Oral ***(31 July 2012) – Invited Presentation ("Year" Special Session)***

Eurasian Snow Cover as a Predictor of Climate in North America and Application to Waterfowl Management

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Extended Abstract: Seasonal climate prediction remains a difficult challenge. During Northern Hemisphere (NH) winter the large-scale teleconnection pattern of the Arctic Oscillation (AO) explains the largest fraction of temperature variance of any other known climate mode and is a useful indicator of subsequent spring snow coverage (Bamzai 2003). Because the combined effects of temperature and snow cover influence autumn waterfowl migration (Schummer et al. 2010) and snow accumulation and melt are drivers of waterfowl breeding habitat (e.g., May ponds), indices enabling accurate prediction of the AO may be beneficial for forecasting waterfowl distributions and indices of waterfowl breeding success in North America. With the development of the Snow Advance Index (SAI), Cohen and Jones (2011) explained approximately 75% of the variance of the winter AO. The SAI is based on rate of accumulation of Eurasian snow cover during October. The high correlation between the SAI and the winter AO demonstrates that the AO is mostly predictable, which enables accurate seasonal climate predictions and may have application to waterfowl management in North America. Waterfowl managers would be wise to monitor climate research predicting autumn snow cover in Eurasian to understand influences of climate change on future distributions of waterfowl in North America. Further, investigating relationships between SAI and waterfowl harvest, survival, and breeding success may provide additional insights to predict influences of changes in climate on populations of these birds in North America.

Schummer et al. (2010) described a Weather Severity Index (WSI) that explained substantial variation in relative change in abundance of mallards (*Anas platyrhynchos*) and other dabbling ducks (*Anas* spp.) at mid-latitude staging areas in North America. We further investigated the relationship between WSI anomalies (WSIA; i.e., changes in WSI compared to average conditions) in eastern North America and atmospheric teleconnections, October – February, 1950 - 2010. During El Niño and La Niña events the winter AO explained substantial variation in WSIA. Because SAI is highly correlated with the winter AO, we also compared variation in WSIA explained by SAI and AO during El Niño and La Niña events during the time series that SAI values were available (i.e., 1972 – 2010). We determined that SAI was a better fit model

than winter AO at explaining variation in WSIA in eastern North America. In addition, winter season forecast models that now include the SAI correctly identified if severity of weather (as indexed by WSIA) during November-December-January and December-January-February was more or less severe than normal with 86% ($r = 0.39$) and 75% ($r = 0.50$) accuracy, respectively.

Because the SAI is produced in October prior to the winter AO, there is great potential for improved winter forecasts and predicting migration patterns and distributions of waterfowl, November - February. We also will discuss effects of reduced Eurasian snow cover on seasonal cycles in North America and potential implications for waterfowl populations.

Literature Cited:

Bamzai, A. S. 2003. Relationship between snow cover variability and arctic oscillation index on a hierarchy of time scales. International Journal of Climatology 23:131-142.

Cohen, J. and J. Jones. 2011. A new index for more accurate winter predictions. Geophysical Research Letters 38:1-6.

Schummer, M. L., R. M. Kaminski, A. H. Raedeke and D. A. Graber. 2010. Weather-related indices of autumn-winter dabbling duck abundance in middle North America. Journal of Wildlife Management 74:94-101.