To: Virginia Rettig, Refuge Manager

Through: Paul Castelli, Lead Refuge Biologist

From: Bill Crouch, Coastal Wetlands Biologist

Subject: Edwin B. Forsythe NWR 2011 Invasive/Exotic Plant Control Program Summary

Date: 14 November 2011

Introduction

This report summarizes the invasive/exotic plant control (IPC) activities at Edwin B. Forsythe National Wildlife Refuge (EBF) for June-October 2011. EBF is approximately 47,500 acres which requires targeting limited resources in specific areas. Those priority areas are as follows: highly managed areas (e.g. impoundments); areas of high visitation (e.g. wildlife drive, trails around EBF Headquarters); and areas of the highest biological significance (e.g. Holgate Wilderness). A team of four seasonal technicians took part in IPC throughout the summer of 2011. This team had additional responsibilities (e.g. beach nesting bird counts, goose banding) and thus, only worked opportunistically on plant control.

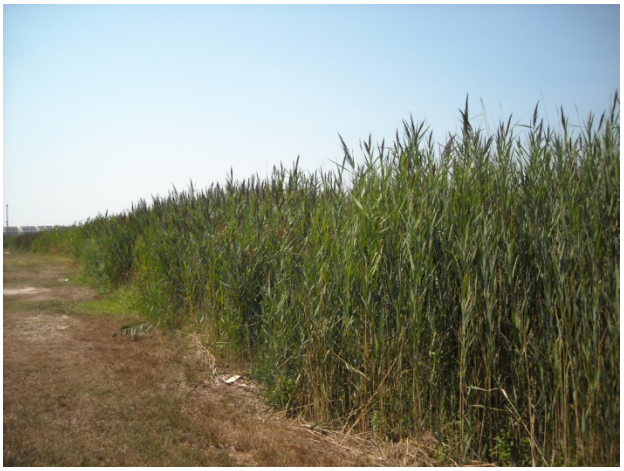
Methods

Elimination of exotic/invasive plants is most often performed using backpack sprayers containing the herbicide Habitat® (Manufactured by BASF/American Cyanamid Co). The active ingredient is Imazapyr. Imazapyr is a non-selective herbicide used for the control of a broad range of weeds including terrestrial annual and perennial grasses, broadleaved herbs, woody species, and riparian and emergent aquatic species. Imazapyr controls plant growth by preventing the synthesis of branched-chain amino acids. Because imazapyr is a weak acid herbicide, environmental pH has an affect on persistence and mobility, where below pH 5 the adsorption capacity of imazapyr increases and limits its movement in soil. Above pH 5, greater concentrations of imazapyr become negatively charged, fail to bind tightly with soils, and remain available (for plant uptake and/or microbial breakdown). In soils imazapyr is degraded primarily by microbial metabolism. It is not, however, degraded significantly by sunlight or other chemical reactions.

The half-life of imazapyr in soil ranges from one to five months. In aqueous solutions, imazapyr may undergo photodegradation with a half-life of two days, which makes it ideal for use in/around the managed impoundments at EBF. Another benefit of this compound is that it is not highly toxic to birds and mammals since any uptake is excreted rapidly with no bioaccumulation. It has a low toxicity to fish, and algae and submerged vegetation are not affected. Because imazapyr can affect a wide range of plants and can remain available, care must be taken during application to prevent accidental contact with non-target species.

Though Imazapyr is of relatively low toxicity to humans and other mammals, it can cause eye and skin irritation, therefore protective equipment is issued to Refuge personnel who will be mixing formulations and applying this compound in the field. Protective equipment includes Tyvek® suits with hoods, nitrile gloves and safety goggles. The Tyvek® suits are durable in that they can be worn multiple times and when they are no longer serviceable, can be recycled. Also, this suit material is more breathable than other products allowing operators to remain cooler in summer high temperatures.

Targeted Species on EBF for 2011



Phragmites australis (common reed)

Common reed (*Phragmites australis*) is a clonal grass species which can grow up to six meters in height and typically forms large monoculture stands called reed beds. Leaves are lanceolate, often 20-40 cm long and 1-4 cm wide. Flowers develop by mid-summer and are arranged in tawny spikelets with many tufts of silky hair. Common reed is wind-pollinated but self-incompatible with seed setting occurring in fall. Germination occurs in spring on exposed moist soils. Vegetative growth by below-ground rhizomes can spread quickly (up to 5 meters/yr). It can grow in damp ground, in standing water up to 1 meter, or even as a floating mat, all of which are common in and around the EBF impoundment system.

Common reed (*Phragmites* spp) has been an ongoing focus at EBF for many years. Aerial spraying from (2004 to 2009) successfully treated large areas of the refuge that were covered in a monoculture of this plant. More recent management efforts focus on the remnant patches in and around high value areas (e.g. impoundments, Wildlife Drive).

2011 control: Approximately 45 acres of common reed were treated with Habitat® (see figure). Common reed consumed the majority of invasive plant management resources at EBF in 2011. Areas treated included: the entrance to the new boardwalk that overlooks the saltmarsh near the beginning of Wildlife Drive (Leeds Eco Trail); sides of the dikes making up the impoundment system/Wildlife Drive; southwest pool (which had a dry area and thus could be accessed on foot); edges of the east pool (via airboat); and the western edge of the impoundments where they transitioned to upland.

Lespedeza cuneata (Chinese lespedeza)

Chinese lespedeza (*Lespedeza cuneata*) is an aggressive warm-season perennial herbaceous legume native to Asia. It is a shrubby, copiously branched plant with ascending stems and an extensive taproot. Plants can reach a height of two meters. Each leaf is divided into three smaller leaflets, about ½ to 1 inch long, which are narrowly oblong and pointed, with awl-shaped spines. Leaflets are covered with densely flattened hairs, giving a grayish-green or silvery appearance. Mature stems are somewhat woody and fibrous with sharp, stiff, flattened bristles. Small (about ¼ in.) creamy white to pale yellow flowers emerge either singly or in clusters of 2-4, from the axils of the upper and median leaves. New stems arise from root crown buds in early spring and increasing numbers of stems are produced each year. A single plant is able to form a large stand that can live over 20 years. Once it gains a foothold, it crowds out native plants and develops an extensive seed bank in the soil, ensuring a long site residence. Established dense stands of lespedeza suppress native flora and its high tannin content makes it unpalatable to native wildlife.

2011 control: One patch of Chinese lespedeza (< 1 acre) was identified along the west side of the cross-dike (south of the peregrine tower). This area was successfully treated.

Wisteria sinensis (Chinese Wisteria)

Chinese wisteria (*Wisteria sinensis*) is a woody, perennial climbing vine, native to China. It can grow up to 30 m long over supporting trees by counter-clockwise-twining stems. The leaves are shiny, green, pinnately compound, 10-30 cm in length, with 9-13 oblong leaflets that are each 2-6 cm long. White, violet or blue flowers produced in spring, usually peak in mid-May (note: Chinese Wisteria blooms in mid-April, a little earlier than the native American Wisteria, *Wisteria frutescens*). The flowers on each raceme open simultaneously before the foliage has expanded, and have a distinctive fragrance similar to that of grapes. The fruit is a flattened, brown, velvety, bean-like pod 5-10 cm long that mature in summer. Empty pods often persist until winter. Seed production is often low, and most regenerative growth occurs through layering and suckering.

2011 control: Chinese wisteria was observed growing along Lake Lily Road and around the Biology House. Control activities included manually hacking down wisteria vines along Lake Lily Road from the EBF boundary to the front gate and around the Biology House.

Buddleja spp. (Butterfly bush)

Butterfly bush (*Buddleja* spp.) is a fast spreading, often invasive shrub containing over 100 species/varieties. The plant originated in Chile, however, most species commercially available today come from China. Its popularity with gardeners and the many varieties cultivated enable this plant to grow in a wide range of environmental conditions. The leaves, deep green in color, are lanceolate in most species, and arranged in opposite pairs on the stems ranging from 1–30 cm long. The flowers are produced in dense panicles 10–50 cm long. Flowering occurs from June or July through fall. Though flower color varies widely, purple is the most common in our area.

2011 control: Control of butterfly bush at EBF in 2011 was a good example of early detection-rapid response. A single large plant was observed along Great Creek Road (the paved road leading to the Refuge). No chemical control was needed; the plant was simply uprooted and disposed of.

Carex kobomugi (Asiatic sand sedge)

Asiatic Sedge (*Carex kobomugi*) is a perennial adapted to coastal beaches and dunes. It forms extensive colonies through cord-like rhizomes that extend many feet under the sand and produce new shoots. Flowering and fruiting occurs April through June and individual plants have either male or female flowers. Flowers are numerous, subtended by scales, and arranged in spikes at the end of a flowering stalk that is triangular in cross section. Asiatic sand sedge may be confused with at least two colonial, rhizomatous native grass species - American beach grass (*Ammophila breviligulata*) and beach panic grass (*Panicum amarum*). Leaves of Asiatic sand sedge are longer tapering than those of the above grasses, have a yellow-green rather than bluish-green cast, and small teeth along the margin that are easily felt.

Asiatic sand sedge was first discovered on the Holgate Wilderness Unit in 2009. Field surveys in 2011 identified eleven separate patches, totally less than 2 acres.

2011 control: Nine of the eleven separate patches of Asiatic sand sedge were chemically treated in October 2011. The remaining two patches (which were nearer to the beach front) had been covered with sand during Hurricane Irene in August. The reason for fall treatment of this species occurred for two reasons: One, the recommended control strategy for spraying Asiatic sand sedge is to treat areas at the end of the growing season when the plants are actively transporting nutrients to the root systems; and two, the Holgate Wilderness Unit is closed from April 1st to September 1st for the beach nesting bird season.

Phragmites sprayed here

Phragmites sprayed

Lespedeza sprayed

Wisteria