OPEN CONTENT LICENSE: Willamette Partnership has developed all of its reports, protocols, metrics, and associated tools with an eye toward transparency and easy extension. As such, permission to use, copy, modify, and distribute this publication for any purpose and without fee is hereby granted, provided that the following acknowledgement notice appear in all copies or modified versions:

“This CONTENT was created in part through the adaptation of procedures and publications developed by Willamette Partnership (www.willamettepartnership.org) with support from the USFWS, but is not the responsibility or property of the Willamette Partnership or USFWS.”

_Prairie Habitat Quality Calculator v2.0, last updated: 05/16/2014_

For more information about the _Prairie Habitat Quality Calculator v2.0_, contact

Willamette Partnership
4640 SW Macadam Avenue Portland, OR 97239
503.946.8350

info@willamettepartnership.org
INTRODUCTION

This guide provides information on how to use the Prairie Habitat Quality Calculator v2.0. The calculator includes tools for assessing upland prairie habitat quality with modules for at-risk plants and Fender’s blue butterfly.

Background and Purpose

The Prairie Habitat Quality Calculator was developed to rapidly assess the quality of upland prairie habitat, and uses U.S. Fish and Wildlife Service (USFWS) species recovery criteria to describe the habitat suitability and conservation value of sites for the endangered Fender’s blue butterfly and at-risk upland prairie plants. The scores generated from the calculator and modules can be used to evaluate a site’s potential contribution to endangered species recovery (down-listing or de-listing), prioritize sites for acquisition and habitat enhancement, describe impact and mitigation site quality, and assist in determining mitigation ratios. If used in combination with more intensive population monitoring protocols, the calculator and modules may also be applied to generate baselines for USFWS Safe Harbor Agreements and upland prairie ecosystem debits and credits for mitigation banking.

How to Use this Prairie Habitat Quality Calculator

The Prairie Habitat Quality Calculator consists of three related excel workbooks and this User Guide. All relevant documents can be downloaded from Willamette Partnership’s website at www.willamettepartnership.org.

There are some important considerations for application of this tool that require users to plan their assessment work well in advance.

1. Access: Arranging access to the site through the owner/manager is essential.
2. Site history: Contact with the owner/manager of the site is needed to obtain information about the site, its history and context.
3. Timing of field visits: Timing of data collection for the prairie calculator and modules can influence the results. General timing guidelines for the peak of the growing season, when plants are best quantified and most easily identified are provided in Table 1, but due to year to year and site to site variation, we recommend planning ahead and making contact with the land manager well before your visit. The land manager will usually be able to advise you on the best time to visit a given site.
4. Defining evaluation area: Identify the boundaries of the area where you will apply the calculator. This may be defined by property boundaries, forest edge, project area, management units or other factors. Keep this area in mind as you answer questions about the site, especially structure, vegetation composition and habitat capacity. Use of the prairie calculator requires that you include a map with an aerial photo background and a polygon showing the area being assessed.

This tool is intended for use in assessing properties with conservation value. It may be applied to a site of any size, but was not developed for use on areas of less than 1 acre in size. The process of delineating site boundaries by ownership, habitat type, project area or management unit, and
then scoring the site on its size and connectivity should be completed with attention to the guidelines described in the US Fish and Wildlife Service Recovery Plan for Prairie Species of Western Oregon and Southwest Washington (USFWS 2010).

5. **Obtaining needed materials:**

   - Current aerial photos are essential to answer many of the questions in the calculator/modules and for planning a field visit. Aerial imagery is available from multiple sources. Current National Agriculture Imagery Program (NAIP) imagery is available for streaming to GIS at [http://gis.apfo.usda.gov/arcgis/services](http://gis.apfo.usda.gov/arcgis/services).

   - You will need to obtain data about any special status species at the site and nearby. The site’s land manager may have current data and USFWS maintains a database of this information. Place your request for information as soon as possible. Biologists at the Portland USFWS Office can be reached at (503) 231-6179.

   **Table 1. Optimal survey periods and units of measure for upland prairie species.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Survey Window</th>
<th>Units to Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden paintbrush</td>
<td>Late April- Early June</td>
<td>Individuals</td>
</tr>
<tr>
<td>Willamette daisy</td>
<td>Mid June – Mid July</td>
<td>Individuals, defined as plants separated by 7 cm or more</td>
</tr>
<tr>
<td>Kincaid’s lupine</td>
<td>Mid May – Mid June</td>
<td>Square meters of foliar (leaf) cover</td>
</tr>
<tr>
<td>Nectar Species for Fender’s Blue Butterfly</td>
<td>Mid May – Mid June</td>
<td>Flowers or inflorescences (groups of flowers)</td>
</tr>
<tr>
<td>General Upland Prairie Plants</td>
<td>Mid May- Late June</td>
<td>• Percent cover of plant functional groups (e.g., native grasses, native forbs, etc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Diversity: the number of different plant species in a given area</td>
</tr>
<tr>
<td>Fender’s Blue Butterfly</td>
<td>Mid May- Mid June</td>
<td>Adult butterflies</td>
</tr>
</tbody>
</table>

6. **Using qualified personnel:** Knowledge of the local flora is required to accurately complete the calculator. At a minimum, a surveyor must be able to recognize and differentiate native and non-native species, identify nectar plants for Fender’s blue butterfly, identify multiple invasive species of concern, and make estimates of vegetation cover. The local land manager may be able to provide a site species list to facilitate efficient plant identification.

7. **Paying attention to units:**

   - For the Fender’s blue butterfly module you will need to sample nectar plant abundance, and for the At-Risk Upland Prairie Plant module, if population data are not available, you may need to estimate at-risk plant abundance. Table 1 describes what to measure for each species.

   - To enhance the readability of the calculator, only one set of units for distances and area is shown. Note that these units are in metric. Conversions for frequently used distances/areas are included in Table 2.
Table 2. Conversions for distances and areas frequently used in the prairie calculator and modules.

<table>
<thead>
<tr>
<th>Hectares</th>
<th>Approximate Value in Standard Units (acres)</th>
<th>Kilometers</th>
<th>Approximate Value in Standard Units (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hectares</td>
<td>2.5 acres</td>
<td>0.75 kilometers</td>
<td>0.5 miles</td>
</tr>
<tr>
<td>3 ha</td>
<td>7.5 ac</td>
<td>1 km</td>
<td>0.6 mi</td>
</tr>
<tr>
<td>6 ha</td>
<td>15 ac</td>
<td>2 km</td>
<td>1.2 mi</td>
</tr>
<tr>
<td>40 ha</td>
<td>100 ac</td>
<td>8 km</td>
<td>5 mi</td>
</tr>
</tbody>
</table>
INSTRUCTIONS FOR USING THE WILLAMETTE VALLEY UPLAND PRAIRIE HABITAT QUALITY CALCULATOR

STEP A. Fill in information on Cover Sheet
Information recorded on the Cover Sheet serve as a record of details associated with the prairie calculator score for a site, including the area on the ground where the calculator was applied, purpose of using the calculator, weather conditions for field work, version of the calculator used, etc.

STEP B. Determine Site Eligibility: Is upland prairie present?
Complete preliminary questions regarding habitat quality, intended to ensure the habitat to be evaluated 1) qualifies as upland prairie; and 2) is eligible for assessment by the upland prairie calculator.

STEP C. Complete scored prairie quality assessment questions
Answer Questions 1-5 in the OFFICE using current aerial photo imagery of the area.

1. What is the size of the prairie area at the site?
   Answer this question in the office using GIS and an aerial photo. In the absence of a clearly delineated project area, the site is defined as prairie area within a single ownership and or management unit, as appropriate.

2. What is the percentage cover of woody vegetation at the site (all native shrub and tree species except oak and Douglas-fir)?
   Answer this question by estimating cover on an aerial photo. In your site area, what is the cover of native shrubby species and non-oak or fir tree species?

3. What is the distance to the closest other prairie patch (either upland or wetland)?
   Measure as the crow flies in GIS or using a scaled aerial photo.

4. What is the size of the closest other prairie patch (either upland or wetland) within 8 km?
   Answer this question in the office using GIS and aerial imagery. Prairie patch is defined as prairie area within a single ownership and or management unit, as appropriate.

5. What is the composition of most of the land cover along a beeline between this site and the closest other prairie patch?
   Estimate along a line as the crow flies in GIS or using an aerial photo.

Answer Questions 6 and 7 about proximal sites with SPECIAL STATUS PLANTS and ANIMALS using survey data, data from the land manager, or information from appropriate state or federal wildlife/plant agencies (e.g., USFWS, ODA, ODFW). As long as the population of plants/animals is established and successfully reproducing, it can be either a wild or introduced population.

6. Is a special status animal species known to be present and reproducing on the site or at a site within 0.75 km?
7. Is a special status *plant* species known to be present and reproducing on the site or at a site within 0.75 km?

Answer Questions 8-11 about SITE SECURITY and LAND USE at the site based on conversations with the land manager or other relevant sources of information.

8. What is the level of protection from future development or land use change at the site?

9. To what degree are appropriate regimes of mowing, fire, grazing, weed control, and/or planting used to manage the upland prairie part of this parcel for biodiversity?
   
   Ask the land manager about management. You may be able to observe some evidence on the ground, but the land manager should be the primary source.

10. To what degree has the soil experienced compaction, plowing, leveling, or excavation unrelated to any restoration activity?
   
   Again, ask the land manager about site history. You may be able to observe some evidence on the ground, but the land manager should be the primary source.

11. What is the apparent threat to the site’s invertebrates from drift of aerially-applied insecticides?
   
   You may be able to estimate this by using an aerial photo to estimate the distance of the site from areas of intensive agriculture, including Christmas trees or industrial forest lands.

Questions 12-19 address the QUALITY OF HABITAT AT THE SITE, and must be answered in the field, during the growing season (mid-May through early July, see Table 1). These questions ask about the relative vegetation composition in the prairie you are evaluating, and must be completed by a qualified biologist that is familiar with Willamette Valley flora and has experience in plant community sampling. Answering these questions requires making ocular estimates of plant functional group cover across the site and selecting the cover class that best describes the attribute in question. At large or heterogeneous sites, we suggest the following methods to improve the accuracy and repeatability of plant cover estimates.

- Using an aerial photo, divide the site into manageable and representative sections (e.g., delineate units that appear homogeneous in vegetation, divided into quarters or eighths if the site is large, etc.).

- Based on the area of the site, determine the dimensions of 1%, 5%, and 10% of the site. Depending on how you split the site up for assessment, you may wish to complete the same exercise for each section. This will give you a better feel for what 5% of the site or 5% of any given section looks like, and improve your cover estimates.

- Walk the site and record vegetation cover/diversity estimates for Questions 12-19 for each section separately.

- Keep a running list of native forb and grass species as you work through each section to allow you to make an overall count once you have visited all sections.
Once you have covered the site, evaluate your data for each section, determine if any sections need to be revisited, and average your results (or sum numbers of species present for diversity questions).

Questions 12-14 involve WOODY, NON-NATIVE OR INVASIVE VEGETATION.

12. What is the total percentage cover of shrubs or vines (woody species) of management concern at the site?
   See Table 3: Woody Species of Management Concern.

13. What is the percent cover of NON-native herbaceous vegetation during the period May 15 to July 1?

14. Within the prairie, what is the overall cover of invasive non-native HERBACEOUS plants of concern (e.g., Tall oatgrass, false brome, meadow knapweed)?

Table 3. List of woody species of management concern from USFWS Prairie Species Recovery Plan (2010)

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Crataegus monogyna</em></td>
<td>Oneseed hawthorn</td>
</tr>
<tr>
<td><em>Crataegus suksdorfii</em></td>
<td>Suksdorf’s hawthorn</td>
</tr>
<tr>
<td><em>Cytisus spp.</em></td>
<td>Non-native brooms (e.g., Scotch broom, Spanish broom, and others)</td>
</tr>
<tr>
<td><em>Pyrus communis</em></td>
<td>Feral common pear</td>
</tr>
<tr>
<td><em>Rosa eglanteria</em></td>
<td>Sweetbriar rose</td>
</tr>
<tr>
<td><em>Rosa multiflora</em></td>
<td>Multiflora rose</td>
</tr>
<tr>
<td><em>Rubus armeniacus</em></td>
<td>Armenian blackberry</td>
</tr>
<tr>
<td><em>Rubus laciniatus</em></td>
<td>Cutleaf blackberry</td>
</tr>
<tr>
<td><em>Toxicodendron diversilobum</em></td>
<td>Poison oak</td>
</tr>
</tbody>
</table>

Questions 15-19 address the NATIVE PLANT COMMUNITY. (See notes above about estimating cover/diversity over larger areas.)

15. In the entire upland prairie area, what is the diversity of native prairie forb species?

16. In the entire upland prairie area, what is the approximate cover of native prairie forb species?

17. In the entire upland prairie area, what is the diversity of native perennial grass species?

18. In the entire upland prairie area, what is the approximate cover of native perennial grass species?

19. In the entire upland prairie area, what is the approximate cover of native herbaceous species (graminoids and forbs combined)?
INSTRUCTIONS FOR FENDER’S BLUE BUTTERFLY MODULE

Answer Questions 1-4 about HABITAT HETEROGENEITY and CONNECTIVITY using GIS or aerial photos. Contact USFWS Oregon Office for information about nearby Fender's sites (allow 2-3 weeks to obtain information).

1. How heterogeneous is the habitat in terms of its topography?
   Select the most accurate description for the site.

2. How heterogeneous is the site in terms of habitat structure?

3. Is the site connected to other site with Fender's blue butterfly?
   Select the most accurate answer, where barriers are defined as hills, forested swaths greater than 100 meter deep, urban areas, or other features that may limit butterfly travel.

4. Are any connected sites (free of barriers) currently occupied by Fender's under protection of public ownership, deed restriction, or conservation easement?
   You may need to query the land manager or USFWS to obtain this information.

Questions 5-6 ask about butterfly HOST ABUNDANCE and FENDER’S BLUE BUTTERFLY POPULATION SIZE. If the land manager does not have current data, contact the USFWS Oregon Fish & Wildlife Office to obtain data or request a survey (allow 2-3 weeks to obtain information). A qualified biologist can make the estimate on site at the time of the survey if time allows, but for data from past years, agency contact will be needed.

5. What is the abundance of host lupines (including Kincaid's lupine, spurred lupine, and sickle keel lupine) at the site?
   Lupine foliar cover is defined as the area of the ground covered by lupine leaves at the site.

6. How many Fender’s blue butterflies are known to occupy the site?
   Select the range that includes the 5 year average of (or average of existing data if < 5 years) population size.

Answer Question 7 regarding SITE OCCUPANCY using GIS. Surveys for host lupine species may be required if current data are not available.

7. Use GIS or other means to estimate the area of currently occupied habitat at the site, as defined by a 50 meter buffer around the current perimeter of host lupine species patches.
   Lupine is often patchy in its distribution. The 50 meter circle (buffer) around one patch may overlap with the buffer around another patch; in this case, use the merged outer perimeter (Figure 1).
Questions 8-10 ask about NECTAR SPECIES for Fender’s blue butterfly (see Nectar Worksheet and partial set of photos in Figure 2) and must be answered in the field.

→ Complete a walk through of the site during peak Fender’s flight season or just post peak to assess nectar species flower abundance. We recommend you plan your assessment in advance using an aerial photo and dividing the site into sections. Complete your systematic measures of nectar flower abundance within each section.

→ Enter data gathered in the field in the Nectar Worksheet. Make sure you enter the habitat area in SQUARE METERS in the red cell. Other formulas will not calculate correctly if the area is missing, or in the wrong units. You may need to convert acres to square meters first (one acre equals 4046.86 square meters).

→ In the shaded cells, enter the abundance index value that describes the quantity of Floral Units (FUs) for each species in the habitat area. The remaining values will calculate automatically. Since different nectar plants have different sizes and arrangements of flowers, the type of floral units counted varies by species. For plants with single, larger flowers, e.g., Tolmie’s mariposa lily, each flower is a floral unit. For species with inflorescences (clusters or branches) of smaller flowers (e.g., narrow leaf onion, bird vetch, or rose checkermallow), the entire cluster/branch of flowers is counted as one floral unit. The floral unit for each species is included in the Nectar Worksheet. To provide a better estimate of nectar throughout the flight season, include flowering units that are in bud or have already bloomed (have scenedesced) in addition to flowering units currently open.

→ While non-native nectar species are included in the Nectar Worksheet, at this time, nectar and sugar form these species are not included in the nectar scoring calculations. While some Fender’s blue butterfly sites may have very little native nectar, suggesting non-native nectar may be essential for the butterfly’s needs, non-native nectar does not count towards Fender’s blue butterfly recovery site habitat quality. The abundance of non-native nectar will generally decrease during prairie restoration activities, and planting of non-native species is generally prohibited at recovery sites for the butterfly.
Figure 2. Photos of nectar species for Fender’s blue butterfly (not a complete set) that are currently included in the Nectar Worksheet.
Use the nectar worksheet calculations to answer the following questions.

8. How diverse are native nectar resources during the flight season?

9. For how many periods (Early, Peak, Late) are nectar sugar needs satisfied by native nectar?

   *Each nectar species blooms and produces nectar at different times and for different durations, all of which are important for Fender's blue. The Nectar Worksheet classifies the flowering timing and duration for each species and totals the nectar sugar available for each period for you—use this information to answer this question.*

10. What is the total native nectar sugar available over the entire flight season?

Complete a walk through of the site to answer Question 11 about PROBLEM VEGETATION. As with cover estimates for the prairie calculator, you may wish to use the following methods to improve your estimate:

   → Using an aerial photo, divide the site into manageable and representative sections (e.g., units that appear homogeneous in vegetation, divide into quarters or eighths if the site is large, etc.).

   → Based on the area of the site, determine the dimensions of 1%, 5% and 10% of the site. Depending on how you split the site up for assessment, you may wish to complete the same exercise for each section. This will give you a better feel for what 5% of the site or 5% of any given section looks like, and improve your cover estimates.

11. How much of the habitat area is covered by tall non-native grasses or shrubs > 0.75 meters high?

   *Of particular concern are tall oatgrass (Arrhenatherum elatius), blackberry (Rubus armeniacus), and Scotch broom (Cytisus scoparius).*
INSTRUCTIONS FOR AT-RISK UPLAND PLANT MODULE

Use the At-Risk Upland Plant Module for one species at a time. If there is more than one at-risk plant species at the site, fill out the calculator for one species, leaving the others blank. Re-run the calculator to generate a score for each species.

Questions 1-5 should be answered in the OFFICE. To quantify the abundance and status of the at-risk plants at the site, answer either by using current information from queries to appropriate state/federal agencies or conservation organizations (allow 2-3 weeks for data turnaround). If data do not exist, you may need to complete on the ground surveys.

1. What is the abundance of Kincaid’s lupine at the site?
   Kincaid’s lupine abundance is assessed in square meters of foliar (leaf) cover.

2. What is the abundance of Willamette daisy at the site?
   Count mature plants; do not attempt to count seedlings for this question. Plants are defined as clumps separated by 7 cm or more (Currin & Meinke 2013).

3. What is the abundance of Golden paintbrush at the site?
   Count mature plants; do not attempt to count seedlings for this question.

4. Is the rare plant population stable in size, increasing or decreasing over the last 5-15 years?
   If no data or less than 5 years of data are available, leave blank. The answer must be based on data from the site manager, or a state/federal agency, or other knowledgeable source.

5. Is the population reproducing as shown by seed set and evidence of seedlings?
   Unless you visit the site at the optimal time(s), you may not have the opportunity to observe seedlings or seed set. Ask the land manager for his/her recent observations.

Questions 6-9 address SITE CAPACITY and CONNECTIVITY. These should be answered in the office using GIS/maps/aerial photos.

6. How much area is occupied by the species at the site?
   Occupied area is defined as the area of target plant patches plus a 10 meter buffer (circle) around the target species. Rare plant distribution is often patchy; some 10 meter buffer circles will overlap while others will be separate.

7. How much suitable habitat for the species is present at the site?
   This includes currently occupied and similar potential habitat at the site. Use mapping and aerial photos to assess. You may wish to ground-truth this area when you make your site visit.

8. Is the site within 3 km of another site with the species, with no significant barriers between them?
Select all true choices. Barriers to pollinator exchange include major ridges, >100 meter wide forested swaths, urban areas.

9. Are any connected (within 3 km, no barriers) sites with the species currently under protection of deed restriction or conservation easement?

Select all true choices. Barriers to pollinator exchange include major ridges, >100 meter wide forested swaths, urban areas. You will likely need to contact appropriate state/federal agencies to obtain the most up-to-date information. The land manager may be able to provide assistance.

Complete Questions 10 and 11 in the FIELD. Some suggestions for estimating cover over large areas are:

→ Using an aerial photo, divide the site into manageable and representative sections (e.g., divide into units that appear homogeneous in vegetation, divide into quarters or eighths if the site is large, etc.).

→ Based on the area of the site, determine the dimensions of 1%, 5%, and 10% of the site. Depending on how you split the site up for assessment, you may wish to complete the same exercise for each section. This will give you a better feel for what 5% of the site or 5% of any given section looks like, and improve your cover estimates.

→ Walk the site and record your vegetation cover estimates for each section separately.

→ Once you have covered the site, evaluate your data for each section, determine if any sections need to be revisited, and average or sum your results, depending on your method.

10. How much of the site (or habitat area?) is covered by tall non-native grasses or shrubs > 0.75 meters high?

Of particular concern are tall oatgrass (Arrhenatherum elatius), blackberry (Rubus armeniacus), and Scotch broom (Cytisus scoparius).

11. Does any single non-native plant species cover more than 50% of the site?

Keep common species like tall fescue (Festuca arundinacea) in mind, in addition to aggressive exotics like false brome (Brachypodium sylvaticum).