State University of New York
College of Environmental Science and Forestry

2019 - 2020 late season duck migration forecast and research update

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Late season forecast

Summary:

1) We apply a published weather severity index (WSI) that predicts autumn-winter migration by dabbling ducks. The WSI includes effects of temperature and snow cover on duck migration. As such, we use seasonal forecasts that predict temperature and precipitation over eastern North America to make predictions about duck migration. We also use available weather forecast data to produce a weekly duck migration forecast based on our published WSI.
2) The NOAA used the Oceanic Niño Index (ONI) to predict below average temperatures January through March in the upper Mississippi Flyway, equal chance of below or above average temperatures in the Atlantic Flyway, and above average precipitation in the northern portions of both flyways.
3) However, ONI is Neutral for Autumn-Winter 2019-2020, which reduces the utility of the NOAA forecast for predicting eastern North America winter weather and specifically the weather severity index for duck migration (see Schummer et al. 2010 and Schummer et al. 2014).
4) We also use published links between Arctic Sea ice coverage and Siberian snow cover with North American temperatures to make our predictions for 2019-2020.
5) Effects of Arctic Sea ice coverage and Siberian snow cover on North American temperatures are more pronounced later in winter.
6) Combined these factors made seasonal forecasts especially difficult this year, which delayed delivery of early and late-season forecasts. Further, there is much debate among seasonal forecasters about the primary drivers of winter weather in eastern North America. The idea of Arctic Amplification (AA) or the "warm Arctic oceans, cold continents" hypothesis noted in point #4 above would predict substantial polar vortex disruptions this year and cause cold outbreaks into mid-latitudes in eastern North America. However, others argue that while AA may have some influence it is increasingly overwhelmed by tropical influences of warm oceans driven by an overall warming of the globe.
7) Current models predict a strong polar vortex, which means cold air will be locked in the Arctic for the remainder of January/waterfowl season.
8) Above normal precipitation and periods of snow and melt that created abundant and widespread habitat in December are expected to continue through January.
9) Any cold fronts that do occur are expected to be brief and, as such, most ducks are where they are going to be for the remainder of the season. Waterfowl hunters should look to follow ducks as they move among available undisturbed and newly flooded habitats. Those with the capacity to move and exploit the regional movements of ducks should do so to increase likelihood of encountering an abundance of ducks for potential harvest.

Details:

The NOAA used the Oceanic Niño Index (ONI) to predict below average temperatures January through March in the upper Mississippi Flyway, equal chance of below or above average temperatures in the Atlantic Flyway, and above average precipitation in the northern portions of both flyways. However, we are in an ONI Neutral pattern for autumn-winter 2019-2020, which reduces the utility of the NOAA forecast for predicting eastern North America winter weather. Our early season forecast was built on the idea of Arctic Amplification (AA), which results from low sea ice (**Fig. 1**) and above average snow cover in Siberia (see explanations below). However, those studying transfer of heat energy in the stratosphere argue that tropical influences have overwhelmed the influence of AA this year. That is, the earth is so warm that AA can't influence our weather in eastern North America and cold air remains locked in the Arctic. As such, fewer polar vortex disruptions are occurring.

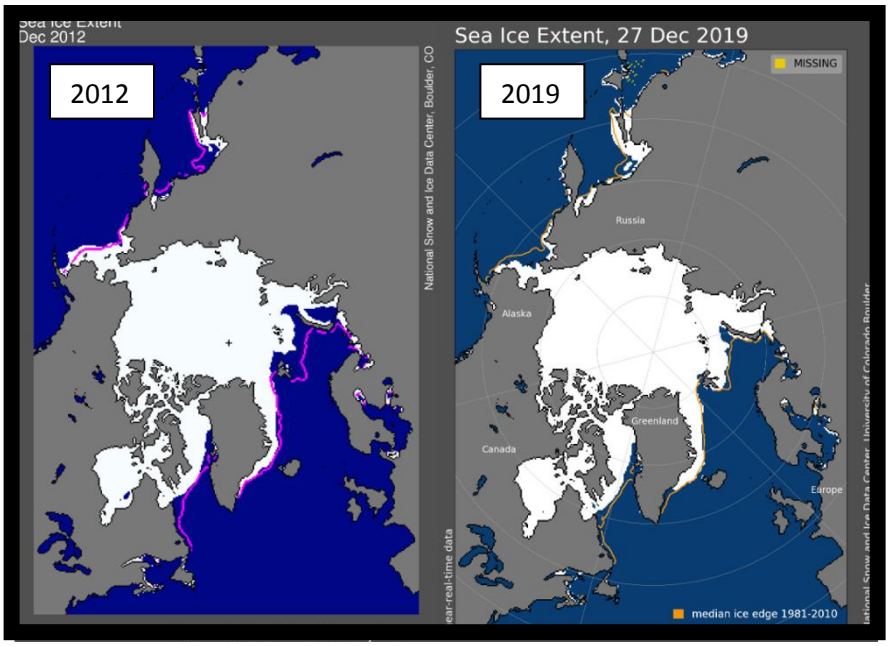

Figure 1. Image comparison of Arctic sea ice extent in December 2012 (record low) and 2019.

Arctic Amplification explained

Arctic sea ice

So, why does Arctic sea ice in September matter for autumn-winter weather in the Mississippi and Atlantic Flyways? The extent of Arctic sea ice greatly influences pressure systems across the Arctic which influences the polar vortex during winter. Essentially, the fewer strong high-pressure systems centered over the Northern Hemisphere, the less disruption to the polar vortex and cold air gets "locked" up north (**Fig 2a**). However, open leads in the ice, especially in the Barents and Kara Sea (**Fig 3**) and specifically in November, can begin the cycle of polar vortex disruption (**Fig 2b**).

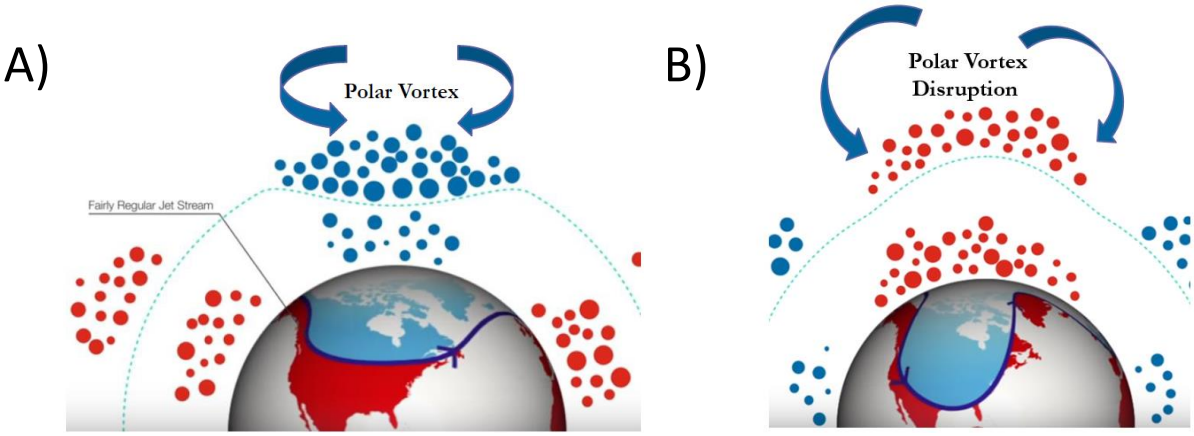

Figure 2. Depiction of a **a)** fairly regular jet stream without polar vortex disruption and **b)** typical cold outbreak into North America during a polar vortex disruption.

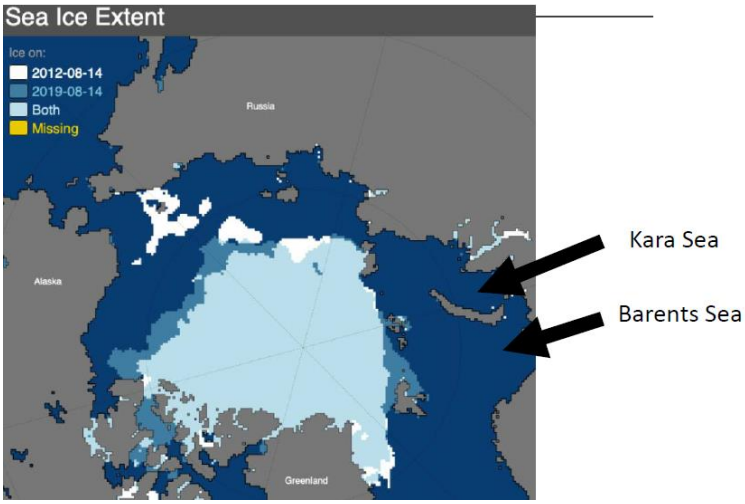

Figure 3. Locations of the Barents and Kara Sea

Siberian snow cover

Lack of Arctic sea ice also sets the stage for October snowfall in Siberia, which, if it advances early and quickly enough during this time period, has a tendency to set up a cold and persistent high pressure system that is positioned to cause a polar vortex disruption that pours cold air down into eastern North America. This information was originally published in 2011 by Dr. Judah Cohen of Atmospheric and Environmental Research and followed up by a diversity of additional publications on this subject and others pertaining to seasonal forecasting during winter. See Judah's blog here. https://www.aer.com/science-research/climate-weather/arctic-oscillation/.

As such, we also can look to snow cover advance in Siberia during October as an indicator for the 2019-2020 season in the Mississippi and Atlantic Flyways. Snow advance in October was well-above normal suggesting increased likelihood of polar vortex disruption.

Collectively, we watch the snow cover in Siberia in October, ice cover in the Barents and Kara seas in November and the Arctic Oscillation (the direct and near-term measure of the potential for polar air outbreaks into eastern North America) to make our seasonal forecasts. However, as noted above, this influence of Arctic Amplification seems to be overwhelmed by warm tropics or an overly warm globe this winter.

In our early-season forecast we noted,

"**Combined, we think the early season low Arctic sea ice is generally indicative of an especially warm planet and this heat energy will take some time to dissipate leading to a warmer than normal October – December. This period of atmospheric changes is also likely to bring abundant rains to portions of eastern North America, with greatest likelihood in the mid-Atlantic coast. However, the stage is also set for the potential for cold outbreaks in the Mississippi and Atlantic Flyways, most likely in January. However, we warn that cold and snow followed by strong warming would create abundant floodwaters at northern and mid-latitudes and would hold and disperse ducks at these latitudes. We predict that if persistent cold is going to occur it will most likely follow the regular duck season in February and March.**"

That is, we basically predicted what generally occurred, AA was overwhelmed by warm ocean air, and absent a few cold outbreaks in November and December, our weather has been relatively seasonal to mild. Our current late-season forecast follows our last sentence of the early-season forecast above, the most persistent cold will occur following January. While the November and December cold outbreaks were enough to move some ducks to southern latitudes, we also continue to have an abundance of mallards (and black ducks) are northern and mid-latitudes. The current atmospheric events are consistent with cold air remaining locked in the Arctic for the remainder of January and little to no weather severe enough to cause another large-scale movement of dabbling ducks in eastern North America. From now until the end of season waterfowl hunters should look to follow ducks as they move among available undisturbed and newly flooded habitats. Those with the capacity to move and exploit regional movements of ducks should do so to increase likelihood of encountering an abundance of ducks for potential harvest.