Winter Storm Severity Index (WSSI)

Product Description Document (PDD)

November 2016

Part I - Mission Connection

a. Product Description – The WSSI is achieved through the use of Geographic Information Systems (GIS) by screening the official National Weather Service 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, population) to create a graphical depiction of anticipated overall impacts to society due to winter weather. The underlying structure of the 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 WSSI provides a classification of the overall expected severity of winter weather using the following terminology: “limited”, “minor”, “moderate”, “major” and “extreme”.

b. Purpose – The WSSI has been developed to have a two-fold focus. One is 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 forecast. 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 winter weather.

c. Audience – The product is intended for use by WFO staff as an enhancement to decision support service information being provided, NWS core partners in emergency management, broadcast/electronic media and transportation categories, as well as the general public.

d. Presentation Format – The experimental graphics are available via a web page at http://www.weather.gov/btv/winterseverity. This page depicts national, regional and local views of the WSSI. This webpage is updated every 2 hours. Currently the output is available only as static .png format images and a user controlled overlay on an ESRI map. See the “Examples” section. Selected WFOs will include links to the WSSI on their local web pages.

e. Feedback Method – Feedback will be gathered from representatives from federal, state and local government partners during routine customer review meetings, as well as a web-based survey for the general public and other users that will be available on the WSSI webpage.

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

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Part II – Technical Description

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

Forecast datasets from NDFD of:

- 6-hour snow accumulation
- 6-hour ice accumulation
- 6-hour precipitation accumulation (QPF)
- wind gust (hourly time steps)
- temperature (hourly time steps)

Additional derived forecast parameters from NDFD:

- 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 from the National Operational Hydrologic Remote Sensing Center (NOHRSC) of:

- Snow depth
- Snowpack temperature
- Snow water equivalent

Non-forecast datasets:

- urban area designation
- land-use designations
- NOAA/NCEI gridded annual snowfall climatology

The WSSI is actually a series of component algorithms each of which use meteorological and non-meteorological data to model 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. 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

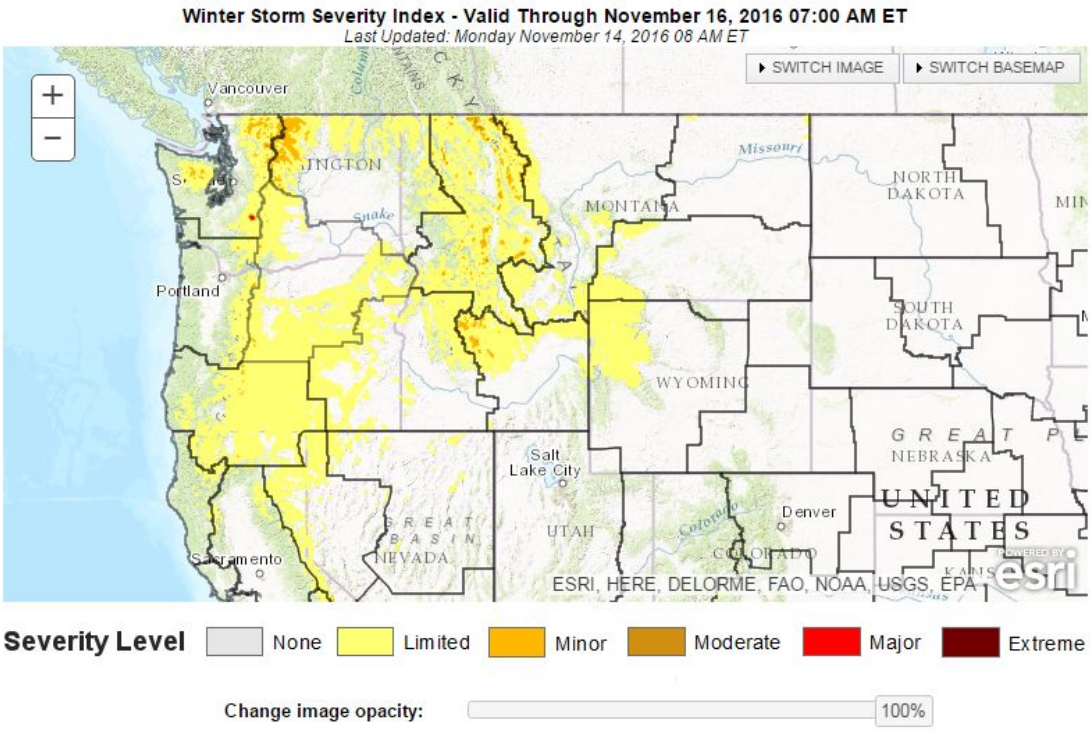
    - Indicates a potential of downed trees/power lines due to the weight of the snow. This index accounts for the land cover type. For example, more forested and urban areas will show increased severity versus the same snow conditions in grasslands.
- Snow Amount Index
    - Indicates a potential of impacts due to the total amount of snow or 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 has a more snowfall on average. Designated urban areas are also weighted a little more than non-urban areas.
- Ice Accumulation
    - Indicates the potential of tree and utility damage as well as transportation difficulties due to combined effects 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 index 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 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 value from among all components for each grid point at the native 2.5km NDFD resolution.

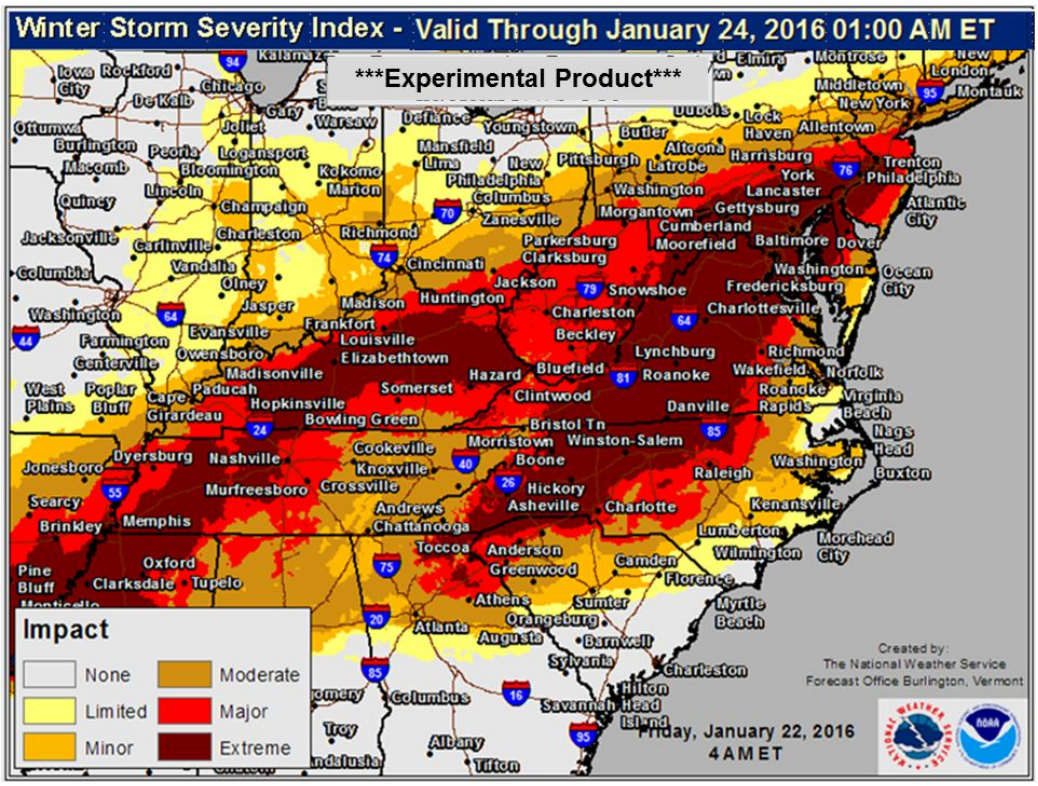
b. Availability -- the WSSI will be available year round. The interactive map provides a national (CONUS only) view of the WSSI. A pull down menu allows the user to select a specific pre-defined zoom area that includes select NWS Weather Forecast Office (WFO) areas of responsibilities, state and FEMA region views. The interactive map also has an option bar to select a one of the WSII components (snow amount, snow load, blowing snow, flash freeze, ice

accumulation or ground blizzard) as the overlay for those users that wish to better understand what particular aspect is primarily responsible for the overall WSSI depiction.

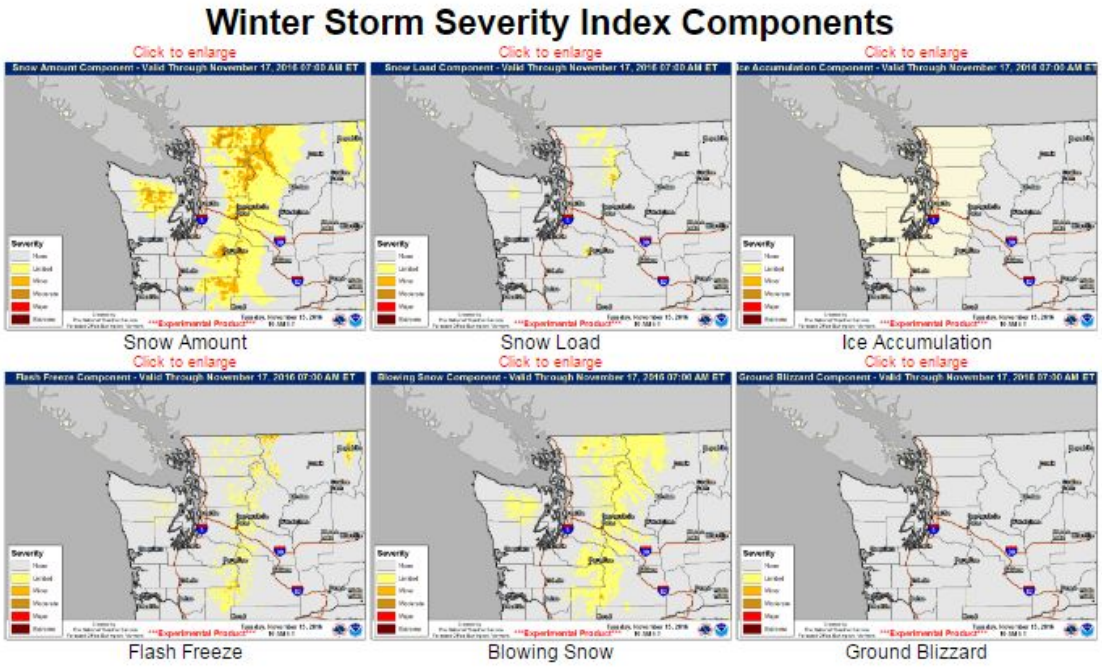
Examples:
Taken from: ***http://www.weather.gov/btv/winterseverity***



Example of WSSI as viewed on the interactive ESRI map interface. The user can zoom in as desired, or select the "Switch Image" button to select a different overlay.



Example of WSSI output for the January 2016 snow and ice storm that impacted the Ohio Valley into the mid-Atlantic region.



Example of WSSI component map outputs as static images for a user selected zoom area.

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