Product/Service Description Document
Experimental Lake Effect Snow Warning Polygons

WFO Buffalo NY

PART 1: MISSION CONNECTION

Product / Service Description

Lake effect snow (LES) is a unique winter event which can cause localized extreme winter weather with high impact to the public and commerce. Snowfall rates of up to three inches an hour can be common in these snow bands and in extreme cases can exceed four inches per hour. It is known that snowfall rate can have a higher impact than actual snowfall totals. In many cases, the focus of these bands of snow will have widths of only ten to twenty miles across.

WFO Buffalo and other offices serving the Great Lakes issue long-fused Lake Effect Snow Watches, Warnings and Advisories on a zone by zone basis. A problem with this issuance scheme is that due to the localized nature of LES, significant portions of counties within the warning may not be receiving substantial, if any, snowfall. Another issue is the transient nature that some of these events can exhibit as shifting winds move the high-impact intense snows across the region.

This proposal is for WFO Buffalo to create polygons to be used in Lake Effect Snow Warning products delineating the locations of highest impact of the LES. The polygons will not be produced for Lake Effect Snow Watches and Advisories. As the LES snow band moves, polygon areas will change spatially and temporally within the warned area to best delineate the areas of highest impact over the course of the LES event (for example, snowfall rate, blizzard-like conditions, total snowfall). Issuance of the product would be based upon forecaster confidence of reaching LES Warning criteria: 7 inches or more in 12 hours, or 9 inches or more in 24 hours.

Purpose/ Intended Use

Specific lake effect snow warning area forecasts would provide enhanced information as to the highest impact areas bordering Lake Ontario and eastern Lake Erie. Reducing the size of the False Alarm area increases the effectiveness of the warning.

The science of forecasting LES has progressed to where the value of specific warning area information is possible. The ever-increasing use of point specific information through the internet, smartphones, etc. requires the NWS to communicate this location-specific impact information in a more efficient means.

The enhanced information provided in polygon LES warning areas would allow for a more organized and cost-effective use of public resources to minimize the effects of these high-impact LES events. This, in turn, would minimize the effect of LES events on transportation and commerce.

Audience

The LES polygon warning area is intended for a wide audience. The delineation of areas of impact would not only serve our emergency response and government partners but be a viable method to be used by the broadcast media to display site specific impact information. Anyone needing specific LES location in time would find this information valuable, including the general public through polygon displays on NWS web pages.

Presentation Format

Our proposal is to present the LES warning area information in several formats, increasing the user audience of this product. Graphically, the polygon information would be available via webpage. The vertices of the polygon delineation would be available via text product (similar to the polygon latitude/longitude information on NWS Severe Thunderstorm Warnings). This information would also be made available in a downloadable KML/KMZ file for the higher-end GIS users.

Evaluation/Feedback Method

Feedback is expected through interaction with core NWS customers and partners, via an OMB approved survey linked to the product. A verification method including an evaluation of the decrease in false alarm area and affected population will be conducted during the test phase.

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PART II: TECHNICAL DESCRIPTION

Format and Science Basis

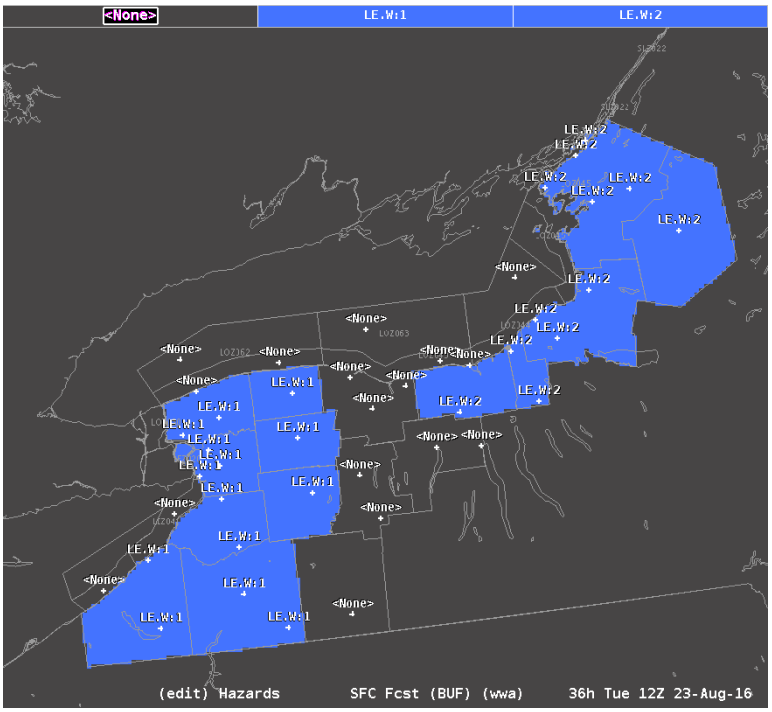
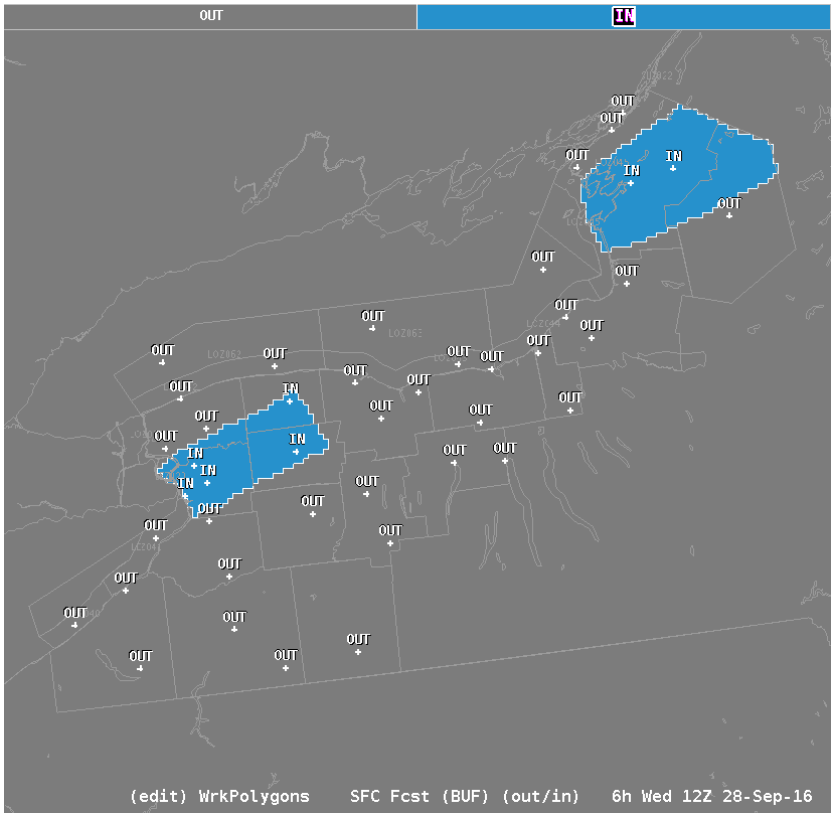
A Graphical Forecast Editor (GFE) procedure will be used by forecasters to create a LES area warranting a polygon. The primary inputs to the polygon will be forecast snow amount and county- based hazards, although other variables related to blizzard-like conditions may be used as well. As an example, one might focus on areas expected to receive >1"/hour within counties designated in a LES warning as determined through forecaster collaboration, with the option of choosing a different snow rate and additional forecast elements needed to create a set of highly focused polygons that key into the most significant areas within a set of counties over a period of time.

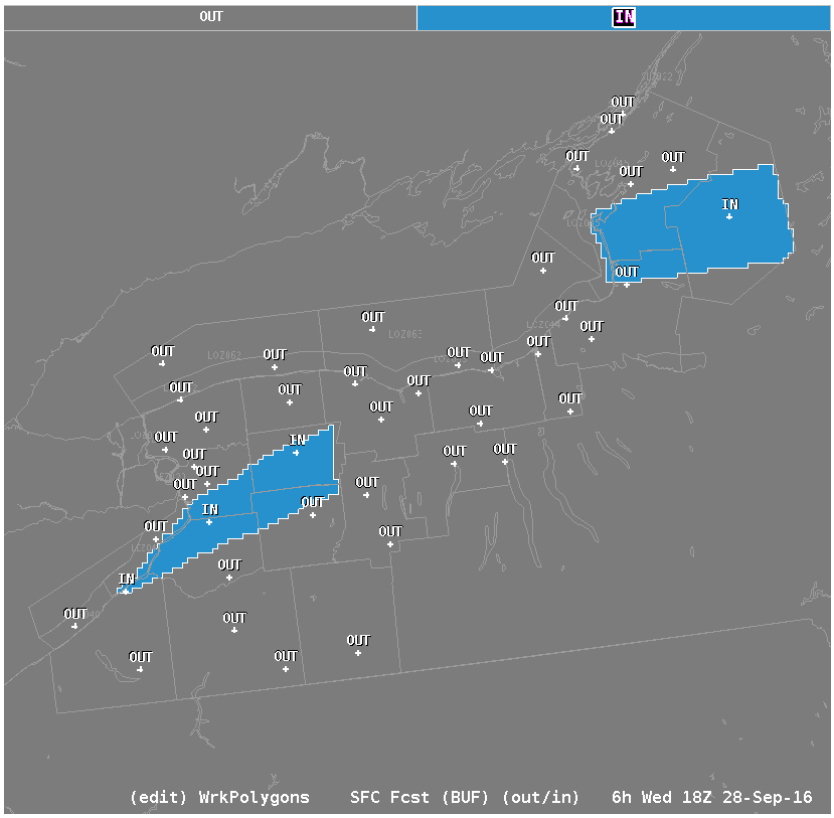
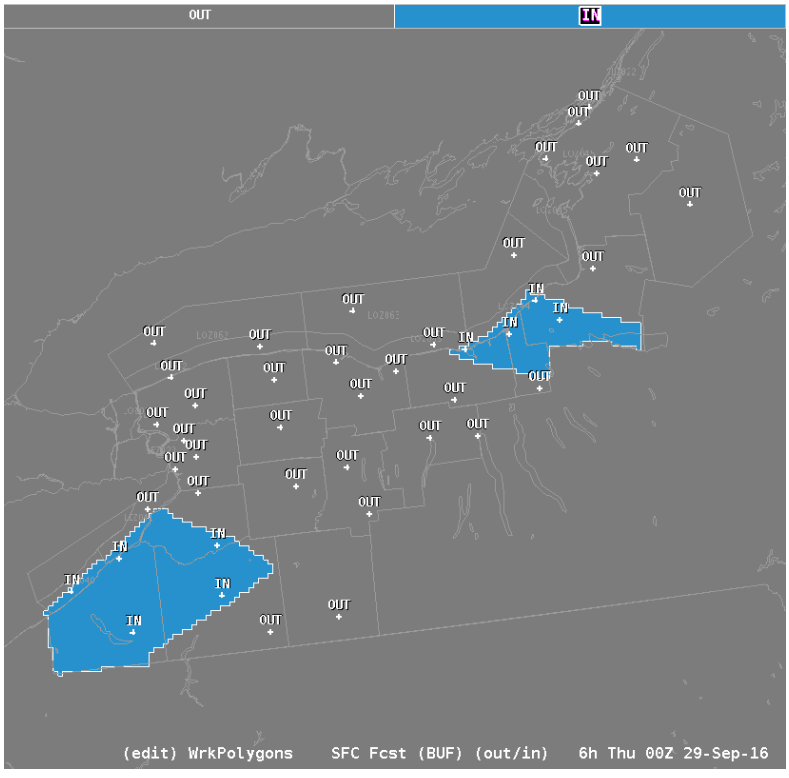
This procedure should output a set of LAT…LON/TIME paired lines denoting the polygon and valid time with as few as three and as many as 20 vertices. These lines will be embedded experimentally within the winter warning product text (WSW) between the && and the $$ delineators. The output should resemble the LAT…LON/TIME lines found in short-fused products like Severe Thunderstorm Warnings (SVR) substituting COORD for LAT…LON and TIME formatted as Y##M##D##T####Z (see below for example). However, since the warning area may change with time, there may be multiple LAT…LON/TIME pairs for each valid time of a polygon. The county based warning will continue to be used as the official warning and source for verification, while the polygons will fine tune the hardest hit areas with time. The maximum number of COORD/TIME pairs will depend on the forecaster. Grouping COORD /TIME pairs in 6 or 12 hour increments with 5-6 vertices may provide a desirable text output.

An example below shows a typical warning for a LES event downwind of Lakes Erie and Ontario. Seven counties downwind of Lake Erie (in blue) are under a warning: Niagara, Orleans, Erie, Genesee, Wyoming, Chautauqua, and Cattaraugus and five counties downwind of Lake Ontario (in blue) are under a warning: Wayne, Northern Cayuga, Oswego, Jefferson and Lewis, but only a small section of those counties may be affected during different times. When looking at the warning without polygon detail, it is impossible to see where and when the lake band might be at any given time. Proposed polygons (blue) delineate the affected areas. This example shows polygons moving once every several hours.

The text output off of Lake Erie would have 6 lines of text for this event. Three separate polygons are shown with a lake band slowly moving southward. The first two polygons have 4 vertices while the other polygon has 5 vertices. In the scenario below, spotters within each of the 5 counties might eventually verify the warning, although several portions of each county may never see a single snowflake.

COORD 4323 7819 4304 7802 4234 8003 4252 8022
TIME Y15M12D30T2100Z-Y15M12D31T0000Z
COORD 4307 7805 7278 7797 4230 8019
TIME Y15M12D31T0000Z-Y15M12D31T1200Z
COORD 4276 7913 4240 7841 4200 7889 4200 7976 4252 7978
TIME Y15M12D31T1200Z-Y16M01D01T0000Z

Twelve counties in a sample warning without polygons: Off Lake Erie: Niagara Orleans, Erie, Genesee, Wyoming, Chautauqua, Cattaraugus Off Lake Ontario: Wayne, Northern Cayuga, Oswego, Jefferson and Lewis	
2100-0000Z: All counties are in the current warning, but only a small portion of the area is affected by the lake snows. Off Lake Erie, this includes southern Niagara and Orleans and northern Erie and Genesee counties. Off Lake Ontario, this includes central Jefferson and northern Lewis counties. The remainder of the counties are not forecast to be under the lake band during this time, despite being under the warning.	

0000-1200Z: All counties are in the current warning, but only a small portion of the area is affected by the lake snows. Off Lake Erie, this includes Erie, Genesee and northern Wyoming counties. Off Lake Ontario, this includes southern Jefferson, central Lewis and northern Oswego counties. The remainder of the counties are not forecast to be under the lake band during this time, despite being under the warning.	
1200-0000Z: All counties are in the current warning, but only a small portion of the area is affected by the lake snows. Off Lake Erie, this includes southern Erie, Chautauqua and western Cattaraugus counties. Off Lake Ontario, this includes northeast Wayne, northern Cayuga and southern Oswego counties. The remainder of the counties are not forecast to be under the lake band during this time, despite being under the warning.	

In addition to the text output and a graphic display on NWS webpages, KML/KMZ data should also be available.

Availability

The text portion of the polygons should be available experimentally via the WSW using an already familiar COORD/TIME format. Graphical products and links to GIS files should be available via the Internet. The graphical products should be easy to use and provide users with simple navigation capabilities similar to looping radar.

Additional Technical Information

The text output should be created using software provided by GSD and locally modified to fit into the existing WSW format. This software will simplify polygons to a user choice of 3-20 vertices. Short-fetch (multi-banded) LES events will require wide polygons with lower snow rate thresholds. However, even multi-banded LES events should show some movement with time and therefore show reduced areal extent when compared to static county-based warnings.