

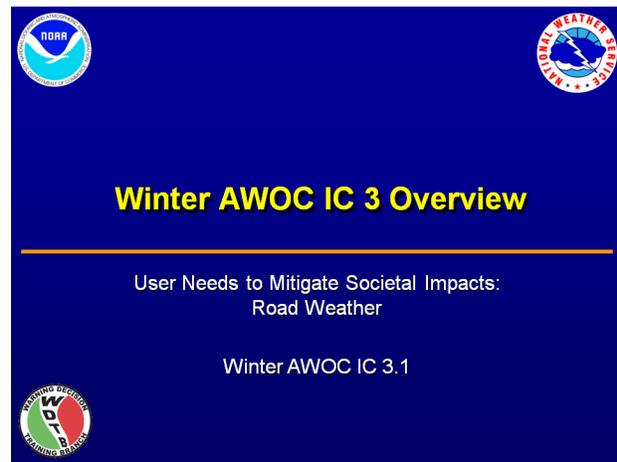
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## 1. Winter AWOC IC 3 Overview

**Instructor Notes:** Welcome to the overview module of this course, entitled User Needs to Mitigate Societal Impacts: Road Weather. Besides being a stand alone course, it also serves as instructional component 3 in the AWOC Winter Weather Track. This module presents an overview of the course, including an outline of all the lessons. This presentation should take approximately 10 minutes. NOTE: Gray speaker notes in italics surrounded by brackets (i.e., [show text] ) indicate at what point during the speaker notes specific animations occur.

**Student Notes:**



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## 2. NWS Support of DOTs

**Instructor Notes:** This portion of the AWOC Winter Weather Track addresses how NWS forecasters can support their local user communities during winter weather events. The needs of state, local, and municipal departments of transportation (hereafter referred to as DOTs) are addressed in this training for several reasons. [show 1st bullet] For starters, weather causes significant impacts to driving conditions. During the winter season in the U.S., these impacts receive more attention from the general public. [show 2nd bullet] DOTs play the lead role in mitigating these road weather impacts. Many other reasons for the significance for focusing on DOT support are discussed throughout this lesson. [show 3rd bullet] The NWS provides service support to DOT partners in several ways. Both groups are committed to protecting life & property. The NWS does so by providing its products & services in a timely fashion so that DOTs can effectively mitigate dangerous impacts related to various kinds of weather. In some circumstances, NWS meteorologists spend time collaborating and communicating with DOT partners to ensure they understand the content of their hazardous weather products.

Student Notes:

AWOC Winter Weather Track

### NWS Support of DOTs during Significant Weather



- Weather causes significant impacts to driving conditions
- Local, municipal, & state Dept. of Transportations (DOTs) play lead roles in mitigating road weather impacts
- NWS provides support by:
  - Providing products & services to protect life & property
  - Ensuring partners understand hazardous weather products

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## 3. Knowing Your Local DOTs Needs Is Critical

**Instructor Notes:** It is critical to understand what your customers need to provide the appropriate level of support. [show 1st bullet] In the case of DOTs, they have a need for weather information on the evolution and timing of hazardous weather events. However, only a portion of this need is met by the NWS. America's Weather Industry (i.e., private sector providers of weather services) support DOTs with specialized road surface temperature (RST) forecasts and expertise on road treatment options. [show 2nd bullet] This training was developed to help NWS forecasters better understand how DOTs operate. Knowledge of weather-related mitigation activities will help NWS forecasters know how to best provide appropriate services to assist DOTs in their efforts. [show 3rd bullet] In other words, a better understanding of how DOTs operate will allow you, as a forecaster, to use your limited time and staffing resources efficiently during significant hazardous weather support.

Student Notes:

AWOC Winter Weather Track

### Knowing Your Local DOTs Needs Is Critical to Providing the Appropriate Support



- These agencies have a variety of weather needs, only a portion of which are met by NWS products & services
- NWS forecasters should understand both:
  - DOT general mitigation activities
  - The appropriate services the NWS can provide to assist in their efforts
- This knowledge will help you focus your limited resources more efficiently

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## 4. What's a Way to Improve NWS Support?

**Instructor Notes:** The NWS has a good history of supporting its partners in DOTs, but how might NWS forecasters do better? Where are the opportunities for a forecaster to improve? [show 1st bullet] One significant area for improvement is in a forecaster's ability to determine which winter weather events that do not meet warning/advisory criteria may have major societal impacts. The events, sometimes called high-impact, sub-advisory (or HISA) events occur repeatedly each winter. Some CWAs may have a handful of such events while others may have none. Other areas for potential improvement include: [show 2nd bullet] The better clarification of forecast details during warning-criteria events and [show 3rd bullet] Better collaboration & communication of hazardous weather information. [show 4th bullet] These opportunities, along with the needs of NWS forecasters to better understand how DOTs work, were the primary drivers of the learning objectives for this topic. To access a complete list of the learning objectives for the road weather training at any time during these lessons, please access the "Objectives" tab in the top portion of this window.

### Student Notes:

AWOC Winter Weather Track

### What's an Example of How to Improve NWS Support of DOTs?



Mundane

Vs.



Significant

- High impact, sub-advisory events
- Clarifying forecast details of warning-criteria events
- Better collaboration & communication when public at risk & standard NWS products & services don't fit
- These needs resulted in the IC learning objectives (see tab)

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## 5. Example of NWS DOT Support

**Instructor Notes:** Here is an example of a sub-advisory event that resulted in significant societal impacts. [show 1st bullet] On January 6, 2004, there was a major traffic pile-up along Interstate 80 in Central Pennsylvania. This accident involved over 35 vehicles and resulted in several injuries and fatalities. [show sub-bullets] The photo on the left shows part of the crash aftermath. The image on the right is a screen capture of the reflectivity data around the time of the crash. As you can see, there are some bands of moderate to heavy snow occurring at the time of the crash, but nothing extensive or long lasting. [show 2nd bullet] Because of this incident, the State College forecast office began work on better forecasting the weather conditions that can lead to these events and better communicating these conditions to DOTs in their area. We'll share some of their experiences later on in the course.

Student Notes:

AWOC Winter Weather Track

**Example of NWS DOT Support:  
January 6, 2004 Sub-Advisory Event**



Photo from NWS State College WFO



- Multi-vehicle accident along I-80 in Centre County, PA
  - Over 35 vehicles involved (20 tractor trailers)
  - 17 injuries
  - 6 fatalities
- Led to CTP WFO staff identifying conditions most likely to cause these events

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## 6. Statistics from Weather-Related Accidents

**Instructor Notes:** The significance of weather impacts on the road surface are pretty clear when you look at recent statistics from the U.S. Department of Transportation. [show 1st bullet] Approximately 1.5 million vehicle accidents annually, or about 24% of all crashes, list adverse weather as a contributing factor. [show 2nd bullet] Those accidents result in approximately 673,000 injuries and [show 3rd bullet] 7,400 deaths on average (FHWA, 2008). [show NWS bullets] That's at least an order of magnitude greater than the weather-related injury and death statistics compiled annually by the NWS (NWS, 2008).

Student Notes:

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**Road Weather Significance: Statistics from  
Weather-Related Traffic Accidents**

DoT Annual Crash Statistics (FHWA, 2008):

- # of Weather-Related Accidents = ~ 1.5 million
- # of Injuries from These Crashes = ~ 673,000
- # of Fatalities from These Crashes = ~ 7,400

NWS Annual Statistics (NWS, 2008):

- # of Injuries Directly Due to Weather = 3106/yr
- # of Fatalities Directly Due to Weather = 649/yr

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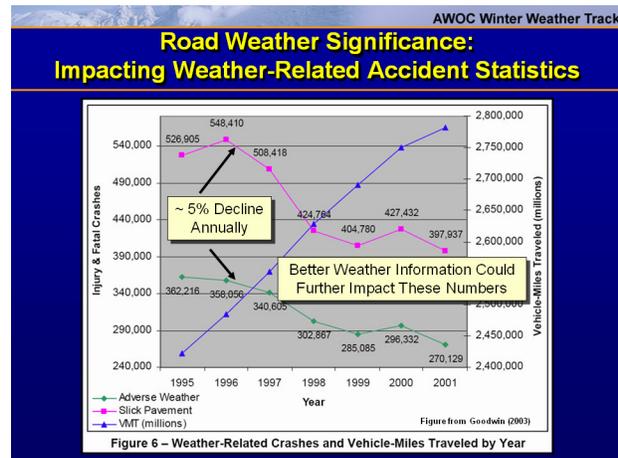
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## 7. Impacting Weather-Related Accident Stats

**Instructor Notes:** [show 1st text box] The vehicle crash statistics have generally declined about 5% annually over the last decade, but more can be done. State, local, and municipal DOTs are autonomous and independent agencies. The U.S. Dept. of Transportation provides national coordination for these agencies, but they cannot mandate change regarding weather impact mitigation. [show 2nd text box] Fortunately,

change is happening at the state and local level. By assisting DOTs as they become more proactive in dealing with weather impacts on their road networks, it's possible that an additional 5-10% positive impact on highway operations goals can occur (Nelson and Persuad, 2002). While linking changes in goals directly to crash statistics is difficult, even a small change would be significant. After all, a reduction in crash statistics of just 1% would result in approximately 3,000 less injury and fatality accidents annually. That's about 5,000 less injuries and 75 less fatalities!

**Student Notes:**



## 8. Road Impacts Depend on a Many Factors

**Instructor Notes:** Road weather impacts depend on both the weather and how people respond to the impacts. Our responses can be the individual behavior of drivers or the group mitigation efforts performed by DOT crews. [show left side text] How drivers behave varies greatly depending on weather conditions. Based on research and accident statistics, the primary threat to drivers is rain and wet pavement (FHWA, 2008). However, winter precipitation (i.e., snow, sleet, and freezing rain) is perceived to be a bigger threat. Generally speaking, driver behavior changes only when they perceive the threat (FHWA, 1977; Ibrahim and Hall, 1994). As a result, there is often an increase in speed variance as inclement weather impacts a road network. Increases in speed variance result in an increase in the accident rate. [show right side text] One reason that winter precipitation is perceived to be the primary threat to drivers is the costs involved in impact mitigation. Approximately 40% of DOT maintenance budgets go to mitigating weather impacts. On average each year, 2.5 billion dollars is spend on road and ice control. Twice that is spent on winter-related road repair. The end result is about \$2800 per route mile is spent annually on winter weather impacts (Pisano et al., 2002).

Student Notes:

AWOC Winter Weather Track

### Road Weather Impacts Vary Depending on a Multiple Factors



**Driver Behavior:**

- Primary threat: Rain/wet pavement
- Winter precip threat is better perceived
- Driver behavior changes when they perceive a threat
- Increase in speed variance = increase in the accident rate



**DOT Mitigation Practices:**

- ~40% of maintenance budget
- Snow/ice control: ~ \$2.5 B
- Winter-related road repair: ~ \$ 5 B
- ~\$2800/route mile annually from winter weather impacts

## 9. NWS & America's Weather Industry

**Instructor Notes:** The NWS recently updated and clarified its national policy on how employees can and should support DOT operations during hazardous weather. This policy, published in June 2009, provides general examples of appropriate NWS support for DOTs, including specific examples of what NWS forecasters can and cannot do. The table shown provides some examples of what support DOTs can expect from the NWS and what to expect from America's Weather Industry. In general, NWS support is limited to [show 1st row] issues related to life and property, [show 2nd row] contact with DOTs promoting motorist safety or protecting life & property, & [show 3rd row] referring DOTs to America's Weather Industry for specialized support of their operations. [show URL text box] References to America's weather industry can be found at the URL shown. If you have any questions about the NWS policy on support of state and local DOTs, you can access the policy document from the attachments tab in the upper right hand side of the window.

Student Notes:

AWOC Winter Weather Track

### NWS Policy on Supporting Local Transportation Agencies during Significant Weather Events

National Weather Service	America's Weather Industry
→ Provide support on issues related to life and property	Provide comprehensive & customized services ←
→ Respond to questions or initiate contact w/DOTs for promoting motorist safety or protecting life & property	Provide specialized support to DOTs, including customized weather info, system support, and/or consulting services ←
→ Refer DOTs to America's Weather Industry for service requests that transcend NWS' mission	Give DOTs support on customized forecast issues like specific road temperature forecasts & advice on chemical treatments ←

<http://weather.gov/im>

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## 10. Road Weather Lesson Outline

**Instructor Notes:** The course is composed of five lessons including this introduction. Each lesson covers a different topic and can be taken for completion separately in the CLC. Here is a simple outline of each lesson: [show 1st bullet] Lesson 1 – This course overview. [show 2nd bullet] Lesson 2 – Discusses the road system impacts due to weather, the mitigation strategies employed by DOTs, and how sub-advisory events are different from warning criteria events. [show 3rd bullet] Lesson 3 – Provides details on the data used by DOTs to monitor adverse weather and how NWS forecasters can integrate that data, and similar surface mesonet observations, into their operational DOT support. [show 4th bullet] Lesson 4 – Discusses how the NWS can communicate and collaborate more effectively with DOT partners locally. [show 5th bullet] Lesson 5 – Compares the timing of NWS products with common DOT responses during a variety of different weather events. [image zoom in] To aid students, some material relevant to this course are included in tabs visible along the top portion of the module window.

### Student Notes:

AWOC Winter Weather Track

### Road Weather IC Outline

Lesson 1/IC 3.1: Course Overview

Lesson 2/IC 3.2: Weather Impacts and Surface Transportation Management Strategies

Lesson 3/IC 3.3: Tools for Monitoring Road Weather

Lesson 4/IC 3.4: The NWS-Ground Transportation Partnership

Lesson 5/IC 3.5: Comparing Timelines of NWS Products & Ground Transportation Mitigation Strategy Implementation

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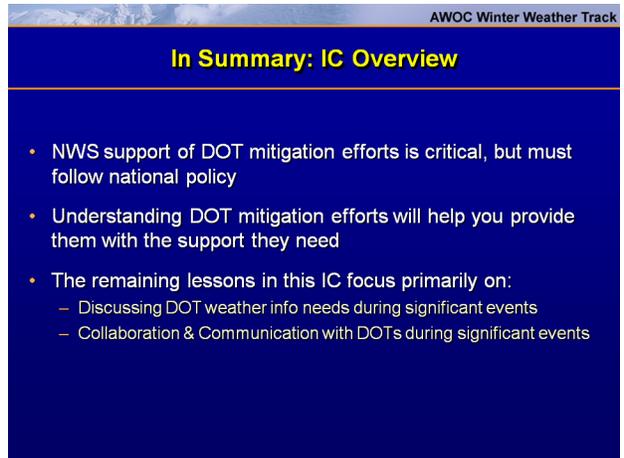


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## 11. In Summary: Overview Lesson

**Instructor Notes:** [show 1st bullet] NWS support of DOT mitigation efforts is critical to meeting both of their respective missions. However, the support that NWS offices provide must follow national policy to insure that it is appropriate. [show 2nd bullet] Similarly, it's important for NWS forecasters to be familiar with DOT mitigation efforts in order to provide efficient support. [show 3rd bullet] The remaining lessons in this course will discuss several topics, including the weather information that DOTs need during hazardous weather, utilizing available data to monitor hazardous weather impacts on roads, and ideas on how to better collaborate and communicate with DOTs during significant events.

Student Notes:



AWOC Winter Weather Track

### In Summary: IC Overview

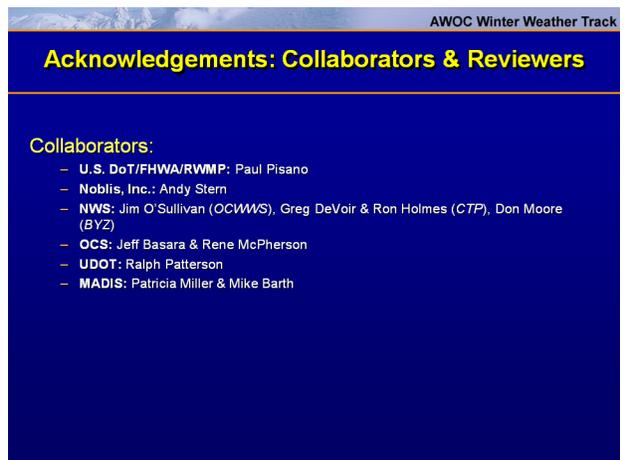
- NWS support of DOT mitigation efforts is critical, but must follow national policy
- Understanding DOT mitigation efforts will help you provide them with the support they need
- The remaining lessons in this IC focus primarily on:
  - Discussing DOT weather info needs during significant events
  - Collaboration & Communication with DOTs during significant events

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## 12. Acknowledgements

**Instructor Notes:** Many people inside and out of the NWS assisted in a variety of ways to bring this course to completion. The many collaborators include everyone that provided the initial guidance and scope for the course, expertise in specific content areas, and answered my numerous questions along the way. All of their efforts are greatly appreciated.

Student Notes:



AWOC Winter Weather Track

### Acknowledgements: Collaborators & Reviewers

**Collaborators:**

- U.S. DoT/FHWA/RWMP: Paul Pisano
- Noblis, Inc.: Andy Stern
- NWS: Jim O'Sullivan (OCWWS), Greg DeVoir & Ron Holmes (CTP), Don Moore (BYZ)
- OCS: Jeff Basara & Rene McPherson
- UDOT: Ralph Patterson
- MADIS: Patricia Miller & Mike Barth