



Board of Supervisors Memorandum

August 4, 2009

Buffelgrass Experimental Eradication in Tucson Mountain Park

Report

As the Board knows, of the non-native invasive species, buffelgrass is perhaps the greatest single threat to the long-term sustainability of the Sonoran Desert. In addition, buffelgrass presents significant public safety risk from wildfire. There has already been at least one fire death related to a buffelgrass fire in Pima County. The buffelgrass invasion on the front face (urban side) of the Santa Catalina Mountains presents a distinct wildfire threat to homes and property in the Santa Catalina Mountains, as well as introducing the potential to initiate a forest fire from a low level, low elevation buffelgrass fire that would ladder up into the traditional forest fire fuels in the Santa Catalina Mountains. The threat of buffelgrass is serious and continuous.

The reports attached explain the multi-agency, multi-scientific consultations undertaken regarding pilot development of various methods to eradicate buffelgrass. Perhaps one of the biggest challenges facing the community regarding buffelgrass eradication is its removal in extremely rough and difficult terrain. This issue has been a major concern with area land managers of surrounding regional mountain ranges, including the United States Forest Service, National Parks Service, Bureau of Land Management, and Pima County. For this reason, a test protocol was developed to try to determine the most effective and safe method of buffelgrass eradication in rough, mountainous terrain, hence the current test regarding helicopter, computer controlled, and boom technology direct application of herbicide to buffelgrass in extreme terrain conditions.

Protocol for this test has been developed by a panel of experts and scientists familiar with the technology. Geographic identification of test plots that total twelve one-acre test plots in varying terrain conditions in Tucson Mountain Park have been identified. Each test plot will have one of two low concentrations of herbicide application, with appropriate controls and monitoring regarding application and the effectiveness of the herbicide. In addition to the area land managers identified above, one of the test sites is on City of Tucson property near Kennedy Park. The City of Tucson has agreed to the inclusion of this site in close proximity to the Tucson Mountain Park plots.

More detail on the process and procedures is contained in the attached memorandum dated July 24, 2009 from Kerry Baldwin, Natural Resources Manager in the Natural Resources, Parks and Recreation Department (Attachment A). Details regarding the buffelgrass plots are attached in aerial photogrammetric format (Attachment B). Actual contract documents developed by the project cooperators and entered into by the United States Forest Service for application of the herbicide to the test plots is attached as Attachment C.

The Honorable Pima County Board of Supervisors
Buffelgrass Experimental Eradication in Tucson Mountain Park
August 4, 2009
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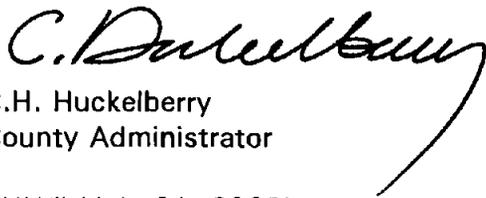
I am also attaching a question and answer information sheet regarding this matter as Attachment D. A number of multi-jurisdictional staff may be available to answer questions from the Board on this proposal on August 4, 2008. The tests scheduled for August 5 and 6 have been postponed pending Board direction.

Finally, since concern has been expressed regarding the toxicity of the herbicide Glyphosate, I am enclosing as Attachment E a fact sheet developed by Jack Kelly, Commercial Horticulture Agent for the Pima County Cooperative Extension Service.

Recommendation

I would recommend that the buffelgrass eradication in rough terrain utilizing helicopter computer controlled technology spraying research project be authorized to proceed as this method of buffelgrass eradication may be the only viable method for such in extremely rough terrain. Given the rapid spread of buffelgrass and its environmental and public safety threat, significant actions must occur in order to manage and eventually eradicate this invasive species.

Respectfully submitted,



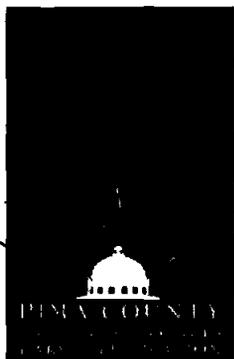
C.H. Huckelberry
County Administrator

CHH/jj (July 31, 2009)

Attachments

A

MEMORANDUM



TO: Chuck H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator
Rafael Payan, NRPR Director

FROM: Kerry Baldwin, NRPR Natural Resources Manager

DATE: July 24, 2009

SUBJECT: Tucson Mountain Park Buffelgrass Control Experimental Design Controls

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For the past several months, NRPR staff has been working with a team of plant scientists from the US Forest Service, National Park Service, University of Arizona, Bureau of Land Management and City of Tucson to develop a cooperative project to test new aerial herbicide application technology on buffelgrass in a desert environment. The test had been coordinated for the morning of August 5 and also August 6, if necessary, but will now be delayed pending Board direction. The general elements of the aerial spraying component of the test are outlined in the Prospectus utilized by the US Forest Service that will supply the helicopter and attached to this memo. I will try to summarize the key information based on areas of concern raised in the 7/23 Buffelgrass Eradication Test Project memo.

Aerial Spray Application Technology:

The test plots will be sprayed by helicopter utilizing new computer controlled boom technology that utilizes precise GPS coordinates and low level application. The technology has been used in other sensitive habitats by USFS and NPS successfully to deliver very accurate spray delivery. Because the actual delivery of the herbicide spray is controlled by computer and GPS data, not the pilot, human timing and error are generally eliminated from the equation. Scientists familiar with technology already used in other settings predict that any overspray should be less than 3-5 feet outside the perimeter of any study plot but definitely no more than 10 feet. The actual GPS guidance package being required on the helicopter must be accurate to within no more than 1 foot. The spray will be applied from approximately 30-50 feet above the plot and with wind conditions of less than 5mph measured near the plot. Droplet size is one measure of the test parameters but the sizes tested will be relatively large, or course, to further minimize potential of drift and provide necessary saturation of the buffelgrass being treated. If weather conditions exceed maximum parameters set for the application phase, the project will be shut down until conditions meet the criteria established.

As a part of the test we will be placing spray indicator cards in a set pattern in and around the test plots to measure efficiency of application of the spray. The initial test

plot runs will also give us an immediate feedback indicator if over spray is occurring and we can shut the test run down if it deviates from expected parameters.

The closest residence is over 600 feet from any study plot. The chances of drift moving that distance is a factor of more than 60 times greater than our worst case expectation. Also, the terrain and vegetation surrounding the plots would further restrict potential drift. The course size of the drops utilized in the test at surface winds of less than 5 mph will be more like a light vertical rain. The location of the boom and the distance of the helicopter above the spray delivery point controls for rotor wash influence.

Herbicide Selection:

The herbicide selected for use is glyphosate. Glyphosate is the active ingredient of many common garden use herbicides. One well known commercial family of products from Monsanto has the trade name Roundup, Roundup Pro, Roundup ProMax or Rodeo. This herbicide was selected because it has been the product of choice for many years by agencies doing active buffelgrass control utilizing spray techniques. The product is very safe, doesn't require licensed applicators for small quantity applications, doesn't require special handling precautions, has been proven to be very effective on buffelgrass, has a short active intake period on plants and does not have any appreciable residual life in soils. Use of Roundup has already gone through environmental review processes in several federal agencies and is used by US Forest Service, Bureau of Land Management and National Parks Service in and around Tucson. Pima County utilizes Roundup in our buffelgrass spraying programs as well.

The herbicide will be applied in the test at a rate of 5 or 10 gallons per acre. This is a rate that would be commonly lower than most of our applications along roadsides. The rate is well below the maximum rate recommended per acre by the manufacturer. We also selected glyphosate because of its effectiveness on the target grass species while not expected to impact cacti, trees and larger shrubs on a long-term basis based on previous projects. The spray will impact currently growing native grasses and some flowers/weeds. Any native that sprouts after the test and the next summer rain should not be impacted. Glyphosate does not have pre-emergent capabilities. The test plots have good seed banks of summer natives and they should recover next year. Fall, spring and winter annuals should not be impacted based on previous tests on Tumamoc Hill. All of this is part of the test design and will be monitored as part of the study.

One of the required test parameters is also that there is less than a 50% expectation of rain within 6 hours. If it would unexpectedly rain, glyphosate dilutes rapidly and loses its active effect on grasses in a very short timeframe and distance from plant. We would expect that under our weather conditions that the initial spray would have dried and been absorbed into the plant in a fairly short timeframe. Off plot effects from this type of unexpected event would be expected to be nonexistent.

Based on the information contained in the Safety Data Sheets for the herbicide, toxicity for arthropods, soil organisms and birds is rated as “Practically non-toxic”.

Summary:

The actual test parameters have been carefully designed to have minimal, if any, impact outside the twelve- (one acre) test plot boundaries. The technology was selected because it has worked very effectively in sensitive habitats and we wanted to affirm that it also works for buffelgrass in a desert situation. We were very cognizant of plot location and residences adjacent to TMP boundaries, but we also needed to consider locations of buffelgrass infestations, terrain diversity, roads, trails, access for project staff pre and post test for monitoring and minimizing helicopter flight time. The team reviewed and determined that concern of potential spray drift to the closest residence was not warranted in this situation and the TMP plots would work well and get us the added benefit of solid control efforts against buffelgrass infestations in the park.

Again, to reiterate some of the key study design and planning considerations;

- This is a multi-agency test that is applying previous experiences of some of the scientific team members with the spray technology to our desert situation
- Safety has been of paramount concern and will be reflected in required onsite safety meetings, written procedures and monitoring during the test period
- Residents within the general vicinity of the test area will get a mailing prior to the test alerting them to test and contact information with NRPR
- We will use Roundup Pro at a rate well below manufacture application recommendations per acre. A total of approximately 100 gallons will be applied across the twelve-(one acre) study plots
- The research plots will be monitored for several years to track effectiveness of application and impacts on native plants
- The test could take as little as several hours but no more than two mornings
- All use of the helicopter has been contractually defined to ensure safety of rotor craft, workers, handling/application of herbicide, coordination of all state and federal business and flight rules and regulations
- Computer driven GPS technology will be utilized that ensures precise application of controlled amounts and droplet size of herbicide within plot perimeters
- Established parameters that will control actual test and allow shut down of test when established safety or weather conditions exceed maximums set before the test

I have attached orthographic maps of the plot locations. You will note that one plot is on Bureau of Land Management Land off Synder Hill and one on City of Tucson land near Kennedy Park. These sites were selected with the concurrence of the respective land management agency. I also attached a copy of the draft notice we planned to send to

residents close to any study plots by mid next week. This will only need to be a small mailing due to the few homes in the area.

If there are still any additional questions or concerns please let me know. The whole project team shares the underlying concerns about spraying herbicides anywhere when they are not being carefully controlled and applied appropriately to vegetation to be managed. I think we have a study design and test procedures that address those concerns in a scientifically based and professionally applied manner as stewards of Tucson Mountain Park resources and the health and safety of our county residences.

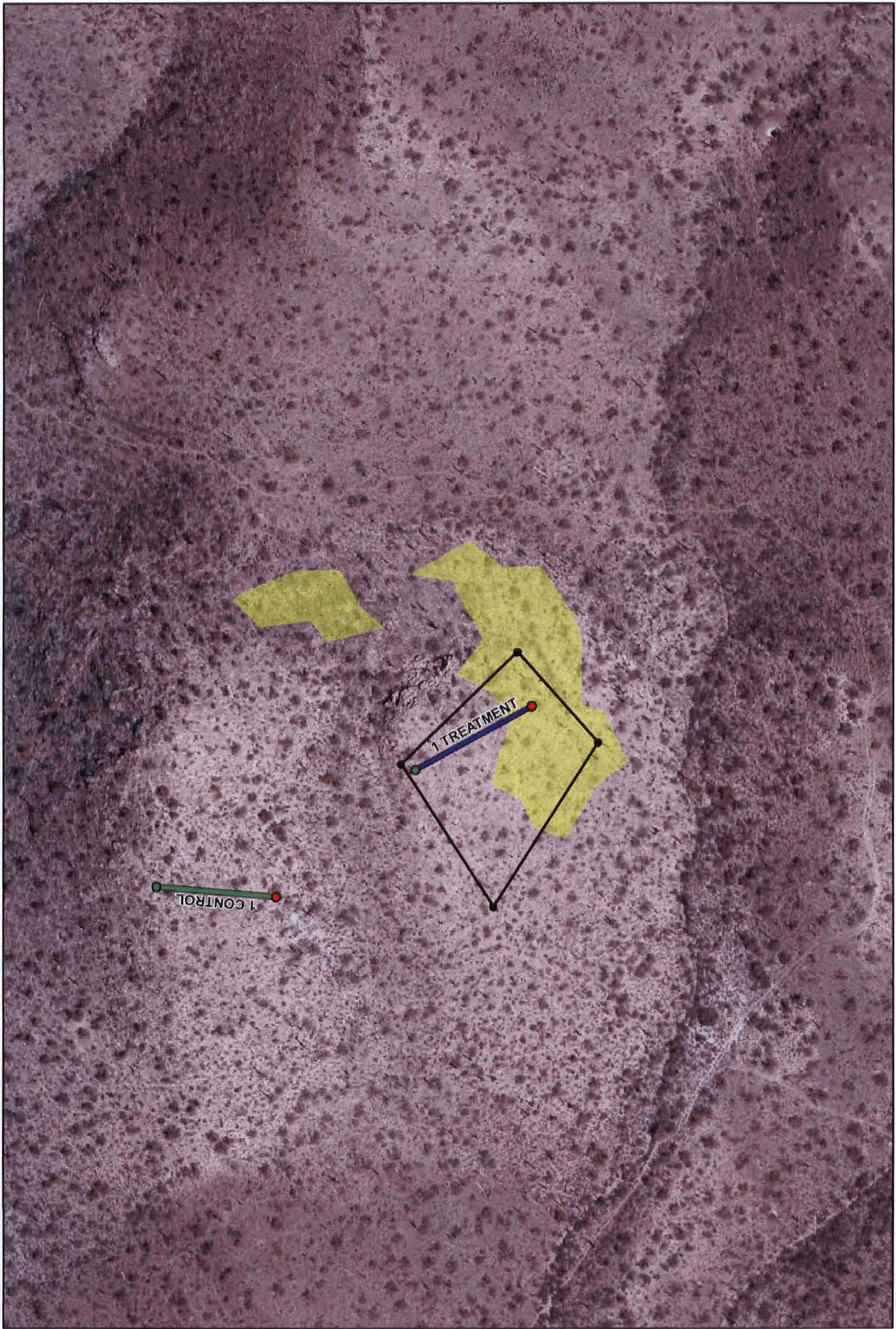
B



BUFFELGRASS PLOTS

We welcome any suggestions for anything you would like to see included on this map. A page will be created for each individual site.





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Green points = transect starting points
Red points = transect ending points

BUFFELGRASS PLOTS



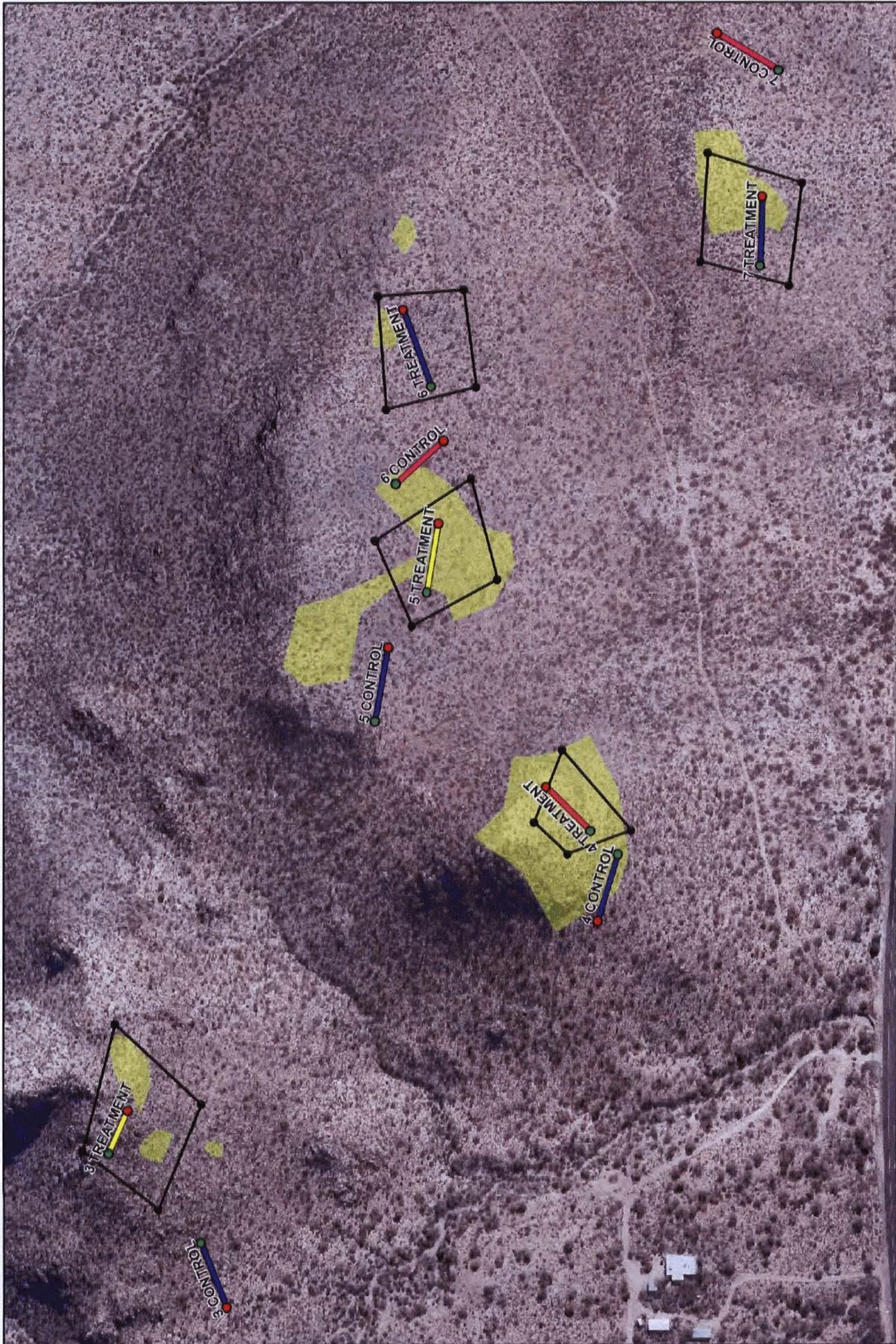


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Green points = transect starting points
Red points = transect ending points



BUFFELGRASS PLOTS



Green points = transect starting points
 Red points = transect ending points

BUFFELGRASS PLOTS





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Green points = transect starting points
 Red points = transect ending points



BUFFELGRASS PLOTS

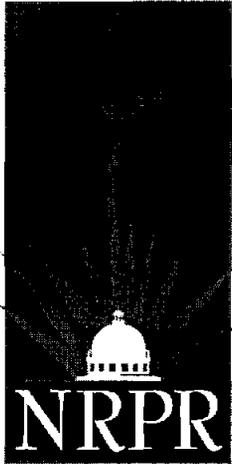


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Green points = transect starting points
Red points = transect ending points

BUFFELGRASS PLOTS





Pima County
Natural Resources,
Parks and Recreation

3500 West River Road
Tucson, AZ 85741

520.877.6000
520.877.6006 fax

www.pima.gov/nrpr

Rafael Payan
Director

*Inspiring greater
enjoyment of our
natural resources,
urban parks and
recreation programs.*

July 27, 2009

Comment DRAFT 7.24.09

Dear Tucson Mountain Park Neighbor:

Pima County Natural Resources, Parks and Recreation is working with a group of agencies and plant scientists to conduct a test on ways to control buffelgrass in rugged desert terrain. The test has been designed to utilize a few acres of Tucson Mountain Park in the general area of your home. We wanted to notify you of the test so you would be aware of any increased activity in the area and the nature of the test design.

The primary test is currently being scheduled for several hours the morning of August 5 and possibly again August 6, as necessary. The test will involve computer controlled aerial application of a common herbicide, Roundup, by helicopter on test plots that are infested with buffelgrass. The new technology will use a computer controlled GPS precise spray application method to insure any potential for drift of the herbicide off the control plots. We expect the spray to stay within 3-5 feet of each perimeter of the one acre study plots. No plot is closer than 600 feet direct line map distance to any nearby residence and your home may well be an even greater distance. The herbicide we will use has a short active life and will not permanently leach into the soil or be transported by natural water drainages. The spray is very effective on the target invasive grass species and will not harm wildlife. The spray being applied has been used for years by all local jurisdictions and Federal land management agencies to control buffelgrass along roads, around buildings and in vacant areas. You might notice a blue color from a dye added to the spray for a day or two after application.

Significant precautions are built into the test procedures and design to ensure public safety and that all applicable rules and regulations are followed. During the brief test period you might see or hear the helicopter flying over the park or see the science crews hiking into or around the area. We will make every effort to minimize any possible intrusion on the peace and quiet of the area.

We appreciate your understanding of the activity near your home during the brief test period. The scientific data we hope to gain will be a significant asset to better developing strategies to combat buffelgrass. If you are not familiar with buffelgrass, we suggest you go to www.buffelgrass.org for an overview of this invasive grass species. If you have any specific questions we might address please feel free to contact:

Kerry Baldwin
Natural Resources Division Manager
Pima County Natural Resources, Parks and Recreation
520 877-6161
520 877-6006 fax
Kerry.Baldwin@pima.gov

C

**PROSPECTUS FOR AN END-PRODUCT CONTRACT TO TEST RATES
OF AERIALY APPLIED GLYPHOSATE FOR BUFFELGRASS CONTROL**

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SECTION 1: INTRODUCTION

Bid offers are hereby solicited by the USDA Forest Service (Forest Service) for an end-product contract for the aerial application of glyphosate herbicide over 12 treatment plots near Tucson, AZ. The project is designed to evaluate various application rates of glyphosate necessary to control invasive buffelgrass, *Pennisetum ciliare*.

An end-product contract provides a means whereby an agency can procure a service for a time-specific event at a specified site (such as pesticide spraying, prescribed burning, etc.) from a Contractor who is sufficiently qualified to perform the full extent of the specified service by whatever means the Contractor deems most appropriate.

The USDI National Park Service, Pima County government agencies, USDI Bureau of Land Management, City of Tucson, and University of Arizona are cooperators on this project together with the Forest Service. The target acres and type of aircraft required for the project are detailed in Section 4.

A list of deliverables that must be sent to the Forest Service for review can be found in the Contractor's Submittal Sheet in Appendix A of this prospectus. For additional specific information on this project (treatment plot locations, topography, acreage, aircraft designation, project logistics, etc.), contact the Forest Service's **Program Manager**:

Allen White

USDA Forest Service
Forest Health Protection
333 Broadway SE
Albuquerque NM 87102
505-842-3280
505-842-3150 (fax)
allenwhite@fs.fed.us

SECTION 2: GENERAL STIPULATIONS

- 2.1 **BIDDER'S QUALIFICATIONS** - To bid on this contract, a Contractor must be a Fixed-Base Operator or firm that is currently certified as a commercial aircraft operator with office, maintenance facilities, aircraft, employees, and qualified pilots and mechanics, and have tools, equipment, and spare parts for the make and type of aircraft indicated in these specifications. The Contractor must be Federal Aviation Administration (FAA) certificated and must qualify under any Federal Aviation Regulations (FAR) including Part 137 as required to conduct the operations specified herein.
- 2.2 **SCOPE OF CONTRACT** - It is the purpose and intent of this document to provide specifications for aircraft, herbicide, equipment, application, and other operational requirements and for securing properly certificated and approved aircraft, dispersal systems, service facilities, qualified ground personnel, and FAA certificated and qualified pilots capable of making a proper aerial application of herbicide and performing necessary related functions.

- 2.3** **AREA TO BE TREATED** - A total of approx. 20 acres (\pm 15%) of shrubland near Tucson, AZ with approximately 12 scattered spray plots are proposed for treatment. More specific information is found in Section 4. The treatment areas consist of public lands owned by Pima County, USDI Bureau of Land Management, and City of Tucson that are partially infested by buffelgrass. In general, the areas are low-use areas with nearby permanent and/or seasonal residences.
- 2.4** **APPLICATION PERIOD AND STARTING DATE** – The application period begins on the date when the Contractor is required to report on site and continues until the final acceptable application is made. It is our objective to get all applications applied consistent with program requirements and constraints in as short a period of time as possible. Weather conditions that influence buffelgrass growth will determine the specific starting date of the application period. Estimated starting dates, based upon previous experience, are given in Section 4. The project is to be completed within 2 to 3 days depending upon weather.
- 2.5** **CONTRACT PERIOD** - This contract shall commence upon execution and will terminate October 1, 2009.
- 2.6** **PAYMENT** - Payment will be based on reimbursement for actual services performed, upon receipt of invoice(s) from the Contractor. Submitted invoice(s) must represent final totals for the performed services which should not exceed the total estimated cost provided in the bidding process for the contract.
- 2.7** **CANCELLATION** – In the event that the Contract must be cancelled for any reason that is beyond the control of the Forest Service or the Contractor after the execution of the Contract and after the Contractor has made a documented significant financial investment in preparing for the operational phase of the project, the Contractor will be compensated according to the costs incurred. Such reasons may include, but are not restricted to, acts of God or of a public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in any case, the failure to perform must be beyond the control and without the fault or negligence of the Contractor.

SECTION 3. AWARDING CONTRACT

- 3.1** **NOTIFICATION OF LOWEST RESPONSIBLE BIDDER** - The lowest responsible bidder to whom the project will be awarded will be identified and notified by the Forest Service within fourteen (14) days after the bid opening.
- 3.2** **CONDITIONS TO BE MET** - In order for the contract to be properly executed and awarded, certain conditions must be met by the Contractor. The following items and information must be completely and accurately supplied to the designated person.

- **From Contractor to Forest Service’s Program Manager (see Section 1 for name and address) at time of application:**
 - A report on the Contractor's designated personnel and equipment to be used on the project. The report must be formatted and include all information as follows:
 - Contractor:
 - Name of Contractor
 - Address
 - Telephone Number
 - On-Site Project Supervisor:
 - Name
 - Address
 - Telephone
 - Spray Pilot(s):
 - Name(s)
 - Spray Aircraft:
 - Make/Model
 - FAA Registration Number
 - Spray System Make
 - Tank Capacity (Gallons)
 - Operating Load Capacity (Gallons)
 - Calibration Specifics
 - Application Air Speed
 - Nozzle Type/Size
 - Number of Nozzles

3.3 WITHDRAWAL OF AWARD - If the conditions described in Section 3 are not fully and accurately met in a timely manner or if other contract specifications and deadlines specified elsewhere in the Contract Specifications are not fully and accurately met, the contract award may be withdrawn from the lowest bidder and the contract awarded to the second lowest responsible bidder.

SECTION 4. PROJECT SPECIFICS

4.1 OPERATIONS

- (A) Counties Involved: Pima County
- (B) Type of Areas to Be Treated: Public lands of Pima County, USDI Bureau of Land Management, and City of Tucson
- (C) Total Acres: approx. 20 acres

- (D) Number of Spray Plots (and average size): 12 plots (approx. one acre in size)
- (E) Estimated Starting Date(s): July 28 or August 4, 2009

The workday weeks starting on either July 27 or August 3, 2009 will be used for aerial applications as agreed upon by the Forest Service and the Contractor. The Tuesday falling on either July 28 or August 4 will be used as a preparation day with actual application to occur on the following Wednesday and, if necessary, Thursday or Friday depending on the weather. Flying operations during the 2 to 3 days estimated for completion of the project may vary according to weather conditions that allow adequate spray droplet sizes required for the project. In the event that both of these two starting dates are unacceptable, an alternative starting date will be agreed upon between the Forest Service and the Contractor.

- (F) Estimated Completion Time: 2-3 days
- (G) Required Aircraft:

A helicopter with a spray boom is required for the project which must have Accu-flo nozzles that can be oriented straight back and are capable of applying an ASAE coarse spray or larger (500-1000 μm $D_{v.05}$). The aircraft must also be capable of variable flow rates and have a programmable DGPS navigation guidance.

- (H) Herbicide (to be provided by project agencies):

Roundup PROMAX® to be applied at two dilutions with two application rates over the 12 plots –

- (a) 43 oz. ProMax® per acre at 5 gal/acre and 10 gal/acre
- (b) 85 oz. ProMax® per acre at 5 gal/acre and 10 gal/acre

- (I) Adjuvant and Dye (to be provided by project agencies):

Ammonium sulfate for water conditioning
Indicator dye

- (J) Application Requirements:

A change of Accu-flo nozzles will be necessary when changing from the 5 gal/acre rate to the 10 gal/acre rate. Also, rinsing of the spray system will be required when herbicide concentrations are changed. Rinsing may be done either on the ground or by discharge in the air over appropriate areas.

- (K) Loading Zones: Work can probably be done from one or two staging areas.

(L) **Operational Spray Manager**

Name: **John Ghent**

Address: Forest Health Protection, 200 Weaver Blvd, Asheville, NC
28804

Office Phone Number: (828) 257-4328

Cell Phone Number: (828) 273-4328

Fax Number: (828) 257- 4856

Email Address: jghent@fs.fed.us

SECTION 5. OBLIGATIONS OF THE CONTRACTOR

- 5.1 GENERAL** - The Contractor is obligated to furnish spray aircraft, support equipment, and personnel necessary to apply herbicide. Other sections in these Contract Specifications give more specific information on the aircraft, equipment, and personnel required.
- 5.2 PESTICIDE APPLICATION BUSINESS LICENSE** – The Contractor is responsible for obtaining a valid Custom Applicator and Pilot Licenses issued by Arizona in the category appropriate for aerial spraying of rangeland and residential areas.
- 5.3 PROOF OF INSURANCE** - The Contractor is responsible for insurance as specified in Section 3 for all aircraft and other equipment owned, leased, rented, subcontracted, or otherwise utilized by the Contractor and for all personnel hired, subcontracted, or otherwise employed by the Contractor.
- 5.4 REGISTERING TO DO BUSINESS IN ARIZONA** - Out-of-state incorporated contractors and out-of-state incorporated subcontractors are responsible for obtaining a certificate of authority from the appropriate state agency(s) in Arizona before doing business in Arizona.
- 5.5 FAA WAIVER FOR CONGESTED AREAS** – The Contractor is responsible for reviewing all spray plot maps and for identifying congested areas that would require an FAA waiver in order to conduct low-level flights over them. The Contractor is responsible for filing the required plan and documentation with the appropriate FAA Flight Safety District Office for congested areas when identified, for obtaining the necessary waiver(s), and for providing proof of such to the Program Manager (see Section 1) two weeks prior to the start of the project.
- 5.6 SPRAY MATERIALS** - The Forest Service and cooperating agencies are responsible for the purchase of the herbicide, adjuvant, and dye used in this project. Specific details on the herbicide and adjuvant are given in Section 7.
- 5.7 LOADING ZONES OR AIRFIELDS** - The selection of suitable helispots or airfields for use as loading zones must be reviewed by the Contractor. Use of the sites must not present problems from a legal aspect, and permission to use the site(s) must be obtained prior to operations.

- 5.8 MAINTENANCE** - The Contractor must maintain a readily available on-site inventory of commonly needed spare parts and spare equipment including, but not limited to, pumps, pump seals, and rotary atomizers to maintain the spray system, the aircraft and its electronic guidance and tracking system, the pumping system, the support trucks, and the storage tanks and to provide for immediate replacement of critically needed parts and equipment. Scheduled maintenance must be conducted only at times that will not interfere with the spray operation. Non-scheduled maintenance may be conducted but not to interfere with spray operations for longer than a period of one hour. Only emergency repairs are permitted during scheduled spray hours. Care must be taken to prevent leakage of spray material at all times.
- 5.9 SECURITY** – The Contractor will be responsible for any current regulations issued by the FAA with regard to aircraft and pesticide safeguarding and security, as well as any rules and/or recommendations that are issued by the National Association of Aerial Applicators, the USDA Forest Service, or any other responsible agency.
- 5.10 PRE-SPRAY MEETINGS** – At a time, date and location agreeable to all parties, no later than one day prior to the scheduled start of the aerial application, representatives of the Contractor and the Forest Service shall meet and discuss the aerial application program. Topics for discussion shall include, but are not limited to, logistics for aerial application; the handling, mixing and application of herbicide; aircraft capabilities; final selection of loading sites; safety precautions, etc. The Contractor shall require all pilots who will be used on this project to attend this meeting.
- 5.11 FIELD EXPENSES AND TRANSPORTATION** - Costs incurred in the operation and maintenance of all contractor equipment are the responsibility of the Contractor. Expenses incurred by all Contractor personnel including arrangements for food, lodging, and transportation are the responsibility of the Contractor. The Contractor is responsible for providing a means of ground transportation for Contractor personnel.
- 5.12 SPILL CLEANUP EXPENSES** - The Contractor is responsible for all cleanup activity and costs resulting from any contamination caused by the accidental or intentional spilling, leakage, or dumping of herbicide, fuel, oil, or any other contaminant from Contractor-supplied equipment.
- 5.13 SAFETY** - The Contractor is required to conduct all operations in a safe manner. The Contractor must provide essential safety equipment including, but not limited to, properly sized and coded fire extinguishers and spill-containment materials and supplies. The Contractor is also required to abide by all provisions of the Forest Service's Safety Plan.

SECTION 6. OBLIGATIONS OF THE FOREST SERVICE

- 6.1 AGENCY PERSONNEL** - The Forest Service and cooperating agencies will furnish personnel to facilitate spray operations in the following capacities:

- (A) **OPERATIONAL SPRAY MANAGER** - This person is a Forest Service specialist who will serve as the agency's field liaison with the Contractor and is responsible for verifying calibration of the spray aircraft, determining acceptable spraying conditions, and conducting quality control checks on the aircraft and application during the spraying operations (see Section 4).
- (B) **PROGRAM MANAGER** – The Program Manager for the Forest Service is responsible for coordinating the overall operation of the application program (see Section 1).
- (C) **MONITORING CREW** - These personnel are responsible for placement of monitoring devices, plot boundary markers (if needed), and monitoring plot treatments of buffelgrass.

6.2 MAPS – Agency personnel from Pima County will supply USGS 7½ minute Quadrangle maps for use by the spray pilot that will show individual spray plots, treatment boundaries, exclusion areas, and known hazards. Even though known local aerial hazards will be provided on maps from Pima County, all application pilots are responsible for the reconnaissance of operational areas and are required to perform any necessary reconnaissance prior to treatment.

6.3 GPS FILES - Prior to spraying, shape files (.shp or equivalent) will be provided to the applicator for entry into the on-board navigation system. Treatment site information will be provided to the contractor as ArcView/ArcInfo shape files for uploading treatment coordinates using a NAD 83 or WGS-84 projection.

6.4 PRE-SPRAY MEETING – At a time, date and location agreeable to all parties, no later than one day prior to the scheduled start of the aerial application, representatives of the Forest Service and the Contractor shall meet and discuss the aerial application program. Topics for discussion shall include, but are not limited to, logistics for aerial application, the handling, mixing and application of herbicide; aircraft capabilities, final selection of loading sites, safety precautions, etc. The Contractor shall require all pilots who will be used on this project to attend this conference.

6.5 SAFETY PLAN - The Forest Service will provide copies of a Safety Plan to all participants at the start of the project. This plan will explain how safety contingencies will be handled during aerial operations. The Contractor and all agency personnel are required to abide by all provisions of the Forest Service's Safety Plan. All Contractor and agency personnel must be briefed on the plan at the Pre-Spray Meeting.

SECTION 7. HERBICIDES, ADJUVANTS, AND DYES

7.1 PURCHASING, STORAGE, AND TRANSPORTATION - The Forest Service or the cooperating agencies will obtain the herbicide, adjuvant, and dye used on this project, pay all applicable sales and use taxes, and arrange for delivery of the products to a suitable site where they will be secure and protected from damage. The Forest Service will ensure that adequate supplies of herbicide, adjuvant, and

dye are strategically located in the project area at least 24 hours prior to the start of spraying in order to assure an efficient operation. The Forest Service will also ensure that personnel from the Contractor and government agencies are aware of the locations of these supplies.

The Contractor is responsible for handling and transporting the herbicide, adjuvant, and dye from the storage site to the aircraft-loading zone.

- 7.2 **BUFFER ACREAGE** - The maximum number of acres to be treated is approx. 20 acres (\pm 15%) — no buffer acreage will be included.
- 7.3 **MSDS** - The Contractor is responsible for keeping a copy of a Material Safety Data Sheet for any herbicide or other relevant materials requiring an MSDS available on site throughout the course of the project.
- 7.4 **HERBICIDE** - All spraying will be conducted with the glyphosate herbicide, Roundup PROMAX®. Section 4 provides details on the acres to be treated and the dilution rates to be used.
- 7.5 **ADJUVANT** – Ammonium sulfate will be used as a water conditioner.
- 7.6 **DYE** – An indicator dye will be used to mark areas that have been treated.
- 7.7 **OPERATIONAL PROBLEMS** - The Contractor must determine what, if any, operational problems exist with any product. These problems may include handling, storage, transportation, and spraying difficulties. To the best of the Forest Service's knowledge at this time, no adverse characteristics exist with the listed product. It is the Contractor's responsibility to insure a trouble-free operation with the material purchased.
- 7.8 **CONTAINER DISPOSAL** - The Contractor is responsible for the proper disposal of all herbicide, adjuvant, and dye containers as specified on the product label.
- 7.9 **APPLICATIONS/RATES/SPRAY VOLUME** - Specifics on the number of applications and application rates are given in Section 4.
- 7.10 **SAFETY** - The Contractor must follow all safety procedures that apply to general pesticide handling and to the specific material being used.

SECTION 8. APPLICATION SPECIFICATIONS, CONDITIONS, AND RESTRICTIONS

- 8.1 **SAFETY** – Personnel of the Forest Service, cooperating agencies, and the Contractor are required to conduct themselves in a safe manner at all times. The Forest Service will prepare a detailed safety plan that will be reviewed by all agency and Contractor personnel prior to the start of the spraying operations.
- 8.2 **LOGISTICS** - Once on site and under contract to the Forest Service, the aircraft and its assigned pilot, ground-support equipment, and crew are under the logistical direction of the Forest Service's Operational Spray Manager.

8.3 WEATHER RESTRICTIONS - Using the following guidelines, the Forest Service will determine when weather conditions are acceptable for spraying operations to be conducted. Information supplied by Forest Service's field personnel and the Contractor's pilot is used in making this decision.

- (A) **WIND VELOCITY** - Wind velocity must be 5 mph or less when measured in or near the spray plot with a hand-held wind gauge. If excessive drifting of the spray cloud occurs because of higher wind velocity above the plant canopy, spray operations must be suspended even though surface-level wind conditions are 5 mph or less. Caution must also be exercised when dead calm conditions exist because of the formation of temperature-inversion layers. Under such conditions, the smaller droplets in the spray cloud will remain suspended and will not settle into the plant canopy. Spray operations must be curtailed until such conditions clear.
- (B) **PROBABILITY OF PRECIPITATION** - Probability of precipitation within six hours after the completion of spraying must be 50 percent or less. This probability of precipitation is provided by Flight Service Weather (1-800-992-7433), National Weather Service (use closest local source), or other contracted weather forecasting source. Any spray plot that incurs significant precipitation (0.25 inch or more) within four hours of spraying must be evaluated and, if necessary, re-sprayed at the Forest Service's expense.
- (C) **AIR TEMPERATURE AND RELATIVE HUMIDITY** – Temperatures and relative humidity conditions must be adequate such that proper herbicide application will not be hindered.
- (D) **WET FOLIAGE** - Foliage must not be dripping wet either from precipitation or overnight dew.

8.4 ACCURACY - The Contractor must produce a complete and accurate coverage of the designated areas within the spray plots as documented by GPS tracking and guidance flight logs. If any designated area is missed or improperly treated, it must be re-sprayed at the Contractor's expense.

Care must be exercised in keeping all spray material within the designated plot boundaries and away from areas designated as being sensitive and/or where property owners object to the spraying. Care must also be exercised by the spray pilot in keeping spray drift out of open water. Some of the areas adjacent to the treatment areas are residential; therefore, access to the treatment areas will be controlled during time of treatment.

8.5 FERRY FLIGHTS - Ferry flights to and from the job or between loading zones in the project area is provided by the Contractor and is not billed separately to the Forest Service. This airtime must be limited to flights that are essential to job efficiency. Ferry flights must be avoided over sensitive areas.

8.6 SPRAY TIME POLICY – Because of the short spray window available, it is essential that advantage be taken of any acceptable spray weather within the

limits imposed by pilot work-hour limits and safety considerations. Therefore, spraying may take place whenever weather conditions permit.

- 8.7 **AIRPEED** - An exact airspeed for application will be designated by the pilot at the time of calibration verification.
- 8.8 **APPLICATION ALTITUDE** - Spray application shall be released 30-50 feet above the target, except where obstruction in or adjacent to the target would endanger the safety of the pilot while applying pesticides at that altitude.
- 8.9 **TURNS** - The aircraft spray boom must be shut off at the end of spray runs and during the time when a turn is being made. Turns must be avoided over sensitive areas.

SECTION 9. CONTRACTOR PERSONNEL

- 9.1 **PROJECT SUPERVISOR** - The Contractor must designate one of its personnel to serve as the on-site project supervisor and to represent the company in all contractual matters that require prompt attention. This person must be familiar with all equipment being used and, as necessary, must be certified or registered as required by the Arizona Department of Agriculture rules and regulations. A spray pilot or ground-support person may serve as the project supervisor since the project involves the use of no more than one loading zone at any given time.
- 9.2 **GROUND-SUPPORT PERSONNEL** - The Contractor must supply sufficient numbers of properly trained and qualified ground-support personnel to drive all necessary support vehicles; handle herbicides, adjuvants and dyes; operate and maintain the equipment used to transfer herbicides; and properly fuel, service, and maintain each aircraft. All ground-support personnel must be familiar with the aircraft's spray system and knowledgeable of calibration techniques. Providing people with no applicable training or no prior applicable experience is not permitted. All personnel provided by the Contractor must understand and be fluent in English. All ground personnel involved with the handling of glyphosate must be supervised, certified, or registered as required.

All ground-support personnel must be equipped and trained to take proper action in an emergency. These people must observe all safety precautions in handling the herbicide and in refueling the aircraft. The Contractor is required to replace any ground-support person who, in the opinion of the Forest Service, does not demonstrate the knowledge and capability to perform his/her duties.

9.3 PILOTS

- (A) **FAA QUALIFICATIONS** - The Contractor must provide pilots who are FAA qualified to operate the aircraft specified in the bid. Each spray pilot, whether in a primary or backup role, must qualify under FAR Part 137 and written evidence of this qualification must be provided to the Program Manager at the time of application.

- (B) PILOT LIST - The Contractor must provide the Forest Service with a list of all pilots including alternate spray pilots slated for use on the project as designated in Section 3.2.
- (C) PESTICIDE APPLICATOR CERTIFICATION - Each spray pilot must be certified in the appropriate category by the Arizona Department of Agriculture for the type of spraying being done. In the event any pilot does not hold a current applicator license, it must be obtained within 10 days after notification of award of contract.
- (D) GPS - Each pilot must demonstrate proficiency in the operation of the aircraft's GPS guidance system, and/or any other electronic tracking and guidance system required (See Section 10.4.1 d).
- (E) EXPERIENCE - Each spray pilot must meet or exceed the following experience minimums as pilot in command:
- All aircraft 2,000 hours
 - Night flying 10 hours
 - Type (rotary/fixed) to be flown in project..... 200 hours
 - Weight class (category) to be flown on project 100 hours
 - Make, model, and series to be flown on project..... 50 hours
- (F) CONTROLLED SUBSTANCE USE - Any pilot observed by the Forest Service using or in possession of any nonprescription, controlled substance such as, but not limited to, marijuana, hashish, cocaine, heroin, and/or amphetamines shall be immediately dismissed from the project. Such findings will be reported to the appropriate law enforcement agency and the FAA for action.
- (G) ALCOHOL CONSUMPTION - A pilot may not consume alcohol or a nonprescription medication containing alcohol within 8 hours of scheduled flight time. Any pilot observed by the Forest Service consuming alcohol or exhibiting symptoms of alcohol intoxication or impairment or any other intoxication or impairment will not be authorized for flight for 24 hours. A second occurrence will result in dismissal from the project.
- (H) RIGHT TO REJECT - The Forest Service reserves the right to reject the Contractor's use of any pilot who, in the Forest Service's opinion, has performed unsatisfactory in previous operations whether in Arizona or elsewhere. The Forest Service reserves the right to permanently reject any pilot who, in the Forest Service's opinion, violates these Contract Specifications, is unsafe, or otherwise performs unsatisfactorily.
- (I) PILOT RESPONSIBILITY - The spray pilot is responsible for the accurate and proper application of the herbicide spray to the designated site using

good application delivery procedures as generally recognized as correct by professionals in the aerial application industry.

The pilot is responsible for being able to proficiently operate all of the aircraft's electronic equipment including, but not limited to, radios, GPS guidance system.

The pilot is responsible at all times for the safe operation of the aircraft. The Forest Service will not require flying in fog, dense smoke, or any other adverse conditions that a prudent pilot would avoid nor is the pilot required to operate from any site that the pilot considers to be unsafe.

The pilot is responsible for the identification and avoidance of all flight hazards en route to, from, and within the operation area. The pilot must make a reconnaissance flight over each spray plot to identify and locate any such hazards or congregations of people prior to treating the plot.

- (J) **SPRAY PILOT PROTECTIVE GEAR** – The Contractor is responsible for ensuring that all spray pilots wear the following Contractor-provided protective gear:
- Nomex flight suit
 - Nomex gloves
 - FAA-approved helmet with headset and microphone assembly (helmet optional in Categories A and B fixed-wing aircraft)
 - Eight-inch high leather boots
 - 100 percent cotton undergarments and socks

SECTION 10. AIRCRAFT

10.1 GENERAL SPECIFICATIONS AND OPERATIONAL LIMITATIONS

- (A) **AIRCRAFT DESCRIPTION** - The Contractor must complete and submit to the Program Manager (see Section 4) at the time of application a description of each designated spray aircraft slated for use on the contract as specified in Section 3.2.
- (B) **AIRCRAFT SUBSTITUTION** - The Contractor is permitted to substitute designated aircraft with aircraft in the same or larger category one week prior to the start of a project with the Forest Service's approval provided all applicable specifications and insurance requirements for the substituted aircraft are met at the time of substitution.
- (C) **LICENSES** - Every aircraft furnished for this contract must be properly licensed under regulations of the Federal Aviation Administration.

- (D) **CONDITION** - Each aircraft must be clean inside and outside and must fully comply with FAA directives and specifications and to any pertinent laws and regulations of Arizona.
- (E) **SAFETY** - Safety regulations prescribed by the FAA, the manufacturer of the aircraft, the Contractor, and the Forest Service's Aviation Program must be observed at all times. All Contractor-supplied aircraft must contain FAA-approved shoulder harnesses and lap belts for the pilot and front crew/passenger and lap belts for all rear seats. All Contractor-supplied aircraft must be equipped with a transponder with Mode C.
- (F) **EQUIPMENT** - All equipment specified in these Contract Specifications for use in or upon any aircraft must be FAA approved or the Contractor must have an FAA field approval (FAA Form 337) from the FAA Flight Safety District Office serving the Contractor's home base of operations.
- (G) **EXCLUSIVE ASSIGNMENT TO FOREST SERVICE** - Once an aircraft and its assigned pilot, ground-support equipment, and support crew report on site and are under contract to the Forest Service, no substitutions may be made unless the aircraft, equipment, or person becomes incapacitated.

While an aircraft is under contract to the Forest Service, the aircraft and its assigned pilot, ground-support equipment, and crew are not permitted to do any other spraying for any other agency or individual. If a delay of two or more days in the spraying operation is anticipated as determined by the Forest Service, the Contractor may be issued a written temporary release by the Program Manager for any or all aircraft, personnel, or support equipment provided that the Contractor will return on site at the time and date specified with all aircraft, personnel, and support equipment and with the aircraft configured and calibrated according to original specifications and with all spray systems and support equipment properly cleaned.

- (H) **INCAPACITATION** - In the event that any aircraft under contract becomes incapacitated, it must be repaired within 24 hours of the original breakdown. If the aircraft cannot be repaired and returned safely to full operation, it must be replaced with an aircraft of similar capabilities subject to all of the provisions of these Contract Specifications within 48 hours.
- (I) **ENGINES** – The Contractor is responsible for ensuring that each aircraft engine meets FAA specifications and must be in first class operating condition. Engine and airframe logs must be present at time of inspection.
- (J) **AIRCRAFT REFUELING** – Any refueling of the aircraft done while the engine is running and/or the rotor spinning must be done by hose line and nozzle only. Fueling from containers will be permitted only during complete engine shutdown. Proper aircraft/fuel truck bonding procedures

as approved by the National Fire Protection Association must be followed while refueling.

- (K) RESERVE FUEL - A minimum 30-minute reserve fuel supply over the amount needed for the planned round trip is required for each flight.
- (L) LOADING - The pilot is responsible for the proper loading of the aircraft. Loading is under the pilot's direction and must be inspected by the pilot before takeoff. The weight must not exceed the maximum gross weight specified by the aircraft manufacturer. The pilot must compensate for altitude, temperature, landing zone conditions, and any adverse flying conditions.
- (M) VISIBILITY - The aircraft windshield or bubble must be kept clean.

10.2 AIRCRAFT SPRAY SYSTEM

- (A) GENERAL SPECIFICATIONS
 - (1) TANKS – Leak proof, corrosion-resistant tanks with exterior filler openings must be used. The location and size of tanks must be so as to not impair airworthiness by overloading or displacing the center of gravity beyond acceptable limits. Filler openings or necks must be large enough to prevent surging during filling. Tanks must be vented to the outside of the fuselage.
 - (2) EMERGENCY DUMP SYSTEM - Each aircraft must be equipped with an emergency jettisonable load-dumping system or emergency non-leaking dump valves of adequate capacity and adequately vented to dump the load and installed so as to prevent blowback into the fuselage. In no case must the ratio between gallons carried and the surface area of the dump-valve opening as measured in square inches be greater than 7.65 to 1. Exposed valve-control linkage must be protected to prevent unintentional opening of the valve in any manner. The control lever must be substantially mounted in the cockpit within easy reach of the pilot when properly wearing the shoulder harness.
 - (3) PUMPING SYSTEM - The pumping system must be securely attached and capable of maintaining the pressure required to insure even distribution of the herbicide. All plumbing and pumps must be large enough to handle the required flow. All parts, including pump seals, must be chemically and abrasively resistant to the spray material being used.
 - (4) PRESSURE GAUGE - An accurate liquid-filled spray pressure gauge must be located so that the pilot can easily read it.
 - (5) SHUTOFF - To avoid contamination of areas not scheduled for treatment, the entire spray system must be leak proof and have a

positive shutoff mechanism capable of eliminating dripping from the nozzles.

- (6) **SYSTEM CLEANING** - The aircraft spray system, including tanks, must be cleaned of all foreign material and flushed with water prior to the start of the spray operation. The spray system must be flushed following spraying on a daily basis to prevent drying of spray material from becoming a problem. The Contractor must daily clean all screens, check for leaks and clogs, verify pump pressure, and monitor flow rate.

During the spray project the spray system must be flushed with water when a switch of glyphosate concentrations is made.

- (7) **STRAINER** - Each aircraft must be equipped with an in-line strainer (no finer than 30 mesh) to filter all material before it enters the spray boom.
- (8) **SPRAY TIMER** - Each aircraft must be equipped with an electronic flow-metering system, such as a CropHawk®, that is activated automatically when the spray switch is operated.

The system must be capable of providing an accurate measurement of the cumulative spray time in minutes and tenths or minutes and seconds as well as an accurate measurement of the volume of spray material dispensed.

- (9) **BOOM SYSTEM** - Each aircraft must be equipped with an FAA-approved boom system of the type most commonly employed for the delivery system being used. This system must have:
 - (a) Nozzles located so as to minimize or eliminate the spraying of herbicide onto any part of the ship's structure.
 - (b) All nozzles rigidly attached to the boom without flexible dropper hoses.
 - (c) Bleeder lines installed at the ends of the boom feeding back to the outboard nozzle if that nozzle is installed more than five inches from the boom end.
- (10) **PUMP PRESSURE** - The pump must have an effective operating pressure range of 20-50 PSI.
- (11) **APPROVED FIRE EXTINGUISHERS MUST BE AT ALL OPERATION LOCATIONS AND ON BOARD ALL AIRCRAFT.** The type and size of the fire extinguisher supplied should be in sufficient quantity to handle the emergencies associated with this type of operation (minimum of 40 lbs. and of the halon or carbon dioxide type). The Contractor is responsible for ensuring all

company personnel are trained in the correct use of these fire extinguishers

- (B) **NOZZLES** - The nozzle system must be hydraulic and meet the following specifications.
- (1) **TYPE** - Nozzles must be of the Accu-flo type. All nozzles on the aircraft must be of the same type. The type of tip must be approved by the Forest Service's Operational Spray Manager prior to reporting on site for calibration verification.
 - (2) **SIZE** - Tips of the proper sizes must produce acceptable flow rates and be capable of producing an ASAE droplet volume median diameter (VMD) of 500 to 1000 microns for glyphosate application. All nozzle tips being utilized on an aircraft at any given time must be the same size. Tip size must be approved by the Forest Service's Operational Spray Manager prior to reporting on site for calibration verification.
 - (3) **ANGLE** - Nozzles must be oriented straight back.
- (C) **CALIBRATION/CHARACTERIZATION** - The Contractor's spray aircraft must arrive on site properly calibrated for the herbicide and rates of application specified. The Forest Service's Operational Spray Manager will verify the calibration by checking the flow rate of the aircraft prior to the start of the operation. If the calibration is incorrect, the Contractor must correct it immediately without causing any delay in the start of operations.

Calibration verification will be made using water. The flow rate from the spray system will be monitored periodically during the spray operation and must be maintained within 5 percent of the desired flow rate.

Flights over card lines to characterize spray swath and droplet size may be required prior to the start of spray operations for certain aircraft as determined by the Forest Service. Standardized characterization techniques will be utilized, including the use of water sensitive spray cards. There will be no separate additional charge to the Forest Service for flights used in making calibration or characterization checks.

10.3 ELECTRONIC RADIO, GPS, AND TELEPHONE EQUIPMENT

- (A) **EQUIPMENT** – The Contractor must ensure that the spray aircraft is equipped with electronic communications and guidance equipment as described herein. All Contractor-furnished communications and guidance equipment for use in aircraft must be of types currently approved by the FCC and the FAA. The following are required for all spray.
- (1) **VHF COMMUNICATIONS** – The Contractor must equip each spray aircraft with an operating VHF (FAA frequencies) communications system consisting of equipment currently

approved by the FCC and FAA. Channels must include the tower and ground control frequency (including 720 channel) most often used in the Contractor's area of operation while under agreement to the Forest Service.

The receiver for the VHF communications system must not be part of a navigational system.

Each ground-support crew must be equipped with a mobile or portable VHF transmitter/receiver that will permit communication with the spray aircraft.

- (2) FM RADIO - Each spray aircraft must be equipped by the Contractor with a field-programmable, rack-installed or portable FM radio transmitter-receiver (10 watts output with a range of 150.0 MHz to 174.0 MHz), compatible externally mounted antenna designed for aircraft use, and a compatible crash helmet microphone/headset assembly for the pilot and each operating crewmember.
 - (3) SELECTOR SWITCH - Each spray aircraft must be equipped with a three-position selector switch that permits the pilot to simultaneously monitor both the VHF and FM systems in one position, monitor and transmit on the VHF system in another position, and monitor and transmit on the FM system in a third position.
 - (4) GPS - Each spray aircraft must have installed, according to the manufacturer's specifications, a GPS guidance system with digital readout of a type approved by the FAA.
 - (5) TRANSPONDER - Each spray aircraft must have installed, according to the manufacturer's specifications, a Transponder with mode C of a type approved by the FAA.
- (B) INSPECTION - The Contractor is responsible for inspecting all radio and guidance system installations before the spray aircraft is used. Installations and facilities that are substandard electrically or mechanically must not be approved. All radio systems must undergo an air-to-ground check to assure that clear and understandable communications exist. Any radio system that does not perform adequately must be repaired or replaced by the Contractor before spray operations will be permitted to start.
- (C) RADIO PROGRAMMING - The Contractor's pilot(s) must be trained in programming the radio provided and must be capable of programming it in the field.

10.4 NAVIGATIONAL AIDS: All aircraft will be equipped with a working navigation/tracking, differentially corrected, global positioning system (GPS). The pilot must have a working knowledge of the GPS system installed in the aircraft that he will be operation.

10.4.1. Aircraft GPS Specifications: The make of the GPS will be identified in the contract offer. Certain electronic guidance systems may not meet program requirements. Guidance systems that meet the following criteria are acceptable:

10.4.1.a Contractor will provide GPS system with software designed for parallel offset in increments equal to the assigned swath width of the application aircraft. A course deviation indicator (CDI) or a course deviation light bar must be installed on the aircraft and must be located in a position that will allow the pilot to view the indicator with direct or peripheral vision. Differential correction shall be provided by satellite using L-band frequencies or Wide Area Augmentation System (WAAS).

10.4.1.b The guidance system being used will allow the flight log to be downloaded to an on-site computer for post-flight analysis and review. The flight log must show the entire flight of the aircraft from takeoff to landing and differentiate between spray on and spray off when viewed on the computer monitor. The software must have the capability to zoom to any portion of the flight for viewing in greater detail and a method to determine distance between each flight lane. The system must be able to calculate and show total acres treated during the flight. The software must be compatible with color printers and differentiate between spray on and spray off on the printed copy.

10.4.1.c The GPS (e.g., *Satloc* or *AgNav*) proposed must have been operated successfully in a similar aerial application program and have demonstrated success for the last 12 months prior to this project. If necessary, the Contractor should be able to provide the name and phone number of previous clients or other users of the system who can validate the GPS capabilities.

10.4.1.d Pilot proficiency or evidence of prior experience with the proposed GPS system must be demonstrated to the soliciting agency at time of application. To demonstrate proficiency, the Contractor must provide a copy of data (printed map and original electronic format) downloaded from GPS proposed for use which was (1) conducted in the same type aircraft proposed for the use on this project, (2) flown in similar topography and aircraft altitude (generally below 200 feet AGL), and (3) collected within the last 12 months. The printed map must display the spray plot

boundary, the flight path of the aircraft and clearly differentiate between spray on and spray off.

- 10.4.1.e If at any time the GPS is not working properly, the pilot must report this to the Program Manager. If the GPS is not working properly during application, the pilot must return immediately to the airport.

10.4.2 Electronic Guidance and Support Furnished by the Contractor

- 10.4.2.a All guidance equipment, materials, computers, printers, personnel, and services required for the system. The guidance equipment shall be capable of accurately guiding the aircraft, while flying at application altitude, along parallel flight lines equal to the assigned swath width of the application aircraft, in plots designated by the Forest Service. The system shall be sufficiently sensitive to provide immediate deviation indications and sufficiently accurate to keep the aircraft on the desired flight path. The guidance system shall be capable of updating current position at a minimum rate of five (5) times per second.

- 10.4.2.b During operation, differentially corrected signal must be accurately recorded at least 95% of the operational time.

- 10.4.2.c Post-flight processing computer and software capable of displaying track, altitude and groundspeed of aircraft during flight, with differentiation between standard flight and flight when the application system is on. Export file format must be compatible with Arc View/ArcInfo GIS systems and must be on a standard USB flash drive or PCMCIA card or other mutually acceptable data storage medium.

10.4.3 Salient characteristics required for the GPS system. The equipment offered must possess the following features:

- 10.4.3.a Precision GPS guidance with pilot-selected cross-track error readout adjustable down to one (1) foot.
- 10.4.3.b Easy to operate, user-friendly pilot's control keypad, with swath advance and decrement function.
- 10.4.3.c Visual display monitor: (1) capable of displaying swath width over flight path; (2) mounted in the aircraft in a location that will allow the pilot to view the screen with direct or peripheral vision without looking down; (3) shall display in real time or be available for in-flight access immediately after application has ceased.
- 10.4.3.d Shall have variable swath width entry.

- 10.4.3.e. A feature that alerts pilot as to when he/she is about to enter or exit a specific treatment plot.

SECTION 11. GROUND-SUPPORT EQUIPMENT

- 11.1 INSPECTION** - In order to execute the Contract, the Contractor must supply the Forest Service with specifics on the ground-support equipment the Contractor will provide as specified in Section 3.2. The Contractor is not permitted to substitute ground-support equipment one week prior to the start of the project. Any substitutions after that date must be with ground-support equipment of similar or greater capability.
- 11.2 ACCESSORY EQUIPMENT** - All accessory equipment, including any vehicles necessary for transporting the herbicide from storage or from one operational site to another, is the responsibility of the Contractor. Accessory equipment supplied by the Contractor includes, but is not limited to, trucks, herbicide storage and/or mixing tanks (equipped for agitation and recirculation), pumps, hoses, metering devices, and similar equipment necessary for handling the herbicide and loading the spray aircraft. The Contractor must also supply readily accessible and properly sized and coded fire extinguishers at each loading zone.
- 11.3 EQUIPMENT CLEANING** - All equipment which comes in direct contact with the herbicide must be kept thoroughly clean and free of residues and foreign particulate matter.
- 11.4 FIELD TRUCKS**
- (A) **LIGHT-DUTY TRUCK** - The Contractor must supply a vehicle for each ground crew to use for transporting personnel; moving herbicide, adjuvant, and dye; running for parts; and similar duties. If the Contractor-provided nurse truck is unsuitable for conducting these errands in an expeditious manner, the Contractor must provide a pickup truck or other acceptable vehicle. Forest Service-owned vehicles may not be used for these purposes.
- (B) **NURSE TRUCKS** - A truck equipped for mixing and/or transporting herbicide is required for each working spray aircraft. Truck and trailer combinations are acceptable if they meet all requirements of the Arizona Dept. of Transportation, do not exceed local road and bridge weight limits, and do not present maneuverability problems at the designated field worksites. Each independently working spray aircraft must have sufficient ground-support equipment and personnel to adequately service it without causing any production delays.

All trucks transporting aircraft fuel or other hazardous materials must be placarded and supplied with shipping papers as required by Hazardous Materials (HAZMAT) regulations of the US Department of Transportation.

11.5 FUEL TRUCKS – When aviation fuel must be transported.

- (A) Fuel trucks shall be properly maintained, clean and reliable. Tanks, pumping, filters, and other required equipment shall be free of rust, dirt, and other contaminants.
- (B) The Fuel Truck(s) manufacturer's gross vehicle weights (GVW) shall not be exceeded. Barrels are not acceptable fuel containers.
- (C) The filtering system shall be equipped with a differential pressure monitoring system or fueling systems with which the pump produces more than 25 psi. Spare filters, fuses, seals, and other components on the fuel truck filtering system shall be stored in a clean, dry area. A minimum of one set is required.
- (D) All tanks shall be securely fastened to the truck bed and shall have a sump or sediment settling area of adequate capacity to provide uncontaminated fuel to the filter.
- (E) All hoses shall be properly secured and safeguarded when not in use. Only hoses designated for dispensing of fuel will be used. Hoses must be at least 50 feet in length. Fuel nozzle shall include a 100 mesh or finer screen, a dust protective device and a bonding clip or plug.
- (F) Fuel Truck(s) shall have tow bonding and ground cables, one to attach to a ground stake and one to attach to the aircraft.
- (G) Markings: "NO SMOKING" signs with three-inch minimum letters visible for both sides and rear of the truck. Each fuel-servicing vehicle shall be conspicuously and legibly marked to indicate the nature of the fuel. Fuel truck(s) must be placarded in accordance with 49 CFR 172.

11.6 TANKS

- (A) GENERAL - All tanks used to transport herbicide must be leak proof and corrosion resistant. Filler openings and air vents must be adequate to prevent surging during filling. All tanks must be equipped with properly fitting covers or hatch plates that must be kept closed except when filling or circulating to reduce the change of contamination with foreign materials.
- (B) CLEANING - All tanks must be thoroughly cleaned and free of rust, residues, and particulate matter, such as grit and sand.

11.7 PUMPS

- (A) WATER PUMP - Each truck used to transport water must be equipped with a pump capable of drafting water a vertical distance of at least ten feet. The truck must be equipped with a non-collapsing suction hose, an anti-siphon device or check valve, a coarse screen, and a bucket. The configuration must be such that water being taken into the truck can be

metered if needed, and it must pass through a strainer no coarser than 50 mesh.

- (B) CIRCULATION PUMP - The pump used for circulation and loading must produce a sufficient flow rate to fill the aircraft it supplies in a maximum of ten minutes without producing high pressures.
- (C) PUMP SEALS - All pump seals must be chemically and abrasively resistant to the spray material being used.
- (D) PROHIBITED PUMPS - No high-pressure piston pumps or hand pumps are permitted.

11.8 METERS

- (A) GENERAL - The herbicide-handling system must be designed to accurately meter water and herbicide concentrate. If the system or herbicide storage system is designed such that air could be sucked into the lines and cause erroneous meter readings, the meter must be equipped with an air eliminator.

A strainer no finer than 30 mesh must be installed in line to screen the solution prior to entering the meter.

The meter must be capable of safely handling the flow rate necessary for loading the aircraft.

Meters with lighted digital displays must be shaded so that they are not difficult to see in direct full sunlight.

- (B) CALIBRATION - The Contractor should have all metering devices inspected and calibrated prior to the start of the spraying operation. All meters used to measure the volume of herbicide at any time during the operation must be capable of being calibrated using the herbicide formulation used on the project or the meter must be calibrated and certified as capable of accurately measuring various materials, each with a different viscosity without being recalibrated for each material.

APPENDIX A

Contractor's Submittal Sheet

Pre-Award

Information to be submitted to the Forest Service's Program Manager at time of application:

1. Report on proposed personnel and equipment to be designated for the project (Section 3.2).
2. Written evidence of qualification by each designated spray pilot under FAR 137 (Section 9.3.A).
3. A description of each spray aircraft slated for use on the contract (Section 10.1.A).
4. Evidence of pilot proficiency with GPS including copy of data (printed map and electronic format) downloaded from GPS proposed for use (Section 10.4.1.d).

Post-Award

Information to be submitted to the Forest Service's Program Manager after award of contract:

1. Pesticide Application Business License and any other pertinent certifications – 10 days after notification of Award (Section 5.2).
2. FAA waiver for congested areas – two weeks prior to start of project (Section 5.5).
3. Location of loading zones or airfields – two weeks prior to start of project (Section 5.7).
4. Substitution of designated aircraft (if applicable) – one week prior to start of the project (Section 10.1.B).

D

BUFFELGRASS CONTROL RESEARCH PROJECT BACKGROUND INFORMATION

7/28/09

Why care about buffelgrass?

Across southern Arizona, an invasive non-native plant has introduced a new fire risk and threatens to irrevocably alter our Sonoran desert. Buffelgrass, (*Pennisetum ciliare*) is a fire prone and shrubby grass introduced from the African savannah. Buffelgrass grows in dense stands that can crowd out native plants, and creates a fire regime in the desert that never existed before. This potentially leads to devastating fires that can convert the ecologically rich Sonoran desert into a more monotypic exotic grassland environment.

Buffelgrass spreads aggressively by seed and establishes itself readily in areas that have been disturbed. Once established in the disturbed areas the invasive grass can then move into native desert habitats on hillsides and along drainages. Buffelgrass stands can burn at over 1,400 degrees and are almost three times hotter than fires generated by flammable native vegetation. Buffelgrass fires are highly detrimental to cacti and native trees and can eliminate them from the landscape. The fires don't significantly impact the buffelgrass stands which can come back more vigorously than before the fire

Over the past five years, the buffelgrass invasion in the Southwest has been the subject of considerable outreach, extensive media coverage and nearly-unanimous consensus over the need to aggressively control this invader grass. Despite the best efforts of a growing group of volunteers, and a growing public investment, control activities have not kept pace with buffelgrass spread. Because this spread is almost exponential- populations of this grass and the costs of controlling it may be doubling every year- time is of the essence and requires working collaboratively and decisively to implement effective control programs.

Where do I learn more about the buffelgrass invasion?

A multi agency/organization web site has been established to help communicate about buffelgrass as an issue and is a source of information on the ongoing control efforts. Go to www.Buffelgrass.org. Other sources are available and you can contact or stop by Pima County Natural Resources Parks and Recreation for a copy of the brochure Buffelgrass- Wanted Dead and Gone.

How did this research project get started?

In February of 2009, an Interagency Workshop was held in Tucson that brought together scientists, environmental organization representatives and resource land managers from around the country to discuss current trends, research findings and control methods for invasive plants. Buffelgrass was a target species of many conference speakers. Out of that meeting a working group of representatives of local agencies, jurisdictions and national experts began to explore shared needs for definitive data on the use of aerial spraying in rugged Sonoran desert situations.

Who is conducting the proposed spraying research project

The project has been a joint cooperative project of scientists and staff of Pima County, USDA Forest Service, National Park Service, University of Arizona, Bureau of Land Management and

the City of Tucson. The actual research plots are located primarily on rugged slopes of Tucson Mountain Park where there are already significant existing stands of buffelgrass. The project will be monitored for several years to measure impacts on buffelgrass and native vegetation.

Why was Tucson Mountain Park selected for the study?

The Tucson Mountain Park locations were selected for:

- Accessible but rugged terrain close to town
- Extended distances from residences during spray test
- Existing dense stands of buffelgrass on hard to reach rugged slopes
- Local support for ongoing buffelgrass control efforts in the park since the early 2000s
- Helped in providing an in-kind no-cost contribution from Pima County as a partner in the research project
- City of Tucson cooperation providing access to one physical land study plot in immediate proximity to the Tucson Mountain Park plots

How much of the park will be impacted by the study?

Tucson Mountain Park is just over 22,000 acres in size. The twelve study plots will cover less than 10 acres in the park.

Why spray at all? Why not get volunteers and employees to pull it up?

This test was specifically designed to look at the safety, effectiveness and cost efficiency of utilizing aerial spraying technology in remote and rugged terrain applications in the Sonoran desert. Unfortunately, buffelgrass continues to expand its distribution and density in natural habitats all around the Tucson basin. The extensive efforts of all the volunteers and limited agency staff working on buffelgrass control have not been able to impact the expansion of the buffelgrass invasion in the rugged foothills and mountains that ring Tucson. Mountainous terrain is a dangerous work environment for most volunteers and even trained crews have major barriers to working in the rugged environments due to the time necessary hiking in and out, the need for onsite water for spray projects, the need to pack tools into remote area and other logistical concerns. The cost per acre of buffelgrass control efforts on sites in the county with steep terrain can easily exceed the cost for more accessible sites with flat terrain by a factor of ten and in the thousands of dollars.

In the Catalina Mountains and Rincon Mountains, the expansion of dense buffelgrass fire ladders up the mountain from the previously fire resistant desert ecosystem is of major concern. Labor intensive mechanical control or hand pulling methods will not work on the scale and terrain in this situation. In many areas, the patches of dense fire prone buffelgrass have been seen to double in size in good weather years.

What herbicide will be used in the study?

The active ingredient of the herbicide will be glyphosate. There are over thirty commercial formulations of glyphosate available for use. We will be using an EPA approved formulation of Roundup PROMAX. This herbicide has been routinely used to hand spray or truck mounted spray buffelgrass by agencies, jurisdictions and individuals for years. The herbicide was developed in the 1970's and is readily available as an off-the-shelf product in most garden centers or nurseries.

Is Glyphosate safe?

Glyphosate was specifically selected because it is an effective herbicide and has been proven safe when applied correctly according to guidelines approved by the manufacturer and EPA. One primary reference that was used to establish product safety parameters and guide application considerations was the body of research referenced in the report Glyphosate-Human Health and Ecological Risk Assessment prepared for the USDA, Forest Service in 2003. The link to that report can be found at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>.

For humans, the greatest risk from glyphosate comes as a result of improper and extended handling of the material at high levels of direct exposure. The herbicide is very poorly absorbed across the skin. There is no scientific basis to assert that glyphosate is likely to pose a substantial carcinogenic risk. As noted in the Forest Service's risk assessment, "For members of the general public, none of the longer-term exposure scenarios exceed or even approach a level of concern."

How much herbicide will be applied during the test?

We anticipate that the final volume for all twelve plots will be approximately 100 gallons. Two application levels will be used in the test, five gallons per acre or ten gallons per acre. These levels are significantly below any manufacturer guideline maximum application per acre per year.

What impact do you expect the test will have on native vegetation and wildlife?

The study plots that will be sprayed are already badly infested with dense stands of buffelgrass that have crowded out native plants. We expect that the one time application of the herbicide will kill all actively growing buffelgrass and possibly impact native grasses, weeds or flowers. We do not expect any long-term impact to the larger shrubs, trees and cacti based on other activities where spray was applied on all plants; however, this is one question we hope to answer by monitoring the test plots over the next several years.

The herbicide is designed to work by inhibiting synthesis of aromatic amino acids in plants and this metabolic pathway does not occur in humans or other animals. The Forest Service's risk assessment generally supports the US EPA conclusions that "Based on current data, it has been determined that effects to birds, mammals, fish and invertebrates are minimal." A recent study done for the City of Tucson as part of its Habitat Conservation Plan, Wildlife Research Report # 2007-07, concluded that there is no apparent glyphosate affect on burrowing owls in the Avra Valley where glyphosate is routinely applied.

Will the spray damage plants that have not emerged yet?

Glyphosate is not a pre emergent herbicide. It does not affect seeds in the ground. Native plants that sprout immediately after the treatment should not be affected. It will also not impact underground rhizomes or rootstock of perennial plants.

This also means that the buffelgrass seed in the ground will sprout under the right conditions requiring future treatments to fully control it. Current research indicates the potential viability of any buffelgrass seed to be at 3-5 years. Fortunately, following effective treatments the next generation of buffelgrass is far smaller in numbers and generally density

thereby allowing native plants a chance to reestablish themselves as well. Additional buffelgrass treatments of the study plots will not occur during the monitoring phase of the project.

How long will the herbicide stay active?

Glyphosate was chosen because it has a short active life span and degrades quickly. In our test environment, we expect the glyphosate spray to dry upon surfaces within minutes of application and become relatively immobile. Once the spray comes in contact with a plant it immediately goes to work inhibiting its growth. Because the spray is poorly absorbed through the skin of animals, potential effects are further minimized. Before an animal can ingest enough treated plant material to raise any contact toxicity concerns the material will have been degraded even further. The material applied is strongly absorbed to soil and will not runoff into drainages and water systems even if rains occurs within several hours of application. The herbicide is relatively non-persistent and does not stay residually within the soil.

How will you control potential spray drift?

Two major strategies are being used to reduce potential drift concerns. First, the helicopter used to deliver the spray will be utilizing GPS computer driven technology to precisely deliver the spray within the boundaries of the plots. Each plot has been GPS mapped and the geographical reference points will be used by the onboard computer to turn spray delivery on and off. A special boom designed to deliver precise droplet size that does not produce fine mist spray will be used to deliver the spray from no more than 30-50 feet above the ground and at ground winds of less than 5 mph.

Second, the herbicide spray will be delivered in a very coarse (large) droplet size and will not be a mist spray more commonly seen in agricultural applications with fixed wing aircraft. The droplet size is very large and will fall straight down based on previous application experience elsewhere and actual modeling of drift potential. At a slow forward movement or hover, a helicopter actually generates a down draft where spray can be delivered before it might be scattered by vortices around the edges of the rotor wash.

Will any special safety precautions be put in place for the public and/or test staff?

A number of procedures and precautions have been planned into the project. Local residences that are close to the test area will be notified of the test and what is going on. No residence is within 600 feet of a test plot which is a distance that negates any concern based on potential overspray modeling and previous observations by science team members.

Safety is a primary concern in any operation that includes aircraft, ground crews and herbicide applications. A safety plan has been developed and will be reviewed by all participants during any operations. Aircraft safety has been provided for and project monitors will be in place to stop operations if any concerns are raised.

Temporary closures of any hiking trails in the immediate vicinity of test plots will occur in Tucson Mountain Park where secondary exposure might occur during the recommended restricted entry interval of four hours.

Ground staff will be briefed and monitored to stay well away from plots during active spray operations and precautions for necessary personal hygiene will be observed during and after the test operations.

What is this project costing and specifically, Pima County?

A specific project cost was never developed because of the multi-agency approach to the project and because most of the cooperators are utilizing funds from their current annual operating budgets for invasive species. The project has been developed to minimize direct costs as much as possible and rely on in-kind support from the partners.

Pima County is not providing any direct dollars to the project. All of the county contribution is in the form of in-kind manpower, technical support and access to the buffelgrass infested plots for the study. Several county agencies have been involved in the project planning with Natural Resources, Parks and Recreation having the lead responsibility.

For additional information contact:

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GLYPHOSATE INFORMATION

July 30, 2009

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Glyphosate is the active ingredient in RoundUp an herbicide developed, patented and marketed by Monsanto Corporation in 1972. The patent on RoundUp has expired and many products are made by many manufacturers and no longer made exclusively by Monsanto. Glyphosate has undergone extensive testing over the years - because of its widespread use and popularity, this is one of the most heavily tested of any currently available registered pesticides by groups all over the environmental safety spectrum.

It is a non-selective (kills whatever broad-leafed and grasses it comes in contact), translocated (moves from the foliage down into the roots) and a contact (kills on contact) herbicide. It is very effective in the control of hard to eradicate weeds such as Johnsongrass, Buffelgrass and Bermudagrass. When applied to rapidly growing weeds, the glyphosate will kill the target plant in 10-14 days. Once the product hits the ground it is broken down by soil microbes. When used responsibly and according to label directions, it is a relatively benign product that breaks down in the soil rapidly with no long term harmful effects.

The LD₅₀ of glyphosate is 4900mg/kg, meaning that 50% of a test population is killed at this level. . It can cause skin and eye irritation. For comparison, the LD₅₀ of aspirin is 1750mg/kg making aspirin more than double the toxicity of glyphosate. The bottom line is that the infrequent use of RoundUp by homeowners, applied only **according to label directions**, poses very little threat to the environment or to themselves, their family or their pets.