BALCONES CANYONLANDS PRESERVE
LAND MANAGEMENT PLAN

TIER II A

CHAPTER IV
VEGETATION MANAGEMENT

August 2007

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1.0 INTRODUCTION

The regional section 10(a)l(B) permit, the Balcones Canyonlands Conservation Plan (BCCP), issued to the City of Austin (COA) and Travis County (TC) by the U.S. Fish and Wildlife Service (USFWS), required the creation of the Balcones Canyonlands Preserve (BCP), designed to secure habitat and protect populations of eight endangered species and 27 species of concern. These Permit Holders are joined by a Managing Partner, the Lower Colorado River Authority (LCRA), and other cooperating entities (including private landowners, The Nature Conservancy of Texas, Travis Audubon Society and others) in owning and managing designated properties within the Preserve. These entities are collectively referred to as the BCP Partners.

This document addresses the management of non-native and invasive plants on the BCP. Because these plants reduce diversity and replace native communities, natural area managers usually attempt to control or eradicate them. The primary goal of the BCP's section 10(a) 1(B) permit is habitat preservation and improvement for the golden-cheeked warbler, *Dendroica chrysoparia*, (GCWA), black-capped vireo, *Vireo atricapilla*, (BCVI), and six karst invertebrates. The goal is to also protect two plant and 25 karst species of concern. Control of non-native plant species on BCP lands using environmentally sensitive methods contributes to these ends. Specific information on vegetation management for the golden-cheeked warbler, black-capped vireo habitat, or the plant species of concern is found in the Tier II-A Management Handbook sections for each bird species (Tier II-A, Chapters VII and VIII) and the plant species of concern (Tier II-A, Chapter II).

2.0 DEFINITIONS

Non-native (exotic, alien): A species introduced where it did not evolve and does not naturally occur. Introduced species often flourish in the absence of their natural predators, diseases, competitors, and parasites.

Native: A native species is located in the area where it naturally occurred historically and/or where it evolved.

Invasive (opportunistic): An "invasive species" is defined as a species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. It may be a "native" species to the county or to the state but is not native to the specific ecosystem where it is causing harm. Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the primary (but not only) means of invasive species introductions.

3.0 BACKGROUND

Currently, non-native and invasive plants cause enormous problems in preserves and national parks across the U.S. (Hestor 1991). Those introduced non-natives, which have successfully naturalized compete aggressively for resources, changing an ecosystem's composition and function (DeLoach 1991). The displacement of native vegetation degrades food, cover and breeding sites used by native animals (Cheater 1992, MacDonald 1985, Simberloff 1996).

On BCP properties, non-native plants such as Japanese ligustrum (*Ligustrum japonicum*), tree of heaven (*Ailanthus altissima*) and King Ranch bluestem (*Bothriochloa ischaemum*) often form dense stands that hamper the growth of native plants. Non-native trees can compete with native oaks, one of the most important components of golden-cheeked warbler and black-capped vireo habitat. In open areas, non-native grasses like King Ranch bluestem, Bermuda grass (*Cynodon dactylon*) and Johnson grass (*Sorghum halepense*) can form large monocultures that also hamper and out compete the growth of native plants therefore, lacking diversity and abundance of food and nutrient sources needed to support a healthy and vibrant ecosystem. Table 1 below contains a list of the most commonly found non-native and/or invasive plants on BCP lands.

Table 1. Non-native and/or invasive plants on the Balcones Canyonlands Preserve
Note: The most problematic plants are in bold font.

Non-Native Plants

Scientific Family	**Species Common Name (*Scientific name)***
Apiaceae (Parsley Family)	**Beggar's lice (*Torilis* spp.)**
Apocynaceae (Dogbane Family)	Periwinkle (*Vinca minor*)
Asteraceae (Aster Family)	Prickly lettuce (*Lactuca serriola*)
	Yarrow (*Achillea millefolium*)
	Maltastar-thistle (*Centaurea melitensis*)
	Rough sow thistle (*Sonchus asper*)
	Musk thistle (*Carduus nutans*)*
	Milk thistle (*silybum marianum)*
	Soft Sow Thistle (*Sonchus oleraceus*)
Berberidaceae (Barberry Family)	**Heavenly bamboo (*Nandina domestica*)**
Caprifoliaceae (Honeysuckle Family)	**Japanese honeysuckle (*Lonicera japonica*)**
Euphorbiaceae (Spurge family)	Chinese tallow tree (*Sapium sebiferum*)
Fabaceae (Bean Family)	Black locust (*Robinia pseudo-acacia*)

Scientific Family	**Species Common Name (*Scientific name)***
Lamiaceae (Mint Family)	Henbit (Lamium amplexicaule)
	Common horehound (*Marrubium vulgare*)
	Motherwort (*Leonurus sibiricus*)
Meliaceae (Mahogany Family)	**Chinaberry (*Melia azedarach*)**
Moraceae (Mulberry Family)	Paper mulberry (*Broussonetia papyrifera*)
	Chinese or white mulberry (*Morus alba*)
	Common fig (*Ficus carica*)
Oleaceae (Olive Family)	**Japanese ligustrum, Privet (*Ligustrum japonicum*)**
	Chinese privet (*Ligustrum sinense*)
Poaceae (Grass Family)	**King Ranch bluestem (*Bothriochloa ischaemum*)**
	Bermudagrass (*Cynodon dactylon*)
	Johnsongrass (*Sorghum halepense*)
	Japanese brome (*Bromus japonicus*)
	Giant reed (*Arundo donax)**
	St. Augustine grass (*Stenotaphrum secundatum*)
	Rescue grass (*Bromus unioloides*)
	European basketgrass (*Oplismenus hirtellus*)
	Annual bluegrass (*Poa annua*)
Rosaceae (Rose Family)	Chinese photinia (*Photinia* spp.)
	Narrow-leaf firethorn (*Pyracantha angustifolia*)
Scrophulariaceae (Figwort Family)	Common mullein (*Verbascum thapsus*)
Simaroubaceae (Quassia Family)	**Tree of heaven (*Ailanthus altissima*)**
Tamaricaceae (Tamarix Family	Salt Cedar (*Tamarix sp)**
Verbenaceae (Verbena Family)	Brazilian verbena (*Verbena brasiliensis)*
	Chaste tree (*Vitex agnus-castus*)

Non-native aquatic plants

Araceae (Arum Family)	Elephant ear (*Colocasia esculenta)*
Hydrocharitaceae	Hydrilla (*Hydrilla verticillata)*
	Egeria (*Egeria densa*)*
Pontederiacea	Water hyacinth (*Eichhornia crassipes*)*
Haloragaceae	Eurasian water-milfoil (*Myriophyllum spicatum*)
	Parrot feather (*Myriopohyllum aquaticum*)

Potentially invasive native plants

Scientific Family	**Species Common Name (*Scientific name)***
Cactaceae (Cactus family)	Texas prickly pear *(Opuntia Lindheimeri)*
Asteraceae (Aster Family)	Roosevelt weed *(Baccharis neglecta)*
	Giant ragweed *(Ambrosia trifida)*
	Western ragweed *(Ambrosia psilostachya)*
	Beggar ticks *(Bidens frondosa)*
	Cocklebur *(Xanthium strumarium)*
Cupressaceae (Cypress Family)	Ashe juniper *(Juniperus ashei)*
Poaceae (Grass family)	Coast sandbur *(Cenchrus incertus)*
Fabaceae (Legume family)	Honey mesquite *(Prosopis glandulosa)*

(* Unconfirmed but likely to be found on BCP property)

4.0 MANAGEMENT METHODS

In the next 5 years, the Managing Partners will develop a table with each specific plant and the best methods for control of that species. Until this table is developed, identified plants will be managed by the appropriate BCP Partner under the general guidelines listed below.

The many potential control methods of non-native plants have positive and negative attributes. It is particularly important to use extreme care near rare native plants, using only those methods, which do not damage non-target plants and their habitats. Some native plants may become invasive in disturbed habitats. Often the best method of control is to allow for natural plant succession and to improve the overall health of the natural community. For example, reducing browse pressure allows native plants to better compete with invasives. Prescribed burns can also be used to control some invasive species. The following are some of the commonly used methods of control. They are not listed in order of preference and may be used simultaneously.

For specific details on controlling some common exotics refer to the following web addresses:

tree of heaven (http://www.nps.gov/plants/alien/fact/aial1.htm)
privet (http://tncweeds.ucdavis.edu/index.html),
Chinese tallow tree (http://aquat1.ifas.ufl.edu/cctct.html),
Johnson grass (www.inhs.uiuc.edu/edu/VMG/johngrass.html),
Japanese honeysuckle (www.inhs.uiuc.edu/edu/VMG/jhnysckl.html).

4.1 Prevention

Land managers can save a great deal of time and money by actively discouraging or reducing the introduction and spread of non-native plants. The following are recommended preventative measures:

- Adjacent landowners should be encouraged to use native plants (or non-invasive ornamentals) in place of aggressive non-natives.
- Local nurseries should be educated about aggressive non-natives, encouraged not to sell them, and provided a list of suggested alternatives such as attractive, hardy native plants that will grow in the Austin area.
- BCP partners could work together in updating and strengthening the Texas noxious weed statute, which restricts the sale of selected non-natives.
- Recently exposed or disturbed areas should be quickly seeded with fast-growing native seed mix that might include side-oats grama to prevent invasion by non-natives.
- Seeds used in restoration projects should be collected near the area to be restored and should be free of weed seeds.
- Managers should be careful of bringing in problem weed seeds in purchased soils and other materials for projects such as trail maintenance or erosion control. Heavy equipment should be cleaned before bringing them into the preserve to prevent bringing in problem species.
- Managers should monitor areas after work has been done to ensure that problem weeds were not brought into an area. This follow-up monitoring may need to continue for several years.
- Managers should concentrate control efforts along roads and utility corridors which open the forest canopy and provide conduits for airborne seed or seed brought in by humans and wildlife.
- Managers should develop and periodically update a “watchlist” of species to be alert for including highly invasive plants such as fountain grass, Buffelgrass, kudzu, etc. Managers should also develop protocols for rapid response and treatment when any of these watchlist species are found;
- Managers should especially monitor hiking trails open to the public or used for public access for the spread of invasive and watchlist species;
- Managers should develop methods to avoid spreading non-native plants to other BCP areas especially when conducting active removal of non-natives, invasives and watchlist species and when conducting work along utility

corridors. Special attention and procedures should be applied to cleaning boots, hand tools, construction and maintenance machinery.

- Managers should use care when using so called "native" seed mixes which may contain invasive species and non-native species to Central Texas. It is recommended that managers obtain single or specific species seed from a reliable local supplier (rather than a larger retailer of mixes prepared by a national company), or to request a local supplier to custom-prepare a local or species specific seed mix.

4.2 Control Methods

BCP Partners should use the following methods for controlling non-native or invasive plants but as more is learned about the best methods of control, these more effective techniques should be adopted.

4.2.1 Biological Control

Some non-natives can be controlled biologically using bacteria, fungus or insects. Great care should be given before using a biological control for management and BCP Partners should consult with botanical experts and obtain approvals from the BCP Partners and the Scientific Advisory Committee before using this option.

4.2.2 Mechanical Control

Many plants, especially young seedlings and saplings, can be removed by hand-pulling. Chinaberry, ligustrum, tree of heaven, photinia and nandina may be effectively controlled in this way. Larger plants can be pulled with a "Weedwrench^{TM} " or other appropriate tool. Clipping and mowing herbaceous plants before seed production effectively reduces seed output. Mechanical controls should be used at the appropriate physiological stage to best control each individual plant species.

Girdling can be used to kill some tree species; that is, cutting through the inner bark (cambium) of the tree. This is easiest and most effective in the spring (Cheater 1992). Many trees including tree of heaven, chinaberry, and Japanese ligustrum will resprout after being cut, and require a systemic herbicide sprayed onto the girdled area.

During the warmer months of the growing season monocultures of invasive grasses can be killed by "solarizing". To solarize grasses, place UV-resistant, black or clear plastic sheeting over the grass, secured with weights and leave in place for several weeks during the growing season. It is best to water the ground before placing the plastic in order to stimulate the

plants. This method effectively kills plant cover and many weed seeds by heating soils to lethal levels (Morgan et al. 1995). This method, however, is only practical for small areas.

4.2.3 Chemical Control

BCP Partners have considerable experience with the aggressive spread of several exotic species. These species are often free of the many pests and diseases, which would have controlled their numbers in their places of origin. Because of this, some exotic ornamental species are able to out-compete the natives. A "no action" option is not considered acceptable due to the accompanying loss of biodiversity. For example, the lower part of the Barton Creek Greenbelt is already dominated by Japanese ligustrum.

Each year millions of seeds are produced by these various species, making the long-term outlook grim without controls. BCP Partners are encouraged to use an Integrated Pest Management program to rid preserves of aggressive exotics.

Preserve land managers should use appropriate caution when planning to use herbicides for the suppression of nuisance plants. Use of any herbicide along watercourses (flowing or intermittent), within floodplain zones, or even in isolated wetlands necessitates a thorough understanding of the chemical being used, its mode of action, potential damage to non target species, and other restrictions on usage. Some sensitive waterways, such as Barton Creek, have additional restrictions such as pesticide-free buffer zones that must be recognized by the land manager considering pesticide use as part of their land management practices.

Planning for pest control should use an Integrated Pest Management approach. When the use of hazardous chemicals is indicated, appropriate procedures should be closely followed to avoid incidental damage to offsite plants and animals, including humans. Field applicators should be trained and licensed by the Texas Department of Agriculture or the Structural Pest Control Board or operate under the close supervision of a licensed applicator. Land managers should establish an offsite location for the safe storage, mixing, and disposal of pesticides and wear protective clothing whenever handling hazardous chemicals. Accidents happen that can affect water quality; even minor spills should be addressed quickly using proper hazardous material cleanup procedures.

The following guidelines are recommended:

(1) Pesticide applicators should be licensed by the Texas Department of Agriculture or the Structural Pest Control Board and should be familiar with all the rare plants and use care to avoid them. Applicators should use targeted applications of chemical controls.

(2) Glyphosate (Round-up [a]) is a chemical of choice for most exotics and should be used only during the active growing season. Imazypr (Arsenal [a]) is the chemical of choice for woody vegetation not effectively controlled by Glyphosate (Rodeo ™). Glyphosate (Round-up™) is a chemical of choice for grasses and vines. Imazypr (Arsenal™) is the chemical of choice for woody vegetation. Triclopyr (Garlon 4™) is a second chemical of choice for woody vegetation not effectively controlled by Imazapyr. For aquatic vegetation, Glyphosate (Rodeo ™) or Triclopoyr (Garlon 3A™) are licensed for aquatic use. It is not effective to use Triclopyr (Garlon 4™) for trees in the spring when sap is still running,. Application in the spring maydamage the top or crown but the most effective time for Triclopyr (Garlon 4™) to get down to the roots is in dry conditions in late summer or fall.

(3) "Foliar spray", "broadcast on soil" or "basal bark" (spraying the lower 18" inches of the trunk) applications are not recommended except as a last resort [LE1].

(4) Use direct spray into fresh cuts made into the cambium layer in the trunks of targeted trees or onto freshly cut stumps. Cuts should be sprayed within fifteen minutes after cutting.

(5) Applicators should be extremely cautious about not over spraying and not allowing spray to run down the sides onto the ground.

(6) Where physically possible, use HAND and HAND TOOL REMOVAL of seedlings and small saplings rather than pesticides.

(7) Follow the "Grow Green Guidelines" prepared by the City of Austin and the Texas Cooperative Extension Service and now adopted by LCRA.

(8) To minimize harm to non-target species when eradicating non-native woody vegetation, individual cut stump treatment of plants with either Arsenal ™ or Garlon 4 ™ is recommended.

Mechanical hand tool removal of seedlings and small saplings are preferred to the use of pesticides. Some common methods of herbicide application are presented below:

Cut surface

This method involves the application of herbicide to freshly cut stumps, girdled shrubs or trees. Girdling is typically done with a hatchet, machete, or chainsaw; however a weedeater equipped with a circular blade is also a very efficient tool. Once girdled, herbicide may then be applied in the cuts using spray bottles, or wick type applicators.

Foliar

This method carries a high risk of harm to non-target species and should be used with Glyphosate products. This method is often used for non-native grasses and vines. A compression sprayer or wick is used to coat the target plant species. A surfactant should be added to increase the adherence of chemicals to leaves.

4.3 Fire Management

Some non-native or invasive plants can also be controlled using a well-planned regimen of prescribed fires (see Tier II-A Chapter VI Fire Management). Others, especially non-native grasses, may be stimulated by fire to grow more vigorously. This cost effective method is often beneficial to wildlife and does not disturb the soil as much as other methods. The timing and frequency of burns are very important factors to consider. A poorly planned burn can harm native plants or help non-natives or invasives colonize newly disturbed areas. Prescribed fires can be helpful in adjusting the effective length of the growing season or by destroying seed heads of non-native plants.

Fire should not be used in occupied endangered species habitat during the breeding season, but may be used during the non-breeding season if a burn plan for the area has been approved by USFWS.

5.0 IMPLEMENTATION AND RESEARCH NEEDS

While much is known about the control of garden and agricultural weeds, far less is known about controlling non-native invasives. Research and experimentation on control methods will continue to be an important part of the Land Manager's role. With experience, Land Managers will discover which methods are most efficient, cost effective, and environmentally friendly. Land Managers should share their experiences and continue to update this document as additional information becomes available. In addition, an extensive literature search is needed to locate research, which has been conducted on controlling non-native plant species found in the BCP.

6.0 MONITORING

BCP Partners should document and monitor the effectiveness of non-native plant control programs. Documentation should include the exact location and spread of non-natives and invasives, the effectiveness of control methods on non-natives species that are eradicated, methods of eradication, quantity and types of treatments used, exact location and estimated numbers of plants killed, or estimated acreage/square feet treated. An estimate of size/age of plants and a follow up (visit the site one year and more after application) on the effects of the

control methods used is also needed. Plants that are immediately controlled should be mapped for later treatment.

The methods used by land managers and their results shall be reported in the BCP annual reports. The best current control and prevention methods should be compiled in a short guide that would provide an illustration of each problem plant and describe ways to control the plant. Such a guide would also be an important resource for private landowners in the region.

7.0 GUIDELINES FOR BIOLOGICAL RESEARCH BY NON-BALCONES CANYONLANDS PRESERVE STAFF

BCP land managers may receive requests from individuals, groups or organizations seeking permission to carry out research within the preserve. Such research must comply with the goals of management plans and guidelines as defined by the HCP and the USFWS permit (i.e. no research shall be permitted to "take" endangered species or in any way degrade protected habitat). Each BCP Partner is responsible for all research underway on tracts that they own or manage. Researchers must obtain approval from the land manager responsible for each tract within the research area. If proposed research may impact endangered species, the researcher shall be responsible for obtaining and providing current copies of the appropriate permits from USFWS and TPWD to the land manager before any research authorization may be provided. Researchers are required to abide by all BCP management plan guidelines and preserve rules. An annual report documenting all research occurring on the preserve must be submitted to the USFWS, and any publication resulting from such research must recognize the participation of the BCP partners. Individual BCP Partners may have additional requirements of researchers that are not listed here.

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