User-Driven Decision Support

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Decision Support
What does Decision Support Look Like?
Model development producing forecast output

Operational Forecasters using and communicating the forecast model output

Core Partners making decisions based on the weather information provided

GSL Grand Scientific Challenge: “Providing actionable environmental information through the delivery of global to storm-scale predictions and innovative decision support capabilities to serve society”
Modernizing Warnings and Watches

Hazard Services

2021 Global Systems Laboratory Science Review
User Experience (UX) Research

Understanding information needs to influence designs
Social Science Research

User Community
- Incident Commanders/Emergency Managers

Social Science

Operational Forecast Community
- Meteorologists/Forecasters

Social Science

Research & Development Community
- GSL Tools & Applications & Information

Actual NWS Fire Weather Briefing Graphic derived from timing uncertainty research
Uncertainty and Ranges of Possibilities

Timing Uncertainty

Key Points
- Light snow will linger into this evening across most areas, before ending from northwest to southeast.
- Travel impacts will linger in far southeast WI near Lake Michigan until early evening, where snowfall rates to 1/2" per hour are possible.
- Light snow will then taper off by mid-evening in this area.

Magnitude Uncertainty

Expected Snowfall - Official NWS Forecast

- Official Forecast for Snow Amount Potential
  - Highest Probability (50%): 1-3 inches
  - Highest Snowfall Amount: 4-6 inches
  - Highest Total Snowfall: 8-10 inches

- Map showing expected snowfall across different regions.
"How Confident Are You That This Will Happen?"

- Automated verification for forecast calibration and confidence
- Verification can influence forecasters’ confidence!

One of the first applications to quantify confidence based on past performance of forecast sources.
The IDSS Engine Project

- User Information Needs
  - Forecasters
  - Decision-Making Partners
- Ranges of solutions
  - Timing
  - Magnitude
  - Worst Case Scenarios
- Confidence
- Probabilities
- Data Mining
- Verification
Extensible, Scalable, Flexible Development

**IDSS Engine**
Informing decision makers and forecasters by automating event-based risk monitoring

**MICROSERVICE ARCHITECTURE**
- Extensible and scalable
- Platform agnostic
- Easy maintenance and upgrades

**USER-CENTERED DESIGN**
- Prioritizes clear graphics and usability
- User feedback early and often
- Focus on accessibility and inclusive design

**DATA ACCESS**
- Easily add new data streams
- Separates data acquisition from processing
- Extensible and supports multiple formats

**RISK PROCESSOR**
- Supports compound events
- Weather and non-weather inputs
- Approximates onset and cessation ranges

**CONTENT RECOMMENDATIONS**
- Enables multiple communication channels
- Customizable templates
- Suggests data-based content and graphics

**VERIFICATION**
- Builds historical baselines of performance
- Quantifies confidence
- Stratifies by location, timing, and criteria
Importance of GSL’s Decision Support Activities

Decision Support is what gives **meaning** to forecasts.

Forecasters “**connect forecasts and warnings to decisions made**,” and they “**emphasize expert interpretation, consultation, and communication of forecasts and their impacts**”

(NWS Strategic Plan 2019, Objectives 1.1 & 1.2, p. 7)
Summary of Decision Support Activities

**Performance**

- Weekly Program Mgmt activities with internal teams, end users, and funding entities
- Ingenuity to utilize cloud resources for development and evaluation activities
- Steady growth trend in funding and associated team development/hiring activities

**Quality**

- NOAA’s NWS relies on GSL’s software for it’s highest priority, mission-critical warning products and services
- NWS has shifted these development efforts more towards GSL recently
- Numerous other entities seek GSL’s applications

**Relevance**

- Embracing and inclusion of social science research to foster societal benefits
- Focus on DSS as aligned with NWS’s focus on DSS
- Engagement with forecasters, end users, and broader DSS community
NOAA Global Systems Laboratory

Summary: Decision Support

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Thank you!

Global Systems Laboratory
Revolutionizing Decision Support

New Hazardous Weather Warning Tools

Decision Support Research

Delivering Information to Decision Makers with Cutting Edge Science and Technologies

Here is our forecast for when places will see the first inch of snowfall tomorrow. Why does this matter? As snow begins to accumulate, roads can quickly become slippery leading to an increased risk of accidents.

When Will Snow Begin Accumulating?

As Snow Begins Accumulating
- Roads can become snow covered
- Drifting snow will increase
- Visibility will decrease
- Hazards
- Icy or slippery roads
- Increased risk of accidents

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