



NOAA In Your State

Colorado

NOAA is an agency that enriches life through science. Our reach goes from the surface of the sun to the depths of the ocean floor as we work to keep citizens informed of the changing environment around them. From daily weather forecasts, severe storm warnings, and climate monitoring to fisheries management, coastal restoration and supporting marine commerce, NOAA's products and services support economic vitality and affect more than one-third of America's gross domestic product. NOAA's dedicated scientists use cutting-edge research and high-tech instrumentation to provide citizens, planners, emergency managers and other decision makers with reliable information they need when they need it.

The following is a summary of NOAA facilities, staff, programs, or activities based in, or focused on, your state or territory: Starting with highlights, then by [congressional districts and cities or towns](#), and then [statewide programs](#).

Highlights of NOAA in Colorado

Space Weather Prediction Center	Boulder	CO-2
National Centers for Environmental Information	Boulder	CO-2
Earth System Research Laboratory	Boulder	CO-2
Center Weather Service Unit	Denver	CO-1
Regional and Mesoscale Meteorology Branch	Fort Collins	CO-2
Cooperative Institute for Research in the Atmosphere (CIRA)	Fort Collins	CO-2
Bipartisan Infrastructure Law (BIL) / Inflation Reduction Act (IRA) Projects	Project Specific	CO

The state of Colorado also has two Cooperative Institutes, three Weather Forecasting Offices, one Lab and Field Office, one NCEI regional office, one Regional and Mesoscale Meteorology branch, one Cooperative Institute, and five Science on a Sphere® exhibitions.

Weather Forecast Offices

Boulder	CO-2
Grand Junction	CO-3
Pueblo	CO-3

National Weather Service (NWS) Weather Forecast Offices (WFO) are staffed 24/7/365 and provide weather, water, and climate forecasts and warnings to residents of Colorado. There are 122 [WFOs nationwide](#) of which three are in Colorado. Highly trained forecasters issue warnings and forecasts for weather events, including severe thunderstorms, tornadoes, hurricanes, winter storms, floods, and heat waves to the general public, media, emergency management and law enforcement officials, the aviation and marine communities, agricultural interests, businesses, and others. Information is disseminated in many ways, including wireless emergency alerts, social media, [weather.gov](#), and NOAA Weather Radio All Hazards. Each WFO has a Warning Coordination Meteorologist who actively conducts outreach and educational programs that strengthen working relationships with local partners in emergency management, government, the media and academic communities. Forecasters provide Impact-based Decision Support Services (IDSS), both remotely and on-site during critical emergencies such as wildfires, floods, chemical spills, and major recovery efforts. To gather data for forecasting and other purposes, NWS WFO staff monitor, maintain and use Automated Surface Observing Stations and Doppler Weather Radar. In addition to the WFOs, NWS operates specialized national prediction [centers](#) and regional headquarters throughout the U.S. for a total of 168 operational units. Over 85% of NWS' workforce is in the field. For current Colorado weather, visit [www.weather.gov](#) and, on the national map, click on the relevant county or district.

Science On a Sphere®

Denver	CO-1
Boulder	CO-2
Boulder	CO-2
Parker	CO-4
Colorado Springs	CO-5

Science On a Sphere (SOS) is a room-sized global display system that uses computers and video projectors to display planetary data onto a six-foot diameter sphere, analogous to a giant animated globe. Researchers at NOAA developed Science On a Sphere® as an educational tool to help illustrate Earth System science to people of all ages. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere, which is used to explain in a way that is simultaneously intuitive and captivating what are sometimes complex environmental processes. They are located at the Museum of Nature and Science in Denver, NOAA's Earth System Research Laboratory in Boulder, David Skaggs Research Center in Boulder, The Wildlife Experience in Parker, and The Space Foundation in Colorado Springs.

CO-1

Denver

[NOAA Office of Education](#) - [Science On a Sphere®](#)- at [Denver Museum of Nature & Science](#). See [Page 2](#) for details.

National Weather Service (NWS) - [Center Weather Service Unit](#)

Housed in the Federal Aviation Administration's Denver Air Route Traffic Control Center (ARTCC), the NWS Center Weather Service Unit (CWSU) provides forecasts and other weather information to ARTCC personnel for use in directing the safe, smooth flow of aviation traffic. The area covered includes most of Colorado and parts of Wyoming, Utah, Arizona, New Mexico, Kansas, Nebraska and South Dakota.

CO-2

Boulder

Acquisition and Grants Office (AGO) - [Boulder Office](#)

The Acquisition and Grants Office provides financial assistance and acquisition services for NOAA by overseeing and implementing all processes related to contracts and grants.

National Ocean Service (NOS) – [National Geodetic Survey Boulder Office](#)

The David Skaggs Research Center in Boulder, CO houses Federal and contract employees in support of the National Geodetic Survey's Gravity and Global Navigation Satellite System (GNSS) programs. These personnel are involved in field work and validation measurements at Table Mountain Geophysical Observatory (TMGO) and around the country, and in support of the modernization of the National Spatial Reference System (NSRS).

National Environmental Satellite, Data, and Information Service (NESDIS) - [Office of Common Services \(OCS\)](#) - [Radio Frequency Interference Monitoring System \(RFIMS\)](#)

In 2015, the Federal Communication Commission completed an auction of the third Advanced Wireless Services (AWS-3) spectrum, between 1695 – 1710 MHz, which resulted in a mandate for NOAA to transition to spectrum sharing with commercial wireless entities. The Radio Frequency Interference Monitoring System (RFIMS), developed by NESDIS, monitors NOAA's shared AWS-3 frequency band to ensure that NOAA's satellite missions are unimpacted by wireless licensee operations. Table Mountain Test Range (TMTR), located in Boulder, CO, is a radio quiet zone with advanced spectrum research capabilities managed by the Institute for Telecommunication Sciences, part of the National Telecommunications and Information Administration. NOAA has one RFIMS operating at TMTR and will complete deployment of a second RFIMS unit by the end of 2024, which enables advanced testing of potential spectrum sharing scenarios with multiple operational earth stations.

National Environmental Satellite, Data, and Information Service (NESDIS) - [National Centers for Environmental Information \(NCEI\)](#)

NOAA's National Centers for Environmental Information (NCEI) are responsible for hosting and providing access to one of the most significant archives on earth with comprehensive oceanic, atmospheric, and geophysical data. NCEI is the Nation's leading authority for environmental information by maximizing the Federal government's billion-dollar investment in environmental data, NCEI provides environmental information, products, and services to private industry and businesses, local to international governments, academia, and the general public to support informed decision making. NCEI headquarters are located in Asheville, North Carolina with other major locations in Boulder, Colorado; Silver Spring, Maryland; and Stennis Space Center, Mississippi.

National Environmental Satellite, Data, and Information Service (NESDIS) - [National Centers for Environmental Information](#) - [Western Regional Climate Services Director](#)

NOAA's six Regional Climate Services Directors (RCSs), which are part of NCEI, support the development and delivery of a wide range of place-based climate science and information products and services to help people make informed

decisions. RCSDs regularly communicate with stakeholders about climate information needs, and help build and strengthen active partner networks with public and private constituents. They play a primary role in integrating the work within NOAA and among its partners in developing and delivering climate services at the regional level. These efforts serve to increase the value of climate information to users and support more efficient, cost-effective delivery of products and services. The Western RCSD region encompasses Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, and Washington.

NOAA Office of Education - [Environmental Literacy Program](#)

The Environmental Literacy Program (ELP), administered by NOAA's Office of Education, provides grants and support for formal (K-12) and informal education to advance the agency's mission. In Colorado, ELP funded a project by the Cooperative Institute for Research in Environmental Sciences in Boulder. The project aims to build the environmental literacy of children, youth, and adults so that they can become knowledgeable about ways to increase their community's resilience to extreme weather, climate change, and other environmental hazards, and be involved in achieving that resilience. To achieve this goal, the project integrates relevant state and local resilience plans and collaborates with stakeholders who are actively implementing these plans. The [CIRES project](#) employs NOAA resources and educational methods to promote community-level environmental literacy, enabling participants to better comprehend threats and implement solutions that build resilience to extreme weather, climate change, and other environmental hazards. Environmental literacy includes the knowledge, skills, and confidence to 1) reason about the ways that human and natural systems interact globally and locally; 2) participate in civic processes; and 3) incorporate scientific information, cultural knowledge, and diverse community values when taking action to anticipate, prepare for, respond to, and recover from environmental hazards, including mitigating and adapting to climate change.

NOAA Office of Education

The National Ocean Sciences Bowl, managed by the University Consortium for Atmospheric Research's Center for Ocean Leadership link, is a nationally recognized and highly acclaimed high school academic competition that addresses a national gap in high school access to environmental and Earth sciences. The NOSB fills this gap by providing a forum for talented students to test their knowledge of the biology, chemistry, physics, and geology of the ocean. At the same time, it introduces them to ocean-related careers in science, technology, engineering and mathematics (STEM). The competition was created in 1998 in honor of the International Year of the Ocean and has grown to include 25 regional competitions with over 275 schools and 1,800 students participating annually. Since its inception, NOAA has supported the NOSB both financially and through staff participation in regional and national competitions.

Office of Oceanic and Atmospheric Research (OAR) - [U.S. Climate Reference Network](#)

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

National Weather Service (NWS) - [Space Weather Prediction Center](#)

Space weather refers to variations in the space environment between the sun and Earth that have the potential to adversely affect critical functions, assets, and operations in space and on Earth that form the backbone of this country's economic vitality and national security. The NWS Space Weather Prediction Center (SWPC) is the Nation's official source for civilian space weather forecasts, warnings, alerts, and real-time space weather monitoring. SWPC operates 24/7 and coordinates its activities daily with its DOD counterpart, the 557th Weather Wing, located at Offutt AFB, in Bellevue, Nebraska. Through continuous and effective delivery of operational event-driven and regularly scheduled space weather products and services, SWPC protects the electric power grid, satellites and satellite communications, aviation operations,

astronauts living and working in space, and space-based position, navigation, and timing systems (including GPS). SWPC supports actions to improve space weather forecasts including: sustaining and enhancing critical observations; identifying research needs and promoting opportunities for research-to-operations and operations-to-research collaborations both within and outside of the Federal Government; advancing space weather models; engaging with all sectors of the space weather community, including academia, the commercial sector, and international partners; and understanding the needs of space weather end users. SWPC is a key contributor to national and international efforts to develop and implement policy to build resilience to space weather storms.

National Weather Service (NWS) - [Weather Forecast Office](#) - See [Page 2](#) for details.

Office of Oceanic and Atmospheric Research (OAR) - [National Integrated Drought Information System](#)

The National Integrated Drought Information System (NIDIS) program was authorized by Congress in 2006 and reauthorized in 2014 and 2019 with an interagency mandate to improve the Nation's drought resilience. NIDIS is an integrated information system that helps the nation proactively manage drought risks and impacts and improve long-term drought resilience. NIDIS is run out of NOAA's Climate Program Office.

NIDIS provides support for drought monitoring, prediction, planning, communication, and research across eight regional drought early warning systems (DEWS), and through its partnerships with Federal, State, Tribal, and local communities and the private sector. A DEWS coordinates this network of key regional partners so that decision makers and citizens can systematically approach drought monitoring and forecasting integration when planning and preparing for drought. Regional DEWS encourage innovation by integrating new, locally relevant drought information, and supporting the introduction and testing of technologies that detect and communicate drought risks and warnings. Among the decision makers who are benefitting from this source of authoritative, reliable information are farmers making decisions about crops, forestry professionals planning ahead for the next fire season, and urban water managers preparing for high-demand seasons. NIDIS provides data that help decision makers like these assess the risk of having too little water and prepare for and mitigate the effects of drought. NIDIS is continually developing more robust services and regional decision support resources.

Office of Oceanic and Atmospheric Research (OAR) - [Climate Adaptation Partnerships \(CAP\) Program](#)

The Western Water Assessment (WWA) is a cooperative agreement between NOAA's Climate Program Office (CPO) and the University of Colorado Boulder. It is one of several Climate Adaptation Partnerships (CAP/RISA), formerly Regional Integrated Sciences and Assessments, teams contributing to the advancement of equitable climate adaptation through sustained regional research and community engagement. WWA conducts innovative research and engagement aimed at effectively and efficiently incorporating knowledge into decision making to advance the ability of regional and national entities to manage climate impacts with a theme of resilient water systems and resilient communities. In addition to conducting user-driven research projects to explore emerging climate vulnerabilities, WWA's aim is to build water sector and community resilience to compound hazards in the Intermountain West, with a particular focus on underserved Indigenous and small rural communities and utilities. WWA works with water resource managers, ecosystem managers, natural hazard planners, and other decision makers to understand, anticipate, and prepare for these challenges. Core partners of WWA include the University of Colorado Boulder, the Cooperative Institute for Research in Environmental Sciences (CIRES), the University of Wyoming, and the University of Utah. Contact information and more details about this team can be found [here](#).

Office of Oceanic and Atmospheric Research (OAR) - [Earth System Research Laboratory](#)

The Earth System Research Laboratory (ESRL) is based in the David Skaggs Research Center. It employs approximately 400 scientists, technicians, and support personnel, and maintains a number of facilities and programs locally and globally in order to execute NOAA Research missions. ESRL is organized as four divisions - Global Monitoring, Physical

Sciences, Chemical Sciences, and Global Systems. The work of these Divisions includes monitoring atmospheric constituents, understanding climate processes and trends, providing climate information related to water management decisions, improving weather prediction, understanding the recovery of the stratospheric ozone layer, and developing air quality forecast models. ESRL scientists serve in leadership positions for local, national and international climate and air quality science assessments. These research products provide long-term state-of-the-science references for local, regional and global policy makers. The vital work of scientists contributing to the IPCC was recognized with the awarding of the Nobel Peace Prize.

Office of Oceanic and Atmospheric Research (OAR) - [Global Systems Laboratory](#)

The Global Systems Laboratory (GSL) is one of ten NOAA Research Laboratories and is located in Boulder, Colorado. Our research improves environmental prediction models, informs state-of-the-science decision support tools, explores new visualizations, and investigates high-performance computing technology to support a Climate, Weather, and Fire-Ready Nation.

Office of Oceanic and Atmospheric Research (OAR) - [Physical Sciences Laboratory](#)

Located in Boulder, Colorado, the NOAA Physical Sciences Laboratory (PSL) of the Earth System Research Laboratories (ESRL) conducts weather, climate and hydrologic research to advance the prediction of water availability and extremes. PSL's overarching science goals are to (1) develop new knowledge and capabilities to explain and predict observed hydrologic extremes and their impacts to advance NOAA's mission capabilities, and (2) identify new sources of predictive skill and improve predictions of weather and climate processes influencing water availability and extremes through observations, understanding and modeling of the coupled Earth system.

Office of Oceanic and Atmospheric Research (OAR) - [Chemical Sciences Laboratory](#)

Located in Boulder, Colorado, the NOAA Chemical Sciences Laboratory (CSL) of the Earth System Research Laboratories (ESRL) is composed of world-renowned scientists, experienced technical staff, committed support staff, world-class laboratory facilities, instrumentation and models, access to dedicated platforms, and dedicated resources to advance scientific understanding of the chemical and physical processes that affect Earth's atmospheric chemistry and composition. CSL air quality research has three focal points: (1) characterizing emissions and emission trends; (2) understanding chemical, physical, and radiative processes that influence atmospheric composition; and (3) boundary layer dynamics and transport processes at all scales, from local to global. CSL climate research has two focal points: (1) understanding aerosol and cloud radiative interactions in the climate system; and (2) characterizing the emissions, transport, chemical transformations, and distribution of key climate species. CSL stratospheric research has four focal points: (1) developing and using instrumentation to measure key species such as ozone, black carbon, aerosol composition, water vapor, and sulfur dioxide; (2) understanding the chemistry, composition, and transport within the upper troposphere and lower stratosphere; (3) developing and using atmospheric models to understand the radiative and dynamical coupling of the stratosphere and troposphere; and (4) studying the relationship between climate change and changes in the stratosphere.

Office of Oceanic and Atmospheric Research (OAR) - [Forecasting Applications Testing Facility](#)

The Hazard Services project hosts National Weather Service forecasters at the GSL Forecasting Applications Testing Facility to test and receive feedback on a software application that will consolidate multiple hazard applications used by NWS forecasters into one application and modernize how National Weather Service (NWS) and National Centers for Environmental Prediction (NCEP) create forecasts, watches, and warnings for the public. The system provides a pathway to operations for promising science and technology to be more rapidly incorporated into the warning decision-making process. It is also the vehicle for bringing clear, direct language improvements into the watch/warning/advisory process to ensure more effective information is disseminated to the public. There are over 100 types of hazard watches, warnings, and advisories that can be issued by NWS forecasters.

Office of Oceanic and Atmospheric Research (OAR) - [Supercomputing Facility](#)

The Global Systems Laboratory (GSL) supercomputing facility is housed at the NOAA campus in Boulder, Colorado. The room's award-winning design can handle the rigorous environmental and electrical demands of the JET Supercomputing systems. State-of-the-art ambient air cooling and a clean-agent fire protection system, as well as many sophisticated facility monitoring and control safeguards, are features that add up to a highly reliable and resilient data center. This space enhances NOAA's ability to facilitate the efficient and timely delivery of products and services.

Office of Oceanic and Atmospheric Research (OAR) - [JET Supercomputer](#)

The JET Supercomputer primarily supports the High-Performance Computing (HPC) needs of the Hurricane Forecast Improvement Program (HFIP), the Global Systems Laboratory (GSL) numerical weather prediction development, and other weather research. JET has been used to run real-time jobs, via reservation schemes, in support of HFIP during hurricane season and various other high-priority GSL Research to Operations (R2O) projects including the extensive testing which was necessary to ready the High-Resolution Rapid Refresh (HRRR) weather model for NOAA National Weather Service (NWS) operations. The JET system totals 55,984 cores of 64-bit Intel CPU's, with a total capability of 1,795 trillion floating point operations per second – TFLOPS with a total scratch disk capacity of 6.6 Petabytes.

Office of Oceanic and Atmospheric Research (OAR) - [Developmental Testbed Center \(DTC\)](#)

The Developmental Testbed Center (DTC) is a distributed facility where the Numerical Weather Prediction community can test and evaluate new models and techniques for use in research and operations. The DTC plays a prominent role in the development of the Unified Forecast System (UFS). DTC activities are primarily carried out at NOAA's Global Systems Laboratory (GSL) and the National Center for Atmospheric Research (NCAR) both located in Boulder, CO. GSL provides the NOAA component of funding for the DTC.

Office of Oceanic and Atmospheric Research (OAR) - [Fire Weather Testbed](#)

The NOAA Fire Weather Testbed aims to accelerate the development and delivery of products, technologies, and communication strategies to users. This includes evaluating capabilities that:

- Support National Weather Service products such as Red Flag Warnings to provide situational awareness and prevent ignitions
- Provide services to safely mitigate dangerous wildland fires
- Aid implementation of prescribed fire and wildfire management to achieve resource benefits, minimize negative impacts on life and property, and reduce future fire hazard
- Help communities prepare for hazards before, during, and after wildland fire.

By supporting all aspects of the fire cycle-- before ignitions, during active fire, and throughout the postfire recovery process--the Fire Weather Testbed will facilitate operational-needs-driven research advancements back to operations. These technological and communication improvements will enhance community resilience and build a fire-ready nation prepared to live with fire.

The NOAA Fire Weather Testbed is a collaborative effort between three NOAA line offices: Global Systems Laboratory (GSL), the National Weather Service (NWS), and the National Environmental Satellite, Data, and Information Service (NESDIS).

Office of Oceanic and Atmospheric Research (OAR) - [Tunable Optical Profiler for Aerosol and Ozone Lidar](#)

The Tunable Optical Profiler for Aerosol and oZone lidar (TOPAZ), operated since 2006 by the NOAA Chemical Science Laboratory measures tropospheric, or ground-level, ozone and aerosols to provide high quality data to OAR's Weather and Air Quality Program. Tracking tropospheric ozone is important because ozone is an EPA-regulated criteria air pollutant and prolonged exposure to high ozone levels can impact human health. After several years of airborne

operation, TOPAZ was reconfigured for ground-based deployment and is now installed in an enclosed trailer. The system is capable of measuring vertical profiles of ozone and aerosols from a few meters above ground level (AGL) through 6-8 km AGL, depending on atmospheric conditions. Recent examples of TOPAZ applications in this arrangement include the California Baseline Ozone Transport Study (CABOTS) 2016 and the Fires, Asian, and Stratospheric Transport - Las Vegas Ozone Study (FAST-LVOS) 2017 experiments. TOPAZ is also part of the NASA Tropospheric Ozone Lidar Network (TOLNet) for ground-based profiling of tropospheric ozone. The TOPAZ system can be toured and discussed at its normal site in Boulder, CO.

Office of Oceanic and Atmospheric Research (OAR) - [Chemical Sciences Laboratory Mobile Laboratory](#)

The NOAA Chemical Sciences Laboratory's mobile laboratory is a modified, full-size cargo van equipped with scientific instrumentation for measuring a range of air quality pollutants (e.g., carbon monoxide, carbon dioxide, methane, NO_x, volatile organic compounds) and meteorological parameters. It is a versatile platform well-suited to regional air quality studies in instances where aircraft are either not feasible or not available, or where hyperlocal, street-level air quality measurements are required. The mobile laboratory was developed to study agricultural emissions in the summer of 2014 in conjunction with the NSF FRAPPÉ and NASA DISCOVER-AQ projects. Since then, the mobile lab has been used to study seasonal changes in agricultural emissions, emissions of methane from the oil and gas industry, on-road emissions, ozone transport, emerging urban pollution sources (e.g., volatile chemical products, cooking emissions), and wildfire emissions. Most recently, the mobile lab was deployed to Salt Lake City, Utah in the summer of 2024 for Utah Summer Ozone Study to investigate local air pollution sources contributing to the high summer ozone levels impacting the Salt Lake City basin.

Office of Oceanic and Atmospheric Research (OAR)- Pick-Up based Mobile Atmospheric Sounder (PUMAS)

The Pick-Up based Mobile Atmospheric Sounder (PUMAS) is a modified F-250 that carries a Micro-pulse Doppler Lidar (MicroDop) system capable of high-resolution, real-time measurements of 3-dimensional wind fields and aerosol backscatter. The PUMAS platform is unique in its capability for collecting lidar measurements while in motion due to its custom-engineered motion stabilization system. Since its development in 2020, PUMAS has been deployed regularly for measurements of boundary-layer dynamics and wind fields for projects ranging from wind energy (WFIP) to oil & gas methane emissions (AMMBEC) to fire weather (CalFiDE). PUMAS can be viewed and toured at its usual home base location in Boulder, Colorado.

[NOAA Office of Education - Science On a Sphere® - Fiske Planetarium at the University of Colorado and NOAA Earth System Research Laboratory](#) See [Page 2](#) for details.

Office of Oceanic and Atmospheric Research (OAR) - [Global Monitoring Laboratory](#)

NOAA's Global Monitoring Laboratory (GML) occupies much of the D-block of the David Scaggs Research Center (DSRC) in Boulder, Colorado. The laboratory is the operations center for research in climate change modeling, greenhouse gas (GHG) sampling and analysis, monitoring the recovery of the ozone layer, monitoring the presence of ozone depleting substances (ODS) in the atmosphere, measuring atmospheric aerosols, and monitoring changes in upwelling and downwelling radiation at the surface. GML conducts long-term monitoring of ozone with in situ surface instruments, Dobson spectrophotometers, and with instruments on balloon sondes. Near ground level, ozone is monitored to provide information on possible long-term changes in tropospheric ozone, including those related to oil and gas production, long-range transport, and biomass burning. Balloon sonde measurements provide data relevant to tropospheric pollution events, lower and upper atmosphere mixing, boundary layer stability, ozone trend studies (vertical distribution), and the health and recovery of the ozone layer. Some balloon payloads from Boulder also carry specially designed instruments to measure water vapor concentrations in the extremely dry upper atmosphere, where standard meteorological instruments are unable to do so. The 40+ year record from Boulder is the longest of its type in the world and shows long term trends in stratospheric water vapor that are essential for improving our understanding of

stratospheric ozone and climate processes. The DSRC is also home to the Global Atmospheric Watch (GAW) World Dobson Calibration Center. The world standard Dobson spectrophotometer at GML is used as the standard measurement of total column ozone to which all other Dobson instruments around the world are calibrated. Dobson observations from the global network and are used to track recovery of stratospheric ozone layer in compliance with the USA Clean Air act of 1990. Flask samples returned from aircraft operations, surface sites, atmospheric baseline observatories, regional observatories, and tall tower sites are analyzed to determine trace gas mole fractions of greenhouse gases, volatile organic compounds, and ozone depleting substances. Determinations of the isotopic composition of carbon and oxygen in the samples can also be made to assist with understanding source regions for the trace species. Trace gas standards and calibration activities support long-term measurements of trace gases by GML and other laboratories. GML has a long history of preparing primary standards and propagating calibration scales both within GML and also within the WMO/GAW community. In support of WMO/GAW, GML has served as the WMO/GAW Central Calibration Laboratory (CCL) for CO₂ since 1995 and for CH₄, CO, N₂O, and SF₆ thereafter. As a CCL, GML maintains WMO primary calibration scales and provides calibrated gas mixtures for CH₄, CO, N₂O, and SF₆ to WMO laboratories. GML also maintains in-house scales, at various levels of maturity, for ~55 other trace gases. These standards are made available to outside laboratories and used extensively in gas analysis as well as for testing instruments and analysis methods.

Office of the Chief Administrative Officer (CAO) - [Real Property, Facilities, and Logistics Office](#)

The Office of the Chief Administrative Officer (CAO) provides building management at the David Skaggs Research Center, including warehousing, storeroom operations, graphic arts, and health clinic operations.

Office of the Chief Information Officer (OCIO) - [High Performance Computing and Communications](#)

The Office of the Chief Information Officer manages research and development high performance computing for weather and climate modeling, research, and predictions, supporting improvements in areas such as the prediction of severe weather, seasonal prediction of temperature and precipitation, and forecasting the next Sandy-like storm.

Office of Oceanic and Atmospheric Research (OAR) - [Information Resource Division](#)

The DOC Boulder Laboratories Library provides information services and resources in support of the research of the Department of Commerce Boulder Laboratories agencies including NIST, NOAA, and NTIA. Services are also provided to DOC components in a nine state region. The Library provides circulation, interlibrary loan, reference, and literature searching services in support of the research. The Library also acquires, maintains and makes accessible information resources to support the scientific missions of the Boulder Laboratories.

Office of Oceanic and Atmospheric Research (OAR) - [Cooperative Institute for Earth System Research and Data Science](#)

The NOAA Cooperative Institute for Earth System Research and Data Science (CIESRDS) was awarded to the University of Colorado, Boulder to fulfill NOAA's vision of healthy ecosystems, communities, and economies that are resilient in the face of change. The University of Colorado, Boulder proposes a comprehensive, innovative, and flexible research program to achieve NOAA's vision and goals, with a focus on Earth system research and data science. The cooperative institute will employ world-class researchers to conduct science in service to society and in partnership with NOAA. The cooperative institute will be supported by a robust infrastructure committed to equity, education, and outreach. The cooperative institute proposes to address the following themes over the course of this 5-year award: (1) Future Atmosphere; (2) Climate Science and Prediction; (3) Earth System Data Science, Stewardship, and Applications; (4) Regional Science and Applications; (5) Scientific Outreach, Education, and Diversity; (6) Space Weather Science and Prediction; (7) Weather Research and Forecasting, and (8) Science and Predictions to Support Ecosystem Research. The cooperative institute will be able to respond quickly to help society meet the rising challenges of environmental change and to inform proposed solutions.

Office of the Chief Information Officer (OCIO) - [Service Delivery Division](#)

The Service Delivery Division provides a suite of IT services to support NOAA's mission. Our work includes IT infrastructure design and maintenance, network and server management and administration, desktop configuration and maintenance, application and system design and implementation, and IT security.

Office of the Chief Information Officer (OCIO) - [NOAA Cyber Security Center Back-up Site](#)

The Boulder, Colorado location serves as a geographically diverse location for the NOAA Cyber Security Center (NCSC). In case the primary site of the NCSC at Fairmont, WV becomes isolated or unavailable, the Boulder location is a fully functional failover site with which the Fairmont site maintains peered information technology systems. By having a peer site, encompassing 100% of the functionality of the primary NCSC site, services can be switched seamlessly between Boulder and Fairmont, meaning routine maintenance and upgrades can be performed at one location while the other location remains continuously functional, better serving and protecting the NOAA IT mission. As a disaster recovery site, Boulder provides vital backup in case of an outage at Fairmont, and can perform the mission until the Fairmont site is reconstituted.

Office of the Chief Information Officer (CIO) - [N-Wave NOAA Enterprise Network](#)

Boulder, CO, hosts the N-Wave Program Office, which is responsible for managing and operating NOAA's cutting-edge enterprise network which supports both operations and research. The office also manages and operates all five of NOAA's Trusted Internet Connection Access Points which provide the security analytics required to ensure secure communication between NOAA networks and the greater internet. TICAPs are NOAA's first line of defense for protecting NOAA's mission from external cyber-attacks and the N-Wave network supports all NOAA's access to and from the Internet and public peering services. N-Wave enterprise network services are provided at multiple locations and, at many sites, is the main communications provider. N-Wave spans from Hawaii, to Alaska, and across the continental United States with international peering at the Washington D.C. TICAP.

Boulder, CO, is also one of the five NOAA Trusted Internet Connection Access Points (TICAPs). The information the TICAPs provide is invaluable for determining the nature and scope of cyber threats. NOAA is also able to offer this as a service to other government agencies, eliminating the requirement for them to build and manage their own TICAPs.

Workforce Management Office (WFMO) - [Boulder Office](#)

The Workforce Management Office employees in the Boulder Office include Payroll and Timekeeping and Records teams servicing all of NOAA. The Payroll and Timekeeping team ensures accurate payroll and WebTA records, and processes payroll actions as appropriate. The team manages employee payroll functions for non-recruitment actions to include error corrections, as well as resolutions to pay errors. They provide support to customers for time and attendance issues, advisory and training services to customers, while also administering NOAA's Leave Share Program. The Records team maintains and manages eOPF records for the NOAA workforce. The team ensures accurate and up-to-date information is filed and indexed in each record, and ensures records are closed upon employee separation.

NOAA Commissioned Officer Corps (NOAA Corps) - [Office of Oceanic and Atmospheric Research, National Ocean Service, and National Weather Service Support Officers](#)

The NOAA Commissioned Officer Corps stations officers across multiple line offices in Boulder, CO to support those offices' missions administratively and operationally. These officers perform a variety of duties, including acting as liaison between the Office of Marine and Aviation Operations and the Office of Oceanic and Atmospheric Research; serving as NOAA liaison to US Northern Command and NORAD; training to serve as station chief at the South Pole; serving in a staff support role for South Pole operations; serving as backup Space Weather Duty Forecaster; developing opportunities for outreach and education to promote the NOAA Corps and Space Weather enterprise; serving as the NCEI liaison for the ocean and coastal data archive for NOAA's Integrated Ocean and Coastal Mapping Program; and serving as Branch Chief

for Coastal Marine Geophysics. Officers fill these critical roles necessary for the success of NOAA operations State- and Nation-wide.

NOAA Office of Space Commerce (OSC) - [TraCSS Primary Operations Center](#).

NOAA's Office of Space Commerce (OSC) is developing the Traffic Coordination System for Space (TraCSS) to provide basic space situational awareness (SSA) data and services to civil and private space operators and to support spaceflight safety, space sustainability, and international coordination. The primary operations center for the Traffic Coordination System for Space will be at the David Skaggs Research Center, operated by the National Oceanic and Atmospheric Administration (NOAA) in Boulder, Colorado. The Boulder center will largely handle TraCSS operations.

[Boulder, Longmont, and Niwot Ridge](#)

Office of Oceanic and Atmospheric Research (OAR) - [Ultraviolet \(UV\) Monitoring Network; Ozone Measurements; Global Greenhouse Gas Reference Network; Halocarbon Measurements](#)

The NOAA Global Monitoring Laboratory (GML) operates instruments as part of the ultraviolet (UV) monitoring network (NEUBrew). These measurements are part of GML's research on the Earth's surface radiation budget and are used in studies of variations in long-term radiation and meteorological parameters. Observations of spectral solar radiation can be used to infer the presence and quantities of atmospheric constituents and to investigate the interaction of ozone and solar radiation. GML conducts long-term monitoring of ozone at the surface. Near ground level ozone is currently monitored using ultraviolet absorption photometers at eight sites that are generally representative of background conditions. These sites, four of which have records exceeding 25 years in length, provide information on possible long-term changes in tropospheric ozone near the surface and support air quality research. GML also operates the Greenhouse Gas Reference Network to measure the distribution and trends of carbon dioxide (CO₂) and methane (CH₄), the two gases most responsible for human-caused climate change, as well as other greenhouse gases and volatile organic compounds. Samples are collected weekly at fixed locations and on several commercial ships. These air samples are delivered to GML in Boulder, Colorado for measurements of CO₂, CH₄, and other greenhouse gases. Additionally, the flasks are analyzed for the distribution and trends of halocarbons, the gases most responsible for human-caused depletion of the stratospheric ozone layer. These data improve our understanding of the distribution of greenhouse gases, models of the global carbon cycle, and the effectiveness of efforts to protect and restore the ozone layer, which protects the surface from the sun's ultraviolet radiation. The observed geographical patterns and small but persistent spatial gradients are used to better understand the processes, both natural and human induced, that underlie the trends. Air samples have been collected at 3475-meter elevation on Niwot Ridge, Colorado since 1968. The samples are collected by researchers at the Mountain Research Station operated by the University of Colorado's Institute for Arctic and Alpine Research. Samples collected at Niwot Ridge represent free tropospheric air that has passed over the western U.S. and possibly Canada. These measurements help determine the magnitude of carbon sources and sinks in North America.

[Fort Collins](#)

Office of Oceanic and Atmospheric Research (OAR) - [Cooperative Institute for Research in the Atmosphere](#)

The Cooperative Institute for Research in the Atmosphere (CIRA) was awarded to Colorado State University. CIRA serves as a key mechanism to promote collaborative research between university scientists and those in NOAA. CIRA's research vision is to improve interdisciplinary research in the atmospheric sciences by entraining skills beyond the meteorological disciplines, exploiting cutting-edge advances in engineering and computer science, facilitating transitional activity between pure and applied research, and assisting the nation through the application of its research. NOAA partners include the Office of Oceanic and Atmospheric Research; National Environmental Satellite, Data, and Information Service, and National Weather Service. CIRA conducts research across five themes: (1) satellite algorithm development, training and education; (2) regional to global scale modeling systems; (3) data assimilation; (4) climate-weather processes; and (5) data distribution.

National Environmental Satellite, Data, and Information Service (NESDIS) - [Center for Satellite Applications and Research](#) - [Regional and Mesoscale Meteorology Branch](#)

The Regional and Mesoscale Meteorology Branch (RAMMB), within the Center for Satellite Applications and Research (STAR) is co-located with the [Cooperative Institute for Research in the Atmosphere](#) (CIRA) at the Colorado State University in Fort Collins CO. The RAMMB conducts research activities in collaboration with CIRA on regional- and small-scale meteorological studies related to weather and climate, with emphasis on meteorological satellite data. The relationship between CIRA and RAMMB enables NOAA to adopt demonstrated research techniques for deriving atmospheric information from remote sensing data for broader distribution to the science community.

CO-3

Cortez

Office of Oceanic and Atmospheric Research (OAR) - [U.S. Climate Reference Network](#)

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

Dinosaur

Office of Oceanic and Atmospheric Research (OAR) - [U.S. Climate Reference Network](#)

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

Grand Junction

National Weather Service (NWS) - [Weather Forecast Office](#) - See [Page 2](#) for details.

Montrose

Office of Oceanic and Atmospheric Research (OAR) - [U.S. Climate Reference Network](#)

The U.S. Climate Reference Network (USCRN) is an operationally viable research network of 135 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS).

Steamboat Springs

Office of Oceanic and Atmospheric Research – [Surface Aerosol Monitoring](#)

NOAA's Global Monitoring Laboratory (GML) operates surface-based aerosol monitoring sites in six states and one territory (Puerto Rico). Guiding the location of these instruments is the finding that human activities primarily influence aerosols on regional/continental scales rather than on global scales. Aerosols create a significant perturbation of the Earth's radiative balance on regional scales. The measurements made include aerosol optical properties (how the particles absorb and scatter solar radiation), aerosol number concentration, and chemical composition of the aerosol particles. The site is operated through a partnership with the University of Utah.

Pueblo

National Weather Service (NWS) - [Weather Forecast Office](#) - See [Page 2](#) for details.

CO-4

Briggsdale

Office of Oceanic and Atmospheric Research (OAR) – [Global Greenhouse Gas Reference Network: Halocarbon Measurements](#)

NOAA's Global Monitoring Laboratory (GML) operates a small aircraft-based North American network of sampling sites to measure vertical profiles of important greenhouse gas concentrations. Air is sampled bi-weekly above the surface up to approximately 25,000 feet above sea level using a relatively small, light, and economical automated system developed by GML researchers. These air samples are delivered to GML in Boulder, Colorado for measurements of CO₂, CH₄, other greenhouse gases, and ozone depleting substances. These data improve our understanding of the distribution of greenhouse gases and models of the global carbon cycle. The measurements of ozone depleting substances help determine the effectiveness of efforts to protect and restore the ozone layer, which protects the surface from the sun's ultraviolet radiation.

La Junta

Office of Oceanic and Atmospheric Research (OAR) - [U.S. Climate Reference Network](#)

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

Longmont, Table Mountain

National Ocean Service (NOS) - [National Geodetic Survey's Gravity Program](#)

The Table Mountain Geophysical Observatory (TMGO) near Longmont, CO houses equipment for the National Geodetic Survey's Gravity and Global Navigation Satellite System (GNSS) programs. Local and worldwide gravity data are collected in conjunction with latitude, longitude, height, and velocity to increase the reliability, accessibility, and accuracy of the National Spatial Reference System.

Nunn

Office of Oceanic and Atmospheric Research (OAR) - [U.S. Climate Reference Network](#)

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

Parker

[NOAA Office of Education](#) - [Science On a Sphere®](#) at South Denver University of Colorado. See [Page 2](#) for details.

Platteville

Office of Oceanic and Atmospheric Research (OAR) - [Wind Profiler Observing System](#)

The NOAA Physical Sciences Laboratory installed a wind profiler observing system to test and evaluate new signal processing and data algorithms to improve the quality and reliability of real-time wind and temperature profile data collected by these instruments. A side benefit of this project is to provide these data to the Denver/Boulder Weather Forecast Office to support weather and terminal aerodrome forecasts.

Byers, Briggsdale

Office of Oceanic and Atmospheric Research (OAR) - [Global Greenhouse Gas Reference Network](#)

NOAA's Global Monitoring Laboratory (GML) operates trace gas monitoring sites at tall towers in eight states, including Colorado. The sites were established to extend GML's monitoring network to provide data to aid estimation of the net carbon balance of the continent. Variations of trace gases, especially carbon dioxide, are largest near the ground, so we utilize existing tall towers as platforms for in situ and flask sampling for atmospheric trace gases. Flask samples are delivered to GML in Boulder, Colorado for analysis. These data improve models and our understanding of the distribution of greenhouse gases, including sources and sinks of carbon in North America.

CO-5

Colorado Springs

[NOAA Office of Education](#) - [Science On a Sphere®](#) at [Space Foundation Visitors Center](#). See [Page 2](#) for details.

Statewide

National Ocean Service (NOS) – [Regional Geodetic Advisor](#)

The Regional Geodetic Advisor is a National Ocean Service (NOS) employee that resides in a region and serves as a liaison between the National Geodetic Survey (NGS) and its public, academic and private sector constituents within their assigned region. NGS has a Regional Geodetic Advisor stationed in Boulder, Colorado serving the Rocky Mountain region – Colorado, Montana, and Wyoming. The Geodetic Advisor provides training, guidance and assistance to constituents managing geospatial activities that are tied to the National Spatial Reference System (NSRS), the framework and coordinate system for all positioning activities in the Nation. The Geodetic Advisor serves as a subject matter expert in geodesy and regional geodetic issues, collaborating internally across NOS and NOAA to ensure that all regional geospatial activities are properly referenced to the NSRS.

National Weather Service - [NEXRAD \(WSR-88D\) Systems](#)

NEXRAD is used to warn the people of the United States about dangerous weather and its location. This radar technology allows meteorologists to warn the public to take shelter with more notice than ever before. The NEXRAD network provides significant improvements in severe weather and flash flood warnings, air traffic safety, flow control for air traffic, resource protection at military bases, and management of water, agriculture, forest, and snow removal. NEXRAD radar has a range of up to 250 nautical miles, and can provide information about wind speed and direction, as well as the location, size, and shape of precipitation. There are 159 operational NEXRAD radar systems deployed throughout the United States and overseas, of which three are in Colorado.

National Weather Service (NWS) - [Automated Surface Observing Systems Stations](#)

The Automated Surface Observing Systems (ASOS) program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). ASOS serves as the Nation's primary surface weather observing network. ASOS is designed to support weather forecast activities and aviation operations and, at the same time, support the needs of the meteorological, hydrological, and climatological research communities. ASOS works non-stop, updating observations every minute, 24 hours a day, every day of the year observing basic weather elements, such as cloud cover, precipitation, wind, sea level pressure, and conditions, such as rain, snow, freezing rain, thunderstorm, and fog. There are 21 ASOS stations in Colorado.

National Weather Service (NWS) - [Cooperative Observer Program Sites](#)

The National Weather Service (NWS) Cooperative Observer Program (COOP) is truly the Nation's weather and climate observing network of, by and for the people. More than 10,000 volunteers take observations on farms, in urban and

suburban areas, National Parks, seashores, and mountaintops. The COOP was formally created in 1890 under the NWS Organic Act to provide observational meteorological data, usually consisting of daily maximum and minimum temperatures, snowfall, and 24-hour precipitation totals, required to define the climate of the United States and to help measure long-term climate changes. The data are also used by other federal (including the Department of Homeland Security), state and local entities, as well as private companies (such as the energy and insurance industries). In some cases, the data are used to make billions of dollars' worth of decisions. For example, the energy sector uses COOP data to calculate the Heating and Cooling Degree Days which are used to determine individuals' energy bills monthly. There are 249 COOP sites in Colorado.

National Weather Service (NWS) - [NOAA Weather Radio All Hazards Transmitters](#)

NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service (NWS) forecast office. NWR broadcasts official NWS warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week. Working with the Federal Communication Commission's (FCC) Emergency Alert System, NWR is an "All Hazards" radio network, making it the single source for comprehensive weather and emergency information. In conjunction with federal, state, and local emergency managers and other public officials, NWR also broadcasts warning and post-event information for all types of hazards – including natural (such as earthquakes or avalanches), environmental (such as chemical releases or oil spills), and public safety (such as AMBER alerts or 911 Telephone outages). Known as the "Voice of NOAA's National Weather Service," NWR is provided as a public service by the NWS. NWR includes 1,100 transmitters covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. There are 29 NWR transmitters in Colorado.

National Weather Service (NWS) - [Incident Meteorologists](#)

The NWS, as mandated by Congress, provides fire weather forecast products and services to the fire and land management community for the protection of life and property, promotion of firefighter safety, and stewardship of America's public wildlands. Since 1928, this effort has included providing critical on-scene support to wildfire managers via specially-trained NWS forecasters called Incident Meteorologists (IMETs). When a fire reaches a large enough size, IMETs are rapidly deployed to the incident and set-up a mobile weather center to provide constant weather updates and forecast briefings to the fire incident commanders. IMETs are very important members of the firefighting team, as changes in the fires are largely due to changes in the weather.

NOAA Office of Education — [Environmental Literacy Program](#)

NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Colorado, ELP supports the Trout Bowl in Colorado, one of 25 regional competitions of the National Ocean Sciences Bowl (NOSB). The NOSB is an academic competition that engages high school students in learning about ocean sciences and related STEM careers while helping them become knowledgeable citizens and environmental stewards. ELP supports the American Meteorological Society's DataStreme courses for K-12 educators through a grant and in-kind support. These courses use weather, climate, and the ocean as contexts for teaching science and improving understanding about the Earth system.

National Ocean Service (NOS) - Students for [Zero Waste Week](#)

Students are inviting their local communities to "Go Green and Think Blue" by joining them in the annual *Students for Zero Waste Week campaign*. During this campaign led by the Office of National Marine Sanctuaries, students focus on reducing land-based waste in order to protect the health of local marine environments. These young leaders are raising awareness of how single-use plastic and other types of litter affect the health of local watersheds, national marine sanctuaries, and the ocean. In addition, some schools are looking at ways to reduce their energy use on campus with hopes of raising awareness of how the burning of fossil fuels also impacts the health of the ocean.

National Ocean Service (NOS) - [NOAA Ocean Guardian Youth Ambassador Program](#)

Youth aged 13-18 from across the United States and its territories that are committed to ocean conservation and stewardship of our blue planet can apply to become a NOAA Ocean Guardian Youth Ambassador. This year-long program looks for enthusiastic youth with new ideas and a unique perspective who want to learn more about America's underwater treasures and share their passion with others. Youth learn how to become a leader at their school or in their local community to make a difference in the conservation of the ocean through marine protected areas.

[Bipartisan Infrastructure Law \(BIL\) / Inflation Reduction Act \(IRA\) Projects](#)

The National Oceanic and Atmospheric Administration (NOAA) was entrusted with billions of supplemental federal funding dollars with passage of the Bipartisan Infrastructure Law on November 15, 2021 and the Inflation Reduction Act on August 16, 2022. This historic infrastructure funding has been invested in communities across the nation to build resilience in the face of climate change. NOAA distributed funding to communities, tribal, state and local governments, higher education programs, businesses, non-profit organizations, and facilities in need. NOAA funded billions of dollars in grants and cooperative agreements across the country to fund projects that enhance climate resilience, restore coastal and marine habitats, improve safety, and create jobs. For an interactive map of NOAA BIL and IRA investments in your state, visit <https://www.noaa.gov/bil-ira-awards-explorer>.

BIL

Health and Social Services in the Long-term Wildfire Recovery of Rural Communities, \$473,798

Wildfires have a large economic and social impact on rural communities; however, these impacts are not borne equally. Rural frontline communities in particular can bear disproportionate impacts to their economies, health, and well-being during the recovery period after a wildfire, especially for vulnerable groups such as low-income households, elderly, young, and socially disadvantaged groups. This work supports and helps build social infrastructure for both the short-term and long-term recovery of communities after disaster. *This award supports work in CO, NM*

Proposal for a Multi-Year Cooperative Agreement for Education, Training and Capacity Development for Weather, Water and Climate Forecasting (ETCD), \$200,000

The ETCD program's goal is to improve performance of all operational meteorologists and hydrologists worldwide. Improving human performance for enhanced decision support services is done through collaborative training and education. ETCD is accomplished through collaboration between operational hydrologists/meteorologists, scientists, and academic staff with expertise across a wide range of environmental, educational, and social and behavioral sciences. These activities engage operational hydrologists, meteorologists, researchers, instructors, and students in applied training and simulation exercises which are pivotal to the operational climate, water, and weather communities. The goal of improving performance is achieved through a competency-based education and training program. By meeting the goal of ETCD, forecasts and warnings of environmental hazards will be improved.

Utilization of Satellite-derived Information for Improved Wildland Fire Behavior Forecasting, \$461,395

The United States has entered a new era of increasing wildfire frequency, size, and intensity, which has culminated in many devastating wildfire seasons over the past decade. Fire behavior is becoming more extreme, bringing enhanced mortal danger for firefighters and first responders. The goal of this project is development and dissemination of fire behavior nowcasts to provide high-quality, real-time products that can inform decisions to better manage fires and keep first responders safe. Work is being performed by the Cooperative Institute for Research in the Atmosphere (CIRA).

**Physical Sciences Observation and Prediction Research In Support of the Bipartisan Infrastructure Law (BIL)
\$3,938,559**

The Cooperative Institute for Earth System Research and Data Science (CIESRDS) will conduct science in support of updated approaches to extreme precipitation estimation for infrastructure hazard risk planning; next-generation of NOAA water modeling; subseasonal to annual integrated water capabilities; wildland fire potential research to inform extended range resource planning; fire-weather boundary layer research; and fire-weather observing systems development.

**Bipartisan Infrastructure Law (BIL): Impact-based Decision Support Services (IDSS) Management System (IMS)
\$1,273,677**

This project will deliver a database capacity to vastly improve NOAA's understanding of community partnerships and their key vulnerabilities to environmental hazards, especially related to flooding. This project will advance Societal Data (SD) for Flood Inundation Mapping (FIM) by operationalizing a community user needs database for every community in the country. The enhancement of Impact-Decision Support Services (IDSS) Management System (IMS) to include community user needs will directly address NOAA service equity goals by allowing NWS community engagement to prioritize historically underserved and socially vulnerable communities that are faced with flooding and other hazards.

Innovative instrument development for fire radiative power and model development to improve satellite observations and forecast modeling supported by the Bipartisan Infrastructure Law (BIL), \$1,015,245

Funding from the Bipartisan Infrastructure Law (BIL) will support two sub-projects at the NOAA Chemical Sciences Laboratory (CSL). The first sub-project focuses on the development and demonstration of a unmanned aerial system (UAS) remote sensing package to measure fire radiative power. The second sub-project focuses on the role of reactive gas-phase chemistry and aerosols in predicting wildfire impacts.

Building a Seafloor Science Information Center, \$3,765,099

In this project, Cooperative Institute for Earth Systems Research and Data Science (CIESRDS) scientists will address known gaps in NOAA's coastal inundation and flood-related data management and decision support services. It will expand NESDIS's capacity to effectively steward all the relevant data types needed for risk management, and develop use inspired science based products and services. Activities include developing digital elevation models, and migration to cloud-based infrastructure to enhance the accessibility and usability of the data and associated products.

Bipartisan Infrastructure Law (BIL): Probabilistic Fire Weather Guidance, \$2,193,246

This project aims to transform deterministic fire weather forecast guidance into probabilistic guidance. This involves (1) Developing, testing, and validating various probabilistic fire weather elements in the National Blend of Models for the contiguous United States; (2) Improving and incorporating the Localized Aviation Model Output Program guidance in support of the project; and (3) Providing the National Centers for Environmental Prediction's Central Operations with robust National Blend of Models codes and documentation for implementation.

**CIESRDS Research and Development in Support of the Bipartisan Infrastructure Law (BIL) Provision 5,
\$5,158,772**

This project will result in improvements to short range fire, weather, and smoke prediction capabilities; Updates to Unified Forecast System (UFS) UFS Mesoscale Analysis systems to include additional diagnostic fields for fire weather and air quality applications as well as for aviation, renewable energy, and hydrology interests; The use of new fire weather observation sets in evaluation and characterization of the performance and accuracy of UFS NWP and Mesoscale Analysis systems; Development of advanced Impact-based Decision Support Services (IDSS) systems to support fire weather events and flash flood events associated with burn scars.

Bipartisan Infrastructure Law (BIL): Social, Behavioral, and Economic Sciences (SBES), \$144,236

This project will seek to develop an Agent-Based Model (ABM) that can demonstrate, describe, and potentially anticipate emergent behaviors within a prescribed system for flooding events. The application of an ABM will support the development of mitigation efforts that stakeholders can test to potentially understand how the actions of specific agents within a system could potentially alter outcomes of flooding events for a community. The outcomes of the successful completion of this sub-project are expected to provide a rigorous understanding of if and how an ABM could potentially be used operationally for flooding events, and also to develop the capability to alter and test various factors within the model to anticipate possible emergent behaviors across the system.

Bipartisan Infrastructure Law (BIL) Refining Numerical Approaches to Extreme Precipitation Estimation for Infrastructure Hazard Risk Planning, \$1,013,809

This project will entail research and development of data assimilation, modeling, and post-processing enhancements to improve probable maximum precipitation estimation in Numerical Weather Prediction products.

CIRA Research and Development for Bipartisan Infrastructure Law (BIL) Provision 3, \$549,299

This project entails the exploration of new data formats, data flows, and modeling outputs for storm surge, in an Advanced Weather Interactive Processing System (AWIPS) cloud environment, leading to the transition of storm surge hazard products into Hazard Services. The cloud environment will enable demonstration and evaluation of these advances within the Hurricane and Ocean Testbed (HOT) at the National Hurricane Center (NHC), and include collaboration and participation from NHC and National Weather Service (NWS) Weather Forecast Office (WFO) forecasters.CO

CIRA Research and Development for Bipartisan Infrastructure Law (BIL) Provisions 3 and 5 \$1,800,140

This project brings together scientific expertise in decision support and social, behavioral, and economic science to aggressively tackle the weather disaster issues addressed by BIL Provisions 3 and 5. New decision support tools will be developed and deployed to provide advanced and targeted information to NWS forecasters, on site incident meteorologists, decision makers, and firefighters. New products, tools, and models will be assessed to measure the accuracy and usability of the technologies that show promise for transition to operations.

CIESRDS Research and Development of the IDSS Management System in Support of the Bipartisan Infrastructure Law (BIL) Provision 3, \$455,284

This project will entail research and development of Impact-based Decision Support Services (IDSS) capabilities for fire weather and related flash-flooding events due to burn scars, to be incorporated into the IDSS Management System.

CIRA Research and Development for Bipartisan Infrastructure Law (BIL) Provision 5, \$5,475,799

This project will result in Improvements to short range fire, weather, and smoke prediction capabilities; Updates to Unified Forecast System (UFS) UFS Mesoscale Analysis systems to include additional diagnostic fields for fire weather and air quality applications as well as for aviation, renewable energy, and hydrology interests; The use of new fire weather observation sets in evaluation and characterization of the performance and accuracy of UFS NWP and Mesoscale Analysis systems; Development of advanced Impact-based Decision Support Services (IDSS) systems to support fire weather events and flash flood events associated with burn scars.

CIRA Research off/for Bipartisan Infrastructure Law: Refining Numerical Approaches to Extreme Precipitation Estimation for Infrastructure Hazard Risk Planning, \$522,948

This project will entail research and development of data assimilation, modeling, and post-processing enhancements to improve probable maximum precipitation estimation in Numerical Weather Prediction products.

IJJA: CIRA Investigations of Exascale-enabling technologies for Earth-System Modeling and beyond, facilitated by the NOAA Software Engineering for Novel Architectures (SENA) Project, \$912,000

This project will involve research and development of various Exascale-enabling technologies to advance high-performance computing techniques for Earth system modeling and Numerical Weather Prediction. These technologies will be explored and applied by implementing and validating them within existing weather and earth system models.

CIRA Research Towards the Bipartisan Infrastructure Law Provision 3: Development of Surface Wind Analysis in Tropical Cyclones, \$400,000

This project aims to utilize currently available datasets from various observational platforms to construct a 2-D surface wind analysis for tropical cyclones (TCs), for use in initializing a next-generation probabilistic storm surge model. Having improved estimates of the surface wind field of a TC is critical to producing more accurate storm surge forecasts. Existing wind forcing capabilities are fragmented and lack the spatial and temporal resolutions necessary to adequately drive a hydrodynamic modeling system. This results in the employment of parametric wind forcing techniques which do not incorporate real-time data nor provide an accurate 2-D structure of the cyclone.

Bipartisan Infrastructure Law (BIL): Development of a second-generation balloon-glider platform for atmospheric sampling of wildfire smoke plumes, \$238,340

This project funds two themes to advance our understanding of fire weather: 1) advances in sampling techniques for instruments aboard unmanned aerial systems (UAS) and 2) the development of new methods for analyzing and characterizing smoke properties using data from these UAS systems.

Bipartisan Infrastructure Law: Global Monitoring Observations in Support of the Bipartisan Infrastructure Law (BIL) for Wildfire-Research, \$1,072,042

Improvements in weather forecasts, especially in complex terrain where many wildfires burn, is critical for emergency managers to both watch for possible fire ignition in potentially hazardous conditions and to provide guidance about how a burning wildfire might spread. This project will build four wildfire weather observational sites in wildfire prone areas of the west that are located in different climate regions and to develop two mobile wildfire units for deploying near prescribed burns, fire prone regions, or existing wildfires regions to understand atmospheric processes that are driving wildfire-weather.

Understanding the influence of ocean model resolution on seasonal to annual United States coastal sea level forecasts, \$207,189,

Accurate and robust sea level forecasts can help residents of coastal regions, and decision-makers, manage risks associated with coastal flooding (including changes in event frequency, severity, and/or duration). To improve seasonal to annual (S2A) forecasts, it is vital to assess the ability of underlying tools, including dynamical ocean models, to capture the processes governing coastal sea level variability over S2A lead times. This project will analyze emerging state-of-the-art global ocean model simulations from two modeling centers to quantify resolution-related improvements in the ability to forecast forced and intrinsic coastal sea level variability.

Using Deep Learning to Improve Knowledge of Synoptic Conditions Leading to Extreme Fire Weather and Behavior, \$84,760

Using Deep Learning to Improve Knowledge of Synoptic Conditions Leading to Extreme Fire Weather and Behavior: The purpose is to improve short-term and medium-term forecasting associated with the near-fire environment.

Using deep learning to improve knowledge of synoptic conditions leading to extreme fire weather and behavior \$46,899

Using Deep Learning to Improve Knowledge of Synoptic Conditions Leading to Extreme Fire Weather and Behavior: The purpose is to improve short-term and medium-term forecasting associated with the near-fire environment.

Real-time RRFS-Smoke hybrid data assimilation of VIIRS/GOES-16/17 AOD and surface PM2.5 observations for improved regional smoke and fire weather forecasting, \$572,911

Real-time RRFS-Smoke hybrid data assimilation of VIIRS/GOES-16/17 AOD and surface PM2.5 observations for improved regional smoke and fire weather forecasting: The purpose is to accelerate the next-generation RRFS-JEDI system's ability to accurately forecast smoke tracers through the assimilation of satellite and ground-based observations.

Integrating Fire Weather Forecast System Verification into METplus, \$299,989

Integrating Fire Weather Forecast System Verification into METplus: The purpose is to build on the verification work performed for the Colorado Fire Prediction System (CO-FPS) project to make consistent metrics available for forecasters, incident meteorologists (IMETs), and other wildland fire response agencies.

Airborne Phased Array Radar (APAR) Sub-Array Panel (SAP) Build and Final Design Activities, \$10,522,313

Development of the next generation of airborne doppler radar is required in order to: a) close the capability gap in airborne remote sensing of precipitating systems created by the retirement of NCAR's Electra Doppler Radar (ELDORA) and b) provide remote sensing observations capable of penetrating heavy precipitation and with dual-polarimetric capabilities for microphysical retrievals and agile scanning. This project advances the final design of Airborne Phased Array Radar (APAR). APAR is a developing technology that has potential to replace legacy airborne weather radars.

Bipartisan Infrastructure Law (BIL) Refining Numerical Approaches to Extreme Precipitation Estimation for Infrastructure Hazard Risk Planning, \$197,124

This project will entail research and development of data assimilation, modeling, and post-processing enhancements to improve probable maximum precipitation estimation in Numerical Weather Prediction products.

Bipartisan Infrastructure Law (BIL): Development and Integration of IDSSe with NWS Connect, \$309,069

This project supports a key component of the National Weather Service's impact-based decision support tool known as NWS Connect. This effort will add capabilities supporting the use of the National Blend of Models in decision-making to mitigate fire weather and flash flooding due to burn scars. This will allow NOAA and other agencies to determine the best course for resilience prior to an environmental hazard event, as well as decision support and communication throughout the lifecycle of the event.

IIJA: CIRA Research and Development for Bipartisan Infrastructure Law (BIL) Provision 3, \$351,931

This project supports a key component of the National Weather Service's impact-based decision support tool known as NWS Connect. This effort will add capabilities supporting the use of the National Blend of Models in decision-making to mitigate fire weather and flash flooding due to burn scars. This will allow NOAA and other agencies to determine the best course for resilience prior to an environmental hazard event, as well as decision support and communication throughout the lifecycle of the event.

CIRA Research off/for Bipartisan Infrastructure Law: Refining Numerical Approaches to Extreme Precipitation Estimation for Infrastructure Hazard Risk Planning, \$168,949

This project will entail research and development of data assimilation, modeling, and post-processing enhancements to improve probable maximum precipitation estimation in Numerical Weather Prediction products.

CIRA Research for Bipartisan Infrastructure Law (BIL) Provision 15, \$93,470

This project will develop and prototype data ingest, processing, and delivery capabilities for observations from fire weather fixed and remote sites. These observations will be made available to fire weather researchers on multiple compute platforms.

Identifying and leveraging large-scale sources of S2S predictability of regional sea-level extremes with explainable machine learning, \$675,453

Much of the focus on future sea level rise concerns the forced trend associated with anthropogenic warming, but on shorter time scales, internal climate variability has the potential to exacerbate the regional impacts of this long-term trend. This project will explore the predictability of regional sea levels (with uncertainties) due to large-scale climate variability at subseasonal-through-seasonal (S2S) lead times. A significant focus of this work will be identifying when prediction skill exists, and when it does, exploring its predictability sources.

Integrating social and meteorological data to assess the dynamics of flood hazards and impacts: An interdisciplinary approach leveraging AI, risk communication, and data sciences, \$1,034,942

This project consists of three research activities that integrate research in artificial intelligence (AI), risk communication, and data sciences to advance scientific methods for learning about the dynamics of flood events and to illustrate societal data insights. *This award supports work in CA, WA, CO, OK*

Differential community needs and uses of fire weather and smoke information, \$1,420,000

This project will study community needs and uses of fire weather and smoke information to inform the response to wildfires and evacuation decisions. The research will expand on existing theories and approaches to explore perceptions of wildfire behavior among individuals, and smoke predictions for communities occupying wildfire-prone landscapes in the United States. The focus will be on regions with recent incidences of extreme fire weather-producing or large wildfire events, with study sites in California, OR, Colorado, and Tennessee. Three steps will be utilized during the project: interview case studies, surveys, and agent-based models to better understand and inform resident wildfire response. *This award supports work in CA, CO, and TN.*

IRA

Constraining near-term U.S. hydroclimate and extreme-event projections with SST pattern storylines, \$588,299

Recent research has highlighted two problems that are not well explored for hydroclimate projections: 1) CoupledCMIP5/6 models are unable to reproduce observed sea surface temperature (SST) pattern changes over the last couple of decades 2) Counter to CMIP5, many CMIP6 models show a very high climate sensitivity. We propose to constrain model spread in projections of near-term US hydroclimate and extreme events.

Multi-decadal projections of extratropical cyclones and their associated extreme precipitation, snowfall, and surface winds, \$558,265

During the cool season, severe Extratropical Cyclones (ETCs) and their associated fronts can produce hazardous weather events that include heavy rain, snow, and strong winds. Such Events lead to significant losses of human life and property and account for many of the billion dollar weather and climate related disasters. The goal of this work is to use three global climate model large-ensembles (GCM-LEs) produced by U.S. modeling centers to develop near-to-long term projections for ETCs and their storm-scale extremes.

Detection of AMOC changes and their potential impact on sea level and storm surges over the U.S. east coast, \$314,072

The occurrence of exceptionally high sea levels can cause catastrophic coastal inundation, threatening lives and infrastructure in the coastal regions. The Extreme Sea Level (ESL) events usually occur during extreme weather events

when Tropical Cyclones (TC), hurricanes or Extratropical storms pass by. The mean sea level is far from stationary along the U.S. east coast. Although the inverse barometric effect can explain 10-30% of its rise, the effect of ocean dynamics is responsible for most of its changes.

Understanding the Evolving Threat of Snow Loads and Rain on Snow Events to Structural Safety, \$78,947

Building collapse due to the weight of settled snow, or snow load, is dangerous. These collapses are sometimes due to rain on snow (ROS) events, which can cause a surge in the weight of the snowpack immediately preceding the melting phase or ponding on the structure during the melting phase. Climate change is anticipated to increase the threat of extreme, short-term snow loads and/or ROS events in certain regions of the United States. The proposed work will improve our understanding of how the statistical distributions describing extreme snow load accumulation and ROS occurrence evolve in a changing climate across the Conterminous United States (CONUS).

Understanding and resolving a global discrepancy in near surface water vapor trends between models and observations, \$223,579

A critical problem facing the American West is increasing aridity and associated risk of droughts, heat extremes, and wildfire as the planet warms under rising greenhouse gases. We rely on Earth System Models (ESMs) to provide future projections that help us plan for this changing climate, but the wide range of complex processes involved, many of which have not been well observed, leads to considerable model uncertainties. ESMs indicate that water vapor over arid/semi-arid regions of the world, including the Southwest, should have risen since 1980, almost at the rate expected from Clausius Clapeyron scaling. However, in observations, this has not occurred.

Advancing understanding of plant-drought interactions for landscape to regional scale drought prediction, \$199,991

Drought in the western US is linked to climate trends in temperature, precipitation, ecosystem water use and atmospheric water demand, but the mechanisms underlying climate variability and ecosystem response are poorly understood. Interannual and sub-seasonal variability in carbon uptake is strongly correlated with moisture limitation in the western US, and plants in turn can weaken or intensify drought conditions through seasonal compensation effects such as increased spring evapotranspiration resulting in a drier summer, or direct phenological changes such as earlier leaf-out. Current drought indices do not take these plant-based carbon-water cycle interactions into account.

Support of the NOAA Fisheries Active and Passive Acoustic Strategic Initiatives under the Inflation Reduction Act, \$2,316,075

The primary focus of this research is to locate, collate, organize, and format data that will be used in conjunction with multifrequency narrowband (CW), frequency modulated (FM), and low frequency echosounder data in advanced analytical models to classify active acoustic data to the lowest taxonomic level possible. Active Acoustic Objectives: 1. Collate and format annotated acoustic data from the six Science Centers for input to advanced analytical echo-classification models; 2. Organize co-variate data for input to advanced analytical echo-classification models; 3. Work collaboratively with the Science Centers and data scientists/software developers in support of the AA-SI 'Echo Classification' activity.

mCDR 2023: Assessing efficacy of electrochemical ocean alkalinity enhancement at an existing outfall using tracer release experiments and oceanographic models, \$1,518,993

Adding alkalinity to the ocean may provide a safe and effective approach to removing carbon dioxide from the atmosphere. Key deliverables of this project will be an evaluation of ocean alkalinity enhancement (OAE) efficacy in a specific coastal ocean system, a demonstration of measurement, reporting, and verification (MRV) for OAE applied to coastal outfalls, and a set of recommendations on methods and best practices for conducting public engagement alongside future pilot field trials of OAE and related mCDR approaches.

A Real-Time Space Weather Alert And Analysis System, \$174,788

A continuous data processing system is proposed to transform the raw magnetic field data produced by the existing MagStar magnetometer network into actionable, mission-relevant, and validated data products that can be used by all clients with interest in space weather conditions. This system will be unique in its ability to produce information that is both real-time and validated. Alerts that are produced while phenomena such as magnetic storms are active, as well as digests that are generated directly after such events will allow clients to consider space weather's effects on their own missions in an immediate way that currently does not exist.

Inflation Reduction Act (IRA): Statistical and Dynamical Downscaling of Coastal Marine Ecosystems, \$350,877

The waters off the U.S. West Coast harbor a vibrant ecosystem with many commercially important species. Improving methods to predict changes in the physical state of the ocean, including temperature and currents, and chemical and biological components, such as nutrients, oxygen and plankton are critical to marine ecosystems and the people who depend on them. This research will address projections of how the oceans may change using two methods. The first will use computer model simulations of the ocean off the US West Coast. The second method will use statistical and artificial intelligence (AI)/machine learning (ML) to estimate changes in coastal ocean conditions along the west coast.

Inflation Reduction Act (IRA) project: Developing a Decision Support System (DSS) for the Climate Ecosystems and Fisheries Initiative, \$393,386

NOAA launched the Climate Ecosystems and Fisheries Initiative (CEFI) to provide observations and model forecasts of US coastal ocean conditions to scientists, managers, stakeholders and the general public. This project will design a decision support system to provide easy access to CEFI information. This web-based system will enable: 1) exploratory science and proof-of-concept applications; 2) development and access to fishery and habitat relevant indices; 3) assessment of forecast skill and 4) analysis of extreme ocean conditions and climate variability and change.

IIJA: CIRA Collaboration on NOAA Software Engineering for Novel Architectures (SENA) Project, \$2,000,000

This project will involve research and development of various Exascale-enabling technologies to advance high-performance computing techniques for Earth system modeling and Numerical Weather Prediction. These technologies will be explored and applied by implementing and validating them within existing weather and earth system models.

Artificial Intelligence (AI) Tools for Extreme Weather Events, \$189,150

This project showcases NOAA datasets and provides industry, state/local leaders, and the public with the tools and training to replicate various artificial intelligence (AI)-based approaches employed within NOAA. Stakeholders will gain the necessary knowledge and skills to improve resilience in a changing climate by developing AI-based products that cater specifically to their needs. Work will be performed by the Cooperative Institute for Research in the Atmosphere (CIRA).

Support of the NOAA Office of National Marine Sanctuaries Passive Acoustic Monitoring under the Inflation Reduction Act, \$550,000

This project will support NOAA's designations of new national marine sanctuaries, and enhance protection of America's marine resources, coastal communities, and economies. A critical area focused on tackling the impacts of climate relevant to NOAA Fisheries and marine protected area management is Essential Data Acquisition (EDA) and management, including passive acoustic monitoring data. This funded work will advance analytical collaboration to address ONMS needs for higher-level soundscape decomposition techniques that can derive estimates of the varying biological, anthropogenic and environmental contributions to a sanctuary's soundscape, including improved tools for baseline assessments and tracking of trends in these contributions and associated sound levels over time.

SENA Proposed Activities, \$2,000,000

This project will involve research and development of Artificial Intelligence techniques with the goal of potential integration into weather forecast systems, along with efforts to enhance Exascale Federated and Unified workflows for Numerical Weather Prediction systems.

Data management services to streamline data archival and improved FAIR compliance, \$200,000

This project will provide a framework for Global Ocean Monitoring and Observing (GOMO) Arctic Research Program (ARP) data management, which will reduce the data submission burden on ARP Principal Investigators, while also ensuring Findable, Accessible, Interoperable, and Reusable (FAIR) compliance, ease of use and preservation of data collected. Essentially, the project will develop an end-to-end, submission-to-access/archive data system for arctic data, primarily through focused extension/leveraging existing substantial cyberinfrastructure components within NOAA.

Enabling Discovery for Climate Resilience: A Registry of Polar Observing Networks, \$279,320

This project will create a Registry of Polar Observing Networks (RoPON), cataloging systems that conduct or coordinate observations in the Arctic and Antarctic. Building on the prototype at polarobservingregistry.org, we will develop a fully operational tool for easy discovery of polar observing assets. Additionally, we will create a Polar Observing Site Discovery tool, using federated search to dynamically aggregate information on thousands of research sites, stations, and community-based observations. This will provide a single-window search for observing assets across multiple networks.

Piloting NOAA Climate Projection Services, \$1,050,655

This project aims to provide climate information for the 30 to 50-year timeframe, addressing risks like heavy precipitation, temperature extremes, drought, and coastal flooding. It will use NOAA's existing resources and new cloud-based platforms to disseminate climate projections to users. The goal is to create sustainable online tools to help decision-makers plan for future climate conditions, supporting NOAA's mission to build a Climate-Ready Nation.

Developing Decadal Climate Projection Services Through Stakeholder Guidance and Foundational Science, \$1,447,922

This project focuses on mid-to-long-range climate outlooks for phenomena such as coastal inundation, extreme heat, flooding, drought and wildfires. Researchers will work closely with decision-makers, including representatives from groups focused on western water resources, heat waves, coastal flood risk, wildfire risk and extreme wind events, to develop customized climate information. This effort aims to provide decision-ready information for water resource planning as well as preparing, constructing and planning resilient infrastructure.

Developing Decadal Climate Projection Services Through Stakeholder Guidance and Foundational Science, \$1,153,796

This project focuses on mid-to-long-range climate outlooks for phenomena such as coastal inundation, extreme heat, flooding, drought and wildfires. Researchers will work closely with decision-makers, including representatives from groups focused on western water resources, heat waves, coastal flood risk, wildfire risk and extreme wind events, to develop customized climate information. This effort aims to provide decision-ready information for water resource planning as well as preparing, constructing and planning resilient infrastructure.

A Multi-University Consortium for Advanced Data Assimilation Research and Education (CADRE), \$685,058

The next-gen NOAA Unified Forecast System Data Assimilation (DA) faces significant challenges associated with earth system modeling and observations. Serious gaps in DA inhibit addressing these challenges. A Multi-University Consortium for Advanced Data Assimilation Research and Education will partner closely with NOAA to advance DA education and research. Supported will be 12 DA research thrusts and their implementation to the UFS. The projects will deliver improvements to DA, the workforce, and improve short range to S2S forecasts.

mCDR 2023: Simulating biotic calcification impacts on marine carbon dioxide removal additionality, \$1,250,482

Calcification releases carbon dioxide into seawater, which may reduce the efficiency of carbon removal projects. This project will explore the potential impacts of increased calcification using ocean model simulations. The team will use simulations from two different model frameworks to identify a range of efficiency reductions that could come from calcification. These results may inform carbon market price and discount rates through improving the accurate estimation (and uncertainty) of efficiency. *This award supports work in WA and CO.*

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