

# The Winter Storm Severity Index (WSSI)

## A Guide for Users

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Website: <https://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php>

The National Weather Service  
Weather Prediction Center

# What The Winter Storm Severity/Impact Index Is

- **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.
- **A tool** to help communicate a general level of potential societal impacts and their spatial distribution.



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# What The Winter Storm Severity/Impact Index Is NOT

- It is not a specific forecast for specific impacts.
  - For example, a depiction of “moderate” severity does not mean schools will or have to close.
- It is not meant to be the sole source of information about a Winter Storm. It should always be used in context with other NWS forecast and warning information.
- The WSSI does not account for conditions that have occurred prior to the creation time. It only uses forecast information. Therefore during an ongoing winter weather situation, the WSSI will not be representative of the entire event.



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# Motivation – To Better Depict Aspects of Winter Storms

- Current NWS Procedures:
  - Winter weather Watches/Warnings/Advisories are raised based primarily on “yes/no” thresholds of accumulation and generally at the level of individual counties.
- Reality of Winter Weather:
  - Severity/impacts from winter weather are due to more than just amounts (one 5” snowstorm is not like the next 5” snowstorm) Great variation in weather conditions frequently occur with individual counties.



# WSSI Scale

Potential Winter Storm Impacts	
	<b>Winter Weather Area</b> Expect Winter Weather. <ul style="list-style-type: none"><li>• Winter driving conditions. <b>Drive carefully.</b></li></ul>
	<b>Minor Impacts</b> Expect a few inconveniences to daily life. <ul style="list-style-type: none"><li>• Winter driving conditions. <b>Use caution while driving.</b></li></ul>
	<b>Moderate Impacts</b> Expect disruptions to daily life. <ul style="list-style-type: none"><li>• Hazardous driving conditions. <b>Use extra caution while driving.</b></li><li>• Closures and disruptions to infrastructure may occur.</li></ul>
	<b>Major Impacts</b> Expect considerable disruptions to daily life. <ul style="list-style-type: none"><li>• Dangerous or impossible driving conditions. <b>Avoid travel if possible.</b></li><li>• Widespread closures and disruptions to infrastructure may occur.</li></ul>
	<b>Extreme Impacts</b> Expect substantial disruptions to daily life. <ul style="list-style-type: none"><li>• Extremely dangerous or impossible driving conditions. <b>Travel is not advised.</b></li><li>• Extensive and widespread closures and disruptions to infrastructure may occur.</li><li>• Life-saving actions may be needed.</li></ul>



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# WSSI Components

## Snow Amount Index

**PURPOSE:** This component is designed to highlight areas in which impacts, especially transportation, could become overwhelmed due to either:

- 1) The total amount of snow.
- 2) The rate at which the snow is falling.

Prior to making calculations based upon the amount or rate of snow, climatology based factors are determined. Climatology is an important aspect to the level of impacts a winter storm brings. Those areas of the country less accustomed to snowfall will be less prepared to deal with snow, resulting in higher level of impacts compared to the same amount of snow in a snowier part of the country.

## Snow Load Index

**PURPOSE:** This component is to highlight areas where the weight of the snow could result in damage to trees and powerlines. In general, the lower the snow-liquid ratio (SLR) is and the greater the total snow accumulation, the higher the index.

## Blowing Snow Index

**PURPOSE:** This component highlights areas where blowing/drifting snow is expected to occur and result in transportation related problems. In general, the blowing snow significance increases as the SLR and winds both increase. Prior blowing snow research indicates that in general it takes just under 20 mph of wind to start to move snow around.



# WSSI Components

## Ground Blizzard Index

**PURPOSE:** This component is to highlight areas where pre-existing snow combined with very strong winds results in ground blizzard conditions, which result in a significant impact to transportation.

## Flash Freeze Index

**PURPOSE:** The component depicts severity primarily to transportation of situations where temperatures rapidly fall below freezing during or just after precipitation.

## Ice Accumulation Index

**PURPOSE:** This component was developed to account for the combined effects of ice accumulation and wind which can produce widespread tree damage, transportation shutdowns and utility problems.

**NWS has implemented the WSSI to provide the public with a tool that attempts to convey the complexities and hazards associated with winter storms as they relate to potential societal impacts. NWS acknowledges contributions to the field of ice impact forecast graphics made by Sidney Sperry (Oklahoma Association of Electric Cooperatives) and Steven Piltz (NWS) in the development of the “Sperry-Piltz Ice Accumulation Index” or SPIA® Index.**



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# Using Non-Meteorological with Meteorological Data

The WSSI uses non-meteorological data along with meteorological data to help forecast impacts

The non-meteorological data, or factors used are:

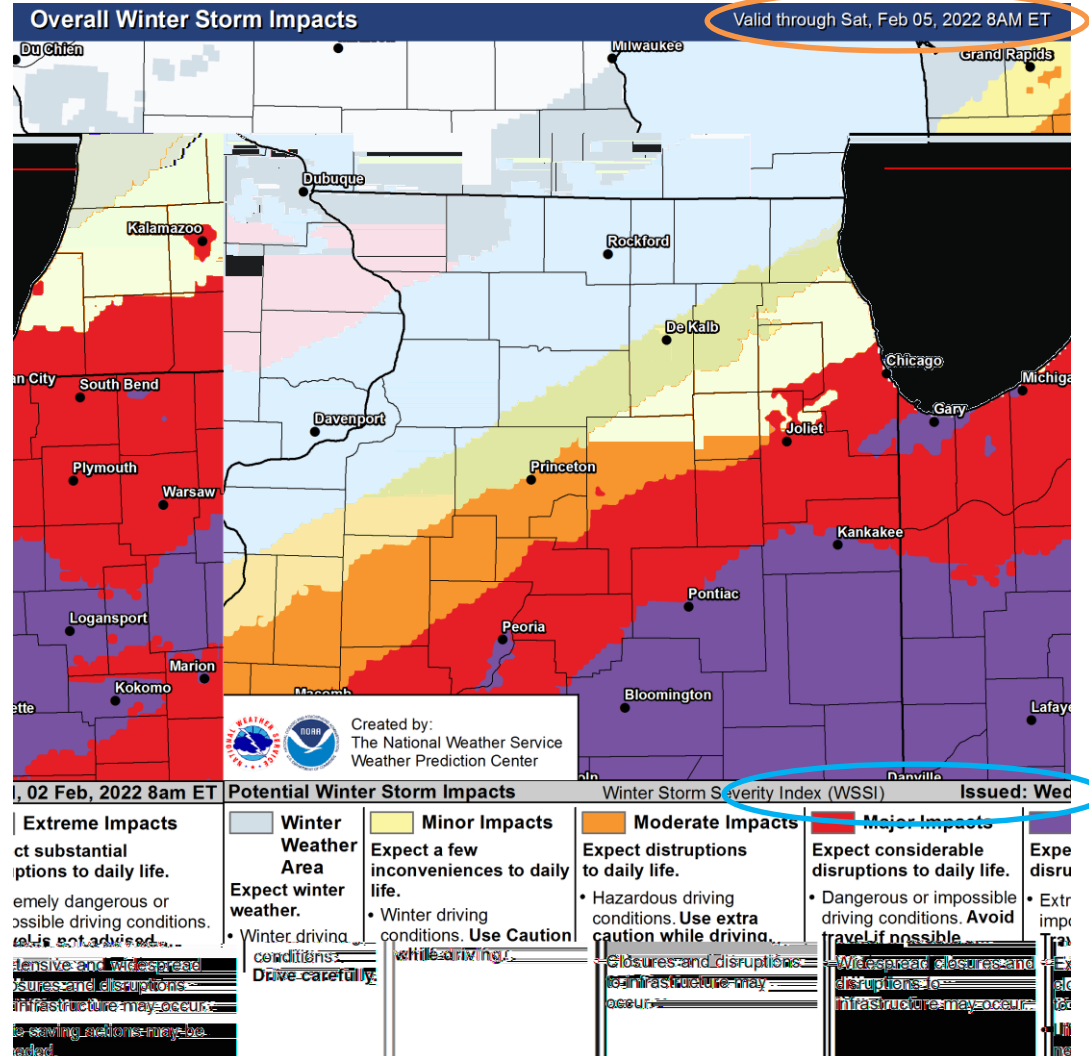
- Urban areas
  - Used in the Ice Accumulation Index and Snow Amount Index
  - They give a 25% increase to impact
  - Defined from US Census Bureau
- Land Use / Coverage
  - Decreases impacts for areas of reduced wind (e.g. forests, high density commercial/residential areas) compared to areas without reductions (e.g. cropland, grassland)
  - Used in the Blowing Snow Index and Ground Blizzard Index
- Forest Classification
  - Delineates forestland described as conifer vs deciduous
    - Conifer trees can handle more snow than deciduous trees
  - Used in the Snow Load Index



# WSSI – How to Interpret

The map on the right depicts the WSSI for expected winter weather occurring between **8 AM ET Feb 2** (time stamp at the bottom) to **8 AM Feb 5** (valid time at the top).

It does NOT indicate *when* the weather will occur during the period. Refer to other NWS forecast data for that information.



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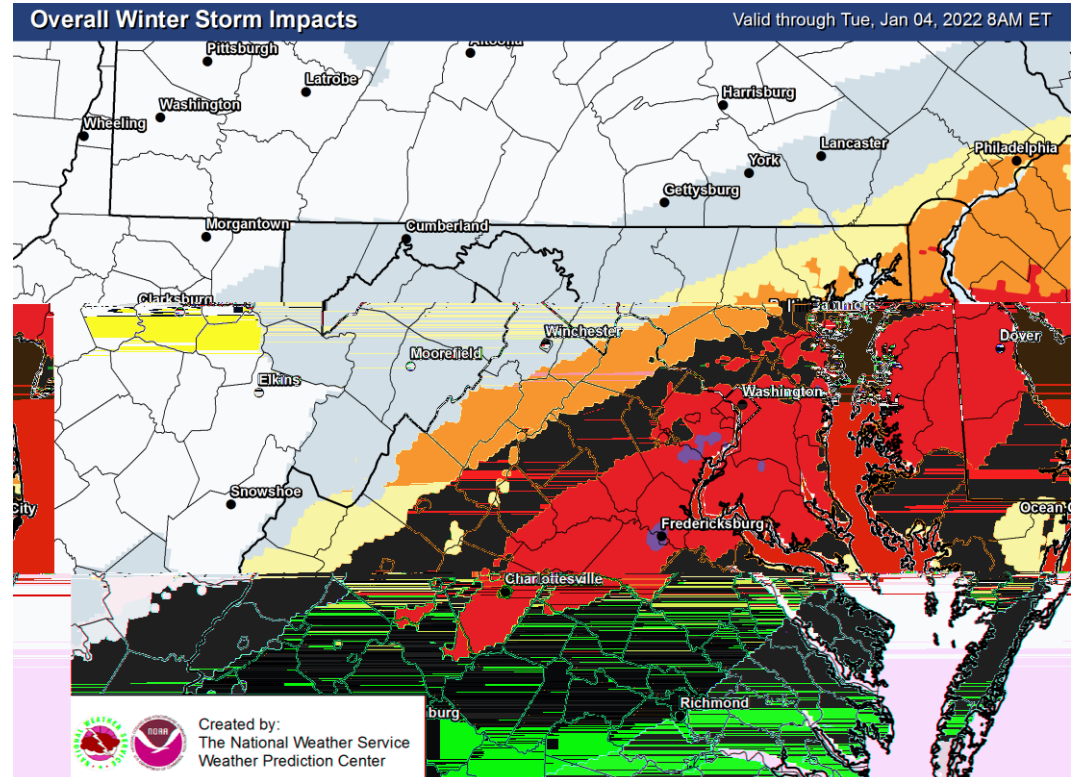
Website: <https://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php>



# WSSI – How to Interpret

The areas where the most significant winter weather is expected are denoted by the **orange** (Moderate), **red** (Major) and **purple** (Extreme) colors.

To understand what is the underlying cause of the final severity depiction, refer to the individual WSSI component maps



Winter Weather Area	Minor Impacts	Moderate Impacts	Major Impacts	Extreme Impact
<p><b>Winter Weather Area</b> Expect winter weather.</p> <ul style="list-style-type: none"> <li>Winter driving conditions. <b>Drive carefully.</b></li> </ul>	<p><b>Minor Impacts</b> Expect a few inconveniences to daily life.</p> <ul style="list-style-type: none"> <li>Winter driving conditions. <b>Use Caution while driving.</b></li> </ul>	<p><b>Moderate Impacts</b> Expect disruptions to daily life.</p> <ul style="list-style-type: none"> <li>Hazardous driving conditions. <b>Use extra caution while driving.</b></li> <li>Closures and disruptions to infrastructure may occur.</li> </ul>	<p><b>Major Impacts</b> Expect considerable disruptions to daily life.</p> <ul style="list-style-type: none"> <li>Dangerous or impossible driving conditions. <b>Avoid travel if possible.</b></li> <li>Widespread closures and disruptions to infrastructure may occur.</li> </ul>	<p><b>Extreme Impact</b> Expect substantial disruptions to daily life.</p> <ul style="list-style-type: none"> <li>Extremely dangerous or impossible driving conditions. <b>Travel is not advised.</b></li> <li>Extensive and widespread closures and disruptions to infrastructure may occur.</li> <li>Life-saving actions may be needed.</li> </ul>

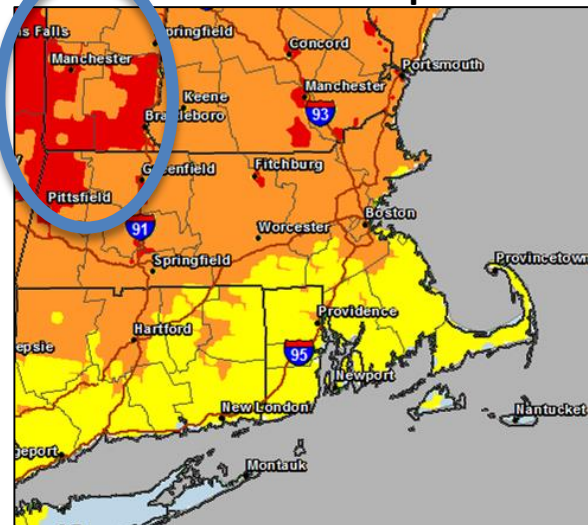
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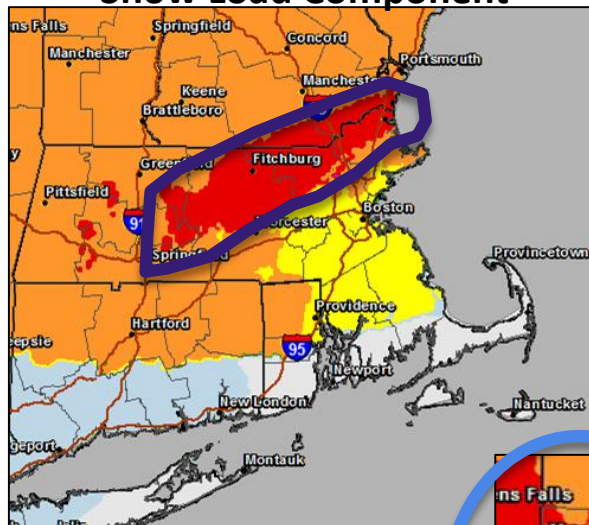


# WSSI – How to Interpret (Example)

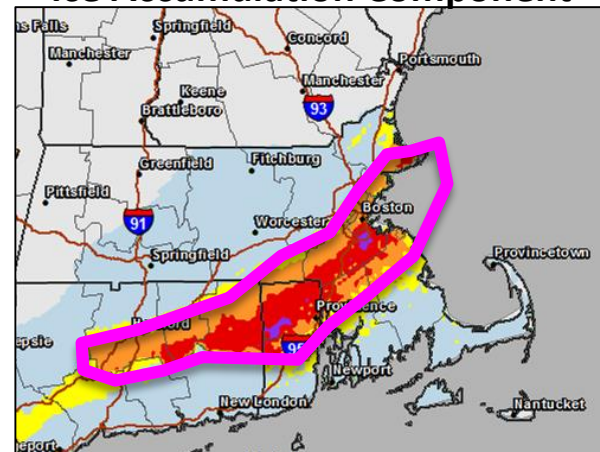
## Snow Amount Component



## Snow Load Component



## Ice Accumulation Component



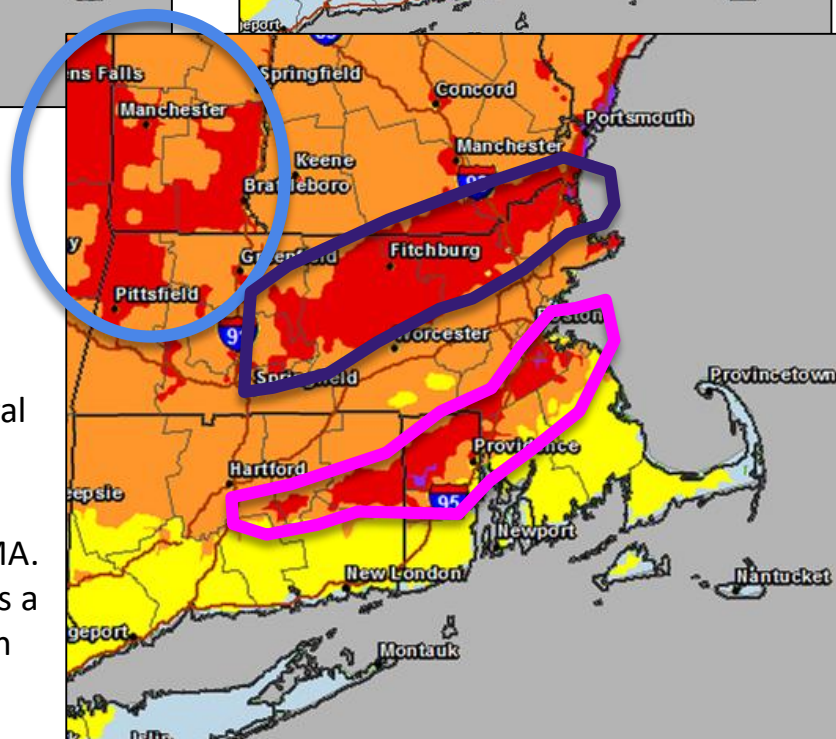
**Bottom Right:** WSSI depiction of all threats.

**Top Left:** The snow amount component matches the total WSSI around southern VT, western MA and NY.

**Top Right:** The ice accumulation component matches the WSSI for southeastern MA and northern RI.

**Top Middle:** The snow load component matches the WSSI for central MA and southeast NH.

**Final interpretation:** Expect the primary impacts to come from ice accumulations across northern RI northeastward toward Boston, MA. Expect impacts to come from heavy snowfall for VT and NY. There is a major threat for impacts from snow load across central MA through southeast NH.



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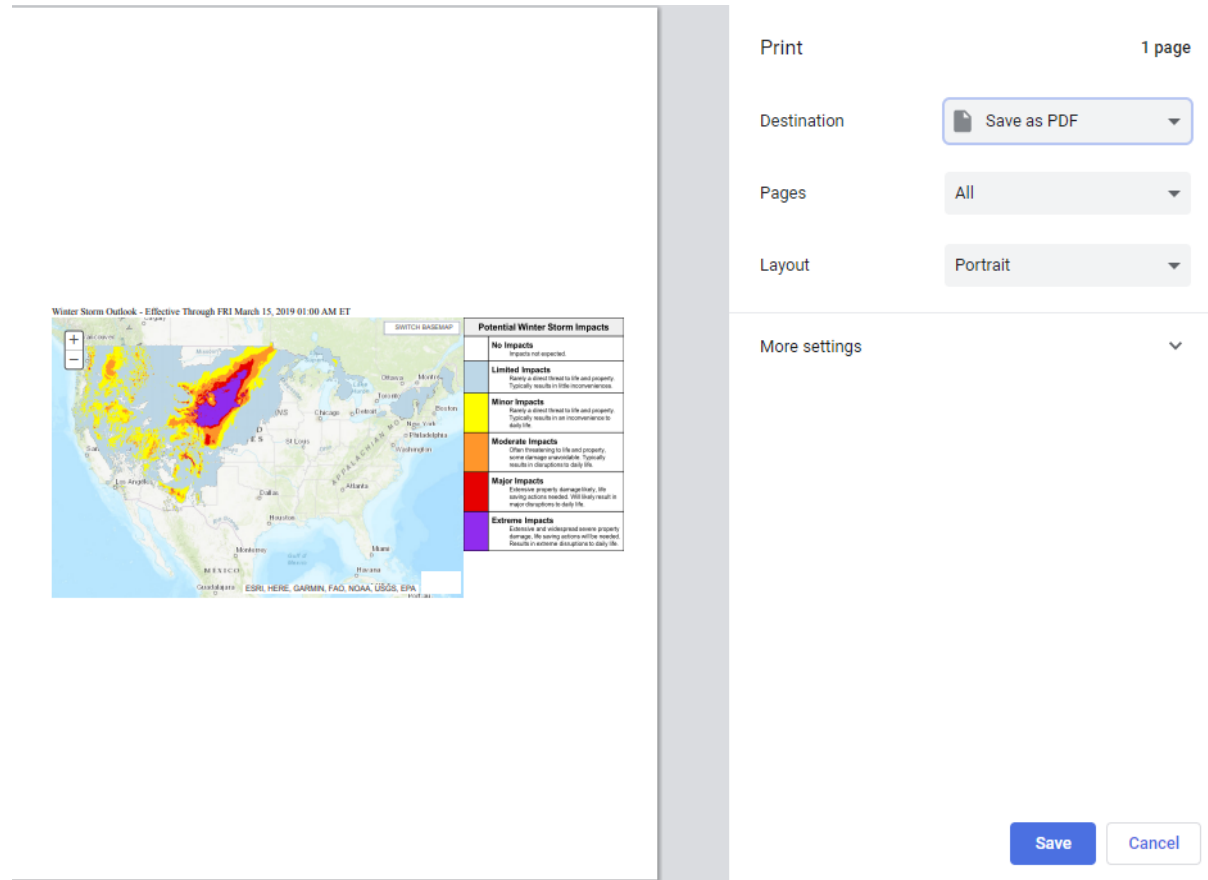
# WSSI – Website Overview

- **Clickable Tabs**
  - Loads WSSI components upon click
  - Day period buttons
- **Zoom to WFO**
  - Dropdown Box
- **Print Image button**
  - Create a PDF of the map with your specifications
- **Variety of basemaps**
  - Switch basemaps dropdown button
- **Links to GIS data**
- **Map overlay options**
  - Toggled via checkbox
- **Static images**
  - Select location and component

The screenshot shows the Weather Prediction Center's Winter Storm Severity Index (WSSI) website. The page features a navigation menu with options like HOME, FORECASTS & ANALYSES, ARCHIVES, VERIFICATION, INTERNATIONAL, DEVELOPMENT, ABOUT, and SEARCH. The main heading is "Winter Storm Severity Index (WSSI)", followed by a brief description and a "Click Me for Additional Information" button. Below this, there are tabs for "Overall Impact", "Snow Amount", "Snow Load", "Ice Accumulation", "Flash Freeze", "Blowing Snow", and "Ground Blizzard". The "Overall Impact" tab is selected, showing a summary: "Overall Impact: Maximum impact from any of the components." and buttons for "Days 1-3", "Day 1", "Day 2", and "Day 3". A "Select Zoom Area" dropdown is set to "[CONUS] CONUS", and a "Print Map" button is visible. The main content area displays a map of the United States titled "Winter Storm Severity Index - Effective Through FRI March 15, 2019 01:00 AM ET". The map shows a color-coded severity index over the central and eastern US. To the right of the map is a "Potential Winter Storm Impacts" table with categories: Winter Weather Area, Minor Impacts, Moderate Impacts, Major Impacts, and Extreme Impacts, each with specific advisory text. Below the map is a "Change image opacity" slider set to 70%. At the bottom, there are two panels: "Map Overlays" with checkboxes for NWS County Warning Areas, FEMA Boundaries, State Boundaries, Urban Areas, River Forecast Center Boundaries, Counties Boundaries, NWS Public Forecast Zones, and ARTCC/FIR; and "Retrieve Static Images" with a "Select Zoom Area" dropdown and radio buttons for WSSI Overall, Blowing Snow, Flash Freeze, Ground Blizzard, Ice Accumulation, Snow Amount, and Snow Load. A footer note states: "To retrieve static images please select a zoom area and WSSI element. \*Please Note\* Static images only update at 01, 09, 13, 19 and 21 UTC".

# WSSI – Website Print Button

- When you click the print button the image on the right will be displayed.
- Make sure to change destination to 'Save as PDF'
- Portrait layout option works better than landscape

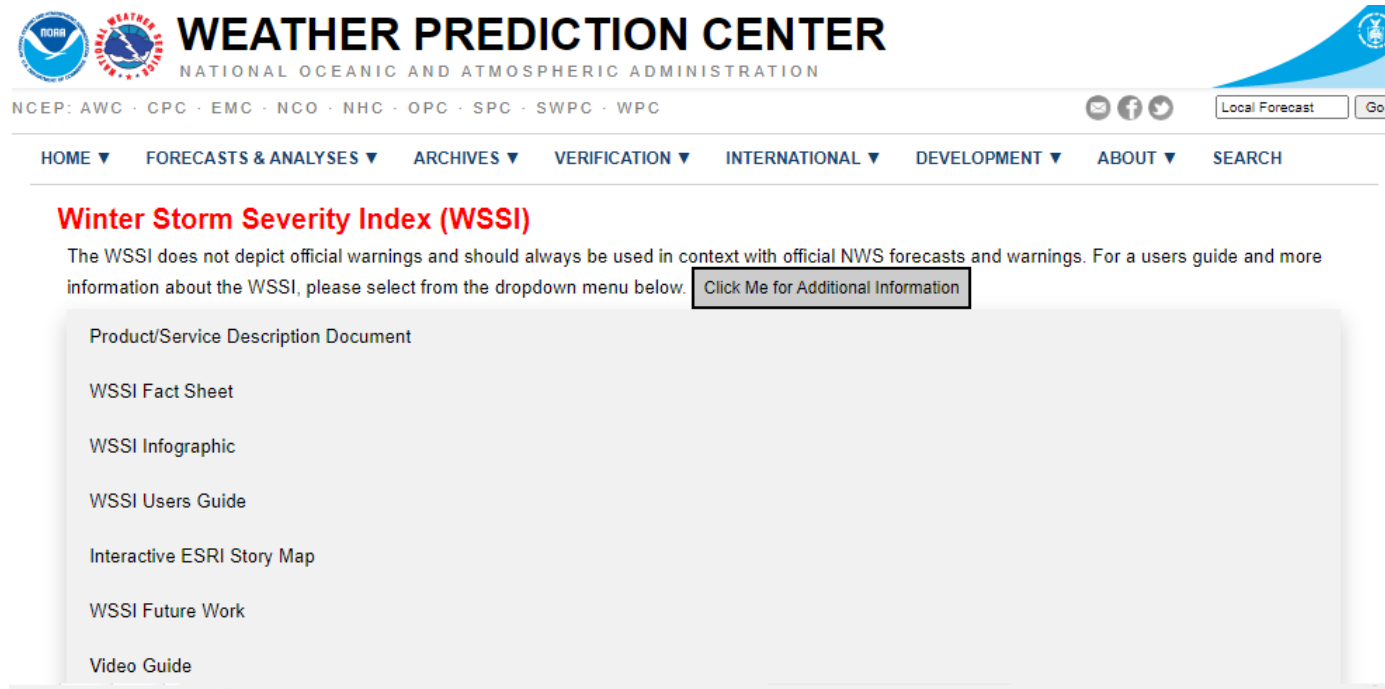


The screenshot displays a web application interface. On the left, a map titled "Winter Storm Outlook - Effective Through FRI March 15, 2019 01:00 AM ET" shows a color-coded forecast of storm impacts across the United States. A legend titled "Potential Winter Storm Impacts" is positioned to the right of the map, detailing five levels of impact: No Impacts, Limited Impacts, Minor Impacts, Moderate Impacts, and Extreme Impacts, each with a corresponding color and description of potential damage.

On the right side of the interface is a print settings panel. It includes a "Print" button and a page count of "1 page". Below this are three dropdown menus: "Destination" set to "Save as PDF", "Pages" set to "All", and "Layout" set to "Portrait". A "More settings" dropdown is also visible. At the bottom right of the panel are "Save" and "Cancel" buttons.

Potential Winter Storm Impacts	
<b>No Impacts</b>	Impacts not expected.
<b>Limited Impacts</b>	Minor property damage, some damage unavoidable. Typically results in minor inconvenience to daily life.
<b>Minor Impacts</b>	Minor property damage, some damage unavoidable. Typically results in minor inconvenience to daily life.
<b>Moderate Impacts</b>	Minor property damage, some damage unavoidable. Typically results in minor inconvenience to daily life.
<b>Major Impacts</b>	Extensive property damage, life threatening conditions. Significant damage to major infrastructure to daily life.
<b>Extreme Impacts</b>	Extensive and widespread severe property damage. Life threatening conditions. Significant damage to major infrastructure to daily life.

# WSSI – Additional Information Menu



The screenshot shows the Weather Prediction Center website. At the top, there are logos for NOAA and the Weather Service, followed by the text "WEATHER PREDICTION CENTER" and "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION". Below this is a navigation bar with links for "HOME", "FORECASTS & ANALYSES", "ARCHIVES", "VERIFICATION", "INTERNATIONAL", "DEVELOPMENT", "ABOUT", and "SEARCH". A search box with "Local Forecast" and a "Go" button is also visible. The main content area features the heading "Winter Storm Severity Index (WSSI)" in red. Below the heading is a paragraph of text: "The WSSI does not depict official warnings and should always be used in context with official NWS forecasts and warnings. For a users guide and more information about the WSSI, please select from the dropdown menu below." A button labeled "Click Me for Additional Information" is highlighted with a black border. A dropdown menu is open below the button, listing several options: "Product/Service Description Document", "WSSI Fact Sheet", "WSSI Infographic", "WSSI Users Guide", "Interactive ESRI Story Map", "WSSI Future Work", and "Video Guide".

- The ‘Click Me for Additional Information’ button open a drop down menu with several options.
  - For technical information and a more in depth description of the WSSI select the Product/Service Description Document
  - For a quick summary select the WSSI Fact Sheet or WSSI infographic
  - For an interactive exploration of the WSSI choose the Interactive ESRI Story Map option
  - For a guided video explanation of the WSSI select the Video Guide

# WSSI – Rolling 24 Hour Winter Storm Severity Index (WSSI)

- The Rolling 24 Hour display is controlled by a slider bar (blue circle). Dragging this bar to the right (left) will move the forecast forward (backward) with time.
- You can change the WSSI impact type (Overall, Snow Amount, Snow Load, Ice Accumulation, Flash Freeze, Blowing Snow, Ground Blizzard) via the dropdown menu (orange box).
- The Rolling 24 hour display shows the WSSI forecast for a 24 hour period update 6 hour cadence.
  - The forecast HR indicator (pink box) shows the initial forecast hour for the current 24 hour block. The 'Valid at' time indicator (green box) shows the end time of the current 24 hour block in UTC time. For example the image to the right is showing the 24 hour forecast starting at hour 30 and valid 18Z. The next time step forward would be Forecast HR 36 with a valid time of 00Z

**WEATHER PREDICTION CENTER**  
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**\*Prototype Display\* Rolling 24 Hour Winter Storm Severity Index (WSSI)**

This display shows the WSSI for a period of 24 hours. Each time-step forward is 6 hours. As you move forward in time using the slider bar you can see how the WSSI is changing every six hours out to the end of the day 3 timeframe.

Select WSSI Impact Type: Overall Impact

Drag the slider to display the 24 hour forecast forecast for WSSI impacts.

Forecast Initialized: 12Z Tue 28 Sep, 2021 Forecast HR: 30 Valid at 18Z Wed 29 Sep, 2021

Potential Winter Storm Impacts	
No Impacts	Impacts not expected.
Limited Impacts	Rarely a direct threat to life and property. Typically results in little inconveniences.
Minor Impacts	Rarely a direct threat to life and property. Typically results in an inconvenience to daily life.
Moderate Impacts	Often threatening to life and property, some damage unavoidable. Typically results in disruptions to daily life.
Major Impacts	Extensive property damage likely, life saving actions needed. Will likely result in major disruptions to daily life.
Extreme Impacts	Extensive and widespread severe property damage, life saving actions will be needed. Results in extreme disruptions to daily life.

Change image opacity: 70%

**Map Overlays**

- NWS County Warning Area Boundaries
- FEMA Boundaries
- State Boundaries
- Urban Areas
- River Forecast Center Boundaries
- Counties Boundaries
- NWS Public Forecast Zones
- ARTCC/FIR

# Summary

- The WSSI tool is designed to help maintain situational awareness and to help communicate a general level of potential societal impacts and their spatial distribution for winter weather.
- This tool uses both meteorological and non-meteorological data to forecast impacts for Snow Amount, Snow Load, Ice Accumulation, Blowing Snow, Ground Blizzard, Flash Freeze and a Summary graphic, which is a composite of the maximum impact from any of the six components.





# Contact Information

- Questions or Comments? Please Reach out to:
- NWS WSSI Project Lead:
  - Jim Nelson ([james.a.nelson@noaa.gov](mailto:james.a.nelson@noaa.gov))
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- WSSI Lead Scientist and Developer
  - Lead: Josh Kastman ([joshua.kastman@noaa.gov](mailto:joshua.kastman@noaa.gov))
  - Dana Tobin ([dana.tobin@noaa.gov](mailto:dana.tobin@noaa.gov))

