Management plans for three Taylor's checkerspot (*Euphydryas editha taylori*) sites on Olympic National Forest

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SECTION 1: BACKGROUND

Species History and Status

The Taylor's checkerspot (*Euphdryas editha taylori*) is a Washington State endangered and federally proposed endangered butterfly. Historically it occurred on over 80 sites from southern Vancouver Island, British Columbia through the Puget Trough in Washington and Willamette Valley in Oregon (Stinson 2005). Today, 10-16 populations persist: one population in British Columbia, 7-13 populations in Washington (two from recent reintroductions and four with no recent detections), and two populations in Oregon. Taylor's checkerspots inhabit open, grassy or herbaceously vegetated sites, including prairies, coastal cliff banks and stabilized dunes, and shallow-soiled balds and timber harvest openings that occur within a forested matrix. Decline in quantity and quality of its habitat is the main threat to this butterfly.

Life History

The adult flight period of Taylor's checkerspots is in the spring (May - June or July at Olympic National Forest sites), when adults fly, feed on floral nectar, and females lay eggs. Eggs hatch after 10-14 days, and larvae emerge, feed and grow through the summer, and then enter an inactive diapause in which they remain until late winter or early spring. Little is known about where Taylor's checkerspot larvae diapause, although limited studies have found them in soil surface litter and below the soil surface in crevices (Fimbel 2009). When larvae break diapause they feed again for several weeks before pupating and emerging as adults. Like other endangered butterflies, Taylor's checkerspot is selective in its use of host plants (plant species on which females lay eggs and larvae develop). Throughout the butterfly's range the following plants have been confirmed as hosts: harsh paintbrush (*Castilleja hispida*), narrowleaf plantain (*Plantago lanceolata*), and in one British Columbia population, species of veronica (*Veronica* spp.). Post-diapause larvae are less selective feeders than pre-diapause larvae. In addition to their hosts, post-diapause Taylor's checkerspot larvae have been found feeding on blue-eyed Mary (*Collinsia parviflora),* sea blush (*Plectritis congesta*), and dwarf owl-clover (*Triphysaria* (*Orthocarpus*) *pusilla*).

Status within Olympic National Forest

Taylor's checkerspot was first documented on the Olympic National Forest (ONF) in 2007 on road edges and balds near the Three O'clock Ridge trail in the Dungeness watershed. Two specimens were collected and their identification was verified by Jonathan Pelham, lepidopteran taxonomist and expert on Washington butterflies at the University of Washington Burke Museum. Follow-up surveys were conducted by Washington Department of Fish and Wildlife (WDFW) and ONF biologists on May 25, 2008, and checkerspots were again detected on road edges and balds near the trail.

In 2009, the ONF received funding from the US Forest Service and Bureau of Land Management Interagency Special Status Sensitive Species Program (ISSSSP), and, with the assistance of WDFW, conducted a broader survey and habitat inventory on the Forest. Several areas of potentially suitable habitat were identified and surveyed during the flight period in 2009 and 2010 (Holtrop 2010). The surveys resulted in identifying three sites with regular concentrations of checkerspots: Bear Mountain in the middle Dungeness (6^{th} field) watershed, Three O'clock Ridge and another site further upstream in the Upper Dungeness watershed. Individual butterflies were detected at other balds within the Dungeness drainage. A few areas were searched in other watersheds, including the Dosewallips, Quilcene, and Hamma Hamma, but Taylor's checkerspots were not detected.

In 2010 ONF and WDFW identified suitable habitat in the Gray Wolf (a subdrainage of the Dungeness) but were not able to complete surveys under favorable conditions until 2012, when a fourth concentration of Taylor's checkerspots was detected.

In 2011, ONF and WDFW developed a monitoring plan for Taylor's checkerspot sites on the ONF (Holtrop and Potter 2011). The plan identified seven life history and monitoring objectives, including monitoring adult abundance, identifying larval and adult food plant species, and determining timing and locations of within-site larval use. ONF and WDFW biologists have monitored ONF checkerspot populations annually since their discovery by conducting adult surveys during the flight period (Table 1). During these surveys, adults were observed taking floral nectar from several plant species (Table 2). Limited pre-diapause and post-diapause larval surveys were conducted in 2010 - 2012, which documented two larval food plant species (both pre- and post-diapause): harsh paintbrush and narrowleaf plantain. Post-diapause larvae have been observed feeding on blue-eyed Mary as well; but more observation is needed to document regular post-diapause larval food plants.

Table 1. High single-day counts of adult Taylor's checkerspots at Olympic National Forest sites.

Site	2009	2010	2011	2012	2013
Bear Mountain	41	61	51	49	39
3 O'Clock Ridge	69*	48*	169	164	158
Upper Dungeness	50*	157*	254	356	265

*Not complete survey visit. Complete counts of the entire site in one day did not occur every year due to lack of personnel and/ or unfavorable weather conditions.

Table 2. Plant species on which Taylor's checkerspots nectaring has been observed at three sites.

Plant		Site		
Scientific Name	Common Name	Bear Mtn	3 O'Clock Ridge	Upper Dungeness
Arctostaphylos columbiana	Hairy manzanita	✓	✓	✓
Arctostaphylos uva-ursi	Kinnikinnik	✓		
Berberis sp.	Oregon Grape		✓	✓
Cryptantha intermedia	Large-flowered Cryptantha		✓	✓
Eriophyllum lanatum	Oregon Sunshine		✓	✓
Erysimum arenicola	Sand-dwelling Wallflower		✓	
Fragaria sp.	Strawberry	✓	✓	✓
Leucanthemum vulgare	Oxeye Daisy		✓	✓
Lomatium utriculatum	Spring-gold/ Parsley	✓	✓	✓
Phlox diffusa	Spreading Phlox		✓	
Plectritis congesta	Sea Blush	✓	✓	✓
Prunus emarginata	Bitter Cherry		✓	
Rhododendron macrophyllum	Pacific Rhododendron	✓		
Sedum sp.	Stonecrop	✓	✓	✓
Taraxacum officinale	Common Dandelion		✓	✓
Trifolium repens	White Cover		✓	✓
Valeriana scouleri	Scouler's Valerian			✓

In 2010 - 2012, the WDFW collected habitat data across three ONF sites following methods used for other Clallam County site assessments (Hays 2011). We used this habitat information, as well as butterfly survey data to develop desired conditions, habitat objectives and management needs at ONF sites. Habitat and survey data were also used to begin habitat improvement treatments at Bear Mountain (Hays 2012), the site most vulnerable to immediate habitat loss.

SECTION II. INFORMATION APPLICABLE TO ALL SITES

Information under this section is applicable to all four known ONF Taylor's checkerspot sites, including the new Gray Wolf Site, and would apply to any newly discovered sites of comparable habitat in the Dungeness Watershed. The Gray Wolf site was recently discovered (2012), and currently there is little data on butterfly abundance, larvae, and plants on which to base a specific management plan (as in Section III); but the site characteristics appear similar to the other sites. Applicable information includes the desired site conditions, objectives, and management actions listed in this section.

Goal of the Management Plans

The goal of these management plans is to provide a reference and resource outlining threats, desired conditions, objectives and management actions needed to maintain and increase Taylor's checkerspot populations and habitat on Olympic National Forest.

General Site Description and Ecological Processes

Olympic National Forest Taylor's checkerspot sites are located on the northeast side of the Olympic Peninsula in Clallam County. The sites are in the Dungeness River (5^{th} field) watershed, which flows north into the Strait of Juan de Fuca (Figure 1). Elevations of the sites range between 2300 and 3300 feet. The areas occupied by checkerspots are small openings, including roadsides, openings within young regenerating forests, and thin-soiled balds in a forest matrix. A mixture of vegetation, including shrubs, forbs, grasses and mosses, rock outcrops, and patches of bare soil characterize the openings. The sites contain host plants and a variety of nectar food plants. Typical tree species include Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*). The sizes of the Taylor's checkerspot management areas range from ~40 acres (Bear Mountain) to 200 acres (Three O' Clock Ridge and Upper Dungeness), although the openings occupied by checkerspots are much smaller.

Taylor's checkerspot habitat suitability is likely shaped by characteristics of the environmental and vegetation zones, such as slow timber regeneration, shallow soils, high fire frequency, and low precipitation. The Upper Dungeness, Three O'clock Ridge and Gray Wolf sites are primarily within the Douglas-fir vegetation zone. Ecology plots at these sites primarily showed a Douglas-fir/oceanspray-baldhip rose plant association. Timber productivity of this vegetation type is low; and regeneration following clearcutting has been slow and sporadic (Henderson et al. 1989). The Bear Mountain site is in the Western hemlock vegetation zone, with has variable productivity, including shallow soils on steep slopes.

The sites are located within environmental zones 10-12, areas of relatively high fire frequency and low precipitation for the Olympic Peninsula (Henderson et al. 1989). Fire has played a major role in these zones, and much of the area has burned several times in the last 700 years. Annual precipitation is 40 – 60 inches. Orthent soils, found throughout the Olympic National Forest, are more common in these zones where soil formation is probably slower (Henderson et al. 1989).

Land Allocations

The ONF Taylor's checkerspot sites are managed under the direction of the Olympic National Forest Land and Resource Management Plan (LRMP) (USDA 1990) as amended by the Northwest Forest Plan (USDA/USDI 1994). The sites are on lands designated as Late Successional Reserve (LSR) in the Northwest Forest Plan. LSRs are managed with an objective to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for a variety of species. One site, Three O'Clock Ridge, is located on lands designated as J3 Botanical Area in the Olympic LRMP. Botanical Areas provide opportunities for protection, study and enjoyment of areas of special botanical interest where unusual plant communities occur.

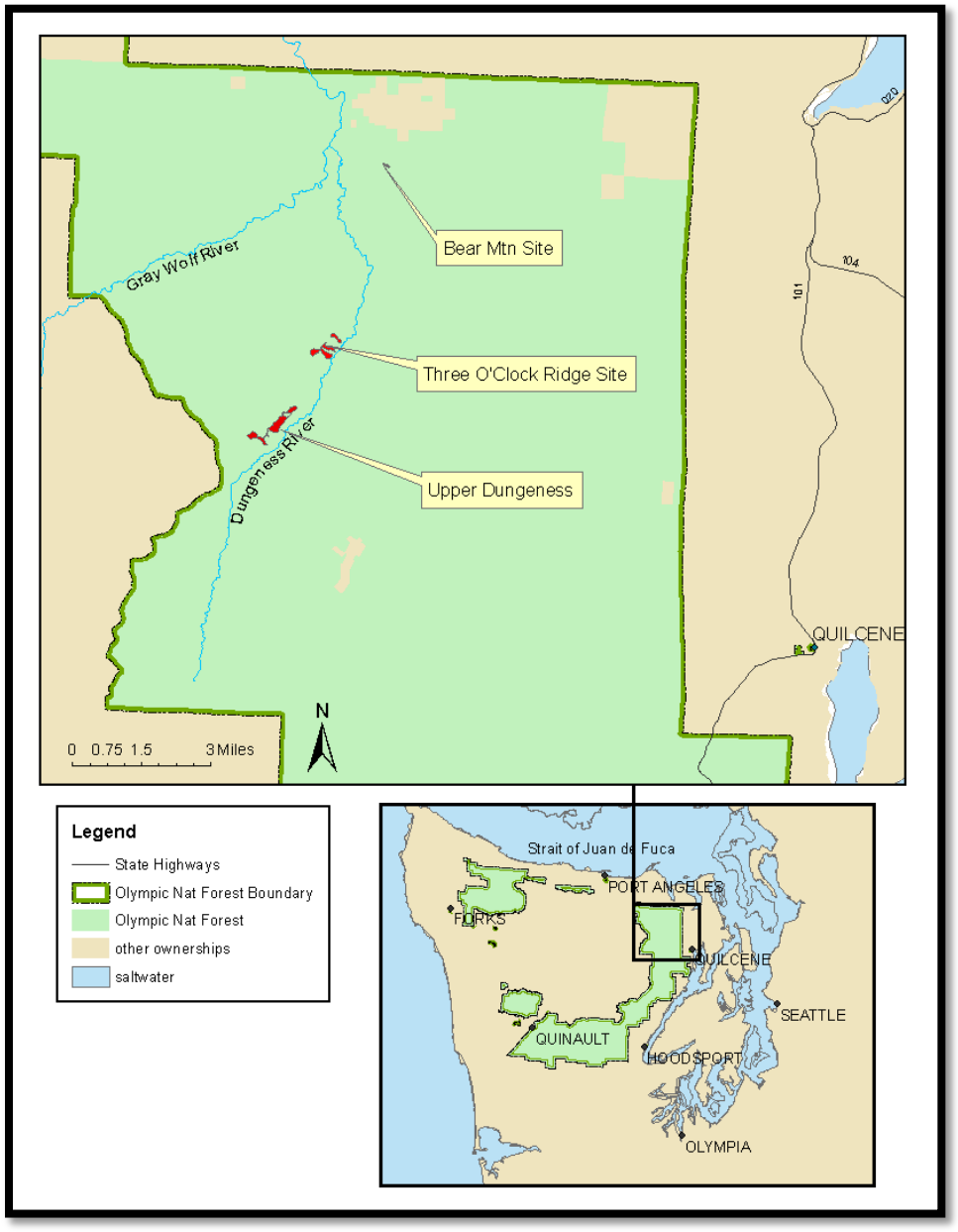

Figure 1. Locations of Taylor's checkerspot sites on Olympic National Forest.

Threats

A number of threats to Taylor's checkerspot and its habitat on the Olympic National Forest have been identified (Holtrop 2010; Hays 2012), including habitat loss from encroaching trees and shrubs, vehicle traffic, recreation, habitat loss from nonnative invasive plants, small habitat patch size, isolated habitat patches, and small population sizes.

The largest immediate threat to Taylor's checkerspot habitat at all ONF sites is the encroachment of trees and shrubs in the habitat patches (openings). Taylor's checkerspot habitat occurs at each site in openings within regenerating forest that originated from clearcut harvest in the 1960s and planted in the 1960s and 1970s. Bear Mountain also received plantings in 1990 after a small wildfire. Young conifers have become established and are rapidly growing in some areas occupied by Taylor's checkerspot, resulting in decreased quality and increased fragmentation of suitable habitat. The Three O' Clock Ridge site also includes natural balds –openings dominated by herbaceous vegetation surrounded by forest on dry sloping sites– that are threatened by encroaching trees as well. Without actions to remove encroaching vegetation, significant Taylor's checkerspot habitat loss will occur in the near-term.

Road use by visitors is also a threat to Taylor's checkerspots on ONF, particularly at the Upper Dungeness and Three O' Clock Ridge sites. These sites include significant forest road edges that support the host plant *Plantago lanceolata.* Within the Three O' Clock Ridge site 0.6 kilometer (0.4 mi) of road edge are occupied by Taylor's checkerspot, and at Upper Dungeness site 2 kilometers (1.2 mi) of road edge are occupied. *P. lanceolata* along these roads is used by checkerspots for oviposition and larval feeding. Pre- and post-diapause larvae have been observed on the roadbeds, and some have been found dead in the road, apparently crushed by vehicles.

Spread of nonnative invasive plants is a concern, particularly with implementation of habitat management activities. Several nonnative or invasive plants have been observed at the sites (Table 3). Some plants may become invasive with or without future disturbance.

Table 3. Nonnative or invasive plants of potential management concern detected at Olympic National Forest Taylor's checkerspot sites.
(Note: should not be considered a complete list of nonnative invasive plants present at the sites.)

Scientific Name	Common Name	Bear Mtn	3OCR	Upr Dung
Aira caryophylla	Silvery Hairgrass	√		
Bromus tectorum	Downy Cheat Grass		√	√
Centaurea jacea x nigra	Meadow Knapweed			√
Cerastium fontanum	Common Mouse-ear Chickweed			√
Cerastium glomeratum	Sticky Chickweed	√		√
Cirsium vulgare	Bull Thistle			√
Dactylis glomerata	Orchard Grass		√	√
Festuca arundinacea	Tall Fescue			√
Hypericum perforatum	Common Saint-Johnswort			√
Hypochaeris radicata	Hairy Cats-ear	√		
Leucanthemum vulgare	Oxeye Daisy	√	√	√
Myosotis discolor	Changing Color Forget-me-not	√		
Prunus emarginata	Bitter Cherry	√	√	√
Taraxacum officinale	Common Dandelion	√	√	√
Trifolium campestre	Largehop Clover			√
Trifolium dubium	Small Hop Clover			√
Trifolium repens	White Clover		√	√
Vicia hirsuta	Tiny Vetch			√
Vulpia myuros	Rat-tail Fescue			√

Desired Site Conditions

The desired future condition at each ONF Taylor's checkerspot site is a mosaic of connected habitat patches (openings) with an abundance of host plants and food resources to support viable Taylor's checkerspot populations over time. Since small openings are important components of late-successional forests, the sites will continue to provide habitat for late-successional forest associated species as well. All land management standards and guidelines under the ONF Land and Resource Management Plan and the Northwest Forest Plan will be met.

We describe specific desired conditions below for: (1) cover of trees and shrubs; (2) habitat connectivity; (3) quantities of checkerspot habitat; (4) butterfly occupancy; (5) abundance and diversity of post-diapause food resources; (6) abundance of larval host plants; (7) abundance of adult food (nectar) resources; (8) butterfly refugia; and (9) nonnative, invasive plant cover.

1. Decrease shrub and tree cover - Tree and shrub encroachment does not threaten checkerspot populations.

Recommended metric: **Reduce cover of trees and shrubs to less than 10% in existing occupied habitat patches.**

Vegetation dynamics and other habitat changes are likely the most common cause of local extinction for medium-sized and larger populations of butterflies (Thomas and Hanski 1997). Taylor's checkerspot utilizes open, grass or forb dominated openings, and has thermal requirements during all life stages. Reducing tree and shrub cover increases habitat patch size and the overall amount of habitat, allows butterflies to access key plants, and reduces habitat fragmentation.

Availability of sunlight can be limiting for larvae, which bask to increase body temperature and rates of digestion (Weiss et al. 1987, 1988) The faster the larvae develop, the better the chance of reaching diapause and contributing to the next generation (Weiss et al. 1987, 1988, Cushman et al. 1994).

In a comparison of known and random paired plots at a known Taylor's checkerspot oviposition site in British Columbia (Page et al. 2009, unpublished data) cover of trees at larval locations averaged 0.5% and cover of trees at random locations averaged 4%. Cover of shrubs at larval locations averaged 4% and shrub cover at random locations averaged 21%. One site in Oregon was discovered in an area where trees and shrubs had been recently removed (Severns 2009).

The cover of trees and shrubs is fairly high (greater than 20%) in portions of ONF occupied sites, and likely is increasing each year. Tree and shrub encroachment is a major threat to checkerspot habitat on the Olympic National Forest. Bear Mountain, the smallest site, is especially threatened in the short term.

2. Habitat connectivity – The majority of habitat patches are connected.

Ensure habitat connectivity is based on the general principal that connected butterfly populations are preferable to less connected populations. This premise has been demonstrated in butterfly modeling studies (McIntire et al. 2007, for example), and within checkerspots (especially see Hanski 1999). Checkerspots as a group are relatively poor dispersers (Weiss 1996, in USFWS 1998).

The ONF sites consist of numerous small habitat patches (natural balds, forest openings within old clearcuts, and roadsides). Currently, it is not clear the degree to which structural vegetation or roads affect

movement between the habitat patches. We assume that connected habitat patches within the sites would be preferable to less connected.

A long-term need for Taylor's checkerspot on the Olympic National Forest is functional connectivity between populations. The greatest distance between currently identified ONF populations is 4.25 miles (6.8 km). An ongoing genetic study will assess the level of genetic diversity within populations and the genetic structure among populations of *E. editha taylori*. Genetics analyses at a USFS genetics lab are under way, and first results may be available in 2013. This study may shed some light on whether the ONF populations, or patches within them, are isolated or part of a large metapopulation. In the former possibility, habitat connectivity between these sites will be a key management issue.

3. **Restore potential habitat – The amount of suitable habitat at the sites is increased.**

Recommended metric: **Increase habitat area at each site by 50 - 100% within the first 10 years of active management.**

Throughout the range of the subspecies, small habitat patch size combined with low habitat quality has been identified as a serious threat (Stinson 2005). Large, high-quality habitat patches play an important role in checkerspot regional persistence (Hanski et al. 2004). Butterfly counts on ONF sites indicate a very small, low density population at Bear Mountain, with larger populations, that still likely only number in the hundreds, at Three O'Clock Ridge and Upper Dungeness. With butterflies still present across these sites, it is likely that newly created habitat will be colonized.

4. **Butterfly occupancy - The majority of potential habitat is occupied.**

Recommended metric: **At least 75% of forest openings / balds greater than 0.5 acres are occupied by Taylor's checkerspot.**

Metapopulations are common in checkerspots, and the species is vulnerable to local extirpation and mass dispersal (Murphy and White 1984). Both occupied and vacant habitat patches are essential for a well-functioning metapopulation (Ehrlich and Murphy 1987). Surveys that determine occupancy should continue.

5. **Abundance and diversity of larval food resources – Two or more post-diapause food plants are available across larger habitat patches.**

Recommended metric: **At least 60% of forest openings greater than 0.5 acres have two or more potential post-diapause larval foods distributed across them.**

This objective is based on indications from other sites (South Puget Sound prairies and Sequim) that additional food plants during the post-diapause diapause (late-winter/early spring) phase add considerably to the food availability during this important developmental period (Linders, pers. comm.). Post-diapause larval observation is still needed to determine plants being used.

6. **Abundance of larval food resources – *Castilleja hispida* (host plant) is abundant and available to checkerspots.**

Recommended metric: **Forest openings/ balds have at least 0.21 *Castilleja hispida* plants per sq. meter.**

Harsh paintbrush (*Castlleja hispida*) is the sole native plant on which Taylor's checkerspot egg-laying has been confirmed in ONF. We recommend establishing a minimum density of host plants based upon data

from other *Castilleja* populations in the Olympic Peninsula region. The number 0.21 is a midpoint between counts from two patches where all the *C. hispida* plants were counted at Eden Valley (Severns and Grosboll 2011).

7. Abundance of adult food resources – Nectar is abundant and available to checkerspots.

Recommended metric: **60% of area within all forest openings and balds have well distributed, abundant populations of 4 or more nectar species, including at least 2 perennial species**.

Checkerspot butterflies feed on floral nectar, and their reproduction and longevity are increased with nectar availability (Boggs and Nieminen 2004, Murphy 1981). Nectar patches have been found to influence oviposition site selection in Taylor's checkerpots (Severns and Warren 2008). The goal is to ensure that nectar resources are provided throughout the flight period. Plant species on which nectaring has been observed at ONF sites are listed in Table 2.

8. Refugia – The majority of occupied habitat areas remain undisturbed each year.

Recommended metric: **Less than 15% of occupied habitat is disturbed annually**.

A certain degree of disturbance will occur from recreational activity, road use, and habitat enhancement activities. However, only a small percentage of occupied sites will be disturbed by habitat work each year. Conservation measures will be implemented to minimize disturbance, such as conducting project work when larvae can easily be avoided. Continued surveys are necessary to determine occupancy.

9. Cover of nonnative plants – Nonnative, invasive plants do not provide a threat to habitat.

Several nonnative plants have been noted at the sites. The principal nonnative species noted include grasses (e.g., rat-tail fescue) and forbs (oxeye daisy, hairy cat's ear). These species came into the sites with past disturbances, and are well established in places. Oxeye daisy, in particular, is locally very abundant at the checkerspot sites. However, currently, it is not known whether the presence of these exotics significantly degrades habitat (causes less egg-laying or increases larval mortality). Control of these species should be considered as part of longer term site management actions. The main short-term concern is continued spread of these species with habitat management activities.

Management Actions (all Sites)

General management actions applicable to all the sites are described below. These actions are necessary to reach the desired site conditions. They are applicable to any new sites with similar habitat and site conditions, including the Gray Wolf, as well as existing known populations. Specific actions and timelines for each of three sites are displayed under Management Plans by Site (Section III).

1. Remove encroaching trees and shrubs in occupied habitat areas to improve and connect habitat.

Removal of encroaching vegetation at occupied sites should be conducted annually and incrementally along with monitoring. Annual effort should be focused on improving habitat in areas known to be occupied by Taylor's checkerspot and establishing openings in nearby unoccupied areas. We recommend habitat patches be connected by openings at least 50' wide.

Treatment areas should be selected using information from adult and larval surveys. The amount of area treated should be greater in areas of no or low adult abundance, and more limited in areas of higher

abundance. Areas of high pre-diapause larvae densities should be avoided. Information on the distribution of larval foodplants can also be used to select vegetation removal areas.

Cut trees and shrubs will be piled within and adjacent to treatment areas. Piling should occur in areas without foodplants and few nectar plants. Typical areas for piling include patches of salal and small openings where fir trees have been removed. Larval and adult foodplants rarely occur within patches of salal (Hays, pers. observation). Patches of snowberry should be avoided when piling brush, as checkerspot foodplants are common in snowberry patches. Considerations in determining the location of piles include: (a) disturbance from walking back and forth to pile (shorter distances are generally preferred); (b) the footprint of the pile (smaller footprint is generally preferred); and (c) the height of the pile (taller is generally preferred). Care should be taken to avoid foot traffic in shallow rock habitat – where only a few inches of soil occur, it can easily be lost during tree cutting and piling.

Selection of specific shrubs to remove should be based upon consideration of checkerspot foodplants. The larval host, harsh paintbrush is often found growing with snowberry and oceanspray. Removal of oceanspray will likely enhance checkerspot habitat, because larval and adult foodplants commonly occur around the base of oceanspray plants. Removal of shrubs that provide extensive ground cover should be considered for areas where re-seeding or planting with native species will occur, or where the general objective is to increase the size of the opening or overall reduction in shrub cover.

Selection of trees to be removed should focus on small (< 8" diameter at breast height or dbh) trees, which comprise the vast majority of trees in each site. Trees greater than 8" dbh would be removed on a case by case basis. Snags could be created from larger trees. Limbing of large trees may also provide habitat benefits. Uncommon tree species such as juniper and yew would not be removed.

Reducing cover of dead trees and shrubs should be considered along with live tree and shrub cover. Small dead shrubs and trees and dead limbs are common on all ONF sites. Oceanspray growing in balds, in particular, occurs often with many dead stems interspersed with live stems. It is important to remove the dead wood along with the live stems to allow butterfly access to adult nectar and host plants.

The greater the reductions in vegetation cover initially, the longer the habitat may be maintained in a suitable condition. However, considerations such as slope stability and providing microhabitats for checkerspots may also be important. Leaving some scattered trees and shrubs, and areas where no trees and shrubs are removed may provide habitat benefits to checkerspots (Linders, pers. comm.). Consultation with other natural resource specialists, such as silviculturists and watershed specialists will help to provide specific vegetation prescriptions at each site.

2. **Increase suitable habitat by creating new openings.**

The amount of suitable Taylor's checkerspot habitat should be increased on ONF through vegetation removal and native seeding and planting. Precommercial (PCT) thinning (typically 4- 8"dbh size trees) and commercial thinning could be ways to expand or create habitat patches. This generally would be achieved in combination with host or larval food plant seeding or planting.

Prescribed fire may also be a tool to enlarge habitats or create new habitat patches. Fire improves habitat condition for checkerspots by (a) removing dead and dying wood, (b) removing young trees and shrubs, (c) increasing nitrogen for larval host plants and nectar plant growth, (d) increasing the size of openings, and (e) providing increased germination of harsh paintbrush and blue-eyed Mary seed (Wilderman, pers. comm., Gilbert, pers comm.). Germination of seed and survival of planted plugs of other paintbrush species are often improved with fire (Dunwiddie 2011). Little is known about the effects of fire intensity,

severity, and pattern on butterfly populations; therefore conservative burning strategies should be used (Schultz et al. 2011), and prescribed fire treatments monitored closely.

Fire may dramatically enhance the habitat around the periphery of the balds. Site field reviews indicated harsh paintbrush may be more abundant in deeper soil areas adjacent and nearby to the balds than the balds themselves. Encroaching trees and shrubs degrade the quality of the habitat for checkerspots by reducing sunlight and increasing shrub cover.

3. Propagate native plants for seeding or planting into sites.

In order to reduce the likelihood of weed establishment and to increase habitat quality, in some situations, native species should be seeded or planted into disturbed areas. Seed to produce plants grown in a nursery for transplanting to the wild should come from the ONF checkerspot sites. This is especially important for larval food sources.

Larval foodplants are the highest priority for propagation due to their critical role in the checkerspot life cycle, patchy abundance, and clear benefits with seeding/planting enhancements. Sites should have two or more larval food plant species distributed across them. The three main native species of potential larval foodplants at ONF sites are harsh paintbrush, a perennial species used for oviposition by adult checkerspots, and two native annuals, blue-eyed Mary and sea blush, used for post- diapause food. Sea blush in particular is found in small patches within the sites. Expansion of the species to provide critical late-winter food within oviposition areas could have a significant positive benefit to butterfly numbers and site stability. It readily seeds into disturbed areas. If only one species could be propagated, this is likely the most important species to propagate in the short term (1-5 years). Sea blush is also used extensively by Taylor's checkerspot adults for nectar.

Other nectar plants suitable for seeding in disturbed areas include Oregon sunshine (*Eriophylum lanatum*), spring-gold (*Lomatium* sp.), wild strawberry (*Fragaria* sp.) and stonecrop (*Sedum sp*). Other plants for potential propagation include native grasses (*Festuca roemerii* or *Bromus caurinatus*), which can be readily established in disturbed habitats, and field chickweed (*Cerastium arvense*).

It is not recommended to propagate a nonnative larval foodplant, narrowleaf plantain, for several reasons: (a) Harsh paintbrush is the dominant host plant present at the sites; (b) paintbrush is not limited at the sites, but threatened by encroaching trees and shrubs; (c) establishment of plantain may be difficult in areas where soils are not compacted; and (d) establishment of non-dominant host species may cause behavioral changes in checkerspot populations. Seeding into burned slash piles may be an effective method to prepare sites for native plant establishment (Wilderman, pers. comm.).

4. Control nonnative or invasive plants to maintain and increase habitat quality.

Several nonnative plant species are present at the sites. However, currently it is not known whether the presence of these exotics significantly degrades habitat (causes less egg-laying or increases larval mortality). Control of nonnative or invasive plant species should be considered as part of longer term site management actions. A necessary short-term action is to prevent the spread of these species with habitat management activities. Invasive species control will require both manual control methods and herbicides. Herbicide use in occupied habitats will be conducted under the direction of ONF biologists and botanists. Application methods will be used that minimize impacts on non target plants and Taylor's checkerspots. Any weed control will be in compliance with the ONF invasive weed Environmental Impact Statement (USDA 2008).

5. Manage roadways, trails, and dispersed camping areas to minimize adverse effects to Taylor's checkerspots.

Recreational activities such as driving, parking, hiking, and dispersed camping are currently impacting Taylor's checkerspot habitat. Forest Service (FS) management activities such as road maintenance could impact checkerspot habitat. FS roads go through two Taylor's checkerspot sites, and an unclassified road goes through a third site. Adults, pre-diapause larval masses (oviposition sites) and post-diapause larvae have been found on the open roads. Taylor's checkerspots also occupy a dispersed camping area along a road and natural balds which are visited by trail users. Wildlife biologists need to work with road engineering and recreation staff to determine how to best protect these areas from potential impacts while allowing safe use by people and their vehicles.

Monitoring and Adaptive Management (all Sites)

Effectiveness monitoring will be carried out with all habitat enhancement activities. The primary objective of tree and shrub removal is to improve habitat conditions for Taylor's checkerspot, specifically releasing larval foodplants so they can be used by the butterflies. Pre-diapause larval searches are an effective way to monitor butterfly response to treatments. Pre-diapause larval surveys should be done in a subset of the treatment areas before and after treatment, following methods outlined in Severns and Grosboll (2011) and Hays (2011). Total number of host plants and larval masses are counted and compared in the areas, and this information is used in an adaptive management approach in planning and implementing additional treatments.

In addition, photos depicting treatment areas should be taken before and after vegetation treatments, to document the action as well as record the changes in tree and shrub cover.

Monitoring of areas where tree and shrub removal has occurred should be conducted one, two, and 5 years post-treatment to assess establishment and spread of invasive plant species. Invasive plants should be treated as needed to protect habitat quality for Taylor's checkerspot.

Population monitoring (adult surveys) should be maintained. Sites should be monitored annually using methods that allow for comparisons of adult abundance across years and distribution across the sites. Planned habitat management activities will be re-evaluated based on results of adult surveys, especially where there is a sharp decline in numbers of butterflies observed.

Baseline host plant abundance and distribution information will be collected at all sites, and at 10 year intervals. Information from adult, larval and vegetation surveys will be used in an adaptive management approach in adjusting habitat management actions and timelines.

SECTION III: MANAGEMENT PLANS BY SITE

Specific site management plans for three sites are described in this section. Management actions are generally outlined for a ten year period. The plans are considered dynamic and can be amended as site conditions, information or land management direction changes. As new information becomes available, we will adapt and refine management actions and timelines. Specific site management plans for any new sites will be developed separately, if needed.

Bear Mountain

Site Description

The Bear Mountain site includes small openings within a young regenerating coniferous forest. The stand was regeneration-harvested in the 1969 (13 acre clearcut unit) and was re-planted with conifer seedlings in 1972-1973. Additional plantings were accomplished in 1990. Portions of the harvest unit remain in open conditions. The openings in this unit are occupied by Taylor's checkerspots.

Below (southwest of) the occupied unit is another unit which was regeneration-harvested in 1988 (27 acre clearcut). This unit is more densely stocked with trees, and is not occupied by checkerspots. We define the Bear Mountain Management Area as an area of approximately 40 acres (16 hectares), including the 13 acre old clearcut unit occupied by butterflies and the unit to the southwest (Figure 2). The unmanaged forests surrounding the site are wildfire-created second growth (year of origin 1895-1920). Figure 3 is a photo of an opening in the occupied harvest unit.

An unclassified road runs between the two old clearcut units. This road extends beyond the end of FS Road 28.260, which is open with maintenance Level 2 (suitable for high clearance vehicles) to within 150 meters (500 feet) walk of the occupied site (Figure 3). The unclassified road that goes through the site is about 450 meters (0.25 mile) long and sometimes driven on and used by recreationists.

The clearcut unit with openings occupied by checkerspots contains rock outcrops and a partially open rocky knob at the top (east side). Although the clearcut was 13 acres, the openings occupied by Taylor's checkerspot total less than 2 acres. The site is sloped with a SW aspect, and is 2400 to 2700 feet in elevation. The openings contain a variety of herbaceous plants, including many nectar plants (Table 2). Shrubs grow throughout the site, including oceanspray (*Holodiscus discolor*), Pacific rhododendron (*Rhododendron macrophyllum*), hairy manzanita (*Arctostaphylos columbiana*), Oregon boxwood (*Pachistima myrsinites*) and baldhip rose (*Rosa gymnocarpa*). The young trees (20- 40 years old) occupying the unit are primarily Douglas-fir. Soil series at the site is Tunnelcreek - Pennycreek complex, 60 to 90% south slopes. The soil depth class ranges very shallow to moderately deep.

Site Management History and Land Allocations

Before the Northwest Forest Plan, the Bear Mountain Taylor's checkerspot site was managed for timber harvest. The Olympic Land and Resource Management Plan designation was F1 (Municipal Watershed), as the watershed provided water for a local city. In 1989 there was a small wildfire (6 acres) at the site, which was quickly suppressed. Under the Northwest Forest Plan, the site was designated as LSR.

Checkerspot Distribution and Abundance

Bear Mountain, the smallest (in area) of the ONF sites, has received complete surveys each year since its discovery in 2009 (Table 1). The highest adult count was 61 butterflies in 2010. In 2010, 2012, and 2013 adults were detected flying in May and June; in 2011 the flight season extended into early July.

Taylor's checkerspots occupy the open and semi-open areas on the slope and at the rocky top in the 1969 clearcut unit. The highest densities of adults have been found in the middle and eastern lower portions of the occupied area, which have the largest openings. Open areas at the end of the road and the roadsides have been surveyed but are not occupied by butterflies.

A limited number of larval surveys have been completed by WDFW and ONF at Bear Mountain. To date, harsh paintbrush (*Castilleja hispida)* has been confirmed as a host plant/ pre-diapause food plant at this site. A pre-diapause larval survey on July 9, 2010 resulted in a single larval mass on *Castilleja hispida*. Pre-diapause larval searches in August 2011 and 2012 also resulted in larvae detections on *Castilleja hispida.* Post-diapause surveys conducted in March 2010 detected larvae feeding on *Castilleja hispida*

and *Collinsia parviflora* (Blue-eyed Mary). *Plantago lanceolata* (narrowleaf plantain) does not occur within occupied habitats at this site.

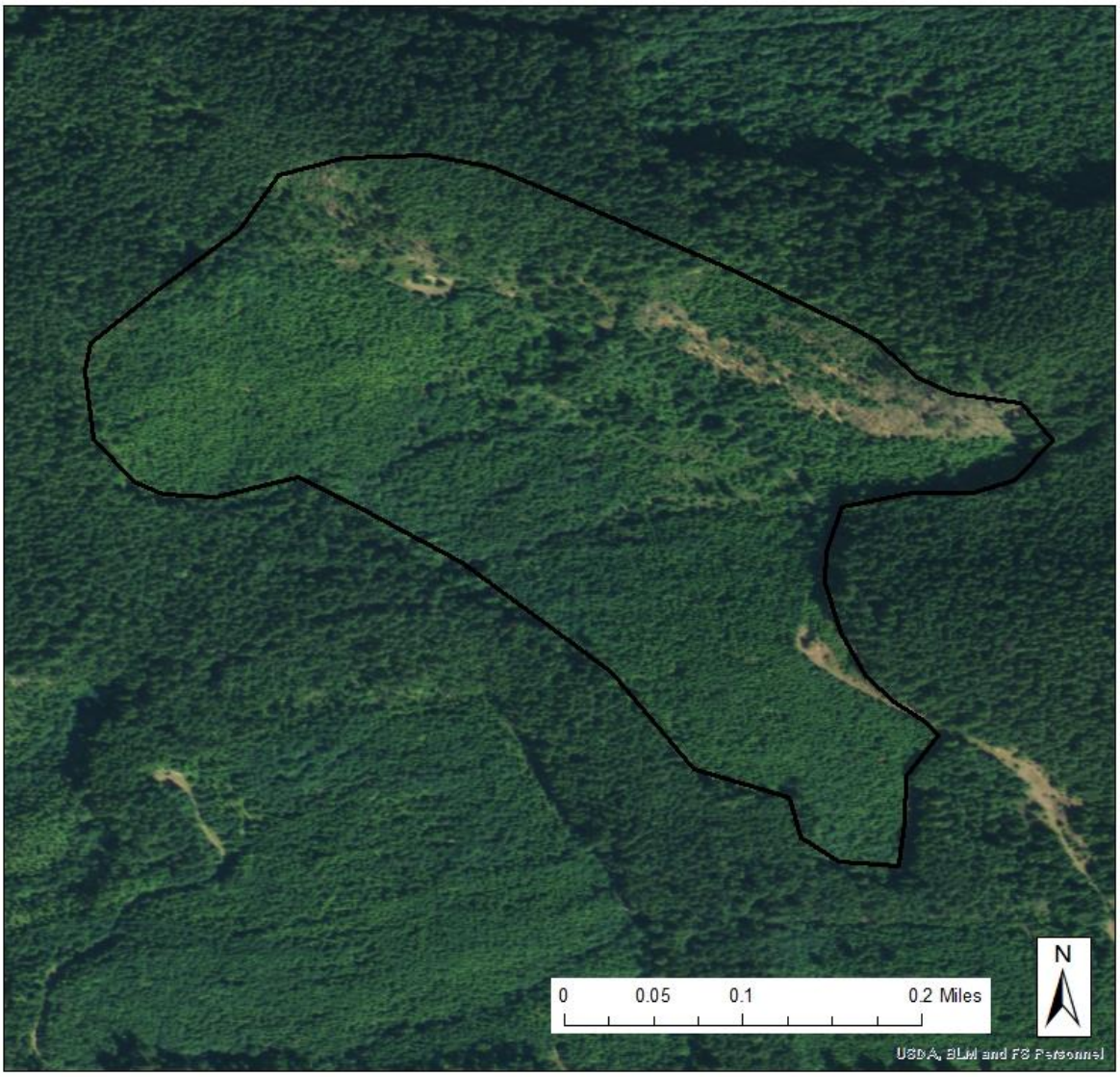

Figure 2. Bear Mountain Taylor's Checkerspot Management Area.

Figure 3. Opening in old clearcut, Bear Mountain site.

Site Threats

The most imminent site threat is tree and shrub encroachment. Bear Mountain is a small site, and is very vulnerable to habitat loss and population loss due to encroachment of conifers and shrubs in and around the openings. Another possible threat includes trampling of vegetation by recreationists. The unclassified road is used by Forest visitors, and there have been campfires at three locations within the site. The area is popular for rhododendron-viewing in the spring. Another threat is the potential spread of nonnative invasive plants. Several nonnative plants occur at Bear Mountain (Table 3).

Management Actions

Management actions for Bear Mountain include removing encroaching vegetation, creating new habitat openings, and planting and seeding native plants (Table 4). Vegetation removal will be accomplished in both the occupied openings and unoccupied areas. Habitat enhancement activities would reduce conifer and shrub cover in the openings, and enlarge and connect habitat patches. Because of the immediate threat of vegetation encroachment, tree and shrub removal was initiated in 2012. In the future, additional habitat patches will be created in the other harvest unit to the southwest. Proposed areas for tree and shrub removal are shown in Figure 4.

Management actions also include closing the end of FS Road 28.260 so that the unclassified portion is not drivable. This would decrease potential site disturbance from recreationists. Working with road engineering staff, we need to research the best methods to block the end of this road so that vehicles cannot pass.

Table 4. Management actions for Bear Mountain Taylor's checkerspot site.

THREAT	ACTION NEEDED	TIMELINE	ACTIVITY LOCATION	HOW TO ACCOMPLISH	DESIRED SITE CONDITION
Encroaching trees and shrubs in occupied habitat.	Remove encroaching trees & shrubs within /near occupied openings.	FY 2012 - 2017 (ongoing)	Existing openings in harvest unit (cell 24020083) and area at end of road.	Cut and pile trees and shrubs. WDFW, ONF or WCC field crews.	Tree/shrub cover <10% in openings. Occupied habitat patches enlarged & connected
Tree growth/ succession inhibiting suitable hab. conditions & connectivity. Small popul.	Remove vegetation to create habitat in unoccupied areas.	FY 2017 – 2022	Lower harvest unit (cell 24020084)	Vegetation treatments and /or Prescribed fire. FS crew or contract.	Amount of suitable habitat is increased 50-100%. Habitat is connected.
Recreation, Vehicle use	Block road to prevent vehicles on unclassified road	FY 2014 or 2015	Unclassified road which extends at end of FS Rd 28.260	FS Contract	Site disturbance is reduced.
Nonnative weeds. Lack of suitable habitat.	Propagate native plants for seeding or planting in disturbed areas. Monitor invasives.	FY 2013 – 2023	Existing habitat patches, new openings, and along the road at site.	FS staff and partners to collect seed. NRCS Plant Materials Center or other partner for propagation.	Checkerspot habitat quality improved.

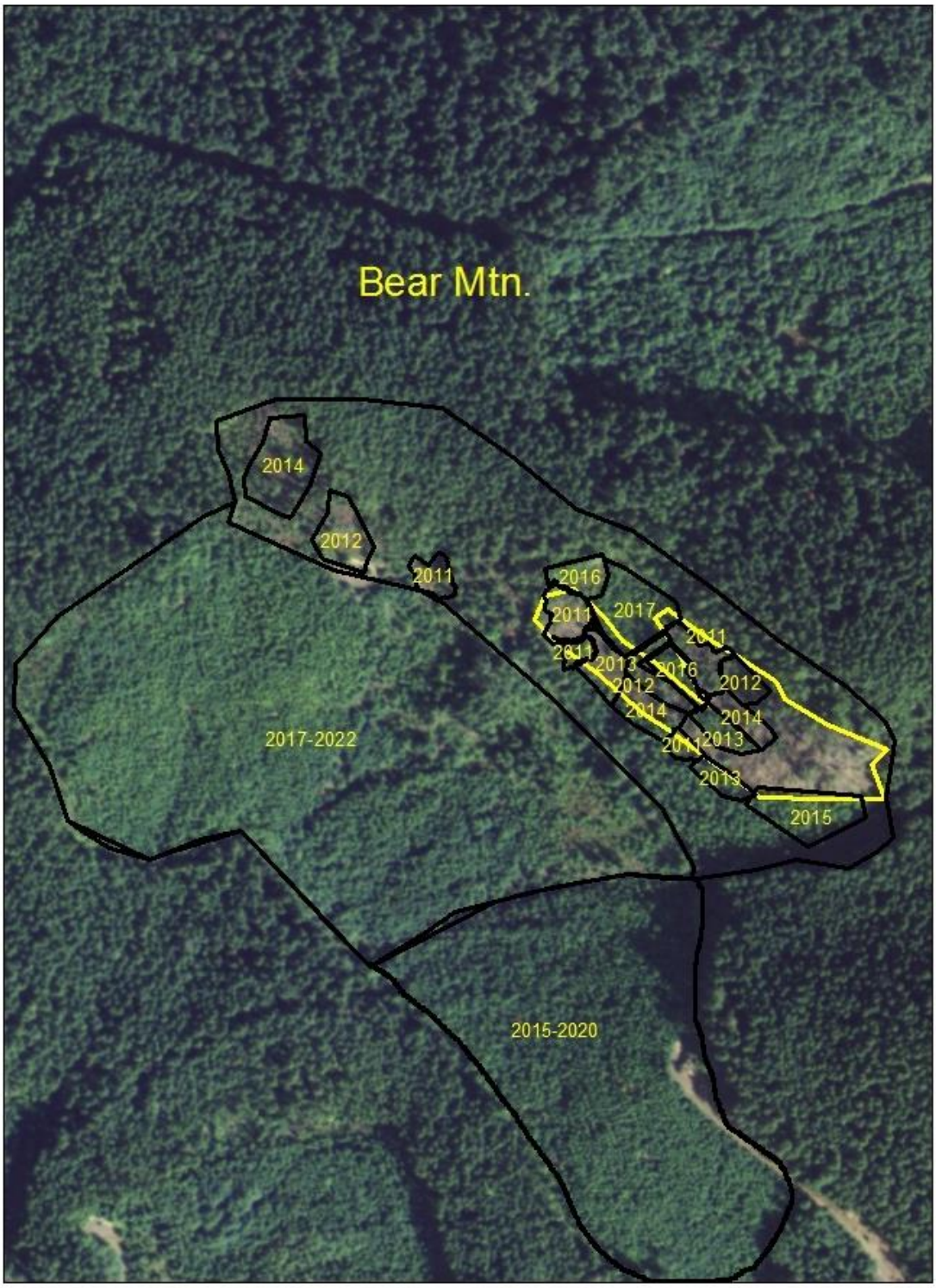

Figure 4. Locations of proposed vegetation treatments, Bear Mountain site. Checkerspots have been detected in the area outlined in yellow.

Three O' Clock Ridge

Site Description

The Three O' Clock Ridge site includes small openings within young regenerating forest, herbaceously vegetated roadsides, and natural balds occupied by checkerspots. For purposes of the management plan, the site has been divided into ***Area A***, ***Area B***, and ***Area C.*** Area A is approximately 10 acres (4 hectares), Area B is approximately 130 acres (53 hectares), and Area C is approximately 60 acres (24 hectares) (Figure 5).

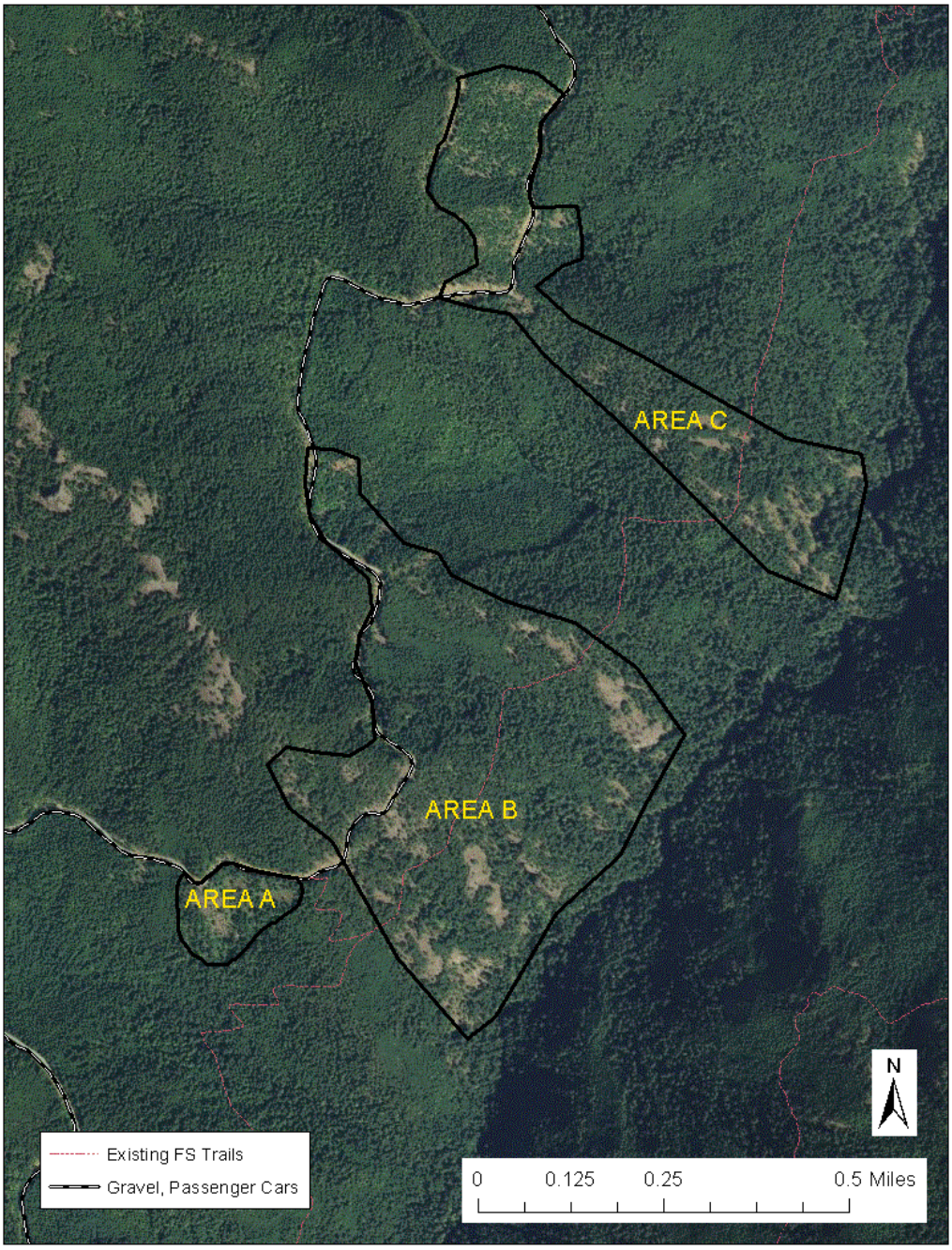

Figure 5. Three O'clock Ridge Taylor's Checkerspot Management Areas.

Area A is a 10-acre timber management unit which was regeneration-harvested in 1965 and was re-planted with conifer seedlings in the late 1960s. The unit contains small natural openings with rock outcrops (Figure 6). Current checkerspot habitat consists of an approximately 4 acre (1.6 hectares) contiguous opening and a ¾ acre (0.3 hectares) contiguous opening. The site is steeply sloped (58 percent slope) with a south aspect and 2700 to 3000 elevation range. The area contains a variety of herbaceous plants. Shrubs grow throughout the site, including oceanspray, juniper (*Juniperus* sp.), hairy manzanita, Oregon boxwood and baldhip rose. The young trees (20- 40 years old) in the harvest unit are primarily Douglas-fir. The soil series at this clearcut is Wellesley very gravelly sandy loam, 30 to 60% south slopes. The soil depth class is deep.

Roadsides habitats are occupied by checkerspots along a 0.6 km (0.4 mile) section of FS Road 2870 (Figure 7), which stretches from the Area A into Area B. A variety of plants occur along the roadsides and on adjacent slopes, including grasses, strawberry (*Fragaria* sp.), narrowleaf plantain (*Plantago lanceolata*), and patches of sea blush (*Plectritis congesta)*. This road is a single-lane gravel road with turn-outs.

Areas B and C include natural balds of rock and shallow soil (Figure 8) surrounding by unmanaged old forest (year of origin is 1750). Balds and natural openings in Areas B and C vary from less than 0.1 acre (0.04 hectares) to approximately 4 acres. The balds are sloped, very steep (80 percent slope) in places with a SE aspect and 2200 - 2800 elevation range. Plants on the natural balds include violets (*Viola* spp.), calypso orchid (*Calypso bulbosa*), meadow death-camas (*Zigadenus venenosus*), wild onion (*Allium* sp.), *Sedum* and *Phlox*. Taylor's checkerspots occupy three balds in Area B. The soil series at the balds is Dystrudepts – Haploxerepts – rock outcrop association, 50-100 % slopes. The soil depth class is very shallow to deep.

Checkerspots also have been detected in a small area on the northwest end of Area C, in a dispersed camping area off the road and the adjacent slope (Figure 9). The sloped area was a small (0.6 acre) clearcut in 1964, and much of it remains open. The aspect of this small harvest unit is SE and elevation is 3000 ft. The soil series at this small unit is Snowcreek - Shanty - Deserter complex, 60 to 90% south slope, with a soil depth shallow to very deep.

Site Management History and Land Allocations

Historically the Three O'Clock Ridge Taylor's Checkerspot Management Area was used for timber harvest and recreation, and continues to be used by recreationalists (hikers and campers). Under the Olympic LRMP, the site is on lands designated as a Botanical Area (J3) due to its unique plant communities. The management emphasis of the Three O'Clock Ridge Botanical Area is protection, education, and research; educational activities and facilities such as trails may occur (USDA 1990, p. IV-108). Under the Northwest Forest Plan, the site is LSR.

Figure 6. Openings in old clearcut, Three O'clock Ridge site.

Figure 8. Natural bald, Three O'clock Ridge site.

Figure 7. Roadside habitat, Three O'clock Ridge site.

Figure 9. Dispersed camp area, Three O'clock Ridge site.

Checkerspot Distribution and Abundance

The Three O' Clock Ridge checkerspot site has been occupied consistently each year since its discovery in 2007. In 2009, 2010 and 2013 adults were detected flying in May and June; in 2011 and 2012 the flight season extended to mid-July. Taylor's checkerspots occupy the openings areas on the slope of the 1965 clearcut unit, three balds in Area B, herbaciously vegetated roadsides along a 0.6 km (0.4 mile) length of road, and a small area on the northwest end of Area C. The highest total adult count was 169 butterflies in 2011.

The first post-diapause larval survey was conducted along the road on March 19, 2010, and larvae were detected crawling over the road and in roadside habitats. Larvae were also detected along the road in April 2012 and 2013 and on the balds in early May, 2012. Pre-diapause surveys were conducted in August, 2011, and larval masses were found along the road and in the harvest unit openings. The pre-diapause larval masses were found on narrowleaf plantain (*Plantago lanceolaa),* primarily along the road, and on harsh paintbrush (*Castilleja hispida*), primarily in the harvest unit openings and balds.

Site Threats

The greatest site threat in the openings is tree and shrub encroachment. Conifer and shrub growth in and around the occupied openings are threatening the open habitat conditions. Other threats include the potential spread of nonnative invasive weeds, tread by recreationists (hikers and dispersed campers), and vehicle traffic on the road.

A direct immediate threat is vehicle use on FS Road 2870, a fairly well-driven road leading to five trailheads further up the Dungeness. Adults, pre-diapause larval masses (oviposition sites) and post-diapause larvae have been found on the roadbed. Checkerspots likely use the road edges for all stages of their lifecycle, including adult flight, nectaring, egg, pupae, and larval feeding and development. Larval surveys indicate that oviposition and larvae use are clustered, not uniform, along the roads; there are roadside locations with particularly high densities of Taylor's checkerspots.

Another threat is the tread by hikers and dispersed campers. The Lower Dungeness Trail #833.3 runs through the area, going within 150 feet of occupied balds. Hikers from this trail sometimes visit the occupied balds via way-trails. The Three O' Clock Ridge Trail also goes through the site, with the trailhead at roadside habitat on the 2870 road. At the north end of the site is a dispersed camping area off the road, commonly used by Forest recreationists in the late spring and summer. The site often contains a lot of dumped garbage, both in the area near the road and on the adjacent slope, which potentially degrades habitat quality for checkerspots.

Management Actions

Vegetation Management

Management actions for Three O' Clock Ridge involve removing encroaching vegetation, creating new habitat openings, planting and seeding native plants, and controlling invasive plants (Table 5). Initial habitat enhancement by removing encroaching trees and shrubs will be focused in the 10 acre management unit occupied by checkerspots. Habitat treatments in the unit would reduce conifer and shrub cover in the existing openings, and increase and connect habitat patches. Control of encroaching trees and shrubs will also be accomplished around the natural balds. Removing vegetation to create additional habitat will be accomplished in units at north end of Area A and in Area C. Areas of proposed vegetation removal are shown in Figures 9-12. Initial vegetation removal will be done mechanically. The use of prescribed fire will be evaluated as a habitat management option, and may be used in the future.

Roadside Habitat Management

Management along FS Road 2870 will focus on reducing impacts to Taylor's checkerspot habitat and population. The following steps are recommended to maintain roadside habitat:

- Map areas of occupied and potential Taylor's checkerspot habitat along the road. Identify areas along the road most important to be protected for Taylor's checkerspot habitat (on-going).
- Work with road engineering staff to determine how to best protect this habitat while allowing safe passing of vehicles on the road. Identify areas that would be needed as vehicle turnouts/ parking.
- Research the best barrier methods of keeping vehicles from driving on the identified important habitat areas. Options include road fencing, similar to that used along highways, metal posts with cables, or large rocks. Installing metal posts with cables is a good potential method to effectively keep out traffic from these areas while limiting the footprint that is created by the barrier. Boulders might be available to be placed, but would take up more of the habitat (and the roadbed) and are more easily moved.
- Install barriers around the identified habitat areas, keeping necessary road turnout areas open for vehicles.

Road maintenance along the 2870 road should be carried out in such a way as to avoid or minimize adverse effects to Taylor's checkerspots (adults and larvae) and their habitat. This could include avoiding moving road gravel onto roadside occupied roadside areas and accomplishing the maintenance during the time of year when the checkerspots are in diapause (September – February). Biologists need to work with road engineering staff to determine best practices to avoid or minimize impacts from road maintenance.

Habitat Management and Recreation

Management actions for Three O' Clock Ridge include improving the small area occupied by checkerspots at the north end of the site, which is used for dispersed camping. A plan needs to be developed to maintain and enhance Taylor's checkerspot habitat at this site while also providing recreation benefits. The following steps are needed:

- Map areas of Taylor's checkerspot habitat at this area. Identify habitat most important to be protected for Taylor's checkerspots (on-going).
- Work with recreation staff to determine how to best protect the habitat while providing for recreation use at this site.
- Research the best methods to keep people off the identified important habitat. Options include placing barriers (such as boulders) to prevent vehicles into the area; placing barriers to prevent people from accessing the adjacent slope; and placing "sensitive area" or "no garbage dumping" signs.
- Implement management actions such as installing barriers and signs.

Management actions for Three O' Clock Ridge also include protecting the natural balds occupied by checkerspots which are botanically very diverse and sensitive. Wildlife biologists need to work with recreation staff to determine methods of keeping people off the balds, if possible, which are accessed from the Lower Dungeness Trail. Options include placing boulders or logs at way-trails to prevent people from walking off the trail to the balds.

Table 5. Management actions for Three O' Clock Ridge Taylor's checkerspot site.

THREAT	ACTION NEEDED	TIMELINE	ACTIVITY LOCATION	HOW TO ACCOMPLISH	DESIRED SITE CONDITION
Encroaching trees and shrubs in occupied habitat.	Remove encroaching trees & shrubs within / near occupied openings.	FY 2013 - 2020	Openings in Area A (cell 25030065) and natural balds.	Cut and pile trees and shrubs. Prescribed fire possible. WDFW/ ONF	Tree/shrub cover <10% in openings. Occupied habitat patches enlarged 10-15% each yr. & connected.
Tree growth/ succession inhibiting suitable habitat conditions.	Remove vegetation to create additional habitat	FY 2014 - 2020	Other harvest units in Areas B & C (cells 25040128 & 129; 25030038, 39, 40, 41)	Cut and pile vegetation; PCT treatments and/or prescribed fire. FS, other agencies, crews or contract.	Amount of suitable habitat is increased 50-100%. Openings connected at least 50' wide.
Roads /vehicles	Carry out road maintenance to minimize impacts.	FY 2013 - 2022	FS Road 2870 at the site.	FS	Disturbance to animals & habitat minimized on road.
Recreation, road use	Identify and protect areas along road occupied by checkerspots by placing barriers.	FY2014 - 2020	FS Road 2870 turnouts with high butterfly density.	FS	Disturbance to animals and habitat is minimized along road. Roadside habitat is maintained.
Recreation (camping, scenery viewing)	Manage dispersed camp area to protect habitat. (such as barriers, signs)	FY 2014 -	Dispersed camp area off 2870 road (north end of site).	FS	Site disturbance is minimized. Habitat quality improved.
Recreation (hiking)	Block way- trails leading from the main trail.	FY 2014 -	Lower Dungeness Trail	FS	Site disturbance is minimized. Habitat quality improved.
Nonnative invasive plants	Control nonnative plants, using application methods that minimize adverse effects on non-target plants and checkerspots.	FY 2013 - 2023	FS Road 2870 at the site and habitat patches if necessary.	FS weed control contracts	Habitat quality is maintained and improved.
Nonnative plants. Low quality suitable habitat.	Propagate native plants for seeding or planting into disturbed areas. Monitor invasives	FY 2013 – 2020	Existing habitat patches, new openings.	FS & partners to collect seed. NRCS Plant Materials Center or other partner for propagation.	Habitat quality improved.

Figure 10. Locations of proposed vegetation treatments, Three O'clock Ridge Area A.

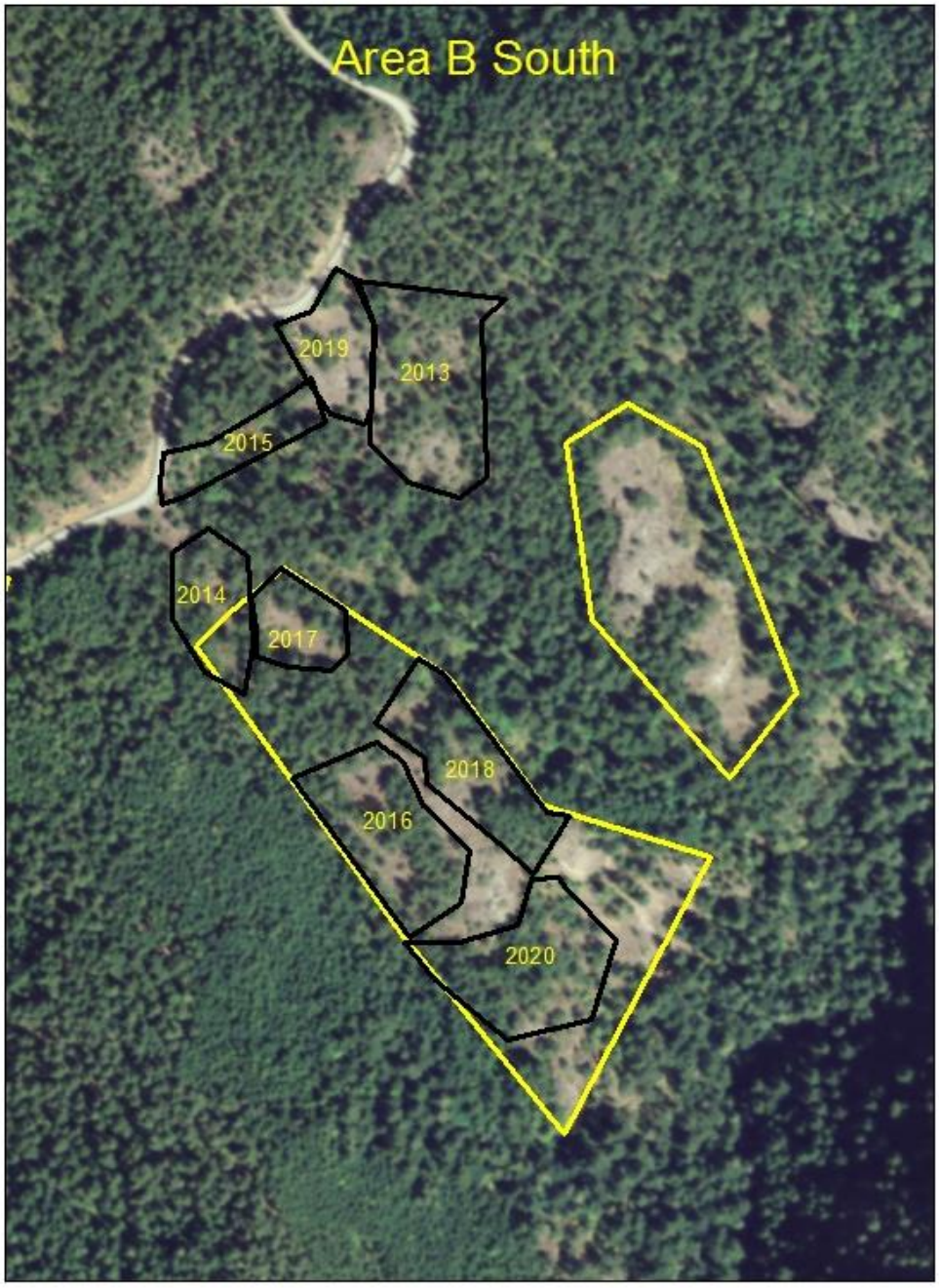

Figure 11. Locations of proposed treatments, Three O'clock Ridge Area B South. Checkerspots have been detected within the areas outlined in yellow.

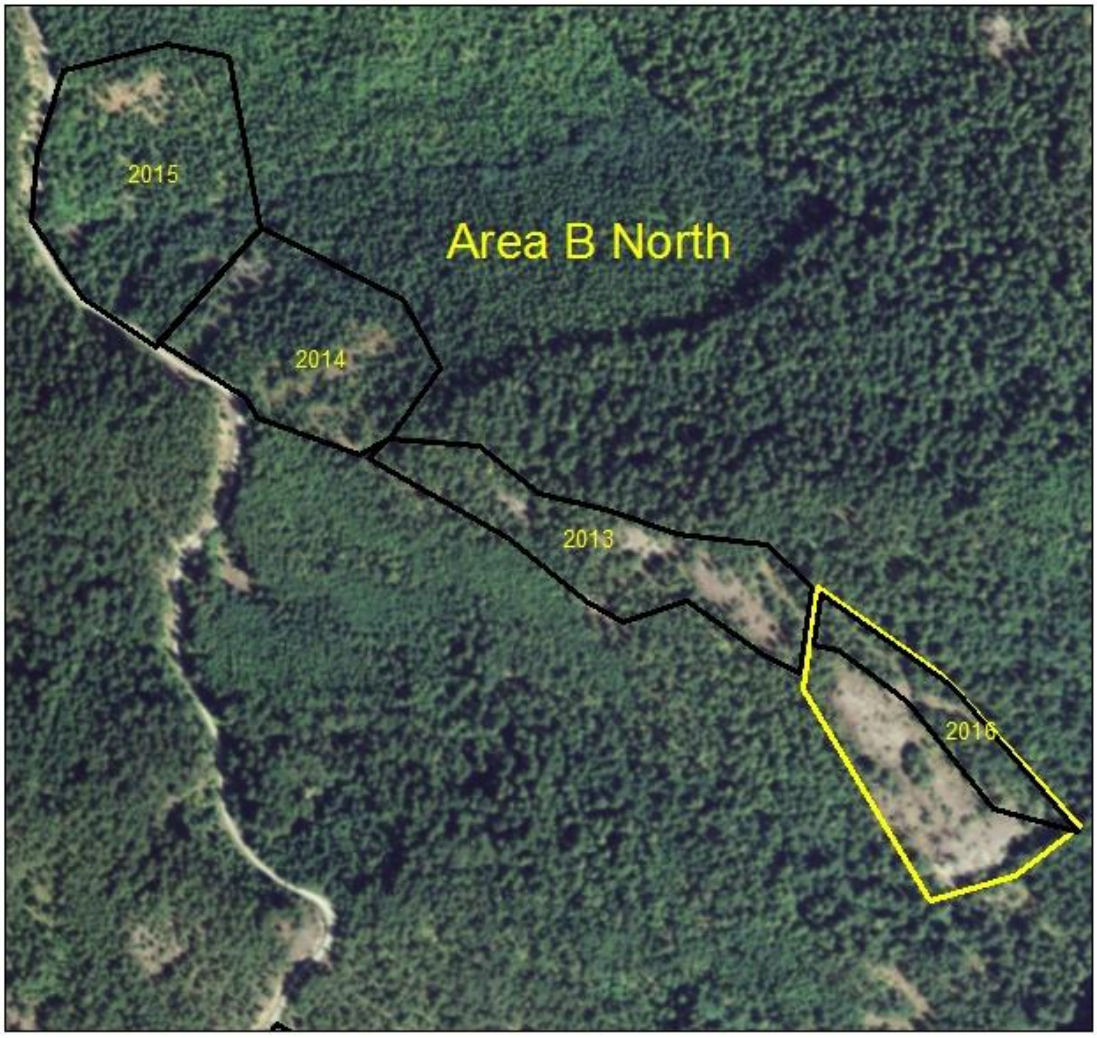

Figure 12. Locations of proposed treatments, Three O'clock Ridge Area B North. Checkerspots have been detected within the area outlined in yellow.

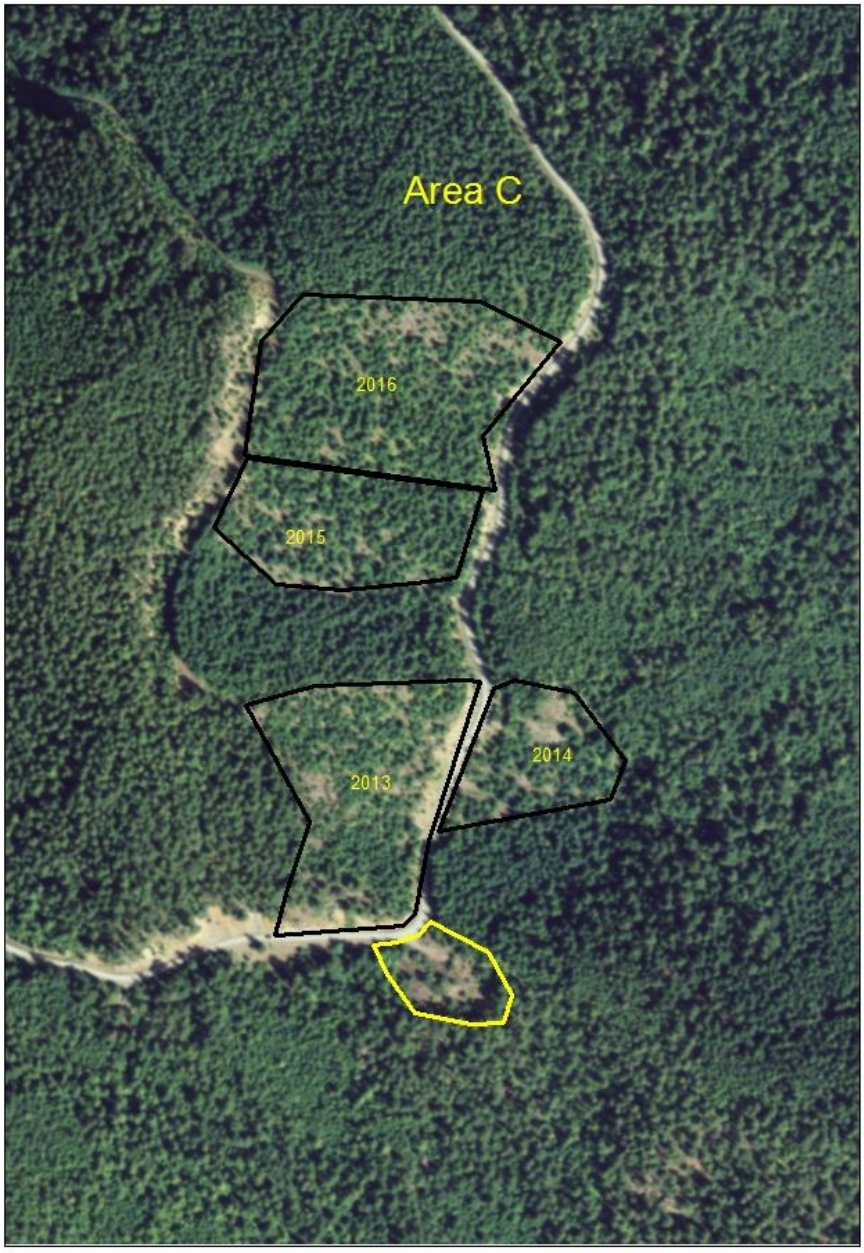

Figure 13. Locations of proposed treatments, Three O'clock Ridge Area C. Checkerspots have been detected in the area outlined in yellow.

Upper Dungeness

Site Description

The Upper Dungeness checkerspot site includes openings in regenerating forest stands and a road corridor (FS Road 2870.270) occupied by checkerspots. The openings are within three timber management units that were clearcut and replanted with Douglas-fir seedlings in the 1960s. The northern clearcut unit was 46 acres, the middle one was 85 acres and the southern one was 40 acres. Sizes of openings in the harvest units vary between less than 0.1 acres (0.04 hectares) and 7 acres (2.8 hectares). The openings are situated between two roads, the 2870.270 and the 2870 (Figure 13).

We define the Upper Dungeness site management area as an area approximately 205 acres (83 hectares) (Figure 13) containing the three clearcuts with openings and the adjacent roadway occupied by checkerspots (Figure 14-15). The site has variable cover of grasses, forbs, trees and shrubs, including a variety of nectar plants (Table 1). Dense tree patches occur in the site. The site is sloped (45-55 percent slope) with primarily a SE aspect (openings in the southern clearcut have a southern aspect). Elevation ranges 2700 to 3200 feet. Shrubs scattered throughout the site include oceanspray, hairy manzanita, and baldhip rose. The soil series is primarily Snowcreek - Shanty - Deserter complex, 60 to 90% south slope. The soil depth classes range shallow to very deep.

The roadsides and adjacent habitats are occupied by checkerspots along a 2 km (1.3 mile) length of FS Road 2870.270 (Figure 15). A variety of plants occur along the roadsides and on adjacent slopes, including grasses, strawberry (*Fragaria* sp.), narrowleaf plantain (*Plantago lanceolata*), and patches of sea blush (*Plectritis congesta*).

Site Management History and Land Allocations

Historically the Upper Dungeness Taylor's checkerspot site was used for timber harvest and recreation, and continues to be used by recreationists (hikers and campers). Portions of the site were designated in the Olympic Land and Resource Management Plan as A2 Scenic. Currently the site in LSR.

Checkerspot Distribution and Abundance

The Upper Dungeness site has been occupied by Taylor's checkerspots consistently each year since its discovery in 2009. In 2009, 2010 and 2013 adults were detected flying in May and June; in 2011 and 2012 the flight season extended to mid-July. Taylor's checkerspot occupy the openings on the slope in the three old clearcut units and the herbaciously vegetated road corridor (FS Road 2870.270). The highest total adult count was 356 butterflies in 2012. The highest density of adults has been found in the larger openings of the middle clearcut. Checkerspot larvae and adults have been detected along almost the entire length of the 2-km 2870.270 road (checkerspots are generally absent at the very beginning of the road before the clearcut and the very end of the road at the trailhead); surveys have revealed locations on the road with particularly high densities of checkerspots.

Post-diapause larvae were observed at Upper Dungness site in April and early May 2012, and in April 2013; larvae were detected on the roadbed and in clearcut openings. Pre-diapause surveys were accomplished in August - September 1, 2011, when larval masses were found in clearcut unit openings and on the roadbed, including on plants in the middle of the road. Pre-diapause larval masses were on narrowleaf plantain (*Plantago lanceolaa)* on the road and on harsh paintbrush (*Castilleja hispida*) in the clearcut unit openings.

Figure 14. Upper Dungeness Taylor's Checkerspot Management Area.

Figure 15. Openings in old clearcut, Upper Dungeness site.

Figure 16. R**oad habitat at Upper Dungeness site.**

Site Threats

The greatest site threat in the openings is tree and shrub encroachment. Conifer and shrub growth in and around the occupied openings are threatening the open habitat conditions. Other threats include the spread of nonnative invasive weeds, tread by recreationists (hikers and dispersed campers), and vehicle traffic on the road.

Direct immediate threats include trampling by Forest recreationists and their vehicles along the 2870.270 road, which goes to the Maynard Burn Trailhead. Adults, pre-diapause larval masses (oviposition sites), and post-diapause larvae have been found along the 2-km stretch of road. Checkerspots likely use the 2870.270 road corridor for all stages of their lifecycle, including adult flight, nectaring, egg, pupae, and larval feeding and development. There is a large road turnout area near the trailhead at end of the 2870.270 road where multiple larvae have been observed in the roadbed. At present this is a large area where recreationists can park vehicles at random, and sometimes people have campfires.

Management Actions

Vegetation Management

Vegetation management actions for Upper Dungeness involve removing encroaching vegetation, creating new habitat openings, planting and seeding native plants, and controlling invasive plants (Table 6). Removing trees and shrubs would be focused in and around the openings occupied by checkerspots, but not along the road. The vegetation removal would reduce conifer and shrub cover within existing openings, enlarge and connect habitat patches, and create additional habitat patches. Figure 9 shows the tentative proposed vegetation removal areas. Initial vegetation removal will be done mechanically. The use of prescribed fire will be evaluated as a habitat management option, and may be used in the future.

Roadside Habitat Management

Management along FS Road 2870.270 would focus on reducing impacts to Taylor's checkerspot habitat and population. The following steps are recommended:

- Map areas of Taylor's checkerspot habitat along the road. Identify habitat areas most important to be protected for Taylor's checkerspots (on-going).
- Work with a road engineering staff to determine how to best protect identified important habitats while allowing safe passing of vehicles on the road. Identify areas that would be needed as vehicle turnouts and parking.
- Research the best barrier methods of keeping vehicles from driving on the identified important habitat areas. Options include road fencing, similar to that used along highways, metal posts with cables, or large rocks. Installing metal posts with cables is a good potential method to effectively keep out traffic from these areas while limiting the footprint that is created by the barrier. Boulders might be available to be placed, but would take up more of the habitat (and the roadbed) and are more easily moved.
- Install barriers around the identified habitat areas, keeping necessary road turnout areas open for vehicles.

Road maintenance along the 2870.270 road should be carried out in such a way as to avoid or minimize adverse effects to Taylor's checkerspots (adults and larvae) and their habitat. This could include avoiding moving gravel onto roadside habitat areas and accomplishing the maintenance during the time of year when the checkerspots are in diapause (September – February). Wildlife staff needs to work with road engineering staff to determine best practices to avoid or minimize impacts from road maintenance.

The large area near the trailhead at the end of the 2870.270 road needs to be managed to allow parking for trailhead users and dispersed campers while protecting the Taylor's checkerspot habitat. This can be effectively accomplished by designing a developed parking area to accommodate parked cars while minimizing the impact on areas used by Taylor's checkerspot larvae.

Table 6. Management actions for Upper Dungeness Taylor's checkerspot site.

THREAT	ACTION NEEDED	TIMELINE	ACTIVITY LOCATION	HOW TO ACCOMPLISH	DESIRED SITE CONDITION
Encroaching trees & shrubs in occupied habitat.	Remove encroaching trees & shrubs in / near openings.	FY 2013 – FY2020	Existing occupied openings in old clearcut units (cells 25030089, 93 & 94).	Cut and pile vegetation treatments. WDFW, ONF or WCC field crews.	Tree/shrub cover <10% in openings. Occupied habitat patches enlarged 10-15% each year & connected.
Tree growth inhibiting suitable habitat and connectivity.	Remove vegetation to create and connect habitat.	FY 2014 - 2023	Areas between the occupied openings.	Vegetation treatments and / or prescribed fire. ONF/ WDFW	Amount of suitable habitat is increased 50-100%. Openings connected at least 50' wide.
Roads/ vehicles	Carry out road maintenance to minimize / avoid impacts.	FY 2013 - 2023	FS Road 2870.270	FS	Disturbance to animals & habitat is minimized on road.
Recreation, Vehicle use	Identify and protect habitat areas along road occupied by checkerspots by placing barriers.	FY2014 – 2020	FS Road 2870.270	FS	Disturbance to animals and habitat is minimized along road. Roadside habitat maintained.
Nonnative invasive plants	Control nonnative plants using application methods that minimize adverse effects on non-target plants and checkerspots.	FY 2013 – 2023	FS Road 2870.270 and Road 2870 at the site.	FS weed control contracts	Habitat quality is improved or maintained.
Recreation	Develop parking area to protect occupied habitat.	2014 - 2020	Large area near trailhead at end of FS Road 2870.270.	FS	Site disturbance is minimized. Habitat quality improved.
Nonnative weeds. Low quality suitable habitat.	Propagate native plants for seeding or planting into disturbed areas. Monitor invasives.	FY 2013 – 2020	Existing habitat patches, new openings.	FS staff and partners to collect seed. NRCS Plant Materials Center or other partner for propagation.	Habitat quality improved.

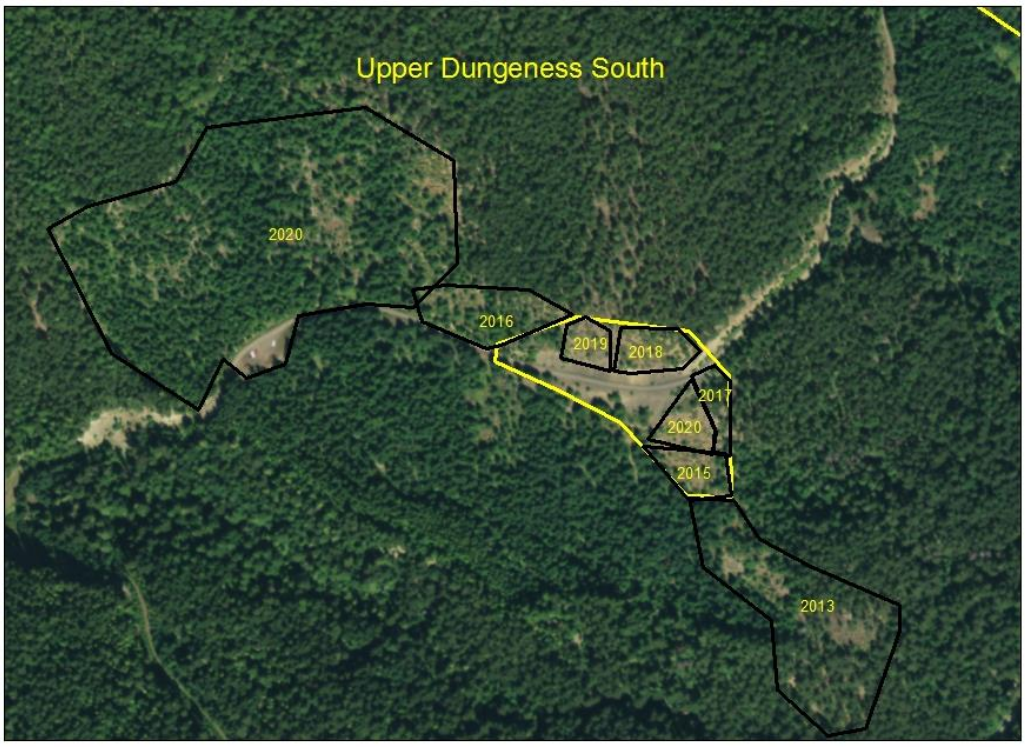

Figure 17. Locations of proposed treatments in Upper Dungeness South. Checkerspots have been detected in the area outlined in yellow.

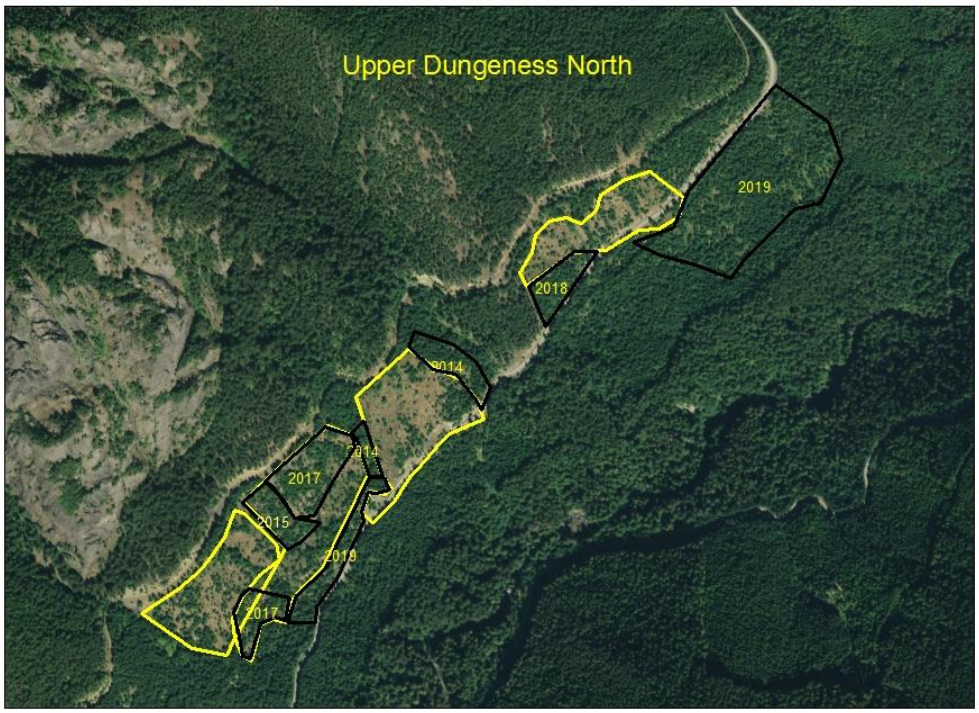

Figure 18. Locations of proposed treatments in Upper Dungeness North. Checkerspots have been detected in the areas outlined in yellow (plus nearby road).

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