

## 6.0 RARE SPECIES

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### 6.1 Special Status Ecological Communities and Rare Plant Species

#### 6.1.1 *Frost Bottom*

The VGC property supports one of only a half dozen areas on Martha's Vineyard known as a "Frost Bottom". Frost Bottoms are topographical depressions believed to have been created by glacial meltwaters, but which in the present often have no drainage associated with them. Soils beneath Frost Bottoms are accordingly excessively well-drained, and typically support a barrens vegetative community. Frost Bottoms derive their name due the pooling of cool air that occurs within the basins, resulting in occasional freezing temperatures within these areas nearly every month of the year. Conversely, due in part to the vegetative structure typical of Frost Bottoms (consisting predominantly of scrub oak and ericaceous shrubs) and lacking canopy cover and any benefit of shade, the basins are subject to intense solar heat gain, and are often much hotter than the surrounding higher elevations.

While it is now understood that the VGC Frost Bottom is an ecologically significant ecosystem, the initial impetus to protect this basin was predicated upon its visual characteristics, as the low vegetative cover allows long views across the basin. The 1983 CR language reflects the desire to protect these scenic vistas.

Few plant species are able tolerate the extreme temperature regime of a Frost Bottom. However, these areas are host to various wildlife species that thrive on the structure and biology of the limited vegetative community. To a large (but not absolute) extent, the temperature extremes prevent canopy-producing species from becoming established in the basins, thus Frost Bottoms provide open habitat conditions, which are otherwise diminishing in the region as land previously in active cultivation becomes developed or reforested. Further, due to lower temperatures within the basins than in surrounding areas, plants leaf out much later in the season, providing various insects with preferred tender emerging growth when vegetation in the surrounding vicinity is already mature. Accordingly, Frost Bottoms, though hostile to many plant species, are havens for a variety of wildlife species, many of which are considered rare.

#### 6.1.2 *Rare Plant Species*

The VGC property was inspected for rare plant species documented to occur in various locations on Martha's Vineyard, as documented through background research of Natural Heritage and Endangered Species Program (NHESP) files that are accessible to the general public. In addition, distribution and occurrence

data listed in The Flora of Martha's Vineyard was also reviewed prior to the field assessment. This information allowed the field surveys to be conducted in a targeted manner, based on the presence of suitable habitat for species previously documented to occur on Martha's Vineyard, and on their probability of occurrence on the site. Information on the presence of rare species in the area from other on-island sources was also considered in the field assessment.

A description of the eleven protected plant species for which specific searches were undertaken is included in Appendix B. Recognizing the necessity of inspecting the site in different seasons, field surveys were conducted on many occasions during both the 1998 and 1999 field seasons. Of the eleven state-listed plant species that were identified as having the potential to occur on the site, only two Special Concern species were observed, namely Nantucket Shadbush (*Amelanchier nantucketensis*) and Bushy Rockrose (*Helianthemum dumosum*). Rare species observations forms for the Nantucket Shadbush and Bushy Rockrose have been submitted to NHESP, and a brief discussion of the habitat requirements and occurrences for these plant species observed on the VGC site is provided below.

A native plant and revegetation program is proposed in association with VGC, which commits to continued monitoring and protection for rare plant species, and which seeks to encourage the establishment of rare plants which do not presently exist on the site, as described in Section 7.

#### **Nantucket Shadbush (*Amelanchier nantucketensis*)**

Adapted to open, sandy areas, which are subject to periodic disturbance, Nantucket Shadbush is a Special Concern species found in sandplain grasslands, old fields, and sand barrens habitats in low, dense clusters. Specimens frequently occur along roadside margins in open, sunny environments. ENSR identified three small clusters of Nantucket Shadbush along the margin of Edgartown-West Tisbury Road adjacent to the mowed road shoulder.

#### **Bushy Rockrose (*Helianthemum dumosum*)**

A Special Concern species associated with coastal heathlands and dry, open, sandplain grassland communities, Bushy Rockrose occurs in low mounds of loosely ascending stems with short coarse hairs and narrowly oblong to elliptic leaves with stellate and simple hairs. Specimens of Bushy Rockrose were found in several locations within the grassy openings in the Frost Bottom; a single specimen observed along Dr. Fisher Road in 1998 was not located again in the 1999 field survey.

### **6.1.3 Protection of Rare Ecological Communities and Rare Plant Species**

#### **6.1.3.1 Protection of the Frost Bottom**

As previously identified, the Frost Bottom was initially only recognized for its scenic attributes, and was not formally delineated until January 1998. As requested by the Martha's Vineyard Commission, the Frost Bottom was formally delineated, with this delineation being subject to review and approval of the MVC. Accordingly, the delimitation of the Frost Bottom was determined by ENSR in consultation with Sheriff's Meadow Foundation, based both upon vegetative cover and as partially defined by topography. The field delineation of the Frost Bottom boundaries and MVC-acceptance thereof resulted in a 24.1 acre area being formally defined. Further, the VGC proponent initially offered to establish a 50 buffer around this area, and later increased that buffer to 100 feet, resulting in the protection of an additional 12.1 acres, for a total area of 36.2 acres being effectively restricted from future development.

In addition to avoiding impacts to the Frost Bottom itself, the proponent has agreed to substantially avoid golf activities within the 100' buffer. Given other restrictions, total avoidance of the 100 foot buffer is not possible, however there will be no grading activities within the buffer zone, and the only 'impact' (which may in part represent an ecological benefit) will be the removal of vegetation in those areas where a 'flyover' is proposed. In these areas, vegetation >3 feet in height will be removed to allow for clear sightlines between tees, fairways, and greens. The extent of clearing has been discussed with NHESP during both field visits and in subsequent meetings, and will furthermore be defined in the NHESP Conservation Permit. In addition, the VGC proposal will facilitate the revegetation of previously disturbed portions of the 100' buffer zone, which had been cleared and graded as part of the subdivision roadway network.

Both the Frost Bottom and its 100 foot buffer will be subject to ongoing management to periodically cull canopy-producing species that are encroaching into lower elevations. The proponent has committed to fund Sheriff's Meadow Foundation in the amount of \$5,000 per annum in perpetuity for research and management efforts to be undertaken in the study of Frost Bottoms island-wide. The management program for the VGC Frost Bottom will be undertaken in consultation with NHESP, in accordance with anticipated Conservation Permit conditions for the VGC project.

#### **6.1.3.2 Protection of Rare Plant Species**

The VGC project will not impact any rare plants species that have been identified in association with the field inventory efforts conducted by ENSR. The proponent has provided NHESP with a 200-scale plan identifying the

locations of the two rare plant species (Nantucket Shadbush and Bushy Rockrose) identified during the 1998 and 1999 field seasons, and rare species observation forms have also been submitted to NHESP. These plants will be flagged prior to any construction activity, and the golf course construction manager will be made aware of their existence and of the necessity of avoiding any disturbance in the immediate vicinity of the plants. Given the distance between the documented locations of rare plants and proposed construction activities, it is not expected that more intensive precautions are necessary. Further, it is anticipated that disturbance of native soils in other locations on the VGC site will expose the seed bank, thus encouraging the self-germination of these rare species which are often found in disturbed, sunny conditions.

## 6.2 Northern Harrier

Northern Harrier (*Circus cyaneus*), a species listed as Threatened under the Massachusetts Endangered Species Act, is a ground-nesting raptor which favors sunny, open habitat (e.g., grasslands, heathlands) for both nesting and foraging. Harriers are known for their spectacular courtship flight, and their distinctive foraging technique, which consists of a methodical survey of the hunting ground flown at low elevations. Harriers are carnivorous, subsisting primarily on small mammals, such as may be most readily captured amid the open foraging habitat favored by Northern Harriers. Abundance of prey has been linked to nest site selection, as referenced by Herkert et al (1999). Northern Harrier has been documented on the VGC property both formally and anecdotally, with the first verified report documented in 1998. The 1998 observation, funded through an NHESP grant administered by Sheriff's Meadow Foundation, located a single nest within the limits of the Frost Bottom. A second nest was located in the following year, again within the Frost Bottom itself. Harriers relocate their nest sites annually, and defend their nests vigorously once eggs have hatched. The present populations of Northern Harrier in Massachusetts are largely concentrated on Martha's Vineyard, Nantucket, Cape Cod, and Plum Island, where expanses of non-forested habitat still exists (in contrast to inland locations, where development and reforestation -the latter tied to the reduction of acreage under cultivation- has been a cause for the decline of the Northern Harrier in Massachusetts).

### 6.2.1 Project Impacts to Northern Harrier and Mitigation Measures

The proposed routing plan involves a 'flyover' at the southern end of the Frost Bottom associated with Hole #16, while Hole #17 involves shots over a portion of the 100' buffer perimeter, but not across the Frost Bottom itself. Existing overstory vegetation in these areas will be cleared, while vegetation less than 3 feet in height will be retained and may also be manipulated consistent with the overall management of the Frost Bottom and its 100' buffer. Such vegetation

will substantively discourage golfers from using these areas. However, golfers will be strictly excluded from entering the Frost Bottom itself, the penalty for which will be suspension of playing privileges. Low (<3') vegetative cover is necessary proximate to flyovers to maintain adequate sightlines between tees and greens.

The NHESP has expressed concerns regarding the impact that such activity would have on nesting Northern Harrier. If disturbed sufficiently, Northern Harriers have been documented to abandon their nest sites before eggs have hatched, although they will aggressively defend their nests once eggs have hatched. Recognizing the concern raised by NHESP, the proponent has developed a multi-faceted program to ensure that there will be a long-term net benefit to the species. These measures include minimizing the potential impact both during construction and operation of VGC, management of nesting and foraging habitat both on-site and off-site, monitoring of Northern Harrier activity once VGC is in operation, both on site and within the off-site mitigation area, and funding for island-wide study of Northern Harrier preferences for nesting sites, with particular regard to nest site fidelity. These mitigation measures are described further below.

#### **6.2.1.1 On-site Mitigation Measures**

##### **Measures to Minimize Impacts During Construction**

- ◆ Construction period sequencing will avoid clearing and grading adjacent to the Frost Bottom (i.e., site preparation of Holes 16, 17 and 18) between April 10 and June 30. Clearing activities will take place in late winter/early spring, before harriers establish their territory. Construction will not resume until hatchlings have fledged, if any nests are confirmed in the Frost Bottom in that year.

##### **Measures to Minimize Impacts During Operation**

- ◆ Golfers will be strictly prohibited from entering the Frost Bottom itself for ball retrieval or for other purposes. The penalty for violation of this rule will be suspension of playing privileges at VGC.
- ◆ The area of canopy clearing adjacent to the crossover has been reduced to the minimum possible to allow golfers to view and aim shots toward the landing area on the west side of the Frost Bottom.
- ◆ The vegetative cover in the 100' buffer will substantively discourage golfers from entering or playing out of the buffer.

- ◆ Educational signage and printed material (e.g., information incorporated into the VGC course guide) to alert members to the sensitivity of nesting Northern Harriers.
- ◆ Signs will be placed along the perimeter of the buffer zone, warning golfers of the likely prevalence of ticks within this area (in that the incidence of ticks in tall grasses and scrub growth is typically high, especially as compared with areas of managed turf).

#### **Measures to Enhance On-site Nesting and Foraging Habitat**

- ◆ On-site measures will consist of funding to study the Frost Bottom habitat and to implement a vegetation management program within the frost bottom itself, and within the 100' buffer zone, to periodically cull encroaching tree canopy species (e.g., pitch pine and tree oaks). This plan will be developed in consultation with NHESP and implemented through Sheriff's Meadow Foundation. Funding for this research and vegetation management, as part of an island-wide program, will be in the amount of \$5,000 per year, in perpetuity.

#### **Off-site Conservation Restriction and Initial Habitat Enhancement**

A Conservation Restriction protecting a 100-acre area will be placed on a 145 acre off-site parcel presently owned by the Edgartown Water Department. This property lies to the immediate south of the VGC project site and is contiguous to other protected or potentially protected parcels. This 145 acre parcel presently has no restrictions to potential future development. The boundaries of the 100-acre CR and the CR language are currently being negotiated with NHESP. Of the approximately 100 acres to be permanently protected under the proposed Conservation Restriction, approximately half will be subject to an active vegetation management program to establish suitable habitat for Northern Harrier nesting and foraging, as described further below. It is anticipated that VGC will fund on the order of \$200,000 for Northern Harrier habitat enhancement and research over the first five years of VGC operation; the actual cost of these efforts is currently being negotiated with NHESP.

On November 22, 1999, Scott Melvin of the NHESP, accompanied by representatives of the proponent (Victoria Hoffman of Epsilon and Jeff Carlson, Superintendent of VGC), toured the proposed site to assess which portions of the 145-acre site have the greatest potential habitat value. The geological depression that represents the on-site Frost Bottom continues across Edgartown-West Tisbury Road, roughly bisecting the 145-acre parcel and proceeding southeast to the mouth of the Edgartown Great Pond. Its northern half exhibits the potential dry scrub oak habitat consistent with the Frost Bottom, although

the area has been substantively degraded by the encroachment of pitch pine. The vegetation within this area then evolves onto an extensive high and low bush blueberry community indicative of increasingly saturated soils, which drain to Wintucket Cove and finally to Edgartown Great Pond.

The area to the west of this lowland already has patches of open grassland communities mixed with large stands of pine trees. Removal of these pines will connect these grassland communities and provide the open scrub oak and grassland habitat sought by Northern Harriers for foraging and nesting. In addition, an area dominated by pine trees northeast of the lowlands will also be removed to expand upon existing grasslands adjacent to this lowland. The proponent will fund the one-time removal of pines within the sub-boundary of the CR designated for active habitat management by hydro-ax and whole-tree chipping. The stumps will remain approximately three feet above grade and chips will be removed. There are approximately twenty (20) acres of pine to be removed in the area recommended for active management. It is desirable that this work be completed before the beginning of the Harrier nesting and breeding season (March-June), followed by flush cutting of stumps in the second year, and periodic burn management for a period of five years thereafter. The proponent will assume the costs associated with the development of the burn program for Northern Harrier habitat (YR 2000), and will fund the implementation of four burn units (YR 2001-2004). The details of the Northern Harrier habitat enhancement measures to be undertaken on the 100-acre Conservation Restriction will be articulated in the anticipated Conservation Permit.

It should be noted that this property forms a critical link as part of an extensive area (1000 ac+) south of Edgartown-West Tisbury Road that has been protected. Included within this larger block of protected lands is a large lowland scrub oak area to the west of the proposed mitigation site, which is part of the recently expanded limits of the Manuel F. Correllus State Forest. Ground-truthing of this area, initially discerned through aerial photograph interpretation, revealed an area that substantively mirrors the habitat characteristics of the VGC Frost Bottom. Further to the south of the proposed mitigation area are parcels owned by the Massachusetts Audubon Society and Sheriff's Meadow Foundation.

◆ Island-Wide Northern Harrier Habitat Research

The proponent has agreed to fund island-wide research focused on Northern Harrier nest selection and fidelity. This research program will be undertaken by a qualified biologist, selected by NHESP and Sheriff's Meadow Foundation. This island-wide study will seek to determine critical nest site characteristics, and will monitor known nesting sites for a period of five years, with the

intention of drawing conclusions with regard to preferred habitat features and fidelity to particular nesting sites over multiple years.

### 6.3 Lepidoptera

Rare lepidopteran species inventory at the Wintucket Cove Frost Bottom was undertaken beginning in 1989 as part of an island wide inventory of regionally threatened invertebrates. The lepidopteran inventory was continued as an addendum to a 1991 inventory of rare species conducted at the Manuel F. Correllus State Forest, and on an ad hoc basis targeting all state-listed species in 1992, 1993, 1994, and 1997.

The inventories consisted of elevated blacklight trapping outside the northeast corner of the Frost Bottom, within the area referred to as "Pasture Zone 2" under the 1983 CR established in association with the Vineyard Acres II subdivision. This location was selected due to the presence of high earthen mounds remaining from road grading operations. A mound approximately 10 feet in height was utilized to set the light trap, so that the trap would draw from across the entire Frost Bottom, as well as from areas outside of the Frost Bottom to the north, east and west of the trap. All told, the lepidopteran inventory effort involved more than 30 trap nights conducted in all months of the flight seasons for rare lepidoptera, April through September. A majority of the effort was focused during the second and third weeks of June in various years, to capture the peak period for rare lepidopteran species diversity and abundance on Martha's Vineyard, estimate from the sum total of all of the Island's rare lepidopteran records documented since 1986.

The visitation schedule for this site places it among the most intensively inventoried locations on Martha's Vineyard. Thus, the list of rare species inventoried represent the upper estimate of the possible rare species that may occur in the area within and immediately outside the Frost Bottom, because the trap placement was such that it drew from outside as well as inside the bottom itself. The species verified on the site as a result of this multiple-year inventory effort is presented in Table 6-1.

Of the 13 state-listed invertebrates (12 moths and the 1 status-pending beetle, *Ptichodis bistrigata*) that occur on the VGC site, the five rarest (*Lycia ypsilon*, *Metarranthis apiciaria*, *Cicinnus melsheimeri*, *Hemileuca maia*, and *Ptichodis bistrigata*) are obligates of frost bottoms on Martha's Vineyard. Four of the 13 species (*Acronicta albarufa*, *Anisota stigma*, *Catocala herodias gerhardi*, and *Zale sp. 1*) are widespread on the Vineyard, and three rely primarily on other habitats (pitch pine barrens for *Eacles imperialis*, wet shrublands for *Metarranthis pilosaria*, and grassy shrublands for *Abagrotis crumbi benjamini*).



Lepidopteran inventory work conducted by Goldstein (1992, 1994) at the Wintucket frost bottom during the late 1980s and early 1990s identified several state-listed species. Like many regionally rare species, they are by and large associated with common native plants and include the scrub oak feeding moths *Acrionicta albarufa* (Threatened), *Anisota stigma* (Special Concern), *Catocala herodias gerhardi* (Threatened), *Cicinnus melsheimeri* (Threatened), and *Zale* sp. 1; the pine-feeding *Eacles imperialis* (Threatened); and two species with unknown host plant associations, *Lycia ypsilon* (Threatened), *Metarranthis apiciaria* (Endangered). Subsequent site visits by Goldstein retrieved the moths *Metarranthis pilosaria* (Special Concern) and *Ptichodis bistrigata* (status pending) and the Purple Tiger beetle (*Cicindela purpurea* (Threatened)).

On Martha's Vineyard, frost bottoms have been identified as critical habitat for three of these species: *C. melsheimeri*, which is rare on mainland New England; *M. apiciaria*, which has not been recorded from anywhere in the world except Martha's Vineyard frost bottoms since 1974; and *Lycia ypsilon*, which does not occur anywhere in New England except the Martha's Vineyard frost bottoms. For these species, frost bottoms are considered the only viable habitats on Martha's Vineyard, which represent the only records for these species. Their occurrence outside the frost bottom would be the first such verification for the Island despite several decades of collecting by Jones and Kimball (1943) and Goldstein (1997), and is considered unlikely.

Five remaining species documented from the VGC site do occur on Martha's Vineyard outside frost bottoms. These include Barrens Daggermoth (*Acrionicta albarufa*), Spiny Oakworm (*Anisota stigma*), Gerhard's Underwing (*Catocala herodias gerhardi*), Imperial Moth (*Eacles imperialis*), and Barrens Zale (*Zale* sp. 1). All of these species, except Imperial Moth, are scrub oak feeders. Both *Acrionicta albarufa* and *Catocala herodias gerhardi* occur in barrens or barren-like habitats throughout the Island and may occur outside the frost bottom proper. The same is likely for *Anisota stigma*, although this species is so general with respect to its habitat preferences on Martha's Vineyard that it occurs anywhere scrub oak grows. Because of their more widespread occurrences on Martha's Vineyard, the anticipated impacts of this project on these species will be negligible; nonetheless, to compensate for any putative loss of habitat, the VGC revegetation program includes retaining scrub oak wherever possible, as well as transplanting this species from areas to be converted to golf uses into vegetative 'transition zones', and augmented by introduced lowbush blueberry and a variety of other native plants (see Section 7 for further discussion).

**Table 6-1 State-listed Lepidoptera Documented to Occur on VGC Site**

Scientific Name	Common Name	MESA Status	Comments
Abagrotis crumbi benjamini	Coastal Heathland Cutworm	Special Concern	Grassy shrubland species
Acronicta albarufa**	Barrens Daggermoth	Threatened	Occurs in barrens habitats throughout island where scrub oak is present
Anisota stigma**	Spiny Oakworm	Special Concern	Habitat generalist on Martha's Vineyard; scrub oak associate
Catocala herodias gerhardi**	Gerhard's Underwing	Threatened	Scrub oak feeder; occurs in barrens or barrens-like habitats throughout island
Cicinnus melsheimeri	Melsheimer's Sack Bearer	Threatened	Exclusive to Frost Bottoms
Eacles imperialis**	Imperial Moth	Threatened	Feeds exclusively on pitch pine
Hemileuca maia	Barrens Buck Moth	Threatened	Frost Bottom obligate
Lycia ypsilon		Threatened	Unknown host plant association, however found exclusively in Frost Bottoms
Metarranthis apiciaria		Endangered	Unknown host plant association, however found exclusively in Frost Bottoms
Metarranthis pilosaria	Coastal Swamp Metarranthis	Special Concern	Considered a wetland species; occurrence at VGC frost bottom is one of several anomalous occurrences in Commonwealth
Ptichodis bistrigata		Status pending	Exclusive to frost bottoms
Zale sp. 1**	Barrens Zale	Special Concern	Occurs in barrens habitats where scrub oak is present
<b>Beetles</b>			
Cicindela purpurea	Purple Tiger Beetle or "Cowpath tiger beetle"	Special Concern	Prefers disturbed soil

\*\*may occur outside CR outside Frost Bottom proper (Goldstein)

### **6.3.1 Project Impacts to Lepidoptera and Mitigation Measures**

As described in Section 3 of this document, numerous alternatives for the fairway routing have been considered. In considering impacts to moth habitat on the site, conversion of any vegetative cover will inevitably result in some removal of scrub oak, particularly where scrub oak forms an understory layer amid larger stands of tree oaks. Provided that the Frost Bottom itself is not impacted, there is negligible difference in potential loss between one routing plan versus another. However, as described in Section 7, the VGC revegetation program anticipates protecting patches of scrub-oak dominated vegetative communities outside of the Frost Bottom and increasing these other scrub-oak dominated areas. This will be accomplished by transplanting clumps of understory occurrences of scrub oak in areas which are scheduled for conversion to managed turf or other golf uses to locations adjacent to other scrub-oak patches. Thus, potential impacts to local moth populations will be avoided and minimized to the extent possible, while the revegetation program, the management program for the Frost Bottom, and the protection and management of off-site habitat will provide a long-term net benefit to lepidoptera in the vicinity of VGC.

The most ecologically significant habitat for rare moths on the VGC golf course is within the Frost Bottom. This resource area will not be impacted by the proposed project, which will maintain a 100' vegetative buffer around the Frost Bottom to further protect its ecological integrity.

The species which may potentially be impacted by the project are the four general scrub oak associates. Although these species are relative habitat generalists, they are apt to favor the Frost Bottom due simply to the dominance of their larval host plant, scrub oak. Moreover, protection and management of the Frost Bottom vegetative structure is particularly important to these species as the bottom provides freshly emerging vegetation, favored by larvae, when scrub oak within other parts of the Island has already matured. With regard to Imperial Moth (*Eacles imperialis*), which feeds exclusively on pine, the entire VGC site includes only pockets of pitch pine, whereas critical habitat requirements for this species on Martha's Vineyard entails large, solid stands of native pines.

Mitigation for the potential impact to these species includes transplanting of scrub oak from areas scheduled to be disturbed (see further discussion in Section 7), as well as protection of a 100 acre area of land south of the VGC site through a Conservation Restriction, of which some fifty acres will be actively managed. Although this Conservation Restriction and vegetation management

program have been developed primarily to benefit the local population of Northern Harrier, in fact the protection and enhancement of this area will also benefit local populations of numerous rare moth species, as a portion of the property is known to support several rare lepidoptera. While in many respects habitat enhancements for Northern Harrier and for certain moths are complementary, that portion of the 100 acre area to be protected by Conservation Restriction which has the highest value for lepidoptera (i.e., an area of headwaters to Wintucket Cove) will not be actively managed for Northern Harrier.

Furthermore, of the five rare species which may occur outside the Frost Bottom proper, each has also been documented in the nearby State Forest and on the property proposed for development of the Meetinghouse Golf Club. Pending the successful advancement of the VGC proposal, a minimum of 100 acres of the Meetinghouse site will be offered to the conservation community for permanent protection. In other words, the VGC site does not represent sole or primary habitat for the five rare lepidopteran species that potentially occur beyond the Frost Bottom, and the implementation of the project will result in a net benefit to local rare moth populations through protection of off-site properties.

Other measures which will serve to avoid and minimize impacts to lepidoptera include the stringency of the Integrated Pest Management and Turf Maintenance Program, discussed in Section 7 of this document. Notably, very few pesticides will be utilized for turf maintenance, and these will only be applied directly to managed turf surface, and will not be applied to vegetation preferred by moths, nor aurally broadcast. The pesticide application equipment at VGC will be equipped with anti-drift pesticide application booms. Lighting, a potentially significant impact to moths, will be restricted to the immediate vicinity of the clubhouse, turf management area, and staff housing, in accordance with the MVC conditional approval of the VGC project. There will be no exterior lighting of the building other than that required for safety and security. Low profile walkway lighting will be used in areas immediately adjacent to the clubhouse for safety considerations. Lighting for safety/code purposes will be located under eaves or adjacent to the exterior doorways, and no metal halide fixtures will be utilized. Only low wattage lighting will be utilized, equipped with motion detectors such that lighting will not be left on overnight. The VGC lighting plan will be subject to the review and approval of Sheriff's Meadow Foundation in collaboration with NHESP.

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