

**02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS**

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PI/PD Name: Frank W Davis

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
(Select one or more)
 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
 Other
 None

Citizenship: (Choose one) U.S. Citizen Permanent Resident Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name):

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PI/PD Name: Lee Hannah

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
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 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
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 Hearing Impairment
 Visual Impairment
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PI/PD Name: Kelly T Redmond

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
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 Visual Impairment
 Mobility/Orthopedic Impairment
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PI/PD Name: Alexandra Syphard

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
(Select one or more)
 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
 Other
 None

Citizenship: (Choose one) U.S. Citizen Permanent Resident Other non-U.S. Citizen

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PI/PD Name: Janet Franklin

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
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 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
(Select one or more)
 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
 Other
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PI/PD Name: Helen M Regan

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
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 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
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Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
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 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
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Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

List of Suggested Reviewers or Reviewers Not To Include (optional)

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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

Compiled Conflict of Interest List

Kelly Redmond : J. Abatzoglou (SJSU),
Kelly Redmond : John Abatzoglou (Idaho State U),
Max Moritz : David Ackerly (U.C. Berkeley),
Helen Regan : Resit Akçakaya, Applied Biomathematics, NY, USA.;
Janet Franklin : Alison Alberts, CRES-SDZS;
Frank Davis : Keith Alger (Conservation International)
Frank Davis : Sandy Andelman (Conservation International)
Helen Regan : ScottFerson, Applied Biomathematics, USA;
Helen Regan : Miguel Araujo, MNCN, Spain;
Janet Franklin : Richard Aspinall, Macaulay Institute;
Frank Davis : Fred Austerlitz (Universite´ Paris-Sud)
Kelly Redmond : R. Bales (UC Merced),
Janet Franklin : Larry Band, University North Carolina;
Max Moritz : Enric Battlori, (UCB)
Janet Franklin : Bray Beltran (ASU);
Alex Hall : Neil Berg UC Los Angeles
Janet Franklin : Erin Bergman, (SDSU)
Helen Regan : Nancy Bettinger, Massachusetts Dept. Env. Protection, MA, USA;
Lee Hannah : R.A. Betts Hadley Centre
Alex Hall : Cecilia Bitz U. of Washington
Janet Franklin : Nell Blodgett, (SDSU)
Alex Hall : Julien Boe UC Los Angeles
Janet Franklin : Leslie Bolick Smith; (SDSU)
Lee Hannah : B. Bomhard IUCN
Lee Hannah : W.J. Bond University of Cape Town
Alex Hall : Sandrine Bony Laboratoire de Meteorologie Dynamique
Frank Davis : Mark Borchert (USDA Forest Service),
Max Moritz : David Bowman (U. Tasmania),
Janet Franklin : Francis Bozzolo; (SDSU)
Alexandra Syphard : Ross Bradstock, University of Wollongong, NSW, Australia,
Alexandra Syphard : Teresa Brennan, USGS, CA, USA,
Kelly Redmond : M. Brewer (NCDC),
Alex Hall : Tony Broccoli Rutgers University
Frank Davis : Berry Brosi (Stanford U.), Ken Chomitz (World Bank),
Alexandra Syphard : Tim Brown, Desert Research Institute, Reno, NV, USA,
Helen Regan : Gary Bunting, The University of New England, NSW, Australia;
Helen Regan : Mark Burgman, The University of Melbourne, VIC, Australia;
Lee Hannah : Jonah Busch Conservation International
Lee Hannah : M. Bush Florida Institute of Technology
Alex Hall : Scott Capps UC Los Angeles
Kelly Redmond : J. Caprio (retired),
Max Moritz : Jean Carlson (U.C. Santa Barbara),
Kelly Redmond : D. Cayan (Scripps),
Frank Davis : Seo, Chang-Wan (Seoul NU),
Janet Franklin : Caitlin Chason, (SDSU)
Alex Hall : Yong Chen UC Los Angeles
Frank Davis : Elizabeth Chornesky (Consultant),
Kelly Redmond : J. Christy (U Alabama),
Janet Franklin : Keith Clarke, UC-Santa Barbara;
Alexandra Syphard : Murray Clayton, University of Wisconsin-Madison, WI, USA,
Alex Hall : Amy Clement U. of Miami
Alex Hall : Francois Colas UC Los Angeles
Helen Regan : Mark Colyvan, University of Queensland, QLD, Australia;

Janet Franklin : Katie Comer Santos, (SDSU)
Kelly Redmond : A. Comrie (U Arizona),
Alex Hall : Sebastien Conil Meteo France
Frank Davis : Chris Costello (UCSB),
Janet Franklin : Charlotte Coulter; (SDSU)
Lee Hannah : R. Cowling University of Port Elizabeth, South Africa
Helen Regan : John Crookston (SDSU),
Janet Franklin : Carla D'Antonio, UCSB;
Frank Davis : Gustavo da Fonseca (Conservation International),
Frank Davis : Gretchen Daily (Stanford U.),
Kelly Redmond : C. Daly (OSU),
Kelly Redmond : G. Dana (DRI);
Lee Hannah : Radhika Dave Conservation International
Kelly Redmond : C. Davey (self-employed),
Kelly Redmond : Christopher Davey (self employed)
Max Moritz : Perry de Valpine (U.C. Berkeley)
Frank Davis : Greg DeAngelo (UCSB),
Kelly Redmond : A. DeGaetano (Cornell),
Max Moritz : Phil Dennison (U. Utah), Alex Hall (U.C.L.A.),
Alex Hall : Greg Derevianko UC Los Angeles
Kelly Redmond : M. Dettinger (Scripps),
Alex Hall : Curtis Deutsch UC Los Angeles
Janet Franklin : Douglas Deutschman, SDSU;
Frank Davis : Brian Dolan (UCLA),
Alex Hall : Charles Dong UC Los Angeles
Janet Franklin : Donald Drake, University Hawaii;
Janet Franklin : Taly Drezner, York University;
Frank Davis : Cyril Dutech (CIFOR-INIA, Spain),
Janet Franklin : C. E. Woodcock, Boston University;
Kelly Redmond : D. Easterling (NCDC),
Kelly Redmond : D. Fagre (USGS),
Alex Hall : Richard Fernandez CCRS
Janet Franklin : Robert Fisher, USGS;
Frank Davis : Erica Fleischman (UCSB),
Frank Davis : Alan Flint (USGS),
Lee Hannah : W. Foden IUCN
Alexandra Syphard : C.J. Fotheringham, USGS, CA, USA,
Alex Hall : Rob Fovell UC Los Angeles
Alexandra Syphard : Janet Franklin, San Diego State University, CA, USA,
Frank Davis : Mariah Freese (San Diego State U.),
Alex Hall : Hartmut Frenzel UC Los Angeles
Alexandra Syphard : Jeremy Fried, USDA Forest Service, OR, USA,
Helen Regan : Alyce Fritz, NOAA, WA, USA;
Kelly Redmond : K. Gallo (NOAA),
Alexandra Syphard : Margot Garcia, Virginia Commonwealth University, Richmond, VA
Kelly Redmond : G. Garfin (U. Arizona),
Lee Hannah : K.J. Gaston University of Sheffield
Kelly Redmond : A. Gershunov (Scripps),
Helen Regan : Jennifer Gervais, Utah State University, UT, USA;
Frank Davis : Roland Geyer (UCSB),
Helen Regan : Lev Ginzburg, SUNY Stonybrook, USA
Kelly Redmond : M. Glueck (U Arizona),
Frank Davis : Dale Goble (U. Idaho),
Max Moritz : Mike Goodchild (U.C. Santa Barbara);
Kelly Redmond : L. Graumlich (U Arizona),
Kelly Redmond : G. Greenwood (MRI),

Frank Davis : Delphine Grivet (UCLA), Lee Hannah
Kelly Redmond : J. Gross (NPS),
Frank Davis : Robin Grossinger (San Francisco Estuary Institute),
Lee Hannah : C. Guo UCSB
Helen Regan : Ben Halpern NCEAS, UCSB;
Janet Franklin : Yuki Hamada (SDSU)
Alexandra Syphard : Roger Hammer, Oregon State University, OR, USA,
Janet Franklin : Stacie Hathaway, USGS;
Alexandra Syphard : Todd Hawbaker, USGS, Denver, CO, USA,
Kelly Redmond : M. Hayes (U Nebraska),
Helen Regan : Keith Hayes, CSIRO, Australia;
Max Moritz : Katharine Hayhoe (Texas Tech U.),
Alexandra Syphard : Hong He, University of Missouri-Columbia, MO, USA,
Kelly Redmond : J. Heaton (UNR),
Max Moritz : Paul Hessburg (U.S. Forest Service),
Janet Franklin : Lauren Hierl, Audobon Society;
Lee Hannah : M.T. Hoffman Conservation International
Alexandra Syphard : Sherry Holcomb, University of Wisconsin-Madison, USA,
Janet Franklin : Allen Hope, SDSU;
Helen Regan : Kevin Hovel, SDSU, USA;
Alex Hall : Jerry Huang UC Los Angeles
Kelly Redmond : K. Hubbard (U Nebraska),
Lee Hannah : G. Hughes DIFID (UK)
Alex Hall : Mimi Hughes Ntl Oceanic & Atmospheric Admin.
Frank Davis : Andrew Irwin (Mt. Allison U.),
Janet Franklin : C. J. Fotheringham, UCLA;
Alex Hall : Charles Jackson U. of Texas
Kelly Redmond : K. Jacobs (U Arizona),
Frank Davis : Patrick Jantz (UCSB),
Janet Franklin : Brenda Johnson, Cal Fish & Game;
Alex Hall : Alex Jousse UC Los Angeles
Helen Regan : James Justus, Florida State University;
Frank Davis : Steve Kaffka (UC Davis),
Kelly Redmond : M. Kaplan (DRI),
Alex Hall : Sarah Kapnick UC Los Angeles
Helen Regan : Larry Kaputka, Ecological Planning and Toxicology, OR, USA.;
Janet Franklin : Heather Karnes (Schmalbach);
Max Moritz : Robert Kaufmann (Boston University)
Max Moritz : Faith Kearns (U.C. Berkeley),
Frank Davis : Jon Keeley (USGS-BRD),
Helen Regan : David Keith, NSW National Parks and Wildlife Service, NSW, Australia;
Frank Davis : Bruce Kendall (UCSB),
Alex Hall : Jinwon Kim UC Los Angeles
Kelly Redmond : N. Knowles (USGS),
Kelly Redmond : D. Koracin (DRI),
Alex Hall : M Krawchuk UC Berkeley
Frank Davis : Jason Kreitler (UCSB),
Kelly Redmond : M. Kruk (ISWS),
Frank Davis : Bill Kuhn (NPS),
Kelly Redmond : S. Kung (UW-Madison);
Kelly Redmond : K. Kunkel (DRI),
Alex Hall : Paul Kushner U. of Toronto
Frank Davis : Richard L. Church (UC Santa Barbara),
Janet Franklin : Michael L. Wells, Calif. Dept. Parks;
Kelly Redmond : N. Lancaster (DRI),
Frank Davis : Charlotte Landau (Minas Gerais, Brazil),

Janet Franklin : Dawn Lawson; (SDSU)
Kelly Redmond : D. LeComte (NOAA CPC),
Alex Hall : Ruby Leung PNNL
Kelly Redmond : J. Lewis (NOAA NSSL, DRI),
Janet Franklin : Rebecca Lewison, SDSU;
Frank Davis : Jan Lindner (U. Stuttgart),
Alex Hall : Kuo-Nan Liou UC Los Angeles
Lee Hannah : C.R. Liu University of Toronto
Lee Hannah : T.E. Lovejoy Heinz Center
Lee Hannah : J. Lovett University of York
Frank Davis : Andrew Macdonald
Frank Davis : Elia Machado (Clark U.),
Frank Davis : Elizabeth Madin (UCSB),
Helen Regan : Lynn Maguire, Duke University;
Frank Davis : Bruce Mahall (UC Santa Barbara),
Frank Davis : Ikegami, Maki (UCSB)
Lee Hannah : J.R. Malcolm University of Toronto
Alex Hall : Suki Manabe Princeton
Helen Regan : Lisa Markovchick-Nicholls (SDSU),
Janet Franklin : Kim Marsden, Calif. State Parks;
Lee Hannah : E. Martinez-Meyer National University of Mexico (UNAM)
Kelly Redmond : G. McCabe (USGS),
Helen Regan : Michael McCarthy, The University of Melbourne, VIC, Australia;
Helen Regan : Bill McClean, University of New South Wales, NSW, Australia;
Kelly Redmond : G. McCurdy (DRI),
Kelly Redmond : E. McDonald (DRI),
Alexandra Syphard : Mark McGinnis, Dudek, Encinitas, CA,
Alexandra Syphard : Jason McKeefry, City of Madison, WI,
Alex Hall : James McWilliams UC Los Angeles
Alex Hall : Brian Medeiros UC Los Angeles
Frank Davis : Ross Meentemeyer (UNC Charlotte),
Kelly Redmond : D. Meko (U. Arizona),
Helen Regan : Charlie Menzie, Menzie-Cura & Associates, Inc., MA, USA;
Frank Davis : Vicky Meretsky (Indiana U.),
Frank Davis : Kurt Merg (Washington State Fish and Wildlife),
Frank Davis : J. Michael Scott (U. Idaho),
Max Moritz : Joel Michaelsen (U.C. Santa Barbara);
Lee Hannah : G. Midgley South African National Biodiversity Institute
Alexandra Syphard : Carol Miller, Aldo Leopold Wilderness Research Institute, MT, USA,
Janet Franklin : Jennifer Miller; (SDSU)
Alexandra Syphard : Brian Miranda, USDA Forest Service, Rhinelander, WI,
Lee Hannah : Russell A. Mittermeier Conservation International
Helen Regan : Toni Mizerek (SDSU),
Alexandra Syphard : David Mladenoff, University of Wisconsin-Madison, WI, USA,
Helen Regan : Vibeke Møller, Danish Environmental Protection Agency, Denmark;
Max Moritz : Tadashi Moody (U.C. Berkeley),
Kelly Redmond : P. Mote (OSU),
Alex Hall : David Neelin UC Los Angeles
Lee Hannah : R.P. Neilson Oregon State University
Max Moritz : Erica Newman, (UCB)
Janet Franklin : Katherine Newman; (SDSU)
Helen Regan : Helen Noel, University of Reading, UK;
Frank Davis : Theresa Nogeire (In progress),
Kelly Redmond : W. Norris (U Alabama),
Janet Franklin : John O'Leary, SDSU;
Max Moritz : Dennis Odion (U.C. Santa Barbara),

Lee Hannah : Porter P. Lowry Missouri Botanical Garden
Kelly Redmond : T. Pagano (CSIRO),
Kelly Redmond : M. Palecki (NCDC),
Kelly Redmond : A. Panorska (UNR),
Frank Davis : Jeanette Papp (UCLA),
Max Moritz : Marc Parisien, (UCB)
Kelly Redmond : P. Pasteris (CH2MHill),
Alex Hall : Tamlin Pavelsky U. of North Carolina
Helen Regan : Richard Pearson, American Museum of Natural History, USA;
Alexandra Syphard : Edward Peeples, Medical College of Virginia, Richmond, VA
Lee Hannah : Richard Perrine UCLA
Kelly Redmond : D. Peterson (U Washington),
Lee Hannah : Townsend Peterson University of Kansas
Helen Regan : Steven Phillips, AT&TResearch, USA;
Janet Franklin : Stuart Phinn, University of Queensland;
Kelly Redmond : T. Piechota (UNLV);
Frank Davis : Andrea Pluess (Swiss Federal Inst. of Technology),
Janet Franklin : Hugh Possingham, University Queensland;
Kelly Redmond : F. Powell (WMRS),
Kelly Redmond : R. Pulwarty (NOAA CDC),
Alex Hall : Xin Qu UC Los Angeles
Kelly Redmond : H. Quamme (Agri-Food Canada),
Alexandra Syphard : Volker Radeloff, University of Wisconsin-Madison, USA,
Lee Hannah : A. Rebelo South African National Biodiversity Institute
Janet Franklin : Serge Rey, ASU;
Frank Davis : Lydia Ries (Oregon State University),
Janet Franklin : Julie Ripplinger (ASU);
Frank Davis : Dave Rizzo (UC Davis),
Janet Franklin : Dar Roberts, UC-Santa Barbara;
Kelly Redmond : D. Robinson (Rutgers),
Janet Franklin : Carlton Rochester, USGS;
Janet Franklin : John Rogan; (SDSU)
Lee Hannah : T. Root Stanford University
Helen Regan : Pamela Rueda
Alexandra Syphard : Heather Rustigian, Conservation Biology Institute, Corvallis, OR,
Janet Franklin : Hugh Safford, USDA Forest Service;
Janet Franklin : Elizabeth Santos; (SDSU)
Helen Regan : Sahotra Sarkar, University of Texas at Austin;
Alexandra Syphard : Robert Scheller, Portland State University, OR, USA,
Janet Franklin : Peter Scull; (SDSU)
Frank Davis : Changwan Seo (Seoul National U),
Frank Davis : Rebecca Shaw (The Nature Conservancy),
Alexandra Syphard : Douglas Shinneman, USDA Forest Service, Grand Rapids, MN,
Lee Hannah : H.H. Shugart University of Virginia
Kelly Redmond : M. Shulski (U Nebraska),
Kelly Redmond : D. Simeral (DRI),
Janet Franklin : Andrew Skidmore, ITC,
Kelly Redmond : J. Smiley (WMRS),
Frank Davis : Peter Smouse (Rutgers),
Lee Hannah : N. Snyder UCSB
Frank Davis : Oliver Soong (In progress),
Frank Davis : Victoria Sork (UCLA),
Janet Franklin : Candan Soykan, SDSU;
Janet Franklin : Linnea Spears-Lebrun; (SDSU)
Alexandra Syphard : Wayne Spencer, Conservation Biology Institute, San Diego, CA,
Kelly Redmond : M. Spinar (ISWS),

Kelly Redmond : D. Stahle (U. Arkansas),
Janet Franklin : David Steadman, University Florida;
Max Moritz : Scott Stephens (U.C. Berkeley),
Kelly Redmond : N. Stephenson (USGS),
Alex Hall : Bjorn Stevens UC Los Angeles
Alexandra Syphard : Susan Stewart, USDA Forest Service, IL, USA,
Janet Franklin : Andrew Steyers, (SDSU)
Frank Davis : David Stoms (UCSB),
Janet Franklin : Douglas Stow, SDSU;
Alexandra Syphard : James Strittholt, Conservation Biology Institute, Corvallis, OR,
Kelly Redmond : M. Stromberg (UC Berkeley),
Alexandra Syphard : Brian Sturtevant, USDA Forest Service, Rhinelander, WI,
Alex Hall : Fengpeng Sun UC Los Angeles
Kelly Redmond : M. Svoboda (U. Nebraska),
Kelly Redmond : T. Swetnam (U Arizona),
Janet Franklin : Christina Tague, SDSU;
Frank Davis : Heather Tallis (Natural Capital Project),
Alexandra Syphard : Robert Taylor, National Park Service, CA, USA,
Frank Davis : Tim Thomas (World Bank),
Frank Davis : Wayt Thomas (NY Botanic Garden),
Lee Hannah : C.D. Thomas University of Leeds
Alex Hall : Dave Thompson Colorado State
Alex Hall : Ellen Thompson Ohio State
Alex Hall : Lonnie Thompson Ohio State
Frank Davis : Jim Thorne (UC Davis),
Helen Regan : Wilfried Thuiller, CNRS, France;
Frank Davis : Claudia Tyler (UCSB),
Kelly Redmond : M. Tyree (Scripps),
Lee Hannah : L.G. Underhill University of Cape Town
Frank Davis : Lorena Vieli (In progress)
Alex Hall : Duane Waliser Jet Propulsion Lab
Max Moritz : Eric Waller: (UCB)
Alex Hall : Daniel Walton UC Los Angeles
Frank Davis : Hong Wang (UCLA),
Alexandra Syphard : Brendan Ward, Conservation Biology Institute, Corvallis, OR, USA,
Kelly Redmond : R. Webb (USGS),
Lee Hannah : T.J. Webb University of Sheffield
Frank Davis : Robert Westfall (USDA Forest Service),
Lee Hannah : Walter Westman University of California, Los Angeles
Frank Davis : Allison Whipple (San Francisco Estuary Institute)
Frank Davis : Astrid Widyanata (SDSU),
Kelly Redmond : D. Wilhite (UNL),
Lee Hannah : P. Williams The Natural History Museum, London
Janet Franklin : Clark Winchell, USFWS;
Janet Franklin : Susan Wiser, Landcare;
Frank Davis : Bastian Wittstock (U. Stuttgart)
Kelly Redmond : C. Woodhouse (U Arizona)
Lee Hannah : F.I. Woodward University of Sheffield
Alexandra Syphard : Jian Yang, University of Nevada Reno, NV, USA
Janet Franklin : Paul Zedler, Univ Wisconsin.
Helen Regan : Paul Zedler, University of Wisconsin Madison, USA.
Alexandra Syphard : Zhiliang Zhu, EROS Space Data Center, USGS, Sioux Falls, SD, USA
Frank Davis : William Zielinski (USDA Forest Service),

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COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

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NSF 10-555			09/16/10		NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)						
EF - MACROSYSTEM BIOLOGY						
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EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
956006145		<input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL				
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University of California-Santa Barbara			Office of Research			
AWARDEE ORGANIZATION CODE (IF KNOWN)			Rm 3227 Cheadle Hall			
0013201000			SANTA BARBARA, CA 93106-2050			
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)			<input type="checkbox"/> SMALL BUSINESS	<input type="checkbox"/> MINORITY BUSINESS	<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE	
			<input type="checkbox"/> FOR-PROFIT ORGANIZATION	<input type="checkbox"/> WOMAN-OWNED BUSINESS		
TITLE OF PROPOSED PROJECT Collaborative Research: Do microenvironments govern macroecology?						
REQUESTED AMOUNT		PROPOSED DURATION (1-60 MONTHS)		REQUESTED STARTING DATE		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
\$ 2,327,903		60 months		04/15/11		
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2) <input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date _____						
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e) <input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)						
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<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)						
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____						
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Inst.for Computational Earth System Sci.			3512 Bren Hall			
PI/PD FAX NUMBER			University of California			
805-893-2578			Santa Barbara, CA 93106			
			United States			
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
Frank W Davis	PhD	1982	805-893-3438	fd@bren.ucsb.edu		
Lee Hannah	ScD	1985	703-341-2400	l.hannah@conservation.org		
Kelly T Redmond	PhD	1982	775-674-7011	kelly.redmond@dri.edu		
Alexandra Syphard	DPhil	2005	541-757-0687	asyphard@yahoo.com		

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, lobbying activities (see below), responsible conduct of research, nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 10-1). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

Conflict of Interest Certification

In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes

No

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

- (1) community in which that area is located participates in the national flood insurance program; and
- (2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

- (1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
- (2) for other NSF Grants when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research.

The undersigned shall require that the language of this certification be included in any award documents for all subawards at all tiers.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE		DATE	
NAME					
TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS			FAX NUMBER	

* EAGER - EARly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

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NSF 10-555			09/16/10		NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)					1065826	
EF - MACROSYSTEM BIOLOGY						
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
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NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
Arizona State University			Arizona State University ORSPA Tempe, AZ. 852873503			
AWARDEE ORGANIZATION CODE (IF KNOWN)						
0010819000						
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)			<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS	
					<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE	
TITLE OF PROPOSED PROJECT Collaborative Research: Do microenvironments govern macroecology?						
REQUESTED AMOUNT \$	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
275,578	60 months	04/15/11				
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2)			<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____			
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)			Exemption Subsection _____ or IRB App. Date _____			
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)			<input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)			
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)			_____			
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)			<input type="checkbox"/> HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)			
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____			_____			
PHS Animal Welfare Assurance Number _____						
PI/PD DEPARTMENT		PI/PD POSTAL ADDRESS				
		ORSPA 1711 S. Rural Rd, Adm B, RM 163 Tempe, AZ 852873503 United States				
PI/PD FAX NUMBER						
480-965-8313						
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
PI/PD NAME	PhD	1988	480-965-7533	janet.franklin1@gmail.com		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

CERTIFICATION PAGE

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(If answer "yes", please provide explanation.)

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- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Patricia McGlynn		Electronic Signature	Sep 16 2010 4:47PM
TELEPHONE NUMBER 480-965-4740	ELECTRONIC MAIL ADDRESS patricia.mcglynn@asu.edu	FAX NUMBER	

* EAGER - EARly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 10-1					FOR NSF USE ONLY	
NSF 10-555			09/16/10		NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)					1065753	
EF - MACROSYSTEM BIOLOGY						
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
09/16/2010	4	08040000 EF	7959	627797426	09/16/2010 5:48pm	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
956006142						
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
University of California-Riverside			Office of Research			
AWARDEE ORGANIZATION CODE (IF KNOWN)			200 University Office Building			
0013169000			RIVERSIDE, CA 92521-1000			
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS		<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Collaborative Research: Do microenvironments govern macroecology?						
REQUESTED AMOUNT \$ 200,354	PROPOSED DURATION (1-60 MONTHS) 60 months	REQUESTED STARTING DATE 04/15/11	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2)			<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date _____			
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)			<input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)			
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)			_____			
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)			<input type="checkbox"/> HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)			
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)			_____			
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____			_____			
PI/PD DEPARTMENT Biology		PI/PD POSTAL ADDRESS 900 University Avenue				
PI/PD FAX NUMBER 951-827-4286		Riverside, CA 92521 United States				
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
Helen M Regan	PhD	2000	951-827-3961	helen.regan@ucr.edu		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE		DATE
NAME Ursula N Prins		Electronic Signature		Sep 16 2010 2:51PM
TELEPHONE NUMBER 951-827-4808	ELECTRONIC MAIL ADDRESS ursulap@ucr.edu		FAX NUMBER 951-827-4483	

* EAGER - EARly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

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PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 10-1					FOR NSF USE ONLY	
NSF 10-555			09/16/10		NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)					1065824	
EF - MACROSYSTEM BIOLOGY						
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
09/16/2010	4	08040000 EF	7959	124726725	09/16/2010 5:48pm	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
946002123		<input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL				
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
University of California-Berkeley			University of California-Berkeley Sponsored Projects Office Berkeley, CA. 947045940			
AWARDEE ORGANIZATION CODE (IF KNOWN)						
0013128000						
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)			<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS <input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE	
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REQUESTED AMOUNT \$	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
199,917	60 months	04/15/11				
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2)			<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date _____			
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<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)			<input type="checkbox"/> HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)			
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)						
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____						
PI/PD DEPARTMENT			PI/PD POSTAL ADDRESS			
Environmental Science, Policy, & Mgt			Ecosystem Sciences Division 151 Hilgard #3110 Berkeley, CA 94720 United States			
PI/PD FAX NUMBER						
510-643-5438						
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
PI/PD NAME	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
Max A Moritz	PhD	1999	510-642-7329	mmoritz@berkeley.edu		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Deborah Rutkowski-Howard		Electronic Signature	Sep 16 2010 4:46PM
TELEPHONE NUMBER 510-643-5603	ELECTRONIC MAIL ADDRESS deborahr@berkeley.edu	FAX NUMBER 510-642-8236	

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CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, lobbying activities (see below), responsible conduct of research, nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 10-1). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

Conflict of Interest Certification

In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes

No

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

- (1) community in which that area is located participates in the national flood insurance program; and
- (2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

- (1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
- (2) for other NSF Grants when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research.

The undersigned shall require that the language of this certification be included in any award documents for all subawards at all tiers.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE		DATE	
NAME					
TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS			FAX NUMBER	

* EAGER - EARly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

**Directorate for Biological Sciences
Emerging Frontiers
Macrosystem Biology**

**Proposal Classification Form
PI: Davis, Frank**

CATEGORY I: INVESTIGATOR STATUS (Select ONE)

- Beginning Investigator - No previous Federal support as PI or Co-PI, excluding fellowships, dissertations, planning grants, etc.
- Prior Federal support only
- Current Federal support only
- Current & prior Federal support

CATEGORY II: FIELDS OF SCIENCE OTHER THAN BIOLOGY INVOLVED IN THIS RESEARCH (Select 1 to 3)

- | | | |
|--|--|---|
| <input type="checkbox"/> Astronomy
<input type="checkbox"/> Chemistry
<input type="checkbox"/> Computer Science
<input checked="" type="checkbox"/> Earth Science | <input type="checkbox"/> Engineering
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Physics | <input type="checkbox"/> Psychology
<input type="checkbox"/> Social Sciences
<input type="checkbox"/> None of the Above |
|--|--|---|

CATEGORY III: SUBSTANTIVE AREA (No selection required)

CATEGORY IV: INFRASTRUCTURE (No selection required)

CATEGORY V: HABITAT (No selection required)

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (No selection required)

CATEGORY VII: CLASSIFICATION OF ORGANISMS (Select 1 to 4)

- | | | |
|--|--|--|
| <input type="checkbox"/> VIRUSES
<input type="checkbox"/> Bacterial
<input type="checkbox"/> Plant
<input type="checkbox"/> Animal
<input type="checkbox"/> PROKARYOTES
<input type="checkbox"/> Archaeobacteria
<input type="checkbox"/> Cyanobacteria
<input type="checkbox"/> Eubacteria
<input type="checkbox"/> PROTISTA (PROTOZOA)
<input type="checkbox"/> Amoeboae
<input type="checkbox"/> Apicomplexa
<input type="checkbox"/> Ciliophora
<input type="checkbox"/> Flagellates
<input type="checkbox"/> Foraminifera
<input type="checkbox"/> Microspora
<input type="checkbox"/> Radiolaria
<input type="checkbox"/> FUNGI
<input type="checkbox"/> Ascomycota
<input type="checkbox"/> Basidiomycota
<input type="checkbox"/> Chytridiomycota | <input type="checkbox"/> Mitosporic Fungi
<input type="checkbox"/> Oomycota
<input type="checkbox"/> Yeasts
<input type="checkbox"/> Zygomycota
<input type="checkbox"/> LICHENS
<input type="checkbox"/> SLIME MOLDS
<input type="checkbox"/> ALGAE
<input type="checkbox"/> Bacillariophyta (Diatoms)
<input type="checkbox"/> Charophyta
<input type="checkbox"/> Chlorophyta
<input type="checkbox"/> Chrysophyta
<input type="checkbox"/> Dinoflagellata
<input type="checkbox"/> Euglenoids
<input type="checkbox"/> Phaeophyta
<input type="checkbox"/> Rhodophyta
<input type="checkbox"/> PLANTS
<input type="checkbox"/> NON-VASCULAR PLANTS
<input type="checkbox"/> BRYOPHYTA
<input type="checkbox"/> Anthocerotae (Hornworts)
<input type="checkbox"/> Hepaticae (Liverworts) | <input type="checkbox"/> Musci (Mosses)
<input checked="" type="checkbox"/> VASCULAR PLANTS
<input type="checkbox"/> FERNS & FERN ALLIES
<input checked="" type="checkbox"/> GYMNOSPERMS
<input type="checkbox"/> Coniferales (Conifers)
<input type="checkbox"/> Cycadales (Cycads)
<input type="checkbox"/> Ginkgoales (Ginkgo)
<input type="checkbox"/> Gnetales (Gnetophytes)
<input checked="" type="checkbox"/> ANGIOSPERMS
<input type="checkbox"/> Monocots
<input type="checkbox"/> Areaceae (Palmae)
<input type="checkbox"/> Cyperaceae
<input type="checkbox"/> Liliaceae
<input type="checkbox"/> Orchidaceae
<input type="checkbox"/> Poaceae (Graminae)
<input type="checkbox"/> Dicots
<input type="checkbox"/> Apiaceae (Umbelliferae)
<input type="checkbox"/> Asteraceae (Compositae)
<input type="checkbox"/> Brassicaceae (Cruciferae)
<input type="checkbox"/> Fabaceae (Leguminosae) |
|--|--|--|

<input type="checkbox"/> Lamiaceae (Labiatae)	<input type="checkbox"/> Pycnogonida (Sea Spiders)	<input type="checkbox"/> Echinoidea (Sea Urchins, Sand Dollars)
<input type="checkbox"/> Rosaceae	<input type="checkbox"/> Scorpionida (Scorpions)	<input type="checkbox"/> Holothuroidea (Sea Cucumbers)
<input type="checkbox"/> Solanaceae	<input type="checkbox"/> Araneae (True Spiders)	<input type="checkbox"/> HEMICHORDATA (Acorn Worms, Pterobranchs)
<input type="checkbox"/> ANIMALS	<input type="checkbox"/> Pseudoscorpionida (Pseudoscorpions)	<input type="checkbox"/> UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
<input type="checkbox"/> INVERTEBRATES	<input type="checkbox"/> Acarina (Free-living Mites)	<input type="checkbox"/> CEPHALOCHORDATA (Amphioxus/Lancelet)
<input type="checkbox"/> MESOZOA/PLACOZOA	<input type="checkbox"/> Parasitiformes (Parasitic Ticks & Mites)	<input type="checkbox"/> VERTEBRATES
<input type="checkbox"/> PORIFERA (Sponges)	<input type="checkbox"/> Crustacea	<input type="checkbox"/> AGNATHA (Hagfish, Lamprey)
<input type="checkbox"/> CNIDARIA	<input type="checkbox"/> Branchiopoda (Fairy Shrimp, Water Flea)	<input type="checkbox"/> FISHES
<input type="checkbox"/> Hydrozoa (Hydra, etc.)	<input type="checkbox"/> Ostracoda (Sea Lice)	<input type="checkbox"/> Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
<input type="checkbox"/> Scyphozoa (Jellyfish)	<input type="checkbox"/> Copepoda	<input type="checkbox"/> Osteichthyes (Bony Fishes)
<input type="checkbox"/> Anthozoa (Corals, Sea Anemones)	<input type="checkbox"/> Cirripedia (Barnacles)	<input type="checkbox"/> Sarcopterygia (Lobe-finned Fishes) (Coelacanth, Lungfish)
<input type="checkbox"/> CTENOPHORA (Comb Jellies)	<input type="checkbox"/> Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)	<input type="checkbox"/> Actinopterygia (Ray-finned Fishes)
<input type="checkbox"/> PLATYHELMINTHES (Flatworms)	<input type="checkbox"/> Isopoda (Wood Lice, Pillbugs)	<input type="checkbox"/> AMPHIBIA
<input type="checkbox"/> Turbellaria (Planarians)	<input type="checkbox"/> Decapoda (Lobster, Crayfish, Crabs, Shrimp)	<input type="checkbox"/> Anura (Frogs, Toads)
<input type="checkbox"/> Trematoda (Flukes)	<input type="checkbox"/> Hexapoda (Insecta) (Insects)	<input type="checkbox"/> Urodela (Salamanders, Newts)
<input type="checkbox"/> Cestoda (Tapeworms)	<input type="checkbox"/> Apterygota (Springtails, Silverfish, etc.)	<input type="checkbox"/> Gymnophiona (Apoda) (Caecilians)
<input type="checkbox"/> Monogenea (Flukes)	<input type="checkbox"/> Odonata (Dragonflies, Damselflies)	<input type="checkbox"/> REPTILIA
<input type="checkbox"/> GNATHOSTOMULIDA	<input type="checkbox"/> Ephemeroptera (Mayflies)	<input type="checkbox"/> Chelonia (Turtles, Tortoises)
<input type="checkbox"/> NEMERTINEA (Rynchozoela) (Ribbon Worms)	<input type="checkbox"/> Orthoptera (Grasshoppers, Crickets)	<input type="checkbox"/> Serpentes (Snakes)
<input type="checkbox"/> ENTOPROCTA (Bryozoa) (Plant-like Animals)	<input type="checkbox"/> Dictyoptera (Cockroaches, Mantids, Phasmids)	<input type="checkbox"/> Sauria (Lizards)
<input type="checkbox"/> ASCHELMINTHES	<input type="checkbox"/> Isoptera (Termites)	<input type="checkbox"/> Crocodylia (Crocodylians)
<input type="checkbox"/> Gastrotricha	<input type="checkbox"/> Plecoptera (Stoneflies)	<input type="checkbox"/> Rhynchocephalia (Tuatara)
<input type="checkbox"/> Kinorhyncha	<input type="checkbox"/> Phthiraptera (Mallophaga & Anoplura) (Lice)	<input type="checkbox"/> AVES (Birds)
<input type="checkbox"/> Loricifera	<input type="checkbox"/> Hemiptera (including Heteroptera) (True Bugs)	<input type="checkbox"/> Paleognathae (Ratites)
<input type="checkbox"/> Nematoda (Roundworms)	<input type="checkbox"/> Homoptera (Cicadas, Scale Insects, Leafhoppers)	<input type="checkbox"/> Sphenisciformes (Penguins)
<input type="checkbox"/> Nematomorpha (Horsehair Worms)	<input type="checkbox"/> Thysanoptera (Thrips)	<input type="checkbox"/> Procellariiformes (Albatrosses, Petrels, Fulmars)
<input type="checkbox"/> Rotifera (Rotatoria)	<input type="checkbox"/> Neuroptera (Lacewings, Dobsonflies, Snakeflies)	<input type="checkbox"/> Pelecaniformes (Pelicans, Gannets, Boobies, Tropicbirds)
<input type="checkbox"/> ACANTHOCEPHALA (Spiny-headed Worms)	<input type="checkbox"/> Trichoptera (Caddisflies)	<input type="checkbox"/> Ciconiiformes (Hérons, Bitterns, Egrets, Storks, Ibis, Flamingo)
<input type="checkbox"/> PRIAPULOIDEA	<input type="checkbox"/> Lepidoptera (Moths, Butterflies)	<input type="checkbox"/> Anseriformes (Ducks, Geese, Screamers)
<input type="checkbox"/> BRYOZOA (Ectoprocta) (Plant-like Animals)	<input type="checkbox"/> Diptera (Flies, Mosquitoes)	<input type="checkbox"/> Falconiformes (Vultures, Hawks, Eagles, Condors, Kites, Falcons)
<input type="checkbox"/> PHORONIDEA (Lophophorates)	<input type="checkbox"/> Siphonaptera (Fleas)	<input type="checkbox"/> Galliformes (Megapodes, Turkeys, Quail, Pheasants, Peafowl, etc.)
<input type="checkbox"/> BRACHIOPODA (Lamp Shells)	<input type="checkbox"/> Coleoptera (Beetles)	<input type="checkbox"/> Gruiformes (Cranes, Rails, Gallinules, Coots, Bustards, Crakes)
<input type="checkbox"/> MOLLUSCA	<input type="checkbox"/> Hymenoptera (Ants, Bees, Wasps, Sawflies)	<input type="checkbox"/> Charadriiformes (Terns, Gulls, Stilts, Avocets, Plovers, Puffins, etc.)
<input type="checkbox"/> Monoplacophora	<input type="checkbox"/> Chilopoda (Centipedes)	<input type="checkbox"/> Columbiformes (Pigeons, Doves)
<input type="checkbox"/> Aplacophora (Solenogasters)	<input type="checkbox"/> Diplopoda (Millipedes)	<input type="checkbox"/> Psittaciformes (Parrots, Lories, Cockatoos, Kakapo, Conures, etc.)
<input type="checkbox"/> Polyplacophora (Chitons)	<input type="checkbox"/> Pauropoda	<input type="checkbox"/> Cuculiformes (Cuckoos, Turacos, Anis, Coucal, Roadrunner, etc.)
<input type="checkbox"/> Scaphopoda (Tooth Shells)	<input type="checkbox"/> Symphyta (Symphyla)	<input type="checkbox"/> Strigiformes (Owls)
<input type="checkbox"/> Gastropoda (Snails, Slugs, Limpets)	<input type="checkbox"/> PENTASTOMIDA (Linguatulida) (Tongue Worms)	<input type="checkbox"/> Apodiformes (Hummingbirds, Swifts, Thornbills)
<input type="checkbox"/> Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)	<input type="checkbox"/> TARDIGRADA (Tardigrades, Water Bears)	<input type="checkbox"/> Coraciformes (Kingfishers, Todies, Bee-Eaters, Rollers, Hornbills, etc.)
<input type="checkbox"/> Cephalopoda (Squid, Octopus, Nautilus)	<input type="checkbox"/> ONYCHOPHORA (Peripatus)	<input type="checkbox"/> Piciformes (Woodpeckers, Toucans, Jacamars, Barbets, Honeyguides)
<input type="checkbox"/> ANNELIDA (Segmented Worms)	<input type="checkbox"/> CHAETOGNATHA (Arrow Worms)	<input type="checkbox"/> Passeriformes (Passerines)
<input type="checkbox"/> Polychaeta (Parapodial Worms)	<input type="checkbox"/> ECHINODERMATA	<input type="checkbox"/> MAMMALIA
<input type="checkbox"/> Oligochaeta (Earthworms)	<input type="checkbox"/> Crinoidea (Sea Lilies, Feather Stars)	
<input type="checkbox"/> Hirudinida (Leeches)	<input type="checkbox"/> Asteroidea (Starfish, Sea Stars)	
<input type="checkbox"/> POGONOPHORA (Beard Worms)	<input type="checkbox"/> Ophiuroidea (Brittle Stars, Serpent Stars)	
<input type="checkbox"/> SIPUNCULOIDEA (Peanut Worms)		
<input type="checkbox"/> ECHIUROIDEA (Spoon Worms)		
<input type="checkbox"/> ARTHROPODA		
<input type="checkbox"/> Cheliceriformes		
<input type="checkbox"/> Merostomata (Horseshoe Crabs)		

<input type="checkbox"/> Monotremata (Platypus, Echidna)	<input type="checkbox"/> Humans	<input type="checkbox"/> Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)
<input type="checkbox"/> Marsupalia (Marsupials)	<input type="checkbox"/> Rodentia	<input type="checkbox"/> Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.)
<input type="checkbox"/> Eutheria (Placentals)	<input type="checkbox"/> Laboratory Rodents (Rat, Mouse, Guinea Pig, Hamster)	<input type="checkbox"/> Sirenia (Manatees, Dugongs)
<input type="checkbox"/> Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)	<input type="checkbox"/> Non-Laboratory Rodents	<input type="checkbox"/> Proboscidea (Elephants)
<input type="checkbox"/> Chiroptera (Bats)	<input type="checkbox"/> Lagomorphs (Rabbits, Hares, Pikas)	<input type="checkbox"/> Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)
<input type="checkbox"/> Edentata (Anteaters, Sloths, Armadillos)	<input type="checkbox"/> Tubulidenata (Aardvarks)	<input type="checkbox"/> TRANSGENIC ORGANISMS
<input type="checkbox"/> Primates	<input type="checkbox"/> Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)	<input type="checkbox"/> FOSSIL OR EXTINCT ORGANISMS
<input type="checkbox"/> Monkeys	<input type="checkbox"/> Ungulates	<input type="checkbox"/> NO ORGANISMS
<input type="checkbox"/> Apes (Gibbons, Orang-utan, Gorilla, Chimpanzee)		

CATEGORY VIII: MODEL ORGANISM (Select ONE)

<input checked="" type="checkbox"/> NO MODEL ORGANISM	MODEL ORGANISM (Input up to 9 characters) <input type="text"/>	
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**Directorate for Biological Sciences
Emerging Frontiers
Macrosystem Biology**

**Proposal Classification Form
PI: / Proposal Number: 1065826**

CATEGORY I: INVESTIGATOR STATUS (Select ONE)

- Beginning Investigator - No previous Federal support as PI or Co-PI, excluding fellowships, dissertations, planning grants, etc.
- Prior Federal support only
- Current Federal support only
- Current & prior Federal support

CATEGORY II: FIELDS OF SCIENCE OTHER THAN BIOLOGY INVOLVED IN THIS RESEARCH (Select 1 to 3)

- | | | |
|--|--|---|
| <input type="checkbox"/> Astronomy
<input type="checkbox"/> Chemistry
<input type="checkbox"/> Computer Science
<input checked="" type="checkbox"/> Earth Science | <input type="checkbox"/> Engineering
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Physics | <input type="checkbox"/> Psychology
<input type="checkbox"/> Social Sciences
<input type="checkbox"/> None of the Above |
|--|--|---|

CATEGORY III: SUBSTANTIVE AREA (No selection required)

CATEGORY IV: INFRASTRUCTURE (No selection required)

CATEGORY V: HABITAT (No selection required)

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (No selection required)

CATEGORY VII: CLASSIFICATION OF ORGANISMS (Select 1 to 4)

- | | | |
|--|--|--|
| <input type="checkbox"/> VIRUSES
<input type="checkbox"/> Bacterial
<input type="checkbox"/> Plant
<input type="checkbox"/> Animal
<input type="checkbox"/> PROKARYOTES
<input type="checkbox"/> Archaeobacteria
<input type="checkbox"/> Cyanobacteria
<input type="checkbox"/> Eubacteria
<input type="checkbox"/> PROTISTA (PROTOZOA)
<input type="checkbox"/> Amoeboae
<input type="checkbox"/> Apicomplexa
<input type="checkbox"/> Ciliophora
<input type="checkbox"/> Flagellates
<input type="checkbox"/> Foraminifera
<input type="checkbox"/> Microspora
<input type="checkbox"/> Radiolaria
<input type="checkbox"/> FUNGI
<input type="checkbox"/> Ascomycota
<input type="checkbox"/> Basidiomycota
<input type="checkbox"/> Chytridiomycota | <input type="checkbox"/> Mitosporic Fungi
<input type="checkbox"/> Oomycota
<input type="checkbox"/> Yeasts
<input type="checkbox"/> Zygomycota
<input type="checkbox"/> LICHENS
<input type="checkbox"/> SLIME MOLDS
<input type="checkbox"/> ALGAE
<input type="checkbox"/> Bacillariophyta (Diatoms)
<input type="checkbox"/> Charophyta
<input type="checkbox"/> Chlorophyta
<input type="checkbox"/> Chrysophyta
<input type="checkbox"/> Dinoflagellata
<input type="checkbox"/> Euglenoids
<input type="checkbox"/> Phaeophyta
<input type="checkbox"/> Rhodophyta
<input type="checkbox"/> PLANTS
<input type="checkbox"/> NON-VASCULAR PLANTS
<input type="checkbox"/> BRYOPHYTA
<input type="checkbox"/> Anthocerotae (Hornworts)
<input type="checkbox"/> Hepaticae (Liverworts) | <input type="checkbox"/> Musci (Mosses)
<input checked="" type="checkbox"/> VASCULAR PLANTS
<input type="checkbox"/> FERNS & FERN ALLIES
<input checked="" type="checkbox"/> GYMNOSPERMS
<input type="checkbox"/> Coniferales (Conifers)
<input type="checkbox"/> Cycadales (Cycads)
<input type="checkbox"/> Ginkgoales (Ginkgo)
<input type="checkbox"/> Gnetales (Gnetophytes)
<input checked="" type="checkbox"/> ANGIOSPERMS
<input type="checkbox"/> Monocots
<input type="checkbox"/> Areaceae (Palmae)
<input type="checkbox"/> Cyperaceae
<input type="checkbox"/> Liliaceae
<input type="checkbox"/> Orchidaceae
<input type="checkbox"/> Poaceae (Graminae)
<input type="checkbox"/> Dicots
<input type="checkbox"/> Apiaceae (Umbelliferae)
<input type="checkbox"/> Asteraceae (Compositae)
<input type="checkbox"/> Brassicaceae (Cruciferae)
<input type="checkbox"/> Fabaceae (Leguminosae) |
|--|--|--|

<input type="checkbox"/> Lamiaceae (Labiatae)	<input type="checkbox"/> Pycnogonida (Sea Spiders)	<input type="checkbox"/> Echinoidea (Sea Urchins, Sand Dollars)
<input type="checkbox"/> Rosaceae	<input type="checkbox"/> Scorpionida (Scorpions)	<input type="checkbox"/> Holothuroidea (Sea Cucumbers)
<input type="checkbox"/> Solanaceae	<input type="checkbox"/> Araneae (True Spiders)	<input type="checkbox"/> HEMICHORDATA (Acorn Worms, Pterobranchs)
<input type="checkbox"/> ANIMALS	<input type="checkbox"/> Pseudoscorpionida (Pseudoscorpions)	<input type="checkbox"/> UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
<input type="checkbox"/> INVERTEBRATES	<input type="checkbox"/> Acarina (Free-living Mites)	<input type="checkbox"/> CEPHALOCHORDATA (Amphioxus/Lancelet)
<input type="checkbox"/> MESOZOA/PLACOZOA	<input type="checkbox"/> Parasitiformes (Parasitic Ticks & Mites)	<input type="checkbox"/> VERTEBRATES
<input type="checkbox"/> PORIFERA (Sponges)	<input type="checkbox"/> Crustacea	<input type="checkbox"/> AGNATHA (Hagfish, Lamprey)
<input type="checkbox"/> CNIDARIA	<input type="checkbox"/> Branchiopoda (Fairy Shrimp, Water Flea)	<input type="checkbox"/> FISHES
<input type="checkbox"/> Hydrozoa (Hydra, etc.)	<input type="checkbox"/> Ostracoda (Sea Lice)	<input type="checkbox"/> Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
<input type="checkbox"/> Scyphozoa (Jellyfish)	<input type="checkbox"/> Copepoda	<input type="checkbox"/> Osteichthyes (Bony Fishes)
<input type="checkbox"/> Anthozoa (Corals, Sea Anemones)	<input type="checkbox"/> Cirripedia (Barnacles)	<input type="checkbox"/> Sarcopterygia (Lobe-finned Fishes) (Coelacanth, Lungfish)
<input type="checkbox"/> CTENOPHORA (Comb Jellies)	<input type="checkbox"/> Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)	<input type="checkbox"/> Actinopterygia (Ray-finned Fishes)
<input type="checkbox"/> PLATYHELMINTHES (Flatworms)	<input type="checkbox"/> Isopoda (Wood Lice, Pillbugs)	<input type="checkbox"/> AMPHIBIA
<input type="checkbox"/> Turbellaria (Planarians)	<input type="checkbox"/> Decapoda (Lobster, Crayfish, Crabs, Shrimp)	<input type="checkbox"/> Anura (Frogs, Toads)
<input type="checkbox"/> Trematoda (Flukes)	<input type="checkbox"/> Hexapoda (Insecta) (Insects)	<input type="checkbox"/> Urodela (Salamanders, Newts)
<input type="checkbox"/> Cestoda (Tapeworms)	<input type="checkbox"/> Apterygota (Springtails, Silverfish, etc.)	<input type="checkbox"/> Gymnophiona (Apoda) (Caecilians)
<input type="checkbox"/> Monogenea (Flukes)	<input type="checkbox"/> Odonata (Dragonflies, Damselflies)	<input type="checkbox"/> REPTILIA
<input type="checkbox"/> GNATHOSTOMULIDA	<input type="checkbox"/> Ephemeroptera (Mayflies)	<input type="checkbox"/> Chelonia (Turtles, Tortoises)
<input type="checkbox"/> NEMERTINEA (Rynchozoela) (Ribbon Worms)	<input type="checkbox"/> Orthoptera (Grasshoppers, Crickets)	<input type="checkbox"/> Serpentes (Snakes)
<input type="checkbox"/> ENTOPROCTA (Bryozoa) (Plant-like Animals)	<input type="checkbox"/> Dictyoptera (Cockroaches, Mantids, Phasmids)	<input type="checkbox"/> Sauria (Lizards)
<input type="checkbox"/> ASCHELMINTHES	<input type="checkbox"/> Isoptera (Termites)	<input type="checkbox"/> Crocodylia (Crocodylians)
<input type="checkbox"/> Gastrotricha	<input type="checkbox"/> Plecoptera (Stoneflies)	<input type="checkbox"/> Rhynchocephalia (Tuatara)
<input type="checkbox"/> Kinorhyncha	<input type="checkbox"/> Phthiraptera (Mallophaga & Anoplura) (Lice)	<input type="checkbox"/> AVES (Birds)
<input type="checkbox"/> Loricifera	<input type="checkbox"/> Hemiptera (including Heteroptera) (True Bugs)	<input type="checkbox"/> Paleognathae (Ratites)
<input type="checkbox"/> Nematoda (Roundworms)	<input type="checkbox"/> Homoptera (Cicadas, Scale Insects, Leafhoppers)	<input type="checkbox"/> Sphenisciformes (Penguins)
<input type="checkbox"/> Nematomorpha (Horsehair Worms)	<input type="checkbox"/> Thysanoptera (Thrips)	<input type="checkbox"/> Procellariiformes (Albatrosses, Petrels, Fulmars)
<input type="checkbox"/> Rotifera (Rotatoria)	<input type="checkbox"/> Neuroptera (Lacewings, Dobsonflies, Snakeflies)	<input type="checkbox"/> Pelecaniformes (Pelicans, Gannets, Boobies, Tropicbirds)
<input type="checkbox"/> ACANTHOCEPHALA (Spiny-headed Worms)	<input type="checkbox"/> Trichoptera (Caddisflies)	<input type="checkbox"/> Ciconiiformes (Hérons, Bitterns, Egrets, Storks, Ibis, Flamingo)
<input type="checkbox"/> PRIAPULOIDEA	<input type="checkbox"/> Lepidoptera (Moths, Butterflies)	<input type="checkbox"/> Anseriformes (Ducks, Geese, Screamers)
<input type="checkbox"/> BRYOZOA (Ectoprocta) (Plant-like Animals)	<input type="checkbox"/> Diptera (Flies, Mosquitoes)	<input type="checkbox"/> Falconiformes (Vultures, Hawks, Eagles, Condors, Kites, Falcons)
<input type="checkbox"/> PHORONIDEA (Lophophorates)	<input type="checkbox"/> Siphonaptera (Fleas)	<input type="checkbox"/> Galliformes (Megapodes, Turkeys, Quail, Pheasants, Peafowl, etc.)
<input type="checkbox"/> BRACHIOPODA (Lamp Shells)	<input type="checkbox"/> Coleoptera (Beetles)	<input type="checkbox"/> Gruiformes (Cranes, Rails, Gallinules, Coots, Bustards, Crakes)
<input type="checkbox"/> MOLLUSCA	<input type="checkbox"/> Hymenoptera (Ants, Bees, Wasps, Sawflies)	<input type="checkbox"/> Charadriiformes (Terns, Gulls, Stilts, Avocets, Plovers, Puffins, etc.)
<input type="checkbox"/> Monoplacophora	<input type="checkbox"/> Chilopoda (Centipedes)	<input type="checkbox"/> Columbiformes (Pigeons, Doves)
<input type="checkbox"/> Aplacophora (Solenogasters)	<input type="checkbox"/> Diplopoda (Millipedes)	<input type="checkbox"/> Psittaciformes (Parrots, Lories, Cockatoos, Kakapo, Conures, etc.)
<input type="checkbox"/> Polyplacophora (Chitons)	<input type="checkbox"/> Pauropoda	<input type="checkbox"/> Cuculiformes (Cuckoos, Turacos, Anis, Coucal, Roadrunner, etc.)
<input type="checkbox"/> Scaphopoda (Tooth Shells)	<input type="checkbox"/> Symphyta (Symphyla)	<input type="checkbox"/> Strigiformes (Owls)
<input type="checkbox"/> Gastropoda (Snails, Slugs, Limpets)	<input type="checkbox"/> PENTASTOMIDA (Linguatulida) (Tongue Worms)	<input type="checkbox"/> Apodiformes (Hummingbirds, Swifts, Thornbills)
<input type="checkbox"/> Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)	<input type="checkbox"/> TARDIGRADA (Tardigrades, Water Bears)	<input type="checkbox"/> Coraciformes (Kingfishers, Todies, Bee-Eaters, Rollers, Hornbills, etc.)
<input type="checkbox"/> Cephalopoda (Squid, Octopus, Nautilus)	<input type="checkbox"/> ONYCHOPHORA (Peripatus)	<input type="checkbox"/> Piciformes (Woodpeckers, Toucans, Jacamars, Barbets, Honeyguides)
<input type="checkbox"/> ANNELIDA (Segmented Worms)	<input type="checkbox"/> CHAETOGNATHA (Arrow Worms)	<input type="checkbox"/> Passeriformes (Passerines)
<input type="checkbox"/> Polychaeta (Parapodial Worms)	<input type="checkbox"/> ECHINODERMATA	<input type="checkbox"/> MAMMALIA
<input type="checkbox"/> Oligochaeta (Earthworms)	<input type="checkbox"/> Crinoidea (Sea Lilies, Feather Stars)	
<input type="checkbox"/> Hirudinida (Leeches)	<input type="checkbox"/> Asteroidea (Starfish, Sea Stars)	
<input type="checkbox"/> POGONOPHORA (Beard Worms)	<input type="checkbox"/> Ophiuroidea (Brittle Stars, Serpent Stars)	
<input type="checkbox"/> SIPUNCULOIDEA (Peanut Worms)		
<input type="checkbox"/> ECHIUROIDEA (Spoon Worms)		
<input type="checkbox"/> ARTHROPODA		
<input type="checkbox"/> Cheliceriformes		
<input type="checkbox"/> Merostomata (Horseshoe Crabs)		

<input type="checkbox"/> Monotremata (Platypus, Echidna)	<input type="checkbox"/> Humans	<input type="checkbox"/> Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)
<input type="checkbox"/> Marsupalia (Marsupials)	<input type="checkbox"/> Rodentia	<input type="checkbox"/> Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.)
<input type="checkbox"/> Eutheria (Placentals)	<input type="checkbox"/> Laboratory Rodents (Rat, Mouse, Guinea Pig, Hamster)	<input type="checkbox"/> Sirenia (Manatees, Dugongs)
<input type="checkbox"/> Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)	<input type="checkbox"/> Non-Laboratory Rodents	<input type="checkbox"/> Proboscidea (Elephants)
<input type="checkbox"/> Chiroptera (Bats)	<input type="checkbox"/> Lagomorphs (Rabbits, Hares, Pikas)	<input type="checkbox"/> Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)
<input type="checkbox"/> Edentata (Anteaters, Sloths, Armadillos)	<input type="checkbox"/> Tubulidenata (Aardvarks)	<input type="checkbox"/> TRANSGENIC ORGANISMS
<input type="checkbox"/> Primates	<input type="checkbox"/> Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)	<input type="checkbox"/> FOSSIL OR EXTINCT ORGANISMS
<input type="checkbox"/> Monkeys	<input type="checkbox"/> Ungulates	<input type="checkbox"/> NO ORGANISMS
<input type="checkbox"/> Apes (Gibbons, Orang-utan, Gorilla, Chimpanzee)		

CATEGORY VIII: MODEL ORGANISM (Select ONE)

<input checked="" type="checkbox"/> NO MODEL ORGANISM	MODEL ORGANISM (Input up to 9 characters) <input type="text"/>	
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**Directorate for Biological Sciences
Emerging Frontiers
Macrosystem Biology**

**Proposal Classification Form
PI: / Proposal Number: 1065753**

CATEGORY I: INVESTIGATOR STATUS (Select ONE)

- Beginning Investigator - No previous Federal support as PI or Co-PI, excluding fellowships, dissertations, planning grants, etc.
- Prior Federal support only
- Current Federal support only
- Current & prior Federal support

CATEGORY II: FIELDS OF SCIENCE OTHER THAN BIOLOGY INVOLVED IN THIS RESEARCH (Select 1 to 3)

- | | | |
|--|--|---|
| <input type="checkbox"/> Astronomy
<input type="checkbox"/> Chemistry
<input type="checkbox"/> Computer Science
<input checked="" type="checkbox"/> Earth Science | <input type="checkbox"/> Engineering
<input checked="" type="checkbox"/> Mathematics
<input checked="" type="checkbox"/> Physics | <input type="checkbox"/> Psychology
<input type="checkbox"/> Social Sciences
<input type="checkbox"/> None of the Above |
|--|--|---|

CATEGORY III: SUBSTANTIVE AREA (No selection required)

CATEGORY IV: INFRASTRUCTURE (No selection required)

CATEGORY V: HABITAT (No selection required)

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (No selection required)

CATEGORY VII: CLASSIFICATION OF ORGANISMS (Select 1 to 4)

- | | | |
|---|--|--|
| <input type="checkbox"/> VIRUSES
<input type="checkbox"/> Bacterial
<input type="checkbox"/> Plant
<input type="checkbox"/> Animal
<input type="checkbox"/> PROKARYOTES
<input type="checkbox"/> Archaeobacteria
<input type="checkbox"/> Cyanobacteria
<input type="checkbox"/> Eubacteria
<input type="checkbox"/> PROTISTA (PROTOZOA)
<input type="checkbox"/> Amoebae
<input type="checkbox"/> Apicomplexa
<input type="checkbox"/> Ciliophora
<input type="checkbox"/> Flagellates
<input type="checkbox"/> Foraminifera
<input type="checkbox"/> Microspora
<input type="checkbox"/> Radiolaria
<input type="checkbox"/> FUNGI
<input type="checkbox"/> Ascomycota
<input type="checkbox"/> Basidiomycota
<input type="checkbox"/> Chytridiomycota | <input type="checkbox"/> Mitosporic Fungi
<input type="checkbox"/> Oomycota
<input type="checkbox"/> Yeasts
<input type="checkbox"/> Zygomycota
<input type="checkbox"/> LICHENS
<input type="checkbox"/> SLIME MOLDS
<input type="checkbox"/> ALGAE
<input type="checkbox"/> Bacillariophyta (Diatoms)
<input type="checkbox"/> Charophyta
<input type="checkbox"/> Chlorophyta
<input type="checkbox"/> Chrysophyta
<input type="checkbox"/> Dinoflagellata
<input type="checkbox"/> Euglenoids
<input type="checkbox"/> Phaeophyta
<input type="checkbox"/> Rhodophyta
<input type="checkbox"/> PLANTS
<input type="checkbox"/> NON-VASCULAR PLANTS
<input type="checkbox"/> BRYOPHYTA
<input type="checkbox"/> Anthocerotae (Hornworts)
<input type="checkbox"/> Hepaticae (Liverworts) | <input type="checkbox"/> Musci (Mosses)
<input checked="" type="checkbox"/> VASCULAR PLANTS
<input type="checkbox"/> FERNS & FERN ALLIES
<input checked="" type="checkbox"/> GYMNOSPERMS
<input type="checkbox"/> Coniferales (Conifers)
<input type="checkbox"/> Cycadales (Cycads)
<input type="checkbox"/> Ginkgoales (Ginkgo)
<input type="checkbox"/> Gnetales (Gnetophytes)
<input checked="" type="checkbox"/> ANGIOSPERMS
<input type="checkbox"/> Monocots
<input type="checkbox"/> Areaceae (Palmae)
<input type="checkbox"/> Cyperaceae
<input type="checkbox"/> Liliaceae
<input type="checkbox"/> Orchidaceae
<input type="checkbox"/> Poaceae (Graminae)
<input type="checkbox"/> Dicots
<input type="checkbox"/> Apiaceae (Umbelliferae)
<input type="checkbox"/> Asteraceae (Compositae)
<input type="checkbox"/> Brassicaceae (Cruciferae)
<input type="checkbox"/> Fabaceae (Leguminosae) |
|---|--|--|

<input type="checkbox"/> Lamiaceae (Labiatae)	<input type="checkbox"/> Pycnogonida (Sea Spiders)	<input type="checkbox"/> Echinoidea (Sea Urchins, Sand Dollars)
<input type="checkbox"/> Rosaceae	<input type="checkbox"/> Scorpionida (Scorpions)	<input type="checkbox"/> Holothuroidea (Sea Cucumbers)
<input type="checkbox"/> Solanaceae	<input type="checkbox"/> Araneae (True Spiders)	<input type="checkbox"/> HEMICHORDATA (Acorn Worms, Pterobranchs)
<input type="checkbox"/> ANIMALS	<input type="checkbox"/> Pseudoscorpionida (Pseudoscorpions)	<input type="checkbox"/> UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
<input type="checkbox"/> INVERTEBRATES	<input type="checkbox"/> Acarina (Free-living Mites)	<input type="checkbox"/> CEPHALOCHORDATA (Amphioxus/Lancelet)
<input type="checkbox"/> MESOZOA/PLACOZOA	<input type="checkbox"/> Parasitiformes (Parasitic Ticks & Mites)	<input type="checkbox"/> VERTEBRATES
<input type="checkbox"/> PORIFERA (Sponges)	<input type="checkbox"/> Crustacea	<input type="checkbox"/> AGNATHA (Hagfish, Lamprey)
<input type="checkbox"/> CNIDARIA	<input type="checkbox"/> Branchiopoda (Fairy Shrimp, Water Flea)	<input type="checkbox"/> FISHES
<input type="checkbox"/> Hydrozoa (Hydra, etc.)	<input type="checkbox"/> Ostracoda (Sea Lice)	<input type="checkbox"/> Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
<input type="checkbox"/> Scyphozoa (Jellyfish)	<input type="checkbox"/> Copepoda	<input type="checkbox"/> Osteichthyes (Bony Fishes)
<input type="checkbox"/> Anthozoa (Corals, Sea Anemones)	<input type="checkbox"/> Cirripedia (Barnacles)	<input type="checkbox"/> Sarcopterygia (Lobe-finned Fishes) (Coelacanth, Lungfish)
<input type="checkbox"/> CTENOPHORA (Comb Jellies)	<input type="checkbox"/> Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)	<input type="checkbox"/> Actinopterygia (Ray-finned Fishes)
<input type="checkbox"/> PLATYHELMINTHES (Flatworms)	<input type="checkbox"/> Isopoda (Wood Lice, Pillbugs)	<input type="checkbox"/> AMPHIBIA
<input type="checkbox"/> Turbellaria (Planarians)	<input type="checkbox"/> Decapoda (Lobster, Crayfish, Crabs, Shrimp)	<input type="checkbox"/> Anura (Frogs, Toads)
<input type="checkbox"/> Trematoda (Flukes)	<input type="checkbox"/> Hexapoda (Insecta) (Insects)	<input type="checkbox"/> Urodela (Salamanders, Newts)
<input type="checkbox"/> Cestoda (Tapeworms)	<input type="checkbox"/> Apterygota (Springtails, Silverfish, etc.)	<input type="checkbox"/> Gymnophiona (Apoda) (Caecilians)
<input type="checkbox"/> Monogenea (Flukes)	<input type="checkbox"/> Odonata (Dragonflies, Damselflies)	<input type="checkbox"/> REPTILIA
<input type="checkbox"/> GNATHOSTOMULIDA	<input type="checkbox"/> Ephemeroptera (Mayflies)	<input type="checkbox"/> Chelonia (Turtles, Tortoises)
<input type="checkbox"/> NEMERTINEA (Rynchozoela) (Ribbon Worms)	<input type="checkbox"/> Orthoptera (Grasshoppers, Crickets)	<input type="checkbox"/> Serpentes (Snakes)
<input type="checkbox"/> ENTOPROCTA (Bryozoa) (Plant-like Animals)	<input type="checkbox"/> Dictyoptera (Cockroaches, Mantids, Phasmids)	<input type="checkbox"/> Sauria (Lizards)
<input type="checkbox"/> ASCHELMINTHES	<input type="checkbox"/> Isoptera (Termites)	<input type="checkbox"/> Crocodylia (Crocodylians)
<input type="checkbox"/> Gastrotricha	<input type="checkbox"/> Plecoptera (Stoneflies)	<input type="checkbox"/> Rhynchocephalia (Tuatara)
<input type="checkbox"/> Kinorhyncha	<input type="checkbox"/> Phthiraptera (Mallophaga & Anoplura) (Lice)	<input type="checkbox"/> AVES (Birds)
<input type="checkbox"/> Loricifera	<input type="checkbox"/> Hemiptera (including Heteroptera) (True Bugs)	<input type="checkbox"/> Paleognathae (Ratites)
<input type="checkbox"/> Nematoda (Roundworms)	<input type="checkbox"/> Homoptera (Cicadas, Scale Insects, Leafhoppers)	<input type="checkbox"/> Sphenisciformes (Penguins)
<input type="checkbox"/> Nematomorpha (Horsehair Worms)	<input type="checkbox"/> Thysanoptera (Thrips)	<input type="checkbox"/> Procellariiformes (Albatrosses, Petrels, Fulmars)
<input type="checkbox"/> Rotifera (Rotatoria)	<input type="checkbox"/> Neuroptera (Lacewings, Dobsonflies, Snakeflies)	<input type="checkbox"/> Pelecaniformes (Pelicans, Gannets, Boobies, Tropicbirds)
<input type="checkbox"/> ACANTHOCEPHALA (Spiny-headed Worms)	<input type="checkbox"/> Trichoptera (Caddisflies)	<input type="checkbox"/> Ciconiiformes (Hérons, Bitterns, Egrets, Storks, Ibis, Flamingo)
<input type="checkbox"/> PRIAPULOIDEA	<input type="checkbox"/> Lepidoptera (Moths, Butterflies)	<input type="checkbox"/> Anseriformes (Ducks, Geese, Screamers)
<input type="checkbox"/> BRYOZOA (Ectoprocta) (Plant-like Animals)	<input type="checkbox"/> Diptera (Flies, Mosquitoes)	<input type="checkbox"/> Falconiformes (Vultures, Hawks, Eagles, Condors, Kites, Falcons)
<input type="checkbox"/> PHORONIDEA (Lophophorates)	<input type="checkbox"/> Siphonaptera (Fleas)	<input type="checkbox"/> Galliformes (Megapodes, Turkeys, Quail, Pheasants, Peafowl, etc.)
<input type="checkbox"/> BRACHIOPODA (Lamp Shells)	<input type="checkbox"/> Coleoptera (Beetles)	<input type="checkbox"/> Gruiformes (Cranes, Rails, Gallinules, Coots, Bustards, Crakes)
<input type="checkbox"/> MOLLUSCA	<input type="checkbox"/> Hymenoptera (Ants, Bees, Wasps, Sawflies)	<input type="checkbox"/> Charadriiformes (Terns, Gulls, Stilts, Avocets, Plovers, Puffins, etc.)
<input type="checkbox"/> Monoplacophora	<input type="checkbox"/> Chilopoda (Centipedes)	<input type="checkbox"/> Columbiformes (Pigeons, Doves)
<input type="checkbox"/> Aplacophora (Solenogasters)	<input type="checkbox"/> Diplopoda (Millipedes)	<input type="checkbox"/> Psittaciformes (Parrots, Lories, Cockatoos, Kakapo, Conures, etc.)
<input type="checkbox"/> Polyplacophora (Chitons)	<input type="checkbox"/> Pauropoda	<input type="checkbox"/> Cuculiformes (Cuckoos, Turacos, Anis, Coucal, Roadrunner, etc.)
<input type="checkbox"/> Scaphopoda (Tooth Shells)	<input type="checkbox"/> Symphyta (Symphyla)	<input type="checkbox"/> Strigiformes (Owls)
<input type="checkbox"/> Gastropoda (Snails, Slugs, Limpets)	<input type="checkbox"/> PENTASTOMIDA (Linguatulida) (Tongue Worms)	<input type="checkbox"/> Apodiformes (Hummingbirds, Swifts, Thornbills)
<input type="checkbox"/> Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)	<input type="checkbox"/> TARDIGRADA (Tardigrades, Water Bears)	<input type="checkbox"/> Coraciformes (Kingfishers, Todies, Bee-Eaters, Rollers, Hornbills, etc.)
<input type="checkbox"/> Cephalopoda (Squid, Octopus, Nautilus)	<input type="checkbox"/> ONYCHOPHORA (Peripatus)	<input type="checkbox"/> Piciformes (Woodpeckers, Toucans, Jacamars, Barbets, Honeyguides)
<input type="checkbox"/> ANNELIDA (Segmented Worms)	<input type="checkbox"/> CHAETOGNATHA (Arrow Worms)	<input type="checkbox"/> Passeriformes (Passerines)
<input type="checkbox"/> Polychaeta (Parapodial Worms)	<input type="checkbox"/> ECHINODERMATA	<input type="checkbox"/> MAMMALIA
<input type="checkbox"/> Oligochaeta (Earthworms)	<input type="checkbox"/> Crinoidea (Sea Lilies, Feather Stars)	
<input type="checkbox"/> Hirudinida (Leeches)	<input type="checkbox"/> Asteroidea (Starfish, Sea Stars)	
<input type="checkbox"/> POGONOPHORA (Beard Worms)	<input type="checkbox"/> Ophiuroidea (Brittle Stars, Serpent Stars)	
<input type="checkbox"/> SIPUNCULOIDEA (Peanut Worms)		
<input type="checkbox"/> ECHIUROIDEA (Spoon Worms)		
<input type="checkbox"/> ARTHROPODA		
<input type="checkbox"/> Cheliceriformes		
<input type="checkbox"/> Merostomata (Horseshoe Crabs)		

<input type="checkbox"/> Monotremata (Platypus, Echidna)	<input type="checkbox"/> Humans	<input type="checkbox"/> Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)
<input type="checkbox"/> Marsupalia (Marsupials)	<input type="checkbox"/> Rodentia	<input type="checkbox"/> Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.)
<input type="checkbox"/> Eutheria (Placentals)	<input type="checkbox"/> Laboratory Rodents (Rat, Mouse, Guinea Pig, Hamster)	<input type="checkbox"/> Sirenia (Manatees, Dugongs)
<input type="checkbox"/> Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)	<input type="checkbox"/> Non-Laboratory Rodents	<input type="checkbox"/> Proboscidea (Elephants)
<input type="checkbox"/> Chiroptera (Bats)	<input type="checkbox"/> Lagomorphs (Rabbits, Hares, Pikas)	<input type="checkbox"/> Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)
<input type="checkbox"/> Edentata (Anteaters, Sloths, Armadillos)	<input type="checkbox"/> Tubulidenata (Aardvarks)	<input type="checkbox"/> TRANSGENIC ORGANISMS
<input type="checkbox"/> Primates	<input type="checkbox"/> Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)	<input type="checkbox"/> FOSSIL OR EXTINCT ORGANISMS
<input type="checkbox"/> Monkeys	<input type="checkbox"/> Ungulates	<input type="checkbox"/> NO ORGANISMS
<input type="checkbox"/> Apes (Gibbons, Orang-utan, Gorilla, Chimpanzee)		

CATEGORY VIII: MODEL ORGANISM (Select ONE)

<input checked="" type="checkbox"/> NO MODEL ORGANISM	MODEL ORGANISM (Input up to 9 characters) <input type="text"/>	
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**Directorate for Biological Sciences
Emerging Frontiers
Macrosystem Biology**

**Proposal Classification Form
PI: / Proposal Number: 1065824**

CATEGORY I: INVESTIGATOR STATUS (Select ONE)

- Beginning Investigator - No previous Federal support as PI or Co-PI, excluding fellowships, dissertations, planning grants, etc.
- Prior Federal support only
- Current Federal support only
- Current & prior Federal support

CATEGORY II: FIELDS OF SCIENCE OTHER THAN BIOLOGY INVOLVED IN THIS RESEARCH (Select 1 to 3)

- | | | |
|--|--|---|
| <input type="checkbox"/> Astronomy
<input type="checkbox"/> Chemistry
<input type="checkbox"/> Computer Science
<input checked="" type="checkbox"/> Earth Science | <input type="checkbox"/> Engineering
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Physics | <input type="checkbox"/> Psychology
<input type="checkbox"/> Social Sciences
<input type="checkbox"/> None of the Above |
|--|--|---|

CATEGORY III: SUBSTANTIVE AREA (No selection required)

CATEGORY IV: INFRASTRUCTURE (No selection required)

CATEGORY V: HABITAT (No selection required)

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (No selection required)

CATEGORY VII: CLASSIFICATION OF ORGANISMS (Select 1 to 4)

- | | | |
|---|--|--|
| <input type="checkbox"/> VIRUSES
<input type="checkbox"/> Bacterial
<input type="checkbox"/> Plant
<input type="checkbox"/> Animal
<input type="checkbox"/> PROKARYOTES
<input type="checkbox"/> Archaeobacteria
<input type="checkbox"/> Cyanobacteria
<input type="checkbox"/> Eubacteria
<input type="checkbox"/> PROTISTA (PROTOZOA)
<input type="checkbox"/> Amoebae
<input type="checkbox"/> Apicomplexa
<input type="checkbox"/> Ciliophora
<input type="checkbox"/> Flagellates
<input type="checkbox"/> Foraminifera
<input type="checkbox"/> Microspora
<input type="checkbox"/> Radiolaria
<input type="checkbox"/> FUNGI
<input type="checkbox"/> Ascomycota
<input type="checkbox"/> Basidiomycota
<input type="checkbox"/> Chytridiomycota | <input type="checkbox"/> Mitosporic Fungi
<input type="checkbox"/> Oomycota
<input type="checkbox"/> Yeasts
<input type="checkbox"/> Zygomycota
<input type="checkbox"/> LICHENS
<input type="checkbox"/> SLIME MOLDS
<input type="checkbox"/> ALGAE
<input type="checkbox"/> Bacillariophyta (Diatoms)
<input type="checkbox"/> Charophyta
<input type="checkbox"/> Chlorophyta
<input type="checkbox"/> Chrysophyta
<input type="checkbox"/> Dinoflagellata
<input type="checkbox"/> Euglenoids
<input type="checkbox"/> Phaeophyta
<input type="checkbox"/> Rhodophyta
<input type="checkbox"/> PLANTS
<input type="checkbox"/> NON-VASCULAR PLANTS
<input type="checkbox"/> BRYOPHYTA
<input type="checkbox"/> Anthocerotae (Hornworts)
<input type="checkbox"/> Hepaticae (Liverworts) | <input type="checkbox"/> Musci (Mosses)
<input checked="" type="checkbox"/> VASCULAR PLANTS
<input type="checkbox"/> FERNS & FERN ALLIES
<input type="checkbox"/> GYMNOSPERMS
<input type="checkbox"/> Coniferales (Conifers)
<input type="checkbox"/> Cycadales (Cycads)
<input type="checkbox"/> Ginkgoales (Ginkgo)
<input type="checkbox"/> Gnetales (Gnetophytes)
<input type="checkbox"/> ANGIOSPERMS
<input type="checkbox"/> Monocots
<input type="checkbox"/> Areaceae (Palmae)
<input type="checkbox"/> Cyperaceae
<input type="checkbox"/> Liliaceae
<input type="checkbox"/> Orchidaceae
<input type="checkbox"/> Poaceae (Graminae)
<input type="checkbox"/> Dicots
<input type="checkbox"/> Apiaceae (Umbelliferae)
<input type="checkbox"/> Asteraceae (Compositae)
<input type="checkbox"/> Brassicaceae (Cruciferae)
<input type="checkbox"/> Fabaceae (Leguminosae) |
|---|--|--|

<input type="checkbox"/> Lamiaceae (Labiatae)	<input type="checkbox"/> Pycnogonida (Sea Spiders)	<input type="checkbox"/> Echinoidea (Sea Urchins, Sand Dollars)
<input type="checkbox"/> Rosaceae	<input type="checkbox"/> Scorpionida (Scorpions)	<input type="checkbox"/> Holothuroidea (Sea Cucumbers)
<input type="checkbox"/> Solanaceae	<input type="checkbox"/> Araneae (True Spiders)	<input type="checkbox"/> HEMICHORDATA (Acorn Worms, Pterobranchs)
<input type="checkbox"/> ANIMALS	<input type="checkbox"/> Pseudoscorpionida (Pseudoscorpions)	<input type="checkbox"/> UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
<input type="checkbox"/> INVERTEBRATES	<input type="checkbox"/> Acarina (Free-living Mites)	<input type="checkbox"/> CEPHALOCHORDATA (Amphioxus/Lancelet)
<input type="checkbox"/> MESOZOA/PLACOZOA	<input type="checkbox"/> Parasitiformes (Parasitic Ticks & Mites)	<input type="checkbox"/> VERTEBRATES
<input type="checkbox"/> PORIFERA (Sponges)	<input type="checkbox"/> Crustacea	<input type="checkbox"/> AGNATHA (Hagfish, Lamprey)
<input type="checkbox"/> CNIDARIA	<input type="checkbox"/> Branchiopoda (Fairy Shrimp, Water Flea)	<input type="checkbox"/> FISHES
<input type="checkbox"/> Hydrozoa (Hydra, etc.)	<input type="checkbox"/> Ostracoda (Sea Lice)	<input type="checkbox"/> Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
<input type="checkbox"/> Scyphozoa (Jellyfish)	<input type="checkbox"/> Copepoda	<input type="checkbox"/> Osteichthyes (Bony Fishes)
<input type="checkbox"/> Anthozoa (Corals, Sea Anemones)	<input type="checkbox"/> Cirripedia (Barnacles)	<input type="checkbox"/> Sarcopterygia (Lobe-finned Fishes) (Coelacanth, Lungfish)
<input type="checkbox"/> CTENOPHORA (Comb Jellies)	<input type="checkbox"/> Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)	<input type="checkbox"/> Actinopterygia (Ray-finned Fishes)
<input type="checkbox"/> PLATYHELMINTHES (Flatworms)	<input type="checkbox"/> Isopoda (Wood Lice, Pillbugs)	<input type="checkbox"/> AMPHIBIA
<input type="checkbox"/> Turbellaria (Planarians)	<input type="checkbox"/> Decapoda (Lobster, Crayfish, Crabs, Shrimp)	<input type="checkbox"/> Anura (Frogs, Toads)
<input type="checkbox"/> Trematoda (Flukes)	<input type="checkbox"/> Hexapoda (Insecta) (Insects)	<input type="checkbox"/> Urodela (Salamanders, Newts)
<input type="checkbox"/> Cestoda (Tapeworms)	<input type="checkbox"/> Apterygota (Springtails, Silverfish, etc.)	<input type="checkbox"/> Gymnophiona (Apoda) (Caecilians)
<input type="checkbox"/> Monogenea (Flukes)	<input type="checkbox"/> Odonata (Dragonflies, Damselflies)	<input type="checkbox"/> REPTILIA
<input type="checkbox"/> GNATHOSTOMULIDA	<input type="checkbox"/> Ephemeroptera (Mayflies)	<input type="checkbox"/> Chelonia (Turtles, Tortoises)
<input type="checkbox"/> NEMERTINEA (Rynchozoela) (Ribbon Worms)	<input type="checkbox"/> Orthoptera (Grasshoppers, Crickets)	<input type="checkbox"/> Serpentes (Snakes)
<input type="checkbox"/> ENTOPROCTA (Bryozoa) (Plant-like Animals)	<input type="checkbox"/> Dictyoptera (Cockroaches, Mantids, Phasmids)	<input type="checkbox"/> Sauria (Lizards)
<input type="checkbox"/> ASCHELMINTHES	<input type="checkbox"/> Isoptera (Termites)	<input type="checkbox"/> Crocodylia (Crocodylians)
<input type="checkbox"/> Gastrotricha	<input type="checkbox"/> Plecoptera (Stoneflies)	<input type="checkbox"/> Rhynchocephalia (Tuatara)
<input type="checkbox"/> Kinorhyncha	<input type="checkbox"/> Phthiraptera (Mallophaga & Anoplura) (Lice)	<input type="checkbox"/> AVES (Birds)
<input type="checkbox"/> Loricifera	<input type="checkbox"/> Hemiptera (including Heteroptera) (True Bugs)	<input type="checkbox"/> Paleognathae (Ratites)
<input type="checkbox"/> Nematoda (Roundworms)	<input type="checkbox"/> Homoptera (Cicadas, Scale Insects, Leafhoppers)	<input type="checkbox"/> Sphenisciformes (Penguins)
<input type="checkbox"/> Nematomorpha (Horsehair Worms)	<input type="checkbox"/> Thysanoptera (Thrips)	<input type="checkbox"/> Procellariiformes (Albatrosses, Petrels, Fulmars)
<input type="checkbox"/> Rotifera (Rotatoria)	<input type="checkbox"/> Neuroptera (Lacewings, Dobsonflies, Snakeflies)	<input type="checkbox"/> Pelecaniformes (Pelicans, Gannets, Boobies, Tropicbirds)
<input type="checkbox"/> ACANTHOCEPHALA (Spiny-headed Worms)	<input type="checkbox"/> Trichoptera (Caddisflies)	<input type="checkbox"/> Ciconiiformes (Hérons, Bitterns, Egrets, Storks, Ibis, Flamingo)
<input type="checkbox"/> PRIAPULOIDEA	<input type="checkbox"/> Lepidoptera (Moths, Butterflies)	<input type="checkbox"/> Anseriformes (Ducks, Geese, Screamers)
<input type="checkbox"/> BRYOZOA (Ectoprocta) (Plant-like Animals)	<input type="checkbox"/> Diptera (Flies, Mosquitoes)	<input type="checkbox"/> Falconiformes (Vultures, Hawks, Eagles, Condors, Kites, Falcons)
<input type="checkbox"/> PHORONIDEA (Lophophorates)	<input type="checkbox"/> Siphonaptera (Fleas)	<input type="checkbox"/> Galliformes (Megapodes, Turkeys, Quail, Pheasants, Peafowl, etc.)
<input type="checkbox"/> BRACHIOPODA (Lamp Shells)	<input type="checkbox"/> Coleoptera (Beetles)	<input type="checkbox"/> Gruiformes (Cranes, Rails, Gallinules, Coots, Bustards, Crakes)
<input type="checkbox"/> MOLLUSCA	<input type="checkbox"/> Hymenoptera (Ants, Bees, Wasps, Sawflies)	<input type="checkbox"/> Charadriiformes (Terns, Gulls, Stilts, Avocets, Plovers, Puffins, etc.)
<input type="checkbox"/> Monoplacophora	<input type="checkbox"/> Chilopoda (Centipedes)	<input type="checkbox"/> Columbiformes (Pigeons, Doves)
<input type="checkbox"/> Aplacophora (Solenogasters)	<input type="checkbox"/> Diplopoda (Millipedes)	<input type="checkbox"/> Psittaciformes (Parrots, Lories, Cockatoos, Kakapo, Conures, etc.)
<input type="checkbox"/> Polyplacophora (Chitons)	<input type="checkbox"/> Pauropoda	<input type="checkbox"/> Cuculiformes (Cuckoos, Turacos, Anis, Coucal, Roadrunner, etc.)
<input type="checkbox"/> Scaphopoda (Tooth Shells)	<input type="checkbox"/> Symphyta (Symphyla)	<input type="checkbox"/> Strigiformes (Owls)
<input type="checkbox"/> Gastropoda (Snails, Slugs, Limpets)	<input type="checkbox"/> PENTASTOMIDA (Linguatulida) (Tongue Worms)	<input type="checkbox"/> Apodiformes (Hummingbirds, Swifts, Thornbills)
<input type="checkbox"/> Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)	<input type="checkbox"/> TARDIGRADA (Tardigrades, Water Bears)	<input type="checkbox"/> Coraciformes (Kingfishers, Todies, Bee-Eaters, Rollers, Hornbills, etc.)
<input type="checkbox"/> Cephalopoda (Squid, Octopus, Nautilus)	<input type="checkbox"/> ONYCHOPHORA (Peripatus)	<input type="checkbox"/> Piciformes (Woodpeckers, Toucans, Jacamars, Barbets, Honeyguides)
<input type="checkbox"/> ANNELIDA (Segmented Worms)	<input type="checkbox"/> CHAETOGNATHA (Arrow Worms)	<input type="checkbox"/> Passeriformes (Passerines)
<input type="checkbox"/> Polychaeta (Parapodial Worms)	<input type="checkbox"/> ECHINODERMATA	<input type="checkbox"/> MAMMALIA
<input type="checkbox"/> Oligochaeta (Earthworms)	<input type="checkbox"/> Crinoidea (Sea Lilies, Feather Stars)	
<input type="checkbox"/> Hirudinida (Leeches)	<input type="checkbox"/> Asteroidea (Starfish, Sea Stars)	
<input type="checkbox"/> POGONOPHORA (Beard Worms)	<input type="checkbox"/> Ophiuroidea (Brittle Stars, Serpent Stars)	
<input type="checkbox"/> SIPUNCULOIDEA (Peanut Worms)		
<input type="checkbox"/> ECHIUROIDEA (Spoon Worms)		
<input type="checkbox"/> ARTHROPODA		
<input type="checkbox"/> Cheliceriformes		
<input type="checkbox"/> Merostomata (Horseshoe Crabs)		

<input type="checkbox"/> Monotremata (Platypus, Echidna)	<input type="checkbox"/> Humans	<input type="checkbox"/> Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)
<input type="checkbox"/> Marsupalia (Marsupials)	<input type="checkbox"/> Rodentia	<input type="checkbox"/> Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.)
<input type="checkbox"/> Eutheria (Placentals)	<input type="checkbox"/> Laboratory Rodents (Rat, Mouse, Guinea Pig, Hamster)	<input type="checkbox"/> Sirenia (Manatees, Dugongs)
<input type="checkbox"/> Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)	<input type="checkbox"/> Non-Laboratory Rodents	<input type="checkbox"/> Proboscidea (Elephants)
<input type="checkbox"/> Chiroptera (Bats)	<input type="checkbox"/> Lagomorphs (Rabbits, Hares, Pikas)	<input type="checkbox"/> Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)
<input type="checkbox"/> Edentata (Anteaters, Sloths, Armadillos)	<input type="checkbox"/> Tubulidenata (Aardvarks)	<input type="checkbox"/> TRANSGENIC ORGANISMS
<input type="checkbox"/> Primates	<input type="checkbox"/> Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)	<input type="checkbox"/> FOSSIL OR EXTINCT ORGANISMS
<input type="checkbox"/> Monkeys	<input type="checkbox"/> Ungulates	<input type="checkbox"/> NO ORGANISMS
<input type="checkbox"/> Apes (Gibbons, Orang-utan, Gorilla, Chimpanzee)		

CATEGORY VIII: MODEL ORGANISM (Select ONE)

<input checked="" type="checkbox"/> NO MODEL ORGANISM	MODEL ORGANISM (Input up to 9 characters) <input type="text"/>	
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**Directorate for Biological Sciences
Emerging Frontiers
Macrosystem Biology**

**Proposal Classification Form
PI: Hall, Alexander**

CATEGORY I: INVESTIGATOR STATUS (Select ONE)

- Beginning Investigator - No previous Federal support as PI or Co-PI, excluding fellowships, dissertations, planning grants, etc.
- Prior Federal support only
- Current Federal support only
- Current & prior Federal support

CATEGORY II: FIELDS OF SCIENCE OTHER THAN BIOLOGY INVOLVED IN THIS RESEARCH (Select 1 to 3)

- | | | |
|--|--|---|
| <input type="checkbox"/> Astronomy
<input type="checkbox"/> Chemistry
<input type="checkbox"/> Computer Science
<input checked="" type="checkbox"/> Earth Science | <input type="checkbox"/> Engineering
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Physics | <input type="checkbox"/> Psychology
<input type="checkbox"/> Social Sciences
<input type="checkbox"/> None of the Above |
|--|--|---|

CATEGORY III: SUBSTANTIVE AREA (No selection required)

CATEGORY IV: INFRASTRUCTURE (No selection required)

CATEGORY V: HABITAT (No selection required)

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (No selection required)

CATEGORY VII: CLASSIFICATION OF ORGANISMS (Select 1 to 4)

- | | | |
|--|--|--|
| <input type="checkbox"/> VIRUSES
<input type="checkbox"/> Bacterial
<input type="checkbox"/> Plant
<input type="checkbox"/> Animal
<input type="checkbox"/> PROKARYOTES
<input type="checkbox"/> Archaeobacteria
<input type="checkbox"/> Cyanobacteria
<input type="checkbox"/> Eubacteria
<input type="checkbox"/> PROTISTA (PROTOZOA)
<input type="checkbox"/> Amoeboae
<input type="checkbox"/> Apicomplexa
<input type="checkbox"/> Ciliophora
<input type="checkbox"/> Flagellates
<input type="checkbox"/> Foraminifera
<input type="checkbox"/> Microspora
<input type="checkbox"/> Radiolaria
<input type="checkbox"/> FUNGI
<input type="checkbox"/> Ascomycota
<input type="checkbox"/> Basidiomycota
<input type="checkbox"/> Chytridiomycota | <input type="checkbox"/> Mitosporic Fungi
<input type="checkbox"/> Oomycota
<input type="checkbox"/> Yeasts
<input type="checkbox"/> Zygomycota
<input type="checkbox"/> LICHENS
<input type="checkbox"/> SLIME MOLDS
<input type="checkbox"/> ALGAE
<input type="checkbox"/> Bacillariophyta (Diatoms)
<input type="checkbox"/> Charophyta
<input type="checkbox"/> Chlorophyta
<input type="checkbox"/> Chrysophyta
<input type="checkbox"/> Dinoflagellata
<input type="checkbox"/> Euglenoids
<input type="checkbox"/> Phaeophyta
<input type="checkbox"/> Rhodophyta
<input type="checkbox"/> PLANTS
<input type="checkbox"/> NON-VASCULAR PLANTS
<input type="checkbox"/> BRYOPHYTA
<input type="checkbox"/> Anthocerotae (Hornworts)
<input type="checkbox"/> Hepaticae (Liverworts) | <input type="checkbox"/> Musci (Mosses)
<input checked="" type="checkbox"/> VASCULAR PLANTS
<input type="checkbox"/> FERNS & FERN ALLIES
<input checked="" type="checkbox"/> GYMNOSPERMS
<input type="checkbox"/> Coniferales (Conifers)
<input type="checkbox"/> Cycadales (Cycads)
<input type="checkbox"/> Ginkgoales (Ginkgo)
<input type="checkbox"/> Gnetales (Gnetophytes)
<input checked="" type="checkbox"/> ANGIOSPERMS
<input type="checkbox"/> Monocots
<input type="checkbox"/> Areaceae (Palmae)
<input type="checkbox"/> Cyperaceae
<input type="checkbox"/> Liliaceae
<input type="checkbox"/> Orchidaceae
<input type="checkbox"/> Poaceae (Graminae)
<input type="checkbox"/> Dicots
<input type="checkbox"/> Apiaceae (Umbelliferae)
<input type="checkbox"/> Asteraceae (Compositae)
<input type="checkbox"/> Brassicaceae (Cruciferae)
<input type="checkbox"/> Fabaceae (Leguminosae) |
|--|--|--|

<input type="checkbox"/> Lamiaceae (Labiatae)	<input type="checkbox"/> Pycnogonida (Sea Spiders)	<input type="checkbox"/> Echinoidea (Sea Urchins, Sand Dollars)
<input type="checkbox"/> Rosaceae	<input type="checkbox"/> Scorpionida (Scorpions)	<input type="checkbox"/> Holothuroidea (Sea Cucumbers)
<input type="checkbox"/> Solanaceae	<input type="checkbox"/> Araneae (True Spiders)	<input type="checkbox"/> HEMICHORDATA (Acorn Worms, Pterobranchs)
<input type="checkbox"/> ANIMALS	<input type="checkbox"/> Pseudoscorpionida (Pseudoscorpions)	<input type="checkbox"/> UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
<input type="checkbox"/> INVERTEBRATES	<input type="checkbox"/> Acarina (Free-living Mites)	<input type="checkbox"/> CEPHALOCHORDATA (Amphioxus/Lancelet)
<input type="checkbox"/> MESOZOA/PLACOZOA	<input type="checkbox"/> Parasitiformes (Parasitic Ticks & Mites)	<input type="checkbox"/> VERTEBRATES
<input type="checkbox"/> PORIFERA (Sponges)	<input type="checkbox"/> Crustacea	<input type="checkbox"/> AGNATHA (Hagfish, Lamprey)
<input type="checkbox"/> CNIDARIA	<input type="checkbox"/> Branchiopoda (Fairy Shrimp, Water Flea)	<input type="checkbox"/> FISHES
<input type="checkbox"/> Hydrozoa (Hydra, etc.)	<input type="checkbox"/> Ostracoda (Sea Lice)	<input type="checkbox"/> Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
<input type="checkbox"/> Scyphozoa (Jellyfish)	<input type="checkbox"/> Copepoda	<input type="checkbox"/> Osteichthyes (Bony Fishes)
<input type="checkbox"/> Anthozoa (Corals, Sea Anemones)	<input type="checkbox"/> Cirripedia (Barnacles)	<input type="checkbox"/> Sarcopterygia (Lobe-finned Fishes) (Coelacanth, Lungfish)
<input type="checkbox"/> CTENOPHORA (Comb Jellies)	<input type="checkbox"/> Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)	<input type="checkbox"/> Actinopterygia (Ray-finned Fishes)
<input type="checkbox"/> PLATYHELMINTHES (Flatworms)	<input type="checkbox"/> Isopoda (Wood Lice, Pillbugs)	<input type="checkbox"/> AMPHIBIA
<input type="checkbox"/> Turbellaria (Planarians)	<input type="checkbox"/> Decapoda (Lobster, Crayfish, Crabs, Shrimp)	<input type="checkbox"/> Anura (Frogs, Toads)
<input type="checkbox"/> Trematoda (Flukes)	<input type="checkbox"/> Hexapoda (Insecta) (Insects)	<input type="checkbox"/> Urodela (Salamanders, Newts)
<input type="checkbox"/> Cestoda (Tapeworms)	<input type="checkbox"/> Apterygota (Springtails, Silverfish, etc.)	<input type="checkbox"/> Gymnophiona (Apoda) (Caecilians)
<input type="checkbox"/> Monogenea (Flukes)	<input type="checkbox"/> Odonata (Dragonflies, Damselflies)	<input type="checkbox"/> REPTILIA
<input type="checkbox"/> GNATHOSTOMULIDA	<input type="checkbox"/> Ephemeroptera (Mayflies)	<input type="checkbox"/> Chelonia (Turtles, Tortoises)
<input type="checkbox"/> NEMERTINEA (Rynchozoela) (Ribbon Worms)	<input type="checkbox"/> Orthoptera (Grasshoppers, Crickets)	<input type="checkbox"/> Serpentes (Snakes)
<input type="checkbox"/> ENTOPROCTA (Bryozoa) (Plant-like Animals)	<input type="checkbox"/> Dictyoptera (Cockroaches, Mantids, Phasmids)	<input type="checkbox"/> Sauria (Lizards)
<input type="checkbox"/> ASCHELMINTHES	<input type="checkbox"/> Isoptera (Termites)	<input type="checkbox"/> Crocodylia (Crocodylians)
<input type="checkbox"/> Gastrotricha	<input type="checkbox"/> Plecoptera (Stoneflies)	<input type="checkbox"/> Rhynchocephalia (Tuatara)
<input type="checkbox"/> Kinorhyncha	<input type="checkbox"/> Phthiraptera (Mallophaga & Anoplura) (Lice)	<input type="checkbox"/> AVES (Birds)
<input type="checkbox"/> Loricifera	<input type="checkbox"/> Hemiptera (including Heteroptera) (True Bugs)	<input type="checkbox"/> Paleognathae (Ratites)
<input type="checkbox"/> Nematoda (Roundworms)	<input type="checkbox"/> Homoptera (Cicadas, Scale Insects, Leafhoppers)	<input type="checkbox"/> Sphenisciformes (Penguins)
<input type="checkbox"/> Nematomorpha (Horsehair Worms)	<input type="checkbox"/> Thysanoptera (Thrips)	<input type="checkbox"/> Procellariiformes (Albatrosses, Petrels, Fulmars)
<input type="checkbox"/> Rotifera (Rotatoria)	<input type="checkbox"/> Neuroptera (Lacewings, Dobsonflies, Snakeflies)	<input type="checkbox"/> Pelecaniformes (Pelicans, Gannets, Boobies, Tropicbirds)
<input type="checkbox"/> ACANTHOCEPHALA (Spiny-headed Worms)	<input type="checkbox"/> Trichoptera (Caddisflies)	<input type="checkbox"/> Ciconiiformes (Hérons, Bitterns, Egrets, Storks, Ibis, Flamingo)
<input type="checkbox"/> PRIAPULOIDEA	<input type="checkbox"/> Lepidoptera (Moths, Butterflies)	<input type="checkbox"/> Anseriformes (Ducks, Geese, Screamers)
<input type="checkbox"/> BRYOZOA (Ectoprocta) (Plant-like Animals)	<input type="checkbox"/> Diptera (Flies, Mosquitoes)	<input type="checkbox"/> Falconiformes (Vultures, Hawks, Eagles, Condors, Kites, Falcons)
<input type="checkbox"/> PHORONIDEA (Lophophorates)	<input type="checkbox"/> Siphonaptera (Fleas)	<input type="checkbox"/> Galliformes (Megapodes, Turkeys, Quail, Pheasants, Peafowl, etc.)
<input type="checkbox"/> BRACHIOPODA (Lamp Shells)	<input type="checkbox"/> Coleoptera (Beetles)	<input type="checkbox"/> Gruiformes (Cranes, Rails, Gallinules, Coots, Bustards, Crakes)
<input type="checkbox"/> MOLLUSCA	<input type="checkbox"/> Hymenoptera (Ants, Bees, Wasps, Sawflies)	<input type="checkbox"/> Charadriiformes (Terns, Gulls, Stilts, Avocets, Plovers, Puffins, etc.)
<input type="checkbox"/> Monoplacophora	<input type="checkbox"/> Chilopoda (Centipedes)	<input type="checkbox"/> Columbiformes (Pigeons, Doves)
<input type="checkbox"/> Aplacophora (Solenogasters)	<input type="checkbox"/> Diplopoda (Millipedes)	<input type="checkbox"/> Psittaciformes (Parrots, Lories, Cockatoos, Kakapo, Conures, etc.)
<input type="checkbox"/> Polyplacophora (Chitons)	<input type="checkbox"/> Pauropoda	<input type="checkbox"/> Cuculiformes (Cuckoos, Turacos, Anis, Coucal, Roadrunner, etc.)
<input type="checkbox"/> Scaphopoda (Tooth Shells)	<input type="checkbox"/> Symphyta (Symphyla)	<input type="checkbox"/> Strigiformes (Owls)
<input type="checkbox"/> Gastropoda (Snails, Slugs, Limpets)	<input type="checkbox"/> PENTASTOMIDA (Linguatulida) (Tongue Worms)	<input type="checkbox"/> Apodiformes (Hummingbirds, Swifts, Thornbills)
<input type="checkbox"/> Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)	<input type="checkbox"/> TARDIGRADA (Tardigrades, Water Bears)	<input type="checkbox"/> Coraciformes (Kingfishers, Todies, Bee-Eaters, Rollers, Hornbills, etc.)
<input type="checkbox"/> Cephalopoda (Squid, Octopus, Nautilus)	<input type="checkbox"/> ONYCHOPHORA (Peripatus)	<input type="checkbox"/> Piciformes (Woodpeckers, Toucans, Jacamars, Barbets, Honeyguides)
<input type="checkbox"/> ANNELIDA (Segmented Worms)	<input type="checkbox"/> CHAETOGNATHA (Arrow Worms)	<input type="checkbox"/> Passeriformes (Passerines)
<input type="checkbox"/> Polychaeta (Parapodial Worms)	<input type="checkbox"/> ECHINODERMATA	<input type="checkbox"/> MAMMALIA
<input type="checkbox"/> Oligochaeta (Earthworms)	<input type="checkbox"/> Crinoidea (Sea Lilies, Feather Stars)	
<input type="checkbox"/> Hirudinida (Leeches)	<input type="checkbox"/> Asteroidea (Starfish, Sea Stars)	
<input type="checkbox"/> POGONOPHORA (Beard Worms)	<input type="checkbox"/> Ophiuroidea (Brittle Stars, Serpent Stars)	
<input type="checkbox"/> SIPUNCULOIDEA (Peanut Worms)		
<input type="checkbox"/> ECHIUROIDEA (Spoon Worms)		
<input type="checkbox"/> ARTHROPODA		
<input type="checkbox"/> Cheliceriformes		
<input type="checkbox"/> Merostomata (Horseshoe Crabs)		

<input type="checkbox"/> Monotremata (Platypus, Echidna)	<input type="checkbox"/> Humans	<input type="checkbox"/> Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)
<input type="checkbox"/> Marsupalia (Marsupials)	<input type="checkbox"/> Rodentia	<input type="checkbox"/> Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.)
<input type="checkbox"/> Eutheria (Placentals)	<input type="checkbox"/> Laboratory Rodents (Rat, Mouse, Guinea Pig, Hamster)	<input type="checkbox"/> Sirenia (Manatees, Dugongs)
<input type="checkbox"/> Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)	<input type="checkbox"/> Non-Laboratory Rodents	<input type="checkbox"/> Proboscidea (Elephants)
<input type="checkbox"/> Chiroptera (Bats)	<input type="checkbox"/> Lagomorphs (Rabbits, Hares, Pikas)	<input type="checkbox"/> Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)
<input type="checkbox"/> Edentata (Anteaters, Sloths, Armadillos)	<input type="checkbox"/> Tubulidenata (Aardvarks)	<input type="checkbox"/> TRANSGENIC ORGANISMS
<input type="checkbox"/> Primates	<input type="checkbox"/> Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)	<input type="checkbox"/> FOSSIL OR EXTINCT ORGANISMS
<input type="checkbox"/> Monkeys	<input type="checkbox"/> Ungulates	<input type="checkbox"/> NO ORGANISMS
<input type="checkbox"/> Apes (Gibbons, Orang-utan, Gorilla, Chimpanzee)		

CATEGORY VIII: MODEL ORGANISM (Select ONE)

<input checked="" type="checkbox"/> NO MODEL ORGANISM	MODEL ORGANISM (Input up to 9 characters) <input type="text"/>	
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Project Summary

Title: Collaborative Research: Do microenvironments govern macroecology? **PI:** Frank Davis
Lead Institution: UC Santa Barbara **Collaborators:** UC Riverside, UC Berkeley, UC Los Angeles, Arizona State University, Conservation Biology Institute, Desert Research Institute, Conservation International

This project examines the effect of microenvironments (i.e. areas of high habitat suitability for individual species) on macroecological processes, including species distribution responses to climate change and consequent extinction risk. Microenvironments have played critical roles in rapid vegetation response to past climate change, such as the emergence from the last glacial maximum. This project tests the importance of these difficult-to-model features in vegetation response to future climate change. The overarching research question addressed is "How does macroecological response to climate change emerge from finer scale climate and population processes?"

The project uses a combination of modeling and field experimentation to answer this question. A collaborative research team will model microenvironment impacts on species distribution, abundance and diversity under rapid climate change for four tree species across four study sites in the Sierra Nevada and Coast Ranges of California. This proposed research design is a novel combination of site trials, distribution models and population models, incorporating measured (rather than inferred) species' tolerances relevant to microenvironments at scales that vary over five orders of magnitude (30m-3000km). Analytical tools will include reciprocal transplant experiments, field surveys, species trait-based distribution models, population models and biogeographic models of climate change. Physical models of microenvironments are linked to models of tree species occupation of microenvironments, which in turn inform models of population-level responses. Climate change is simulated using Regional Earth Systems Models and statistical downscaling from global climate model simulations. Field experiments examine the response of establishment phase (seedling) dynamics, the life history stage most sensitive to altered climate, through transplanting protocols to lower (warmer) elevations. The frequency of fire in the landscape is projected using correlations of fire to landscape conditions under current climate. Establishment phase and fire information is then used in models of single species population responses and multi-taxa responses in complex landscapes. These population-level models will give clear indication of whether microenvironments change species dynamics in rapid climate change in ways that will dramatically change range-wide and continental-scale biological responses to climate change.

Intellectual Merit

The insights provided by this research have the potential to revise and refine estimates of extinction risk due to climate change, estimates of species' ability to track rapid climate change, and our understanding of macroecological response to anthropogenic climate change. Extinction risk estimates can vary by an order of magnitude depending on ability of species to attain future suitable climate. Microenvironments are a critical part of this ability, as demonstrated by the paleoecological record. Species' ability to track rapid climate change is a critical issue as conservation strategies are developed to deal with future climate change. This combination of insights into the future of biology of the planet is powerful, owing to its applicability in fields as diverse as ecology, biogeography, conservation planning and international climate change policy.

Broader Impacts

Tree species' ranges are shifting and will continue to shift under ongoing rapid climate change, with important consequences for biodiversity, carbon cycling, timber production, climate and watershed hydrology. This research directly informs adaptive management of existing, proposed and future protected areas systems, production forests and carbon sequestration in the face of climate change. The project includes governmental and NGO researchers who will provide linkages to public and private land managers, conservation specialists, policy makers in the region, and non-Government organizations for application of research results in better management of production and conservation lands in the face of climate change.

TABLE OF CONTENTS

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	Total No. of Pages	Page No.* (Optional)*
Cover Sheet for Proposal to the National Science Foundation		
Project Summary (not to exceed 1 page)	1	_____
Table of Contents	1	_____
Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	15	_____
References Cited	5	_____
Biographical Sketches (Not to exceed 2 pages each)	8	_____
Budget (Plus up to 3 pages of budget justification)	32	_____
Current and Pending Support	13	_____
Facilities, Equipment and Other Resources	2	_____
Special Information/Other Supplementary Docs/Mentoring Plan	1	_____
Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____
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References Cited	_____	_____
Biographical Sketches (Not to exceed 2 pages each)	2	_____
Budget (Plus up to 3 pages of budget justification)	8	_____
Current and Pending Support	1	_____
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Project Description

a. Problem Statement

Broader Significance of Topic

Tree species' ranges are shifting under ongoing rapid climate change (e.g., Lenoir et al. 2009), with important consequences for biodiversity, carbon cycling, timber production, climate and watershed hydrology (Bonan 2008). Given their ecological and economic importance, trees are a focal group for developing predictive understanding of how individual and population level responses to climate change lead to species range shifts and associated changes in ecosystem composition and dynamics (Purves et al. 2008). Understanding the establishment phase or "regeneration niche" (Grubb 1977) is particularly important, especially for long lived trees in arid and semi-arid environments. We are proposing an ambitious program of integrated, multi-disciplinary field and modeling studies to better understand how fine-scale variation in climate interacts with local population processes to generate regional-scale shifts in tree species distributions under rapid climate change.

A Multi-scale, Multi-disciplinary Problem

Climate controls plant distributions at macroecological scales, but exerts this influence on individual plants. Understanding tree response to climate change therefore requires integration of phenomena that occur on scales of meters (e.g., seedling establishment) across scales of hundreds or thousands of kilometers (species ranges). To deal with the complexities introduced by climate change, it is often assumed that fine-scale phenomena are represented in coarse-scale correlations between climate and species' distributions. Under this assumption all micro-scale phenomena (hereafter 'microenvironments') are treated as equal. However, the degree to which fine-scale environmental heterogeneity determines emergent macro-scale properties of range dynamics, this will not be detected in coarse-scale correlations of species presence with environmental variables. New approaches are therefore required.

The PIs of this proposal are part of a working group at the National Center for Ecological Analysis and Synthesis (NCEAS) that addresses this issue. The group includes ecologists, climatologists, and hydrologists who have worked together over the past two years to develop fine-scale climate downscaling methods relevant to climate change impacts, and modeling frameworks for integrating fine-scale physical models across broad (macro-ecologic) biological domains. This group has documented mounting evidence of the importance of fine-scale processes in explaining future diversity, abundance and range responses to climate change. The group has identified key physical inputs to biological models of change, designed methods for producing fine-scale climatologies, prioritized field experiments to fill information gaps, and constructed trial models of species response to climate change at fine scales (90m). This experience has reinforced the need to move to even finer scales of topographically driven heterogeneity to integrate information from experimentation to fill key information gaps, and to capture dynamic fine-scale climatic forces. We use the term 'microenvironments' to describe fine-scale biophysical phenomena, a term which is synonymous with 'cryptic refugia' (e.g., Stewart and Lister 2001), 'micro-refugia' (McGlone and Clark 2005) and similar to 'micro-climates' (sensu Dobrowski 2010).

Evidence for Microenvironment Control in Macroecology

Recent evidence from paleoecology suggests micro-level phenomena can be critical in determining macro-ecological outcomes as climate changes. Re-examination of the record of plant responses to warming from the Last Glacial Maximum (LGM) suggests that microenvironments may have played a critical role in mediating long-distance migration of core populations. Microenvironments at range margins have been documented in the plant macro-fossil record (Willis and van Andel 2004), vertebrate fossils (Stewart and Lister 2001) and other lines of evidence (e.g. Svenning et al. 2008). These results have forced re-interpretation of the palynological record, in which microenvironments may be difficult to resolve due to similar signatures of distant wind-borne pollen. In the Southern Hemisphere, microenvironments have also been the dominant explanation of rapid colonization by plants to newly suitable post-LGM climates for some time (Markgraf and Kenny 1995, McGlone 1995).

Model results are also emerging which support the key role of microenvironments in macro-ecological response. Paleo-vegetation modeling of the Northern Hemisphere suggests near ice sheet vegetation in

Europe was comparable to vegetation now found only in central Asia, where forest stands are restricted to specialized sites along river courses or in areas of topographic relief offering azonal microenvironments (Allen et al. 2010). Model results of species' range response to future climate change in Scotland and the Alps suggest strong microenvironment effects (Trivedi et al. 2009, Randin et al. 2009). Fine-scale models that capture microenvironments show markedly different range loss and extinction estimates than coarse-scale models for some species. Results from the Western U.S. also suggest that microenvironments may allow vegetation to persist where coarse-scale models show no suitable future climate (Dobrowski 2010).

Life History Controls

Microenvironmental effects are particularly relevant to juvenile life stages and recruitment. Recruitment limitation in forests can result from a shortage of seed supply (dispersal) or limited microsites that provide conditions conducive to germination, establishment and growth ("safe sites"; Clark et al. 1999). Knowledge of the biophysical conditions associated with initial establishment and the spatiotemporal variability in those conditions is critical to understanding the implications of ongoing climate change for tree species distributions (e.g., Ibanez and Clark 2007). Tree population dynamics in semi-arid Mediterranean climates may be strongly controlled by spatial and temporal availability of seedling and sapling safe sites that provide adequate light, sufficient moisture to survive the long summer drought period, and refuge from seed predators and herbivores (e.g., Borchert et al. 1989, Callaway 1992, Gomez-Aparicio 2008). Topographic variation in microclimate as well as variation created by overstory plants can exert strong influences on establishment patterns (e.g., Callaway and Davis 1998, Keyes et al. 2009).

Responses to microenvironments are likely to be influenced by intra-specific genetic variation and adaptation to local climate, so that tree species respond differently to climate change in different microenvironments and in different parts of their range (Davis et al. 2005, Rehfeldt et al. 2006; Murphy and Lovett-Doust 2007). Thus, understanding how a tree species will re-distribute under climate change ultimately requires understanding the interplay between multi-scale climate dynamics, geographically structured variation in gene flow and climate adaptation, and species-specific dispersal and establishment processes (Davis and Shaw 2001, Sork et al. 2010).

Macroscale modeling of microenvironment influence

The most common approach to modeling biological response to climate change is to drive a model of correlation between species' current ranges and climate with relatively coarse-scale (1-5km) downscales of GCM simulations. This approach has insufficient resolution to capture microenvironments. It ignores population effects. It utilizes very simple climatic variables commonly archived in GCMs, thereby missing dynamic climatic processes, effects that occur on sub-decadal timescales and other physical and climatic factors important in the study of microenvironments.

Tools now exist to create fine-scale climatologies, and to link species models to models of population dynamics. Two groups in Europe have linked simple fine-scale (25-50m) climatologies to correlational species distribution models (Randin et al. 2009, Trivedi et al. 2009). Other researchers have linked species models to population models for climate change assessment (Keith et al. 2008). Advances in species distribution modeling have allowed simulation of future ranges using process based models rather than correlations, allowing simulation on shorter temporal scales and other advantages (Morin and Lechowicz 2008, Morin and Thuiller 2009).

Application of these advances to the study of microenvironments requires close collaboration between natural and physical scientists and between field experimentation and modeling. Physical-natural science collaboration allows development of climatologies specifically for biological applications. Physical scientists in the NCEAS group have developed downscaling methods appropriate for scales of 30-270m, and can characterize landscapes at these scales in biologically relevant variables, such as the climatic water deficit plants experience during the dry season. Cross-discipline collaboration yields biological models better able to utilize a full suite of climatic inputs. Ecologists in the NCEAS group have developed a mechanistic habitat suitability model that can make use of fine temporal scale climatic input and information on species sensitivities from field experimentation. Within-discipline collaboration permits integration of modeling tools, such as driving statistical downscaling with fine-scale (2km) dynamic regional climate models, and improved methods of integrating species models with population models.

Proposed Research

We propose to measure and model microenvironment impacts on tree species establishment and population dynamics in order to predict regional range dynamics under projected future climate for four dominant tree species across four study sites in the Sierra Nevada and Coast Ranges of California. In a novel combination of site trials, physical models, distribution models and population models, our design incorporates measured (rather than inferred) species' tolerances relevant to microenvironments at spatial scales that vary over five orders of magnitude (30m-3000km). Our tools will be reciprocal transplant experiments, species trait-based distribution models, field surveys, population models and biogeographic models of climate change. Biological studies will be coordinated with and informed by detailed, multiscale measurement and modeling of climate and soil factors related to temperature and moisture regimes.

Our approach is an integrated multi-scale modeling framework that allows us to bridge scales from micro- to macro-, incorporating experimental results and field observations in an iterative process of refinement. The advantages of such a system in climate change analyses have long been recognized (Root and Schneider 1995). From our perspective, it is evident that such a framework is essential to advance understanding of microenvironment effects on macroecology. The work of the NCEAS group provides a strong conceptual foundation on which to build such an integrated research effort.

Research Questions

Our overarching research question is "How does macroecological response to climate change emerge from finer scale climate and population processes?" To answer this question we employ a multi-scale modeling framework informed by field measurements of four tree species (*Pinus ponderosa*, *P sabiniana*, *Quercus douglasii*, *Q kelloggii*) in four study sites (see Figure 2) to answer three specific questions:

Question 1. What is the distribution of microenvironments in the landscape under current climate?

- Develop a physical model that represents the topographic, energy budget, and hydrologic drivers under current climate, describing the microenvironments of each study area
- Develop mechanistic models species specific of habitat suitability of microenvironments
- Survey microenvironments in the landscapes of our study sites, using remote sensing and field surveys
- Measure conditions in microenvironments to validate inputs and outputs of the physical model

Question 2. How does climate change affect species occupancy of microenvironments?

- Project future distributions of microenvironments using the physical model driven by GCM simulations downscaled through both dynamic and statistical methods
- Determine species sensitivities to climate change in the establishment phase through experimental manipulation
- Model habitat suitability of future microenvironments

Question 3. How are the macroscale dynamics of species distribution, abundance and diversity response to climate change altered by microenvironments?

- Model population responses to climate change incorporating microenvironments
- Model community/population dynamics in response to climate change incorporating microenvironments
- Model the frequency of disturbance (fire) relevant to creation of establishment phase microenvironments

Transformative Concepts

The insights provided by this research have the potential to revise and refine estimates of extinction risk due to climate change, estimates of species' ability to track rapid climate change, and our understanding of macroecological response to anthropogenic climate change. Extinction risk estimates can vary by an order of magnitude depending on ability of species to attain future suitable climate. Microenvironments are a critical part of this ability, as demonstrated by the paleoecological record. Species' ability to track rapid climate change is a critical issue as conservation strategies are developed to deal with future climate change. This combination of insights into the future of biology of the planet is powerful, applicable

in fields as diverse as ecology, biogeography, conservation planning and international climate change policy.

b. Qualifications and Project Management

Qualifications of Research Team

Individual PIs from UCSB, UC Berkeley (UCB), Arizona State University (ASU), UC Los Angeles (UCLA) and UC Riverside (UCR) have experience in biogeographic and landscape ecological modeling of the effects of climate change, ecology and biogeography of California tree species, population modeling, design of conservation responses to climate change, dynamic regional climate modeling, and statistical downscaling of climatologies. USGS and USFWS scientists are participating, observing the guidelines for participation of governmental researchers.

Project Management

Project coordination will be provided by the collaborative lead institution, UCSB. UCSB will implement the field experimentation and several aspects of modeling. Management of contributions from other institutions will be handled by UCSB, facilitated by continued regular meetings of the fine-scale modeling group in Santa Barbara. This working group's two-year track record of successfully managing complex modeling conducted at multiple institutions provides a foundation for management of the work proposed here. The group will continue to meet semi-annually (1-2 meetings per year supported by this grant), and as part of these meetings will the project team will convene to review progress, refine experimental and research protocols, integrate field research results into modeling and to develop and monitor annual workplans.

Financial management will be by individual collaborating institutions. When unforeseen issues related to study design, project logistics, data, or models arise, UCSB will confront the issue at the next scheduled meeting of the working group, or in time-sensitive situations, resolve issues by a conference call of PIs.

Budgetary Resources

Budget has been allocated based on considerable past experience of the PIs in all components of the project and existing field support at the study sites. The experimental components of the project will benefit from co-location at existing long-term research sites, including the California NEON site. Long-term research sites included in our study regions are the San Joaquin Experimental Forest (Sierras), the Teakettle Experimental Watershed (Sierras) and the UCSB Sedgwick Reserve (Coast Range). The infrastructure and long-term research support offered by these sites will help ensure that the budgetary resources for the experimental work will be adequate. Team members have extensive experience in using species, population and range dynamics models, which ensures that the budget allocations for these components are accurate. Climatologists involved in the project have developed meso-scale (270m) present and future statistically downscaled climatologies for the study region, which provides a strong basis in experience for budget estimation for the fine-scale (30m) climatologies to be produced here. We have already invested in major hardware upgrades necessary for this work, particularly storage capacity sufficient to accommodate the large fine-scale datasets. The Regional Climate Models that will provide the inputs for the statistical downscaling are already being run for domains (extents) similar to those needed for this project, and so will require straightforward adaptation to these new domains, again minimizing costs and ensuring that the budget estimates are based on strong experiential track record. Budget allocations for coordination meetings are based on two years of budget experience with the NCEAS fine-scale working group.

c. Methods

Overview

Our overall research design is a multiscale modeling framework, informed by field experimentation and survey (Figure 1). We use two main types of biological models: species-specific, mechanistic models of the habitat suitability for establishment and initial growth; and population models—a meta-population model and a hybrid population/environmental change model. We generate spatial projections of the physical microenvironment under current and future climates using downscaled climate data as inputs to the habitat suitability model, which in turn provides inputs to the population models. Information from field

surveys is used to validate the suitability model under current conditions and to provide starting conditions for the population-level models. Field experiments provide information on the sensitivity of our target species to changed climate for the habitat suitability model and germination, survival and growth rates for seedlings, the most vulnerable life stage, for the population-level models. This combination of models, experimental manipulation and field data collection allows us to scale up from microenvironments to the level of populations, and to explore different elements of population-level change (e.g., population persistence and community dynamics).

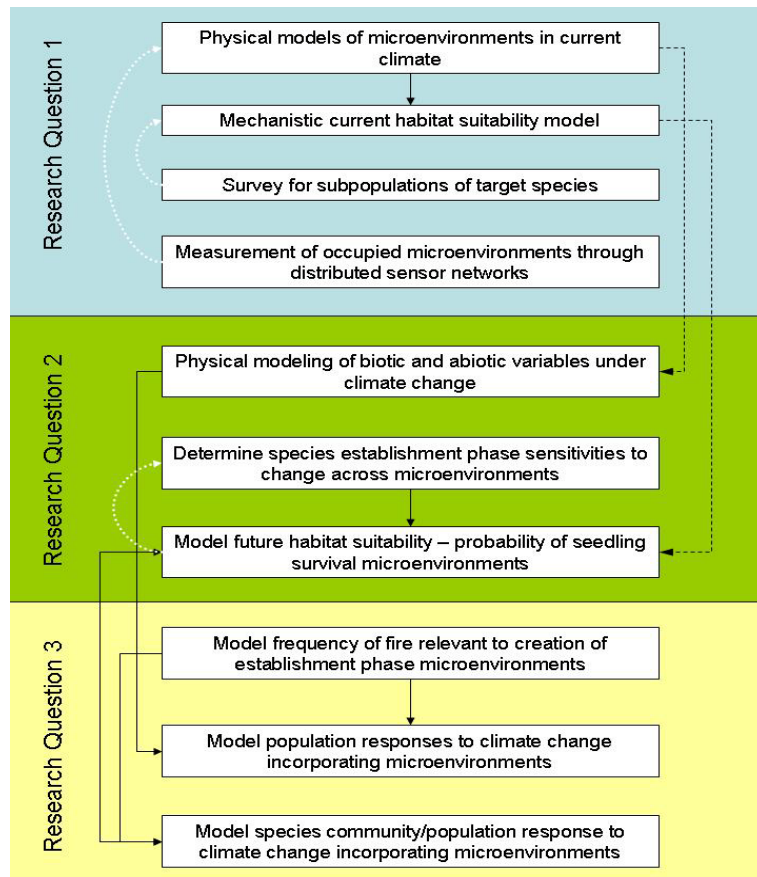


Figure 1. Schematic diagram of research objectives and methods. Solid black connectors depict data flow, dashed black connectors are an iteration of current vs. future modeling and white curved arrows represent model validation

Resource Assessment Program. Study plots will be established in the foothill and montane zones of each region. Coast Range study sites include the University of California’s Sedgwick Reserve and Figueroa Mountain summit in the Los Padres National Forest. Sierran sites include the San Joaquin Experimental Range and Teakettle Experimental Forest. [Note: We have discussed our research with SJER and Sedgwick research directors but are submitting this proposal to them to obtain formal approval.]

Foothill plots in the southern Coast Range will be located at elevations between 300-400m at the University of California’s Sedgwick Reserve in Santa Barbara County. PI Davis has conducted long-term observational and experimental research on oak woodlands at this site since 1993 (e.g., Sork et al. 2001, Tyler et al. 2008) and has amassed extensive geospatial data on vegetation, topography, soils, historical land use and vegetation dynamics. Blue oak and blue oak-foothill pine woodlands are extensive in canyons and on north-facing slopes. The site is very close to the southern range limits of blue oak and foothill pine and does not support any black oak or ponderosa pine. Coast Range montane plots will be located between 1250 and 1400m at the summit of Figueroa Mountain in the Los Padres National Forest. Mountaintop populations of ponderosa pine and black oak occur here along with Coulter pine (*Pinus*

The remainder of this overview will summarize the activities under each research question. Detailed methods of each activity are presented in the following section.

Target Species

Our target species are two evergreen needle-leaved conifers, foothill pine (*Pinus sabiniana*) and ponderosa pine (*Pinus ponderosa*) - and two broadleaved deciduous oaks, blue oak (*Quercus douglasii*) and California black oak (*Quercus kelloggii*). Foothill pine and blue oak are canopy-co-dominants across much of their range in the California foothills, as are black oak and ponderosa pine in cooler, wetter montane California. All are relatively well studied and ecologically important tree species.

Study sites and Modeling Domains

We define 4 study areas, two in the Sierra Nevada and two in the southern Coast Ranges. The Sierra Nevada and Coast Range study regions represent coastal vs. continental climate regimes and fall within different tree seed zones as defined by the USDA Forest Service and mapped by the California Fire and

coulteri) and canyon live oak (*Q. crysolepis*). The site does not support blue oak and foothill pine is limited to rare individuals on south facing slopes.

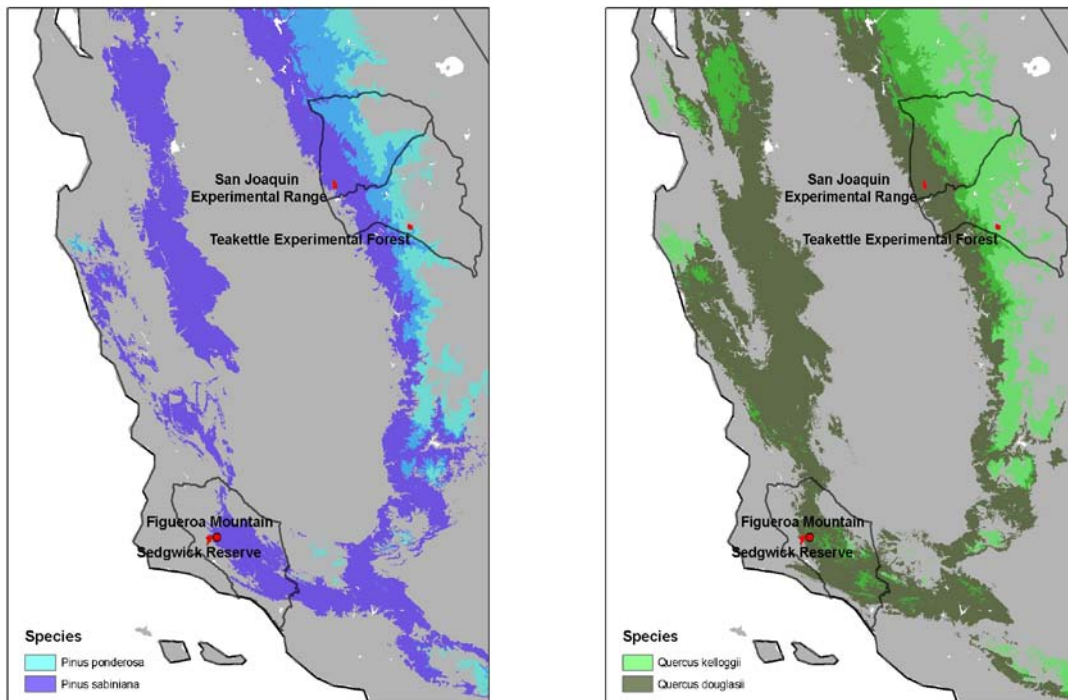


Figure 2. Location map of study areas with predicted current distributions of *Pinus* (left) and *Quercus* (right) target species. Color gradient denotes distribution of individual species as well as overlap. Experimental plot locations are shown in red and seed zone modeling domains are outlined in black.

Foothill plots in Sierra Nevada will be established at the San Joaquin Experimental Range (SJER) at elevations between 325 and 425m. SJER is a candidate NEON core site and has long-term databases on climate, soil and vegetation conditions. Vegetation here is dominated by blue oak-foothill pine woodland and is in the middle of the range for both species. Ponderosa pine and black oak occur at higher elevations in the region. This foothill site is wetter and experiences greater temperature seasonality than Sedgwick Reserve, mainly due to high summer temperatures. Montane plots in the Sierra Nevada will be established at the Teakettle Experimental Watershed (a NEON satellite site) in the Sierra National Forest (Figure 2). Contract scientist Malcolm North (USFS PSW Research Station) is PI for the Teakettle Ecosystem. Experiment and has conducted extensive research here on the ecology and recruitment dynamics of dominant tree species including black oak and ponderosa pine. The site is above the current elevational limits for blue oak and foothill pine.

The modeling domain for all models is the entire seed zone or, in the Sierra Nevada, adjacent seed zones, corresponding to the hypothesized geographic domain for regional climatic adaptation (see Figure 2). Model grain is 30m for the physical model and all biological models, sufficient to capture topoclimatic microenvironments and subpopulations.

Methods and Materials- Research Question 1

What is the distribution of sub-populations in the landscape under current climate?

Here we establish the current distribution of microenvironments for each species (i.e. those areas with high habitat suitability for the target species) that can be perturbed by climate change in the latter parts of the project. We develop a physical model of climate, soils and topography at 30m, downscaled from historical climate datasets at 800m, to provide the inputs for a habitat suitability model. The mechanistic habitat suitability model will utilize published or measured limiting factors to identify relevant bioclimatic

and physical variables which determine the distribution of microenvironments. This will also serve as the initial map of suitable habitat for the metapopulation to which the effects of climate change on seedling habitat suitability are applied (Research Questions 2 and 3). We measure physical conditions with a sensor network sampling design at each study area to validate the output of the physical model. We survey and map subpopulations in each study area to validate the output of the habitat suitability model and to initialize spatial population models BioMove and Ramas GIS (see below).

Methods and Materials- Research Question 2

How does climate change affect species occupancy of microenvironments?

We use state-of-the-art dynamic and statistical downscaling of NCAR, GFDL and other global climate simulations to build future climatologies at 30m. The downscaling includes nested Regional Climate Models at 6km and 2km resolutions to capture large-scale cold air drainage and topographic climate effects, downscaled statistically to 800-m using inverse distance squared interpolation and bias corrected to historical climate data, further downscaled to 30-m, and complemented with a 30-m calculation of local-scale cold air drainage. The fine-scale climate data is input into the physical model to estimate energy loads and hydrologic drivers. The habitat suitability model is then driven with these physical models, to simulate changes in the distribution of microenvironments due to projected climate change through 2100. We measure climate and soil moisture controls on seed germination, seedling establishment and initial growth for four test species using common garden trials combined with microclimate measurements across regions, sites and microsites. Two types of information are derived from these experiments: 1) empirical measurement of topographic variation in bioclimatic parameters to support production of high-resolution climatic grids (e.g., Ashcroft 2009); 2) response functions relating bioclimatic variables to species' seedling survival rates that can be used to model species establishment across the landscape under different climate scenarios.

Methods and Materials- Research Question 3

How are the macroscale dynamics of species distribution, abundance and diversity altered by subpopulations as climate changes?

We apply spatial data on microenvironments and establishment niche models to examine species-specific metapopulation dynamics and viability across the landscape. A time series of dynamic microenvironment maps (defining seedling habitat suitability) will be generated by interpolating the initial map constructed under Research Question 1 and the altered microenvironment map resulting from climate change in Research Question 2. These will provide the dynamic spatial arrangement of microenvironments for the population models. Our main modeling tools are the meta-population model utilized in RAMAS GIS and the population/environmental dynamics models utilized in BioMove. RAMAS GIS allows us to explore the effect of microenvironments on single-species population dynamics. In our model, subpopulations will be defined as occupied microenvironments as defined by the habitat suitability model developed under the activities of Research Question 1. Seedling survival rates will vary across the microenvironments as determined by the field trials under Research Question 2. Unoccupied microenvironments can become occupied via dispersal and successful seedling establishment. BioMove allows us to explore the effects of changes in microenvironments of multiple species in a changing landscape. Again, the previously developed habitat suitability model will provide spatial information on microenvironments. The experimental results will provide mortality rate parameters for BioMove for the sensitive establishment phase. In both population-level models we will compare simulations at fine scales that resolve subpopulations with simulations at coarser scales to determine the importance of microenvironments to species persistence. We will systematically compare results from the two models to explore the influence of plant species community interactions on tree species persistence and re-distribution in a changing climate.

d. Detailed Methods

Detailed methods are presented below. The alpha-numeric code refers to research question (i.e., 1a is the first activity of Research Question 1).

1a. Physical model of microenvironments in current climate

Downscaling of historical climate data

Historical monthly precipitation and air temperature data are available in gridded map format at 800-m spatial scale from Parameter-Elevation Regressions on Independent Slopes Model (PRISM; Daly et al., 2004) for the study area from 1896 through 2009. Spatial downscaling was done using the 800-m data for application to the physical model used for this study (Basin Characterization Model, BCM; Flint and Flint, 2007) at a finer-scale of 30-m. Spatial downscaling refers to the calculation of fine-scale information on the basis of coarse-scale information using various methods of spatial interpolation. Spatial downscaling is performed on the coarse resolution grids (800-m) to produce fine resolution grids (30-m) using a model developed by Nalder and Wein (1998) modified with a nugget effect specified as the length of the coarse resolution grid. Their model combines a spatial Gradient and Inverse Distance Squared weighting (GIDS) to monthly point data with multiple regressions that are calculated for every grid cell for every month. Using the 800-m resolution digital elevation model in PRISM, parameter weighting is based on location and elevation of the new fine resolution grid relative to existing coarse resolution grid cells (Flint and Flint, in review).

Physical model development

The Basin Characterization Model (BCM) (Flint and Flint, 2007) calculates recharge and runoff using a mathematical deterministic water-balance approach that includes the distribution of precipitation and the estimation of potential evapotranspiration that relies on a rigorous hourly energy balance calculation using topographic shading and vegetation density. The BCM uses available spatial maps of elevation, bedrock permeability estimated from geology, soil water storage from SSURGO, mapped vegetation density, and PRISM precipitation and air temperature maps, including air temperature corrected for cold-air pooling. The BCM provides grid-based outputs of solar radiation, potential evapotranspiration, soil moisture storage, actual evapotranspiration, climatic water deficit (Stephenson, 1998), snow accumulation and melt, sublimation, basin runoff, and groundwater recharge, for every 30-m cell in the study area on a monthly basis for 1895-2009.

The BCM is calibrated regionally to measured potential evapotranspiration data and MODIS snow cover data (Flint and Flint, 2007). Locally, the model is calibrated to measured streamflow data. The determination of whether excess water becomes recharge or runoff is governed in part by the underlying bedrock permeability. The higher the bedrock permeability, the higher the recharge and the lower the runoff generated for a given grid cell. In small gaged basins that generate unimpaired flows, the bedrock permeability can be adjusted to calculate a total basin discharge that matches the measured basin discharge. Changes in soil moisture content can also be verified using field measurements.

Our study sites have complex terrain prone to cold-air pooling when air in contact with the ground is cooled from radiative energy loss on calm clear nights and, being denser than the free atmosphere at the same elevation, sinks to valley bottoms. We will use the methods of Lundquist et al. (2008) to adjust the 30m downscaled air temperature maps for cold air drainage effects prior to model application.

1b. Mechanistic model of habitat suitability of microenvironments

In order to establish the spatial structure of suitable habitat under climate change for the population models, we will develop mechanistic niche models of fitness components (*sensu* Kearney 2006). Using the seedling data collected from our field trials (Section 2b) and surveys (Section 1c), we will fit species' response functions for the environmental variables that represent factors limiting establishment and survival, particularly those related to energy and water balance. These models will represent the regeneration niche of the focal species because recruitment is a critical bottleneck for long-lived species with episodic recruitment. Seed and seedling survivorship at a site will be modeled as a function of environmental variables measured at the plot scale (e.g., minimum winter temperature, soil moisture) using univariate (e.g., Huisman et al. 1993) and multivariate generalized linear models with a logit link (e.g., Ibanez et al. 2007) or generalized additive models (Hastie and Tibshirani 1987, Guisan et al. 2007) that represent the hypothesized form of relationships between fitness and limiting factors (e.g., Austin et al. 1990, Austin 2007). We will also explore a complementary modeling approach that can combine data from field trials and the literature and develop suitability indices (reviewed in Franklin 2009) using semi-

quantitative techniques (e.g., Stoms et al. 1992, Duncan et al. 1995, Bojorquez-Tapia et al. 2003, Rubio and Sanchez-Palomares 2006, Boitani et al. 2008).

We will compare models between species and within and between regions for each species. In general we expect survivorship for each species to be highest in their site of origin and lowest in the complementary life zone outside their region of origin. We also anticipate that different climate factors may be more or less important within the same life zone in different regions.

These models will subsequently be applied to topoclimatic predictor variables derived from downscaled climate data (Section 1a). We propose to develop models of seedling survivorship because spatially explicit predictions of survivorship can be incorporated directly into population models. If strong predictive relationships between environmental predictors and survivorship cannot be developed from the field trials, however, models of seedling abundance will be developed using more extensive seedling survey data, and used to predict habitat suitability specifically for the seedling age class. Our approach is innovative because, although there have been many calls for incorporating more ecophysiological realism into species distribution models (Buckley et al. 2010), there are few examples (cf Kearney and Porter 2004, Helaouet and Beaugrand 2009, Monahan 2009).

1c. Survey of microenvironments in study sites

Tree species distributions in the 2 study regions will be mapped by combining and enhancing existing vegetation maps using recent, 1-2 m digital orthophotos combined with field reconnaissance (e.g. Davis et al. 2000). Recent 30 m gridded vegetation maps are available from LANDFIRE project, GAP, and the national forests. Map accuracy will be assessed using a stratified random design. The maps will provide initial distributions for spatially explicit population modeling.

1d. Measurement of conditions in microenvironments to validate the physical model

Two sets of sensors will be deployed to monitor conditions in the field experimental plots and throughout the landscape. Within each plot there will be a full weather station to monitor air temperature, precipitation, solar radiation, relative humidity, wind speed and wind direction, and accompanied by measurements of soil water content and water potential profiles. These data will be used to monitor conditions related to seedling mortality and provide validation of soil moisture storage and climatic water deficit estimates from the physical model constructed in 1a. Extensive sensor networks will be deployed in a stratified sample of the microenvironments identified in 1c. Sensors will be Hobo temperature and relative humidity recording devices or the equivalent. Approximately 100 sensor units will be deployed at each study area, at ground level. Data from the sensor network will be used to calibrate the cold-air pooling temperature development and validate the downscaling of the coarse-scale temperature maps and projections used as input to the physical model.

2a. Project future distributions of microenvironments using the physical model driven by downscaled GCM simulations

We will create future climatologies corresponding to the latter half of the 21st century using a combination of a regional earth system model (a Regional Climate Model with biotic interactions) and statistical downscaling. The earth system model will provide dynamic downscaling of GCM climate change simulations at a spatial resolution of 2km. These scenarios will be downscaled using GIDS, described earlier, from the coarse scale to match the 800-m PRISM data for the purpose of bias-correction. Statistical downscaling approaches use both the spatially downscaled grids and measured data for the same period to adjust the 800-m grids so that the mean and standard deviation match those of the measured data set. To make the correction possible the GCM is run using the historical forcing function to establish a baseline for modeling to match current climate for 1950-2000 using current (pre-2000) atmospheric greenhouse gas conditions. This baseline period can then be corrected (transformed) using the PRISM data from 1950-2000. Simple scaling of the mean and standard deviation of the projections to match those of the PRISM data will be done following Bouwer et al. (2004). Once the bias correction is complete, the 800-m projections are further downscaled to 30-m spatial resolution for physical model application.

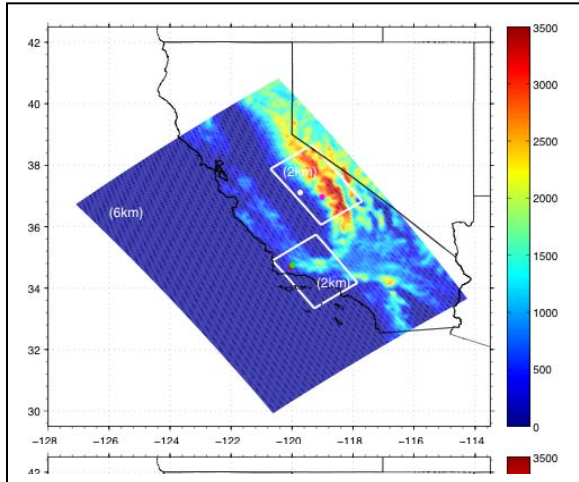


Figure 3. Nested domains for the WRF simulations with topography for the outer domain. Model resolution is 6km (outer domain) and 2km (two inner domains) separately. Dots denote the locations of San Joaquin Experimental Range (white), Teakettle Experimental Forest (magenta), Sedgwick Reserve (red) and the Figueroa Mountain (green). Elevation in meters is shown on the right.

Figure 3 illustrates the nested domains and resolution of the dynamic regional model. The essential components of the regional earth system model are: Weather Research and Forecasting (WRF) model for the atmosphere (Skamarock et al. 2008), and Regional Oceanic Modeling System (ROMS) for the ocean (Shchepetkin and McWilliams 2005). Using a version of this modeling system, we have undertaken reconstructions of the recent climate of California and the adjacent coastal ocean (Boé et al. 2010).

The boundary forcing for dynamic downscaling will be climate change simulations done with the latest version of the National Center for Atmospheric Research (NCAR) Community Climate System Model (CCSM) developed for the upcoming IPCC 5th assessment (AR5). We will choose the run forced by the IPCC AR5 Representative Concentration Pathway 4.5, a middle-of-the road emission scenario that assumes stabilization of greenhouse gas concentrations around the year 2100 (Moss et al. 2010). To determine potential spread and uncertainty in California climate change, other GCM simulations (at least three, including GFDL) and forcing scenarios (at least two) will be carefully chosen for their representativeness of the spread, and downscaled statistically.

2b. Experimental manipulation to determine species' establishment phase sensitivities to climate change

Our field experiments are designed to improve understanding of multi-scale biogeographic and climatic controls on initial establishment of tree species within and outside of their current elevational ranges in California. The experiment will directly inform process-based species distribution modeling and population modeling using high resolution climate grids. The experiments involve common gardens and reciprocal exchange of seeds across regions, and life zones within regions, to produce climate response functions for species germination and establishment. The experiments also allow us to examine the interaction between seed provenance and climate-growth relationships for our study species. We will compare seed germination, seedling establishment and initial seedling growth as a function of seed source, seed weight, local climate and soil moisture conditions for our four target tree species.

Our experimental plots will be distributed to deliberately sample topoclimatic variation across our four study sites. We anticipate co-variation in topoclimate and important soil properties such as soil depth and water holding capacity (e.g., Meyer et al. 2007). Rather than trying to control for soil properties, we will measure variation in soil properties affecting seasonal trends in soil water balance and include soil moisture as a microenvironmental variable along with measured climate variables. Our plots will be located in open sites to control for vegetation canopy influences on microclimate and soils. While recognizing the importance of plant canopies in microclimate variability and potential nurse plant effects (e.g., Callaway 1992), we have elected to work with light-loving tree species that often establish and generally flourish in gaps and clearings. We assume that open sites made available by disturbances such as fire will play an important role in governing re-distribution of these species under rapid climate change. The choice not to conduct establishment trials in forest understories is also a practical consideration to reduce the size and cost of the field trials.

At each site, ten experimental plots will be located in open areas that represent a range of local topoclimatic conditions, including 2 plots in each of five topographic positions: 1) lower north/northeast-facing slopes, 2) mid-to-upper north/northeast facing slopes, 3) ridges, 4) mid-to-upper south/southwest-facing slopes, and 5) lower south/southwest-facing slopes. In sum this results in forty common garden

plots. Experimental plots will be 5 x 5m and will be fenced with 1.8m high deerwire to exclude large herbivores including cattle, deer, and feral pigs, as well as with 0.5m aviary wire buried to 0.25cm and topped with metal flashing to exclude rodents. Twelve 1 x 1m subplots will be established within the fenced plot and randomly assigned to 4 species x 3 cohort plantings.

Sedgwick Reserve and SJER will serve as seed source areas for blue oak and foothill pine; Figueroa Mountain and Teakettle Experimental Forest will serve as source areas for black oak and ponderosa pine. Intact viable seeds will be collected in early Fall from a range of local environments at all four study sites and stored under cool dark conditions until planted. In the Fall of each year (assuming adequate seed supply, 100 seeds of each species (50 from southern Coast Range site, 50 from Sierra Nevada site) will be sown in a 10x10cm grid pattern across the sub-plot. We will also grow seedlings from all sites in pots at the Sedgwick field station. Seedlings will be outplanted in spring of the following year in a complementary set of subplots. Planting seeds and seedlings on a precise grid will allow us to distinguish germinants from natural seedlings (Barbour et al. 1990). Seedling height, weight, and basal diameter will be measured prior to transplanting. Annual planting trials will be repeated over 3 consecutive years. All seedlings will be allowed to grow for the duration of the study and then removed.

Plots will be monitored monthly to record seedling emergence, seedling height and condition. In the fall of the second year, surviving seedlings will be harvested and the following variables recorded: above-ground dry weight, below ground dry weight and one-sided leaf area. We expect seed germination and seedling survivorship to vary significantly between species and for a given species to vary between plots at a site, between sites within a region, and between regions. We will test for "home advantage" effects on seed and seedling survivorship using a mixed-model ANOVA with plot as a random effect and maternal site and planting site as fixed effects.

Species germination and growth as a function of time since planting will be compared across species and sites. We expect blue oak acorns to germinate in late Fall immediately after planting and black oak to germinate in later winter or early spring after a period of stratification (MacDonald 1969, Matsuda and McBride 1989). Both pines require some cold stratification, and we expect pine seeds at the low elevation sites to germinate very slowly in the absence of cold stratification, especially those from the Sierra Nevada where the climate is more continental (Griffin 1971).

2c. Model habitat suitability of future microenvironments

We will apply the models of habitat suitability (Section 1b) to the maps of projected future microenvironments (Section 2a), yielding spatially-explicit predictions of changes in suitable habitat. Due to the uncertain nature of future climate projections, we will use a scenario approach (Section 2a) to identify a range of potential distribution changes (and ultimately population level responses) to climate change. The temporally-interpolated maps resulting from modifying the suitability models with the climate change data will then be processed to generate dynamic patch maps of spatially-varying values of seedling survivorship and carrying capacity. These will be linked to the population dynamics models in each time step as described in the section below.

3a. Model population responses to climate change incorporating microenvironments

We will use stochastic, spatially explicit, age/stage-based metapopulation models to simulate the dynamics of the four focal species. To build a reliable population model, the following life history processes must be parameterized (along with their concomitant variability): stage-based survival, stage-based fecundity, between-fire survival rates, post-fire responses and seedling survival. Data from the literature will be used to parameterize the established stages for each species. Regan, Franklin and Syphard (co-PIs) have begun to parameterize population models for *Quercus* species and other fire-adapted plant species through our current NSF and Department of Energy funded projects. The spatially-explicit seedling/germinant survival and establishment rates, determined via the reciprocal transplant field experiments, will be incorporated into the population model to match the climatic conditions of each patch as determined through the seedling survivorship models. Responses to fire will be included directly in the models and will be triggered by fire hazard functions (see Regan et al. 2010 for example). Fire hazard functions will be modeled using historical fire records to predict the impact of climate, vegetation and location on fire regime (see section 3c). The probability of a fire will depend on the time since the last fire, the spatially-explicit predictions of future fire regime under climate and where the sub-population (or

patch) is located in the landscape. The population models will be linked to dynamic bioclimate envelopes using the following steps:

Step 1. Potential suitable habitat for species under current and future climate conditions will be generated using species distribution models based on standard methods (Franklin 2009), applied to range-wide distribution data available for California plant species (e.g., Syphard and Franklin 2009, 2010), and using the same set of topo-edaphic and downscaled bioclimatic predictors described above. For each species, a time series of future changes in the distribution of habitat suitability due to climate change will be interpolated from the SDMs.

Step 2. Spatially-explicit seedling/germinant establishment and survival rates will be extracted, on a patch-by-patch basis, from the map relating climate variables to seedling establishment.

Step 3. Spatially explicit population models will be developed for the focal species using inputs from the previous steps and linked to spatially explicit fire hazard models. Future fire hazard under climate change predicted from the models described in the section 3c will be incorporated. Dispersal will be incorporated, where appropriate, using published data to parameterize exponentially decreasing distance functions.

Step 4. In each time step of the population model, the spatial configuration of populations is updated based on the map for that time step. The effects of this on population dynamics is invoked via changes in

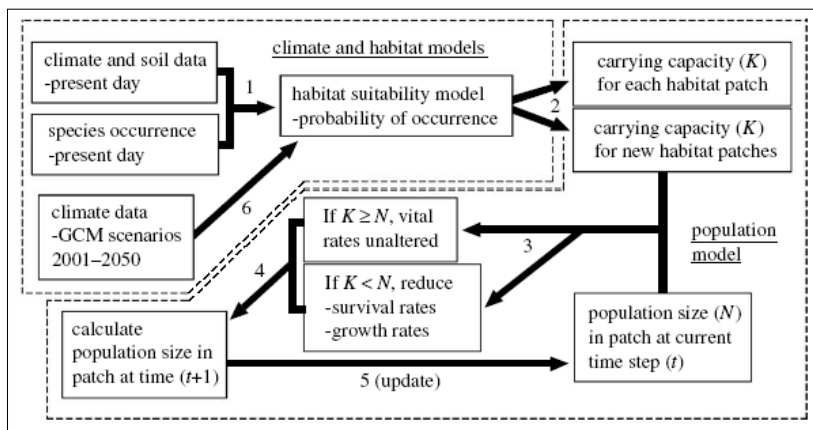


Figure 4. Coupling of dynamic SDMs with a stochastic population model. Each simulation commences with label 1. After the first iteration (time step) is completed at label 5, second and subsequent iterations (time steps) commence with label 6 in lieu of label 1. Please note, these labels do not correspond to the steps described directly above. From Keith et al. (2008).

carrying capacity (K), changes in seedling survival and establishment rates, and dispersal. Density dependence is implemented by reducing rates of survival and growth (due to intraspecific competition) independently for particular life stages whenever a population exceeds the carrying capacity of its habitat patch. K is determined from modeled habitat suitability index from the SDM. Climate change may alter K , seedling survival and establishment rates, or dispersal success, as determined by the time series of habitat suitability models (Figure 5).

Multiple stochastic model runs (e.g., 1000) will provide a set of population trajectories that differ from one another due to simulated uncertainty and variability in demographic parameters. We will use RAMAS® GIS to link the population models with dynamic habitat suitability maps in each time step (Akçakaya 2005). This program has been applied to hundreds of species, including many plants and is currently employed by Regan, Franklin and Syphard (co-PIs) to determine the effects of land-use change, altered fire regime and climate change on a range plant functional types in southern California (Regan et al. 2010, Lawson et al. 2010). The program allows users to incorporate their own code for unique population features (as demonstrated in Akçakaya et al. 2004). Importantly, the program allows for the incorporation of GIS data to establish the spatial structure of populations. In each time step, the population models will be linked to dynamic habitat maps that incorporate the effects of climate change (as demonstrated in Keith et al. 2008, Anderson et al. 2009, Brook et al. 2009, Lawson et al. 2010).

Results will be reported in terms of expected minimum abundance (EMA), a comprehensive and robust measure that takes the entire distribution of minimum population abundances into account. EMA is calculated as the average of the minimum population sizes across all population trajectories (McCarthy and Thompson 2001). To determine the degree to which microenvironments contribute to population viability we will run simulations with only microclimate patches included and alternatively with all suitable

habitat included and compare the two outputs. This will highlight the benefit that microenvironments afford to population persistence across a region.

3b. Model community/population dynamics in response to climate change incorporating microenvironments.

Other modeling frameworks simulate species migration under rapid climate change while explicitly accounting for dispersal and demographic processes to varying degrees (Iverson et al. 2004, Engler and Guisan 2009, Dullinger et al. 2004; reviewed by Franklin 2010), but these are less well-tested than RAMAS. BioMove, a recently developed landscape simulation model of plant community disturbance and succession (Midgley et al. 2010), links a model of vegetation dynamics (based on plant functional types) to a population model for a focal species. The model is grid-based, age-structured, and uses kernel seed dispersal. Distribution models for both the “habitat” (plant functional types making up the vegetation community) and the target species are developed externally and then linked to BioMove. By integrating vegetation dynamics and demographic models, BioMove has the potential to directly address the effects of interspecific competition on the target species, which RAMAS does not do. We (L. Hannah, H. Regan) collaborate with the BioMove developers, and have extensive experience using complex landscape simulation models (e.g., Franklin et al. 2005, Syphard et al. 2006). We propose to parameterize and test BioMove for the study species and domains, and compare the outcomes (expected species distribution and persistence) to those predicted using the RAMAS framework. RAMAS will produce more explicit and validated treatment of population dynamics and demographic detail than BioMove, but with less explicit treatment of competition. The data-rich environment of this project will provide the perfect opportunity to compare the trade-offs between these environmental forecasting tools in terms of data needs, uncertainty, and outcomes.

3c. Model the frequency of fire relevant to creation of establishment phase microenvironments

Our fire activity models stem largely from the methods developed for spatial characterization of species habitat suitability and distributions. Such statistical models for modeling fire probabilities have been developed for California at statewide (Parisien and Moritz 2009) and landscape (Syphard et al. 2008) scales, and also for projecting global fire activity into the future under climate change scenarios (Krawchuk et al. 2009). We will produce a series of fire activity projections with the same downscaled climate variables to be used for species distribution modeling, which will ensure that the set of climatic drivers for both species ranges and fire activity are consistent and comparable. Variables at a finer temporal scale (e.g., monthly) will also be investigated (e.g., Westerling and Bryant 2008, Krawchuk and Moritz in press). Output from the downscaled hydrological and regional weather models described above will provide a new and promising set of fire controls, especially the wind- and humidity-related variables not available from standard GCMs (Moritz et al. 2010). Because fire regimes are also altered by human activities (Syphard et al. 2007), we will explore land use/land cover change scenarios as potential explanatory variables in our models. The spatial modeling software that we will use for projections is the latest version of Maxent (Elith et al. 2010), and several decades of fire observations exist for this approach to modeling fire activity in California (Parisien and Moritz 2009).

Instead of modeling fine scale behavior and progression of individual fires, we will focus on modeling fire frequency distributions, aggregating projected fire activity up by vegetation type in subcoregions or watersheds. This spatial statistical output is well suited to integrate into the population modeling with RAMAS and BioMove, as both internally simulate the frequency and size of disturbances and allow for user-specified sensitivities (i.e., at species level in RAMAS and successional level in Biomove); changing fire frequency distributions and their effect through fire hazard functions (Regan et al. 2010) are also key to the metapopulation modeling already described.

e. Expected Outcomes and Broader Impacts of Proposed Activities

Benefits to Society

Our proposed research can directly inform adaptive management of existing, proposed and future reserve systems in the face of climate change. We will use an existing network of public and private land managers, conservation specialists, policy makers in the region, non-Government organizations to communicate the scientific results directly to those people more directly able to act on it at the local level.

The PIs are currently working with the US Fish & Wildlife Service, California Department of Fish & Game, National Park Service, USGS Biological Resources Division, The Nature Conservancy and the California Energy Commission to provide recommendations for management of native biota under climate change. Climate change biologists from the Nature Conservancy (Rebecca Shaw) and Conservation International (Lee Hannah) are participating in this proposed research, due to the importance of its findings for designing conservation responses to climate change. These collaborations assure direct communication of our activities and findings to those agencies and groups responsible for managing biodiversity in the study area and elsewhere in the face of climate change.

Research Training and Science Mentoring

Graduate students will be mentored by Davis (UCSB), Franklin (ASU) and Regan (UCR). The proposed research will support the infrastructure of science through the training of the next generation of quantitative scientists and will allow students to gain useful and portable quantitative and mathematical skills that are often lacking in, or avoided by, life sciences graduates in the USA. The educational objectives of this project tie in with a number of support programs at ASU and UCR designed to enhance the quality of science education for students from underrepresented groups (Dept of Education STEM Pathway Project for an Hispanic Serving Institution; Minority Access to Research Careers - Undergraduate Student Training in Academic Research; California Alliance for Minority Participation in Science, Engineering and Mathematics), and we will use these programs to recruit and support students to work on this project. This research will enhance the depth of teaching in quantitative ecology by the PIs and will provide salient case studies for courses. Regan and Franklin are both female quantitative ecologists who attract a large proportion of female students. Since women are often under-represented in quantitative fields of science we believe this to be an important impact of the proposed research.

Both ASU and UCR champion intellectual and cultural diversity and are consistently ranked among campuses promoting economic and ethnic diversity and public good. ASU was ranked among the top 25 US universities enrolling Latinos by Exelencia in Education. Consistent with the vision of the research university as a catalyst for societal transformation, ASU and UCR favor research enterprise dedicated to societal relevance.

Dissemination of Results

The extensive data used in this project come primarily from publically-available sources and main products produced will be the scientific results of the research disseminated in publications, presentations and technical reports, although some value-added data products will also be developed and those will be made available.

Publications: We anticipate a number of papers suitable for publication in international peer-reviewed journals such as *Ecology*, *Journal of Applied Meteorology and Climatology*, *Global Change Biology*, *Climatic Change*, *Biological Conservation*, *Landscape Ecology*, and *Forest Ecology and Management*.

Web resources: We will make all non-proprietary data, maps, and models resulting from the proposed research publicly available in a dedicated website served from the UCSB Biogeography Lab (www.biogeog.ucsb.edu). These will include current and projected habitat maps of modeled species, and fire probability, as ASCII raster files with appropriate metadata, and scripts for statistical analysis (to be developed using open-source R software) with instructional comments to increase their usefulness to other researchers. All of these products will be made available within 12 months of the completion of the project

f. Results from Prior NSF Support

“Collaborative Research: The persistence of biodiversity in southern California under future land-change scenarios” (Award DEB-0824708, H.M. Regan and J. Franklin PIs; 2008-2011). The total award is \$449,965. We are linking urban growth models, species distribution models, and fire hazard functions with population models for obligate seeding shrubs/trees, resprouting shrubs/trees and annual plants to identify the species attributes associated with vulnerability to extinction under realistic habitat loss scenarios, altered fire regime and encroachment of invasive species. This project is ongoing and has thus far resulted in 4 papers, published or in review, and six presentations at conferences. Main findings include:

- The rate, extent, and spatial pattern of predicted urban development, and associated habitat loss, may vary substantially depending on the source of input data, regardless of how much land is excluded from development (Syphard et al. in review)
- Results for obligate seeders show that the best average fire return intervals lie between 30 and 50 years, altered fire regime is a more serious threat to obligate seeders than habitat loss alone, even when distribution contractions due to climate change are considered (Regan et al. 2010; Lawson et al. 2010a; Swab et al. 2010; Lawson et al. 2010b, 2009; Regan et al. 2009; Syphard et al. 2009)
- Resprouters are fairly robust to different fire regimes. However, additional mortality in the form of habitat loss or disease is detrimental to population persistence (Regan et al. in review).
- Threat risk classification can be robust, even with limited and uncertain data, if model structure is complex enough to capture basics of organism life-histories (Anderson et al. 2009).

“Collaborative Research: Spatial inference and prediction with biogeographical data” (Award 0452389, **J. Franklin** and J. Miller, PIs; 2005-2009). The total award to Franklin was \$142,369. We conducted comparative species distribution modeling (SDM) using data for plant and animal species in the southern California biodiversity hotspot. We developed a conceptual framework for SDM that matches modeling methods with data and applications. This resulted in six scholarly publications, eight conference presentations, and 11 invited talks, including:

- Spatial dependence terms more consistently increased SDM performance for widespread than for rare species (Miller and Franklin 2006).
- For SDMs, autoregressive models capture the fine-scaled spatial dependence that results from local biotic factors, such as disturbance, competition, or dispersal, while geostatistical methods are more suitable for modeling broad-scale spatial dependence (Miller et al. 2007).
- More accurate SDMs were developed for rarer than for common species because it is difficult to discriminate suitable from unsuitable habitat for habitat generalists, and this was not a statistical artifact of the effect of sample prevalence (Franklin et al. 2009). Disturbance response functional type affected SDM performance more than any other plant species trait. Accuracy was significantly higher for species that are longer-lived, of intermediate abundance, and with smaller range sizes (Syphard and Franklin 2010).
- Although accuracy was roughly equal for most methods, differences in spatial predictions show that it is important to evaluate more than one model to estimate spatial uncertainty before making planning decisions based on SDM (Syphard and Franklin 2009).
- Broader Impacts: A definitive book on SDM (Franklin 2009) is expected to be widely used by students and practitioners. The project supported a post-doctoral associate and four students as research assistants (who coauthored 3 of the peer-reviewed publications).

Spatially-explicit Life Cycle Assessment Tools for Environmental Sustainability: Award #: 0932369, Principal Investigators: Roland Geyer, **Frank Davis**, David Stoms. October 1, 2009 – September 30th, 2011; Awarded Amount: \$218,120.00. Summary of Results to Date: We developed a proof-of-concept approach for coupling GIS and LCA for biodiversity assessments of land use and applied it to a case study of ethanol production from agricultural crops in California. We demonstrated how, using GIS, land use can be modeled as a geospatial and nonlinear function of output, and have developed a set of biodiversity impact indicators linked to land use and habitat change. We are currently designing and engineering spatial decision support tools to facilitate application of our approach by others.

Co-PI Hall has the following current NSF grant of greatest relevance to this proposal: **“Collaborative Research: VOCALS Climate Simulation and Operational Forecasting using a Regional Earth System Modeling Framework”** (ATM-0747533, 530K, 01/01/08 – 12/31/10) The project has partly funded the development and evaluation of the regional earth system modeling framework to be applied in this proposal, and has produced a high resolution regional coupled simulation for Peru, Chile and the adjacent Southeast Pacific. Representative publications include, Boé et al. (2010) and Sun et al. (2010).

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A. Professional Preparation

Williams College

Biology

B.A., 1975

The Johns Hopkins University

Geography and Environmental Engineering Ph.D., 1982

B. Academic/Professional Appointments

1996-present: Professor, Donald Bren School of Environmental Science and Management, UCSB

1995-1998: Deputy Director, National Center for Ecological Analysis and Synthesis, UCSB

1994-present: Professor, Department of Geography, UCSB.

1989-1994: Associate Professor, Department of Geography, UCSB

1983-1989: Assistant Professor, Department of Geography, University of California, Santa Barbara

C. Publications

i) Five publications most closely related to proposal

Borchert, M., **F. W. Davis**, J. Michaelsen and L. Oyler. 1989. Interactions of factors affecting seedling recruitment of blue oak (*Quercus douglasii*) in California. *Ecology* 70:389-404.

Callaway, R. M. and **F. W. Davis**. 1998. Recruitment of *Quercus agrifolia* on central California landscapes. *Journal of Vegetation Science* 9: 647-656.

Tyler, C., W. Kuhn, and **F.W. Davis**. Demography and recruitment limitations of three oak species in California. *Quarterly Review of Biology* 81: 127-152.

Tyler, C. M., **F. W. Davis** and B. E. Mahall. 2008. The relative importance of factors affecting age-specific seedling survival of two co-occurring oak species in southern California. *Forest Ecology and Management* 255:3063-3074.

Sork, V.L., **F.W. Davis**, R. Westfall, A. Flint, M. Ikegami, H. Wang and D. Grivet. Gene movement and genetic association with regional climate gradients in California valley oak (*Quercus lobata* Née) in the face of climate change. *Molecular Ecology* 19: 3806–3823.

ii) Five other publications

Callaway, R.M. and **F.W. Davis**. 1993. Vegetation dynamics, fire and the physical environment in central California. *Ecology* 74: 1567-1578.

Odion, D. C. and **F. W. Davis**. 2001. Fire, soil heating, and the formation of vegetation patterns in chaparral. *Ecological Monographs* 70: 149–169.

Sork, V.L., **F. W. Davis**, P. Smouse, V. Apsit, R. Dyer, J. Fernandez, W. Kuhn. 2002. Pollen movement in declining populations of California valley oak, *Quercus lobata*: Where have all the fathers gone? *Molecular Ecology* 11: 1657-1668.

Davis, F. W., C. Seo and W. Zielinski. 2007. Regional variation in home range scale habitat models for fisher (*Martes pennanti*) in California. *Ecological Applications* 17:2195-2213.

Davis, F. W., M. Borchert, R. K. Meentemeyer, A. Flint and D. M. Rizzo. 2010. Pre-impact forest composition and ongoing tree mortality associated with sudden oak death in the Big Sur region; California. *Forest Ecology and Management* 259: 2342-2354.

D. Synergistic Activities

Principal Investigator, California Gap Analysis Project, 1990-1998,

http://www.biogeog.ucsb.edu/projects/gap/gap_home.html

Member, Science Team, U.S. Forest Service Sierra Nevada Ecosystem Project, 1993-1996,

<http://ceres.ca.gov/snep/>

Member, Union of Concerned Scientists/Ecological Society of America Committee on Ecological Impacts of Climate Change in California, 1998-1999;

http://www.ucsusa.org/assets/documents/global_warming/calclimate.pdf

Member and current Chair, National Research Council Committee for the Independent Scientific of the Everglades Restoration Program, since 2006,

<http://www8.nationalacademies.org/cp/projectview.aspx?key=WSTB-U-03-04-A>

Fellow, Aldo Leopold Leadership Program, <http://leopoldleadership.stanford.edu/>

E. Collaborators & Other Affiliations

i) Collaborators, co-authors and co-editors, past 48 months

Keith Alger (Conservation International), Sandy Andelman (Conservation International), Fred Austerlitz (Universite' Paris-Sud), Mark Borchert (USDA Forest Service), Berry Brosi (Stanford U.), Ken Chomitz (World Bank), Elizabeth Chornesky (Consultant), Richard L. Church (UC Santa Barbara), Chris Costello (UCSB), Gretchen Daily (Stanford U.), Greg DeAngelo (UCSB), Brian Dolan (UCLA), Cyril Dutech (CIFOR-INIA, Spain), Gustavo da Fonseca (Conservation International), Alan Flint (USGS), Mariah Freese (San Diego State U.), Erica Fleischman (UCSB), Roland Geyer (UCSB), Robin Grossinger (San Francisco Estuary Institute), Dale Goble (U. Idaho), Delphine Grivet (UCLA), Lee Hannah (Conservation International), Andrew Irwin (Mt. Allison U.), Patrick Jantz (UCSB), Steve Kaffka (UC Davis), Jon Keeley (USGS-BRD), Bruce Kendall (UCSB), Jason Kreitler (UCSB), Bill Kuhn (NPS), Charlotte Landau (Minas Gerais, Brazil), Jan Lindner (U. Stuttgart), Elia Machado (Clark U.), Bruce Mahall (UC Santa Barbara), Elizabeth Madin (UCSB), Ross Meentemeyer (UNC Charlotte), Vicky Meretsky (Indiana U.), Kurt Merg (Washington State Fish and Wildlife), Jeanette Papp (UCLA), Andrea Pluess (Swiss Federal Inst. of Technology), Helen Regan (UC Riverside), Dave Rizzo (UC Davis), J. Michael Scott (U. Idaho), Changwan Seo (Seoul National U), Rebecca Shaw (The Nature Conservancy), David Stoms (UCSB), Heather Tallis (Natural Capital Project), Jim Thorne (UC Davis), Claudia Tyler (UCSB), Victoria Sork (UCLA), Peter Smouse (Rutgers), Tim Thomas (World Bank), Wayt Thomas (NY Botanic Garden), Robert Westfall (USDA Forest Service), Allison Whipple (San Francisco Estuary Institute) Astrid Widyanata (SDSU), William Zielinski (USDA Forest Service), Hong Wang (UCLA), Bastian Wittstock (U. Stuttgart)

ii) Doctoral Advisor: Grace S. Brush

iii) Graduate Advisees and Postdoctoral Scholars, past 5 years

Ph.D.

Patrick Jantz (In progress)

Jason Kreitler (USGS)

Bill Kuhn (National Park Service)

Theresa Nogeire (In progress)

Oliver Soong (In progress)

Lortena Vieli (In progress)

Andrew Macdonald (In progress)

Postdoctoral Scholars

Seo, Chang-Wan (Seoul NU)

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A) Professional preparation

University of California, Berkeley	Biology and Sociology	B.Sc., 1978
University of Hawaii	Biomedical Science	M.S., 1980
University of California, Los Angeles	Environmental Science	D.Env., 1985

B) Appointments

Senior Research Fellow, Climate Change Biology	Science & Knowledge (formerly CABS), Conservation International	2000 –
Research Fellow	Center for Applied Biodiversity Science (CABS), Conservation International	1998 – 2000
Senior Director	Conservation International	1990 – 1998
AAAS Fellow	American Association for the Advancement of Science	1986 – 1990
Assistant Professor	University of Hawaii	1984 – 1986

C) Publications

i)

Hannah, L., Costello, C., Guo, C. and Snyder, N. (in review) Climate change impacts on California timberlands. *Climatic Change*.

Hannah, L. 2010. A Global Conservation System for Climate-Change Adaptation. *Conservation Biology* **24**:70-77.

Seo, C., J. H. Thorne, L. Hannah, and W. Thuiller. 2009. Scale effects in species distribution models: implications for conservation planning under climate change. *Biology Letters* **5**:39-43.

Hannah, L., Midgley, G., Andelman, S., Araujo, M., Martinez-Meyer, E., Pearson, R. and Williams, P. (2007) Protected Area Needs in a Changing Climate. *Frontiers in Ecology and the Environment* **5**:131-138.

Hannah, L., R. A. Betts, and H. H. Shugart. (2007) Modeling Impacts of Climate Change on Tropical Forests in J. Flenley, and M. B. Bush, editors. *Tropical Forest Responses to Climate Change*. Praxis, London.

ii)

Malcolm, J. R., C. R. Liu, R. P. Neilson, L. Hansen, and L. Hannah. (2006) Global warming and extinctions of endemic species from biodiversity hotspots. *Conservation Biology* **20**:538-548.

Hannah, L., Midgley, G. F., Hughes, G. and Bomhard, B. 2005. The View from the Cape: Extinction risk, protected areas and climate change. *BioScience*. **55**, 231-242.

Lovejoy, T. and Hannah, L. 2005. *Climate Change and Biodiversity* (edited volume). New Haven: Yale University Press.

Thomas, C. D., A. Cameron, R. E. Green, M. Bakkenes, L. J. Beaumont, Y. C. Collingham, B. F. N. Erasmus, M. Ferreira de Siqueira, A. Grainger, L. Hannah, L. Hughes, B. Huntley, A. S. Van Jaarsveld, G. E. Midgely, L. Miles, M. A. Ortega-Huerta, A. T. Peterson, O. L. Phillips, and S. Williams. 2004c. Extinction risk from climate change. *Nature*, 427:145-148.

Hannah, L., Lovejoy, T, Midgley, G., Lovett, J., Woodward, I. (2002). Conservation of biodiversity in a changing climate. *Conservation Biology* **16**:1 264-268.

D) Synergistic Activities

- 1) PI, Ecosystem Modeling for California, a collaborative project of Conservation International and the University of California at Santa Barbara.
- 2) Working group leader, climate change and reserve selection working group (in collaboration with the National Center for Ecological Analysis and Synthesis at the University of California-Santa Barbara).
- 3) Co-convernor of the Karoo Group, an international group of leading climate change biologists dedicated to helping guide conservation policy in the light of projected climate change (members including F. Ian Woodward, Mark Bush, Thomas E. Lovejoy and others).

E)

- i) Collaborators: **Davis, F.** (UCSB); **Lovejoy, T. E.** (Heinz Center); **Midgley, G.** (South African National Biodiversity Institute); **Root, T.** (Stanford University); **Shaw, R.** (The Nature Conservancy), **Bush, M.** (Florida Institute of Technology), **Cowling, R.** (University of Port Elizabeth, South Africa), **Gaston, K. J.** (University of Sheffield), **Lovett, J.** (University of York), **Peterson, Townsend** (University of Kansas), **Thomas, C. D.** (University of Leeds), **Williams, P.** (The Natural History Museum, London), **Woodward, F.I.** (University of Sheffield).
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Education

Ph.D. Meteorology	1982	University of Wisconsin-Madison
M.S. Meteorology	1977	University of Wisconsin-Madison
B.S. Physics	1974	Massachusetts Institute of Technology

Professional Experience

2007-present	Research Professor, Desert Research Institute
1992-present	Deputy Director, WRCC (interim director 2007-2008)
1989-present	Regional Climatologist for western US, Western Regional Climate Center
1989-2007	Associate Research Professor, Desert Research Institute
1984-1989	State Climatologist for Oregon, Climatic Research Institute and Atmospheric Sciences Department, Oregon State University
1982-1984	Assistant State Climatologist for Oregon, Climatic Research Institute and Atmospheric Sciences Department, Oregon State University
1982-1982	Project Associate, Institute for Environmental Sciences, Center for Climatic Research, University of Wisconsin-Madison
1975-1982	Research Assistant, Project Assistant, Institute for Environmental Sciences, Center for Climatic Research, and Department of Meteorology, University of Wisconsin-Madison

Professional Memberships, Awards

Sigma Xi 1974-
American Association of State Climatologists 1983 -
National Weather Association 1995-
Associate editor (hydrology/climate), Journal of American Water Resources Association, 2002-2007
Editor's citation for refereeing, Water Resources Research, AGU, April 1994.
American Meteorology Association, Applied Climatology Award, 2008.

Five Related Publications

Kunkel, K.E., M.A. Palecki, L. Ensor, D. Easterling, K.G. Hubbard, D. Robinson, and K. Redmond, in revision, 2009. Trends in 20th Century U.S. extreme snowfall seasons. *J. Climate*, 22(23), 6204-6216.
Redmond, K.T., 2007. Evaporation and the hydrologic budget of Crater Lake, Oregon. *Hydrobiologia*, 574 (1), 29-46, DOI 10.1007/s10750-006-0345-3.
Kunkel, K.E., D.R. Easterling, K.T. Redmond, K.G. Hubbard, 2003. Temporal variations of extreme precipitation events in the United States: 1895-2000. *Geophys. Res. Lett.*, **30**(17), 1900, 09 Sept. 2003, doi:10.1029/2003GL018052.
Dettinger, M.D., K.T. Redmond, and D.R. Cayan, 2004. Winter orographic-precipitation ratios in the Sierra Nevada: Large-scale atmospheric circulations and hydrologic consequences. *J. Hydrometeor.*, **5**, 1102-1116.
K.T. Redmond, Y. Enzel, P.K. House, and F. Biondi, 2002. Climate variability and flood frequency at decadal to millennial time scales. Pp. 21-45, in *Principles and Applications of Paleoflood Hydrology*, editors: P.K. House, R.H. Webb, and V.R. Baker, American Geophysical Union, 385 pp.

Five Significant Publications

Abatzoglou, J.T., and K.T. Redmond, 2007. Asymmetry between trends in spring and autumn temperature and circulation regimes over western North America. *Geophys. Res. Lett.*, 34(18), L18808, 10.1029/2007GL030891, www.agu.org/journals/gl/gl0718/2007GL030891/2007GL030891.pdf
Redmond, K.T., 2009. Historic climate variability in the Mojave Desert. Chapter 1, 11-30, in *The Mojave Desert: Ecosystem Processes and Sustainability*, eds. R.H. Webb, L.F. Fenstermaker, J.S. Heaton, D.L. Hughson, E.V. McDonald, and D.M. Miller, University of Nevada Press. May 2009.

- Redmond, K.T. 2007. Climate variability and change as a backdrop for western resource management. In: Joyce, L.; Haynes, R.; White, R.; Barbour, R.J., eds. 2007. Bringing climate change into natural resource management. Gen. Tech. Rep. PNW-GTR-706. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 5-40.
- Redmond, K.T., 2003. Climate variability in the intermontane West: Complex spatial structure associated with topography, and observational issues. Chapter 2, p. 29-48, in *Water and Climate in the Western United States*, ed. W.M. Lewis Jr., University Press of Colorado, Boulder, Colorado.
- Redmond, K.T., and R.W. Koch, 1991. Surface Climate and Streamflow Variability in the Western United States and Their Relationship to Large Scale Circulation Indices. *Water Resour. Res.*, 27, 2381-2399.

Narrative and Synergistic Activities

Dr. Kelly Redmond maintains an interest in all facets of climate and climate behavior, its temporal variability, spatial characteristics and physical causes, how climate interacts with other human and natural processes, and how such information is acquired, used, communicated, and perceived. As Regional Climatologist for the western United States, Dr. Redmond has played an active role nationally in development of the climate services sector. He has taught graduate and undergraduate classes in climatology, forecasting and synoptics, and atmospheric dynamics. Interdisciplinary interactions have encompassed topics such as fisheries and wildlife, forestry, water resources and hydrology, and western land management, with much emphasis on observational and data management systems. Dr. Redmond has served on nine National Research Council panels, and a variety of panels and committees covering NSF CUAHSI hydrologic activities, the National Ecological Observatory Network, National Weather Service Coop Modernization, the NOAA Climate Reference Network, NOAA National Climate Services, the NOAA National Data Stewardship Council, Science Advisory Board of the NOAA Climate Test Bed, NOAA coastal and upper air climate data sets, the AMS Climate Services Committee, and National Park Service Inventory/Monitoring Network (32 reports). He currently serves on the Executive Committee of the Consortium for Integrated Climate Research in Mountain Regions (CIRMOUNT), and is co-chair of its Mountain Climate Network Work Group. Dr. Redmond is currently co-lead on the Implementation Team for the National Integrated Drought Information System (NIDIS), and active on its Colorado River Pilot Project, the US Drought Monitor, and California drought monitoring. He is closely involved in the NOAA Regional Integrated Sciences and Assessment (RISA) Program under the Climate Program Office, and its four western projects (CO, AZ, CA, OR-WA). This unique activity performs rigorous examination of the decision environment and context in which climate data and information are understood, interpreted, and incorporated (or not). Climate change in the western US is a new major preoccupation. He interacts daily with members of the public and with print, radio and television media across the West.

Collaborators in past 48 months

J. Abatzoglou (SJSU), R. Bales (UC Merced), M. Brewer (NCDC), T. Brown (DRI), J. Caprio (retired), D. Cayan (Scripps), J. Christy (U Alabama), A. Comrie (U Arizona), C. Daly (OSU), G. Dana (DRI); C. Davey (self-employed), A. DeGaetano (Cornell), M. Dettinger (Scripps), D. Easterling (NCDC), D. Fagre (USGS), K. Gallo (NOAA), G. Garfin (U. Arizona), A. Gershunov (Scripps), M. Glueck (U Arizona), L. Graumlich (U Arizona), G. Greenwood (MRI), J. Gross (NPS), M. Hayes (U Nebraska), J. Heaton (UNR), K. Hubbard (U Nebraska), M. Hughes (U Arizona), K. Jacobs (U Arizona), M. Kaplan (DRI), N. Knowles (USGS), D. Koracin (DRI), K. Kunkel (DRI), M. Kruk (ISWS), N. Lancaster (DRI), S. Kung (UW-Madison); J. Lewis (NOAA NSSL, DRI), D. LeComte (NOAA CPC), G. McCabe (USGS), E. McDonald (DRI), G. McCurdy (DRI), D. Meko (U. Arizona), P. Mote (OSU), W. Norris (U Alabama), T. Pagano (CSIRO), M. Palecki (NCDC), A. Panorska (UNR), P. Pasteris (CH2MHill), D. Peterson (U Washington), T. Piechota (UNLV); F. Powell (WMRS), R. Pulwarty (NOAA CDC), H. Quamme (Agri-Food Canada), D. Robinson (Rutgers), M. Shulski (U Nebraska), D. Simeral (DRI), J. Smiley (WMRS), M. Spinar (ISWS), D. Stahle (U. Arkansas), N. Stephenson (USGS), M. Stromberg (UC Berkeley), M. Svoboda (U. Nebraska), T. Swetnam (U Arizona), M. Tyree (Scripps), R. Webb (USGS), D. Wilhite (UNL), C. Woodhouse (U Arizona)

Postdoctoral Sponsor John Abatzoglou (Idaho State U), Christopher Davey (self employed)

Masters and Dissertation Advisor Reid A. Bryson (U Wisconsin, deceased)

Alexandra D. Syphard

(a) Professional Preparation

University of Mary Washington, Fredericksburg, VA, BA, English, 1992
Medical College of Virginia, Richmond, VA, MPH, Master Public Health, 1994
Virginia Commonwealth University, Richmond, VA, MES, Master Environmental Studies, 1998
University of California Santa Barbara and San Diego State University, PhD, Geography, 2005
University of Wisconsin-Madison, Forest and Wildlife Ecology, Postdoctoral Fellow, 2005-2007
San Diego State University, Biology, Postdoctoral Fellow, 2007-2009

(b) Appointments

Conservation Biology Institute, San Diego, CA, Senior Research Scientist, 2007-current
San Diego State University, Geography, San Diego, CA, Teaching Associate, 1999-2005
Vanasse Hangen Brustlin, Inc., Williamsburg, VA, GIS Analyst/Environmental Planner, 1998-1999
Alliance for the Chesapeake Bay, Richmond, VA, Writer, 1995-1998

(c) Publications – 5 related to proposal

Syphard, A.D., Franklin, J. 2010. Species' traits affect the performance of species' distribution models for plants in southern California. *Journal of Vegetation Science* 21: 177-189.
Syphard, A.D., Franklin, J. 2009. Differences in spatial predictions among species distribution modeling methods vary with species traits and environmental predictors. *Ecography* 32: 907-918.
Syphard, A.D., Radeloff, V.C., Keuler, N.S., Taylor, R.S., Hawbaker, T.J., Stewart, S.I., and M.K. Clayton. 2008. Predicting spatial patterns of fire on a southern California landscape. *International Journal of Wildland Fire* 17: 602-613.
Syphard, A.D., V.C. Radeloff, J.E. Keeley, T.J. Hawbaker, M.K. Clayton, S.I. Stewart, and R.B. Hammer. 2007. Human influence on California fire regimes. *Ecological Applications* 17: 1388-1402.
Syphard, A.D. and J. Franklin. 2004. The effect of aggregation of landscape attributes on the simulation of fire disturbance and succession using the LANDIS model. *Ecological Modelling* 180: 21-40.

Publications – 5 other

Syphard, A.D., Scheller, R.M., Ward, B.C., Spencer, W.D., and J. R. Strittholt. In press. Simulating long-term, broad-scale effects of fuel treatments on fire regimes in the Sierra Nevada, California. *International Journal of Wildland Fire*.
Syphard, A.D., Radeloff, V.C., Hawbaker, T.J., and S.I. Stewart. 2009. Conservation threats due to human-caused increases in fire frequency in Mediterranean-climate ecosystems. *Conservation Biology* 23: 758-769.
Syphard, A.D., K.C. Clarke, and J. Franklin. 2007. Simulating frequent fire and urban growth in southern California coastal shrublands, USA. *Landscape Ecology* 22: 431-445.
Syphard, A.D., J. Yang, J. Franklin, H.S. He, and J.E. Keeley. 2007. Calibrating a forest landscape model to simulate high fire frequency in Mediterranean-type shrublands. *Environmental Modelling & Software* 22: 1641-1653.
Syphard, A.D., J. Franklin, and J.E. Keeley. 2006. Simulating the effects of frequent fire on southern California coastal shrublands. *Ecological Applications* 16: 1744-1756.

(d) Synergistic Activities

- Participant in NCEAS workshops, *Global climate change and adaptation of conservation priorities*, Santa Barbara, CA, 2008-2010
- Scientific advisor and member of Vegetation/Fuels Fire Committee for the San Diego County Forest Area Safety Taskforce (FAST), 2008 - 2010
- Invited member of expert review panel of vegetation models for chaparral, LANDFIRE project, Santa Barbara, CA, 2008
- Peer review manuscripts for scientific publication and scientific proposals, including *Amnio*, *Applied Vegetation Science*, *Conservation Letters*, *Ecology*, *Ecological Applications*, *Ecoscience*, *Ecosystems*, *Environmental Modelling & Software*, *Environmental Monitoring and Assessment*, *Forest Ecology and Management*, *Forest Science*, *International Journal of Wildland Fire*, *Journal of Environmental Management*, *Journal of Vegetation Science*, *Landscape Ecology*, *Maryland Sea Grant*, *Plant Ecology*, 2008 California climate change impacts assessment, *Ecological Modelling*
- Participated in various press releases and radio/television interviews related to fire research (including Wisconsin Public Radio, ABC News, and Ivanhoe Broadcasting)

(e) Collaborators & Other Affiliations

Dr. John Abatzoglou, Desert Research Institute, Reno, NV, USA, **Teresa Brennan**, USGS, CA, USA, **Dr. Ross Bradstock**, University of Wollongong, NSW, Australia, **Dr. Tim Brown**, Desert Research Institute, Reno, NV, USA, **Dr. Keith Clarke**, University of California Santa Barbara, CA, USA, **Dr. Murray Clayton**, University of Wisconsin-Madison, WI, USA, **Dr. C.J. Fotheringham**, USGS, CA, USA, **Dr. Janet Franklin**, San Diego State University, CA, USA, **Dr. Jeremy Fried**, USDA Forest Service, OR, USA, **Dr. Roger Hammer**, Oregon State University, OR, USA, **Dr. Todd Hawbaker**, USGS, Denver, CO, USA, **Dr. Hong He**, University of Missouri-Columbia, MO, USA, **Sherry Holcomb**, University of Wisconsin-Madison, USA, **Dr. Jon Keeley**, USGS, CA, USA, **Nicholas Keuler**, University of Wisconsin-Madison, WI, USA, **Dawn Lawson**, San Diego State University, CA, USA, **Mark McGinnis**, Dudek, Encinitas, CA, **Jason McKeefry**, City of Madison, WI, **Brian Miranda**, USDA Forest Service, Rhinelander, WI, **Dr. David Mladenoff**, University of Wisconsin-Madison, WI, USA, **Dr. Carol Miller**, Aldo Leopold Wilderness Research Institute, MT, USA, **Dr. Volker Radeloff**, University of Wisconsin-Madison, USA, **Heather Rustigian**, Conservation Biology Institute, Corvallis, OR, **Dr. Helen Regan**, University of California Riverside, CA, USA, **Dr. Robert Scheller**, Portland State University, OR, USA, **Douglas Shinneman**, USDA Forest Service, Grand Rapids, MN, **Dr. Wayne Spencer**, Conservation Biology Institute, San Diego, CA, **Dr. Susan Stewart**, USDA Forest Service, IL, USA, **Dr. James Strittholt**, Conservation Biology Institute, Corvallis, OR, **Dr. Brian Sturtevant**, USDA Forest Service, Rhinelander, WI, **Dr. Robert Taylor**, National Park Service, CA, USA, **Brendan Ward**, Conservation Biology Institute, Corvallis, OR, USA, **Dr. Jian Yang**, University of Nevada Reno, NV, USA, **Dr. Zhiliang Zhu**, EROS Space Data Center, USGS, Sioux Falls, SD, USA

(f) Graduate Advisors and Postdoctoral Sponsors

Dr. Edward Peeples, Medical College of Virginia, Richmond, VA
Dr. Margot Garcia, Virginia Commonwealth University, Richmond, VA
Dr. Janet Franklin, San Diego State University, CA
Dr. Keith Clarke, University of California Santa Barbara
Dr. Volker Radeloff, University of Wisconsin-Madison, WI

Janet Franklin

**BIOGRAPHICAL SKETCH
JANET FRANKLIN**

EDUCATION

University of California, Santa Barbara	Environmental Biology, With High Honors	B.A., 1979
University of California, Santa Barbara	Geography	M.A., 1983
University of California, Santa Barbara	Geography	Ph.D., 1988

PROFESSIONAL EXPERIENCE

2009-present	Professor, School of Geographical Sciences, Arizona State University, Tempe, AZ
2006-2009	Associate Chair and Professor, Department of Biology, Adjunct Professor of Geography, San Diego State University (SDSU), San Diego, CA
2002-2009	Professor, Department of Biology, Adjunct Professor of Geography, SDSU, San Diego, CA
1995-2002	Professor, Department of Geography, SDSU.
1989-2002	Co-Director, Center for Earth Systems Analysis Research (CESAR), SDSU.
1992-1995	Associate Professor, Department of Geography, SDSU.
1988-1992	Assistant Professor, Department of Geography, SDSU.
1983-1984	Staff Scientist, Universities Space Research Association, Washington, DC.

Five refereed publications related to the proposal

- Franklin, J., 2009, *Mapping Species Distributions: Spatial Inference and Prediction*, Cambridge University Press, Cambridge, UK. ISBN 978-0-521-87635-3 338 pp.
- Lawson, D. M., Regan, H. M., Zedler, P. H. and Franklin, J., in press, Cumulative effects of land use, altered fire regime and climate change on persistence of *Ceanothus verrucosus*, a rare, fire-dependent plant species, *Global Change Biology*
- Franklin, J., 2010, Moving beyond static species distribution models in support of conservation biogeography, *Diversity & Distributions* 16(3): 321-330.
- Syphard, A. D. and Franklin, J., 2010, Species' functional type affects the accuracy of species distribution models for plants in southern California, *Journal of Vegetation Science* 21(1):177-189. (Both authors contributed equally to this paper.)
- Syphard, A. D. and Franklin, J., 2009, Differences in spatial predictions among species distribution modeling methods vary with species traits and environmental predictors, *Ecography* 32:907-918.

Five other refereed publications (out of 94 total)

- Franklin, J., Wejnert, K., Hathaway, S., Rochester, C. and Fisher, R., 2009, Effect of species rarity on the accuracy of species distribution models for reptiles and amphibians in southern California, *Diversity and Distributions* 15: 167-177
- Franklin, J., A. D. Syphard, H. He and D. Mladenoff, 2005, The effects of altered fire regimes on patterns of plant succession in the foothills and mountains of southern California, *Ecosystems* vol. 8, no. 8, pp. 885-898
- Franklin, J., Spears-Lebrun, L., D. Deutschman, and K. Marsden, 2006, Impact of a high-intensity fire on mixed evergreen and mixed conifer forests in the Peninsular Ranges of southern California, USA, *Forest Ecology and Management* 235: 18-29
- Akçakaya, H. R., J. Franklin, A. D. Syphard, and J. Stephenson, 2005, Viability of Bell's Sage Sparrow (*Amphispiza belli* ssp. *belli*) under altered fire regimes, *Ecological Applications* vol. 15, no. 2, pp. 521-531
- Franklin, J., 1998, Predicting the distributions of shrub species in California chaparral and coastal sage

Janet Franklin

communities from climate and terrain-derived variables, *Journal of Vegetation Science* 9: 733-748.

Synergistic Activities

- Teaching and training: Franklin, J., 2009, *Mapping Species Distributions: Spatial Inference and Prediction*, Cambridge University Press, Cambridge, UK. 978-0-521-7002-3 pb
- Visiting Scholar, Erasmus Mundus (European Union Education and Training), Geo-Information Science and Earth Observation for Environmental Modelling and Management, ITC, Enschede, The Netherlands. 2008
- Subject Matter Editor, *Ecology, Ecological Monographs*, 2006-present; *Diversity & Distributions* 2008–present; *Ecography* 2010–present.
- Knowledge Transfer (talks to non-academic groups): Public Symposium, CRSP Interpretive Association, Descanso, CA (8 Nov 2008); San Diego Region Weed Management Areas Stakeholders Meeting, County Department of Agriculture (May 14 2008); San Diego Partners for Biodiversity (network of local professional environmental biologists), San Diego County Department of Planning (January 25 2005); Public symposium, Cuyamaca Rancho State Park, Descanso, CA. (October 16 2004).
- Female students (underrepresented in quantitative physical geography) supervised: Julie Ripplinger, PhD in progress; Dawn Lawson, PhD in progress; Alex Syphard, Ph. D. 2005; Jennifer Miller, Ph. D. 2003; Twelve MS/MA students 1991-2009. Four undergraduates, 2006-2009.

Collaborators (last 48 mos) (No Co-editors last 24 mos)

Alison Alberts, CRES-SDZS; **Richard Aspinall**, Macaulay Institute; **Larry Band**, University North Carolina; **Keith Clarke**, UC-Santa Barbara; **Carla D’Antonio**, UCSB; **Douglas Deutschman**, SDSU; **Donald Drake**, University Hawaii; **Taly Drezner**, York University; **Robert Fisher**, USGS; **C. J. Fotheringham**, UCLA; **Stacie Hathaway**, USGS; **Lauren Hierl**, Audobon Society; **Allen Hope**, SDSU; **Brenda Johnson**, Cal Fish & Game; **Jon Keeley**, USGS; **Rebecca Lewison**, SDSU; **Kim Marsden**, Calif. State Parks; **Max Moritz**, UC-Berkeley; **John O’Leary**, SDSU; **Hugh Possingham**, University Queensland; **Stuart Phinn**, University of Queensland; **Helen Regan**, UC-Riverside; **Serge Rey**, ASU; **Dar Roberts**, UC-Santa Barbara; **Carlton Rochester**, USGS; **Hugh Safford**, USDA Forest Service; **Andrew Skidmore**, ITC; **Candan Soykan**, SDSU; **David Steadman**, University Florida; **Douglas Stow**, SDSU; **Alexandra Syphard**, CBI; **Christina Tague**, SDSU; **Michael L. Wells**, Calif. Dept. Parks; **Clark Winchell**, USFWS; **Susan Wiser**, Landcare; **C. E. Woodcock**, Boston University; **Paul Zedler**, Univ Wisconsin.

Graduate Advisor

Professor Alan Strahler, currently at the Department of Geography, Boston University (no postdoctoral advisors)

Graduate Students (last 5 years; at SDSU unless otherwise noted)

Bray Beltran (ASU); Erin Bergman, Nell Blodgett, Francis Bozzolo; Caitlin Chason, Katie Comer Santos, Charlotte Coulter; John Crookston, Yuki Hamada, Heather Karnes (Schmalbach); Dawn Lawson; Jennifer Miller; Katherine Newman; Julie Ripplinger (ASU); John Rogan; Elizabeth Santos; Peter Scull; Leslie Bolick Smith; Linnea Spears-Lebrun; Andrew Steyers, Alexandra Syphard.

Helen M. Regan

(a) Professional Preparation

Latrobe University, Victoria, Australia. Applied Mathematics, 1992 BSc with first class honors.
The University of New England, NSW, Australia. Applied Mathematics, PhD 1999.
The University of Melbourne, Victoria, Australia. Conservation Biology, 1997-1999
National Center for Ecological Analysis and Synthesis, University California Santa Barbara.
Conservation Biology, 2000-2002.

(b) Appointments

2010-present Associate Professor, Department of Biology, University of California Riverside, CA
2007-2010 Assistant Professor, Department of Biology, University of California Riverside, CA
2003–2007 Assistant Professor, Department of Biology, Ecology Program, San Diego State University.
1999–2000 Research Associate, Applied Biomathematics, Setauket, NY.
1996–1997 Numerical Analyst, Chemistry Department, Macquarie University, Sydney, NSW, Australia.
1993–1996 Mathematics Teaching Assistant, Mathematics Department, The University of New England, NSW, Australia.

(c) Publications – 5 related to proposal

Lawson, D. M., H.M. Regan, P.H. Zedler and J. Franklin. Cumulative effects of land use, altered fire regime and climate change on persistence of *Ceanothus verrucosus*, a rare, fire-dependent plant species. *Global Change Biology* 16(9):2518–2529, 2010.
Regan, H.M., J.B. Crookston, R. Swab, J. Franklin, and D.M. Lawson. Habitat fragmentation and altered fire regime create trade-offs for the persistence of an obligate seeding shrub. *Ecology* 91(4):1114-1123, 2010.
Keith, D.A., H.R. Akçakaya, W. Thuiller, G.F. Midgley, R.G. Pearson, S.J. Phillips, H.M. Regan, M.B. Araújo, T.G. Rebelo. Predicting extinction risks under climate change: a new mechanistic approach linking stochastic population models with dynamic bioclimatic habitat models. *Biology Letters* 4:560-563, 2008.
Regan, H.M., H.R. Akçakaya, S. Ferson, K.V. Root, S. Carroll and L.R. Ginzburg. Treatments of uncertainty and variability in ecological risk assessment of single-species populations. *Human and Ecological Risk Assessment*, 9(4):889-906, 2003.
Regan, H.M., T.D. Auld, D. Keith and M.A. Burgman. The effects of fire and predators on the long-term persistence of an endangered shrub *Grevillea caleyi*. *Biological Conservation*, 109(1):73-83, 2003.

Publications – 5 other

Regan, H.M., Y. Ben-Haim, B. Langford, W.G. Wilson, P. Lundberg, S.J. Andelman, and M.A. Burgman. Robust decision making under severe uncertainty for conservation management. *Ecological Applications*, 15(4):1471-1477, 2005.
Halpern B.S., H.M. Regan, H.P. Possingham, M.A. McCarthy. Accounting for uncertainty in marine reserve design. *Ecology Letters* 9:2-11, 2006.
Elith, J., M.A. Burgman and H.M. Regan. Mapping epistemic uncertainty and vague concepts in predictions of species' distribution. *Ecological Modelling*, 157:313-329, 2002.
Regan, H.M., M. Colyvan, and M.A. Burgman. A taxonomy and treatment of uncertainty for ecology and conservation biology. *Ecological Applications*, 12(2):618-628, 2002.
Regan, H.M., R. Lupia, A.N. Drinnan and M.A. Burgman. The currency and tempo of extinction. *The American Naturalist*, 157(1):1-10, January 2001.

(d) Synergistic Activities

2008-present. Member of the working group Global climate change and adaptation of conservation priorities at the National Center for Ecological Analysis and Synthesis, University of California Santa Barbara, CA.

2007-present. World Conservation Union (IUCN) Species Extinction Risks under Climate Change Working Group

2006-present. Editorial Board Member, *Ecology Letters*

2006-present. Member of the Standards and Petitions SubCommittee, Biodiversity Assessments Subcommittee of the IUCN Species Survival Commission.

2003. Member of the South-Central California Coast Technical Recovery Team for Steelhead Trout. NOAA, National Marine and Fisheries Service.

(e) Collaborators and Other Affiliations

(a) Collaborators (no Co-Editors)

Dr. Resit Akçakaya, Applied Biomathematics, NY, USA.; **Dr Sandy Andelman**, Conservation International; **Dr Miguel Araujo**, MNCN, Spain; **Prof Yakov Ben-Haim**, Technion University, Israel; **Dr. Nancy Bettinger**, Massachusetts Dept. Env. Protection, MA, USA; **Prof. Mark Burgman**, The University of Melbourne, VIC, Australia; **Prof. Mark Colyvan**, University of Queensland, QLD, Australia; **Dr Doug Deutschman**, San Diego State University; **Dr Janet Franklin**, Arizona State University; **Dr. Alyce Fritz**, NOAA, WA, USA; **Dr Jennifer Gervais**, Utah State University, UT, USA; **Dr. Ben Halpern** NCEAS, UCSB; **Dr Brenda Johnson**, CDF&G, Sacramento, CA; **Dr James Justus**, Florida State University; **Dr Keith Hayes**, CSIRO, Australia; **Dr Kevin Hovel**, SDSU, USA; **Dr. Larry Kaputska**, Ecological Planning and Toxicology, OR, USA.; **Dr. David Keith**, Dept of the Environment, Water and Climate Change, NSW, Australia; **Dr Bill Langford**, RMIT, Australia; **Prof Per Lundberg**, Lund University, Sweden; **Prof. Lynn Maguire**, Duke University; **Dr. Michael McCarthy**, The University of Melbourne, VIC, Australia; **Dr. Charlie Menzie**, Menzie-Cura & Associates, Inc., MA, USA; **Dr Guy Midgley**, SANBI, South Africa; **Dr. Vibeke Møller**, Danish Environmental Protection Agency, Denmark; **Dr. Helen Noel**, University of Reading, UK; **Dr Richard Pearson**, American Museum of Natural History, USA; **Dr Steven Phillips**, AT&T Research, USA; **Prof Hugh Possingham**, University of Queensland, Australia; **Dr Tony Rebelo**, Protea Atlas Project, South Africa; **Dr Tracey Regan**, University of Melbourne, Australia; **Prof Sahotra Sarkar**, University of Texas at Austin; **Dr Wilfried Thuiller**, CNRS, France; **Dr Mark Tozer**, Dept of the Environment, Water and Climate Change; **Prof Paul Zedler**, University of Wisconsin Madison, USA; **Dr Wil Wilson**, Duke University.

(b) Graduate and Postdoctoral Advisors

Dr. Gary Bunting, The University of New England, NSW, Australia; **Dr. Bill McClean**, University of New South Wales, NSW, Australia; **Dr. Sandy Andelman**, Conservation International, USA; **Prof. Mark Burgman**, The University of Melbourne, VIC, Australia; **Dr Scott Ferson**, Applied Biomathematics, USA; **Prof Lev Ginzburg**, SUNY Stonybrook, USA

(c) Thesis Advisor (9 graduate students total, 3 postgraduate sponsors)

John Crookston (SDSU), Dawn Lawson (SDSU), Lisa Markovchick-Nicholls (SDSU), Toni Mizerek (SDSU), Pamela Rueda (UCR), Andrew Steyers (SDSU), Rebecca Swab (UCR), Erin Conlisk (UCR), Alejandro Martinez (IMEDEA CSIC-UIB Spain), Katie Steele (London School of Economics)

Max Alan Moritz

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Education:

Ph.D. 1999 Geography, NSF RTG in Spatial Ecology; U.C. Santa Barbara (F.W. Davis, adviser)
M.A. 1993 Energy & Environmental Studies; Boston University
B.A. 1987 Management Science, Computer Science minor; U.C. San Diego

Appointments:

2009-present Cooperative Extension Specialist in Wildland Fire, Adjunct Associate Professor, Department of Environmental Science, Policy, & Management, U.C. Berkeley.
2004-2009 Cooperative Extension Specialist in Wildland Fire, Adjunct Assistant Professor, Department of Environmental Science, Policy, & Management, U.C. Berkeley.
2005-present Co-Director of the Center for Fire Research & Outreach, C.N.R., U.C. Berkeley.
2002-2003 Visiting Research Scientist, Department of Physics, U.C. Santa Barbara.
1999-2002 Assistant Professor of Geography, Cal Poly San Luis Obispo.
1993-1999 Graduate Student Researcher, Biogeography Lab, Geography Department, U.C. Santa Barbara.
1991-1993 Graduate Student Researcher, Center for Energy & Environmental Studies, Boston University.
1988-1991 Senior MIS Consultant, Andersen Consulting, Los Angeles.

Relevant Publications

Krawchuk, M.A. & M.A. **Moritz** Constraints on global fire activity vary across a resource gradient. *Ecology* (in press).
Krawchuk M.A., M.A. **Moritz** (2009) Fire regimes of China: inference from statistical comparison with the United States. *Global Ecology and Biogeography* 18:626-639.
Krawchuk M.A., M.A. **Moritz**, M.-A. Parisien, J. Van Dorn, & K. Hayhoe (2009) Global pyrogeography: the current and future distribution of wildfire. *PLoS ONE* 4(4): e5102. doi:10.1371/journal.pone.0005102.
Parisien, M.A. & M.A. **Moritz** (2009) Environmental controls on the spatial distribution of wildfire at multiple spatial scales. *Ecological Monographs* 79: 127-154.
Moritz, M.A. T.J. Moody, L. Miles, M. Smith, & P. de Valpine (2009) The fire frequency analysis branch of the pyrostatistics tree: sampling decisions and censoring in fire interval data. *Environmental and Ecological Statistics* 16: 271-289.

Additional Publications

Bowman, D.M.J.S., J.K. Balch, P. Artaxo, W.J. Bond, J.M. Carlson, M.A. Cochrane, C.M. D'Antonio, R.S. DeFries, J.C. Doyle, S.P. Harrison, F.H. Johnston, J.E. Keeley, M.A. Krawchuk, C.A. Kull, J.B. Marston, M.A. **Moritz**, I.C. Prentice, C.I. Roos, A.C. Scott, T.W. Swetnam, G.R. van der Werf, & S.J. Pyne (2009) Fire in the earth system. *Science* 324: 481-484.
Moritz, M.A. & S.L. Stephens. 2008. Fire and sustainability: considerations for California's altered future climate. *Climatic Change* 87: S265-S271.
Moritz, M.A., M.E. Morais, L.A. Summerell, J.M. Carlson, & J. Doyle (2005) Wildfires, complexity, and highly optimized tolerance. *Proceedings of the National Academy of Sciences USA* **102**: 17912-17917.
Moritz, M.A. (2003) Spatio-temporal analysis of controls of shrubland fire regimes: Age dependency and fire hazard. *Ecology* **84**:351-361.

Romme, W.H., E.G. Everham, L.E. Frelich, M.A. **Moritz**, & R.E. Sparks (1998) Are large, infrequent disturbances qualitatively different from small, frequent disturbances? *Ecosystems* 1:524-534.

Synergistic Activities:

Dr. Moritz studies controls on fire regimes at various spatial and temporal scales, with the goal of understanding the natural role of fire in terrestrial ecosystems and translating that information to decision-makers:

- He is co-director of the Center for Fire Research and Outreach at the University of California, Berkeley, which has become a focal point for disseminating fire-related data and information in California, primarily through the extensive online Fire Information Engine Toolkit.
- The Moritz Fire Research Lab and Fire Center staff are involved in several California State agency projects, such as the development and extension of the new Fire Hazard Severity Zone maps, which dictate building codes in much of California; he was also a contributor to the 2006 California Climate Action Team Report to Governor Schwarzenegger and the Legislature.
- Dr. Moritz is the U.C. Cooperative Extension Specialist in wildfire for the entire state of California, convening and participating in fire-related workshops across California to help get science-based information out to decision-makers; he is co-chair of the U.C.-wide Agriculture and Natural Resources Fire Workgroup, which allows for wide contact and dissemination of research results.
- He is acting president of the California chapter of the Association for Fire Ecology.
- The Moritz Lab plays a key role in an ongoing research project funded by the California Energy Commission (lead PI D. Ackerly), in which future changes to fire activity under climate change are being investigated for conservation planning purposes.

Collaborators & Other Affiliations:

Collaborators: David Ackerly (U.C. Berkeley), David Bowman (U. Tasmania), Jean Carlson (U.C. Santa Barbara), Phil Dennison (U. Utah), Alex Hall (U.C.L.A.), Katharine Hayhoe (Texas Tech U.), Paul Hessburg (U.S. Forest Service), Faith Kearns (U.C. Berkeley), Jon Keeley (U.S. Geological Survey), Tadashi Moody (U.C. Berkeley), Dennis Odion (U.C. Santa Barbara), Scott Stephens (U.C. Berkeley), Perry de Valpine (U.C. Berkeley)

Graduate Advisors: Frank Davis (U.C. Santa Barbara); Mike Goodchild (U.C. Santa Barbara); Joel Michaelsen (U.C. Santa Barbara); Robert Kaufmann (Boston University)

Thesis Advisor & Postgraduate-Scholar Sponsor (5 yr): Enric Battlori, Meg Krawchuk, Erica Newman, Marc Parisien, Eric Waller: (3 graduate students and 2 postdoctoral scholars); several additional international students have also spent time in my lab.

ALEX HALL

UCLA Dep't of Atmospheric and Oceanic Sciences
7955 Math Sciences Building, 405 Hilgard Ave., Box 951565
Los Angeles, CA 90095
lab: (310) 206-5257 fax: (310) 206-5219
<http://www.atmos.ucla.edu/csrl/>

BACKGROUND

Dr. Hall studies the climate system from both regional and global perspectives. He has experience in analysis of climate simulations, and comparing output from these experiments to *in situ* and remote sensing data. At the global scale, he studies processes determining the climate system's response to increases in greenhouse gases. At the regional scale, he has been active in the development and integration of regional climate models. He uses these simulations to examine mesoscale climate dynamics and interactions among earth-system components that are crucial for simulating and understanding regional climate but are largely unrepresented in current global climate models. This research also has applications in the areas of climate impacts, water resources, renewable energy, and conservation. At UCLA, Dr. Hall teaches climate-related courses at the undergraduate and graduate levels. He is a recipient of the NSF Graduate Fellowship (1993-1996), the NASA Earth System Science Fellowship (1996-1998), the Lamont Fellowship (1999-2001), and the NSF CAREER award (2002-2007).

SYNERGISTIC ACTIVITIES

Dr. Hall was a contributing author to the 2007 IPCC 4th scientific assessment of climate change Working Group I report, where his work on climate sensitivity is featured. He will also be a Lead Author for Chapter 14 of the Working Group I component of the upcoming IPCC 5th Assessment, entitled "Climate Phenomena and their Relevance for Future Regional Climate Change". He was co-chair of US CLIVAR Climate Prediction and Applications Interface Panel, charged with making research and funding recommendations to US agencies regarding climate prediction and climate applications and was also a member of the overarching US CLIVAR committee (2002-2009). He is a member of the executive committee of the UCLA-JPL Joint Institute for Regional Earth System Science and Engineering, and the faculty director of the UCLA Center for Climate Change Solutions. Finally, he is a member of the technical advisory board for the Los Angeles Collaborative for Climate Action and Sustainability, a consortium of local governments, NGOs and businesses.

PROFESSIONAL PREPARATION

Pomona College, Claremont, CA

B.A., 1993, *summa cum laude*, double concentration in Physics and History

Princeton University, Princeton, NJ

Ph.D., Atmospheric and Oceanic Sciences, 1998, Thesis advisor: Suki Manabe

Lamont-Doherty Earth Observatory, Lamont postdoctoral fellow. October 1998-
November 2000.

APPOINTMENTS

University of California—Los Angeles, Associate Professor, *Department of Atmospheric and Oceanic Sciences*. June 2008-present. Associate Professor, *Institute of the Environment*, 2009-present, Assistant Professor, November 2000-June 2008.

Collaborators

Cecilia Bitz, U of Washington; Julien Boé, UCLA; Sandrine Bony, Laboratoire de Meteorologie Dynamique; Tony Broccoli, Rutgers U; Yong Chen, UCLA; Amy Clement, U of Miami; Sebastien Conil, Meteo France; Greg Derevianko, UCLA; Charles Dong, UCLA; Richard Fernandez, CCRS; Rob Fovell, UCLA; Mimi Hughes, NOAA; Ruby Leung, PNNL; Kuo-Nan Liou, UCLA; Charles Jackson, U of Texas; Jinwon Kim, UCLA; Paul Kushner, U Toronto; Jim McWilliams, UCLA; Brian Medeiros, UCLA; Max Moritz, UC Berkeley; David Neelin, UCLA; Tamlin Pavelsky, UNC; Xin Qu, UCLA; Dave Thompson, Colorado State U; Lonnie Thompson, Ohio State; Ellen Thompson, Ohio State; Bjorn Stevens, UCLA; Duane Waliser, JPL

Graduate and Postdoctoral Advisors.

Graduate Advisor: Suki Manabe, currently Professor Emeritus of Princeton University. No fixed postdoctoral advisor.

Thesis Advisor and Postgraduate-Scholar Sponsor.

Currently advising Sarah Kapnick, Daniel Walton, Alex Jousse, and Neil Berg, graduate students in the UCLA Atmospheric and Oceanic Sciences Department. Advised Dr. Xin Qu, who obtained his Ph.D. in March 2007, and Dr. Mimi Hughes, who obtained her Ph.D. in June 2008, as well as 3 other students. Total students advised: 5. Postdoctoral-Scholar sponsor for Drs. Xin Qu, Julien Boé. Fengpeng Sun, Tamlin Pavelsky, Jerry Huang, and Scott Capps.

TEN RELEVANT PUBLICATIONS

- Boé J, Hall A, Colas F, McWilliams J, Qu X, Kurian J, Deutsch C, Kapnick S, Frenzel H (2010) What shapes mesoscale wind anomalies in coastal upwelling zones? submitted to *Climate Dynamics*
- Hughes M, Hall A, Kim J (2010) Human-induced changes in Wind, Temperature and Relative Humidity during Santa Ana events. submitted to *Climatic Change*.
- Kapnick S, Hall A (2010) Observed climate-snowpack relationships in California and their implications for the future. accepted to *J. Clim.*
- Moritz M, Moody T, Krawchuk M, Hughes M, Hall A (2010) Spatial Variation in Extreme Winds Predicts Large Wildfire Locations in Chaparral Ecosystems, *Geophys. Res. Lett.* 37, L04801, doi:10.1029/2009GL041735
- Hughes M, Hall A (2009) Local and synoptic mechanisms causing Southern California's Santa Ana winds. *Clim Dyn.* DOI: 10.1007/s00382-009-0650-4
- Hughes M, Hall A, Fovell RG (2009) Blocking in areas of complex topography, and its influence on rainfall distribution. *J. Atmos. Sci.* 66:508-518, DOI: 10.1175/2008JAS2689.1
- Hall A., X. Qu, and J. D. Neelin (2008), Improving predictions of summer climate change in the United States, *Geophys. Res. Lett.*, 35, L01702, doi:10.1029/2007GL032012
- Hughes M, Hall A, Fovell RG (2007) Links between diurnal cycles of wind and temperature in complex topography. *Clim. Dyn.* 29: 277-292, DOI: 10.1007/s00382-007-0239-8
- Conil S, Hall A (2006) Local Modes of Atmospheric Variability: A case study of Southern California. *J. Clim.* 19: 4308–4325
- Hall A and Qu X (2006) Using the current seasonal cycle to constrain snow albedo feedback in future climate change. *Geophys. Res. Lett.*, 33, L03502, doi: 10.1029/2005GL025127.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of California-Santa Barbara				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Frank W Davis				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Frank W Davis - professor				0.00	0.00	1.00	\$ 17,583
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	17,583
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (3) POST DOCTORAL SCHOLARS				12.00	0.00	0.00	135,501
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (1) GRADUATE STUDENTS							12,665
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							165,749
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							27,822
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							193,571
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							7,780
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							198,400
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,500
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							65,311
6. OTHER							26,196
TOTAL OTHER DIRECT COSTS							291,407
H. TOTAL DIRECT COSTS (A THROUGH G)							492,758
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) On Campus rate of 51.5% of TMDC (Rate: 51.5000, Base: 479482)							
TOTAL INDIRECT COSTS (F&A)							246,933
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							739,691
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 739,691
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Frank W Davis				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of California-Santa Barbara				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Frank W Davis				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Frank W Davis - professor				0.00	0.00	1.00	\$ 17,935
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	17,935
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (3) POST DOCTORAL SCHOLARS				12.00	0.00	0.00	139,827
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (1) GRADUATE STUDENTS							12,920
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							170,682
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							29,208
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							199,890
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							8,091
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,560
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							103,828
6. OTHER							27,244
TOTAL OTHER DIRECT COSTS							132,632
H. TOTAL DIRECT COSTS (A THROUGH G)							340,613
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) On Campus rate of 51.5% of TMDC (Rate: 51.5000, Base: 256523)							
TOTAL INDIRECT COSTS (F&A)							132,109
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							472,722
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 472,722
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Frank W Davis				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of California-Santa Barbara				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Frank W Davis				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Frank W Davis - professor	0.00	0.00	1.00	\$	18,294	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00		18,294		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (2) POST DOCTORAL SCHOLARS	12.00	0.00	0.00		96,198		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (1) GRADUATE STUDENTS					13,178		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					127,670		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					22,490		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					150,160		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					7,410		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					1,622		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					99,487		
6. OTHER					28,333		
TOTAL OTHER DIRECT COSTS					129,442		
H. TOTAL DIRECT COSTS (A THROUGH G)					287,012		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) On Campus rate of 51.5% of TMDC (Rate: 51.5000, Base: 185540)							
TOTAL INDIRECT COSTS (F&A)					95,553		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					382,565		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	382,565	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Frank W Davis				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of California-Santa Barbara				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Frank W Davis				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Frank W Davis - professor	0.00	0.00	1.00	\$	18,660	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00		18,660		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (2) POST DOCTORAL SCHOLARS	12.00	0.00	0.00		99,274		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (1) GRADUATE STUDENTS					14,333		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					132,267		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					23,792		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					156,059		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					7,706		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					1,687		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					120,268		
6. OTHER					29,466		
TOTAL OTHER DIRECT COSTS					151,421		
H. TOTAL DIRECT COSTS (A THROUGH G)					315,186		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) On Campus rate of 51.5% of TMDC (Rate: 51.5000, Base: 192635)							
TOTAL INDIRECT COSTS (F&A)					99,207		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					414,393		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	414,393	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Frank W Davis				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of California-Santa Barbara				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Frank W Davis				Proposed	Granted		
				AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Frank W Davis - professor				0.00	0.00	1.00	\$ 19,033
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	19,033
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				12.00	0.00	0.00	51,223
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (1) GRADUATE STUDENTS							14,620
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							84,876
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							16,057
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							100,933
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							6,928
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							6,928
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,754
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							107,390
6. OTHER							30,645
TOTAL OTHER DIRECT COSTS							139,789
H. TOTAL DIRECT COSTS (A THROUGH G)							247,650
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
On Campus rate of 51.5% of TMDC (Rate: 51.5000, Base: 137635)							
TOTAL INDIRECT COSTS (F&A)							70,882
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							318,532
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 318,532 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Frank W Davis				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION University of California-Santa Barbara				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Frank W Davis				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Frank W Davis - professor	0.00	0.00	5.00	\$	91,505	\$	
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	5.00		91,505		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (11) POST DOCTORAL SCHOLARS	60.00	0.00	0.00		522,023		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (5) GRADUATE STUDENTS					67,716		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					681,244		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					119,369		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					800,613		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					37,915		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					198,400		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					8,123		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					496,284		
6. OTHER					141,884		
TOTAL OTHER DIRECT COSTS					844,691		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,683,219		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)					644,684		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					2,327,903		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 2,327,903	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Frank W Davis				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Macrosystems Biology – NSF Program #10-555

Budget Justification

Frank Davis

Bren School of Environmental Science and Management
University of California Santa Barbara

Senior Personnel

Project PI

Dr. Frank Davis will serve as PI for this collaborative research proposal. Davis will advise in many aspects of the project as well as the overall execution of project. Additionally he will take the lead on the reciprocal transplant experimental studies. Davis will contribute to the development of papers and presentations throughout the project. He will liaise with co-investigator Malcolm North (USFS) to ensure consistent methodology is applied across field study site locations. Salary has been calculated using University of California Academic Salary Scales, effective 10/01/07; and includes a 2% COLA for each PY.

Work effort: Year 1 - One month @ \$17,583
Year 2 - One month @ \$17,935
Year 3 - One month @ \$18,294
Year 4 - One month @ \$18,660
Year 5 - One month @ \$19,033

Total = \$91,505

Other Personnel

Post-Doctoral Researcher Years 1-5

This position, advised by PI Davis, PI Redmond and CI Malcolm North will be responsible for coordination and execution of the reciprocal transplant experimental field studies, primarily at Sedgwick Preserve and Figueroa Mountain study locations. Activities include initial experimental design and planning, installation of experimental plots, seed collection and storage, frequent data collection, and analysis. Researcher will actively develop papers and presentations in conjunction with PI Davis. Researcher will also participate in collaborative meetings as needed with entire research group.

Post-Doctoral Researcher Years 1-4

Under the supervision of PI Davis, PI Redmond, and advised by CI North, this position will coordinate and execute reciprocal transplant field studies at the San Joaquin Experimental Range and Teakettle Experimental Forest study locations. Activities include initial experimental design and planning, installation of experimental plots, seed collection and storage, frequent data collection, and analysis. Researcher will actively develop papers and presentations in conjunction with PI Davis and CI North. Researcher will also participate in collaborative meetings as needed with entire research group.

Post-Doctoral Researcher Years 1-2

This position will, under the supervision of PI Davis and advised by CI Alan Flint, perform statistical downscaling of existing climate and future climate projections. This will generate finescale datasets that will be used to model the existing distribution of micro-environments and the species occupation of micro-environments under climate change. Researcher will actively develop papers and presentations in conjunction with PI Davis and CI Flint. Researcher will also participate in collaborative meetings as needed with entire research group.

Graduate Student Researcher Years 1-5

This position will assist with experimental plot management, data collection, analysis and maintenance for roughly four months each year of the project. GSR will also participate in collaborative meetings with research group and generate papers/reports as desired.

Fringe Benefits

Benefit rates are expressed as a percent of salaries. The benefit rates used are in accordance with the rates reported to our audit agency, DHHS.

Senior Personnel – Project PI: Year 1 – 16.7%
Year 2 – 18.7%
Year 3 – 20.7%
Year 4 – 22.7%
Year 5 – 22.7%

Other Personnel:

Post Doctoral Researchers: 17%

Graduate Student Researcher: 9 academic months @1.3%
3 summer months @3%

Also included are the Partial Fee Remission (PFR) and Graduate Student Health Insurance Premiums (GSHIP) for the Graduate student researcher to be supported by this project.

Equipment and Supplies

Experimental plot setup: Requested costs are estimates of equipment and supplies needed to install 40 common garden reciprocal transplant plots and sensor networks at four study sites in the Sierra Nevada mountains and California Coast Range. Experimental plots will be 5 x 5 m and will be fenced with 1.8 m high deerwire to exclude large herbivores including cattle, deer, and feral pigs, as well as with 0.5 m aviary wire buried to 0.25 cm and topped with metal flashing to exclude rodents such as gophers, mice and ground squirrels. Twelve 1 x 1 m subplots will be established within the fenced plot and randomly assigned to 4 species x 3 cohort plantings.

Sensor networks: Line items for sensor networks, automated mini-stations, and garden plot sensors are estimated costs of acquiring sensor required to install 12 distributed sensor networks (100 sensors each) – one at each study location and an additional 40 sensors to monitor each reciprocal transplant plot. HOBO-type sensor units with automated collection of temperature and relative humidity are estimated at \$120/ea. Additionally, each study location will be outfitted with one automated ministration that will provide additional local measurements (e.g. precipitation, wind speed, solar radiation). Mini-stations are estimated at \$2,000 each.

Researcher Workstations: We request one PC workstation for each of the 3 postdoctoral researcher positions estimated at \$1,800 each.

Travel - Domestic

Collaborative Travel Expenses: In our experience, intensive in-person collaboration is the most effective and efficient means to discourse on model construction—it ensures consistent attention and minimizes misunderstandings and errors. Requested travel amount is \$1,000/yr for PI Davis, CI North, CI Flint, and each postdoctoral research position; \$500 per year for the graduate student researcher.

Annual Working Group Meeting Expenses: \$750 per year for logistical support and supplies for semi-annual working group meeting.

Conference Attendance. Annual travel support is requested for the PI Davis, postdoctoral researchers or the graduate student researcher to attend and present at a national conference (e.g. American Geophysical Union, Ecological Society of America): \$1200 per year in travel costs are requested (registration, transportation, lodging, and meals) based on attending a domestic annual meeting.

Other Direct Costs (all increase at 4%/year)

Experimental plot maintenance/repair: We request \$2,000 annually for scheduled maintenance and necessary repairs for each of the 12 reciprocal transplant plot and distributed sensor networks. Maintenance estimates are based on prior research experience of PI Davis with common garden plots and PI Redmond with distributed sensor networks. Transportation and lodging for maintenance personnel is also included in this line item.

Calls, Mailing, Fax: \$200 per year is requested to cover conference call fees and shipping charges.

Publication expenses: \$1500 per year is requested to cover computing costs and page charges for publication.

Computer Support/ICISS Staff Recharge: Requested to support institutional software licensing, network/server maintenance, and general computational support.

Subawards: Due to the wide range of expertise required to complete this project we will enter subaward agreements with the following individuals and institutions.

Conservation International – Dr. Lee Hannah \$138,851 (species distribution and range dynamics modeling)

Desert Research Institute – Dr. Kelly Redmond \$199,485 (climate measurement and sensor network design)

Conservation Biology Institute – Dr. Alexandra Syphard \$168,118 (species distribution and population modeling)

Please refer to separate budget justification documents for each of the subawardees.

Indirect Costs/Facilities and Administrative Costs (F&A)

Facilities and Administrative Cost off-campus research rate of 51.5% of MTDC (modified total direct costs excludes the graduate student's Partial Fee Remission and Graduate Student Health Insurance Premium) is predetermined for the period July 1, 2002 through June 30, 2008, and provisional thereafter. DHHS agreement dated July 11, 2003.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Conservation Biology Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexandra Syphard				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Alexandra Syphard	0.52	0.00	0.00	\$ 4,558	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	0.52	0.00	0.00	4,558		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					4,558		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					889		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					5,447		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					1,070		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					0		
H. TOTAL DIRECT COSTS (A THROUGH G)					6,517		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 20% (Rate: 20.0000, Base: 6517)							
TOTAL INDIRECT COSTS (F&A)					1,303		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					7,820		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 7,820	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexandra Syphard				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Conservation Biology Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexandra Syphard				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Alexandra Syphard	2.10	0.00	0.00	\$ 18,778	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	2.10	0.00	0.00	18,778		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					18,778		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					3,888		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					22,666		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					3,480		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					0		
H. TOTAL DIRECT COSTS (A THROUGH G)					26,146		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 20% (Rate: 20.0000, Base: 26146)							
TOTAL INDIRECT COSTS (F&A)					5,229		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					31,375		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 31,375	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexandra Syphard				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Conservation Biology Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexandra Syphard				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Alexandra Syphard	2.60	0.00	0.00	\$ 24,179	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	2.60	0.00	0.00	24,179		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					24,179		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					5,292		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					29,471		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					1,070		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					500		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					500		
H. TOTAL DIRECT COSTS (A THROUGH G)					31,041		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 20% (Rate: 20.0000, Base: 31041)							
TOTAL INDIRECT COSTS (F&A)					6,208		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					37,249		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 37,249	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Alexandra Syphard				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Conservation Biology Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexandra Syphard				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Alexandra Syphard	2.60	0.00	0.00	\$ 24,903	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	2.60	0.00	0.00	24,903		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					24,903		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					5,742		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					30,645		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					3,480		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					500		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					500		
H. TOTAL DIRECT COSTS (A THROUGH G)					34,625		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 20% (Rate: 20.0000, Base: 34625)							
TOTAL INDIRECT COSTS (F&A)					6,925		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					41,550		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 41,550	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Alexandra Syphard				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Conservation Biology Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexandra Syphard				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Alexandra Syphard	2.60	0.00	0.00	\$ 25,650	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	2.60	0.00	0.00	25,650		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					25,650		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					6,075		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					31,725		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					1,070		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					500		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					500		
H. TOTAL DIRECT COSTS (A THROUGH G)					33,295		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 20% (Rate: 20.0000, Base: 33295)							
TOTAL INDIRECT COSTS (F&A)					6,659		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					39,954		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 39,954	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexandra Syphard				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Conservation Biology Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexandra Syphard				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1. Alexandra Syphard		10.42	0.00	0.00	\$ 98,068	\$	
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)		0.00	0.00	0.00	0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)		10.42	0.00	0.00	98,068		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS		0.00	0.00	0.00	0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		0.00	0.00	0.00	0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					98,068		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					21,886		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					119,954		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					10,170		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					1,500		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					1,500		
H. TOTAL DIRECT COSTS (A THROUGH G)					131,624		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)					26,324		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					157,948		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 157,948	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexandra Syphard				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget
Alexandra D. Syphard
Conservation Biology Institute

	Hours	Hourly Salary	Fringe	Hourly Rate	Costs
Year 1	90	\$50.64	\$9.88	\$60.52	\$5,447
Year 2	360	\$52.16	\$10.80	\$62.96	\$22,666
Year 3	450	\$53.73	\$11.76	\$65.49	\$29,471
Year 4	450	\$55.34	\$12.76	\$68.10	\$30,645
Year 5	450	\$57.00	\$13.50	\$70.50	\$31,725
					\$119,954
Travel					\$10,170
Publication & materials					\$1,500
Total Direct					\$131,624
Indirect rate 20%					\$26,325
Total					\$157,948

Budget Justification

Senior Personnel
Project PI

Alexandra Syphard will contribute to the development of fire-regime maps, models, and parameters that will be incorporated into the population and landscape models and will coordinate with Moritz as external supervisor of the UCB postdoctoral student (years 2 and 3). Dr. Syphard will work with Franklin in the integration of experimental data and modeling methods for the species mechanistic modeling (years 2 – 5) and will share responsibility for development of the landscape model, as well as analysis and interpretation of model results (years 4 and 5). She and Franklin will also work closely with Regan to link the population, landscape, and species mechanistic models (years 4 and 5). Syphard will contribute to papers and presentations throughout the project. To fulfill these responsibilities, salary is requested for 0.5 month in year 1, 2 months in year 2, and 2.5 months for years 3 – 5. Increase in salary over this tie period is estimated to increase by 3% each year.

Fringe Benefits:

Fringe benefits (25% of annual salary) include all medical, dental, and retirement benefits plus corporate payroll taxes. Expected increase is 1% each year.

Travel – Domestic

Mileage reimbursement, hotel and per diem support is requested for annual group project meetings at UCSB. In addition, two trips are requested to meet with the postdoctoral student at UCB. Support is also requested to attend and present at 2 national conferences.

Other Direct Costs

\$500 per year is requested to cover computing costs and page charges for publication in years 3-5.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Conservation International				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Lee Hannah				AWARD NO.	Proposed	Granted
				NSF Funded Person-months		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Lee Hannah - Senior Scientist				1.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
Indirect cost rate at 18.04% (Rate: 18.0400, Base: 17550)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Lee Hannah				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Conservation International				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Lee Hannah				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1.	Lee Hannah - Senior Scientist			1.00	0.00	0.00	\$ 12,692
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			1.00	0.00	0.00	12,692
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	0
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							12,692
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,040
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							17,732
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							10,710
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							525
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							525
H. TOTAL DIRECT COSTS (A THROUGH G)							28,967
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Indirect cost rate at 18.04% (Rate: 18.0400, Base: 28967)							
TOTAL INDIRECT COSTS (F&A)							5,226
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							34,193
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 34,193 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Lee Hannah				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Conservation International				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Lee Hannah				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Lee Hannah - Senior Scientist			1.00	0.00	0.00	\$ 13,200
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			1.00	0.00	0.00	13,200
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	0
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							13,200
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,242
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							18,442
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						551
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							551
H. TOTAL DIRECT COSTS (A THROUGH G)							18,993
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Indirect cost rate at 18.04% (Rate: 18.0400, Base: 18993)							
TOTAL INDIRECT COSTS (F&A)							3,426
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							22,419
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 22,419 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Lee Hannah				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Conservation International				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Lee Hannah				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Lee Hannah - Senior Scientist				1.00	0.00	0.00	\$ 13,728
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	0.00	13,728
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							13,728
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,451
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							19,179
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							11,808
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							579
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							579
H. TOTAL DIRECT COSTS (A THROUGH G)							31,566
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 18.04% (Rate: 18.0400, Base: 31566)							
TOTAL INDIRECT COSTS (F&A)							5,695
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							37,261
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 37,261 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Lee Hannah				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Conservation International				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Lee Hannah				Proposed	Granted		
				AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Lee Hannah - Senior Scientist				1.00	0.00	0.00	\$ 14,277
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	0.00	14,277
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							14,277
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,669
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							19,946
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							608
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							608
H. TOTAL DIRECT COSTS (A THROUGH G)							20,554
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Indirect cost rate at 18.04% (Rate: 18.0400, Base: 20554)							
TOTAL INDIRECT COSTS (F&A)							3,708
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							24,262
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 24,262 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Lee Hannah				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Conservation International				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Lee Hannah				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Lee Hannah - Senior Scientist				5.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				5.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Lee Hannah				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

CONSERVATION INTERNATIONAL

SECTION F: BUDGET JUSTIFICATION

A. Salaries and Wages

The salaries of personnel in the Virginia region are based on current salaries, with an average annual increase of 4% in accordance with Conservation International's Personnel Evaluation Policy.

Scientist working on this project will be Lee Hannah, Senior Scientist, Climate Change Biology

Work effort:

Year 1: One month for \$12,204

Year 2: One month for \$12,692

Year 3: One month for \$13,200

Year 4: One month for \$13,728

Year 5: One month for \$14,277

Total 5 years of the project: 5 months days for \$66,101

Please refer to the budget for further detail.

C. Fringe Benefits

Conservation International has a NICRA fringe benefit rate of 39.71% of salaries for full-time staff based at headquarters, and includes health and social security benefits.

Fringe per year:

Year 1: \$4,846

Year 2: \$5,040

Year 3: \$5,242

Year 4: \$5,451

Year 5: \$5,669

Total fringe for 5 years is \$26,249

E. Travel

Travel amounts are estimated based on the following schedule:

Year 2: Two international trips for Lee Hannah to Cape Town to coordinate field works (\$1,575 for international airfare per trip plus \$473 per day for lodging, meals, and incidentals for 8 days per trip). Total for the two trips is estimated to be \$10,710

Year 4: Two international trips for Lee Hannah to Cape Town to coordinate field works and follow-up project activities (\$1,736 for international airfare per trip plus \$521 for lodging, meals, and incidentals per day for 8 days per trip). Total for the two trips is estimated to be \$11,808

International Airfare

The budget amounts were calculated based on US airlines fares, also taking into account the average cost of our actual staff that travels these routes on a frequent basis. International flights may vary according to the season or the availability of seats.

Per Diem

The per diem was calculated on the basis of the average cost for three star hotel accommodations, three meals per day and incidentals. We are estimating an average international per diem of \$473 for Cape Town in Year 2 and based on an inflation factor of 5% per year we are estimating a cost increase of 10% from year 2 costs for Year 4. In accordance with CI policy, CI staff is reimbursed for actual expenses incurred.

G. Other Direct Costs

1. Material and Supplies

The amount is calculated based on the following:

Year 1 to Year 5: \$500 for office supplies. We are estimating an annual increase of 5% for each year. Total Materials and Supplies will be \$2,763

I. Indirect Costs

Conservation International provisional indirect rate with its cognizant agency (US Agency for International Development.) is 20.92%. Our most recent NICRA was signed in September 2009 and rates were based on the FY08 audit. Based on our FY09 A-133 audit, we are applying a lower rate of 18.04%. The lower rate of 18.04% is applied to modified direct costs; that is all direct costs except for major equipment, subgrants, ocean freight, and currency gain/loss.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Nevada Desert Research Institute				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kelly T Redmond				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Kelly T Redmond				1.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						13,154
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						5,525
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						18,679
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						2,650
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						1,800
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						1,800
H. TOTAL DIRECT COSTS (A THROUGH G)						23,129
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 59% (Rate: 59.0000, Base: 23129)						
TOTAL INDIRECT COSTS (F&A)						13,646
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						36,775
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 36,775 \$
M. COST SHARING PROPOSED LEVEL \$ 0 AGREED LEVEL IF DIFFERENT \$						
PI/PI NAME Kelly T Redmond				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of Nevada Desert Research Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kelly T Redmond				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Kelly T Redmond			1.00	0.00	0.00	\$ 13,812
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			1.00	0.00	0.00	13,812
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	0
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							13,812
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,801
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							19,613
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,650
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____						0
2.	TRAVEL _____						0
3.	SUBSISTENCE _____						0
4.	OTHER _____						0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							1,800
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							1,800
H. TOTAL DIRECT COSTS (A THROUGH G)							24,063
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 59% (Rate: 59.0000, Base: 24063)							
TOTAL INDIRECT COSTS (F&A)							14,197
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							38,260
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 38,260 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kelly T Redmond				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Nevada Desert Research Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kelly T Redmond				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Kelly T Redmond			1.00	0.00	0.00	\$ 14,502
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			1.00	0.00	0.00	14,502
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	0
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							14,502
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							6,091
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							20,593
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,650
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____						0
2.	TRAVEL _____						0
3.	SUBSISTENCE _____						0
4.	OTHER _____						0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							1,800
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							1,800
H. TOTAL DIRECT COSTS (A THROUGH G)							25,043
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 59% (Rate: 59.0000, Base: 25043)							
TOTAL INDIRECT COSTS (F&A)							14,775
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							39,818
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 39,818
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kelly T Redmond				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of Nevada Desert Research Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kelly T Redmond				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Kelly T Redmond	1.00	0.00	0.00	\$ 15,227	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	1.00	0.00	0.00	15,227		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					15,227		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					6,396		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					21,623		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					2,650		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					1,800		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					1,800		
H. TOTAL DIRECT COSTS (A THROUGH G)					26,073		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect cost rate at 59% (Rate: 59.0000, Base: 26073)							
TOTAL INDIRECT COSTS (F&A)					15,383		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					41,456		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 41,456	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kelly T Redmond				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of Nevada Desert Research Institute				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kelly T Redmond				AWARD NO.			
				Proposed	Granted		
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kelly T Redmond				1.00	0.00	0.00	\$ 15,989
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	0.00	15,989
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							15,989
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							6,715
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							22,704
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							2,650
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,650
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							1,800
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							1,800
H. TOTAL DIRECT COSTS (A THROUGH G)							27,154
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Indirect cost rate at 59% (Rate: 59.0000, Base: 27154)							
TOTAL INDIRECT COSTS (F&A)							16,021
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							43,175
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 43,175 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kelly T Redmond				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Nevada Desert Research Institute				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kelly T Redmond				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Kelly T Redmond				5.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				5.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						72,684
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						30,528
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						103,212
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						13,250
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						9,000
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						9,000
H. TOTAL DIRECT COSTS (A THROUGH G)						125,462
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						74,022
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						199,484
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 199,484 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Kelly T Redmond				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

DRI - Budget Justification

General: The methods used in estimating the costs for this proposal are consistent with those used in other projects of this type and are consistent with DRI's governing Federal cost principles, OMB A-122.

Salaries: The Desert Research Institute (DRI) is a non-profit research institution of higher education (as opposed to a degree granting entity). As such, DRI faculty salaries are funded solely from grants and contracts with no ability to obtain tenure. It is our understanding that this qualifies DRI for an exemption from the new guidance which limits salary support. Monthly rates are based on current actual salaries with a 5% increase for annual merit and cost of living adjustment for the future project years. The salary coverage for all DRI faculty and support staff is provided by soft funding (grants and contracts).

Funding is requested for Kelly Redmond for one month salary for each of the five years of the project duration. Dr. Redmond will work with UCSB graduate students and post-docs on field sensing and interpretation of climate measurements. He is currently a co-PI on an NSF project to install and manage data from 20 climate stations in the UC Natural Reserve System, and will integrate these activities with those proposed. He also leads the Surface Climate Mapping Consortium, a group of about 30 organizations interested in improvement of techniques such as PRISM for mapping climate and its variability at fine spatial scales.. He will attend annual project meetings, visit the field stations, attend science conferences to report on this work, and assist in the preparation of research manuscripts arising during the project.

Fringe Benefits: The fringe benefit rate is 42% for professional employees. Rates are negotiated and approved annually by the U.S. Department of Health and Human Services. DRI uses a fringe benefit rate, which is applied to salaries for both budgeting and charging purposes for research projects. The benefits that are included in the rate are FICA, health insurance, vacation, sick leave, unemployment, grant-in-aid, disability insurance, Medicare, and retirement plan.

Equipment: None

Travel: All per diem rates are based on the Federal Travel Regulations, airfare rates are based on 7-21 day advance coach-class, and vehicle rental rates are based on contracted rates for State of Nevada agencies. Funding is requested for travel and registration for one science conference per year, and travel to the field site(s).

Other Direct Costs: Funding is requested for communications, copying, software and graphics upgrades, and other supplies in support of the project..

Indirect Costs: Indirect cost rates are negotiated and approved by the U.S. Department of Health and Human Services. The current indirect cost rate for NSF projects is 71% effective 07/01/09; however, DRI has elected to use the rate of 59% on this proposal. Indirect cost has been applied to total direct cost.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Arizona State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Janet Franklin				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Janet Franklin - ASU-PI				0.00	0.00	1.00	\$ 10,920
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	10,920
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							10,920
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							3,112
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							14,032
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,412
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							500
H. TOTAL DIRECT COSTS (A THROUGH G)							16,944
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.5000, Base: 16944)							
TOTAL INDIRECT COSTS (F&A)							8,896
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							25,840
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 25,840 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Janet Franklin				FOR NSF USE ONLY			
ORG. REP. NAME* Patricia McGlynn				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION Arizona State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Janet Franklin				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Janet Franklin - ASU-PI				0.00	0.00	1.00	\$ 11,357
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	11,357
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							11,357
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							3,237
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							14,594
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,412
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							500
H. TOTAL DIRECT COSTS (A THROUGH G)							17,506
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.5000, Base: 17506)							
TOTAL INDIRECT COSTS (F&A)							9,191
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							26,697
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 26,697 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Janet Franklin				FOR NSF USE ONLY			
ORG. REP. NAME* Patricia McGlynn				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Arizona State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Janet Franklin				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Janet Franklin - ASU-PI	0.00	0.00	1.00	\$	11,811	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00		11,811		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (1) GRADUATE STUDENTS					28,840		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					40,651		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					5,529		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					46,180		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					2,412		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					500		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					18,521		
TOTAL OTHER DIRECT COSTS					19,021		
H. TOTAL DIRECT COSTS (A THROUGH G)					67,613		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.5000, Base: 50092)							
TOTAL INDIRECT COSTS (F&A)					26,298		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					93,911		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	93,911	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Janet Franklin				FOR NSF USE ONLY			
ORG. REP. NAME* Patricia McGlynn				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION				FOR NSF USE ONLY			
Arizona State University				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Janet Franklin				AWARD NO.			
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Janet Franklin - ASU-PI				0.00	0.00	1.00	\$ 12,284
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	12,284
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (1) GRADUATE STUDENTS							29,993
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							42,277
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,750
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							48,027
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							2,412
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,412
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							19,923
TOTAL OTHER DIRECT COSTS							20,423
H. TOTAL DIRECT COSTS (A THROUGH G)							70,862
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 52.5000, Base: 51939)							
TOTAL INDIRECT COSTS (F&A)							27,268
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							98,130
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 98,130 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Janet Franklin				FOR NSF USE ONLY			
ORG. REP. NAME* Patricia McGlynn				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Arizona State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Janet Franklin				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1.	Janet Franklin - ASU-PI			0.00	0.00	1.00	\$ 12,775
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			0.00	0.00	1.00	12,775
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	0
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							12,775
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							3,641
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							16,416
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,412
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,000
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							1,500
H. TOTAL DIRECT COSTS (A THROUGH G)							20,328
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 52.5000, Base: 20328)							
TOTAL INDIRECT COSTS (F&A)							10,672
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							31,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 31,000
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Janet Franklin				FOR NSF USE ONLY			
ORG. REP. NAME* Patricia McGlynn				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Arizona State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Janet Franklin				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Janet Franklin - ASU-PI				0.00	0.00	5.00	\$ 59,147
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	5.00	59,147
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (2) GRADUATE STUDENTS							58,833
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							117,980
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							21,269
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							139,249
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							12,060
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							2,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,000
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							38,444
TOTAL OTHER DIRECT COSTS							41,944
H. TOTAL DIRECT COSTS (A THROUGH G)							193,253
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							82,325
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							275,578
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 275,578 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Janet Franklin				FOR NSF USE ONLY			
ORG. REP. NAME* Patricia McGlynn				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

A. Senior Personnel \$59,147

Janet Franklin (ASU PI on the Collaborative Project) has primary responsibility for the successful implementation of the project at ASU including communication with all other PIs and collaborators. She will train and supervise the student at ASU to carry out advanced geospatial data processing and statistical analysis. She will have primary responsibility for oversight and preparation of reports, technical documents and peer-reviewed publications resulting from the proposed research.

Franklin and her student will have primary responsibility for the distribution modeling (SDM) component of the project, with the greatest activity in years 2-4, because those models will link the climate downscaling and field trial data (years 1-3) with the population modeling (years 4-5). We will create statistical, predictive models of species distributions based on downscaled topoclimate data and use them to create predictive maps of future distributions under climate change.

Franklin will devote 1 summer month @ 100% FTE each year toward this project. In years 1 and 2 this will support close coordination with other PIs regarding development of downscaled topoclimate data in a form suitable for input to SDMs, as well as design and implementation of field trials and data collection in a form suitable for input to SDMs. In years 3-4 Franklin's time will be devoted to supervision of the doctoral student and development of SDMs, and linking them to population models. In year 5 her time will be devoted to implementation of community/landscape models (BioMove) based on SDM input.

B. Other Personnel \$58,833

One Ph.D. GRA will work 50% FTE (20 hours/week) over 12 months in two of the project years. This individual will be responsible for assisting Franklin with the proposed research, acquiring and preprocessing in situ species data from the field trials, GIS environmental data including climate maps and future climate projections, implementing the species distribution modeling under current and future scenarios, and preparation of technical reports, dissertation, conference presentations and manuscripts for peer-reviewed publication. This student will also assist with data preparation for the BioMove model which will be run in collaboration with Syphard (CBI), Hannah (CI/UCSB) and others (PI Davis at UCSB).

C. Fringe Benefits \$21,269

Benefits for faculty are calculated at 28.5%, and benefits for graduate research students is calculated at 7.5%.

D. Equipment

None

E. Travel \$12,060

Funds are requested for PI and/or GRA for domestic travel to attend project meetings at UCSB twice a year. This complex project will require close collaboration among many distributed

investigators. Perdiem is based on the State of Arizona travel policy; perdiem for Santa Barbara is \$223/day per person during the high season.

F. Participant Support

None

G. Other Direct Costs \$41,944

Funds are allocated for publications \$1,000

Other funds are requested for data archiving (off site, per NSF requirements), \$2,000

Materials and supplies are budgeted at \$500 a year (\$2,500)

Tuition for graduate students is included as a benefit for graduate students and is charged to projects in proportion to the amount of effort the graduate student will work on the project. The tuition charge for graduate students is \$14,231 for FY 11 and \$15,369 for FY 12. Students must take at least one credit hour if working in the summer. One credit hour of tuition will be charged during the summer at \$790 in FY11, and \$854 in FY12. Tuition is exempt from the Facilities and Administrative (F&A) costs. The cost for tuition remission increases by 8% per year, total requested is \$36,444 for years 3 and 4 only.

H. Total Direct Costs \$193,253

I. Indirect Costs \$82,325

Indirect costs are calculated on Modified Total Direct Costs (MTDC) using F&A rates approved by US Department of Health and Human Services. The University's rate agreement was revised on June 16, 2009. Items excluded from F&A calculation include: graduate student tuition remission, participant support, subcontracts over the first \$25,000, capital equipment. F&A rate of 52.5% was used for this project. The indirect costs for this project are listed below:

J. Total Direct and Indirect Costs (H+I) \$275,578

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of California-Riverside				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Helen M Regan				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Helen M Regan - Assoc Researcher				0.00	0.00	1.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						9,599
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						1,248
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						10,847
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						3,262
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						500
H. TOTAL DIRECT COSTS (A THROUGH G)						14,609
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 14609)						
TOTAL INDIRECT COSTS (F&A)						7,597
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						22,206
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 22,206 \$
M. COST SHARING PROPOSED LEVEL \$ 0 AGREED LEVEL IF DIFFERENT \$						
PI/PI NAME Helen M Regan				FOR NSF USE ONLY		
ORG. REP. NAME* Ursula Prins				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of California-Riverside				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Helen M Regan				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Helen M Regan - Assoc Researcher				0.00	0.00	1.00	\$ 9,791
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	9,791
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							9,791
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,469
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							11,260
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							3,262
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							3,262
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							500
H. TOTAL DIRECT COSTS (A THROUGH G)							15,022
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 52.0000, Base: 15022)							
TOTAL INDIRECT COSTS (F&A)							7,811
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							22,833
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 22,833 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Helen M Regan				FOR NSF USE ONLY			
ORG. REP. NAME* Ursula Prins				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of California-Riverside				FOR NSF USE ONLY				
				PROPOSAL NO.	DURATION (months)			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Helen M Regan				AWARD NO.	Proposed	Granted		
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months
				CAL	ACAD	SUMR		
1. Helen M Regan - Assoc Researcher				0.00	0.00	1.00	\$ 9,987	\$
2.								
3.								
4.								
5.								
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	9,987	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS							0	
4. (0) UNDERGRADUATE STUDENTS							0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0	
6. (0) OTHER							0	
TOTAL SALARIES AND WAGES (A + B)							9,987	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,698	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							11,685	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
TOTAL EQUIPMENT							0	
E. TRAVEL							3,262	
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							3,262	
2. FOREIGN							0	
F. PARTICIPANT SUPPORT COSTS								
1. STIPENDS \$ _____				0				
2. TRAVEL _____				0				
3. SUBSISTENCE _____				0				
4. OTHER _____				0				
TOTAL NUMBER OF PARTICIPANTS (0)								
TOTAL PARTICIPANT COSTS							0	
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES							500	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0	
3. CONSULTANT SERVICES							0	
4. COMPUTER SERVICES							0	
5. SUBAWARDS							0	
6. OTHER							0	
TOTAL OTHER DIRECT COSTS							500	
H. TOTAL DIRECT COSTS (A THROUGH G)							15,447	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)								
MTDC (Rate: 52.0000, Base: 15447)								
TOTAL INDIRECT COSTS (F&A)							8,032	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							23,479	
K. RESIDUAL FUNDS							0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 23,479	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$				
PI/PI NAME Helen M Regan				FOR NSF USE ONLY				
ORG. REP. NAME* Ursula Prins				INDIRECT COST RATE VERIFICATION				
		Date Checked		Date Of Rate Sheet		Initials - ORG		

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of California-Riverside				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Helen M Regan				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Helen M Regan - Assoc Researcher	0.00	0.00	1.00	\$	10,187	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00		10,187		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (1) GRADUATE STUDENTS					14,089		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					24,276		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					20,555		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					44,831		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					3,262		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					500		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					500		
H. TOTAL DIRECT COSTS (A THROUGH G)					48,593		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 30405)							
TOTAL INDIRECT COSTS (F&A)					15,811		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					64,404		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	64,404	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Helen M Regan				FOR NSF USE ONLY			
ORG. REP. NAME* Ursula Prins				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of California-Riverside				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Helen M Regan				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Helen M Regan - Assoc Researcher				0.00	0.00	1.00	\$ 10,391
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	10,391
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (1) GRADUATE STUDENTS							14,371
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							24,762
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							22,712
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							47,474
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							3,262
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							3,262
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							500
H. TOTAL DIRECT COSTS (A THROUGH G)							51,236
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 52.0000, Base: 31146)							
TOTAL INDIRECT COSTS (F&A)							16,196
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							67,432
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 67,432 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Helen M Regan				FOR NSF USE ONLY			
ORG. REP. NAME* Ursula Prins				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of California-Riverside				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Helen M Regan				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Helen M Regan - Assoc Researcher				0.00	0.00	5.00	\$ 49,955
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	5.00	49,955
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (2) GRADUATE STUDENTS							28,460
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							78,415
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							47,682
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							126,097
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							16,310
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							2,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							2,500
H. TOTAL DIRECT COSTS (A THROUGH G)							144,907
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							55,447
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							200,354
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 200,354
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Helen M Regan				FOR NSF USE ONLY			
ORG. REP. NAME* Ursula Prins				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification
Helen Regan
Dept. of Biology, UC Riverside

Senior Personnel

Project PI

Helen Regan will support the population modeling components of this project, and the integration of the experimental data, species distribution modeling and population models in RAMAS GIS for which the equivalent of 1 month salary for each Project Year (PY) is requested. Dr. Regan will work with the UCR graduate student, the UCSB, ASU, UCB teams and Syphard on integrating the various data and modeling components of this project. She will assist the UCR graduate student in developing the population models and linking them to the species distribution models. She will advise and assist in analyzing the data from field experiments into parameters for the model. Regan will contribute to the development of papers and presentations throughout the project. She will liaise with the ASU team and Syphard to ensure compatibility in the population models across the RAMAS GIS and BioMove platforms. Salary has been calculated using University of California Academic Salary Scales, effective 10/01/07; and includes a 2% COLA for each PY.

Other Personnel

Graduate Student Researcher

We request full support (49% x 12 mos and 100% for 3 months over the summer) for one Graduate Student Researcher in years 4 and 5 of this 5-year project. The student will be responsible for constructing the population models, estimating model parameters from the data collected in the field and the literature, linking the model to the SDMs and in executing the model and compiling results. This will include converting available demographic data into model parameters, characterizing variability and uncertainty in model parameters, linking the fire hazard functions to the population models and linking the population models with the SDMs. The PhD student will work closely with Regan who will assist in the model development and in the model parametrization. S/he will run the model with scenarios, perform detailed sensitivity analyses and analyze results. Salary has been calculated using University of California Academic Salary Scales, effective 10/01/07; and includes a 2% COLA for each PY.

Fringe Benefits

Benefit rates are expressed as a percent of salaries. The benefit rates used are in accordance with the rates reported to our audit agency, DHHS.

Senior Personnel – Project PI: 12.7%

Graduate Student Researcher: 3.06%

Also included are the Partial Fee Remission (PFR) and Graduate Student Health Insurance Premiums (GSHIP) for the Graduate student researcher to be supported by this project.

Travel - Domestic

Annual project meetings: In our experience, intensive in-person collaboration is the most effective and efficient means to discourse on model construction—it ensures consistent attention and minimizes misunderstandings and errors. As such, mileage reimbursement, hotel and per diem support is requested for UCR researchers to meet with collaborators at UCSB for 8 days per year. These are projected at \$300 mileage + 8days/year x \$160/night hotel + 8days/year x \$54/day per diem + \$50/year parking.

Conference Attendance. Annual travel support is requested for the PI Regan or the graduate student researcher to attend and present at a national conference: \$1200 per year in travel costs are requested (registration, transportation, lodging, and meals) based on attending a domestic annual meeting.

Other Direct Costs

\$500 per year is requested to cover computing costs and page charges for publication.

Indirect Costs/Facilities and Administrative Costs (F&A)

Facilities and Administrative Cost off-campus research rate of 52% of MTDC (modified total direct costs excludes the graduate student's Partial Fee Remission and Graduate Student Health Insurance Premium) is predetermined for the period July 1, 2002 through June 30, 2008, and provisional thereafter. DHHS agreement dated July 11, 2003.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Max A Moritz				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Max A Moritz - Professor				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							840
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							2,400
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							2,400
H. TOTAL DIRECT COSTS (A THROUGH G)							3,240
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (Rate: 53.5000, Base: 3240)							
TOTAL INDIRECT COSTS (F&A)							1,733
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							4,973
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 4,973 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Max A Moritz				FOR NSF USE ONLY			
ORG. REP. NAME* Deborah Rutkowski-howard				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Max A Moritz				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
	CAL	ACAD	SUMR				
1. Max A Moritz - Professor	0.00	0.00	0.00	\$	0	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS	12.00	0.00	0.00		50,000		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					50,000		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					8,500		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					58,500		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					3,360		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					400		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					400		
H. TOTAL DIRECT COSTS (A THROUGH G)					62,260		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Modified Total Direct Costs (Rate: 53.5000, Base: 62260)							
TOTAL INDIRECT COSTS (F&A)					33,309		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					95,569		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	95,569	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Max A Moritz				FOR NSF USE ONLY			
ORG. REP. NAME* Deborah Rutkowski-howard				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Max A Moritz				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Max A Moritz - Professor				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				12.00	0.00	0.00	50,000
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							50,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							8,500
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							58,500
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							3,360
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							3,360
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							400
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							400
H. TOTAL DIRECT COSTS (A THROUGH G)							62,260
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Modified Total Direct Costs (Rate: 53.5000, Base: 62260)							
TOTAL INDIRECT COSTS (F&A)							33,309
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							95,569
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 95,569 \$
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Max A Moritz				FOR NSF USE ONLY			
ORG. REP. NAME* Deborah Rutkowski-howard				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Max A Moritz				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Max A Moritz - Professor				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							840
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							400
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							400
H. TOTAL DIRECT COSTS (A THROUGH G)							1,240
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (Rate: 53.5000, Base: 1240)							
TOTAL INDIRECT COSTS (F&A)							663
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,903
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 1,903 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Max A Moritz				FOR NSF USE ONLY			
ORG. REP. NAME* Deborah Rutkowski-howard				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Max A Moritz				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Max A Moritz - Professor				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							840
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							840
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							400
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							400
H. TOTAL DIRECT COSTS (A THROUGH G)							1,240
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Modified Total Direct Costs (Rate: 53.5000, Base: 1240)							
TOTAL INDIRECT COSTS (F&A)							663
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,903
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 1,903 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Max A Moritz				FOR NSF USE ONLY			
ORG. REP. NAME* Deborah Rutkowski-howard				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Max A Moritz				AWARD NO.	Proposed	Granted
				NSF Funded Person-months		
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Max A Moritz - Professor				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (2) POST DOCTORAL SCHOLARS				24.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						100,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						17,000
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						117,000
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						9,240
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						4,000
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						4,000
H. TOTAL DIRECT COSTS (A THROUGH G)						130,240
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						69,677
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						199,917
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 199,917
M. COST SHARING PROPOSED LEVEL \$ 0 AGREED LEVEL IF DIFFERENT \$						
PI/PI NAME Max A Moritz				FOR NSF USE ONLY		
ORG. REP. NAME* Deborah Rutkowski-howard				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Personnel Salaries: We are requesting 2 years at 100% time for a post-doctoral research associate who will perform research in fire distribution modeling and assist in integrating results with vegetation distribution and population viability models (primarily with PI Syphard). This effort will take place relatively early in the project (e.g., anticipated over years 2-3), so that fire-related data is available to other collaborators needing future fire projections under climate change scenarios.

Fringe Benefits: All fringe benefits are based on the University of California, Berkeley composite rates for post-doctoral researcher benefits (17%).

Travel: We are requesting support for travel to participate in project team meetings each year (i.e., 5 trips for PI Moritz and 2 trips for post-doctoral researcher). In addition, funds are requested for 2 trips per year for 2 years (4 total) for the post-doctoral researcher to work directly with PI Syphard on integration of fire projections with vegetation distribution models. Estimates for travel costs are as follows for each trip:

Travel details:

\$300 Flight (RT San Francisco Bay Area to southern CA)

\$300 Hotel (\$150/night for 2 nights)

\$240 Meals, transportation, and incidental expenses (\$80/day for 3 days)

Total travel request is for 11 trips * \$840/trip = \$9240

Other Direct Costs: We are requesting \$2000 for computer hardware requirements over the life of the project (e.g., a PC and data storage devices for fire modeling) and \$400/year for general materials and computing supplies related to the project.

Indirect Costs: Indirect cost rates for the University of California, Berkeley campus are 53.5% for the project period and are requested for allowed categories.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of California-Los Angeles				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexander D Hall				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
	CAL	ACAD	SUMR				
1. Alexander D Hall - PI	0.00	0.00	1.00	\$	10,333	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00		10,333		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS	12.00	0.00	0.00		50,000		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					60,333		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					10,812		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					71,145		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
HOFFMAN CLUSTER				\$	15,000		
RAID ARRAY					15,000		
TOTAL EQUIPMENT					30,000		
E. TRAVEL					2,000		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					3,400		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					3,000		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					1,200		
5. SUBAWARDS					0		
6. OTHER					543		
TOTAL OTHER DIRECT COSTS					8,143		
H. TOTAL DIRECT COSTS (A THROUGH G)					111,288		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC calculated @ 54% (Rate: 54.0000, Base: 81289)							
TOTAL INDIRECT COSTS (F&A)					43,896		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					155,184		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	155,184	\$	
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Alexander D Hall				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION University of California-Los Angeles				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexander D Hall				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Alexander D Hall - PI	0.00	0.00	1.00	\$	10,850	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00		10,850		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS	12.00	0.00	0.00		52,500		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					63,350		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					11,553		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					74,903		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					2,000		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					1,200		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					3,000		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					1,200		
5. SUBAWARDS					0		
6. OTHER					543		
TOTAL OTHER DIRECT COSTS					5,943		
H. TOTAL DIRECT COSTS (A THROUGH G)					82,846		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC calculated @ 54% (Rate: 54.0000, Base: 82847)							
TOTAL INDIRECT COSTS (F&A)					44,737		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					127,583		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	127,583	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Alexander D Hall				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of California-Los Angeles				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexander D Hall				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Alexander D Hall - PI				0.00	0.00	1.00	\$ 11,393
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	11,393
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							11,393
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,447
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							12,840
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							2,000
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,000
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							100
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,000
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							200
5. SUBAWARDS							0
6. OTHER							54
TOTAL OTHER DIRECT COSTS							1,354
H. TOTAL DIRECT COSTS (A THROUGH G)							16,194
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC calculated @ 54% (Rate: 54.0000, Base: 16195)							
TOTAL INDIRECT COSTS (F&A)							8,745
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							24,939
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 24,939 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexander D Hall				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of California-Los Angeles				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexander D Hall				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Alexander D Hall - PI				0.00	0.00	1.00	\$ 11,620
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	11,620
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							11,620
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,476
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							13,096
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,000
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							100
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,000
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							200
5. SUBAWARDS							0
6. OTHER							54
TOTAL OTHER DIRECT COSTS							1,354
H. TOTAL DIRECT COSTS (A THROUGH G)							16,450
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC calculated @ 54% (Rate: 54.0000, Base: 16450)							
TOTAL INDIRECT COSTS (F&A)							8,883
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							25,333
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 25,333 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexander D Hall				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of California-Los Angeles				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexander D Hall				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Alexander D Hall - PI				0.00	0.00	1.00	\$ 11,853
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	1.00	11,853
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							11,853
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,505
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							13,358
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							2,000
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							100
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,000
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							200
5. SUBAWARDS							0
6. OTHER							54
TOTAL OTHER DIRECT COSTS							1,354
H. TOTAL DIRECT COSTS (A THROUGH G)							16,712
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC calculated @ 54% (Rate: 54.0000, Base: 16712)							
TOTAL INDIRECT COSTS (F&A)							9,024
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							25,736
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 25,736 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Alexander D Hall				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of California-Los Angeles				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Alexander D Hall				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Alexander D Hall - PI				0.00	0.00	5.00	\$ 56,049
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	5.00	56,049
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (2) POST DOCTORAL SCHOLARS				24.00	0.00	0.00	102,500
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							158,549
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							26,793
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							185,342
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
				\$		30,000	
TOTAL EQUIPMENT							30,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							10,000
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							4,900
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							9,000
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							3,000
5. SUBAWARDS							0
6. OTHER							1,248
TOTAL OTHER DIRECT COSTS							18,148
H. TOTAL DIRECT COSTS (A THROUGH G)							243,490
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							115,285
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							358,775
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 358,775 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Alexander D Hall				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

UCLA – PI: Hall- Budget justification: Narrative and Details

*PERSONNEL:

Professor Alex Hall (1.0 summer months/year) is the UCLA PI. He will co-lead the physical modeling team, directing production of dynamic downscales using Regional Earth System Models developed in his lab.

TBN, PDR (12.0 calendar months in Yrs: 01 & 02 only) The UCLA postdoc will be supervised by Professor Hall. He will assist in the physical modeling team; directing production of dynamic downscales using Regional Earth System Models developed in his lab.

Fringe Benefits:

PI's fringe benefits calculated @ 12.7%

PDR's fringe benefits: 19.0% annual

TRAVEL: (1) trip annually

Domestic (1): @ \$2,000/ea collaborators meetings for PI or PDR each year

EQUIPMENT:

(1) \$15K for a RAID array for secure storage of the very large amount of data to be produced, (2) \$15K to purchase some nodes on a high-performance computing cluster.

OTHER COSTS:

MATERIALS AND SUPPLIES \$1,200/year @ \$100/month in Yrs: 01 & 02 and \$100/yr in Yrs: 03-05:
Yr-01 includes workstation for PDR @ \$2,200

Material and Supplies: research related copying, mailing, drafting, computing media & data acquisition, expendable materials.

PUBLICATION COSTS - \$3,000 in Yrs: 01 & 02 and year and \$1000/yr in Yrs: 03-05:

An estimated production of ~24 pages per year in Yrs: 01 & 02 and 8 pages in Yrs: 03-05 of scientific papers resulting from this project. The cost of publishing is ~ \$125/page.

COMPUTER USER'S FEES - \$1,200/year @ \$100/month in Yrs: 01 & 20 and \$100/yr in Yrs: 03-05:

Usage and maintenance costs on Departmental workstations, graphic systems, printers, tape drives, and other peripherals, which will be dedicated to this research effort. Cost estimated @ \$200/month

Section G. 6 - Technology Infrastructure Fee at the rate of \$40.75/FTE @\$543/year in Yrs: 01 & 02 and

\$54/yr in Yrs: 03-05: The Technology Infrastructure Fee (TIF) is a consistently-applied direct charge that is assessed to each and every campus activity unit, regardless of funding source, including units identified as individual grant and contract awards. The TIF pays for campus communication services on the basis of a monthly accounting of actual usage data. These costs are charged as direct costs and are not recovered as indirect costs.

FACILITIES AND ADMINISTRATIVE COST RATES

54.0% MTDC (excluding fee remission). Our rates were approved by U.S.D.H.H.S. (the responsible Federal audit agency) on February 28, 2007.

***Yrs-02-05 personnel budget category includes 5% inflation factor**

Investigator: Frank Davis
Support: Current
Project/Proposal Title: Biofuels and Biodiversity in California
Principal Investigators: Davis, Stoms
Award Number:
Source of Support: California Energy Commission
Total Award Amount: 269,434.00 Total Award Period Covered: 12/11/08-11/26/10
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.00 Sumr: 0.00

Investigator: Frank Davis
Support: Current
Project/Proposal Title: Preparing of Natural Resources Condition Assessment for Santa Monica Mountains NRA, Pinnacles NM, and John Muir NHS.
Principal Investigators: Davis
Award Number: J8C07080005
Source of Support: Department of Interior
Total Award Amount: 143,350.00 Total Award Period Covered: 8/31/08-3/31/11
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.38

Investigator: Frank Davis
Support: Current
Project/Proposal Title: Climate and Land Use Change
Principal Investigators: Davis
Award Number: SB090056
Source of Support: Conservation International
Total Award Amount: 109,527.00 Total Award Period Covered: 11/1/08-5/31/11
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.00

Investigator: Frank Davis
Support: Current
Project/Proposal Title: Spatially-explicit Life Cycle Assessment Tools for Environmental Sustainability.
Principal Investigators: Geyer, Davis, Stoms
Award Number: CBET-0932369
Source of Support: National Science Foundation
Total Award Amount: 218,120.00 Total Award Period Covered: 10/1/09-9/30/11
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.50

Investigator: Frank Davis
Support: Current
Project/Proposal Title: Santa Barbara County Oak Restoration Project
Principal Investigators: Tyler, Davis

Award Number: 06-00881
Source of Support: Santa Barbara County
Total Award Amount: 140,000.00 Total Award Period Covered: 8/7/05-8/6/12
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.00

Investigator: Frank Davis
Support: Current
Project/Proposal Title: Advanced Modeling of the Biological Effects of Climate Change in California.
Principal Investigators: Davis, Hannah, Stoms
Award Number: 500-08-020
Source of Support: California Energy Commission
Total Award Amount: 300,000.00 Total Award Period Covered: 6/1/09-12/30/12
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.33

Investigator: Frank Davis
Support: Pending
Project/Proposal Title: How Abiotic Processes, Biotic Processes, and their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of how a Reach of the Merced River Responds to Restoration.
Principal Investigators: Dunne, Davis, Lenihan
Proposal Number:
Source of Support: CalFed Bay-Delta Program
Total Proposal Amount: 1,400,000.00 Total Award Period Covered: 6/1/06-6/30/11
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.75

Investigator: Frank Davis
Support: Pending
Project/Proposal Title: Downscaling Global Climate Model Data for Terrestrial Biogeographic Analysis.
Principal Investigators: Davis, Hannah, Michaelson
Proposal Number: 20100231
Source of Support: US Department of Energy
Total Proposal Amount: 118,153.00 Total Award Period Covered: 3/1/10-2/28/11
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.25

Investigator: Frank Davis
Support: Pending
Project/Proposal Title: Cumulative Biological Impacts Framework for Solar Energy Projects in the California Desert.
Principal Investigators: Davis, Stoms
Proposal Number: 20101173
Source of Support: California Energy Commission

Total Proposal Amount: 383,787.00 Total Award Period Covered: 7/1/10-6/30/12
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 0.50

Investigator: Frank Davis
Support: Pending
Project/Proposal Title: Collaborative Research: Do microenvironments govern macroecology?
Principal Investigators: Davis (this proposal)
Source of Support: National Science Foundation
Total Proposal Amount: 2,237,903.00.00 Total Award Period Covered: 4/15/11-4/14/16
Location of Project: UCSB
Person Months Per Year Committed to the Project: Cal: 0.00 Acad: 0.18 Sumr: 1.00

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Lee Hannah	Other agencies (including NSF) to which this proposal has been/will be submitted.
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Support: Current Pending Submission Planned in Near Future *Transfer of Support
 Project/Proposal Title:
 Collaborative Research: Do microenvironments govern macroecology?

Source of Support: University of California Santa Barbara, NSF
 Total Award Amount: \$138,851 Total Award Period Covered: April 15, 2011 – April 14, 2016
 Location of Project: Santa Barbara, CA
 Person-Months Per Year Committed to the Project. 1 Cal: 1 Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support
 Project/Proposal Title:
 Ecosystem-based Adaptation in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change

Source of Support: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany
 Total Award Amount: \$5,685,750 Total Award Period Covered: Oct, 2010 – Dec, 2014
 Location of Project: South Africa, Brazil, Philippines
 Person-Months Per Year Committed to the Project. 2.3 Cal: 2.3 Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support
 Project/Proposal Title:
 Adapting to Environmental Change in the Tonle Sap Lake and Floodplains: Enhancing Resilience of Ecosystems and Communities

Source of Support: John T. and Catherine D. MacArthur Foundation
 Total Award Amount: \$265,000 Total Award Period Covered: Jan, 2011 – Dec, 2012
 Location of Project: Cambodia
 Person-Months Per Year Committed to the Project. .4 Cal: .4 Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support
 Project/Proposal Title:
 Cumulative Biological Impacts Framework for Solar Energy Projects in the California Desert

Source of Support: University of California, Santa Barbara
 Total Award Amount: \$34,092 Total Award Period Covered: July, 2010 - June, 2012
 Location of Project: Santa Barbara, CA
 Person-Months Per Year Committed to the Project. .8 Cal: .8 Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support
 Project/Proposal Title:
 Implementation Grant

Source of Support: Gordon & Betty Moore Foundation
 Total Award Amount: \$217,605 Total Award Period Covered: July 1, 2010 – June 30, 2011
 Location of Project: Santa Barbara, CA
 Person-Months Per Year Committed to the Project. 7.5 Cal: 7.5 Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support
 Project/Proposal Title:
 Implementation Grant

Source of Support: Gordon & Betty Moore Foundation

Total Award Amount: \$870,420

Total Award Period Covered: July 1, 2011 – June 30, 2015

Location of Project: Santa Barbara, CA

Person-Months Per Year Committed to the Project. 35.9 Cal: 35.9 Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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USE ADDITIONAL SHEETS AS NECESSARY



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Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.				
Investigator: Redmond, Kelly T.		Other agencies (including NSF) to which this proposal has will be submitted		
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Regional Climate Services Support in the Western Region (<i>PI Brown</i>)				
Source of Support: NOAA				
Total Award Amount: \$512,804		Total Award Period Covered: 07/10 – 03/11		
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project.		Cal: 3.20	Acad:	Sumr:
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Integrated Desert Terrain Forecasting for Military Operations (<i>PI McDonald</i>)				
Source of Support: DOD-Army				
Total Award Amount: \$10,215,808		Total Award Period Covered: 07/03-06/12		
Location of Project: Desert Southwest & Israel				
Person-Months Per Year Committed to Project.		Cal: .50	Acad:	Sumr:
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: HCN-M West CA-NV				
Source of Support: NOAA				
Total Award Amount: \$313,000		Total Award Period Covered: 07/10 – 03/11		
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project.		Cal: 1.75	Acad:	Sumr:
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Wx Coder				
Source of Support: NOAA				
Total Award Amount: \$8,000		Total Award Period Covered: 07/10 – 03/11		
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project.		Cal: 0.25	Acad:	Sumr:
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: NIDIS DM Author				
Source of Support: NOAA				
Total Award Amount: \$75,000		Total Award Period Covered: 07/10 – 03/11		
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project.		Cal: 0.00	Acad:	Sumr:
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: NIDIS Portal				
Source of Support: NOAA				
Total Award Amount: \$75,000		Total Award Period Covered: 07/10 – 03/11		
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project.		Cal: 1.00	Acad:	Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.				
Investigator: Redmond, Kelly T.	Other agencies (including NSF) to which this proposal has will be submitted			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: NIDIS NPIT				
Source of Support: NOAA				
Total Award Amount: \$136,096 Total Award Period Covered: 07/10 – 03/11				
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project. Cal: 2.98 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: National Climate Assessment				
Source of Support: NOAA				
Total Award Amount: \$57,700 Total Award Period Covered: 07/10 – 03/11				
Location of Project: Reno, NV				
Person-Months Per Year Committed to Project. Cal: 0.45 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: Collaborative Research: A Climate Station Network for the UC Natural Reserve System				
Source of Support: NSF				
Total Award Amount: \$248,393 Total Award Period Covered: 09/09 – 08/12				
Location of Project: CA				
Person-Months Per Year Committed to Project. Cal: 0.50 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: WestWide Drought Tracker: Monitoring Drought at Fine Spatial Scales Across the Western US				
Source of Support: NOAA TRACS				
Total Award Amount: \$254,907 Total Award Period Covered: 08/08 – 07/11				
Location of Project: NV				
Person-Months Per Year Committed to Project. Cal: 0.25 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: 2007-2008 Flood Emergency Response Program Improvement Consulting Services				
Source of Support: GEI Consultants				
Total Award Amount: \$230,000 Total Award Period Covered: 07/08 – 11/10				
Location of Project: NV				
Person-Months Per Year Committed to Project. Cal: 1.00 Acad: Sumr:				

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Redmond, Kelly T.	Other agencies (including NSF) to which this proposal has will be submitted		
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support		
Project/Proposal Title: Climate Monitoring Assessment for the Arctic Inventory and Monitoring Network			
Source of Support: DOI – NPS GBCESU			
Total Award Amount: \$22,022		Total Award Period Covered: 09/09 – 11/10	
Location of Project: NV			
Person-Months Per Year Committed to Project.	Cal: 0.30	Acad:	Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support		
Project/Proposal Title: Fire Weather and Climate Information – CAP (T. Brown, PI)			
Source of Support: University of California, San Diego			
Total Award Amount: \$689,509		Total Award Period Covered: 12/98 – 06/10	
Location of Project: NV and CA			
Person-Months Per Year Committed to Project.	Cal: 0.90	Acad:	Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support		
Project/Proposal Title: Aid Hydrologic Basin Management in Eastern Nevada by Assessing Water Availability Under Changing Climate Conditions (J. Thomas, PI)			
Source of Support: Southern Nevada Water Authority			
Total Award Amount: \$200,000		Total Award Period Covered: 09/09 – 06/10	
Location of Project: Eastern NV			
Person-Months Per Year Committed to Project.	Cal: 1.00	Acad:	Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support		
Project/Proposal Title: California Observations and Analysis			
Source of Support: UCSD			
Total Award Amount: \$90,000		Total Award Period Covered: 04/10 – 03/11	
Location of Project: NV			
Person-Months Per Year Committed to Project.	Cal: 0.10	Acad:	Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support		
Project/Proposal Title: A Tahoe Climate Information Management System (TahoeClim)			
Source of Support: USDA Forest Service			
Total Award Amount: \$139,650		Total Award Period Covered: 07/10 – 09/12	
Location of Project: NV			
Person-Months Per Year Committed to Project.	Cal: 0.50	Acad:	Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

NSF Form 1239 (7/95)

USE ADDITIONAL SHEETS AS
NECESSARY

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.				
Investigator: Redmond, Kelly T.	Other agencies (including NSF) to which this proposal has will be submitted			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Climate Change and Water Resources (J. Thomas, PI) Source of Support: Southern Nevada Water Authority Total Award Amount: \$158,000 Total Award Period Covered: 03/08 – 09/10 Location of Project: NV Person-Months Per Year Committed to Project. Cal: 0.50 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Aid Hydrologic Basin Management in Eastern Nevada by Assessing Water Availability Under Changing Climate Conditions (J. Thomas, PI) Source of Support: Southern Nevada Water Authority Total Award Amount: \$200,000 Total Award Period Covered: 09/09 – 01/11 Location of Project: NV Person-Months Per Year Committed to Project. Cal: 1.00 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Environmental Consulting Services (G. Cochran, PI) Source of Support: DOD – Air Force Total Award Amount: \$4,250,000 Total Award Period Covered: 04/10 – 09/14 Location of Project: Classified Person-Months Per Year Committed to Project. Cal: 0.50 Acad: Sumr:				
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Co-Evolution Planning Phase (D. Shafer, PI) Source of Support: USDA Forest Service Total Award Amount: \$300,000 Total Award Period Covered: 05/10 – 09/13 Location of Project: SW United States Person-Months Per Year Committed to Project. Cal: 0.50 Acad: Sumr:				
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: APEX Mine Environmental Monitoring Source of Support: Uranium Company of Nevada, LLC Total Award Amount: \$ 294,336 Total Award Period Covered: 09/08 – 08/11 Location of Project: NV Person-Months Per Year Committed to Project. Cal: 1.00 Acad: Sumr:				

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.				
Investigator: Redmond, Kelly T.	Other agencies (including NSF) to which this proposal has will be submitted			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Pahrnagat climate Monitoring				
Source of Support: DOD – Air Force				
Total Award Amount: \$ 290,418 Total Award Period Covered: 09/09 – 08/12				
Location of Project: NV and CA				
Person-Months Per Year Committed to Project. Cal: 0.27 Acad: Sumr:				
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: California Nevada Applications Program (CNAP)				
Source of Support: University of California, San Diego				
Total Award Amount: \$ 199,711 Total Award Period Covered: 07/10 – 06/11				
Location of Project: NV and CA				
Person-Months Per Year Committed to Project. Cal: 1.25 Acad: Sumr:				
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: CNAP Assessment Supplement				
Source of Support: University of California, San Diego				
Total Award Amount: \$ 208,924 Total Award Period Covered: 07/10 – 06/11				
Location of Project: NV				
Person-Months Per Year Committed to Project. Cal: 0.83 Acad: Sumr:				
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Southwest Climate Science Center				
Source of Support: University of Arizona				
Total Award Amount: \$ 751,205 Total Award Period Covered: 10/10 – 09/15				
Location of Project: NV				
Person-Months Per Year Committed to Project. Cal: 0.00 Acad: Sumr:				
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Web Access to RAWs Data and Products (G. McCurdy, PI)				
Source of Support: NOAA				
Total Award Amount: \$ 23,750 Total Award Period Covered: 09/10 – 08/11				
Location of Project: NV				
Person-Months Per Year Committed to Project. Cal: 0.05 Acad: Sumr:				

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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USE ADDITIONAL SHEETS AS
NECESSARY

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Redmond, Kelly T.	Other agencies (including NSF) to which this proposal has will be submitted		
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Collaborative Research: Do microenvironments govern macroecology? THIS PROPOSAL			
Source of Support: NSF			
Total Award Amount: \$199,488 (DRI)		Total Award Period Covered: 04/11 – 04/16	
Location of Project:			
Person-Months Per Year Committed to Project.		Cal: 1.00	Acad: Sumr:
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.			

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USE ADDITIONAL SHEETS AS
NECESSARY

Current and pending support for Syphard

Current Support

Project/Prosal Title: Collaborative Research: The Persistence of Biodiversity in Southern California Under Future Land-Use Scenarios

PI: Regan, H.M, Franklin, J. (PIs) Syphard, A.D. (Lead Scientist).

Program name: NSF-Directorate for Biological Sciences (BIO)

Performance period: 07/01/08 – 06/30/11

Total budget for Syphard: \$80,000

Commitment by PI: 0.5 FTE, 2008 – 2010

Project/Prosal Title: Quantitative Assessment of the Effect of Fuel Manipulation Projects on Fire Behavior and Urban Loss

PI: Syphard, A.D.

Program name: U. S. Geological Survey Western Ecological Research Center

Performance period: 09/16/08 – 09/30/10

Total budget for Syphard: \$135,000

Commitment by PI: 0.4 FTE

Project/Prosal Title: Multi-hazards demonstration project: Fire Scenario

PI: Keeley, J.E., Syphard, A.D., Bradstock, R., Fotheringham, C.J.

Program name: U. S. Geological Survey Western Ecological Research Center

Performance period: 06/01/10 – 09/30/12

Total budget for Syphard: \$95,000

Commitment by PI: 0.2 FTE

Project/Prosal Title: Understanding and Improving Wildfire Management for Marine Corps Base Camp Pendleton

PI: Katz, C., Sorensen, K., Syphard, A.D., Regan, H.M, Franklin, J., and Lawson, D.L.

Program name: Space and Naval Warfare Systems Command (SPAWAR)

Performance period: 07/01/10 – 06/30/12

Total budget for Syphard: \$125,000

Commitment by PI: 0.3 FTE

Pending Support

This project

Project/Proposal Title: Quantitative Assessment of the Effect of Fuel Manipulation Projects on Fire Behavior and Urban Loss

PI: Syphard, A.D.

Program name: U. S. Geological Survey Western Ecological Research Center

Performance period: 10/01/10 – 09/30/11

Total budget for Syphard: \$40,000

Commitment by PI: 0.3 FTE

Project/Proposal Title: Impacts of Climate Change on Plant Biodiversity in Fire-prone Mediterranean-type Ecosystems Worldwide

PI: Franklin, J., Regan, H., Syphard, A.D., Akçakaya, H.R

Program name: NASA Climate and Biological Response: Research and Applications - NNH10ZDA001N-BIOCLIM

Performance period: 05/01/11 – 04/30/15

Total budget for Syphard: \$ 306,530

Commitment by PI: 0.35 FTE

Project/Proposal Title: Collaborative Research: Do microenvironments govern macroecology?

PI: Davis, F., Syphard, A.D. (this proposal)

Program name: NSF Macrosystems Biology: Research on Biological Systems at Regional to Continental Scales

Performance period: 04/15/11 – 04/14/16

Total budget for Syphard: \$ 157,948

Commitment by PI: 0.17 FTE

Current and pending support for Regan

Current projects

Project/Proposal Title: Collaborative Research: The persistence of biodiversity in southern California under future land-use scenarios

PI: Regan

Source of Support: NATL SCIENCE FOUNDATION (NSF)

Total Award Amount: \$324,167.00

Total Award Period Covered: 7/1/2008 - 6/30/2011

Commitment by Regan: 0.5 month summer (2008), 1 month summer (2009), 1.35 month summer (2010)

Project/Proposal Title: Collaborative Project: Climate change impacts on plant functional groups in a biodiversity hotspot

PI: Regan

Source of Support: DOE NICCR

Total Award Amount: \$79,543

Total Award Period Covered: 04/01/2010-03/31/2011

Commitment by Regan: 0.5 month summer (2010)

Pending projects

Project/Proposal Title: Development of Fire Management Tools at Marine Corps Base Camp Pendleton.

PI: Regan

Source of Support: SPAWAR (Dept of Defense) & Californian Cooperative Ecosystems Studies Unit

Total Award Amount: \$99,634

Total Award Period Covered: 01/01/2011-12/31/2011

Commitment by Regan: 1 month summer (2011)

Project/Proposal Title: Impacts of Climate Change on Plant Biodiversity in Fire-prone Mediterranean-type Ecosystems Worldwide

PI: Janet Franklin (Arizona State University)

Source of Support: National Aeronautics and Space Administration – NASA

Research Opportunities in Space and Earth Sciences (ROSES) - 2010

A.30 Climate and biological response: research and applications

Funding opportunity number: NNH10ZDA001N-BIOCLIM

Subaward to UCR from ASU

Total Award Amount: \$362,304 (UCR portion)

Total Award Period Covered: 4/1/2011 to 3/31/2015

Commitment by Regan: 1 month summer each year (2011 – 2015)

Project/Proposal Title: Collaborative Research: Do micro-environments govern macroecology?
(THIS PROPOSED PROJECT)

PI: Regan

Source of Support: NATL SCIENCE FOUNDATION (NSF)

Total Award Amount: \$200,354.00

Total Award Period Covered: 4/15/2011 - 4/14/2016

Commitment by Regan: 1 month summer each year (2011 - 2015)

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Max Moritz	Other agencies (including NSF) to which this proposal has been/will be submitted.
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Fire Regimes in China</p> <p>Source of Support: Nature Conservancy</p> <p>Total Award Amount: \$ 25,000 Total Award Period Covered: 04/08/10 - 12/31/10</p> <p>Location of Project: UC Berkeley</p> <p>Person-Months Per Year Committed to the Project. Cal:0.10 Acad:0.00 Sumr: 0.00</p>	
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Development of a California Fire Science Delivery Consortium</p> <p>Source of Support: USDA Forest Service</p> <p>Total Award Amount: \$ 110,176 Total Award Period Covered: 09/03/09 - 09/30/10</p> <p>Location of Project: UC Berkeley</p> <p>Person-Months Per Year Committed to the Project. Cal:0.50 Acad:0.00 Sumr: 0.00</p>	
<p>Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Protecting Healthy Ecosystems and Human Well-Being in California: Elucidating the Links Between Fire, Land Use Patterns, Climate Change on Californians with a Special</p> <p>Source of Support: Nature Conservancy</p> <p>Total Award Amount: \$ 97,745 Total Award Period Covered: 07/30/10 - 07/29/11</p> <p>Location of Project: UC Berkeley</p> <p>Person-Months Per Year Committed to the Project. Cal:0.25 Acad:0.00 Sumr: 0.00</p>	
<p>Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Collaborative Research: Do micro-environments govern macroecology?</p> <p>Source of Support: NSF</p> <p>Total Award Amount: \$ 194,975 Total Award Period Covered: 04/15/11 - 04/14/16</p> <p>Location of Project: UC Berkeley/ UC Santa Barbara</p> <p>Person-Months Per Year Committed to the Project. Cal:0.50 Acad:0.00 Sumr: 0.00</p>	
<p>Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title:</p> <p>Source of Support:</p> <p>Total Award Amount: \$ Total Award Period Covered:</p> <p>Location of Project:</p> <p>Person-Months Per Year Committed to the Project. Cal: Acad: Summ:</p>	
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.	

Current and Pending Support

<p><i>The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.</i></p>	
Investigator: Alex Hall	Other agencies (including NSF) to which this proposal
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Climate Change in the Southern Hemisphere Extratropics Source of Support: NSF Total Award Amount: \$371,259 Total Award Period Covered: 09/01/07 – 08/31/10 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1.50</p>	
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: UNDERSTANDING AND CONSTRAINING FUTURE ARCTIC CLIMATE CHANGE Source of Support: NSF Total Award Amount: \$335,329 Total Award Period Covered 09/15/07 – 08/31/10 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1.00</p>	
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Collaborative Research: Climate Simulation and Operational Forecast for VOCALS Using a Regional Earth System Modeling Source of Support: NSF Total Award Amount: \$530,529 Total Award Period Covered: 01/01/08 – 12/31/10 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: <u>Sumr: 0.0 (Yr-03 only: 1.0)</u></p>	
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Transforming the Representation of the Boundary Layer and Low Clouds for High-Resolution Regional Climate Modeling Source of Support: DOE – DE-SC0001467 Total Award Amount: \$565,000 Total Award Period Covered: 08/15/09 – 08/14/11 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1.0</p>	

PENDING SUPPORT:

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Improving the representation of precipitation in the Indonesian Archipelago in regional and global climate models Source of Support: NASA – UCI subaward Total Award Amount: \$236,680 Total Award Period Covered: 03/01/10 - 02/28/13 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1.0

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Fires in Southern California: Interactions between climate change, ecosystems, and humans (UCLA Co-I) Source of Support: NASA – UCI Subaward Total Award Amount: \$570,538 Total Award Period Covered: 03/01/10 - 02/28/13 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 0.50

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Collaborative Research: Do microenvironments govern macroecology? (UCLA Co-I) Source of Support: NSF Total Award Amount: \$358,782 Total Award Period Covered: 04/15/11 - 04/14/16 Location of Project: UCLA Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1.00

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. Use additional pages if necessary.

Laboratory: The proposed computational work will be performed at the Earth Research Institute (formerly the Institute for Crustal Studies) at the University of California, Santa Barbara (UCSB). The Earth Research Institute is an organized research unit, a department-level entity dedicated to supporting extramurally-funded research. Professors Douglas Burbank and David Siegel are the co-Directors and over fifty independent research groups conduct and administer their research using the facilities and resources of the Institute. The Earth Research Institute supports administrative employees and partially supports three computer system administrators, all from University resources. Several conference rooms are available for group meetings and a limited amount of laboratory facilities are available.

Computer:

The computational facility is a unique, shared, community resource, allowing interdisciplinary and collaborative research and training to flourish. The open nature of the shared computational resources enables students and faculty researchers to share not only hardware and software resources but also the data sets and specialized computer programs that are the core of the individual research projects. This sharing of intellectual achievements enables researchers to share their results quickly with the wider community, and provides a truly interdisciplinary environment to train students.

All computers are connected to a common wired and wireless high-speed switched data network. The network is 1000Mb/s connection from the UCSB campus backbone to server rooms in Girvetz and Ellison Hall. This provides shared access to a 622Mb/s CALREN-2 connection, which in turn provides access to Internet2. High speed layer two switches and WAPs provide Ethernet, Fast-Ethernet, Gigabit-Ethernet and Wi-Fi connectivity. The Institute's network spans 3 class C subnets and extends to several campus locations via VLAN tagging and additional small subnet allocations across the campus backbone.

The computing environment is based on a network of primarily Linux-based (x86) hardware but also includes Sun Microsystems (SPARC and x86), and HP Compaq Digital (Alpha) servers and workstations. The computing environment's architecture is designed to permit rapid deployment and easy integration of new hardware. Virtual systems based on the open source Xen project are also available to institute researchers providing rapid, inexpensive, flexible and reliable resources. Vast datasets of MODIS, TM, AVHRR, to name just a few, are readily available on-line to all researchers at the Institute as are the tools and software for modeling and other modalities of scientific analysis.

Two of the primary Linux Clusters consist of 22 AMD 2800+ MP CPUs, 22GB of RAM and 2TB of dedicated, high-speed disk space and the other of 35 AMD 2500+ CPUS, 35GB of RAM, and 8TB of dedicated, high-speed disk space. The clusters are built with the flexibility to add more resources quickly and easily should participants' needs change. IT staff also manages the "Dragon" cluster; a 32 node (64 1.8Ghz AMD Opteron CPUs) compute cluster. The cluster has Gnu and IBM compilers linked in to both LAM-MPI and MPICH MPI configurations. The head node has 9Tb of disk space and 8Gb of RAM. Each compute node has 4Gb of RAM.

Wintel and Mac systems predominate on desktops, which integrate with the general compute environment. The total hard disk storage is presently in excess of 155TB. High-performance and inexpensive SATA based RAID disk arrays allow participants to add disk storage to the environment in reliable, disk-sized discrete increments. Nightly backups to off-site RAID arrays minimizes the risk of critical data loss. There are ten networked printers including three color laser printers and a 36" 300 DPI inkjet plotter. Finally, a full compliment of computational,

image processing, statistical, database, graphical, scientific visualization, and animation software are available for use by our researchers. Programming support is provided on a recharge basis.

Other:

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate, identify the location and pertinent capabilities of each.

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual/subaward arrangements with other organizations.

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Facilities, Equipment, and Other Resources

The **School of Geographical Sciences and Urban Planning** will be the administrative home for the proposed project. Professional staff will help to plan and coordinate activities related to this project. The PI's tenure home is the School of Geographical Sciences and Urban Planning (75%) and she (Franklin) has a 25% joint appointment in the School of Life Sciences at Arizona State University, where lab space is provided for her.

The School of Geographical Sciences and Urban Planning has a center and labs available for all students and faculty members. The School of Geographical Sciences and Urban Planning has been recently recognized as an ESRI Educational Development Center that has exemplary programs focused on educating students to design and develop advanced GIS applications.

Currently the School of Geographical Sciences and Urban Planning at Arizona State University runs two GIS labs equipped with 25 state of the art Apple iMac workstations and 24 Dell PC stations. The labs are on a two year update cycle. Along with these facilities, the School includes a specialized research lab facility, the Laboratory for Geosimulation, Digital Phoenix and the GeoDa Center for Geospatial Analysis and Computation. The GeoDa Center currently occupies five modern offices on the fifth floor of Coor Hall at Arizona State University. Computing equipment consists of more than 10 desktop machines, a mix of state of the art Apple Mac Pro and iMac workstations, as well as several laptops (Macbook, Macbook Pro and Macbook Air) and several Linux workstations and Windows machines. The GeoDa center also maintains two high end servers in the School of Geographical Sciences and Urban Planning server room. All machines are networked on a high speed network with access to ASU's High Performance Computing infrastructure, as well as other digital resources, such as the library and the spatial data clearinghouse supported by the Institute for Social Science Research. The other facilities include servers, a 42-inch color plotter, laser printers (BW, color) along with more than 20 individual workstations for advance geospatial processing. In addition to these facilities, there are an additional 50 faculty and graduate student work stations for advanced computing and geoprocessing. All facilities run the latest in ESRI products.

Franklin's Vegetation and Landscape Ecology laboratory in the School of Life Sciences A Wing, Room 227, also has two state of the art Apple iMac workstations supporting geospatial and statistical analysis software and Dell PC workstation supporting state of the art ESRI GIS software. The lab, which is 652 square feet, also includes facilities for plant specimen collection, identification and storage (plant presses, herbarium cabinet, freezer, dissecting microscope), as well as equipment to support field data collection (Garmin Global Positioning Systems, Laser Rangefinders, Nikon Coolpix digital camera with hemispherical lens, Kodak digital camera with close-up lens for botanical photography, diameter tapes, tape measures, clinometers, laptop computers for field use).

ASU's Library holds more than 2.6 million volumes, making it the 27th largest research library in the USA and Canada. The Noble Science and Engineering Library contains about 360,000 books, 11,500 serials and periodicals, and 135,000 maps. Both ASU libraries are depositories for U.S. Government publications. The library's digital resources are accessible by computer via the internet, enabling access from the Bahamas.

Computer and Office Equipment

Regan's (PI) laboratory will be used to support the project at UCR and to conduct the population modeling and viability analysis and assist in the dynamic landscape modeling components. Equipment includes a local computer network supporting population modeling software (RAMAS Landscape, Metapop, GIS), statistical package (Systat), programming packages (Visual Fortran, C, C++, Matlab) and image processing (Adobe Illustrator and Photoshop). The server has a 240 GB hard drive (in RAID), 2GB RAM, a 2 GHz processor, and read/write CD/DVD drives. There are personal computer workstations including one with high-speed (3.06 GHz) processor and 1 GB RAM (2x120 GB hard drive), and four student workstations (1.8 GHz processors, 512 GB RAM and 80 GB hard drives). Laptop computers (Toshiba Satellite: 2.2 GHz processor, 512 GB RAM and 60 GB hard drive) are also available to support computing work. Peripherals include b/w and color laser and inkjet printers, and an HP Scanjet flatbed scanner.

University of California Riverside has excellent library resources, subscribing to many print and electronic journals, and supporting the comprehensive California Digital Library. The Department of Biology has the necessary infrastructure to support this work including administrative staff, fax machines, and photocopiers.

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. USE additional pages as necessary.

Laboratory:

Clinical:

Animal:

Computer: This research will utilize computer and network resources provided primarily by the Center for Fire Research and Outreach and the Moritz Lab, which are part of the College of Natural Resources at U.C. Berkeley. Resources have also been included in the budget for 1 new PC workstation

Office: This research will utilize existing office space provided by the College of Natural Resources to the Center for Fire Research and Outreach and the Moritz Lab. The post-doctoral researcher will also interact with other researchers working on related projects in this space.

Other:

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate identifying the location and pertinent capabilities of each.

The most important equipment available for the fire modeling portion of this project are computers, which will be located in the office space described above. Web servers and backup systems are co-located in the U.C. Berkeley Campus Data Center, a state-of-the-art facility with complete power backup for both the servers and the network infrastructure. It is a seismically-isolated building a redundant network, and has built-in failover with UC system computer centers in southern California.

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual arrangements with other organizations.

FACILITIES, EQUIPMENT & OTHER RESOURCES

Continuation Page:

COMPUTER FACILITIES (continued):

at a level appropriate for spatial modeling of fire patterns. All required software for this research has already been acquired by our group, or it is available through collaboration with the Geospatial Innovation Facility in the College of Natural Resources. All computers are backed up to a university back-up system.

UCLA Facilities and Equipment

- The department maintains a fast (gigabit) network for high data transfer rates and connectivity amongst participating scientists.
- Printers (also for poster printing), scanner, backup facilities.
- The department also supports a full time system administrator and web programmer who provide support for research infrastructure on a limited basis and will assist in the configuration and maintenance of the data server requested for this project.

Supplemental 3. Postdoctoral Scholar Mentoring Plan

The project will mentor postdoctoral scholars through well-established traditional programs, and through a program designed specifically to give postdoctoral scholars insights into non-traditional career paths. We begin the mentorship description by detailing the non-traditional mentorship and conclude with an outline of the traditional mentoring program.

The non-traditional mentoring will have its foundation in experiential learning at project field research sites, which are focused in long-term research sites (NEON: San Joaquin Experimental Forest, Teakettle Experimental Watershed; and Sedgwick Reserve, UC reserve system), and on interaction with the conservation NGO members of the NCEAS working group from the Nature Conservancy and Conservation International. The exposure to long-term research sites and personnel will be in a day-to-day framework for postdoctoral scholars in the experimental field trials. For postdocs and graduate students in other teams (where relevant), twice-annual visits to one of the field sites will allow experience in long-term research operations.

Project postdoctoral scholars and graduate students will work on a daily basis with research staff of long-term research facilities or will be focused on modeling with regular interaction with long-term research sites. This will provide first-hand insight into daily research responsibilities and opportunities. We expect this to build skill sets actually used by researchers in non-traditional, long-term research career paths.

In addition to this continuous exposure, we will provide a structured learning experience based on one-on-one and group meetings. One-on-one meetings with scientists such as Teakettle PI and Contract Scientist (this project) Malcolm North, NEON research scientists and UC reserve scientists will be on a quarterly basis. These meetings will focus on subjects that most interest our postdocs and graduate students, and those the involved researchers feel are important to alternative career paths.

The group experiences will be in annual workshops with field research staff, focused on a series of topics defined by the postdocs and graduate students themselves, with input from project researchers, PIs and peers (especially NCEAS postdoctoral scholars). Illustrative topics include:

- working with data collected by others, design of data collection protocols for implementation by collaborators or long-term research site staff
- advanced instrumentation (e.g., potential field visit to UC Black Oak Reserve sensor network)
- project management for multi-investigator research
- outreach to research users (for example, NGO conservation planners, possible field visit to Nature Conservancy California conservation planning unit)

Exposure to NGO careers will be scheduled to coincide with working group meetings on project progress. In-depth mentoring sessions with NGO scientists will be conducted in conjunction with working group meetings. These meetings have taken place approximately every eight months over the past two years, and will continue with similar frequency throughout the life of the project (partly funded by the project and partly funded by a grant from the Nature Conservancy).

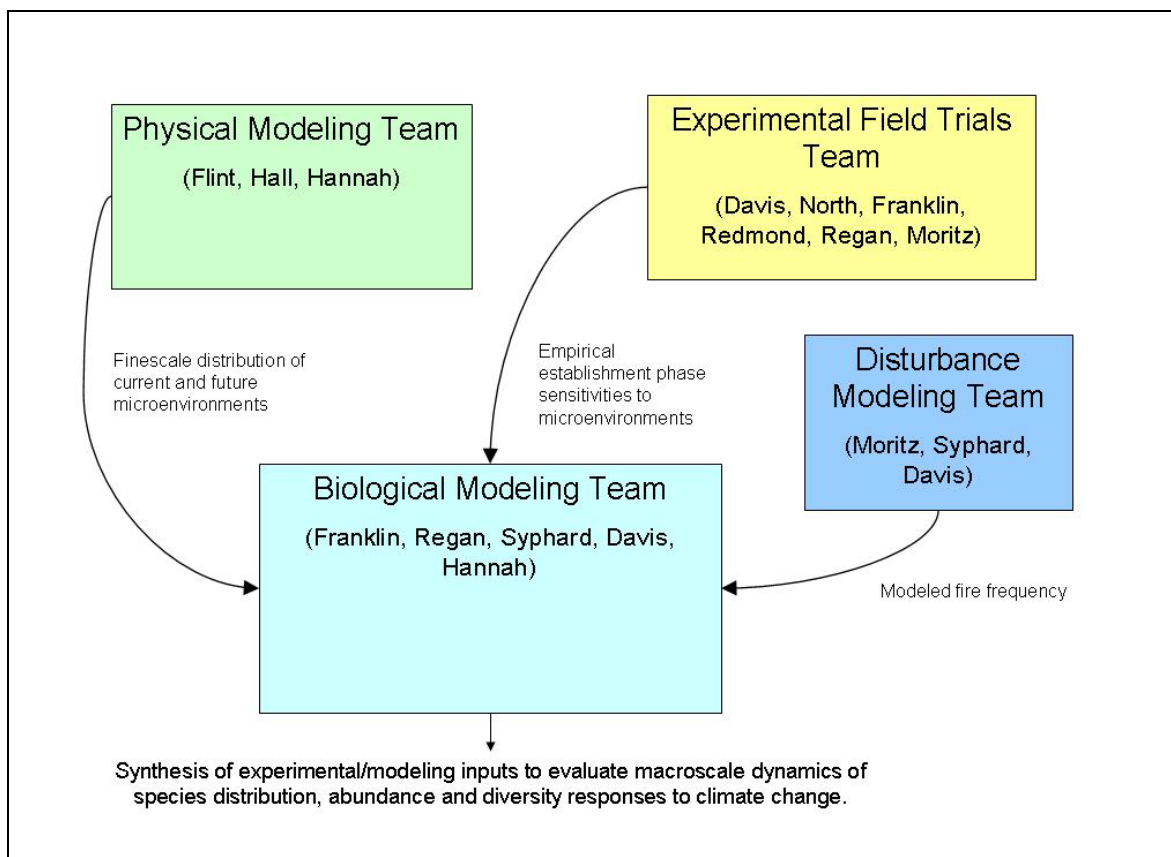
To complement these experiences and mentoring sessions in non-traditional career paths, postdoctoral scholars will participate in a structured mentoring program provided by host institutions. For example, UC Santa Barbara conducts an intensive program for the Professional Development for Postdoctoral Scholars (PDPDS). The PDPDS is focused on the knowledge and practical experience essential for the success of postdoctoral scholars and future faculty in science, engineering and mathematics. The program focuses on three main topics: (1) Teaching and Mentoring, (2) Communicating Science, and (3) Networking and Interviewing. Each of these topics will be addressed in workshops and intensive sessions over several afternoons, beginning Fall 2009. Scholars in the program will also gain practical experiences in a variety of campus education projects, providing follow up on how to develop the skills and confidence to move into faculty roles. All postdoctoral scholars on this grant request are eligible to participate in workshops and intensive sessions conducted with UCSB's PDPDS program. ASU and UCR conduct similar programs.

Supplement 1. Project Management Plan

Management Overview: Davis as lead PI will oversee the proposed work, which is organized by research teams. The management plan includes integration of the participating researchers at three levels: (1) *Links among teams* - At least one member of every team is also a member of another team. (2) *Annual inter-team meetings*- All researchers, from PIs to graduate students, share their findings and provide constructive critique of others findings annually at dedicated sessions of the NCEAS working group. (3) *Weekly virtual (web conference) team meetings* – a weekly web conference will be held for all available project members to join, with a brief presentation from one team and updates from all teams. The teams are:

- **Biological Modeling Team** led by Franklin and Regan, who have collaborated on previous NSF-supported biological modeling research. Other team members are Syphard, a frequent collaborator with Franklin and Regan; Hannah, co-leader of the research team that developed BioMove, with background in species modeling and conservation planning; Davis, with experience in landscape analysis and modeling, climate change analysis and conservation planning; postdoctoral scholars and graduate students. The team will further develop and implement the mechanistic habitat suitability model (species model) and apply the population-level models (RAMAS for single species, BioMove for multi-taxa analyses). This team will integrate results from other teams, particularly the Experimental Field Trials team and Disturbance Modeling team, into their habitat suitability and population-level models.
- **Physical Modeling Team**, led by Flint and Hall. Hall leads the dynamic modeling (GCM resolution to 2km) components of the physical modeling, Flint leads the statistical downscaling of climatologies (2km to 30m), Basin Characterization Model execution and fine-scale cold air drainage modeling. Other team members include Redmond (sensor network design) and Hannah (integration with biological modeling). Flint is a USGS employee, so does not receive direct support from this grant, but participates in the project, the working group and advises a postdoctoral fellow in downscaling supervised by Davis. The Davis and Flint labs have collaborated over the past two years on climate scenario downscaling at 90m linked to species distribution models, so the intellectual and logistical arrangements for this collaboration are well-established. Similarly, Flint and Hall have worked together in the working group, so the logistics of data transfer from Hall's dynamic regional Earth system models to Flint for downscaling is well established.
- **Experimental Field Trials Team** is led by Davis, with North, Franklin, Regan, Moritz and Redmond participating. This team manages the experimental field trials (common garden experiments). The results of the field trials produce information for the species models and parameters for the population-level models for the Biological Modeling team of which Davis is also a member. The team will collaborate with the physical modeling team, Redmond, who is designing the sensor network array to validate the physical models, but who will also instrument the experimental sites with sensors so that local conditions can be correlated with seedling survivorship and compared to physical model simulations of plot conditions.
- **Disturbance Modeling Team** is led by Moritz, with Syphard and Davis as members. This team provides input to population-level models (RAMAS and BioMove) of the Biological Modeling team.

The figure on the following page depicts the schematic relationship of the teams described above in the context of this project. Arrows are illustrative of information flow and points of collaboration/coordination among teams.



Working Group Meetings: The PIs have already participated in a series of NCEAS working group meetings that serve as the model for continued research coordination under this collaborative proposal. Soon after the grant is funded, a meeting of the working group will be scheduled to create the first annual workplan and schedule theoretical and empirical milestones. The entire group will provide input for the first workplan. At subsequent meetings each team will lay out its progress, present findings and prepare subsequent annual workplans. The other teams will offer critiques and refinements. These meetings, held at least annually but likely every six to eight months, will continue to be held at the National Center for Ecological Analysis and Synthesis or at the Donald Bren School of Environmental Science and Management of UCSB. Individual team meetings and mentoring sessions will be scheduled in additional days of meetings in concert with, or in addition to, the plenary working group meetings. Participants in the working group to date who are not active participants in the proposal (e.g., Nate Stephenson, USGS; Rebecca Shaw, Nature Conservancy), have indicated their support for this proposal and will continue to be members of the working group. Working group and project business will be divided sequentially on different days in the working group meetings (i.e., a working group meeting centered on joint conceptual progress of 2-3 days will be followed by a 1-day project meeting).

Weekly PI Web Conference: Frequent communication among the PIs will be essential for research coordination and project management. This group has an existing track record of sharing information and coordinating research activities via regular conference calls. We plan to continue this practice through weekly standing conference calls among the PIs. Given the complexity of coordinating schedules among all project personnel, our experience dictates that a regularly scheduled call with all available personnel participating is the most efficient way to accommodate all schedules.

Contribution of each participant to project management

Frank Davis – Davis is a Professor at the Donald Bren School of Environmental Science and Management. Davis has conducted field research on oak recruitment and at Sedgwick Reserve (a project study location) since 1993. Davis will direct field experimental studies at Sedgwick Reserve and Figueroa Mountain study location and oversee work at the Teakettle and San Joaquin sites with assistance from on-site staff. He will participate in the modeling and disturbance teams to facilitate data transfer from field experiments to modeling efforts, and from the disturbance team to biological modeling efforts. Davis will direct the role of the NCEAS working group in coordinating project management.

Lee Hannah – Hannah is a Senior Research Scientist in Climate Change Biology with Conservation International. Hannah co-lead the team that developed the BioMove model and is co-leader (with Davis) of the NCEAS fine-scale working group. Hannah will participate in the modeling team to advise on the model's application in the project, and in the physical modeling team to ensure integration in the biological modeling. Hannah will continue to co-lead the working group and will organize project management and training activities associated with working group meetings.

Janet Franklin – Franklin is a Professor at the School of Life Sciences, Arizona State University. Franklin's expertise is centered on models of species distribution and persistence. Franklin will co-lead the modeling team with Regan. She will lead development of the mechanistic habitat suitability modeling efforts, working with frequent collaborators Regan and Syphard.

Helen Regan – Regan is Assistant Professor of Biology at the University of California Riverside. Regan's expertise lies in population modeling, and she has helped pioneer integration of species distribution and population models. Regan will co-lead the biological modeling team. She will direct the population modeling component of the project, including RAMAS and BioMove.

Alexandra Syphard – Syphard is an Ecologist at the Conservation Biology Institute. Syphard is a frequent collaborator with Regan and Franklin. She will participate in the biological modeling efforts, working with Regan to implement both RAMAS and BioMove. She will participate in the disturbance modeling team.

Alex Hall – Hall is a Professor in the Department of Atmospheric and Oceanic Sciences at UCLA. Hall will co-lead the physical modeling team, directing production of dynamic downscales using Regional Earth System Models developed in his lab.

Alan Flint – Flint is a research hydrologist with USGS. *Flint is employed by USGS and therefore will not receive salary funds under this grant.* Flint has been integral in the production of very fine scale (<100m) current and future climatologies for the Western U.S. Flint will co-lead the physical modeling team, leading fine-scale statistical downscaling.

Kelly Redmond – Redmond is a Research Professor at the Desert Research Institute and Regional Climatologist for the Western United States. He will participate in the physical modeling team, advising on the design of sensor installations at field experimental sites and physical data collection.

Max Moritz – Moritz is a professor at University of California Berkeley with research focus on fire ecology under climate change. Moritz will lead the disturbance modeling team and direct modeling of fire frequency to parameterize the population and community models.

Malcolm North – Malcolm North is an Associate of Forest Ecology, Plant Sciences Department at UC Davis and Research Plant Ecologist at the USFS Pacific Southwest Research Station. *North is employed by USFS and therefore will not receive salary funds under this grant.* North is PI of the Teakettle Experimental Forest (one of the project study locations). He will participate in the experimental field trials team and assist in implementation at the Teakettle site.

Supplemental 2. Data Access and Management

Field experiments

Our research design calls for common garden studies of tree establishment and initial growth across a spectrum of microsites in foothill and montane landscapes in the southern Coast Ranges and central Sierra Nevada.

Garden-scale physical environmental data include:

- Topography and related variables (slope angle; slope azimuth; hillslope position; hillslope form; modeled monthly, seasonal and annual clearsky radiation; modeled annual heatload).
- Soil physical and chemical characteristics (parent material, depth to bedrock, horizon-integrated texture, available water holding capacity in 50 cm increments to bedrock, pH).
- Microclimate monitoring of temperature and relative humidity.
- Disturbance history (land use and fire history to at least 1940).

Garden-scale biological data include:

- Seed data (species, source area, year, weight, condition, sowing date).
- Seed planting trial data (planting date, emergence data, survivorship)
- Seedling growth data (species, live/dead, monthly height, monthly condition, above-ground and below-ground dry biomass at time of harvest (1-3 years depending on planting year), 1-sided leaf area index at time of harvest)

Analysis will consist of univariate and multivariate models of seedling survivorship and growth as a function of measured or modeled topographic, soil, and microclimate factors. Outputs will consist of model formula, input data, fitted models, model predictions, model residuals, and spatial and temporal autocorrelation of model residuals.

Data will be managed using common Microsoft platforms (Excel, Access), documented using metadata tools developed at the National Center for Ecological Analysis and Synthesis (NCEAS) including Morpho and Metacat, and archived with NCEAS using the

Knowledge Network for Biocomplexity (KNB, <http://knb.ecoinformatics.org/index.jsp>). A mirror site will be provided at UCSB's Biogeography Lab (www.biogeog.ucsb.edu).

We will make all non-proprietary data, maps, and models resulting from the species habitat suitability modeling publicly available in a dedicated project website at UCSB's Biogeography Lab. These will include current and projected habitat maps of modeled species (outputs of the habitat suitability models), and fire probability, as ASCII raster files with appropriate metadata, and scripts for statistical analysis (to be developed using open-source R software) with instructional comments to increase their usefulness to other researchers. All of these products will be made available within 12 months of the completion of the project.