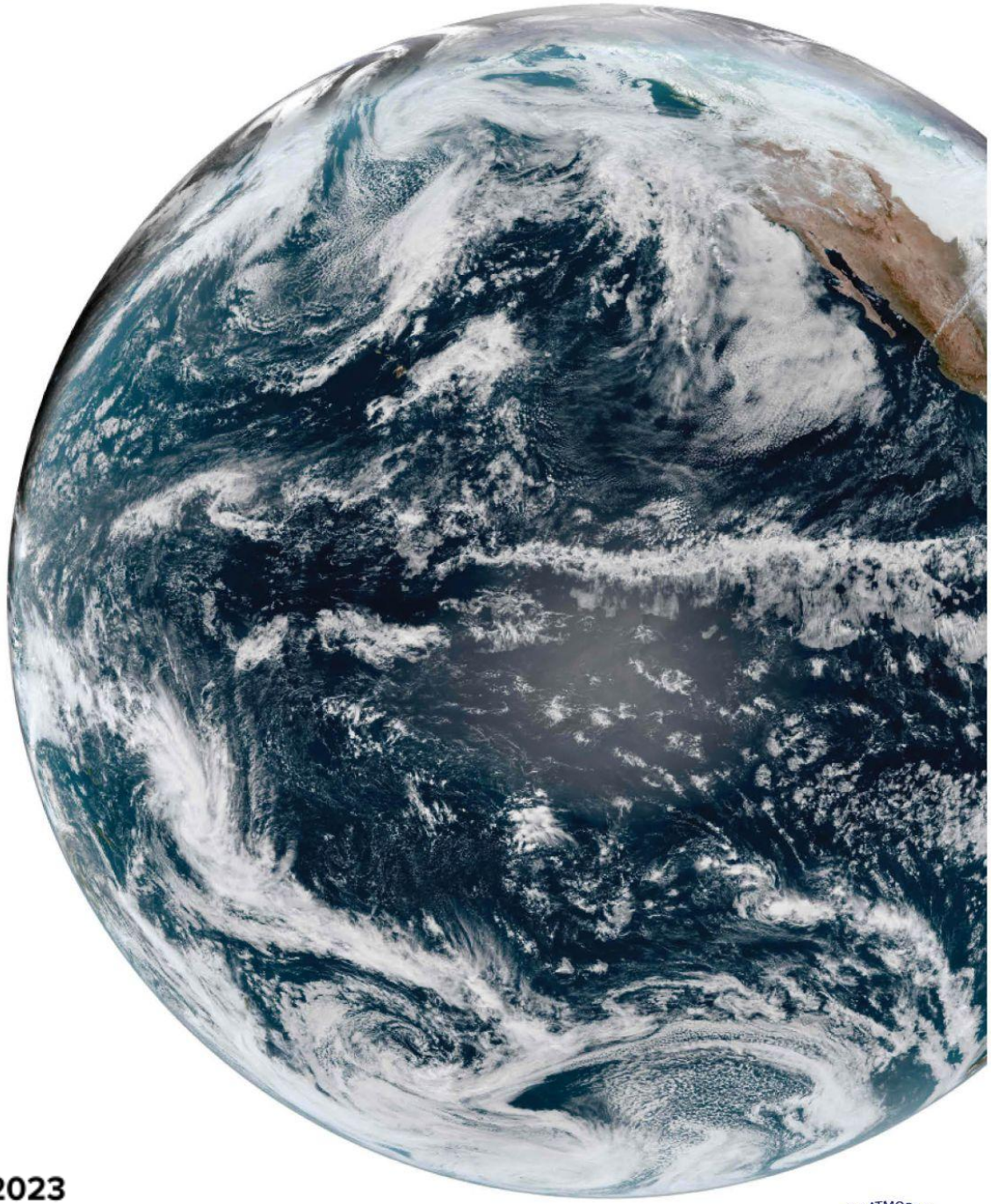
NOAA Global Systems Laboratory

Implementation Plan Summary

FY2023



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General Description: For each of GSL's 3 Strategic Goals this Implementation Plan summary includes selected performance measures and short-term milestones that GSL believes are critical to achieving overall Strategic Goal success. These milestones and performance measures are selected from more comprehensive listings that are included in the various project plans GSL has developed internally or developed in concert with development partners. Under each goal you will find:

- Key FY23 Milestones, and
- Key Performance Measures.

The GSL 2021-2031 Strategic Plan: The GSL 2021-2031 Strategic Plan articulates GSL's Core Values, Vision, Mission, and Grand Scientific Challenge. This Strategic Plan further describes GSL's 3 Strategic Goals and a series of related objectives it is pursuing toward the Plan's completion. The full text of the GSL 2021-2031 Strategic Plan can be found at this link on the GSL website. To provide further context as you read this document please consider the following from the GSL Strategic Plan.

GSL Vision: Forecast systems that deliver solutions.

GSL Mission: Lead research and directed development through the transition of environmental data, models, products, tools, and services to support commerce, protect life and property and promote a scientifically literate public.

GSL's Grand Scientific Challenge: Provide actionable environmental information through the research and development of rapidly-updating global storm-scale prediction and innovative decision support capabilities to reduce societal impacts from hazardous weather and other environmental phenomena.

Reference: In the far right column of each table you will see a code to track to the source of the Milestone or Performance Measure. The coding is as follows:

GSL IP	From the GSL internal Implementation Plan
OAR IP	From the OAR implementation plan
GSL AOP	From the GSL section of the FY23 OAR Annual Operating Plan
SES Pert.	From the FY23 SES performance plan for the GSL Lab Director

Please note that milestones and performance measures taken from the GSL AOP or SES Performance plan are typically verbatim from those documents. The GSL AOP generally includes further descriptions of each item for context and completion criteria.

Milestones vs Performance Measures:

MIlestone: GSL considers a milestone to be a one-time event that marks the completion of a planned effort. An example would be the transition of a product from GSL to availability for operational usage in another NOAA office. These are numbered as follows in this summary - Mx.

Performance Measure: GSL considers a performance measure as a quantifiable description of recurring events or activities where the measurement is the tally of actual progress toward a defined target. These are numbered as follows in this summary - PMx.

GSL Risks to Implementation Plan Success: Success in completing GSL strategic objectives are subject to various risks both internal and external. GSL maintains a risk register which highlights the highest risks to its success which it has considered during the creation and selection of milestones and performance measures found in this document.

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Goal 1: Invest in people, partnerships, and organizational performance

Long-Term Outcome: A healthy, diverse, high-achieving, agile, and enthusiastic staff that is empowered and supported by a forward-thinking administrative and IT support staff and infrastructure, and that enables diverse perspectives and effective internal and external collaboration to achieve high impact results.

Description: In FY23, GSL will continue to make strides to enhance the diversity and inclusion amongst the GSL team, further build the GSL focus on research, and ensure the continued and efficient development of meaningful scientific and technical products internally and through dynamic collaborations.

Key FY23 Milestones:

M1	**Research and Development Milestone** - Annual work plan for the Science and Technology Council (STC) established (GSL Implementation Plan Objective 1.2). POC: DaNa Carlis	GSL IP
M2	**Staffing Milestone -** Number of internships offered to under-represented early career students by July 31, 2023. (target 4). SES: Jennifer Mahoney	SES Perf
M3	**Staffing Milestone -** Increase the number of federal staff (2 FTE) by September 30, 2023. SES: Jennifer Mahoney	SES Perf

Key Performance Measures:

	Performance Measure	Source	FY 23	FY 24	FY 25	FY 26	FY 27
PM1	**Transitions Measure - R2A Index:** Number of OAR products transitioned to a new stage by September 30, 2023 (development, demonstration, application).	GSL AOP SES Perf	5	3	3	3	3
PM2	**Publications Measure - SES Perf. Plan:** Annual number of GSL peer-reviewed publications or reports providing contribution to environmental prediction and understanding by September 30, 2023. (also in (GSL Implementation Plan Objective 1.2)	SES Perf GSL AOP GSL IP	SES 20 AOP 35	AOP 30	AOP 30	AOP 30	AOP 30

PM3	**R&D Increase - Measure -** Increased GSL funding is applied to research and development efforts as indicated by stable or increased ratio of GSL Base funds applied to RL 1-6 activities versus RL 7-9 from prior FY. (GSL Implementation Plan Objective 1.1)	GSL IP	=>	=>	=>	=>	=>
PM4	**R&D Planning - Measure -** Percentage of STC planned outcomes for the FY that are achieved (GSL Implementation Plan Objective 1.2)	GSL IP	50 %	50 %	50 %	50 %	50 %
PM5	**Partnerships - Measure -** GSL establishes its list of current and desired critical partnerships. (GSL Implementation Plan Objective 1.6)	GSL IP	up-date		up-date		up-date
PM6	**Partnerships - Measure -** Number of partnerships deemed critical to GSL achieving its mission objectives is established or renewed. (GSL Implementation Plan Objective 1.6)	GSL IP	1	1	1	1	1

Goal 2: Develop state-of-the-art Earth-system prediction capabilities

Long-Term Outcome: A computationally efficient and scale agnostic next generation Earth system prediction capability that is mission relevant, using advanced techniques in assimilation, physical and atmospheric composition processes, verification, and leverages a broad range of observations for improved forecasts.

Description: In FY23, GSL shall continue to deliver advancements to weather and environmental forecast models for use in operational environments, investigate methods to enhance forecast quality, improve and enhance the availability and quality of relevant observations, provide new tools for fire weather forecasting, investigate and make use of the latest available computational methods and computer systems available to NOAA, and through analysis and collaboration enhance both the quality and usability of forecast models.

Key FY23 Milestones:

M4	**Modeling** - **Milestone** - Core research method developed for measuring convectively-induced turbulence in the Graphical Turbulence Guidance Version 4.	GSL AOP
M5	**Modeling** - **Milestone -** Evaluate 3D-RTMA/URMA effort with 3D-RTMA/URMA user community via Hazardous Weather Testbed Spring Forecast Experiment.	GSL AOP
M6	**Modeling** - **Milestone -** Finalize publication process for a Monthly Weather Review manuscript on development of an exascale-ready prototype model.	GSL AOP
M7	**Modeling** - **Milestone -** Complete porting of the GSL physics suite on GPUs and within CCPP framework.	GSL AOP
M8	**Modeling** - **R2X Milestone -** Weather Research and Forecast model coupled with Chemistry (WRF-Chem - WRF-Chem Version 4.5).	GSL AOP
M9	**Satellite Observations - Milestone -** Expand the use of satellite data in high resolution weather models by September 30, 2023 (Target 1). **GSL Milestone -** Add satellite radiance and atmospheric motion vector observations into the Rapid Refresh Forecast System and demonstrate improvement in the accuracy of meteorological weather variables such as tropospheric temperature, humidity and winds.	GSL AOP OAR IP SES Perf
M10	**Satellite Observations - R2X Milestone -** Assimilation of Aerosol Optical Depth (AOD) retrievals.	GSL AOP

M11	**RRFS - Milestone -** Evaluation of RRFS-based ensemble datasets to assess relative advantages/disadvantages of the time-lagged ensemble approach.	GSL AOP
M12	**RRFS - R2X Milestone** - Initial Assessment of the Rapid Refresh Forecast System (RRFS)	GSL AOP
M13	**RRFS - R2X Milestone -** Rapid Refresh Forecast System (RRFS) v1 ready for implementation at NWS.	GSL AOP
M14	**Verification - Milestone -** Optimized database storage for large datasets in Continuous Improvement through Verification System	GSL AOP
M15	**UFS - Milestone -** Atmospheric chemistry integration with Unified Forecast System Medium Range Weather (UFS MRW) Application and testing with Working Group for Numerical Experimentation (WGNE) datasets	GSL AOP
M16	**Fire Weather - Milestone -** Real-time demonstrations to evaluate GSL Experimental Hourly Wildfire Potential (HWP) Index derived from the HRRR model predictions of temperature, winds, and soil moisture conditions (Q4)	GSL AOP
M17	**Fire Weather - R2X Milestone -** Hourly Wildfire Potential (HPW) Index. Diagnostics added to the RRFS ensemble.	GSL AOP

Key Performance Measures:

	Performance Measure	Source	FY 23	FY 24	FY 25	FY 26	FY 27
PM7	**Satellite Observations - Measure -** Increase the use of satellite observation types in the high resolution rapidly updating weather model to be delivered to NWS by 2026. Supported by M9	GSL AOP OAR IP	1	-	2	-	2
PM8	**UFS - Measure -** Annual number of contributions to the advancement of UFS. Supported by M14	GSL AOP	1	-	-	-	-
PM9	**NWP Evaluation - Measure -** Annual number of test and evaluation reports on numerical weather prediction forecast systems or their components to inform decisions for NWS operational and research weather systems. Supported by M11	GSL AOP	1	3	3	3	3
PM10	**Testbeds - Measure -** Number of testbed evaluations of GSL products. Supported by M19 & M5	GSL AOP	2	-	-	-	-
PM11	**Fire Weather - Measure -** Cumulative number of NOAA Fire Weather Model improvements transitioned into NWS operations. Supported by M15	GSL AOP OAR IP	1	-	1	-	2

PM12	**Advanced Computing - Measure -** Annual number of studies/analyses exploring the use of advanced computing technologies (AI/ML, exascale, etc.) for numerical weather prediction and information delivery. Supported by M6, M7, M23, & M25	GSL AOP	4	-	-	-	-
PM13	**RRFS - Measure -** Annual scientific and technological advances to improve RRFS/RTMA analyses and RRFS forecasts in real-time experimental runs. (GSL Implementation Plan Objective 2.1).	GSL IP	1	1	1	1	1
PM14	**UFS - Measure -** Annual number of physics and Atmospheric Composition/Chemistry enhancements to the CCPP within the UFS for open community development. (GSL Implementation Plan Objective 2.1)	GSL IP	3	2	2	1	2
PM15	**Verification - Measure -** Number of new Earth system prediction verification and assessment (V&A) capabilities evaluated, developed, and/or implemented by GSL. (GSL Implementation Plan Objective 2.4)	GSL IP	1	1	1	1	1
PM16	**Nest Demonstrations - Measure -** Number of fine-scale limited-area nests demonstrated and deployed for one or more cities for major activities, planned or emergent events. (GSL Implementation Plan Objective 2.3)	GSL IP	1	1	1	1	1

Goal 3: Revolutionize communications, products, and services to enable informed decision-making

Long-Term Outcome: Environmental information systems and impact-based verification services that are useful and actionable. Decision-makers and the public have access to clear visualizations and communications of weather and climate risks leveraging social, behavioral and economic science. These services should use a centralized data source, cloud storage, and cloud computing that informs decision making associated with potential impact of environmental hazards.

Description: In FY23 GSL shall make continued advances in the development of aviation forecast quality and improvements, Hazard Service improvements to aid weather forecasters ability to provide high quality decision support, the usability of forecast tools, fire weather forecast improvements, and the application of artificial intelligence and machine learning towards better use of environmental data.

Key FY23 Milestones:

M18	**Aviation - Milestone -** Complete development of the short-fuse convective workflow, partial county alerting framework, and Aviation in-flight hazards workflows for currently scheduled integration into the AWIPS baseline in Q4.	GSL AOP
M19	**Hazard Services - Milestone -** On-site forecaster assessment test evaluating the Integrated Hazard Services architecture in Boulder, Colorado on the AWIPS FSLC test system.	GSL AOP
M20	**Hazard Services - Milestone -** Evaluation of Hazard Services in the Operations Proving Ground.	GSL AOP
M21	**Hazard Services - R2X MIlestone -** Tropical Cyclone Wind Hazard Recommender	GSL AOP
M22	**Hazard Services - R2X Milestone -** Hazard Services Short-Fuse Convective Warnings and Advisories. Ready for check in as part of a AWIPS Operational build.	GSL AOP
M23	**Hazard Services - R2X Milestone -** Operational activation of the Long-Duration Non-Precipitation Weather (NPW) workflow in Hazard Services.	GSL AOP
M24	**Hazard Services R2X Milestone -** Partial County Alerting (PCA) Infrastructure Implementation into Hazard Services.	GSL AOP
M25	**Fire Weather Milestone -** Finalize publication on AI Application for Fire Radiative Power.	GSL AOP
M26	**Fire Weather Milestone -** GSL establishes a lead position for the NOAA Fire Weather Testbed.	GSL AOP
M27	**Artificial Intelligence - Milestone -** Finalize publication on AI Application for Tropical Cyclone Intensification.	GSL AOP

M28	**Artificial Intelligence - R2X Milestone -** Machine Learning Code for Tropical Cyclone Rapid Intensification transferred to Taiwan Central Weather Bureau (CWB).	GSL AOP

Key Performance Measures:

	Performance Measure	Source	FY 23	FY 24	FY 25	FY 26	FY 27
PM17	**New Technologies - Measure -** Explore new technologies including new processing technologies, new tools, machine learning, scientific algorithms and techniques, and I/O improvements that will advance weather prediction capabilities in the next 5-10 years by September 30, 2023.	SES Perf	3	-	-	-	-
PM18	**Aviation - Measure -** Annual number of assessments/reports evaluating new aviation weather products for their potential to transition to NWS operations supporting FAA aviation operations, including core research project reports. Supported by Milestones M4 and"Imp M13	GSL AOP	1	2	2	2	2
PM19	**Hazard Services - Measure -** Annual number of code packages (developed, evaluated and tested) for the Hazard Services components committed to the main NWS 18-Hazardous Services software repository. Supported by Milestones M17 and M18	GSL AOP	2	1	1	1	1
PM20	**Cloud Capability - Measure -** Percentage of GSL's AWIPS and IDSS application components operating on cloud platforms and accessing cloud-based datasets (GSL Implementation Plan Objective 3.1).	GSL IP	45 %	60 %	70 %	80 %	90 %
PM21	**Decision Support - Measure -** Number of applications, or sub-components of applications, developed that support analysis, visualization, verification, and decision support (GSL Implementation Plan Objective 3.2).	GSL IP	1	1	1	1	1
PM22	**Threat Identification - Measure -** Number of new methods developed to identify threat areas derived from pairing environmental data with impact data and social vulnerability data (GSL Implementation Plan Objective 3.2).	GSL IP	1	1	1	1	1
PM23	**Fire Weather - Measure -** Number of evaluations performed within the Fire Weather Testbed. (GSL Implementation Plan Objective 3.4).	GSL IP	1	2	2	2	2
PM24	**Social Science - Measure -** Number of social science and behavioral science user studies completed (GSL Implementation Plan Objective 3.3)	GSL IP	0	1	1	1	1