



NWS Science and Technology Roadmap

Decision Support Tiers 3-5



Team Composition



- **David Ruth, NWS/OST/MDL – Team Lead**
- **Doug Hilderbrand, NWS/OST/SPB – Contributor**
- **Carl Bullock, OAR/ESRL/GSD – Contributor**
- **Heath Hockenberry, NWS/OCWWS/MSD – Contributor**
- **Andy Edman, NWS/WR/SSD – Contributor**
- **Kurt Hondl, OAR/NSSL – Contributor**



Vision/Benefits/Impacts

- **Team Vision:**

- Good customer decisions empowered with essential environmental data, information, forecasts, and warnings that provide enough accuracy, consistency, and lead time for protection of life and property, and for promotion of economic prosperity

- **Benefits**

- Public safety decisions fully informed with environmental information delivered in ways that generate timely, appropriate action
- Flow of consistent and accurate environmental information to customers in ways that eliminate confusion, promote efficiency in decision-making, and ensure everyone is working with the same information
- Every sector of the US economy affected by weather, water, and climate integrates environmental information to improve their decision making
- Widespread use of environmental information that will be available on demand and in widely-supported standard formats through a common virtual interface
- Public sector decision makers at all levels (federal, state, local) will use NWS to inform a wide range of public policy decisions requiring authoritative information

- **Impacts:**

- Reducing deaths and injuries from environmental hazards to a minimal level associated with intentional risk-taking or unavoidable hazards



NO STRETCH² STRETCH



- A 4-D environmental database that can be trusted as the single authoritative source for all public decisions affected by weather, water, and climate.





Goals/Targets: Customer Needs

Goal	Outstanding Issues
1. Timely, accurate, consistent, relevant, and actionable information to support risk-based decision making	Forecast latency, verification methods, forecast coordination, temporal/spatial resolution, completeness, and clarity
2. Comprehensive information (ecosystem predictions, air and water quality, water resources, health effects, etc.)	Need for net-enabled integration
3. Highly accessible and readily understandable information that can be easily ingested by customer decision support systems	Limited server capacity and bandwidth to support interactive web Lack services for diverse user groups
4. Consistency and interoperability across NWS information services (weather, water, climate, space)	Lack of established NOAA-wide standards



Goals/Targets: Emerging Science & Technology

Goal/Target	Outstanding Issues
5. Quickly recognize and respond to evolving dissemination technologies and standards (e.g., GIS, Web 2.0/3.0)	Lack of solid plan and architecture to integrate new dissemination technologies
6. Leverage creation of NextGen to expand net-enabled weather information concepts for aviation weather to all NWS service areas	Reconciling NextGen requirements with NWS forecast process



Key Information Gaps



Gap	Solution Alternative	Impact
<p>1. Forecast latency (i.e., updates not timely)</p>	<p>1.1 Offices and centers update forecasts in cube to reflect recent observations</p> <p>1.2 Automate day 1 update process with rapid refresh model guidance</p> <p>1.3 Status Quo</p>	<p>1.1 Adverse impact on forecaster workload</p> <p>1.2 Unknown impact on forecast accuracy and consistency</p> <p>1.3 Forecasts not useful to all customers (e.g. aviation)</p>
<p>2. Gridded verification methods not established</p>	<p>Alternatives covered by S&T Verification Team</p>	<p>Impacts covered by S&T Verification Team</p>
<p>3. Consistency lacking spatially, temporally, and among forecast elements</p>	<p>3.1 Centrally facilitate forecast coordination between offices</p> <p>3.2 Establish single authoritative model (or ensemble)</p> <p>3.3 Status Quo</p>	<p>3.1 Planned and orderly changes to guidance</p> <p>3.2 Unknown impact on forecast accuracy</p> <p>3.3 Forecasts not useful to many customers</p>



Key Information Gaps



Gap	Solution Alternative	Impact
4. Temporal resolution inadequate	4.1 Increase database to hourly resolution or finer 4.2 Automate day 1 update process with hourly model guidance 4.3 Status Quo	4.1 Increase in forecaster workload (“chasing obs”) 4.2 Unknown impact on forecast accuracy 4.3 Forecasts not useful to all customers (e.g. aviation)
5. Spatial resolution inadequate	5.1 Increase database spatial resolution at all field offices 5.2 Centrally interpolate where necessary 5.3 Status Quo	5.1 Adverse impact on GFE performance 5.2 Minor additional workload on NDFD CSS 5.3 Forecasts not as useful in areas of complex terrain
6. Forecast elements incomplete	6.1 Include elements for all NWS forecast products within datacube (e.g., hydrology, aviation) 6.2 Status Quo	6.1 Forecasts more useful to customers 6.2 Forecasts not as useful to as many customers



Key Information Gaps



Gap	Solution Alternative	Impact
7. Uncertainty and probability information lacking	<p>7.1 Post-process NDFD to add uncertainty information</p> <p>7.2 Develop tools and techniques for forecasters to enter uncertainty information as part of NDFD</p> <p>7.3 Provide uncertainty information for model guidance only</p>	<p>7.1 Forecast uncertainty quantified within NDFD</p> <p>7.2 Forecast uncertainty quantified within NDFD</p> <p>7.3 Uncertainty information unavailable for official NWS forecast</p>



Key Information Gaps



Gap	Solution Alternative	Impact
8. Unknown standards for consistency and data integration NOAA-wide	8.1 Coordinate with NOAA OCIO and other agencies 8.2 Solve each project independently (e.g., Nextgen)	8.1 Interoperability according to standards 8.2 Optimized solutions for particular users



Key Information Gaps



Gap	Solution Alternative	Impact
9. Sector-specific digital thresholds	9.1 Ad hoc user-specified thresholds for alerting 9.2 Users register for alerts from NWS-assembled threshold lists for various sectors 9.3 Status Quo	9.1 System may easily be overloaded 9.2 Somewhat limited, but more manageable 9.3 Users must monitor database on own
10. Sector-specific internet map services	10.1 Develop IMS like nowCoast for other service areas 10.2 Status Quo	10.1 NWS users who are unable to process digital forecasts will be better served 10.2 Services provided by private sector



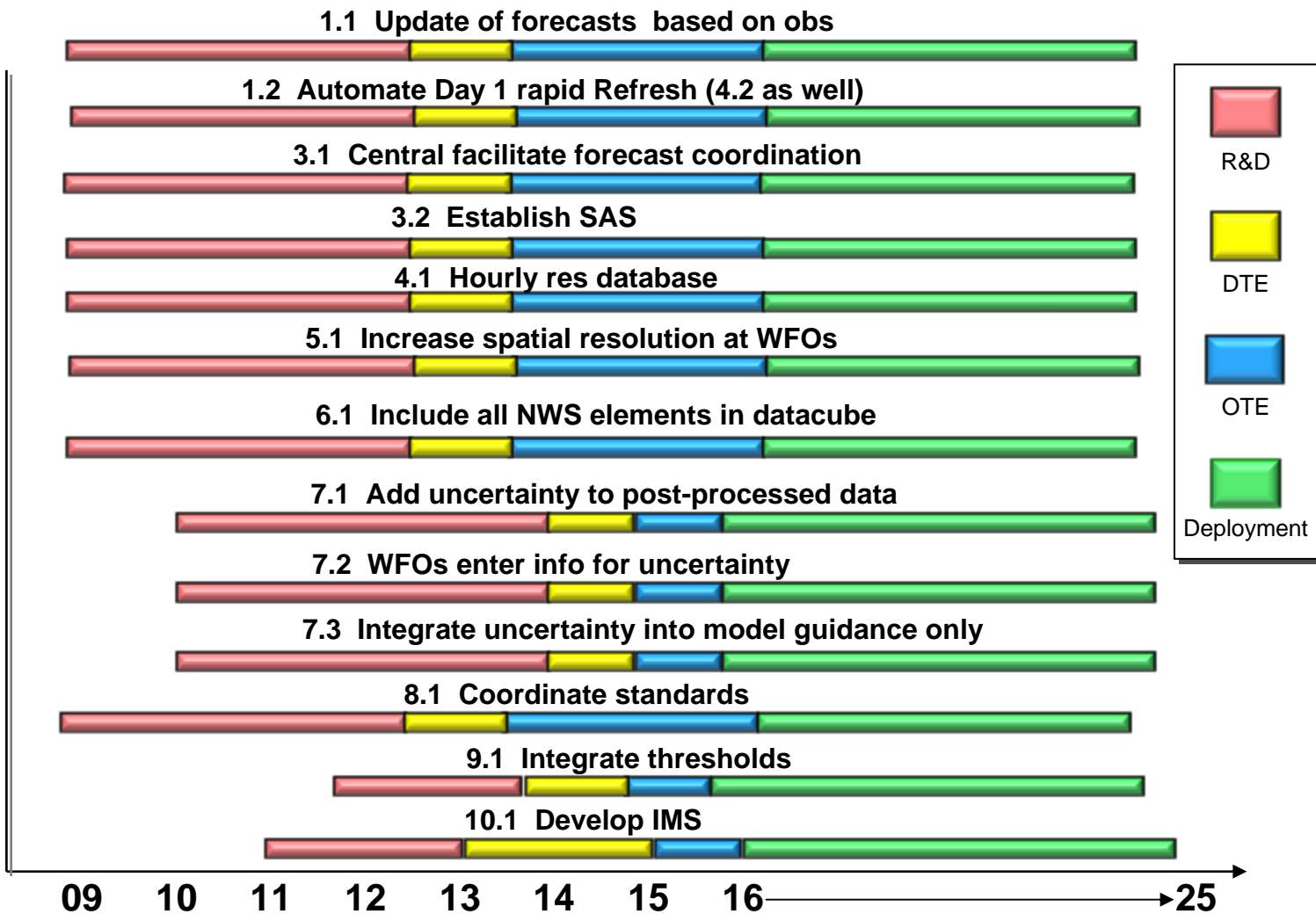
Research Needs and Opportunities



- **Short-term**
 - Blend rapid-refresh model guidance with official NWS forecast while maintaining temporal, spatial, and inter-element consistency
 - Increase spatial resolution of model guidance to match WFO resolution
 - Supplement official NWS forecasts with consistent uncertainty information
- **Long-term**
 - Optimize/address sector-specific thresholding
 - Integrate weather with other environmental data

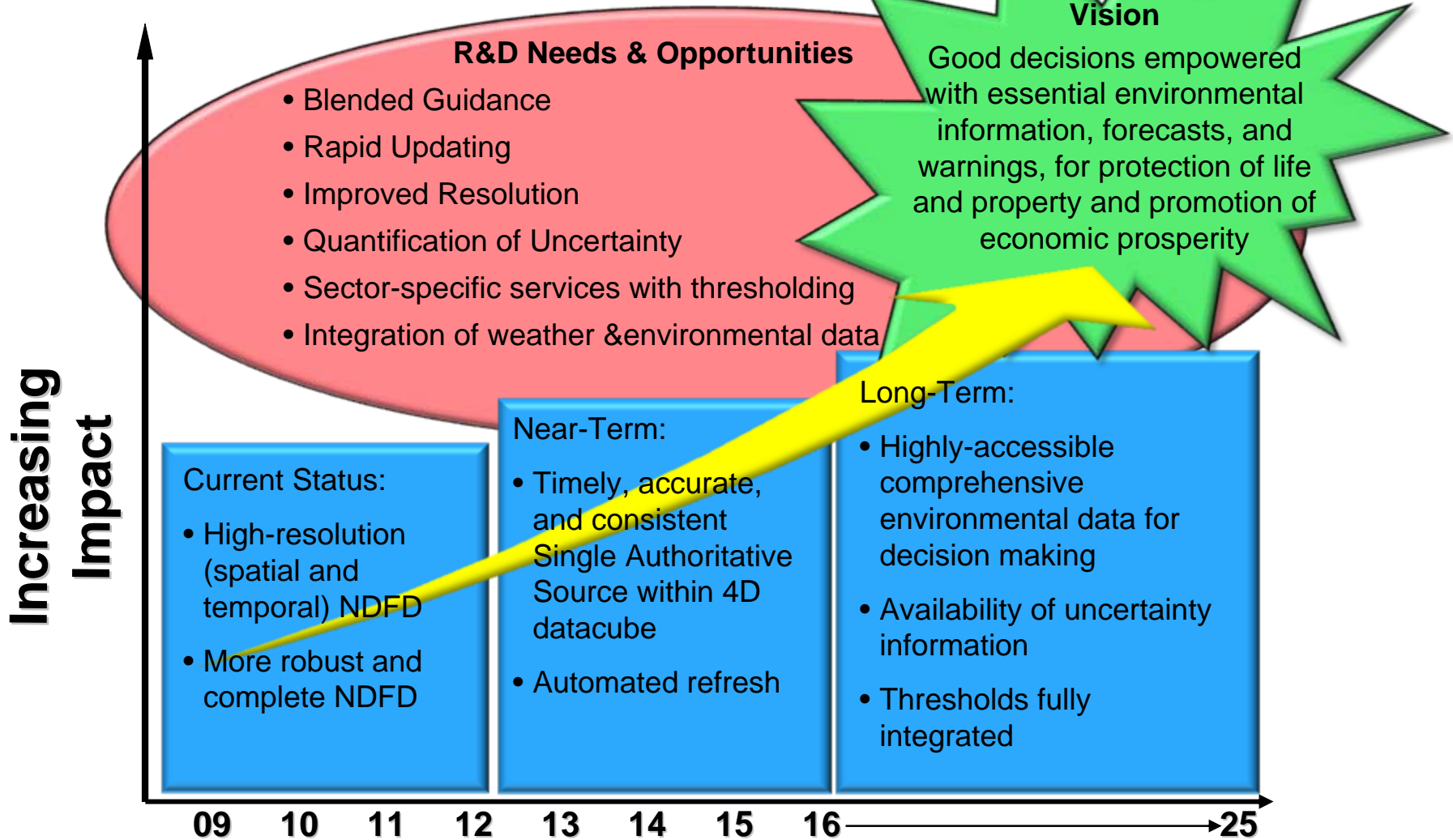


DSS 3-5 Alternative Solutions





Focus Area Team Summary: DSS 3-5





NWS Science and Technology Roadmap

DSS 3-5 Team Additional Information



Target Performance Measures: DSS 3-5



Proposed	Current (2009)	FY 16 Target Example	FY 25 Target Example
Dissemination latency Time for warning messages	<10 sec for NWWS <30 sec for EMWIN <1 min for NWR <3 min for Web Services	<8 sec for NWWS <25 sec for EMWIN <45 sec for NWR <2 min for Web Services	<6 sec for NWWS <20 sec for EMWIN <30 sec for NWR <1.5 min for Web Services
NOAANet connectivity and bandwidth expansion	WFOs, RFCS, Regions, Centers, AWIPS	Support mission-critical observation, processing, and dissemination systems with VSAT satellite backup link	Support all observation, processing, and dissemination systems with VSAT satellite backup link
Smart push-pull capability to support Decision Support Service (DSS)	Tier 5 and 4	Tier 5, 4, and 3	Tier 5, 4, 3, 2, and 1
Adopt and implement common data and protocol standards	None	Major systems	All systems
DSS Support (Scale)	Ad hoc Local	Local	Local, Regional, National
NWS DSS Delivery Mechanisms	Web, NOAA Weather Radio,, Briefings	Mobile Devices, Web 2.0, Webinars	Anytime & Anywhere, Web 3.0