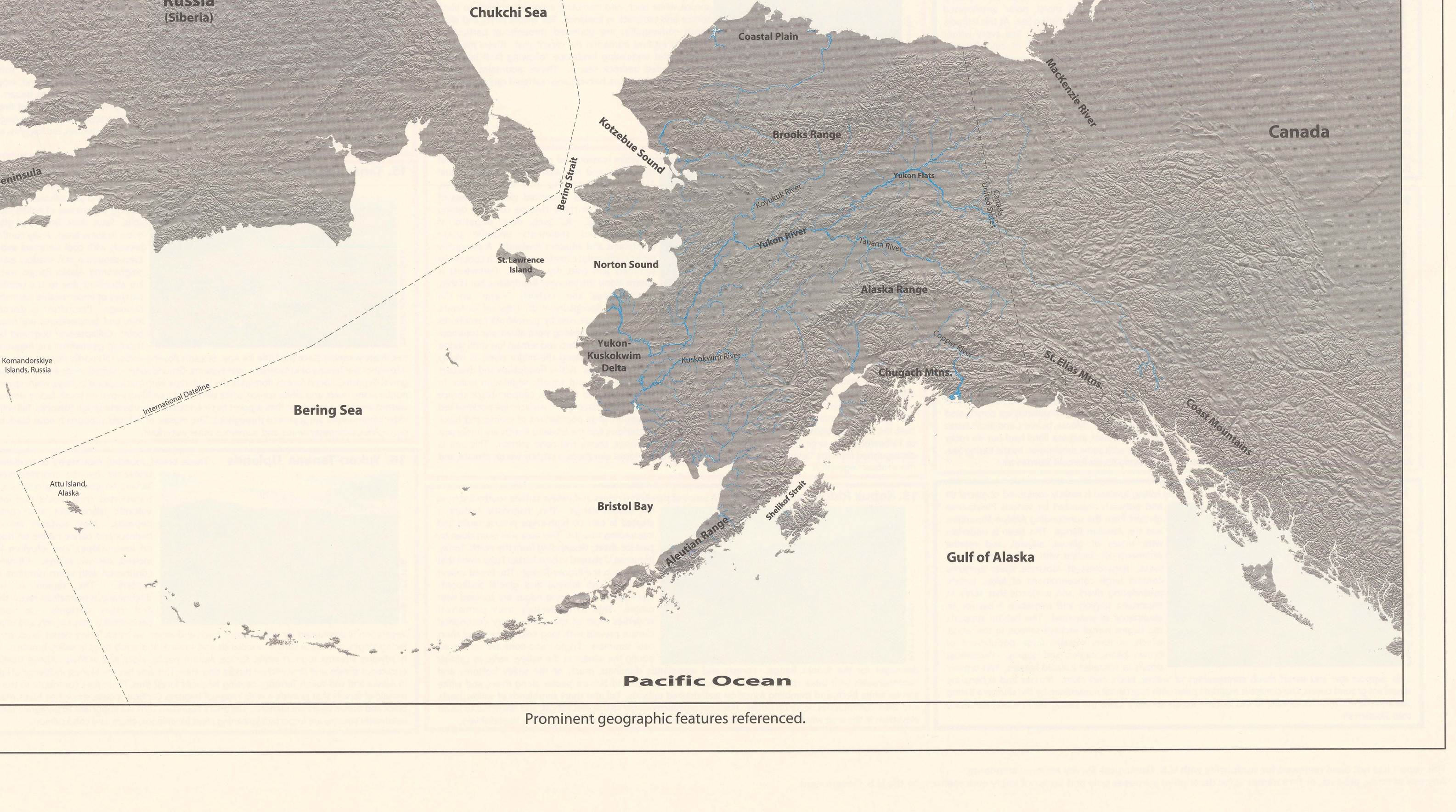
26. Aleutian Islands	(421,200 ha)	(1,040,808 ac)
27. Alaska Peninsula	(6,080,500 ha)	(15,025,244 ac)

Coastal Rainforests

These coastal areas adjacent to the north Pacific Ocean receive copious amounts of precipitation throughout the year. Seasonal temperature changes are limited due to proximity to open ocean. These areas warm sufficiently in the summer to allow trees to grow and dominate at lower elevations. Massive ice fields and glaciers are common in the mountains.

28. Kodiak Island	(1,138,500 ha)	(2,813,295 ac)
29. Gulf of Alaska Coast	(1,579,400 ha)	(3,902,783 ac)
30. Chugach-St. Elias Mountains	(9,276,000 ha)	(22,921,497 ac)
31. Northern Coast Mountains	(4,209,200 ha)	(10,401,160 ac)
32. Alexander Archipelago	(4,979,700 ha)	(12,305,108 ac)





Prominent geographic features referenced.

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