



The Arctic growing seasons are getting longer

Terrestrial Landscape Patterns and Dynamics Vital Sign 2021

Who/What/Where

The NPS Arctic Inventory and Monitoring Network (ARCN) monitors the timing and length of the growing season and the snow season in the five national park units of northern Alaska (Figure 1). Ecologist Dave Swanson uses remote automated cameras and satellite images to monitor these seasonal changes in ARCN.

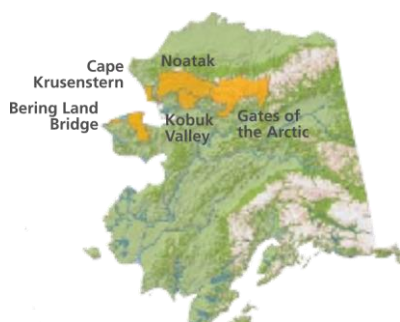


Figure 1. The National Park Service's Arctic Inventory and Monitoring Network

Key Findings

- Satellite images show that the start and the end of both the continuous snow season and the green vegetation season vary by about a month between years.
- On-the-ground cameras have verified that the satellite results are realistic (Figure 2).
- By 2020, the average across ARCN for the end of the snow season in the spring was about 8 days earlier, and spring green-up about 11 days earlier than in the year 2000 (Figure 3). See Figure 4 for a map showing where the change to earlier snow-off occurred.
- By 2020, the end of the green season and start of the snow season averaged 11 and 5 days later, respectively, than in the year 2000. However, we are less certain of the fall dates because of cloudiness and low sun angles in the fall (Figure 5).
- The midsummer maximum vegetation greenness varies a lot from place-to-place, because of varying density of vegetation, but it is fairly constant from year to year in any one place.

- Vegetation greenness increased very gradually over much of ARCN since the year 2000, as the result of vegetation becoming taller or denser.



Figure 2. An example photo taken by a remote camera at the Mt. Noak climate monitoring station in Cape Krusenstern National Monument on June 6, 2019. The numerous white spots are *Dryas* flowers.

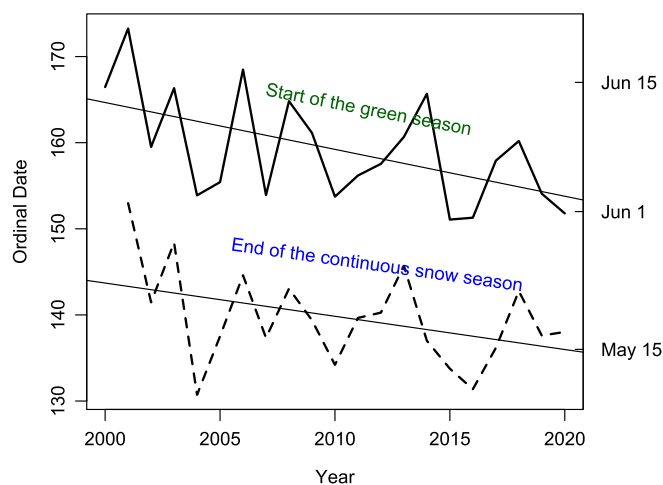


Figure 3. The average date of the end of the continuous snow season and start of the green season in ARCN, 2000-2020.

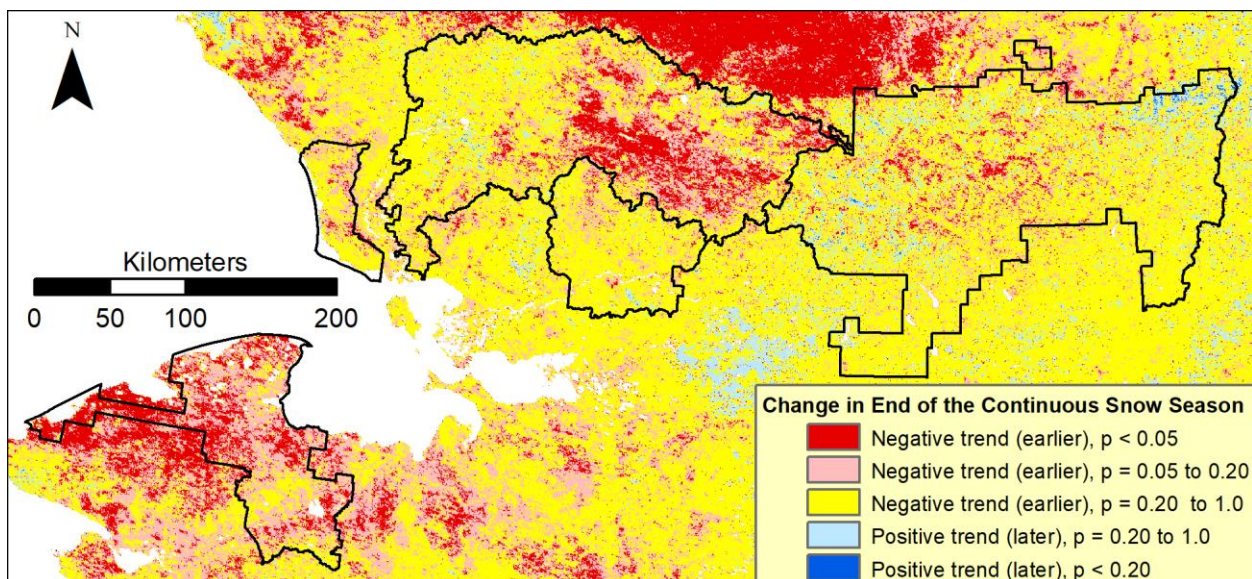


Figure 4. Map showing changes in the timing of the end of the continuous snow season in ARCN, 2001-2020. Most of ARCN has red, pink, or yellow colors that indicate a trend toward earlier snow-off. In the red areas, the trend was highly statistically significant. The most significant changes in ARCN were observed in Bering Land Bridge National Preserve and the Noatak National Preserve. A large area north of the ARCN parks also had a trend toward earlier snow-off.

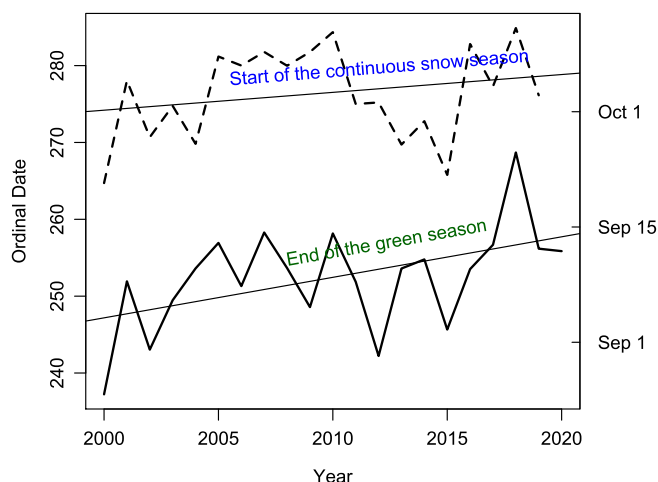


Figure 5. The average date of the end of the green season and start of the continuous snow season in ARCN, 2000-2020.

How do we monitor seasonal changes?

ARNC has five remote automated cameras, one in each National Park unit. These cameras take five photos per day year-round, and we use them to observe the timing of snowmelt, flowering and leaf-out of selected plants, the color change of leaves in the fall, and return of the winter snow cover. These observations are very local in

scope, but they provide important verification of what we see on satellite images.

We use images from the MODIS satellites to monitor the coming and going of the snow cover, the timing of spring green-up and fall senescence, and the maximum greenness of vegetation. These satellites have been sending back daily images since the year 2000. These frequent images allow us to take advantage of every clear day to see what is happening on the ground.

Management implications

Changes in the timing of the snow and green seasons are likely to affect the movements and survival of wildlife species, especially migratory animals such as caribou and birds. The length of the season when people can access the parks on snow is also affected. Over the long term, longer growing seasons will allow trees and shrubs to expand into new areas and grow taller and denser.

For more information

Read the full NPS Natural Resources Report at : <https://irma.nps.gov/DataStore/Reference/Profile/228675>
Or contact Dave Swanson, 907-455-0665, david_k_swanson@nps.gov.