

Appendix H: Credit-Debit Methodology

Overview

This Appendix describes the credit-debit methodology for the Thurston County Habitat Conservation Plan (HCP). This is the method that the County will use to quantify impacts (debits) from Covered Activities and mitigation offsets (credits) from the Conservation Program for the Covered Species that reside in prairies: Olympia Pocket Gopher, Tenino Pocket Gopher, Yelm Pocket Gopher, Taylor’s Checkerspot Butterfly, and Oregon Vesper Sparrow. The credit-debit methodology for Oregon Spotted Frog is included in HCP Chapter 7.

Before the development of the HCP, and in advance of some of the listing of the Covered Species, the Prairie Habitat Assessment Methodology (PHAM; Thurston County Resource Stewardship Department 2014), based on the Species and Habitat Asset and Risk Prioritization model framework, was developed by Thurston County, Willamette Partnership and ENVIRON. PHAM was intended to help standardize an approach for assessing impacts to and coordinating mitigation for prairie ecosystems in Thurston County. PHAM focused on the Mazama Pocket Gopher subspecies, Taylor’s Checkerspot Butterfly and Streaked Horned Lark.

During the period of HCP development from 2014 to 2020, the list of species to be covered by the HCP changed, and the information describing species needs evolved. The United States Fish and Wildlife Service (USFWS) has produced updated habitat suitability criteria for the Mazama Pocket Gopher subspecies (MPG) and Taylor’s Checkerspot Butterfly and has provided feedback that has significantly altered how credits and debits will be calculated under the HCP. This current guidance is the basis of the credit-debit methodology for the HCP and is described in this Appendix. PHAM is no longer used. All credit and debit calculations are consistent with the Performance Standards identified for each Covered Species in HCP Chapter 7: Implementation. Any revisions to the Performance Standards resulting from adaptive management will be carried through to this credit-debit methodology and associated Effectiveness Monitoring procedures.

All personnel implementing the activities described credit-debit methodology must possess the training and qualifications identified in HCP Chapter 6: Monitoring and Adaptive Management and be in possession of any required USFWS or Washington Department of Fish and Wildlife (WDFW) permits.

Key HCP Parameters Overview

Key parameters for the credit-debit methodology calculations are included in the tables of the HCP. These tables, with original numbering for cross reference, are also provided in this Appendix for ease of reference. The following HCP tables are provided at the end of this Appendix:

- HCP Table 2.3 Prairie soils with documented use by MPG subspecies in Thurston County (USFWS 2016).
- HCP Table 2.4 Key species for Taylor’s Checkerspot habitat in Thurston County.
- HCP Table 4.1 Assigned relative occupancy values for MPG habitat, based on occupancy and soil preference categories. A value of 1 = 100% value.
- HCP Table 7.1 All upland species vegetation Performance Standards comparison table.
- HCP Table 7.3 All prairie species relative value/credit value comparison table.
- HCP Table 7.4 Assigned relative occupancy values for Oregon Vesper Sparrow habitat. A value of 1 = 100% value.

Procedures for Quantifying Debits

The Debit Method guides the assessment of the habitat quality and quantity for Covered Species in a localized area, specifically the Assessment Area. The Assessment Area is the area associated with a project’s potential impact and it defines the boundaries for the calculation of debits. For most activities, this is the area directly affected by a Covered Activity.

The Debit Method is intended to be implemented as a mapping exercise in the office, without field surveys, and can occur at any time of year. A field survey is only required if a permit application requests an Expanded Permit Review (see HCP Chapter 7: Implementation). If using the Expanded Permit Review, the County will follow the field survey procedures in Appendix K: Site Evaluation Protocol.

Debit Method Steps:

- 1) Obtain a map of the project design for the proposed activity location. Map should include project site coordinates, scale bar, Assessment Area boundary, and parcel boundaries (if relevant), overlaid on recent, high-resolution aerial imagery.
- 2) Integrate the Assessment Area boundary into a GIS map that includes the following layers:
 - a) Mapped extent for each Covered Species
 - b) MPG Basemap of Occupancy Levels (this will include mapped Covered Species extents from Thurston County GeoData)
 - c) Oregon Vesper Sparrow Basemap of Occupancy Levels (this will include mapped Covered Species extents from Thurston County GeoData)
 - d) NRCS Soil Survey Data with soils classified by MPG preference
 - e) Recent high-resolution aerial imagery (ESRI/AGOL or other source)
 - f) Service Areas for MPG

- 3) Clip the Assessment Area to remove non habitat areas (e.g., closed-canopy evergreen forest, impervious surface, existing development footprint). This creates the Modified Debit Assessment Area.
- 4) Identify overlap of the Modified Debit Assessment Area with the mapped extent for the Covered Species.
 - a) If the Modified Debit Assessment Area overlaps the mapped extent for a MPG subspecies, for each Service Area, complete the following steps:
 - i. Use HCP Table 2.3 and the NRCS Soil GIS data layers to identify the MPG extent in the Modified Debit Assessment Area – this is the area of MPG soils within the Modified Debit Assessment Area. Identify the preference of MPG for the soils present. Use the HCP Basemap to also identify the level of MPG occupancy in the Modified Debit Area. Identify the correct occupancy and preference category(ies) in HCP Table 4.1.
 - ii. Multiply the MPG extent (in acres) in each Occupancy/Soil Preference category by the relative value in HCP Table 4.1 to calculate the functional acre debit for MPG occupancy.
 - iii. Multiply the MPG extent (in acres) by the habitat quality default for MPG debits, a relative value of 0.6 functional acre debits/acre (this assumes a vegetation condition intermediate between Shrub Dominated and Degraded Grassland; HCP Table 7.1; Performance Standards), to calculate the functional acre debit for MPG habitat quality.
 - iv. Sum the occupancy debit and the habitat quality debit to calculate the total debit for MPG in the Modified Debit Assessment Area.
 - b) If the Modified Debit Assessment Area overlaps the mapped extent for Taylor’s Checkerspot Butterfly:
 - i) Multiply the extent of the overlap (in acres) by the assumed habitat quality for Taylor’s Checkerspot Butterfly debits, a relative value of 0.3 functional acre debits/acre (HCP Table 7.1; Performance Standards), to calculate the total debit for Taylor’s Checkerspot Butterfly in the Modified Debit Assessment Area.
 - c) If the Modified Debit Assessment Area overlaps the mapped extent for Oregon Vesper Sparrow:
 - i) Use best available species occupancy data (e.g., WDFW) to determine which occupancy category best describes the impact area.
 - ii) Multiply the extent of overlap of the impact area (in acres) by the assigned relative value for its occupancy category (HCP Table 7.4).

- iii) Multiply the extent of overlap (in acres), by the assumed habitat quality for Oregon Vesper Sparrow debits, a relative value of 0.3 functional acre debits/acre (HCP Table 7.1; Performance Standards), to calculate the debit for Oregon Vesper Sparrow in the Modified Debit Assessment Area.
- 5) For Yelm Pocket Gopher, if the debit will be mitigated outside the Service Area where the impact occurred, an out-of-Service Area multiplier will of 1.25 will be applied. This multiplier is applied to the debit-side formula only.
- 6) Summarize total debits by Covered Species for the Modified Debit Assessment Area. A sample summary table is included in Table 1.

Table 1. Sample Modified Debit Assessment Area debit summary.

Site/Project:			
Covered Species	Occupancy Debits	Habitat Quality Debits	Total Debits
Olympia Pocket Gopher			
Tenino Pocket Gopher			
Yelm Pocket Gopher – YPG E			
Yelm Pocket Gopher – YPG N			
Yelm Pocket Gopher – YPG S			
Taylor’s Checkerspot Butterfly	n/a		
Oregon Vesper Sparrow			
Total			

Procedures for Quantifying Credits

The Credit Method is intended primarily for use in Thurston County from:

- 1st of April through the 15th of June (Taylor’s Checkerspot Butterfly and MPG);
- 1st of May through the 31st of May (Oregon Vesper Sparrow) and MPG; and
- 1st of June through the 31st of October (MPG Only).

Dates are based on the typical flowering period of prairie plants. As such, dates are weather dependent, with some annual variation expected in start and end date. County staff should consult WDFW or USFWS to determine whether April 1st is an appropriate survey start date in any given year.

Office Preparation

- 1) Obtain a map of the project design for the proposed mitigation site. Map should include project site coordinates, scale bar, Credit Assessment Area boundary, and parcel boundaries (if relevant), overlaid on recent, high-resolution aerial imagery. The Credit Assessment Area is the area being evaluated for credits.
- 2) Integrate the Credit Assessment Area boundary into a GIS map that includes the following layers:
 - a) Mapped extent for each Covered Species
 - b) Mazama Pocket Gopher Basemap of Occupancy Levels (MPG Basemap; this will include mapped Covered Species extents from Thurston County GeoData)
 - c) Oregon Vesper Sparrow Basemap of Occupancy Levels (Oregon Vesper Sparrow Basemap; this will include mapped Covered Species extents from Thurston County GeoData)
 - d) NRCS Soil Survey Data
 - e) Recent high-resolution aerial imagery (ESRI/AGOL or other source)
 - f) Service Areas for MPG
 - g) Any site-specific management zones
 - h) Other site-specific data (including Taylor’s Checkerspot occupancy)
- 3) Identify overlap of the Credit Assessment Area with the mapped extent for the Covered Species.
 - a) MPG Soils:

- i) Using the soil data (and list of soils in HCP Table 2.3), identify the area for each MPG soil type within the Credit Assessment Area. Identify existing known areas of MPG occupancy using the MPG Basemap.
 - b) Taylor’s Checkerspot Butterfly: Identify overlap of Credit Assessment Area with mapped extent for Taylor’s Checkerspot Butterfly.
 - c) Oregon Vesper Sparrow: Identify overlap of Credit Assessment area with mapped extent for Oregon Vesper Sparrow.
- 4) If potential habitat for Covered Species exist, obtain permission to visit the project site and schedule a field visit between approximately: 1st of April and 15th of June. These dates will ensure you are able to detect key prairie plant species. There will be variation between years. For Oregon Vesper Sparrow, a visit in the month of May is required. If potential habitat exists for MPG, a second field visit may be required between: 1st of June and 31st of October (September 1 through October 31, supports the highest probability of gopher mound detection (Olson 2011). See Table 2 for approximate time needed to complete a survey.
- 5) Using a GIS grid, within the Credit Assessment Area, map where you will establish on-the-ground transects that traverse the entire area, approximately 25 meters apart. Identify the points on the transects for data collection.
- 6) Develop and review a data collection form, either electronic or paper.

Table 2. Approximate field survey times estimates.

Survey Extent	Time Estimate
1 acre	1.5-3 hour
5 acres	3-6 hours
10 acres	6-9 hours
30 acres	9-12 hours
100 acres	24-40 hours

Field Procedures

Suggested Field Equipment List: Hardware with GIS Platform, polygon of Credit Assessment Area, polygon of any management zones or other stratification by Covered Species, data collection form (digital or otherwise, e.g., Survey 123 or ArcCollector), meter tapes, digital camera, compass, flagging, laser range finder.

1. Identify the Credit Assessment Area on the ground and familiarize yourself with the topography and layout of the site.
2. Within the Credit Assessment Area, using your GIS established grid, establish on-the-ground transects that traverse the entire area, approximately 25 meters apart. Establish temporary or permanent markers if prescribed by the site manager. Establish the centroid of each cell – this will be the data collection point. Each cell represents 0.1544 acre (625 m²) in area.
3. Walking each transect, collect data every 25 meters by evaluating habitat characteristics 12.5 m to the front, back, left, and right directions (representing a 25 m x 25 m area, or ‘cell’).
 - a. Record the following data at each point based on ocular estimates for all measurements (except for vegetation height), according to the categorical bins provided in the relevant data forms:
 - i. Herbaceous (non-woody) plant species richness in the 25 m x 25 m area, separating native and nonnative.
 - ii. Percent cover (aerial) of trees, native and non-native, separating deciduous and evergreen, and specifically noting Oregon white oak (*Quercus garryana*).
 - iii. Percent cover (aerial) of shrubs, distinguishing native and non-native, and specifically noting Oregon white oak and kinnikinnick (*Arctostaphylos uva-ursi*).
 - iv. Total percent cover (aerial) native herbaceous species (excluding bracken fern, and separating forbs and graminoids).
 - v. Total percent cover (aerial) non-native herbaceous species (separating forbs and graminoids).
 - vi. Total percent cover of invasive species (inclusive of species identified as noxious weeds or species of concern by the Thurston County Noxious Weeds and Lakes Management Department).
 - vii. Percent cover (aerial) unvegetated ground cover (moss/lichen/litter less than 2 cm (0.8 in) high is also considered unvegetated).
 - viii. Average vegetation height, using a meter stick to measure representative plants.
 - ix. Presence and abundance of gopher mounds.
 - x. Species richness of oviposition and larval host plant(s) species (HCP Table 2.4) for Taylor’s Checkerspot Butterfly (note each species present).

- xi. Presence of Taylor’s Checkerspot Butterfly nectar species (note species present and abundance- either as square meters of foliar cover or counts of flowering units). A current list of Taylor’s Checkerspot Butterfly Nectar species is included in HCP Table 2.4. This list will be adaptively managed over time.

Data Management and Calculations

1. Implement data quality control and quality assurance measures.
2. Analyze the field data for each 25 m cell in the Credit Assessment Area relative to the Performance Standards for each Covered Species. Attribute data to the cell centroid point.
 - a. For Olympia, Tenino and Yelm Pocket Gopher (each Service Area):
 - i. Evaluate data and buffer the centroid of cells with gopher mounds by 200 meters, to identify the boundaries of Category 2 MPG occupancy: Adjacent or Proximal to Occupancy (see HCP Table 4.1).
 - ii. Categorize each cell for MPG occupancy and MPG soil preference (HCP Table 4.1). Using the relative values for occupancy and soil preference (HCP Table 4.1), calculate a MPG occupancy credit value for each cell. Convert the 625 m² cells to acres first – one cell equals 0.1544 acres.
 - iii. Evaluate data and categorize each cell for MPG habitat quality (HCP Table 4.7). Using the relative values for MPG prairie quality (HCP Table 7.3), calculate a MPG habitat quality credit value for each cell. Convert the 625 m² cells to acres first – one cell equals 0.1544 acres.
 - iv. Sum the MPG occupancy and MPG habitat quality credit values for each cell to generate a total MPG credit attribute for each cell.
 - v. Sum the total MPG credits for the Credit Assessment Area.
 - b. For Taylor’s Checkerspot Butterfly:
 - i. Using the field data, categorize each cell for Taylor’s Checkerspot Butterfly habitat quality (HCP Table 7.1).
 - ii. Using the relative values for Taylor’s Checkerspot Butterfly habitat quality (HCP Table 7.3), calculate the Taylor’s Checkerspot Butterfly credit value for each cell. Convert the 625 m² cells to acres first – one cell equals 0.1544 acres.

1. Use existing Taylor’s Checkerspot Butterfly transect survey data to determine occupancy. If the data from the step above indicate any cells supports high quality native prairie, and those cells also meet the occupancy definition for Taylor’s Checkerspot Butterfly, use the full 1 credit per acre credit value instead of 0.8.
 - iii. Sum the total Taylor’s Checkerspot Butterfly habitat quality credits for the Credit Assessment Area.
 - c. For Oregon Vesper Sparrow:
 - i. Using best available data, identify the Oregon Vesper Sparrow occupancy category, and associated relative occupancy credit value (HCP Table 7.1 and HCP Table 7.3). Convert the 625 m² cells to acres first – one cell equals 0.1544 acres.
 - ii. Using the field data, categorize each cell for Oregon Vesper Sparrow habitat quality (HCP Table 7.1).
 - iii. Using the relative values for Oregon Vesper Sparrow habitat quality (HCP Table 7.3), calculate the Oregon Vesper Sparrow habitat quality credit value for each cell. Convert the 625 m² cells to acres first – one cell equals 0.1544 acres.
 - iv. Sum the occupancy credits and habitat quality credits to calculate total Oregon Vesper Sparrow credits for the Credit Assessment Area.
3. Summarize all credits for the Credit Assessment Area, by management zone or other stratification, if appropriate. See a sample credit summary table in Table 4.

Table 3. Sample Credit Assessment Area credit summary.

SITE:			
Management Zone A			
Covered Species	Occupancy Credits	Habitat Quality Credits	Total Credits
Olympia Pocket Gopher			
Tenino Pocket Gopher			
Yelm Pocket Gopher – YPG E			
Yelm Pocket Gopher – YPG N			
Yelm Pocket Gopher – YPG S			
Taylor’s Checkerspot Butterfly			
Oregon Vesper Sparrow			
Management Zone B			
Covered Species	Occupancy Credits	Habitat Quality Credits	Total Credits
Olympia Pocket Gopher			
Tenino Pocket Gopher			
Yelm Pocket Gopher – YPG E			
Yelm Pocket Gopher – YPG N			
Yelm Pocket Gopher – YPG S			
Taylor’s Checkerspot Butterfly			
Oregon Vesper Sparrow			
TOTAL:			
Covered Species	Occupancy Credits	Habitat Quality Credits	Total Credits
Olympia Pocket Gopher			
Tenino Pocket Gopher			
Yelm Pocket Gopher – YPG E			
Yelm Pocket Gopher – YPG N			
Yelm Pocket Gopher – YPG S			
Taylor’s Checkerspot Butterfly			
Oregon Vesper Sparrow			

Key HCP Parameters- HCP Tables

HCP Table 2.3 Prairie soils with documented use by Mazama Pocket Gopher subspecies in Thurston County (USFWS 2016).

Preference by MPG	Description
More Preferred	Nisqually loamy fine sand, 0 to 3 percent slopes Nisqually loamy fine sand, 3 to 15 percent slopes Spanaway-Nisqually complex, 2 to 10 percent slopes Cagey loamy sand Indianola loamy sand, 0 to 3 percent slopes Spanaway gravelly sandy loam, 0 to 3 percent slopes Spanaway gravelly sandy loam, 3 to 15 percent slopes
Less Preferred	Alderwood gravelly sandy loam, 0 to 3 percent slopes Alderwood gravelly sandy loam, 3 to 15 percent slopes Everett very gravelly sandy loam, 0 to 3 percent slopes Everett very gravelly sandy loam, 3 to 15 percent slopes Indianola loamy sand, 3 to 15 percent slopes Kapowsin silt loam, 3 to 15 percent slopes McKenna gravelly silt loam, 0 to 5 percent slopes Norma fine sandy loam Norma silt loam Spana gravelly loam Spanaway stony sandy loam, 0 to 3 percent slopes Spanaway stony sandy loam, 3 to 15 percent slopes Yelm fine sandy loam, 0 to 3 percent slopes Yelm fine sandy loam, 3 to 15 percent slopes

HCP Table 2.4 Key species for Taylor’s Checkerspot habitat in Thurston County.

Species Type	Scientific Name	Common Name	Origin
Larval host species – Oviposition host			
	<i>Castilleja levisecta</i>	Golden paintbrush	Native
	<i>Plantago lanceolata</i>	English plantain	Non-native
	<i>Castilleja hispida</i>	Harsh paintbrush	Native
Larval host species			
	<i>Collinsia spp</i>	Blue eyed mary	Native
Nectar resources			
	<i>Armeria maritima</i>	Sea pink	Native
	<i>Balsamorhiza deltoidea</i>	Balsamroot	Native
	<i>Camassia quamash</i>	Camas	Native
	<i>Fragaria virginiana</i>	Strawberry	Native
	<i>Lomatium triternatum</i>	Nineleaf biscuitroot	Native
	<i>Lomatium utriculatum</i>	Spring gold	Native
	<i>Saxifraga integrifolia</i>	Wholeleaf saxifrage	Native
	<i>Plectritis congesta</i>	Seablush	Native
	<i>Ranunculus occidentalis</i>	Western buttercup	Native

HCP Table 4.1 Assigned relative occupancy values for Mazama Pocket Gopher subspecies, based on occupancy and soil preference categories. A value of 1 = 100% value.

Occupancy Category	Definition of Category	Relative Occupancy Value*	
		More Preferred Soils	Less Preferred Soils
Category 1: Occupied	Site is known to be occupied by Mazama Pocket Gophers.	1	1
Category 2: Adjacent or Proximal to Occupancy	Site occupancy is unknown, but site is within 656 ft (200 m) of an occupied area (MPG soils are present on project site, and there are no barriers to MPG movement between project site and occupied area).	0.95	0.75
Category 3: Suitable, Connected but Less Close to Occupancy	Site occupancy is unknown, and site is more than 656 ft (200 m) of an occupied area (MPG soils are present on project site, and there are no barriers to MPG movement between project site and occupied area).	0.60	0.15

HCP Table 7.1 All upland species habitat quality Performance Standards comparison table.

	Taylor’s Checkerspot Butterfly				Oregon Vesper Sparrow			Mazama Pocket Gopher	
	Shrub/Tree Cover ^{2,3,4}	Native Herbaceous Cover ²	Larval Host Species	Nectar Species	Shrub/Tree Cover ²	Native Herbaceous Cover ²	Cover of Veg. Between ~ 6 – 20 in (15- 51 cm) in Height During May	Shrub/Tree Cover ^{2,3,4}	Native Herbaceous Cover ²
Shrub-Dominated	Shrub cover ≥30%; Tree cover <5%	-	-	-	Shrub cover ≥50%; Tree cover <5%	-	< 50%	Shrub cover ≥25%; Tree cover <5%	-
Degraded Grassland	Shrub cover <30%; Tree cover <5%	<10%	1 Larval Host species	< 4 Nectar species	Shrub cover >30%; Tree cover <5% or 15-25%	<10%	< 50	Shrub cover ≤25%; Tree cover <5%	<10%
Native Prairie	Shrub cover <15%; Tree cover <5%	10-30%	2-5 Larval Host species, At least 1 oviposition host	> 4 Nectar species	Shrub cover <30%; Tree cover <5% or 15-25%	10-30%	50-75%	Shrub cover ≤10%; Tree cover <5%	10-30%
High-Quality Native Prairie	Shrub cover <5%; Tree cover <5%	>30%	2-5 Larval Host species, At least 1 oviposition host	> 8 Nectar species, at least one with late flowering phenology	Shrub cover <15%; Tree cover <5%	>30%	> 75 %	Shrub cover ≤10%; Tree cover <5%	>30%

¹ The Performance Standards define five categories of overall prairie habitat quality; mitigation sites and proposals should realize benefits in the form of long-term restoration and enhancement of dry prairie habitat functions (functional lift).

² Percent cover metrics are assessed using a grid of 25m x 25m sample cells; or, a conditionally approved alternative sample cell/unit configuration.

³ Trees may not exceed 5 percent cover, unless native oak savanna (less than 25 percent cover of oaks, *Quercus garryana*).

⁴ Woody shrubs; excludes native oak and kinnikinnick (*Arctostaphylos uva-ursi*).

⁵ Native plant richness (number of native species) and soils should be assessed with a conditionally approved sample cell/unit configuration.

HCP Table 7.3 All upland species habitat quality relative value/credit value comparison table. A value of 1 = 100% value.

Habitat Category	Credit Value (companion to vegetation Performance Standards table)		
	TCB	OVS	MPG
Shrub-Dominated	0.1	0.1	0.5
Degraded Grassland	0.3	0.4	0.7
Native Prairie	0.6	0.6	0.9
High-Quality Prairie	0.8*	0.8	1.0

*If high quality prairie becomes occupied by TCB, the habitat value becomes 1. Occupancy is the true test of the suitability of habitat.

HCP Table 7.4 Assigned relative occupancy values for Oregon Vesper Sparrow habitat. A value of 1 = 100% value.

Occupancy Category	Definition of Category	Relative Occupancy Values
Category 1: Occupied	Site is known to be occupied by Oregon Vesper Sparrow	1
Category 2: Adjacent or Proximal to Occupancy	Site occupancy is unknown, but site is located on a parcel adjacent to a site known to be occupied by Oregon Vesper Sparrow	0.8
Category 3: Suitable, not adjacent to occupancy	Site occupancy is unknown, and site is not located on a parcel adjacent to a site known to be occupied by Oregon Vesper Sparrow	0

Literature Cited

Thurston County Resource Stewardship Department. 2014. Thurston County Prairie Habitat Assessment Methodology: Protocol Document. Version 1.00. Olympia, WA.