Peonies in a changing climate

A case study

Peony farming serves as an excellent case study for research on climate change and agriculture in Alaska. Why? Peonies represent a burgeoning niche market, and are a crop that is uniquely lucrative in Alaska for reasons linked directly to our climate. Peonies bloom in Alaska in July, August, and September—later in the year than in other locations—and are available commercially nowhere else in the world during this time.

Not just for peonies! The University of Alaska Fairbanks and partners have developed an online Garden Helper tool to make it easier for you to explore future changes in growth and survival for Alaska crops in your part of the state.

The tool has four components:

- **Length of Growing Season—** helps you estimate the number of days between the last cold spring day and the first cold fall day in your community
- **Growing Degree Days (GDD)—** estimates how much heat is available to crops. Plants reach particular growth stages when cumulative GDD reaches the necessary values.
- **Daily Minimum Temperatures**
- **Alaska Hardiness Zones—** similar those created by USDA, but based on average annual minimum winter temperatures in Alaska

Commercial peony farming has seen considerable growth in recent years, with gross sales of well over a million dollars. Peony stems are shipped to U.S. destinations in California, Colorado, Florida, Hawai'i, Iowa, New York, Oregon, Pennsylvania, and Rhode Island; as well as to Canada, Japan, Taiwan, and other locations.

Peony growers are concerned about seeing shifts toward earlier blooming times, which put Alaska's peonies in more direct competition with other markets.

What can we predict about the future of the crop in this state, and how might growers adapt?

Climate data, climate model projections, and agricultural research on peonies—particularly research conducted in Alaska at the University of Alaska Fairbanks' Georgeson Botanical Garden—change is in store for Alaska peonies.

What the research shows

Peonies are unaffected by day and night lengths, meaning that Alaska's long summer days are not a factor. However, heat does have an effect in winter, spring, and summer.

Winter— Relatively cool winter temperatures are necessary for the plant roots to achieve dormancy. Therefore, as long as temperatures are consistently below 43°F for 70 days, dormancy will be achieved.[1] This is unlikely to become a problem in most parts of the state.

Spring and summer— The timing of spring is the next factor to consider. Plants emerge from dormancy and start growing as soon as temperatures rise above freezing.[3,4,5] This means that if spring arrives earlier, growth will start earlier. Using the **Length of Growing Season tool** to look at the 32°F threshold can help you estimate when this may occur in the future for your Alaska community.

Once growth begins, flowering can occur in a span of only about 50 days in greenhouse conditions.[1] However, slower growth in cooler temperatures would actually be better for increasing the chances that buds will open.

Research has shown that moderate temperatures with highs of 72°F and lows of 50°F are best for enhancing stem length and flowering.[6] Hotter temperatures are not as good for blooming: temperatures over 77°F have resulted in reduced blooms. When daily highs were 82°F and lows were 72°F, flowering was drastically reduced.[2]

more

EXPLORE THE GARDEN HELPER TOOL ONLINE snap.uaf.edu/tools/gardenhelper


Peony roots. (Team Flower)

The Growing Degree Days (GDD) web tool can help you with planning

Using the **Growing Degree Days tool** to plan for peony growth once buds have emerged is likely more effective than using the Growing Season tool.

Researchers tracked how many days it took for peonies to bloom in different years and different locations. They compared these dates with cumulative GDD above a 32°F threshold. Generally, flowers bloomed when cumulative GDD reached between 1,734 and 2,313—a fairly small window. In contrast, the number of days from bud emergence to first cutting ranged from 32 days in Fairbanks to 79 days in much cooler Kenai.[3,4,5]

In summary

Alaska winters are likely to remain cool enough for peony dormancy, while growers in other parts of the world may find challenges in this regard. This may provide some local advantage. However, late springs and cool summer weather are better for Alaska's peony growers. These conditions:

- promote healthier flowering
- promote later flowering, which allows Alaska growers to capture the late-season niche market

As late springs and cool summers become more rare, growers may need to adapt. This may be hardest for those who already farm in regions of the state that are warmest in the summer, such as Fairbanks.

For new growers, picking cooler parts of the state or cooler sites within a community—such as north-facing slopes—might help. New storage methods for cut blooms can also extend the season for sales.

Alaska's peony growers will see a mixed bag of climate change effects on their growing efforts as the state's climate continues to change. Use the Garden Helper tools to help you with planning your growing strategies, no matter which crop you're planting.

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Citations

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Above: Peonies in bloom at Fox Hollow Peonies, Nenana, AK. (Photo courtesy Fox Hollow Peonies)