DOE National Institute for Climatic Change Research (NICCR)

Notice RFP-05

Summary

The U.S. Department of Energy (DOE) National Institute for Climatic Change Research (NICCR) hereby announces its request for research proposals. Proposed research is requested that would answer important questions about potential effects of contemporary climatic change on the structure and functioning of important U.S. terrestrial ecosystems, or that would answer important questions about possible feedbacks from terrestrial ecosystems to changes in climate or atmospheric composition.

This request for proposals is to (1) perform one-year synthesis activities that address a clearly defined gap in scientific knowledge of terrestrial ecosystems and climate change, (2) renew ongoing NICCR research projects for one year, or (3) carry out value-added additions to existing NICCR or non-NICCR-funded experiments that can be completed in one year. The question(s) proposed by investigators should be answerable within the one-year project period.

NICCR divides terrestrial ecosystems into two groups: inland (not adjacent to an ocean) and coastal (adjacent to an ocean, including barrier islands).

For inland terrestrial ecosystems, the main climatic changes of interest are changes in temperature and precipitation. Research should: (1) answer important questions about potential effects of climatic change on the structure and functioning of terrestrial ecosystems within the 50 states or District of Columbia; (2) evaluate or improve the understanding and prediction of potential effects of climatic change on the future geographic distribution of U.S. terrestrial ecosystems at the regional scale; (3) use measurements of contemporary exchanges of mass and energy between the atmosphere and terrestrial ecosystems to answer important questions about possible effects of an altered terrestrial carbon cycle and/or surface energy exchange on global and/or regional climate; or (4) use synthesis of existing experimental or observational data, or modeling, to answer important questions about potential effects of climatic change on U.S. ecological systems and/or feedbacks from U.S. terrestrial ecosystems to climate at the regional scale. Proposals for research on inland ecosystems should be submitted to one of the four NICCR Regional Centers.

For coastal ecosystems, the climatic changes of interest are sea-level rise and the possibility of increased frequency and/or intensity of storms (including hurricanes) directly affecting U.S. coastal ecosystems. Ecosystems to be studied will be the terrestrial ecosystems (including wetland and freshwater ecosystems, but not marine or estuarine ecosystems) in the coastal states that could be directly and significantly altered by sea-level rise or increased frequency or intensity of coastal storms. The ecological endpoints of interest are ecosystem or species migrations, changes in biodiversity, changes in primary production, or alterations

in goods and services uniquely supplied by coastal terrestrial ecosystems. Proposals for research on coastal ecosystems should be submitted to the NICCR Coastal Center.

Eligibility

Colleges, universities, and not-for-profit, non-governmental research institutions located within the 50 states or District of Columbia are eligible for support through NICCR. The Principal Investigator must be principally employed by an eligible institution. Contractors to and employees of federal facilities, including federal agency laboratories and Federally Funded Research and Development Centers (FFRDCs), are ineligible for NICCR funding, either directly or through subawards; subcontracts to ineligible institutions (e.g., government agencies, laboratories, or facilities and FFRDCs) will not be allowed. Questions about eligibility should be directed to Dr. Jeff Amthor (see Contact Persons below).

Projects funded through NICCR will have one Principal Investigator, except in the case of Collaborative Projects, as defined below. Principal Investigators may submit only one preproposal and a scientist cannot concurrently be Principal Investigator on more than one NICCR project or award.

Dates

Preproposals are REQUIRED. Full proposals will only be accepted from applicants who: (1) submit a compliant preproposal on time and (2) are informed by NICCR that their preproposal was selected to be developed into a full proposal.

Preproposals are due 5:00 PM Pacific Time, May 15, 2009.
Proposals are due 5:00 PM Pacific Time, August 14, 2009.

Research project start dates of about April 1, 2010, are expected.

Application Materials

Preproposals and proposals must be submitted electronically (uploaded) to the NICCR web site (http://niccr.nau.edu). Proposals should be contained within a single pdf file. The pdf file should be no larger than 3 MB. The required preproposal and proposal formats are described below in the sections “Preproposal Submission and Format” and “Proposal Format”. Required templates for the Cover Page and Budget Page(s) are available for download at the NICCR web site.

Organization of NICCR

The NICCR is composed of four Regional Centers (encompassing all 50 states and the District of Columbia) and one Coastal Center. Research on inland terrestrial ecosystems is managed by the four Regional Centers while research on coastal terrestrial ecosystems is managed by the Coastal Center.

For inland research projects, the states are distributed among the four NICCR regions as follows:

Northeastern Region -- Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, the District of Columbia, and Virginia.

Southeastern Region -- Texas, Louisiana, Arkansas, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Tennessee, and Kentucky.

Midwestern Region -- North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Missouri, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Ohio, and Michigan.

Western Region -- Alaska, Hawaii, Washington, Oregon, California, Idaho, Nevada, Arizona, Utah, Montana, Wyoming, Colorado, and New Mexico.

All states with a seashore are within the scope of Coastal Center research interests.

Contact Persons

Northeastern Region: Dr. Ken Davis, (814) 863-8601, davis@met.psu.edu

Southeastern Region: Dr. Rob Jackson, (919) 660-7408, jackson@duke.edu

Midwestern Region: Dr. Andrew Burton, (906) 487-2566, ajburton@mtu.edu

Western Region: Dr. Bruce Hungate, (928) 523-0925, bruce.hungate@nau.edu

Coastal Center: Dr. Torbjörn Törnqvist, (504) 314-2221, tor@tulane.edu

Eligibility: Dr. Jeff Amthor, (301) 903-2507, jeff.amthor@science.doe.gov

Background

The purpose of NICCR is to mobilize university scientists, from all regions of the country, in support of the research goals of DOE's Climate Change Research Division (in the DOE Office of Science's Office of Biological and Environmental Research). Information about the Division's research goals is at http://www.sc.doe.gov/ober/CCRD_top.html.

The NICCR national web site is at http://niccr.nau.edu. Web sites maintained by the NICCR Centers are linked to the national web site. Current NICCR research projects are described at these sites.

Request for Proposals

This notice solicits proposals to conduct research related to effects of climatic changes on terrestrial ecosystems and potential feedbacks from terrestrial ecosystems to climatic change. Proposals should state clearly how the proposed research will fill important knowledge gaps that hinder regional-scale or national-scale forecasts of effects of climatic change on important ecosystems or feedbacks from ecosystems to climatic change. Proposals should state why the ecosystems to be studied are important. Criteria that could be considered are areal extent, primary production relative to total production in the region, habitat for threatened and endangered species, or ecosystem characteristics that would allow extrapolation of results to large areas or many ecosystem types.

It is expected that most projects supported by NICCR will be for individual investigators or small research teams (single institutions), but coordinated, multi-institutional (collaborative) projects will be considered for funding (see Collaborative Projects section). The purpose of considering collaborative projects is to allow science questions to be addressed that cannot be readily addressed with traditional single-investigator research projects, and to encourage synthesis activities that are integrated into observational or experimental studies at the regional scale; *collaborative proposals should clearly state how their collaborative nature will satisfy these objectives*. Proposals for Collaborative Projects must present either evidence of past collaborative success, or a clear plan that will facilitate successful project integration.

Only proposals addressing one of the following five focus areas will be considered for support in response to this Notice. The first four foci are associated with inland terrestrial ecosystems and will be administered by the four Regional Centers. The fifth focus is associated with coastal ecosystems and will be administered by the Coastal Center. Research addressing all foci should be directed at climatic changes possible during the next 50-100 years in the United States, and all research will be conducted within the 50 states or District of Columbia.

Focus 1: Focus 1 projects will address potential effects of climatic change on terrestrial ecosystems. Projects should determine the theoretical and/or empirical basis of whether, and how, changes in temperature (annual mean temperature, seasonal and/or diel temperature cycles) and/or changes in precipitation (annual amount, number of events, temporal distribution of events and amounts) might affect the structure and functioning of important U.S. terrestrial ecosystems. Such research could include consideration of threshold effects of extreme temperature and/or precipitation "events" or periods (e.g., heat waves, extended droughts, extended wet periods or significantly altered snowpack) on terrestrial ecosystems. This objective should be met through manipulative experiments in the field or laboratory (field research will generally be given higher priority during project selection). *At this time, proposals to establish new experiments will not be considered.* Instead, proposals should be based on (1) renewal funding for ongoing NICCR manipulative experiments or (2) value-added additions to NICCR or other (non-NICCR-funded) ongoing experiments that can be completed in one year. Experimental manipulations of temperature and/or precipitation could include other "climatic change" factors, such as elevated CO_2 concentration. To the

extent that "model" or "constructed" ecosystems can be justified for the study of ecosystem structure and functioning, experiments using such systems will be considered for support. Experimental research based on underlying theory would be especially relevant. The magnitude of temperature and/or precipitation manipulations should be clearly justified, and important results should be obtainable within one year.

Ecological endpoints of interest include changes to (a) net primary production, (b) ecosystem-scale species composition and diversity, (c) ecosystem-atmosphere mass and energy exchanges (including albedo and water fluxes), and (d) ecosystem susceptibility to pests and disturbances. Proposed research should be directed at measurable and specified endpoints attainable within the proposed project period. Proposals should state briefly and clearly how the research results could or will be used to improve models of terrestrial ecosystems relevant to climatic change issues.

Focus 2: Focus 2 projects will improve the scientific basis for detecting or projecting changes in the geographic boundaries of U.S. terrestrial ecosystems (or biomes), and the populations of their dominant plant or animal species, in response to potential climatic changes. This goal could be achieved through improved understanding of changes to abundance, growth, reproduction, dispersal, or competitive interactions of major plant or animal species within their present ranges that might eventually lead to changes in the species composition or geographic distribution of communities. Climatic changes of interest are the annual mean and seasonal and diel cycles of temperature and the annual amount, frequency, and temporal distribution of precipitation (and available soil moisture). Studies of the potential effects of these climatic changes on important ecosystem disturbances (e.g., changes in the frequency or areal extent of fires) might be appropriate. The magnitude of climatic changes to be studied, and any relationships to major ecosystem disturbances, should be clearly justified.

The intent of this research is to reduce scientific uncertainty about how the geographic distribution of U.S. terrestrial ecosystems, and their component organisms, might be altered by future climatic changes or how those changes in the distribution of ecosystems might in turn alter regional climate. Projects might also attempt to determine if climatic changes during the past 100 years resulted in population and/or ecosystem movements. A particular emphasis should be placed on the relationship between geographic distributions of terrestrial ecosystems and their dominant organisms as that relationship is affected by climate. An important objective is to advance the development and evaluation of models of regional (of the order of one million square kilometers), national, or global biogeography that are, or may be, used to project effects of climatic change on the geographic distributions of terrestrial organisms and ecosystems in the United States. Toward this goal, all proposals should explain clearly how the research results will help develop, improve, or evaluate relevant models in a one-year timeframe.

Projects using existing models of biogeography to make predictions of effects of specified climatic change scenarios on the future distribution of terrestrial ecosystems without accompanying improvements to those models, or directed efforts at evaluating the usefulness or accuracy of those models, will not be considered for support.

Focus 3: Focus 3 projects will address the measurement and analysis of contemporary exchanges of mass and energy between the atmosphere and terrestrial ecosystems or landscapes, and the use of those measurements and analyses to evaluate mechanisms that are, or that might be, included in climate and carbon cycle models. The intent of this research is to reduce scientific uncertainty about the potential effects of climatic change on atmosphere-ecosystem exchanges of mass and energy with an emphasis on the carbon cycle. Projects should use appropriate methods (including, but not limited to, eddy covariance) to quantify and understand ecosystem-atmosphere exchanges relevant to the climate system, focusing on regionally important terrestrial ecosystems (e.g., those covering significant area of land). Proposals should be based on (1) renewal of ongoing NICCR-supported studies or (2) value-added additions to other NICCR or non-NICCR-funded ongoing studies. Proposals should state how the research will improve understanding of the role of terrestrial ecosystems in regional or global cycles of energy and mass, with a focus on the biological control of those cycles and the effects of climatic change on that control.

Examples of relevant studies could include but are not limited to: (a) evaluation of specific ecological processes that are important to the climate system that may be either poorly represented or altogether lacking in climate and carbon cycle models, (b) efforts to detect changes in ecosystem functioning caused by recent climatic changes, or (c) efforts to improve observational methods essential to improving our ability to predict the effects of climatic change on ecosystem-atmosphere carbon and energy exchanges. Research aimed at maintaining or filling gaps in critical regional or continental-scale components of the ongoing North American Carbon Program (http://www.nacarbon.org) are encouraged. Though proposals will be evaluated primarily on the hypotheses to be addressed in response to this RFP, the value of the proposed work to the broader scientific community (e.g., value of the data to complementary, ongoing research projects; relevance to a broader network of measurements) will be considered. Such broader relevance should still fit within the foci of this RFP.

Key endpoints of the proposed research should include (a) improved quantitative understanding of the importance of terrestrial ecosystems as sources and sinks of greenhouse gases, leading to an improved ability to predict how those sources and sinks might change in response to climatic change during the coming 50–100 years; (b) improved quantitative understanding of how the surface energy balance of terrestrial ecosystems might change in response to climatic change during the coming 50-100 years; and/or (c) reduced uncertainty in future climatic change as a result of improved quantification of these potential feedbacks.

Focus 4: Focus 4 projects will carry out synthesis activities (including, but not limited to, process modeling) related to effects of climatic variability and change on U.S. terrestrial ecosystems, or feedbacks from terrestrial ecosystems to climatic change, principally with a regional focus. Projects should synthesize and advance mechanistic understanding of how future climatic variability and change might influence terrestrial ecosystem structure and functioning. Projects that include an effort to identify and quantify important scientific knowledge gaps, integrate multiple kinds of information (e.g., observations and experiments), or use data from multiple sources, including ongoing and previous

observations or manipulative experiments supported by NICCR, NIGEC, and other research programs, are encouraged. Synthesis activities that can address a clearly defined gap in scientific knowledge in one year are particularly encouraged.

The spatial scale of the research may be encompassed within, or up to the size of, a NICCR region, but multi-region syntheses are also appropriate. Synthesis could involve: (1) development of new, or use of existing, databases; (2) development and/or evaluation of ecological models or coupled climate-ecosystem models; (3) meta-analysis; (4) model-data comparisons; (5) development and/or application of new research tools appropriate for regional analyses; (6) evaluation of the uncertainty in current predictions of climate-ecosystem interactions and the ability of current or future observational or experimental networks to reduce this uncertainty; (7) innovative ecological data assimilation; or (8) other appropriate research activities focused on advancing fundamental understanding of how and why climatic variability and change might influence the structure, functioning, and geographic distribution of terrestrial ecosystems at the regional scale. Research topics might include (but are not limited to): (a) interactions among climatic variability/change and disturbances (natural or human-caused); (b) effects of multiple changes in climate and atmospheric composition (e.g., ecological effects of concomitant changes in temperature, precipitation, and [CO_2]); or (c) detection, prediction, and/or modeling of regional-scale feedbacks between climatic change and terrestrial ecosystem functioning, including energy and greenhouse gas exchanges (i.e., feedbacks to the climatic system).

Research directed at climatic change mitigation options, including carbon sequestration in terrestrial ecosystems, will not be considered for support.

Focus 5: Focus 5 projects will reduce scientific uncertainty about potential effects of climatic change on coastal ecosystems in the United States. The environmental changes of interest are sea-level rise (which in some cases will be affected by coastal subsidence) and the possibility of increased intensity and/or frequency of storms, including hurricanes. Ecosystems to be studied will be the terrestrial ecosystems located on or very near the coast (ranging from mean sea level to the landward limit of likely direct and significant effects of sea-level rise and/or coastal storms in the next century), including ecosystems on barrier islands. Open aquatic ecosystems are excluded. Research may involve manipulative experiments (in the field or the laboratory as appropriate), mechanistic modeling, paleoenvironmental analyses, or observational studies, including remote sensing studies. All studies must be relevant to improved understanding of potential ecological effects of sea-level rise and/or changes in the intensity or frequency of coastal storms during the coming 50-100 years. The magnitude of sea level rise and/or altered frequency or intensity of storms to be studied should be clearly justified. *At this time, proposals to establish new experiments will not be considered.* Instead, experimental proposals should be based on (1) renewal funding for ongoing NICCR manipulative experiments, (2) value-added additions to NICCR or non-NICCR-funded ongoing experiments, or (3) synthesis of work on coastal ecosystems and climate change.

Ecological endpoints of interest include changes in the geographic (spatial) boundaries of whole ecosystems or communities, ecosystem-scale species composition and biodiversity, net primary production, and the goods and services supplied by coastal ecosystems.

Specific questions that could be addressed include: (1) How might coastal terrestrial ecosystems and their services to society be affected by changes in relative sea level and frequency or intensity of storms, including hurricanes? (2) What are the ecological mechanisms of species or community responses to sea level rise and related coastal environmental changes? (3) Can past climatic and sea-level changes, as recorded by coastal-wetland sediments, be used to improve understanding of potential future changes in coastal wetlands caused by climatic change and sea-level rise?

Synthetic projects combining aspects of experimental manipulations, simulation modeling, and observational studies (including remote sensing) are encouraged.

All Research Foci (Foci 1–5): All proposals should briefly and clearly describe tangible outcomes (products or deliverables) of the proposed activities, including a one-year timetable of those outcomes. It is expected that all data and analyses (including model codes) obtained and developed with NICCR support will be made available to the public in a timely manner. Each proposal must *briefly* state how and when the data and analyses (including model codes) will be made publicly available and must include sufficient resources to provide this access. For example, data collected, databases synthesized, and/or codes developed might be posted to a public web site within 12 months of collection (for data) or development (for syntheses conducted and codes developed). Public access will not circumvent the rights of investigators to publish their work and/or receive proper acknowledgement for use of their research products. Established data and metadata formats should be used when they exist.

Collaborative Projects

A Collaborative Project is defined as one that involves substantial NICCR support to more than one institution. Specifically, any project for which more than 25% of the total budget request is from each of two or more institutions will be considered a Collaborative Project. (Projects involving a modest subcontract to a second institution, i.e., less than 25% of the total project budget, are not classified by NICCR as a Collaborative Project.) The potential collaborators should choose a single Principal Investigator and institution for the purpose of submitting a preproposal.

For successful preproposals, a single collaborative proposal should be submitted by one of the Principal Investigators/institutions. That single proposal should include a cover page for each of the collaborating institutions. Each collaborating institution must identify a single Principal Investigator from that institution. Those Principal Investigators must be listed as Co-Investigators on the proposal Cover Pages from each of the other institutions.

For successful Collaborative Project proposals, separate awards will be made to each of the collaborating institutions.

Funding

Annual budgets for individual projects (both inland and coastal) are expected to not exceed $125,000, unless there is prior approval obtained at the preproposal stage for more costly manipulative or observational studies or larger collaborative (multi-institutional) projects.

Inland ecosystems. It is expected that about $2 million will be available in 2010 for new research on inland terrestrial ecosystems (i.e., up to about 16 new projects), contingent on availability of appropriated funds. Those funds will be divided about equally among the four Regional Centers.

Coastal ecosystems. It is expected that about $550,000 will be available in 2010 for new research on coastal terrestrial ecosystems (i.e., up to about five new projects), contingent on availability of appropriated funds.

Publication of research results must acknowledge NICCR support as follows. "This research was supported by the U.S. Department of Energy's Office of Science (BER) through the [Coastal; Northeastern Regional; Midwestern Regional; Southeastern Regional; or Western Regional] Center of the National Institute for Climatic Change Research at [Tulane; The Pennsylvania State; Michigan Technological; Duke; or Northern Arizona] University."

Merit Review

Each proposal will be reviewed for technical merit by at least three independent reviewers. Reviewers will evaluate the scientific merit of the proposed research, the appropriateness of the proposed methods, the competency of the research team, and the appropriateness of the proposed budget. Proposals will also be evaluated by NICCR, for their relevance to the terms of this Notice and with respect to the balance of research projects within NICCR, including the balance of research topics within the NICCR regions. The DOE will evaluate the proposals for their relevance to the goals of the DOE climatic change research program.

Preproposal Submission and Format

Preproposals are REQUIRED. Preproposals must be prepared using the preproposal template available at the NICCR web site (http://niccr.nau.edu). Background material (literature review) should not be included in the preproposal. Preproposals must indicate whether a project is to be a Collaborative (multi-institutional) Project (see the preproposal template).

For inland research, preproposals should be submitted to the Regional Center in which the majority of the research will be conducted, which could be a different region than that containing the PI's institution. For all coastal research, preproposals should be submitted to the Coastal Center.

All preproposals will be reviewed and evaluated for scientific merit and adherence to the terms of this Notice by an independent panel. Adherence to the terms of this RFP will

constitute 50% of the evaluation. Recommendations of that panel will then be reviewed by NICCR, which will make final decisions about the preproposals. Those decisions will be communicated to the applicants via e-mail as soon after the submission deadline as possible. Written reviews of (or comments on) the preproposals will not be provided by NICCR.

Proposals will be accepted only from applicants who are notified by NICCR that their preproposal was selected to be developed into a full proposal.

Proposal Format

The proposal must be prepared with one-inch margins all around, and no more than 51 lines of text per page (11 point font, single spacing). (The margins of the cover page are set by the cover page template; they are less than one inch.) Text in tables, figures, and figure legends can be more compact, but must be legible. The entire proposal should be contained within a single pdf file (maximum size of 3 MB) uploaded at the NICCR web site (http://niccr.nau.edu).

The proposal should include (in this order):
Cover Page(s)
Budget(s) and Budget Explanation(s)
Abstract (on a page by itself)
Narrative (15 pages maximum)
Literature Cited
Biographical Sketch(es)
Other Support of Investigator(s) (including project abstracts for related projects, see below)
Annotated Bibliography of Prior NIGEC or NICCR Research (if applicable; see below)

Cover Page: The required template for the cover page is available at the NICCR web site (http://niccr.nau.edu; see Cover Page Format). It should be downloaded from the web site. All fields indicated on the cover page template must be completed, except the co-investigator block, which is to be used only for Collaborative Projects.

For Collaborative Projects, a separate Cover Page for each collaborating institution must be included. These should all be placed at the top of the proposal.

Budget and Budget Explanation: The required template and instructions for the budget are available at the NICCR web site (http://niccr.nau.edu; see Budget Page and Instructions). There should be one budget page for the 12-month period of the proposed project. The budget page must be followed by a budget explanation, including a brief description of each budget item and a justification (or explanation) for the requested amounts. This should include brief descriptions of tasks to be performed by each named person to be funded by NICCR and uses to be made of any purchased items. Any travel should be described. Any subcontracts should be sufficiently described in the budget justification. If any single subcontract exceeds $25,000, separate budget page(s) and separate budget explanation pages must be included for that subcontract.

For Collaborative Projects, separate budget pages must be included for each of the collaborating institutions.

The budget explanation must be followed by a **copy of a signed agreement that establishes the allowable rates of reimbursement entered into between the Principal Investigator's employing institution and the U.S. Government (Federally audited and approved)**. For Collaborative Projects, a copy of the signed agreement for each of the collaborating institutions must be included. This agreement should not, however, be included in proposals submitted from scientists at the NICCR host university.

Abstract (on a page by itself): At the top of the abstract give the project title. On separate lines list the name(s) and employing institution(s) of the Principal Investigator and any coinvestigator(s). The text of the Abstract should be 400 words or less. It should contain five paragraphs as follows: (1) a statement, in broad scientific terms, of the project objectives; (2) a list of the specific hypotheses to be tested or science questions to be answered; (3) a statement of the location(s) of the research activities; (4) a brief outline, in general terms, of the approach (methods) to be used; and (5) a statement of what the research is intended to accomplish, including expected deliverables.

Narrative: The narrative comprises the research plan for the project and is limited to **15 pages (maximum)**. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science and to set the stage for the proposed research. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the methods to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities. If any portion of the project is to be done in collaboration with another institution (or institutions), the narrative must provide information on the institution(s) and what part of the project it will carry out. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation".

If the Principal Investigator or co-investigator(s) are supported by another DOE program to perform similar research, the narrative must state (no more than one-half page) how this proposed project differs from the other DOE-funded research being conducted. If the Principal Investigator or co-investigator(s) are (or were) supported by NIGEC or NICCR to perform related research, a brief description of the results of that research, and the length of NIGEC/NICCR support, must be included in the Narrative in a section titled "Results of Related NIGEC/NICCR Research" (two pages maximum). This section of the Narrative (if included) should reference an Annotated Bibliography to be placed at the end of the proposal (see below).

Literature Cited: Give full bibliographic citations for all literature cited in the Narrative.

Biographical Sketch(es): Biographical sketches of all senior personnel must be included and are limited to two pages each. Each sketch should include, at the end, a list of all

collaborators and co-authors during the past 48 months, to be used to determine potential conflicts of interest when selecting reviewers.

Other Support of Investigator(s): For each of the senior personnel, a list of current and pending research support should be included. An abstract of any current research project that is related to the proposed NICCR research project (in scope or location) must be included (no more than one half page per project/abstract).

Annotated Bibliography of Prior NIGEC or NICCR Research (if required; see Narrative above): The annotated bibliography is a list of publications resulting from prior NIGEC or NICCR research, with each citation followed by a brief--no more than 150 words--description of the publication and its scientific importance. The purpose of the annotation is to demonstrate the relevance of these publications of previous NIGEC/NICCR-funded research to the stated goals of the previous NIGEC or NICCR project as well as the broad significance of the results.