



Status and Future Path of Evolving the NWS

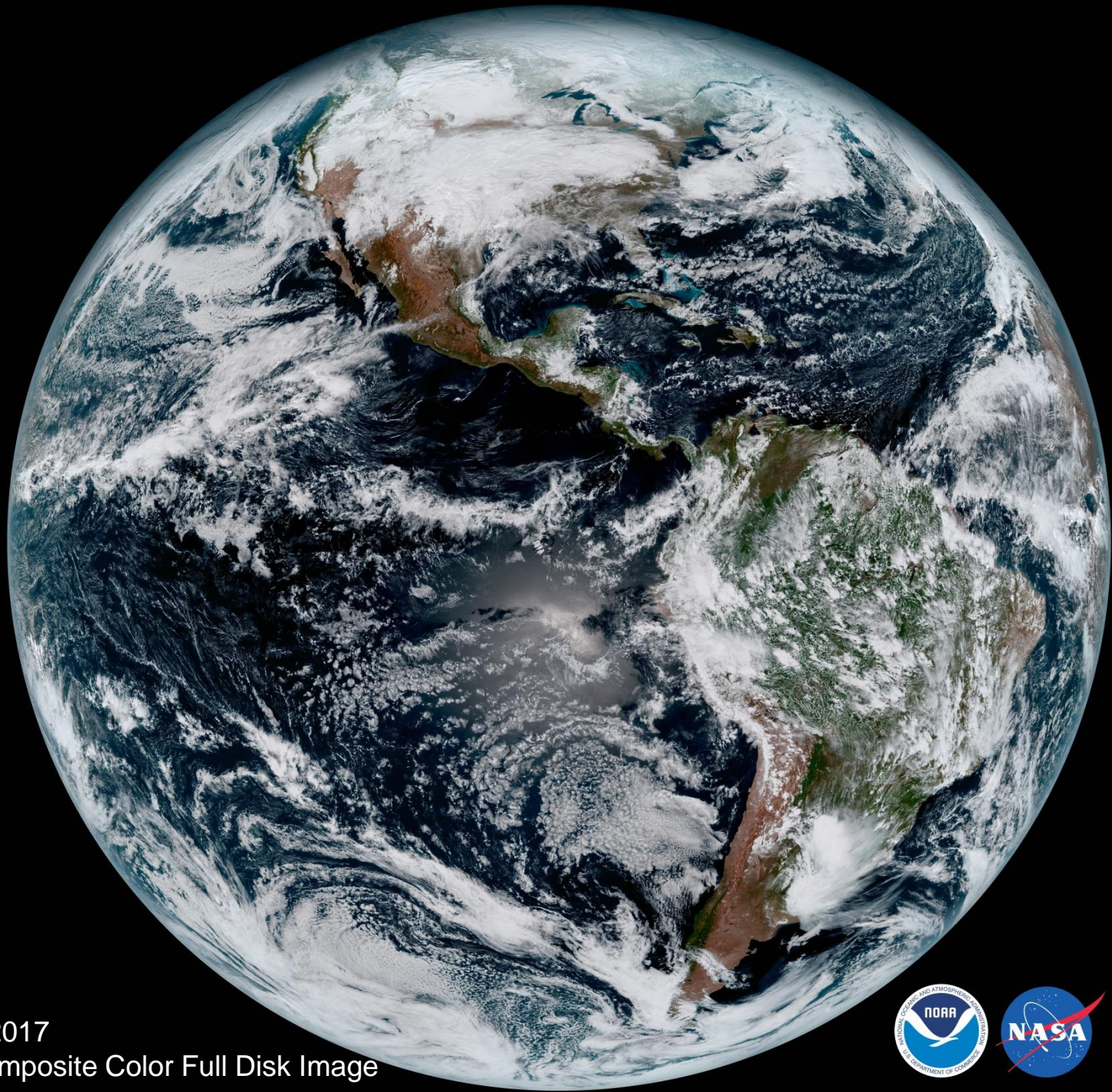
Dr. Louis W. Uccellini

Director, National Weather Service

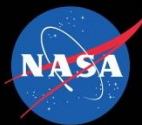
NOAA Assistant Administrator for Weather Services

January 26, 2017 – NWS Partners Meeting

Seattle, WA



January 15, 2017
GOES-16 Composite Color Full Disk Image





Outline

- Transition
- NWS HQ Organization
- Budget
- Portfolio Highlights
- Weather-Ready Nation
- NWS Evolve
- Impact-based Decision Support Services



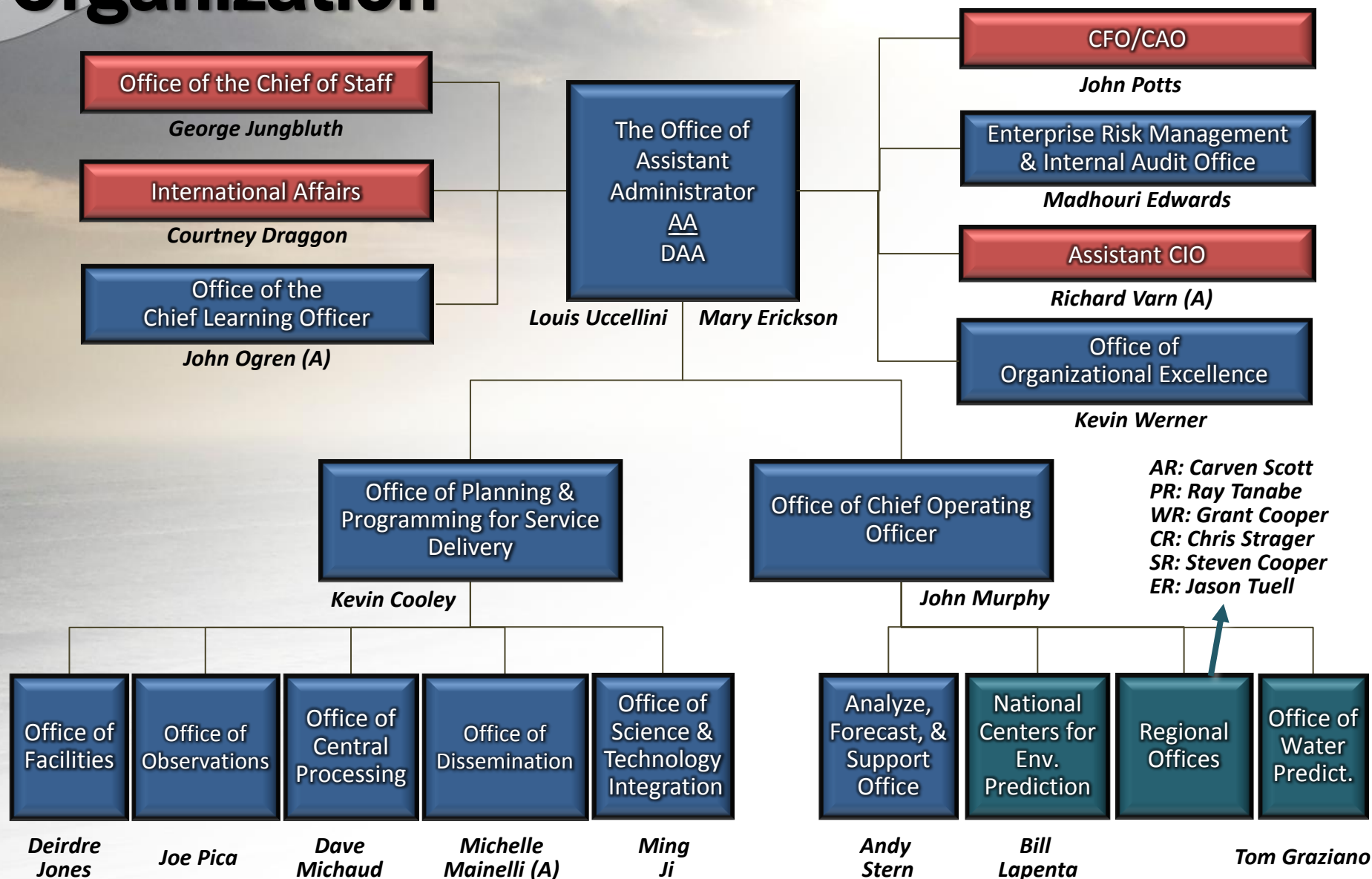
Transition

NWS HQ Organization

New HQ Office

Field Office

Existing HQ Office



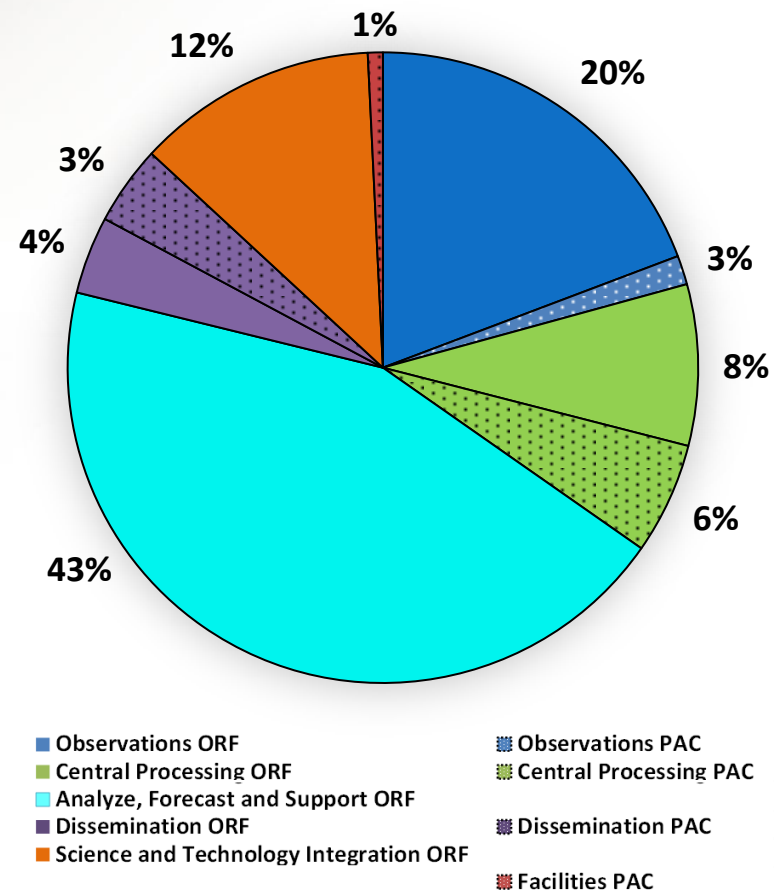
FY 2017 Full Year Budget Target based on FY 2016 Enacted Level

Composition by Portfolio

PPA	Funds*	Full Time Employees (FTE)
Observations ORF	216,363	804
Observations PAC	16,720	-
Central Processing ORF	92,871	232
Central Processing PAC	64,261	22
Analyze, Forecast and Support ORF	496,031	3,010
Dissemination ORF	44,743	82
Dissemination PAC	45,684	-
Science and Technology Integration ORF	138,826	488
Facilities PAC	8,650	-
TOTAL	1,124,149	4,638

* In thousands of dollars

Funds Breakdown



FY 2017 Portfolio Highlights

Observations

- NEXRAD Service Life Extension
- ASOS SLEP
- Radiosonde frequency migration (auto-launchers)
- Achieve IOC for GOES-R
- Weather Buoy Recapitalization

Science & Tech Integration

- Complete GOES –R training development (SIFT)
- National Water Model v 1.1
- GDAS/GFS upgrade (last spectral upgrade)
- NGGPS Dynamic Core Integration
- HWRf upgrade
- Implement Impacts Catalog IDSS Portal
- National Blend of Models v3.0

Facilities

- Complete relocation of WFO Davenport & WFO Boston
- Initiate Facility Assessments for 3rd 1/3
- Complete Phase 1 disposal of Annette Island, Alaska

Central Processing

- AWIPS configured for GOES-R data
- Complete use case development for NAWIPS
- Extend the performance period WCOSS supercomputing systems and service.



WRN Ambassador Initiative
4100+ Ambassadors

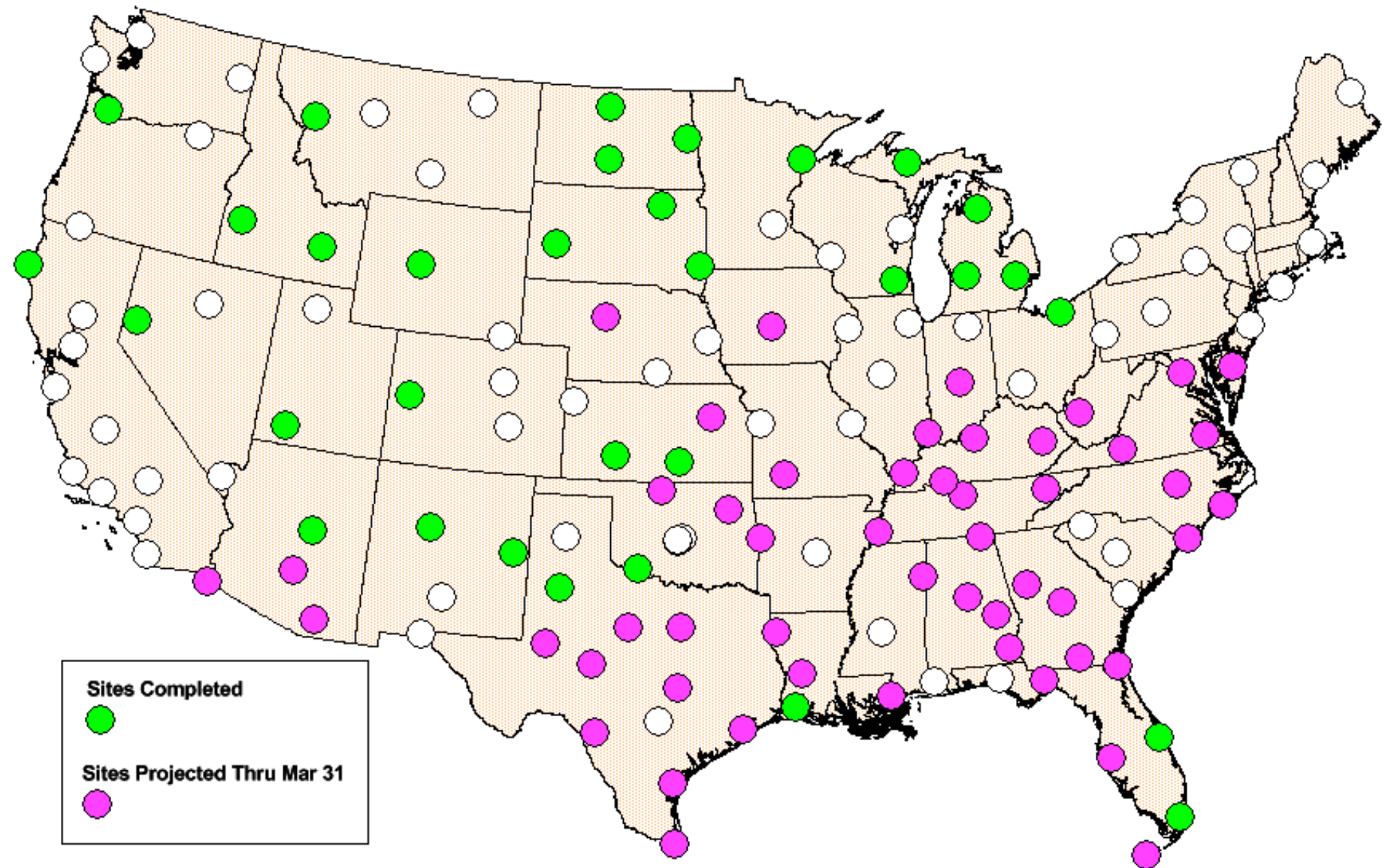
Dissemination

- Shutdown legacy NWSTG
- OneNWS upgrades for 50 CONUS sites
- Mass Dissemination for hazardous weather
- GOES-R Readiness

Analyze, Forecast, Support

- Evaluation of National Blend of Models prototype demonstration
- Impacts Catalog demonstration to show integration with field ops
- Operational Storm Surge Watch/Warning in 2017
- Integration of GOES-16 products into SWPC operations & website
- CONOPS for NWC Operations Center
- Probabilistic snowfall experiment expanded to 44 WFOs
- Add WFOs to DOT Pathfinder Project

Signal Processor Tech Refresh (SLEP) Deployment



A/O Jan 6, 2017

Integrated Dissemination Program (IDP)

Long-Term Sustainable Solution

Future Functionality at IDP College Park and Boulder (Expected By March 2017)

- NWS Chat
- AOMC/EM7
- SPOT

IDP

IDP Dissemination
Site DSRC
(Boulder, CO)

IDP Dissemination
Site NCWCP
(College Park, MD)

**Network
“Backbone”**

Supercomputer
(Reston, VA)

Supercomputer
(Orlando, FL)

Functionality in place at IDP College Park and Boulder* (as of December 2016)

- NOMADS*
- FTPPRD*
- TGFTP*
- MADIS*
- MRMS*
- MAG*
- Radar Level 3*
- NWSTG Switch*
- BUFR Migration Tool (BMT)*
- NLETS*
- Radar Level 2*
- EDIS/FTPmail*
- HazCollect (Extended)*
- HazCollect (Legacy)*
- FNMOC
- FTTPush*
- Global Information Center System (GISC) *
- IRIS/INWS*
- GMDSS*
- **SNOTEL***
- **Hydrometeorological Automated Data System (HADS)***
- **HF-FAX**
- SOCKET/CMHP
- NWS GIS Services
- NOS Chart Tile
- nowCOAST
- Weather.gov
- VLAB
- SPOT

** Application operational in both College Park & Boulder*

OCNUS

COMPLETE

CONUS
WFOs

IN PROGRESS

RFCs

IN PROGRESS

Internet

National
Centers

COMPLETE

External
Partners

COMPLETE

CWSUs /
FAA CMD
CTR

IN PROGRESS

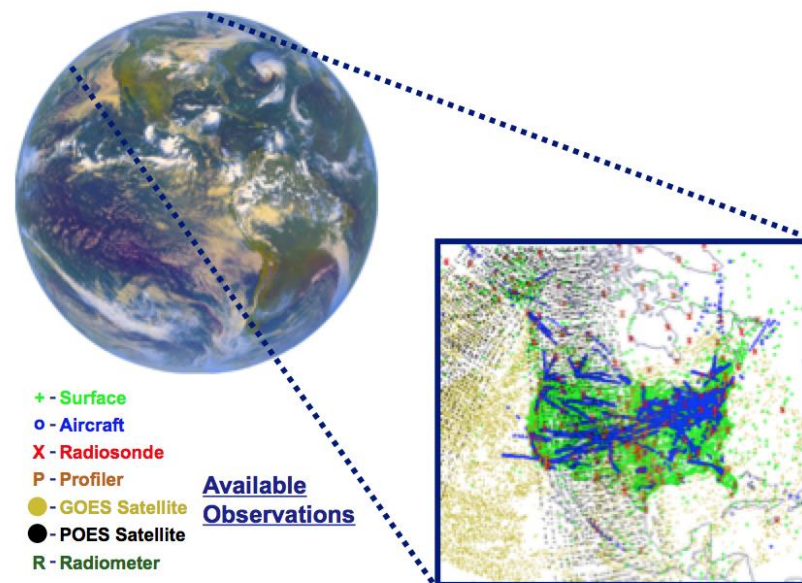
“OneNWS” Network

The future OneNWS network will consolidate all operational networks (OPSnet, Regional, etc.) as a single managed network under NCEP Central Operations (NCO).

MADIS

Meteorological Assimilation Data Ingest System

- An operational system with **100% backup capability** on NWS-managed IDP systems in College Park, MD and Boulder, CO providing a comprehensive, accurate, timely, and high density observational infrastructure for use by the weather enterprise
- Provides access to real-time and archived quality controlled datasets
- Provides a conduit to operations
 - Clarus
 - Aircraft Based Observation ESRI interactive graphical display.
 - Advanced Vertical Atmospheric Profiling Sensing (AVAPS) data.
 - Hydrometeorological Automated Data System / Automated Flood Warning System (AFWS).
 - Snow Telemetry (SNOTEL)



MADIS observations covering North America

<http://www.madis.ncep.noaa.gov>

<https://madis-data.ncep.noaa.gov/MadisSurface/>

NGGPS Status and Future Plans

- Global model dynamical core selected (GFDL FV3) and Phase 3 integration is underway
 - Unified model strategic planning is underway
- Teams continue to identify, prioritize and develop model component and system improvements for NGGPS. Related plans include:
 - Accelerated evolution of model physics - develop/implement Common Community Physics Package (CCPP)
 - Data assimilation improvements
 - Enhanced across-team coordination
 - Accelerated model component and system development and integration of community development into testing at EMC
- Community Involvement
 - Coordinating proposal driven scientific development by universities, federal labs, and testbeds (including 2016 FFO selections);
 - Employment of GMTB
 - Collaboration with JCSDA through JEDI



STI Modeling Program Website:

<http://www.weather.gov/sti/stimodeling>

Information NGGPS:

http://www.weather.gov/sti/stimodeling_nggps

Information on NGGPS dycore testing is available at:

http://www.weather.gov/sti/stimodeling_nggps_implementation_atmdynamics

Information on Grants:

<http://www.weather.gov/sti/stigrants>



Questions?

Implementation Plan of FV3GFS (FY17-FY19)

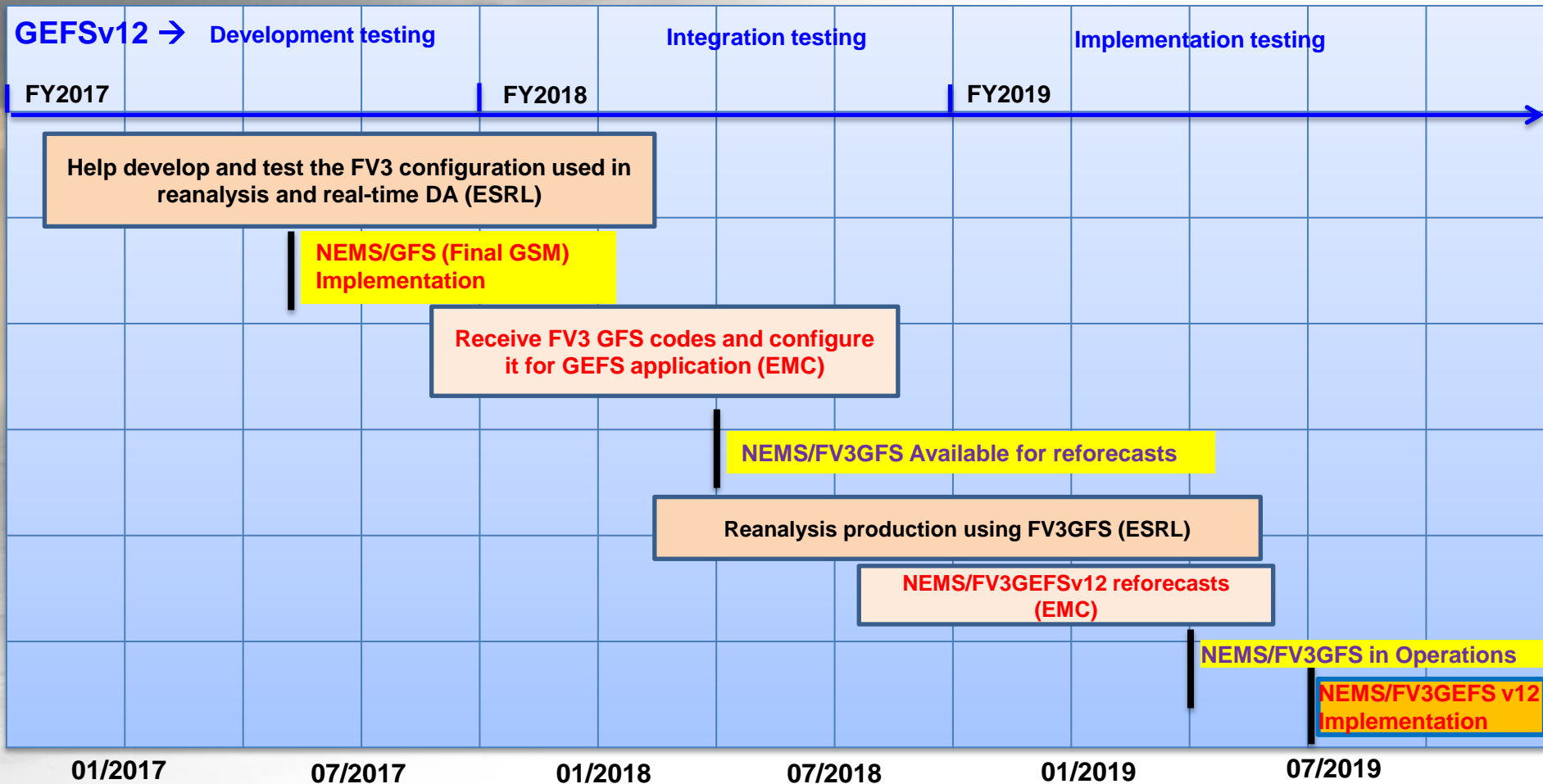
FY17				FY18				FY19			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Evaluate FV3 structure and document FV3 modeling system											
	Implement FV3 dycore in NEMS [@]										
		Couple FV3 to GFS physics (NUOPC physics driver) perform forecast-only experiments, tuning and testing ^{&}									
			Develop DA techniques [%] (native grid vs physics grid; New data)								
				Cycled experiments, New physics options, benchmarking, computational efficiency & optimization							
					Preprocessing and post-processing, up & downstream dependencies						
Q3FY19 FV3GFS Configuration						Test and Implement NGGPS Verification tools					
						3-year retrospective + real-time parallels, EMC and Community Evaluation					
						Early experimental implementation of FV3GFS (~13km L64) w/cycled DA		Code delivery, NCO Parallel & operations		NEMS/ FV3GFS in operations	

[@] The targeted FV3GFS resolution is ~10km L128 with model top ~80 km.

[&] New physics: Scale-aware convection and PBL, Double-moment cloud and aerosol-aware microphysics, Unified convective and orographic gravity wave drag etc

[%] ~25km L128 4D-EnVAR data assimilation

Proposed Plan for FV3-based GEFS v12 (sub-seasonal ensemble system) with reanalysis and reforecast

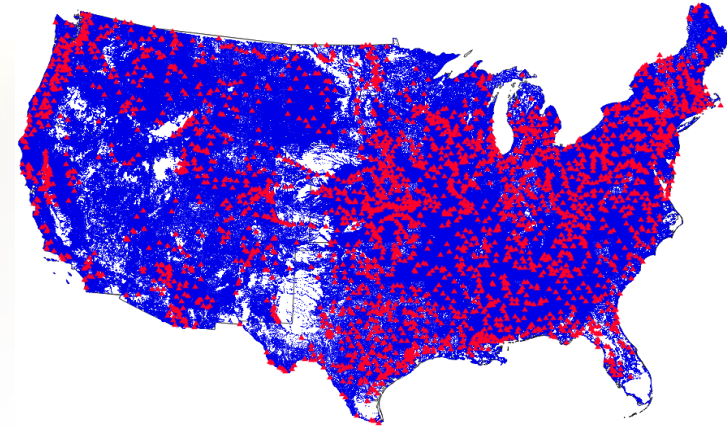


Proposed changes: 1) Start producing FV3-based reanalysis for GEFS v12 in ~Q1 FY18, using the configuration of FV3GFS. 2) Reforecasts will commence soon after starting the reanalysis, uncoupled*, with 2-tier SST approach, and will include extension to 35 days

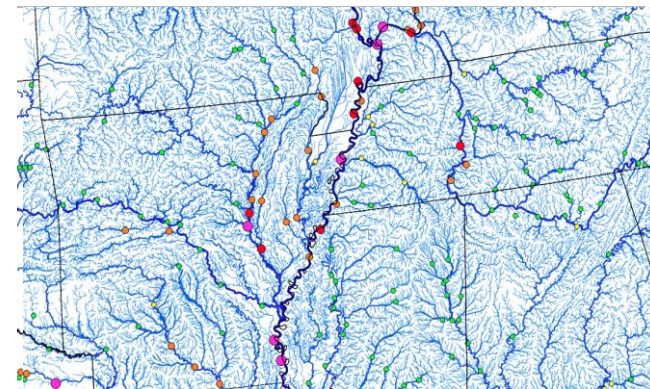
National Water Model (NWM)

Version 1.0 Implemented August 16, 2016 : Based on NCAR WRF-Hydro

- **Foundation for sustained growth in nationally consistent operational hydrologic forecasting capability**
- **Goals for NWM V1.0**
 - Provide forecast streamflow guidance for underserved locations
 - Produce spatially continuous national estimates of hydrologic states (soil moisture, snow pack, etc.)
 - Implement a modeling architecture that permits rapid infusion of new data and science, and allows for geo-intelligence linkages
- **Hydrologic Output**
 - River channel discharge & velocity at 2.7 million river reaches
 - Surface water depth and subsurface flow (250m CONUS+ grid)
- **Land Surface Output**
 - 1km CONUS+ grid (soil and snow pack states; energy and water fluxes)
- **Data Services**
 - Public-facing NWC website
 - Data feed to River Forecast Centers
 - NOMADS data service



Current NWS AHPS locations (red)
NWM output locations (blue)



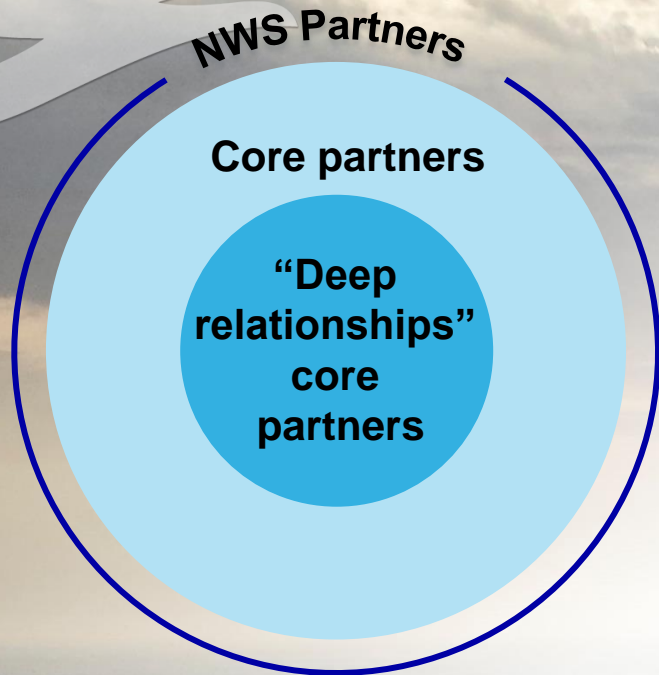
Current NWS River Forecast Points (circles) Overlaid with NWM Stream Reaches

National Water Model (NWM)

Future Enhancements

- **NWM Version 1.1 will be first NWM upgrade, targeted for Q3 FY17**
 - Enhancements based upon from feedback from the RFCs, broader NWS user base, internal evaluation and OWP research plans
- **NWM Version 1.1 Upgrade Highlights**
 - Short range extended to 18 hours, medium range cycling increased to 4 X day
 - Regional parameter calibration performed to reduce hydrologic biases
 - Forcing improvements for NWM Analysis and Short Range forecasts
 - Corrections and additions to stream network
 - Improved soil infiltration and snowpack schemes
 - Large reduction in output file size
- **Longer Term Efforts**
 - Domain expansions to Hawaii and Alaska
 - Coupling to coastal models (for improved total water forecast in coastal zone)
 - Hyper-resolution modeling
 - Drought and water quality modeling
- **NWM Version 1.2 targeted for Q1 FY18, with annual updates in Q1 every year thereafter**

OWA Finding: Need for Local IDSS



- NWS IDSS users are engaged and loud and clear on the need for:
 - Accuracy and consistency
 - Timely/reliable delivery
- 94% of IDSS is provided locally through the Weather Forecast Offices – No Office Closures!
- Success depends on:
 - IDSS focused on core partners and deep relationships with those partners
 - Knowing partner key decision points/thresholds and risk preferences
 - Providing consistent IDSS at national, regional and local levels
- In response:
 - NWS must work towards a Fully Integrated Field Structure based on a Collaborative Forecast Process
 - Working towards “One NWS – One Forecast” to ensure consistency and accuracy

NWS Evolve Strategy

NWS Vision:

Weather-Ready Nation: Society is prepared for and responds to extreme weather, water, climate events

The vision is realized through the NWS mission: **Provide forecasts and warnings for the protection of life and property and to enhance the national economy**

To realize the full value of our mission and to Evolve the NWS, NWS will:

Deepen our service to core partners: Testing and implementing the Operations and Workforce Analysis (OWA) recommendations through the NWS Program Management Office (PMO)

Enhance our science and technology capabilities: Advance NWS infrastructure, science, and technology to the “cutting edge” (e.g., next generation modeling and data assimilation systems)

Engage strategically with and grow the broader enterprise: NWS fosters partnerships at all levels, proactively harnesses external advances that benefit the mission, and enables the enterprise to grow

Field-Driven Proposals to Unlock Staff Time



Involve, Engage, and Communicate with Internal and External Stakeholders Throughout!

NWS Strategic Outcome: *A Weather- and Water-Ready Nation*



“Ready, Responsive, Resilient”

Becoming a Weather-Ready Nation is about
building community resiliency in the face of increasing vulnerability to extreme weather, water and climate events

Better forecasts and warnings

Consistent products and services

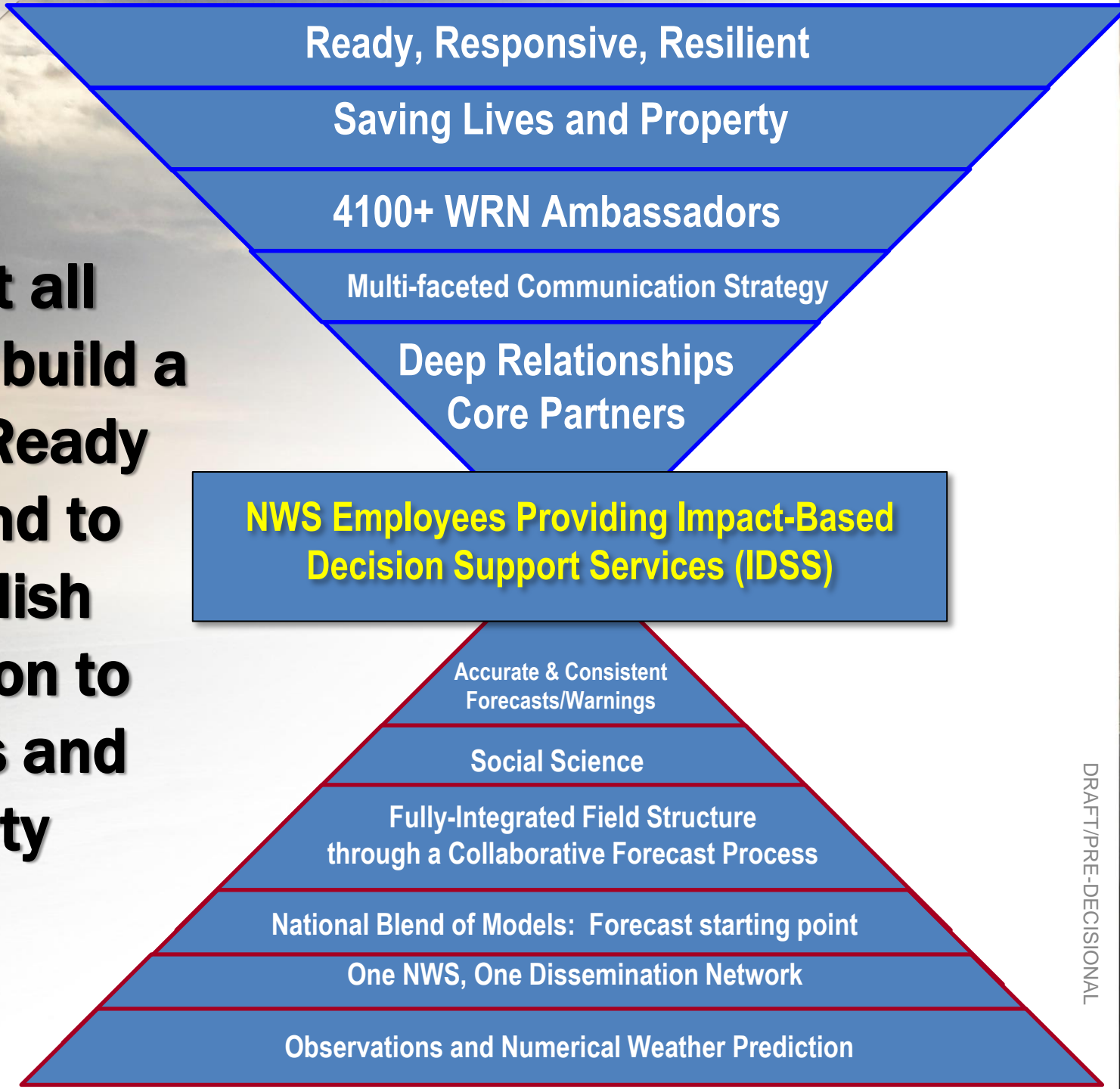
Actionable environmental intelligence

Connecting forecasts to decisions

Involves the entire US Weather, Water and Climate Enterprise WORKING TOGETHER

We have 4100+ WRN Ambassadors

**Pulling it all
together to build a
Weather-Ready
Nation and to
accomplish
our mission to
save lives and
property**



January 2016 Blizzard and Coastal Storm: Connecting All of the Pieces

Jan 15 - 18

Medium range products begin identifying snowstorm threat for the end of next week

NWS offices begin briefing partners on potential storm

Jan 19

Confidence increasing

Partner Coordination/
Briefings



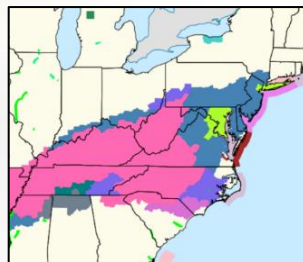
Media interviews



Jan 20

Partner Coordination/
Briefings

Blizzard Watches Issued



Media interviews

Jan 21

Fed./state/local govts make critical decisions before the snow begins

State of Emergency Declared:

- North Carolina
- Virginia
- West Virginia
- District of Columbia
- Maryland
- Pennsylvania
- New Jersey
- New York

Blizzard Warnings Issued

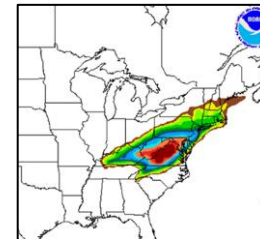
1 pm: Press Briefing



Jan 22

Snow begins in the Mid-Atlantic

Snow forecast adjusted to include NYC in Blizzard Warning



Schools/Govt

Close

Flights Canceled
Roads Closed



January 2016 IDSS Example: Long Island Expressway comparison to 2013

2013 Snowstorm



The Past

2016 Snowstorm



**With NWS Impact-Based
Decision Support Services
(IDSS)**

THANK YOU!



Vision for NWS Operations

Diagnostic findings

From the operations and workforce of today...

Production focus, with staff operations focused on forecast “desks”

WFO staff constrained by 24/7/365 shift requirements

“One size fits all” staffing based on requirements of the past

Siloed operations - each office must fully support itself

Overlapping roles and requirements across field offices

Vision

...to a **fully integrated field structure** through a collaborative forecast process, involving all offices at all levels



Service delivery focus on areas of highest impact – including analysis, forecasts, warnings, & partner support



Local staff work hours set strategically to meet partners' needs



Staffing levels based on meeting partner needs



Field offices work collaboratively to support each other and their partners



Functions aligned to expertise, increasing role clarity and making best use of resources

Vision for Evolving the NWS through service and science: five objectives

Why evolve?



Vulnerability of the American population to severe weather events



Need for NWS services among deep core and core partners



Ongoing need to continue to **meet the mission** of the NWS

Deepening our service to core partners

- Better serving partners by **enhancing quality and consistency of IDSS** at all levels of the organization, in all current locations because analysis shows 94% of partners are local
- Building a flexible and nimble **workforce the NWS needs to deliver science-based services**: both through enhancing skills today and hiring for tomorrow
- Improving **effectiveness of forecasting in support of IDSS through a collaborative process** that makes the best use of technology, reduces duplication, and ensures consistency of the forecast
- **Matching workforce to workload** across the organization and building a stronger organizational structure to better meet the needs of NWS partners

Enhancing our science and technology capabilities

- Supporting the **innovation, science, technology**, and culture required for NWS to continue improving over time