

Arizona Water Protection Fund FY 2011 Grant Application Review

Application # WPF0398 Applicant: Northern Arizona University

Title of Project: Inventory of Tamarisk Leaf Beetle and effects on
Riparian Habitat in the Colorado, Verde, Salt and Tonto Rivers

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, 2nd Floor, Phoenix). The additional materials available are the following:

Maps
 Photographs
 Disk
 Other

WPFO398

Arizona Water Protection Fund
Application Cover Page
FY 2011

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Water Protection Fund

Title of Project: Inventory of tamarisk leaf beetle and effects on riparian habitat in the Colorado, Verde, Salt and Tonto Rivers

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 type="checkbox"/> 16-20 years
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Applicant Information: Name/Organization: Northern Arizona University Address 1: 1298 S. Knoles Dr., ARD Bldg. 56, Ste. 240 Address 2: City: Flagstaff State: AZ ZIP Code: 86011 Phone: (928) 523-6917 Fax: (928) 523-1075 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: Matthew Johnson Title: Research Associate Phone: 928-523-7764 Fax: 928-556-9111 e-mail: matthew.johnson@nau.edu	Any Previous AWPf Grants: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, please provide Grant #(s):
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Arizona Water Protection Fund Grant Amount Requested: \$ 144,877.62 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>Applicant/Agency/Organization:</th> <th>Amount (\$):</th> </tr> </thead> <tbody> <tr> <td>1. Applicant</td> <td>4,915.93</td> </tr> <tr> <td>2. USGS</td> <td></td> </tr> <tr> <td>3.</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: right;">Total: 4,915.93</td> </tr> </tbody> </table>	Applicant/Agency/Organization:	Amount (\$):	1. Applicant	4,915.93	2. USGS		3.		Total: 4,915.93	
Applicant/Agency/Organization:	Amount (\$):										
1. Applicant	4,915.93										
2. USGS											
3.											
Total: 4,915.93											

Has your legal counsel or contracting authority reviewed and accepted the Grant Award Contract General Provisions?
 Yes No 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.

Typed Name of Applicant or Applicant's Authorized Representative	Title and Telephone Number Director, OGCS, 928-523-8319
<i>Ulma G. Ennerga</i>	1 September 2010
Signature	Date Signed



NORTHERN
ARIZONA
UNIVERSITY

Office of Grant and Contract Services

Northern Arizona University
PO Box 4130
Flagstaff, AZ 86011-4130

928-523-4880
928-523-1075 fax
nau.edu/grants

August 31, 2010

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

Dear Sir/Madame:

I am pleased to submit, on behalf of Matthew Johnson, Research Associate, Colorado Plateau Research Station, a proposal for the AWPf Fiscal Year 2011 funding cycle. My signature below confirms the approval to submit this proposal on behalf of Northern Arizona University.

We have reviewed the Grant Award Contract General Provisions, and request the following changes be to the General Provisions, or inclusion in the Special Provisions:

Paragraph 6. Indemnification. Since both AWPf and Northern Arizona Universities are entities of the State of Arizona, and unable to indemnify, we request that the agreement exclude state entities from being subject to this provision.

Paragraph 9(b). Termination of Contract pursuant to A.R.S. § 38-511. NAU also is subject to this provision.

I would be pleased to discuss any of these concerns and provide whatever additional information may be helpful. Please contact Cindy Judge for administrative questions at (928) 523-6917. If I can provide additional assistance, please call me at (928) 523-8319 or contact me via e-mail at winnie.ennenga@nau.edu. Your consideration of our proposal is appreciated.

Sincerely,

A handwritten signature in blue ink that reads "Wilma G. Ennenga".

Wilma G. Ennenga
Director

Enc.

cc:

Inventory of Tamarisk Leaf Beetle and Effects on Riparian Habitat Within the Colorado River, Verde River Watershed and Tonto and Salt Rivers, AZ.

2. Executive Summary

Tamarisk beetles, *Diorhabda spp.*, were introduced as a biocontrol agent on tamarisk (*Tamarix spp*) in 2000 in Utah and Colorado. Tamarisk beetles defoliate the leave of tamarisk and reduce the plant's ability to photosynthesize resulting in reduced flowering and seed production. Since its introduction, its range has expanded to include Nevada, Texas, and New Mexico, and it is now in the Colorado River in Arizona. Because tamarisk is a component of much of the riparian ecosystem in the southwestern United States and provides critical habitat for some endangered riparian bird species, the effect of defoliation by the beetle is likely to include associated elements of riparian habitat beyond tamarisk such as ecosystem processes and wildlife population dynamics, and plant community structure. For example, defoliation will affect microclimate variables (temperature, humidity, light availability) of riparian habitats. Each of these parameters plays a role in nesting environments by possibly increasing temperatures and understory plant assemblages by changing light availability. This project proposes to continue a beetle-sampling program along the Colorado River initiated in 2010 and expand sampling for the beetle along the Verde, Tonto and Salt Rivers. Each of these rivers provide habitat for southwestern willow flycatcher (*Empidonax traillii extimus*), and the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) but vary in tamarisk cover. We propose to measure microclimate parameters, estimate plant cover, and identify plant species, including nonnative plants that may benefit from defoliation. The goal of this project is to provide resource managers with information about beetle advancement along Arizona watersheds, identify potential effects of defoliation on microsite variables within riparian ecosystems, and provide recommendations for approaches that may be used to mitigate the effects of defoliation by the beetle.

3. Project Overview

-Background

Tamarisk (*Tamarix spp.*) is an invasive riparian shrub that has spread extensively in the southwestern U.S. since its introduction in the late 19th Century. Tamarisk occupies approximately 600,000 ha of riparian habitat in the southwestern region, and it is the second most common woody species in riparian zones in the western United States (Friedman et al., 2005; Ditomasi 1998). Though occurring in both regulated and free flowing rivers systems (Birken and Cooper 2006; Stromberg 1997), tamarisk is particularly successful at propagation under regulation (Beauchamp and Stromberg 2007, Stromberg et al. 2007). The plant affects native plant diversity, wildlife habitat, and poses an increased wildfire risk where dense stands occur (Fleishman et al. 2003; Beauchamp et al. 2005; Moseman et al. 2008, Busch and Smith 1995; Busch 1995). In spite of its affect on community and ecosystem processes, the plant provides critical habitat for animals within the southwest including endangered species such as the southwestern willow flycatcher (*Empidonax traillii extimus*), and the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*). Within the Colorado Plateau region of Arizona, it is a dominant constituent of the Colorado River in Grand Canyon (Ralston et al., 2008), and is a component of riparian habitats along the Verde River (Johnson et al. , Stromberg 1998, Beauchamp and Stromberg 2007, Stromberg et al. 2007).

With increasing emphasis by public and private sectors to control tamarisk in the western United States, the Department of Agriculture explored identifying a biocontrol agent for tamarisk. By 2000, specialist herbivore beetles in the genus *Diorhabda*, from Eurasia, were identified as potential biocontrol agents. Experimental field trials of the tamarisk beetle determined that these beetles caused substantial defoliation and mortality of tamarisk (DeLoach et al. 2000, Dudley et al. 2001). The release of several species of *Diorhabda* in western U.S. river systems to control tamarisk began in 1999 and has resulted in reduction of tamarisk cover along the Colorado and Green Rivers in Utah (Dennison et al. 2009). Though introductions of this biocontrol agent were stopped in 2009, the beetle continues to spread within the Upper Colorado River watershed, is well established in parts of Texas, New Mexico, Wyoming, Utah and Nevada, and is expected to colonize the Lower Colorado River system in the future. Ground surveys for the beetle in 2009, identified one adult beetle in Grand Canyon National Park along the Colorado River at river mile 6 (Fig. 1) and larvae were detected near Navajo Bridge and at river mile 12. Most recent surveys in July 2010 identified larvae and adult tamarisk beetles 6 miles upstream of Lees Ferry, Arizona and downstream of Lees Ferry at river miles 12, 122 and at the mouth of Kanab Creek, river mile 145 (M. Johnson, pers. communication). The reduction in tamarisk cover in riparian areas, by beetle defoliation, pave the way for changes in plant community composition and structure, with consequent effects on wildlife populations and ecosystem processes (such as wildfire, hydrological dynamics, and sediment dynamics).

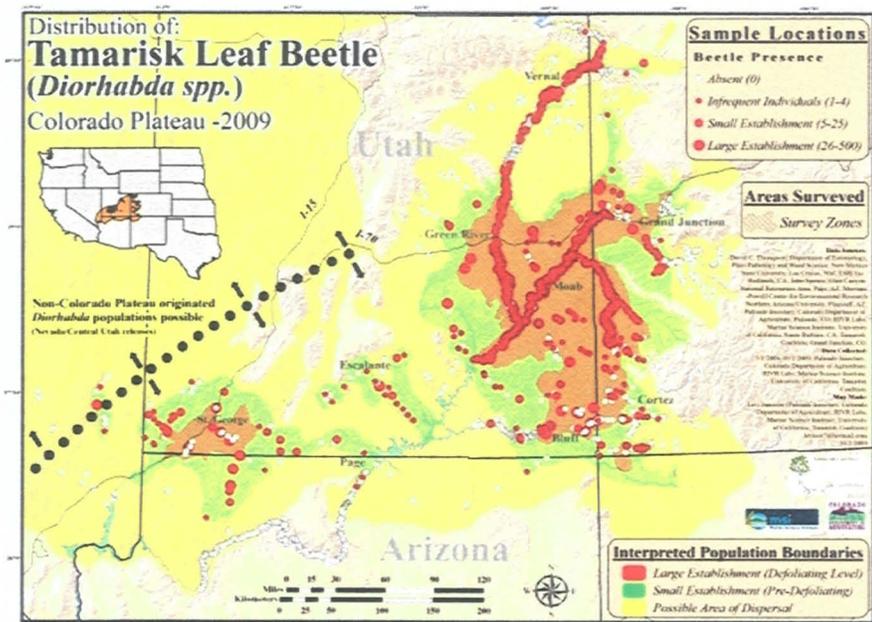


Figure 1. 2009 tamarisk leaf beetle distribution in Utah, Colorado, and Arizona (from tamarisk coalition <http://www.tamariskcoalition.org>).

The rates at which vegetation changes in composition will occur, and the resultant effects on riparian-dependent fauna and birds that breed in tamarisk are presently unknown. Effects on riparian vegetation communities will likely include changes in plant biomass, microclimate changes, and plant species diversity (Busch and Smith 1995). These changes could potentially affect migratory and breeding birds within riparian corridors throughout the southwest (van Riper et al. 2008, Hultine et al. 2009) and particularly in those areas where tamarisk is the dominant overstory plant. Central questions about the ecosystem effects of tamarisk defoliation exist and need to be addressed including

- *What is the beetle distributions and directionality of their spread in Arizona?*
- *How does defoliation affect microhabitat parameters such as temperature and light availability in riparian understory?*

Answering these questions require ground surveys to sample for the presence and identification of beetle species, and collection of baseline microhabitat data prior to beetle infestation. A secondary activity involves using field observations of defoliation rates and microhabitat changes to estimate resultant effects on riparian fauna and understory plant communities. The information gained can be used by resource managers to mitigate the effects of beetle defoliation if beetles do infest critical habitat of endangered riparian birds.

-Project Goals

The goal of this project is to provide resource managers with information about beetle advancement along Arizona watersheds, identify potential effects of defoliation on microsite variables within riparian ecosystems, and provide recommendation for approaches that may be used to mitigate the effects of defoliation by the beetle.

-Objectives

Objective 1

Identifying the directionality and extent of beetle distributions in three watersheds across three ecotones in Arizona.

Statement of Problem: *Beetles may disperse differently within watersheds and under variable tamarisk densities. The three study areas are of different stream orders with variable densities of tamarisk. These surveys may inform managers about potential dispersal patterns by the beetle in other stream channels.*

Objective 2

Establish baseline microhabitat and plant diversity data prior to beetle infestation using thermistors that record temperature and humidity values, and ground surveys to establish types of understory cover.

Statement of Problem: *Defoliation may increase temperatures, reduce relative humidity, and increase light availability to understory plants. Each of these changes in microhabitat variables may affect nesting success by riparian bird species, and understory plant diversity. Defoliation effects has repercussion in ecosystem services associated with riparian habitat as refugia for resident and transient populations and the effect of habitat change on this function/service.*

Objective 3

Use data from objectives 1 and 2, published estimates of defoliation rates as well as from field observations to estimate how defoliation might change microhabitat variables (temperature and light availabilities), identify which understory plant species may benefit following defoliation and provide potential approaches that may mitigate beetle defoliation affects.

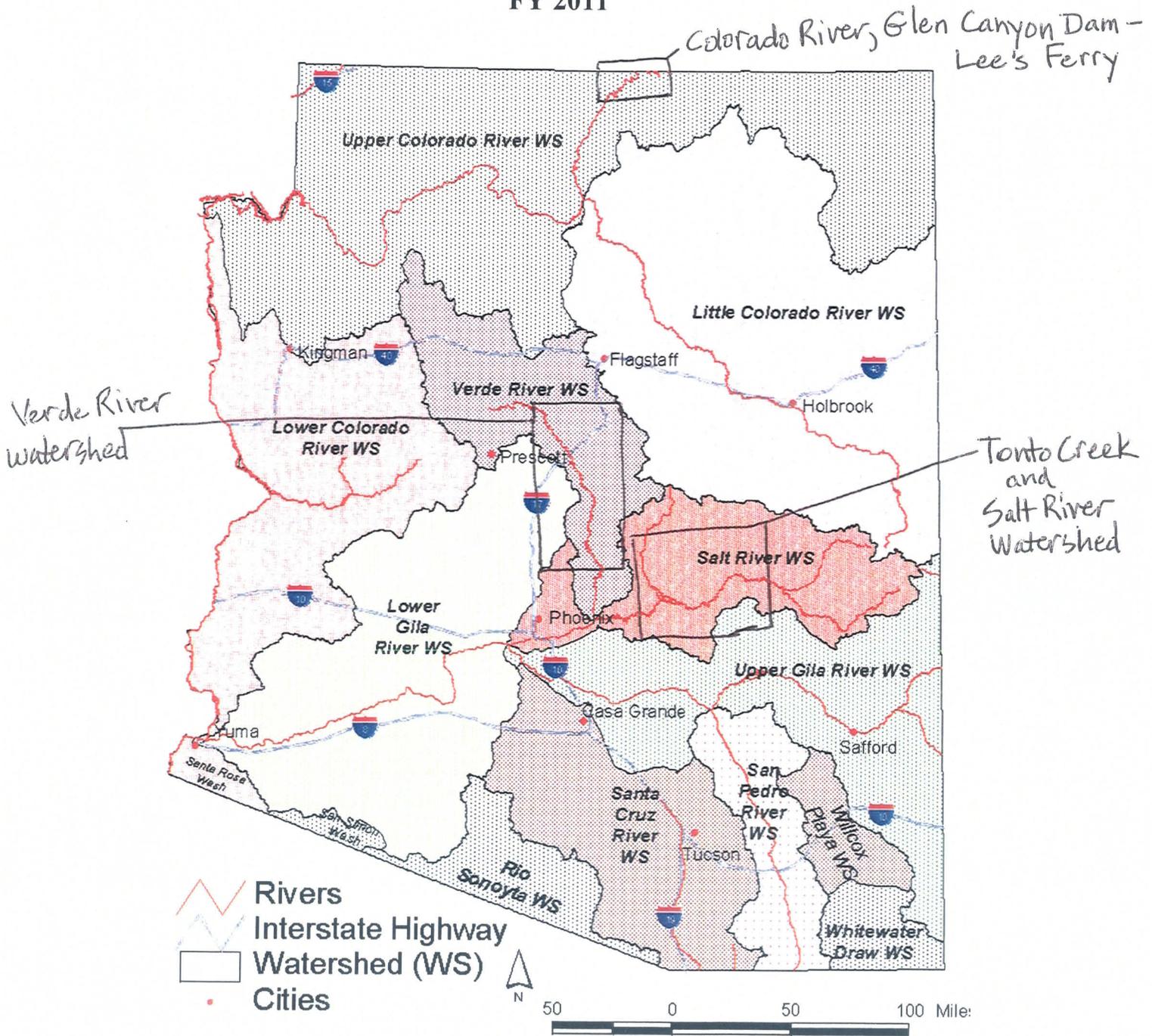
Statement of Problem: *Light availability affects temperature and relative humidity values, which affect nesting success in riparian birds. Light availability also affects seedling establishment in the understory. The baseline data will provide information about existing variability and potential seed sources for understory plants. Publish information or field observations on percent defoliation can be used to establish percent cover/light availability.*

Project Location & Environmental Contaminant Information FY 2011

Project Location Information			
1. County: <u>Coconino</u>	2. Section: _____	3. Township: _____	4. Range: _____
<p>5. Watershed: <u>Upper Colorado River WS, Verde River WS, Salt River WS</u></p> <p>6. 8 or 10 Digit Hydrologic Unit Code (HUC): _____</p> <p>7. Name of USGS Topographic Map where project area is located: _____</p> <p>8. State Legislative District: <u>District 1</u></p> <p>(Information available at: http://159.87.126.6/mapping/default2.asp?tname=Original.2009.Legislative.Map&org2009leg=on&service=ircmaps&init=true)</p> <p>9. Land ownership of project area: <u>National Park Service and US Forest Service</u></p> <p>10. Current land use of project area: <u>Public Land</u></p> <p>11. Size of project area (in acres): <u>Approximately 2,400</u></p> <p>12. Stream Name: <u>Colorado River (Glen Canyon Dam – Lee’s Ferry); within the Verde valley watershed including parts of Wet Beaver creek, Oak Creek, Verde River, and West Clear Creek; Tonto and Salt Rivers near Roosevelt Lake, AZ.</u></p> <p>13. Length of stream through project area: <u>Approximately 80</u></p> <p>14. Miles of stream benefited: <u>Approximately 80 miles</u></p> <p>15. Acres of riparian habitat: <u>Approximately 2,400 acres</u> will be:</p> <div style="margin-left: 300px;"> <input type="checkbox"/> Enhanced <input checked="" type="checkbox"/> Maintained <input type="checkbox"/> Restored <input type="checkbox"/> Created </div>			
<p>16. Provide directions to the project site from the nearest city or town. List any special access requirements:</p> 			
Environmental Contaminant Location Information			

1. Does your project site contain known environmental contaminants? YES NO If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants:
2. Are there known environmental contaminants in the project vicinity? YES NO If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants:
3. Are you asking for Arizona Water Protection Fund monies to identify whether or not environmental contaminants are present? YES NO

Arizona Watershed Map FY 2011



Title of Project: 2. Executive Summary

Inventory of tamarisk leaf beetle and monitoring effects on riparian bird habitat in the Colorado, Verde, Salt and Tonto Rivers

-Project Location/Ownership Maps

We will survey for beetles along the Colorado River (Glen Canyon Dam – Lee’s Ferry); within the Verde valley watershed including parts of Wet Beaver creek, Oak Creek, Verde River, and West Clear Creek; Tonto and Salt Rivers near Roosevelt Lake, AZ. (See attached maps)



United States Department of the Interior

NATIONAL PARK SERVICE
Glen Canyon National Recreation Area
P.O. Box 1507
Page, Arizona 86040



IN REPLY REFER TO:

N2219 GLCA-R

August 30, 2010

Matthew J. Johnson
Colorado Plateau Research Station
Northern Arizona University, Box 5614
Flagstaff, AZ 86011
(928) 523-7764
Matthew.Johnson@nau.edu

Re: Permission to access Glen Canyon National Recreation Area lands

Dear Mr. Johnson

The United States National Park Service as managers of the Glen Canyon National Recreation Area support your proposed research, and will allow access on these properties (Colorado River; Glen Canyon Dam – Lee's Ferry, AZ) for the purpose of performing the proposed research project; "Inventory of Tamarisk Leaf Beetle and Monitor the Effects on Riparian Habitat". This assumes all state and federal permits for performing the proposed research are obtained. This ensures that all activities will be consistent with NPS rules and regulations.

A field season schedule should be submitted to the Glen Canyon National Recreation Area office at the beginning of the Field Season. Please contact me at (928) 608-6267 if you have any questions.

Sincerely,

John Spence, Ph.D.
Terrestrial Ecologist & Research Coordinator
National Park Service
Glen Canyon National Recreation Area
928-608-6267; John_Spence@nps.gov



United States
Department of
Agriculture

Forest
Service

Red Rock
Ranger District

P. O. Box 20429
Sedona, AZ 86341
Phone: (928) 282-4119
Fax: (928) 203-7539

File Code: 2610

Date: August 31, 2010

Matt Johnson
Colorado Plateau Research Station
Northern Arizona University
Box 5614
Flagstaff, AZ 86011

Dear Mr. Johnson,

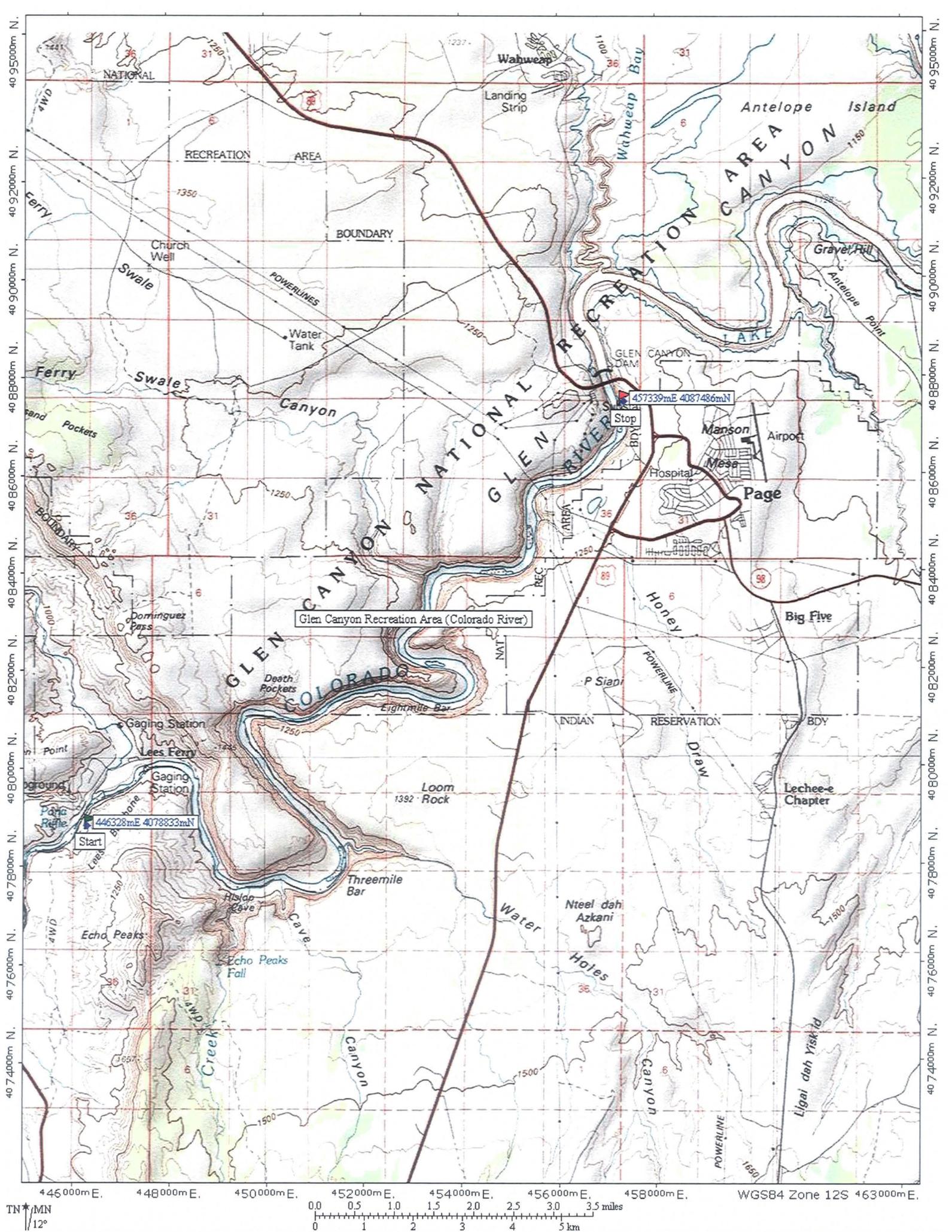
The Coconino National Forests recognizes the potential threat the tamarisk beetle may have on riparian fauna and support you in your inventory efforts. We grant you permission to access National Forest Lands on the Coconino, specifically, the Verde Valley Watershed which includes parts of Wet Beaver creek, Oak Creek, Verde River, and West Clear Creek, for the purpose of performing the proposed research project; "Inventory of Tamarisk Leaf Beetle and Monitor the Effect on Riparian Habitat". This assumes all state and federal permits for performing the proposed research are obtained. This also provides that all activities will be consistent with the USFS rules and regulations. Please contact our district biologist, Janie Agyagos, at (928) 203-7507, if you have any questions.

Sincerely,

MICHAEL CHAVEAS
Acting District Ranger

cc: Cecelia Overby





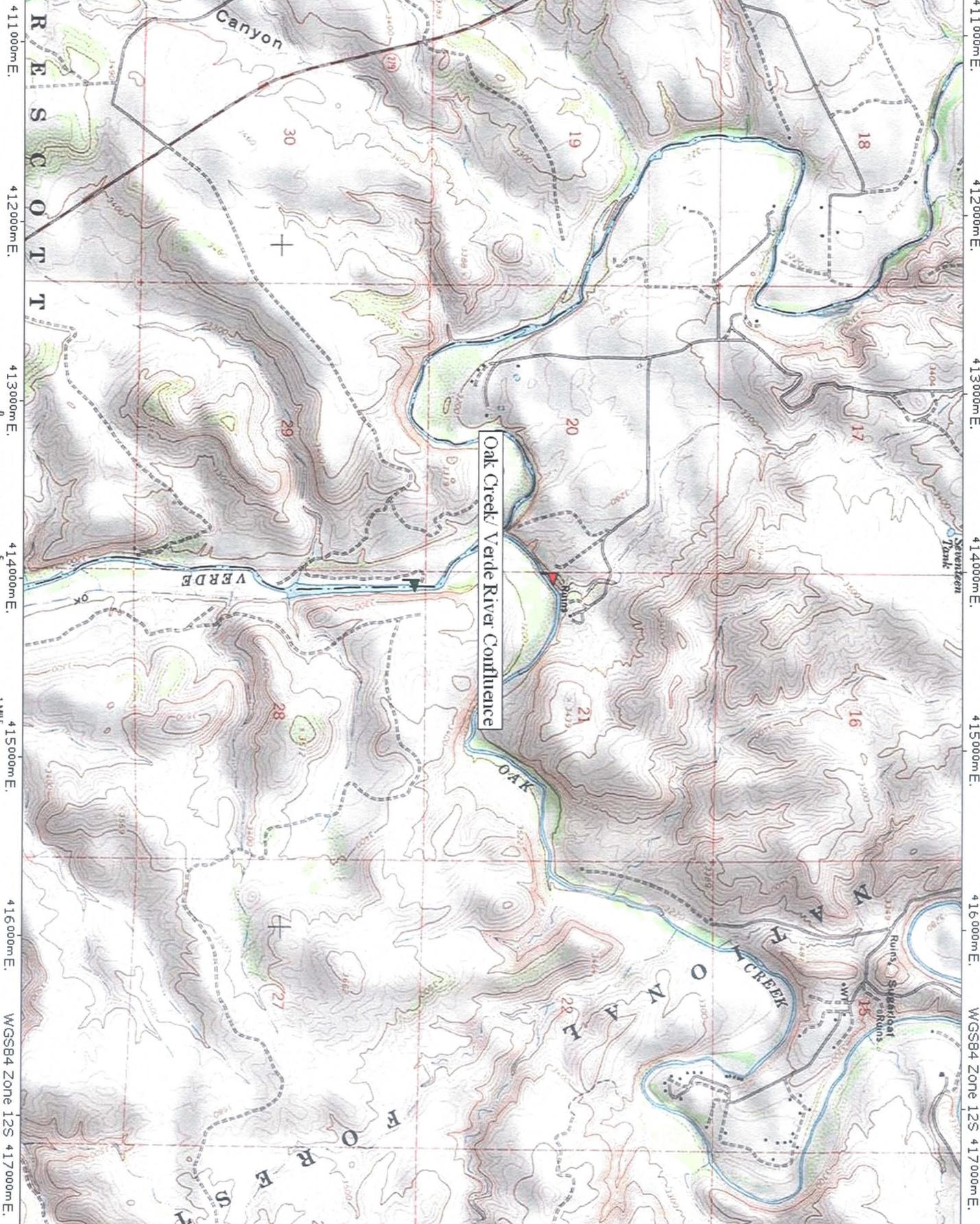
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TN MN
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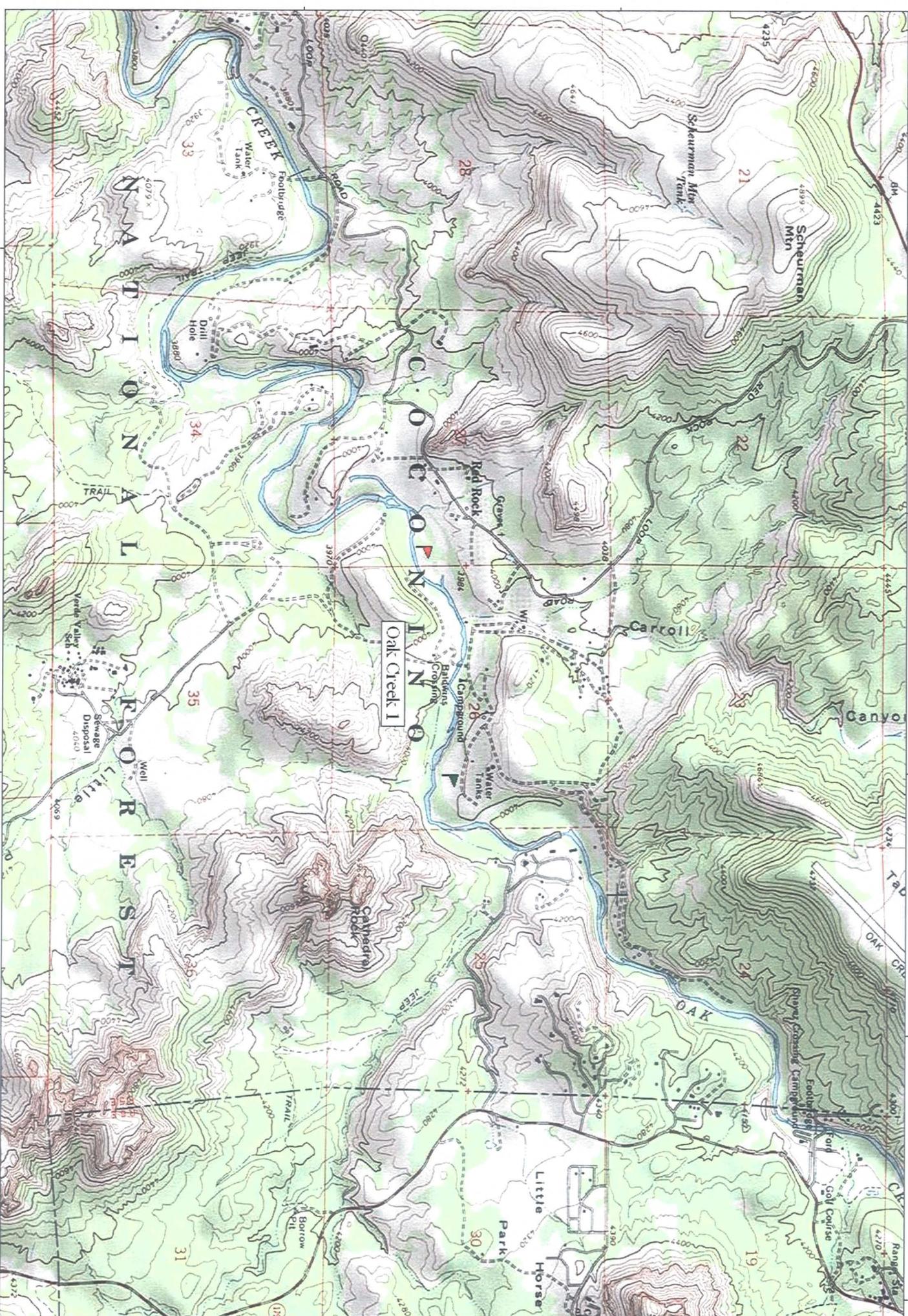
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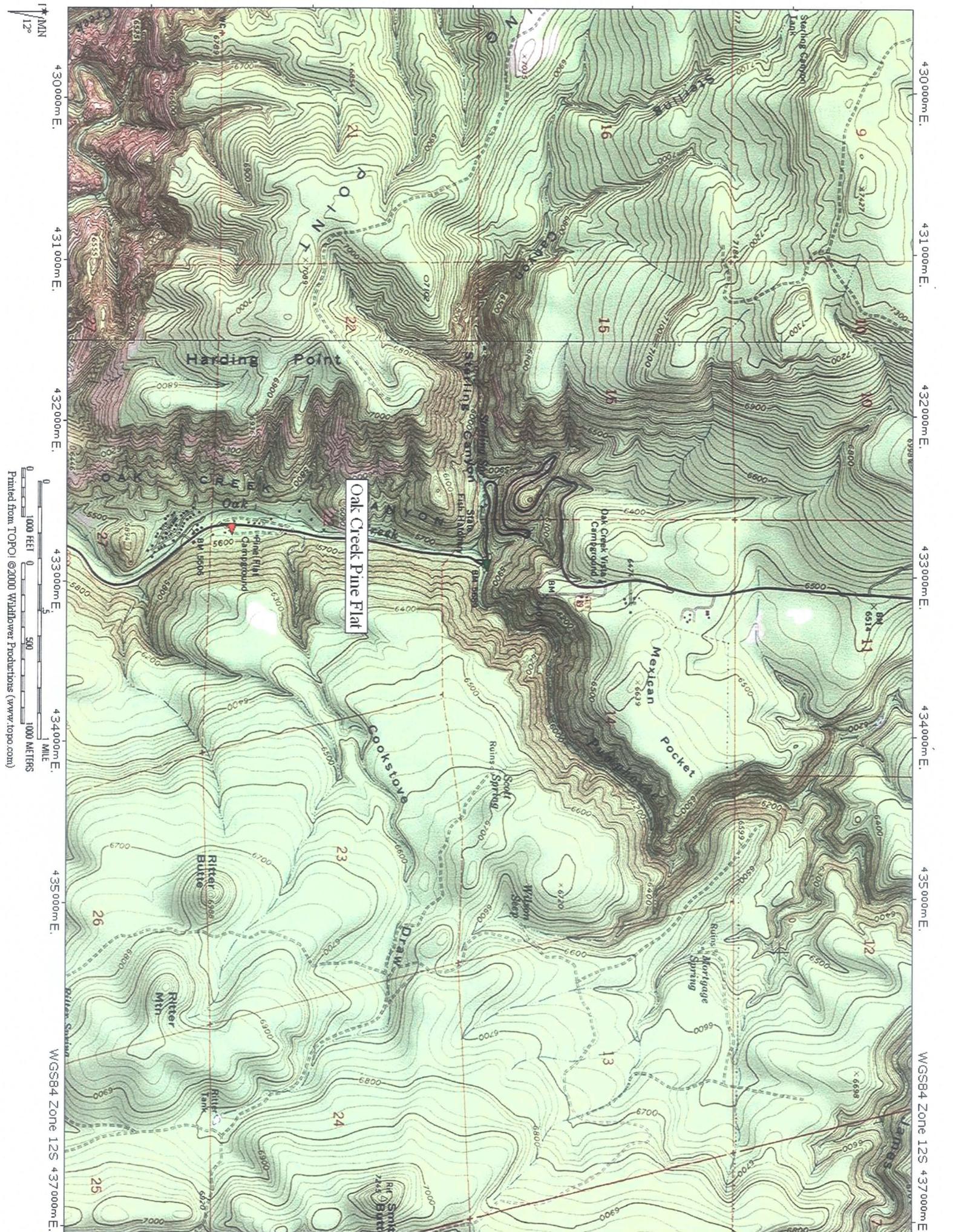
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WGSS84 111°46.000' W



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Printed from TOPOI ©2000 Whitliver Productions (www.topo.com)



Oak Creek Pine Flat

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12°

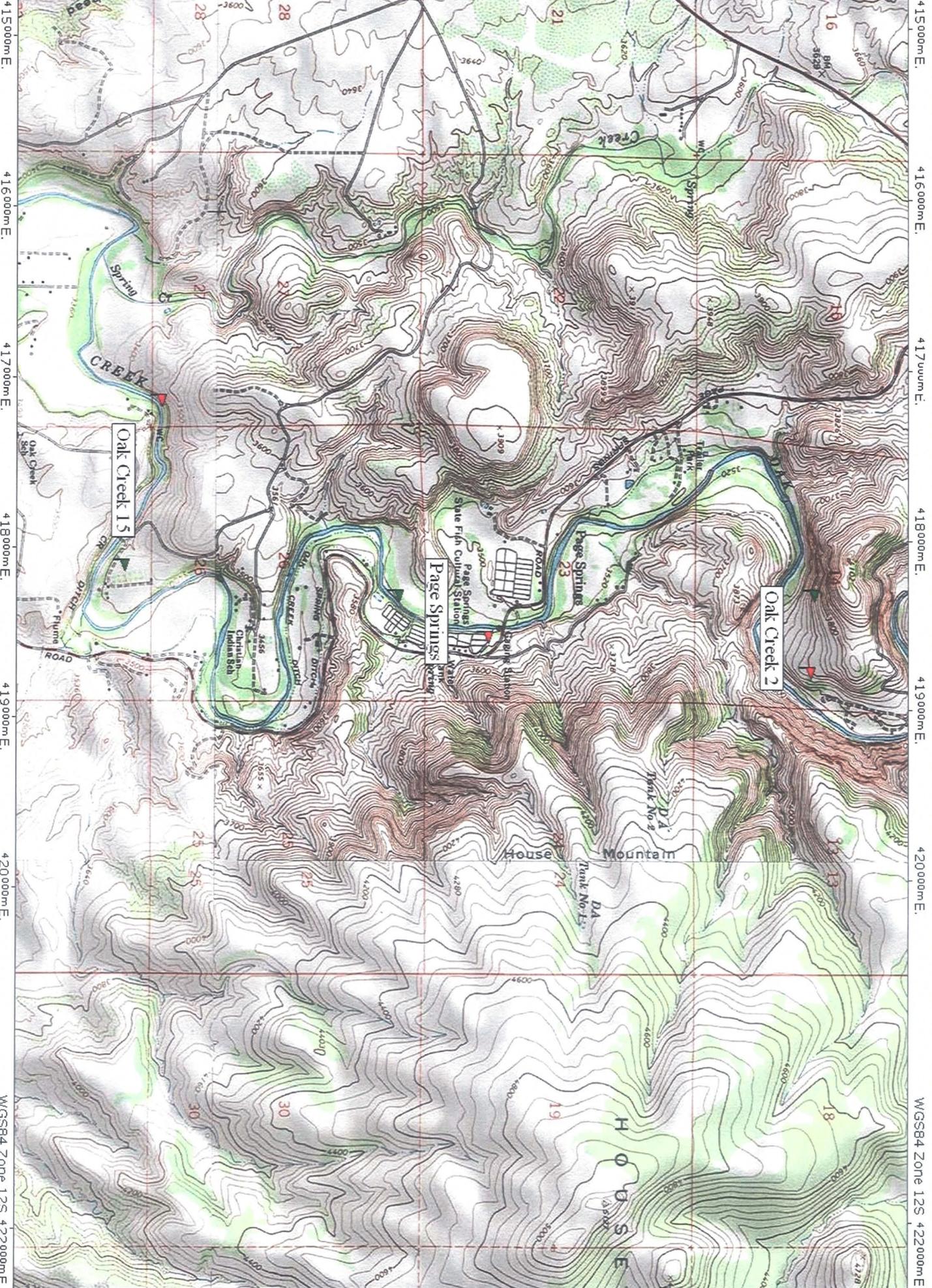
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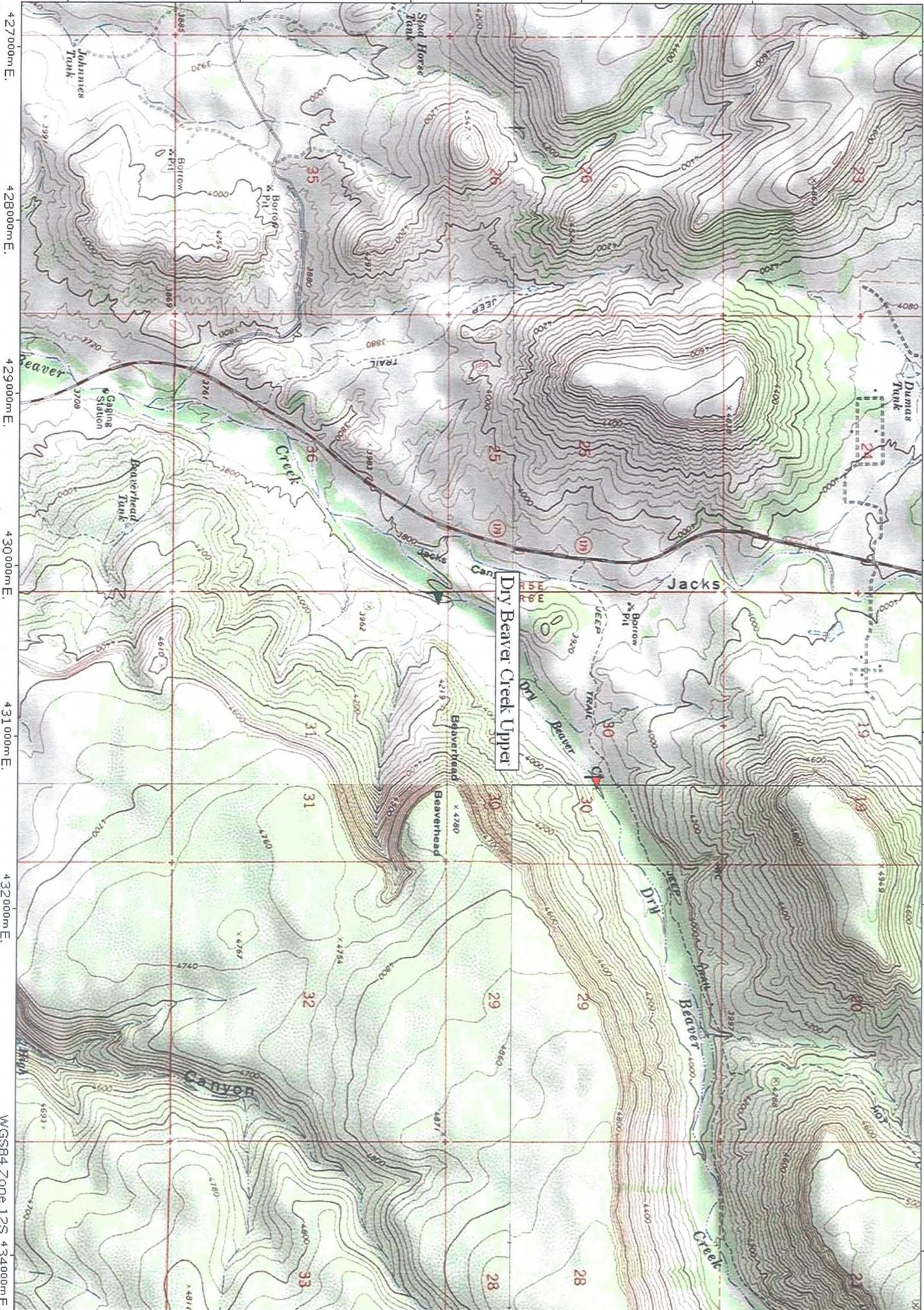
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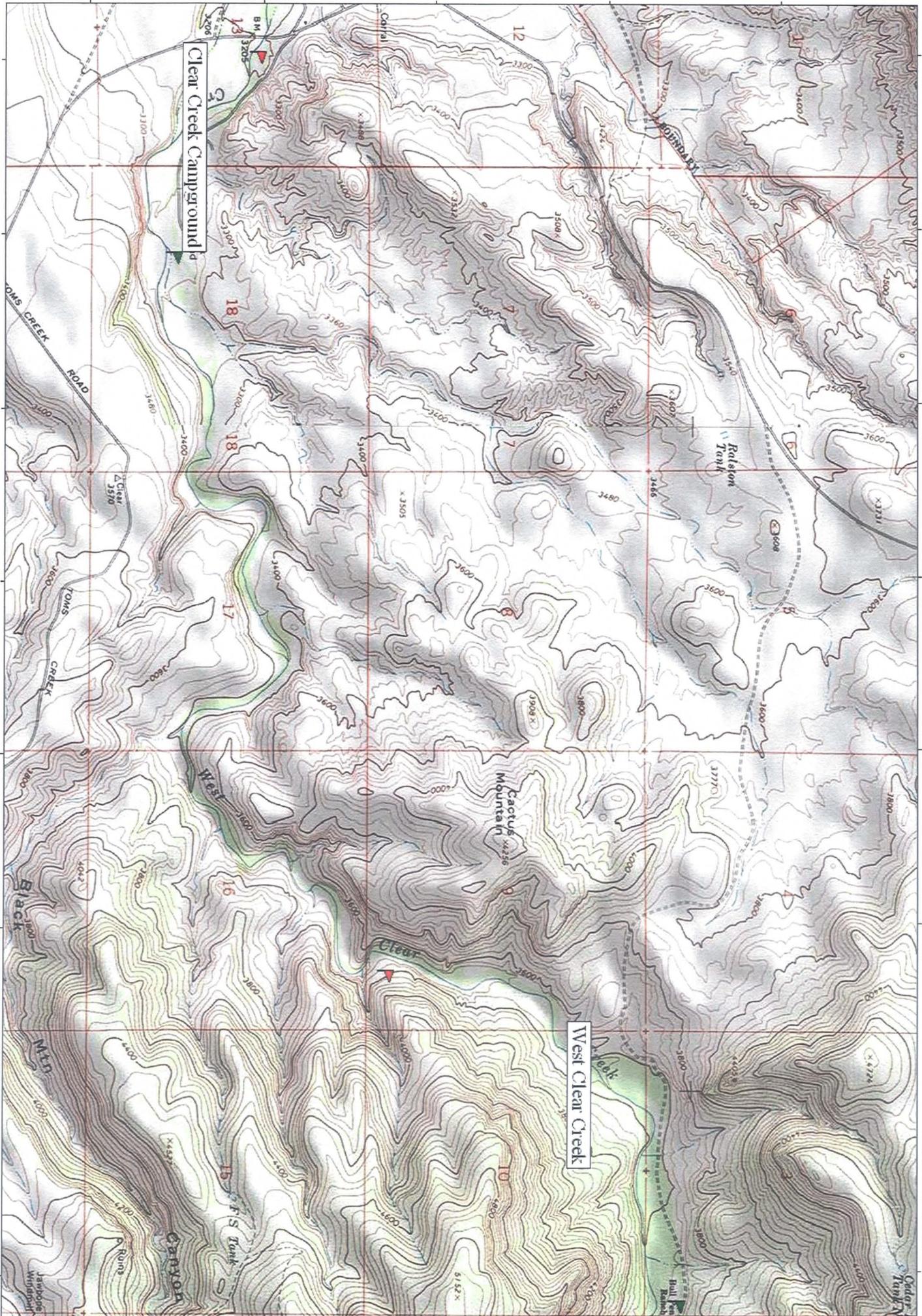
Dry Beaver Creek Upper

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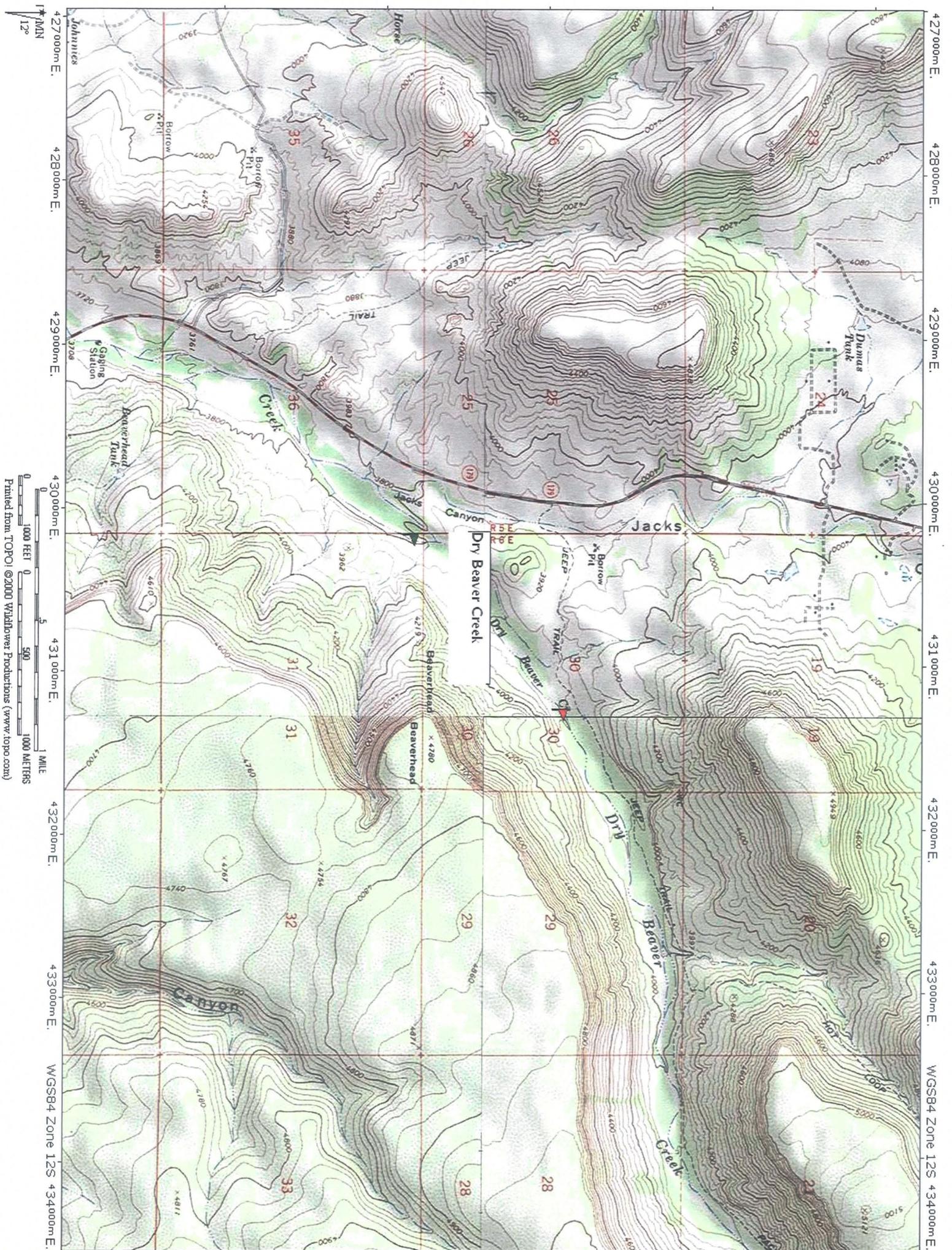


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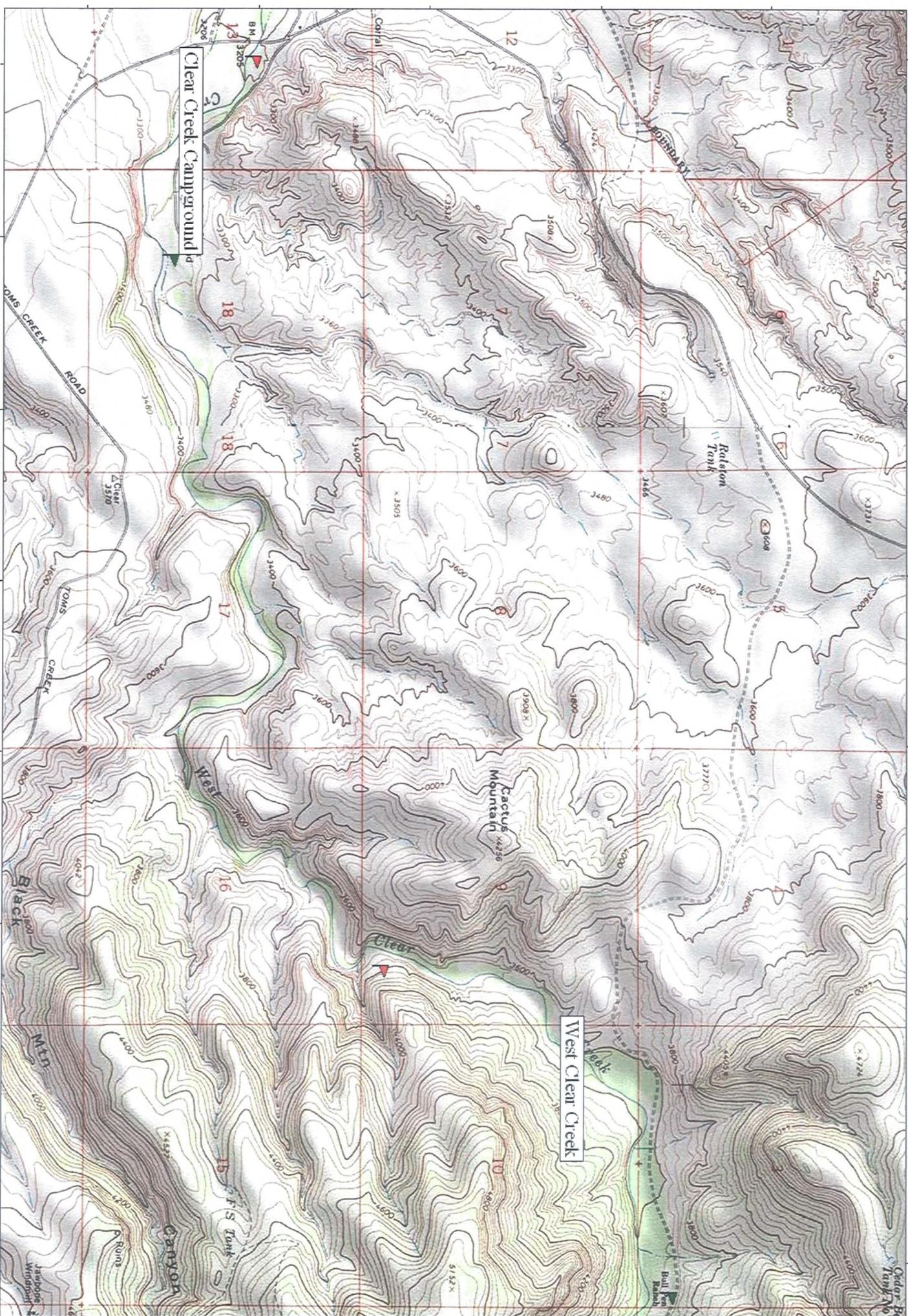


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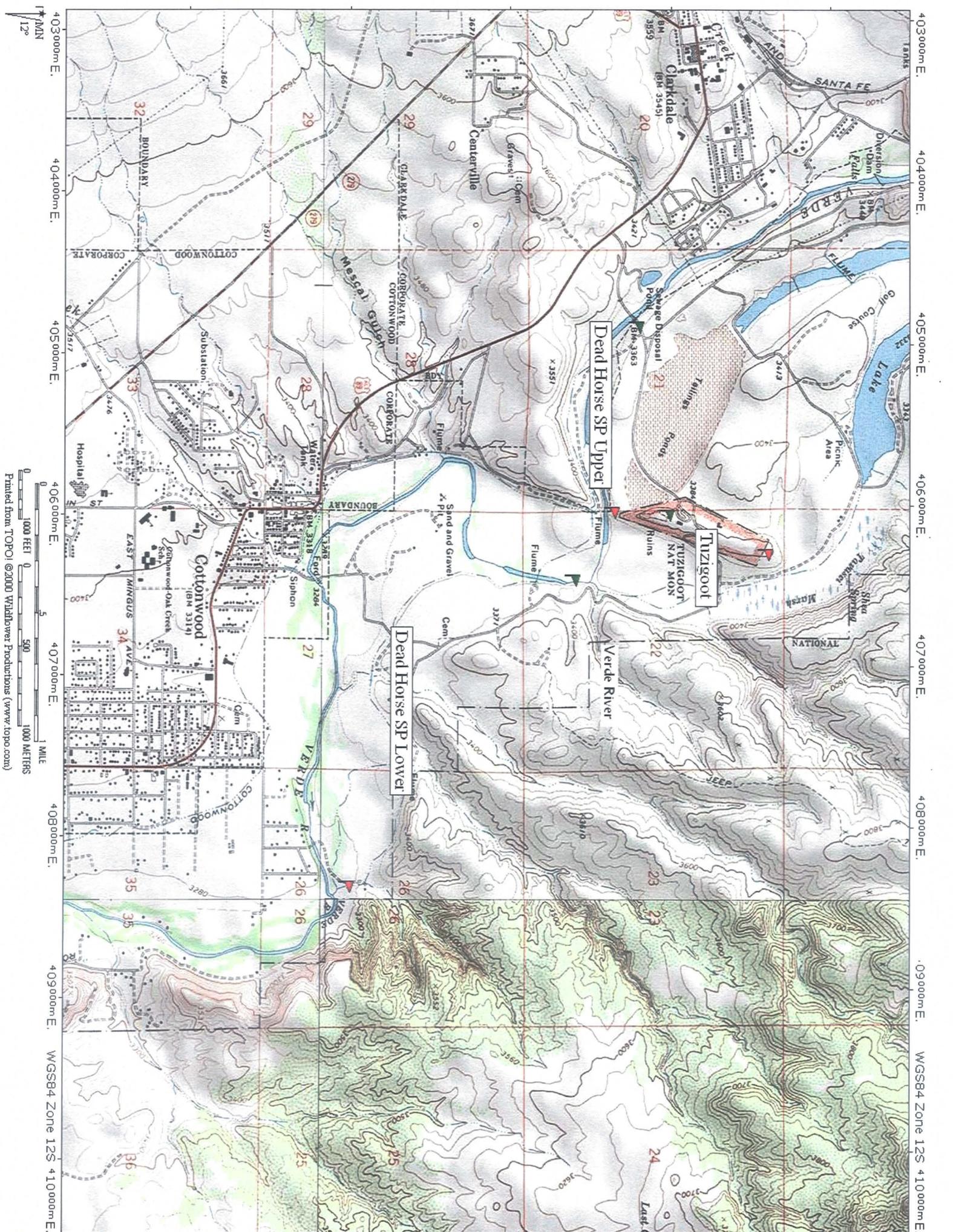


West Clear Creek

Clear Creek Campground

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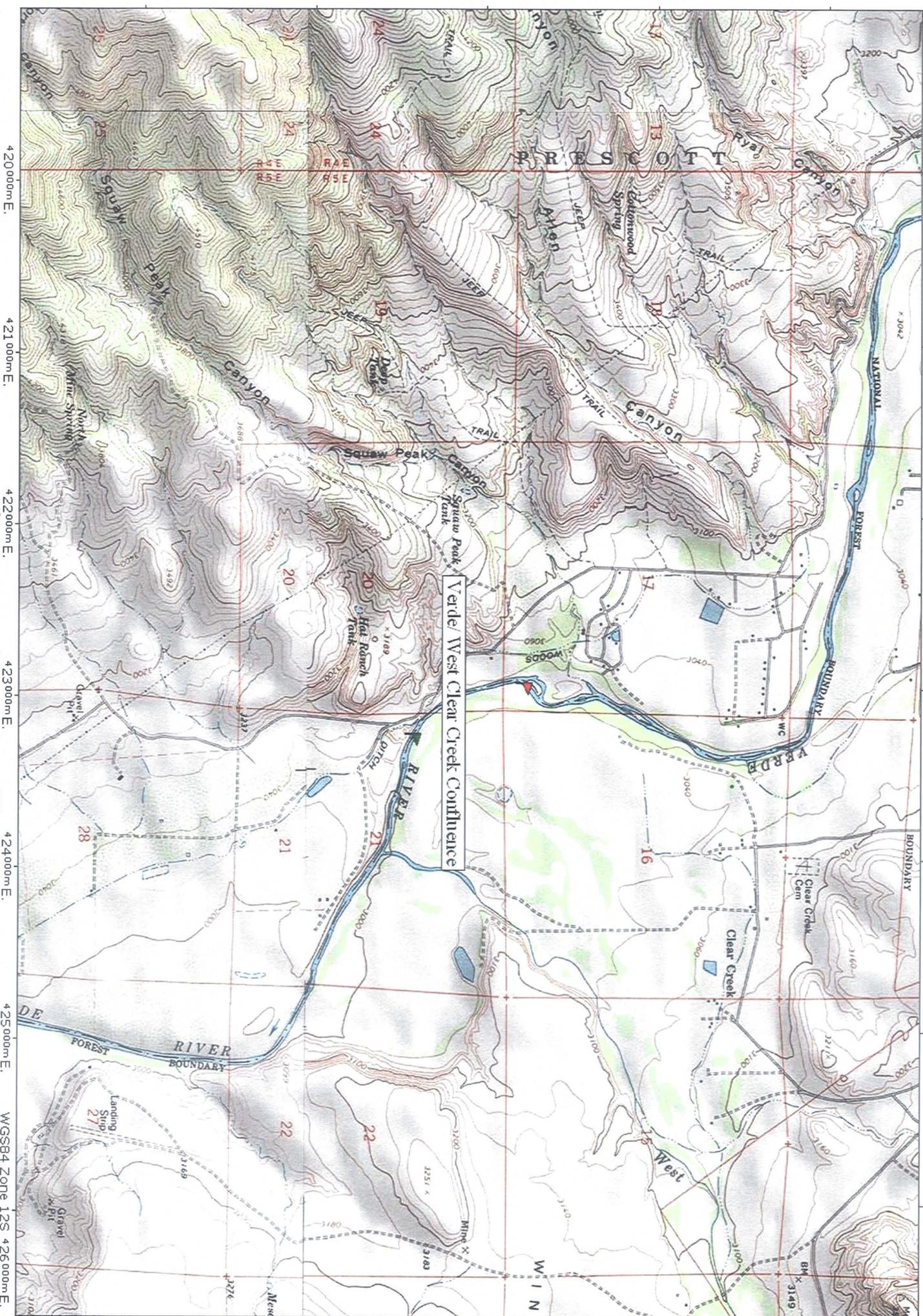


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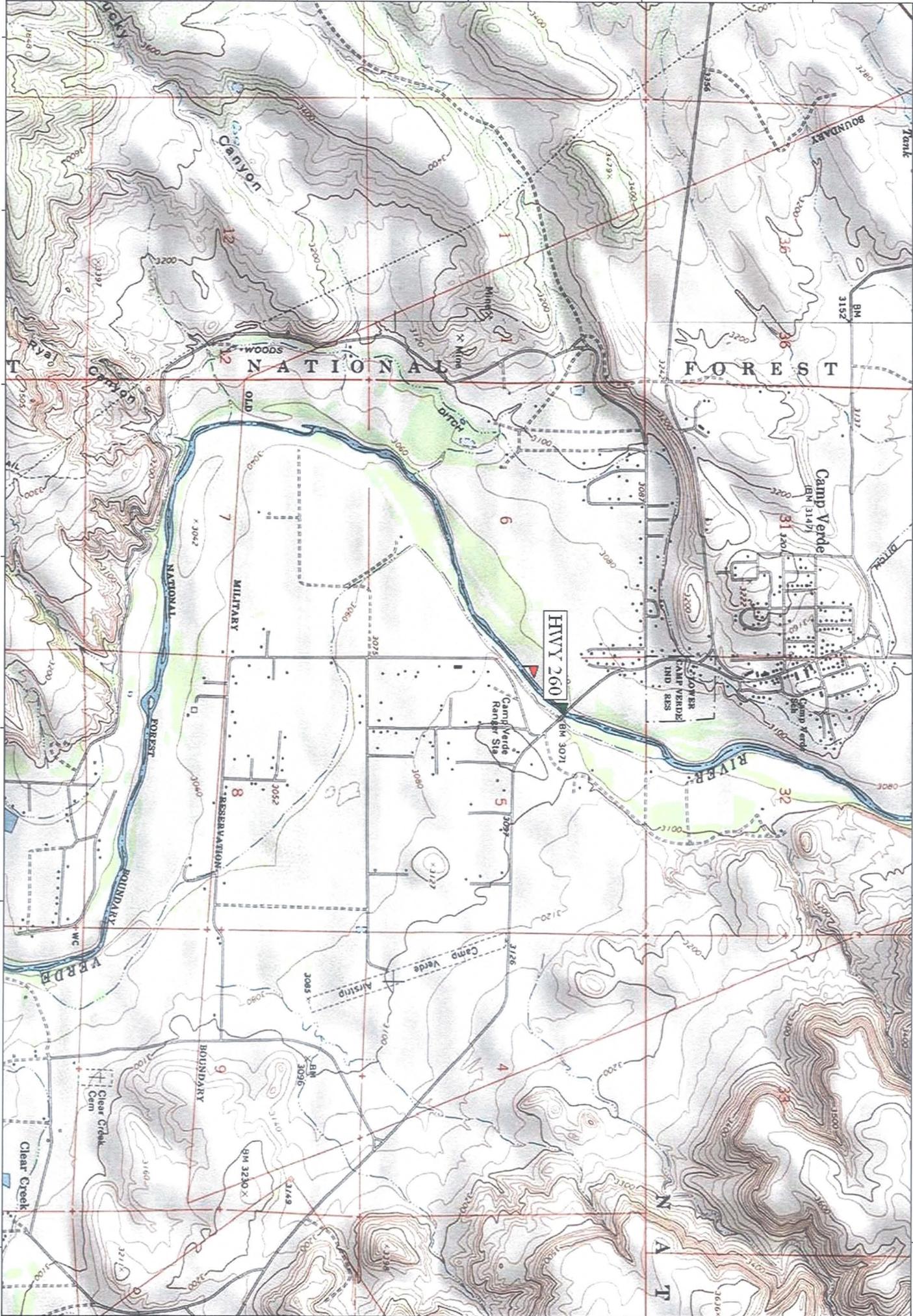
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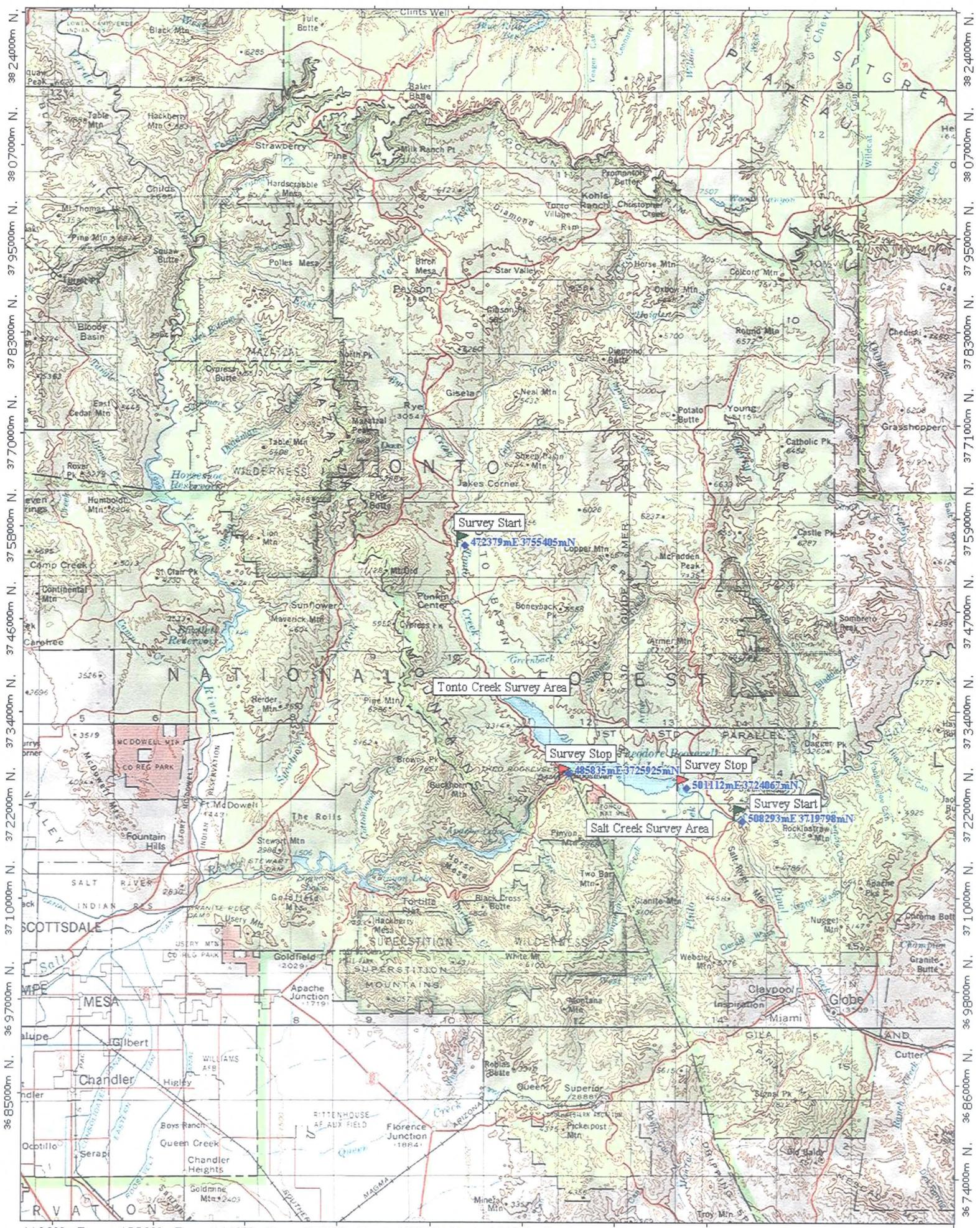
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36 74000m N, 36 86000m N, 36 98000m N, 37 10000m N, 37 22000m N, 37 34000m N, 37 46000m N, 37 58000m N, 37 70000m N, 37 83000m N, 37 95000m N, 38 07000m N, 38 24000m N

-Project Schematic (Not Applicable)

6. Scope of Work

Tasks and Methods

Task #1: Permits, Authorizations, Clearances and Agreements

The Grantee shall obtain all permits, authorizations, clearances and agreements necessary to conduct the work described in this Scope of Work, including but not limited to cultural resource clearance (SHPO).

Deliverable Description: Copy of SHPO clearance.

Deliverable Due Date: Prior to any ground disturbing activities

AWPF Reimbursable Cost: \$0

Task #2 and #3: Prepare and Submit Plans, Identify Survey Areas

The Grantee shall prepare and submit appropriate plans or designs (e.g. sampling, and monitoring plans, and study or research designs) consistent with appropriate outlines in project overview.

Deliverable Description

1. In coordination with the Tamarisk Coalition and resource managers develop a sampling schedule for beetle and ground surveys
2. Prepare plans by using standard sampling methods for beetle surveys at each site (see appendix).
3. Identify all survey areas using aerial photos, and ground verification of all sites.

Deliverable Due Date: April 15, 2011 and 2012

AWPF Reimbursable Cost: \$17,443.99

Task #4: (Field Inventory-Beetle Surveys and Vegetation Measurements)

Deliverable Description:

1. The beetle sampling methods will follow those used by USDA, USDI, Colorado Department of Agriculture, and the Tamarisk Coalition, which are all part of a regional effort to monitor the spread of the tamarisk leaf beetle. At each sampling location, personnel will record the UTM using NAD 83 datum, and will document vegetation and other ancillary site information. Beetle sampling will involve using standard 38 cm aerial sweep nets. We will complete 1 m sweeps within each sampling location. At each sampling location, personnel will complete five sweep sets. For each sweep set, personnel will complete five sweeps within the tamarisk foliage, and will then empty and record the contents of the net using defined

parameters. This process will be repeated five times, roughly 5 m away from each previous sweep set per sampling location. For sites along each drainage, sampling locations will be at least .5 km apart. A minimum of three sampling visits will occur per year per area in order to capture the beetle's full life cycle.

2. In coordination with the resource managers associated with each river, develop a sampling schedule for deploying thermistors, conducting understory plant surveys in and estimating current tamarisk cover along drainages. Sampling for vegetation should take place in late spring to estimate overstory cover. Defoliation estimates will be determined in the fall when thermistors are collected. One year of thermistor data currently exists from the Colorado River.
3. Plant cover surveys will consist of a minimum of 10 25-m² quadrats with subsections of the plot sampled with 1m² plot to sample herbaceous cover along each river. Cover classes that incorporate a range of cover values will be used (1 (0-5% cover); 2 (6-25% cover); 3 (26-50% cover); 4 (51-75% cover); 5 (76-95% cover); 6 (96-100% cover)).
4. Percent overstory and understory cover will be determined from the plots as well as species diversity and identification of nonnative species. Overstory cover associated with tamarisk defoliation where the beetle currently exists (e.g., Glen Canyon) will be determined in a similar manner.

Deliverable Due Date: 15 May – 1 September 2011 and 2012

AWPF Reimbursable Cost: \$79,832.24

Task #5: Attend AWPF Information Transfer Meeting

The Grantee may attend an AWPF Information Transfer Meeting and participate in either an oral presentation or a poster presentation about this project. The value of this Task is \$367 fixed cost to compensate the Grantee for its expertise and participation in the meeting.

Deliverable description: Photograph of poster to be used at the AWPF Information Transfer Meeting with an abstract, or a copy of paper to be presented.

Deliverable due date: To be determined

AWPF Fixed Cost: \$734.00

Task #6: Translate Field Data

1. Enter results into spreadsheet and GIS coverage for resource managers (see spreadsheet example).
2. Indicator species analysis (McCune et al. 2002) will be done to identify dominant understory plants using the software package PC-ORD.
3. Use nearest neighbor analysis to determine if there are dispersal patterns associated with largest areas of adult and larval occurrences and adjacent beetle establishment sites.

4. Using 2011 and 2012 microclimate data (temperature, relative humidity and cover) estimate defoliation rates to estimate how defoliation might change microhabitat variables (temperature and light availabilities) and identify which understory plant species may benefit following defoliation based on previous plant surveys.

Deliverable Due Date: 2 September – 30 October 2011 and 2012

AWPF Reimbursable Cost: \$6,660.00

Task #7: Complete Annual and Final Reports

The Grantee shall prepare and submit a comprehensive annual report after 2011 field data collection and a final report summarizing 2011 and 2012 results. The reports will be consistent with the Final Report Guidelines in AWPF Policies and Application Guidelines Manual, including a summary of all methodologies used, outcome of all tasks, analysis of all project and monitoring data, suggestions for any further changes needed in the project, and an evaluation of the projects success measured against the objectives.

Deliverable description: Final project report will summarize all methodologies used, outcome of all tasks, summarize and analyze project data & monitoring data, suggest any further changes needed in the project and evaluate project success measured against the objective.

Deliverable due date: Annual Report -March 31, 2012; Final Report 31 March 2013

AWPF Fixed Cost: \$30,511.32

Year 1 Inventory of tamarisk beetle and effects on riparian in the Colorado, Verde, Salt and Tonto Rivers						
Task 1 (Permits)	Rate per hr.	Weekly rate	Time	Total amount requested		
				0.00		
Task 2 (Prepare plans)						
Biologist PI	29.55	1,182.00	1/2 time 2 weeks	\$1,182.00		
ERE (NAU-43%)				\$508.26		
				\$1,690.26		
Subcontractor:						
Plant Biologist Barbara Ralston	39.56	1,582.40	1 week	\$1,582.40	USGS Matching Funds	
ERE (USGS-35%)				\$553.84	2011 Labor	\$1,608.40
				\$2,136.24	2011 Benefits	\$482.52
						\$2,090.92
Task 3 (ID Survey Areas)						
Biologist PI	29.55	1,182.00	2 weeks	\$1,182.00		
ERE (NAU-43%)				\$508.26		
				\$1,690.26		
GIS Consultant TBD	30.00	1,200.00	1/2 time 3 weeks	\$1,800.00		
				\$1,800.00		
Travel						
1 vehicle @ \$280 per wk		280.00	2 weeks	560.00		
Mileage (700 mi @ \$0.35 mi)		.35 per mile		245.00		
				805.00		
Task 4 (Field Work-Beetle Surveys and Vegation Measurements)						
Field Technician Supervisor	14.00	560.00	18 weeks	\$10,080.00		
ERE (NAU-8.22%) TBD				\$828.58		
				\$10,908.58		
Camping Per diem	20 per day	100.00	16 weeks	1,600.00		
Field Technician TBD	12.50	500.00	16 weeks	\$8,000.00		
ERE (NAU-8.22%)				657.60		
				8,657.60		
Camping Per diem	20 per day	100.00	16 weeks	1,600.00		
Biologist PI	29.55	1,182.00	1/2 time 8 week	\$4,728.00		
ERE (NAU-43%)				\$2,033.04		
				6,761.04		
Camping Per diem	20 per day	100.00	8 weeks	400.00		
				\$400.00		

Year 1 continued							
Travel							
1 vehicle @ \$280 per wk		280.00	16 weeks		\$4,480.00		
Mileage (5500 mi)	.35 per mile				\$1,925.00		
					6,405.00		
Travel							
1 vehicle @ \$280 per wk		280.00	8 weeks		\$2,240.00		
Mileage (2500 mi)	.35 per mile				\$875.00		
					3,115.00		
Equipment (supplies)						USGS Matching Funds	
Sweep Nets	09.45 per nest		4 nets		\$437.80		
GPS	250 per GPS		2 GPS		\$500.00	2 New GPS Units	500.00
					\$937.80		
Task 5 (Attend ITM)							
1 vehicle @ \$56 per day		280.00	2 days		\$112.00		
Mileage (500 mi)	.35 per mile				175.00		
Urban Per Diem	40 per diem				80.00		
					367.00		
Task 6 (Translate Field Data)							
GIS Consultant TBD		30.00	1/2 time 6 weeks		\$3,600.00		
					3,600.00		
Task 7 (Complete Annual Report)							
Biologist PI		29.55	1,182.00	1/2 time 8 weeks	\$4,728.00		
ERE (NAU-43%)					\$2,033.04		
					6,761.04		
Subcontractor:							
Plant Biologist (Barbara Ralston)		39.56	1,582.40	1 week	\$1,582.40	2011 Labor	\$1,608.40
ERE (USGS-35%)					\$553.84	2011 Benefits	\$482.52
					\$2,136.24		\$2,090.92
GIS Consultant TBD		30.00	1,200.00	6 weeks	\$4,800.00		
					4,800.00		
Sub-total Costs							
5% overhead (NAU Indirect Costs)					\$66,171	USGS Matching Funds	4,681.84
					\$3,308.55	2011 USGS Salary/Equipmt.	\$234.09
						2011 Indirect Costs 5%	
Total Costs					69,479.61	2011 Total Matching	4,915.93

Year 2 Inventory of tamarisk beetle and monitoring effects on riparian bird habitat in the Colorado, Verde, Salt and Tonto Rivers

	Rate per hr.	Weekly rate	Time	Total amount requested
Task 1 (permits)				0.00
Year 2 Inventory of tamarisk beetle and monitoring effects on riparian bird habitat in the Colorado, Verde, Salt and Tonto Rivers				
Task 2 (Prepare plans)				
Biologist PI	29.55	1,182.00	1/2 time 1 week	\$591.00
ERE (NAU-43%)				\$254.13
				\$845.13
Subcontractor:				
Plant Biologist Barbara Ralston	39.56	1,582.40	2 week	\$3,216.80
ERE (USGS-35%)				\$965.04
				\$4,181.84
Task 3 (ID Survey Areas)				
Biologist PI	29.55	1,182.00	2 weeks	\$1,182.00
ERE (NAU-43%)				\$508.26
				\$1,690.26
GIS Consultant TBD	30.00	1,200.00	1/2 time 3 weeks	\$1,800.00
				\$1,800.00
Travel				
1 vehicle @ \$280 per wk		280.00	2 weeks	560.00
Mileage (700 mi @ \$0.35 mi)	.35 per mile			245.00
				805.00
Task 4 (Field Work-Beetle Surveys and Vegetation Measurements and Monitoring Sites)				
Field Technician Supervisor TBD	14.00	560.00	18 weeks	\$10,080.00
ERE (NAU-8.22%)				\$828.58
				\$10,908.58
Camping Per diem				
	20 per day	100.00	16 weeks	1,600.00
Field Technician TBD				
	12.50	500.00	16 weeks	\$8,000.00
ERE (NAU-8.22%)				657.60
				8,657.60
Camping Per diem				
	20 per day	100.00	16 weeks	\$1,600.00

Year 2 continued						
Biologist PI	29.55	1,182.00	1/2 time 8 week	\$4,728.00		
ERE (NAU-43%)				\$2,033.04		
				6,761.04		
Camping Per diem	20 per day	100.00	8 weeks	\$400.00		
Travel						
1 vehicle @ \$280 per wk		280.00	16 weeks	\$4,480.00		
Mileage (5500 mi)	.35 per mile			\$1,925.00		
				6,405.00		
Travel						
1 vehicle @ \$280 per wk		280.00	8 weeks	\$2,240.00		
Mileage (2500 mi)	.35 per mile			\$875.00		
				3,115.00		
Task 5 (Attend ITM)						
1 vehicle @ \$56 per day			2 days	\$112.00		
Mileage (500 mi)	.35 per mile			175.00		
Urban Per Diem	40 per day		2 days	80.00		
				367.00		
Task 6 (Translate Field Data)						
GIS Consultant TBD	30.00	1,200.00	1/2 time 5 weeks	\$3,000.00		
				3,000.00		
Task 7 (Complete Annual Report)						
Biologist PI	29.55	1,182.00	6 weeks	\$7,092.00		
ERE (NAU-43%)				\$3,049.56		
				10,141.56		
Subcontractor:						
Plant Biologist Barbara Ralston	39.56	1,782.00	3 weeks	\$3,164.80		
ERE (USGS-35%)				\$1,107.68		
				\$4,272.48		
GIS Consultant TBD	30.00	1,200.00	5 weeks	\$2,400.00		
				2,400.00		
Sub-total Costs				\$68,950		
5% overhead				\$3,447.52		
Total Costs				72,398.01		

-Key Personnel

MATTHEW J. JOHNSON

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EDUCATION

Master's of Science – Biology. May 1997. Northern Arizona University, Flagstaff, AZ.

Bachelor of Science – Zoology. 1990-1992. Weber State University, Ogden, UT.

Bachelor of Arts – Education. 1983. Western State College, Gunnison, CO.

RESEARCH EXPERIENCE

Ecologist – USGS/SBSC Ecologist – USGS/SBSC, Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2005 – current. . Project Coordinator overseeing the planning, coordination and implementation of research to determine distribution, abundance Tamarisk Leaf Beetle along the Colorado River in Grand Canyon NP. Supervised 2 project related staff each year. Prepared agency reports, technical reports and scientific presentations. Submitted research proposals and oversaw contracts and budgets. Represented USGS/SBSC/CPRS in meetings, seminars and symposia.

Ecologist – USGS/SBSC, Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2005 – current. Project Coordinator overseeing the planning, coordination and implementation of research to determine distribution, abundance and habitat use of Western Yellow-billed Cuckoos along the Lower Colorado River under the Multi-Species Conservation Program in Arizona, California and Nevada. Supervised 10 project related staff each year. Prepared agency reports, technical reports and scientific presentations. Submitted research proposals and oversaw contracts and budgets. Represented USGS/SBSC/CPRS in meetings, seminars and symposia.

Ecologist – Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2004 – current. Co-principle Investigator overseeing the planning, coordination and implementation of the avian inventory and monitoring of 11 National Parks throughout the northern and southern Colorado Plateau. Responsibilities include; initiation of study design to implement systematic surveys determining the inventory of all land bird species (including raptors and owls) and currently involved in developing protocols to implement a long term monitoring program. Co-supervised four project related staff each year. Prepared scientific journal articles, agency reports, technical reports and scientific presentations. Submitted research proposals and oversaw contracts and budgets. Represented CPRS/NAU in meetings, seminars and symposia.

Ecologist – USGS/SBSC, Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2004 – current. Project Coordinator overseeing planning, coordination and conducting research

to determine distribution, abundance and habitat use of Common Black-hawks within the Fossil Creek watershed. Supervised two project related staff each year. Prepared agency reports, technical reports and scientific presentations. Submitted research proposals and oversaw contracts and budgets. Represented USGS/SBSC/CPRS in meetings, seminars and symposia.

Research Biologist (Senior) – Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2002 – 2004. Principle Investigator overseeing the planning, coordination and implementation of research to determine distribution, abundance and habitat use of Western Yellow-billed Cuckoos throughout Utah and Arizona. Supervised 4-10 project related staff each year. Prepared scientific journal articles, agency reports, technical reports and scientific presentations. Submitted research proposals and oversaw contracts and budgets. Represented CPRS/NAU in meetings, seminars and symposia.

Research Biologist (Senior) – Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2004 – 2007. Principle Investigator overseeing the planning, coordination and implementation of Mexican Spotted Owl population demographic study at Mesa Verde National Park. Duties included study design and implementation of Protected Activity Centers (PAC). Supervised two project related staff each year. Prepared agency reports, technical reports and scientific presentations. Submitted research proposals and oversaw contracts and budgets. Represented CPRS/NAU in meetings, seminars and symposia.

Research Biologist (Senior) – Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2000 – 2004. Principle Investigator overseeing the planning, coordinating and initiation of a stable isotope study to investigate linking breeding and wintering grounds of Willow Flycatchers. Collected and analyzed feather samples throughout the United States, Mexico and Central America. Responsibilities included analyzing data, writing scientific journal articles, technical reports and preparing scientific presentations. Submitted research proposals and oversaw contracts and budgets.

Wildlife Biologist - Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 2000 - 2001 – Oversaw the implementation of a Golden Eagle monitoring program. Responsibilities included coordinating the collection of all historical Golden Eagle breeding and non-breeding data on all public and private lands in Arizona, New Mexico, Colorado, Utah and Nevada.

Wildlife Biologist – Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 1997 – 2001. Principle Investigator overseeing the planning, coordination and implementation of Southwestern Willow Flycatcher and Yellow-billed Cuckoo distribution, abundance and habitat use in Grand Canyon National Park, Canyonlands National Park and along San Juan River, UT). Duties included analyzing data, writing agency reports, technical reports and preparing scientific presentations. Submitted research proposals and oversaw contracts and budgets.

Master's Thesis Research – Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 9/1994 – 5/1997. Conducted research on the effects Brown-headed Cowbird brood parasitism on Black-throated Sparrow productivity in Northern Arizona. Responsibilities included study design, data analysis, writing scientific journal articles, agency reports, and prepared presentations at agency meetings and scientific conferences.

PUBLICATIONS

Etzel, K.E, T.C. Theimer, **M.J. Johnson**, J.A. Holmes. In review at Condor. Prey Delivery at Common-Black Hawk (*Buteogallus Anthracinus*) nests and the importance of Exotic Crayfish.

Johnson, M.J., R. T. Magill, and C. van Riper, III. In press. Yellow-billed Cuckoo Distribution and Habitat Associations in Arizona, 1998-1999: Conservation and Management Implications. Proceedings of the Ninth Biennial Conference on Research in Colorado Plateau, 25-28 October 2007.

Van Riper, III, C., M.K. Sogge, **M.J. Johnson**. In press. A historical assessment of changes in avian community composition from the Camp Verde Region of Arizona, with a focus on Montezuma Castle and Montezuma Well National Monuments. Proceedings of the Ninth Biennial Conference on Research in Colorado Plateau, 25-28 October 2007.

Kelly, J. F Kelly, **M.J Johnson**, S. Langridge, and M. Whitfield. 2008. Efficacy of stable isotope ratios in assigning endangered migrants to breeding and wintering sites. *Ecological Applications*. 18(3):568-576.

Holmes, J.A. and **M.J. Johnson**. 2005. Sage Sparrow (*Amphispiza belli*): a technical conservation assessment. USDA. Forest Service. Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/sagesparrow.pdf>.

Holmes, J.A. and **M.J. Johnson**. 2005. Brewer's Sparrow (*Spizella breweri*): a technical conservation assessment. USDA. Forest Service. Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/brewerssparrow.pdf>.

Johnson, M.J., and C. van Riper, III. 2004. Cowbird brood parasitism of the Black-throated Sparrow in the Verde Valley of central Arizona. *Journal of Field Ornithology*. 75(3):303-311.

Johnson, M. J., C. Van Riper, III, and K. M. Pearson. 2002. Black-throated Sparrow (*Amphispiza bilineata*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; <http://bna.birds.cornell.edu/bna/species/637doi:bna.637>.

Sogge, M.K. and **Johnson, M.J.** 1998. A checklist of birds of Montezuma Castle and Well National Monuments and Vicinity. Southwest Parks and Monument Association, Tucson, AZ.

Johnson, M.J. 1997. Cowbird brood parasitism of the Black-throated Sparrow in the Verde Valley of central Arizona. Master's thesis, Flagstaff, Arizona, Northern Arizona University.

Johnson, M.J., and M.K. Sogge. 1995. Cowbird concentrations at livestock corrals in Grand Canyon National Park. Pages 275-284 in C. van Riper III, Editor. Proceedings of the Second Biennial Conference on Research in Colorado Plateau National Parks, 25-28 October 1993. National Park Service Transactions and Proceedings Series NPS/NRNU//NRTP-95/11.

Johnson, M.J., and M.K. Sogge. 1995. A checklist of birds of Tuzigoot National Monument and Vicinity. Southwest Parks and Monument Association, Tucson, AZ.

Johnson, M.J., L.E. Ellison and M.K. Sogge. 1993. Southwestern Willow Flycatcher declines in Grand Canyon National Park. *Park Science* 13:12-13.

TECHNICAL REPORTS, OPEN FILE REPORTS, FACT SHEETS (2004-2010)

Johnson, M.J. 2010. Understanding the Habitat Needs of the Declining Western Yellow-billed Cuckoo. USGS Fact Sheet 2009-3091.

Johnson, M.J., Etzel, K.E, J.A. Holmes. 2009. Potential Impact of an Exotic Species on Nesting Common Black-Hawks (*Buteogallus anthracinus*). Annual Report to Arizona Game and Fish.

Johnson, M.J. and K Etzel. 2009. Determining the Presence of Mexican Spotted Owls at Navy Observatory and Dry Lake PAC. Annual Report to Department of Defense, Flagstaff Navy Observatory. 16 pp.

Johnson, M.J., and K. Etzel. 2009 Yellow-billed Cuckoo and Common Black-hawk distribution, habitat use and monitoring in Fossil Creek, AZ. 22pp.

Johnson, M.J., P. Whitefield and J. Cannella. 2009. Mexican Spotted Owl monitoring at Walnut Canyon National Monument 2009 Annual Report. 32pp.

Johnson, M.J. and K Etzel. 2008. Determining the Presence of Mexican Spotted Owls at Navy Observatory and Dry Lake PAC. Bi-annual Report to Department of Defense, Flagstaff Navy Observatory. 17 pp.

Johnson, M.J., and K. Etzel. 2008 Yellow-billed Cuckoo and Common Black-hawk distribution, habitat use and monitoring in Fossil Creek, AZ. 22pp.

Johnson, M.J., P. Whitefield and J. Cannella. 2008. Mexican Spotted Owl monitoring at Walnut Canyon National Monument 2008 final Report. 42pp.

Johnson, M.J., S.L Durst, C.M. Calvo, L. Stewart, M.K. Sogge, G. Bland, and T. Arundel. 2008. Yellow-billed Cuckoo distribution, abundance, and habitat use along the lower Colorado River and its tributaries, 2007 Annual Report: U.S. Geological Survey Open-File Report 2008-1177, 268 pp.

Johnson, M.J., J.A. Holmes, and M. Stuart. 2008. Final Report: Southern Colorado Plateau Avian Inventory. Southwest Biological Science Center/Colorado Plateau Research Station/Northern Arizona University. 85 pp.

Holmes, J.A., **M.J. Johnson** and C. Calvo. 2008. Yellow Billed Cuckoo distribution, habitat use and breeding ecology in the Verde Watershed of Arizona, 2003-2004. Final Report, Arizona Game and Fish Heritage Program, Phoenix, Arizona, 174 pp.

Johnson, M. J.; J.A. Holmes, C.M. Calvo, I. Samuels, S. Krantz, M.K. Sogge. 2007. Yellow-Billed Cuckoo Distribution, Abundance, and Habitat Use Along the Lower Colorado and Tributaries, 2006 Annual Report Open File Report 2007-1097, 210 pp. <http://pubs.er.usgs.gov/usgspubs/ofr/ofr20071097>.

Johnson, M.J., J.A., Holmes, R. Weber. 2006. Yellow-billed Cuckoo distribution and abundance, habitat use, and breeding ecology in select habitats of the lower Colorado River. 2005. Final Report to Bureau of Land Management, US Bureau of Reclamation and USGS/SBSC, Colorado Plateau Research Station/Northern Arizona University report. 104 pp.

Johnson, M.J., J.A., Holmes, R. Weber. 2006. Yellow-billed Cuckoo distribution and abundance, habitat use, and breeding ecology in select habitats of the Roosevelt Habitat Conservation Plan, 2003-2006. Final Report to Salt River Project and USGS/SBSC, Colorado Plateau Research Station/Northern Arizona University report. 42 pp.

Halterman, M., **M.J. Johnson**, and J.A. Holmes. 2006. Yellow-billed Cuckoo Survey Methodology and Natural History. Submitted to U.S. Fish and Wildlife Service.

Johnson, M.J. 2005. Determining Protective Activity Centers (PAC) for Mexican Spotted Owls at Mesa Verde National Park. Annual Report to Mesa Verde National Park, Colorado Plateau Research Station/Northern Arizona University report. 17 pp.

Johnson, M.J. and R. Weber. 2005. Determining the Presence of Mexican Spotted Owls at Navy Observatory and Dry Lake PAC. Bi-annual Report to Department of Defense, Flagstaff Navy Observatory. 17 pp.

Johnson, M.J., J. A., Holmes, R. Weber. 2005. Yellow-billed Cuckoo distribution and abundance, habitat use, and breeding ecology in select habitats of the Roosevelt Habitat Conservation Plan, 2004. Final Annual Report to Salt River Project and USGS/SBSC, Colorado Plateau Research Station/Northern Arizona University report. 20 pp.

FUNDED PROPOSALS AND PROJECTS

Development of a GIS-Based Model of Yellow-billed cuckoo breeding habitat within the Lower Colorado River Multi-Species Conservation area, San Pedro River and Verde River, AZ. (\$157,634) 2008-2010. Bureau of Reclamation funded.

Implementation of the avian monitoring within selected National Parks of the southern Colorado Plateau Network. (\$113,869) 2006-07. National Park Service funded.

Distribution of Yellow-billed Cuckoos along the Lower Colorado River. (\$714,000) 2006-07. US Bureau of Reclamation funded.

Distribution of Yellow-billed Cuckoos along the Lower Colorado River. (\$84,000) 2005. Arizona Game and Fish Heritage Grant and US Bureau of Reclamation funded.

Distribution of Common Black-Hawks and Yellow-billed Cuckoos in Fossil Creek, AZ. (\$35,455) 2004-present. APS funded.

Conceptual Models and Monitoring Protocols to Support Long-Term Monitoring of Bird Communities in National Park Service Units of the Southern Colorado Plateau Network. (\$39,050) 2004. National Park Service funded.

Distribution of Yellow-billed Cuckoos in the Verde Valley Watershed. (\$88,000) 2004-2005. Arizona Game and Fish Heritage Grant.

Determining Mexican Spotted Owl Protective activity Centers (PAC) at Mesa Verde National Park. (41,000) National Park Service funded.

Winter range investigation of the Willow Flycatcher (*Empidonax traillii*) in central and southern Mexico (\$13,280) 2001-2002 (1 yr.) United States Fish and Wildlife Service funded.

Avian Inventor and Monitoring throughout the southern and northern Colorado Plateau (\$120,000) (3 yr) National Park Service funded.

Winter range investigation of the Willow Flycatcher (*Empidonax traillii*) in Central America (Panama, El Salvador, and Costa Rica) (\$4000) 2000 (2 mo.) United States Forest Service funded.

Avian Inventory and Monitoring along the Colorado and Green Rivers in Canyonlands National Park, Utah (38,000) 2000-2001 (2 yr.) National Park Service funded.

Grassland Bird surveys at Wupatki National Monument, Arizona (5,000) 1999 (1 yr.) National Park Service funded.

Southwestern Willow Flycatcher and Western Yellow-bill Cuckoo surveys along the Green and Colorado Rivers, Utah. (53,000) 1999-2000 (2 yr.) Utah Department of Wildlife Resources and Bureau of Reclamation funded.

Southwestern Willow Flycatcher and Western Yellow-bill Cuckoo surveys along the Green and Colorado Rivers in Canyonlands National Park, Utah. (40,000) 1999 (2 yr.) Canyonlands Natural History Association funded.

Barbara E. Ralston, Ph.D.
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Education

Ph.D.	Northern Arizona University, Flagstaff, Arizona	1993	Botany
M.S.	Sul Ross State University, Alpine, Texas	1987	Biology
B.S.	Kansas State University, Manhattan, Kansas	1984	Physical Science

Current Position:

December 2005 – present: Biological Scientist GS12/7– Grand Canyon Monitoring and Research Center. Serves as lead terrestrial biologist for monitoring and research for the Grand Canyon Monitoring and Research Center as part of the Glen Canyon Adaptive Management Program.

- Participate in the development of integrated projects that answer management questions about the effects of river regulation on natural resources
- Plan, develop, recommend, and implement monitoring programs for riparian vegetation and associated wildlife along the Colorado River below Glen Canyon Dam
- Coordinates research and monitoring efforts with other Department of Interior Agencies (NPS, Bureau of Reclamation, BIA)
- Collect and analyzes riparian vegetation data for long-term monitoring of riparian vegetation along the Colorado River corridor including applying information to production of vegetation map for the purposes of change detection.

Relevant Publications:

Kennedy, T.A., and *Ralston, B.E.*, 2010. Regulation leads to increases in riparian vegetation, but not direct allochthonous inputs, along the Colorado River in Grand Canyon, Arizona, River Research and Applications. DOI:10.1002/rra.1431.

Ralston, B. E., 2010, Riparian vegetation response to the March 2008 short-duration, high-flow experiment—implications of timing and frequency of flood disturbance on nonnative plant establishment along the Colorado River below Glen Canyon Dam: U.S. Geological Survey Open-File Report 2010–1022, 30 p.

Ralston, B.E., Davis, P.A., Weber, R.M., and Rundall, J.M., 2008. A vegetation database for the Colorado River ecosystem from Glen Canyon Dam to the Western Boundary of Grand Canyon National Park, Arizona. U.S. Geological Survey Open-file Report 2008-1216, 37 p.

Publications In Preparation:

Ralston, B.E., Summary report of response of key resources to the 2000 low steady summer flow experiment: U.S. Geological Survey Open-File Report *in review*.

Waring, G., *Ralston, B.E.*, Stevens, L.E. and Archer, S.A. The natural history and status of mesquite (*Prosopis glandulosa*) in Grand Canyon. Field and lab data conducted in 2009/2010.

Cobb, N., and *Ralston, B.E.*, Results of pilot project to monitoring arthropods in Glen Canyon National Recreation Area. Field data collected in 2009/2010.

Current Projects:

Update of map of riparian vegetation below Glen Canyon Dam to Lake Mead; Monitoring Tamarisk Leaf Beetle (*Diorhabda carinulata*) and Vegetation / Avian Response in Grand Canyon National Park; Evaluating effect of vegetation on sandbar restoration efforts along the Colorado River in Grand Canyon.

Current Collaborators:

David Copper, Colorado State University – riparian vegetation monitoring design;

Neil Cobb, Northern Arizona University – arthropod sampling/monitoring;

Matthew Johnson, Northern Arizona University, Lori Makarick, National Park Service-tamarisk beetle surveys in Grand Canyon.

Matthew Kaplinski, Joseph Hazel Northern Arizona University – vegetation expansion and sediment conservation/sandbar building along the Colorado River;

Phil Davis, USGS, minerals-riparian vegetation classification along the Colorado River in Grand Canyon

Literature Cited/Background Literature

- Beauchamp V., Stromberg J., Stutz J. 2005. Interaction between *Tamarix ramosissima* (saltcedar) *Populus fremontii* (cottonwood) and mycorrhizal fungi: Effects on seedling growth and plant species coexistence. *Plant Soil* 275:221–231.
- Beauchamp, V. and J. Stromberg. 2007. Flow regulation of the Verde River, Arizona encourages *Tamarix* recruitment but has minimal effect on *Populus* and *Salix* stand density. *Wetlands* 27:381-389.
- Birkin, A. S. and Cooper, D. J. 2006. Processes of *Tamarix* invasion and floodplain development along the Lower Green River, Utah. *Ecological Applications* 16:1103-1120.
- Busch, D. 1995. Effects of fire on southwestern riparian plant community structure. *Southwest Nat* 40:259–267.
- Busch, D., Smith, S. 1995. Mechanisms associated with the decline of woody species in riparian ecosystems of the southwestern US. *Ecological Monographs* 65:347–370.
- DeLoach, C. J., Carruthers, R. I., Lovich, J. E., Dudley, T. L., & Smith, S. D. 2000. Ecological interactions in the biological control of saltcedar (*Tamarix* spp.) in the United States: toward a new understanding. In N. R. Spencer (Ed.), *Proceedings of the X International Symposium on Biological Control of Weeds*. Bozeman, MT: Montana State University. pp. 819–873
- Dennison, P. E., P. L. Nagler, K. R. Hultine, E. P. Glenn, and J. R. Ehleringer. 2009. Remote monitoring of tamarisk defoliation and evapotranspiration following saltcedar leaf beetle attack. *Remote Sensing of Environment* 113:1462-1472.
- DiTomaso, J.M. 1998. Impact, biology, and ecology of saltcedar (*Tamarix* spp.) in the southwestern United States. *Weed Technology* 12: 326–336.
- Dudley, T. L., DeLoach, C. J., Lewis, P. A., & Carruthers, R. I. 2001. Cage tests and field studies indicate leaf-eating beetle may control saltcedar. *Ecological Restoration*, 19:260–261.
- Fleishman, E., McDonal, N., Nally, R.M., Murphy, D.D., Walters, J., and Floyd, T., 2003, Effects of floristics, physiognomy and non-native vegetation on riparian bird communities in a Mojave Desert watershed: *Journal of Animal Ecology*, v. 72:484-490.
- Friedman, J., Auble, G., Shafroth, P., Scott, M. Merigliano, M., Freehling, M., Griffin, E. 2005. Dominance of non-native riparian trees in western USA. *Biological Invasions* 7:747–751
- Hultine, K. R., Belnap, J., van Riper, C. Ehleringer, J. R., Dennison, P. E., Lee, M. E., Nagler, P. L., Snyder, K. A., Uselman, S. M., and West, J. B. 2009. Tamarisk biocontrol in the western United States: ecological and societal implications. *Frontiers in Ecology and the Environment* 0
- Johnson, T., Kolb, T., and Medina, A.. 2010. Do riparian plant community characteristics differ between *Tamarix* (L.) invaded and non-invaded sites on the upper Verde River, Arizona? *Biological Invasions* 12:2487-2497.
- McCune, B., Grace, J. B. and Urban, D. L. 2002. *Analysis of ecological communities*. MjM Software, Gleneden Beach, Oreg.
- Moseman, S.M., Zhang, R., Quian, P.Y., and Levin, L.A. 2008. Diversity and functional responses of nitrogen-fixing microbes to three wetland invasions. *Biological Invasions*. 11: 225-239.
- Ralston, B. E., Davis, P. A., Weber, R. M. and Rundall, J. M. 2008. A vegetation database for the Colorado River ecosystem from Glen Canyon Dam to the western boundary of Grand

- Canyon National Park, Arizona. U.S. Geological Survey Open-File Report 2008-1216, 37 p.
- Stromberg, J. C. 1997. Growth and survivorship of Fremont cottonwood, Goodding willow, and salt cedar seedlings after large floods in central Arizona. *Great Basin Naturalist* 57:10.
- Stromberg, J. C. 1998. Dynamics of Fremont cottonwood (*Populus fremontii*) and saltcedar (*Tamarix chinensis*) populations along the San Pedro River, Arizona. *Journal of Arid Environments*, 40: 133–155.
- Stromberg, J. 1998. Dynamics of Fremont cottonwood (*Populus fremontii*) and salt cedar (*Tamarix chinensis*) populations along the San Pedro River, Arizona. *Journal of Arid Environments* 40:133-155.
- Stromberg, J. C., Lite, S. J., Marler, R., Paradzick, C., Shafroth, P. B., Shorrocks, D., White, J. M., and White, M. S. 2007. Altered stream-flow regimes and invasive plant species: the *Tamarix* case. *Global Ecology and Biogeography* 16:381-393.

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: Research
2. Project Title: Inventory of tamarisk beetle and monitoring effects on riparian bird habitat in the Colorado, Verde, Salt and Tonto Rivers
3. Applicant Name and Address: Northern Arizona University, Matthew Johnson, Box 5614, Flagsaff, AZ 86011
4. Current Land Owner/Manager(s): National Park Service, US Forest Service
5. Project Location, including Township, Range, Section: _____
6. Total Project Area in Acres (or total miles if trail): Approximatley 2,400
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: The goal of this project is to provide resource managers with information about Tamarisk Leaf Beetle advancement along Arizona watersheds, identify potential effects of defoliation on microsite variables within riparian ecosystems, and provide

recommendation for approaches that may be used to mitigate the effects of defoliation by the beetle.

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: NA

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.

Wilma G. Ennenga / 11 Sept. 2010
Applicant Signature /Date

Wilma G. Ennenga
Applicant Printed Name

FOR SHPO USE ONLY	
SHPO Finding: <input type="checkbox"/> Funding this project will not affect historic properties. <input type="checkbox"/> Survey necessary – further GRANTS/SHPO consultation required (<i>grant funds will not be released until consultation has been completed</i>) <input type="checkbox"/> Cultural resources present – further GRANTS/SHPO consultation required (<i>grant funds will not be released until consultation has been completed</i>)	
SHPO Comments	
For State Historic Preservation Office:	Date:

To be eligible for the National Register, a property must represent an important part of the history or architecture of an area. The significance of a property is evaluated within its historic context, which are those patterns, themes, or trends in history by which a property occurred or gained importance. Describe the historic and architectural contexts of the property that may make it worthy of preservation.

- A. HISTORIC EVENTS/TRENDS – Describe any historic events/trends associated with the property: _____
- B. PERSONS – List and describe persons with an important association with the building: _____
- C. ARCHITECTURE – Style: _____ no style

Stories: _____ Basement Roof Form: _____

Describe other character-defining features of its massing, size and scale: _____

INTEGRITY

To be eligible for the National Register, a property must have integrity (i.e. it must be able to visually convey its importance). The outline below lists some important aspects of integrity. Fill in the blanks with as detailed a description of the property as possible.

Location - Original Site Moved: Date: _____ Original Site: _____

DESIGN

Describe alterations from the original design, including dates: _____

MATERIALS

Describe the materials used in the following elements of the property:

Walls (structure): _____

Walls (sheathing): _____

Windows: _____

Roof: _____

Foundation: _____

SETTING

Describe the natural and/or built environment around the property: _____

How has the environment changed since the property was constructed? _____

WORKMANSHIP

Describe the distinctive elements, if any, of craftsmanship or method of construction: _____

NATIONAL REGISTER STATUS (if listed, check the appropriate box)

Individually Listed; Contributor; Non-contributor to _____ Historic District

Date Listed: _____ Determined eligible by Keeper of National Register (date: _____)

RECOMMENDATIONS ON NATIONAL REGISTER ELIGIBILITY (opinion of SHPO staff or survey consultant)

Property is is not eligible individually.

Property is is not eligible as a contributor to a listed or potential historic district.

More information needed to evaluate.

If not considered eligible, state reason: _____