7.2 NWS CENTRAL REGION IMPACT-BASED DECISION SUPPORT SERVICES PROTOTYPE PROJECT

Andy Foster*
National Weather Service Springfield, Missouri*

Brian Barjenbruch
National Weather Service Topeka, Kansas

Lewis Kanofsky
National Weather Service St. Louis, Missouri

1. Introduction

The National Weather Service (NWS) is moving forward with Impact-based Decision Support Services (IDSS) to support core partners and build a Weather Ready Nation. This effort includes advancements in the forecast process, evolution of interpretive services, and increased interaction with core partners and the entire weather enterprise. The goal of providing IDSS is clearly stated in the Weather Ready Nation roadmap and is defined as the "NWS' provision of relevant information and interpretative services to enable core partner decisions when weather, water, or climate has a direct impact on the protection of lives and livelihoods."

In an effort to meet the needs of a Weather Ready Nation, the NWS Central Region (NWS-CR) embarked on an initiative to deliver effective and consistent Impact-based Decision Support Services (IDSS) by creating the IDSS Prototype team. The mission of the NWS-CR IDSS Prototype team was to identify a baseline suite of Impact-based Decision Support Services that all NWS Central Region Weather Forecast Offices (WFOs) can provide with an emphasis on consistent production tools, techniques and methodologies.

A team was assembled representing four adjacent weather forecast offices: Kansas City (EAX), Springfield (SGF), St. Louis (LSX) and Topeka (TOP). This team developed, demonstrated and evaluated a 1) Consistent set of Decision Support Services to be provided to the emergency management community, and 2) Common set of IDSS tools to support a common operating picture. From this demonstration, IDSS baselines were identified and implemented in all NWS Central Region WFOs in 2016.

* *Corresponding author address:* Andy Foster, National Weather Service Springfield, 5805 W HWY EE Springfield, MO 65802-8430; e-mail: andy.foster@noaa.gov.

2. Objectives

The team's primary objective was to develop a consistent approach to IDSS by synthesizing best practices from several NWS-CR WFOs. These best practices included locally-developed tools, procedures, interpretive services, and operational aids. The NWS-CR IDSS Prototype Team explored these locally-developed best practices and identified a set of tools, procedures, and services which would both support a common operating picture and cultivate a "whole office" culture to engage the entire forecast staff in serving NWS core partners.

After identifying a baseline set of services and a common protocol, the NWS-CR IDSS team's next objective was to further develop these components and provide them to all NWS-CR WFOs. Using the same components at all WFOs ensures a consistent regional approach to one-to-one decision support as requested by emergency management officials, whether it is provided remotely or onsite.

By providing common tools to procedures that support a Forecaster Decision Support Environment, forecasters are equipped to provide effective decision support services to NWS core partners in support of public safety.

2.1. Applications

A number of applications and procedures were implemented as part of the IDSS "toolbox" to enable NWS-CR WFO's to consistently document and track DSS opportunities, and provide baseline scheduled one-to-one DSS. These tools included 1) DSS request form in which core partners submit detailed requests for DSS, 2) DSS calendar and action log for tracking, planning, and documenting support provided, and 3) Dynamic plotting of DSS events within the Advanced Weather Information Processing System (AWIPS) and other situational awareness viewers. (fig. 1 and 2). This dynamic plotting lets forecasters interpret real-time weather information in relation to the exact location of the event being supported, along with the ability to utilize the full suite of tools available within the AWIPS framework.

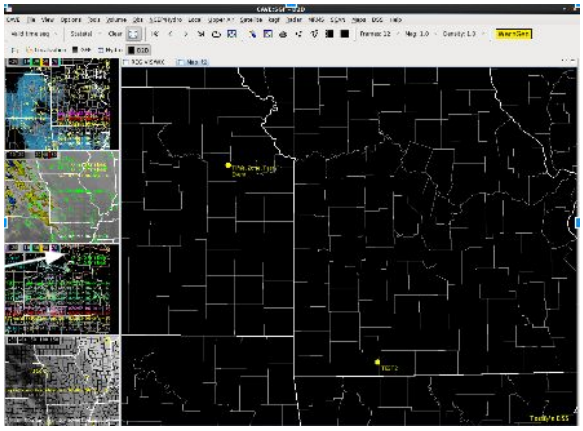

Figure 1: Situational Awareness Display in a National Weather Service Office

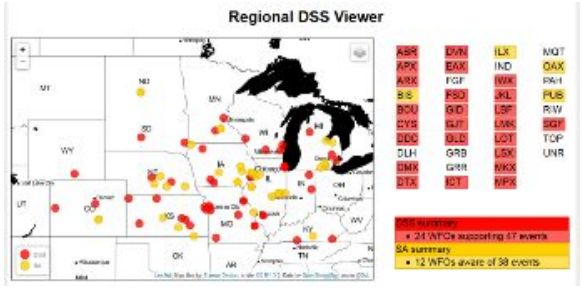

Figure 2: Daily plot of DSS activities across NWS Central Region

These tools comprised an integrated process (fig. 3) that begins with an emergency manager submitting a request to their weather forecast office via a standard form. An automated confirmation email with a dynamic forecast link for the event location is sent back to the requesting official. The incoming request automatically populates the WFO's DSS event calendar, which is internal to the NWS. The DSS event request information also populates an action log and AWIPS. This allows NWS staff to effectively track, plan and provide DSS for scheduled events.

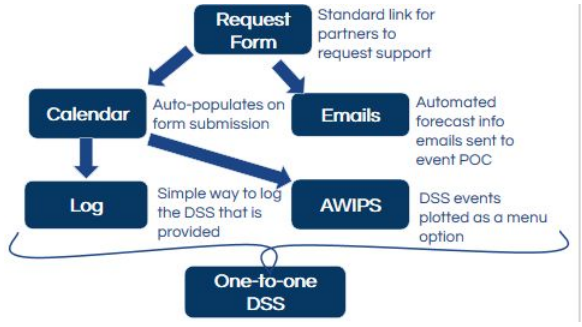

Figure 3: IDSS process flow chart

2.2. **Results**

Since the implementation of the IDSS baseline toolkit in NWS Central region in the spring of 2016, decision support services have been provided to emergency management for over 7200 scheduled events. Information about these scheduled events was retrieved from the WFOs' calendars and then analyzed to provide insight into core partners' DSS needs.

This gives an effective visualization of when and where scheduled DSS is in most demand. First year results indicate that summer weekends (fig. 4 & 5) stand out with the highest volume of DSS requests. This result is unsurprising given the increased frequency of large outdoor events supported by emergency management during the summer months.

In terms of time of day, DSS was most frequently provided in the early morning, and again later in the afternoon and early evening (fig. 6). The morning spike likely reflects the preferred time to receive a daily briefing for an event as many emergency managers need weather briefings in the preparation stages of an event. Event duration averaged approximately seven hours (fig. 7). The volume of DSS requests for a given location was also analyzed in an effort to identify DSS hot spots (Fig. 8).

The ability to analyze where and when DSS is being provided will provide weather forecast offices with useful information to better allocate resources and plan staffing strategies to strategically serve core partners. For instance, DSS repositories for annual events can be developed to support planning.

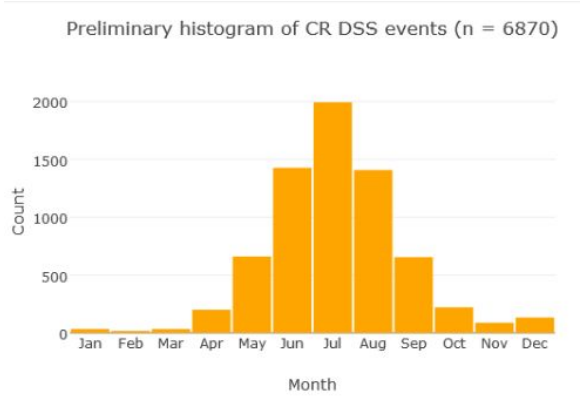

Figure 4: Histogram of DSS requests per month

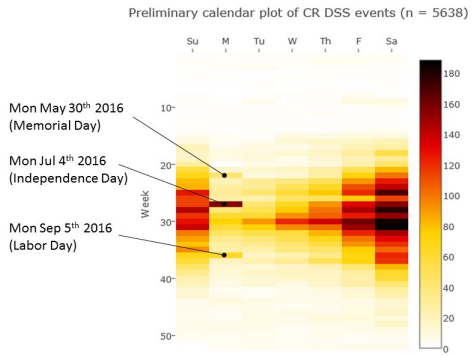

Figure 5: 2-D Histogram of DSS requests per day of the week over the course of the year

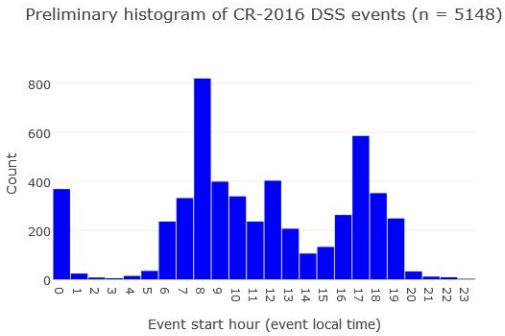

Figure 6: Histogram of DSS requests per hour

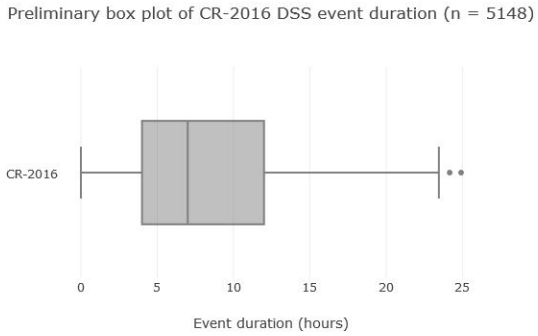

Figure 7: Plot of DSS event duration

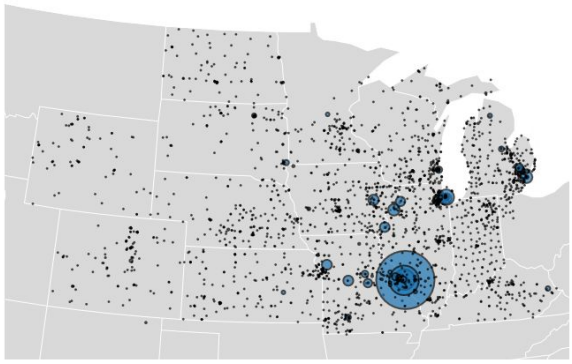

Figure 8: Plot of DSS locations and hot spots

2.3. **Additional Tools**

Additional tools and services are planned to be implemented as part of the NWS Central Region IDSS toolkit. Two of the items under active development are the DSS Matrix or Trigger Chart and the Situation Report. The DSS Trigger Chart is an internal tool to assist WFO operations by assessing confidence and impacts for a given hazardous weather event. This DSS Trigger Chart yields DSS levels that guide consistent operations and services across the spectrum of hazardous weather types. This internal DSS Trigger Chart can serve a number of functions to improve DSS consistency including:

- Identify critical weather periods
- Set operational tempo
- Trigger consistent actions & services
- Allow regional operations centers and adjacent offices to monitor any office's DSS status

DSS levels yielded from the DSS Trigger Chart will guide operational and service tempo, including the issuance and dissemination of interpretive services such as the Situation Report. The Situation Report is disseminated via an email blast for potentially significant events and serves as a “tap on the shoulder” to core partners, and provides information specific to the potentially significant impacts.

2.4. **Future Work**

Moving forward with IDSS will require a “whole office” concept, leveraging the wide array of skill sets and roles within a WFO to achieve effective IDSS. This includes:

- Forecasts based on sound science
- Healthy collaborative partnerships and an understanding of user needs and impacts
- Operational readiness through strategies and tools to support a responsive staff
- Enhanced and effective services to convey a clear and consistent message
- Staff training and preparedness

NWS Central Region has taken initial steps in building an integrated end-to-end process from forecast production to operational support to the delivery of interpretive services.

3. ACKNOWLEDGEMENTS

Special thanks goes out to the NWS-CR Impact-based Decision Support Services Prototype team and NWS-CR IT staff for their efforts in the developing and implementing this project.

Special thanks also goes out to all NWS-CR WFOs for their participation in providing feedback, troubleshooting and implementing the NWS-CR IDSS prototype project.

4. REFERENCES

NWS Weather Ready Nation Roadmap