Environmental Assessment for Non-native Plant Control and Re-establishment of Riparian Habitats Along the Rio Grande River on U.S. International Boundary and Water Commission and Bureau of Land Management Lands

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Prepared for: United States Section International Boundary and Water Commission & Bureau of Land Management

Prepared by: United States Fish and Wildlife Service, San Andres National Wildlife Refuge

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ACRONYMS AND ABBREVIATION

ac - acre
BA – Biological Assessment
BLM – Bureau of Land Management
BMP – Best Management Practices
cfs – cubic feet per second
cfu – colony forming unit
cm - centimeters
CWA – Clean Water Act
DR – Decision Record
EA – Environmental Assessment
EC – Electrical Conductivity
EIS – Environmental Impact Statement
EPA – Environmental Protection Agency
ESA – Endangered Species Act
ft – feet
in -inches
m – meters
mph – miles per hour
NEPA – National Environmental Policy Act
NMDOT – New Mexico Department of Transportation
NMISC – New Mexico Interstate Stream Commission
NMSP – New Mexico State Parks
NTU – Nephelometric Turbidity Units
OHM – Ordinary High Water Mark
PCE – Primary Constituent Element
PM – Particulate Matter
ppm – parts per million
RMP – Resource Management Plan
SHPO – State Historic Preservation Office
SWFL – Southwestern Willow Flycatcher
TDS – Total Dissolved Solids
USFWS – United States Fish and Wildlife Service
USIBWC – United States Section, International Boundary and Water Commission

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1.0 INTRODUCTION

This Environmental Assessment (EA) describes and evaluates the proposed federal actions to be implemented by the United States Fish and Wildlife Service (USFWS), San Andres National Wildlife Refuge (herein referred to as the "Refuge") on behalf of the United States Section, International Boundary and Water Commission, (USIBWC) and Bureau of Land Management (BLM) for the purpose of improving and restoring riparian habitats on two tracts within the Rio Grande floodplain. The project sites are federal property owned by USIBWC and BLM (Figure 1). This EA outlines actions to be taken based on the best information available at this time. It is assumed that as conditions on the river change, new information is available, or wildlife management priorities change, project designs and implementation schedules would be amended. Funds from USIBWC task order IBM11W0020 for Riparian Restoration Phase I – Pilot Project Implementation and Interagency Agreement, between BLM and USFWS would finance this project and federal land ownership constitutes the federal nexus. USFWS is the lead agency for this project and will be responsible for implementation and overall coordination of the project. This EA is being prepared by the USFWS for the IBWC and BLM. The Decision Record (DR) will be signed by each agency and will serve as the required NEPA analysis and decision for implementation of the proposed work on lands administered by each respective agency.

The proposed action would seek to improve and restore riparian habitats through treating and removing exotic vegetation and restoring native vegetation; including but not limited to, Goodding's willow (*Salix gooddingii*), Cottonwood (*Populus deltoides* ssp), Coyote willow (*Salix exiqua*), Alkali sacaton (*Sporobolus airoides*), pale wolfberry (*Lycium pallidum*), four-wing saltbush (*Atriplex canescens*), screwbean mesquite (*Prosopis pubescens*), arrow-weed (*Pluchea sericea*), three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), apache plume (*Fallugia paradoxa*), desert willow (*Chilopsis linearis*), and inland saltgrass (*Distichlis spicata*).

The project would also monitor the outcomes, and based on that monitoring, continuing follow-up treatments of non-native vegetation as needed. This site-specific project is based on a larger scale project for which conceptual planning has already been completed by USIBWC, titled *Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande – Caballo Dam to American Dam, New Mexico and Texas.*

The project as described is a continuation of previous work on the nearby New Mexico State Parks (NMSP) property, Broad Canyon Ranch, which included mechanical extraction of exotic saltcedar and establishment of native vegetation to provide riparian habitat for associated wildlife species. Due to its proximity to an active restoration site, this project provides the opportunity to increase continuity of native riparian habitats as well as broaden the floodplain/upland interface.

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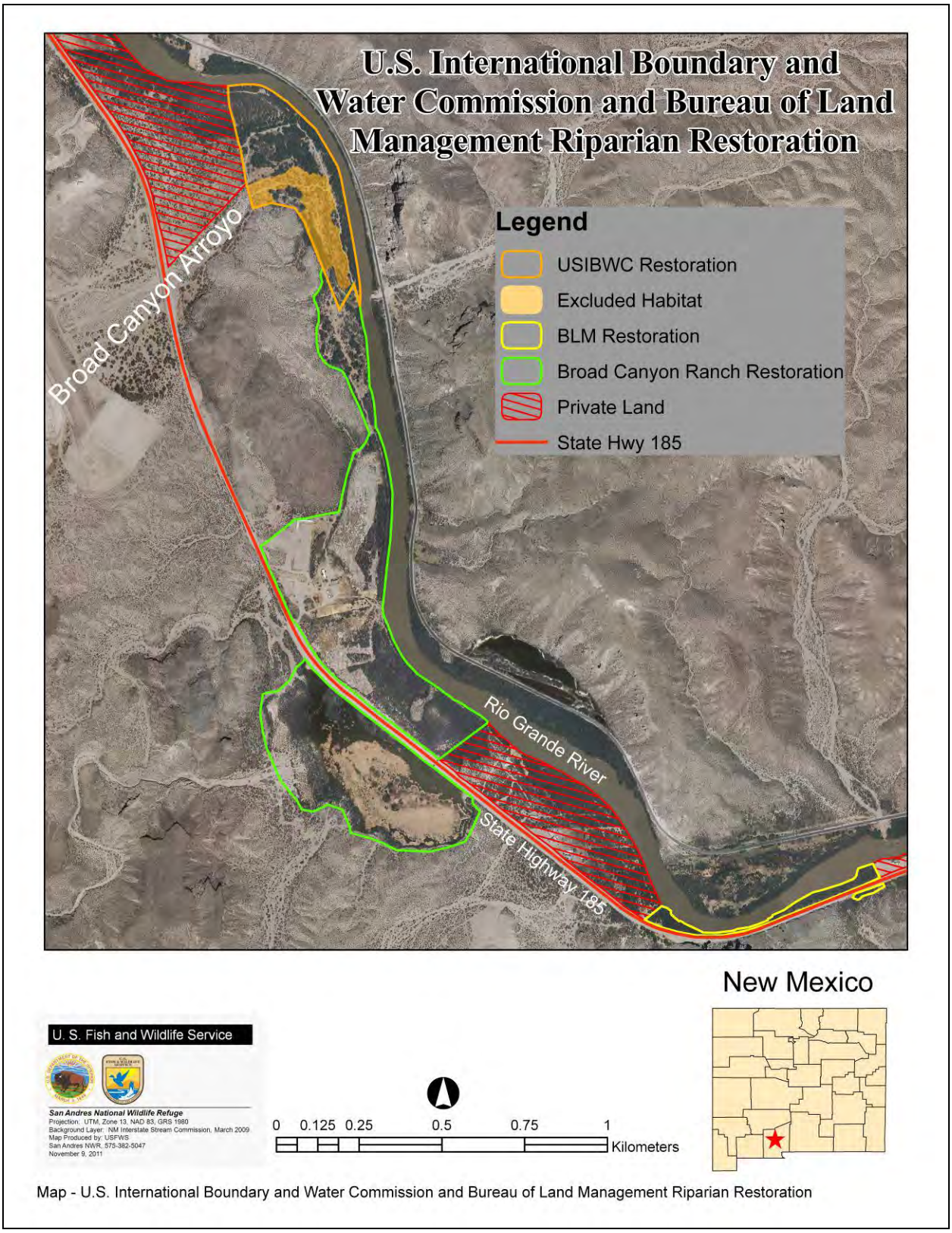

Figure 1. Map of USIBWC and BLM proposed restoration Sites.

1.1 Purpose and Need for Action

Need

Today wetland and riparian habitat occupy less than 1% of New Mexico's arid landscape, but sustain a disproportionately large number of New Mexico's wildlife including 80% of all sensitive vertebrate species at some stage in their life cycle (NMDGF 2006: 219-20). Over the last century, 90 percent of riparian ecosystems statewide and 87 percent of wetland acreage along the Rio Grande have been lost (NMDGF 2006: 218, 223). The Rio Grande reach below Elephant Butte and Caballo reservoirs has experienced the greatest impacts to its geomorphology, hydrology and biology of the entire New Mexico portion of the Rio Grande (Fullerton and Batts 2003: 30). In some cases, habitats have been lost to urbanization, and in other cases, they have been degraded by any or all of the following factors: fragmentation; invasion of nonnative vegetation; livestock impacts; lowering of water tables and subsequent changes in soil characteristics; other local and landscape scale factors. Remedying this lack of suitable habitat is the single most important factor in ensuring the long-term persistence of associated wildlife.

Periodic flooding events on the Rio Grande encouraged river meandering and dynamic changes in vegetative communities (Szaro 1989, Crawford et al. 1993). The dynamic nature of the floodplain changed irreversibly through the 20th century with major irrigation and flood control developments on the Rio Grande. The construction of reservoirs, conveyance canals and drains altered the annual river hydrograph (Bullard and Wells 1992) and resulted in the loss of wetland and meadow habitats (Hink and Ohmart 1984). Changes in river flow management curtailed the regeneration of native woody plants which historically released seed coinciding with late spring flooding events. Non-native invasive species, Saltcedar (*Tamarix chinensis*) introduced during this same time period, flourished and currently occur in large areas of the Rio Grande floodplain (SOBTF 2004, BOR 2002).

Saltcedar is one of the most invasive, natural community altering, shrub-trees in the southwestern United States. Estimates of the saltcedar invasion in the southwest include over 1,482,632 acres of riparian habitats dominated by this species. In New Mexico, saltcedar is a dominate plant along the Rio Grande, Pecos and Canadian Rivers and is particularly troublesome from the middle reaches of these rivers to the Gulf of Mexico. Saltcedar is an aggressive competitor, often growing in near monoculture stands, and is suspected of lowering water tables, thus destroying wetlands and wildlife habitats.

Each saltcedar produces 500,000 wind dispersed seeds per year. Once established, saltcedar acts as a facultative halophyte, tolerating salt concentrations up to 15,000 ppm, and secreting salt at 41,000 ppm which is deposited on the soil surface. In addition to increased soil salinity, saltcedar increases fire frequency within the riparian habitats it dominates. The high levels of dead leaves and branches produced by the fast growing plant provide ample fuels for wildfires. After the fires, saltcedar sprouts vigorously, while native riparian trees and shrubs generally do not. As a result both increased soil salinity and fire frequency is a riparian community, dominated by saltcedar. Along with the invasive adaptations saltcedar possesses, human alteration of hydrologic regimes (i.e., dams) along streams and rivers has reduced the natural flood processes that willows and cottonwoods thrive under, giving saltcedar one more advantage.

This proposed project would be part of a regional initiative to restore the form and function of the Rio Grande floodplain that has been undertaken by other Federal, State, and non government organizations. The overarching goals of the project are to improve the ecosystem integrity within the project area by shifting conditions to match those that historically existed.

This project will focus on restoring 31.35 acres divided between two tracts of federal lands (25.85 ac USIBWC and 5.5 ac BLM) from saltcedar to native riparian habitats by utilizing validated mechanical and chemical control methods to remove and control saltcedar (Figure 1).

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Purpose

The purposes of this project are:

1. To help ensure the long-term persistence of riparian habitats and associated species by:
   a. Removing and controlling invasive exotic saltcedar through validated mechanical and chemical methods.
   b. Restoring native plant species through either encouraged natural recruitment or plantings. Based on the abiotic conditions of the site, it may be possible to support the following species including, but not limited to; Goodding's willow (*Salix gooddingii*), Cottonwood (*Populus deltoides* ssp), Coyote willow (*Salix exiqua*), Alkali sacaton (*Sporobolus airoides*), pale wolfberry (*Lycium pallidum*), four-wing saltbush (*Atriplex canescens*), screwbean mesquite (*Prosopis pubescens*), arrow-weed (*Pluchea sericea*), three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), apache plume (*Fallugia paradoxa*), desert willow (*Chilopsis linearis*), and inland saltgrass (*Distichlis spicata*).

Anticipated Environmental Benefits

The project is expected to result in the following benefits:

- Restoration of native vegetation communities that would provide quality wildlife habitat;
  - Restoration of the currently degraded areas would contribute to regional habitat diversity and integrity, and provide additional habitat for wetland obligate or facultative species that reside in or migrate through the area.

- Removal of exotic saltcedar that will:
  - Reduce wildfire risk in the project vicinity thus protecting nearby vegetation and habitat, and reducing the risk of private property damage, and impacts associated with fire suppression.

1.2 Project Background

1.2.1 Location

The proposed project would be implemented on two tracts of land consisting of approximately 31.35 acres (ac) in Doña Ana County, New Mexico. The tracts are located on the western side of the Rio Grande and are approximately 15 miles south of Hatch, New Mexico and approximately 5 miles north of Radium Springs, New Mexico on County Highway 185. Lands immediately adjacent are owned by NMSP and private entities (Figure 1).

1.2.2 Project Proponents

The proposed project would be carried out collaboratively by:

- USIBWC, landowner, is providing project funding for 25.85 ac through task order IBM11W0020 ,
- BLM, landowner, is providing funding for the 5.5 acre parcel of public lands through an Interagency Agreement.
- USFWS, San Andres National Wildlife Refuge, which will be the lead agency implementing the restoration actions.

The relationships of the proposed action to identified Fish & Wildlife Service goals include the preservation of natural diversity and abundance of fauna and flora on refuge lands as outlined in goals for the National Wildlife Refuge System (2 RM 1.4); and pest control guidelines including the justification of control when the pest organism is detrimental to primary refuge goals (7 RM 14.1). More recently, the Fish and Wildlife Service has outlined an "Ecosystem Approach to Fish and Wildlife Conservation" in which specific ecosystem actions include focusing management on natural communities of plants and animals and maintaining naturally occurring structural and genetic diversity within ecosystems located on public and private lands.

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1.2.3 Regulatory Compliance

This Environmental Assessment (EA) was prepared by the USFWS, San Andres National Wildlife Refuge in close coordination with the project proponents and in compliance with all applicable Federal statutes, regulations, and Executive Orders, including the following:

- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq.*)
- Clean Water Act of 1972, (CWA)as amended (33 U.S.C. 1251 *et seq.*)
- Endangered Species Act of 1973, (ESA) as amended (16 U.S.C. 1531 *et seq.*)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, 1994.
- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 *et seq.*)
- Floodplain Management (Executive Order 11988)
- National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*)
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq.*)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq.*)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq.*)
- Protection and Enhancement of the Cultural Environment (Executive Order 11593)
- Protection of Wetlands (Executive Order 11990)
- National Pollutant Discharge Elimination System, as amended (33 U.S.C. 1251 *et seq.*)

This EA is a standalone analysis and does not rely on or tier from any previous NEPA analyses although actions are consistent with the USIBWC 2009 Record of Decision for the long-term management of the Rio Grande Canalization Flood Control Project. It reflects compliance with all applicable State of New Mexico and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources. The proposed action on the BLM parcel is consistent with both the BLM Las Cruces District Mimbres Resource Management Plan (RMP) and tiered to the Vegetation Treatments Using Herbicide in 17 Western States Environmental Impact Statement (EIS) (2007).

A separate Biological Assessment (BA) is being prepared for these proposed actions on the 25.85 acre USIBWC parcel in compliance with the Endangered Species Act (ESA) and is incorporated by reference (USIBWC, 2011).

This BA will aid in ESA compliance for the BLM parcel as it evaluates the point bar directly across the Rio Grande River. Further consultation with USFWS Ecological Services will be conducted for this site.

2.0 PROPOSED ACTION AND ALTERNATIVE

There are two alternatives described and analyzed in this EA. Alternative 1 is the No Action Alternative, which is based on maintaining all current conditions and management actions in their current state. Alternative 2 is the proposed Action Alternative which would carry out restoration activities on the project sites.

2.1 Alternative 1. No Action

The No Action Alternative would provide no Federal funding for restoration efforts at these locations. Under this scenario, very limited to no actions would occur, nonnative vegetation control and restoration planting would not occur.

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2.2 Alternative 2. Proposed Action

The project consists of four general phases, although activities in any one phase may overlap those of other phases:

1. Pre-project implementation activities – site visits, project proponents meetings, mapping, on-site information gathering, and environmental compliance.
2. Control of nonnative vegetation – this is a key phase in that it would lay the critical foundation for the restoration activities in phase 3. Treatment to control nonnative vegetation is detailed in section 2.2.4, these treatments where chosen to ensure the greatest possible success. For more information refer to *New Mexico Options for Non-native Phreatophyte Control*. This document provides detailed descriptions and photographs of the techniques that may be used in various combinations for vegetation control.
3. Restoration of native vegetation – Once nonnative vegetation is removed and controlled, active restoration of native plants would occur. Native plants selected for planting will be dependent on the abiotic conditions found on the sites.
4. Monitoring and follow-up activities – Methods would be followed and evaluated for success, and based on these monitoring results, continuing follow-up treatments of non-native vegetation would be implemented as needed to maintain the value of the restored habitat areas.

The project activities are summarized below in section 2.2.4 Sections 2.2.5 and 2.2.6 contain impact avoidance and minimization measures, and conservation measures, respectively. These measures are an integral part of the project design.

2.2.1 Project Timeline

The project covers a total of 2 federal fiscal years, beginning October 1, 2011, ending September 30, 2013, and is dependent on available funding for completion.

Project year 1 = October 1, 2011 – September 30, 2012
Project year 2 = October 1, 2012 – September 30, 2013

After this two year timeframe, if found necessary some actions including saltcedar control and native plantings may extend for a number of years beyond September 30, 2013 on an "as needed" basis and as funding become available.

2.2.2 Project Tracts

This restoration project will focus on two tracts of federally owned land totaling 31.35 acres, both tracts are located within the floodplain and upland interface on the west side of the Rio Grande. Tract 1 (25.85 ac) is owned by USIBWC and bordered by private lands to the North and West, State lands to the South, and the Rio Grande channel to the East. Tract 2 (5.5 ac), owned by BLM, is bordered by private land to the North and South, Rio Grande channel to the East, and State Highway 185 to the West (Figure 1).

Tract boundaries were defined using the following:

- Photo interpretation of 2009 New Mexico Interstate Stream Commission (NMISC) digital ortho photography.
- Digital versions of the public land survey system and surface land ownership developed by the New Mexico office of the BLM.
- On-site boundary markers will be placed along federal and private lands boarders by certified land surveyors to ensure private lands is not encroached upon.
- And USIBWC EOF File 1031, Rio Grande Canalization Project Right of Way

All acreages in this document were calculated with ERSI Inc., ArcGIS 9.2 software. All acreages are approximate. Boundaries will be clearly and continually marked by certified surveyors before on-site activities begin.

2.2.3 Restoration Objectives

The restoration objectives would seek to improve and restore riparian habitats through treating and removing exotic vegetation and restoring native vegetation. Due to its proximity to an active restoration site, this project provides the opportunity to increase continuity of native riparian habitats as well as broaden the floodplain/upland interface. The restoration potential for each project area is based on the information related to abiotic site characteristics available at this time.

2.2.4 Detailed Project Activities, Methods, and Timelines

The project is divided into three phases, each of which is detailed below in sequential order.

Pre-project

This phase is composed of site visits, project proponents meetings, mapping, on-site information gathering, and environmental compliance.

Mechanical Extraction

If possible, depending on site conditions, large root masses will be extracted utilizing a tracked excavator with a thumb attachment to extract and pile saltcedar for prescribed burning. Care will be taken by an experienced operator to remove as much of the root crown and lateral roots as possible and to reduce damage to existing native plants. A tracked skid steer with a brush rake attachment will be used to rake and pile slash as well as smooth divots or ruts back to the original grade. Typically, mechanical extraction methods will only be utilized within the first year, with foliar, basil, or cut stump herbicide follow up treatments in subsequent years as noted in the herbicide follow-up treatments section below.

Herbicide Follow-up Treatment

Herbicide application will be done by or under the direct supervision of an experienced, State certified and licensed herbicide applicator as well as someone who is knowledgeable of native and exotic plant species. Foliar, basil, and or cut stump herbicide treatments with Garlon 4 Ultra (Habitat herbicide (aquatic label) in wet conditions) will be used on saltcedar resprouts. This treatment will occur for at least two subsequent years and will continue on an as needed basis with available funding.

Prescribed Pile Burning

Saltcedar biomass will be piled with an excavator. With their current live status, it is recommended leaving the piles in place for a period of time until fuel moisture is significantly reduced. Upon allowing sufficient drying time, San Andres National Wildlife Refuge will coordinate with the USFWS New Mexico Fire District to prepare all plans and regulatory compliance documentation as well as mobilize resources to implement burning under prescription.

Soil Delineation

Before proceeding with pole planting, native tree and shrub species, it is important to understand soil characteristics and variability within a given area. Soil texture and salinity are two of the most important factors when determining placement of selected plant species. Therefore, the stratigraphy of the soil profile should be examined in order to proceed with informed decisions related to placement of pole plantings. A skid steer with an auger attachment will be utilized to examine the texture (field classification, ribbon method) of the soil profile from the surface to the seasonal low ground water table. A refractometer will be used to measure salinity to parts per thousand within the groundwater table. It is unknown how many bore holes will be needed to assess soils across the site and is dependent on the variability as well as targeted pole planting density and patch size. If necessary, it may be found useful to

excavate soil pits to gain a better understanding of the profile. Any soil disturbances will be smoothed back to its original grade. Existing studies will be utilized to update site specific soil characteristics and delineations.

Native Plantings
After assessing the soil stratigraphy, groundwater salinity, depth to groundwater, topography and saltcedar resprouts, adequate information will have been generated to proceed with native plantings.

Based on the abiotic conditions of the site, it may be possible to support the following species including, but not limited to; Goodding's willow (*Salix gooddingii*), Cottonwood (*Populus deltoides* ssp), Coyote willow (*Salix exiqua*), Alkali sacaton (*Sporobolus airoides*), pale wolfberry (*Lycium pallidum*), four-wing saltbush (*Atriplex canescens*), screwbean mesquite (*Prosopis pubescens*), arrow-weed (*Pluchea sericea*), three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), apache plume (*Fallugia paradoxa*), desert willow (*Chilopsis linearis*), and inland saltgrass (*Distichlis spicata*).

For the USIBWC site, preliminary scoping to understand possible planting locations for cottonwood/willow is currently underway by utilizing, an order 2 soil survey conducted by Caplan and Landers (2008) (see section 3.7 for more soils information) and Doña Ana County's 2010 Light Detection And Ranging (LIDAR) data (see section 3.3) as way to assess topography and its relationship to depth to groundwater. For more information related to topography see section 3.3 and for soils section 3.7.

Table 1. Estimated Schedule of Project Activities

Action	Estimated Schedule
Planning and Environmental Compliance	May 2011 – September 2011
Mechanical Extraction	October 2011 – February 2012
Prescribed Pile Burning**	December 2011 – April 2012
Herbicide Follow-up Treatment*	June 2012 – February 2013
Soil Delineation*	January 2013 – February 2013
Native Plantings *	February 2013 – September 2013

*This activity may extend past the estimated schedule to be conducted on an "as needed" basis and funding availability.
** This activity may extend past the estimated schedule depending on fuel moisture and weather conditions.

2.2.5 Impact Avoidance and Minimization Measures

General Activities

- Equipment access to the work site will be done using existing roads to the extent possible.
- No vehicles may be parked on public roads at any time to ensure roadways are open for emergency vehicles and law enforcement.
- Any gates on the property will be locked or otherwise secured.
- Outside areas of planned nonnative vegetation treatment, disturbance will be minimized and native vegetation will not be disturbed.
- Power or high-pressure clean all equipment of all mud, dirt, and plants immediately prior to moving onto and out of the project area. No soil spoil that could potentially contain noxious weed seeds shall be transported out of the area where it is created.

Procedures for Toxic Materials including Herbicides, and Spills

- The project will adhere to the Refuge's spill prevention and response plan that regulates the use of hazardous and toxic materials, including petroleum-based vehicle fuels, lubricants for equipment, and herbicides. The plan will include the following provisions, at a minimum:
  - Workers will be trained in advance to monitor for spills, avoid spills, and correctly manage spills.

- A list of emergency phone numbers and contact people will be readily available to workers at all times.
- Emergency spill control kits appropriate for the types of chemicals utilized in the project will be kept readily available to workers at all times.
- Vehicle and equipment maintenance areas will be located to avoid spillage of oil, fuel and other hazardous materials into waterways or wetlands. These areas shall be located at least 100 ft (30 m) away from the river channel, wetlands or other water sources.
- Supplies of toxic materials will not be stored on site.
- No lubricants or other fluids may be drained from vehicles on site.
- All spills will be cleaned up immediately and appropriate agencies will be notified of any spills, as required, and of the clean-up procedures employed.
- Vehicles that are discovered to be leaking will be immediately removed from the work area.

Herbicide-specific

- All products will be stored, mixed, applied and disposed of in compliance with material safety data sheets and label instructions (see appendices A &B).
- Herbicides will not be applied during windy conditions exceeding 15 mph or when rain is forecast within 3 days.
- Spray equipment will be properly maintained and calibrated to insure accurate application according to manufacturer's and label instructions.
- For all application methods, no treatment with a non-aquatic label herbicide will be made within 30 ft (6 m) of water to avoid the possibility of spray drift.

Soil and Water

- To the extent possible project activities will be conducted during the dry season.
- Removal of native vegetation will be minimized.
- All activities will be conducted in a way that minimize sediment and herbicide runoff input to river, streams, ponds, arroyos, or any other water source.
- Ash from prescribed burns will be graded and stabilized to minimize erosion of sediment into the river, arroyos, or any other water source.

Use of Heavy and Light Equipment, Access Roads, etc., for Nonnative Vegetation Treatment

- Equipment selected for use will in all cases be the lightest weight, low ground pressure, tracked, or have the least possible impact on soil compaction.
- Access routes appropriate for equipment, weather conditions, and site conditions will be designated by project proponents in advance.

Air Quality and Dust Control

- All activities will be prohibited when winds exceed 30 mph.
- Vehicle speed on unpaved roads will not exceed 15 mph.

Noise

- Work within 1000 ft (300 m) of residences or other noise sensitive uses or areas shall be restricted to daytime hours.
- No actions shall be performed within 1000 ft (300 m) of an occupied dwelling on Sundays, legal holidays, or between 7 pm and 7 am on all other days.
- All equipment shall have sound-control devices that are at least as effective as those devices provided on the original equipment.

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Vegetation Removal and Replacement

- Areas of desirable native vegetation will be delineated as areas not to be disturbed or as areas of limited activity.
- Where extraction of saltcedar or other trees results in depressions or holes backfilling to original grade will be completed.
- Extracted trees and slash material will be piled in locations away from waterways and native vegetation. To the extent possible slash piles will be separated by a minimum distance of 100 ft (30 m) of bare ground, no larger than 20 ft (6 m) in diameter and 10 ft (3 m) in height.

Repairs to Damaged Roadways

- The USFWS shall repair any damage to the existing roadways caused as a result of activities for this project.
- Repair work shall be coordinated with the agencies having jurisdiction over each roadway, with the intent to return the roadway to the conditions existing immediately prior to the commencement of the project.

Prevention of Human-caused Fire

- No smoking will be allowed on the site.
- All equipment will have approved spark arrestors and other such devices to protect against accidental fire ignitions.
- All equipment will be outfitted with the appropriate sized fire extinguishers.
- During Regional Preparedness Levels 3 and above a small firefighting unit (+/- 125 gallons with pump) will be available to prevent the spread of any accidental ignitions.
- Upon project completion the sites may not have high concentrations of logs, piled brush, or woody debris that will add increased fuel loading to the cleared site.

Invasive Species Prevention and Control

- Once the initial non-native plant removal activities have been completed, the activity areas will be monitored for the presence of nonnative weedy species. Any nonnative species found will be immediately be evaluated and addressed with appropriate approved control measures.

2.2.6 Conservation Measures

The following conservation measures to avoid adverse effects to listed species and their critical habitats are required.

1. The action area will be analyzed by species experts for:
   a. all listed species' suitable habitat;
   b. critical habitat for the Southwestern Willow Flycatcher (SWFL);
   c. and the nearest documented SWFL territories.
2. If suitable habitat is present, service-approved survey protocols will be conducted.
3. If any SWFL territories are present, a 0.25–mile buffer will be established around each territory. Project activity will be excluded from the buffer. Mechanical vegetation management will be conducted outside of the SWFL breeding season, which extends from April 15 through August 15 of each year, to avoid potential effects from human disturbance such as noise.
4. If a bald eagle (*Haliaeetus leucocephalus)* is present within 0.25 mile upstream or downstream of the riparian work zone on the morning before project activity starts, or following breaks in project activity, the project proponents will suspend all activity until the bird leaves of its own volition, or a project biologist in consultation with the Service determines that the potential for harassment is minimal. If an eagle enters the project zone during work activity, the activity can continue.
5. Project activity, specifically vegetation management, within designated critical habitat for the SWFL will adhere to guidance in the Southwestern Willow Flycatcher Recovery Plan (U.S Fish and Wildlife Service, 2002a), Middle Rio Grande Ecosystem: Bosque Biological Management Plan (Crawford et

al, 1993) , Middle Rio Grande Endangered Species Act Collaborative Program: Habitat Restoration Plan for the Middle Rio Grande (Tetra Tech, Inc., 2004b) and Strategy for Long-term Management of Exotic Trees in Riparian Areas for New Mexico's Five River System , 2005-2014 (Parker et al, 2005) This will ensure that only insignificant and discountable effects will occur to the Primary Constituent Elements (PCEs) of SWFL critical habitat. There will be no permanent loss of critical habitat, only short-term modification to PCEs. No work will be authorized until Section 7 consultation with USFWS Ecological Services is completed.

2.3 Alternatives Considered But Not Analyzed in Detail

No other alternative actions were considered.

3.0 AFFECTED ENVIRONMENT

Information in this EA is focused on aspects of the ecosystem that relate to the proposed project and does not include general background information on the Rio Grande, bosque ecosystems, cultural and historic resources in these areas, etc. For overviews on the Rio Grande ecosystem see the following documents: *New Mexico Options for Non-Native Phreatophyte Control* (Saltcedar Coalition, 2005), *A Guide for Planning Riparian Treatments in New Mexico* (USDA, 2007), *Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande – Caballo Dam to American Dam, New Mexico and Texas* (U.S. Army Corps of Engineers, 2009), Draft Biological Assessment: Integrated Land Management for Long-Term River Management of the Rio Grande Canalization Flood Control Project (USIBWC, 2011), Final Environmental Impact Statement: River Management Alternatives for the Rio Grande Canalization Project (USIBWC, 2004)

3.1 Setting

The proposed project would be implemented on two tracts consisting of approximately 31.35 acres in Doña Ana County, New Mexico. The tracts are located on the western side of the Rio Grande and are approximately 15 miles south of Hatch, New Mexico and approximately 5 miles north of the Radium Springs, New Mexico on County Highway 185. Both tracts are located within the floodplain and upland interface on the west side of the Rio Grande. Tract 1 (25.85 ac) is owned by USIBWC and bordered by private lands to the North and West, New Mexico State Park to the South, and the Rio Grande channel to the East. Tract 2 (5.5 ac), owned by BLM, is bordered by private land to the North and South, Rio Grande channel to the East, and State Highway 185 to the West (Figure 1).

3.2 Land Use

Currently both sites are open to the public for river access. Little is known about the land use history on the USIBWC tract. Historical aerial photography from as early as 1935 through the 80's and 90's shows no evidence of substantial human use of the site. There is no farming or grazing leases on this property or on the adjacent properties. The 5.5 acre BLM site is very narrow with State Highway 185 and the Rio Grande River bordering the East and West sides. Little is known about the land use of the property before BLM acquired the property, today it acts as a river access for fishing.

3.3 Topography and Climate

Topography

The USIBWC site's topography is related to its position on the landscape and natural processes that have historically taken place there as this site lies on a portion of an alluvial fan that was created by the Broad Canyon Arroyo. These alluvial fans are typical at the interface where upland drainages, or arroyos, are intercepted by the Rio Grande River. According to Doña Ana County's 2010 LIDAR data there is a 17.4 feet difference in elevations from the highest point to the lowest point with elevations ranging from 3,984.7 to 4002.1 feet MSL. The Broad Canyon Arroyo sediment control dam was constructed in 1969 by the Soil Conservation Service (now, Natural Resource Conservation Service) under the Public Law 566

program. Much of the area topography has been altered as a result of this project including two levees which were placed on-site to direct water toward the southern end of the property (Figure 2).

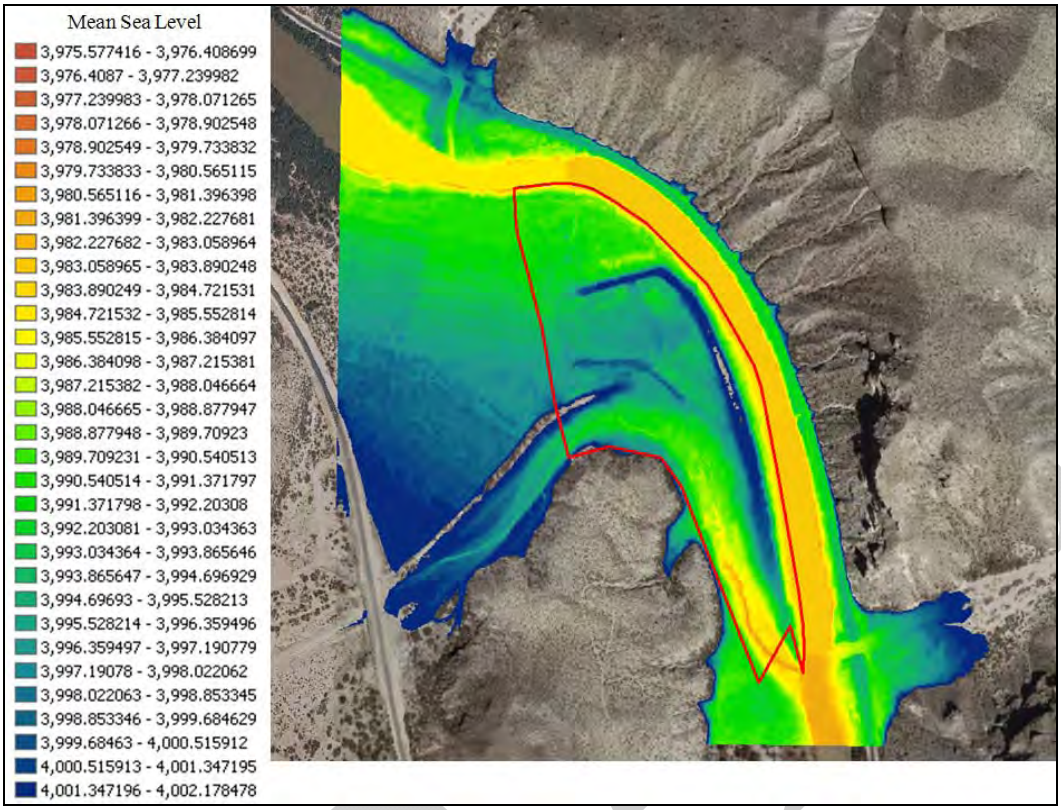

Figure 2. Doña Ana County Flood Commission LIDAR data displaying a bare ground digital elevation model.

The 5.5 acre BLM parcel is narrow and bordered by State Highway 185 and the Rio Grande River on the West and East sides, respectively. The majority of the site has a relatively flat topography with the exception of the tapering slope that was created when the highway was constructed.

Climate

Doña Ana County's climate is generally mild and semiarid, averaging 350 days of clear weather annually. Annual precipitation averages 8.5 inches of rainfall and 3 inches of snowfall. Prevailing winds are generally southwesterly. Windstorms are common during the late winter and throughout the spring months. Temperatures in the summer months routinely reach the high 90's, with nighttime lows in the 60's. The fall is cooler with daytime highs of mid 70's to low 80's. In the winter months daytime temperatures range from the upper 50's to lower 60's. As spring arrives in March and April, temperatures climb steadily from the low to high 80's.

3.4 Air Quality

Doña Ana County is within New Mexico Environment Department, Air Quality Bureau Air Quality Control Region 153. In recent years, Doña Ana County has not met the federal ambient air quality standards for PM10. These high levels of PM10 are largely due to dust storms throughout the area. While much of the dust in the Doña Ana County area is caused by natural events such as high wind speeds and ambient dry conditions, man-made dust sources are on the increase near major municipalities as the County becomes more populated and development increases.

3.5 Noise

Ambient noise in the area is low, limited to vehicles passing on State Highway 185, and an occasional train passing down the tracks on the East side of the river.

3.6 Water Resources

The east side of the project sites is bordered by the high water mark of the Rio Grande River channel and so the river channel is not included within the area of project activities. However, the immediate proximity of the channel and river necessitate consideration of this area for potential impacts and therefore baseline condition information is included below.

3.6.1 Water Quality

The New Mexico Environment Department has established water quality standards for river reaches throughout New Mexico, including the reach in which the proposed action is located. The following New Mexico Water Quality Control Commission Standards, as amended through April 2006, are for the reach between the international boundary with Mexico upstream to one mile below Percha dam (20.6.4.101, Rio Grande Basin):

Water Quality Standards
A. **Designated Used**:
Irrigation, marginal warm water aquatic life, livestock watering, wildlife habitat, and secondary contact.
B. **Criteria**:
(1) In any single: pH: within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.
(2) The monthly geometric meaning of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL (see Subsection B of 20.6.4.14 NMAC).
(3) At mean monthly flows above 350 cfs, the monthly average concentration for: TDS 2,000 mg/L or less, sulfate 500 mg/L or less and chlorides 400 mg/L or less.
C. **Remarks**:
Sustained flow in the Rio Grande below Caballo reservoir is dependent on release from Caballo reservoir during the irrigation season; at other times of the year, there may be little or no flow. [20.6.4.101 NMAC – Rp 20 NMAC 6.1.2101, 10-12-00; A, 12-15-01; A, 05-23-05]

<u>Irrigation</u>
Application of water to land areas to supply the water needs of beneficial plants.

<u>Marginal warm water aquatic life</u>
In reference to an aquatic life use means natural intermittent or low flow or other natural habitat conditions severely limit the ability of the surface water of the state to sustain a natural aquatic life population on a continuous annual basis; or historical data indicate that natural water temperature routinely exceeds 32.2°C (90°F).

<u>Livestock watering</u>
The use of a surface water of the state as a supply of water for consumption by livestock.

<u>Wildlife habitat</u>
A surface water of the state used by plants and animals not considered as pathogens, vectors for pathogens or intermediate hosts for pathogens for humans or domesticated livestock and plants.

<u>Secondary contact</u>

Any recreational or other water use in which human contact with the water may occur and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading, commercial and recreational boating and any limited seasonal contact.

General criteria related to this Project

A. Bottom Deposits and Suspended or Settleable Solids:

(1) Surface waters of the state shall be free of water contaminants including fine sediment particles (less than two millimeters in diameter), precipitates or organic or inorganic solids from other than natural causes that have settled to form layers on or fill the interstices of the natural or dominant substrate in quantities that damage or impair the normal growth, function or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.

(2) Suspended or settleable solids from other than natural causes shall not be present in surface waters of the state in quantities that damage or impair the normal growth, function or reproduction of aquatic life or adversely affect other designated uses

J. Turbidity:

Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water. Activities or discharges shall not cause turbidity to increase more than 10 NTU over background turbidity when the background turbidity, measured at a point immediately upstream of the activity, is 50 NTU or less, nor to increase more than 20 percent when the background turbidity is more than 50 NTU. However, limited-duration turbidity increases caused by dredging, construction or other similar activities may be allowed provided all practicable turbidity control techniques have been applied and all appropriate permits, certifications and approvals have been obtained.

K. Total Dissolved Solids (TDS):

TDS attributable to other than natural causes shall not damage or impair the normal growth, function or reproduction of animal, plant or aquatic life. TDS shall be measured by either the "calculation method" (sum of constituents) or the filterable residue method. Approved test procedures for these determinations are set forth in 20.6.4.14 NMAC.

3.6.2 Hydrology

From Caballo Dam to Mesilla Diversion Dam this reach of the Rio Grande represents the upper portion of the IBWC's Canalization Project, which consisted of channel maintenance by dredging and levee construction. Records indicate past alterations had been conducted along this reach prior to USIBWC's Canalization Project. Channel width typically ranges from 200-300 feet, levees to the east, and uplands or levees to the west constrict the current floodplain to a width of 600-1200 feet. No levees have been constructed within the southern portion of the reach through the Selden Canyon. The channel is heavily engineered, with constructed curves and tangents, and conveyance channels for agricultural irrigation. The three major diversions within this reach including Percha, Leasburg, Mesilla diversion dams. The gradient is similar to upstream reaches with a 4 foot drop in elevation each river mile.

Inflow is limited on this reach of the Rio Grande, all tributaries are considered ephemeral, due to the narrowness of the watershed many upland areas adjacent to the floodplain are considered closed basins and drain internally. Flows decrease downstream due to the small contributing watershed, the ephemeral tributaries, large amount of water diversion, and natural losses. Though, uncontrolled tributaries can still deliver short duration of large volume during monsoonal thunderstorms, there are several tributaries where flood control structures have been conducted reducing these inputs. (Fullerton and Batts 2003)

3.6.3 Net Depletion Analysis

The Rio Grande Compact limits the amount of surface water that can be depleted (utilized for all purposes) annually in the Middle Rio Grande based on the flow of the river as measured at the Otowi Gage near Los Alamos (Rio Grande Compact, 1939). In addition, the New Mexico State Engineer has determined that the Rio Grande is fully appropriated. As a result, any increase in water use by one user must be offset by a reduction by another use or user, so that senior water rights and New Mexico's ability to meet its downstream delivery obligations are not impaired. Therefore, the New Mexico State Water Plan (Office of the State Engineer/Interstate Stream Commission, 2003) requires that habitat restoration projects do not result in increased net water depletion, or that any increases are offset by purchased or leased water rights.

3.6.4 Wetlands and Floodplains

After multiple field visits by USFWS staff to the 25.85 acre USIBWC site only one area on the southwestern border showed to have significant wetland characteristics. This wetland (back water area) was not created naturally, it was constructed as a drainage ditch to convey drain water that collects behind the Broad Canyon sediment retention dam. Water from the Rio Grande now backs up into this channel creating wetland conditions. This area will not be disturbed due to its avian species use and compliance with the Endangered Species Act (ESA) (Figure 1). The Rio Grande River borders this site and a small volume of hydrophilic plant species does exist along the Ordinary High Water mark (OHM). Care will be taken not to disturb on or below the OHM, any saltcedar growing at the OHM will not be extracted mechanically, a stump cut treatment will be employed.

The remainder of the site appeared to be higher in elevation, drier, and no hydrophilic vegetation. The topography was also assessed by using LIDAR data to understand depth to groundwater. Although some areas are lower in elevation than others we believe these areas do not have reasonable sub-connection to support hydrophilic vegetation.

The BLM parcel does not appear to have significant wetland characteristics, the Rio Grande River borders this site and a small volume of hydrophilic plant species does exist along the Ordinary High Water mark. Care will be taken not to disturb on or below the OHM, any saltcedar growing at the OHM will not be extracted mechanically, a stump cut treatment will be employed.

3.7 Soils

An order 2 soil survey was conducted on the USIBWC site by Parametrix and Soil and Water West, Inc. in August. A total of 8 soil cores were taken with a hand auger to a depth of 60 inches or until the water table was reached. Soil characteristics were recorded including horizon symbol, depth of each layer, soil color, texture, consistence, reaction, boundary, mottling, and presence of free ground water. Samples where then bags and sent for laboratory analysis to assess pH, electrical conductivity, sodium content, calcium, magnesium, sodium absorption ratio, and saturation percent.

A combination of soils were found on this site including; Anthony fine sandy loam, Gila very find sandy loam, Gila Variant loam, Torriorthents, and Vinton Variant clay. Electrical conductivity (EC) ranged from 36.3 to 2.4 dS/m throughout this site, sample #31 showed to have the lowest EC at 2.4 dS/m within the 0-12 inch strata. Sample #30 showed to have the greatest EC within the 14-30 inch strata at 36.3 dS/m (Figure 3, Table 2). As outlined in section 2.2.4, due to the coarse scale of this survey further soil investigating will occur prior to planting on this site.

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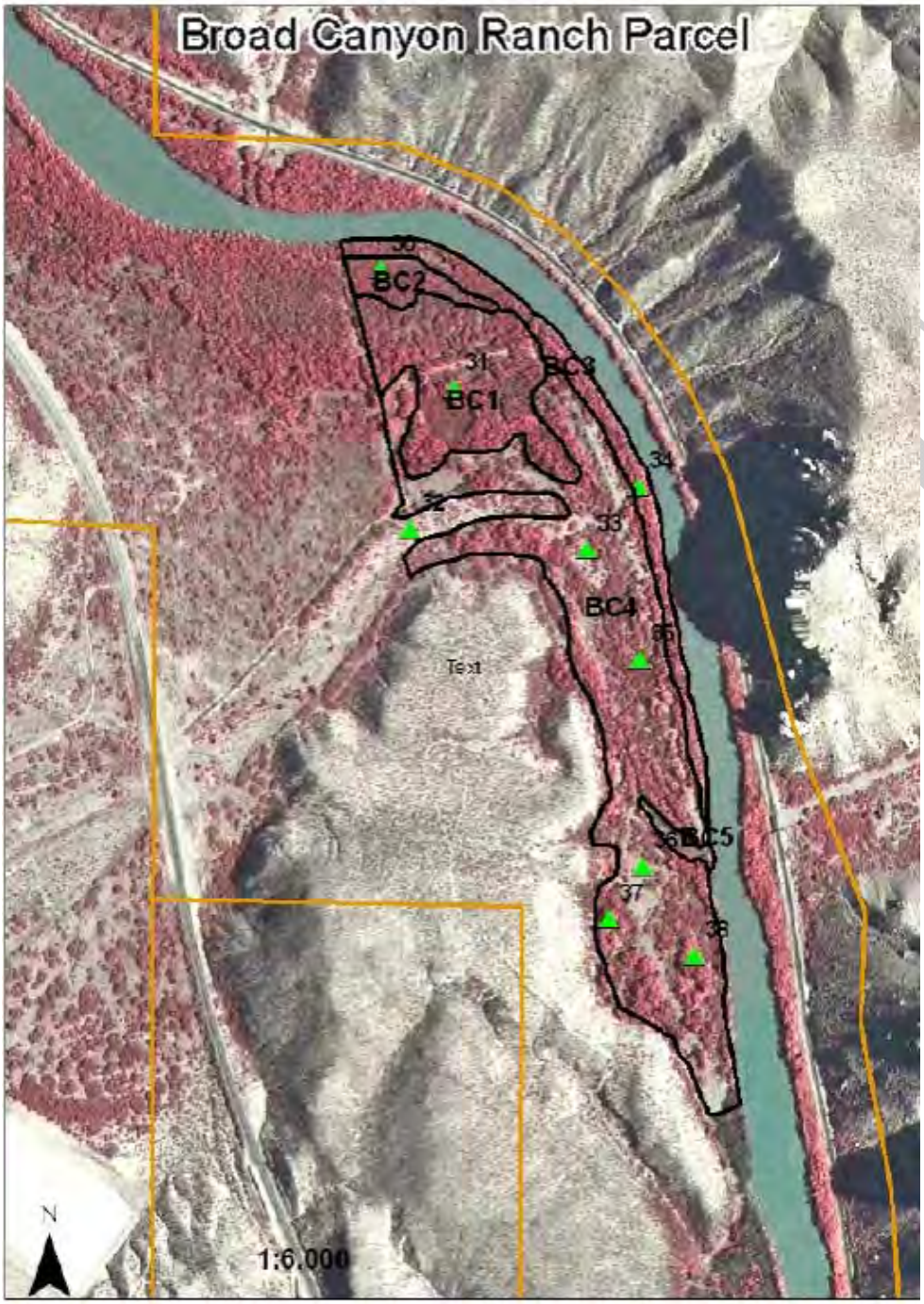

Figure 3. Order 2 soil survey conducted by by Parametrix and Soil and Water West, Inc. in August 2008

Table 2 Laboratory results from order 2 soil survey conducted by Parametrix and Soil and Water West, Inc. in August 2008

			Saturation Paste Extract		
Site Number	Depth (Inches)	pH (Paste)	ECe (dS/m)	SAR	Saturation Percent
30-1	0 to 14	7.7	24.9	9.4	54.4
30-2	14 to 30	7.7	36.3	11.8	32.7
31-1	0 to 12	8.1	2.4	1.3	86.8
34-1	0 to 4	7.8	3.8	13.2	57.2
34-2	4 to 12	8.1	5.6	6.0	66.0
34-3	12 to 26	7.6	14.5	15.7	46.6
36-1	0 to 10	7.9	10.4	6.3	113.4
36-2	10 to 24	7.7	8.8	9.7	28.1

3.8 Biological Resources

Biodiversity has been greatly impacted by the saltcedar that has occupied these areas. Exotic species often compete for resources utilized by native species and in many cases disrupt ecological cycles. Ecologists are well aware of the problems caused by the invasion of exotic species into natural areas and some consider this to be the greatest single threat to biodiversity globally because of their rapid spread and potential dominance in native plant communities. Native riparian habitats of the Southwest support some of the richest faunas in North America (Ohmart et al. 1988, Farley et al. 1994). Several studies have attempted to quantify specific habitat values based on vegetative species composition and growth form, but have found difficulties in locating homogeneous habitat blocks large enough for valid comparisons (Ellis et al. 1994, Thompson et al. 1994). Riparian habitats tend to be linear and faunal use can be influenced by edge habitats (Hink and Ohmart 1984). It is well documented however, that native riparian stands with rich canopy structures and abundant decadent trees which support nesting cavities harbor greater avian species diversities and abundances than saltcedar monocultures with little foliage diversity (Anderson and Ohmart 1982, Anderson and Ohmart 1984, Sedgwick and Knopf 1986, Ohmart et al. 1988, Busch et al. 1992).

3.8.1 Vegetation Communities and Nonnative Species

A vegetation map produced by Caplan and Landers (2008) shows saltcedar to be the dominate plant species on the 25.85 acre USIBWC site with honey mesquite occupying the remainder (Figure 4).

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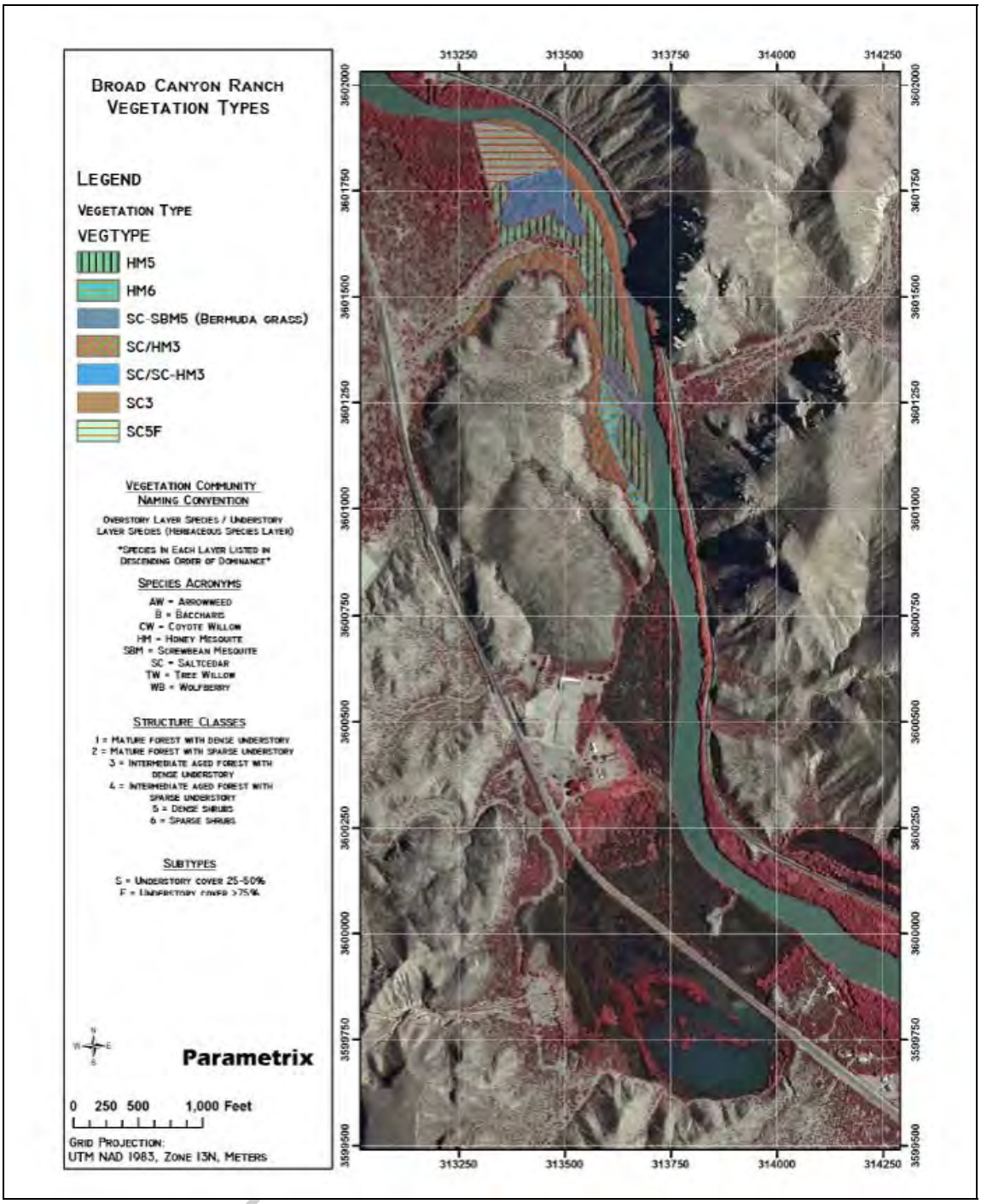

Figure 4. Vegetation mapping conducted by Parametrix and Soil and Water West, Inc in August 2008

The 5.5 acre BLM parcel is currently occupied by a mixture of saltcedar and native plants including but not limited to coyote willow, three leaf sumac, alkali sacaton, and pale wolfberry. Care will be taken on this site to disturb these plants as little as possible.

3.8.2 Wildlife and Fish

There has been limited opportunity for staff to visit these sites at a reasonable frequency to capture species response throughout an annual cycle. To date an extensive avian species occurrence list has been generated documenting 181 species by Mesilla Valley Audubon Society for an ongoing restoration site (Broad Canyon Ranch) that is directly adjacent to the USIBWC site and approximately 800 meters (2624 feet) from the BLM site. Many other wildlife species frequently found within the vicinity including but not limited to raccoon, fox, bobcat, mule deer, javelina, ring-tailed cat, skunk, coyote, as well as various reptile and invertebrate species.

Table 3. Complete avian species list for Broad Canyon Ranch compiled by Mesilla Valley Audobon Society.

Canada Goose	Western Sandpiper	Chihuahuan Raven	Green-tailed Towhee
Wood Duck	Least Sandpiper	N. Rough-winged Swallow	Spotted Towhee
Gadwall	Long-billed Dowitcher	Tree Swallow	Canyon Towhee
American Wigeon	Wilson's Snipe	Violet-green Swallow	Rufous-crowned Sparrow
Mallard	Ring-billed Gull	Bank Swallow	Cassin's Sparrow
Blue-winged Teal	Rock Pigeon	Barn Swallow	Chipping Sparrow
Cinnamon Teal	Eurasian Collared-Dove	Cliff Swallow	Brewer's Sparrow
Northern Shoveler	White-winged Dove	Cave Swallow	Black-chinned Sparrow
Northern Pintail	Mourning Dove	Verdin	Vesper Sparrow
Green-winged Teal	Inca Dove	Bushtit	Lark Sparrow
Hooded Merganser	Yellow-billed Cuckoo	Cactus Wren	Black-throated Sparrow
Common Merganser	Greater Roadrunner	Rock Wren	Sage Sparrow
Ruddy Duck	Great Horned Owl	Canyon Wren	Lark Bunting
Scaled Quail	Lesser Nighthawk	Bewick's Wren	Savannah Sparrow
Gambel's Quail	Common Nighthawk	House Wren	Song Sparrow
Pied-billed Grebe	Common Poorwill	Winter Wren	Lincoln's Sparrow
Double-crested Cormorant	White-throated Swift	Marsh Wren	Swamp Sparrow
American White Pelican	Black-chinned Hummingbird	Blue-gray Gnatcatcher	White-throated Sparrow
American Bittern	Broad-tailed Hummingbird	Black-tailed Gnatcatcher	White-crowned Sparrow
Great Blue Heron	Rufous Hummingbird	Ruby-crowned Kinglet	Dark-eyed Junco
Great Egret	Belted Kingfisher	Eastern Bluebird	Hepatic Tanager
Snowy Egret	Red-naped Sapsucker	Hermit Thrush	Summer Tanager
Cattle Egret	Ladder-backed Woodpecker	American Robin	Western Tanager
Green Heron	Northern Flicker	Northern Mockingbird	Pyrrhuloxia
Black-crowned Night-Heron	Olive-sided Flycatcher	Sage Thrasher	Black-headed Grosbeak
White-faced Ibis	Western Wood-Pewee	Curve-billed Thrasher	Blue Grosbeak
Turkey Vulture	Willow Flycatcher	Crissal Thrasher	Lazuli Bunting
Osprey	Hammond's Flycatcher	European Starling	Indigo Bunting
Northern Harrier	Gray Flycatcher	American Pipit	Painted Bunting
Sharp-shinned Hawk	Dusky Flycatcher	Phainopepla	Red-winged Blackbird
Cooper's Hawk	Cordilleran Flycatcher	Orange-crowned Warbler	Western Meadowlark
Swainson's Hawk	Black Phoebe	Nashville Warbler	Yellow-headed Blackbird
Red-tailed Hawk	Eastern Phoebe	Virginia's Warbler	Great-tailed Grackle
Golden Eagle	Say's Phoebe	Lucy's Warbler	Bronzed Cowbird
American Kestrel	Vermilion Flycatcher	Northern Parula	Brown-headed Cowbird
Merlin	Ash-throated Flycatcher	Yellow Warbler	Bullock's Oriole
Prairie Falcon	Brown-crested Flycatcher	Yellow-rumped Warbler	Scott's Oriole
Virginia Rail	Cassin's Kingbird	Black-throated gray Warbler	House Finch
Sora	Western Kingbird	Townsend's Warbler	Pine Siskin
Common Moorhen	Eastern Kingbird	Northern Waterthrush	Lesser Goldfinch
American Coot	Loggerhead Shrike	MacGillivray's Warbler	American Goldfinch
Sandhill Crane	Warbling Vireo	Common Yellowthroat	House Sparrow
Killdeer	Bell's Vireo	Wilson's Warbler	
Spotted Sandpiper	Plumbeous Vireo	Painted Redstart	
Solitary Sandpiper	Cassin's Vireo	Yellow-breasted Chat	
Greater Yellowlegs	Western Scrub-Jay		
Willet	American Crow		

3.8.3 Special Status Species

Primary responsibility for the conservation of Federally listed threatened, endangered and candidate plants and animal species in New Mexico lies with the U.S. Fish and Wildlife Service, under authority of

the Endangered Species Act. Responsibility for state listed plants and animals lies with the New Mexico Department of Game and Fish, under authority of the New Mexico Wildlife Conservation Act of 1974, and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act. The New Mexico Wildlife Conservation Act and New Mexico Endangered Plant Species Act protect state-listed species by prohibiting taking without proper permits. One Federal candidate species, the Yellow-billed Cuckoo (*Coccyzus americanus*) has been observed on the USIBWC site and on the adjacent active restoration site at five different times over the past three years. In 2009 a pair was detected, no sightings in 2010, and four sightings in 2011 (one observations of a single adult, a juvenile or fledgling, and two observations of pairs). Three of these five sightings were within the wetland area on the Southern end of the site (Figure 1). This 8 acre area will not be disturbed at this time (Figure 1.). A separate Biological Assessment is being prepared for compliance with the Endangered Species Act for this proposed action on the USIBWC site. USFWS staff will consult with USFWS Ecological Services for ESA compliance on the 5.5 acres BLM parcel. Both of these sites are included in the proposed Critical Habitat designation for the South Western Willow Flycatcher which includes the reach from Caballo Reservoir to Leesburg Dam.

3.9 Hazardous or Solid Waste

During site visits conducted by project proponents, there were no indications that hazardous or solid waste was illegally buried on the property. There were no suspect materials stored on the site and no subsided areas indicating previous waste burial. Because all past land use activities on this property are not known, further information regarding hazardous and solid waste is not available.

3.10 Minerals

There are no known mineral resources on the property.

3.11 Visual Resources

The property currently has a limited view of the river or uplands, or any other visual resources due to the dense saltcedar.

3.12 Recreation

Both tracts have been utilized as public lands and river access, although use on the USIBWS is uncontrolled and unauthorized. The USIBWC tract is occasionally used for fishing and camping, the BLM tract is occasionally used for fishing. There are no developed recreational facilities on these sites, nor in the vicinity.

3.13 Cultural and Historical Resources

Several cultural resource surveys have been completed on the USIBWC Broad Canyon parcel. A cultural site was identified near the parcel, however it is located outside of the project boundaries on private property and will not be impacted by the proposed action. An archeological monitor will be on site for further assessment at the time the saltcedar extraction occurs.

On the BLM parcel, existing a data records check was performed prior to a sampling field inventory, (Class II), no cultural or historic assets were observed in the record or on the ground. If any cultural resources are encountered during the project, notify the archaeologist before proceeding.

3.14 Socioeconomics

The principal socioeconomic activity in the area is livestock and other agricultural crop production; there is no agricultural production on or adjacent to either of the two tracts.

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3.15 Indian Trust Assets

Indian Trust Assets are legal interests in property held in trust by the United States for Indian tribes or individuals. Examples of trust assets include land, minerals, hunting, and fishing rights, and water rights. The United States has an Indian Trust Responsibility to protect and maintain rights reserved by or granted to Indian tribes or individuals by treaties, statues, executive orders, and rights further interpreted by the courts. This trust responsibility requires that all Federal agencies take all actions reasonably necessary to protect such trust assets.

No Indian Trust Assets were identified within the project area.

The USIBWC completed an intensive archaeological survey of its property in 2010 and has obtained Section 106 clearance from the New Mexico SHPO for the proposed restoration activities.

3.16 Transportation and Access

State Highway 185, which passes along the western boundary of both tracts, is the only access to the project sites. This is a paved road and receives moderate traffic.

3.17 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) was designed to focus the attention of Federal Agencies on the human health and environmental conditions of minority and low-income communities.

The proposed project is not located near or associated with any low-income or minority populations. No disproportionately high environmental and/or socioeconomic effects on minority or low-income communities could result from the proposed project.

3.18 Summary of Potentially Impacted Resources

Table 4 below summarizes resources that may potentially be impacted by the activities of the proposed action. Some resource categories that are included in the Affected Environment section either do not exist in the project or the proposed action clearly would not affect them. These resources are not further analyzed in the Environmental Consequences section.

Table 4. Environmental resources potentially impacted by project

Environmental Resource	Extent of Influence	Potentially Impacted by Project?
Land Use	Property	Yes
Air Quality	Area of disturbance and 0.25 mile buffer	Yes
Noise	Area of disturbance and 0.25 mile buffer	Yes
Water Resources – water quality	Rio Grande River and floodplain	Yes
Water Resources – hydrology	Rio Grande River and floodplain	Yes
Water Resources – net depletion	Rio Grande River and floodplain	Yes
Water Resources – wetlands and floodplain	Property	Yes
Geology and Soils	Property	Yes
Biological Resources – vegetation and non-native species	Property	Yes
Biological Resources – fish and wildlife	Local region	Yes
Biological Resources – special status species	Western hemisphere	Yes

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Cultural and Historic Resources	Property	Yes
Hazardous or Solid Wastes	Property	No
Minerals	Property	No
Visual Resources	Property and adjacent property	Yes
Recreation	Property	Yes

4.0 ENVIRONMENTAL CONSEQUENCES

Resource categories that were described in the section 3.18, Summary of Potential Resource Impacts, as having no effect on the environment or as not present on the project site are not considered in the analyses below.

4.1 Land Use

No Action Alternative

No impacts to land use would occur under this alternative.

Proposed Action Alternative

These sites are currently used as public river access, public use of the USIBWC site is unauthorized. Under the Proposed Action Alternative both sites will be temporarily closed to the public while restoration is underway.

4.2 Air Quality

No Action Alternative

The No Action Alternative would not impact air quality in the projects area or vicinity; air quality would remain the same.

Proposed Action Alternative

Under the Proposed Action Alternative, potential impacts would include particulate dust from project activities, exhaust from equipment, and smoke from prescribed burning.

Particulate dust is always a possibility during activities; however, BMP's of reduced vehicle equipment speeds and limited to no work will be done if wind speeds are greater than 30 mph. These BMPs would reduce fugitive dust and would be implemented at all times during construction. Due to the average wind speed and direction, surrounding topography and soil moisture the proposed project would result in a localized but negligible amount of dust. All nearby residences are upwind from the project sites; therefore, we do not anticipate any negative impacts to the nearby residences.

Air quality is temporarily reduced when piles of non-native trees are burned during various times of the year. Generally the time involved in prescribed burning is less than 48 hours. To minimize the effects during this period, burn prescriptions are written to avoid weather inversion conditions that can result in prolonged poor air quality.

4.3 Noise

No Action Alternative

The No Action Alternative would allow noise level to remain at its current condition.

Proposed Action Alternative

Under the Proposed Action Alternative the equipment to be used on site would generate a fair amount of noise. However, since the operation of equipment would take place a fair distance and down-wind from local residence noise pollution would be attenuated. In addition, the BMPs for noise require that all work would take place during normal work hours between 7:00 am and 5:00pm in order to minimize

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disturbance. This increase in noise levels should be moderate, short-term, and limited to daytime work hours.

4.4 Water Resources

4.4.1 Water Quality

No Action Alternative

The No Action Alternative would not impact or modify water quality in the in the project area or vicinity and would be expected to maintain water quality that meets New Mexico standards.

Proposed Action Alternative

Section 404 of the Clean Water Act, (CWA; 33 U.S.C. 1251 *et seq*.) as amended, provides for the protection of waters of the United States through regulation of the discharge of dredged or fill material. All work associated with the project would be accomplished outside of aquatic areas regulated by this law.

Two herbicides were selected for use in the Proposed Action Alternative, Garlon® 4 and Habitat®. Garlon 4 is a formulations of triclopyr; Habitat is an isopropylamine salt of imazypyr (see Appendices for material safety data sheets, labels and herbicide prescription). Garlon 4 would be used as needed throughout most of the project sites, except within a 30ft (9 m) buffer of the river channel and seasonal pond. Habitat is approved for aquatic use and would be applied within this buffer area where needed.

Triclopyr is the preferred herbicide for control of saltcedar as it is effective year-round outside of the "green-up" period (for the purpose of this document the green-up period refers to the time period when saltcedar emerges from winter dormancy until after first flower), affects only woody broad-leaved plants (not grasses), and has limited mobility in soil. The active ingredient, triclopyr, acts by interrupting plant growth. It is absorbed by green bark, leaves and roots and moves throughout the plant. Triclopyr accumulates in the meristem (growth region) of the plant. Basal bark and cut stump techniques can be done at any time of year except for the green-up period. The BMPs ensure that both Garlon 4 and Habitat would be applied in a very targeted fashion (spot spraying) and only when there is little or no hazard of spray drift to ensure that the minimum to no amount of herbicide contacts non-target vegetation, soil or water. Garlon 4, to the extent that it comes into contact with soil, adheres tightly to soil particles; the potential to leach from soil into ground water is minimal.

Imazapyr is a non-selective herbicide used for the control of a broad range of weeds including terrestrial annual and perennial grasses and broadleaved herbs, woody species, and riparian and emergent aquatic species. It controls plant growth by preventing the synthesis of branched-chain amino acids. Despite its potential mobility in soils, imazapyr (Habitat) has not been reported in water runoff, and we found no reports of imazapyr contamination in water. If it enters the water column, imazapyr can be photodegraded by sunlight with an average half-life of two days (Mallipudi et al. 1991). In aquatic systems, imazapyr is not expected to be biodegraded or absorbed to sediment particles. Volatilization of imazapyr from water is insignificant. Aquatic degradation studies under laboratory conditions demonstrated rapid initial photolysis of imazapyr with reported half-lives ranging from 3 to 5 days (BASF 2004; American Cyanamid 1986b in SERA 12/04). The two primary photodegradation products were rapidly degraded with half-lives less than or equal to 3days and eventual mineralization to carbon dioxide.

In compliance with the BMPs, burning prescription and herbicide prescription would ensure that the Proposed Action would have no significant effect on the water quality of the Rio Grande.

Under the Proposed Action, no adverse impacts to surface water or groundwater quality are anticipated.

4.4.2 Hydrology

Under both the No Action and the Proposed Action Alternatives, there would be no change in the amount or duration of flow in the river. The Proposed Action utilizes passive restoration methods utilizing the existing hydrologic conditions to develop the desired habitat types.

4.4.3 Net Depletion Analysis

No Action Alternative

Under the No Action Alternative, there would be no change in water depletion as the monoculture of saltcedar would remain on site.

Proposed Action Alternative

Under the Proposed Action Alternative, after saltcedar is removed, native vegetation would be expected to re-colonize the project site over the next decade. As compared to the current state of vegetation on the sites, water depletion through evapo-transpiration would initially decrease due to the saltcedar removal actions and with the re-colonizing native vegetation, eventually increase to less than or equal to the current water depletion rate seen under the No Action Alternative. As compared to the No Action Alternative, the Proposed Action Alternative would create a net depletion savings. The amount of savings cannot be quantified at this time, as it is impossible to accurately predict the acreages of each community type of vegetation that would re-establish on the project footprint in the future. Some project areas may be targeted for planting, while others may be targeted for natural regeneration. The eventual vegetation present in both planted and non-planted areas will be determined by the abiotic characteristics found on site.

No activity of the project includes in-water work of any kind, no activities will be conducted below the ordinary high water mark. No changes would be made to the existing channel shape, location, or form. No mechanical manipulation of the floodplain would occur. No water would be temporarily or permanently directed onto the project footprint or out of the main channel. It may be possible that overbank flooding would occur on this project site during future high flows. Further, it is not possible to assess the likelihood that it would actually occur and if these overbank floods occur, this would not be a new event, or attributable to the project activities.

In sum, a small positive change to net water depletion would occur in this reach of the Rio Grande due to the Proposed Action Alternative.

4.4.4 Wetlands and Floodplains

No Action Alternative

Saltcedar is known to transpire large volumes of water, studies in New Mexico and Utah show saltcedar uses four to thirteen acre-feet of water a year (University of Nevada Fact Sheet). In some places, this high water consuming exotic plant has led to the drying of springs and marshes. It is impossible to know if this is occurring on these sites. If the No Action Alternative is taken, groundwater may not be given the opportunity to exist at the depth it would otherwise. With this said, wetlands may be negatively impacted as the site remains in a monoculture of saltcedar.

Proposed Action Alternative

The Proposed Action Alternative would remove saltcedar, possibly resulting in a rise in the ground water table which would positively affect wetlands. This proposed action would have no negative impacts to wetlands and floodplains.

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4.5 Soils

No Action Alternative

Under the No Action Alternative, saltcedar is expected to increase in density and expand in size over most of the project site. Saltcedar, through various metabolic processes, concentrates and exudes salt in leaves, which then fall to the ground as leaf litter, where the salt is released to the surface soil via decomposition. Dense saltcedar would adversely affect soil chemistry by increasing the salinity in the vicinity of infestations subsequently reducing the chances for native plant species to germinate.

Proposed Action Alternative

Under the Proposed Action Alternative potential impacts to soils could potentially result from soil compaction or rutting by vehicles and equipment and soil disturbance created from root extraction.

Control of saltcedar on the project sites would reduce the salinity problem described above.
As studies have shown saltcedar root crowns average 18 inches in depth, root removal with an excavator would cause a disturbance at that depth. A skid steer with a rake attachment will be utilized to smooth any soil disturbance back to the original grade and to loosen any compacted soils. Soil disturbance would generally be limited to the area where extraction occurs. To further reduce the soil disturbance, wet soils will be avoided by scheduling work during the driest part of the year and using the lightest possible equipment and tracked vehicles. Revegetation of the site during the subsequent growing season by naturally colonizing native species would help to reverse any compaction effects.

If Garlon 4 does contact soil, microorganisms degrade triclopyr rapidly; the average half-life in soil is 46 days. Triclopyr is slightly toxic to practically non-toxic to soil microorganisms and quite immobile in soil, typically remaining within 12 in (30 cm) of the contact point.

Depending on environmental conditions, imazapyr, the active ingredient in Habitat herbicide, has an average half-life in soils of several months (Vizantinopoulos and Lolos 1994, El Azzouzi et al. 1998). El Azzouzi et al. (1998) reported half-lives between > 58 to 25 days in two Moroccan soils. In a laboratory study, the half-life of imazapyr ranged from 69-155 days, but factors affecting degradation rates were difficult to identify because the pH varied with temperature and organic content (McDowell et al. 1997). In a more extreme example, Vizantinopoulos and Lolos (1994) found that in loam and clay loam soils with pH 7-8, half-lives ranged up to 50 months. The manufacturer reports that persistence in soils is influenced by soil moisture and that in drought conditions, imazapyr could persist for more than one year (Peoples 1984).

4.6 Biological Resources

Saltcedar infested areas in New Mexico usually have low vertebrate densities and diversities compared to native plant habitats. Several studies report that saltcedar stands have fewer small mammals and birds compared to native riparian communities. The same is true for reptiles and amphibians. Bird species richness and number is lower in saltcedar areas along the Rio Grande River. Apparently saltcedar can act as an ecological equivalent to other plants for some breeding bird species. Birds will use saltcedar differently in various locations, depending on the species and its biological habits.

Over the last 75-100 years, saltcedar has altered the hydrology and plant succession of many western river systems. Unless restoration practices are implemented to manage saltcedar and to enhance regeneration of native species, diversity of flora and fauna along these rivers will continue to diminish.

4.6.1 Vegetation Communities and Nonnative Species

No Action Alternative

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Saltcedar has several real and potential impacts on biodiversity at all levels of organization. At the broad level, ecosystems exhibit heterogeneity that contributes to biodiversity at lower levels of organization. Spatially extensive assemblages of any species have the potential to alter geomorphology and geomorphic processes through bioturbation, alteration of nutrient or fire cycles, and patterns of succession. At the level of communities, saltcedar has been implicated in the decline of riparian cottonwood forests along the Rio Grande in New Mexico by limiting the amount of germination sites available to cottonwood. The higher soil salinity tolerance of saltcedar gives it a competitive advantage over native riparian plant species in some areas. Saltcedar also promotes increased fire frequencies in plant communities that are generally fire-intolerant resulting in a higher risk of wildfire on adjacent landowners.

If the No Action Alternative is taken and the sites are left untreated, saltcedar will remain the dominate plant species with limited to no native plants.

Proposed Action Alternative

Under this alternative, saltcedar and other non-native woody species would be controlled on 31.35 acres using methods described in a number of publications including Taylor and McDaniel (1998) and Smith et al. (2002). These techniques include the use of excavators or hand crews to remove above ground biomass. Direct application of herbicide to the cut stump area could be included in this initial treatment to assure greater control. The techniques for above ground plant material removal from project sites include prescribed pile burning. The removal of aerial vegetation would occur during winter months when nesting passerine species are not present. Initial treatment of plant material is accomplished using different mechanical techniques. When using mechanical methods of plant extraction care would be taken in areas of mixed vegetation to assure limited negative impacts to existing quality native habitat.

As mentioned previously in this document, saltcedar increases surface soil salinity, inhibiting native plant germination. The proposed saltcedar removal techniques using an excavator and skid steer with a rake attachment will allow for pedoturbation (mixing of soil) to take place subsequently moving salts down and seed stock up within the soil profile. This action will help facilitate native plant germination within areas that were previously occupied by saltcedar. Also, by removing the dense stands of saltcedar, sunlight will be allowed to penetrate the soil surface which will help facilitate native plant recruitment.

Habitat form and function will be enhanced as plant diversity, vertical structure, patch size, and age class variability increase within the plant communities. Enhanced patchiness in native plant communities also will reduce fuel continuity and reduce risk of large fires in the local bosque.

4.6.2 Fish and Wildlife

No Action Alternative

Under the No Action Alternative, in the short term there would be no direct impact to wildlife species that currently occupy the area in the long term as saltcedar expands there would be an adverse impact through the loss of biodiversity. Moreover this alternative would not allow actions to take place that will increase wildlife response within the area.

Proposed Action Alternative

The suitability of saltcedar as wildlife habitat has been a subject of considerable debate. Most studies show that saltcedar-dominated riparian areas have depauperate faunas, even in the native range of saltcedar. In contrast, other species assemblages, most notably birds, will utilize, and sometimes appear to prefer, saltcedar woodlands in the southwestern United States, although preferences may vary geographically. At the level of individual species, responses of various animals to saltcedar domination of their habitats also varies. Although no species are known to have become extinct as a result of saltcedar spread, local declines of some are attributed to the invasion including desert pupfish and Southwestern

willow flycatchers. In contrast, some birds are known to nest in saltcedar-dominated plant communities including doves, Mississippi kites and Black-chinned Hummingbirds in the Grand Canyon. Ironically, some populations of Southwestern willow flycatchers also nest in saltcedar. Saltcedar may have the potential to cause the extinction of narrowly distributed, endemic and endangered species such as the desert slender salamander if it invades their habitat. Under the Proposed Action Alternative, the habitat lost by the removal of non-native plants will affect associated fauna. On a broader scale, however, the abundance of non-native habitat (plant communities) detracts from landscape biodiversity in terms of species richness and stand structure. Replacement with a diversity of native plant communities would aid in creating the diversity of habitats benefiting numerous wildlife species.

Mechanical vegetation removal would force some avian species which use non-native vegetation into adjacent habitats. This removal and prescribed pile burning would occur outside the breeding season, avoiding disturbance to nesting species. Birds present at time of removal and burning should be able to easily move to adjacent habitats avoiding direct impacts.

Based on studies in similar habitat adjacent to treatment areas at Bosque del Apache National Wildlife Refuge, short term losses of small mammal populations including *Peromyscus leucopus*, *Peromyscus maniculatus*, *Dipodomus ordii*, *Reithrodontomys megalotis*, and *Sigmodon hispidus* would occur as a result of soil disturbance. Above ground vegetation removal would occur during winter periods. Small mammal population monitoring in these disturbed areas indicates that these species recolonize disturbed areas quickly, responding to early herbaceous plant community establishment. Mechanical disturbance actually may benefit *Dipodomys ordii* and *Perognathus flavus* by loosening soils which facilitates burrowing (Stuart et al. 1992).

Herbicide treatments present some hazards to non target plants and animals if applications are not made in accordance with pesticide use proposal restrictions including specified application rates and wind speed during application. Herbicides can become more toxic if excessive rates are applied, and drift to non target areas can occur if applications are made during windy periods. Application rates will strictly adhere to label directions, and no application will occur if winds are in excess of 5 mph. Small mammal populations including *Peromyscus leucopus*, *Peromyscus maniculatus*, *Dipodomys ordii*, *Reithrodontomys megalotis*, and *Sigmodon hispidus* would be susceptible to direct contact with the herbicides based on small mammal surveys in adjacent saltcedar habitat. Avian communities would also be susceptible to direct contact. Fall surveys conducted at Bosque del Apache National Wildlife Refuge in adjacent saltcedar habitat indicate substantial use by mourning doves, northern flickers, western wood-peewees, house wrens, American robins, Virginia's warblers (*Vermivora virginiae*), MacGillivray's warblers (*Oporornis tolmiei*), common yellowthroats, Wilson's warblers (*Wilsonia pusilla*), blue grosbeaks, rufous-sided towhees, chipping sparrows, house finches (*Carpodacus mexicanus*), and lesser goldfinches (*Carduelis psaltria*).

Based on test results submitted to the Environmental Protection Agency (EPA) by the Monsanto and American Cyanamid companies (past owners of the above mentioned labels), these herbicides when properly applied should pose minimum risks to representative wildlife species which occur in the area. Using the general toxicity classification scheme designed by the EPA, both herbicides would be slightly toxic to rodents, practically non-toxic to slightly toxic to birds, practically non-toxic to slightly toxic to fish and practically non-toxic to slightly toxic to arthropods. Glyphosate toxicity field studies have been extensive compared with those for Imazapyr. In related glyphosate studies, it did not affect reproduction or growth or survival in *Peromyscus maniculatus* (Ritchie et. al. 1987, Sullivan and Sullivan 1981, Sullivan 1988b). Most changes in small mammal communities on treated sites are a result of plant community changes attributed to glyphosate applications (Sullivan and Sullivan 1982, Anthony and Morrison 1985, D'Anieri et. al. 1986, Sullivan 1988a, Sullivan and Hogue 1987). Glyphosate toxicity findings were similar in two avian studies where several times the recommended treatment rate for the

herbicide was not toxic to embroyonic growth in mallard eggs. Bird community use was altered as a result of plant community changes attributed to herbicide application. Boller et al. (1984) did indicate some toxicity of glyphosate applications to laboratory experiments with an arachnid species. Similarly, Saly and Ragala (1984) detected changes in population levels, community composition and biomass of soil nematodes at three times the recommended application rate. Additional studies conducted by McComb et al. (1990), indicate amphibian species are not generally more sensitive than other species to glyphosate. Surfactants or spreaders used in conjunction with these products include Agri-Dex (Helena Chemicals) and vegetable oil. No definitive studies have been done to determine the acute toxicity of these additives.

Under the Proposed Action Alternative, as noted in section 4.6.1, wildlife habitat will be enhanced as plant diversity, vertical structure, patch size, and age class variability increase within the plant communities subsequently enhancing wildlife diversity and reduce the chance of wildfire.

4.6.3 Special Status Species

Based on discussions with USFWS Ecological Services, the area (8.0 ac) on the USIBWC site where Yellow-billed Cuckoos have been observed on more than one occasion will be left untreated (Figure 1). This area of saltcedar will remain intact until conditions change in such a way that would justify removal of the saltcedar. Examples of these changes goes as follows: if a wildfire occurs and results in the removal of saltcedar habitat; if the saltcedar beetles invade this area or become significantly close to this area; if observations show that cuckoos are moving into the newly established habitats with the remainder of the site or adjacent sites. At this time no special status species will be impacted under both the No Action Alternative and the Proposed Action Alternative. A separate Biological Assessment for the Southwestern Willow Flycatcher and Yellow-billed Cuckoo is being prepared for this proposed action on the USIBWC site in compliance with the Endangered Species Act and is incorporated by reference.

Based on the FWS Recovery Plan for the Southwestern Willow Flycatcher, Flycatchers are generally not found nesting in confined floodplains where only a single narrow strip of riparian vegetation less than approximately 10 m (33 ft) wide develops, although they may use such vegetation if it extends out from larger patches, and during migration (Sogge and Tibbitts 1994, Sogge and Marshall 2000, Stoleson and Finch 2000z). Therefore the BLM parcel does not have potential to be flycatcher habitat. The site is too linear with high disturbance from the traffic down Highway 185. Based on the described actions and the current state of this site listed species may be affected but not likely to be adversely affected under the No Action and Proposed Action Alternative.

A separate ESA consultation will be conducted by San Andres National Wildlife Refuge with USFWS Ecological Services for the South Western Willow Flycatcher and the Yellow-billed Cuckoo seeking concurrence with “may affect not likely to adversely affect” for both sites.

4.7 Cultural and Historic Resources

Cultural and historic resources have been surveyed on these sites. Based on these surveys there would be no impacts to cultural or historic resources under either alternative action.

4.8 Transportation and Access

No Action Alternative

There would be no change in transportation and access under the No Action Alternative.

Proposed Action Alternative
The USIBWC site is not directly adjacent to any public roads, there will be no impacts to transportation systems under the Proposed Action Alternative. The BLM site is a narrow strip of land (approximately 752 meters in length) between State Highway 185 and the Rio Grande River. For the duration of the initial mechanical saltcedar extraction, approximately 5 days, there will be a slight change in the flow of traffic through the area due to the Proposed Action Alternative. Project proponents will coordinate with New Mexico Department of Transportation (NMDOT) to address hazardous driving conditions. Signs, flashing lights, flag personnel, cones, or barrels will be placed in appropriate locations if needed.

The USIBWC site is currently open to uncontrolled and unauthorized public use and act as a River access for recreation. The site will be closed to the public temporarily for restoration and conservation purposes. The BLM parcel will remain open to the public except during project implementation.

4.9 Visual Resources

No Action Alternative
The sites currently have a limited view of the river or uplands, or any other visual resources due to the dense saltcedar. The No Action Alternative would not remove the dense saltcedar which will continue to block the view of the natural landscape.

Proposed Action Alternative
The proposed action alternative would remove the dense monoculture of invasive exotic saltcedar initially allowing for more natural viewing opportunities of the river and the surrounding bluffs and cliffs. As time progresses native vegetation will grow taller in greater density which will increase visual dynamics between the native plants and the upland cliffs and bluffs. As native plant communities become established views of the Rio Grande may become less although a more diverse wildlife response will occur creating public opportunities for viewing.

4.10 Recreation

No Action Alternative
Under the No Action Alternative, current recreational use of the sites would likely remain the same however, saltcedar may become so overgrown that access would be further reduced on the sites.

Proposed Action Alternative
Under the Proposed Action Alternative, both sites will be temporarily closed to public access for restoration and conservation purposes.

4.11 Cumulative Impacts, Irreversible and Irretrievable Commitments of Resources

A number of environmental impacts have occurred in the riparian areas of the Rio Grande associated with changes in the water regime and the large-scale invasion by salt cedar. These past impacts have largely stabilized and can be considered baselines against which impacts of the proposed action can be compared. The control of salt cedar and restoration of native vegetation habitats would be a step in mitigating these past impacts. A number of other salt cedar control and revegetation projects are being implemented along the Rio Grande. The completion of each additional project such as this would help to leverage the positive cumulative impact of these efforts.

The adverse cumulative impacts upon the biological and cultural resources of the proposed project would be negligible, while the positive impacts would be great. The proposed project would substantively restore an area degraded by nonnative vegetation and an altered fire regime to a naturally occurring one.

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An irreversible and irretrievable impact is a commitment of a resource(s) that is, through a given action, lost forever. There are no foreseeable irreversible and irretrievable commitments of resources associated with the proposed action.

5.0 CONCLUSIONS

This Environmental Assessment described and analyzed the impacts of the proposed habitat restoration projects. The description included information about the existing site resources and conditions, use, cultural and historic resources, relevant regional context, the project's restoration objectives, specific activities to accomplish those objectives, and measures that would be employed to ensure that the project activities result in improvements to the ecosystem of the Rio Grande without negative impacts to resources. The analysis then examined in depth the potential effects that activities could have on resources. For each type of resource, a determination of impact was made based on the project design.

5.1 Summary of Impacts by Alternative

The overall effects of the No Action Alternative versus the Proposed Action Alternative are summarized below in Table 5.

Table 5. Environmental resources potentially impacted by the No Action and Proposed Action Alternative

Environmental Resource	No Action Alternative	Proposed Action Alternative
Land Use	No Impact	No Impact
Air Quality	No Impact	Minor short-term impact
Noise	No Impact	Minor short-term impact
Water Resources – water quality	No Impact	No Impact
Water Resources – hydrology	No Impact	No Impact
Water Resources – net depletion	Moderate long-term adverse impact	Moderate short-term/minor long-term beneficial impact
Water Resources – wetlands and floodplain	No Impact	No Impact
Geology and Soils	No Impact	Minimal short-term impact
Biological Resources – vegetation and non-native species	Moderate adverse Impact, short-term and long-term	Minor short-term adverse impacts, moderate long-term beneficial impacts
Biological Resources – fish and wildlife	Moderate adverse impact, current and long-term	Moderate short-term adverse impacts, major long-term beneficial impacts
Biological Resources – special status species	Moderate adverse Impact, current and long-term	Minor short-term adverse impacts, moderate long-term beneficial impacts
Cultural and Historic Resources	No Impact	No Impact
Public Access	No Impact	Moderate short-term impact

On a scale 1-5; No impact =0, minimal impact =1, minor impact =2, moderate impact =3, major impact =4, catastrophic =5

6.0 DOCUMENT PREPARATION

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APPENDIX

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Material Safety Data Sheet
Dow AgroSciences LLC

Product Name: GARLON* 4 Ultra Herbicide

Issue Date: 07/19/2007
Print Date: 01 Aug 2007

Dow AgroSciences LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
GARLON* 4 Ultra Herbicide

COMPANY IDENTIFICATION
Dow AgroSciences LLC
A Subsidiary of The Dow Chemical Company
9330 Zionsville Road
Indianapolis, IN 46268-1189
USA

Customer Information Number: 800-992-5994

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 800-992-5994
Local Emergency Contact: 800-992-5994

2. Hazards Identification

Emergency Overview
Color: Colorless to yellow
Physical State: Liquid
Odor: Mild
Hazards of product:

CAUTION! Causes skin irritation. Causes eye irritation. Harmful if swallowed. May cause allergic skin reaction.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause slight eye irritation. Corneal injury is unlikely.
Skin Contact: Brief contact may cause moderate skin irritation with local redness. May cause drying and flaking of the skin.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Skin Sensitization: Prolonged or frequently repeated skin contact may cause allergic skin reactions in some individuals. Has caused allergic skin reactions when tested in mice.
Inhalation: Prolonged exposure is not expected to cause adverse effects.
Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Effects of Repeated Exposure: For the active ingredient(s): In animals, effects have been reported on the following organs: Blood. Kidney. Liver.
Cancer Information: In long-term animal studies with ethylene glycol butyl ether, small but statistically significant increases in tumors were observed in mice but not rats. The effects are not believed to be relevant to humans. If the material is handled in accordance with proper industrial handling procedures, exposures should not pose a carcinogenic risk to man.
Birth Defects/Developmental Effects: For the active ingredient(s): Has been toxic to the fetus in lab animals at doses toxic to the mother.
Reproductive Effects: The data presented are for the following material: Triclopyr. In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

3. Composition Information

Component	CAS #	Amount
Triclopyr-2-butoxyethyl ester	64700-56-7	60.5 %
Ethylene glycol monobutyl ether	111-76-2	0.5 %
Balance		39.0 %

4. First-aid measures

Eye Contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.
Skin Contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.
Ingestion: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.
Notes to Physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective. Water fog, applied gently may be used as a blanket for fire extinguishment.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Do not use direct water stream. May

spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.
Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Hydrogen chloride. Carbon monoxide. Carbon dioxide. Phosgene.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance.
Personal Precautions: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling.

Storage
Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Triclopyr-2-butoxyethyl ester	Dow IHG	TWA	2 mg/m3 D-SEN

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.
A D-SEN notation following the exposure guideline refers to the potential to produce dermal sensitization, as confirmed by human or animal data.

Personal Protection
Eye/Face Protection: Use safety glasses.

Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly. Items which cannot be decontaminated, such as shoes, belts and watchbands, should be removed and disposed of properly.

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Neoprene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Viton. Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations.

9. Physical and Chemical Properties

Physical State	Liquid
Color	Colorless to yellow
Odor	Mild
Flash Point - Closed Cup	> 100 °C (> 212 °F) *Closed Cup*
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Autoignition Temperature	> 325 °C (> 617 °F) *Literature*
Vapor Pressure	No test data available
Boiling Point (760 mmHg)	No test data available.
Vapor Density (air = 1)	No test data available
Specific Gravity (H2O = 1)	1.11 *Literature*
Freezing Point	No test data available
Melting Point	No test data available
Solubility in Water (by weight)	emulsifies
pH	3.4 *Literature*

10. Stability and Reactivity

Stability/Instability

Thermally stable at typical use temperatures.

Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous Polymerization
Will not occur.

Thermal Decomposition
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrogen chloride. Nitrogen oxides. Phosgene.

11. Toxicological Information

Acute Toxicity
Ingestion
LD50, Rat, female 3,200 mg/kg
Skin Absorption
LD50, Rat, male and female > 5,000 mg/kg
Inhalation
LC50, 4 h, Aerosol, Rat, male and female > 5.05 mg/l
Sensitization
Skin
Prolonged or frequently repeated skin contact may cause allergic skin reactions in some individuals. Has caused allergic skin reactions when tested in mice.
Repeated Dose Toxicity
For the active ingredient(s): In animals, effects have been reported on the following organs: Blood. Kidney. Liver.
Chronic Toxicity and Carcinogenicity
In long-term animal studies with ethylene glycol butyl ether, small but statistically significant increases in tumors were observed in mice but not rats. The effects are not believed to be relevant to humans. If the material is handled in accordance with proper industrial handling procedures, exposures should not pose a carcinogenic risk to man. The data presented are for the following material: Triclopyr. Did not cause cancer in laboratory animals.
Developmental Toxicity
For the active ingredient(s): Has been toxic to the fetus in lab animals at doses toxic to the mother. For the active ingredient(s): Did not cause birth defects in laboratory animals.
Reproductive Toxicity
The data presented are for the following material: Triclopyr. In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals. The data presented are for the following material: Butoxyethanol. In animal studies, did not interfere with reproduction. For the minor component(s): Available data are inadequate to determine effects on reproduction.
Genetic Toxicology
For the active ingredient(s): In vitro genetic toxicity studies were negative. For the active ingredient(s): Animal genetic toxicity studies were negative.

12. Ecological Information

CHEMICAL FATE

Movement & Partitioning
For the active ingredient(s): Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Potential for mobility in soil is low (Koc between 500 and 2000).

Persistence and Degradability
Based largely or completely on information for similar material(s). Biodegradation under aerobic static laboratory conditions is moderate (BOD20 or BOD28/ThOD between 10 and 40%).

ECOTOXICITY
Based largely or completely on information for similar material(s). Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested). Material is slightly toxic to birds on an acute basis (LD50 between 501 and 2000 mg/kg).

Fish Acute & Prolonged Toxicity
Based largely or completely on information for similar material(s). LC50, bluegill (Lepomis macrochirus): 0.44 - 1.2 mg/l
LC50, rainbow trout (Oncorhynchus mykiss): 0.98 - 2.6 mg/l
LC50, Atlantic silverside (Menidia menidia): 0.77 mg/l
Aquatic Invertebrate Acute Toxicity
Based largely or completely on information for similar material(s). EC50, water flea Daphnia magna, immobilization: 0.35 - 2.0 mg/l
EC50, eastern oyster (Crassostrea virginica), shell growth inhibition: 0.30 mg/l
LC50, grass shrimp (Palaemonetes pugio): > 1.8 mg/l
Aquatic Plant Toxicity
Based largely or completely on information for similar material(s). EC50, green alga Selenastrum capricornutum, biomass growth inhibition: 11 mg/l
Toxicity to Non-mammalian Terrestrial Species
Based largely or completely on information for similar material(s). oral LD50, bobwhite (Colinus virginianus): 1,350 mg/kg

13. Disposal Considerations

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

Toxic Substances Control Act (TSCA)
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

16. Other Information

Hazard Rating System

NFPA	**Health**	**Fire**	**Reactivity**
	2	1	0

Revision
Identification Number: 1001102 / 1016 / Issue Date 07/19/2007 / Version: 5.1
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.

DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

Dow AgroSciences LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

The Chemical Company

Safety Data Sheet
HABITAT HERBICIDE

1. Product and Company Identification

Company
BASF CORPORATION
100 Campus Drive
Florham Park, NJ 07932, USA

24 Hour Emergency Response Information
CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP

Substance number:	000000063383
Molecular formula:	C(13) H(15) N(3) O(3). C(3) H(9) N
Chemical family:	imidazole derivative
Synonyms:	Isopropylamine salt of imazapyr

2. Hazards Identification

Emergency overview

CAUTION:
KEEP OUT OF REACH OF CHILDREN.
Avoid contact with the skin, eyes and clothing.
Avoid inhalation of mists/vapours.

See Product Label for additional precautionary statements.

State of matter: liquid
Colour: blue, clear
Odour: ammonia-like

Potential health effects

Primary routes of exposure:
Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Acute toxicity:
Relatively nontoxic after single ingestion. Slightly toxic after short-term skin contact. Relatively nontoxic after short-term inhalation.

Irritation / corrosion:
May cause slight but temporary irritation to the eyes. May cause slight irritation to the skin.

Sensitization:
Skin sensitizing effects were not observed in animal studies.

Chronic toxicity:

Repeated dose toxicity: No other known chronic effects.

Potential environmental effects

Aquatic toxicity:
There is a high probability that the product is not acutely harmful to fish. There is a high probability that the product is not acutely harmful to aquatic invertebrates. Acutely harmful for aquatic plants.

Terrestrial toxicity:
With high probability not acutely harmful to terrestrial organisms.

3. Composition / Information on Ingredients

CAS Number	Content (W/W)	Chemical name
81510-83-0	28.7 %	Isopropylamine salt of imazapyr
	71.3 %	Proprietary ingredients

4. First-Aid Measures

General advice:
First aid providers should wear personal protective equipment to prevent exposure. Remove contaminated clothing. Move person to fresh air. If person is not breathing, call 911 or ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or physician for treatment advice. Have the product container or label with you when calling a poison control center or doctor or going for treatment.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary.

If on skin:
Rinse skin immediately with plenty of water for 15 - 20 minutes.

If in eyes:
Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after first 5 minutes, then continue rinsing.

If swallowed:
Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to by a poison control center or doctor. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician

Antidote:	No known specific antidote.
Treatment:	Treat symptomatically.

5. Fire-Fighting Measures

Flash point:	Non-flammable.
Self-ignition temperature:	not self-igniting

Suitable extinguishing media:
foam, dry extinguishing media, carbon dioxide, water spray

Hazards during fire-fighting:
carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons,
If product is heated above decomposition temperature, toxic vapours will be released. The substances/groups of substances mentioned can be released if the product is involved in a fire.

Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:
Evacuate area of all unnecessary personnel. Contain contaminated water/firefighting water. Do not allow to enter drains or waterways.

6. Accidental release measures

Personal precautions:
Take appropriate protective measures. Clear area. Shut off source of leak only under safe conditions. Extinguish sources of ignition nearby and downwind. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.

Environmental precautions:
Do not discharge into the subsoil/soil. Do not discharge into drains/surface waters/groundwater. Contain contaminated water/firefighting water.

Cleanup:
Dike spillage. Pick up with suitable absorbent material. Place into suitable containers for reuse or disposal in a licensed facility. Spilled substance/product should be recovered and applied according to label rates whenever possible. If application of spilled substance/product is not possible, then spills should be contained, solidified, and placed in suitable containers for disposal. After decontamination, spill area can be washed with water. Collect wash water for approved disposal.

7. Handling and Storage

Handling

General advice:
RECOMMENDATIONS ARE FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS. PESTICIDE APPLICATORS & WORKERS must refer to the Product Label and Directions for Use attached to the product for Agricultural Use Requirements in accordance with the EPA Worker Protection Standard 40 CFR part 170. Ensure adequate ventilation. Provide good ventilation of working area (local exhaust ventilation if necessary). Keep away from sources of ignition - No smoking. Keep container tightly sealed. Protect contents from the effects of light. Protect against heat. Protect from air. Handle and open container with care. Do not open until ready to use. Once container is opened, content should be used as soon as possible. Avoid aerosol formation. Avoid dust formation. Provide means for controlling leaks and spills. Do not return residues to the storage containers. Follow label warnings even after container is emptied. The substance/ product may be handled only by appropriately trained personnel. Avoid all direct contact with the substance/product. Avoid contact with the skin, eyes and clothing. Avoid inhalation of dusts/mists/vapours. Wear suitable personal protective clothing and equipment.

Protection against fire and explosion:
The relevant fire protection measures should be noted. Fire extinguishers should be kept handy. Avoid all sources of ignition: heat, sparks, open flame. Sources of ignition should be kept well clear. Avoid extreme heat. Keep away from oxidizable substances. Electrical equipment should conform to national electric code. Ground all transfer equipment properly to prevent electrostatic discharge. Electrostatic discharge may cause ignition.

Storage

General advice:
Keep only in the original container in a cool, dry, well-ventilated place away from ignition sources, heat or flame. Protect containers from physical damage. Protect against contamination. The authority permits and storage regulations must be observed.

Storage incompatibility:
General advice: Segregate from incompatible substances. Segregate from foods and animal feeds. Segregate from textiles and similar materials.

Temperature tolerance
Protect from temperatures below: 0 °C

Changes in the properties of the product may occur if substance/product is stored below indicated temperature for extended periods of time.
Protect from temperatures above: 40 °C
Changes in the properties of the product may occur if substance/product is stored above indicated temperature for extended periods of time.

8. Exposure Controls and Personal Protection

Users of a pesticidal product should refer to the product label for personal protective equipment requirements.

Advice on system design:
Whenever possible, engineering controls should be used to minimize the need for personal protective equipment.

Personal protective equipment

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory protection:
Wear respiratory protection if ventilation is inadequate. Wear a NIOSH-certified (or equivalent) TC23C Chemical/Mechanical type filter system to remove a combination of particles, gas and vapours. For situations where the airborne concentrations may exceed the level for which an air purifying respirator is effective, or where the levels are unknown or Immediately Dangerous to Life or Health (IDLH), use NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

Hand protection:
Chemical resistant protective gloves, Protective glove selection must be based on the user's assessment of the workplace hazards.

Eye protection:
Safety glasses with side-shields. Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.

Body protection:
Body protection must be chosen depending on activity and possible exposure, e.g. head protection, apron, protective boots, chemical-protection suit.

General safety and hygiene measures:
Wear long sleeved work shirt and long work pants in addition to other stated personal protective equipment. Work place should be equipped with a shower and an eye wash. Handle in accordance with good industrial hygiene and safety practice. Personal protective equipment should be decontaminated prior to reuse. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Take off immediately all contaminated clothing. Store work clothing separately. Hands and/or face should be washed before breaks and at the end of the shift. No eating, drinking, smoking or tobacco use at the place of work. Keep away from food, drink and animal feeding stuffs.

9. Physical and Chemical Properties

Form:	liquid	
Odour:	ammonia-like, faint odour	
Colour:	blue, clear	
pH value:	6.6 - 7.2	
Freezing point:	approx. 0 °C	(1,013.3 hPa) Information applies to the solvent.
Boiling point:	approx. 100 °C	(1,013.3 hPa) Information applies to the solvent.
Vapour pressure:	approx. 23.3 hPa	(20 °C) Information applies to the solvent.
Density:	1.04 - 1.09 g/ml	

Bulk density:		not applicable
Viscosity, dynamic:	approx. > 1 mPa.s	(20 °C)
Solubility in water:		miscible
Molar mass:	320.4 g/mol	

10. Stability and Reactivity

Conditions to avoid:
Avoid all sources of ignition: heat, sparks, open flame. Avoid extreme temperatures. Avoid prolonged exposure to extreme heat. Avoid contamination. Avoid electro-static discharge. Avoid prolonged storage.

Substances to avoid:
oxidizing agents, reducing agents

Hazardous reactions:
The product is chemically stable.

Decomposition products:
Hazardous decomposition products: No hazardous decomposition products if stored and handled as prescribed/indicated., Prolonged thermal loading can result in products of degradation being given off.

Thermal decomposition:
Possible thermal decomposition products:
carbon monoxide, carbon dioxide, nitrogen oxide
Stable at ambient temperature. If product is heated above decomposition temperature toxic vapours may be released. If product is heated above decomposition temperature hazardous fumes may be released.

Corrosion to metals:
Corrosive effect on: mild steel brass

Oxidizing properties:
not fire-propagating
Not an oxidizer.

11. Toxicological information

Acute toxicity

Oral:
Type of value: LD50
Species: rat (male/female)
Value: > 5,000 mg/kg

Inhalation:
Type of value: LC50
Species: rat (male/female)
Value: > 5.3 mg/l (OECD Guideline 403)
Exposure time: 4 h
An aerosol was tested.

Dermal:
Type of value: LD50
Species: rabbit (male/female)
Value: > 2,000 mg/kg

Irritation / corrosion

Skin:
Species: rabbit
Result: mildly irritating

Method: Primary skin irritation test

Eye:
Species: rabbit
Result: non-irritant

Sensitization:
Skin sensitization test
Species: guinea pig
Result: Skin sensitizing effects were not observed in animal studies.

Genetic toxicity

Information on: imazapyr
No mutagenic effect was found in various tests with microorganisms and mammals.

Carcinogenicity

Information on: imazapyr
In long-term studies in rats and mice in which the substance was given by feed, a carcinogenic effect was not observed.

Reproductive toxicity

Information on: imazapyr
The results of animal studies gave no indication of a fertility impairing effect.

Development:

Information on: imazapyr
No indications of a developmental toxic / teratogenic effect were seen in animal studies.

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12. Ecological Information

Fish

Information on: imazapyr
Acute:
Oncorhynchus mykiss/LC50 (96 h): > 100 mg/l

Aquatic invertebrates

Information on: imazapyr
Acute:
Daphnia magna/EC50 (48 h): > 100 mg/l

Aquatic plants

Toxicity to aquatic plants:
other swollen duckweed/EC50 (14 d): 0.0228 mg/l
The product has not been tested. The statement has been derived from products of a similar structure and composition.

Non-Mammals

Information on: imazapyr

Other terrestrial non-mammals:
mallard duck/LC50: > 5,000 ppm
With high probability not acutely harmful to terrestrial organisms.
Honey bee/LD50: > 100 ug/bee
With high probability not acutely harmful to terrestrial organisms.

Degradability / Persistence
Biological / Abiological Degradation

Evaluation: Not readily biodegradable (by OECD criteria).

Other adverse effects:

The ecological data given are those of the active ingredient. Do not release untreated into natural waters.

13. Disposal considerations

Waste disposal of substance:
Pesticide wastes are regulated. Improper disposal of excess pesticide, spray mix or rinsate is a violation of federal law. If pesticide wastes cannot be disposed of according to label instructions, contact the State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container disposal:
Rinse thoroughly at least three times (triple rinse) in accordance with EPA recommendations. Consult state or local disposal authorities for approved alternative procedures such as container recycling. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:
This product is not regulated by RCRA.

14. Transport Information

Reference Bill of Lading

15. Regulatory Information

Federal Regulations

Registration status:

Crop Protection	TSCA, US	released / exempt
Chemical	TSCA, US	blocked / not listed

EPCRA 311/312 (Hazard categories): Acute;

State regulations

CA Prop. 65:
There are no listed chemicals in this product.

16. Other Information

Refer to product label for EPA registration number.

Recommended use: herbicide

BASF supports worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

Local Contact Information
Product Stewardship
919 547-2000

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE , IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY BASF HEREUNDER ARE GIVEN GRATIS AND BASF ASSUMES NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.
END OF DATA SHEET

Specimen Label

Dow AgroSciences

Garlon® 4 Ultra

Specialty Herbicide

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For the control of woody plants and herbaceous broadleaf weeds in non-crop areas, including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides, railroads, fence rows, non-irrigation ditch banks, forests and in the establishment and maintenance of wildlife openings. Use on these sites may include application to grazed areas.

Active Ingredient:
triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester 60.45%
Other Ingredients 39.55%
Total 100.00%

Acid Equivalent: triclopyr - 43.46% - 4 lb/gal

Keep Out of Reach of Children

CAUTION

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. Refer to label booklet under "Agricultural Use Requirements" in the Directions for Use section for information about this standard.

Refer to inside of label booklet for additional precautionary information including Directions for Use.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies at end of label booklet. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

EPA Reg. No. 62719-527

Precautionary Statements

Hazards to Humans and Domestic Animals

CAUTION

Causes Moderate Eye Irritation • Harmful If Swallowed • Prolonged Or Frequently Repeated Skin Contact May Cause Allergic Reactions In Some Individuals

Avoid contact with skin, eyes, or clothing. Wear gloves and protective clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco.

Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category E on an EPA chemical resistance category selections chart.

Applicators and other handlers who handle this pesticide must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves (≥14 mils) such as barrier laminate, nitrile rubber, neoprene rubber, or viton
- Shoes plus socks

Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6)), the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

First Aid

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

This pesticide is toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

The requirements in this box apply to forestry uses.

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves (>14 mils) such as barrier laminate, nitrile rubber, neoprene rubber, or viton
- Shoes plus socks

Non-Agricultural Use Requirements

The requirements in this box apply to all use sites on this label except for forestry uses.

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for Agricultural Pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Entry Restrictions for Non-WPS Uses: For applications to non-cropland areas, do not allow entry into areas until sprays have dried.

Storage and Disposal

Do not contaminate water, food, or feed by storage and disposal. Open dumping is prohibited.
Pesticide Storage: Store above 28°F or agitate before use.
Pesticide Disposal: Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

Nonrefillable containers 5 gallons or less:
Container Handling: Nonrefillable container. Do not reuse or refill this container.
Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Refillable containers 5 gallons or larger:
Container Handling: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water and, if possible, spray all sides while adding water. If practical, agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Nonrefillable containers 5 gallons or larger:
Container Handling: Nonrefillable container. Do not reuse or refill this container.
Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

General Information

Garlon® 4 Ultra specialty herbicide is recommended for the control of woody plants and herbaceous broadleaf weeds in non-crop areas, including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides and railroads, fence rows, non-irrigation ditch banks, forests and in the establishment and maintenance of wildlife openings. Use on these sites may include application to grazed areas.

General Use Precautions and Restrictions

Chemigation: Do not apply this product through any type of irrigation system.

When applying this product in tank mix combination, follow all applicable use directions and precautions on each manufacturer's label.

Do not apply Garlon 4 Ultra directly to, or otherwise permit it to come into direct contact with cotton, grapes, peanuts, soybeans, tobacco, vegetable crops, flowers, citrus, or other desirable broadleaf plants. Do not permit spray mists containing it to drift onto such plants.

It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs) and transitional areas between upland and lowland sites where surface water is not present except in isolated pockets due to uneven or unlevel conditions. Do not apply to open water (such as lakes, reservoirs, rivers, streams, creeks, salt water bays, or estuaries).

Do not apply on ditches that are used to transport irrigation water. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result.

Do not apply this product using mist blowers unless a drift control additive, high viscosity inverting system, or equivalent is used to control spray drift.

Sprays applied directly to Christmas trees may result in conifer injury. When treating unwanted vegetation in Christmas tree plantations, care should be taken to direct sprays away from conifers.

Garlon 4 Ultra is formulated as a low volatile ester. However, the combination of spray contact with impervious surfaces, such as roads and rocks, and increasing ambient air temperatures, may result in an increase in the volatility potential for this herbicide, increasing a risk for off-target injury to sensitive crops such as grapes and tomatoes.

Grazing and Haying Restrictions
Except for lactating dairy animals, there are no grazing restrictions following application of this product.

- **Grazing Lactating Dairy Animals:** Do not allow lactating dairy animals to graze treated areas until the next growing season following application of this product.
- Do not harvest hay for 14 days after application.
- Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Slaughter Restrictions: During the season of application, withdraw livestock from grazing treated grass at least 3 days before slaughter.

Avoid Injurious Spray Drift
Make applications only when there is little or no hazard from spray drift. Small quantities of spray, which may not be visible, may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible crops or ornamental plants that are near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movement, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Aerial Application (Helicopter Only): For aerial application on rights-of-way or other areas near susceptible crops, apply through a Microfoil[1] or Thru-Valve[1] boom, or use an agriculturally labeled drift control additive. Other drift reducing systems or thickened sprays prepared by using high viscosity inverting systems may be used if they are made as drift-free as mixtures containing agriculturally labeled thickening agents or applications made with the Microfoil or Thru Valve boom. Do not use a thickening agent with the Microfoil or Thru-Valve boom, or other systems that cannot accommodate thick sprays. Spray only when the wind velocity is low (follow state regulations). Avoid application during air inversions. If a spray thickening agent is used, follow all use recommendations and precautions on the product label.

[1] Reference within this label to a particular piece of equipment produced by or available from other parties is provided without consideration for use by the reader at its discretion and subject to the reader's independent circumstances, evaluation, and expertise. Such reference by Dow AgroSciences is not intended as an endorsement of such equipment, shall not constitute a warranty (express or implied) of such equipment, and is not intended to imply that other equipment is not available and equally suitable. Any discussion of methods of use of such equipment does not imply that the reader should use the equipment other than is advised in directions available from the equipment's manufacturer. The reader is responsible for exercising its own judgment and expertise, or consulting with sources other than Dow AgroSciences, in selecting and determining how to use its equipment.

Spray Drift Management
Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications:

1. The distance of the outer most operating nozzles on the boom must not exceed 3/4 the length of the rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator should be familiar with and take into account the information covered in the following Aerial Drift Reduction Advisory. [This information is advisory in nature and does not supersede mandatory label requirements.]

Aerial Drift Reduction Advisory

Information on Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height: Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Ground Equipment: To aid in reducing spray drift potential when making ground applications near susceptible crops or other desirable broadleaf plants, Garlon 4 Ultra should be used in thickened (high viscosity) spray mixtures using an agriculturally labeled drift control additive, high viscosity invert system, or equivalent as directed by the manufacturer. When using a spray thickening or inverting additive, follow all use directions and precautions on the product label. With ground equipment, spray drift can be reduced by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by keeping the operating spray pressures at the lower end of the manufacturer's recommended pressures for the specific nozzle type used (low pressure nozzles are available from spray equipment manufacturers); and by spraying when wind velocity is low. Do not apply with nozzles that produce a fine droplet spray. Select nozzles and pressures which provide adequate plant coverage, but minimize the production of fine spray particles.

High Volume Leaf-Stem Treatment: To minimize spray drift, keep sprays no higher than brush tops and keep spray pressures low enough to provide coarse spray droplets. A agriculturally labeled thickening agent may be used to reduce spray drift.

Mixing Directions

Garlon 4 Ultra may be foliarly applied by diluting with water or by preparing an oil-water emulsion. For woody plant control, an oil-water emulsion performs more dependably under a broader range of conditions than a straight water dilution and is recommended for aerial applications.

Oil-Water Mixture Sprays

Prepare a premix of oil, surfactant and Garlon 4 Ultra in a separate container using diesel fuel, fuel oil, or kerosene plus an emulsifier such as Sponto 712 or Triton X-100. Use a jar test to check spray mix compatibility before preparing oil-water emulsion sprays in the mixing tank. Do not allow any water or mixtures containing water to get into the premix or Garlon 4 Ultra since a thick "invert" (water in oil) emulsion may form that will be difficult to break. Such an emulsion may also be formed if the premix of Garlon 4 Ultra is put into the mixing tank before the addition of water. Fill the spray tank about one-half full with water, then slowly add the premix with continuous agitation and complete filling the tank with water. Continue moderate agitation.

Oil Mixture Sprays for Basal Treatment

Prepare oil-based spray mixtures using either a commercially available basal oil, kerosene diesel fuel, or No. 1 or No. 2 fuel oil. Substitute other oils or diluents only as recommended by the oil or diluent's manufacturer. When mixing an oil mixture, read and follow the use directions and precautions on the manufacturer's product label. Add Garlon 4 Ultra to the required amount of oil in the spray tank or mixing tank and mix thoroughly. If the mixture stands over four hours, reagitation is required.

Oil Mixtures of Garlon 4 Ultra and Tordon K: Tordon K and Garlon 4 Ultra may be used in tank mix combination for basal bark treatment of woody plants. These herbicides are incompatible and will not form a

stable mixture when mixed together directly in oil. Make a stable tank mixture for basal bark application by first combining each product with a compatibility agent prior to final mixing in the desired ratio. (See product bulletin for mixing instructions.) Tordon K is not registered for use in the states of California and Florida.

Plants Controlled by Garlon 4 Ultra

Woody Plants Controlled

alder	chinquapin
madrone	scotch broom
arrowwood	choke cherry
maples	sumac
ash	cottonwood
mulberry	sweetbay magnolia
aspen	Crataegus (hawthorn)
oaks	sweetgum
bear clover (bearmat)	dogwood
persimmon	sycamore
beech	Douglas fir
pine	tanoak
birch	elderberry
poison ivy	thimbleberry
blackberry	elm
poison oak	tree-of-heaven
blackgum	gallberry (*Ailanthus*)[1]
poplar	
boxelder[1]	gorse
salmonberry	tulip poplar
Brazilian pepper	hazel
saltbush	wax myrtle
buckthorn (*Braccharis* spp.)	hickory
	wild rose
cascara	hornbeam
salt cedar[1]	willow
Ceanothus	kudzu[2]
sassafras	winged elm
cherry	locust

[1]For best control, use either a basal bark or cut stump treatment.
[2]For complete control, re-treatment may be necessary.

Annual and Perennial Broadleaf Weeds

black medic	curly dock
matchweed	sweet clover
bull thistle	dandelion
mustard	vetch
burdock	field bindweed
Oxalis	wild carrot
Canada thistle	goldenrod (Queen Anne's lace)
plantain	
chicory	ground ivy
purple loosestrife	wild lettuce
clover	lambsquarters
ragweed	wild violet
creeping beggarweed	lespedeza
smartweed	yarrow

Application Methods

- Apply no more than 2 lb ae of triclopyr (2 quarts of Garlon 4 Ultra) per acre per growing season on range and pasture sites, including rights-of-way, fence rows or any area where grazing or harvesting is allowed.
- On forestry sites, triclopyr may be used at rates up to 6 lb ae (6 quarts of Garlon 4 Ultra) per acre per year.
- Triclopyr may be used at rates up to 8 lb ae (8 quarts of Garlon 4 Ultra) per acre per year on non-crop areas including industrial manufacturing and storage sites, non-grazed portions of rights-of-way including electrical power lines, communication lines, pipelines, roadsides and railroads, fence rows, non-irrigation ditch banks. Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Use Garlon 4 Ultra at rates of 1 to 8 quarts per acre to control broadleaf weeds and woody plants. It is suggested that rates higher in this rate range be used to control woody plants. In all cases, use the amount specified in enough water to give uniform and complete coverage of the plants to be controlled. The order of addition to the spray tank is water, spray thickening agent (if used), surfactant (if used), additional herbicide (if used), and Garlon 4 Ultra. If a standard agricultural surfactant is used, use at a rate of 1 to 2 quarts per acre. Use continuous adequate agitation.

Before using any recommended tank mixtures, read the directions and all precautions on both labels.

For best results apply when woody plants and weeds are actively growing. When hard to control species such as ash, blackgum, choke cherry, elm, maples (other than vine or big leaf), oaks, pines, or winged elm are prevalent, during applications made during late summer when the plants are mature, or during drought conditions, use the higher rates of Garlon 4 Ultra alone or in combination with Tordon(r) 101 Mixture specialty herbicide or Tordon K herbicide. Tordon 101 Mixture and Tordon K are restricted use pesticides. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

When using Garlon 4 Ultra in combination with 2,4-D low volatile ester herbicide, generally the higher rates of Garlon 4 Ultra should be used for satisfactory brush control.

Use the higher dosage rates when brush approaches an average of 15 feet in height or when the brush covers more than 60% of the area to be treated. If lower rates are used on hard to control species, resprouting may occur the year following treatment.

On sites where easy to control brush species dominate, rates less than those listed may be effective. Consult state or local extension personnel for such information.

Foliage Treatment With Ground Equipment

High Volume Foliage Treatment

For control of woody plants, use Garlon 4 Ultra at the rate of 2 to 6 quarts per 100 gallons of spray mixture, or Garlon 4 Ultra at 2 to 4 quarts may be tank mixed with labeled rates of 2,4-D low volatile ester herbicide, Tordon 101 Mixture, or Tordon K and diluted to make 100 gallons of spray. Do not apply more than 2 gallons of Garlon 4 Ultra per acre. Apply at a volume of 100 to 400 gallons of total spray per acre depending upon size and density of woody plants. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida. When tank mixing, follow applicable use directions and precautions on each manufacturer's label.

Depending upon the size and density of the woody plants, apply sufficient spray volume to thoroughly wet all leaves, stems, and root collars. To minimize spray drift, select the minimum spray pressure that provides adequate plant coverage without forming a mist and direct sprays no higher than the top of the target plants. Use a drift control additive cleared for application to growing crops to reduce spray drift. Before using any tank mixture, read the directions and use precautions on both labels. For best results, apply when woody plants and weeds are actively growing.

Table 1: The following table is provided as a guide to the user to achieve the proper rate of Garlon 4 Ultra.

Total Spray Volume (gallons/acre)	Rate of Garlon 4 Ultra	
	Forestry Sites (qt/100 gallons of spray)[1]	Non-Cropland Sites (qt/100 gallons of spray)[2]
400	1.5	2
300	2	2.7
200	3	4
100	6	8
50	12	16
40	15	20
30	20	26.7
20	30	40
10	60	80

[1]Do not exceed the maximum use rate of 6 quarts of Garlon 4 Ultra (6 lb ae of triclopyr) per acre per year.

[2]Do not exceed the maximum use rate of 8 quarts of Garlon 4 Ultra (8 lb ae of triclopyr) per acre per year for non-grazable areas, or 2 quarts (2 lb ae of triclopyr) per acre per year for grazed areas, except on portions of grazed areas that meet the following requirement. Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Low Volume Foliar Treatment

To control susceptible woody plants, mix up to 5% v/v of Garlon 4 Ultra in water and apply 10 to 100 gallons of finished spray. The spray concentration of Garlon 4 Ultra and total spray volume per acre should be adjusted according to the size and density of target woody plants and kind of spray equipment used. With low volume sprays, use sufficient spray volume to obtain uniform coverage of target plants including the surfaces of all foliage, stems, and root collars (see General Use Precautions and Restrictions). For best results, a surfactant should be added to all spray mixtures. Match equipment and delivery rate of spray nozzles to height and density of woody plants. When treating tall, dense brush, a truck mounted spray gun with spray tips that deliver up to 2 gallons per minute at 40 to 60 psi may be required. Backpack or other types of specialized spray equipment with spray tips that deliver less than 1 gallon of spray per minute may be appropriate for short, low to moderate density brush.

See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Tank Mixing: As a low volume foliar spray, up to 12 quarts of Garlon 4 Ultra may be applied in tank mix combination with labeled rates of Tordon K or Tordon 101 Mixture in 10 to 100 gallons of finished spray. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Broadcast Applications With Ground Equipment

Apply Garlon 4 Ultra using equipment that will assure thorough and uniform coverage at spray volumes applied. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Woody Plant Control

Foliage Treatment: Use 4 to 8 quarts of Garlon 4 Ultra in enough water to make 5 gallons or more per acre of total spray, or 1 1/2 to 3 quarts of Garlon 4 Ultra may be combined with labeled rates of 2,4-D low volatile ester, Tordon 101 Mixture, or Tordon K in sufficient water to make 5 gallons or more per acre of total spray. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Broadleaf Weed Control

Use Garlon 4 Ultra at rates of 1 to 4 quarts in a total volume of 5 gallons or more per acre as a water spray mixture. Apply anytime weeds are actively growing. Garlon 4 Ultra at 0.25 to 3 quarts may be tank mixed with labeled rates of 2,4-D amine or low volatile ester, Tordon K, or Tordon 101 Mixture to improve the spectrum of activity. For thickened (high viscosity) spray mixtures, Garlon 4 Ultra can be mixed with diesel oil or other inverting agent. When using an inverting agent, read and follow the use directions and precautions on the product label. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Aerial Application (Helicopter Only)

Aerial sprays should be applied using suitable drift control (see General Use Precautions and Restrictions).

Foliage Treatment (Utility and Pipeline Rights-of-Way)

Use 4 to 8 quarts of Garlon 4 Ultra alone, or 3 to 4 quarts of Garlon 4 Ultra in a tank mix combination with labeled rates of 2,4-D low volatile ester, Tordon 101 Mixture or Tordon K and apply in a total spray volume of 10 to 30 gallons per acre. Use the higher rates and volumes when plants are dense or under drought conditions. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Basal Bark, Dormant Stem and Cut Surface Treatments

Individual plant treatments such as basal bark and cut surface applications may be used on any use site listed on this label at a maximum use rate of 8 quarts of Garlon 4 Ultra (8 lb ae of triclopyr) per acre. These types of applications are made directly to ungrazed parts of plants and, therefore, are not restricted by the grazing maximum rate of 2 quarts of Garlon 4 Ultra (2 lb ae of triclopyr) per acre.

Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 1 to 5 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with knapsack sprayer or power spraying equipment using low pressure (20 to 40 psi). Spray the basal parts of brush and tree trunks to a height of 12 to 15 inches from the ground, thoroughly wetting the indicated area. Spray until runoff at the ground line is noticeable. Old or rough bark requires more spray than smooth young bark. Apply anytime, including the winter months, except when snow or water prevent spraying to the ground line. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Low Volume Basal Bark Treatment
To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Spray the basal parts of brush and tree trunks to a height of 12 to 15 inches from the ground in a manner that thoroughly wets the lower stems, including the root collar area, but not to the point of runoff. Herbicide concentration should vary with size and susceptibility of species treated. Apply anytime, including the winter months, except when snow or water prevent spraying to the ground line or when stem surfaces are saturated with water. See Table 1 for relationship between mixing rate, spray volume and maximum application rate. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Garlon 4 Ultra Plus Tordon K in Oil Tank Mix: Garlon 4 Ultra and Tordon K may be used in tank mix combination as a low volume basal bark treatment to improve control of certain woody species such as ash, elm, maple, poplar, aspen, hackberry, oak, oceanspray, birch, hickory, pine, tanoak, cherry, locust, sassafras, and multiflora rose. (See product bulletin for mixing instructions.) Tordon K is not registered for use in the states of California and Florida.

Streamline Basal Bark Treatment (Southern States)
To control or suppress susceptible woody plants for conifer release, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Streamline basal bark treatments are most effective on stems less than 4 inches in basal diameter. Apply with a backpack or knapsack sprayer using equipment that provides a directed straight stream spray. Apply the spray in a 2- to 3-inch wide band to one side of stems less than 3 inches in basal diameter. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes. Treat both sides of stems which are 3 to 4 inches in basal diameter. Direct the spray at bark that is approximately 12 to 24 inches above ground. Pines (loblolly, slash, shortleaf, and Virginia) up to 2 inches in diameter breast height (dbh) can be controlled by directing the spray at a point approximately 4 feet above ground. Vary spray mixture concentration with size and susceptibility of the species being treated. Better control is achieved when spray is applied to thin juvenile bark and above rough thickened mature bark. This technique is not recommended for scrub and live oak species, including blackjack, turkey, post, live, bluejack and laurel oaks, or bigleaf maple. Apply anytime, including winter months, except when snow or water prevents spraying at the desired height above ground level. **Note:** Best results with some hardwood species occur when applications are made from approximately 6 weeks prior to leaf expansion in the spring until approximately 2 months after leaf expansion is completed. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Low Volume Stem Bark Band Treatment (North Central and Lake States)
To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Apply the spray in a 6- to 10-inch wide band that completely encircles the stem. Spray in a manner that completely wets the bark, but not to the point of runoff. The treatment band may be positioned at any height up to the first major branch. For best results apply the band as low as possible. Spray mixture concentration should vary with size and susceptibility of species to be treated. Applications may be made anytime, including winter months. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Thinline Basal Bark Treatment
To control susceptible woody plants with stems less than 6 inches in diameter, apply Garlon 4 Ultra, either undiluted or mixed at 50 to 75% v/v with oil, in a thin stream to all sides of the lower stems. The stream should be directed horizontally to apply a narrow band of Garlon 4 Ultra around each stem or clump. Use a minimum of 2 to 15 milliliters of Garlon 4 Ultra or oil mixture with Garlon 4 Ultra to treat single stems and from 25 to 100 milliliters to treat clumps of stems. Use an applicator metered or calibrated to deliver the small amounts required. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Dormant Stem Treatment
Dormant stem treatments will control susceptible woody plants and vines with stems less than 2 inches in diameter. Plants with stems greater than 2 inches in diameter may not be controlled and resprouting may occur. This treatment method is best suited for sites with dense, small diameter brush. Dormant stem treatments of Garlon 4 Ultra can also be used as a chemical side-trim for controlling lateral branches of larger trees that encroach onto roadside, utility, or other rights-of-way.

Mix 4 to 8 quarts of Garlon 4 Ultra in 2 to 3 gallons of crop oil concentrate or other recommended oil and add this mixture to enough water to make 100 gallons of spray solution. Use continuous adequate agitation. Apply with knapsack or power spraying equipment, using low pressure (20 to 40 psi). In western states, apply anytime after woody plants are dormant and most of the foliage has dropped. In other areas apply anytime within 10 weeks of budbreak, generally February through April. Garlon 4 Ultra may be mixed with 4 quarts of Weedone 170 herbicide to improve the control of black cherry and broaden the spectrum of herbicidal activity. Do not apply to wet or saturated bark as poor control may result.

Cut Stump Treatment
To control resprouting, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressures and a solid cone or flat fan nozzle. Spray the root collar area, sides of the stump, and the outer portion of the cut surface, including the cambium, until thoroughly wet, but not to the point of runoff. Spray mixture concentration should vary with size and susceptibility of species treated. Apply anytime, including in winter months, except when snow or water prevent spraying to the ground line. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Cut Stump Treatment in Western States
To control resprouting of salt cedar and other Tamarix species, bigleaf maple, tanoak, Oregon myrtle, and other susceptible species, apply undiluted Garlon 4 Ultra to wet the cambium and adjacent wood around the entire circumference of the cut stump. Treatments may be applied throughout the year; however, control may be reduced with treatment during periods of moisture stress as in late summer. Cut stumps so that they are approximately level to facilitate uniform coverage of Garlon 4 Ultra. Use an applicator that can be calibrated to deliver the small amounts of material required.

Forest Management Applications

For broadcast applications, apply 1 to 6 quarts of Garlon 4 Ultra per acre in a total spray volume of 5 to 25 gallons per acre by air or 10 to 100 gallons per acre by ground. Use spray volumes sufficient to provide thorough coverage of treated foliage. Nozzles or additives that produce larger droplets of spray may require higher spray volumes to provide adequate coverage.

Plant Back Interval for Conifers: Conifers planted sooner than one month after treatment with Garlon 4 Ultra at less than 4 quarts per acre or sooner than two months after treatment at 4 to 6 quarts per acre may be injured. When tank mixtures of herbicides are used for forest site preparation, labels for all products in the mixture should be consulted and the longest recommended waiting period observed.

Forest Site Preparation (Not For Conifer Release)

Southern States Including Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia: To control susceptible woody plants and broadleaf weeds, apply Garlon 4 Ultra at a rate of 4 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 2 to 4 quarts of Garlon 4 Ultra per acre in tank mix combination with labeled rates of Tordon 101 Mixture or Tordon K. Tordon 101 Mixture and Tordon K are not registered for use in the state of Florida. Where grass control is also desired, Garlon 4 Ultra, alone or in combination with Tordon K or Tordon 101 Mixture, may be applied with labeled rates of other herbicides registered for grass control in forests. Use of tank mix products must be in accordance with the most restrictive of label limitations and precautions. Do not exceed labeled application rates. Garlon 4 Ultra cannot be tank mixed with any product containing a label prohibition against such mixing.

In Western, Northeastern, North Central, and Lake States (States Not Listed Above as Southern States): To control susceptible woody plants and broadleaf weeds, apply Garlon 4 Ultra at a rate of 3 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 1.5 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Tordon 101 Mixture, Tordon K, or 2,4-D low volatile ester. Tordon 101 Mixture and Tordon K are not registered for use in the state of California. Where grass control is also desired, Garlon 4 Ultra, alone or in tank mix combination with Tordon 101 Mixture or Tordon K, may be applied with labeled rates of other herbicides registered for grass control in forests. When applying tank mixes, follow applicable use directions and precautions on each product label.

Southern Coastal Flatwoods: To control susceptible broadleaf weeds and woody species such as gallberry and wax-myrtle, and for partial control of saw-palmetto, apply 2 to 4 quarts of Garlon 4 Ultra per acre. To broaden the spectrum of species controlled to include fetterbush, staggerbush, titi, and grasses, apply 2 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Arsenal Applicator's Concentrate herbicide. Where control of gallberry, wax-myrtle, broadleaf weeds, and grasses is desired, apply 2 to 3 quarts of Garlon 4 Ultra per acre in tank mix combination with labeled rates of Accord Concentrate or Accord SP herbicide.

These treatments may be broadcast during site preparation of flat planted or bedded sites or, on bedded sites, applied in bands over the top of beds. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August. **Note:** Do not apply after planting pines.

Directed Sprays Applications for Conifer Release

To release conifers from competing hardwoods and brush such as red maple, sugar maple, striped maple, sweetgum, red and white oaks, ash, hickory, alder, birch, aspen, pin cherry, Ceanothus spp., blackberry, chinquapin, and poison oak, mix 4 to 20 quarts of Garlon 4 Ultra in enough water to make 100 gallons of spray mixture. This spray mixture should be directed onto foliage of competitive hardwoods using knapsack or backpack sprayers with flat fan nozzles or equivalent anytime after the hardwoods and brush have reached full leaf size, but before autumn coloration. The majority of treated hardwoods and brush should be less than 6 feet in height to ensure adequate spray coverage. Care should be taken to direct spray solutions away from contact with conifer foliage, particularly foliage of desirable pines. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Note: Spray may cause temporary damage and growth suppression where contact with conifers occurs; however, injured conifers should recover and grow normally. Over-the-top spray applications can kill pines.

Broadcast Applications for Mid-Rotation Understory Brush Control in Southern Coastal Flatwoods Pine Stands (Ground Equipment Only)

For control of susceptible species, such as gallberry and wax-myrtle, and broadleaf weeds, apply 2 to 4 quarts of Garlon 4 Ultra per acre. To broaden the spectrum of woody plants controlled to include fetterbush, staggerbush, and titi, apply 2 to 3 quarts of Garlon 4 Ultra per acre in tank mix combination with labeled rates of Arsenal Applicator's Concentrate. Saw-palmetto will be partially controlled by use of Garlon 4 Ultra at 4 quarts per acre or by mixtures of Garlon 4 Ultra at 2 to 3 quarts per acre in tank mix combination with either Arsenal Applicator's Concentrate or Escort herbicide. These mixtures should be broadcast applied over target understory brush species, **but to prevent injury to pines, make applications underneath the foliage of pines.** Apply sprays in 30 gallons or more per acre of total volume. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August.

Broadcast Applications for Conifer Release in the Pacific Northwest and California

Dormant Conifers Before Bud Swell (Excluding Pines): To control or suppress deciduous hardwoods such as vine maple, bigleaf maple, alder, scotch broom, or willow **before leaf-out**, or evergreen hardwoods such as madrone, chinquapin, and *Ceanothus* spp., use Garlon 4 Ultra at 1 to 2 quarts per acre. Use diesel or fuel oil as a diluent, or use water plus 1 to 2 gallons per acre of diesel oil or a suitable surfactant or oil substitute at manufacturer's recommended rates. **Mixing with oil as the only diluent requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Conifer Plantations (Excluding Pines) After Hardwoods Begin Growth and Before Conifer Bud Break ("Early Foliar" Hardwood Stage): Use Garlon 4 Ultra at 1 to 1.5 quarts alone or with 2,4-D low volatile ester herbicide in water carrier to provide no more than 3 lb ae per acre from both products. After conifer bud break, these sprays may cause more serious injury to the crop trees. Use of a surfactant may cause unacceptable injury to conifers especially after bud break.

Conifer Plantations (Excluding Pines) After Conifers Harden Off In Late Summer and While Hardwoods Are Still Growing Actively: Use Garlon 4 Ultra at rates of 1 to 1.5 quarts per acre alone or with 2,4-D low volatile ester to provide no more than 3 lb ae per acre from both products. Treat as soon after conifer bud hardening as possible so that hardwoods and brush are actively growing. Use of oil, oil substitute, or surfactant may cause unacceptable injury to the conifers.

Broadcast Applications for Conifer Release in the Eastern United States

To release spruce, fir, red pine, and white pine from competing hardwoods such as red maple, sugar maple, striped maple, alder, birch (white, yellow, and grey), aspen, ash, pin cherry, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 Ultra at rates of 1.5 to 3 quarts per acre alone or with 2,4-D amine or low volatile ester to provide no more than 4 lb ae per acre from both products. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Broadcast Applications for Conifer Release in the Lake States Region

To release spruce, fir, and red pine from competing hardwoods such as aspen, birch, maple, cherry, willow, oak, hazel, and Rubus spp. and perennial and annual broadleaf weeds, use Garlon 4 Ultra at rates of 1.5 to 3 quarts per acre. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies.

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Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

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It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperature, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. To the extent permitted by law, all such risks shall be assumed by buyer.

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To the extent permitted by law, the exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

To the extent permitted by law, Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. To the extent permitted by law, in no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

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Revisions:

1. Added Mixing Directions section.
2. Added additional directions for high volume foliage treatment.
3. Added stem and cut surface treatments.

Habitat® Herbicide

INTELLIGENT VEGETATION CONTROL FOR AQUATIC AND RIPARIAN AREAS

Throughout the United States, key wetland areas are increasingly threatened by undesirable vegetation. Invasive species like phragmites, water hyacinth, torpedograss, melaleuca, saltcedar and purple loosestrife infest vast expanses of aquatic environments and riparian areas nationwide – causing extensive damage and costing millions of dollars in control and restoration.

To help combat such problems, BASF offers **Habitat® herbicide**, an innovative tool that helps protect and reclaim aquatic environments by improving habitat and raising land values for humans and wildlife alike. Specially formulated for use in aquatic applications, **Habitat** is the most effective tool on the market today for long-term control of emergent, shoreline and wetland woody invasive species in or near water.

The Smart Solution for Aquatic Applications

Habitat is effective at very low rates of active ingredient and puts less chemical load on the environment. It contains no heavy metals, organochlorides or phosphates, and effectively controls a diverse range of nuisance plant species, including a broad spectrum of invasive floating, emergent and woody wetland weeds:

Alligator Weed
Melaleuca
Saltcedar
Brazilian Pepper
Water Hyacinth
Water Lily
Torpedograss
Cattail
Phragmites
Parrot Feather
Cordgrass
Chinese Tallow
Purple Loosestrife
Water Lettuce
Water Primrose
Giant Reed

In addition, **Habitat** provides long-term control of many perennial species without the need for frequent re-applications, like 2,4-D, glyphosate and triclopyr, making control with **Habitat** a cost-effective alternative to other aquatic herbicides and vegetation management techniques. And, it helps increase productivity by allowing aquatic vegetation managers to spend more time expanding treatment programs to additional wetlands and waterways.

Tough on Undesirable Plants, Gentle on Aquatic Environments

A member of the BASF **Smart Herbicide**™ family of products, **Habitat** affects specific enzymes found only in plants – not humans, animals, birds, fish or insects. Once applied, the active ingredient in **Habitat** moves rapidly through the targeted plant's leaves and stems, eliminating it at the root and preventing re-growth. **Habitat** also breaks down quickly in aquatic systems.

Habitat is labeled for application in lakes, rivers, streams, ponds, seeps, drainage ditches, canals, reservoirs, swamps, bogs, marshes, estuaries, bays, brackish water, transitional areas between terrestrial and aquatic sites and seasonal wet areas.

Habitat herbicide

To find out about approved **Habitat** use in your area, please consult your BASF sales specialist to develop an application plan and project guidelines prior to application. For more information about **Habitat**, or our entire line of vegetation management products, call **1-800-545-9525** or visit **www.vmanswers.com.**

Professional Vegetation Management

BASF
The Chemical Company

Habitat® Herbicide

INTELLIGENT VEGETATION CONTROL FOR AQUATIC AND RIPARIAN AREAS

Keys to Successful Application

Because **Habitat® herbicide** does not control plants that are completely submerged or have a majority of their foliage under water, the product must be applied to emergent foliage located above the water's surface. For maximum effectiveness, **Habitat** should be applied to weeds that are growing vigorously, using a spray solution that includes a surfactant. It may be applied selectively, using a low-volume directed-application technique, or using a broadcast technique involving ground equipment, watercraft or helicopter.

For aerial applications (helicopter only), applicators should take precautions to minimize or eliminate spray drift. Appropriate buffer zones should be maintained to prevent spray drift out of the target area and equipment designed to minimize spray drift, such as a spray boom or raindrop nozzle, should also be used. In general, a uniform application of **Habitat** in 5 to 30 gallons of water per acre is recommended. The spray solution should include a nonionic surfactant, methylated seed oil or manufacturer's label rate of a silicone-based surfactant. **Habitat** can also be used for cut-stump or frill-and-girdle treatments within aquatic sites.

GUIDANCE FOR APPLICATORS

Habitat May Only be Applied by the Following Authorized Applicators:

- Federal or state government entities
- Licensed or certified aquatic pest control applicators that are authorized by state or local government

All users should carefully follow label guidelines to ensure effective control of target weed species and reduce the possibility of off-target impacts. For example, per the product's label restrictions, **Habitat** should not be used to treat more than one half of a water body's surface area in a single operation. Applicators should wait at least 10 to 14 days between treatments, beginning treatment along the shore and proceeding outward in bands to allow aquatic organisms to move into untreated areas. Other key restrictions to consider before applying **Habitat** include:

- **Habitat** should not be applied within one-half mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within one-half mile of an active potable water intake on standing water, such as a lake, pond or reservoir.
- After applying **Habitat**, do not drain or flush application equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the treated soil may be washed or moved into contact with their roots.
- Do not apply **Habitat** on lawns, walks, driveways, tennis courts or similar areas. Similarly, the product should not be used to "side trim" desirable vegetation.

Certain Restrictions Apply to Irrigation Waters

Areas treated with **Habitat** according to label directions are non-restrictive for recreational purposes, including swimming and fishing. Similarly, there are no restrictions on livestock consumption of water from a treated area. However, because **Habitat** can have a negative impact on irrigated crops, water treated with the herbicide should not be used for irrigation purposes for 120 days after application or until **Habitat** residue levels are determined to be 1.0 ppb or less by appropriate means of analysis. For a complete list of precautions, restrictions and instructions on aquatic uses, including seasonal irrigation waters, irrigation canals or ditches, quiescent, moving water or slow moving waters, see product label.

Always read and follow label directions.

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