U.S. GEOLOGICAL SURVEY/EROS CENTER
TECHNICAL REQUIREMENTS DOCUMENT
for
TECHNICAL SUPPORT SERVICES CONTRACT SOLICITATION

TRD NUMBER

0005

PERFORMANCE PERIOD

Contract Base Year: April 1, 2010 thru March 31, 2011

PROJECT NAME

Early Warning and Environmental Monitoring Part 1

1.0 Scope

USGS goals and objectives are to perform research, transition research techniques into operational monitoring, and support applications in order to answer the following question through use of remote sensing science:

- What are the locations of, the general recent trends, the causes, and the consequences of gradual terrestrial change (or vegetation dynamics) across the conterminous U.S. within the last 20 years? [This period of record relates to the primary time series data used for analysis (AVHRR, MODIS) but future work with other satellite time series data may extend the historical record back into the 1970s].

Statement of Problem
Changes in the Earth's vegetation canopy occur both abruptly and gradually. Whereas abrupt changes generally occur as a result of extreme circumstances (e.g., hazards like wildfire or flood) and are relatively easy to map and monitor with remote sensing tools, gradual changes can be subtle and are much more challenging to monitor. Gradual changes may relate to shifting cyclical phenologic events (e.g., greenup, maturity, and senescence), global change, or to gradually-developing hazards such as drought.

Tracking vegetation dynamics utilizing remote sensing and documenting their trends, causes, and effects is an ongoing effort with specific desired technical outcomes. Outcomes are in the form of databases, research analysis techniques and methods (e.g., models and the output products of models), and information products (such as publications, presentations, posters, web sites, web map services, and workshops).

Because of the scientific research nature of the Vegetation Dynamics tasks (under EWEM#1), USGS EROS will work collaboratively with both the SSSC and TSSC on deliverables, however, this TRD will focus primarily on the technical deliverables required of the TSSC, some of which are closely tied to research deliverables. In addition, the USGS will frequently require TSSC staff to work closely with SSSC staff to achieve the desired outcomes.

Sponsors and Collaborators
U.S. Agency for International Development
University of California at Santa Barbara
National Drought Mitigation Center, University of Nebraska-Lincoln
National Aeronautical and Space Administration's Jet Propulsion Laboratory
U.S. Department of Agriculture's Risk Management Agency
High Plains Regional Climate Center

2.0 Deliverables

FEWS NET

1. Provide assistance in developing and improving operational applications of remote sensing and modeling for seasonal monitoring, harvest assessment, and identification of long-term climate trends.
2. Maintain the FEWS NET geographic data archive, including tabular, vector, and raster datasets.
3. Provide timely access to satellite data and derived products
4. Seasonal monitoring products and analysis – including NDVI (MODIS), WRSI, BERM, SPI, snow cover and snow water equivalent (for Afghanistan, Central Asia, Southwest Asia, and other snow-covered regions), rainfall anomalies in malaria epidemic zones, etc, and participation in Weekly Weather Assessment telecons.
5. Spatial data management and infrastructure – including remote sensing images and derived products, vector/map data, tabular data, and web resource maintenance.
6. Provide support for custom analysis and briefings support – including USAID and FEWS NET briefings.
7. Help generate harvest assessments – including yield, area, and production estimates from remote sensing.
8. Maintain an early warning website to disseminate daily, dekadal, and irregular updates and information on climate-, weather-, and/or crop-related food security hazards for Africa, Asia (Southwest, South Central, and Southeast), Central America and the Caribbean, and South America.
9. Communicate regularly and frequently with FEWS NET Regional Scientists and researchers at the University of California, Santa Barbara, Geography Department to ensure smooth integration of monitoring, modeling activities.
10. Support USGS participation in the NASA Early Warning Systems project through custom processing of rainfall and other climate grids for malaria and famine early warning.

Phenology/Drought (USGS Geography GAM)

11. Update MirAD-US irrigation with 2008 MODIS peak and 2008 USDA NASS irrigation statistics (as soon as they are available from USDA).
12. Design and perform traditional accuracy assessment on the 2003 MODIS irrigation map.
13. Contribute writing content and graphics to a MirAD-US irrigation manuscript for journal publication, and implement USGS FSP review process.
14. Support USGS publication (Open file or science investigations map) of U.S. irrigation (MirAD) map (provide content and graphics as requested).
15. Update content, edit, and design for the Drought fact sheet, implement USGS FSP review process.
16. Update remote sensing phenology (RSP) web site with new content and graphics.
17. Update RSP web site to include 2009 phenology metrics, metadata, and graphical maps.
18. Load VegDRI and other products to drought viewer on the product schedules determined by USGS (e.g., weekly, bi-weekly, and daily).

19. Apply the automated process for AVHRR and MODIS NDVI or VegDRI statistics calculation from selected targets (related to the Platte River Basin pilot study but extensible to other targets) and develop reporting statistics.

U.S. Drought Monitor (USGS Geography LRS)

20. Calculate and assess start of season metrics from MODIS and AVHRR NDVI for sites (for multiple years, e.g., 2005-2009).
21. Assist USGS in developing and implementing an experimental design for phenologic metrics intercomparison to ground (flux) data.

NASA JPL Yr2/Yr3 (NASA/JPL funding)

22. Implement eMODIS VegDRI system in near real time every Sunday starting May3, 2009.
23. Automate ranking code process and integrate code within the VegDRI system and produce rank seasonal greenness products as a regular output of the system each week.
24. Implement process to provide an off season mask into VegDRI products – provide software code (modeled from research code/analysis steps) and integrate code into VegDRI system.
25. Track VegDRI system operational processing (in the form of an automated log) and provide service to system if products fail.
26. Develop automated production of kml format VegDRI and PASG from eMODIS VegDRI system and web enable through Drought Monitoring web map service.
27. Develop and test automated production of NDVI change from VegDRI system (e.g., output formats tif and kml, TBD).
28. Provide reports of test results (e.g., processing times for VegDRI and other metric products) for NASA annual and semi-annual reviews, as requested.

USDA RMA (USDA Risk Management Agency funding through NDMC)

29. Run AVHRR VegDRI operationally every two weeks on Tuesday, deliver to collaborators.
30. Continue testing VegDRI models for 48 states.
31. Provide updated historical metrics for VegDRI models.

3.0 Schedule

1. Start 4/1/10, Finish on 3/30/11
2. Start 4/1/10, Finish on 3/30/11
3. Start 4/1/10, Finish on 3/30/11
4. Start 4/1/10, Finish on 3/30/11
5. Start 4/1/10, Finish on 3/30/11
6. Start 4/1/10, Finish on 3/30/11
7. Start 4/1/10, Finish on 3/30/11
8. Start 4/1/10, Finish on 3/30/11
9. Start 4/1/10, Finish on 3/30/11
10. Start 4/1/10, Finish on or before 3/30/11
11. Start 4/1/10, Finish on or before 3/31/11
12. Start 4/1/10, Finish on or before 3/31/11

13. Start 4/1/10, Finish on or before 3/31/11
14. Start 4/1/10, Finish on or before 3/31/11
15. Start 4/1/10, Finish on or before 3/31/11
16. Finish on or before 3/31/11
17. Start 4/1/10, Finish on or before 3/31/11
18. Ongoing for Option Year 2, year long service (products load daily, weekly, and bi-weekly)
19. Start 4/1/10, Finish on or before 3/31/11 (but may be extended to add additional targets)
20. Start 4/1/10, Finish on or before 3/31/11
21. Start 4/1/10, Finish on or before 3/31/11
22. Ongoing for Option Year 2, Finish on or before 3/3/11
23. Finish on or before 6/30/11
24. Start 4/15/10, Finish on or before 7/15/11
25. Ongoing Option year 2, as needed
26. Start 10/1/09, Finish on or before 3/31/11
27. Start 4/1/010, Finish on or before 3/31/11
28. As requested per NASA review schedule
29. Ongoing Option Year 2, every Tuesday
30. Start 4/1/10, Finish on or before 3/31/11
31. Start 4/1/10, Finish on or before 3/31/11

4.0 Communication

The USGS requires informal verbal communication on a biweekly basis from the TSSC work manager. There may be times when specific information is required or issues need to be addressed more quickly, and the USGS may require specific briefings from TSSC staff on these occasions. In addition, the USGS will frequently require TSSC staff to work and communicate with SSSC staff to achieve coordinated and/or desired outcomes. Direct communication between TSSC and SSSC regarding technical details is strongly encouraged. TSSC technical staff should be prompt to report any issues that arise that might impact the delivery of products and services or their schedule. A monthly status report (documenting work progress, plans, issues, risks and mitigation efforts) will be delivered by the work manager such that timely evaluations of the work can be made. USGS requests direct delivery to the project and task leads.