



## Arctic Network

Bering Land Bridge N Pres. • Cape Krusenstern NM  
Gates of the Arctic NP & Pres. • Kobuk Valley NP • Noatak N Pres.

# Shrub Expansion Project Brief

November 2011



### Introduction & Importance

#### Understanding shrub expansion in arctic parks

One of the major landscape changes underway in Alaska's arctic parks is the encroachment of shrubs into tundra areas. This shift toward a shrubbier arctic has been documented primarily using before and after photography, satellite images, and plot studies. The shift is mostly a response to elevated temperatures during the 20<sup>th</sup> century. A shift toward shrubbier Arctic Network Parks has potentially profound implications, such as restricting hiking and impacting visitor

perception, reducing primary caribou forage, increasing moose and ptarmigan habitat, and slowing ungulate travel.

Repeat photography from 1950 and 2002 showed shrub patches expanding in some places and relatively unchanged in others. This project compared shrub growth in these two types of shrub patches, including relationships with soil and climate variables. By using annual shrub rings (like tree rings) and repeat photography to reconstruct 20<sup>th</sup> century shrub growth dynamics, this project provided a temporal context for the 21<sup>st</sup> century ARCN



**Shrub expansion emanating from a small stream near the Nimiuktuk River, Noatak National Preserve (top 1950: bottom 2002)**

vegetation monitoring. These pre-monitoring records of shrub growth precede and support the trajectories that are being established by the long-term monitoring program. The shrub rings and repeat photography paired with *in situ* measurements also allowed us to generalize about which parts of the landscape are changing most rapidly, and are therefore susceptible to future changes.

### Objectives

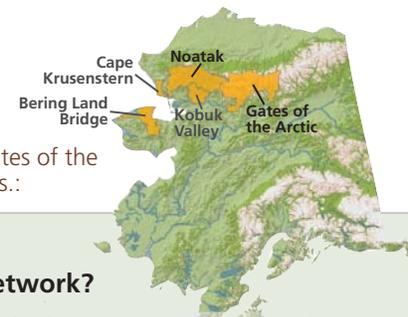
#### What do we want to know about shrub expansion in the Arctic Network?

- Use annual shrub rings (like tree rings) to reconstruct 20<sup>th</sup> century shrub growth dynamics in expanding and stagnant shrub patches.
- Measure *in situ* soil, climate, and vegetation parameters from expanding shrub patches and compare them to stagnant shrub patches.

### Methods

#### How did we conduct our study?

Ken Tape (U of Alaska) and his team visited 26 locations where repeat photography showed shrub patches that had expanded and shrub patches that had stagnated. They sampled shrub discs for the shrub ring work and also made a host of measurements in paired expanding and stagnant patches, including soil temperature and moisture, thaw depth, soil acidity, species presence and abundance, leaf carbon and nitrogen isotopes, and more.



Shrub expansion was studied in Gates of the Arctic NP & Pres. and Noatak N Pres.:

### Results & Discussion

#### How does this project help us monitor vegetation in the Arctic Network?

The findings are important because they indicate that tall, clumped shrubs are expanding preferentially along gullies and streams, rock outcroppings, or in areas of subsurface channelized flow of water and nutrients. These areas of the landscape have greater summer heat flux and consequently warmer, drier and deeper thawed soils. Most parameters measured (see above) showed significant differences between expanding and stagnant shrub patches. Given the

importance of shrubs in ecosystem function, from herbivores to fire and visitor perception, the land managers need informed predictions of which areas are likely to continue changing, particularly prior to the Inventory & Monitoring dataset maturing. This study establishes some generalizations regarding the susceptibility of certain areas (gullies, streams, floodplains, and rock outcrops) to continued shrub expansion, which will augment the I&M program and ultimately influence land management decisions.

