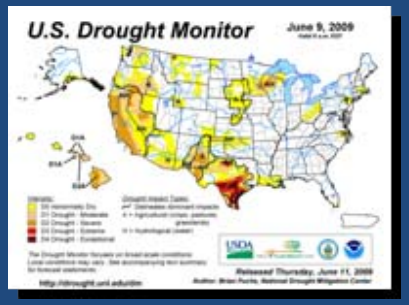
NWS SCIENCE AND TECHNOLOGY ROADMAP

*Preparing for Tomorrow… Today*



# NWS – OAR Retreat Introduction and Objectives

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# NWS - OAR Retreat Goals

- ***Concurrence on S&T areas of alignment, areas of opportunity for OAR research partners, areas of opportunity for additional research partners***
- ***Draft agreement on way ahead for improving research coordination in several key areas (e.g. climate modeling, hydrology, DSS (in Next-Gen context))***
- ***Conceptual agreement for NWS and OAR partnership to pursue a new Science-Service Challenge demonstration***

# Potential Societal Benefits

## Improved Enabling Capabilities

- Observations
- Forecasts
- IT Infrastructure
- Dissemination/Access
- Decision Support
- Verification & Metrics
- Customer Outreach & Feedback Technologies
- Incorporating Social Science Strategies

## Service Area Improvements

- Tropical Cyclone, Track, Intensity, Precip Forecasts
- Tornado and Flash Flood Warnings
- Aviation, Fire, and Marine Forecasts
- Flood and River Predictions
- Air Quality Predictions
- Space Weather
- Seasonal Climate Forecasts for Energy, Agriculture, Ecosys, etc

## Potential Benefits

- Reduce $10B/yr in trop cyclone damage
- Reduce $1B/yr in damage from severe wx
- Reduce $60 B/yr losses from air traffic delays
- Reduce $4.3B/yr in flood damage
- Reduce mortality from 50,000/yr from poor AQ
- Reduce $365M/yr in losses (power industry)
- Reduce $7B/yr in losses (drought)

# S&T Roadmap: Guiding Principles

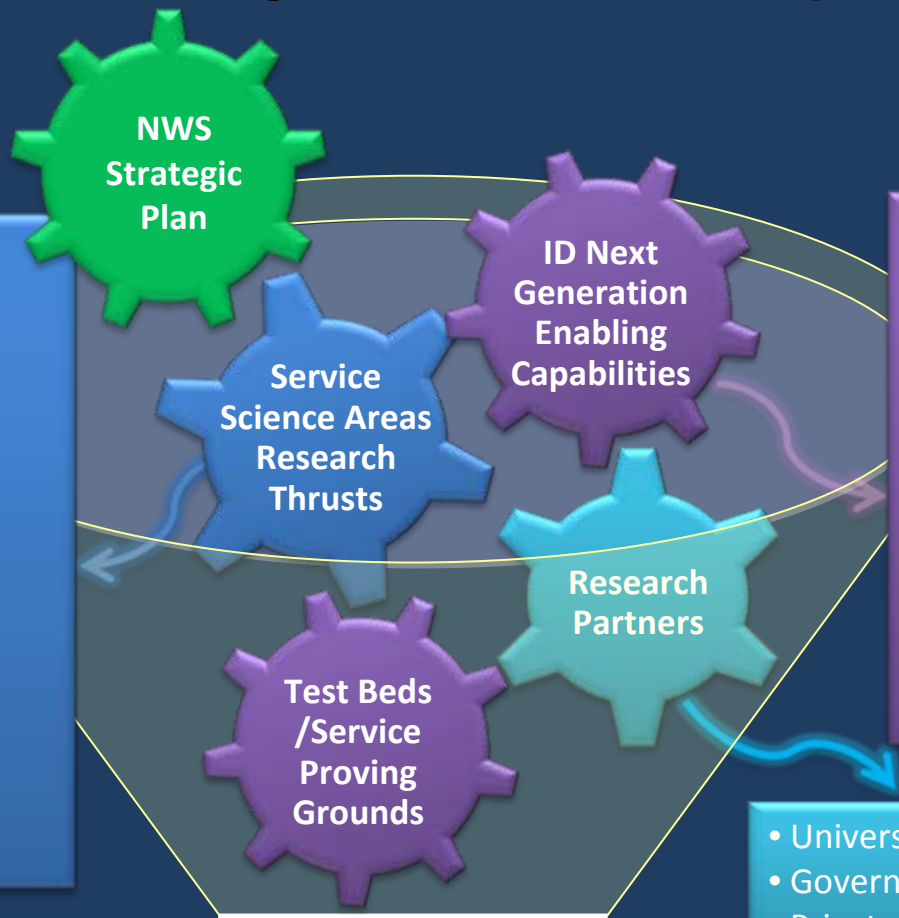
- **Meet NWS Strategic Plan S & T objectives for 2025**
- **Develop service area stretch goals to rally and influence Nation's research strategies, plans and investments**
- **Harness the Nation's best expertise to solve scientific challenges**
- **Field next generation observing/forecast systems to…**
  - ✓ *Ensure timely, accurate and relevant weather information for governmental decision makers, general public, private industry*
- **Ensure rapid, on-demand access to information for all users of NWS information**

# Sustaining an Enduring R2O Process

- Collect R&D project-level data (Q1)
- Annual NWS-OAR Summit (Q1)
- Prioritize R&D transition portfolio (Q2)
- Evaluate gaps, alignment, and progress in S&T Roadmap (Q2)
- Input into PPBES (Q3 & Q4)
- OAR Laboratory Review (2 – 3 Labs per year)

# Roadmap Construct (Dec 08)

- Fire Weather
- Hydrology
- Aviation
- Severe Weather
- Winter Weather
- Marine
- Tropical Weather
- Climate
- Air Quality
- Space Weather
- Tsunami
- Sensible Weather & Emerging areas (e.g. energy, ecosystems)




- Observations
- Data Assimilation
- Forecasting:
  - Models
  - Post Processing
  - Human Aided
- Dissemination
- Decision Support
- Verification & Metrics
- Customer Outreach, Feedback Technologies
- Social Sciences

- Universities
- Government Labs
- Private Industry

**S&T Research to Operations**

**Protection of Life and Property**

**Enhanced National Economy**

# High Impact Science-Service Goals and Research Opportunities

Significant, cross-cutting challenge

| Science Service Area | Key Products/ Services | S&T Goal 2025 Examples | Research Needs and Opportunities: Examples |
|---|---|---|---|
| **Fire Weather** | Red Flag Warning | >24hr Lead Time (LT) with 95% POD | Simulations (high-resolution) of integrated fire weather/behavior |
| **Hydrology** | Inundation Forecasts | Dependable Street Scale Probabilistic Warnings | Physically based hydrologic models and ensembles |
| **Aviation** | Convection Initiation, evolution and dissipation | 30 mins LT | Initiation and evolution of convection |
| **Severe Weather** | Tornado Warning | Warn on Forecast, LT > 1hr | Improved understanding of tornado formation and severe weather microphysics |
| **Winter Weather** | Winter Storm Warning | 30 hour LT | Snow band formation and snow intensity |
| **Marine** | Storm Warnings | Probabilistic Warning, LT > 5 days | Improve wave model physics from shelf to shore |
| **Tropical Weather** | Hurricane Track, Intensity Forecasts | Errors reduced by 50% | Causes of rapid intensity changes |
| **Climate** | Seasonal/IA Forecasts | Accurate, probabilistic 6 month+ LTs on forcing events | Earth system modeling with ensemble prediction and uncertainty |
| **Air Quality** | Air Quality Predictions | Accuracy >85% out to day 5 | Advanced simulations of generation and reactive chemical transport of airborne particulate matter |
| **Space Weather** | Geomagnetic Storm Warnings | >90% accuracy, out to day 2 | Data Assimilation: Ionosphere, Magnetosphere, and Solar Wind |
| **Tsunami** | Tsunami Warnings | <5 mins after triggering event | Enhanced observations and models |
| **Emerging Areas/ Surface Wx** | Wind Forecasts | 1km resolution, 5 min updates | Meteorological influences on renewable and sustainable energy systems |

# NWS/OAR Alignment Imperative

- Tightening budgets
- Growing technological needs/capabilities
- Science and Technology advances present incredible opportunities for unprecedented societal and economic benefits
- How do we prioritize for highest impact?