

**RARE SPECIES HABITAT ASSESSMENT
FOR PROPOSED MESHACKET ROAD AFFORDABLE HOUSING
PROJECT, EDGARTOWN, MASSACHUSETTS**

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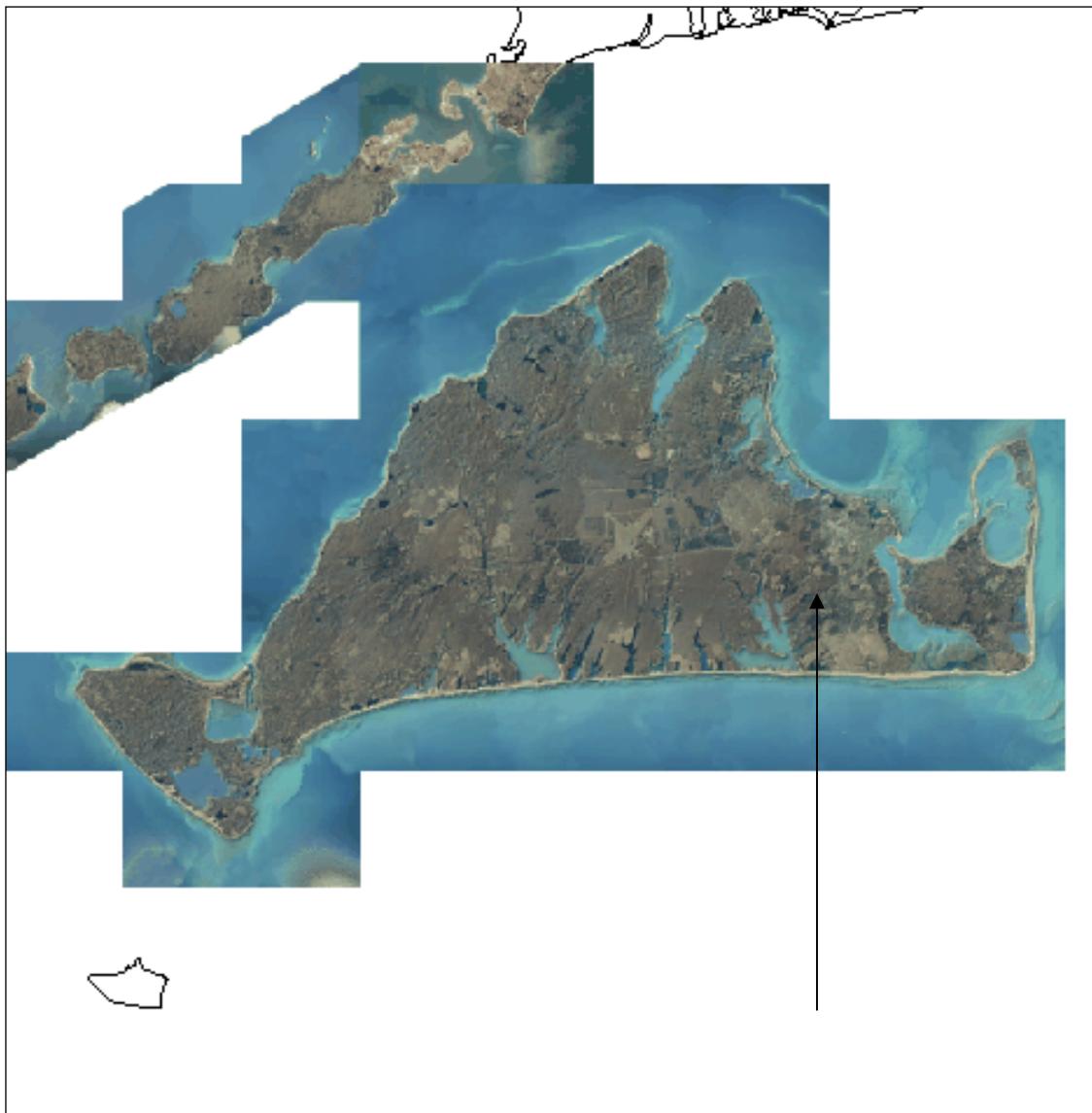
Herodias Underwing moth (*Catocala herodias*) and Melsheimer's sack-bearer (*Cicinnus melsheimeri*). Photos by M.W. Nelson (TNC, 2009).

I. PROJECT LOCUS

LOCATION OF PROJECT

The proposed Meshacket Road Affordable Housing is located in the southern portion of Edgartown, Massachusetts, on Meshacket Road, south of the Edgartown-West Tisbury Road and northeast of the northern end of Edgartown Great Pond's Turkeyland Cove (Figure 1). This 9.2 acre property is Edgartown Assessor's Map 28 Lot 225. This project occurs within the Natural Heritage and Endangered Species Program's *Priority Habitat 279* (Leddick, 2022).

FIGURE 1. Location of proposed Meshacket Road Affordable Housing, Edgartown, MA



II. EXISTING CONDITIONS NARRATIVE

a. Soils

The proposed Meshacket Road Affordable Housing soils are entirely Carver loamy coarse sand on 0-3 percent slopes. This soil type is well drained with low to moderate ability to retain water (NCSS, 1986). The soil's inability to hold water contributes to the dry (xeric) nature of these soils, so plants growing on these soils must be tolerant of drought and low-nutrient, low organic matter soil conditions.

b. Topography

The elevation of the proposed Meshacket Road Affordable Housing site range from 46 to 52 feet above mean sea level. In general, the highest elevations on the property are along the northern boundary with the road and the entire western half of the property, from 50-51 feet in elevation. The lowest area is along the eastern boundary upslope from a nearby frost bottom system, at 46-49 feet in elevation (SBH, 2014).

c. Cover Type Map

We determined that there are two cover types on the proposed Meshacket Road Affordable Housing site (see Figure 2): **coastal woodland** and **disturbed ground** (Swain, 2020), with a lower elevation scrub oak frost bottom/pitch pine woodland system to the southeast of the property. A woodland has 70% or less canopy closure, while a forest has greater than 70% canopy closure (Cowardin, 1979). Coastal woodlands are found in protected areas along the coast and are sheltered from direct salt spray but exposed to wind and salt during storms (Swain, 2020). The deciduous canopies are 30-60' tall and closed (>75% cover), with a dense understory shrub layer and sparse, scattered herbaceous layer (Swain, 2020). This woodland has 15% cover of older, emergent pitch pine, with only a few scattered pine saplings along Swimming Place Path on the western boundary, where this break in the canopy has allowed past germination of pitch pine seedlings. The complete absence of pine seedling germination is likely the result of fire suppression in the landscape since the 1980's, when the nearby residential neighbor-hoods (Island Grove and Schoolhouse Village) were built (see Figure 3). Today, coastal disturbance processes are insect infestation and defoliation, wind and storms due to hurricanes, and heavy herbivore browsing pressure by white-tailed deer. These disturbances are less frequent and patchier than a landscape-level forest fire. This coastal woodland was likely part of a larger pitch-pine scrub oak barrens before disturbance frequency and intensity were reduced in the landscape, as it has remnant patches of 6-8' tall scrub oak in its southern reaches and remnant pitch pines. No white pine germination was seen, as is common in MV woodlands succeeding from pine to oak woodlands. This is likely due to the lack of a seed source nearby.

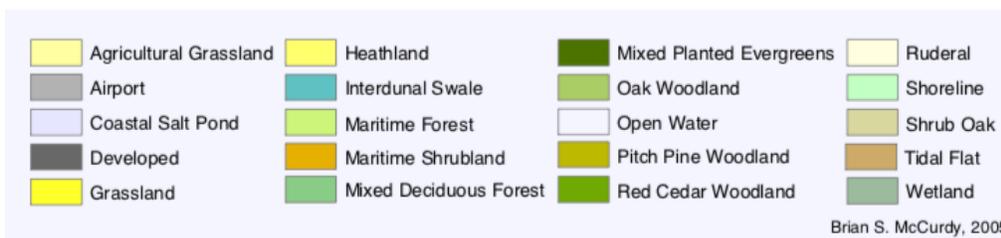
Figure 2 shows the cover type map for the proposed Meshacket Road Affordable Housing, overlaid on a Google Earth March 2019 image. The acreage of the two cover types was calculated from the cover type map. The property lines for the proposed Meshacket Road Affordable Housing are seen in white on the cover type map. The 9.2 acres breaks down into the following cover types: oak woodland is 9.0 acres (98%), disturbed ground is 0.2 acres (2%).

FIGURE 2. Cover type map for the proposed Meshacket Road Affordable Housing, Edgartown, MA. Property lines are white. The unshaded area of the property is coastal woodland, while the yellow rectangle represents disturbed ground.

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FIGURE 3. The Nature Conservancy's Generalized Vegetation Community Types, Edgartown, Massachusetts, shows Oak Woodland (dark lime-green) cover along Meshacket Road between Pitch Pine Woodland to the northeast, and a grass-covered capped landfill (dark gray) to the northwest. Shrub Oak (tan) is adjacent to the southern boundary of the proposed Meshacket Road Affordable Housing (McCurdy, 2005).



d. Description of Vegetation Cover Types

A January 28, 2022 survey of the vegetation cover revealed the dominant woody plants and visible low groundcover in this coastal woodland. This survey captured most of the biomass, if not the full diversity, and is not a full botanical inventory. Nomenclature is from Gleason and Cronquist (1991) and Holmgren et al. (1998).

The **coastal woodland** (see Figures 2 and 4) is dominated by a 40' to 45' tall canopy of white oak (*Quercus alba*), black oak (*Q. velutina*), scarlet oak (*Q. coccinea*) and post oak (*Q. stellata*) with a coverage of <15% of 45-55' tall pitch pines (*Pinus rigida*) in the emergent canopy. Scattered sassafras saplings (*Sassafras albidum*) and black cherry (*Prunus serotina*) are found in the northwestern corner. The understory is composed of a fairly continuous cover of 2-3' tall black huckleberry (*Gaylussacia baccata*), 3-4' tall dangleberry (*Gaylussacia frondosa*), 2-3' tall bracken fern (*Pteridium aquilinum*), and patchy cover of 5-7' tall scrub oak (*Q. ilicifolia*) along the eastern boundary. Less common are 5-6' tall highbush blueberry (*Vaccinium corymbosum*), and a few small patches of 2-3' tall sheep laurel (*Kalmia angustifolia*). Low groundcover includes wintergreen (*Gaultheria procumbens*), common dewberry (*Rubus flagellaris*), and Pennsylvania sedge (*Carex pennsylvanica*). Of note is the presence of wintergreen on the forest floor, which is considered to be an indicator of unplowed ground (Foster and Motzkin, 2003). Also found in open sunny patches along the banks of The Swimming Place Path are trailing arbutus (*Epigaea repens*), striped wintergreen (*Chimaphila maculata*), bearberry (*Arctostaphylos uva-ursi*), a pinweed (*Lechea* sp.), rough-stemmed goldenrod (*Solidago rugosa*), pincushion moss (*Leucobryum glaucum*), haircap moss (*Polytrichum* sp.), and reindeer lichen (*Cladonia rangiferina*). This woodland has scattered multi-trunk coppice-growth oaks, evidence of a past history as a woodlot. The patchy nature of the openings in the canopy may be a remnant effect of 1991 Hurricane Bob's disturbance to the canopy, but dead trees are not prominent here.

The **disturbed ground** is found on the edge of Meshacket Road, along the northern property boundary (see Figures 2 and 4). This area receives direct sunlight and has a weedy growth of Morrow honeysuckle (*Lonicera morrowii*), southern arrowwood (*Viburnum dentatum* var. *venosum*), sawbrier (*Smilax glauca*), Japanese honeysuckle (*L. japonica*), oriental bittersweet (*Celastrus orbiculatus*), poison ivy (*Toxicodendron radicans*), and weedy herbs and grasses that include mouse-ear chickweed (*Cerastium fontanum* ssp. *vulgare*), common plantain (*Plantago major*), sheep sorrel (*Rumex acetosella*), rough-stemmed goldenrod (*Solidago rugosa* var. *rugosa*), sweet white clover (*Trifolium repens*), path rush (*Juncus tenuis*), sweet vernal grass (*Anthoxanthum odoratum*), orchard grass (*Dactylis glomerata*), and velvet grass (*Holcus lanatus*).

e. Invasive Species

Two invasive vines are found on the proposed Meshacket Road Affordable Housing in the disturbed cover type: Japanese honeysuckle and oriental bittersweet (IPANE, 2022). The honeysuckle forms a dense tangle along the road edge, but does not penetrate into the shaded woodland. The bittersweet is climbing on roadside trees, and is found up to 50' into the woodland and should be monitored for further encroachment into the woodland. Control and/or eradication of this invasive vine is recommended.

Figure 4a-d. Representative photos of a. coastal woodland, b. scrub oak patches, c. disturbed ground, and d. view of frost bottom with GPS points as shown in Figure 5.



4a. Coastal woodland at GPS pts 233 to east (top L), 267 to east (top R), 245 to northwest (middle L), 256 to north (middle R), and 254 to west (bottom L).



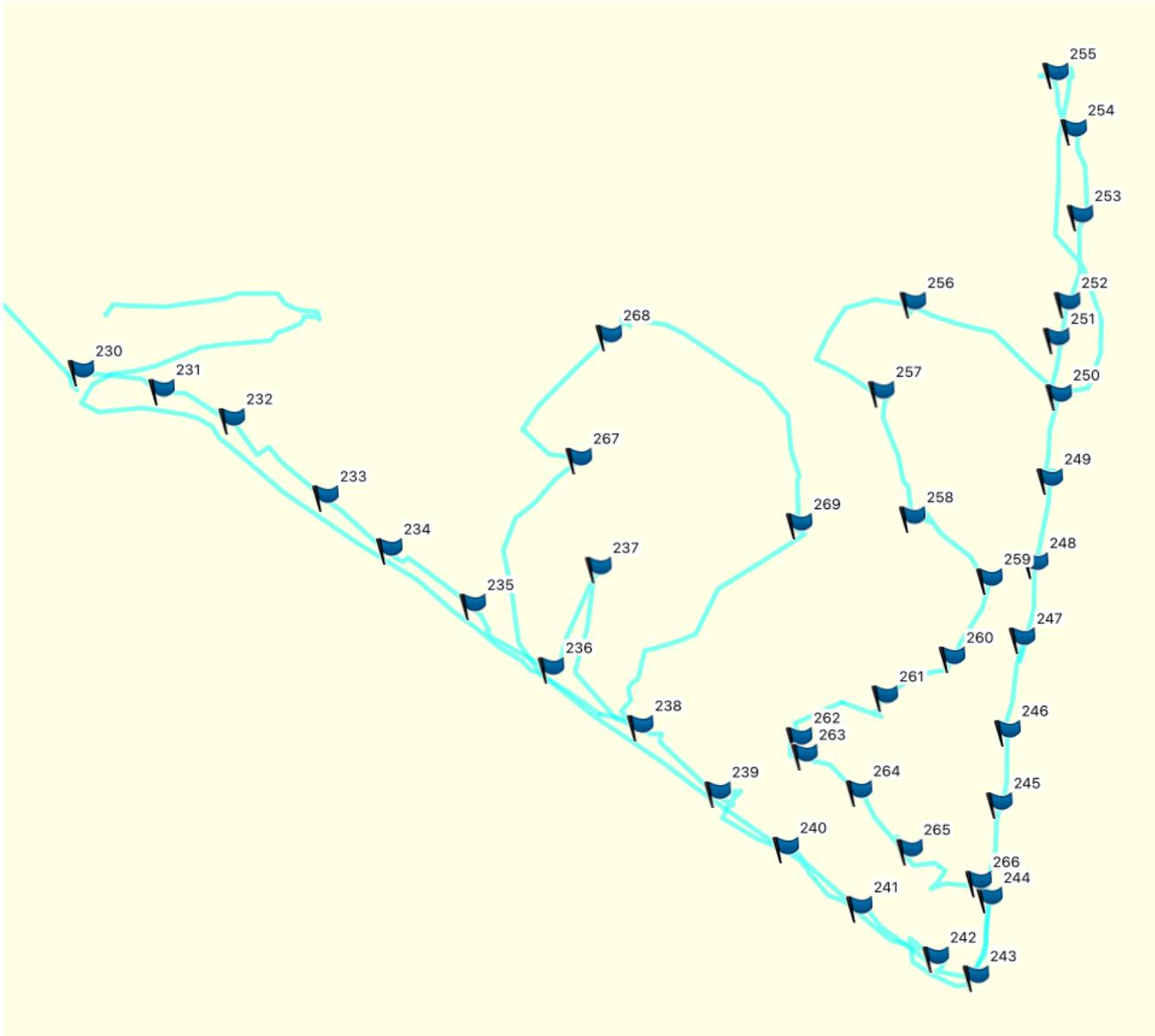
4b. Scrub oak patches, GPS points 267 to north (top left), 245 to north (top right), 249 to north (bottom left), and 256 to south (bottom right).



4c. Disturbed edge to northeast, GPS point 230.

4d. View of frost bottom to east, GPS point 245.

Figure 5. GPS points for representative photos shown in Figure 4a. coastal woodland, 4b. scrub oak patches, 4c. disturbed ground, and 4d. view of frost bottom. North is top of page.



Lepidoptera Habitat Analysis and Habitat Maps

Ten species of Massachusetts protected, rare moths occur within *Priority Habitat 279* (Leddick, 2022), which includes this proposed subdivision. Table 1 summarizes the habitat functions of each of these ten moth species.

All ten of the moth species are described in the literature as using habitats described as either scrub oak thickets, scrub oak barrens, or pitch-pine scrub oak barrens (Table 1). This 9.2-acre property is not a scrub-oak barrens or a pitch-pine scrub oak barrens, but does contain patchy scrub oak shrub thickets (see Figure 6) and may have had features of a pitch-pine scrub oak barrens roughly 50 years ago. Additionally, it lies in close proximity on its eastern edge to a pitch-pine scrub oak barrens with a scrub oak dominated frost bottom (see Figure 6), which is high quality habitat for at least six of these moth species. Pink sallows do not have high quality habitat here or nearby as they were absent from all barrens less than 2000 acres in size (WI DNR, 2020).

Habitat Map

A map of the coastal woodland with the scattered understory scrub oak thickets delineated in yellow is presented in Figure 5. The scrub oak thickets along the eastern boundary line are covered by a sparse oak canopy, while the two thickets within the property are more oval in shape with canopy closure on the outside edges only. Thus, they form two open patches of scrub oak thicket within the coast woodland understory. All combined, these thickets represent a total of 0.91 acres of a 9 acre woodland, or 10% cover by scrub oak shrub thicket. However, scrub oak also occurs in small scattered patches mixed in with the huckleberry and dangleberry that dominate the understory shrub layer. This dispersed shrub layer is unmappable, simply forming a portion of the dense understory shrubs in this property's coastal woodland.

Feeding Habitat

Seven of the ten moth species use oak leaves as a larval food source, and six of these specify scrub oak leaves (Table 1). Due to the patchy presence of food plants and the proximity to a frost-bottom, this property is at least a low quality habitat for the seven oak-eating species of rare moths. Scrub oak leaves are palatable when their buds first unfurl, but soon toughen and build up tannins that protect them from insect herbivory. Frost bottoms provide high quality habitat to these moths as they have a cold microclimate due to a low, basin like profile in the landscape. Some frost bottoms have a connection to colder coastal air through a long valley, such as Deep Bottom Cove in West Tisbury. This cold climate delays leaf emergence, and ensures a ready supply of young tender leaf shoots later into the season, while the oak leaves in the surrounding woodlands have emerged over a month prior and are already tough and full of tannin. Of the seven oak feeders, only the Pine Barrens Zale feeds before a May flight period, so could use the newly emerged scrub oak leaves on this property in April and May (Table 1). Thus this property does not provide high quality habitat for six of these scrub oak moths, as the scrub oak leaf emergence is too early as compared to their larval feeding periods that come just before flight periods (Table 1.)

The remaining three moths - scrub *Euchlaena*, woolly gray, and Heath *Metarranthis* – have possible food plants on the property. The lowbush blueberries eaten by scrub *Euchlaena* larvae were surprisingly not found here, but highbush blueberries and huckleberry are quite abundant on the property. Similarly, the roses eaten by woolly gray larvae – pasture and virginia rose – are found in sandplain heathlands, but were not found here. However, members of the Rose family on the property include bristly dewberry and black cherry. It is not clear whether woolly gray larvae can feed on these plants. The ericads listed as larval food plants of the heath *Metarranthis* – blueberries, cranberries, and leatherleaf - are either scattered or not found here, but black huckleberry and dangleberry are ericaceous shrubs abundant throughout the understory of this coastal woodland, so medium quality habitat is likely to be present for the heath *Metarranthis*, if it feeds on huckleberry and highbush blueberry vs. lowbush blueberry.

The four species listed as using shrub oak thicket habitat - Melsheimer's sack-bearer, barrens dagger moth, Herodias underwing moth, and pine barrens *Zale* – have patchy habitat on this property, and the food plants are 5-7' tall as compared to frost bottom thickets where scrub oak is 3-5' tall, so this presents a low quality habitat as the larvae need to travel much longer distance to reach the terminal buds to feed on the newly emerging, tender shoots. The scrub oak barrens dependent pink sallows are known to depend upon having a high density of low oaks or blueberries, which their larvae can easily locate and climb, and their habitat is degraded when trees invade (WI DNR, 2020). Oak woodlands with a canopy closure of greater than 50% are not considered to be suitable habitat for the Melsheimer's sack-bearer (NatureServe, 2005).

Additionally, the scrub oak thickets on this property are under a partial canopy, rather than being in full sun, so this may limit the warmth and energy used by these insects for growing and pupating. Size-dependent mortality is important to all insects, so the faster one can grow the less likely one is to be preyed upon before reproducing. Due to all these factors, I conclude that the scrub oak thickets on this property are low quality habitat for nine of the moths, but high quality habitat for the pine barrens *Zale*.

The low-quality habitat available to six oak-feeding moth species and the high-quality habitat for the pine barrens *Zale* corresponds to the scrub oak thicket areas, circled in the Lepidoptera Habitat map, Figure 6. The entire coastal woodland is a possible habitat for the non-oak feeders, who have similar food plants to those listed, so the habitat quality is not fully known.

Breeding Habitat

The coastal woodland provides medium quality breeding habitat for the three Geometrid moths that do not use scrub oak as their host plant. They lay eggs on host plant stems, and the patchy canopy openings provide filtered light for the warmth needed for optimal growth. However, the remaining oak-feeding moths have low quality habitat in the coastal woodland, as the scrub oak thickets are present but once the eggs hatch into larvae, they will not have the young, nutritious scrub oak leaves to eat, as they would in the nearby frost bottom. Essentially, these scrub oak thickets would act as a trap were these moths to attempt to breed here. The coastal woodland provides high quality

breeding habitat for woolly gray moths, whose males hone in on the pheromone scents released by the females waiting on tree trunks (see Table 1).

Aestivating Habitat

Five of the ten moths pupate and aestivate, or lie in a dormant state, in the summer months (see Table 1). These have medium quality habitat in the coastal woodland as there are suitable soils and filtered light in the canopy. It is difficult to know the relative predation pressure between the two habitats, as song birds breed and feed in both the nearby open frost bottom and the coastal woodland. However, the impenetrable nature of the low, dense shrub oaks (*Quercus ilicifolia* and *Q. prinoides*) found in the nearby frost bottom habitat likely provides better protection from visual predators such as birds and wasps than does the coastal woodland.

Overwintering Habitat

All ten of the moths in Table 1 overwinter *in situ* in one life stage, rather than migrate seasonally, as do some large lepidoptera. Herodias underwing, pink sallow, and pine barrens *Speranza* overwinter as eggs laid on scrub oak stems (See Table 1). I postulate that the scrub oak thickets in the understory of this coastal woodland provide a low quality habitat in this life stage, as cold winds can penetrate to the soil more in the 6-8 tall shrub thickets than in the low, dense shrubs in the nearby frost bottom. Melsheimer's sack-bearer overwinters in sacs sewed out of scrub oak leaves, and the remaining six species overwinter as pupae in the soil. Again, the coastal woodland provides a low quality habitat, as the emerging pupae do not have tender new shoots readily available to them near the ground, but would have to travel up-stem some distance, using up precious energy reserves. These scrub oak thickets could act as a breeding trap, or population "sink" rather than "source", for larvae overwintering in the coastal woodland habitat.

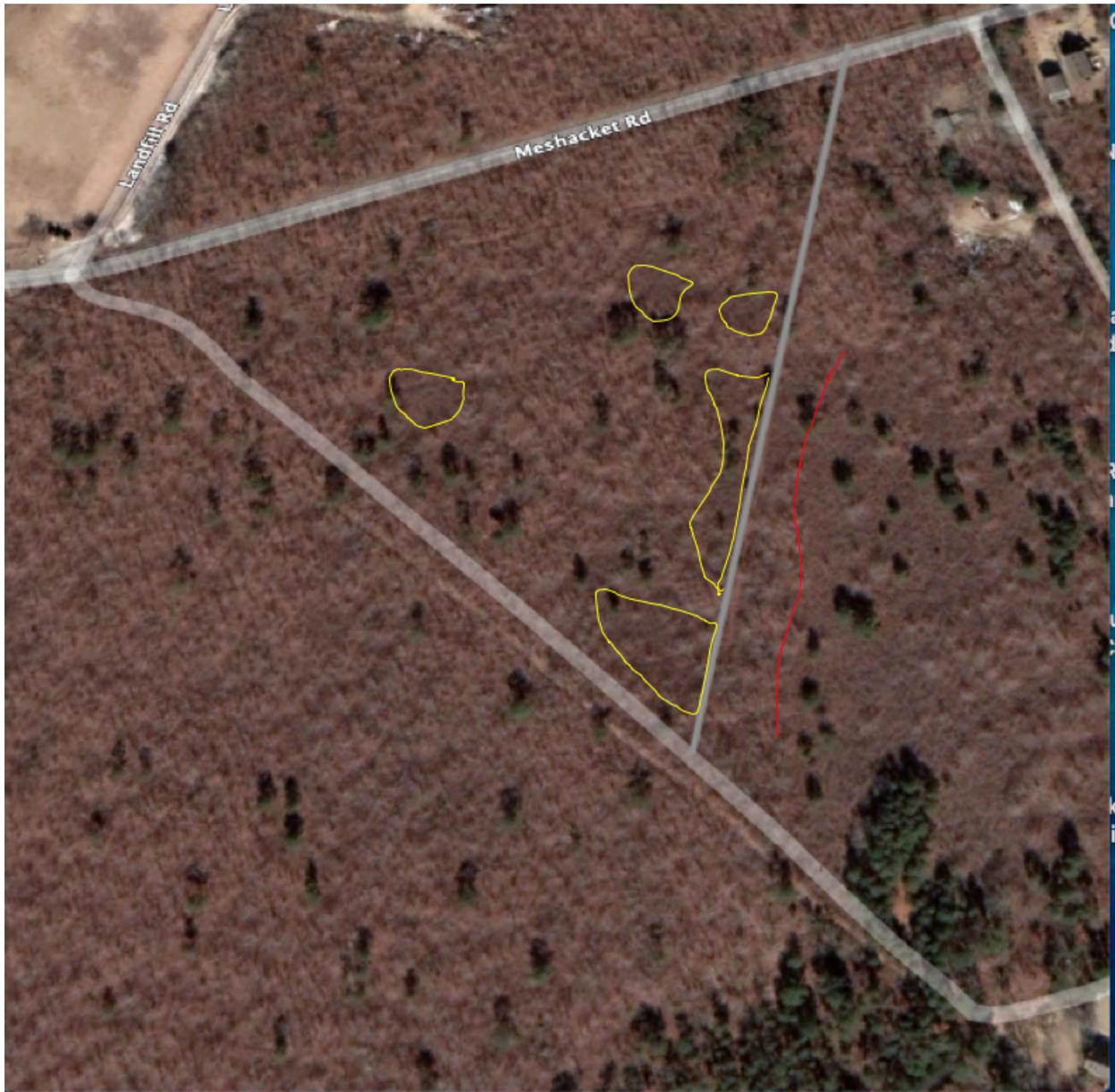
Table 1. Habitats of 10 species of MA Protected, rare Lepidoptera occurring within Priority Habitat 279 (Le...
 Scrub oak feeders and habitat use is highlighted in yellow.

Family Scientific name	Family Common name	MA rank	MA Distr.	Activity period	Larval Food plant	Habitat Type:	breeding	larval feeding	aestivating (summer dormancy)
Mimallonidae	Sack-Bearers								
<i>Cicinnus melsheimeri</i>	Melsheimer's sack-bearer	T	5 MV towns 6 MA towns	Adults fly in late June	only scrub oak in MA	Scrub oak thickets, pitch pine-scrub oak barrens	scrub oak	Larvae: scrub oak summer & fall	Pupa leaf in late spring
Noctuidae	Owlet Moths								
<i>Acrionicta albarufa</i>	Barrens Dagger Moth	T	3 MV towns 3 MA towns	Nocturnal adults fly June-Aug	scrub oak, maybe other oaks	Scrub oak thickets, pitch pine-scrub oak barrens	Lay eggs in July/August	Larvae: scrub oak summer & fall	no
<i>Catocala herodias</i>	Herodias Underwing Moth	SC	6 MV towns 10 MA towns	Nocturnal adults fly July-Aug	young scrub oak, maybe other oaks	Scrub oak thickets, pitch pine-scrub oak barrens	Lay eggs scrub oak July/Aug, hatch May	scrub oak in June: new leaves, catkins	Pupa leaf in June
<i>Psectraglaea carnosa</i>	Pink Sallow	SC	3 MV towns 14 MA towns	Nocturnal adults fly Sept-Oct	young oak leaves, <i>Vaccinium</i> & <i>Aronia</i> flowers preferred	Scrub oak barrens/ heathlands, ericaceous	Lay eggs loosely in sand or leaf litter in fall	spring-early summer	Prep below soil; pupa fall
<i>Zale lunifera</i>	Pine Barrens Zale	SC	5 MV towns 6 MA towns	Adults fly mid May to late June	scrub oak	Scrub oak thickets, pitch pine-scrub oak barrens	Lay eggs, hatch May/June	scrub oak new leaves May/June	Pupa late June

Family Scientific name	Family Common name	MA rank	MA Distr.	Activity period	Larval Food plant	Habitat Type:	breeding	larval feeding	estiv (summer dorma
Notodontidae	Prominents								
<i>Heterocampa varia</i>	Sandplain Heterocampa	T	3 MV towns & 1 MA town	Adults fly late June to early Aug	Scrub oak, post oak, dwarf chinquapin oak	pitch pine-scrub oak barrens, heathlands grasslands	Lay eggs scrub oak July/Aug, hatch in 1 week	Feed 4-7 weeks in Aug-Sept	Pupa soil
Geometridae	Inchworm Moths								
<i>Euchlaena madusaria</i>	Scrub Euchlaena	SC	4 MV towns & 11 MA towns	Adults fly May-June, then Aug	polyphagous: lowbush blueberries	pitch pine-scrub oak barrens, sandplain heathlands, grasslands	2 broods a year: fly May-June, then Aug	April to June	No
<i>Lycia ypsilon</i>	Woolly gray	T	3 MV towns	Males fly May	Unknown in MA, Rosaceae	shrubby areas in pitch pine-scrub oak barrens	Females wait on tree trunks for males	June to July	No
<i>Metarranthis pilosaria</i>	Heath Metarranthis	SC	3 MV towns & 8 MA towns	Adults fly June to early July	Ericaceae: blueberries, cranberries, leatherleaf	pitch pine-scrub oak barrens, heathlands, acid bogs		June thru August, pupate in Sept.	No
<i>Speranza exonerata</i>	Pine Barrens Speranza	SC	4 MV towns & 11 MA towns	Adults fly mid June thru July	scrub oak: new leaves & catkins	pitch pine-scrub oak barrens	Eggs hatch early spring	Pupate early June	No

Figure 6. Lepidoptera Habitat Map

The yellow polygons represent coastal woodland understory scrub oak thickets, while the red line delineates the boundary between scrub oak thicket and the lower elevation scrub oak-dominated frost bottom within a larger pitch-pine scrub oak barrens. Scale is 1" = 225 feet. The distance from the property boundary to the frost bottom is 56 feet. The area within the yellow polygons represents 0.91 acres.



III. IMPACT ASSESSMENT

Only the pine barrens Zale has high quality habitat on this property; all the remaining lepidoptera species have low to medium quality habitat, with optimal habitat present for all life stages of all ten lepidoptera species in the nearby scrub oak-dominated frost bottom that lies 56 feet to the east of the property boundary (see Figure 6). The principle ecological value of this coastal woodland is to provide a buffer to threats to the intact, optimal habitat for these rare lepidoptera to the east.

Wagner (2020, 2019a-f, 2015a-c) lists the following threats to the habitat of these ten moths: habitat loss, fire suppression, generalist parasitoids, aerial insecticide spraying, non-target herbiciding, off-road vehicles, and light pollution.

Habitat loss is primarily an issue in the shrub oak-dominated frost bottom that is optimal habitat for these species. This habitat is maintained by a microclimate that causes a freeze-thaw cycle to occur on a nightly schedule up until July through ambient cooling in these shallow basins. The soils are so droughty that heating and cooling occurs rapidly, much like a high desert climate, and ice forms nightly, melting in the morning. This delays leaf-out, and is visible across Martha's Vineyard in spring and early summer, when surrounding tree oaks are well past leaf out. The coastal woodland surrounding the adjacent frost bottom provides a buffer in that it shelters the area from strong winds that can disrupt settling of cold air into the frost bottom basin. So maintaining at least a 100' buffer to the edge of the frost bottom, or at least 50' of buffer on this property, is a benefit to maintaining the health of the optimal moth habitat in the nearby frost bottom.

Fire suppression has occurred in the surrounding landscape for at least the past 50 years, and is evident in the mixed cover of oak woodlands and pine forests (see Figure 3). Without fire, these pitch pines will not regenerate, since their serotinous cones need the heat of a wildfire to open and disperse their seeds. These mature pine stands will slowly senesce, with oak seedlings invading in the understory. This pattern is evident today. However, the microclimate in the frost bottom is mostly self-sustaining, as young tree seedlings cannot germinate successfully here.

Generalist parasitoids have been found to be less common on Martha's Vineyard (Goldstein, pers comm.), due to island biogeography and a lack of introduction for forestry pest control. These wasps, bees, or flies are generally introduced to an area to lay eggs and feed upon developing pupae of forest pests, such as the gypsy moth, and have become common in the New England landscape in the last century. The barrier of 8 miles of ocean has prevented their arrival *en masse* to the island of Martha's Vineyard. This proposed Affordable Housing project would not impact this issue, but no species introductions could be emphasized as part of a larger rare moth habitat educational effort.

Aerial insecticide spraying is a noxious threat to any invertebrate, as well as to groundwater, and should be prohibited in the proposed Affordable Housing project. I would also recommend banning the use of “bug zappers” in the proposed Affordable Housing project, as these can contribute to the mortality of rare moths while in their adult flight stage. I recommend including a rare moth habitat educational effort with signage that points out moths, their food plants, and their habitats to residents. This could also be shared through environmental education partnerships with Biodiversity Works, MassAudubon at Felix Neck, Sheriffs Meadow Foundation and The Trustees of Reservations educational outreach, and the Island school system. Understanding the ecology of the outwash plain is a part of learning about where we live and how we impact our environment, and this is a part of current school curricula today.

Non-target herbicide use is also detrimental to invertebrates and should be prohibited in the proposed Affordable Housing project. This may refer to large-scale herbicide use in powerline right-of-ways, as occurs at Miles Standish State Forest, but should not be a threat in this small residential area.

Off-road vehicles can degrade the sandy soils in the coastal woodland and frost bottom areas. This is unlikely to be a problem as the number of units in the proposed Affordable Housing project is small, and there are numerous pathways in the surrounding neighborhood that are already used for this purpose, including the Doctor Fisher Path. Signage and educational materials can prevent the overuse of the neighboring property, which is owned by the Town of Edgartown and has protected aquifer status for its wellheads.

Light pollution is likely the greatest threat to the rare moths that have low quality habitat in the coastal woodland, but high quality habitat 56 feet to the east in the shrub oak-dominated frost bottom. Bright outdoor lighting could attract moths away from their suitable breeding habitat and increase rates of predation by night-flying insectivores. A lighting plan is recommended to avoid incidental insect attraction, and may be modeled after the low-light plan implemented by Edgartown’s Morgan Woods housing complex, due to their proximity to a frost bottom habitat. Again, signage and educational materials can be used to gain buy in to the lighting plan. I recommend at least a 50’ setback of the limit of work from the eastern boundary, which would provide over 100’ of buffer to the edge of the nearby frost bottom (see Figure 6. The coastal woodland provides an ideal buffer as it has an open forested canopy with tall understory shrubs that will effectively block light from reaching the optimal moth habitat to the east.

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