

Habitat Suitability Assessment protocol

Leucorrhinia dubia - the white-faced darter

Version: April 2025

Field parameters:

- Broad habitat category
- Peat depths (cm)
- Waterbody depths (cm)
- Water quality: electrical conductivity, nitrate levels, phosphate levels
- Acidity pH
- Pond species coverage (i.e. *Sphagnum cuspidatum*, or algae)
- Presence of fish

UAV parameters:

The HSI aimed to quantify white-faced darter habitat requirements, as follows: pool area, pool access, tree roost access, shrub roost access and emergent vegetation presence. Pool geometries and pool vegetation cover are also accounted for in the HSI, but this needs to be derived outside the methodology through automated means (i.e. image classification). Alternatively, these can be manually digitised, a process that is much more accessible.

The aspects of habitat suitability are quantified from: the input data, a set of pool geometries with vegetation cover, geometries for the site boundary, and a 0.5m DSM. The processes for each aspect are detailed below:

1. **Pool area** – WFD show a preference for certain sized pools. Directly calculated from the input pool geometries, with sub-optimal pool geometries are removed.
2. **Pool access** – Flight distance around the pool geometries is calculated as this represents access and density of the pools, which are important for both food and breeding.
3. **Tree roost access** – Roosts are an important aspect of WFD ecology. Tree height is determined through a ‘difference from mean’ calculation. Trees of a suitable height are isolated, and flight distance around these trees is calculated.
4. **Shrub shelter access** – Shrub height is determined through a ‘difference from mean’ calculation. Shrub cover that is suitable height as according to the information

provided in the literature review is isolated, and flight distance around these areas is calculated.

5. **Emergent vegetation** – Suitable emergent vegetation is determined through a ‘difference from mean’ calculation, and any pool that does not overlap with suitable emergent vegetation is removed.
6. **Pool vegetation cover** – WFD breed in pools with an average *Sphagnum cuspidatum* cover of between 49%-100%. Pools are scored based on their vegetation cover, and pools with optimal vegetation cover are scored higher.

Scoring the HSI:

The result produced by the HSI is a Georeferenced raster displaying areas of relative habitat suitability. To test the HSI it was run on a highly productive area of Fenn’s and Whixall mosses, a site with a well-established population of white-faced darter. The result, Figure 1, highlights a traditionally productive monitoring pool, along with many unmonitored pools in the vicinity. The HSI for this area of Fenn’s and Whixall had an average score of 96.07, with a standard deviation of 27.08, with the area directly surrounding the monitored breeding pool having an average of 114.59, and a standard deviation of 28.39.

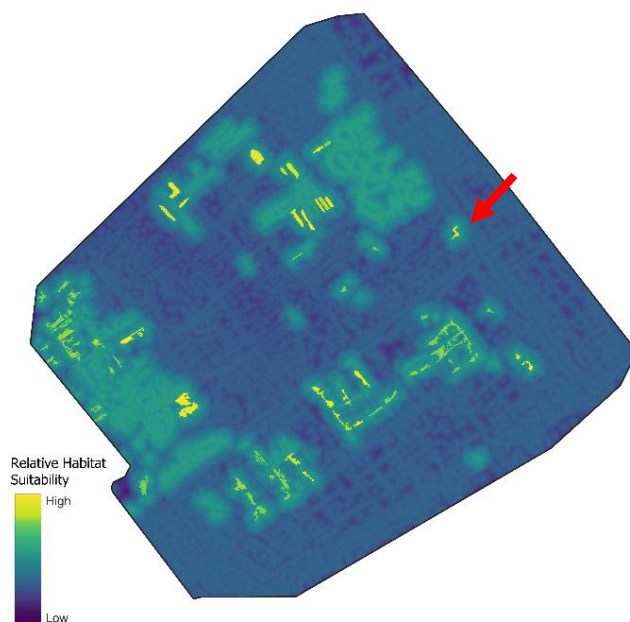


Figure 1 - Test example Habitat Suitability Index (HSI) result from Fenn’s and Whixall. Location of a traditionally productive monitoring breeding pool indicated with arrow.

The HSI value of the chosen target site is then compared to this as an ideal score.