

Arizona Water Protection Fund FY 2009 Grant Application Review

Application # WPF0382 Applicant: ARIZONA BOARD OF REGENTS FOR AZ
STATE UNIVERSITY

Title of Project: EVALUATION OF LONG-TERM CHANGE AND ESTABLISHMENT
OF AN INVASIVE SPECIES MONITORING PLAN FOR THE MIDDLE VERDE RIVER

Additional materials were submitted with this application that could not be reproduced and distributed for review. These materials may be reviewed in person at the Arizona Water Protection Fund offices at (3550 N. Central Avenue, 4th Floor, Phoenix). The additional materials available are the following:

Maps
 Photographs
 Disk
 Other

- SCOPE OF WORK & DETAILED BUDGETS
- EXISTING REPORTS
 - FINAL REPORT: EFFECTS OF LIVESTOCK USE LEVELS ON RIPARIAN TREES ON THE VERDE RIVER
 - VERDE WILD AND SCENIC RIVER COMPREHENSIVE MANAGEMENT PLAN

June 11, 2008

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 North Central Avenue
Phoenix, AZ 85012

Subject: ASU Proposal 08121975

Attached is the proposal titled "Evaluation of long-term change and establishment of an invasive species monitoring plan for the Middle Verde River." The University's principal investigator for this work is Dr. Doug Green, Department of Applied Biological Sciences, at Arizona State University's Polytechnic Campus. Any resulting award should reflect the recipient as "Arizona Board of Regents for and on behalf of Arizona State University."

Your consideration of this application is appreciated. Please contact Dr. Green at (480) 727-1251 if you have questions regarding the technical portions of the project or me at (480) 727-1003 if you have any administrative, budgetary or award questions.

Sincerely,



Lacey Ward
Sponsored Project Officer

Attachments

June 9, 2008

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 North Central Ave.
Phoenix, AZ 85012

Subject: Arizona State University's Proposal in Response to
Fiscal Year 2009 Funding Cycle

To Whom It May Concern:

Please find enclosed an application for support of a project in response to the above referenced Funding Cycle. The University's principal investigator for this work is Dr. Douglas Green of the Applied Biology Department at Arizona State University at the Polytechnic Campus.

Any resulting award should reflect the recipient as, "Arizona Board of Regents for and on behalf of Arizona State University".

With regards to Appendix A, "Grant Award Contract General Provisions", As a non-profit educational institution we have both constitutional and statutory restrictions precluding us from contractually indemnifying another party or naming a third party as an additional insured. This is not intended to affect any common law or statutory rights to indemnity or contribution that either party may have against the other relative to an incident arising out of the performance of a contract. ASU is self-insured by the State of Arizona Risk Management Program and maintains coverage for liabilities arising from the acts or omissions of its employees. ASU is therefore requesting the following changes to any resulting agreement:

6. Indemnification

Each party to this Agreement is independently responsible in the event of its own negligence. Neither party agrees to indemnify the other party.

9. Termination of Contract

Please include the following to the first sentence. Either party may at any time terminate this Agreement by giving the other party not less than thirty (30) days prior written notice.

Your consideration of this application is appreciated. Please contact Dr. Green at (480) 727-1251 if you have questions regarding the technical portions, or myself at (480) 727-1003 or lacey.ward@asu.edu if you have any administrative, budgetary or award questions.

Sincerely,

Candyce C. Lindsay
Assistant Director, Sponsored Projects Services

Enclosure

APPENDIX A

Grant Award Contract General Provisions

1. DEFINITIONS:

As used throughout this Contract, including the General Provisions, Special Provisions, and the Scope of Work, the following terms shall have the meaning set forth below:

- a. "Administrative Cost" means those costs that are traditionally termed indirect and overhead.
- b. "Agreement" or "Contract" means this Arizona Water Protection Fund Grant Award Contract between the Commission and Grantee.
- c. "Arizona Water Protection Fund" means the fund established by A.R.S. § 45-2111 and consisting of monies as set forth in A.R.S. § 45-2112.
- d. "Chair" means the chairperson of the Arizona Water Protection Fund Commission or a person duly authorized by the Chair to act on the Chair's behalf.
- e. "Commission" means the Arizona Water Protection Fund Commission or its authorized representative.
- f. "Deliverables" means the reports, documentation, and other materials developed for submission to the Project Manager by the Grantee in the course of the Grantee's performance under this Contract.
- g. "Equipment" means one or more tools, implements, computers, computer hardware, computer software, cameras, camera accessories, vehicles, or instruments purchased with Grant funds pursuant to either this Contract or a prior Contract between the Commission and the Grantee that is intended to be used to carry out the purposes of this Contract.
- h. "Grantee" means the person, firm, or organization performing the work or delivering the items described in this Contract.
- i. "Grant Application" means the application filed by the Grantee upon which this Contract was awarded.
- j. "Grant Award Contract" means this Contract between the Grantee and the Commission.
- k. "Operation and Maintenance Period" means the period of time during which grant-assisted structures, human access or educational facilities, revegetation sites, and any other grant-assisted improvements shall be operated and maintained.
- l. "Project" means the total of all work to be performed by the Grantee as set forth in this Contract.
- m. "Project Manager" means the Arizona Department of Water Resources technical Staff person delegated by the Chair to administer this Contract.

- n. "Scope of Work" means that part of this Contract that describes the work to be performed by the Grantee to accomplish the Project purpose. If the Scope of Work conflicts with the General or Special Provisions, the terms of the Scope of Work shall govern.
- o. "Shall" means what is mandatory.
- p. "Special Provisions" means those provisions of this Contract that alter or augment the General Provisions. If the Special Provisions conflict with the General Provisions, the Special Provisions shall govern.
- q. "Staff" means the technical, legal, and administrative staff, including the Project Manager, provided to the Commission by the Director of the Arizona Department of Water Resources pursuant to A.R.S. § 45-2114.
- r. "State" means the State of Arizona, including the Department of Water Resources.
- s. "Task" means the specific provisions in the Scope of Work of this Contract that describe the nature and manner of the specific work to be performed and the Deliverables to be submitted to the Project Manager by the Grantee.

2. GENERAL REQUIREMENTS:

- a. This Contract shall be interpreted in accordance with Arizona law.
- b. The Grantee shall obtain and maintain all licenses, permits, and authorizations necessary to perform its obligations under this Contract. The Grantee is responsible for compliance with all applicable local, state, and federal laws.
- c. In this Contract, Special Provisions alter the General Provisions. If the Special Provisions conflict with the General Provisions, the Special Provisions shall govern. If the Scope of Work conflicts with either the Special or General Provisions, the Scope of Work shall govern.

3. RELATIONSHIP OF THE PARTIES:

The parties agree that the Grantee shall not be considered an employee, associate, partner, officer, joint venturer, or agent of the Commission or the State as a result of this Contract. The Grantee is solely responsible for the planning, design, scope, and implementation of the Project funded through this Contract. Neither the Commission nor the State is responsible for any liabilities resulting from the Grantee's planning, design, scope and implementation or performance of the Project funded through this Contract.

4. BOOKS AND RECORDS:

The Grantee shall keep adequate books, accounts, files, and records related to work performed and expenditures incurred for a period of five (5) years after the termination of this Contract. Such books, accounts, files, and records shall be made available for inspection by the Commission, Staff, or other

appropriate agents of the State upon timely written notice. Financial records shall: (1) identify the Tasks completed; (2) include records of the time the Grantee spent performing the Tasks; and (3) include original copies of invoices, statements, sales tickets, billings for work, and similar documents as necessary to document all expenditures applicable to this Contract.

5. INSPECTION AND AUDIT:

Commission representatives and other appropriate agents of the State shall, during the term of this Contract, be entitled to review and inspect the Grantee's Project site and data which pertain to the work specified in the Scope of Work. Timely written notice shall be provided prior to any inspection. The right to inspect shall include review of operation and maintenance of the Project site and performance of field analyses and data collection to assess the degree of success of the Project.

All data collected and maintained pursuant to the requirements of this Contract shall be subject to examination on the request of the Auditor General in accordance with A.R.S. § 41-1279.

6. INDEMNIFICATION:

The parties to this Contract agree that the Grantee shall indemnify, defend, and hold harmless the Commission and the State, including the Department of Water Resources, for all claims which result in vicarious/derivative liability of the State as a result of the act, omission, misconduct, or other fault of the Grantee, its agents, officials or employees.

7. RESOLUTION OF DIFFERENCES:

- a. Disputes arising during the performance of this Contract will be resolved to the maximum extent possible through cooperation and coordination of the Grantee and Staff. If the Grantee and Staff are unable to resolve the differences or circumstances require an immediate decision, the Project Manager will refer the conflict to the Commission for resolution.
- b. Disputes arising out of this Contract are subject to arbitration to the extent required by A.R.S. § 12-133 and § 12-1518.
- c. Disputes arising out of this Contract are subject to the jurisdiction of the Superior Court of the State of Arizona.

8. STOP WORK NOTICE:

In the event of unapproved changes in the Scope of Work, performance or changes outside the scope of the Contract, illegal or unpermitted activities, or other material discrepancies between the Contract and the Grantee's activities, the Commission reserves the right to issue notice to the Grantee to stop work. The notice will further specify that the Commission will not approve resumption of performance or further payments until the issue or issues identified in the stop work notice have been resolved to the satisfaction of the Commission.

9. TERMINATION OF CONTRACT:

- a. The Commission, in addition to other rights set forth elsewhere in this Contract, reserves the right to terminate this Contract in whole or in part, without cause, effective thirty (30) calendar days after receipt of written notice of termination sent by certified mail to the Grantee.

The Commission, in addition to other rights set forth elsewhere in this Contract, reserves the right to terminate this Contract in whole or in part, for cause, effective upon receipt of written notice of termination sent by certified mail to the Grantee.

In the event of termination as provided in Paragraph 9 (a):

- 1) The Grantee shall stop work as specified in the notice of termination.
 - 2) If the payments prescribed by this Contract are made on a reimbursable basis, the Commission shall pay the Grantee the allowable cost for all Tasks completed in accordance with the Scope of Work as approved by the Project Manager. In addition, the Commission shall pay the Grantee its reasonable, actual costs, not to exceed the allowable costs established in the Scope of Work, for work in progress as determined by generally accepted accounting principles and practices.
 - 3) If payments have been made on an advance basis, the Grantee shall return all unexpended Grant funds within fifteen (15) calendar days of receipt of notice of termination. The Grantee, at the Commission's request, shall deliver to Staff specified completed documents, programs, data, and other information described in the Contract.
- b. The State may cancel this Contract without penalty or further obligation pursuant to A.R.S. § 38-511, which provides for cancellations of any contract made by the State, its political subdivisions, or any of the departments or agencies of either if any persons significantly involved in initiating, negotiating, securing, drafting, or creating the contract on behalf of the State, its political subdivisions or any of the departments or agencies of either is, at any time while the contract or any extension of the contract is in effect, an employee or agent of any other party to the contract or a consultant to any other party to the contract with respect to the subject matter of the contract.
 - c. In the event of cancellation under Paragraph 9 (b) of this Contract, or if the term of the Contract expires, the Grantee shall receive payment as established in Paragraph 9 (a) (2) and (3) of this Contract.
 - d. In the event that the parties mutually agree to terminate a portion of the Contract, the Grantee shall continue to perform work under this Contract to the extent not terminated under the provisions of this Paragraph.

10. NON-DISCRIMINATION:

The Grantee shall comply with Arizona State Executive Order Numbers 03-22 and 99-4 and all other applicable federal and state laws, rules and regulations, including the Americans with Disabilities Act.

11. EXPENDITURES AND PAYMENTS:

- a. All expenditures must be itemized in the attached Detailed Budget Breakdown. Any expenditure not listed shall be ineligible for reimbursement unless prior written approval is received from the Commission or Staff.
- b. Payments made by the Commission to the Grantee pursuant to the Contract are conditioned upon the availability to the Commission of funds authorized for expenditure in the manner and for the purpose provided herein. The Commission shall not be liable for any purchases or work entered into by the Grantee prior to the effective date of this Contract.
- c.
 - 1) Fixed cost and reimbursable payments are conditioned upon receipt and approval by the Project Manager of the Deliverable(s) specified in the Scope of Work and an applicable, accurate, and complete payment request prepared by the Grantee.
 - 2) The Project Manager shall have a minimum of thirty (30) working days to approve the Deliverable(s) and payment request forms.
 - 3) If the Project Manager does not approve the Deliverable(s) or payment request, the Project Manager shall provide a reasonable time to the Grantee to correct the problem.
- d. If the Project Manager determines that the Grantee is in default in the performance of any obligation under this Contract, the Project Manager may, at its option and in addition to other available remedies, either adjust the amount of payment or withhold payment until satisfactory resolution of the default.

12. ADMINISTRATIVE COSTS:

The Grantee may request reimbursement for Administrative Costs at a rate not to exceed five (5) percent of the total Project costs incurred that are eligible for payment under this Contract.

13. RECOUPMENT OF PAYMENTS:

The Grantee shall reimburse the Arizona Water Protection Fund for all grant funds determined by the Commission not to have been spent in accordance with the terms of this Contract.

14. NOTICES:

Whenever notice is required pursuant to this Contract, such notice shall be in writing and shall be directed to the persons and addresses specified for such purpose in the Scope of Work, or to such other persons and addresses as either party may designate to the other party in writing. Unless otherwise set forth in this Contract, notice shall be delivered in person or by certified mail, return receipt requested.

15. AMENDMENTS:

No amendments to this Contract shall be effective unless in writing and signed by all parties to the Contract.

16. SUBCONTRACTS:

- a. Subcontractors or consultants may be used in the performance of Tasks described in the Scope of Work of this Contract.
- b. Proposals to subcontract any Task described in this Contract must be approved by the Project Manager. Any subcontract shall be submitted to the Project Manager for approval prior to execution by the Grantee. A copy of any executed subcontract shall be submitted to the Project Manager prior to commencement of the subcontracted work.
- c. Any subcontractor or consultant participating in this Contract shall comply with the terms and conditions of this Contract, as set forth in the General Provisions, Special Provisions, and Scope of Work.

17. ASSIGNMENTS:

- a. The Grantee shall not transfer or assign in whole or in part, any obligations under the General or Special Provisions of this Contract to another party without prior written approval of the Commission.
- b. In the event that the Grantee transfers control or access to the Project site location through sale, lease, or other alienation of title during the term of this Contract or the Operation and Maintenance Period:
 - 1) The Grantee shall retain all duties and responsibilities assumed under this Contract unless otherwise approved by the Commission.
 - 2) The Grantee must provide written notice to the Commission within 30 days of such action.

18. WAIVERS:

- a. Neither the Grantee nor the Commission shall waive or modify any condition or requirement contained in or made a part of this Contract without a written amendment to this Contract.
- b. A waiver by the Commission of any breach or default of any of the provisions of this Contract shall not be construed as a waiver of any succeeding breach or default of the same or other provisions.

19. INCORPORATION OF GRANT APPLICATION:

The Grantee's approved Grant Application is incorporated by reference as part of this Contract; however, the terms of this Contract shall take precedence over the terms of the approved Grant Application in the event of conflict or ambiguity.

20. OPERATION AND MAINTENANCE:

- a. The Operation and Maintenance Period shall be for 20 years unless otherwise specified in the Special Provisions.

- b. The Operation and Maintenance Period for each individual grant-assisted structure, human access or educational facility, revegetation site, or any other grant-assisted improvement shall begin upon the approval by the Project Manager of the designated Deliverables identified in the Scope of Work.
- c. During the Operation and Maintenance Period, the Grantee shall, in good faith, provide operation and maintenance of all grant-assisted structures, human access or educational facilities, revegetation sites, and any other grant-assisted improvements.
- d. During the term of this Contract and the Operation and Maintenance Period, the Grantee shall provide reasonable protection from vandalism to the Project site and to any grant-assisted structural, revegetation, or other improvements thereon.
- e. If, during the during the term of this Contract or the Operation and Maintenance Period, a major flood, fire, or other unforeseen act of nature causes substantial damage to the Project site, or to any grant-assisted structure, revegetation, or other improvements, the Grantee shall notify the Project Manager in writing within fifteen (15) calendar days of discovering the damage. The parties shall assess the damage and determine whether to continue the Project and/or operation and maintenance responsibilities.

21. EQUIPMENT:

- a. The Grantee shall not purchase any Equipment without the prior approval of the Project Manager. In addition, the Grantee shall not purchase any Equipment with a value equal to or greater than \$3000 without the prior approval of the Commission.
- b. Equipment shall be the property of the Grantee, and the Grantee shall be responsible for maintenance and safekeeping of such Equipment.
- c. Equipment shall be used only for the purposes of this Contract.
- d. If Equipment purchased pursuant to this Contract or a prior Contract between the Commission and the Grantee has a remaining useful life after termination of this Contract, the Grantee shall continue to use the Equipment for work in any subsequent Arizona Water Protection Fund Contracts as appropriate.
- e. The Grantee shall not execute a lease of Equipment without the prior approval of either the Commission or the Project Manager.

22. DATA:

- a. All data, information, research, reports, and analyses prepared or collected by the Grantee in carrying out the terms of this Contract shall be owned by the parties to this Contract.
- b. Unless otherwise provided in this Contract, all data, information, research, reports, and analyses prepared or collected by the Grantee in carrying out the terms of this Contract shall be provided to the Commission as specified in the Scope of Work of this Grant Award Contract.

- c. All Deliverables, including data, information, research, reports, and analyses submitted to the Commission are public records generated for the benefit of the citizens of the State, and may be copied, published, and disseminated to any person upon proper request.

23. REQUEST FOR COPIES:

If the Grantee receives a request to prepare a copy of any Deliverable required by this Contract, the Grantee shall provide the copy at cost, or at a price required by law.

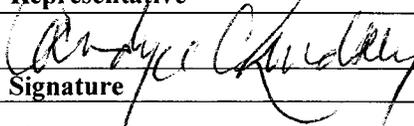
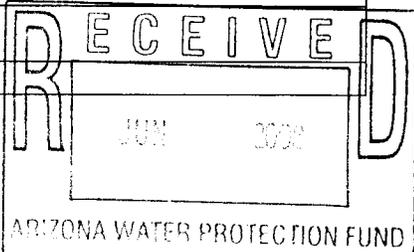
24. GRANTEE'S REPRESENTATIONS AND WARRANTIES:

All representations and warranties made by the Grantee under this Contract, including but not limited to those representations made in Paragraph 20 and in the Grant Application, shall survive the expiration or termination of this Contract. In addition, the parties acknowledge that pursuant to A.R.S. § 12-510, except as provided in A.R.S. § 12-529, the State is not subject to or barred by any limitations of actions prescribed in A.R.S., Title 12, Ch. 5.

COPY

Arizona Water Protection Fund Application Cover Page FY 2009

WPFO382

Title of Project: Evaluation of long-term change and establishment of an invasive species monitoring plan for the Middle Verde River												
Type of Project: <input type="checkbox"/> Capital or Other <input type="checkbox"/> Water Conservation <input checked="" type="checkbox"/> Research	Stream Type: <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral	Your level of commitment to maintenance of project benefits and capital improvements: <input type="checkbox"/> < 5 years <input type="checkbox"/> 5-10 years <input type="checkbox"/> 11-15 years <input checked="" type="checkbox"/> 16-20 years										
Applicant Information: Name/Organization: Arizona Board of Regents for AZ State University Address 1: Address 2: City: State: ZIP Code: Phone: Fax: Tax ID No.:		Inside an AMA: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, which AMA: <input type="checkbox"/> Phoenix <input type="checkbox"/> Tucson <input type="checkbox"/> Prescott <input type="checkbox"/> Pinal <input type="checkbox"/> Santa Cruz Type of Application: <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation										
Contact Person: Name: Douglas Green Title: Associate Professor Phone: Fax: e-mail:		Any Previous AWPB Grants: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, please provide Grant #(s): 99-091-WPF										
Arizona Water Protection Fund Grant Amount Requested: \$108,324 If the application is funded, will the Grantee intend to request an advance: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Matching Funds Obtained and Secured: <table border="1"><thead><tr><th><u>Applicant/Agency/Organization:</u></th><th><u>Amount (\$):</u></th></tr></thead><tbody><tr><td>1. Applicant</td><td>128,588.00</td></tr><tr><td>2.</td><td></td></tr><tr><td>3.</td><td></td></tr><tr><td colspan="2" style="text-align: right;">Total: 128,588.00</td></tr></tbody></table>		<u>Applicant/Agency/Organization:</u>	<u>Amount (\$):</u>	1. Applicant	128,588.00	2.		3.		Total: 128,588.00	
<u>Applicant/Agency/Organization:</u>	<u>Amount (\$):</u>											
1. Applicant	128,588.00											
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Total: 128,588.00												
Has your legal counsel or contracting authority reviewed and accepted the Grant Award Contract General Provisions? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A												
Signature of the undersigned certifies understanding and compliance with all terms, conditions and specifications in the attached application. Additionally, signature certifies that all information provided by the applicant is true and accurate. The undersigned acknowledges that intentional presentation of any false or fraudulent information, or knowingly concealing a material fact regarding this application is subject to criminal penalties as provided in A.R.S. Title 13. The Arizona Water Protection Fund Commission may approve Grant Awards with modifications to scope items, methodology, schedule, final products and/or budget.												
Deborah Shaver	Director, Research Administration,											
Typed Name of Applicant or Applicant's Authorized Representative	Title and Telephone Number											
	6/6/08											
Signature	Date Signed											
for Deborah N. Shaver Director, Research Administration Arizona State University												
												

Executive Summary

The Verde River is a highly dynamic rapidly changing ecosystem. The middle Verde River is unique as it is the only federally designated Wild and Scenic River and one of the last large free flowing rivers in the state of Arizona. American Rivers recently (2006) named the Verde River as one the 10 most endangered rivers in the U.S. This portion of the Verde River is also habitat for several federally listed and Arizona State Species of Special Concern including the spikedace (*Meda fulgida*), razorback sucker (*Xyrauchen texanus*), and the bald eagle (*Haliaeetus leucocephalus*). This reach of the Verde is an important resource for boating, fishing, and other recreational pursuits. Rapid population growth of the Verde Valley, and potential groundwater pumping to supply Prescott and other communities may also impact the Middle Verde. This creates a need to assess a baseline of natural variability and riparian plant community composition for the Middle Verde River.

The purpose of this study is to increase awareness of temporal changes in riparian areas, provide baseline data from which departures from current vegetation and streambank conditions can be judged, and create an early detection/rapid-response monitoring system for invasive plants in riparian communities along the Middle Verde River.

This study is timely as it proposes to assess temporal change of the riparian area associated with the portion of the Verde River designated Wild and Scenic, located between Childs and Sheep Bridge, approximately 24 river miles below Camp Verde. A Decision Notice approving the Verde Wild and Scenic River Comprehensive Management Plan (VWSRP) (available at http://www.fs.fed.us/r3/verde_crmpl/) was signed by Forest Supervisors of the three National Forests (Coconino, Prescott and Tonto) with jurisdiction over this part of the river on June 14, 2004.

Management of riparian vegetation under the VWSRP is key to protection and enhancement of the "Outstandingly Remarkable Values" that caused this river to be designated, since riparian vegetation is key to wildlife species, water quality, channel stability and scenic values. This plan calls for management of good to excellent species and age diversity of riparian vegetation, and control or eradication of invasive species (USDA 2004). The monitoring plan contains little mention of invasive species; results of this proposed study will provide information to assist in invasive species management and improve other vegetation monitoring activities on the river.

Results of this research will benefit management of the Verde Wild and Scenic River, and indirectly, management of other southwestern riparian areas. Activities in the Verde watershed such as groundwater pumping, grazing, land development, encroachment of invasive species, and recreational uses such as river rafting are expected to increase; the effects of these actions cannot be determined without baseline information on vegetation and river morphology. Study results will provide information on range of natural variability for the dynamic ecosystem of this large desert river. Analysis of ground-based and aerial photos spanning 10 years will provide a baseline from which future changes due to human-caused changes or natural events may be compared. Establishment of a long term, low intensity monitoring plan for invasive species will an important managerial tool, which will be carried forward after this project is concluded. Early detection/rapid response is an essential part of a timely response to invasive species as it enables managers to detect and react quickly to new infestations before they grow beyond what the agency is able to control.

Knowledge of the natural variability, species composition and changes in species diversity over time as determined by long-term monitoring is vital to protection of native riparian vegetation, habitats and function. This same knowledge is critical to protection and restoration of wildlife species, many of which depend upon functional riparian ecosystems.

Project Overview

Project background

This project proposes to study the Verde River from Childs to Sheep Bridge a distance of approximately 33 river miles (Fig. 1). Many reaches of the Verde River throughout the study area represent a compound river channel (Graf 1988) where a braided high flow channel occupied only by flood flows contains a smaller inset active channel occupied by all flows (Fig 2). Dominant riparian woody species occupying stream banks of the active channel include Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and seep willow (*Baccharis salicifolia*). Cobble textured floodplains are frequently dominated by burro bush (*Hymenoclea monogyra*) desert broom (*Baccharis sarothroides*) and desert willow (*Chilopsis linearis*). The outer margins of the floodplain and terraces that contain finer textured substrates, are often dominated by mature willow and cottonwood, while terraces are dominated by mesquite (*Prosopis* spp.) and other facultative riparian species.

The Verde River upstream of the USGS Tangle Creek river gage (USGS station number 09508500) drains an area of approximately 5858 mi² of which 5494 mi² are contributing. The Tangle Creek gage is located approximately 1 mile downstream from Sheep Bridge. The Verde River upstream of the Tangle Creek gage is a free flowing river. Average daily discharge of the Verde River is extremely variable from 1945 to 2006 the flow ranged from 53 to 110,000 cfs (Fig. 3). During the last 10 years average daily flow ranged from 53 to 40,400 cfs (Fig. 3). The largest instantaneous peak flow on record, 145,000 cfs, occurred on 8 Jan 1993 and is estimated as a 62.1 year return interval. The most recent peak flow, 65,000 cfs occurred 2 Dec 2005 and is estimated as an 8.9 year return interval. Return intervals were estimated with the US Geological Survey's PEAKFQ ver 5.0.0 a program which utilizes the Pearson Log III analysis for flood data (USGS 1982).

The extreme variability of discharge is driven by watershed-level factors that include steep topography and shallow soils of low water holding capacity. These factors, typical for many semiarid watersheds of the Southwest, because a large percentage of precipitation to be partitioned as overland flow, resulting in very high peak flows relative to base and bankfull discharge (Fig. 3 and Table 1). Ratios of bankfull discharge (1.5 year) to 5 and 10 year events are some of the highest in the United States (Table 1).

These high flow events are critical regenerative mechanisms for southwestern desert riparian ecosystems. They are the mechanism that maintains high species diversity and spatial heterogeneity (Naiman et al. 2005), and redistribution of nutrients and organic matter (Malanson 1993).

At any one location along the river, flow variability results in variable plant communities occupying that location over time. During periods of small yearly flood peaks characteristic of below normal precipitation periods, vegetation encroaches into the stream channel (Fig. 4, 5, and 6). Species that typically encroach upon the channel include cattail (*Typha latifolia*), knotgrass, (*Paspalum distichum*), bulrush, (*Scirpus acutus*), reedgrass (*Phragmites australis*), and the exotic species salt cedar (*Tamarix* spp.). During periods of high precipitation, much of this vegetation is removed from the channel (Fig. 4, 5 and 6). Given predictions of long-term drought, documentation of vegetation dynamics in riparian systems is of particular importance for managers. Managers and users of riparian areas can utilize this information to refine their conceptual model of riparian function and their expectations of riparian potential over time.

In 1999, a series of photo points along the river were established by the US Forest Service and monitored 2 to 3 times per year by Forest Service and ASU personnel until 2003. During this time the Forest Service and ASU monitored livestock utilization of woody species to comply with Terms and Conditions of a Biological Opinion issued by the US Fish and Wildlife Service. Additional monitoring of woody species was also conducted by ASU and Forest Service personnel during this time period as part of a AWPf grant. Visits to the study reach during 2004 and 2006 revealed significant changes in the stream channel and riparian communities (Figs 4 and 5). An increase in establishment of salt cedar was notable.

Project Goals

The overall goals of this project are three fold: 1) to increase awareness of the temporal dynamics and, 2) provide a baseline of data to evaluate temporal change associated with the middle reach of the Verde River, and 3) provide an early detection/rapid response system for management of invasive plant species. The middle reach of the Verde River is defined in this study to be that portion of the river between Childs and Sheep Bridge.

Objectives of this study:

1. Develop information on range of natural vegetation and morphologic variability on the Verde River, as natural events allow.
2. Develop and implement a quick method for monitoring vegetation.
3. Develop an early detection/rapid response system for management of invasive species on the Verde River.

Statement of Problems and Causes

This proposal addresses three major problems within the middle portion of the Verde River.

1. Lack of understanding of temporal variation of large river riparian systems. Unfamiliarity with temporal dynamics of large river riparian systems can lead to reactions to system disturbance that are either out of phase with actual system dynamics or are inappropriate to the system.
2. Need for long-term monitoring for invasive species. Invasive species have been implicated as drivers of change in several ecosystems; a relevant example includes salt cedar in riparian systems of the southwest (Busch and Smith 1995, Kennedy and Hobbie 2004). Significant sources of invasive plant infestations include the Verde Valley/Cottonwood area directly up river and the Payson area via the East Verde River. Rapidly increasing populations of the Verde Valley, (51% increase from 1990 to 2000) and the Payson region represent

increased likelihood of introducing invasive species into drainage systems and waterways. At this time *Arundo* (*Arundo donax*), an invasive species of concern in southern California riparian areas, is found at Beasley Flats and downstream throughout the entire reach of the Verde designated as “Wild”. Dalmatian toadflax was identified just downstream of Childs, on a site that is the lowest recorded elevation for this species in the state. Fountain grass (*Pennisetum setaceum*) an invasive escaped ornamental currently occupies very limited locations in the Middle Verde, but has great potential to spread. The lack of an early detection system for the Middle Verde River may result in missed opportunities for management and control of these and other invasive species.

Statement of solutions

The results of the proposal will address problems listed previously by providing data on temporal variation and plant community composition. Data on temporal variation will be derived from oblique and aerial photos. Understanding the temporal dynamics will allow managers to better assess natural variability of the riparian ecosystem and manage the system in phase with natural dynamics. Using the results of this work, managers can adjust their perspectives on the desired future condition and potential of riparian systems associated with larger desert rivers such as the Verde River.

A major premise of this proposal is that riparian ecosystems are products of a suite of processes acting over multiple temporal and spatial scales. Some of these processes include flow regime, climate change, and invasion of non-native organisms. These processes and others set conditions whose expression may be either instantaneous or have considerable lag time. Where the temporal context of change is well understood, serious misjudgments concerning management and restoration of riparian systems can be avoided.

Long-term low intensity monitoring of invasive species forms an early detection network for the Middle Verde River. Posting the guide book that will be created as part of this project on line so it will be available to recreationists will enhance this network. Early detection of invasive species is widely recognized as a critical first step in managing and responding in a timely manner to invasive species (Mooney and Hobbs 2000, GAO 2003).

Statement of project years of benefit

Results of the research could have long-term implications for management in riparian areas not only in the proposed study area, but in similar desert river systems in the southwest. These benefits will exceed 20 years as management of invasive species and the need to understand natural variability of riparian systems continues to increase.

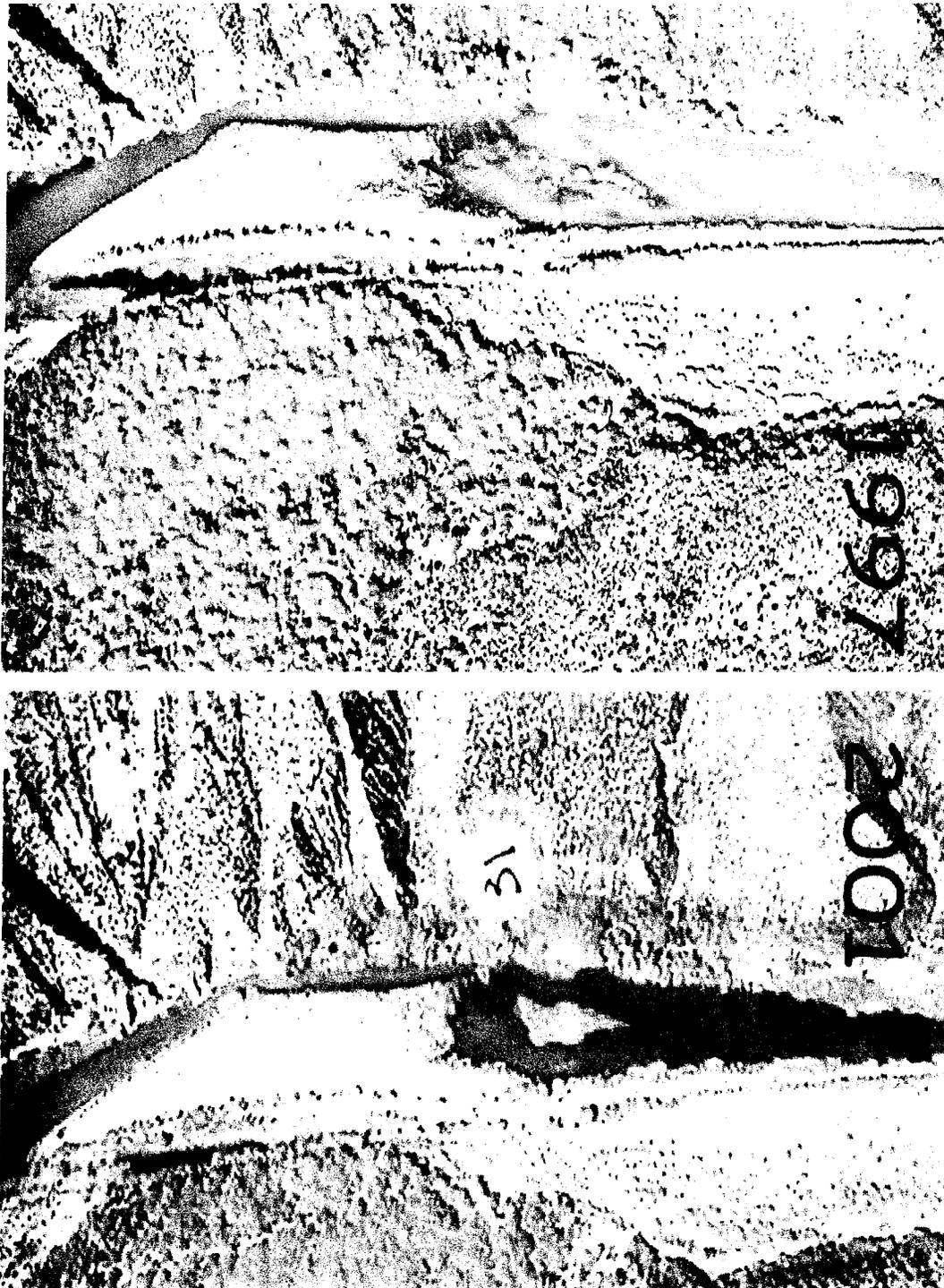
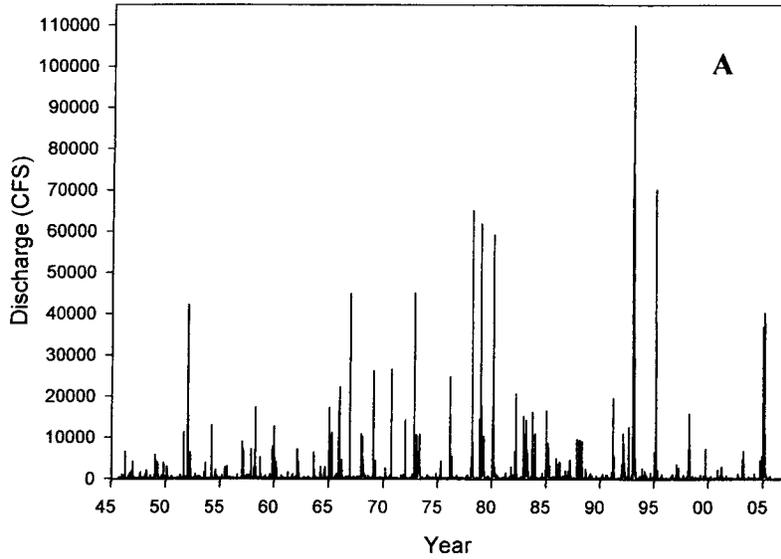


Fig. 2. Vegetation change in the active channel of the Verde River upstream of Goat Camp Canyon (river mile 29) from 1997 to 2001. Note the increase in bank vegetation and expansion of the plant community in the mid channel bar. Bank vegetation consists mostly of willow, reedgrass and knotgrass. Vegetative cover on the coarse textured flood plains is relative constant and consists mainly of desert willow, desert broom, and burro bush. Flow is from right to left in the photos.

Average daily discharge Verde River at
Tangle Creek Gage 1945 to 2007
(USGS 09508500)



Average daily discharge Verde River at
Tangle Creek Gage 1995 to 2007
(USGS 09508500)

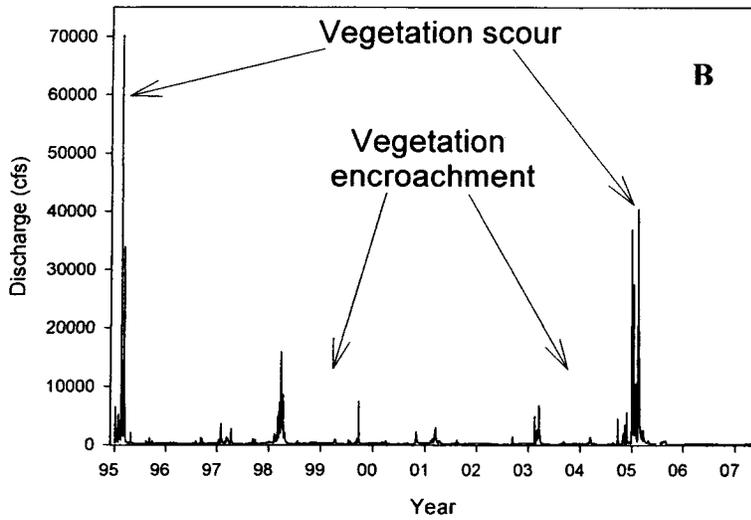


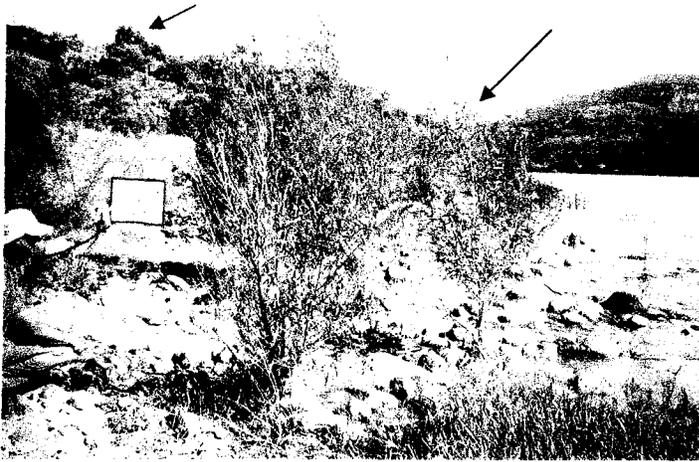
Fig. 3. Average daily discharge of the Verde River at the Tangle Creek Gage. A. data from the period of record, B. data from 1995 to 2007. Note the extreme variability of flow and peak of the most recent high flow relative to the period of record.

Table 1 Ratios of discharges of given recurrence intervals to bankfull discharge for selected rivers.

Site	Q_5/Q_{bf}	Q_{10}/Q_{bf}	Q_{25}/Q_{bf}
Maryland*	2.7	4.2	7.5
Eastern US*	1.8	2.1	3.3
Salmon River*	1.6	1.9	2.2
Verde River**	4.7	8.0	13.9

* Leopold L.B. 1994. A View of the River

** Data from the Tangle Creek gage (09508500), return intervals determined with PEAKFQ



2000



2002

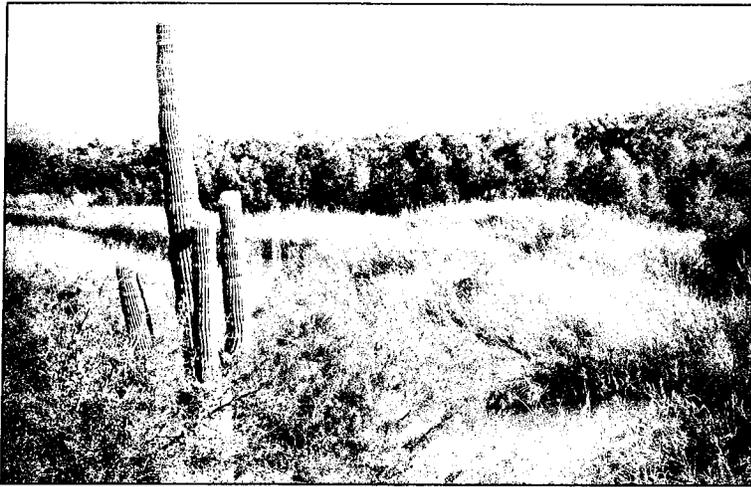


2006

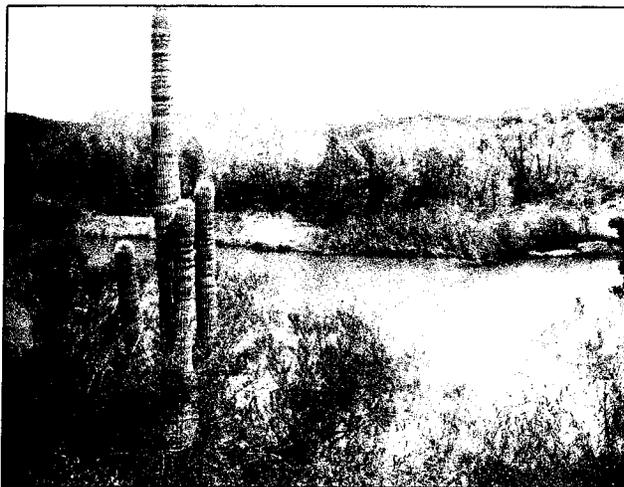
Fig. 4. Photo point located below Houston Creek (river mile 27.3) Verde River. Note woody and herbaceous vegetation response to low flows prior during 2000 to 2005 and removal of woody and herbaceous vegetation due to flooding in December 2005. Arrows point out a USGS gage house (Station number 09508000) and a juniper tree on the ridge (dead in the 2006 photo) Fig. 3 shows the hydrograph for this time period.



2000



2002



2006

Fig. 5. Photo point located down stream of Wet Bottom Creek (river mile 46.8) Verde River. Note the expansion of the reedgrass in the center of the photos from 1999 to 2003 and removal due to flooding in December 2005. Fig. 3 shows the hydrograph for this time period.

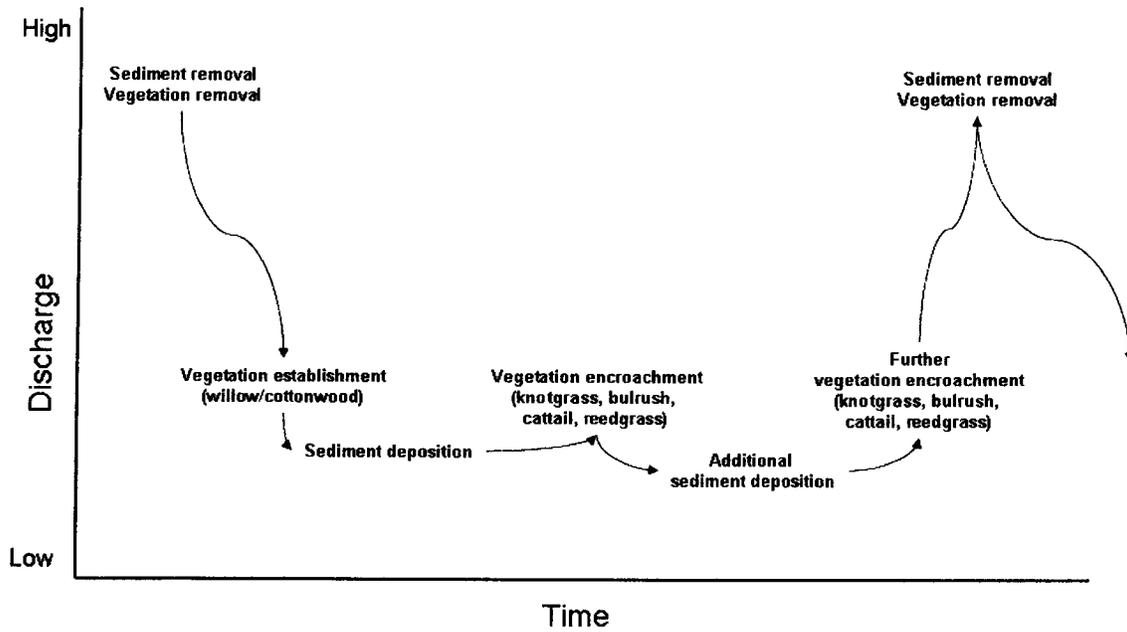
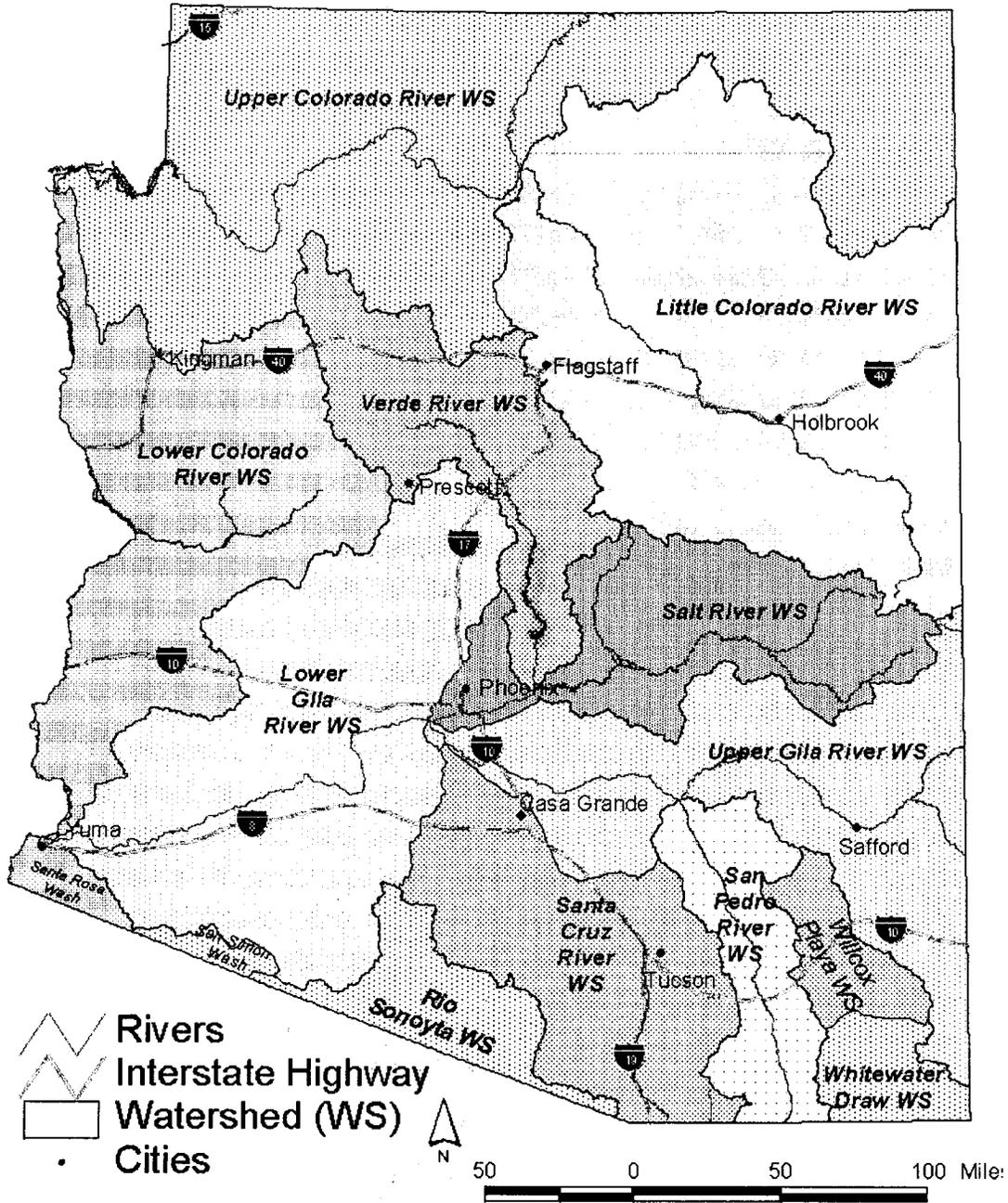


Figure 6. A conceptual model of riparian community change with time as a function of stream discharge. The time between high flow events is variable and depends upon climatic events at spatial scales much larger than the riparian area.

Project Location & Environmental Contaminant Information FY 2009

Project Location Information			
1. County: <u>Yavapai</u>	2. Section: <u>see maps</u>	3. Township: <u>9N, 91/2, 10N, 11N</u>	4. Range: <u>6E</u>
<p>5. Watershed: <u>Verde River</u></p> <p>6. Name of USGS Topographic Map where project area is located: <u>Verde Hot Springs, Wet Bottom Creek, Chalk Mtn</u></p> <p>7. State Legislative District: <u>1</u> (Information available at http://156.42.40.10/mapping/default2.asp?tname=Interim.2004.Legislative.Map)</p> <p>8. Land ownership of project area: <u>US Forest Service</u></p> <p>9. Current land use of project area: <u>Multiple use</u></p> <p>10. Size of project area (in acres): <u>400</u></p> <p>11. Stream Name: <u>Verde River</u></p> <p>12. Length of stream through project area: <u>34 miles</u></p> <p>13. Miles of stream benefited: <u>34 miles miles</u></p> <p>14. Acres of riparian habitat: <u>400 acres</u> will be:</p> <div style="margin-left: 400px;"> <input type="checkbox"/> Enhanced <input checked="" type="checkbox"/> Maintained <input type="checkbox"/> Restored <input type="checkbox"/> Created </div>			
<p>15. Provide directions to the project site from the nearest city or town. List any special access requirements: From Camp Verde, drive east on Highway 260 approximately 9 miles to the Childs turnoff (Forest Rd 708). Drive 14 miles south to Forest Rd 502, turn right (west) and drive 7 miles to Childs.</p>			
Environmental Contaminant Location Information			
<p>1. Does your project site contain known environmental contaminants? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants: •</p> <p>2. Are there known environmental contaminants in the project vicinity? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants: •</p> <p>3. Are you asking for Arizona Water Protection Fund monies to identify whether or not environmental contaminants are present? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>			

Arizona Watershed Map FY 2009



Title of Project: Evaluation of long-term change and establishment of an invasive species monitoring plan for the Middle Verde River

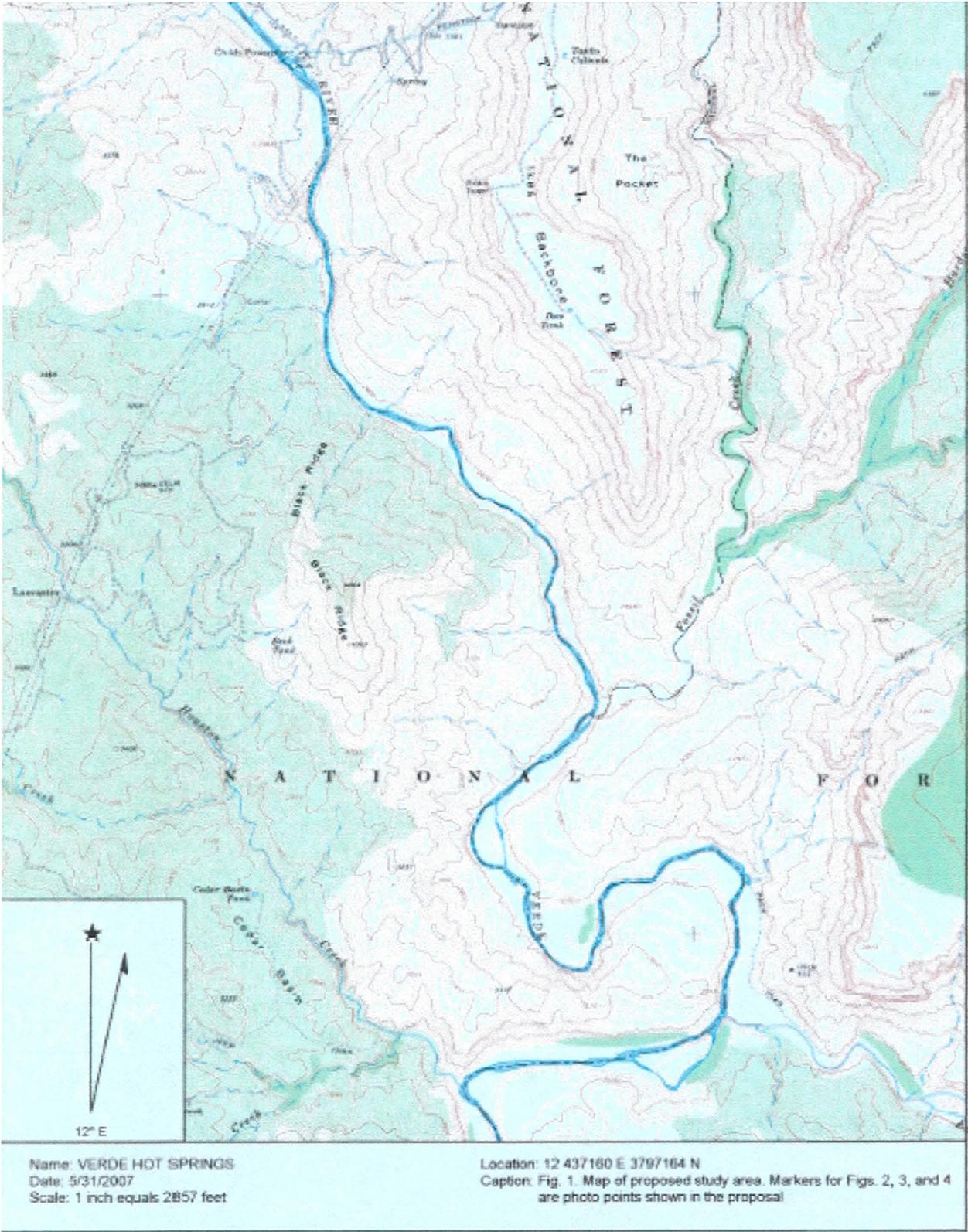
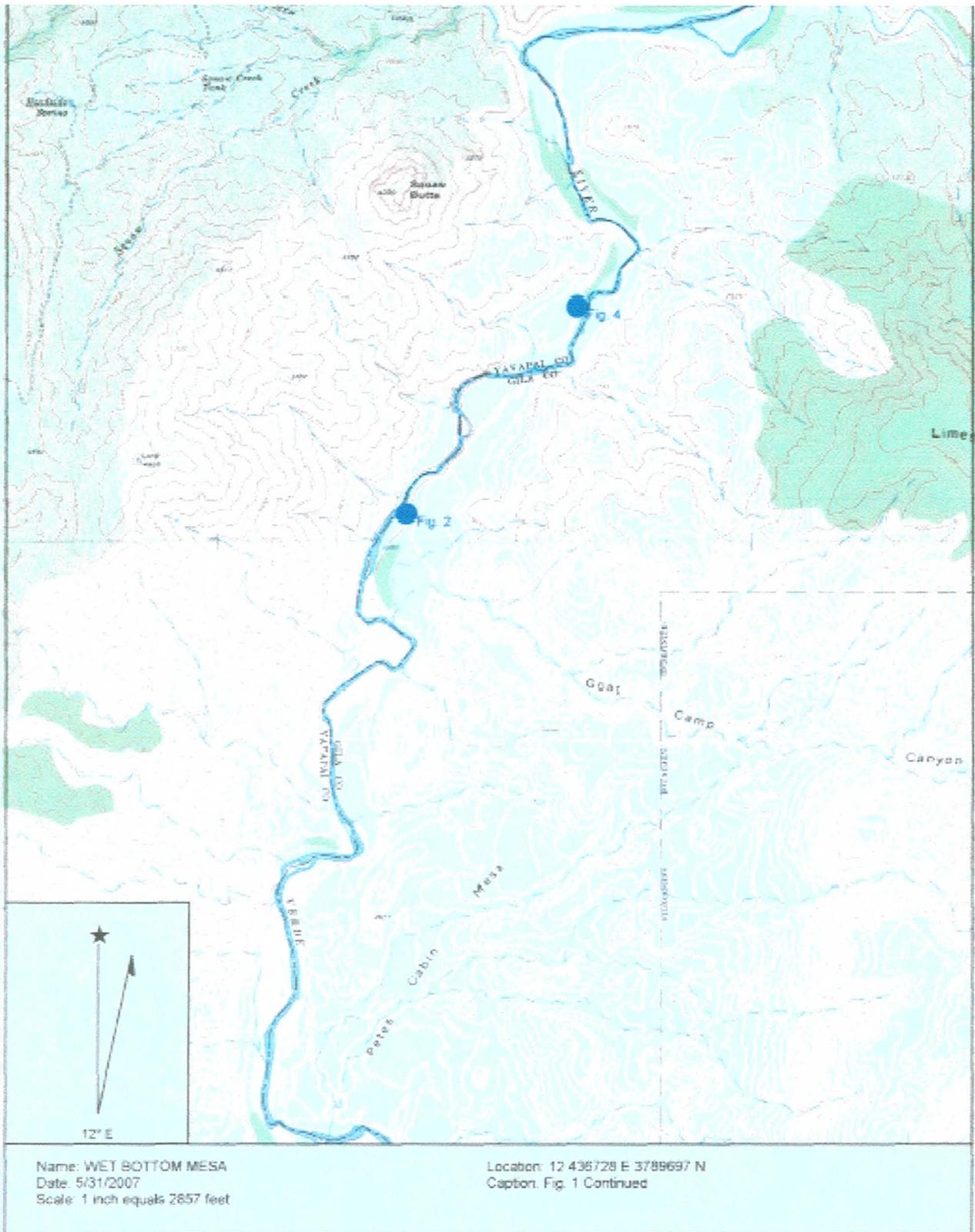


Fig. 1. Map of the proposed study area. Markers for Figs. 2, 3, and 4 are photo points shown in the proposal.



Copyright (C) 1997, Maptech, Inc.

Fig. 1 Continued

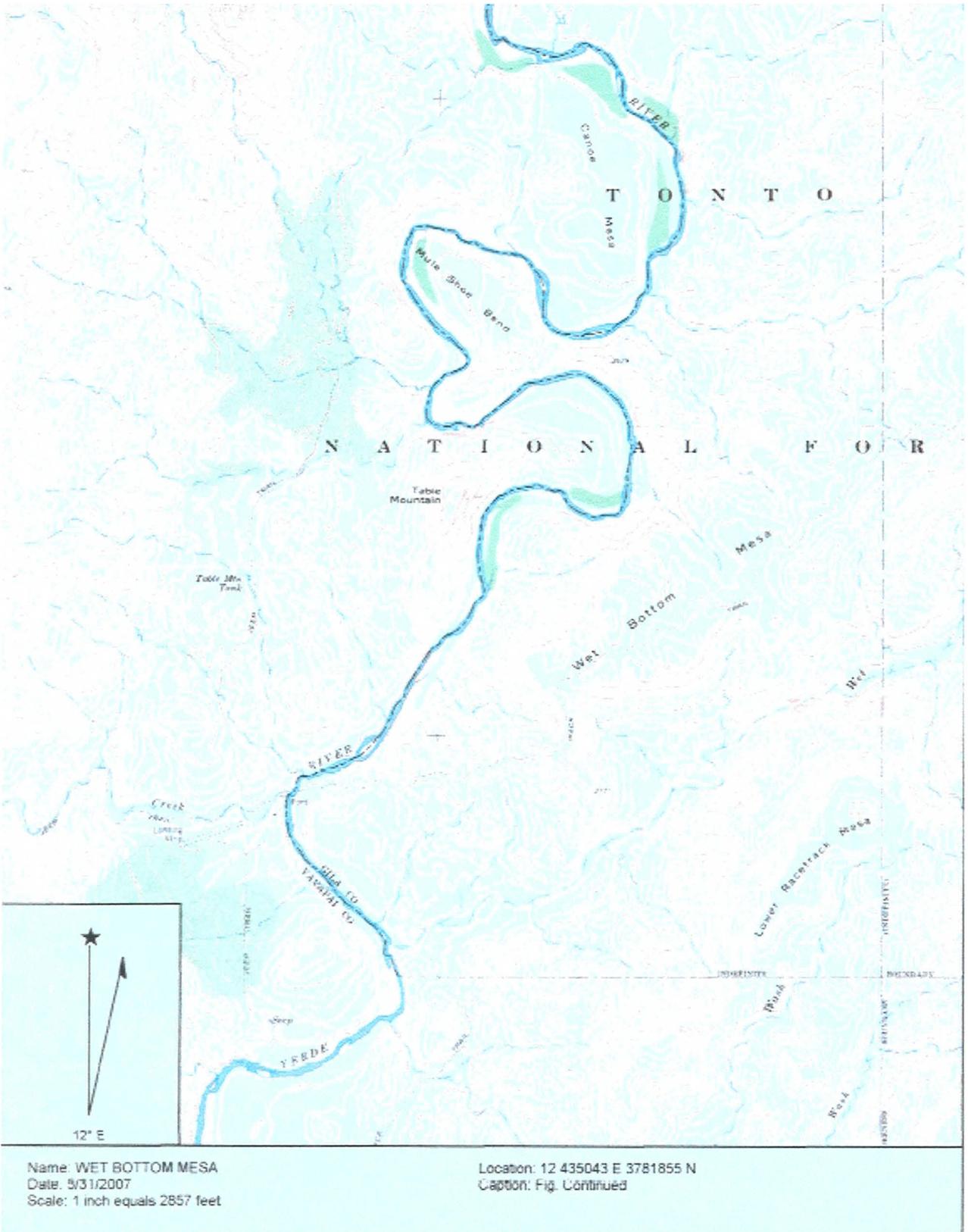
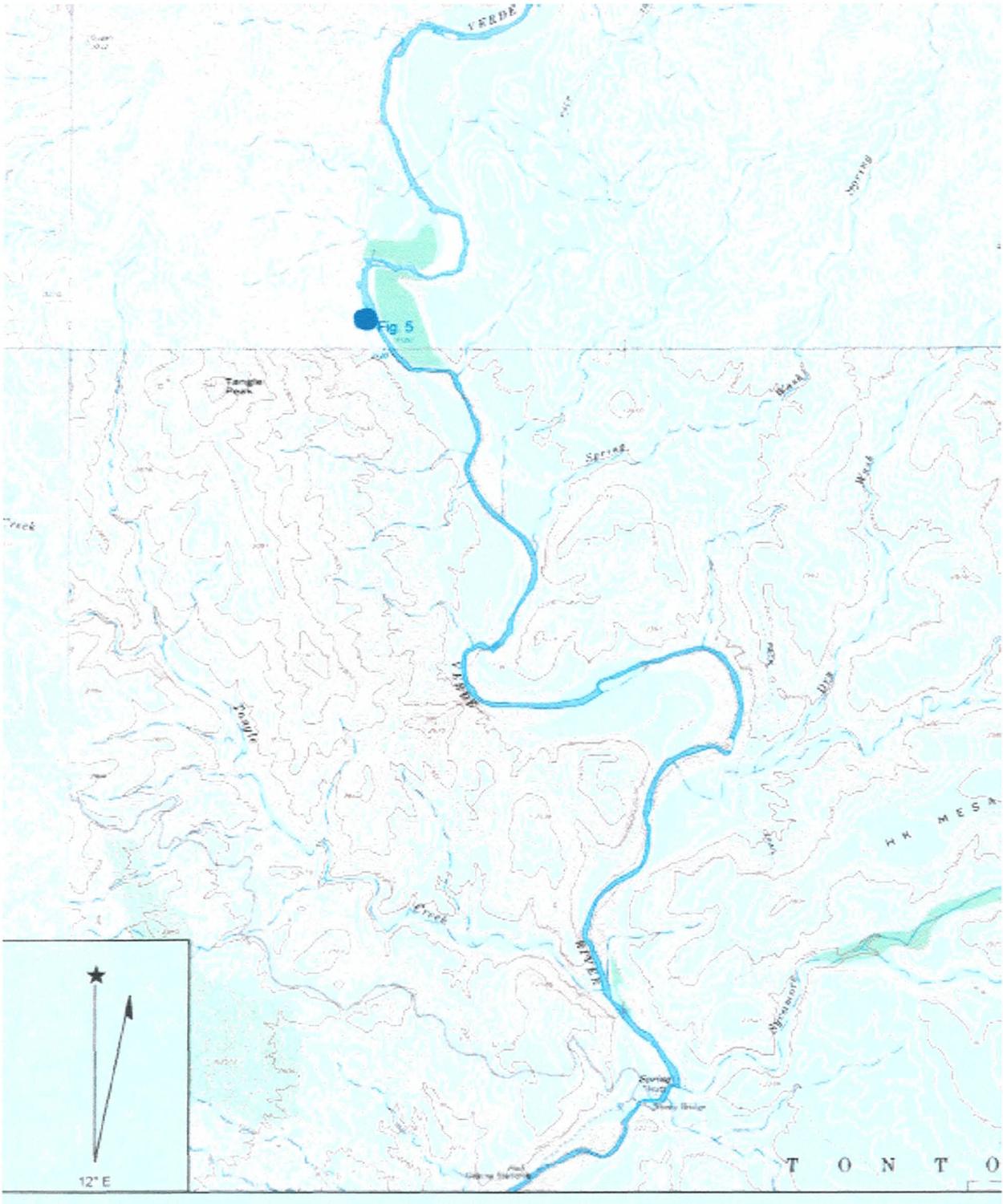


Fig. 1 Continued



Name: CHALK MT
 Date: 5/31/2007
 Scale: 1 inch equals 2857 feet

Location: 12 433815 E 3774315 N
 Caption: Fig. 1. Continued

Fig. 1 Continued

Scope of Work

Task # 1: Clearances and Permits

Task Description: Grantee shall obtain permits and clearances necessary to complete tasks listed in the Scope of Work

Task Purpose: To comply with applicable requirements and laws

Deliverable Description: Copies of permits and clearances

Deliverable Due Date: Feb 28, 2008

Task Cost: Requested \$0, Contributed \$442

Task # 2: Write detailed project monitoring and data analysis plan

Task Description: Write a detailed final monitoring plan and data analysis plan

Task Purpose: Provide repeatable, objective sampling methods and valid analysis procedures for data.

Deliverable Description: Final monitoring plan

Deliverable Due Date: March 30, 2008

Task Cost: Requested \$0, Contributed \$3,684

Task # 3: Collect existing information

Task Description: Collect and categorize existing photos, hydrologic data, review herbarium specimen data of the study area

Task Purpose: Provide a basis for selecting existing and future photo points based on quality of existing photos and to provide an initial indication of potential sites for vegetation monitoring.

Utilization of existing data to provide framework for proposed research.

Deliverable Description: in first annual report submitted to AWPf

Deliverable Due Date: Annual report deadline

Task Cost: Requested \$6,937, Contributed \$4,667

Task # 4: Initial sampling trip

Task Description: Survey of study site, selection of photo points, and preliminary sampling

Task Purpose: Select photo points and vegetation sampling sites for further study. Conduct preliminary sampling of vegetation to determine optimal sampling intensity and plot size.

Deliverable Description: results in first annual report

Deliverable Due Date: Annual report deadline

Task Cost: Requested \$14,848, Contributed \$7,468

Task # 5: Analysis of existing photographs

Task Description: Analysis of existing ground based and aerial photos

Task Purpose: Determine change of vegetative features between photos, evaluate photo points for inclusion in future years of the study.

Deliverable Description: Annual report

Deliverable Due Date: Annual report deadline

Task Cost: Requested \$13,688, Contributed \$2,358

Task # 6: Sampling trips

Task Description: Two sampling trips per year (year early fall and late spring) will be used to retake photo points, sample vegetation and collect plant specimens for the river flora

Task Purpose: Collection of data to partially meet objectives 1 and 3. Objective 1 will be met by retaking photo points in the study area. Objective 2 will be met by vegetation sampling and plant collection activities.

Deliverable Description: Annual reports

Deliverable Due Date: Annual report deadline

Task Cost: Requested \$21,780, Contributed \$45,680

Task # 7: Analysis of photos (oblique and aerial)

Task Description: Vegetative cover and channel features from each photo point will be analyzed.

Task Purpose: Analysis of photos will provide data to assess the degree of vegetative change over the last decade at photo points on the Verde River.

Deliverable Description: Photos and data in annual reports

Deliverable Due Date: Annual report deadline

Task Cost: Requested \$23,324, Contributed \$9,041

Task # 8: Analysis Field data

Task Description: Analysis of project data collected from field activities

Task Purpose: Organize and provide an objective treatment of data

Deliverable Description: results in annual reports

Deliverable Due Date: Annual report deadline

Task Cost: Requested \$16,186, Contributed \$28,002

Task # 9: Preparation of invasive weeds monitoring guide

Task Description: Prepare an illustrated guide to major invasive weeds that have potential to establish within the study reach of the Verde River

Task Purpose: This guide will provide information for river rangers about identification of invasive species of concern. The river rangers can then act as an early detection/rapid response network for control of invasive species.

Deliverable Description: A copy of the invasive weeds guide

Deliverable Due Date: Final report deadline

Task Cost: Requested: \$6,937, Contributed \$2,702

Task # 10: Final report

Task Description: Prepare and submit a final report

Task Purpose: Final report will summarize methods and data and outcomes of tasks.

Deliverable Description: Final report including copies of data, photos, training guide, and flora of the study area.

Deliverable Due Date: Final report deadline

Task Cost: Requested \$4,624 Contributed \$25,544

Detailed Budget Breakdown - Requested Funds
Note: a budget broken down by year is located in Appendix A

PROJECT BUDGET		TOTAL REQUESTED	
TASKS		# Days	Cost
TASK 1 - Clearance & Permits			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST			
INDIRECT COST @ 05%			
TOTAL TASK COST			
TASK 2 - Project Monitoring Plan			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST			
INDIRECT COST @ 05%			
TOTAL TASK COST			
TASK 3 - Collect Existing Information			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student			
		30	\$4,620
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			
			\$370
Grad Student @ 35.0% of Salary			
			\$1,617
Equipment			
Supplies			
TOTAL DIRECT COST			
			\$6,607
INDIRECT COST @ 05%			
			\$330
TOTAL TASK COST			
			\$6,937

PROJECT BUDGET		TOTAL REQUESTED	
TASKS		# Days	Cost
TASK 4 - Initial Sampling Trip			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student	15		\$2,310
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			\$185
Grad Student @ 35.0% of Salary			\$809
Equipment			
(4) inflatable kayaks @ \$1,525 ea			\$6,100
(1) 12 volt pump @ \$100 ea			\$100
(1) foot pump @ \$35 ea			\$35
(4) one-piece paddles @ \$70 ea			\$280
(4) PTR two-piece paddles @ \$85 ea			\$340
(1) digital SLR camera & memory card)			\$1,125
Supplies			
(4) personal floatation devices @ \$95 ea			\$380
(4) splash jackets @ \$105 ea			\$420
(4) wet suits @ \$135 ea			\$540
(3) extra large dry bags @ \$100 ea			\$300
(10) large dry bags @ \$40 ea			\$400
(6) small dry bags @ \$20 ea			\$120
(1) dry case 1300 @ \$75 ea			\$75
(1) dry case 1400 @ \$110 ea			\$110
(16) 4 foot straps @ \$4 ea			\$64
(28) 6 foot straps @ \$5 ea			\$140
(16) 9 foot straps @ \$5 ea			\$80
(8) 12 foot straps @ \$6 ea			\$48
(20) carabiners @ \$9 ea			\$180
TOTAL DIRECT COST			\$14,141
INDIRECT COST @ 05%			\$707
TOTAL TASK COST			\$14,848
TASK 5 - Analysis of Existing Oblique and Arial Photos			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student	50		\$7,700
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			\$616
Grad Student @ 35.0% of Salary			\$2,695
Equipment			
Computer			\$1,700
Supplies			
Image Acquisition Software			\$325
TOTAL DIRECT COST			\$13,036
INDIRECT COST @ 05%			\$652
TOTAL TASK COST			\$13,688

PROJECT BUDGET		TOTAL REQUESTED	
TASKS		# Days	Cost
TASK 6 - Sampling Trips			
Personnel			
Salaries			
	Doug Green		
	Bill Miller		
	Grad Student	70	\$10,780
Fringe Benefits (% of Salary)			
	Faculty @ 25% Request/15% Contrib		
	Grad Student @ 8.0% of Salary		\$862
	Grad Student @ 35.0% of Salary		\$3,773
In-State Travel			
	(2) Trips/year to site (Vehicle Rental/Gas)		\$4,128
Equipment			
	Vegetation Sampling Equipment		\$300
	(2) GPS Units w/supporting software		\$900
TOTAL DIRECT COST			\$20,743
INDIRECT COST @ 05%			\$1,037
TOTAL TASK COST			\$21,780
TASK 7 - Analysis of New Photos (Oblique & Aerial)			
Personnel			
Salaries			
	Doug Green		
	Bill Miller		
	Grad Student	60	\$9,240
Fringe Benefits (% of Salary)			
	Faculty @ 25% Request/15% Contrib		
	Grad Student @ 8.0% of Salary		\$739
	Grad Student @ 35.0% of Salary		\$3,234
Equipment			
Supplies			
Services			
	Aerial Photography		\$9,000
TOTAL DIRECT COST			\$22,213
INDIRECT COST @ 05%			\$1,111
TOTAL TASK COST			\$23,324
TASK 8 - Analysis of Field Data			
Personnel			
Salaries			
	Doug Green		
	Bill Miller		
	Grad Student	70	\$10,780
Fringe Benefits (% of Salary)			
	Faculty @ 25% Request/15% Contrib		
	Grad Student @ 8.0% of Salary		\$862
	Grad Student @ 35.0% of Salary		\$3,773
Equipment			
Supplies			
TOTAL DIRECT COST			\$15,415
INDIRECT COST @ 05%			\$771
TOTAL TASK COST			\$16,186

PROJECT BUDGET		TOTAL REQUESTED	
TASKS		# Days	Cost
TASK 9 - Prep of Invasive Weeds Monitoring Guide			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student	30		\$4,620
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			\$370
Grad Student @ 35.0% of Salary			\$1,617
Equipment			
Supplies			
TOTAL DIRECT COST			\$6,607
INDIRECT COST @ 05%			\$330
TOTAL TASK COST			\$6,937
TASK 10 - Final Report			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student	20		\$3,080
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			\$246
Grad Student @ 35.0% of Salary			\$1,078
Equipment			
Supplies			
TOTAL DIRECT COST			\$4,404
INDIRECT COST @ 05%			\$220
TOTAL TASK COST			\$4,624
PROJECT TOTALS - All Tasks			
Personnel			
Salaries			
Doug Green			
Bill Miller			
Grad Student	345		\$53,130
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			
Grad Student @ 8.0% of Salary			\$4,250
Grad Student @ 35.0% of Salary			\$18,596
In-State Travel			\$4,128
Equipment			\$10,880
Supplies			\$3,182
Services			\$9,000
TOTAL DIRECT COST			\$103,166
INDIRECT COST @ 05%			\$5,158
TOTAL PROJECT COST			\$108,324

Detailed Budget Breakdown - Contributed Funds
Note: a budget broken down by year is located in Appendix A

PROJECT BUDGET		TOTAL CONTRIBUTED	
TASKS		# Days	Cost
TASK 1 - Clearance & Permits			
Personnel			
Salaries			
Doug Green	1	\$366	
Bill Miller			
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib		\$55	
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST		\$421	
INDIRECT COST @ 05%		\$21	
TOTAL TASK COST		\$442	
TASK 2 - Project Monitoring Plan			
Personnel			
Salaries			
Doug Green	5	\$1,830	
Bill Miller	3	\$1,221	
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib		\$458	
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST		\$3,509	
INDIRECT COST @ 05%		\$175	
TOTAL TASK COST		\$3,684	
TASK 3 - Collect Existing Information			
Personnel			
Salaries			
Doug Green	5	\$1,830	
Bill Miller	5	\$2,035	
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib		\$580	
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST		\$4,445	
INDIRECT COST @ 05%		\$222	
TOTAL TASK COST		\$4,667	

PROJECT BUDGET		TOTAL CONTRIBUTED	
TASKS		# Days	Cost
TASK 4 - Initial Sampling Trip			
Personnel			
Salaries			
Doug Green	8		\$2,928
Bill Miller	8		\$3,256
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$928
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
(4) inflatable kayaks @ \$1,525 ea			
(1) 12 volt pump @ \$100 ea			
(1) foot pump @ \$35 ea			
(4) one-piece paddles @ \$70 ea			
(4) PTR two-piece paddles @ \$85 ea			
(1) digital SLR camera & memory card)			
Supplies			
(4) personal floatation devices @ \$95 ea			
(4) splash jackets @ \$105 ea			
(4) wet suits @ \$135 ea			
(3) extra large dry bags @ \$100 ea			
(10) large dry bags @ \$40 ea			
(6) small dry bags @ \$20 ea			
(1) dry case 1300 @ \$75 ea			
(1) dry case 1400 @ \$110 ea			
(16) 4 foot straps @ \$4 ea			
(28) 6 foot straps @ \$5 ea			
(16) 9 foot straps @ \$5 ea			
(8) 12 foot straps @ \$6 ea			
(20) carabiners @ \$9 ea			
TOTAL DIRECT COST			\$7,112
INDIRECT COST @ 05%			\$356
TOTAL TASK COST			\$7,468
TASK 5 - Analysis of Existing Oblique and Arial Photos			
Personnel			
Salaries			
Doug Green	2		\$732
Bill Miller	3		\$1,221
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$293
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Computer			
Supplies			
Image Acquisition Software			
TOTAL DIRECT COST			\$2,246
INDIRECT COST @ 05%			\$112
TOTAL TASK COST			\$2,358

PROJECT BUDGET		TOTAL CONTRIBUTED	
TASKS		# Days	Cost
TASK 6 - Sampling Trips			
Personnel			
Salaries			
Doug Green	70		\$25,620
Bill Miller	30		\$12,210
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$5,675
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
In-State Travel			
(2) Trips/year to site (Vehicle Rental/Gas			
Equipment			
Vegetation Sampling Equipment			
(2) GPS Units w/supporting software			
TOTAL DIRECT COST			\$43,505
INDIRECT COST @ 05%			\$2,175
TOTAL TASK COST			\$45,680
TASK 7 - Analysis of New Photos (Oblique & Aerial)			
Personnel			
Salaries			
Doug Green	6		\$2,196
Bill Miller	13		\$5,291
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$1,123
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
Services			
Aerial Photography			
TOTAL DIRECT COST			\$8,610
INDIRECT COST @ 05%			\$431
TOTAL TASK COST			\$9,041
TASK 8 - Analysis of Field Data			
Personnel			
Salaries			
Doug Green	30		\$10,980
Bill Miller	30		\$12,210
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$3,479
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST			\$26,669
INDIRECT COST @ 05%			\$1,333
TOTAL TASK COST			\$28,002

PROJECT BUDGET		TOTAL CONTRIBUTED	
TASKS		# Days	Cost
TASK 9 - Prep of Invasive Weeds Monitoring Guide			
Personnel			
Salaries			
Doug Green	5		\$1,830
Bill Miller	1		\$407
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$336
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST			\$2,573
INDIRECT COST @ 05%			\$129
TOTAL TASK COST			\$2,702
TASK 10 - Final Report			
Personnel			
Salaries			
Doug Green	30		\$10,980
Bill Miller	25		\$10,175
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$3,173
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
Equipment			
Supplies			
TOTAL DIRECT COST			\$24,328
INDIRECT COST @ 05%			\$1,216
TOTAL TASK COST			\$25,544
PROJECT TOTALS - All Tasks			
Personnel			
Salaries			
Doug Green	162		\$59,292
Bill Miller	118		\$48,026
Grad Student			
Fringe Benefits (% of Salary)			
Faculty @ 25% Request/15% Contrib			\$16,100
Grad Student @ 8.0% of Salary			
Grad Student @ 35.0% of Salary			
In-State Travel			
Equipment			
Supplies			
Services			
TOTAL DIRECT COST			\$123,418
INDIRECT COST @ 05%			\$6,170
TOTAL PROJECT COST			\$129,588

STATE HISTORIC PRESERVATION OFFICE Review Form

In accordance with the State Historic Preservation Act (SHPO), A.R.S. 41-861 *et seq*, effective July 24, 1982, each State agency must consider the potential of activities or projects to impact significant cultural resources. Also, each State agency is required to consult with the State Historic Preservation Officer with regard to those activities or projects that may impact cultural resources. Therefore, it is understood that **recipients of state funds are required to comply with this law** throughout the project period. All projects that affect the ground-surface that are funded by AWPf require SHPO clearance, **including those on private and federal lands.**

The State Historic Preservation Office (SHPO) must review each grant application recommended for funding in order to determine the effect, if any, a proposed project may have on archaeological or cultural resources. To assist the SHPO in this review, the following information **MUST** be submitted with each application for funding assistance:

- A completed copy of this form, and
 - A United States Geological Survey (USGS) 7.5 minute map
 - A copy of the cultural resources survey report if a survey of the property has been conducted, and
 - A copy of any comments of the land managing agency/landowner (i.e., state, federal, county, municipal) on potential impacts of the project on historic properties.
- NOTE: If a federal agency is involved, the agency must consult with SHPO pursuant to the National Historic Preservation Act (NHPA); a state agency must consult with SHPO pursuant to the State Historic Preservation Act (SHPA),
- OR**
- A copy of SHPO comments if the survey report has already been reviewed by SHPO.

Please answer the following questions:

1. Grant Program: Arizona Water Protection Fund
2. Project Title: Evaluation of long-term change and establishment of an invasive species monitoring plan for the Middle Verde River
3. Applicant Name and Address: Arizona Board of Regents for AZ State University, Office for Research and Spons. Proj., PO Box 873505, Tempe, AZ, 85287-3503 480-727-1003
4. Current Land Owner/Manager(s): US Forest Service
5. Project Location, including Township, Range, Section: Township 9N, 91/2, 10N, 11N, Range 6E
6. Total Project Area in Acres (or total miles if trail): 34 miles/400ac
7. Does the proposed project have the potential to disturb the surface and/or subsurface of the ground?
 YES NO
8. Please provide a brief description of the proposed project and specifically identify any surface or subsurface impacts that are expected: This project involves photographing the riparian area and measuring vegetation at selected sites along the Verde River. Potential for surface or subsurface disturbance if very low

9. Describe the condition of the current ground surface within the entire project boundary area (for example, is the ground in a natural undisturbed condition, or has it been bladed, paved, graded, etc.). Estimate horizontal and vertical extent of existing disturbance. Also, attach photographs of project area to document condition: Site disturbance is limited to natural disturbance resulting from flooding

10. Are there any known prehistoric and/or historic archaeological sites in or near the project area? YES NO

11. Has the project area been previously surveyed for cultural resources by a qualified archaeologist? YES NO UNKOWN

If YES, submit a copy of the survey report. Please attach any comments on the survey report made by the managing agency and/or SHPO

12. Are there any buildings or structures (including mines, bridges, dams, canals, etc.), which are 50-years or older in or adjacent to the project area? YES NO

If YES, complete an Arizona Historic Property Inventory Form for each building or structure, attach it to this form and submit it with your application.

13. Is your project area within or near a historic district? YES NO

If YES, name of the district:

Please sign on the line below certifying all information provided for this application is accurate to the best of your knowledge. Douglas Green 23 May 08

Lacey Ward /Date 6/2/08
Applicant Signature

LACEY WARD / DOUGLAS GREEN
Applicant Printed Name

FOR SHPO USE ONLY

SHPO Finding:

- Funding this project will not affect historic properties.
- Survey necessary – further GRANTS/SHPO consultation required (*grant funds will not be released until consultation has been completed*)
- Cultural resources present – further GRANTS/SHPO consultation required (*grant funds will not be released until consultation has been completed*)

SHPO Comments

For State Historic Preservation Office:

Date:

Supplemental information

Key Personnel (resumes are in Appendix C)

Dr. Douglas Green (Project Coordinator) is an associate Professor at Arizona State University Polytechnic in the Department of Applied Biological Sciences. His research and coursework has focused on riparian and soil ecology for over 15 years. Since 1998, Dr Green has been involved extensively with the wild and scenic portion of the Verde River. From 1999 to 2002 he worked with US Forest Service personnel measuring the impact of livestock use on willow and cottonwoods.

Patti Fenner is the Tonto National Forest Invasive Plant Program Manager. She has worked in range and watershed management on the Tonto National Forest for 28 years, including monitoring of the Middle Verde River.

Dr. William Miller is an associate Professor at Arizona State University Polytechnic in the Department of Applied Biological Sciences. He has taught course work and research natural resources systems for 23 years. Since 1990 Dr. Miller has been involved in the application of remote sensing and GIS technologies for the analysis and monitoring of natural systems.

Project Schematic

No construction is associated with this project

Description of Monitoring/Sampling Plans

Note: The monitoring/sampling plants that follow are included to allow AWPf staff to evaluate the adequacy of the activities. A more detailed monitoring plant will be developed to meet to meet Task 2.

Methods to address objective 1 – Develop range of natural variability

We will work with US Forest personnel to acquire and catalog available study area images. These photos include existing ground-based photos and aerial photos. Analysis of ground-based photos will utilize methods outlined in Clark and Hardegree (2005). This method involve use of image analysis software to spatially register the images to one another. Once the images are spatially registered, image lines are drawn across each image and random pixels on each image line are sampled. Cover type of each pixel is determined and changes of cover type for pixels on each transect is determined. A quantitative estimate of cover type change over time is then determined. Note that it may not be possible to utilize all existing photos due to quality problems (too dark improper camera angle, etc).

Aerial photo analysis will be performed using a combination of remote sensing and GIS techniques. Aerial photos of selected locations will be spatially referenced to provide for spatial comparison over time. Reaches will be selected in consultation with US Forest Personnel. At this time it is anticipated that the area near the confluences of the East Verde River, Huston Creek, Red Creek and Wet Bottom Creek will be utilized, in addition to other reaches. Content of the photos will then be classified for their vegetative and geomorphologic content using Leica Imagine software. The classified images will then be imported into ESRI ArcGIS software for time series change detection analysis.

Methods to address objective 2 – Collect information to provide baseline conditions

Photo points from which existing photos were taken will be relocated and documented. The photo point location will be recorded on AWPf forms created for this purpose. Photos will be retaken on each sampling trip and analyzed as explained in the previous section.

Vegetation will be inventoried at selected locations along the Verde River. These locations will be those that are visible from selected photo points and others chosen in consultation with US Forest Service personnel. Herbaceous vegetation will be sampled using a 20X50cm Daubenmire plot placed at one meter intervals along a 50 meter transect. Woody vegetation will be sampled using a 20 by 5 meter belt transect, species density and height classes will be recorded. Sampling intensity (the number of transects and plots) will be determined utilizing the Stein's two stage method and cross-checked using the running mean of species richness (Steele and Torrie 1980, Quinn and Keough 2002). Although we have selected a plot size of 20X50cm and the 5X20m belt transect, we will explore optimal plot size using methods in Krebs (1998). Data to evaluate sampling intensity and plot size will be collected during the

first sampling trip. Vegetation sampling will be restricted to the bank zone of the active low flow channel.

Methods to address Objectives 3– Develop vegetation monitoring and rapid response for invasive species

In conjunction with US Forest Service personnel, several sites will be selected for long term low intensity vegetation monitoring. During the project, project personnel will conduct monitoring at the sites. Sites selected for monitoring will be areas located adjacent to and downstream of major tributary junctions.

Research Design

Cover analysis data from oblique photos will be analyzed as using a repeated measures anova (Neter et al. 1996). Aerial photos will utilize the same analysis procedure.

Existing Plans

The Verde Wild and Scenic River Comprehensive River Management Plan provides guidance for management and standards for the Verde River is on the enclosed CD. A copy of the final report for AWPf grant number 99-091-WPF, Effects of livestock use levels on riparian trees on the Verde River, is also enclosed on the CD.

Letters of community support

See attached

Maricopa County

ARIZONA COOPERATIVE
EXTENSION

THE UNIVERSITY OF ARIZONA • COLLEGE OF AGRICULTURE AND LIFE SCIENCES

4341 E. Broadway Road • Phoenix AZ 85040-8807 • (602) 470-8086 • FAX: (602) 470-8092 • cals.arizona.edu/maricopa

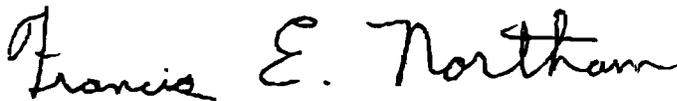
TO: Arizona Water Protection Fund Commission
RE: Verde River Grant Proposal by Dr. Doug Green (ASU Polytechnical)

DEAR COMMISSIONERS:

Doctor Green's proposal to document and establish a systematic monitoring protocol to survey plant community dynamics on the middle Verde River will produce an important set of ecological plant distribution data. As urban and semi-rural construction continues to reduce native environments around the entire Verde River, water flow, water quality and aquatic/riparian organisms (including native plant species) will be adversely affected. Years from now, it will be possible to use Dr. Green's results to identify vegetation changes, and then determine future management or remediation policies to maintain the Wild and Scenic conditions in middle Verde River corridor.

As a weed biologist that works with non-native pest plants, I am especially interested in the fact that data resulting from this proposed research will facilitate early detections and rapid responses to colonization by foreign weed species. Due to a phenomenon known as biological invasion, plus urban and agricultural sources of non-native plants immediately above the proposed research area, aggressively colonizing alien plants will encroach into the wild and scenic area. Identifying small, initial infestations of invasive weeds before they expand and dominate river flood plains, riparian areas or aquatic sites is a key management component for maintaining what remains of Verde River's intact native plant communities.

Therefore, I strongly recommend that you fund Dr. Green's work. Thank you. ED NORTHAM



Francis E. (Ed) Northam, Ph.D., Weed Biologist
Program Coordinator, Sr. - Invasive Plants
University of Arizona Cooperative Extension Office -- Maricopa Co.
4341 E. Broadway Road, Phoenix, AZ 85040
602/470-8086 ext. 339
FAX 602/470-8092
enortham@cals.arizona.edu



RE: Letter of support for Middle Verde Invasive Species Monitoring Proposal

To Whom It May Concern:

As an avid boater and a student of watershed management, I am strongly in support of a project that will help us manage the Wild and Scenic stretch of the Verde River in Central Arizona. The proposed project; the "Evaluation of Long-Term Change and Establishment of an Invasive Species Monitoring Plan for the Middle Verde River," will provide greater insight into the functioning of the riparian areas along the Verde River as well as allow land managers to make informed decisions that will preserve the ecological diversity and recreational values of the Verde River. Although I am greatly in favor of the preservation of species diversity as it promotes ecosystem resilience, Dr. Green's proposal already states that with eloquence. Rather, as an avid boater who dumped his first canoe on the Verde River at the age of 12, I feel that it is my duty to state the social benefits of a well managed Middle Verde River.

Besides being a Wild and Scenic River, it's the most accessible river in Arizona for novice and advanced boaters due to its central location and varying degrees of whitewater difficulty. Living as far as Tucson, I have made many trips down the Verde, and look forward to making many more. My first trip down the Verde was when I was twelve with my family, my second was with my high-school, and by the time I was in college I had discovered a wonderful community of boaters that have made boating the Verde a lifelong ritual. Paddling between walls of limestone and basalt, through stands of willow and cottonwood, below hills of saguaro, and down Class I through IV rapids, makes any trip down the Verde impressionable, exciting, and inspires conservation ethics based on personal experiences; be they sentimental, spiritual, or simply for the enjoyment of being on a river.

By directly monitoring the Middle Verde we can more precisely establish an accurate baseline of data that will help us manage invasive species and preserve a recreational gem of Arizona. As apparent along many reaches of the Colorado River, invasive species can redefine channel and bank structure; depositional sand-bars once great for camping have turned into dense thickets of salt cedar. On a smaller river system such as the Verde, similar invasive species could also make boating the river at medium and higher flows dangerous as they can obscure the proper channel and misdirect boaters into snags which are the greatest threat to a boater's life on such rivers. As one of only a handful of rivers in Arizona that draws boaters on a regular basis, and as we experience an increase in human-uses as well as shifts in climate patterns, it is imperative that we understand how to manage it. As a part of the boating community along the Verde River I am completely in favor of this project, and hope that it is seriously considered for funding.

Thank you for your attention,

A handwritten signature in black ink that reads "Jonathan Martin". The signature is written in a cursive style with a large initial "J" and "M".

Jonathan Martin
Graduate Student/Research Technician
Watershed Management and Ecohydrology Program
School of Natural Resources
University of Arizona
jrm5@email.arizona.edu

Arizona Water Protection Fund
Department of Water Resources
3550 North Central Avenue
Phoenix, AZ 85012

Dear Commission Members

Last June, 2007 I wrote your Commission asking that Dr. Doug Greens' proposal for the Verde Wild and Scenic River Plan (VWSRP) be approved.

Again this year, I'm reiterating that same support for Dr. Greens' proposition to devise an early detection and formalized monitoring system in the continuing battle against INVASIVE and mostly non-Native species on and around the Verde River.

Our Verde River ecosystem needs all the help we can muster for the river or it too will end up being a has been ecological riparian prize for the state of Arizona.

Your consideration and approval of Dr. Greens' plan would be most appreciated by me as a private citizen of Arizona, as well as the appreciation of the organizations, I represent.

Sincerely,

C. Douglas Green

Member of:

Central Arizona Weed Mgmt. Area (CAWMA)

Master Watershed Steward Program (MWS)

Arizona Riparian Council (ARC)

Central Arizona Cactus and Succulent Society (CAC&SS)

Maricopa Audubon Society (MAS)

The Nature Conservancy (TNC)

Cactus and Succulent Society of America (CSSA)

Sierra Club – Grand Canyon Council

Arizona Native Plant Society (AZNPS) - Board of Directors & President – Phoenix Chapter

Douglas Green

From: Savannah Mackey [savannah@helpingyougrow.com]
Sent: Thursday, June 05, 2008 12:14 PM
To: Douglas Green
Subject: Jeff Whitney's Letter per your request...

May 24, 2008

Mr. Rod Held
Arizona Water Protection Fund
Department of Water Resources
3550 North Central Ave.
Phoenix, AZ 85012

Dear Mr. Held:

I am writing in support of a Water Protection Fund Grant Proposal and Request from Dr. Douglas Green, Department Associate Chair, Department of Applied Biological Sciences, ASU Polytechnic Campus.

The Tonto National Forest fully support both in concept and as a cooperator, the implementation of the proposal to evaluate conditions on the Verde River between Beasley Flat and Sheep Bridge. This important wild and scenic river is all the more precious due to its' central role as a source of free flowing water amidst the Sonoran Desert.

The focus of, and resulting data, will produce vital information of mutual benefit in meeting our respective mandates. In supporting Dr. Green in his endeavor to: 1) assess changing conditions over time within the river corridor; and 2) in developing a catalogue of invasive plant species the Verde River through and with the establishment of long term monitoring "sentinel sites" our knowledge base will be greatly expanded.

Please feel free to contact me if you would care to discuss this matter further. I can be reached at the Tonto National Forest Supervisor's Office. My direct line is 602-225-5252.

Sincerely,

Jeff Whitney
Ecosystem Management Group Leader
Tonto N.F.
2324 E. McDowell Rd.
Phoenix, AZ 85006
602.525.3879

cc Dr. Douglas Green

6/10/2008



Delivering More Than Power™

**SALT RIVER PROJECT
Environmental Services**

Mail Station PAB352
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PHOENIX, ARIZONA
85072-2025
(602) 236-2724

**Charles E. Paradzick
Senior Ecologist**

May 19, 2008

Arizona Water Protection Fund Commission
C/o Rodney Held
500 North 3rd Street
Phoenix, Arizona 85004

Dear Commissioners:

SRP would like to express its support for the Water Protection Fund application submitted by Dr. Doug Green of Arizona State University. The research plan seeks to quantify riparian conditions on the middle Verde River, update and collect essential information to establish a baseline of riparian vegetation and river morphology, develop a methodology for future assessment, and develop an invasive plant response plan. As pressure for utilization of water resources for growth and development in the upper and middle Verde River increase, quantitative data concerning river conditions, including flora and fauna, will be critical in assessing potential impacts of future resource development, monitoring change over space and time, and providing water resource managers and policy makers with sound science-based information to better understand the complexities and interactions between hydrology and ecology.

This research project will contribute to the understanding and provide a baseline inventory of the eco-hydrology of the middle Verde River, and provide important information for decisions makers. We urge you to fund this research. If you have any questions about SRP's views on this application, please do not hesitate to call me at (602) 236-2724.

Sincerely,

A handwritten signature in black ink, appearing to read 'Charles E. Paradzick', written in a cursive style.

Charles E. Paradzick

cc: Dr. Doug Green, Arizona State University

P.O. Box 25939
Tempe, AZ 85285

(C)480-980-4802
(R)480-838-9248



John H. Brock

*Brock Habitat Restoration, LLC
Invasive Plant Management*

28 May, 2008

Arizona Water Protection Fund
c/o Department of Water Resources
3550 N. Central Avenue
Phoenix, AZ 85012

Attn: Rodney Held

Dear Colleagues:

I have reviewed at proposal to the Arizona Water Protection Fund authored by Douglas M. Green of the Department of Applied Biological Sciences at ASU Polytechnic. I believe this work would be vital to the protection of one of the few free flowing segments of rivers in Arizona. The Verde River has many special attributes which has earned it designation as a federally designated Wild and Scenic River. Central to sustaining its critical riparian functions, monitoring the middle Verde River, is needed so management actions if needed can be applied in a timely fashion.

Of particular interest to me, is the part of the proposal at deals with early detection of invasive species along this section of river. Hopefully, with documented detection, rapid response to invasive species threats would be an action item as a result of the work outlined in the proposal. After prevention, early detection and rapid response is one of the key steps in invasive species management. Information gained from this research / monitoring effort can fit nicely into the data set(s) that will be developed by the Center of Invasive Species which is one of several actions being proposed to Governor Napolitano by the Arizona Invasive Species Advisory Council. Information about the geographical location of invasive species, their population densities, extent of area invaded and management actions directed the species are vital data for the Center of Invasive Species, and to sustain the Verde River.

Several invasive plant species are known to occur along this stretch of river, most

*Certified Rangeland Professional
AZ Commercial Applicator*

P.O. Box 25939
Tempe, AZ 85285

(C)480-980-4802
(R)480-838-9248



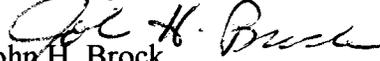
John H. Brock

Brock Habitat Restoration, LLC
Invasive Plant Management

commonly, salt cedar (*Tamarix ramosissima*) and water primrose (*Lugwigia hexapetala*). Both of these plants can transform riparian / aquatic systems to less desirable habitats for all animals, including the rare and endangered fishes noted in Green's proposal. Furthermore, new invaders to the system for example: giant reedgrass (*Arundo donax*), pampas grass (*Cortaderia sp.*) (which has invaded the Verde River at Cottonwood, AZ), fountain grass (*Pennisetum setaceum*), and African sumac (*Rhus lancea*) which may spread to the river by bird vectors from the Phoenix metropolitan area, should be noted as soon as possible if they are found along any area.

The proposed research / monitoring effort will add to the baseline type of data Dr. Green and his graduate students have collected in the past along this section of free flowing Verde River. I strongly recommend that this project be awarded funding by the Arizona Water Protection Fund.

Sincerely yours,


John H. Brock

Member, Arizona Invasive Species Advisory Council
Professor Emeritus, Arizona State University Polytechnic

Certified Rangeland Professional
AZ Commercial Applicator

Evidence of Control and Tenure of Land

The study is located within the Tonto National Forest. Dr. Green has worked extensively with Tonto National Forest personnel on the Verde River and in other locations. A letter from Mr. Jeff Whitney, Biological Resources Team Leader, indicating the Tonto National Forest's support for this project is enclosed.

Evidence of physical and Legal Available of Water

This project will not consumptively utilize water.

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Appendix A

Project time line

Detailed budget

Justification – Aire Super Lynx Kayaks

PROJECT BUDGET		TOTAL - ALL PROJECT YEARS				PROJECT YEAR 1				PROJECT YEAR 2				PROJECT YEAR 3			
		REQUESTED # Days	COST	CONTRIBUTED # Days	COST	REQUESTED # Days	COST	CONTRIBUTED # Days	COST	REQUESTED # Days	COST	CONTRIBUTED # Days	COST	REQUESTED # Days	COST	CONTRIBUTED # Days	COST
TASK 4 - Initial Sampling Trip																	
Personnel																	
Salaries																	
	Doug Green			8	\$2,928			8	\$2,928								
	Bill Miller			8	\$3,256			8	\$3,256								
	Grad Student	15	\$2,310			15	\$2,310										
Fringe Benefits (% of Salary)					\$928				\$928								
	Faculty @ 25% Request/15% Contrib		\$185				\$185										
	Grad Student @ 8.0% of Salary		\$809				\$809										
	Grad Student @ 35.0% of Salary																
Equipment																	
	(4) inflatable kayaks @ \$1,525 ea		\$6,100				\$6,100										
	(1) 12 volt pump @ \$100 ea		\$100				\$100										
	(1) foot pump @ \$35 ea		\$35				\$35										
	(4) one-piece paddles @ \$70 ea		\$280				\$280										
	(4) PTR two-piece paddles @ \$85 ea		\$340				\$340										
	(1) digital SLR camera & memory card		\$1,125				\$1,125										
Supplies																	
	(4) personal flotation devices @ \$95 ea		\$380				\$380										
	(4) splash jackets @ \$105 ea		\$420				\$420										
	(4) wet suits @ \$135 ea		\$540				\$540										
	(5) extra large dry bags @ \$100 ea		\$300				\$300										
	(10) large dry bags @ \$40 ea		\$400				\$400										
	(6) small dry bags @ \$20 ea		\$120				\$120										
	(1) dry case 1300 @ \$75 ea		\$75				\$75										
	(1) dry case 1400 @ \$110 ea		\$110				\$110										
	(16) 4 foot straps @ \$4 ea		\$64				\$64										
	(28) 6 foot straps @ \$5 ea		\$140				\$140										
	(16) 9 foot straps @ \$5 ea		\$80				\$80										
	(6) 12 foot straps @ \$6 ea		\$48				\$48										
	(20) carabiners @ \$9 ea		\$180				\$180										
	TOTAL DIRECT COST		\$14,141		\$7,112		\$14,141		\$7,112								
	INDIRECT COST @ 05%		\$707		\$356		\$707		\$356								
	TOTAL TASK COST		\$14,848		\$7,468		\$14,848		\$7,468								
TASK 5 - Analysis of Existing Oblique and Aerial Photos																	
Personnel																	
Salaries																	
	Doug Green			2	\$732			2	\$732								
	Bill Miller			3	\$1,221			3	\$1,221								
	Grad Student	50	\$7,700			50	\$7,700										
Fringe Benefits (% of Salary)					\$293				\$293								
	Faculty @ 25% Request/15% Contrib		\$616				\$616										
	Grad Student @ 8.0% of Salary		\$2,695				\$2,695										
	Grad Student @ 35.0% of Salary																
Equipment																	
	Computer		\$1,700				\$1,700										
Supplies																	
	Image Acquisition Software		\$325				\$325										
	TOTAL DIRECT COST		\$13,036		\$2,246		\$13,036		\$2,246								
	INDIRECT COST @ 05%		\$652		\$112		\$652		\$112								
	TOTAL TASK COST		\$13,688		\$2,358		\$13,688		\$2,358								

PROJECT BUDGET		TOTAL - ALL PROJECT YEARS						PROJECT YEAR 1		PROJECT YEAR 2		PROJECT YEAR 3	
		REQUESTED # Days	REQUESTED Cost	CONTRIBUTED # Days	CONTRIBUTED Cost	REQUESTED # Days	REQUESTED Cost	CONTRIBUTED # Days	CONTRIBUTED Cost	REQUESTED # Days	REQUESTED Cost	CONTRIBUTED # Days	CONTRIBUTED Cost
TASK 6 - Sampling Trips													
Personnel													
Salaries													
Doug Green			70	\$25,620			28	\$10,248					
Bill Miller			30	\$12,210			12	\$4,884					
Grad Student		70	\$10,780			28	\$4,312				14	\$2,156	
Fringe Benefits (% of Salary)				\$5,675				\$2,270				\$1,135	
Faculty @ 25% Request/15% Contrib								\$345				\$172	
Grad Student @ 8.0% of Salary				\$862				\$1,509				\$755	
Grad Student @ 36.0% of Salary				\$3,773				\$1,376				\$682	
In-State Travel				\$4,128				\$300				\$0	
(2) Trips/year to site (Vehicle Rental/Gas)				\$300				\$900				\$0	
Equipment				\$900				\$900				\$0	
Vegetation Sampling Equipment				\$300				\$900				\$0	
(2) GPS Units w/supporting software				\$900				\$900				\$0	
TOTAL DIRECT COST				\$20,743				\$17,402				\$8,701	
INDIRECT COST @ 05%				\$1,037				\$370				\$185	
TOTAL TASK COST				\$21,780				\$18,272				\$9,136	
TASK 7 - Analysis of New Photos (Oblique & Aerial)													
Personnel													
Salaries													
Doug Green			6	\$2,196			2	\$732				\$366	
Bill Miller			13	\$5,291			4	\$1,628				\$814	
Grad Student		60	\$9,240			21	\$3,234				9	\$1,386	
Fringe Benefits (% of Salary)				\$1,123				\$364				\$177	
Faculty @ 25% Request/15% Contrib								\$269				\$134	
Grad Student @ 8.0% of Salary				\$739				\$1,132				\$566	
Grad Student @ 36.0% of Salary				\$3,234				\$1,132				\$485	
Equipment													
Supplies													
Services													
Aerial Photography				\$9,000				\$9,000					
TOTAL DIRECT COST				\$22,213				\$13,625				\$6,539	
INDIRECT COST @ 05%				\$1,111				\$361				\$180	
TOTAL TASK COST				\$23,324				\$14,306				\$6,937	
TASK 8 - Analysis of Field Data													
Personnel													
Salaries													
Doug Green			30	\$10,980			9	\$3,294				\$1,391	
Bill Miller			30	\$12,210			9	\$3,663				\$1,464	
Grad Student		70	\$10,780			20	\$3,080				30	\$4,620	
Fringe Benefits (% of Salary)				\$3,479				\$1,044				\$405	
Faculty @ 25% Request/15% Contrib								\$246				\$123	
Grad Student @ 8.0% of Salary				\$862				\$1,078				\$539	
Grad Student @ 36.0% of Salary				\$3,773				\$1,078				\$411	
Equipment													
Supplies													
TOTAL DIRECT COST				\$15,415				\$4,404				\$6,607	
INDIRECT COST @ 05%				\$771				\$220				\$110	
TOTAL TASK COST				\$16,186				\$4,624				\$6,937	

PROJECT BUDGET	TOTAL - ALL PROJECT YEARS						PROJECT YEAR 1			PROJECT YEAR 2			PROJECT YEAR 3			
	REQUESTED		CONTRIBUTED		REQUESTED		CONTRIBUTED		REQUESTED		CONTRIBUTED		REQUESTED		CONTRIBUTED	
	# Days	Cost	# Days	Cost	# Days	Cost	# Days	Cost	# Days	Cost	# Days	Cost	# Days	Cost	# Days	Cost
TASK 9 - Prep of Invasive Weeds Monitoring Guide																
Personnel																
Salaries																
Doug Green			5	\$1,830											2	\$732
Bill Miller			1	\$407											0.5	\$204
Grad Student	30	\$4,620						15	\$2,310					15	\$2,310	
Fringe Benefits (% of Salary)																
Faculty @ 25% Request/15% Contrib				\$336												
Grad Student @ 8.0% of Salary				\$370												
Grad Student @ 35.0% of Salary				\$1,617												
Equipment																
Supplies																
TOTAL DIRECT COST		\$6,607		\$2,573					\$3,304						\$3,304	\$1,076
INDIRECT COST @ 05%		\$330		\$129					\$166						\$166	\$54
TOTAL TASK COST		\$6,937		\$2,702					\$3,469						\$3,469	\$1,130
TASK 10 - Final Report																
Personnel																
Salaries																
Doug Green			30	\$10,980											30	\$10,980
Bill Miller			25	\$10,175											25	\$10,175
Grad Student	20	\$3,080												20	\$3,080	
Fringe Benefits (% of Salary)																
Faculty @ 25% Request/15% Contrib				\$246												
Grad Student @ 8.0% of Salary				\$1,078												
Grad Student @ 35.0% of Salary				\$3,173												
Equipment																
Supplies																
TOTAL DIRECT COST		\$4,404		\$24,328											\$4,404	\$24,328
INDIRECT COST @ 05%		\$220		\$1,216											\$220	\$1,216
TOTAL TASK COST		\$4,624		\$25,544											\$4,624	\$25,544
PROJECT TOTALS - All Tasks																
Personnel																
Salaries																
Doug Green			152	\$59,292				60	\$21,960					43	\$15,738	
Bill Miller			118	\$48,026				44	\$17,908					29	\$11,600	
Grad Student #1	345	\$53,130						164	\$25,256					93	\$14,322	
Fringe Benefits (% of Salary)																
Faculty @ 25% Request/15% Contrib				\$4,250					\$2,021						\$1,146	
Grad Student @ 8.0% of Salary				\$18,596					\$8,840						\$5,013	
Grad Student @ 35.0% of Salary				\$4,128					\$1,376						\$1,376	
In-State Travel				\$10,860					\$10,860						\$0	
Equipment				\$3,182					\$3,182						\$0	
Supplies				\$9,000					\$9,000						\$0	
Services				\$123,418					\$60,555						\$21,857	
TOTAL DIRECT COST		\$103,166		\$56,170					\$21,857						\$31,439	
INDIRECT COST @ 05%		\$5,158		\$2,761					\$1,092						\$1,092	
TOTAL PROJECT COST		\$108,324		\$58,931					\$22,949						\$33,011	

Aire Super Lynx Kayaks

Selection of this particular model of kayak is based on prior experience on the Verde River. The Verde river is a harsh environment for inflatable boats due to numerous downed trees, logs, and exposed rocks in the channel. In addition, during low water times dragging through shallow reaches of the river is common. These kayaks are among the most solidly constructed in the industry with three heavily armored air chambers. The air chambers are thick polyethylene tubes incased in 1100 denier weight fabric that is coated with hypalon . The 600 pound carrying capacity of these boats allows for extended field time necessary for this project. This same model has been used extensively by the US Forest Service and has proven very durable on the Verde River.

Appendix B

Aerial image specifications and cost report

Aerial image coverage

PHOTO MISSION COST REPORT: Friday March 28, 2008 2:20 PM

Verde River, Arizona 40% overlap, 30% sidelap

*****FILM COST*****

Camera -----> Kodak645IR
Ground Resolution -----> 0.25 Meter
Image Width -----> 1020 Meters (3346 ft, 0.63 miles)
Image Height -----> 1020 Meters (3346 ft, 0.63 miles)
Total Area of Mission Polygons (sq. miles)-----> 21.31 sq. mi.
Number of Digital Images -----> 241

One-Way Miles to Project Area ----->600 miles
Round Robin Time to Project Area ----->6 Hrs
Miles from Local Airport to Project Area ----->55 miles
Local Round Robin Time To Project Area ----->0.55 Hrs
Round Robin Cost To Project Area ----->\$3216.00
Local Round Robin Cost To Project Area ----->\$884.40

Aircraft Ferry Cost ----->\$4100.40

Number of Flight Lines ----->13 lines
Number of Flight Line Turns ----->12 turns
Total Project Area Flight Line Miles ----->91.62 miles
Aircraft Flight Line Time ----->0.54 hrs
Time in Flight Line Turns ----->1.00 hrs
Total Aircraft Time for Flight Lines ----->1.53 Hrs
Aircraft Flight Line Cost ----->\$288.88
Flight Line Turns Cost ----->\$533.86

Aircraft Mission Cost ----->\$822.74

Fixed Operating Rate (\$0.00 * 4 Days) ----->\$0.00

Total Ferry/Flight-Lines Run Time ----->8.08 hrs

TOTAL AIRCRAFT COST: FOR+MISSION+FERRY ----->\$4923.14

*****CONTRACTING COST*****

Trip Days ----->4 days
Contractor Salary (per day) ----->\$390.00

TOTAL CONTRACTING COST ----->\$1560.00

*****TRAVEL COSTS*****

Trip Days ----->4 days
Lodging Per Diem Cost (\$119.00 * 4 days * 2 person)-->\$714.00
Food Per Diem Cost (\$64.00 * 4 days * 2 person) ---->\$512.00
Car Rental Cost (\$75.00 * 4 days) ----->\$225.00

TOTAL TRAVEL COST ----->\$1451.00

IMU Data-----> 00.00
Index Map-----> 00.00
Weekend Pilot Salary (if necessary)----->\$1000.00
Orthorectify and Mosaic Images----->\$1000.00
TOTAL PHOTO MISSION COST ----->\$9000.00<-----*

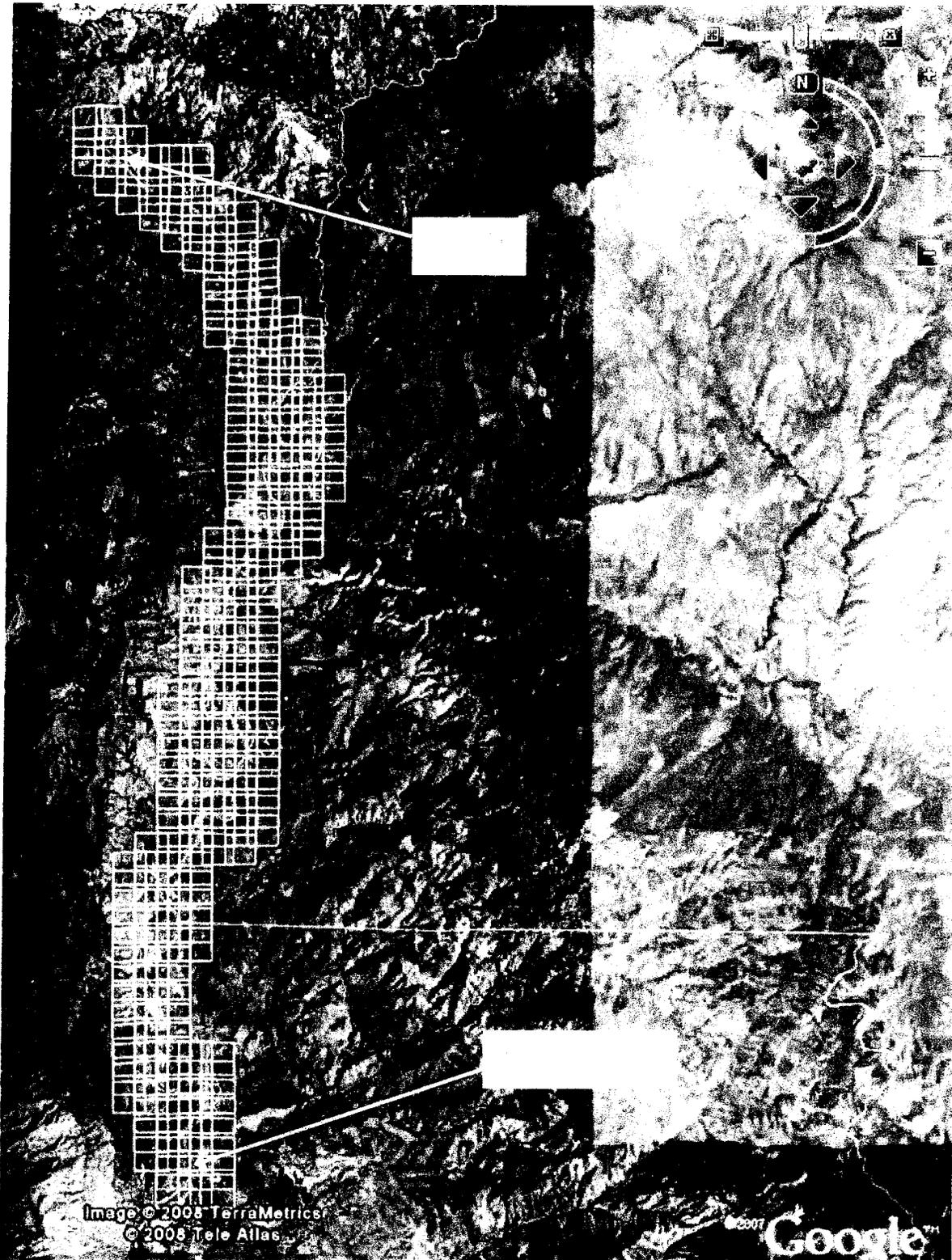


Image showing overlap of aerial photos within the study area.

Appendix C

Key Personnel Resumes

Douglas M. Green
Associate Department Chair / Associate Professor
Interim Department Chair (effective July 2008)

OFFICE ADDRESS

Department of Applied Biological Sciences
7001 E. Williams Field RD
Mesa AZ 85212
Phone: (480)-727-1251 (office) (480)-309-4815 (cell)
FAX (480)-727-1236
Email: dm.green@asu.edu

HOME ADDRESS

209 E. Palmcroft Dr.
Tempe, AZ 85282
(480)-966-2243

CURRENT POSITION

Tenured associate professor Department of Applied Biological Sciences and Associate Department Chair, nine month appointment 40% teaching (2 to 3 classes per semester) 40% research, and 20% service. I am affiliated with the wildlife and restoration ecology option within the department. My research and teaching interests are in soils and riparian ecology of arid and semiarid ecosystems

EDUCATION

- 1991 Ph.D. Rangeland Resources, Oregon State University
Dissertation title: Soil conditions along a hydrologic gradient and successional dynamics in a grazed and ungrazed montane riparian ecosystem.
- 1987 M.S. Animal and Range Sciences, North Dakota State University
Thesis title: Composition, production, disappearance, and nutritive content of wetland vegetation on the Missouri Coteau.
- 1985 B.S. Range Management, Humboldt State University

HONORS AND AWARDS

- 2006 Researcher of the Year, Arizona State University Polytechnic Campus
- 2006 Wakonse Fellow Arizona State University (excellence in teaching)
- 2005 Nominee ASU Centennial Professorship Award (excellence in teaching)

- 2000 Exceptional Academic Advisor, Graduate Women's Association of Arizona State University
- 1992 Morrison Award, Outstanding Faculty, Department of Agribusiness and Environmental Resources, Arizona State University.
- 1989 Outstanding Ph.D. Student, Department Rangeland Resources, Oregon State University.
- 1987 Adrian C. Fox Scholarship, North Dakota State University.

ACADEMIC EXPERIENCE

- 2001- present Member of the graduate faculty, Oregon State University
- 1997 - present Member graduate faculty PhD program College of Architecture and Environmental Design, Arizona State University
- 1997- present Associate Professor, Applied Biological Sciences, Arizona State University.
- 1991 to 1997 Assistant Professor, Environmental Resources Program, Arizona State University.
- 1990 to 1991 Instructor, Environmental Resources Program, Arizona State University.
- 1987 to 1990 Graduate Research Assistant, Department of Rangeland Resources, Oregon State University.
- 1986 to 1987 Graduate Research Assistant, Department of Animal and Range Sciences, North Dakota State University.
- 1985 to 1986 Teaching Assistant, Department of Animal and Range Sciences, North Dakota State University.

RESEARCH

RESEARCH INTERESTS

Soil-vegetation relationships, ecology of urban systems, riparian ecology, biogeochemistry of hydric soils, soil microbial ecology in arid and semiarid ecosystems.

REFEREED PUBLICATIONS

Green, D.M., J. Stromberg, and R. Tiller. 2007. Riparian Soils of the San Pedro and other Desert Rivers. In: Ecology of Desert Riparian Ecosystems: The San Pedro River Example. J.C. Stromberg and B.A. Tellman editors University of Arizona Press, Tucson (In Press)

Nichols, M., and D.M. Green. 2007. Stream Restoration in the Arid Southwest. In: The stream Restoration Worker, National Center for Earth Surface Dynamics Summer/Fall 4-5.

Green, D.M.. 2007. Biological Processes in Riparian Zones – Habitat. In: Understanding Arizona's Riparian Areas. Arizona Cooperative Extension publication # az1432. pp.15-30.

Zaimes G.N, M. Nichols, and D.M. Green. 2007. Characterization of Riparian areas. In: Understanding Arizona's Riparian Areas. Arizona Cooperative Extension publication # az1432. pp.15-30.

G. Zaimes, K. McReynolds, M. Nichols, D. Green, M. Crimmins, J. Sprinkle, J. Schalau, C. Jones. 2006. A New Approach to Riparian Area Education in Arizona. Hydrology and Water Resources In Arizona and the Southwest. Journal of the Arizona-Nevada Academy of Science (accepted).

Brock, J.H., and D.M. Green. 2003. Impacts of livestock grazing, other land uses, and roads on watershed resources. Journal of the Arizona-Nevada Academy of Science 35:11-22.

Green, D.M., and M.G. Baker. 2003. Urbanization impacts on habitat and bird communities in a Sonoran desert ecosystem. Landscape and Urban Planning. Accepted for publication, issue number not yet assigned.

Green, D.M., and M. Oleksyszyn. 2002. Enzyme activities and carbon dioxide flux in a Sonoran Desert urban ecosystem. Soil Science Society of America. Journal 66:2002-2008

Krämer, S., and D.M. Green. 2000. Acid and alkaline phosphatase dynamics and their relationship to soil microclimate in a semiarid woodland. Soil Biology and Biochemistry 32:179-188

Krämer, S., and D.M. Green. 1999. Seasonal dynamics of soil phosphatase, temperature, and moisture in two microsites of a pinyon-juniper woodland. Soil Science Society of America Journal 63:1901-1905

Steiner, F., L. McSherry, D. Brennan, M. Soden, J. Yarchin, D. Green, J. McCarthy, C. Spellman, J. Jennings, K.Barre. 1999. Concepts for suburban desert character in the northern Sonoran Desert. Journal of the American Planning Association 65:207-222

Green, D.M. 1998. Recreational Impacts on erosion and runoff a central Arizona riparian area. *Journal of Soil and Water Conservation* 53:38-42.

Green, D.M., and M.G. Baker. 1997. Species composition along a gradient of urbanization in the lower Sonoran desert, Arizona, USA. Pages 37-44, in J.H. Brock, M. Wade, P. Pysek, and D. Green, editors. *Plant invasions: Studies from North America and Europe on the ecology and management of alien plants*. Backhuys Publishers Leiden, The Netherlands.

Green, D.M., and J.B. Kauffman. 1995. Succession and livestock grazing in a northeastern Oregon riparian ecosystem. *Journal of Range Management* 48:307-313.

Green D.M., and J.H. Brock. 1994. Soil chemical conditions of four plant communities in an urban riparian zone. *Landscape and Urban Planning* 28:179-199.

Fry, J., F. Steiner, and D. Green. 1994. Evaluation of riparian areas using a modification of LESA. *Landscape and Urban Planning* 28:121-127.

Green, D.M., and J. B. Kauffman. 1989. Nutrient cycling at the land-water interface: the importance of the riparian zone. In *Practical Approaches to Riparian Resource Management*. BLM 89-001-4351.

Kirby, D.R., D.M. Green, and T.S. Mings. 1989. Nutrient composition of selected macrophytes in Northern Prairie wetlands. *Journal of Range Management* 42:323-326.

Other Peer Reviewed Literature

Green, D.M. 1994. Riparian conceptual model. Southwest University Consortium Forest Study. Unpublished Report, United States Forest Service.

WORKS IN PROGRESS

Green, D.M., and D.E. Johnson. Twenty years of successional change in an Eastern Oregon riparian area 1979-1999.

Livestock grazing impacts on woody species on the Verde river

Impacts of ATV usage on a Sonoran Desert soil.

EDUCATIONAL WEB SITE

In collaboration Drs. M. Crimmins, M. Nichols, and G. Zaines in 2005-2006, developed an educational web site *Arizona's Riparian Areas*
<http://alic.arid.arizona.edu/riparian/index.shtml>

BOOK EDITOR

J.H. Brock, M. Wade, P. Pysek, and D. Green. 1997. Plant invasions: Studies from North America on the ecology and management of alien plants. Bachyhus Publishing, Leiden, The Netherlands.

CONSULTING REPORTS

Va Shly'ay Akimel HGM Assessmnt: Analysis, Results and Documentation 100% Final Report Febuary 2004 prepared as part my role as subcontractor to WASS Gerke and AssociatesInc, Phoenix AZ-

Va Shly'ay Akimel Salt River Restoration Study ITR Draft (F4) Feasibility Report May 23, 2003 U.S. Army Corps of Engineers Planning Section C Phoenix, AZ

Impact of a short term flooding event on *S. Gooddingii* at Horseshoe Reservoir Report to Salt River Project December 2003

SOFTWARE DEVELOPMENT

Johnson, D.E., M. Louhaichi, N.R. Harris, P.E. Clark, D. Ganskopp, D. Green, M.D. Johnson, K.E.Johnson, M.R. George. 2005. KRESS Modeler Version 2.0.1. Department of Rangeland Resources Oregon State University, Corvallis OR.

CONSULTING WORK

- | | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2004 | Salt River Project - Impact of a short term flooding event on <i>Salix gooddingii</i> at Horseshoe Reservoir |
| 2001 to 2004 | United States Army Corps of Engineers - Salt River restoration- Va Shly'ay Akimel reach - provided input for without project condition and alternate plan formulation |
| 2002 | United States Army Corps of Engineers - Adaptation of the USACE Hydrogeomorphic Model to arid land riparian ecosystems |
| 1997 | Recreational carrying capacity of selected Arizona State Parks. Arizona Department of State Parks |

1992

Plant community and soil moisture response as a result of riparian restoration during road construction. Evaluation of the Zuni Mountain road project, Cibola National Forest, New Mexico. Consultant to the US Forest Service.

PUBLISHED ABSTRACTS

Balluff, T., J. King, and D.M. Green. 2007. Small-Scale Spatial Variation and Soil Nutrient Properties in a Semi-Arid Riparian Community. Abstr. of papers 60th Annual Meeting, Society for Range Management. Reno, NV Feb 9-16.

Brock, J., W. Brady, D.M. Green, W. Miller, G. Whysong, A. Mushkatel, K. Steele, and E. Alford. 2007. Natural Resources Management Education at Arizona State University: The Polytechnic Campus Model. Abstr. of papers 60th Annual Meeting, Society for Range Management. Reno, NV Feb 9-16.

King, J., T. Balluff, and D. M. Green. 2007. Soil temperature and respiration following restoration in a central Arizona riparian zone. Abstr. of papers 60th Annual Meeting, Society for Range Management. Reno, NV Feb 9-16.

G. Zaimes, K. McReynolds, J. Sprinkle, J. Schalau, R. Grumbles, C. Jones, W. Albrecht and D. Fish, M. Crimmins, D. Green, and M. Nichols. Understanding Arizona's Riparian Areas. Arizona Riparian Council Annual Meeting. Flagstaff, AZ. April 27-29, 2006.

G. Zaimes, K. McReynolds, J. Sprinkle, J. Schalau, B. Hutchinson, M. Nichols, R. Grumbles, C. Jones, D. Green, M. Crimmins. A New Approach to Riparian Area Education in Arizona. 5th Natural Resource Extension Professionals Conference. Park City, UT, May 14-17, 2006.

G. Zaimes, K. McReynolds, M. Crimmins, J. Sprinkle, J. Schalau, B. Hutchinson, M. Nichols, R. Grumbles, C. Jones, D. Green, W. Albrecht, D. Fish A. Parker. A New Approach to Riparian Area Education in Arizona. University of Arizona CALS Faculty Conference. Theme: "Fulfilling the Land Grant Vision". Tucson, AZ, August 15-17, 2006.

Green, D.M. and M. Debnar. 2006. Impact of Juniper removal on soil enzymes, temperatures, and organic matter. Abstr. of papers 59th Annual Meeting, Society for Range Management. Vancouver British Columbia Feb 12-16.

Green, D.M., and B. Fox. 2005. All terrain vehicle impacts on a Sonoran desert soil. Abstr. of papers 58th Annual Meeting, Society for Range Management. Fort Worth, TX, Feb 5-11.

Green, D.M. and D.E. Johnson. 2004. Inventory and mapping of invasive plants in riparian zones. Abstr. of papers 57th Annual Meeting, Society for Range Management. Salt Lake City UT, Jan 24-30.

Green, D.M., S. Miyazawa. 2003. Changes in carbon pools in of agricultural soils in response to urbanization. Abstr. of papers 88th Annual Meeting, Ecological Society of America. Sanvana GA, August 3-8.

Green, D.M. and D.E. Johnson 2003. Changes in vegetative indicators: implications for riparian management. Abstr. of papers 88th Annual Meeting, Ecological Society of America. Sanvana GA, August 3-8.

Green, D.M., D.E. Johnson, and A.S. Laliberte. 2003. 20 Years of vegetative change and species diversity in Catherine Creek, Northeastern Oregon. Abstr. of papers 56th Annual Meeting, Society for Range Management. Casper WY Feb. 2-6.

Green, D.M., and P. Fenner. 2002. Livestock herbivory impacts on woody species in a central Arizona riparian area. Abstr. of papers 87th Annual Meeting, Ecological Society of America. Tucson, AZ Aug. 4-9.

Green, D.M., S. Miyazawa, and A. More. 2001. Carbon pools in urban and agricultural land use types in a Sonoran desert ecosystem. Abstr. of papers 86th Annual Meeting, Ecological Society of America. Madison, WI Aug. 5-10.

Green, D.M., P. Fenner, T. Willard. 2000. Impacts of livestock herbivory on woody species in a central Arizona riparian area. Abstr. of papers 85th Annual Meeting, Ecological Society of America. Snowbird, UT Aug. 6-10.

Olekyszyn, M.M., J.C. Stromberg, and D.M. Green. 2000. Relationships between edaphic factors and vegetation in a chronosequence of abandoned agricultural fields: A case study along the San Pedro River Arizona. Abstr. of papers 85th Annual Meeting, Ecological Society of America. Snowbird, UT Aug. 6-10.

Green, D.M., M.M. Oleksyszyn and C.M. Farley. 1999. Soil CO₂ flux and enzyme activity in residential patch types of differing origins. Abstr. of papers 1st Annual Symposium Long Term Ecological Research - Central Arizona Project. ASU Tempe AZ. Jan. 22.

Krämer, S. and D.M. Green. 1998. Changes in phosphorus biogeochemistry in response to soil warming in a pinyon-juniper ecosystem. Abstr. of papers 83rd Annual Meeting, Ecological Society of America. Baltimore, MD Aug. 2-6.

Baker, M.G., and D.M. Green. 1997. Land use effects upon bird diversity in urban riparian habitats of the upper Sonoran Desert. Abstr. of papers 82nd Annual Meeting, Ecological Society of America. Albuquerque, MN Aug. 10-14.

Krämer, S. and D.M. Green. 1997. Soil phosphorus pools in different microsites and soils of a pinyon-juniper woodland. Abstr. of papers 82nd Annual Meeting, Ecological Society of America. Albuquerque, MN Aug. 10-14.

Green, D.M., and M.G. Baker. 1997. Urbanization impacts on avifauna in a Sonoran desert ecosystem of the Southwestern United States. Poster abstract, Interantional Conference on Urban Ecology, Leipzig, Germany, June 25-29.

Baker, M.G. and D.M. Green. 1996. Effects of habitat fragmentation by urbanization on bird diversity and habitat in a Sonoran Desert environment. Abstr. of papers 49th Annual Meeting, Society for Range Management. Wichita, KS Feb. 10-14.

Baker, M.G. and D.M. Green. 1995. Riparian vegetation along a gradient of urbanization in the upper Sonoran Desert. Third Annual Conference on Invasive Weeds. Arizona State University, Tempe, AZ.

Green D.M., L.A. Stephens, and K. Killian. 1995. Soil respiration rates in canopy and interspace areas of a *Larrea tridentata* community. Abstr. of papers 80th Annual Meeting, Ecological Society of America. Snowbird, UT July 30-Aug. 3.

Krämer, S. and D.M. Green. 1995. A simple approach to modify soil climate: design and field testing. Abstr. of papers 80th Annual Meeting, Ecological Society of America. Snowbird, UT July 30-Aug. 3.

Green, D.M., and S. Krämer. 1995. Soil moisture and temperature effects on soil respiration rates of juniper and interspace microsites. Abstr. of papers 48th Annual Meeting, Society for Range Management. Phoenix, AZ Jan. 14-20.

Krämer, S., and D.M. Green. 1995. Soil moisture and temperature regimes in microsites of a pinyon-juniper woodland. Abstr. of papers 48th Annual Meeting, Society for Range Management. Phoenix, AZ Jan. 14-20.

Green, D.M., and J.H. Brock. 1994. Recreational impacts on runoff and erosion in a central Arizona riparian area. Abstr. of papers 47th Annual Meeting, Society for Range Management. Colorado Springs, CO Feb. 12-17.

Green, D.M. 1993. Vegetation recovery with 10 years of non-grazing in a northeastern Oregon riparian zone. Annual Meeting Northwest Scientific Society, LaGrande, OR Apr. 1993.

Green, D.M., and J.B. Kauffman. 1992. Impacts of herbivory on biological diversity in a montane riparian ecosystem. Abstr. of papers 45th Annual Meeting, Society for Range Management. Spokane, WA Feb. 9-14.

Green, D.M., and J.B. Kauffman 1991. Belowground chemical and physical characteristics of three plant communities in a northeastern Oregon riparian zone. Abstr. of papers 76th Annual Meeting, Ecological Society of America. San Antonio, TX Aug. 4-8.

Green, D.M., and J.H. Brock 1991. Urban riparian ecosystems: Assessing functions and values. Proceedings of "Environmental Issues of the Border Areas of the United States and Mexico", an International Conference Sponsored by the Southwest Center for Environmental Research and Policy. Snowbird, UT Aug. 14-16.

Green, D.M., and J.B. Kauffman 1990. Reduction-oxidation potential and its relationship to plant communities in a northeastern Oregon riparian zone. Abstr. of papers 75th Annual Meeting, Ecological Society of America. Snowbird, UT July 29-Aug. 2.

Kirby, D.R., D.M. Green, and T.S. Mings. 1988. Nutritive content of wetland vegetation. Proceedings of the North Dakota Cow/Calf Conference. Bismark, ND Dec. 3.

Green, D.M., and D. Kirby. 1987. Nutritive content of selected emergent macrophytes in North Dakota prairie potholes. Abstr. of papers 40th Annual Meeting, Society for Range Management. Boise, ID Feb. 8-13.

INVITED PRESENTATIONS

2005-2007

Biology of Riparian Areas- Habitat. Understanding Arizona's Riparian Areas - a series of workshops presented state-wide in cooperation with the University of Arizona Cooperative Extension

Workshops in:

Tasile – Navajo County, Navajo Nation

Sierra Vista – Cochise County

Safford – Graham County

Flagstaff – Coconino County

Kingman – Mohave County

Prescott – Yavapai County

Showlow – Coconino County

- 2007 Riparian Vegetative Community Types in the Verde Valley: The Role of Flooding – Presentation at: The Dynamic Nature and Natural Diversity of Riparian Areas. Camp Verde Arizona, Nov. 8-9.
- 2006 Riparian Restoration: 3 factors to help insure success. University of Arizona Master Watershed Stewards April 20
- 2004 Factors of riparian restoration. Southwest Vegetation Management Association 5th Annual Conference. November 3-4, Phoenix, AZ.
- 2004 Inventory and mapping of invasive plants in riparian zones. Abstr. of papers 57th Annual Meeting, Society for Range Management. Salt Lake City UT, Jan 24-30.
- 2002 Riparian Ecosystem Management. Southwest Vegetation Management Association 5th Annual Conference. November 5-8, Arizona State University East.
- 2002 Livestock grazing impacts on the Verde River. Diné Beef Group, September 30, Arizona State University East.
- 2002 Livestock grazing impacts on woody species along the Verde River. Tonto Riparian Monitoring Workshop. May 29th, Arizona State University East.
- 2001 Desert soils. Design with the Desert: Ecological perspectives of living in a desert environment. March 17th, Arizona State University Downtown Center.
- 2000 Water Issues in Arizona. Desert Awareness Coalition, Cave Creek Arizona.
- 1990 Annual Meeting WRCC-40. Led field tour for WRCC-40 scientists of Catherine Creek research site in Northeastern Oregon, presented posters and short seminars entitled:
 Nutrient cycling at the land water interface: the role of the riparian zone.
 Changes in stream geomorphology and cover 1979-1989.
 Vegetation ecology of the Catherine Creek riparian zone.

RESEARCH SUPPORT

(Co-principal investigators in parenthesis)

- 2006 -2009 (Zaimes, G., Crimmins, M.) 2006. Characterization of microclimate and vegetation structure within the riparian areas along urbanized and nonurbanized ephemeral streams. U.S. Environmental Protection Agency \$211,041
- 2005 to present Green, D.M. Salt River Project research plan for the 2005 operation of Horseshoe Lake flycatcher recovery plan. Salt River Project \$53,975
- 2004 to present (Moore, D., Hixson, S.) Lynx Creek Stream Course Restoration. USDA Forest Service/Arizona Water Protection Fund \$33,000
- 2004 to present (Moore, D) Lynx Creek Sediment Trap #2 Restoration. USDA Forest Service/Arizona Water Protection Fund \$9,122
- 2000 - 2003 (Fenner, P) Effects of livestock use levels on riparian trees on the Verde River. Arizona Water Protection Fund. \$ 41,416
- 1999 - 2002 (Wu, J.) A Hierarchical patch dynamics approach to regional modeling and scaling. U.S. Environmental Protection Agency, STAR Program. \$ 635,000
- 1996 - 1998 (R. Ohmart, J.H. Brock, W. Graf) Development of a rapid assessment for functional condition in Arizona riparian systems. Arizona Game and Fish Department. \$ 143,000.
- 1995 - 1997 (J.H. Brock) Plant and avian use of urban riparian areas. Arizona Game and Fish Department. \$ 52,298.
- 1994 Southwestern Forest Riparian Model. Southwest Forest Research Consortium. \$ 8,582.
- 1994 (J.H. Brock) Food and Agricultural Organization (FAO) Fellow Mr. Anand Raturi (India). USDA, International Training. \$ 6,341.
- 1992 - 1993 (E. Averitt, J. Fry, F. Steiner, R. Yabes, D. Patten, P. Parker) Case studies of two Arizona river corridor projects: assessment and proposal. Arizona Water Resources Research Center. \$ 12,433.

- 1992 - 1993 (D. Patten, M. Sommerfeld, J. Stromberg) Development of best management practices for water and riparian resources along the Santa Cruz watershed, U.S./Mexico Border. Southwest Center for Environmental Research and Policy
\$ 110,500.
- 1991 - 1993 (J.H. Brock) Urban riparian ecosystems: assessing functions and values. Southwest Center for Environmental Research and Policy.
\$ 18,912.

PROPOSALS NOT FUNDED

(Co-principal investigators in parentheses)

- 2007 Green, D.M., (Steele, K.P., Miller W.H.) Evaluation of Long-Term Change and Establishment of an Invasive Species Monitoring Plan for the Middle Verde River. Arizona Water Protection Fund \$166,000
- 2006 (Zaimes, G.N.) Development of Ecological Site Descriptions for Selected Riparian areas in Arizona. Arizona Water Institute
- 2005 (Gottfried, G.J., Fenner, P., Narog, M., Alford, E., Haase, S.M.) Impacts of livestock grazing on fire behavior and post-wildfire recovery of native and non-native vegetation in the Arizona Sonoran Desert. Joint Fire Science Program \$220,947
- 2004 (Jonhson, D.E.) Evaluation of 26 years of livestock grazing in a Northeastern Oregon riparian area. \$92,603
- 2001 (L. Olson, C. Johnston) Acquisition of chromatographic instrumentation for use in a multi-disciplinary analytical laboratory. National Science Foundation.
\$ 246,382
- 1998 (Wu, J.) Linking ecosystem processes with land use/land cover change: A hierarchical approach. National Research Initiative Competitive Grants Program, USDA, \$406,815.
- 1998 Enhancing the effectiveness of Envirothon: A program to promote environmental awareness of high school students. Heritage Grant Program, Arizona Game and Fish Department, \$7,047
- 1997 (Malkawi, A., Schneider, I., Watson, R.) Development of a spatiotemporal computational system for evaluation of urban change. National Science Foundation, \$175,000.
- 1995 (W.W. Brady, F. Steiner) Optimum width of suburban wash corridors. Arizona Game and Fish Department, Heritage Grant Program.

- \$14,562.
- 1995 (J. Rinne) Relation of riparian condition and aquatic invertebrate populations in three high elevation streams of Arizona. Arizona Game and Fish Department, Heritage Grant Program.
\$ 23,215.
- 1994 (J.H. Brock) Water consumption and ecophysiology of saltcedar. Arizona Department of Water Resources. 1994 Augmentation and Conservation Assistance Program.
\$ 53,328.
- 1994 (R. Jemison, R. Francis, R. Aguilar, A. Medina, D. Neary) Plant community and soil moisture responses as a result of riparian restoration during road reconstruction. US Forest Service, Rocky Mountain Forest and Range Experiment Station.
\$ 75,000.
- 1994 Teaching innovation in the life sciences: Impacts of soil warming on the soil ecosystem. Hughes Program at Arizona State University.
\$ 9,558.
- 1993 (D. Patten, M. Sommerfeld, J. Stromberg) Water and riparian resources of the Santa Cruz River Basin: Best management practices for water and resource quality. Southwest Center for Environmental Research and Policy.
\$ 203,700.
- 1993 (J.H. Brock) Riparian habitat response to fire in adjacent uplands. Arizona Game and Fish Department, Heritage Grant Program.
\$ 64,761.
- 1992 (W.H. Miller, G.L. Whyson, W.W. Brady, J.H. Brock) Tonto Creek Riparian Unit monitoring study. Bureau of Reclamation, Arizona Projects Office.
\$ 976,385.
- 1992 (W.H. Miller) Elk impacts on riparian habitats. Arizona Game and Fish Department, Heritage Grant Program.
- 1992 (N.C. Conklin, J. Doll, R. Skaggs) U.S.-Mexico pesticide regulation. Southwest Center for Environmental Research and Policy.
\$ 99,989.

PREPROPOSALS, NOT FUNDED

2006	Development of Ecological Site Descriptions for Selected Riparian areas in the Coronado National Forest. Western Region Sustainable Agriculture Research and Education
2004	Evaluation of 26 years of livestock grazing in a northeastern Oregon riparian area. Western Region Sustainable Agriculture Research and Education
1996	(R. Knoph, R. Marans, I. Schneider, R. Virden) Implementing sustainable tourism planning focused on water resources: A case study of the southwestern United States and the Middle East. Seed project for Water Environment in Arid lands Initiative at Arizona State University.
1995	(G.L. Whysong) Linkages between soil properties and riparian vegetation. Water Resources Research Center, Tucson, AZ.
1995	Impacts of runoff management on moisture status of urban riparian vegetation. Water Resources Research Center, Tucson, AZ
1993	Recreational impacts on riparian areas. Water Resources Research Center, Tucson, AZ.
1992	Seedling root development of introduced and native vegetation. Water Resources Research Center, Tucson, AZ.

TEACHING**SUMMARY OF TEACHING RESPONSIBILITIES**

Teaching load is 2 to 3 courses per semester (6 to 10 semester hours)

<u>Course Number</u>	<u>Course Title</u>
BIO 187*	General Biology
ABS 225*	Soils
ABS 226*	Soils Laboratory
ERS 333	Water Resources Management
CAM 341	Riparian Ecosystems, Endangered Habitats, Endangered Species
ABS 430*	Watershed Management
ABS 433*	Riparian Ecosystems Management
ABS 448*	Soil Ecology
ABS 481	Riparian Ecosystem Restoration
ABS 490	Undergraduate Seminar

ABS 434* Wetland Ecosystems and Soils
 ERS 494 Urban Soils
 ABS 591 Graduate Seminar I
 ABS 533* Advanced Riparian Ecology
 ABS 691* Graduate Seminar II

* regularly offered

I have also taught numerous independent study, internship, and readings and conference courses.

GRADUATE STUDENTS, COMMITTEE CHAIR, COMPLETED

Note: the department does not offer a PhD

<u>Student</u>	<u>Degree, Date, Thesis Title</u>
Tricia Baluff	M.S. 2007. Assessment of willow communities at Horseshoe Reservoir
Mellissa Debnar	M.S. 2007. Soil enzyme activity in a pinyon juniper ecosystem
Charlotte Benson	M.S. 2006. Reconciling the endangered species and water management: Roosevelt Dam, Arizona
Barbara Fox	M.S. 2004. Impacts of ATV use on Sonoran desert soil
Shinichi Miyazawa	M.S. 2003. Changes of soil carbon and nitrogen pools in Sonoran desert soils with urbanization
April More	M.S. 2002. Soil carbon pools in agricultural and urban land use types of the Sonoran desert ecosystem
Michelle Oleksyszyn*	M.S. 2001. Vegetation and soil changes in secondary succession of abandoned fields along the San Pedro River.
Mathew Bucchin	M.S. 1999. Constructed wetlands, creating public space from waste
Rodney Held	M.S. 1997. Ungulate impact on water quality of a stream in the White Mountains of Arizona.
Michael Baker	M.S. 1997. Impacts of urbanization on plant and avian species in urban riparian areas.
James McCarthy	M.S. 1996. Analysis of aircraft regulations intended to substantially restore natural quiet at Grand Canyon National Park
Kathy Killian	M.S. 1996. Use of polyacrylamides for reduction of soil erosion

Laura Stephens M.S. 1996. Invertase activity as measured along a slope gradient in
the upper Sonoran Desert

* Co chair with Dr. Julie Stromberg, degree awarded in Plant Biology

GRADUATE STUDENTS, COMMITTEE CHAIR, IN PROGRESS

<u>Student</u>	<u>Thesis Topic</u>
Jessica King	Assessment of Lynx Creek restoration: Soil temperatures and respiration rates Expected completion: Spring 2007
Kayla Eckert	Evaluation of different data collection groups on output from the USAE Hydrogeomorphic Model.
Todd Elliot	Restoration of Sonoran desert after burning using saguaro cacti
Chris Weller	Long term change on the Verde River
Amy Hutmacher	Impacts of urbanization on riparian areas of ephemeral stream systems

I am also serve as a committee member on many other graduate committees

OTHER ADVISINGGraduate Student Proposals

I have helped several graduate students write proposals to the ASU Graduate and Professional Student Association Research Development Program. Two of these proposals were funded.

<u>Honors Thesis</u>	<u>Thesis Title</u>
Keith Vogelsang	Moisture stress in <i>Atriplex</i> as related to sex differences.
<u>Honors Projects</u>	<u>Project Title</u>
Keith Vogelsang	A historic photographic comparison of the Salt River crossing at Haydens Ferry.
Keith Vogelsang	Temperature effects on respiration rates in soils of a <i>Larrea tridentata</i> community
Arron Bradford	Infiltration rates of detention basins of differing ages.

ILTER -Hughes Undergraduate Education in Biology Project Advisor and Mentor

Chris Farley Research Project: Soil enzyme activities in residential patch types.

Co-Advisor - Diplomarbeit (Senior project) Fachhochschule Wiesbaden, Germany

Served as a Co-Referent (Co-advisor) for Sabine Kästner on her Diplomarbeit titled Development of Plant Communities in Yavapai County at Lynx Lake.

SERVICE

Professional Affiliations

Society for Range Management
Soil and Water Conservation Society
Arizona Riparian Council

Book and Article Reviews

2007	Journal of Soil and Water Conservation, Journal Paper
2006	Wetlands, Journal paper
2005	Wetlands, Journal paper
2004	Journal of Soil and Water Conservation, Journal paper
2003	Journal of Soil and Water Conservation, Journal of Range Management, Ecological Applications, Journal papers
2002	Journal of Soil and Water Conservation. Journal paper
2001	Wetlands. Journal papers.
2000	Laboratory Manual for Soil Science 6th edition. Thein, S.J. and Graveel, J.G. Wm. C. Brown Co. Publ.
1999	The Living Landscape 2nd edition. Steiner, F. McGraw-Hill Professional Publishing. Book Chapters
1997	Journal of Range Management. Journal paper
1996	Council of Educators in Landscape Architecture annual meeting. Abstracts.
1996	Proceedings of Council of Educators in Landscape Architecture annual meeting. Journal papers.
1994	Journal of Soil and Water Conservation. Paper.
1992	Environmental Science: Earth as a Living Planet. Botkin, D., and Keller, L. John Wiley and Sons. Book chapters

Working Groups

2005 to present	Chair testing and education for the 2008 International Cannon Envirothon ,Flagstaff Arizona
2005 to 2005	Member of the Technical review team Tonto National Forest Riparian Areas Management Utilization Guidelines (RAMUG)
2004 to present	Founding Member of the Central Arizona Weed Management Association
1998 to present	Member of the testing and education committee, Arizona Envirothon
1996 to present	Coordinator for soils contest, FFA Superstition Field Day, ASU East
1996	Member of the Cave Creek Wash Study Group, to determine riparian habitat value of Cave Creek Wash for the City of Phoenix.
1995-2000	Participating scientist with the National Science Foundation Long Term Ecological Research site in Phoenix, AZ. Focusing on soil organic matter in suburban landscapes.
1995	Co-Instructor for SCENE Urban wildlife workshop, a workshop designed to educate high school teachers about the functions and value of urban riparian habitat for wildlife.
1995	Participant in City of Phoenix Areas C and D Working Group. A workgroup to provide advice to the city concerning development of open spaces surrounding the City of Phoenix.

Committee Service*Arizona State University East (now Polytechnic)*

2005 to present	Member East College Committee of Review
2005 to present	Member ASU Polytechnic Graduate curriculum review committee
2000 to 2004	Member, East Campus Hazards/Safety Committee
2000 to 2002	Member, Personnel Committee
1999 to present	Member, STAR (Sustainable Technologies, Agribusiness and Resources) research center steering committee

Department of Applied Biological Sciences

2006 to present	Chair Peer Teaching Evaluation committee
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2005 to present	Member, College renaming committee
2005 to present	Member Applied Biological Sciences planning committee (move to new college)
2005 to 2006	Member, search committee Program Head Mathematics and Statistics
2005 to 2006	Member, search committee professor of practice, wildlife position
2005 to 2006	Member, search committee professor of practice, physiology position
2005 to present	Member Program review committee
2005 to present	Department Personnel committee
2004 to present	Chair, Review committee (student grievances)
2003 to present	Chair, Graduate program committee
2004	Member, Undergraduate core curriculum committee
2004	Member Department by-laws committee including P&T
<i>College of Architecture and Environmental Design, ASU Main</i>	
1998	Member, by-laws committee
1998	Secretary, College assembly
<i>Morrison School of Agribusiness, ASU East</i>	
1999 to 2004	Chair, MSABR Standards Committee
<i>Environmental Resources Program (ERS)</i>	
1997 to present	Member, ERS Curriculum Committee
2002 to present	Member, ERS/ABS Laboratory Planning and Design Committee
1997 to 2000	Member, ERS Personnel Committee
1991 to 1994	Member, ERS Ph.D. Program Planning Committee
1991 to 1993	Member, High School and FFA Recruitment Committee

Other committee service

- 2002 Member, Chandler-Gilbert Community College Faculty Search Committee (Organic Chemist)
- 1999 to present Member, Arizona Envirothon Test and Education Committee

Other service

- 2002 to present Member, board of directors Arizona chapter, Society for Ecological Restoration
- 2002 School representative Inauguration of Michael Crow ASU president
- 2002 Helped organize and present program information at SEE ASU, a publicity event for ASU
- 1999 to present Presentations at the annual Envirothon Coaches Workshop
- 1998 By-laws committee College of Architecture and Environmental Design
- 1991 to present Academic Advisor, of undergraduate students
- 1993 to present School representative Fall and Spring Commencement
- 1993 to present School representative Fall and Spring Convocation
- 1998 Secretary, for the College of Architecture and Environmental Design college assembly
- 1998 Participant, 27th Avenue Solid Waste Facility Master Plan Charrette
- 1998 Organizer, ERS alumni reunion and picnic
- 1995 Participant, North Sonoran Land use Charrette
- 1995 Helped to establish a Soil and Water Conservation Scholarship for undergraduate students
- 1995 Helped to establish a student chapter of the Soil and water Conservation Society at Arizona State University
- 1994 to 2001 Judge, Graduate Student Paper Competition at the Ecological Society of America Meetings.
- 1992 - 1994 Set up laboratory experiments and demonstrations for visiting high school students interested in soils and environmental resources

Resume for Patti Fenner

1975 BS in Botany from Arizona State University

1980 MS in Natural Resource Management from Arizona State University

1980 – 1990 Range Conservationist, Cave Creek Ranger District, Tonto National Forest

1990 – 2003 Range/Watershed Staff, Cave Creek Ranger District, Tonto National Forest

2003 – present time Noxious Weed Program Manager, Tonto National Forest

William Henry Miller

Associate Professor
Department of Applied Biological Sciences
7001 E. Williams Field Rd.
Arizona State University, East Campus
Mesa, Arizona 85212-0180

EDUCATION

Ph.D. Animal Science, Washington State University, 1984
M.S. Forest and Range Science, Washington State University, 1980
B.S. Range Management, Washington State University, 1978

POSITIONS HELD

Jul. 1999	Associate Professor (tenured); Applied Biological Sciences
Present	Department, Arizona State University East Campus, Mesa, AZ.
Jul. 1994	Associate Professor (tenured); School of Planning and Landscape
Jun. 1999	Architecture, Arizona State University, Tempe, AZ.

RESEARCH PUBLICATIONS

Archival Refereed Papers, Journals, and Refereed Proceedings:

Miller, W. H. and W. E. Yoder. 2005. Nutrient content of Mount Graham red squirrel diets. Proceedings Mount Graham Red Squirrel Symposium. May 2003. Safford, AZ. (Refereed Proceedings, in Press)

DeVos, J. and W. Miller. 2004. Sonoran Pronghorn Antelope Population Dynamics on the Barry M. Goldwater Range Prior to 1990. The Wildlife Bulletin. Accepted.

Miller, W. H., M. G. Collins, F. R. Steiner and E. Cook. 1999. An approach to greenway suitability analysis. Landscape and Urban Planning. 42:91-105.

Books :

W. Miller. 2002. Ecosystem Management of Elk. in Elk of North America. Towell and Thomas ed. Stackpole Book, MD. (In Press)

National/Regional Conference Presentations

Brookins, M. and W. Miller 2005 Use of Thematic Mapper Data for Fuel Load Determination in the Mineral King Area of Sequoia-Kings Canyon National Park. USFS/BLM/ASU Geospatial Tools Conference. Phoenix, AZ April 19-21, 2005.

Miller, W. and B. Herres. 2005. Efficacy of Online Data for Habitat Suitability Analysis. USFS/BLM/ASU Geospatial Tools Conference. Phoenix, AZ April 19-21, 2005.

DeVos, J. and W. Miller. 2004. Sonoran Pronghorn Antelope Population Dynamics on the Barry M. Goldwater Range Prior to 1990. Symposium on Sonoran Pronghorn. Tucson, AZ, May 2-3, 2004.

Miller, W. H. and W. E. Yoder. 2003. Nutrient quality of selected foodstuffs of the Mount Graham red squirrel. Proceedings Mount Graham Red Squirrel Symposium. Safford, AZ. May 21-24, 2003.

Other Paper Presentations

W. Miller. 2003. Wildlife Response to Climatic Changes. Land Management in a Changing Climate. ASU. April 25, 2003

Reports

Miller, W. and M. Drake. 2004. Nutritional Concerns of Pronghorn Antelope in North Central Arizona. Arizona Game and Fish Dept.

Miller, W., B. Mish, C. Fuller, and E. Ellocitt. 2001. Deadman Wash/Pyramid Peak Wildlife Inventory. Final Report submitted to Recreation and Library Department, City of Phoenix, Arizona.

Miller, W., W. Yoder, K. Nicholson, D. Brewer, and B. Mish. 2001. Union Hills Wildlife Inventory. Final Report submitted to Recreation and Library Department, City of Phoenix, Arizona.

Miller, W. 1999. North Phoenix Wildlife Inventory. Final Report submitted to Recreation and Library Department, City of Phoenix, Arizona.

SPONSORED RESEARCH PROJECT

W. Miller. 2004. Nutrient Content of Potential Pronghorn Forage Species from Six Selected Herds in Arizona. AzG&F. \$77,047.

W. Miller. 2004. Impact of Catastrophic Fire on Availability and Characteristics of Mule Deer Habitat in Central Arizona. AzG&F. \$27,914.

W. Miller. 2003. Nutritional Concerns of Pronghorn Antelope in North Central Arizona. AzG&F, \$22,627,

W. Miller. 2000-2001. Deadman Wash/Pyramid Peaks Wildlife Inventory. City of Phoenix, AZ. \$79,200

W. Miller. 1999-2001. Union Hills Wildlife Inventory. City of Phoenix, AZ. \$82,026.

W. Miller. 1998-1999. North Phoenix Wildlife Inventory. City of Phoenix, AZ. \$65,436.

TEACHING COURSES:

ABS 374 Intro. To Wildlife Management. F 05.

ABS 376/ ERS 474 Wildlife Ecology: F 00, F01, F02, F03, F04, F05.

ABS 378/ERS 353 Wildlife Nutrition: S 01, F 02, S 04.

ABS 476/ERS 475 Big Game Habitat Management: S 99 – 05.

ABS/ERS 485 GIS in Natural Resources: F-99 – 04.

ABS/ERS 486 Remote Sensing: S 00 – 03, S 05
ABS 570 / ERS 553 Advanced Nutrition: F 00, F 02, S 04.
ERS 410 Wildlife Habitat Relations: F 99.

STUDENT MENTORING

Chair of Completed Thesis:

Cohen J. R. 1999. Avian population abundance and distribution along Cave Creek and Skunk Creek washes.

Carpenter, J. 1999 Small mammal population abundance and distribution along Cave Creek and Skunk Creek washes.

Frein, D. 2000. Reptile population abundance and distribution along Cave Creek and Skunk Creek washes.

Brewer, D. 2001. Reptile abundance and distribution in the Union Hills area of north, Phoenix.
Herres, B. 2001. Efficacy of online data for habitat suitability analysis along the San Pedro River, Arizona.

Yoder, W. E. 2001. Rattlesnake habitat selection in the Union Hills area of north Phoenix, Arizona.

Nicholson, K. 2002. Small mammal abundance and distribution in the Union Hills area of north Phoenix, Az.

Member of completed committees:

PhD.

Biology: 1
Architecture: 1

M.S.

ERS: 6
ABS: 3

Chair Active Committees:

Ph.D.

Yoder. W. Use of advanced technologies for the development of habitat suitability analysis.

M.S.

Brookins. M. Use of remote sensing to determine fuel loads in the Mineral King area of Sequoia National Park.

Colliver, L. Changes in pronghorn antelope diet composition and diet quality on Anderson Mesa and Garland Prairie in 2003.

Drake. M. Characteristics and quality of pronghorn antelope diets on Anderson Mesa and Garland Prairie in 2002.

McAdams, C. Effects of catastrophic fire on elk habitat in the Rodeo-Chediski fire area.

Dealher, M. Year round cow elk habitat selection along Arizona highway 260.

Romanowitz, J. Year round bull elk habitat selection along Arizona highway 260

Member of Active Committees:

M.S. ABS – 6

SERVICE

UNIVERSITY:

Co-Director University GIS Certificate Committee, 2000-present.

Member University Honorary Degree Committee, 2002-present.

Polytechnic Campus Promotion and Tenure Committee, 2002-present

Polytechnic Campus Curriculum and Academic Policies Committee. 2002-2005.

Polytechnic Campus Facility and Infrastructure Committee. 2005-present.

College:

PhD. Executive Committee (CAED) 2001-2005.

Scholarship Committee (MSABR) 2000-2003.

Department:

Promotion and Tenure Committee, 1999-2002.

Curriculum Committee, 1999 – 2003.

By Laws Committee, 2003-2004.

Chair Laboratory Renovation Committee, 2001-2003.

Coordinator for the development of an IGA agreement between Arizona Game and Fish

Department and Department of Applied Biological Science, ASU.

ASU representative to the USFS/BLM/ASU Geospatial conference planning and executive committee, 2003-2005.

Reviewer for the J. Wildlife Management and J. Range Management.

Member of :

American Society of Photogrametry and Remote Sensing.

The Wildlife Society

The Society for Range Management.