



OXBOW ASSOCIATES, INC.

Wetlands Delineation and Permitting Wildlife Studies Herpetology Vernal Pool Ecology

Conservation & Management Permit Application

Pursuant to the Massachusetts Endangered Species Act
(MGL Ch. 131A & 321 CMR 10.23)

**25 Stephens Way
Truro, Massachusetts**
(NHESP File Number 06-21061)



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Introduction

The proposed project is the construction of a single family home on the existing 9.49± acre lot located at 25 Stephens Way, Truro (the “site”). The existing residential building will remain in place; the additional amenities include the proposed single family home, subsurface septic system, water supply well, swimming pool, and limited landscaped perimeter. A substantial portion of the site, offered by the Applicant, is to be placed under permanent protection to provide rare and endangered species habitat protection and components of a net benefit as required pursuant to the Regulations.

The entire project site is within mapped Natural Heritage and Endangered Species Program (NHESP) Priority Habitats for Rare Species, PH 1232 (and Estimated Habitat 821). According to correspondence to Donald Kline (the “Applicant”) from NHESP (File #06-21061, dated 4/9/07), this portion of the polygon is attributable to local element occurrences for eastern box turtle (*Terrapene c. carolina*: species of Special Concern), eastern spadefoot toad (*Scaphiopus holbrookii*: Threatened), and northern harrier (*Circus cyaneus*: Threatened).

During the habitat characterization and vegetative cover type mapping of the site, Oxbow Associates, Inc. (OA) documented and mapped broom crowberry (*Corema conradii*: Special Concern) growing in portions of the site. The Applicant reconfigured the home setting to diminish impact to broom crowberry and vertebrate species in the plan submitted with the MESA Project Review Checklist (dated May 31, 2007). Despite the reduced impacts, NHESP provided written affirmation (October 5, 2007 correspondence to Applicant) that the revised project would result in a regulatory, “take” of broom crowberry. As part of its determination, NHESP indicated that impacts to broom crowberry necessitate a Conservation and Management Permit (CMP) Application. NHESP also found that the proposed increased land protection and project design will mitigate the potential impact to the three vertebrate species of concern (eastern box turtle, spadefoot toad, and northern harrier).

Section A. Existing Conditions

A.1. Current Land Uses

The site encompasses approximately 9.49± acres, east of Cape Cod Bay and west/northwest of Stephens Way in the town of Truro, Massachusetts (Figure 1). The Hogsback Conservation Restriction abuts the site along the northwestern edge. The remainder of the site is bordered by private, previously developed residential properties. There is a single-family home (Cobb homestead), shed, stone patio, pathways, and gravel driveway and parking area existing at the eastern part of the site (Figure 4). Site elevations range from 0 feet along the western edge of the site at Cape Cod Bay, to 58± feet at the crest of the hill near

the existing stone patio, northwest of the existing single-family home. Topography along the western half of the site is moderately rolling from the beach (west), through a dune to the east, and up to the top of the hill. The eastern portion of the site has gradual slopes as well as part of a shrub swamp that is associated with a large, predominantly off-site, wetland kettle hole. The majority of this shrub swamp wetland is located off-site to the south, with a small area of open water at the southeastern edge of the site.

The western edge of the site is comprised of coastal beach and coastal dune. Tidally influenced groundwater and high surf occasionally inundate a topographic depression east of the beach and immediately southwest of the site (Figure 2). This depression is not a vernal pool.

The heathland to the east of the dunes extends to the tree line, greater than 100 feet from the dunes. Sparse, low scrub-forested areas with a mix of hardwood species is scattered within the central and eastern portion of the site. Portions of the heathland community show indication of being overrun by successional species including poison ivy, huckleberry and bayberry, and deciduous and coniferous tree species. An old field community with scattered shrubs and trees is located to the north of the existing driveway in the eastern end of the site. The freshwater wetland with a shallow pond is in the southeastern corner of the site (Figure 2).

Vegetation within the majority of the site appears to be in its more or less natural, post-agricultural condition (Motzkin, et al., 2002). The existing gravel driveway, with mowed lawn beneath a locust grove around the house, and long standing footpaths indicate historic alterations associated with the existing home.

According to the Soil Survey of Barnstable County (USDA, 1993), predominant soils found onsite are of the Carver coarse sand series and consist of excessively drained glacial outwash typically found on hills and ridges in the region.

Adjacent landscape and land use includes predominantly low-density residential/seasonal use, including at least two conservation restrictions held by the Truro Conservation Trust adjacent to and nearby the site. The Hogsback Conservation Restriction is located directly to the north of the project site and largely includes coastal beach and coastal dune, as well as hillside heathland cover types. The Truro Conservation Trust owns another undeveloped portion of land, adjacent to the southeastern corner of the site.

A.2. Vegetative Cover Characteristics

Three tables have been prepared summarizing the vegetation in each of the major cover types found on the site.

Dunes, Heathland and Field

The vegetation along the dunes to the west is typical of these habitats in that it is dominated by grasses and low-growing shrubs. Further up the slope to the east, the habitat is dominated by heathland cover (Table 1). This heathland cover type extends to the crest of the hill, where there is sparse woody vegetation as well as herbaceous species in the open field habitat (Figure 5). To the southwest of the site boundary and within the local dune and swale community, there is a small, isolated, tidally influenced wetland located within the dune area (Figure 6). This depression was dry at the time of our evaluation, but it appears to be inundated from overwash during storm events or charged by saline groundwater during extreme high tides. The total area of dunes, heathland, and field onsite is 6.40± acres (Table 4).

Table 1. Dunes, Heathland and Field

Plant species	
Latin name	Common name
<i>Ammophila breviligulata</i>	Dune grass
<i>Arctostaphylos uva-ursi</i>	Bearberry
<i>Carex pensylvanica</i>	Pennsylvania sedge
<i>Cladonia</i> sp.	Reindeer moss
<i>Corema conradii</i>	Broom Crowberry
<i>Deschampsia flexuosa</i>	Hairgrass
<i>Gaylussaccia</i> sp.	Huckleberry
<i>Lathyrus maritimus</i>	Beach pea
<i>Matricaria matricarioides</i>	Pineapple weed
<i>Myrica pensylvanica</i>	Bayberry
<i>Poacea</i> spp.	Various grass species
<i>Polytrichum commune</i>	Hairy-cap moss
<i>Prunus maritima</i>	Beach plum
<i>Rosa rugosa</i>	Saltspray rose
<i>Usnea</i> sp.	Old man's beard
<i>Vaccinium angustifolium</i>	Lowbush blueberry
<i>Schizachyrium scoparium</i>	Little bluestem

Scrub-Forest

The scrub-forested and sub-mature areas are sparsely scattered across the site in several patches, the largest area being adjacent to the wetland in the southeastern edge of the site (Figures 4, 7 and 8). The total area of scrub-forest onsite is 1.76± acres (Table 4).

Table 2. Scrub Forest

Plant species	
Latin name	Common name
<i>Quercus ilicifolia</i>	Bear oak
<i>Pinus rigida</i>	Pitch pine
<i>Juniperus virginiana</i>	Eastern red cedar
<i>Prunus serotina</i>	Black cherry
<i>Robinia pseudo-acacia</i>	Black locust
<i>Betula</i> sp.	Birch
<i>Lonicera</i> sp.	Honeysuckle

Wetlands

The freshwater wetland that extends onto the southeastern corner of the site contains a shallow pond, shrub periphery, and forested swamp edge (Figures 8 and 9). The onsite portion of the wetland is part of a larger, offsite isolated shrub swamp with several patches of open water along the edges. The onsite pond has an average depth of 3-5 feet with some areas that are slightly deeper during seasonal high water. The bottom of the pond is mostly mucky deposits of various depth over sand. The total area of wetland onsite is 0.36± acres (Table 4).

Table 3. Wetlands

Plant species	
Latin name	Common name
<i>Acer rubrum</i>	Red maple
<i>Clethra alnifolia</i>	Sweet pepperbush
<i>Smilax</i> sp.	Greenbrier
<i>Chamaedaphne calyculata</i>	Leatherleaf
<i>Decodon verticillatus</i>	Swamp loosestrife
<i>Sphagnum</i> sp.	Sphagnum moss

The total area of each of the vegetative communities described above, plus other anthropogenic features are detailed in Table 4.

Table 4. Summary of Vegetative Cover Type

Cover Type	Acres
Coastal Beach	0.49
Coastal Dune	1.56
Field	0.94
Scrub / Forest	1.76
Heathland	3.90
Residential	0.33
Gravel Road	0.14
Wetland	0.36
Total	9.49

A.3. Rare Species Habitat

The entire site is mapped within NHESP Priority Habitats for Rare Species, PH 1232 (and Estimated Habitat 821). In addition to the three species listed by NHESP in its correspondence to the Applicant, OA staff documented and mapped broom crowberry (Special Concern) at the site.

Broom Crowberry

Although not listed in the NHESP correspondence (April 9, 2007), OA observed areas of broom crowberry within heathland and field communities, as well as in the vicinity of the site (Figure 2). Broom crowberry is a low growing evergreen shrub that typically inhabits dry, sandy soils with a history of disturbance and where disturbance intolerant species have been suppressed by fire, agriculture, or wind (Figures 10 and 11). Martine et al. (2005), suggests that this species requires fire disturbance to regenerate by seed. Colonies of this plant may persist for a half century but ultimately become senescent and are reliant on periodic seed germination. Unlike some fire-tolerant/fire dependent species the underground root mass does not typically re-sprout following loss of the above ground thalli to fire.

Broom Crowberry - Available Habitat

OA used GPS and GIS to map the extent of large areas and small patches of existing broom crowberry within the site. Several areas of significant broom crowberry growth were identified on the slopes of the hill in the north-central portion of the site and mapped as polygons, while nearly two dozen smaller “patches” of plants were mapped as GPS point locations (Figure 2). The total aerial extent of this plant is approximately 0.54 acres. Several somewhat isolated patches were also mapped in the eastern portion of the site, and larger tracts of the shrub can be observed on the adjacent properties directly east, north and south of the site.

As shown in Figure 2, broom crowberry growth is found on the slopes of the hill in the north-central portion of the site, as well as westward toward the bay and in the old-field habitat in the southeast part of the site. This distribution, and that observed on adjacent properties indicates that the property contains potentially suitable physiography to support broom crowberry, particularly when competitive pressures are moderated.

Eastern Spadefoot Toad

Spadefoot toads have two functionally distinct requisite habitat types: aquatic habitat for breeding and larval development; and terrestrial, non-breeding habitat for feeding, burrowing, and overwintering. Based on Mr. Brad Timm's locally focused, ongoing research (B. Timm, pers. comm.), eastern spadefoot toads of the Cape Cod National Seashore (CCNS) breed during nights with heavy rainfall and warm air temperatures (>50 F), then move back into surrounding uplands within 200-300 meters of their breeding wetland (with some individuals moving as far as 450 meters from their breeding wetland), where they feed at night and burrow diurnally. Burrowing sites are often concentrated along the edge of forested and scrub areas probably owing to the physiographic attributes of these ecotones that may provide favorable burrowing and thermal conditions. Therefore, their habitat is centered around breeding wetlands, but their overall habitat extends radially, though not uniformly, into the surrounding uplands.

OA worked with Brad Timm to evaluate general habitat features within the project site and to conduct call surveys from the project site during appropriate weather and seasonal conditions. On April 27, 2007 we used dipnets to evaluate the only potential spadefoot toad wetland on the site, the southeastern wetland. We identified a variety of invertebrate taxa as well as green frog (*Rana clamitans melanota*) tadpoles. Invertebrates included midge larvae (Chironomidae), dragonfly nymphs (Odonata), segmented worm (Oligocheta), and caddisfly larvae (Phryganeidae). The pond itself was 3-5 feet deep with a mostly sandy bottom, along with some deeper organic sediment deposits. The pH was strongly acidic (3.7) and the water temperature was 13 C during the dipnet survey.

After evaluating the wetland and discussing the project site with Mr. Timm we determined that Mr. Timm would use his general knowledge of the local populations of spadefoot toads so that we could confirm the presence or absence of calling spadefoot toads at our project site. Mr. Timm conducted several call surveys dedicated to the project site as well as nearly simultaneous surveys (same night) of known populations in the region (i.e., Provincetown and Truro). To date, Mr. Timm has documented a number of calling individuals, but has not documented any breeding choruses at any sites on the outer Cape due to unfavorable conditions. During these call surveys he has not heard any individuals or choruses on the subject site. Due to the absence of substantial rain in the region with appropriate temperatures, the lack of auditory or visual documentation may indicate that spadefoot toads may delay or abandon local breeding in 2007. No work is proposed within or near the southeastern wetland.

Eastern Spadefoot Toad Available Habitat

Based on our preliminary, general habitat review, OA does not believe the wetland habitat provides exemplary breeding habitat for spadefoot toads. However, the breeding habitat is suitable if spadefoot toads find breeding habitat elsewhere, even in the remote vicinity of the site. Given the uncertainty of spadefoot toad breeding within the Hogsback area in general, portions of the site, including sparse scrub woodland and field edges provide only potential terrestrial habitat for the species.

Eastern Box Turtle

In the northeastern extent of its range, including Massachusetts, the box turtle preferentially inhabits mesic (moist) upland forests with a relatively closed canopy, sparse understory, abundant leaf litter, plenty of cover objects such as logs or fallen branches, and areas of sunlight sufficient for basking. Additionally, box turtles are often found in open canopy habitat such as fields. Nesting typically occurs in clearings that have a sandy, friable substrate and are not prone to flooding (Dodd, 2001). While box turtles are generally considered an upland-dwelling species, OA has documented varying degrees of forested wetland habitat use by animals during several box turtle studies across Massachusetts.

Eastern Box Turtle Available Habitat

The field, scrub-forested uplands and forested wetlands, in and amongst low-density residentially developed areas are all potential habitat for eastern box turtles. Heath and dune communities are less likely to support eastern box turtles, particularly during the more extreme seasonal conditions because the environment is harsh and cover suitable for hibernation, and to a lesser extent, aestivation is sparse. However the more mesic forested areas, in close proximity to open canopy old field and scrub habitat may support this species throughout the year. In OA's experience, viable populations of eastern box turtles are often situated partially within low-density residential areas, where there is little traffic. While no eastern box turtles have been observed onsite, the activity areas for this species on the site would be biased toward open field edge and forested habitat. The project has been designed to avoid work in these areas.

Northern Harrier

This raptor is typically dependent on expansive grasslands and otherwise open habitat for foraging on small mammals. Nests are constructed in marshes or other wetlands and upland habitats.

Northern Harrier Available Habitat

Any field, dune, or heathland provides potential foraging habitat for this species on this site or anywhere else on the lower Cape. Nesting may quite possibly occur within portions of the shrub-scrub wetland, which is predominantly offsite. Onsite portions of the wetland will be protected by restriction.

Section B. Proposed Conditions

B.1. Proposed Plan

Construction of the new single family home will occur to the northwest of the existing home (Figure 3). The proposed work will include an extension of the existing driveway, a swimming pool, and landscaping. An underground septic sewage disposal system will be located northeast of the new house. All construction access will occur via the existing driveway, while portions of the building materials will be transported via a temporary access that will not disturb broom crowberry, as shown in Figure 3. The proposed work will impact 0.22± acres (of 0.54± total acres) of the existing broom crowberry and 0.96± acres overall within a mix of heathland, scrub forest, and field. The corner of the site located southeast of Stephens Way is not a developable lot, and it will remain in its current undeveloped state.

Approximately 6.58± acres of the site will be protected under a permanent Conservation or Deed Restriction donated by the Applicant.

B.2. Future Proposed Use

The land surrounding the existing structures and yard have not been included as part of the restricted land (Figure 3). As indicated in the figure, approximately 69% of the site is proposed to be placed under Conservation Restriction.

Section C. Impact Analysis

The proposed plan is an architecturally designed, low-profile dwelling with natural siding materials that will complement the landscape. This includes a two-car drive through garage and portico, connected to the dwelling, a necessary and suitable area for traffic accommodation in the parking area. The current design minimizes the project's impacts on existing broom crowberry habitat to the extent possible while maintaining a "no-take" impact for the more imperiled (e.g., "Threatened") extant vertebrate species. The current proposal is the result of several siting changes, each intended to reduce the overall footprint as well as to avoid the most significant areas of crowberry growth and to provide a net benefit to the species identified by NHESP on the site.

C.1. Alternatives Assessment

The project team considered several design alternatives prior to submitting this application proposal. A sub-set of these alternatives is described below and graphically represented in Appendix B, attached:

- Alternative 1 – The initial plan was developed prior to documentation and mapping of broom crowberry and would disturb approximately 26% of heathland supporting community (70% of the broom crowberry), and 13% of the entire site. To preserve the character of the surrounding landscape, the plan already included relatively tight constraints on the project work area relative to the size of the proposed project.
- Alternative 2 – The first revision would disturb approximately 24% of heathland supporting community (58% of the broom crowberry), and 12% of the entire site.
- Alternative 3 – The second revision included in OA's Rare Species Habitat Assessment submitted to NHESP reduced the disturbance to 19% of heathland supporting community (-7% from original design), and broom crowberry to 48% (-22% from original design), with a total disturbance on the site of 10% (-3% from original design).
- Alternative 4 (See Figure 3) – As a result of discussions with NHESP, the Applicant shifted the building location approximately 10 feet to the east, to preserve the largest contiguous area of actual and potential habitat for broom crowberry.
 - With some additional adjustments to the driveway and work perimeter a further reduction of the disturbance to broom crowberry (-4%) and heathland supporting community (-1%) were achieved, while the overall disturbance remained approximately the same.
 - NOTE: This (Alt. 4) is the proposed alternative.
- Alternative 5 (5a and 5b) – As requested by NHESP, the Applicant explored the possibility of shifting the proposed house approximately 50 feet to the east as well as a similar offset to the west. These scenarios require altering the natural topography and an inordinate amount of additional grading and site work, thus increasing the overall work area.
 - Alternatives 5a and 5b also result in an increase of the disturbance to the heathland supporting community (both alternatives = +5%), and increased displacement of broom crowberry (western alternative = +18%, eastern alternative = +23%), with an increase in total disturbance within the site (western alternative = +1%, eastern alternative = +4%).

C.2. Impact Quantification

As a result of revisions, the proposed project has a footprint of disturbance limited to approximately 0.96± acres overall, or 10% of the total site. The footprint includes approximately 0.21± acres of mapped broom crowberry habitat, which is ± 39% of the total crowberry documented onsite (Figure 3 and Table 5).

Several additional acres of (un-mapped) crowberry occur to the immediate south, north and northeast. As discussed in the previous section, the currently proposed work area represents a significantly revised and reduced design that minimizes impacts to broom crowberry to the greatest extent feasible. This reduced impact combined with the proposed mitigation plan result in a project that meets the “insignificant impact” standard (321 CMR 10.23(2)(b)).

Table 5. Proposed Impact

Area Description	Total (acres)	Impact (acres)	Impact (sq. ft.)	Percent Impact
Coastal Beach	0.49	0.00	0.00	0%
Coastal Dune	1.56	0.00	0.00	0%
Field	0.94	0.10	4356.00	11%
Heathland	3.90	0.65	28314.00	18%
<i>--Broom Crowberry</i>	<i>0.54</i>	<i>0.21</i>	<i>9147.60</i>	<i>39%</i>
Residential	0.33	0.00	0.00	0%
Road (Gravel)	0.14	0.02	871.20	14%
Scrub / Forest	1.76	0.13	6098.40	7%
Wetland	0.36	0.00	0.00	0%
Total	9.49	0.96	41817.60	10%

Section D. Conservation and Management Plan

To ensure the long-term “net benefit” of broom crowberry habitat, the Applicant proposes a two-fold plan that includes land protection and support of ongoing crowberry habitat management efforts. The plan components are described below and in further detail in Appendices A and C.

D.1. Land Protection Component

The Applicant proposes to protect in perpetuity approximately 6.58± acres, or 69% of the site, by donating a Conservation Restriction on portions of the property as indicated in Figure 3. This land to be protected includes 0.32± acres of existing broom crowberry, as well as 2.94± acres of significant coastal heathland supporting community, plus old field and upland scrub habitat, offering the potential for additional growth of the species. The Draft CR is attached in Appendix C. The lengthy CR execution process will take place within the next year.

D.2. Habitat Management and Research Component

In the last 20 years, management of heathland habitat has been the focus of several conservation efforts and research programs on Cape Cod, Martha’s Vineyard and Nantucket because this particular ecosystem provides a unique environment for many plant species that prefer areas subject to recurring

disturbance. According to Motzkin et al. (2002), most of Cape Cod was forested prior to settlement by European colonists in the seventeenth century. During colonial settlement, most of the land was cleared of forests and transferred to agricultural land use as either pasture or cropland. The local climate combined with periodic disturbance due to agricultural activity, including grazing and fire (accidental or intentional) increased dramatically during colonial expansion (Parshall and Foster, 2002) and provided the development of the heathland that has been prevalent on Cape Cod since European contact. Although there is an argument that managing such habitat is artificial and it should be allowed to revert to its natural ecological climax of forest, conservation plans targeting rare plant species that occur in these habitats must perpetuate early successional species assemblages, thus requiring traditional land-use practices or appropriate substitutes (Motzkin and Foster, 2002).

Proposed on site habitat management and mitigation includes two components, (1) transplantation of patches of broom crowberry from the proposed work area to designated protected areas within the conservation restriction and (2) ongoing selective clearing of encroaching trees and shrubs that could ultimately shade and impact the heathland vegetation that typically requires full exposure to the sun.

Transplantation methods are described in detail in Appendix A.1. Any modifications to this protocol will be approved by NHESP prior to implementation. The transplanted patches of broom crowberry will be watered for two growing seasons utilizing an automatic watering system. As required in the protocol, the transplanted vegetation will be monitored for four growing seasons (including at least 3 full growing seasons). Transplantation will be restricted to an area of relict cart road, currently supporting predominantly heathland vegetation (bearberry) and having a generally level aspect (so as to avoid erosion of the soil surface). This site was chosen for its generally level aspect and for access with limited equipment damage to the landscape. Approximately one hundred square feet of broom crowberry, selected from the project footprint and for positive transplantation attributes, will be translocated to the cart road located west of the building site. A 100± square foot translocation was adopted to allow use of small equipment to execute the necessary excavation and translocation while limiting alteration of the heathland community.

Transplantation will precede construction of the house and the transplant field will be equipped with an automated watering system for the first two growing seasons.

Selective clearing of trees and shrubs competing with broom crowberry will be conducted under the direction of a qualified botanist or ecologist familiar with heathland plant communities. Any invasive species will be targeted for removal. This effort is focused upon those areas observed in the field where crowberry in

particular is being displaced by vegetation not typically prevalent in heathland communities.

Lack of perturbation over the last half century or more have fostered competing species in some areas of otherwise robust crowberry/heathland. For additional details and monies associated with this transplanting and clearing program see Appendix A.1.

The Applicant also proposes to support ongoing research conducted by a research scientist from the University of Massachusetts. A portion of this scientist's research focuses on prescribed burning experiments in North Atlantic pine-oak forests and barrens, including evaluating the fire ecology of coastal grasslands and heathlands within the Cape Cod National Seashore.

OA has corresponded with this researcher throughout the permitting process to develop a conceptual research proposal combining both onsite habitat enhancement and applied research that will result in valuable information that can be used for future conservation of broom crowberry populations on the Cape and Islands. Funding for the research will be applied to a specific study that will include prescribed burns with three (3) burn treatments (spring, summer, and fall) on four (4) different sites to determine the relative effects of burning during different seasons on the vegetative characteristics and species competition in the heathland community.

In general, prescribed burns within heathlands have been demonstrated to have a positive influence on regenerating broom crowberry colonies by stimulating seed germination on Nantucket (Dunwiddie, 1990). However, the effects of burns during different seasons have not been tested specifically and systematically for this species. Conversely, the effects of how spring or summer burns differentially affect vegetation and arthropods have been reported for sandplain grasslands of Nantucket (Dunwiddie, 1991) and elsewhere (Martine, et al., 2005). As reported by Dunwiddie (1990, 1991), within two growing seasons vegetation had become re-established and most orders of arthropods were more abundant in burned plots compared to the unburned, control plots.

In the currently proposed study, burns will occur in three (3), 20 x 20 m plots at four (4) different sites (4 replicates). A portion of each plot will contain at least some live broom crowberry. One of the study sites is proposed within the subject site off Stephens Way, two will be in nearby Cape Cod heathlands, and a fourth site will be on Nantucket. A disproportionate amount of heathland is located on Nantucket (Dunwiddie et al., 1996), thus, developing applied management methods for the conservation of heathland communities, including populations on the island of Nantucket, has a logical connection to the management of heathland communities on Cape Cod.

At each site, one plot will be burned in the spring (Treatment 1), another in the summer (Treatment 2), and third in the fall (Treatment 3). In other words, one

plot will be burned at each site during each season (four replicates of each treatment). Using quantifiable methods, vegetative regrowth will be monitored for three (3) growing seasons (April to October) following the initial burn treatment. Three consecutive years of monitoring are prescribed because germination and recruitment by broom crowberry may occur within less than a year of a burn treatment (Dunwiddie, 1990) and the establishment of non-target species, specific to the time of the experimental burn is a desirable factor to evaluate in this effort.

The results of this program will be useful to determine how the different seasonal treatments affect broom crowberry growth and other plant species. The implementation of the burns on private land will be coordinated by a professional fire management consultant, and cannot be conducted without the proper permits from local and state officials. Good faith efforts will be made to obtain these permits. Reports and any publications associated with this study will be submitted to NHESP. For additional details and budget associated with this program see Appendix A.2 and A.3.

In addition to the tri-seasonal research, OA has corresponded with a botanist, who is familiar with heathland communities and was involved in a 5-year monitoring study of heathland plant community recovery from prescribed burns performed in 1998 on brush piles in the heathlands in the Cape Cod National Seashore, which included broom crowberry (ENSR, 2005). This botanist proposes to revisit the same study plots to quantify the species composition and species density in the heathland plant community 10 years later (1998-2008). A report summarizing the methods, analysis, and findings, will be submitted to NHESP. For additional details and budget associated with this heathland restoration study see Appendix A.3.

Once the results of the three-season burns are analyzed and the longer-term quantification of how different burn management techniques influence heathlands is evaluated, the project ecologists will develop a prescribed burn plan to implement heathland management on a larger scale. This official burn plan will be coordinated through a prescribed fire burn boss. Any prescribed burns will need approval from the local, state, and/or federal authorities, thus we will work with the project's fire management consultant in good faith, to obtain the necessary permits. Stephens Way Nominee Trust will provide funding directed at prescribed burns to benefit senescing populations of broom crowberry, where the species is documented to require some management, specifically, Cape Cod and Nantucket. The details of this management plan will depend on the results of the field research and the ability to obtain the proper permits and permission at the time of the prescribed burns.

Stephens Way Nominee Trust has agreed to provide funding to the tri-seasonal research in the amount of \$10,000. Additional funding in the amount of \$17,500 will be provided to support heathland habitat management on a larger scale.

Management will target areas inhabited by broom crowberry through prescribed burns (on site and off site), transplanting (on site), and selective clearing (on site). It is important to note that the appropriate authorities must approve any studies conducted within the Cape Cod National Seashore or other potential management sites on Cape Cod; therefore, we cannot guarantee that this work can be completed in the future. However, our additional study area in Nantucket and proposed future mitigation on Nantucket island is an important component to this conservation plan to broaden options for potential mitigation locations. In the event that permits are denied for this work, the applicant will propose equivalent donations for mitigation subject to Division approval.

Furthermore, conducting such heathland studies on Nantucket, one of the locations where broom crowberry was first studied in detail (Dunwiddie, 1990, 1991; Zaremba, 1984) allows the researchers to compare their results with population studies on Cape Cod, and thereby provides an opportunity to add a regional context to the study of a plant community that is globally rare, but locally abundant in these two locations. This will also expand heathland management options. A well-planned regional study will result in more useful data because it will consider natural variability between distinct populations.

Although the management budget (\$17,500) includes an applied research component, the majority of these funds will be directly applied to either onsite or offsite mitigation. An estimated \$5,000 will be allocated to the fire management consultant for developing a burn plan based on the proposed research and existing scientific literature, permitting, and coordination for future heathland management on Cape Cod and Nantucket. An estimated \$5,000 will be allocated for the botanist to oversee selective clearing and transplanting on site, conduct vegetative monitoring at previous heathland burn sites on Cape Cod, data analysis, report preparation, and working with the fire management consultant with regard to heathland management on Cape Cod.

A section of the project botanist's report will include a narrative explanation and map of areas within the heathland that should be monitored and cut back periodically (5 year intervals as needed) by a qualified botanist or other professional.

An estimated \$2,500 is budgeted for a restoration ecologist services and costs associated with transplanting broom crowberry on the subject site; and \$5,000 will be allocated to a conservation organization on Nantucket for management activities including general costs for burning, vegetative monitoring, data analysis, and report preparation. For additional details and budget associated with heathland management see Appendices A.4 and A.5.

This contribution will ultimately provide important data on how heathlands respond to controlled burns (applied management/research) resulting in the development of a heathland management plan. Implementing this plan on Cape

Cod and Nantucket will provide a net benefit to the Commonwealth's understanding of this species' ecology and enhance its habitat within the region.

Conclusions

The project proposed in this application is the result of considerable effort to balance the siting requirements related to the property in the context of the low profile architectural plan specifically designed to accommodate this landscape, while at the same time minimizing disturbance to multiple rare species on, or potentially found, onsite. This application focuses primarily on broom crowberry because the NHESP has already determined that the project as substantially proposed would not result in a take of the other state-listed species in previous correspondence (letter dated 10/5/07).

A conservation restriction encompassing 6.58± acres of ocean front land, and with an equivalent acquisition value of several million dollars has been offered as a prominent component. This feature protects greater than three acres of heathland community as well as other cover types that are supportive of broom crowberry in the local context.

As discussed in the preceding sections, the proposed work area represents a significantly revised and reduced layout, in combination with a disproportionately large proposed conservation restriction that, to the greatest extent feasible, minimizes impacts to broom crowberry colonies and other natural habitat features while providing perpetual protection of the remaining significant habitat features. In addition, the proposed land protection, habitat management strategy, and off-site mitigation in the form of supporting coastal ecology research and heathland management provide an enduring "net-benefit" to the species.

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Figures

Figure 1. USGS Site Locus

Figure 2. Vegetative Cover

Figure 3. Proposed Conditions with Supplement

**Supplement: Site and Sewage Disposal System Plan (Sheet C2.1.1),
revised October 19, 2007, by Coastal Engineering Company, Inc.**

Figures 4-11. Site Photographs

Appendix A – Mitigation

Appendix B – Alternative Siting Plans.

Alt. 1 – 3 by Oxbow Associates, Inc.;

Alt. 4 is shown in Figure 3;

Alt. 5a (SKC-1) and 5b (SKC-2) by Coastal Engineering Assoc.

**Appendix C – Draft Conservation Restriction, Declaration of
Restriction, Metes and Bounds Plan**



Figure 4. Existing house with field and scrub-forest



Figure 5. Top of dune and heathland along path to beach



Figure 6. Tidally influenced wetland (off site)



Figure 7. Scrub-forest and field north of existing house



Figure 8. Wetland (northern end)



Figure 9. Wetland (southern end)



Figure 10. Broom crowberry



Figure 11. Broom crowberry in the foreground

APPENDIX A.1

Transplant and Heathland Management On the Project Site for Conservation and Management Permit

NHESP File #06-21061

Pre Transplant Site Evaluation and Selection

- The botanist shall investigate and document soil characteristics and the surrounding vegetation community at the location of the impacted broom crowberry.
- The botanist shall investigate soil characteristics and the surrounding vegetation community at the proposed location(s) of the transplant
- The results of this comparison, including photographs, shall be presented to the NHESP.

Pre Construction Fencing and Monitoring

- All broom crowberry plants/colonies located within or near the construction zone, but not to be impacted (i.e., transplanted) shall be surrounded with construction fencing to avoid an accidental “take” during the construction process.
- After transplanting, the area around the re-located plants will be staked in at each corner for future reference. Construction fence will not be needed because the relocated area is far from any construction work area.
- Construction crews shall be alerted to the locations of the broom crowberry within and in proximity to the construction zone.
- Prior to excavating any impacted broom crowberry, the dedicated transplant site shall be excavated enough for the transplanted mats of broom crowberry.
- An inert polymer wetting agent shall be applied to the surface of the subsoil (where transplanted roots will come in contact with the subsoil) to prevent desiccation after planting. Just prior to transplanting the wetting agent will be activated with a gentle watering.

Transplanting Protocol

Transplantation will be restricted to an area of relict cart road, currently supporting predominantly heathland vegetation (bearberry) and having a generally level aspect (so as to avoid erosion of the soil surface). Approximately one hundred square feet of crowberry, selected from the project footprint and for positive transplantation attributes will be translocated to the cart road located west of the building site (See Appendix A.3). This component of the habitat

management is not intended as an in-kind, 1:1 replacement to impact of broom crowberry. The purpose of this effort is to select some of the healthiest crowberry for relocation to establish a new patch of the species and monitor the success over time.

- Using a low-disturbance (track vehicle) excavating machine equipped with a specialized 36-inch transplanting scoop (or larger if available), several mats of crowberry will be cut to a depth of approximately 8-10 inches and moved from the construction area. The transplantation location shall be within the cart road located west of the building site (Appendix A.3). The botanist shall direct all transplantation and excavation activities and may adjust the excavation depth and/or area based on site conditions.
- Excavation will begin 12-18 inches away from the leading and following edge of the plant and extend the full width of 36 inches along the length of the specimen so that as much lateral rhizomes will be included in the transplant. The objective of the transplant will be to move the plants carefully taking all precautions to minimize disturbance to the plants and soil around their root systems. This will be accomplished by supporting the root systems with a wooden frame throughout the transplant process. Then the plants will be relocated to the transplant location and carefully deposited in the planting hole, which was previously excavated and prepared with a suitable wetting agent. The time from initial excavation will be less than 30 minutes per section of plant.
- Immediately following transplant, the entire area will be soaked with water to minimize any trapped air within the soil.
- An irrigation drip line will be set on a timer to be adjusted as needed throughout the first two growing seasons.

Estimated Budget for Transplanting Broom Crowberry: \$2,500

Transplant Monitoring

- Monitoring will occur at a minimum of every 2 weeks for the first growing season, then three times per growing season (April, July, October) for the following 3 years.
- The transplant will only be considered successful if >50% of the transplanted specimens survive through 3 complete growing seasons.
- Monitoring reports will be submitted to the NHESP by December 31 for each season of monitoring. Reports should include photographs and detailed observations regarding plant morphology, general vigor for each transplanted patch, and general seasonal weather patterns.

Contingency

Good faith efforts will be made by the restoration ecologist to conduct the transplanting during the late fall-early winter (November - December), or when the ground is not frozen and the immediate forecast allows for sunny conditions above freezing during, and several days following, the planting. If further delays from permit review or construction scheduling result in the necessity to transplant material in January or February, the area of transplanted material will be doubled to a total of 200 square feet, the thickness of transplanted root mat will be increased to 12 inches (from 8-10 inches), and clear plastic sheets (2-3 mil) will be secured with ground staples over freshly transplanted material to minimize any frost damage for 10-20 days. The plastic will provide some enhanced solar radiation that could benefit root growth, but the plastic will not be sealed entirely to the ground surface so that it does not become too warm. This area will be monitored once per day, to ensure the plastic is secure, during the construction period or until the weather is warm enough to remove the plastic sheets.

Up to 50% of any ripe seed available from the transplanted plants can be taken under a Scientific Collection Permit and held in a reserve seedbank, nursery, greenhouse, etc. The storage and propagation facility and method(s) for these reserve plants, seeds or propagules shall be approved by NHESP as part of this Contingency Plan. All persons collecting and propagating this plant material shall be pre-approved by NHESP and shall hold a valid Scientific Collection Permit from the Division of Fisheries and Wildlife.

On-site habitat management

- **Initial Treatment**

During the first growing season (June-October) following the start of work (2008 anticipated), selective clearing of trees and shrubs currently encroaching upon extant crowberry patches will be conducted under the direction of a qualified NHESP-approved botanist or ecologist familiar with heathland plant communities. On the project site, there are a number of areas where trees and shrubs are actively shading Broom Crowberry, killing the crowberry or resulting in crowberry plants of poor vigor. In addition, there are portions of the site, where dense shrub or tree growth appears to be impeding the spread of Broom Crowberry. As a first step in the management process, the management target areas where shading or dense vegetation is impeding the growth of Broom Crowberry will be flagged in the field by the qualified botanist. The botanist will then supervise the removal of competing trees and shrubs. The methods employed will be determined in the field and may include saw cutting, utilization leveraging tools, spot application of topical herbicide or other methods. This effort will include the removal of invasive species not typical of heathland communities (e.g. Black Locust within the heathland).

By December 31 of the calendar year in which the initial vegetation management is conducted, the qualified botanist will provide the NHESP with a detailed report describing the management activities and methods of vegetation removal. The report will include a plan showing approximate GPS coordinates of flagged areas where vegetation management was implemented, an estimate of the total area managed, photographs representative of pre- and post-treatment conditions, and future management recommendations.

- **Long-term Management**

At five (5) year intervals, commencing in 2010 and every five years thereafter (2015, 2020, 2025...), the site will be examined by a qualified botanist or other individual approved by NHESP and management and reporting shall be conducted as described above ("Initial Treatment"). In all cases, first priority will be to avoid actual or potential damage to extant broom crowberry on the site. The applicant will make every attempt to implement the specific management recommendations made by the qualified botanist. Any recommendations that deviate from the specific management techniques and procedures described herein, shall be approved in writing by the NHESP.

Estimated Budget for selective removal of competing vegetation and preparation of a 5-year vegetative management plan: \$3,000

APPENDIX A.2

Research Component for Conservation and Management Permit On- and Off-site

NHESP File #06-21061

Introduction --- An NHESP-approved professional will implement prescribed burns with three (3) burn treatments (spring, summer, and fall) on four (4) different sites to determine the relative affects of burning during different seasons on the vegetative characteristics and species competition in the heathland community.

Tri-Seasonal Burn Plot Study

Methods.---In the proposed study, each burn action will occur in 20 x 20 m plots (3 plots per site) at 4 different sites (4 replicates per treatment). A portion of each plot will contain at least some live broom crowberry. One of the study sites will be within the subject site off Stephen's Way, two will be in nearby Cape Cod heathlands, and a fourth site will be on Nantucket.

Burn Schedule

May 2008 - one plot burned in the spring (Treatment 1)

July-August 2008 – one plot burned in the summer (Treatment 2)

October-November 2008 – one plot burned in the fall (Treatment 3)

Vegetative Monitoring.--- Vegetative re-growth (species composition, percent cover) will be quantified using quadrat sampling for 3 growing seasons (April to October) . Because broom crowberry typically does sprout during the first season after a burn, it is important that monitoring occur during year 2. Furthermore, since our proposed burning will be staggered throughout the growing season, sprouting may also be staggered during the second and third growing seasons. Thus, it is important that monitoring occur during each consecutive growing season and not to skip years to extend the monitoring period. The differential response of the affected species and colonizing species will be assessed and quantified for analysis between the three treatment regimes as well as among the seasonal replicates. The results of this experiment, in this particular application will potentially provide preferred seasonal burn conditions for maintenance and enhancement of broom crowberry.

Estimated Budget for tri-seasonal burn plot study: \$10,000

Ten-Year Burn-Site Evaluation

In 1998 prescribed burns were conducted on Cape Cod including areas of broom crowberry. A five-year, post-burn monitoring study of heathland plant community recovery from prescribed burns in heathlands that included broom crowberry was conducted (ENSR, 2005). In the intervening period, no critical evaluation has been made of the resulting recovery within these burn plots.

A qualified, NHESP-approved biologist will revisit the same study plots to quantify the species composition and species density in the heathland plant community 10 years later (1998-2008). A report summarizing the results of these methods, findings, and analysis will be submitted to NHESP.

Estimated Budget for 10-year Heathland Monitoring: \$2,000

APPENDIX A.4

Implementing Heathland Management at Off-site Locations For Conservation and Management Permit

NHESP File #06-21061

Once the results of the three-season programs are analyzed and the longer-term quantification of how different burn management techniques influence heathlands, the project ecologists will develop a prescribed burn plan to implement heathland management on a larger scale. Any prescribed burns will need approval from the local, state, and/or federal authorities, thus we will work with a local expert in the field, in good faith, to obtain the necessary permits. Stephens Way Nominee Trust will provide funding directed at prescribed burns to benefit senescing populations of broom crowberry, where the species is documented to require some management, specifically, Cape Cod and Nantucket. The details of this management plan will depend on the results of the field research and the ability to obtain the proper permits and permission at the time of the prescribed burns.

Additional funding in the amount of \$17,500 will be provided to support heathland habitat management. Management will target areas inhabited by broom crowberry through prescribed burns (off site), transplanting (on site), and selective clearing (on site). As stated previously, the appropriate authorities must approve any fire management

Although the management budget includes an applied research component, the majority of these funds will be directly applied to either onsite or offsite mitigation.

The offsite mitigation component budget is listed below:

Estimated budget to develop a burn plan based on the proposed research and existing scientific literature, permitting, and coordination for future heathland management on Cape Cod and Nantucket: **\$5,000**

Estimated budget to conservation organization located on Nantucket for management activities including general costs for experimental and landscape-scale burning, vegetative monitoring, data analysis, and report preparation: **\$5,000**

APPENDIX A.5

Mitigation Budget

Onsite transplanting and heathland management	\$5,500
Research Experiment (onsite, Cape Cod, Nantucket)	\$10,000
Vegetative Monitoring 10 years after heathland burning on Cape Cod	\$2,000
Offsite heathland management (Cape Cod, Nantucket)	<u>\$10,000</u>
TOTAL FINANCIAL CONTRIBUTION TO MITIGATION*	\$27,500

*This does not include the conservation benefit resulting from the donated conservation restriction on existing rare species habitat within 6.58 acres (69% of the site).