Prototype Winter Storm Severity Index (WSSI)

Product Description Document (PDD)

November, 2017

Part I - Mission Connection

a. Product Description – The prototype WSSI is achieved through the use of Geographic Information Systems (GIS) by screening the official National Weather Service (NWS) gridded forecasts from the National Digital Forecast Database (NDFD) for winter weather elements and combining those data with non-meteorological or static information datasets (e.g., climatology, land-use, urban areas) to create a graphical depiction of anticipated overall impacts to society due to winter weather. The underlying structure of the prototype WSSI allows it to potentially use other meteorological datasets as inputs (e.g., deterministic or ensemble model output) to create additional guidance products that cover periods beyond that covered by the NDFD. The prototype WSSI provides a classification of the overall expected severity of winter weather using the following terminology: “none”, “limited”, “minor”, “moderate”, “major” and “extreme”.

b. Purpose – The prototype WSSI has been developed to have a two-fold focus. The first is for use as a tool to assist NWS operational forecasters in maintaining situational awareness of the possible significance of weather-related impacts based upon the current official forecasts. The second is to enhance communication to external partners, media and general public of the expected severity (potential societal impacts) and its spatial distribution due to a variety of winter weather hazards.

c. Audience – The prototype is intended for use by 20 Weather Forecast Office (WFO) offices and Weather Prediction Center (WPC) staff as an enhancement to decision support services and is under evaluation for further development and validation. These WFOs will share the data with NWS core partners and participate in a structured evaluation. During the prototype period, all WFOs will have access to an interactive national map through a password protected website to enable further evaluation across varied climatological regimes.

d. Presentation Format – The prototype graphics are available at 20 specified WFO websites. The page depicts local views of the prototype WSSI which includes disclaimers appropriate for prototype products under NWS policy. This webpage is updated at least four times a day. Currently, the publicly available output is available only as static images in portable network graphics (.png) format. See the “Examples” section. Participating WFOs will include links to the prototype WSSI on their local web pages. The participating offices and websites are listed below:

Albany, NY: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=ALY
Albuquerque, NM: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=ABQ
Amarillo, TX: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=AMA
Binghamton, NY: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=BGM
Burlington, VT: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=BTV
Dodge City, KS: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=DDC
Elko, NV: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=LKN
Gaylord, MI: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=APX
Grand Junction, CO: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=GJT
Grand Rapids, MI:http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=GRR
Jackson, MS: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=JAN
Little Rock, AR: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=LZK
Medford, OR: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=MFR
Memphis, TN: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=MEG
Morristown, TN: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=MRX
Nashville, TN: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=OHX
Omaha, NE: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=OAX
Paducah, KY: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=PAH
Philadelphia, PA: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=PHI
Wichita, KS: http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=ICT

e. Feedback Method – Feedback will be gathered from representatives from federal, state and local government partners during routine customer review meetings, as well as from a web-based survey for the general public and other users: http://www.nws.noaa.gov/survey/nws-survey.php?code=WSSI.

Comments or questions regarding the prototype WSSI can be also addressed to:

James Nelson, Branch Chief - Development and Training
National Weather Service – Weather Prediction Center
james.a.nelson@noaa.gov; 301-683-1493

Dave Soroka, National Winter Weather Program Leader
National Weather Service - Severe, Fire, Public and Winter Service Branch
Silver Spring, MD
david.soroka@noaa.gov; 301-427-9346

Part II – Technical Description

a. Format and Science Basis – The prototype WSSI output is via graphical image files (.png), though the core calculations are done in a GIS environment. The following datasets are used or derived as part of calculating the prototype WSSI.

Official NWS Forecast datasets from NDFD of:

- 6-hour snow accumulation
- 6-hour ice accumulation
- 6-hour precipitation accumulation (Quantitative Precipitation Forecasts)
- Wind gust (hourly time steps)
- Temperature (hourly time steps)

Additional derived forecast parameters from other official NWS NDFD fields:

- Total snowfall
- Total ice accumulation
- Maximum wind gust within each 6 hour period
- 6-hourly snowfall accumulation rate
- 6-hourly snow-liquid ratio
- Average snow-liquid ratio

Daily National Snow Analyses is obtained from the NWS National Operational Hydrologic Remote Sensing Center (NOHRSC) which includes:

- Snow depth
- Snowpack temperature
- Snow water equivalent

Non-forecast datasets include:

- Urban area designation
- Land-use designations
- National Oceanic and Atmospheric Administration (NOAA)/National Centers for Environmental Information (NCEI) gridded annual snowfall climatology

The prototype WSSI is actually a series of component algorithms, each of which use meteorological and non-meteorological data to model predicted severity of specific characteristics of winter weather. Each of the components produce a 1 to 5 output scale value that equates to the potential severity based on the winter weather hazards. The final WSSI value is the maximum value from all the sub-components. The 5 levels are given the following descriptors: Limited, Minor, Moderate, Major, and Extreme. The specific sub-components are:

- Snow Load Index
    - Indicates potential infrastructure impacts (e.g., downed trees/power lines) due to the weight of the snow. This index accounts for the land cover type. For example, more forested and urban areas will show increased severity versus the same snow conditions in grasslands.
- Snow Amount Index
    - Indicates potential impacts due to the total amount of snow or the snow accumulation rate. This index also normalizes for climatology, such that regions

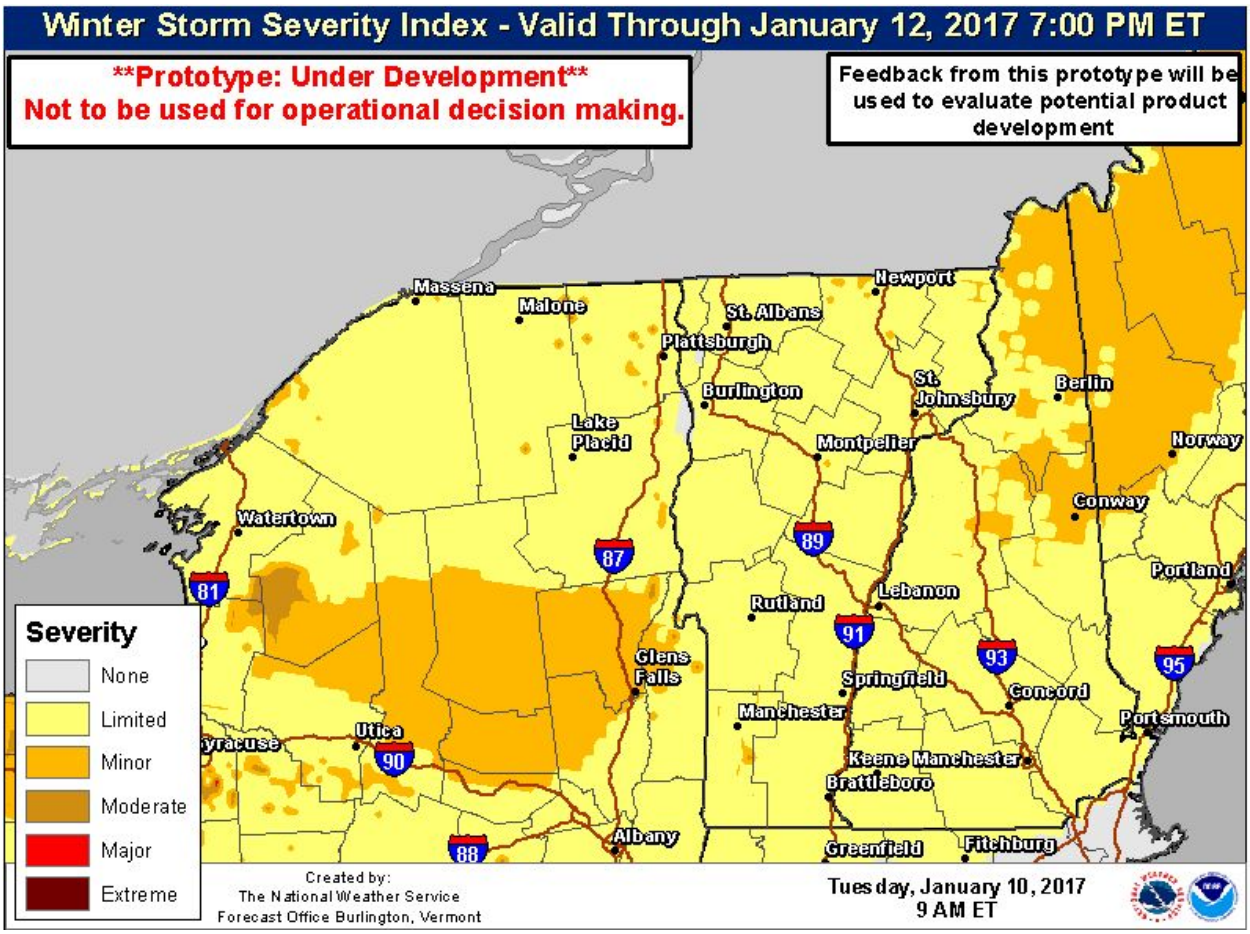
of the country that experience, on average, less snowfall will show a higher level of severity for the same amount of snow that is forecast across a region that experiences more snowfall on average. Designated urban areas are also weighted a little more than non-urban areas.

- Ice Accumulation
    - Indicates potential infrastructure impacts (e.g., downed trees/power lines, roads/bridges) due to combined effects and severity of ice and wind. Designated urban areas are also weighted a little more than non-urban areas. Please note that not all NWS offices provide ice accumulation information into the NDFD. In those areas, the ice accumulation is not calculated.
- Blowing Snow Index
    - Indicates the potential disruption due to blowing and drifting snow. This index accounts for land use type. For example, more densely forested areas will show less blowing snow than open grassland areas.
- Flash Freeze Index
    - Indicates the potential impacts of flash freezing (temperatures starting above freezing and quickly dropping below freezing) during or after precipitation events.
- Ground Blizzard
    - Indicates the potential travel-related impacts of strong winds interacting with pre-existing snow cover. This is the only sub-component that does not require snow to be forecast in order for calculations to be made. The NOHRSC snow cover data along with forecast winds are used to model the ground blizzard. Adjustments are made based upon the land cover type. For example, heavily forested areas will have a lower ground blizzard severity than the same conditions occurring across open areas.

These raw and calculated forecast values are then used for a series of additional calculations to compute individual WSSI components which are then categorized internally on a 1 to 5 scale. The final WSSI value is the maximum from among all components for each grid point at the native 2.5 km NDFD resolution.

b. Availability -- The prototype WSSI products will be available through the end of the 2017/2018 winter season via a WFO-centric view at 20 selected WFOs. An evaluation of both internal and external comments will be conducted during the warm season for consideration in moving forward with an experimental demonstration for the 2018/2019 winter season.

Examples:


Winter Storm Severity Index - Valid Through January 12, 2017 7:00 PM ET
Prototype: Under Development
Not to be used for operational decision making.
Feedback from this prototype will be used to evaluate potential product development
Severity
None
Limited
Minor
Moderate
Major
Extreme
Created by:
The National Weather Service
Forecast Office Burlington, Vermont
Tuesday, January 10, 2017
9 AM ET
Massena
Malone
St. Albans
Newport
Plattsburgh
Burlington
St. Johnsbury
Berlin
Lake Placid
Montpelier
Norway
Conway
Watertown
Portland
Rutland
Lebanon
Glens Falls
Springfield
Concord
Manchester
Portsmouth
Utica
Keene
Manchester
Brattleboro
Albany
Greenfield
Fitchburg
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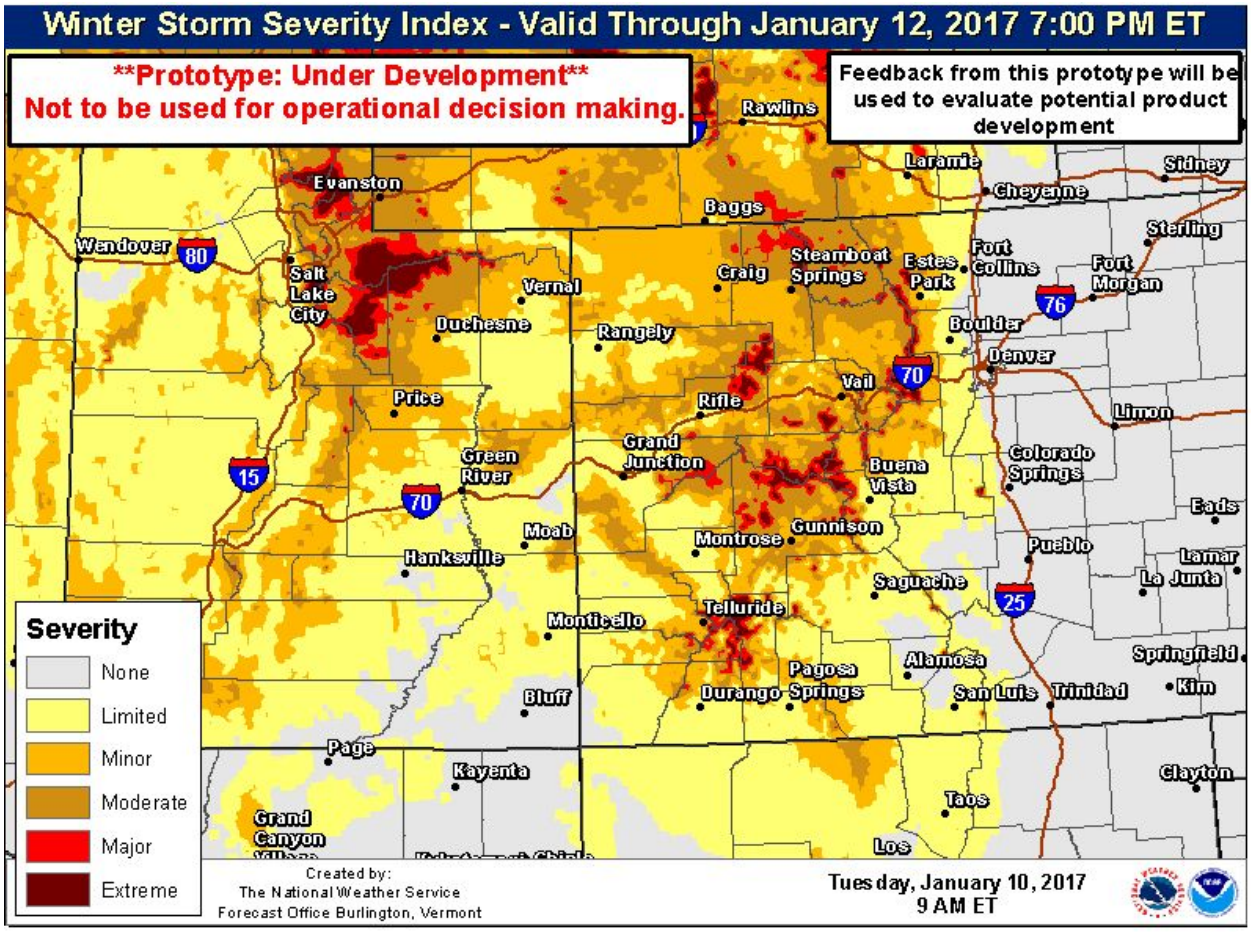
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Rawlins
Laramie
Sidney
Cheyenne
Evanston
Baggs
Sterling
Wendover
80
Steamboat Springs
Craig
Estes Park
Fort Collins
Fort Morgan
Salt Lake City
Vernal
76
Duchesne
Rangely
Boulder
Denver
70
Vail
Price
Rifle
Limon
Grand Junction
Green River
Buena Vista
Colorado Springs
15
Eads
Moab
Gunnison
Montrose
Pueblo
Hanksville
Lamar
La Junta
Saguache
25
Telluride
Monticello
Springfield
Alamosa
Pagosa Springs
Durango
San Luis
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