ARIZONA GAME AND FISH DEPARTMENT
HABITAT PARTNERSHIP COMMITTEE
HABITAT ENHANCEMENT AND WILDLIFE MANAGEMENT PROPOSAL

Game Branch / HPC Project Number:	12-216

PROJECT INFORMATION

Project Title: Mastication-Based Restoration of Grasslands on the Williams Ranger District, Kaibab National Forest

Region and Game Management Unit: Region II, Units 7W, 8, and 10

Local Habitat Partnership Committee (LHPC): Flagstaff/Williams HPC	**Was the project presented to the LHPC?** **YES**[] **NO**[X] Note: Reviewed by AZGFD and HPC members.

Has this project been submitted in previous years? YES[] NO[X]
If Yes, was it funded? YES[] NO[] → Funded HPC Project #(s):

Project Type: Mechanical treatment and prescribed fire in encroached grasslands

Brief Project Summary:
The primary objectives of this project are to:

1. Restore heavily encroached grasslands with mastication-based treatments
   Thin junipers, pines, and other invading conifers using masticators (e.g., grinders) to restore grasslands on the Williams Ranger District of the Kaibab National Forest. Treatment areas serve as habitat for elk, pronghorn antelope, mule deer, white-tailed deer, wild turkey, and many non-game species found only in grasslands. The South Zone of the Kaibab National Forest currently uses agra-ax machines, strategic fuelwood harvests, and wildland fire to restore and maintain grasslands. The historic grasslands that would be treated under this project have been heavily invaded by conifers, and mastication is the most effective method to restore grassland structure and composition without hindering the movement of game and non-game species of wildlife. The South Zone of the Kaibab National Forest has not yet used mastication as a method to restore grasslands, and we conservatively estimate the cost at $500/acre, which would result in 100 acres of accomplishment; however, if we are able to contract at a lower rate (which is likely), then we will treat the maximum acreage possible at that rate.
2. Use experimental mastication as the first step in landscape-scale, adaptive management of grasslands
   Use these treatments to test the effects of mastication on various parameters of grassland wildlife habitat, including the spread of noxious weeds into grasslands. If this project demonstrates that mastication is an appropriate tool for restoring heavily encroached grasslands, then we could use this method to restore tens of thousands of acres that have NEPA and archeological clearance.

It is important to note that HPC funds will be used solely for mastication treatments alone; the administrative study aspect of this proposal will be covered by the Forest Service.

Background
The Williams Ranger District uses agra-ax treatments and wildland fire to restore 2,000-5,000 acres of grasslands per year, largely through funding from the HPC program. Working with the Arizona Elk Society, we are using volunteers to restore even more grasslands than before. If mastication proves effective and ecologically responsible, then the Kaibab National Forest will seek internal and external funds to masticate many more acres of grasslands each year.

Big Game Wildlife Species to Benefit: Elk, pronghorn antelope, mule deer, white-tailed deer

Implementation Schedule (Month/Day/Year):	**Environmental Compliance**:
Project Start Date: 05/01/2013 Project End Date: 09/01/2015	NEPA Completed: Yes[] No[x] N/A[] Projected Completion Date: 05/2013 – Categorical Exclusion (quick NEPA) State Historic Preservation Office - Archaeological Clearance: Yes[] No[x] N/A[] Projected Completion Date: 05/2013 Arizona Game and Fish Department EA Checklist: N/A[x] To be Completed by: _____ Projected Completion Date:

PROJECT FUNDING

Special Big Game License Tag Funds Requested:	$ 50,000 (solely used for mastication treatments)
Cost Share or Matching Funds:	$ 40,000
Total Project Costs:	**$ 90,000**

PARTICIPANT INFORMATION

Applicant (please print):	**Address**:	**E-mail**:
John DeLuca Supervisory Wildlife Biologist Williams and Tusayan Districts Kaibab National Forest	Williams Ranger District 742 S. Clover Rd. Williams, AZ 86046	johndeluca@fs.fed.us
Telephone: (928) 635-5627		**Date**: 09/04/2012

AGFD Contact and Phone No. (If applicant is not AGFD personnel):
Mike Rice (928) 606-2290
Matt Padilla (928) 606-3093

Project has been coordinated with:
Arizona Game and Fish Department, Arizona Elk Society, Arizona Wildlife Federation, Babbitt Ranch, and ranchers with grazing permits in the project area.

Approved Victoria L. Scott for MICHAEL R. WILLIAMS
Kaibab Forest Supervisor

9/04/12
Date

NEED STATEMENT – PROBLEM ANALYSIS:
Historic overgrazing and fire exclusion have allowed junipers and pines to encroach upon hundreds of thousands of acres of historically open lands on the Kaibab National Forest. Grasslands on the Williams Ranger District serve as essential habitat for elk, mule deer, white-tailed deer, wild turkey – and most notably – pronghorn antelope. Golden eagles, burrowing owls, ferruginous hawks, Gunnison's prairie dogs, and other grassland wildlife of conservation concern also use these areas. However, many of these grasslands are being so heavily invaded by junipers and pines that mechanical treatment is necessary before fire can be reintroduced to the ecosystem.

The grassland thinning staff of the Williams Ranger District is largely funded by HPC funds, and we currently complete mechanical treatments with an agra-ax. While the agra-ax is a useful tool for restoring grasslands, the ability to use other methods of mechanical treatments, such as mastication,

would greatly increase our productivity and efficiency. Mastication would allow the restoration of heavily encroached grasslands that are inoperable with an agra-ax machine. Mastication could serve as another "tool in the toolbox" to greatly increase the acres of grassland that we restore each year. However, the ecological effects of mastication are largely unknown, and concerns about the spread of cheatgrass and other noxious weeds preclude us from initiating landscape-scale restoration of grasslands through the use of masticators.

PROJECT OBJECTIVES:

The objectives of our project are to 1) restore heavily encroached grasslands with mastication-based treatment and 2) use experimental mastication as the first step in landscape-scale, adaptive management of grasslands. This project will benefit pronghorn antelope, elk, mule deer, white-tailed deer, wild turkey, and many non-game species of conservation concern.

PROJECT DESCRIPTION AND STRATEGIES:

It is important to note that HPC funds will be used solely for mastication treatments alone; the administrative study aspect of this proposal will be covered by the Forest Service.

Project Description and Strategies for Mastication-Based Treatments and Prescribed Fire

We will use masticators (e.g., grinders) to restore at least 100 acres of heavily encroached grasslands. *However, please note that we will restore more acres if the cost of the mastication contract is less than our conservative estimate of $500/acre.* Only invasive conifers will be masticated, and treatment areas will only be located in historic grasslands (e.g., areas dominated by mollisols). All standing dead trees above 12" in diameter and all pre-settlement trees (i.e., trees that occurred on the landscape before approximately 1870) will be retained. For every large stump or other pre-settlement evidence, we will leave 1-2 large post-settlement trees. We will design treatment areas to serve as corridors that connect larger grasslands or provide a good line of sight when accessing water.

NEPA and archeological clearance associated with this project is will take a matter of a few days and not be a cost or time burden to the agency, as selected areas are already cleared for mechanical treatment but need additional clearance for prescribed fire.

Project Description and Strategies for Mastication Study

This study design was created with the assistance of researchers from Northern Arizona University. Recent studies[1] have found that masticating pinyon and juniper trees resulted in the establishment of cheatgrass (*Bromus tectorum*) and Canada thistle (*Cirsium arvense*). However, our educated guess is that the existing understory community and initial tree densities are the primary influence behind the response of grasses and forbs to mastication treatments; mastication in and of itself may not necessarily cause the invasion of noxious weeds into grasslands. We therefore propose the following study design:

Question: How do mastication and pre-treatment tree densities affect the composition of grasses and forbs in grasslands, including invasion of noxious weeds, forage production, and species diversity?

Independent Variables (Factors Affecting Grasslands):

Mastication – Two levels: masticated or un-masticated. Mastication will be conducted on 5-10 acre

[1]2009. Owen, S.M., C. Hull Seig, C.A. Gehring, and M.A. Bowker. Above- and belowground responses to tree thinning depend on the treatment of tree debris. Forest Ecology and Management 259: 71-80.

plots.

Fire – Two levels: burned or un-burned. Fire treatments will occur across the two levels of mastication and three levels of tree density as described above. Due to safety considerations, the locations of fire treatments are constrained by the landscape configuration of vegetation and the presence of fire breaks. Burning will occur after mastication.

Initial Tree Density – Three levels: moderately encroached grasslands (100-300 4-8" diameter stems/acre); highly encroached grasslands (200-400 4-8" diameter stems/acre); and severely encroached grasslands (400-600 4-8" diameter stems/acre). Initial tree density is likely to impact both the initial composition of grasses and forbs, which may influence the change in herbaceous vegetation after mastication and fire treatments.

We will use a split-split-plot design (Figure 1), allowing for treatments to represent every unique combination of the different levels of the independent variables. We will create four blocks of each burn treatment, and we will place treatment combinations in each block. We will place three 5x5-meter experimental units in each treatment combination. Total replication will be: (2 fire treatments X 4 blocks) X (2 mastication treatments) X (3 initial tree densities) X (3 experimental units per treatment combination per block) = 144 units (12 units per treatment combination).

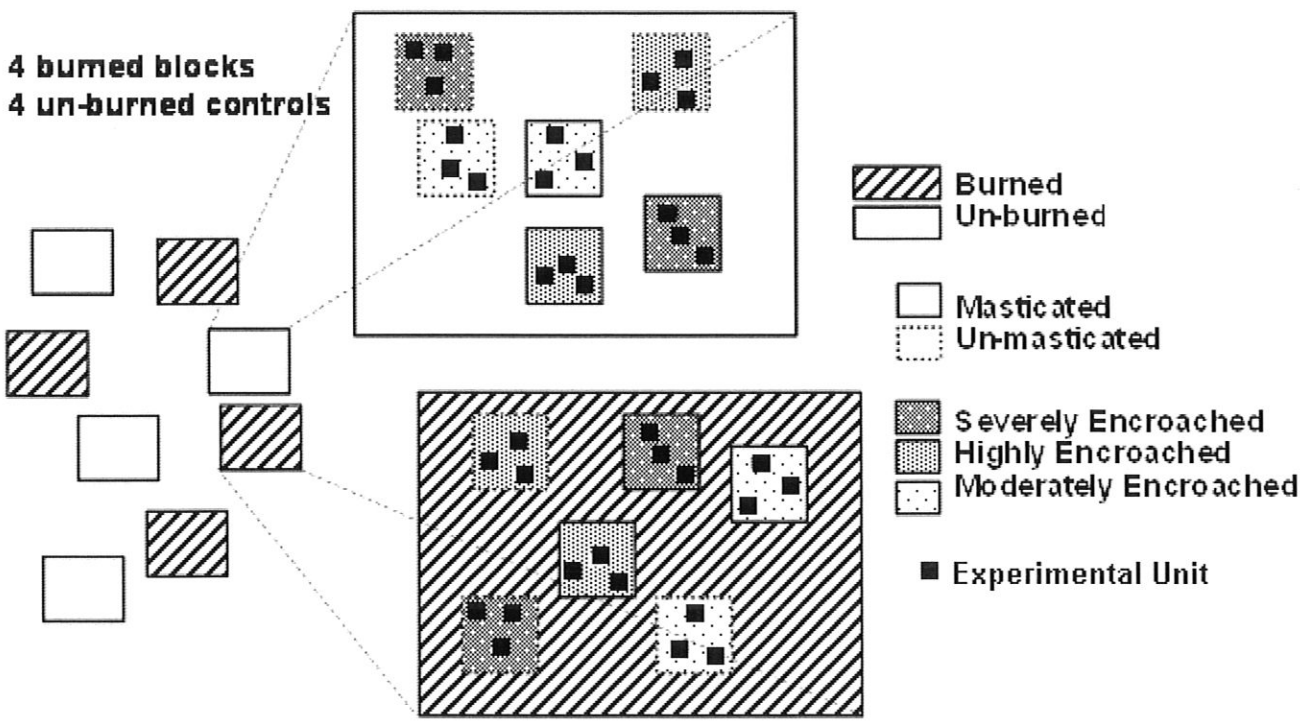


Figure 1. Diagram of experimental design.

Dependent variables (Affected Elements of Grasslands):

- *Biomass/productivity of grasses and forbs.*
- *Species composition of grasses and forbs, including noxious weed species.*
- *Soil bulk density (measure of soil compaction).*
- *Soil infiltration rates (indicator for potential for watershed erosion).*

PROJECT LOCATION:
The study will take place within the Ida Grassland, Irishman Dam Grassland, Winter Range Treatment Area, and/or the White Hills Grassland (see Map 1 for locations).

LAND OWNERSHIP AT THE PROJECT SITE(S)*:*
(if the project area is private property, please state specifically and provide the landowner's name)

- All public land (Williams Ranger District, Kaibab National Forest).

IF PRIVATE PROPERTY, IS THERE A COOPERATIVE BIG GAME STEWARDSHIP or LANDOWNER AGREEMENT BETWEEN THE LANDOWNER AND THE DEPARTMENT?
YES[] NO[] N/A[x]

HABITAT DESCRIPTION: Grasslands invaded by junipers, pinyon pines, and other woody species.

ITEMIZED USE OF FUNDS:

Special Big Game License Tag Funds
$50,000 to spent solely on mastication treatments. We will use masticators (e.g., grinders) to restore at least 100 acres of heavily encroached grasslands. *However, please note that we will restore more acres if the cost of the mastication contract is less than our conservative estimate of $500/acre.*

Cost Share or Matching Funds (*for volunteer labor rates please refer to the worksheet below*)
TOTAL
$40,000

$10,000 or more for prescribed fire treatments.

We estimate that prescribed fire will cost approximately $200/acre for these treatments, as prescribed fire planning and implementation is more costly due to the greater complexity of burning in pinyon-juniper systems. Prescribed fire will occur on at least 50 acres (half of the masticated acres).

$30,000 for NEPA, site selection, monitoring, data collection, and data analysis.

100 personnel days, at approximately $300/day.

LIST COOPERATORS AND DESCRIBE POTENTIAL PARTICIPATION:
This proposal was developed with input from the Arizona Game and Fish Department, Arizona Elk Society, and Arizona Wildlife Federation.

WOULD IMPLEMENTATION OF THIS PROJECT ASSIST IN PROVIDING, MAINTAINING, OR FACILITATING RECREATIONAL ACCESS?
YES[x] NO[] N/A[]
Grassland restoration increases hunting opportunities.

PROJECT MONITORING PLAN:
See "Project Descriptions and Strategies for Mastication Study" above.

PROJECT MAINTENANCE:
Following mechanical thinning with masicator, prescribed fire (and when the opportunity arises, wildfire) will be used to maintain grasslands on a 7-12 year fire return interval. Weather and fuel moisture conditions preclude exact timing of use of wildfires or prescribed fires.

PROJECT COMPLETION REPORT TO BE FILED BY:
30 days after completion or 10/2015, whichever comes first.

WATER DEVELOPMENT PROJECTS (*please use the worksheet below*)**:**
N/A

TREE CLEARING/REMOVAL PROJECTS (*please use the worksheet below*)**:**
See below.

ARIZONA GAME AND FISH DEPARTMENT
TREE CLEARING/REMOVAL WORKSHEET

PROJECT TITLE:

1) What is the estimated acreage of the project?

The total acreage treated through collaborative funding between Forest Service funded and HPC funds would be approximately 100 acres upon project completion. *However, please note that we will restore more acres if the cost of the mastication contract is less than our conservative estimate of $500/acre.*

2) How are the trees going to be cleared? (agra axe, chain saw, push):

Masticator.

3) What is the estimated number of trees per acre?

Trees per acre will vary from 100-600.

4) Describe trees to be cleared (species, estimated diameter, single stem, multi-stem):

One-seed juniper (*Juniperus monosperma*; multi-stem), Utah juniper (*Juniperus osteosperma*; single-stem), pinyon pine (*Pinus edulis*). All post-settlement trees will be cleared. All pre-settlement trees will be retained. This would generally involve cutting trees up to 12" diameter-at-breast-height.

5) Describe terrain (slope, soil type, rocks)

Relatively even terrain. Grassland mollisols. Rocky areas occur sporadically throughout the project area, but do not predominate. Pre-settlement trees will be retained.

6) Please list any special land management status for the project site (e.g. Wilderness, National Park, National Monument). If private land, list landowner.

N/A.

7) Please provide the following information about access to the proposed site:

Type of access (mark one): []2x4 vehicles [X]4x4 only []Foot only**

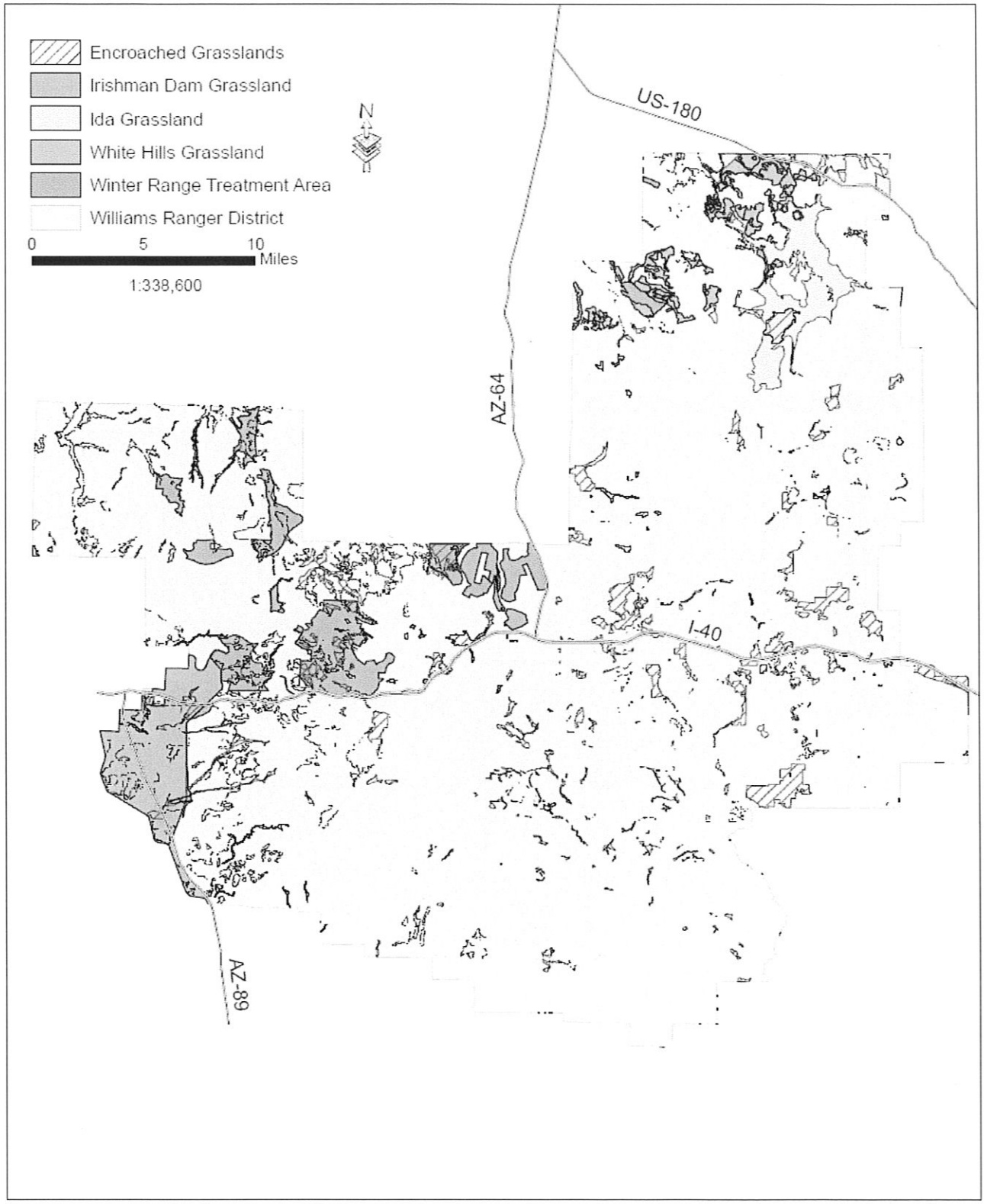
**If foot access only: Distance in miles: Approx. hiking time:

Does access to this site require crossing private or tribal lands? YES[] NO[X]

Is the site relatively accessible for tree shearing equipment? YES[X] NO[]

Please describe any restrictions to public access: None.

Williams Ranger District Grassland Conservation Projects



Map 1: Approved grassland restoration project sites for potential treatments using a masticator. Diagonal lines show severely encroached grasslands within and outside areas with project sites.