

**Prospectus for Synthesis and Assessment Product 4.3*****The effects of climate change on agriculture, biodiversity, land, and water resources***

Lead Agency: US Department of Agriculture

Supporting Agencies: Department of Energy  
US Geological Survey  
Environmental Protection Agency  
National Aeronautics and Space Administration  
National Oceanic and Atmospheric Administration  
National Science Foundation

**1. Overview: Description of Topic, Audience, Intended Use, and Questions to be Addressed*****1.1 Description of Topic and Questions to be Addressed:***

The 2003 Strategic Plan for the United States Climate Change Science Program identified 21 synthesis and assessment products that represent principal responses to the top-priority research, observation, and decision support needs of society. The Climate Change Science Program (CCSP) Synthesis and Assessment Product 4.3 (SAP 4.3) will address the effects of climate change on agriculture, land resources, water resources, and biodiversity<sup>1</sup>. These areas are addressed under the ecosystems, land use, and water research elements of the CCSP. One of the primary goals of these research elements is to enhance understanding and ability to estimate impacts of future climate change on these systems.

Over the past several decades, numerous scientific assessment reports have described and discussed historical and potential impacts of climate change and climate variability on managed and unmanaged systems and their constituent biota and processes<sup>2</sup>. This report will build on recent assessments and focus on questions relevant to decision-makers. In particular, this report will focus on our ability to identify, observe, and monitor the stresses that influence agriculture, biodiversity, land and water resources. The report will evaluate the relative importance of these stresses and how they are likely to change in the future. A lasting contribution of this report will be the synthesis of information on resource conditions, observation systems, and monitoring capabilities that can be used to gauge future change.

The potential scope of the material in SAP 4.3 is very broad. To ensure that the report addresses key resources in a meaningful way, we propose that the scope of the report be limited to an assessment of the United States and that the timeframe of interest be weighed toward the near-

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<sup>1</sup> On July 15, 2005, CCSP agreed to modify its SAP list to explicitly incorporate coverage of all assessment areas listed under Section 106 of the Global Change Research Act. One of these modifications was to change Product 4.3 to focus on effects of climate change on agriculture, biodiversity, land and water resources. Product 4.3 was initially focused on the relationship between observed ecosystem changes and climate change.

<sup>2</sup> A description of relevant assessments and reports is included in section 7 of this prospectus.

1 term (e.g. the next 20-30 years). We do not anticipate that the report will include specific  
2 scenarios of future conditions. Rather, the report will highlight the changes in resource  
3 conditions that recent scientific studies suggest are most likely to occur in response to climate  
4 change, and when and where to look for these changes. The resources that will be addressed in  
5 this product include:

- 6
- 7 • Agriculture
  - 8 ○ Cropping systems
  - 9 ○ Pasture and grazing lands
  - 10 ○ Animal management
- 11 • Land Resources
  - 12 ○ Forests
  - 13 ○ Arid lands
- 14 • Water Resources
  - 15 ○ Supply
  - 16 ○ Quality
- 17 • Biodiversity
  - 18 ○ Species diversity
  - 19 ○ Rare ecosystems
- 20

21 Temperature, precipitation, and related climate variables are fundamental regulators of biological  
22 processes, and so it is reasonable to expect that climate change will have effects on the condition,  
23 composition, structure, and functioning of biological systems and resources. Such changes may  
24 also alter the linkages and feedbacks between these systems and the climate system.  
25 Additionally, biological systems and resources produce a wide array of goods and services  
26 valued by humans.

27

28 Climate variables are linked to specific resource responses through complex chains of interacting  
29 processes. Impacts of climate change on managed and unmanaged systems interact with the  
30 impacts of numerous other human actions, including land use changes that fragment and degrade  
31 ecosystems at various spatial scales, pollutants, invasions of non-native species, and resource  
32 management and utilization practices. Competition for water is driven by many factors that have  
33 little to do with climate change, including development and population growth. Water  
34 availability could also be affected by changes in climate. Demand could change in response to  
35 higher temperatures and supply could change due to changes in precipitation volume and timing.  
36 It is difficult to separate the effects of climate change from those due to these other human  
37 activities. These challenges are made all the more problematic by the current paucity of long-  
38 term monitoring data and information for most managed and unmanaged system types.  
39 However, in order to gain a better understanding of the effects of climate change on resources  
40 and ecosystems, it is important to focus specifically on our ability to identify causal links.

41

42 A primary focus of SAP 4.3 will be the identification of observations and measures to establish  
43 baselines or benchmarks that could be used in the future to evaluate changes in conditions. The  
44 report will also highlight where we could expect to see effects as a consequence of climate  
45 change. In order to accomplish this, the report will highlight the factors that have the greatest  
46 potential to be influenced by climate change. Factors include: temperature related factors (e.g.

1 growing season, heat stress, etc.), moisture related factors (e.g. rainfall, snowpack,  
2 evapotranspiration rates, etc.), and other factors (e.g. human demand for goods and services, pest  
3 tolerance, CO<sub>2</sub> fertilization). Second, the report will explore how changes in these factors could  
4 increase or decrease stress on the resources and systems being examined. Third, the report will  
5 identify indicators that can be used to assess resource conditions and evaluate stress. Finally, the  
6 report will provide an assessment of our ability to monitor changes in the stresses facing the  
7 systems, including addressing whether these systems are sensitive to changes attributable to  
8 climate change.

9  
10 The specific questions to be addressed in SAP 4.3 are:

- 11 1. What factors influencing agriculture, land resources, water resources, and biodiversity in the  
12 United States are sensitive to climate and climate change.
- 13 14
- 15 2. How could changes in climate exacerbate or ameliorate stresses on agriculture, land  
16 resources, water resources, and biodiversity?
- 17
- 18 3. What are the indicators of these stresses?
- 19
- 20 4. What current and potential observation systems could be used to monitor these indicators?
- 21
- 22 5. Can observation systems detect changes in agriculture, land resources, water resources, and  
23 biodiversity that are caused by climate change, as opposed to being driven by other causal  
24 activities?
- 25

26 The report will be based on an objective evaluation of the peer-reviewed literature. The product  
27 will not provide advice or recommendations but will be limited to a synthesis of facts and  
28 information. Where appropriate, for example in addressing question 4, the report will include  
29 evaluations of alternatives and options. The product will in some cases rely on information  
30 developed through interpretation of original data and synthesized products. This information  
31 could incorporate additional contextual and/or normative data, standards, or information that puts  
32 original data and synthesized products into larger spatial, temporal, or issue contexts.

### 33 34 **1.2 Audience**

35  
36 The document will be relevant to many audiences who have interests in assessing and evaluating  
37 potential effects of climate change on agriculture, land, water, and biodiversity. The product will  
38 address scientific issues on a comprehensive, objective, and transparent basis. While based on  
39 the peer-reviewed literature, it will be written to be accessible and useful to the well-informed,  
40 general readers, land and resource managers, policy-makers, and other decision makers.

41 Examples of potential users include:

- 42
- 43 • Sectors, organizations, and individuals at local, state, regional, national, and international  
44 levels who make ecosystem and resource management decisions and establish natural resource  
45 policy;
- 46

- 1 • Research scientists who conduct studies of climate change impacts on systems and resources,  
2 and on their potential responses;
- 3
- 4 • State and local governments; and
- 5
- 6 • Others who depend on and use the products and services provided by systems and resources to  
7 human communities.
- 8

## 9 **2. Contact Information for Responsible Individuals at the Lead and Supporting Agencies**

10 The US Department of Agriculture (USDA) is the lead agency for SAP 4.3. Key contacts for the  
11 lead and supporting agencies are listed below:

12  
13 *US Department of Agriculture (lead agency)*

14 William Hohenstein – [whohenst@mailoce.oce.usda.gov](mailto:whohenst@mailoce.oce.usda.gov), 202-720-6698

15 Bryce Stokes – [bstokes@fs.fed.us](mailto:bstokes@fs.fed.us), 703-605-5263

16  
17 *US Geological Survey (supporting agency)*

18 Jack Waide – [jwaide@usgs.gov](mailto:jwaide@usgs.gov), 703-648-4053

19  
20 *US Department of Energy (supporting agency)*

21 Jeff Amthor – [Jeff.Amthor@science.doe.gov](mailto:Jeff.Amthor@science.doe.gov), 301-903-2507

22  
23 *Environmental Protection Agency (supporting agency)*

24 Susan Herrod-Julius – [Julius.susan@epa.gov](mailto:Julius.susan@epa.gov), 202-564-3394

25  
26 *National Aeronautics and Space Administration (supporting agency)*

27 Woody Turner – [woody.turner@hq.nasa.gov](mailto:woody.turner@hq.nasa.gov), 202-358-1662

28 Paula Bontempi – [paula.s.bontempi@hq.nasa.gov](mailto:paula.s.bontempi@hq.nasa.gov), 202-358-1508

29  
30 *National Oceanic and Atmospheric Administration (supporting agency)*

31 (TBD)

32  
33 *National Science Foundation (supporting agency)*

34 Henry Gholz – [hgholz@nsf.gov](mailto:hgholz@nsf.gov), 703-292-7185

35 Phil Taylor – [prtaylor@nsf.gov](mailto:prtaylor@nsf.gov), 703-292-8582

## 36 37 **3. Document Production and Lead Author Selection**

38  
39 The overarching goal of the synthesis and assessment reports called for in the CCSP Strategic  
40 Plan is to provide society with research and observations to help it deal with key climate change  
41 issues. Given the breadth of SAP 4.3, USDA foresees significant benefit from cooperation  
42 between federal, academic, and private scientists and researchers in producing the report. While  
43 the document will benefit the federal government, the audience for the report includes scientists,  
44 organizations, industry, and governments at the state and local levels. The product will be of  
45 mutual interest and benefit to the author team, the organizations involved, and the broader  
46

1 scientific, technical, and policy community. SAP 4.3 will provide a comprehensive reference for  
2 those involved with managing agricultural systems, land and water resources, and biodiversity on  
3 the potential stresses that could affect these systems due to climate change. The document will  
4 provide a direct benefit to organizations that are working to improve the scientific understanding  
5 human interactions with the climate system. The document will also be of use to resource  
6 managers that are developing plans that need to accommodate climate variability and change.  
7 The production of the document will be best served by an exchange of resources and substantial  
8 involvement between USDA, other federal agencies, and a cooperator (including activities such  
9 as drafting, providing reviews, financial assistance, and technical input). Based on these  
10 considerations, USDA decided to pursue the production of this report through a cooperative  
11 agreement.

12  
13 Development of SAP 4.3 will require an interdisciplinary group of lead and supporting authors  
14 with expertise and experience directly related to the subject matter. The cooperator, in  
15 coordination with USDA, will select a convening lead author and lead authors for each chapter  
16 of the report, consistent with the following required expertise. The public may submit  
17 nominations for consideration. Nominations should be emailed to  
18 **whohenst@mailoce.oce.usda.gov** or sent to William Hohenstein at the United States  
19 Department of Agriculture, 1400 Independence Ave., SW, Room 112-A J. L. Whitten Building,  
20 Washington DC, 20250 on or before July 21, 2006. Nominations must include CVs, publications  
21 listings and brief descriptions of the strengths of the nominee(s).

22  
23 The convening, lead, and supporting authors will be scientists or individuals with recognized  
24 technical expertise appropriate to assessing the effects of climate change on agriculture,  
25 biodiversity, land, and water resource. Authors may be citizens of any country and be drawn  
26 from within or outside the Federal government (e.g., universities or other public or private sector  
27 organizations). Authors will be acknowledged as experts based on their publication records and  
28 relevant accomplishments and contributions, including, editorial record; experience directing  
29 research efforts; academic training; professional service, operational knowledge of agriculture,  
30 forestry, biodiversity, land, and water resources; professional memberships; previous  
31 contributions to international, national, and regional scientific assessments; receipt of national  
32 professional awards; and other applicable special experience or abilities.

33  
34 USDA will publish the biographical information for the convening lead author and lead authors  
35 in a Federal Register Notice.

36  
37 The convening lead author and lead authors for each chapter of the report —organized by the  
38 cooperator, will draft answers to the five key questions addressed in the product. The lead  
39 authors will incorporate material from any supporting authors as they deem appropriate. The  
40 convening lead author and lead authors will also prepare an introductory section to describe the  
41 topic, the audience, and the intended use of this product. The lead authors will incorporate  
42 material from supporting authors in the draft product.

43  
44 After the product is drafted, the convening lead author and lead authors will write a non-  
45 technical summary. Authors will base all their writing on published, peer-reviewed scientific  
46 literature. Authors will consider the full range of relevant peer-reviewed information. Highly

1 relevant non-peer reviewed literature may be used with permission from USDA and the CCSP.  
2 The product and its non-technical summary will identify disparate views, where appropriate.  
3

#### 4 **4. Stakeholder Interactions**

5  
6 In preparing this draft prospectus, USDA and supporting agencies considered feedback received  
7 from stakeholders at the December 2002 Climate Change Science Program Planning Workshop  
8 for Scientists and Stakeholders and the November 2005 U.S. Climate Change Science Program  
9 Workshop: Climate Science in Support of Decision Making. Development of this prospectus  
10 reflects other recent developments as well. The lead and supporting agencies will refine and  
11 shape the scope, content, and organization of the product based on input provided by scientists,  
12 decision makers, resource managers, and other stakeholders received during the prospectus  
13 public comment period.  
14

15 In addition, USDA, working with the supporting agencies, will provide guidance to the  
16 cooperator regarding solicitation of additional input from a broader group of stakeholders at the  
17 beginning of the product drafting process. This could involve convening a focused stakeholder  
18 workshop, soliciting stakeholder input through a structured e-mail or web-based process or  
19 survey, or other appropriate process. This input, together with other input received from sources  
20 noted above will be considered carefully in defining the scope, organization, content, and  
21 expectations for the product.  
22

#### 23 **5. Drafting Process: Materials to be Used in Preparing the Product**

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25 The convening and lead authors, organized by the cooperator, will meet in person, through e-  
26 mail exchanges, and via teleconferences, to develop a detailed outline for the organization and  
27 content of the product, to draft answers to the key questions to be addressed, and to prepare the  
28 introductory section. The lead authors may assign primary responsibility for drafting  
29 components of the responses to questions to a supporting author.  
30

31 Lead and supporting authors will base their writing on published, peer-reviewed scientific  
32 literature. Authors will consider the full range of relevant peer-reviewed information. The  
33 product and its non-technical summary will identify disparate views, where appropriate, and will  
34 carefully enumerate remaining sources of uncertainty and their effects on the responses to the  
35 questions and the main conclusions to be reached.  
36

#### 37 **6. Review Process**

38  
39 The product will be reviewed independently, following the process described in the Guidelines  
40 for Producing CCSP Synthesis and Assessment Products, including (1) a first draft for expert  
41 peer review, (2) a second draft posted for public comment, and (3) a third draft for final review  
42 and approval through the CCSP Interagency Committee and the National Science and  
43 Technology Council (NSTC).  
44

45 The expert peer review for the product will fully comply with requirements of the Information  
46 Quality Act (PL 106-554, §515(a)) ("IQA"), USDA's Information Quality Guidelines, and the

1 requirements of the Office of Management and Budget's (OMB) Final Information Quality  
2 Bulletin for Peer Review ("OMB Bulletin"), including developing the peer review plan,  
3 preparing the peer review report, and developing the response to the peer review.  
4

5 Prior to completion of the first draft of the product, USDA, working with supporting agencies,  
6 will develop a peer review plan and post it on its website, (<http://www.usda.gov/occe/agenda.htm>)  
7 as part of its Agenda of Peer Review Plans, with a link to the CCSP web site. The peer review  
8 plan will include the tentative title of the product report, a short paragraph describing the subject  
9 and purpose of the report, and an agency contact person.  
10

11 USDA intends to pursue the expert peer review through the establishment of a Federal Advisory  
12 Committee (FACA). The public is invited to nominate independent scientific reviewers to the  
13 FACA review committee. Nominations should be emailed to **whohenst@mailoce.occ.usda.gov**  
14 or sent to William Hohenstein at the United States Department of Agriculture, 1400  
15 Independence Ave., SW, Room 112-A J. L. Whitten Building, Washington DC, 20250 on or  
16 before July 21, 2006. Nominations must include CVs and publications listings. The expert  
17 review process will involve one or more face to face meetings of the FACA Review Committee  
18 in compliance with the Federal Advisory Committee Act and with the requirements for peer  
19 review from the Office of Management and Budget Final Information Quality Bulletin for Peer  
20 Review ("OMB Peer Review Bulletin"), issued 16 December 2004. Each Expert FACA  
21 Reviewer will review the document as a whole. USDA will select qualified reviewers based on  
22 their experience, published work, and stature within and across scientific and technical  
23 communities. USDA will also screen for real or perceived conflict of interest and ensure that the  
24 full slate of reviewers selected reflects a balance of scientific and technical perspectives.  
25

26 Following expert review, the authors will revise the draft product by incorporating comments  
27 and suggestions from the reviewers, as the authors deem appropriate. USDA will prepare the  
28 required peer review report, including a summary of peer review comments and the agency's  
29 response to the review. The peer review report will be posted on USDA's web site and linked to  
30 the CCSP web site.  
31

32 Following this expert review process, the second draft will be released for public comment  
33 following CCSP guidelines. The public comment period will last at least 45 days. The authors  
34 will prepare a third draft of the product, taking into consideration the comments submitted during  
35 the public comment period. The scientific judgment of the authors will determine responses to  
36 the comments. A summary of the public comments received for the product will be posted on  
37 the CCSP web site.  
38

39 The third draft of the product will be submitted to the CCSP Interagency Committee for final  
40 review and approval. If the CCSP Interagency Committee review determines that no further  
41 action is needed and that the product has been prepared in conformance with these guidelines  
42 and the IQA (including ensuring objectivity, utility, and integrity as defined in 67 FR 8452), they  
43 will submit the product to the National Science and Technology Council (NSTC) for clearance.  
44 If the CCSP Interagency Committee determines that further revision is necessary, their  
45 comments will be sent to the lead agency for consideration and resolution by the authors. If  
46 needed, the National Research Council (NRC) will be asked to provide additional scientific

1 analysis to bound scientific uncertainty associated with specific issues. The lead agency will  
 2 produce the final product and it will be released in coordination with the Climate Change  
 3 Science Program Office (CCSPO).

#### 4 5 **7. Related Activities, including Other National and International Assessment Processes**

6  
7 This CCSP product will draw on previous Intergovernmental Panel on Climate Change (IPCC)  
 8 assessments (e.g., First, Second, and Third Assessment Reports); the 2000 United State National  
 9 Assessment of the Potential Consequences of Climate Variability and Change (including the  
 10 Foundation and Overview reports and the several regional and topical assessment reports); the  
 11 Artic Climate Impact Assessment, 2005; the Millennium Ecosystem Assessment; relevant NRC  
 12 reports (e.g., Global Environmental Change: Research Pathways for the Next Decade, 1999;  
 13 Science Priorities for the Human Dimensions of Global Change, 1994; Sea Level Rise and  
 14 Coastal Disasters: Summary of a Forum, 2002; Hydrologic Science Priorities for the U.S. Global  
 15 Change Research Program: An Initial Assessment, 1999; Climate Change Science: An Analysis  
 16 of Some Key Questions, 2001); and other relevant national and international reports. It is  
 17 expected that this CCSP product will provide input to future IPCC assessments, and future NRC  
 18 reports on climate change effects.

#### 19 20 **8. Communications: Proposed Method of Publication and Dissemination of the Products**

21  
22 USDA will coordinate production and release with CCSPO using the standard format established  
 23 for all CCSP Synthesis and Assessment Products. The final product and the comments received  
 24 during the public comment period will be posted on the CCSP web site. Similarly, the peer  
 25 review report for the product, along with the lead agency's response to the review, will be posted  
 26 on USDA's website and linked to the CCSP web site. The number of hard copies of the product,  
 27 and the means for dissemination and notification of availability will be designed to ensure broad  
 28 availability to the scientific community and to the public, including all stakeholders with a stated  
 29 interest in the product.

#### 30 31 **9. Proposed Timeline**

##### 32 33 2006

34		
35	March	Draft prospectus prepared for review
36	May	Prospectus provided to CCSP Principals for approval
37	June-July	Public review of draft prospectus
38	July-August	Final prospectus cleared & published on CCSP web site
39	July-August	Work plan prepared by cooperator
40	August	USDA releases peer-review plan on USDA web-site
41	August- December	Cooperator prepares first draft of technical chapters

##### 42 43 2007

44		
45	January	First draft completed by lead and contributing authors
46	February	Expert review of first draft



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|---|----------|--|
| 1 | April    | Second draft completed                                   |
| 2 | May      | Public comments on second draft completed                |
| 3 | July     | Third draft completed                                    |
| 4 | August   | CSP review of third draft completed                      |
| 5 | October  | NSTC approval of final product                           |
| 6 | December | Final product published on CCSP website and in hard copy |
| 7 |          |  |