S. HRG. 109–388

WINTER STORMS

HEARING

BEFORE THE

SUBCOMMITTEE ON DISASTER PREVENTION AND PREDICTION

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

MARCH 1, 2006

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ONE HUNDRED NINTH CONGRESS

SECOND SESSION

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WINTER STORMS

WEDNESDAY, MARCH 1, 2006

U.S. SENATE,
SUBCOMMITTEE ON DISASTER, PREVENTION AND PREDICTION,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 2:37 p.m. in room SD–562, Dirksen Senate Office Building, Hon. Jim DeMint, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. JIM DEMINT, U.S. SENATOR OF SOUTH CAROLINA

Senator DEMINT. A particular thanks to our witnesses today. This afternoon, the Subcommittee on Disaster Prevention and Prediction will be meeting to discuss severe winter weather and its impacts on communities and commerce. While winter storms are often not as sensational as hurricanes and tornadoes, these storms still have a devastating impact on businesses and their accurate prediction is essential to the efficient movement of commerce and the protection of public safety.

Our Nation faces a variety of winter storms. Most people are familiar with the nor'easters that hit the eastern seaboard of the United States, frequently blanketing cities from Washington to Boston with a layer of snow. But people are likely not as aware of the devastating storms that buffet the coast of Alaska with high winds, intense cold, and devastating erosion. There's also probably not as much understanding of the driving blizzards that produce blinding white-outs in the Midwest, crippling traffic and creating huge snowdrifts. And finally, there seems to be little recognition of the ice storms that hit the southern United States, often leaving thousands without power.

In the middle of December, upstate South Carolina was hit with a devastating ice storm. As the ice accumulated on tree limbs and wires in communities across the upstate, houses went dark. All told, at the end of the storm, nearly 900,000 people were without power. Many had their homes damaged, including mine. The destruction was so widespread and devastating that the damage was significant; so significant that the region received a disaster declaration from FEMA, and this was a relatively small area of the state. While the storm's onset was not a surprise, its magnitude caught some people off guard.

To avoid some of the consequences of these storms, the Nation needs accurate and timely storm prediction. While there would still have been a high level of power outages during the storm in South Carolina, if we had had a clearer idea of what was to come, individuals would have had a better idea of what was in store and the power companies could have marshaled more support to get our power back on more quickly. Many were without power for a week.

The news is not always bad. NOAA is improving the quality of its forecast. For example, the 72-hour forecasts are as accurate today as the 36-hour forecasts were 20 years ago. This is important progress because it provides an essential planning time that's necessary for emergency planners as well as for citizens who may need to stock up on food and water and alternative sources of heat.

I'm looking forward to the comments of our witnesses this morning to explain what they believe needs to be done to ensure that we improve the quality of our forecasts and better prepare our communities for these storms. I'll now yield to Chairman Stevens for his opening comments and the introduction of our first witness.

STATEMENT OF HON. TED STEVENS, U.S. SENATOR FROM ALASKA

The CHAIRMAN. Thank you very much, Senator. I do appreciate you holding this hearing. If the Senate wasn't in session, I would have preferred to hold it in Mayor Michels' hometown. Unfortunately, the Weather Bureau has just put out a warning, a blizzard warning, Mayor. I assume you know. It's in effect until 6 a.m. tomorrow. It's for Nome and the surrounding areas. Current weather there is a wind chill of minus 29 and the winds are 38 miles an hour from the east.

That's not good news, Senator, because it's just 2 days away from one of my favorite activities in Nome we will start celebrating, and this is the—this is a tough time to have this kind of weather when the Iditarod is underway. It is the last great race. It's a great sporting event. We'd love to have you come up and witness the—the end of it is in Mayor Michels' home, and it, of course, was the target for serum that was delivered by dog sled back in 1925.

But I do thank you, Denise, for coming up—or coming down rather and being up here on the Hill to testify and I think this is the kind of hearing we should have more often. By the way, Mr. Chairman, there is the warning that came out of the Fairbanks Weather Service. Now you have to realize that Fairbanks is 900 miles away, at least. That's where our weather station is that deals with storms off that part of the coast, if I'm correct, Mr. Uccellini.

I brought with me some of the typical storms of the past. The Bering Sea storm of 2004, compared to Hurricane Andrew, you can see where it came off the Russian Peninsula, the Kamchatka area and it came across to Alaska. This is the latest storm, in September of this past year. It really is a very, very beautiful picture of what happens in the North Pacific when there is a monstrous storm of this type. And we also have some of the photographs of what happened to Nome in October of 2004.

And this is one of the area maps that I like to show people. It shows how Alaska stretches across the whole of the United States, but when you look at it, we have three areas of—weather forecasting areas of responsibility and that shows you how far away they really are from—in the days gone by, we had these weather offices in almost every area of the state. This is the Ninilchik flood on the Kenai Peninsula. I was actually down there at that time in 2002. It took out that bridge there over the Illiamna River.

I'm telling you, these are—the comparisons to—this is a map prepared by NOAA showing the comparison of the number of storms that have hit the United States and the number that hit Alaska on an annual basis. This is the Barrow Storm of 2000. Again, one of the most difficult storms that they've had in the Arctic in history. I do think it's an area that should be studied more and we should have more information about it because of its impact on the overall National Weather System.

So I thank you very much, and as I said, thank you, also, Doctor, for coming to testify. I see behind you a familiar face. You have support.

Senator DEMINT. Thank you, Mr. Chairman. Senator Nelson, would you like to make an opening statement?

STATEMENT OF HON. E. BENJAMIN NELSON, U.S. SENATOR FROM NEBRASKA

Senator NELSON. Thank you very much, Mr. Chairman, particularly for holding this hearing. Obviously, Nebraska sees our share of winter storms every year, so this is clearly a topic of great interest to me.

Now winter storms, perhaps, have less direct impact on society than maybe other storms such as hurricanes or tornadoes, but they still can threaten lives, disrupt transportation systems, and have a significant impact on the national economy. Winter weather not only presents a substantial challenge for forecasters, but poses risks to public safety and can take a huge economic toll on agriculture, transportation, utilities, and other businesses long after the storm passes.

In Nebraska, for example, the average yearly snowfall ranges from about 27 inches in the southeastern part of the state to 41 inches in the panhandle. Now this year, it hasn't reached anything like that, but along with the snowfall, each year we contend with ice and bitter cold temperatures. Even a small accumulation of ice can make driving treacherous and heavy accumulations can bring down trees and utility poles, affecting power and communications. Because Nebraska is a very windy state, it's not uncommon for wind chills to be several degrees below zero, leading to the possibility of frostbite or hypothermia for anyone exposed to the cold for any length of time.

As a former Governor and with the responsibility for making sure my state was prepared to respond to severe winter weather, I can state firsthand that timely and accurate forecasting of winter storms is crucial to being able to respond in an effective manner. And I'm sure that Mayor Michels will agree with me on that. Accurate, advance warning of approaching storms allows both state and local officials to give the public adequate notice of the storm and instructions on how to prepare. Clearly, safety is our first priority, but there's also an economic factor to be considered as well. Large winter storms can impact the daily activities of potentially millions of people over the course of several days. But the economic costs of cleanup, underemployment, and lost business are not typically accounted for in damage estimates. The impacts of winter storms on shipping and airline industries likewise can be substantial.

The Nation's complex infrastructure of highways, city streets, and local roads present a challenge to the Department of Transportation, state agencies, and municipal governments who are charged with maintaining safe transit conditions for the public and the flow of commerce. More accurate winter storm forecasts can help people prepare for these events and reduce direct and indirect costs associated with them.

I look forward to the testimony today and I appreciate very much this opportunity, Mr. Chairman.

Senator DEMINT. Thank you, Senator. We will start with the Mayor, but before we do, I think I need to introduce Dr. Uccellini, right? Do I have that right? Dr. Uccellini is currently the Director of National Weather Service's National Center for Environmental Prediction, which we call NCEP. In his position, he's responsible for directing and implementing the science, technology, and operations related to the seven national centers that forecast specific weather phenomena, including the Climate Prediction Center and the National Hurricane Center.

In addition to his role as Director of NCEP, he is one of the Nation's leading authorities on severe winter weather. Just a few years ago, Dr. Uccellini co-published, with Paul Kosin from The Weather Channel, a two-volume study on northeast snow storms, which is widely regarded as a definitive text. Throughout his career with NOAA, he's published a number of other publications on severe weather and winter weather in particular. So we're pleased to have you and we'll hear from you in just a moment, but Mayor Michels, since you've come the longest way, we greatly appreciate you doing that, we'll allow a short opening statement and then we'll go to Dr. Uccellini.

STATEMENT OF HON. DENISE MICHELS, MAYOR, CITY OF NOME/PRESIDENT, ALASKA CONFERENCE OF MAYORS

Ms. MICHELS. Thank you for inviting me. The information I'm going to provide you today comes from the communities that are affected, the State of Alaska, and also the University of Alaska's International Arctic Research Center.

As you can see on there, Nome is located on the Seward Peninsula. We're facing the Norton Sound. The Bering Strait's region occupies 17 communities and every time we have a storm, every one of these communities is affected because we are located on the coast. Unlike most of America, we do not have a road system. All of our transportation coming into Nome and into the villages is by air and so when we do have a storm, all transportation is stopped. We are greatly affected by the high winds. Planes cannot fly and our roads get wiped out.

Western Alaska has survived the Spanish flu, deadly diphtheria and, for the last few years, storms with erosion which is something new. We have listed, in the paperwork that I've provided you, storms documented since 1900 to 1946 and this caused Nome to request for a seawall that was built in 1949, 1950. This seawall has just saved Nome immensely. Without that, the damage and economics of it would be just devastating.

During the 2003 storm, we were lucky that the Weather Service gave us an early warning, where the communities up in the north, like Shishmaref and Kivalina, had 1 day to prepare to put items to high land. That still caused damage and impacted their community because meat on racks were lost and so there was economic hardship that was faced that normal communities in the south don't experience.

In 2003, FEMA approved the city of Nome's Hazardous Mitigation Plan. We were the first in the state and second in the Nation to get our plan approved. We identified community and business leaders, vulnerable locations, developed effective mitigation strategies. We learned about an incident command system, which is totally different. And the Weather Service in Nome is a very essential part of this team.

During the 2004 storm, the Weather Service also gave us an early warning and this time we were able to take precautionary steps. Our emergency operation center, along with the Troopers and the National Guard, we were able to go downtown and ask the stores and the people that live there to board up their windows and prepare to go to higher ground. Now, in the villages, there is no Home Depot where you can run and grab plywood. You have to find what is available and so, giving this early warning really helps us try to find those resources in the rural areas.

It is very evident that we are seeing these storms more often, mainly because freeze-up is coming later in the year and so far, the Western Alaska storms for the last 100 years, based on the information we have, is $48,000,000, without the 2005 numbers that we have not received yet.

We are impacted because our per capita income is lower. Economic options are limited. For example, if you lose your boat, that's your only source for getting subsistence. You can't get a grant or you—you know, we don't have the money to get a loan for a new boat. And then another one is the infrastructure, like if a road or an airport goes out, we have to wait for resources to come to us and that may take a couple days.

In the City of Nome, we continue to hold our LEPC meetings. We conduct drills. We receive training. As you can see with our professional response, we are very dedicated to make sure that disaster preparation and recovery is the number one priority.

Some of the items that the region is doing, for instance, our power plant is located in the flood zone. We are working on moving that onto higher ground. In Shishmaref, with the assistance of the State, they wrote an evacuation and flood plan. They're also working to relocate with assistance from USDA's Natural Resource Conservation Service. The Northwest Arctic Borough, where Kivalina is located, is working on finding resources to help them complete their Hazardous Mitigation Plan. No communities have completed their Hazardous Mitigation Plan, one of the reasons why is that they're financially strapped in rural areas. We don't have the economic base because we rely on subsistence.

So I'm hoping to bring this message to you today to help our communities complete their Hazardous Mitigation Plans, that you would consider funding the State of Alaska to provide more funds so that they can complete these plans, or consider a pilot project in Northwest Alaska to have an agency come in and work with the communities to complete these Hazardous Mitigation Plans. The reason why is that once these plans are done, the economics and the damage will not be as expensive. And so there's going to be a savings, both life, property, and resources.

Also, to assist the Weather Service in predicting models, we recommend that possibly more buoys be in the Bering Strait region. There's one buoy about 600 miles toward the Aleutians that they have to use to predict weather. The Corps of Engineers, when they're designing ports and harbors and erosion facilities, basically use the information on the buoy. So, to provide them with more technical assistance, that would, I think, benefit everyone. Also, more observation points are needed. We do not have that many in the area and so if we were able to have more observations, be it automatic or in person, that would be able to help the Weather Service in doing predictions and providing that information out to us faster.

We're also working with the University of Alaska to see if a research center in Nome would be possible. It's evident that the permafrost is melting. You can go down the Nome Teller Highway and you can see where the tundra sloughed off and the permafrost is exposed and everything is just melting and creating big divots and that will be expensive to our transportation infrastructure.

We really thank NOAA for being a partner with the city of Nome on our economic—on our local emergency committee and I thank you for having me here. It's a real honor and if you need any information, I have a whole stack of stuff here that I can provide to you. Thank you.

[The prepared statement of Ms. Michels follows:]

PREPARED STATEMENT OF HON. DENISE MICHELS, MAYOR, CITY OF NOME/PRESIDENT, ALASKA CONFERENCE OF MAYORS

Good afternoon Mr. Chairman, I am Denise Michels, Mayor of the City of Nome and President of the Alaska Conference of Mayors. I would like to provide you an overview of the winter storms western Alaska has been hit with for the last 100 years and our ability to prepare for these storms and recommendations for your consideration. This information was provided by the communities affected by the storms, National Weather Service, State of Alaska's Division of Community Advocacy, Division of Homeland Security & Emergency Management, and the University of Alaska's International Arctic Research Center.

The City of Nome is located in Northwest Alaska on the southern coast of the Seward Peninsula. Nome lies along the Bering Sea facing Norton Sound. The city is 539 air miles north of Anchorage and 161 miles east of Russia.

Nome Census Area encloses a 23,013 square mile section of the Seward Peninsula and the Norton Sound coast. The Nome Census Area is commonly referred to as the Bering Strait region. Currently 17 communities occupy the Nome Census Area, of which Nome has the largest population and is the regional hub for medical and transportation facilities and other services.

Unlike most areas in America, a road system does not exist throughout the Bering Strait region. Air transportation is the most common and reliable mode of transportation throughout the year. Many of the communities of Northwest Alaska have developed because of the convenience to traditional hunting or fishing grounds and community residents utilize the rivers and coastline as vital routes for transportation during the summer months using boats with outboard motors. When storms hit, all transportation ceases. We are not able to perform medical or emergency evacuations of remote isolate communities due to the high winds and dangerous freezing ice conditions.

Gold was reported in the Nome area as far back as 1867 but it was not until the Gold Rush of 1899 that brought people in the area settling on the coast. Western

Alaska has survived the Spanish influenza, the deadly diphtheria breakout in Nome and winter storms.

The major risk for the City of Nome and other communities are from coastal storm surges which in the last few years have caused severe erosion. The fairly shallow water off shore normally keeps waves small. However during a surge, water depth increases, allowing larger, more powerful waves to impact the coast. This fact, combined with the flooding due to the surge itself can deal a devastating double blow to the area. The situation is made worse if the surge comes at high tide. Ice override may occur when the storm wind conditions are coupled with open water depending on the prevailing winds. These storm surges have wreaked havoc on the city many times in the past and will do so again.

The City of Nome has been battered many times over the years by storm surges, which have caused significant loss of life and property since the early 1900s. The following is a chronology of information on the largest storms taken from newspaper articles, publications, the Nome Flood Insurance Study, and technical documents prepared by the United States Government.

Great Storm of September 12, 1900. The first recorded storm in Nome occurred on September 12, 1900. It is estimated that the winds were 75 mph. The towering waves destroyed or washed away almost everything on the beach, and part of Nome's business district. It was estimated that 1,000 people were homeless, numerous people died, many head of cattle and sheep were lost and 10,000 tons of coal were swept into the sea. The total damage was estimated at $750,000.

Storm of October 1902. The storm of October 11, 1902 produced waves only 2″ less than the storm in 1900 however the wind was not as fierce. The estimated damaged would not exceed $25,000 to $30,000.

Storm of October 1913. The October 1913 is the worst storm to date. Waves broke over the top of the city breaking apart entire business blocks. Gale winds were clocked at 60 mph, which produced breaking waves of 40′ high and a storm surge of 20′. Most of the town was destroyed. The entire sand spit, which housed hundreds of homes, was completely swept away. Five hundred people were homeless, most of them destitute. The damage was estimated at $1,000,000.

Storms of 1945 and 1946. The 1945 storm caused severe damage to waterfront structures, hurling blocks of ice into the town. In October 1946, a coastal storm created surge estimated at 9′ above normal. Many of the streets of Nome were inundated, flooding buildings and property. The storm leveled six buildings. Coastal erosion was so severe that several near shore buildings were undermined and collapsed.

These storms led to the push for a seawall and were successful in getting Congress to appropriate $1 million (Rivers & Harbors Action, 6/16/1948—Pub. L. 80–649) in 1949 to build the seawall.

The Great Bering Sea Storm of 1974. Three separate storms simultaneously hit Northwestern Alaska's coastline in November that produced a storm surge or rise in water level of up to 12′ MLLW. Extensive damage to streets and structures occurred with approximately 30 homes destroyed and many displaced as one of the power plant's generators sat in pit and flooded with water and power lines were down. The city's sewage treatment plant was out of order until it was by-passed so toilets could be used. Water was contaminated due to the sea water coming into the river so water trucks delivered 100 gallons of water to those on the truck route; others had to get water at the fire hall. An ice pileup reached 30–40′. The seawall protected the city; however, damage was still estimated to be over $30 million.

Extensive damage to villages occurred, flooding homes damaging power lines, and roads.

1980s. A pileup in the winter of 1980 reached a height of 20–25′. The seawall localizes the effects of ice override and prevents the transport of ice inland.

Storm of 1992. A storm in October 1992 severely damaged the revetment on the eastern edge of the seawall. This storm led to the 1993 expansion of the large rock seawall to replace the revetment, which was at a lower elevation and a pavement structure of small stones.

Sizable ice piles occur with considerable frequency in Nome. Ice override occurred a few years ago on the east side of town, but a bulldozer turned the ice sheet back.

Storm of 2002. On October 8, 2002, a winter storm hit with winds at 45 mph and in Shishmaref and Kivalina seas were reported at 14′ at high tide. Severe erosion on the embankment of the beach in Shishmaref occurred losing 10′–20′. Homes were endangered along with a bulk fuel tank farm. Total damage was $382,032.

Storm of 2003. On November 21–23, 2003, Shishmaref was hit by a storm with winds blowing 45 mph with gusts to 61 mph, seas were as high as 14′. Early warning by the National Weather Service (NWS) gave community members one day to move items to higher land. Severe erosion occurred again losing an additional 10′–

30′ of land causing power poles to fall over. Boats and drying racks with subsistence food were washed out to sea causing economic hardship to the community. Total damage was $695,000.

In 2003, FEMA approved the City of Nome's Hazard Mitigation Plan making us the first in the state and second in the Nation. We are eligible to apply for various hazard mitigation project grants. Because this was new to us a consultant was hired. We identified community and business leaders, identified vulnerable locations, developed effective mitigation strategies and practiced disaster response plans. We've learned about Incident Command and Unified Command Management and learned how to work and communicate effectively as a team and have established an Emergency Operations Center. The National Weather Service's Nome staff is an essential part of this team.

Storm of 2004. October 19, 2004 Bering Sea Storm caused significant damage and destruction to Western Alaska. Early warnings by the NWS predicted the 941 mb pressure storm could rival that of November 1974, so precautionary steps were taken. The storm did not develop to the levels of the event. At the airport in Nome peak winds were 59 mph. NOAA maintains a weather station on the port causeway which recorded an hourly observation during the storm at 55 mph and a peak tide of +10.5′.

The City of Nome activated the Emergency Operations Plan and implemented the Incident Command System. We involved approximately 100 personnel from the Alaska State Troopers, Alaska National Guard, Nome Volunteer Fire Department, Nome Ambulance Department, Nome Police Department; City/Utility/Public works employees and civilians in various capabilities. Pre-storm activities included boarding up doors and windows, relocating inventory to high ground, securing docks and closing roads.

Many villages in low lying areas were flooded and major damage occurred to the infrastructure and roads. The community of Shishmaref lost more land due to erosion. Kotezbue's Front Street was under water. Commercial propane bottles were thrown around causing an evacuation of Nome's Front Street. We experienced power outages which can compound the destruction by freezing up water and sewer lines. The storm created a new channel and washout the Nome-Council Road at Safety Bridge.

The City of Nome declared a disaster on 10/19 along with Northwest Arctic Borough. The Governor declared a disaster on 10/29 along with the Federal Government on 11/16/2004. The estimate cost of this disaster is $12,460,469.

Storm of 2005. The 966 mb September 22nd storm hit Western Alaska and continued until the 23rd. Nome's peak tide was +10.3′ with peak winds at 56 mph. The Early warnings by the NWS gave a day and a half for the city to establish an Emergency Operations Center (EOC). Front Street businesses prepared for the storm by boarding windows, doors, protecting inventory and ensuring operational pumps. The EOC kept in contact with our villages in preparation to assist and to communicate with our emergency services folks if anything developed. In Unalakleet this early warning allowed the community to haul rocks to protect their shorelines in hopes of slowing down erosion.

Kivalina lost 25′–30′ of beach erosion along their shoreline and 20′ of beach erosion towards the airstrip. In Golovin, water covered roadways 3′ deep, fuel tanks were floating and the lower half of town was under water. In Teller, sea water flooded the main road splitting the town in two. The community of Shaktoolik located on a spit will become an island if they are hit with another big storm blocking evacuation access.

In Nome power lines were down. Low lying homes were flooded. The new harbor entrance failed as sand eroded away and nearly exposed the utility sewer line. The new breakwater was damaged, 5–8 ton rocks were displaced and repairs had to be done. The Nome Council Road was washed away for several miles and the newly created channel broke thru again. Shelter was given to 17 evacuees; several families were dislocated as their homes were damaged. The City of Nome and surrounding areas, the State of Alaska and the FEMA declared disasters. State DHSEM is preparing an estimate cost and has identified $2 million in damage to communities and another $1.2 million to roads and infrastructure.

It is evident that we are seeing severe winter storms more often then the prior years as documented, mainly freeze up comes later in the year. Total cost of Western Alaska storms for the last 100 years is estimated at $48,517,501. Alaska is severely impacted by storms as our per capita income is lower than the U.S. eastern seaboard, economic options are limited, and recovery may be slower due to the needed infrastructure.

The City of Nome continues to hold monthly Local Emergency Planning Committee meetings, conduct drills and receive training in incident command and coordination of multiple agencies in Nome. Our professional response, before and after the storm demonstrated our commitment to disaster preparation and recovery. Another preventative measure is that the City of Nome is in process of moving the power plant to higher ground and we need an additional $4 million to complete construction.

The City of Shishmaref with the assistance of the Alaska Division of Emergency Services completed an evacuation and flood action plan. The Shishmaref Erosion and Relocation Committee are actively pursuing to relocate to the mainland. The community is working with USDA's Natural Resources Conservation Service in assessing two different sites on the mainland. Also the Northwest Arctic Borough is an Emergency Management Grant program participant and they are researching several options to apply for funds to help Kivalina complete their Hazardous Mitigation Plan.

No other communities have completed their hazardous mitigation plan. One reason is that a majority of our cities are hurting financially and are not fully staffed and secondly the State received minimal amount of funds for remaining cities to apply for a grant to complete the hazardous mitigation plan. To assist our communities we recommend the following for your consideration:

- That the Federal Government provide more funds to the State of Alaska for the cities to complete their plans.
- Consider funding a pilot project through the State to complete the plans with the communities in Western Alaska.

To assist the National Weather Service to predict models we recommend the following for your consideration:

- More buoys are need in the Bering Sea. Currently two buoys are located near the Aleutian chain; the closest buoy #46035 is several hundred miles south of Nome. This would also assist the U.S. Corps of Engineers with the design of causeway, flood protection and shore erosion facilities.
- More observation points are needed throughout the region to help NWS fill in the data holes.

The City of Nome is in process of working with the University of Alaska in Fairbanks to assess if a science research center is feasible for focus on science, education and history including research. We hope that NOAA will be a partner as Nome is in a unique location to study the environmental changes.

Mr. Chairman, I would like to thank you for giving me the opportunity to provide this information to the Committee, it's truly an honor to be here. If there is anything else I can provide please let me know.

Senator DEMINT. I'm sure we'll have some questions in a moment, but Dr. Uccellini, if you will give us a short statement.

STATEMENT OF DR. LOUIS W. UCCELLINI, DIRECTOR, NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Dr. UCCELLINI. OK. Mr. Chairman and Members of the Committee, I am Dr. Louis Uccellini, the Director of NCEP, or the National Centers for Environmental Prediction, which is the central component of the National Weather Service within NOAA within the Department of Commerce. You mentioned several of the centers. I also want to point out the Ocean Prediction Center and I do that because the director of the Ocean Prediction Center is sitting behind me, Dr. James Hoke and they have to deal with storms like that, too, in the Pacific, North Pacific, and North Atlantic Oceans. And it obviously provides tremendous challenges to the forecasters in these centers and in the local offices within Alaska in dealing with those storms.

I'd like to thank the Mayor for making the comments she did about NOAA and the National Weather Service and the services that we've provided for several of the most critical storms which have occurred in Alaska over the past several years.

I'd also like to thank Members of the Committee for their support of a much needed facility. The NOAA Center for Climate and Weather Prediction is a project we've been working on for many years now and we have our official ground breaking ceremony on March 13th and we're due for occupancy within 2 years. So we want to thank you for your support.

OK. So let's get to the winter storms. A major winter storm can produce freezing rain, ice, sleet, heavy snowfall, coastal flooding, and erosion, and high winds that combine with cold temperatures to produce dangerous wind chills. The severity of the winter storms can range from a storm that produces snow or freezing rain over a few hours to blizzard conditions lasting several days. Winter storms can threaten lives, disrupt transportation systems, have a significant impact on the national economy, and affect all regions of the United States. A single winter storm can cause major damage and billions of dollars in economic losses.

The science of winter storm prediction has improved steadily over the past two decades. As noted earlier, the 72-hour forecasts are as accurate as 36-hour forecasts. That's actually 15 to 20 years ago. The average national lead time for warning for winter storms has been increasing and in Fiscal Year 2005, the lead time was 17 hours, on average, across the country, which exceeded our GPRA goal of 15 hours. The improvement is due, in large part, to the continual enhancements in global observations and American weather prediction models, including advancements in the high performance computing systems. And an aspect of this global observing system is maintaining and enhancing our satellite observation network and improving dissemination methods of the data and of the forecasts and warnings once they're made.

Now, NOAA has a suite of winter weather products which spans from seasonal outlooks to two week outlooks down to the short term warnings issued hours in advance. A hazard assessment product shows where the potential for hazardous weather and extreme events are possible across the country out to 2 weeks in advance. Additional improvements in winter weather predictions and services 5 days in advance can be attributed to NOAA's winter storm reconnaissance program, in part. The winter storm reconnaissance program is designed to improve forecasts of significant winter weather by targeting observations in data sparse areas in the North Pacific Ocean. These observations significantly improve numerical weather predictions 60 to 80 percent of the time. We do this program only during the winter. When we get the planes out there and when we get the drop zones to areas where we know we have observation issues, we can show that 60 to 80 percent of the time, we improve subsequent forecasts. By improving the model analysis over the North Pacific, we see improved forecasts for Alaska as well as the rest of the Nation.

We are also addressing the winter storm watch and warning program, the short term aspect of our service program, by increasingly focusing staff on winter storm predictions. Initial results in the east and in central United States have been positive as our warning lead times have increased over the past 3 years, on average, from 13 hours to 19 hours, and increased our accuracy to 92 percent. We expect similar improvements as we continue to expand this program to other areas of the country.

NOAA provides radar data, surface observation, sea surface temperatures, and satellite images as well as computer model simulations of the atmosphere that are used by the entire weather community. NOAA's data, forecasts, and warnings are disseminated through the vast National Weather Service dissemination network, including the NOAA Weather Radio All Hazards, Emergency Managers Weather Information Network, NOAA Weather Wire Services, the Emergency Alert System, and, where applicable, the Internet. We work in close partnership with all the media and other private sector firms to ensure that dangerous and potentially life threatening weather situations such as winter storms are readily communicated to the public.

Our ability to predict major snow and ice events with increased confidence allows officials to make decisions prior to these events concerning public safety, transportation, and commerce. Now, a most recent example, and one that affected this part of the country, is the recent February winter storm along the northeast urban corridor. State and local communities up and down the coast positioned road crews and prepared schedules to apply road chemicals well before the onset of the storm. Retail outlets had snow removal equipment and heavy clothing on the shelf with advertising of "blizzard blowouts" days before this storm actually occurred. Affected areas were able to make a remarkable recovery after the storm due to the advance planning. NOAA's medium range and short range forecasts were accurate and provided state and local governments with the information they needed to take action to mitigate the impact of the snow storm. And I'd like to add here that this is very similar to October 18–20, 2004, which was just alluded to, off of the coast of Alaska. Mitigating steps were taken before the storm's arrival because of the forecast provided.

Recently NOAA has implemented a new snowfall impact scale which my colleague, Paul Kosin of The Weather Channel, and I developed. The scale takes into account snowfall amounts and the population of affected areas and measures the impact the storm has, in this case, in the northeast sector of the country. With this scale, scientists can quickly assess a snow storm's potential impact to heavily populated areas, compare it with past storms in an objective manner and assign it one of five categories ranging from notable to crippling to extreme. Work is currently underway to expand this concept and the baseline equation that we use to compute this index to other parts of the country. In fact, I had phone conversations over the past week with the Director of the National Climate Data Center to work this issue, not only for the CONUS, the Continental United States, but also for Alaska.

NOAA continues to work with universities, the private sector, and other Federal agencies to improve our understanding of these storms. NOAA is also working to improve satellite observing capabilities over ocean, land, and ice, through the NPOESS and GOES programs with this new data expected to have major impacts on the numerical prediction systems used to predict winter storms.

NOAA will continue these efforts to improve winter storm forecasting and all other weather predictions.

That concludes my statement, Mr. Chairman.

[The prepared statement of Dr. Uccellini follows:]

PREPARED STATEMENT OF DR. LOUIS W. UCCELLINI, DIRECTOR, NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Mr. Chairman and Members of the Committee, I am Dr. Louis W. Uccellini, Director of the National Centers for Environmental Prediction, in the National Weather Service (NWS), at the National Oceanic and Atmospheric Administration (NOAA), in the Department of Commerce. Thank you for inviting me here today to discuss the role of the National Weather Service in forecasting and warning for winter storms.

A major winter storm can last for several days and be accompanied by freezing rain (ice) or sleet, heavy snowfall, and high winds that combine with cold temperatures to produce dangerous wind chills. The severity of a winter storm can range from a storm that produces snow or freezing rain over a few hours to blizzard conditions lasting several days. Extreme cold, accumulating or blowing snow, strong winds, and coastal flooding can cause long-term hazardous conditions. Winter storms can threaten lives, disrupt transportation systems and have a significant impact on the national economy. A single winter storm can cause major damage and billions of dollars in economic losses.

The impacts of heavy snow and high winds in the Northeast United States have been documented by the earliest settlers dating to the 17th century. Legendary events, such as the "great snow" of 1717, the Washington-Jefferson Snowstorm of 1772, the blizzards of 1888 and 1899, the 1922 Knickerbocker storm, and the great New England snowstorm of 1978 are recalled for generations by those who lived through these events or learned about them through local lore. Just last month an East Coast storm impacting regions from Alabama through Maine set an all time snowfall record in New York City. Over time, we may see this February storm included in this list of major U.S. winter storms.

Winter storms also pose enormous challenges to the meteorological research and operational communities who have attempted to understand and predict them, often with mixed results.

Heavy snow causes concerns larger in scope than mere discomfort and inconvenience of shoveling the driveway or walks. The impact to the airline and shipping industries can be devastating. The Nation's complex infrastructure of highways, city streets, and local roads present a challenge to the Department of Transportation, state agencies, and municipal governments, when hazardous winter weather conditions threaten our ability to maintain safe transit conditions for the public and the flow of commerce. Most people are unaware of the significant efforts, in terms of both planning and expense, by local and state agencies to remove snow and ice from our roadways.

While severe winter weather can be debilitating and pose a serious threat to safety anywhere in our Nation, winter storms can have a particularly devastating impact to the economy in heavily populated and highly industrialized areas. The Northeast region from Virginia to Maine is such an area, and includes the densely populated metropolitan centers of Washington, Baltimore, Philadelphia, New York, and Boston. This region is home to nearly 50 million people. In the Northeast, heavy snowfall associated with intense coastal storms, often called nor'easters, may strand millions of people at home, at work or in transit; severely disrupt human services and commerce; and endanger the lives of those who venture outdoors. Snowstorms have their greatest impact on transportation, being especially disruptive to automotive travel, trucking, and aviation.

The aviation industry can be significantly affected by snowstorms causing widespread delays, airport closings and occasionally contributing to serious airline accidents. For example, the snowstorm of January 7–8, 1996 crippled air transportation on the East Coast (New York, Washington, Boston, Philadelphia), causing an estimated $50–$100 million in losses to the airlines industry. During the February 12, 2006 snowstorm, airlines cancelled 2,500 flights in the New York City area alone.

East Coast snowstorms can also have a long-term impact on the Nation's economy. Examples include the snowstorms of March 1993 and January 1996, which caused economic losses in the billions of dollars. In both of these instances, state and local resources were unable to keep pace with the enormous expenses incurred during each storm, and the President responded with numerous disaster declarations, allowing Federal funds to be used in disaster relief. The Department of Commerce measured a downturn in the economy following the March 1993 Super Storm. Studies based on economic indicators that are heavily weighted by employment statistics have also suggested that a major snowstorm in heavily populated areas, such as the Northeast, significantly influences the regional and the national economies, since a major storm temporarily puts millions of people out of work. Retail sales and housing activity are affected by heavy snows and severe cold. Reports have suggested that the Nation's economic strength was significantly weakened following the major snowstorms in February 1978, March 1992, and January and February 1994. During the harsh winter of 1977–78, the economy slowed from a 9 percent growth rate at the beginning of the winter season to only 1 percent during the winter itself. Once severe weather conditions eased, the economy rebounded significantly.

Winter storms in the Central states can be equally devastating to the local economy and threaten life and safety. Heavy snow, strong winds and cold temperatures have shut down our interstate highway system, at times stranding hundreds of travelers and having a detrimental impact on our trucking industry.

Winter storms along the West Coast provide a mixed blessing. While snow, ice and subfreezing temperatures are not as common in the major West Coast cities as in East or Central U.S. cities, impacts from winter storms can be just as devastating as in the East. Strong storms bring very heavy rains to coastal areas causing major flooding, flash floods, and mud, or debris, slides. Pacific Northwest storms which undergo "explosive cyclogenesis," or very rapid intensification, can strike quickly bringing hurricane-force winds into the region. These storms frequently knock down power lines causing widespread power outages. The NWS works closely with our partners in the U.S. Geological Survey (USGS) and will issue a debris slide warning for vulnerable areas at the request of the USGS, when conditions warrant.

While the impact from winter storms can be devastating, these storms also provide the lifeline for residents in the West. They bring heavy snow to the mountains to form the winter "snowpack," which provides essential springtime and summer water as the snow melts in the mountains and feeds into the streams and rivers, providing water to farmers and the public. When too few winter storms occur in the West, the region can be faced with severe water resource challenges, particularly in the dry summer months.

Some of the harshest winter weather conditions imaginable effect Alaska, including heavy snow, biting winds, and extreme cold. Eastern Pacific Ocean waters south of Alaska experience some of the most ferocious winter storms. Strong winds, waves of thirty feet or more, and subfreezing temperatures, combine to make this region very dangerous to shipping and fishing industries. Waves from intense storms crossing the Bering Sea produce coastal flooding and can drive large chunks of sea ice inland, destroying buildings near the shore. Blizzards occur across Alaska's Arctic coast, some causing extreme wind chill temperatures reaching as low as −90 °F. Extreme cold and ice fog may last a week at a time. Heavy snow can impact the interior part of the state and is common along the southern coast. Improved forecasts will have a large impact across Alaska, given the state's reliance on aviation for transportation, and on the marine fishing and shipping industries.

During winter El Niño episodes, a strong jet stream and storm track generally persists across the southern part of the United States, and milder-than-average conditions producing fewer storms prevail across the northern part of the country. In contrast, El Niño conditions result in exceptionally stormy winters and increased precipitation across California and the southern United States. La Niña episodes generally produce the opposite pattern—bringing colder and stormier-than-average conditions across the North, and warmer and less stormy conditions across the South. Also during La Niña, there is generally considerable month-to-month variation in temperature, rainfall and storminess. We are currently experiencing weak La Niña conditions across the country.

The science of winter storm prediction has improved steadily over the past decades. Our 72-hour forecasts are as accurate today as our 36-hour forecasts were 20 years ago. Tremendous advances have been made in the prediction and subsequent warnings of heavy snow events. In the 1970s we could provide less than 12 hours advanced notice for snow fall amounts greater than 4 inches. Today, we are predicting heavy snow events 3–5 days in advance and are differentiating between 4-, 8-, 12-inch snow fall amounts out to 3 days in advance. The average lead time for winter storms has been increasing and in FY 2005 the lead time was 17 hours, surpassing the Government Performance and Results Act (GPRA) goal of 15 hours. This improvement is due in large part to continual improvements in our ability to observe and describe the current state of the atmosphere and to model the future state of the atmosphere.

Specifically, this forecast improvement is due to (1) increases in the number of observations available, particularly satellite information and increases in surface observations; (2) improvements in depicting and understanding the state of the atmosphere through NOAA aircraft reconnaissance flights, which increase the number of observations over an area of the globe where additional information is needed to improve the accuracy of the numerical model's prediction of winter storms; (3) more sophisticated model data assimilation systems that are run on some of the most powerful high-performance computing systems in the world; and (4) improved global atmospheric modeling.

Our improved ability to predict major snow events with increased confidence allows our diverse user community to make decisions prior to major snow events concerning public safety, transportation and commerce. For example, before the recent 12 February 2006 winter storm along the Northeast corridor, state and local communities up and down the coast had:

Road crews positioned and schedules prepared to apply chemicals,

Retail outlets had snow removal and heavy clothing made available with advertising of "Blizzard Blowouts" days before this major snow event,

Remarkable recovery due to planning ahead.

Medium range and short range forecasts were accurate and provided the state and local governments with the information they needed to take action to mitigate the impact of this snowstorm. The public and private industry also had advance lead time to take necessary actions to prepare for this record-breaking winter storm.

Using the new Northeast Snowfall Impact Scale (NESIS), the February 12, 2006, storm was preliminarily classified as a "Major," or a Category 3 storm. NESIS uses five categories (Notable, Significant, Major, Crippling, or Extreme) to communicate the severity of a storm based on snowfall amount and the population of the affected areas. NESIS will permit meteorologists to quickly communicate a snowstorm's potential impact and compare it with a past storm.

While NOAA's storm prediction capabilities have improved over time, we continue to work to improve our forecasts. For the February 12, 2006 storm, we predicted a major snowstorm, but we did not predict the snowfall amounts would be as heavy as they were. In New York City, we predicted a blizzard well in advance, with snowfall amounts more than a foot in places, but we did not forecast the storm would dump 26.9 inches of snow in Central Park. We updated our forecasts based on the latest radar data and small scale reports we had, but we need to be able to predict these smaller scale situations within the overall larger storm.

One of the biggest challenges in winter storm prediction is determining what type of precipitation will fall (rain, snow, sleet or freezing rain), how long it will last, and how much will fall. Meeting this challenge depends on our ability to accurately measure the current state of the atmosphere from the global scale to the local scale, to integrate this information into our forecast systems, and to predict the future state of the atmosphere. Specifically, understanding and depicting moisture throughout the atmosphere is a key area targeted for improvement as we strive to advance our models and predictions of the future state of the atmosphere.

Another challenge we face is how to better communicate the uncertainty of our predictions. We asked the National Research Council to conduct a study to recommend how we might improve the methods we use to communicate forecast uncertainty and suggest ways to improve our products toward that end. We expect the report to be complete later this spring or early summer.

NOAA produces a suite of winter weather products to assist state and local governments, private industry, and the media in communicating the effects and impacts of developing and ongoing weather systems to the general public and to help determine appropriate preparations in advance of a winter storm event. Winter Storm Outlooks are given when forecasters believe winter storm conditions are possible, and are usually issued 3 to 5 days in advance of a winter storm. Winter Storm Watches are issued 12 to 48 hours before the beginning of a Winter Storm and alert the public to the possibility of a heavy snow, heavy freezing rain, or heavy sleet. Winter Storm Warnings are issued when hazardous winter weather is imminent and are now being issued with lead times greater than 12 hours before the winter weather is expected to begin.

NOAA's data and information are critical to ensure government officials, the public and private industry are informed of impending winter storms. NOAA provides essential observations, including radar data, surface observations, sea surface temperatures, and satellite images, as well as computer model simulations of the atmosphere that are used by the entire weather community. NOAA's data and information, including forecasts and warnings, are disseminated through the vast NWS dissemination network including NOAA Weather Radio All Hazards, Emergency Managers Weather Information Network, NOAA Weather Wire Service, the Emergency Alert System where applicable, and the Internet. Most of the public receives the weather information through the media. We work in close partnership with the media to ensure dangerous and potentially life threatening weather situations, such as winter storms, are communicated to the public.

The private meteorological community also plays a critical role to ensure the public, and industry, are informed.

Research into winter storms by universities, the private sector, and the Federal Government has provided us insight to understand the inner workings of these weather situations, but we can do more. As we increase our understanding of these storms, and increase observations of the environment with increasing detail, our storm predictions become more accurate—defining when and where the storm will hit. People now expect more from the National Weather Service, and believe we should get it right every time. At NOAA we will continue our efforts to improve winter storm forecasting, and all other weather predictions, to meet this high expectation.

That concludes my statement, Mr. Chairman. Thank you for the opportunity to provide information on NOAA's winter storm forecasting capabilities. I am happy to respond to any questions the Committee may have.

Senator DEMINT. Doctor. Senator Stevens would you like to start our questioning?

The CHAIRMAN. Thank you very much, Mr. Chairman, and I do thank you again for holding this hearing. I have a conflict later about 3:45, so I appreciate your letting me go first.

Well first, Mayor Michels, you have some better planning mechanisms now than you had before coming out of the 2004 storms. Do you think we need to do more to get you even better prepared? I noticed you mentioned one comment in your statement about some assistance you would like to have, could you elaborate on that?

Ms. MICHELS. Yes, Senator. A lot of our villages do not have a hazardous mitigation plan, nor do they have the resources to do an incident command. This is something totally new to a city and to establish something of that magnitude requires someone walking you through, either a consultant, to establish this system and to be able to assist the cities. I think if we would be able to provide to be able to do that, that would greatly help them be able to prepare and recover faster.

The CHAIRMAN. You'd like to see the villages in your area have the same kind of planning mechanisms that you've established for emergencies?

Ms. MICHELS. Yes.

The CHAIRMAN. Thank you. Doctor, I'm a little interested in some of the statistics I have. I hope I don't bore you with statistics, but I understand there are 122 NOAA weather offices in the United States. Is that right?

Dr. UCCELLINI. That's correct.

The CHAIRMAN. And we have, in Alaska, three. We're one-fifth the size of the United States and the Anchorage weather forecast office area of responsibility is 1,038,737 miles. The Fairbanks area of responsibility is 507,870 miles. And the Juneau AOR is 155,029 miles. Now I know that we don't deal with population per se in weather prediction. Why do we have so few offices in Alaska as compared to the other four-fifths? Four-fifths of the United States has 122. We have three.

Dr. UCCELLINI. Well, during the design of the weather service modernization in the 1980s and 1990s, I know there was a tremendous amount of discussion, not only within the executive branch of the government, but between the executive and the legislative branches, in terms of the optimal number of offices that could be supported during the course of that modernization. With respect to Alaska, in deciding on the three that were named Fairbanks, Anchorage, and Juneau, there was also a decision made to sustain the Weather Service offices so that there'd be a way of outreaching into the other communities. That configuration of offices does not exist in the rest of the country. In other words, we just have the weather forecast offices in the continental U.S. and, for the most part, and I don't know if there are any what we call WSOs still open in the CONUS, Continental U.S.

The CHAIRMAN. How many of those remain in Alaska now?

Dr. UCCELLINI. There are—I think the number is seven or eight, but we'll get the specific back to you. But, for example, the office in Nome is a Weather Service office that works in collaboration and in partnership with Fairbanks in terms of——

The CHAIRMAN. These predictions come from Fairbanks, right?

Dr. UCCELLINI. That's correct. And, actually, some aspects of the predictions, the basis of the forecast process actually starts with numerical models that are run in Gaithersburg, Maryland and backed up in Fairmont, West Virginia. We have centers that provide information to Alaska as guidance products from the National Centers for Environmental Prediction.

The CHAIRMAN. Then why don't you eliminate about 100 from the south 48?

Dr. UCCELLINI. Well, we have——

The CHAIRMAN. Why do you have 3 Weather Service offices in Alaska and 122 of them, in the lower 48 states?

Dr. UCCELLINI. Well, there—the challenges involved—I'll try to address the Alaska situation first. The challenges involved in providing the level of services over such a large area, as you well know, and there are maps, which I have one in front of me, show how large an area it really is. And given the topographical influences that Alaska has which poses unique and important challenges to getting these services out, we felt, as we went through the modernization, that this was the best way of sustaining the level of services and then improving upon those services. Within the continental U.S., there are other weather challenges that were best served, like tornadic storms, which was one of the major reasons and was the major basis for the modernization, which was best served by those number of stations with their access to their radar data and which had a much shorter time element associated with it in getting the watches and warnings out. So, for example, these types of storms and the challenges that you're facing in Alaska, for which the October storm is a classic example, involves a larger area and the forecast process is over days down to hours. For a tornadic type of storm, you're dealing with hours to minutes and the station design and the network design in the United—the continental United States was really focused on that kind of weather phenomena.

The CHAIRMAN. Well, I understand when you're talking about the problems of rivers and flooding and things like that, but when I went up to the west coast of Alaska this last summer, I was told that Shishmaref, for instance, had no warning at all about the storm that hit them and it comes down to a question—in the old days, there would have been a weather office every place there was a flight service station. When I first went to Alaska, everywhere there was a flight service station, there was a weather office. And that weather office had contact with the basic centers of forecasting at the time. You don't have that kind of a system now at all. You don't have anyone along the west coast. The whole west coast of Alaska is entirely denuded of any kind of weather forecast.

Dr. UCCELLINI. OK. Well, let me just say that I think any meteorologist, any forecaster in any part of the world will tell you that our forecasts are not perfect, and I would say that the chances are they'll never be perfect. There are too many parameters in the atmosphere, the surface, ocean interaction, et cetera, which leads to potential for error. So there are cases in which forecasts are missed, warnings are missed. We have found that there are less of those now than there were 20 years ago by a large degree. With respect to the specific storm that you highlight, I don't have any information on that and I can't answer that directly here, but I will certainly go back and get the required information on that.

The CHAIRMAN. Well, I would ask you to restudy it. I also have here a map of river monitors in the south—what we call the south 48, continental U.S. and in Alaska. If you want to look at it, along the east coast, for instance, the monitors are so many, they overlap. In the Kenai Peninsula, which is south of Anchorage, which is the size of New England, there's one. One river monitor, although there's a series of rivers. Now why does that exist, Doctor?

Dr. UCCELLINI. We recognize that there are deficiencies in observing networks involving many parameters. We work to—we attempt, not only within NOAA, but in working with other agencies, in enhancing those observing parameters. And we have worked those up through the budget process and clearly, we never get everything we want in terms of the observational capability, but we make—we work with what we can get, and it's not only observations that NOAA provides, but observations that other agencies provide. So the USGS, for example, we work in partnership with in terms of getting river observations. And there have been many examples where, through the budget cycles where we don't—we can't get what we need. They have gotten capabilities. We rely on their capabilities. So it's not just what NOAA has in terms of an observing network, it's what other agencies have as well. And one of the things that we've been doing over the last 5 to 10 years is working with a number of the land management agencies to get access to their data and get them to that—get that data to our forecast offices in real time to enhance our short term forecast capabilities. So what we have done is try to capitalize and leverage off of what's going on in other agencies. But that's an ongoing process.

The CHAIRMAN. That's a nice explanation. Respectfully, I've got to tell you, you're basing your weather observation on population. You look at the most populated states, you've got several monitors on one river. You have an area of a state like ours that has many, many, many rivers and has a small population, you have one. Now I don't understand that at all and I urge you to go back and study it again. In this process now—we're going through now, we can't have earmarks. We can't make changes to budgets. You people are making these decisions, but somehow or another, we have to find a way to catch up. Our people are being harmed very drastically, on an individual basis, small small areas. Whenever there's something like Katrina, respectfully, the world turns out to help them. But this is the—this will now be the third summer since those storms hit the west coast of Alaska and I just spent time this morning with the Corps of Engineers, we still haven't got the money to start repairing the damage that was done then. But that's not your fault, the problem is, they didn't have any warning. And I think we're entitled to warning, whether it's two or three people in the village or 2,000 people in the city or 20—2,000,000 people in the city. Somehow or another, this has to be changed. I'm really upset with these—the statistics that's come out of this hearing that we didn't have a chance to have before. I never saw those maps before and I'm delighted you had the hearing, because you've given us the maps. You prepared those maps for us and they struck me like a brick bat. I don't understand why—again, I'll get back to you. I want you to tell me, who made the decision only one river monitor in the State of Alaska?

Dr. UCCELLINI. I'd have to get back to you on that.

The CHAIRMAN. I'd like to talk to them.

Dr. UCCELLINI. OK.

The CHAIRMAN. I'd like to have them come up, just come up and visit the state.

Dr. UCCELLINI. If I may just add one aspect to this, and it's—again, it's always a balancing act within, you know, the budget that one is allotted——

The CHAIRMAN. Well, there we get back to population.

Dr. UCCELLINI. Well, we also——

The CHAIRMAN. It's allocated on the basis of population size—a lot more area.

Dr. UCCELLINI. We're also making decisions with respect to remotely sensed data versus the in situ data that's collected at these individual points, and that's where the power of the satellite comes in. And for Alaska, actually you're uniquely positioned because you get more overpasses from the lower earth orbiting satellites than—and more frequently than——

The CHAIRMAN. I've taken more of my time than I should, Senator. I'm sorry.

Dr. UCCELLINI. So that we can actually, you know, get a fair amount of observations now in areas that we haven't before, and they're all important to us. It's not just in the populated areas. We need those observations everywhere to make these models work to give you the 72-hour and 96-hour forecasts. So we need these observations everywhere, not just in the populated areas.

The CHAIRMAN. Thank you.

Dr. UCCELLINI. But you're right in pointing to specific gauges and those types of problems that do require in situ observations, we could always use more data.

The CHAIRMAN. Thank you. And thank you again, Mayor, for coming down to testify. We appreciate it very much.

Senator DEMINT. Senator Nelson?

The CHAIRMAN. Thank you, Senator.

Senator DEMINT. Thank you, Chairman.

Senator NELSON. Again, thank you, Mr. Chairman. Dr. Uccellini, you're clearly an expert in winter storms, particularly in the northeast and with the Alaska area as well, and I understand that the nor'easterner—nor'easter can be particularly devastating, and I'm very interested in that, but obviously, being a little bit closer to home in Nebraska, I'd like to learn more about what kind of weather needs and concerns you're working on for the Midwest, in particular our location in Nebraska, Dakotas, Kansas, Iowa area.

Dr. UCCELLINI. I'd be glad to. I would like to point out that I spent 11 years at the University of Wisconsin going through my various degrees and post-op work and all that, and I did a number of case studies on Midwestern storms, including those that affected Nebraska, both from a severe weather point of view and a blizzard point of view, and I recognize the challenge—I've actually done case studies on storms out there and recognize the challenges are immense. One of the complexities involved with the storms in the Midwest is how these systems come off the Rocky Mountains. And it's only been in the last 10 years—time flies, the last 15 years, that we've actually been able to model the development of these storms that come off the Rockies and actually get an accurate track prediction that would affect areas like Nebraska and the rest of the Midwest. So, when you're looking at the forecast problem from days in advance, it's not just what's going on in the Midwest, it's what's going on upstream a few, being able to get those observations, being able to do the numerical modeling that accounts for the true impact of the mountains. That allows us to predict the track of these storms and the type of weather that you will get. Now one of the aspects—so the track forecast, you might have heard this with the hurricane problem, you know, it comes down to track and intensity. And we're making improvements on track forecasts on both measures, and the numerical models are an important part of that. The intensification of these storms, and the rapid intensifications are what can change what you might consider a—just a normal storm coming through into a full blown blizzard that provides incredible challenges, not only to the forecasters, but to the people who have to live through them. We are getting a lot better on those intensity changes as well. In fact, we're making more rapid progress for these what we call extra tropical storms over the United States than we are for hurricanes. So, I believe we are making the progress, but refining those forecasts, giving you the exact area where you'll have your transition from rain to snow, where, you know, the strongest winds will be as the snow is falling, those types of parameters still need improvement and we're looking to the numerical modeling and the better observations upstream of your area to help us along.

Senator NELSON. What about the observation platforms and radars that are located? Do you have a sufficient number of those? Are they strategically located, or is that any part of the challenge that you're facing?

Dr. UCCELLINI. That northern—the central part of the country is well observed from a radar perspective and I have to tell you that the radars, the Doppler radars, have probably been the single most effective observing tool that allows us to define what's going on now and project what's going to go on in the short term. In fact, when I see these radar images today, I don't know how we did this before we got the Doppler radar system. We were dealing with these short term changes in the blind before we had this system. So I believe that the—especially the Midwest is well observed from a radar perspective. The other advantage that you actually have, immediately to the south of you is you have this—the profiler network which was implemented in the late 1980s and it really is focused on the central part of the country. And that real time continuous measure of winds throughout a deep layer of the atmosphere that we don't really have anyplace else in the country, provides an enormous advantage to the forecasters that are dealing with the storms that affect Nebraska, both from severe spring/summer weather kind of storms and the winter weather as well.

Senator NELSON. What impact does the—well, the presence of the satellites, for example, the National Polar Orbiting Operational Environmental Satellite System, NPOESS, I'm concerned because it's my understanding that that may be delayed because it's undergoing a cost review. What does that do to your capabilities to track the weather?

Dr. UCCELLINI. Yes. The—when you look at the numerical weather prediction system, we start with a global observing system, assimilate all that data into global models and run those models out 16 days in advance four times a day. We use those models then to set boundary and initial conditions for higher resolution, more local models. So when you trace the forecast process back, you're always starting with a global observing system. We recognize all forecasts are local, but you start with a global observing system. The key parameter for that global observing system is in polar satellites. So we have come to rely on those. If you track the improvements in numerical models in our model forecast, they're related to the improvements in the global observing and to the improvements in the models in the computing capacity that allows us to run those models in real time. If we were to lose the polar orbiting system, if we had a delay where there was a gap, we would have significant impacts on our ability to do those two, three, four, five day forecasts for critical weather events.

Senator NELSON. Well, if there's a delay, isn't that exactly what's going to happen?

Dr. UCCELLINI. Well what we have done, we've been working with NASA and Department of Defense. We've actually created in 2000 a Joint Center for Satellite Data Assimilation and we are now working more effectively with the research and operational community, which involves DOD and other international satellites. And we have a pathway now of working our way from what was the satellite observations in the 1990s with 16 channels and about three vertical layers, into this hyperspectral mode. We have a whole sequence of research satellites and satellites being launched by Europe which will allow us to fill that gap up until the time NPOESS, you know, is launched. We were asked that question about a potential 1-year or 2-year delay. We said as long as, you know, the CrIS, the IASI, the NPOESS preparatory missions, if all those stay on track, we're OK. Now that's a risk factor, you know, that people have to measure risk and how you're going to deal with that. But as long as that sequence is there, we will not have the gap. Then NPOESS comes along and operationalizes the whole notion and we'll be ready for that launch.

Senator NELSON. What does—now does NPOESS help you with the jet stream or is that another monitoring procedure?

Dr. UCCELLINI. Yes. We rely—observing the winds aloft is probably one of the bigger challenges that we have. We can use the channels from the current satellites into NPOESS to help us derive the winds. We can use channels to actually measure vectors and measure the winds directly. In the polar regions, where we have a more frequent overpass and we use the GEO stationary satellite imagery then to also compute wind vectors. So that's a whole sequence that we can use from satellites, plus we have the winds from commercial airlines now that we get every 5 minutes while these, you know, planes are in flight, we get the vertical profiles when they're taking off and landing. All of this data is assimilated in real time. I would say that there's no one silver bullet with respect to getting a wind feel which is essential for a forecast. We have to assimilate all of these different types of winds, bring them into the numerical models in such a way that the models will accept them and then we can run out in our forecast.

Senator NELSON. If there was one thing that you could ask of us that would make it possible for you to do your job better or more thoroughly or improve your capabilities, what would it be, outside of money?

Dr. UCCELLINI. Yeah. I've got people behind me to make sure I don't mention the word money. The—it's really clear when you look at the way a forecast is made, you have observations, you have numerical models that run on powerful computing systems, and then you have forecasters who digest—you bring the information to these forecasters with work stations. They bring their expertise and they make judgments. They reach out to the state and local officials that have to make critical decisions. You know, it's always tough to say where's one thing, but I always point to the computing power. If we—you know, we have a system now where we lease computers. We upgrade every year and a half. It's a pretty good system, but we're still falling behind the curve. And there are still things that we can do in terms of improving numerical forecasts, improving the use of satellite data in which hundreds of millions of dollars are invested in every year. That if we had more and more powerful computers, there are more and more things we can do across the board for all of these weather systems. So, you know, I—you got to have the forecasters and we've got to support our people, but if there is one thing that, you know, that makes this thing tick, it's the computers and we have to be on the competitive edge on the—in the computer world to be able to advance.

Senator NELSON. Thank you very much, Mr. Chairman. Thank you, Dr. Uccellini.

Senator DEMINT. Doctor, I think you may have just answered my question, but I am curious at recent ratings of the 500 top computers in the world rated the United States Weather Service 90th while the Chinese agency is 36th. My question was, is it a problem with our modeling, our people, or our computers, or why are we falling behind the rest of the world?

Dr. UCCELLINI. Well, I mentioned that I feel good about the situation we're in from the way we lease computers now, compared to where we were in the 1990s when we were in a buy mode. You could always get hung up in any aspect of the procurement process and actually literally get frozen, much less, you know, fall behind. You know, literally frozen, which is—was almost a death for us with respect to keeping up with the rest of the world. So, in one hand, I'm happy with what we've been able to do in terms of going into this lease arrangement, every year and a half upgrading our systems. But the fact is, given, you know—and we're all living under budget constraints, and given the amount of money we're actually able to move forward with, we get the best—you know, through our procurement process, get the best computing power that we can get for that. At the same time, there is an increasing mission on us in terms of computational needs. Five years ago, we didn't have a climate forecast system that was run operationally. We do today. We made allotments for that in our computing resources, but the advances are going so much faster than we anticipated that there are things that can be done today for even the climate fore—we're talking short range, like the seasonal into annual type forecast. We've got the ocean prediction systems. We weren't making specific forecasts for ocean systems 5 years ago. We are today. So all of these added factors, and important factors, are being pushed onto the same computational system. So as we approach the next procurement cycle, which is about a year and a half or 2 years from now, you're going to see requirements now driving this computer buy or lease in ways that the previous one didn't. But we have to go through that cycle. Now these other groups, I think have a bit more flexibility than we have, some of these countries do and some of them have just got their computing systems. And I can almost guarantee you that a year from now you'll see them drop down the list and others work their way up. We're planned for an upgrade at the end of this calendar year. It's two and a half times what we do today. So we're 1.5 trillion computations per second. We'll more than double that and we'll still probably be about 40 or 50 for 6 or 7 months and then somebody will leapfrog us on that. But there's clearly more that can be done in the computational area.

Senator DEMINT. Does the leasing approach solve the government procurement problem, or do we still have a problem with the way the government purchases? What's holding you back there? Or is the problem solved?

Dr. UCCELLINI. The procurement issues have—you know, I wouldn't say—I'm not a procurement expert, but I would say that we're in a lot better shape now through leasing arrangements than we were in buying. OK. Because if you get hung up at any level as you go up to OMB, you know, again, tough decisions are made. If you get hung up in the interaction between the executive and legislative branch and you lose that opportunity to buy, then you start all over again. What we found in the leasing arrangement, we had more flexibility in the procurement cycle and were able to get things through because you don't have a bigger cost up front. OK. And you work your way up in a steadier budget profile. So I think that's a better way to go. It's just that how much resources you can bring. Literally, we're in an era now with parallel processing, it's the more racks you buy, the more power you get, or the more racks you lease, the more power you get. So we get a budget, we design our computing capability within that budget and apply her to our requirements. And that's basically where we're at.

Senator DEMINT. Ms. Michels, you mentioned that the Weather Service was working well with you in Nome, but that your problem was surrounding villages were not well prepared. Is the problem that they're not getting the word of weather that's heading that way or it's just that they don't have the means, the ability to be prepared and to take precautions?

Ms. MICHELS. I think it's both. The Weather Service, the Nome staff had provided me an Excel spreadsheet from 2002 when the time they were to do an advisory and a warning, and there were a couple of times in the Shishmaref, Kivalina area where they didn't have enough data to be able to provide the information to do a warning until the storm was, you know, right at your doorstep. So there are data holes out there that really would be able to help the Weather Service predict more of these weather advisories. And then, second, it is also a resource issue in our villages. There's just not a lot of training or the resources out there to be able to prepare. A lot of heavy equipment doesn't work or there's a lack of heavy equipment. So, it's both.

Senator DEMINT. One of the frustrations we have as we push this Committee forward is we know that even when people are warned, as we saw last year, that sometimes they don't do anything or they don't get prepared. So I guess our question is, how much do we spend to be able to give people notice if we're not sure they're going to respond. And I guess that gets back to local authorities and preparation, but what's your comment to that?

Ms. MICHELS. I can guarantee you, when we get those storm warnings, we are running around trying to get everything up to high ground, doing whatever we can to protect our food, our boats, you know, our cabins, everything. When we do get those warnings, we——

Senator DEMINT. You take them seriously.

Ms. MICHELS.—take them very seriously.

Senator DEMINT. OK. All right. Senator Nelson, any more questions?

Senator NELSON. Yes. Doctor, one other question. In terms of reaching out to other sources for help, computer help or other just informational sources, do you interact with the Weather Service part of a strategic command located at Offutt in the Omaha area?

Dr. UCCELLINI. The answer is yes. I'm actually—there's a group—you know, I hate to throw acronyms around, but there's a group that meet three times a year, including the AFWA commander, myself, FNOC out of Monterey, and AVO. We have shared resources. We have backup plans. We have come up with an operations concept which allows us now—we actually, for non-classified applications, we provide computing—computer model support for AFWA for the United States areas. Actually for the whole North America sector, and then we rely on their model runs for their windows. If we have to, for example, support USAID over Afghanistan, we don't run our model over Afghanistan, we rely on the Air Force models that are run over Afghanistan. So we got this whole shared process. We are working toward backup plans, which are much more rigorous than we've had in the past, which involves double and triple ways of moving the data around because not only what we have in Gaithersburg but because of what—the backup system we have in Fairmont, West Virginia. And, last but not least, with the new building out in Omaha, we are working on plans which have not been finalized yet, but are pretty close, in terms of locating our operational computer, our next generation operational computer there since our security ranking is going up. That's probably one of the most secure areas which has access to all the data that I was talking about before. So the working relationship is very close. We follow up three times a year and we've made tremendous progress over the last 20 years.

Senator NELSON. Is any of the data that they can accumulate, is that—can you access that or is that in a format that you can use?

Dr. UCCELLINI. Yeah. We not only access the DMSPs, the Defense satellite systems, but they also have classified data which we're allowed to access and use for our land models as long as—you know, we don't—we can't re-release that data, but we can use it within our numerical models and then release the predictions. And that's all done under a special arrangement now that's been signed off at the highest level. So the data exchange has—it's been a very good arrangement, especially—not only with the Air Force, but with the Navy as well.

Senator NELSON. I think that concludes my questions. Thank you.

Senator DEMINT. One last question, and I know we need to let you folks go, but Doctor, I'm just curious about the flexibility you have in your agency to, I guess, move dollars around. For instance, Nome. The Mayor has said perhaps a closer buoy, another observation point. Can you, the way we're structured as—as NOAA's structured as an agency, go back and say, hey, we're going to close a couple of sites in these states and add a couple along the west coast of Alaska, or is that just a political bombshell? I mean, do you not adjust by priorities? I mean, is that something we would have to mandate for you to do, or can you do it?

Dr. UCCELLINI. Well, let me say this. We've had situations in the last 3 years in which buoys have been added, especially in the gulf. Even the—and we've had tsunami, the buoys, the special observation systems now that have been added in the Atlantic. Those were all done through supplementals. It's very hard. We have our own set of buoys. There are other agencies that have had buoys out there that we've accessed that when they close down those buoys, we get blamed for closing down those buoys. OK. In other words, because we've used those buoys, made the data visible to the communities nearby or the data, as it's being used in our models, people understand how important they are. I haven't seen—I personally haven't seen situations where one buoy is closed down and moved someplace else. It—you're really adding to it. Now, there was an Academy of Sciences study done in the late 1990s and early 2000 time period that pointed to an optimal array of buoys around the United States. We're working toward that, but we haven't attained it.

Senator DEMINT. Yeah. As you can see, Senator Stevens is very interested in coverage in Alaska, so I would encourage that.

Dr. UCCELLINI. By the way, I have some information with respect to questions he asked. Should I say that now, or should I just bring it over to the—like the number——

Senator DEMINT. I think if you can submit those in writing, it'd be most helpful.

Dr. UCCELLINI. OK.

Senator DEMINT. I thank you both very much, particularly, again, Mayor, for your long travels and this information will be included in the record and hopefully we can respond in a way that'll be helpful. Thank you.

Ms. MICHELS. Thank you.

[Whereupon at 3:35 p.m., the hearing was adjourned]

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