

## Winter SKYWARN Spotter Program National Weather Service Gray, ME **Presented By: Donny Dumont** Warning Coordination Meteorologist

## Frequently Asked Questions

#### What if I do not live in the Gray forecast area of responsibility?

• We will forward your information on to the office that covers the area where you live. They will contact you with your spotter ID.

#### What if I do not own any weather equipment?

• Winter weather observing equipment can consist of a ruler or yardstick and a simple snowboard. You don't need a home weather station.

#### When can I expect to receive a spotter ID?

 We will email you your Weather Spotter Certificate and spotter ID typically within a week of the course. The email will be sent to the address you provided during your registration.



- Why do We Need Spotters?
- National Weather Service Watch/Warning Process
- Drivers of Winter Weather
- Winter Weather Patterns and Seasonal Snowfall
- Winter Weather Hazards
- Measuring Winter Weather Phenomenon
- What to Report & How
- Safety Resources



#### NWS Mission

Provide weather, water and climate data, forecasts, warnings, and impact-based decision support services for the protection of life and property and enhancement of the national economy.

#### **NWS** Vision

A Weather-Ready Nation: Society is prepared for and responds to weather, water, and climatedependent events.





## Our Area of Responsibility



- Hazardous weather warnings, watches, and advisories
- 24/7 Decision support for various government agencies
- Aviation, Marine, Hydrology, Tropical, Winter, Severe & Fire Weather forecasts
- 7 day forecasts for public/media (~15,400 individual forecast points)
- Storm damage surveys, storm reviews
- Data gathering and climate services



 SKYWARN Spotters provide lifesaving weather reports to their local NWS office.

 The baseline citizen science initiative with roots back to the 1960s.





# The View from the Forecaster











# The View from the Weather Spotter









## How the Program Works

- Once trained the weather spotter gets assigned a spotter # and certificate.
- Contact information is entered into our internal spotter database. https://www.weather.gov/privacy





# How the Program Works

- During active weather we activate our spotters and have them contact us with significant weather.
- We also directly contact spotters that we think have experienced significant weather.



# What do we do with the reports?

- Most important; real time reports help us in our warning decision process
  - Reports help us update our forecasts in real time
  - Heavy snowfall rates and dangerous conditions could prompt us to issue a statement or warning





## What do we do with the reports?

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# Verification of our warnings and historical storm data reports



Merrimack County				
ew London	24.0 in	0929	PM	03/14
SSE Dunbarton	23.0 in	0911	AM	03/15
unbarton 1.0 S	19.0 in	0700	AM	03/15
hichester 2.7 SSW	17.5 in	0100	AM	03/15
ow 1.6 NW	16.6 in	0800	AM	03/15
SE Henniker	15.0 in	0700	AM	03/15
S South Hooksett	14.8 in	0520	AM	03/15
ittsfield 3.5 ESE	12.0 in	0700	AM	03/15
E Tilton	11.8 in	0753	AM	03/15
psom 4.2 SW	11.5 in	0700	AM	03/15
arner	10.0 in	0121	PM	03/14
oncord Municipal Airp	10.0 in	1200	AM	03/15
ENE Canterbury	10.0 in	0954	AM	03/15
utton Mills 0.1 ENE	9.5 in	0700	AM	03/15
orthfield 2.8 E	9.3 in	0751	AM	03/15
ew London 0.8 S	9.0 in	0600	AM	03/15
E Canterbury	9.0 in	1010	PM	03/14
outh Sutton 1.3 SE	8.0 in	0800	AM	03/15
anbury 2.2 ESE	6.3 in	0800	AM	03/15
ontoocook 0.6 NNW	5.9 in	0705	AM	03/15
oscawen 2.2 SSE	5.8 in	0730	AM	03/15
Rockingham County				
ESE Epsom	19.8 in	0725	AM	03/15
ENE Derry	19.0 in	0953	AM	03/15
NNW Chester	18.5 in	0707	AM	03/15
SSW Sandown	17.3 in	0700	AM	03/15
orthwood 2.9 WSW	16.8 in	0700	AM	03/15
NW Lee	16.5 in	0520	PM	03/14
erry 5.7 N	15.0 in	0700	AM	03/15
ampstead	14.0 in	0857	PM	03/14
ampstead 3 NW	13.3 in	0740	AM	03/15
ottingham 1.2 S	13.0 in	0845	AM	03/15
.5 W Epping	12.0 in	0700	AM	03/15
ENE Stratham	11.9 in	0600	AM	03/15
W Hampstead	10.0 in	0619	PM	03/14
SSE Salem	7.5 in	1129	PM	03/14
S Exeter	7.3 in	0718	AM	03/15
tratham 1.9 ESE	6.8 in	0500	AM	03/15
uburn 1.8 E	6.5 in	0700	AM	03/15
.1 SE Greenland	6.2 in	0700	AM	03/1
SSE Greenland	6.2 in	0800	AM	03/15
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Trained Spotter COCORAHS

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COOP

Public

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COOP

Trained Spotter

CO-OP Observer

# NEATHER SERRER SERRER

NUMBER KOVY DOTAA

## What do we do with the reports?

### Local Storm Reports are sent to the media and can be used in some cases for FEMA disaster declarations.

LSRGYX					
PRELIMINARY	LOCAL STORM RE	PORT			
643 AM EST	SUN JAN 20 2019				
TIME DATE	EVENT MAG REMARKS	CITY LOCATION COUNTY LOCATIO	 NST	LAT.	LON CE
0643 AM	SNOW	HOPE		44.27N	69.16W
01/20/2019	M7.5 INCH	KNOX	ME	TRAINED	SPOTTER

#### 88

EVENT NUMBER GYX1900552

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DS





## Radar Limitations

Dry Air





### • Bright Banding

- Over estimated snowfall and/or cold rain rates
- Caused by melting snowflakes
- Highlights rain/snow transition

Evaporation

ladar

16



### • Overshooting

Radar

3,000 ft above ground level\*

6,000 ft above ground level\*

10,000 ft above ground level\*





## Watch/Warning Process

### Day 4-7 Time-Frame <u>Hazardous Weather</u> <u>Outlook (HWO)</u>

- 30% chance or greater that local warning or advisory criteria will be met, the details will be included in the HWO.
- Confidence at this point can be low and again this is just an outlook.

#### Day 1-3 Time-Frame

#### <u>Watch</u>

- Issued 24 hours to as much as 72 hours in advance.
- Anytime there is a 50% chance or greater that local warning criteria will be met or exceeded.
- Confidence at this point is medium and a watch means these conditions are possible.
- Examples include: Winter Storm Watches, Wind Chill Watches, etc.



## Watch/Warning Process

#### Day 1-2 Time-Frame

### <u>Warning</u>

- Issued 12 hours to as much as 36 hours in advance.
- Anytime there is a 80% chance or greater that local warning criteria will be met.
- Potential for life threatening conditions, confidence is high.
- Examples include Winter Storm Warnings, Blizzard Warnings, Wind Chill

#### Day 1-2 Time-Frame

#### <u>Advisory</u>

- Issued 12 hours to as much as 36 hours in advance.
- Anytime there is an 80% chance or greater that local advisory criteria will be met or exceeded.
- More of a nuisance, confidence is high.
- Examples include Winter Weather Advisory, and Wind Chill Advisories.

#### Day 1 Time-Frame

### Snow Squall Warning

- Issued now up to 45 minutes.
- Issued when a snow squall is observed on radar/satellite.
- Life threatening conditions occurring or about to occur, confidence is high.
   <u>Special Weather</u>

#### <u>Statement</u>

- Issued 1-6 hours in advance.
- Black ice formation, intense snowbands



## Drivers of Winter Weather

### Location...Location...Location



Dominican



## Drivers of Weather: Atlantic Ocean

- Large source of nearby moisture
  - Moderates temperature extremes (especially coastal New England
  - Primary source of moisture for rain and snow
- Gulf Stream
  - Warm ocean current moving northeastward
    - Affects track and intensity of storm systems





## Drivers of Weather: Mountains

- White Mountains greatly influence New England Weather
- Downslope winds can moderate air for coastal areas
- Mountains can also trap cold air "Cold Air Damming"





## New England Weather: Mountain Effects

"Upslope" Clouds/Snow

Cold, dense air

"Downslope" Warm/Windy



### New England Weather: Mountain Effects

#### "Northwest Flow"







### New England Weather: Mountain Effects

#### **Southeast Flow**





### New England Weather: Mountain Effects

#### **Cold Air Damming**



Cold E/NE wind

- Blocked by mountains
- Cold, dense air piles up and gets shoved southward
- Storm systems send warm, moist air up and over this cold air
  - Snow, sleet, freezing rain



- Warm front
  - Warm air moving into colder air
  - Cold air is dense and hard to move
  - Light to moderate precipitation and low ceilings
- Cold front
  - Cold air moving into warm air
  - Cold air easily pushes away the warm air
  - More intense but brief precipitation, snow showers/squalls

















### The Big Four:

Coastal Storms, Nor'easter (Big Heavy Snows)
Alberta Clippers (Small Light Snows)
Overrunning (Saint Lawrence Track)
Northwest Flow (Canadian Maritime Low)



- Large storms that can paralyze the entire Northeast
  - 12"+ snowfall, blizzard conditions, mixed precipitation, damaging winds, coastal impacts









- Surface low track controls precipitation type
- We watch the track closely as it is a high skill predictor of the rain/snow line







### It's not all about the heavy snow!











### Landmass Storm

- Fast moving weak systems with limited moisture
- Most common in January & February
- Snowfall amounts are light 4-6" and the snow has low water content (fluffy)
- Cold arctic air follows these systems







- Inland storm tracks bring mixed precipitation to rain to the region.
- Amount of frozen precipitation depends on how cold the antecedent air mass is.
- Strong possibly damaging southerly
- <sup>36</sup> winds to the coast.

#### (Saint Lawrence Runner)





## Northwest Flow

### Canadian Maritime Low

- Surface low deepens over the Canadian Maritimes, establishing strong (cold) northwest winds over New England
- Light snowfall activity (localized snowfall amounts) across mountains/foothills, dry near coast

 Cold and blustery with cold wind chill values




### **Active Ice Storm**

- Replenishing cold air transport at surface with warm moist air overrunning aloft
- Persistent stationary front
- Sustained long duration icing



#### **Passive Freezing Rain Events**

- Cold air retreating from low levels with warm moist air pushing north
- Warm front pushing north
- Short duration icing (dependent upon antecedent cold air & coastal/inland location





- Ice storm struck Jan 5-9, 1998 leaving 5 people dead in state of Maine
- 80% of the state of Maine lost power





#### What is a

# SNOW SQUALL?

Intense burst of snow and winds Short duration (1-3 hours) Whiteout visibility Rapidly deteriorating road conditions





- Short lead time warning, think severe thunderstorm warning
- Bring brief near blizzard conditions in localized areas



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# Winter Hazards

- Heavy Snow
- Ice (Sleet & Freezing Rain)
- Extreme Cold
- High Winds

- Coastal Erosion
- Coastal Flooding
- High Surf
- Ice Jams





# Winter Hazards: SNOW

- Snow is primarily a travel hazard! Leading indirect cause of fatalities of all weather events (1,300 fatalities and 117K injuries).
- Heavy wet snow can cause significant power outages.
- Snow load on building roofs can collapse structures.
- BLIZZARD combination of heavy snow and strong winds.
  - Whiteout conditions ( $>^{1}/_{4}$  sm)
  - Winds > 35 mph







# Winter Storm Warning Criteria

🚈 Add 🚽 📔 🖉 Edit 🛛 🔡 Basemap 🔄 Details Leaend 2 Quebec USA States (Generalized) Shawinigan 0 **Trois-Rivieres** County Warning Areas St-George Frederict UpdatedCriteria092222 Montreal Sherbrooke Granby MAINE 0 1 Montpeller Conce Albeny

Criteria varies from 6" to 8" across Northern New England within a snow event

There is no longer a separate 12 and 24 hour snow criteria

For borderline events, impacts such as timing and snowfall rates can influence warning decisions



# Winter Hazards: FREEZING RAIN

- Freezing rain is a serious travel hazard.
  - Extremely low traction on roads
  - Especially freezing rain on bare pavement!
- Power Grid Impacts
  - Ice can accumulate on tree limbs and utility lines causing widespread outages due to sagging branches, snapped tree limbs, and eventually power line failure.
- Big Ice Storm events
  - January 1998
  - December 2008
  - December 2013







# Ice Storm Warning Criteria



Criteria can vary depending on wind speeds and how much mixed precipitation is also occurring to limit impacts



# Winter Hazards: SLEET

- Sleet also known as ice pellets are frozen raindrops of pure dense ice
- Sleet on some levels is either more or less hazardous than snow.
- Sleet is slicker than snow, so can lead to more hazardous driving conditions
- Visibility is much higher during sleet compared to snow
- Sleet doesn't drift due to its density, stays in place.





# Winter Hazards: COLD AND WIND

- Extreme cold can be life threatening
  - Frostbite, hypothermia
- Combination of cold and wind produces
   wind chill
  - "Feels like" temperature magnifies the effect of cold
  - WIND CHILL ADVISORY: Wind chill -20 to -30°F
  - WIND CHILL WARNING: Wind chill -30°F or colder
- Strong winds can cause destruction
  - Tree damage, downed power lines, property damage
  - WIND ADVISORY: 46-57 mph
  - HIGH WIND WARNING: 58+ mph



Visit our Page for Additional Forecast Information: www.we



# Winter Hazards: BLOWING SNOW

- Blowing snow can be a widespread hazard during blizzard conditions.
- Blowing snow is a localized hazard after snowstorms in open field areas.
- Localized near zero visibility along with icy roads leads to unexpected slick roads to motorist.





# Winter Hazards: FLOODING

- Flooding occurs when water rises into areas it normally does not flow.
  - Drowning, closed roads, flooded property
  - FLASH FLOOD WARNING: rapid water rises due to heavy rain and ice jams
  - RIVER FLOOD WARNING: specific river overflowing banks
- Snow melt often magnifies flooding threat.
  - Warm rain falls onto deep, melting snow pack
- Ice jams can cause rapid, unpredictable river rises.





# River Flooding: Peak Crests

# • Historic river water levels are common in late winter and early spring.

#### Merrimack River @ Concord

#### **Historic Crests**

(1) 26.20 ft on 03/20/1936
(2) 23.00 ft on 09/22/1938
(3) 20.80 ft on 11/05/1927
(4) 15.12 ft on 05/15/2006
(5) 14.65 ft on 04/06/1960
(6) 14.40 ft on 04/04/1951
(7) 14.28 ft on 04/19/1969
(8) 13.69 ft on 03/28/1953
(9) 13.63 ft on 03/31/1998
(10) 13.41 ft on 03/03/1987

Androscoggin @ Auburn

Historic Crests (1) 27.57 ft on 03/20/1936 (2) 23.71 ft on 04/02/1987 (3) 22.84 ft on 03/28/1953 (4) 17.80 ft on 03/01/1896 (5) 17.42 ft on 05/13/1989 (6) 17.27 ft on 04/07/1984 (7) 16.78 ft on 12/22/1973 (8) 16.76 ft on 06/04/2012 (9) 16.59 ft on 01/28/1986 (10) 16.44 ft on 04/04/2005 Kennebec @ North Sidney

#### **Historic Crests**

- (1) 39.31 ft on 04/02/1987
- (2) 26.60 ft on 06/01/1984
- (3) 26.40 ft on 04/28/1979
- (4) 25.69 ft on 04/26/1983
- (5) 25.56 ft on 01/28/1986 (6) 23.61 ft on 04/12/1993
  - (7) 22 20 8 -- 04/04/2005
- (7) 22.29 ft on 04/04/2005
- (8) 22.23 ft on 12/19/2003
- (9) 22.08 ft on 04/30/2008

(10) 21.25 ft on 04/16/2014













#### What Causes Them?

- Freeze up jams happen during arctic outbreaks causing excessive formation of frazil ice
- Break up jams happen during winter thaw/heavy rain on snow events

#### **Break Up Jams**

- When thick sheet ice (>6") begins to break up after sharp river rises Ice chunks get caught up on river bends/islands/bridges and jam the river • channel
- Water diverted around the restricted flow and causes flooding



# Ice Jam at Plymouth, NH





### • Why are they dangerous?

- Ice jams are highly unpredictable and occur very fast (minutes to hours).
- Backwater behind the jam can flood homes and allows ice to transport into buildings.
- Jam release causes a dangerous torrent of water downriver.



# Winter Hazards: COASTAL FLOODING

 During major coastal storms the combination of high tides, strong onshore winds, and wave action cause significant damage to coastal areas.









## • What is Total Water Level?



HPMN3(plotting HMIRP) "Gage 0" Datum: 0



Accurate and timely snowfall measurements can be <u>extremely</u> important to the local National Weather Service office, public works departments, media outlets, climatologists, and other scientists.



## • Rulers, Measuring Tape, Yardsticks



## Snowboard





- A snow board can be any white board, roughly 2 feet by 2 feet.
- A piece of plywood painted white would be an example.
- Mark the snowboard or it will be lost!





- Best site will be:
  - 1) relatively open ground and
  - 2) protected but away from tall objects (tall trees, buildings).
- You want to <u>minimize</u> drifting as much as possible!









# Step 3: Measuring Snow

# **Snowfall (newly fallen snow)** is measured to the nearest tenth of an inch. Ex. 3.5"



**Snow depth** (total snow on the ground) is measured to the nearest whole inch. Ex. 18"





• **Best Practice** is to have 3 snowboards and take 3 separate measurements and take an average if possible!





 Standard Procedure – Measure at the end of the storm (report storm total snow).

- Super Snow Weather Spotter
  - Report every 6 hours during the storm.
  - Report every hour when
     experiencing snowfall rates >= 2"
     per hour (put don't clear board).





# Step 5 - Clearing Your Location

### • Final Storm Measurement

- Clear off the snowboard
- Try to level off the area of snow around the observation location
- Put the snowboard on top of the snowpack
- 6 Hour Measurement
  - Clear the board off after your 6 hr measurement
  - Do not clear the board off hourly!





# Step 6 – How to Report

## How to Report

- Who - What - Where - When You are (Name and Spotter #) You experienced (observation/damage) The event occurred (home or someplace else) The event occurred (observation time)

**Toll Free Weather Spotter Reporting Number:** 

# 1-800-482-0913



# Step 6 - Online Form

- Via our website homepage select the "Submit Storm Report" Tile https://inws.ncep.nogc.gov/report/
- Forecasters will be notified at the office
- Do not forget your Spotter ID Number!



Report Ty	Storm Reports Alerting the NWS to local weather Report Type -> Details -> Location -> Review and Send
Your rep	Here is the information you'll be sending:
Latitude: Longitud	Report time: 0246 PM 10/23/2023 Latitude: 43.8926
Automatic	You are reporting: 4.0 inches of snow (estimated).
Search for	Details: Snow stopped at 1 PM.
Or, you ca	
+	If you wish to provide a name, spotter ID, or contact in you can do so here.
-	CU-01
May all Ro	If your NWS office has set up custom reporting groups, you can select one here
	· · · ·
62	Pursuant to 18 U.S.C. § 1001, knowingly and willfully make any materially false, fictitious, or fraudulent statement or entry on t form is a crime punishable by fine and imprisonment.
e Bac	Send Report!







# **Email Reports**

# <u>gyx.skywarn@noaa.gov</u>

## Sending videos and pictures of storm damage and observations

## **Reports via Social Media**





NWS Gray 🕸 @NWSGray

Official Twitter Account for National Weather Service Portland/Gray, Maine. Details weather.gov/twitter



# Social Media Reports

### We will put up a post looking for reports. Please remember to include your Spotter ID in your comment!

### Winter Weather Expected Send Us Your Reports! Report:

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Snow Amounts	Measured Storm Total Snowfall to the tenth of an inch (ex. 7.2")		
Snowfall Rates	Snowfall Rates of >= 2" per hour		
Precipitation Types	When pure snow or rain changes over to mixed precipitation		
Ice Accretion	Measured on a flat surface or branch to the hundredth of an inch ( $ax = 0.24$ ")		



Comment to This Post



Comment to This Post



inws.ncep.noaa.gov/report/



Normal Reporting Procedures





## Reporting Winter Weather - Sleet

- Measuring sleet is similar to snow, use a ruler and your snowboard
- Measure to the nearest tenth
- Report changeover!
- Measuring snow and sleet together
  - This is difficult!
  - Try to measure amount of snow and sleet separately.
  - Report storm total as a snow and sleet mix when reporting.





## Reporting Winter Weather - Ice

### • Vertical Thickness

- Find a flat surface & measure ice directly (vehicle, deck railings)
- Mean Radial Thickness
  - Find a twig coated by ice
  - Measure the ice thickness on both sides of twig.
  - Then divide by two  $\frac{3}{8}$ " +  $\frac{1}{8}$ " =  $\frac{1}{2}$ " / 2 =  $\frac{1}{4}$ " ice
- Please take a picture that has a ruler reference for heavy ice >.25"!
- Report Changeover!



## Reporting Winter Weather – Blizzard Conditions

- Report when experiencing white out conditions in a large storm or snow squall
- Significant blowing and drifting of snow causing ground blizzard conditions




## Reporting Winter Weather – River Flooding

- Any ice jams (don't get close)!
- River flooding of roads & buildings!
- First time local river ices over (send a picture!)





### **Reporting Winter Weather – Coastal Flooding**

# Erosion - Beaches, rock debris



#### Damage - Road damage, structural damage



 Inundation - Roads, Homes, Parking lots (water depth if possible!)









## **Reporting Winter Weather – Wind Damage**

- Any downed tree or wires
- Building damage directly caused by wind or a tree falling into the building





# Measuring Snow Practice



# Poll EV for Quiz Questions

https://pollev.com/donal ddumont106



You are taking observations every hour to check snowfall rates, should you clear your snowboard every hour?

Yes	
	0%
No	
	0%
Only if it snowing at 2" per hour or greater	
	0%





Before a snowstorm starts you have an 8" snow depth. Snow starts at 1PM, by 7PM you have 6" of new snow. What do you report?

14" Snowfall

6" of snowfall has fallen

Nothing, you should only report at the end of the storm.

0%

0%

0%



It is now evening and the snowstorm has ended. You have an additional 4" since your last report at 7 pm. What do you report?

18" of storm total snow on the ground

Storm total snowfall of 10"

4" of snowfall

0%

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Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app



#### Why is it important to take a picture with your ice accumulation report? (Choose All That Apply)

There are many different ways to measure ice

There is a large difference between Flat and Mean Radial Ice

Pictures help the NWS accurately record the ice accumulation

0%

0%

0%

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

# WEATHER SERVICE

# CoCoRaHS

#### vww.cocorahs.ora



- Report rain and snow amounts everyday
- Log reports online
- Ideal for those who wish to record the weather everyday
  Reports auto-ingest into our system





# HAM Radio

#### http://www.ws1sm.com/SKYWARN.html

- During major winter storms a weather net will be activated to relay weather reports.
- Activation will be initiated through club presidents and Emergency Communication Teams
- Open weather net times will be coordinated on a storm by storm basis





# How to Stay Up To Date?

### • Internet:

- <u>www.weather.gov/gyx</u>
- www.weather.gov/gyx/winter
- Social Media
  - <u>https://twitter.com/nwsgray</u>
  - <u>https://www.facebook.com/NWS</u>
     <u>Gray</u>
- Phone/Tablet Apps
  - FEMA Weather Alerts
  - Private Weather Apps
    - All of them relay NWS Watches/Warnings





High End Amount 1 in 10 Chance (10%) of Higher Snowfall



Low End Amount 9 in 10 Chance (90%) of Higher Snowfall





## Winter Preparedness Resources

- https://www.weather.gov/safety/winter •
- https://www.weather.gov/wrn/winter\_safety •
- https://newengland511.org/ •

#### **PROTECT YOURSELF FROM SNOW SQUALLS**



If a Snow Squall Warning is issued, delay travel If you're already driving, safely exit the road at the next opportunity.

If you cannot exit the road in time:



Slow down. but avoid slamming the brakes



Turn on your lights (low-beam headlights & hazards, if allowed)



Pull over safely to the side of the road, and when safe, guickly exit your vehicle and move as far away from the road as possible

