

# FINAL REPORT

## NOAA/SEA GRANT REGIONAL INTEGRATION



LAKE ALEKNAGIK NEAR DILLINGHAM. PHOTO BY DAWN MONTANO



PORT OF NOME ON A CALM SUMMER DAY. PHOTO BY DAVIN HOLEN

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*“We live and die by the weather.”*

—Nome resident and gold dredging operator, Bering Strait Region

## INTRODUCTION

In western Alaska, accurate weather forecasts easily accessible and understood by the public are essential. There is a great deal of focus by the National Weather Service (NWS) in western Alaska to better predicting and understanding major storm events that are common in the fall-winter. These storms erode coastlines and threaten infrastructure and livelihoods, but daily forecasts are also critical for rural land-based and maritime travel, maintenance of roads and runways, and personal safety. The NWS partnered with Alaska Sea Grant (ASG) to

improve the use and understanding by western Alaska communities of daily forecasts including but not limited to sea ice, wind, marine weather, and aviation weather, as well as the delivery and dissemination of daily forecasts. For this small project, two regional hub communities were identified for fieldwork: Nome and Dillingham. These outlying transportation hub communities are serviced by two different NWS forecast offices; Nome is serviced by the NWS Fairbanks Office, and Dillingham is serviced from the NWS Anchorage office. This project was focused on

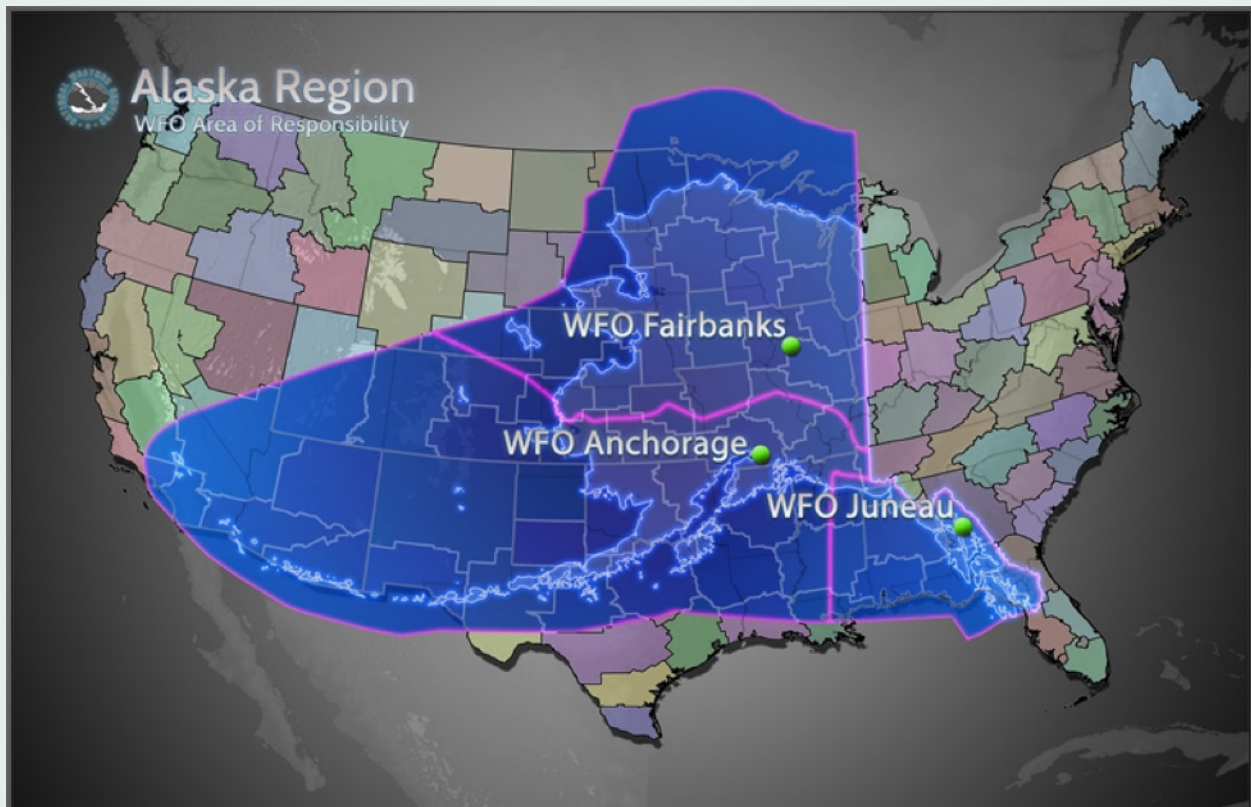


Figure 1. NWS Alaska areas of responsibility. Map courtesy of the NWS.

western Alaska, so the Juneau forecast office was not included as this office covers southeast Alaska. The area of responsibility for the NWS Fairbanks, Anchorage, and Juneau offices are large compared to areas of responsibility in other US states as noted in Figure 1.

This project responds to the National Sea Grant College Program opportunity for regional integration with the NOAA Region Collaboration Team. The NWS in Alaska has the ability through their website and radio broadcasts to broadly deliver a detailed weather forecast for communities throughout Alaska via their website and radio broadcasts. Alaska has many remote communities connected by air travel and sea routes, and inclement weather is a common hazard. Residents rely on weather forecasts to prepare for storm events that may flood

their communities, for safety when traveling between communities, or when conducting wild resource harvesting activities. How well Alaska residents understand weather forecasts and to what degree they have confidence in forecasts to prepare for extreme events and to make decisions regarding travel and safety is important to the NWS. During discussions on what the scope of an outreach and extension project should encompass, priorities were identified. These priorities included obtaining feedback from communities on improvements in delivery of weather forecasts, getting feedback from traditional knowledge holders to better understand perceptions of weather and local decision making, and finally, improving how residents are notified of coastal hazards such as powerful storms and coastal inundation.

## GOALS AND OBJECTIVE

As noted above, this project responds to NOAA and NWS priorities for Alaska. After consultation between ASG and the NWS research team, the following research questions were identified. Integrated into each of these four focus areas is how do residents use their local knowledge of weather coupled with a forecast to better predict weather.

1. What are the main sources residents of western Alaska use to view weather forecasts?
2. What information is most important in a forecast?
3. Can residents easily navigate the NWS sources and easily find the information they need?
4. Recommended improvements to forecasts for particular geographical areas.

## METHODOLOGY

In March of 2018, Ed Plumb from the NWS and Davin Holen from ASG held a workshop as part of the Western Alaska Interdisciplinary Science Conference (WAISC) in Nome . Eleven participants attended this workshop and were from the surrounding area working in a variety of occupations that rely on accurate weather forecasts. These included gold mining, environmental management, and Alaska Department of Fish and Game operations. In addition to Nome-area residents, participants from Golovin, Wales, Barrow, and Unalakleet also attended. This workshop was a test case for questions to be asked in follow-up workshops with community members in Nome and Dillingham as well as to identify key questions to ask during more in-depth interviews.

At the WAISC science conference the following questions were asked using a PowerPoint and online polling (N=11). The purpose of the questions was not so much to collect data but to generate discussion and test the questions.

- How do you most commonly receive a weather forecast?
  - a. Application on my phone.
  - b. Radio broadcast.
  - c. From the National Weather Service either online or on my phone.
  - d. Television.
- If either online, on the radio, or on your phone or computer, do you know if the source of the forecast is the National Weather Service?
  - a. Yes
  - b. No
- Why do you most commonly use a weather forecast?
  - a. Everyday use.
  - b. Traveling to another community.
  - c. Subsistence activities.
  - d. Making decisions for work.
- How far out do you need a forecast?
  - a. One day
  - b. Three day
  - c. Five day
  - d. Seven day
- Using the everyday forecast what is most useful and what is missing or difficult to find?
- What are improvements that could be made to deliver the weather?

The results of these questions can be found in Figures 2-5. Figure 2 shows that for this workshop half the respondents were either from Nome or another Bering Strait community with others coming from other Alaska communities. Figure 3 shows that a majority of the respondents (63%) said they received the weather from the NWS either online or on their phone. Yet in Figure 4, only 67% said they were sure that the source of the information was from the NWS. Upon further discussion the source of weather was not actually well known. When asked why they use a weather forecast many (67%) said they use it for everyday use, while only 22% said they use a forecast for work (Figure 5). However, there was no option to choose both and after further discussion respondents said it was vitally important for work in many cases; however, the most frequent use was for every day. When asked how far out they would like a forecast most said seven days (44%), with five days (33%) being the second choice and (22%) being the third choice (Figure 6). During discussion respondents learned that confidence in forecasts diminished the further out and that reliable data was more important in making decisions than having a longer-term forecast.

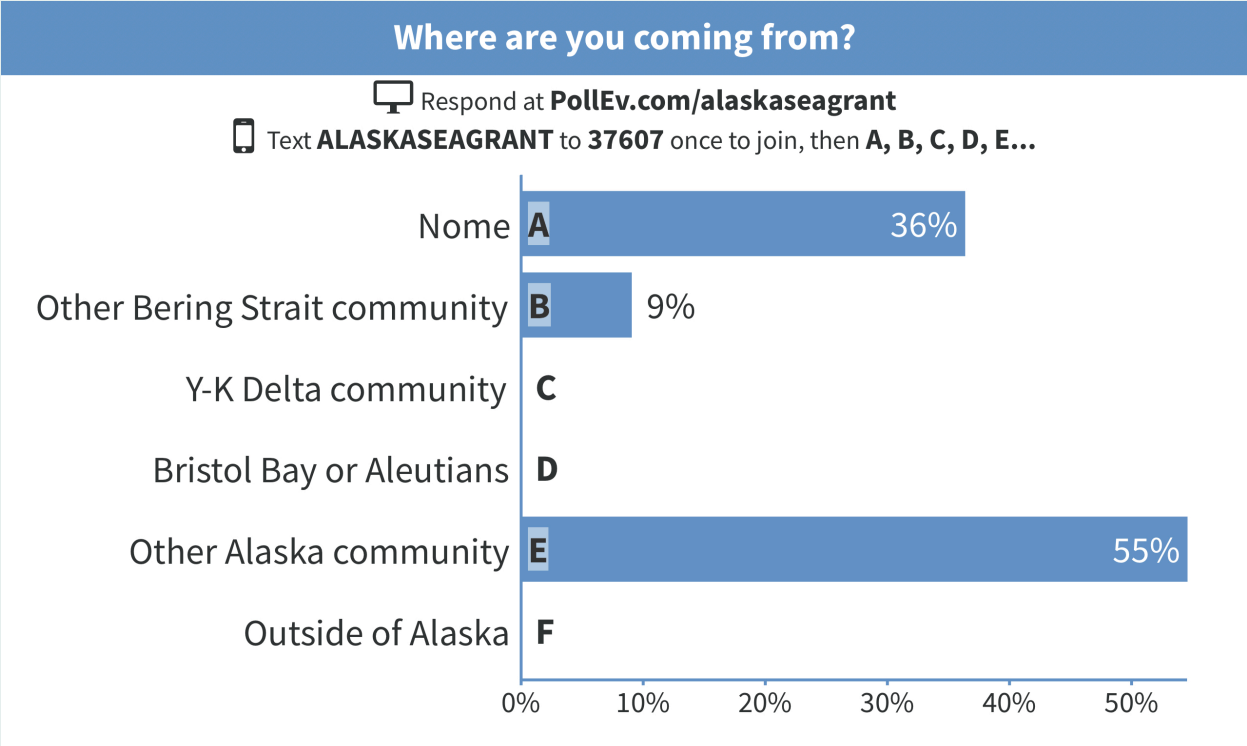


Figure 2.

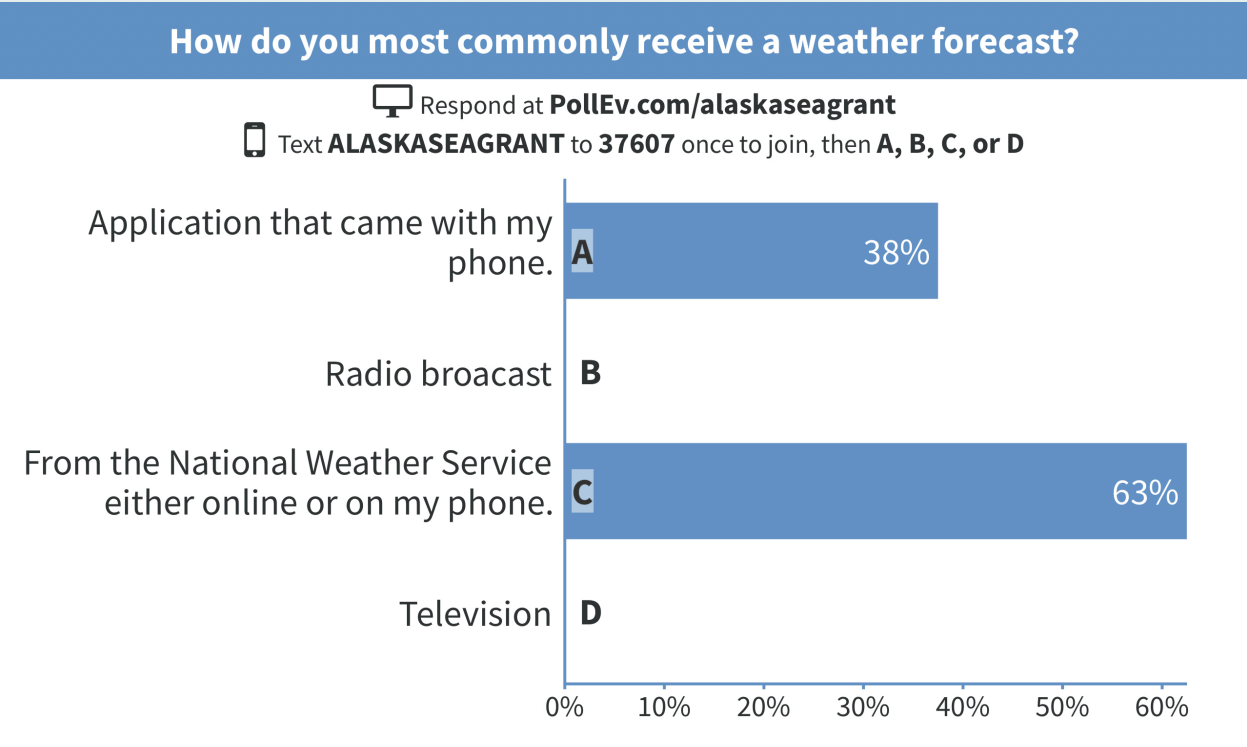
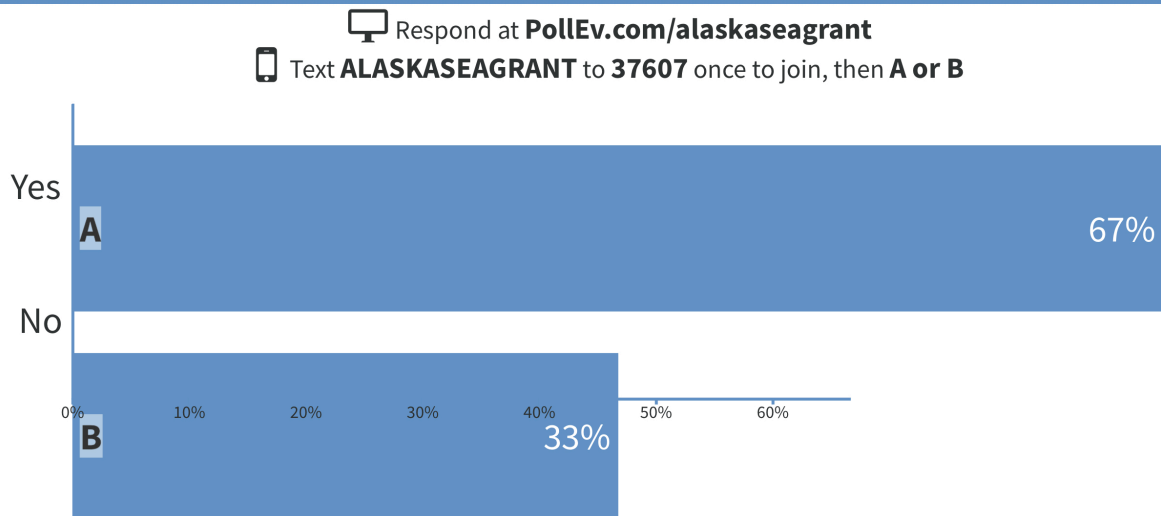


Figure 3.

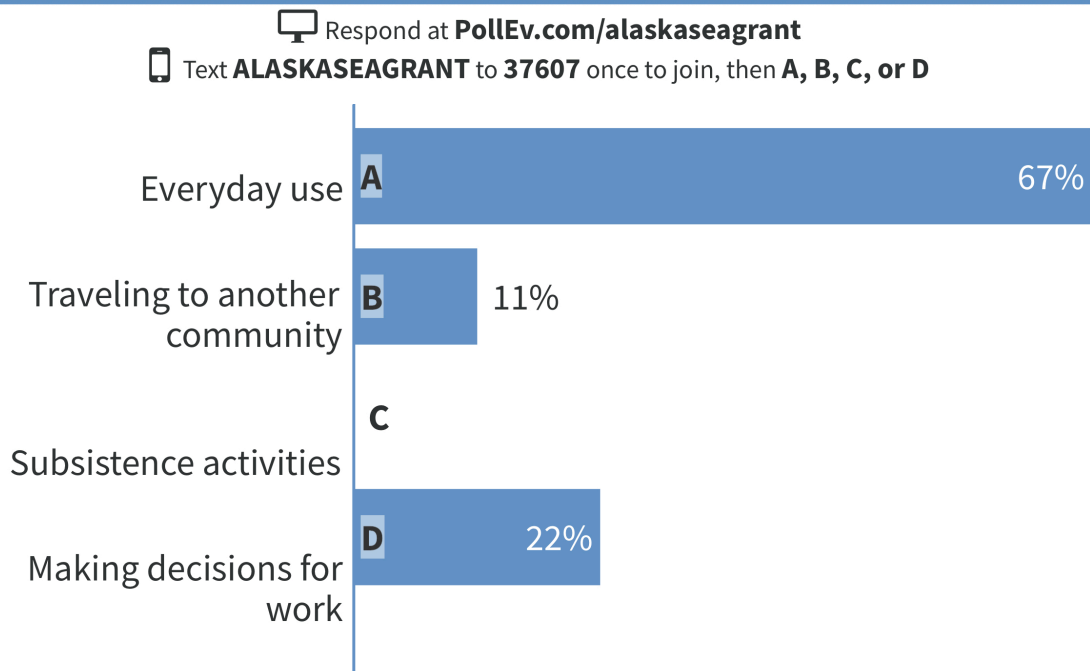
## If either online, on the radio, or on your phone or computer, do you know for sure if the source of the forecast is the National Weather Service?



Poll Everywhere

Figure 4.

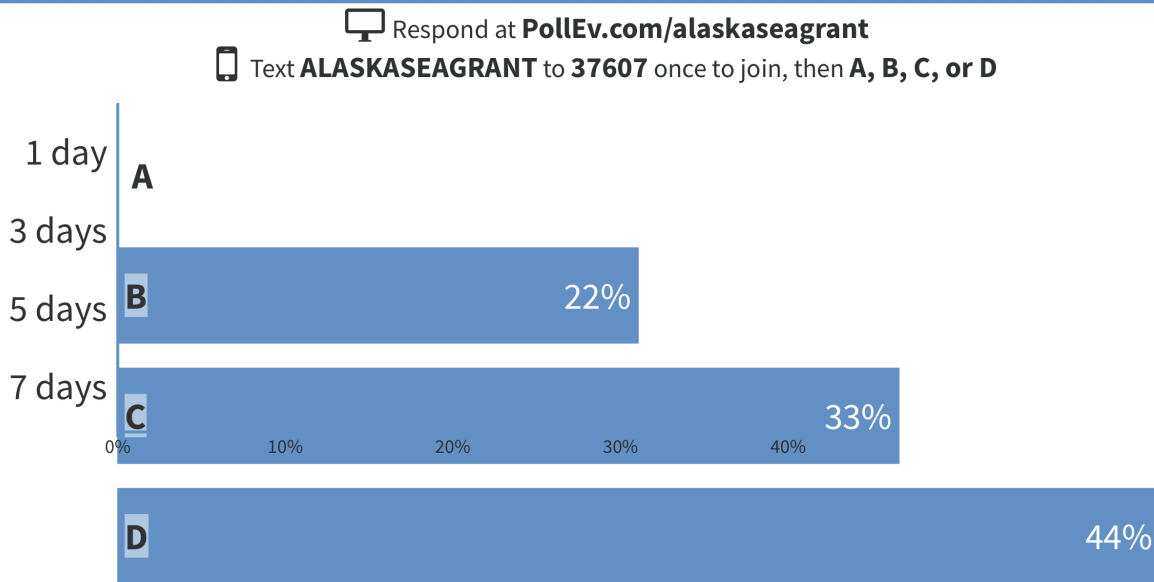
## Why do you most commonly use a weather forecast?



Poll Everywhere

Figure 5.

## How far out do you need a forecast?



Poll Everywhere

Figure 6.

These questions were helpful in understanding respondents' knowledge of weather forecasts and potential needs. This helped the researchers devise questions for the in-person interviews as well as discussion points for the two workshops to be held in Dillingham on May 2, 2018 and in Nome in June 2018. Workshops were led by ASG Coastal Community Resilience Specialist Davin Holen, partnering with two Warning Coordination Meteorologists, Ed Plumb based in Fairbanks who worked with Holen in Nome, and Louise Frode based in Anchorage who worked with Holen in Dillingham. ASG Marine Advisory Program Agent Gay Sheffield set up the workshop in Nome and ASG Marine Advisory Program Agent Gabe Dunham set up the workshop in Dillingham. For the follow-up workshops in Nome in attendance were 12 residents who lived along the road system and worked in a variety of jobs including mining and commercial fishing. There were 10 community members in attendance in Dillingham including

a former DOT foreman, pilot, several commercial fishers, a trapper, a retired ADF&G researcher, and a federal manager. Many of the participants in both communities, as is common in most small towns in Alaska, have many duties besides those listed above.

In addition to the workshops, more in-depth interviews were conducted with three local decision-makers in each community to obtain feedback on current daily weather forecasts using the same questions above and then focused on specific needs to better serve their positions. Interviews in Nome were conducted by Holen, Plumb, and Sheffield and interviews in Dillingham were conducted by Holen, Fode, and Dunham.

## FINDINGS

This section summarizes the findings from all three events as well as the six interviews. During the workshops and interviews, ASG and NWS learned what residents look for in a forecast, what information sources they use to obtain the data, and what needs there are, as well as potential new or improved products and services.

### ***WHAT ARE THE MAIN SOURCES WESTERN ALASKA RESIDENTS USE TO VIEW WEATHER FORECASTS?***

#### **Nome**

Respondents in the Bering Strait region noted they obtain weather forecasts mainly from phone applications including Weather Underground -- a favorite with several participants -- as well as marine forecasts and aviation forecasts. At least two participants said they use several sources to understand marine and aviation conditions. Some residents use the NWS web page while others receive the forecast by calling a number, which used to be common in the pre-internet era and is still useful in areas where there is limited data for cell services. Radio remains useful for remote locations without reliable internet. Alaska Weather on the Channel 2 television station is popular. They noted that on the radio the weather is too geographically broad to be used at a local level as the weather can vary so much in the Bering Strait region. When out at camp in the summer residents listen to KNOM radio as that is one of the only sources they can receive. They said the forecast is not detailed enough but as it's the only source they can get in an area with little cellular connectivity, it's better than nothing.

During the data source discussion, respondents said they would like to see the NWS site blend several data sources such as marine conditions and wind speed. Wind speed came up as

particularly useful and it took some residents quite a bit of time on the NWS website to understand where to get windspeed, as well as how to obtain a better local forecast for a particular area they are interested in using the map feature. Besides obtaining information from the NWS, residents would like an easy way to communicate back to the NWS local observations. Residents want the capacity to contribute to local weather forecasts as weather can be drastically different depending on where people live in the area. There is a substantial road system in the Nome area, a region with a small population and limited capacity to immediately clear roads. Residents need to know whether it is safe to drive or what to expect so they can plan accordingly. Aviation maps are often used to see if a system is moving into the area. This helps with planning activities. Residents would like to see larger maps to view weather systems in a context that will help them plan travel and harvesting activities on land or in marine waters, or just to know whether to drive into town or not.

#### **Dillingham**

Residents use a variety of methods to access a weather forecast. This includes using applications on their phones, online, and television. The VHF radio is very important in the summer as well as the forecast read on KDLG the local radio station. In the summer during the commercial fishing season a detailed forecast is read out on the VHF and on the KDLG. The only issue they see is that the forecast is only read in detail during the summer and residents would like more information in fall and winter as well when they are planning subsistence harvest activities especially in the fall during the moose hunting season.

Very few participants understood if their forecast was coming from a NWS source. Louise from NWS explained during the workshop the



difference between a computer-generated model and one from NWS which is created and written by forecasters using data collection, local observations, and local knowledge of weather patterns in a particular area. This helped residents understand that seeking a forecast from NWS may give them more accuracy based on this knowledge of weather in the region by the forecaster.

### **WHAT INFORMATION IS MOST IMPORTANT IN A FORECAST?**

#### **Nome**

“Wind is what makes or breaks weather around here.” —Nome Resident

Residents are looking for the following in forecasts; wave height, swells, wind direction and speed, and snowfall accumulation. Marine forecasts should have an arrow showing wind direction. During a storm identifying surge height can help residents prepare for potential flooding. For these activities, wind direction and speed, and wave height are the most important factors. For example, operations at the Port of Nome rely extensively on NWS forecasts. Docking a ship in Nome with its shallow draft and narrow entry means the harbormaster, pilot, and company/agency official meet to carefully plan docking procedures and the NWS forecast can be a critical piece of information.

In addition, ceiling and visibility information is critical to pilots. An ADF&G Division of Wildlife Conservation representative noted they conduct aerial moose surveys in the spring and need to know conditions for a larger area. Besides a forecast, having cameras at locations such as Quartz Creek, Granite, and Council would significantly improve their operations.

In a forecast, local residents noted they would like better details on timing for major changes in weather. For example, they would like to know when will the wind pick up or when will it start snowing. The timing is crucial in planning activities. Snowfall estimates are also critical.

A major theme heard throughout the meeting and during interviews was projections of certainty. In forecasts, estimates of the degree of certainty is something they would like to see. They understand that the further out a forecast, the less reliable it becomes. Having this language would be helpful, expressed as a percentage or other terms that are easily understood.

#### **Dillingham**

The most important item in a forecast is wind speed and direction. Better information is needed two to three days out. This would assist with a variety of activities including subsistence harvesting and commercial fishing. Louise Fode went over the website and showed the workshop attendees several features of the NWS website that are not evident. When residents learned how they could navigate the map to get wind speed and direction for particular locations in the marine environment. they were very pleased. They also requested tide information to be included. The combination of the tide and wind can have a dramatic impact on commercial fishing activities. Visibility would also be a helpful addition.

In the winter residents need to know more about precipitation. This is especially important as there is more rain in the winter now than there used to be. When snow is predicted having more information on how much will accumulate would be helpful with planning efforts. A respondent at the airport noted how important this is to airport runway maintenance. This knowledge has the potential to save them a great deal of money as they can better plan plowing and airport runway deicing or other related maintenance.

## ***CAN RESIDENTS EASILY NAVIGATE THE NWS SOURCES AND EASILY FIND THE INFORMATION THEY NEED?***

### **Nome**

There were a number of critiques related to the NWS site, most of which came from the national approach to providing a forecast. First the residents said the website needs larger font: it's too small with too much text to navigate. The national discussion at the top of the page is not relevant to Alaska. The page should have the option for regional focus areas. For a regional page, there could be more detail. This last question was followed by an open-ended discussion on tools that could be useful for the public. In the Bering Strait region, we learned that of primary importance is wind direction and wave height for planning daily activities. Residents would like to see more information on wind including speed and direction, depth of snowfall, timing of weather, and especially make available information for the marine environment. These data are available on the NWS site, however, the use of the tools available are not well known. For example, a map is available on the NWS regional website where you can click on specific areas and a forecast for that grid will be generated. These forecasts are made using observations as well as NWS knowledge of how winds and weather change in the area based on local conditions. However, there are no directions on how to access the specific forecasts on the site nor that you can move the map around to see areas where you would like to see the forecast. Tools are present on the website that allow for navigation and obtaining more information, but there needs to be more directions for the user as to 1) the presence of the tools, and 2) directions on how to use them.

### **Dillingham**

Regarding certainty in the forecast, the most important item again is wind speed and direction. In addition, residents stated they

would like to see a metric to assess confidence in a forecast.

As one resident noted, "The changing climate means impacts to safety." They have seen people out in the winter in 18ft skiffs when the wind is blowing 40-70 miles an hour. Wind speed coupled with tide can become disastrous quickly. A commercial fisher in the group noted that "the wind can stack up the tide." Having better hourly forecasts, especially during the commercial fishing season that includes wind speed would greatly increase safety.

## ***RECOMMENDED IMPROVEMENTS TO FORECASTS FOR PARTICULAR GEOGRAPHICAL AREAS.***

### **Nome**

The method of delivering a weather forecast in western Alaska needs to include more visible venues for the forecast. This includes integration with social media. Social media is a powerful tool for sharing information in rural Alaska. A Facebook page for Bering Strait weather would be very popular. This social media page, with easy to understand map and quick forecast for the week could include links to a more detailed forecast. It could also be a good education tool for residents on how to better understand a forecast, as well as the tools that are included on the NWS site which may not be evident. For example, there could be a quick tutorial on how to use the point map feature on the website to get a forecast for a smaller local area, instead of relying on a forecast for the entire Bering Strait region.

Also, a flyer would be good to hand out in the community to describe the webpage and how to use the map and detailed forecast section.

### **Dillingham**

Social media that is specific to an area would be helpful. As noted above, Facebook is a powerful tool for sharing information in rural

Alaska and this is true for Bristol Bay as well. For example, there should be a Facebook page for Bristol Bay that includes what local residents consider is their area. Using Facebook, the NWS could deliver quick forecasts specific to the sub-regional areas where the weather can differ greatly. This could include forecasts for 1) the Bay for example, right around Dillingham, 2) another page for the Togiak area, 3) Iliamna Lake, 4) Nushagak River communities, and

5), and finally one for King Salmon, Naknek, and upper AK Peninsula area. Information should be easy to read quickly and include certainty of the forecast through a percentage scale for example. Residents noted that if this was possible to use social media, specifically Facebook, these pages would be highly subscribed to.

## SUMMARY

As heard in both communities from local decision makers and residents, and articulated by a resident of Nome, “wind is what makes or breaks the weather around here.” This was articulated by public safety officers, commercial fishers, and pilots interviewed. In addition, residents would like more detailed local weather for communities and more weather monitoring stations within communities, as well as additional weather stations deployed in remote locations to assist in safer aircraft travel. In western Alaska, forecast areas can be as large as some US states, and a generalized forecast for a marine area as large and dynamic as the Bering Sea is not useful. Findings are organized by region. A frustration voiced in Nome was the impending loss of the local NWS station. This station provides important local weather forecasts by meteorologists who understand the dynamics of the local area. The Nome office provides local forecasting essential for ship navigation, and conditions for local travel both on land and for small planes. The loss of this office was perceived to increase hazards. As noted in Figure 1 the area of responsibility for each of the three forecast offices are large and having more local observations of weather would provide better forecasts to increase accuracy and safety.

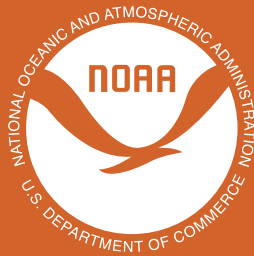
Delivery of weather could be better accomplished through different outlets that

might also act as education tools. Having a forecast specific to a small region on a social media page could include links to more information as well as educational tools to better understand how to access more information. The NWS Alaska has a robust website with the ability to see a forecast for smaller areas, but it’s difficult for the user to understand how to access the information. In addition, besides receiving information residents would like an easy way to relate back to the NWS local observations as well. This might assist the forecaster stationed in the regional office to understand what is occurring and better tailor forecasts to a specific area.

Finally, it was evident that the NWS is highly respected and trusted by western Alaska residents. The observations noted here aim to improve delivery of information to reach a broader audience and provide the most useful information to residents who “live and die by the weather” in western Alaska.



DILLINGHAM. PHOTO BY DAWN MONTANO.



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