SITE PLAN: FRANCIS CRANE WMA-SOUTH, FALMOUTH

UPLAND HABITAT MANAGEMENT PROGRAM
BIODIVERSITY INITIATIVE

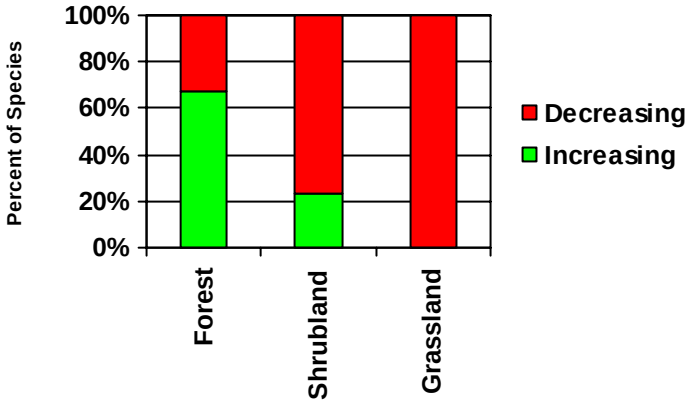
Introduction

The Upland Habitat Management Program (Upland Program) of the Massachusetts Division of Fisheries and Wildlife (DFW) is a component of the Division's Biodiversity Initiative, which was established in 1996 to maintain and restore native diversity of flora and fauna through active land management. The Upland Program focuses on reclaiming abandoned fields and other open habitats, which are an increasingly rare component of the Massachusetts landscape. The Upland Program is supported by the current Open Space Bond Act and is charged with reclaiming open habitats on both public and private lands in an effort to stem the decline of species of conservation concern associated with early-successional habitats. Species of conservation concern are defined as legally protected rare or endangered species, and other native species experiencing documented regional population declines. Reclamation typically involves mowing or mulching of trees and controlling exotic plants that are invading open habitats.

Open, early-successional habitats (e.g., grasslands and shrublands) have been a part of the New England landscape for hundreds of years. Prior to European colonization, beaver activity, wind storms, occasional catastrophic wildfire following windstorms, river flooding, and fires set by Native Americans generated significant quantities of early-successional habitats. During the 19th century, much of Massachusetts' forests were cleared for farming and fuelwood, creating a landscape dominated by early-successional habitats, and associated wildlife species such as bobolinks and northern harriers thrived (Cronon 1983, Foster & Aber 2004, Whitney 1994). As Massachusetts' agricultural lands were abandoned from 1850 to the present, and as the use of fuelwood gave way to fossil fuels in the mid-1800's, fallow fields and abandoned woodlots became very productive wildlife habitat for species such as ruffed grouse, American woodcock, and New England cottontails.

As abandoned fields and woodlots eventually succeeded to forest, habitat for early-successional wildlife species declined dramatically (Hill and Hagan 1991, Litvaitis 1993). This decline, along with limited forest regeneration cutting, has resulted in a relative scarcity of early-successional habitats in Massachusetts today (USDA 2000). The decline of early-successional habitats in New England is recognized as a serious threat to biodiversity; many wildlife species dependent on these habitat types are species of conservation concern (Askins 1998, DeGraaf and Yamasaki 2001, Litvaitis 2003).

Bird Population Trends in the Northeast, 1966-2003



From Sauer, J. R., J. E. Hines, and J. Fallon. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. *USGS Patuxent Wildlife Research Center*, Laurel, MD

Potential reclamation sites are identified through recommendation by biologists and land managers, land use composition analysis using GIS technology, and field visits to prospective sites. Sites are selected for reclamation according to criteria including habitat patch size, landscape setting, species of conservation concern present on or near the site, and the current vegetation status. Through this evaluation process, the south parcel of the Francis Crane Wildlife Management Area (WMA) (Fig 1), sometimes referred to as the "Quail Area", was identified as a high priority for early-successional habitat reclamation and management.

Site History

Prior to DFW acquisition of the ~380 acre parcel (Fig 2) in the 1950's and 60's, the property was reportedly tomato fields, pasture and woodlands. A series of 81 fields, each ~1 to 1.5 acres in size, were cleared and planted in the 1960's and 70's with non-native food-plot plants including millet, Korean lespedeza, crown vetch and sorghum. The fields have been maintained by biannual mowing. Some of the fields have been occasionally harrowed and planted in a multiflora rose (*Rosa multiflora*) control effort. Quail are stocked annually, and the site is a locally popular bird hunting destination.

Site Description

The parcel is completely bounded by roads and residential areas. Most of the parcel is closed canopy forest, with the exception of the maintained fields interspersed with forested hedgerows, and small frost pocket scrub oak (*Quercus ilicifolia*) barrens on the east side totaling ~15 acres (Fig 3). Much of the current forest occurs on former pastureland. A power line right of way ~150 feet in width that bisects the parcel from northwest to southeast is maintained as low scrub oak. Soils are generally sandy and well-drained (Fig 4).

The fields are dominated by non-native grasses and invasive exotic shrubs including autumn olive (*Elaeagnus umbellata*) and multiflora rose. The forested areas and hedgerows within fields are dominated by pitch pine (*Pinus rigida*) and oaks (*Quercus* spp.) with trees up to ~14" diameter at breast height (dbh). The understory in these areas includes scrub oak, huckleberry (*Gaylussacia baccata*) and blueberries (*Vaccinium* spp.).

To establish a pre-treatment baseline for comparison, surveys of vegetation and breeding birds using standardized protocols were conducted in 2004 at a cost to DFW of $3,000 (Table 1). The bird survey detected 31 species, including species of conservation concern targeted by management (e.g. Black-billed Cuckoo, Prairie Warbler). A variety of state-listed species, all with a protection status of 'Special Concern', are documented on this site by MassWildlife's Natural Heritage and Endangered Species Program (Natural Heritage) (Table 2). Natural Heritage will be consulted regarding management practices to address conservation of these rare species, and management plans will be adapted accordingly. All of the documented state-listed species would benefit by the planned management.

Reasons for Early-successional Habitat Management

The parcel is appropriate for early-successional habitat management for the following reasons:

Biological

The landscape setting is appropriate for early-successional habitat management. Prior to European colonization, repeated fires were likely set by Native Americans, and such fires would effectively maintain an early-successional state. The site was probably pitch pine/oak savannah for hundreds of years, long before contemporary land uses.

Early-successional pitch pine/oak savannah habitat has particular habitat value because a variety of native species depend on it. This formerly common habitat in southeastern Massachusetts is becoming increasingly rare as savannah is lost to development, and as forests mature and canopies close due to fire exclusion. This habitat is fire-dependent, and fire suppression activities over the last century have degraded habitat for associated native species.

The fields currently provide more than 90 acres of early-successional habitat. Maintenance of existing early-successional habitat is preferable to reclamation of new habitat because many target species are already on site and can immediately benefit from habitat enhancement; colonization from other sites is not required. Biological surveys document that this site supports multiple individuals of a variety of species of conservation concern including Black-billed Cuckoo, Northern Bobwhite, and Prairie Warbler.

At the habitat patch level, fragmentation can lead to a reduction in wildlife species diversity (Litvaitis 1993, Rochelle et al. 1999, Wilcox and Murphy 1985). Large habitat patches provide resources not only for edge and less area-dependent species (e.g., ruffed grouse, eastern meadowlark), but also for highly area-dependent species, which tend to be more rare (e.g., grasshopper sparrow, New England cottontail) (e.g. Johnson and Igl 2001). Additionally, the deleterious impacts associated with fragmented habitats such as increased nest predation rates (Batáry and Báldi 2004, Chalfoun et al. 2002, Stephens et al. 2003), increased risk of population extinctions (Litvaitis 1993, Wilcox and Murphy 1985), and increased potential for invasion by exotic species (Hobbs 2000) are minimized when extensive habitat patches are maintained. After completion of this project, early-successional habitats will form a patch of over 360 acres.

Economics

The sale of merchantable wood products generated during initial reclamation sometimes helps offset reclamation costs. Although initial reclamation costs may be relatively high (>$2,000/ac), maintenance costs following clearing are expected to be low (<$50/ac/yr). The site will preferably be maintained by prescribed burning, which has relatively low economic costs. Mowing will also be used; mowing costs will be minimized by mowing woody vegetation while stems are still relatively small in diameter. Reclamation and management costs are both low relative to the development value for this type of land, which can reach or exceed $100,000/acre.

Cultural

Although projects are selected based on biological and economic criteria, cultural factors also support management. Pitch pine forest and pitch pine/oak savannah are fire-prone habitat types. The parcel is surrounded by residences, and development around the parcel will likely continue. The planned management will reduce fire danger and risk to life and property.

Agriculture is no longer practiced at this site, but maintenance of open habitat retains some of the cultural history of the site, as well as provides aesthetic and recreational value to the public. Wildlife enthusiasts should enjoy a greater diversity of species on this site following management. The quality of the upland bird hunting experience will likely improve as a more heterogeneous vegetation structure develops following management actions.

Management Goals and Strategy

The overall objective is to maintain the site as a mosaic of field and pitch pine/oak savannah habitats, dominated by native and non-invasive exotic plant species, and supporting viable populations of wildlife species of conservation concern. The objective will be accomplished through the following conservation actions:

Tree Clearing

About 60% (230 of 380 acres) of the site will be treated between 2006-2010 by clearing enough trees to create desired pitch pine/oak savannah habitat . A tree shear and grapple skidder will typically be used to cut and remove 80-90% of all softwood trees 4-10" dbh and hardwoods 4-8" dbh.. which will then be chipped at landing areas and trucked off site. A Fecon or similar mower will typically be used to mulch smaller trees and shrubs.

Invasive exotic vegetation will be specifically targeted for removal. Permanent removal of hedgerows within the fields is not planned, but select hedgerows will be similarly treated and be allowed to re-grow. Clearing operations are scheduled to avoid disturbance during the bird nesting season (May 15-Jul 15), and will ideally occur during the dormant season (Nov 1-Mar 1).

No cultural or historical resources are known on this site, but, if found, these will be conserved by maintaining stone walls and foundations, by using existing roads whenever possible, and by restricting machinery to operating under dry or frozen conditions to prevent disruption of any historical artifacts that may lie beneath the soil surface.

Tree Shear (top) & Fecon Mower (bottom)

Year	Anticipated Acres Treated
2006-2007	70
2007-2008	90
2008-2009	50
2009-2010	20

Treatment of Invasive Exotics

Exotic species are widely recognized as the most important threat to rare species after habitat destruction (Wilcove et al 1998, Wilson 1992), and the economic cost of invasive exotic control can be enormous (OTA 1993, Pimentel et al 2004). If left unchecked, invasive exotic plants can quickly become dominant species, displacing native species and degrading ecosystems (Mack et al 2000). They thrive on disturbance (Hobbs and Huenneke 1992, Hobbs and Humphries 1995), a concern because maintenance of early-successional habitats is dependent on disturbance. Early control measures, when the invasion is relatively contained, are preferred to minimize costs (Hobbs and Humphries 1995).

An array of invasive exotic species including multiflora rose, autumn olive and Asiatic bittersweet (*Celastrus orbiculata*) are present. The forested areas are generally free of invasive exotic plants, but many of the fields are dominated by invasives. Control measures will be directed toward invasions on and adjacent to reclaimed areas. Control is an achievable goal, but monitoring and occasional spot-treatment will be necessary to maintain very low cover by invasive species over the long-term.

Typical invasive exotic control options include chemical (herbicide) and/or mechanical methods (e.g. individual plant pulling, repeated mowing). The site is relatively large, with thousands of individual invasive plants scattered throughout. The current status of invasive exotic plants at the site dictates that herbicide application is the most efficient, cost-effective option for initial invasive exotic control. Mechanical methods will be considered for future spot-treatments.

Invasive exotic plants that are mulched during reclamation activities will re-sprout vigorously, especially if mulching occurs during the dormant season. In late summer, contractors that have qualified as licensed pesticide applicators under the Pesticide Management Act administrated by the Department of Agricultural Resources (DAR) will treat resprouting invasive exotic plants in cleared areas, as well as invasive exotic plants within adjacent areas. A foliar herbicide application will be applied to individual invasive exotic plants (rather than a broadcast treatment). The foliar application method dampens the leaf surface of targeted plants, and minimizes impact to non-target organisms by controlling drip from sprayed vegetation. This method is relatively inexpensive and effective, and low concentrations of herbicide are employed. A potential disadvantage is that non-target organisms can be impacted; specifically, non-target plants neighboring invasive plants may be injured or killed if they intercept the foliar spray.

Any herbicide used will be approved for use in sensitive areas, which include sites within the primary recharge area of a public drinking water supply well, within 400 feet of any surface water used as a public water supply, and within 100 feet of private water supplies, surface waters, wetlands, and agricultural and inhabited areas. "Sensitive area" herbicides are approved through an additional detailed review of toxicity and environmental impacts beyond the typical two-tiered process of federal review by the Environmental Protection Agency and standard state review by the Massachusetts Pesticide Bureau. The use of herbicides selected from this small list (21 brands representing 6 active ingredients) will minimize the risk of impacts to water quality and protected species. "Sensitive area" herbicides typically break down quickly upon reaching the soil or water and do not bioaccumulate if exposure occurs. Information about sensitive area herbicide use, including factsheets for specific herbicides, is available on the MA Dept. of Agricultural Resources website: http://www.mass.gov/agr/pesticides/rightofway/.

Following these invasive exotic control measures, long-term monitoring will be conducted to detect exotic colonizers and take early control measures as necessary to prevent costly invasions (both in a biological and economic sense).

Planting

No harrowing or planting is planned at this time. However, the fields are comprised of primarily non-native grasses and would provide greater wildlife habitat value if converted to a more diverse mix of native grasses and herbs. Currently, local ecotypes of native plants are not readily commercially available as seed. If this issue can be addressed, conversion of fields to native species will be considered.

Maintenance

After the initial treatment, the site will be maintained with a combination of prescribed burning and mowing:

Savannah & hedgerow maintenance

Prescribed burns will be conducted in cooperation with MassWildlife's Ecological Restoration Program on a 3- to 7-year return interval starting in spring 2007 or earlier depending on fuel conditions. Prescribed burns will be conducted by trained personnel from DFW and cooperating agencies under a prescribed fire plan that will be developed in 2006. A permit based on the plan is required from the Department of Environmental Protection and Town authorities. If logistics prevent burning within 7 years, the site will be mowed to reduce fire risk so prescribed burning can be used.

Field maintenance

Biannual field mowing by DFW District personnel will continue. Fields may also be burned as climatic conditions and staffing allow, but implementation of burning within the fields is a lower priority than in the savannah habitat.

Project Evaluation

In 2006 and at regular intervals thereafter, biomonitoring will be conducted. Results of long-term monitoring of birds, lepidoptera, and vegetation will be used to:

1) Assess success of habitat enhancement for species of conservation concern.
2) Verify the suitability of the management regime, and adapt as necessary.
3) Find any invasive exotics that may re-colonize the site. If any plants are found, they will be hand-pulled if possible, or individually sprayed with approved herbicides by licensed applicators if necessary.

Five-Year Timeline for Management Actions*

Jun 2006:	Bird & vegetation surveys
Winter 2006-07:	Phase 1 Tree & brush clearing
Apr-May 2007:	Prescribed burning
Jul-Sep 2007:	Invasive exotic control
Winter 2007-08:	Field mowing, Phase 2 Tree & brush clearing
Apr-May 2008:	Prescribed burning
Jun 2008:	Bird & vegetation surveys
Winter 2008-09:	Phase 3 Tree & brush clearing
Apr-May 2009:	Prescribed burning
Winter 2009-10:	Field mowing, Phase 4 Tree & brush clearing
Apr-May 2010:	Prescribed burning
Jun 2010:	Bird & vegetation surveys
Summer 2010:	Lepidopteran survey
Jul-Sep 2010:	Invasive exotic control
Winter 2010-11:	Phase 5 Tree & brush clearing

*****Timing of all actions subject to change according to funding availability.

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Table 1. Crane South bird species detected in 2004 survey. Red font indicates Upland Program targeted species of conservation concern.

American Crow	Eastern Wood-Pewee
American Goldfinch	Field Sparrow
American Robin	Gray Catbird
Baltimore Oriole	Hermit Thrush
Barn Swallow	House Finch
Black-billed Cuckoo	Indigo Bunting
Black-capped Chickadee	Mourning Dove
Blue Jay	Northern Bobwhite
Brown-headed Cowbird	Northern Cardinal
Carolina Wren	Orchard Oriole
Cedar Waxwing	Pine Warbler
Chipping Sparrow	Prairie Warbler
Common Yellowthroat	Red-winged Blackbird
Downy Woodpecker	Scarlet Tanager
Eastern Towhee	Tree Swallow
Eastern Tufted Titmouse	

Table 2. Crane South state-listed species

Common Name	**Species Name**	**Type**
Frosted elfin	*Callophrys irus*	Butterfly
Gerhard's underwing	*Catocala herodias gerhardi*	Moth
Barrens buckmoth	*Hemileuca maia maia*	Moth
Oak hairstreak	*Satyrium favonius*	Moth
Eastern box turtle	*Terrapene carolina*	Reptile
Nantucket shadbush	*Amelanchier nantucketensis*	Shrub

Year	**Acres Treated**
2006-2007	70
2007-2008	90
2008-2009	50
2009-2010	20

Figure 1. Location
Francis Crane WMA Quail Area, Falmouth

Quail Area

Highways and Roads

Towns

N
W
E
S

3 1.5 0 3 Miles

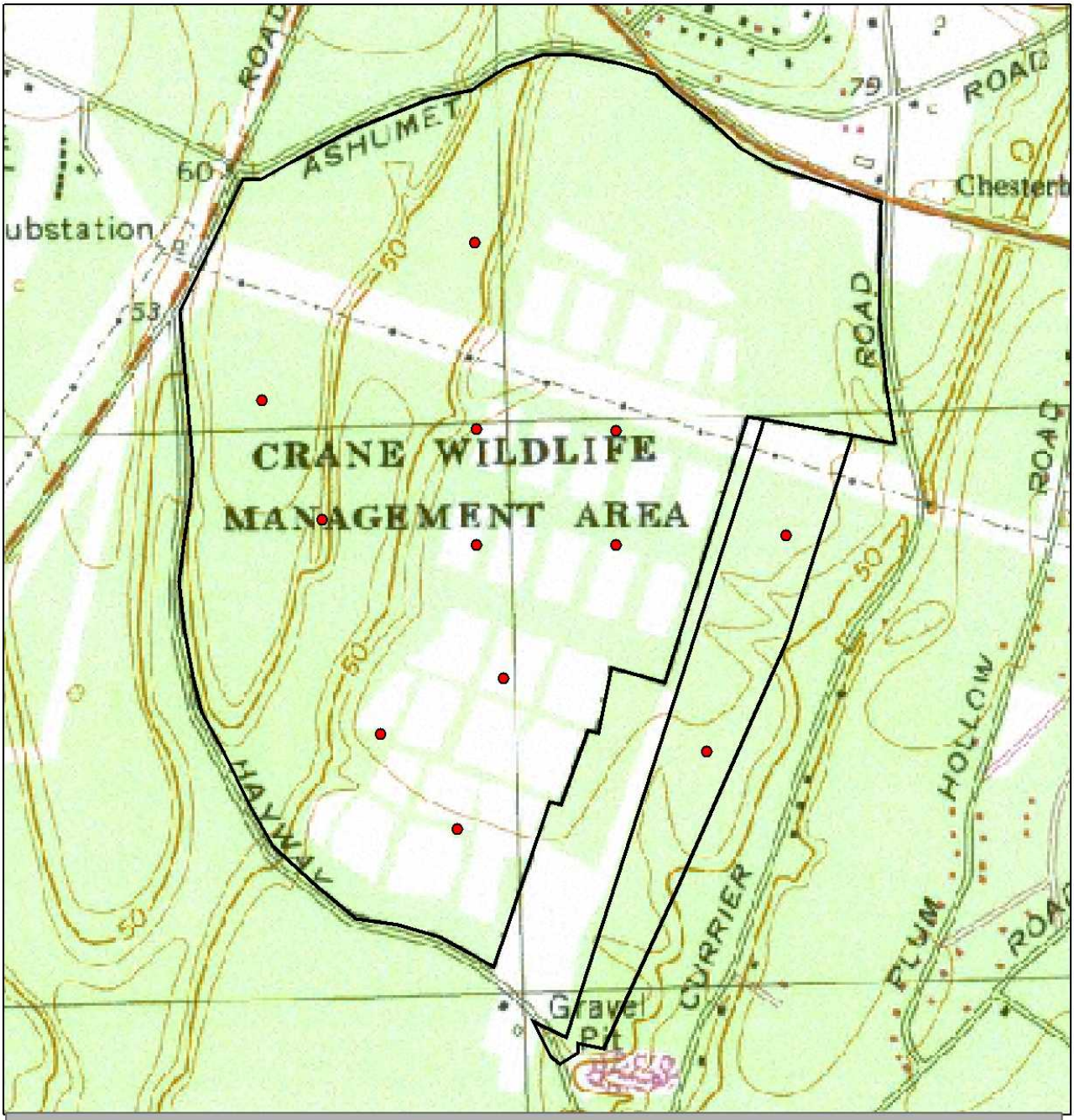

Figure 2. Crane South Topographic Map & Biomonitoring Points
Crane WMA, Falmouth

N
W
E
S

DFW Boundary

Biomonitoring Survey Point

1,000 500 0 1,000 Feet

Figure 3. Landcover Types
Crane Quail Area, Falmouth

Landcover Type

DFW Property Boundary

1,000 500 0 1,000 Feet

Landcover Code Descriptions

Stand Type	Development Class	Canopy Closure
CH: Central Hardwoods	1 = <1" dbh	A = >66%
PP/OK: Pitch Pine/Oak	2 = 1-6" dbh	B = 33-66%
AF: Abandoned Field	3 = 7-12" dbh	C = <33%
SB: Shrubland		
GR: Grassland		

Figure 4. Soils
Crane Quail Area, Falmouth

Soil w/Code

DFW Property Boundary

2,500 1,250 0 2,500 Feet

Code	Soil Description
EnA	Enfield silt loam, 0-3% slopes
CdD	Carver coarse sand, 15-35% slopes
CcB	Carver loamy coarse sand, 3-8% slopes
CcA	Carver loamy coarse sand, 0-3% slopes
CdC	Carver coarse sand, 8-15% slopes
DeA	Deerfield loamy fine sand, 0-3% slopes

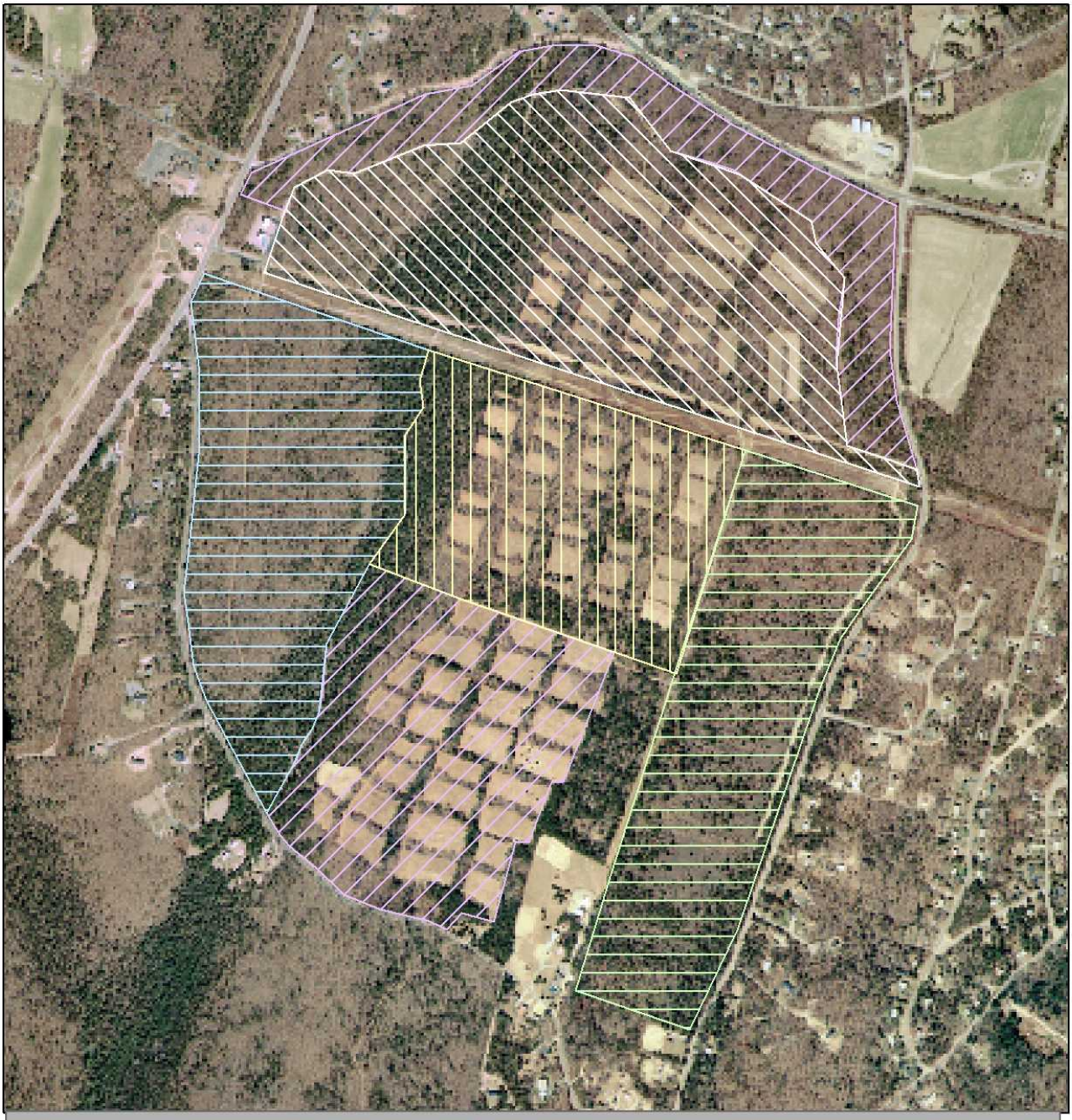

Figure 5. Crane South Reclamation Project 5-Year Plan*
Crane WMA, Falmouth

2006 (48.2 acres)
2007 (67.0 acres)
2008 (55.5 acres)
2009 (28.1 acres)
2010 (56.7 acres)

*Exact location of hedgerow clearing within fields is to be determined

1,000 500 0 1,000 Feet