

Experience in ecology, botany, forestry, and related sciences

Scope of my ecological expertise:

I am a field botanist experienced in plant identification (including bryophytes and lichens) and taxonomic and plant community research. My undergraduate and graduate degrees have been in geography with coordination from botany & ecology faculties and I thus have strong grounding not only in spatial analysis; GIS; and mapping, but also landscape ecology, soils, forest ecology, and physical geography subjects important to ecology including meteorology & climatology, glaciology, geology, hydrology, and other ecosystem topics.

I am familiar with the vegetation and flora over much of this area from work in North America and Eurasia. This includes field botany work in Alaska with the FWS, NPS, and NRCS, the Pacific northwest and northern Rocky Mountains for the USFS, undergraduate and graduate research in the Great Lakes region and the former USSR, study for the US Forest Service on Grand Island in Lake Superior, and other projects in Alaska, Yukon and the Northwest Territories, the Lake Superior region, Siberia, the Crimean Mountains (Ukraine), Caucasus Mountains (Republic of Georgia, former USSR) the southeastern US and the Appalachians, the Carpathian Mountains (Central Europe), and the Andes (Ecuador).

Ecological interests include phytogeography, landscape ecology, nested ecosystems, vegetation mapping, rare & disjunct plant ecology, and related aspects of spatial ecology and northern ecosystems, from the temperate to the arctic.

I have served as botanist, vegetation ecologist, and biotech (botany, forestry, fisheries) on ecological projects for the US Fish & Wildlife Service, Forest Service, National Park Service, and Natural Resources Conservation Service, and specialized in vegetation ecology in graduate and undergraduate studies.

The experience from this diversity of locations, colleagues, organizations, methodologies, and equipment has been indispensable to understanding complex ecological systems, and has given me proficiency in:

- **Plant identification** including bryophytes and lichens, rare; threatened; listed; and non-native/invasive species using sight identification of plants in their habitats or keying to species or other taxonomic level with manuals, and use of extended resources such as herbaria; specialist consultation; and literature reviews when problems are encountered.
- **Ecological surveys, inventories, and monitoring** projects.
- **Forest inventory and measurements.**
- **Classification of vegetation, forests & stands, landscapes, wetlands, and others.**
- **Interpretation and analysis of aerial & satellite imagery** and other remote sensing data.
- **Vegetation, soil, and landscape mapping.**
- **Environmental impact** investigations and documents.

General field skills:

- I have made many vascular and nonvascular plant **field collections** in dry and wet habitats using vascula, plant presses, and envelopes (e.g., for bryophytes and lichens), and I am practiced in post-field botanical techniques (drying, re-pressing, cleaning, etc.) and have prepared sheets and labels for herbarium deposit and worked closely with herbaria for identification and deposit of project plants.
- I have documented the occurrence and ecological importance of native, **rare/threatened, non-native/exotic, range edge/extension/disjunct**, and naturalized plant species and communities in the landscape, and am proficient in recognizing such species that are not part of the original composition in an area. All of my botanical fieldwork has an “eye toward” the detection, identification, and documentation of populations of such indicator species.
- My interest in broad-scale phytogeography requires an understanding of **taxonomic names and naming conventions** for plants, communities, landscapes, soils, and wetlands used in different regions, countries, and periods, and I have often used my understanding of taxonomy to resolve identities of taxa and syntaxa.
- **Equipment used include** compass, clinometer, cover densitometer, forestry prism, electronic distance indicator, measuring tape, permafrost & soil measurement tools, field computers and datasheets, quadrat frame, survey & navigation GPS units, surveying equipment including rods & transects, cameras, distance finders, and other ecological and forestry field measuring equipment.
- **Field techniques used** include relevés; transects; plots; quadrats; and other survey arrangements, aerial surveys and reconnaissance, field navigation with GPS and map & compass, soil investigations & sampling, scientific photography and repeat photography, field sketching, etc.
- **Some botanical and ecological references used:** Hulten's *Flora of Alaska and Yukon*; *Flora of Alaska and neighboring territories*; and *Flora of the Aleutian Islands*, Anderson's *Flora of Alaska and adjacent parts of Canada*, Welsh's *Anderson's flora of Alaska and adjacent parts of Canada*; Cody's *Flora of Yukon*; Porsild & Cody's *Vascular plants of the continental Northwest Territories*; the *Flora of North America* volumes, Hitchcock et al.'s *Vascular Plants of the Pacific Northwest*, Gleason and Cronquist's *Manual of the Vascular Plants of Northeastern United States and Adjacent Canada*, Fernald's *Gray's Manual of Botany*, Hitchcock & Cronquist's *Flora of the Pacific Northwest*, Voss' *Michigan Flora*, Voss & Reznicek's *Field manual of Michigan flora*, and many other plant manuals and other ecological guides in several languages for North America, Siberia and other areas of the former USSR, Scandinavia, and elsewhere.
- **Vegetation & wetland classification manuals used:** *The Alaska vegetation classification* (Vioreck, et al. 1992), The Nature Conservancy's *US National Vegetation Classification System, Classification of wetlands and deepwater habitats of the United States* (Cowardin, et al. 1979), *Forest habitat types of northern Idaho* (Cooper et al 1991), *Forest vegetation of eastern Washington and northern Idaho* (Daubenmire 1968), *Ecoregions of the United States* (Bailey 1976), and others.

Work experience on ecological projects:

In my work as **ecologist/botanist** for the **US Fish & Wildlife Service**, I have been responsible for the development and coordination of a pilot vegetation inventory project for interior Alaskan National Wildlife Refuges to collect initial vegetation data and test methodologies and practicability of inventorying little-studied and remote FWS lands.

- This project included extensive remote fieldwork, plant identification, ecological interpretation and classification, and has resulted in a significant increase in knowledge of the vegetation and flora of large formerly “blank” areas of interior Alaska, many herbarium deposits, numerous range extensions, and several new nonvascular plants to the state.
- Experience with similar projects in Alaska and elsewhere allowed me to select field methods that are tested and also data that are compatible with other projects in Alaska.
- To identify or confirm difficult taxa and voucher vascular and nonvascular plants to herbaria, I worked with external botanical specialists and herbaria.
- In addition to strengthening my plant identification and vegetation classification skills, this project relied on my knowledge of GIS & imagery interpretation for potential site identification, landscape interpretation, and field planning.
- A component of this project was entomology - trapping of insects at remote stations for a contract between the FWS and University of Alaska Museum entomologists. I learned the methodologies and equipment of this to integrate malaise trapping into the vegetation studies and train project field workers in the proper selection of sites, setup of traps, and curation of samples.

From 2010-2012 I was **research forestry technician** at the **US Forest Service Rocky Mountain Research Station** (RMRS) in Moscow, Idaho working with a research forester on projects related to remote sensing in forest and fire ecology (including prescribed burns, wildfire, and post-fire recovery of ecosystems) and forest stand inventory. My work was primarily acquisition; processing; and analysis of satellite and aerial imagery and remotely-sensed data (particularly Lidar), with occasional fieldwork including field botany, forest type identification, and forestry measurements.

- In this work I developed my abilities in applied remote sensing (including Lidar) and other geospatial data analysis in the study of forest ecology, landscape geography, and forest analysis.
- I participated in field studies of forest and postfire ecology on several field projects in Washington, Idaho, Oregon, and Montana, broadening my knowledge of botany and ecology to the plants and landscapes of the pacific and inland northwest including arid lands, Palouse, rain-forest, and montane pineland ecosystems.
- In summer 2016 while a FWS employee I participated for two weeks via a USFS-FWS agreement as botanist for Alaskan fieldwork with my former USFS supervisor on a post-fire remote-sensing and ecology project to which I had contributed remote sensing work as a USFS employee.

I was **botanist and crew leader** in 2010 for the **Central Alaska Inventory and Monitoring Network** of the US National Park Service. This work was the location and initial survey of long-term ecological monitoring plots in remote areas. Fieldwork consisted of accessing remote areas of Yukon-Charley National Preserve via helicopter or boat on the Yukon River, setting a base camp, and navigation to preselected survey sites to complete botanical-ecological surveys during ~10 day field hitches. This fieldwork applied the following abilities:

- Field plant identification and the use of manuals and collecting/herbarium methods & supplies, other vegetation and site measurements, preliminary landscape classifications, and site photography.

- Pre- and post-field procedures, including site selection and fieldwork planning, additional plant identification and ecological classifications, data management (database and GPS data transfer, paper to database entry, and documentation; backup; and manipulation), GIS and mapping, report writing, and equipment maintenance.
- Flight planning and logistics for fixed-wing and helicopter transport of crew and field supplies, and boat navigation and piloting and navigation on the Yukon River, as well as selecting a base camp and hiking routes to field sites.
- Safety, procedural, and logistical concerns associated with remote fieldwork such as wilderness navigation, bear safety, first aid, radio and satphone communications, boat and water safety, and arranging all supplies and food for 10 day field hitches.

I was project **ecologist** for an integrated soil-vegetation inventory for the USDA **Natural Resources Conservation Service** 2008-2009. In this work I made the following contributions:

- I was responsible for the field identification of vascular and nonvascular plant species and vegetation communities in the project area.
- I made field measurements of ecological and vegetation conditions including species and community cover estimates, ecological site classifications, tree coring; cover estimates; basal area estimates; and other forestry & dendrological measurements; and field photography.
- I was responsible for the development of soil-community association successional and development concepts (ecosites) and the formulation of landscape-ecological unit classifications.
- I performed extensive “pre-mapping” - aerial imagery interpretation of landscape units to prioritize field sites and planning.
- I taught the regional flora to, and later assisted in species confirmation for a seasonal biotech with no previous botany experience in Alaska to the level of competent field botanist for the project, able to correctly identify most species in the field.

As **vegetation ecologist** for an Environmental Assessment (EA) project at **Denali National Park & Preserve** 2005-2007 under the Park's plant ecologist, I was responsible for the inventory and mapping of off-road vehicle impacts, vegetation and landscape studies of the 110 km² project area, development of impact models for different landscapes and vehicle use; pattern; and intensity, monitoring protocols to detect changes in impacts or use, and participating and writing for the EA. Some specific tasks were:

- I regularly identified and classified plant species, vegetation landscape associations, and ecological sites as part of my work.
- I conducted detailed ecological site studies of vegetation, soil, and hydrological conditions using GPS, photography, ground-based measurements, and aerial imagery interpretation to apply vegetation and wetland classifications to the sites using the “Vioreck” Alaska vegetation and the “Cowardin” wetland classifications mentioned above.
- Using these data and classifications combined with recent Denali soil survey data, aerial and satellite imagery, and other information I interpreted areas not directly surveyed on the ground and used GIS and cartographic skills to produce a detailed large-scale vegetation landscape map of the project area, including wetland classifications, to be used in the impact analysis.

- I supplemented the map with an interpretive document of text and photographs to describe the map classifications, show examples and characteristic features, describe their ecological conditions, and relate their significance to the EA topic.
- I developed impact models across the landscape map units based on site indicators for use in estimating comparative susceptibility, response patterns, impact severity, and recovery pathways of vegetation, soil, and hydrological features from off-road vehicle use.
- This map and the impact models served as the primary analysis tool for predicting possible future impacts and conditions under the various off-road vehicle use alternatives proposed in the EA.
- I researched by site visits and literature research other ORV impact studies and occurrences in Alaska, and co-wrote an annotated bibliography on the topic that has been widely used.
- I made site searches in my fieldwork areas to detect the presence of rare, protected, and non-native plant species.
- As a side project, I conducted regular phenological surveys at established plots to document the dates of key events (e.g., leafing, flowering start and end, leaf fall) of various plant species in a subalpine aspen forest as part of an ongoing project.
- I assisted other Denali botany staff in site surveys for the NPS Central Alaska Network's (CAKN) Long-Term Ecological Monitoring (LTEM) project, including plant species identification and soil data and related site condition documentation.

In several positions at **Glacier Bay National Park & Preserve** 2002-2004 I was responsible for field data collection, GIS, and cartography under supervision of the Park's aquatic biologist for a vegetation landscape delineation, classification, and mapping project as part of a larger fisheries study of the area, in association with the Alaska Natural Heritage Program (AKNHP).

- Using multi-decadal aerial imagery, site vegetation and soil investigations, input from AKNHP botanists, and data from related nearby studies, I identified, refined, and mapped vegetation and hydrological landscape development over a 50-year period in a recently deglaciated area.
- Classifications in this mapping project were also based on the “Viereck” and “Cowardin” classification systems mentioned above with localized and project-specific modifications to describe conditions.
- The products of this work were a multi-decadal vegetation map of the area, a set of georeferenced & orthorectified imagery for the area from four periods over 50 years, a set of GIS shapefiles with several types of vegetation and wetland classifications delineated, and documents describing the processing methodology and steps.

At an earlier position at **Glacier Bay National Park & Preserve** 2002 I participated in aerial and boat-based fisheries field research:

- I conducted boat-based surveys of fisheries activity in remote areas of the Park, and entailed identifying, and recording data and locations of fisheries gear.
- I also conducted aerial fishing vessel surveys to determine commercial fishing vessel use in the Park's outer (oceanic nearshore) waters.

University ecological projects:

Before beginning my work Alaska, I conducted **undergraduate and graduate research** focusing on botany, plant geography, and vegetation ecology of the northern circumboreal forest.

My master's degree thesis on the **vegetation of remote lake islands in Siberia and Canada**.

- This involved two field seasons of ecological fieldwork in Russia and Canada, and examined in detail the flora, vegetation development, soils, geology, climate, and natural and human history to show how they result in surprising similarities and differences in vegetation on opposite sides of the earth.
- I created vegetation, soil, and other maps for my thesis using vegetation, soil, and wetland classifications from Ontario Ministry of Natural Resources, Great Lakes, and Russian/Soviet regional schemes, and created sets of site-specific ecological indicators to characterize and explain various phytogeographical phenomena.
- My major adviser described my thesis to the graduate dean as “closer to a dissertation in complexity and originality of work, scope, and quality”.

My doctoral fieldwork on the **landscape conservation in the Ukrainian Carpathian Mountains**.

- It included several years' in-country fieldwork with protected areas and conservation bodies to support landscape analysis to suggest effective ecological connectivity with human land use.
- This work included many visits to Ukrainian protected areas, research institutes & universities, and government and NGO offices.

My undergraduate thesis on the terrestrial **vegetation at Lakes Superior and Baikal** (Siberia).

- It was based on fieldwork at both lakes, and literature and specialist communications in four countries, and first examined many of the same subjects that I later visited in greater depth in my master's thesis.
- I described the vegetation types and their reasons and influences for similarities of the areas.
- I also created vegetation and landscape maps for this project, applying and borrowing from existing North American and Soviet classifications.

I completed several undergraduate independent research projects for academic credit that were based on ecological fieldwork, literature research, interviews and consultation, including:

- 1) a **demographic and ecological study** of disjunct plants on an island in northern Lake Michigan,
- 2) **landscape ecology and vegetation of the Crimean Peninsula** (Ukraine), including vegetation and soil landscape classification, and
- 3) the history of Soviet ecological monitoring and conservation.

I audited and completed all coursework and other requirements at the University of Michigan Biological Station for Ed Voss' Boreal Flora and Howard Crum's Bryolophytes summer field courses in 1994; the last year either of these courses were offered. Both of these courses involved extensive visits to natural environments of the Lower Peninsula and Upper Peninsula of Michigan, and the Algoma District of northern Ontario.

I completed comprehensive undergraduate and graduate coursework in botany, ecology, taxonomy, geology, climatology, soils, GIS & spatial analysis, and related subjects as detailed on my transcripts & course description document.

Applications to wider studies:

I am always ready to associate with or incorporate my work into peripheral or more integrated projects. Some examples of this are:

- My work in forest type and habitat classification (in my USFS and Glacier Bay and Denali NP work).
- Incorporation of zoological and entomological studies into ecological research or assisting others on such projects including insect malaise trapping in my FWS project; small mammal live trapping surveys as part of my master's research; and large mammal aerial tracking assistance (for bear collaring at Denali).
- Studies on landscape-vegetation changes related to fish habitat (at Glacier Bay and Denali NP).
- Incorporation of wildlife abundance; habitat use; and activity patterns into site investigations and management planning (in my masters and PhD research and in my ecologist positions with the USNPS, NRCS, and FWS).

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