



# **Recovery Act Program Plan**

**For**

## **Earth Science**

**Within the**

### **American Recovery and Reinvestment Act of 2009**

**Program:** NASA Earth Science  
**TAFS:** 80-0119  
**Submitted Date:** May 15, 2009

<b>Program-specific Recovery Plan for Recovery.gov</b>	
Does this program align with an existing PART program?	<b>Yes - Earth Science</b>
Does this program align with an existing CFDA program?	<b>Yes-Small Business Innovation Research</b>
<b>1. Objectives</b>	
Program Purpose	<p>Earth Science studies Earth from space to advance scientific understanding and meet societal needs. NASA works with scientific and engineering communities to develop new observing capabilities from space, pioneer the use of data to further science goals, and to transition mature capabilities to end users. Recovery Act funding is predominantly focused on accelerating the development of Earth science climate research missions and supercomputing capabilities, hence advancing key science goals.</p>
Public Benefits	<p>Recovery Act funds for NASA’s Earth Science Program will lead to job creation and will accelerate scientific research, which improves public understanding of the complexity of the global integrated Earth System and provides a technical and scientific foundation for addressing national needs and priorities.</p> <p>The 2008 NASA Authorization Act and the 2006 National Space Policy assign NASA a leading role in advancing fundamental scientific knowledge of the global integrated Earth system. NASA's role is to develop and make first use of new observing and research capabilities to understand the underlying processes, provide objective scientific information to researchers and decision-makers, and transition mature capabilities and results to operational users, such as the National Oceanic and Atmospheric Administration (NOAA) and the US Geological Survey (USGS). NASA's Earth Science Program is essential to the implementation of three major U.S. initiatives: Climate Change Research (June 2001), Global Earth Observation (July 2003), and the U.S. Ocean Action Plan (December 2004).</p> <p>NASA’s Earth Science Program is guided primarily by the 2007 National Research Council Decadal Survey, where NASA is executing an ambitious plan to answer questions regarding why and how the environment is changing, define the impacts of environmental change on humans, and identify how humans can mitigate the impact of environmental hazards. Through its work with other Federal agencies to improve their operational services, NASA Earth Science advances capabilities in such areas as weather and air quality forecasting, climate prediction, and natural hazard and land use assessment.</p> <p>The program addresses specific, identified national needs in several areas, including: the causes and consequences of climate change; improvements in the reliability and extension of weather forecasts; and the monitoring and eventual prediction of natural hazards such as floods, volcanic eruptions, and earthquakes.</p>

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	<p>These national needs are further identified in the strategic plans for the Climate Change Science Program (CCSP) and the U.S. Integrated Earth Observation System Strategic Plan.</p> <p>For more information, see <a href="http://nasascience.nasa.gov/earth-science">http://nasascience.nasa.gov/earth-science</a></p>
<p><b>2. Projects and Activities:</b></p>	
<p>Kinds and scope of projects and activities to be performed</p>	<p>\$325M of Recovery Act funds will be applied to the Earth Science Program. The Earth Science Program conducts breakthrough research to advance fundamental knowledge on the most important scientific questions on the global and regional integrated Earth system. Activities encompass the global atmosphere; the global oceans including sea ice; land surfaces including snow and ice; ecosystems; and interactions between the atmosphere, oceans, land, and ecosystems.</p> <p>Advancements are made through continuous interactions among four major elements: Flight Programs develops satellite missions; Research and Analysis provides the scientific rationale, as well as analytical support for satellite missions; Technology develops new technology and matures existing technologies for satellite and airborne measurements; and, Applied Sciences enables other agencies to utilize these observations.</p> <p>Recovery Act funds will be used to accelerate the implementation of the recommendations of the National Research Council's Earth Science and Applications Decadal Survey (2007). This includes rapid deployment of a suite of Earth-observing satellites to leverage existing missions and provide cutting-edge measurements of key parameters relevant to climate change while preserving the balance between all of the elements of the overall NASA Earth Science Program, including the spaceflight missions, technology development, research and analysis, and science applications. Specific activities include:</p> <ul style="list-style-type: none"> <li>• Completing and launching foundational Earth Science missions now under development, to lay the groundwork for the new Decadal missions</li> <li>• Accelerating the recommended priorities of the Decadal Survey: initiating a series of Venture-class missions, accelerating or beginning development of Decadal Survey missions, providing focused technology development in support of planned missions</li> <li>• Advancing understanding of scientific questions with a robust, integrated program of airborne measurements, scientific research and applications, technology development, supercomputing, climate modeling, and education and public outreach.</li> </ul>
<p><b>3. Characteristics:</b></p>	
<p>Types of Financial Awards to be used.</p>	<p>The majority of work will be accomplished utilizing contracts; there are no grants planned.</p>

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Type of Recipient	The recipients of this work will be non-governmental for-profit organizations, including small businesses, and private non-profit institutions/organizations.
Type of Beneficiary	The primary beneficiaries are the general public and its “scientist/researcher” and “engineer” communities.
<b>4. Major Planned Program Milestones:</b>	
Schedule with milestones for major phases of the program’s delivery	<p>Many of the Earth System Science program activities are associated with on-going research efforts to gain better scientific knowledge or provide long-term educational value. These include Airborne Science, Scientific Computing, Global Modeling &amp; Assimilation Office, Research &amp; Analysis, Earth Science Education &amp; Outreach within Earth Science Research, Mission Operations for the Terra, Aqua and Aura satellites and Multi-Mission Operations within Earth Systematic Missions, Advanced Technology Initiatives, and Applied Science. The activities associated with stimulus funding for these activities will typically be started before June 2009, with the first milestone evaluation between July 2009 and May 2010 depending upon the nature of the activity. The expected completion date of activities associated with stimulus funding is typically no later than September 2010.</p> <p>Mission development activities within the Earth Systematic Missions program and the Earth System Science Pathfinder program are also ongoing efforts with multiple in-process developmental milestones. The mission development activities that will be supported with stimulus funding will typically occur between May 2009 and September 2010. Major mission milestone dates during this time period for each mission are provided below.</p> <p>Note the following milestones are subject to change, based on the complex and highly dynamic nature of research and development-type activities.</p>
Milestone #1	Aquarius spacecraft launch into space.
Expected Completion Date for Milestone #1	May 2010
Milestone # 2	Venture Class Solicitation and Award Process Initiation. NASA will issue a NASA Research Announcement (NRA) for Venture class missions. The Venture Class solicitation is for a series of small, relatively inexpensive, competitively selected missions and instruments that can be implemented quickly. Typically, these are a mix of instruments that can be flown on partner-funded spacecraft, and airborne, suborbital, and small space-based missions.
Expected Completion Date for Milestone # 2	July 2009

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Milestone # 3	Landsat Data Continuity Mission (LDCM), Thermal Infrared Sensor (TIRS) Critical Design Review (CDR). The CDR demonstrates that the maturity of the TIRS design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test.
Expected Completion Date for Milestone #3	February 2010
<b>5. Monitoring and Evaluation:</b>	
	<p>NASA uses multiple methods, processes and entities for monitoring and evaluating performance. These same procedures will be used for activities funded under the Recovery Act. NASA’s programs are assessed for relevance, quality, and performance. A relevance review assures alignment with national priorities, the NASA Strategic Plan, impact on related fields of research or technology, and “customer” (users of NASA data, research results, etc.) needs. Determining quality is generally prospective and assures “best value” for an investment, using peer review processes. Performance reviews evaluate whether a program is on track to meet its baseline performance commitments (cost, schedule, science/technical deliverable).</p> <p>Reviews are conducted internal and external to the Agency. External evaluations are performed by entities such as the NASA Advisory Council and the National Research Council to assess NASA’s program content and direction. Additional independent reviews are commissioned by the NASA Administrator or responsible mission organization to review programs for relevance, quality, and performance. Reviews are rigorous, methodical and focused on program methods, results, and findings by others in the field with requisite expertise, and independence.</p> <p>Responsibility for program and project management and their control mechanisms (NASA Procedural Requirements (NPR) 7120 series)*, institutional management (NPR 8500 series)*, and financial management (NPR 9010 and 9120 series)*, occurs at all management levels of the Agency. NASA’s management monitors different aspects of program or institutional performance, at the highest Agency levels, and uses a rigorous structure of program and management reviews for Agency-level decisions. To continue through each phase of development, programs must demonstrate, on an on-going basis, an ability to manage in a manner that produces identifiable results, and must document performance against previously defined commitments including multi-year outputs, annual performance goals, milestones and other metrics, as appropriate.</p> <p>NASA internally monitors performance through monthly and quarterly reviews at each management level. At the senior management level, program reviews, accompanied by an independent (internal) assessment, occur across all mission areas, with an in-depth review each quarter rotating among the mission organizations. Senior management also reviews institutional data (finance, human capital, acquisition, infrastructure), and aggregated Agency measures and metrics, e.g., safety, cross-cutting technical and non-technical issues. The data reviewed, and the accompanying analysis, allows the Agency to focus on, and proactively</p>

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	<p>address, issues that could lead to not achieving desired performance goals.</p> <p>Specific to the Earth Science Program, the NRC provides advice on the strategy and evolution of the whole Climate Change Science Program (CCSP) and carries out independent analyses and studies via three Committees: i) Committee on Strategic Advice on the CCSP, ii) Ad Hoc Committee on Analysis of Global Change Assessments, and iii) Climate Research Committee. For operating missions, external peer-review panels weigh the scientific merits of continued operation of missions that have fulfilled their designed lifetimes.</p> <p>Earth Science weekly, monthly, and quarterly reports are archived and available online to management. This information is used to assess progress, develop risk mitigation strategies, adjust priorities, and/or make resource allocations. Key data includes the tracking of lifecycle costs. Programs are descoped, restructured, or cancelled based on evaluation of performance data. Independent reviews for achieving long-term performance outcomes and efficiencies occur at major program milestones in development and bi-annually during implementation.</p> <p>* The <a href="#">NASA Online Directives Information System Library</a>, ensures access by NASA employees and contractors to the most current documentation.</p>
<b>6. Measures:</b>	
<b>Measure Text</b>	<b>Achievement of progress on key formulation and development activities for decadal survey and precursor missions.</b>
Measure Type	Output
Measure Frequency	Annual
Direction of Measure	+
Unit of Measure	Percent
Explanation of Measure	<p>Complete decadal survey and precursor mission milestones within 10% of projected schedule. For eight mission milestones, the combined schedule from the June 2009 receipt of ARRA funds to completion is equivalent to 57 months. For each update, NASA will confirm dates of completion for those milestones already achieved and planned completion dates for the remainder in order to provide the percentage of planned schedule within which milestones are/will be completed.</p> <p>NASA completes many spacecraft and instrument development activities that demonstrate progress toward providing the critical systems for the conduct of scientific research. Each year a series of activities are tracked for their successful completion. Generally, major system formulation activities consist of the completion of conceptual studies, requirements reviews and preparation to proceed into the design and development phases of the project. Design and development activities consist of key design reviews, fabrication completion events and eventual launch of the spacecraft.</p>

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Year	FY 2009, FY 2010
Original Program Target	Completion of seven mission milestones within 10% of the established schedules: FY 2009: Complete SMAP Advanced Concepts Study (Jul 2009); Complete GPM Confirmation Review/KDP-C (Jul 2009 – note this was revised from May); and FY 2010: Complete GPM Critical Design Review (Jan 2010); Complete Aquarius Operational Readiness Review (May 2010); and Complete LDCM Confirmation Review (May 2010). FY 2011: Complete ICESat II Initial Confirmation Review (Feb 2011); and Complete SMAP Preliminary Design Review (Jan 2011).
Revised Full Program Target	Completion of eight mission milestones within 10% of the (accelerated) schedules: FY 2009: Complete SMAP Advanced Concepts Study (Jul 2009), Complete GPM Confirmation Review/KDP-C (Jul 2009), and FY 2010: Complete ICESat II Initial Confirmation Review (Dec 2009), Complete SMAP Preliminary Design Review (Sept 2010), Complete GPM Critical Design Review (Oct 2009), Complete Aquarius Operational Readiness Review (Nov 2009), Complete LDCM Confirmation Review (Nov 2009), Complete first Venture Class mission competitive selection process (Feb 2010). Note that completing the first Venture Class competitive selection process was not supported by NASA's budget, prior to Recovery Act funds.
Target (incremental change in performance)	No change in percentage (both original & revised targets are within 10%), but with the following acceleration: Complete ICESat II Initial Confirmation Review (14 months earlier); Complete SMAP Preliminary Design Review (4 months earlier); Complete GPM Critical Design Review (3 months earlier); Complete Aquarius Operational Readiness Review (6 months earlier); Complete LDCM Confirmation Review (6 months earlier); and Complete first Venture Class mission competitive selection process (new opportunity).
Actual	
Goal Lead	Director, Earth Science Division, Science Mission Directorate
<b>Measure Text</b>	<b>Variance from the planned cumulative obligations for the Earth Science Program.</b>
Measure Type	Output
Measure Frequency	Quarterly
Direction of Measure	+
Unit of Measure	Percent

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Explanation of Measure	<p>A key aspect of the American Recovery and Reinvestment Act, is to assure the timely obligation of funds to the intended beneficiaries.</p> <p>NASA plans to make every effort to assure this happens on the plan that it has put forward, which has been designed to also maintain a prudent use of taxpayer funds, and provide key research and development program deliverables to the benefit of the public. An obligation of funds means a binding agreement is made with NASA's contractors and grantees that will result in outlays (or a payment for the services or goods they provided), immediately or in the future. NASA will measure its progress toward the planned obligations to-date, on a quarterly basis.</p> <p>NASA's baseline obligation plan (when available) is posted at <a href="http://www.nasa.gov/Recovery/">www.nasa.gov/Recovery/</a>.</p>
Year	2009, 2010
Original Program Target	10
Revised Full Program Target	10
Target (incremental change in performance)	0
Actual	
Goal Lead	Director, Earth Science Division, Science Mission Directorate
Measure Text	<b>Variance from the planned cumulative outlays for the Earth Science Program.</b>
Measure Type	Output
Measure Frequency	Quarterly
Direction of Measure	+
Unit of Measure	Percent
Explanation of Measure	<p>A key aspect of the American Recovery and Reinvestment Act, is to assure the timely outlay of funds to the intended beneficiaries. NASA plans to make every effort to assure this happens on the plan that it has put forward, which has been designed to also maintain a prudent use of taxpayer funds, and provide key research and development program deliverables to the benefit of the public. An outlay of funds means a payment that fulfills an obligation and is the measure of Government spending. This is a payment for the services or goods the contractor or grantee provided. NASA will measure its progress toward the planned outlays to-date, on a quarterly basis.</p> <p>NASA's baseline outlay plan (when available) is posted at</p>

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	<a href="http://www.nasa.gov/Recovery/">www.nasa.gov/Recovery/</a> .
Year	2009, 2010
Original Program Target	10
Revised Full Program Target	10
Target (incremental change in performance)	0
Actual	
Goal Lead	Director, Earth Science Division, Science Mission Directorate
<b>7. Transparency and Accountability:</b>	
	<p>NASA currently utilizes multiple methods to assure transparency and accountability, and will apply these standard processes and procedures to activities supported by Recovery Act funds. The principle of transparency is applied to program and fund allocation planning methods, and in reporting, both internal and external to the Agency, of progress toward the resultant plans. NASA requires accountability at all levels of management and from all of its cost-sharing and non-cost sharing partners, contractors, and grantees for the timely delivery and quality of products.</p> <p>Rigor is applied to NASA programs' design, structure, management, and funding to ensure that resources reach the intended beneficiaries and address the programs' purpose directly. Transparent, merit-based criteria and decision-making procedures are employed at multiple steps in this process. Governing documents, such as the NASA Strategic Plan and supporting mission specific plans, guide the activities of these programs and provide the context through which specific science and research objectives are formulated, investigations are solicited, and missions or activities that address them are planned. Missions are prioritized on the basis of expert opinion such as Decadal Surveys on science, available budget resources, technological maturity, and partnering opportunities.</p> <p>As explained in detail in the Monitoring and Evaluation Section of this Program Plan, NASA will employ multiple methods of review and evaluation of progress toward the goals of this Program Plan. These reviews will assure that funds are being utilized as intended and are delivering on their committed objectives. Managers at all levels will be held accountable both via review of their progress and individual performance plans. At NASA, all employee performance plans for Federal managers include elements tied to the program plans for which they are responsible.</p> <p>Contractors will be held accountable for the timely delivery and quality of products. Award fee reviews, where appropriate, will be performed on contracts and past performance evaluations are integral in solicitation criteria. Grants and</p>

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	<p>cooperative agreements are subject whenever possible to deliverables and milestones that must be met in order to receive funding renewal. International and Federal government partners work in accordance with applicable Memoranda of Understanding (MoUs) and agreements, which generally detail schedule and performance commitments.</p> <p>Contractor and government accounting systems are audited periodically to ensure compliance with government standards. Specific reports that record and track the obligation and expenditure of program funds are as follows: contractor monthly and quarterly reports, reports on budget execution and budgetary resources, the year-end closing statement, and the annual Performance and Accountability Report. Additionally, NASA will cooperate with the Government Accountability Office and the NASA Office of Inspector General through various engagements and audits that monitor specific items dealing with Recovery funds.</p> <p>To assure transparency and accountability to the public and its key stakeholders, NASA will post its current plans, and outline any revisions to previous versions on the Agency Recovery Act website. Information will be available on key events, the status of on-going activities, outcomes of Inspector General Audits and the accomplishment of and performance toward, annual and long-term Recovery Program goals. Web links will be provided, where applicable to posted solicitations, awards, and grantee performance, among other relevant information. For this and other important information on NASA implementation of the Recovery Act, see <a href="http://www.nasa.gov/recovery/">http://www.nasa.gov/recovery/</a>.</p>
<p><b>8. Federal Infrastructure Investments:</b></p>	
<p>Description of Agency plans to spend funds effectively to comply with energy efficiency and green building requirements</p>	<p>Not applicable</p>