# HABITAT STRUCTURE ASSESSMENT (HSA)

The Monitoring Avian Productivity and Survivorship (MAPS) program is focused on monitoring avian demographic parameters and relating their spatial and temporal variation to landscape-scale ecological and environmental data. For this purpose, we utilize geographic information systems (GIS), remote sensing of habitat types, and existing vegetation maps from various sources, at a variety of spatial resolutions (e.g., from 1km to 30m cells). Many of these spatial data have greatly improved in quality in the last few years and we are depending on them for much of our vegetative analyses. However, there certain pieces of data, such as the specific plant communities and vertical structure of the vegetation associated with the habitat types that must be collected directly at the station.

The horizontal pattern, vertical structure, and type of the vegetation within a MAPS station can affect the number and diversity of breeding birds present, as well as the efficiency with which birds can be monitored by mist-netting. Many ecological studies show that habitat structure is an important factor for predicting avian diversity and abundance. It has been shown, in general, that spatial habitat patterns and vertical habitat structure are good predictors of the presence and relative demographic success of component species in avian communities. Furthermore, changes in the vegetation at a station may cause changes in the breeding bird community or affect how attractive the site is to dispersing birds. For all these reasons, the Habitat Structure Assessment (HSA) protocol is designed to describe the type and distribution of the vegetation at each monitoring station.

MAPS banding data can be combined with remotely sensed datasets, habitat structure assessment data, breeding status lists (BSL), breeding/overwintering range data, and various weather and other environmental data to tackle some aspects of avian population conservation. Analyses of these data will help guide efforts towards the ultimate goal of providing management solutions to the problems of declining avian populations, and to make these solutions available to a variety of land stewards. The success of this approach will depend in large measure upon the participation of station operators in applying the HSA protocol.

## HABITAT TYPES

The goal is to describe the arrangement and coverage of up to five (but **usually one or two**) discrete and recognizable habitat types at your station and, within each of those habitat types, to describe the arrangement and coverage of component vertical layers. We provide a blank grid map to help you map and classify the main habitat types within your station but this can also be done using GIS software, if you have it. The methods outlined in these instructions are designed to provide useful information with a minimum of effort. Please keep in mind that the purposes of these maps and descriptions are:

- a) to provide a general classification and characterization of the habitat of the study area to allow for broad comparisons and groupings among stations;
- b) to provide a method for monitoring major changes in the vegetation that occur as a result of natural successional change, new management practices (logging, grazing, development), or the occurrence of major "catastrophes" such as fire or flood; and
- c) to provide a relatively rapid assessment of the habitat structure and spatial patterns of vegetation.

Once the results of these assessments are analyzed, we will be able to group stations in terms of features to which a chosen target species may respond.

Habitat Structure Assessments should be conducted <u>every five years</u>, unless the habitat at the station has undergone a major change (e.g., fire, hurricane, logging, construction, brush-clearing, etc.). We ask that contributors take a copy of their station map and competed HSA forms into the field every 5 years at the appropriate time (see below) and verify that the information is correct, and has not significantly changed. These vegetation assessments **should be made during the fourth period of recommended operation** (usually the time of maximum canopy and shrub cover), e.g. stations beginning in Intended Period 4 should do their HSA in Intended Period 7.

It may be helpful to follow the step-by-step approach to preparing your station map and habitat description(s) as outlined on the following pages.

#### A STEP-BY-STEP APPROACH:

**Step1: Prepare a station map.** The station map should depict the locations of your nets and the major physical features of the study area. A typical MAPS station consists of about ten 12-m mist nets dispersed rather uniformly over an 8-hectare (20-acre) core area. Plot the exact location, orientation, and designation (net number) of each of your nets in the central portion of a copy of the 24 x 24 cell grid map (Form H0: MAPS Station Map) provided in the HSA protocol. The scale of each cell on this map should normally be 30m on a side. If your station is very long you might need to increase the size of a map cell from the standard 30m to perhaps 40m. If your station is very small (because you have your nets spaced closely together; see below), you might need to decrease the size of a map cell down to 20m. Be sure to indicate the scale on your station map by using the scale bar provided. In addition, plot also the exact locations of all the important natural and human-made physical features. Be sure also to indicate magnetic north on your map.

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If possible, obtain an aerial photograph or GIS output of the site, use it to help locate the nets and other physical features on your station map, and submit it to IBP in addition to the station map. It is important to mark clearly the exact location and orientation of each net on the station map. This will assure that the location and orientation of individual nets will remain consistent if the personnel operating a station changes from year to year.

**Step 2: Identify the boundary of your station and draw it on the station map.** The boundary of a MAPS station is defined to include all areas that lie within 100m of the outermost nets. Remember, 100m is equal to over eight standard (12m) net lengths; you may be surprised at how much area this encompasses! On the map, however, 100m is a distance equivalent to three and one-third cells on the 30m grid (see heavy dashed line on Figure 12). The station boundary itself can be determined by first drawing a circle with radius equal to 100m centered at the outermost end of each net. This should produce a set of overlapping circles. Then connect the outermost points of the outermost circles with a smooth, straight or slightly outwardly convex line. This will give you the boundaries of your station. If you have nets that are more than 200m removed from all other nets (producing non-overlapping circles), a corridor about 100m wide between these nets and encompassing the route traveled to reach them should be included within the station boundary. In this way, all stations will be single units regardless of layout of their nets.



## FIGURE 12. Completed Station Map (truncated)

Note that, in general, this procedure will create an approximately 20 hectares (50 acre) station if ten nets are dispersed over an 8-hectare (20-acre) core area. In the ideal case, the periphery of the 8-hectare core area would approximately be a square 280m on a side or a 160m radius circle, while the boundary of the 20-hectare station would approximately be a square 450m on a side or a 250m radius circle. When

plotted on the 30m grid map, such stations will encompass about 225 squares (a grid of 15 x 15 cells for a square station). The shape of your station, however, may not be a square or a circle. Nets, for example, might be located along a riparian corridor, within and around a montane meadow, or around part of an ox-bow lake. To allow you to map variously shaped stations, Form H0 depicts a 24 x 24 cell grid. In general, you should try to include between about 200 and 250 cells in your station. Even if your station is long and narrow, it should be drawn at least eight squares wide; a map using a grid of 9 x 24 cells might be ideal for such a case. Figure 12 presents an example of a completed station map based on an actual map submitted to us by a MAPS operator. Note that the nets are clustered somewhat more closely than normal for a typical MAPS station and, as a result, the total area of the station is only about 13 hectares (rather than 20 hectares).

**Step 3: Define and delineate the habitats within the station.** Habitat definitions should be based primarily on vegetation type and structure, and hydrology. Generally, anything smaller than about one ha (about 2.5 acres) in area - roughly equivalent to about ten or eleven 30m grid cells - should not be considered a separate habitat. Water features, such as lakes or rivers, should not be considered a separate habitat, regardless of size. Consider also the bird communities present in deciding whether to define and delineate separate habitat; different habitats should be reflected in some way in the bird communities they support. However, do not define your habitats too narrowly; if you wind up with more than five, you must reconsider your definitions. **Typically, stations have one, two or three habitat** types. Each habitat must be at least 5% of the station area. If not, it isn't considered a separate habitat for MAPS purposes.

Provide a concise name for each habitat type you identify within your station. In addition, use the National Vegetation Classification Standard (2021) provided in the MAPS HSA Code Supplement to identify each habitat type to the ALLIANCE level (see below under 'National Vegetation Classification Standard Alliance). Please ensure that no two habitat types present within your station have the same alliance code – if they do, they are the same habitat. **NOTE: The classification system has been updated and habitat codes defined prior to the 2022 season will need to be re-determined. Call IBP if you need help with this.** 

Clearly indicate the habitat delineations on your station map by drawing solid lines around them and shading the area if necessary. However, do not let your shading mask the clarity of net locations and other physical features.

**Step 4: Complete the MAPS Habitat description forms.** One form should be used for each habitat type (Form H1: Habitat Assessment Form). For each habitat type, consider only the portion of that habitat that falls within the station boundaries (area within 100 m from each net).

**Cover:** When describing habitat types, cover applies to the percentage of the station that is covered by that particular habitat type. When cover is used to describe upperstory, midstory, and understory vegetative layers, it is defined as the sum of the areas delimited by the vertical projections of plant perimeters onto the ground and not to light passing through the foliage of a single tree, shrub or fern. Consider any area inside the "drip-line" of the individual plant or tree as fully covered. Any overlap of cover between neighboring individual plants or trees is only considered once. In this case a completely closed canopy forest with overlapping crowns can only total 100% cover.

# Habitat Structure Assessment form H1

We provide below a guide to filling in each field of those forms. We also provide, based on the example station map (Figure 12), a completed form H1 for the dominant forest habitat (Figure 13).

**DATE:** Indicate the month, day and year on which the habitat assessment is undertaken. We recommend you do this during the fourth visit to your station (not necessarily Period 4).

**HABITAT NAME:** The letter (A, B, C, D or E) and name should correspond to the labeling of the habitat types marked on your station map H0.

**PERCENTAGE OF STATION COMPRISED OF THIS HABITAT TYPE:** What percentage of the area of the station is occupied by the habitat in question? The sum of the percentages for each of the habitat types defined at the station (up to five) should generally be 100%. Small patches (<1 hectare, or <5% of the total area) of distinct habitat types must be lumped into the habitat type they appear to be associated with and described in the vegetative (or non-vegetative) layers. For instance, the presence of a few bushes around the edges of a meadow can be described in the shrub layer of the meadow habitat description and not treated as a separate habitat.

NATIONAL VEGETATION CLASSIFICATION STANDARD DIVISION: This is obtained from the National Vegetation Classification Standard (2021) which we have summarized in a separate document, the MAPS HSA Code Supplement: <u>https://www.birdpop.org/docs/misc/HSA\_code\_supplement\_2022.pdf</u>. The supplement provides the background and instructions on how to use the hierarchical classification system and provides a key to the NVCS codes (e.g., 1.B.2.Ne North American Great Plains Forest & Woodland Division); and provides a glossary of the terms used in the classification system.



Form H1: MAPS Habitat Structure Assessment (HSA) form

Location: <u>HALF</u> Station: <u>HAFR</u>

Survey Date: 07 / 23 / 2022 Surveyed by: Jane Intern

Habitat Name (as indicated on station map H0): <u>Sycamore, Tulip Poplar, Sweetgum Forest</u> Percentage of station comprised of this habitat type (from station map): <u>62</u>%

National Vegetation Classification Standard Division: <u>I.B.3.Na</u> National Vegetation Classification Standard Alliance: <u>A3702</u>

General description of habitat type. Include habitat age, major species, disturbance history, etc: <u>Second growth woods on gently sloping hillside, on either side of a small riparian</u> <u>corridor containing a few greater than 100 year old Sycamore trees. Lies on well-</u> <u>drained (mostly) calcareous substrate. The lower portion of the station was clearcut in</u> <u>1954 and they whole station was heavily flooded by a hurricane in 1983 but hasn't</u> <u>flooded since.</u>

Vegetative Layers	% cover of station
Upperstory: >15m	80
Midstory: 5-15m	40
Understory: 0.5 - 5m	40

#### Average height of:

Tree canopy: <u>20</u>m Shrubs: <u>2.0</u>m Herbaceous vegetation: <u>1.2</u>m Number of snags (>1m tall, >10cm diam.) Circle one: 0-5 | 5-15 | >15

Geographic Features	<b>Options</b> Circle one per line.
Drainage:	well-drained   poorly-drained
Slope:	flat (gentle) undulating   steep
Geography:	bottomland hillside bidgetop   plain

Aquatic Features (if applicable):

Features	% cover of station	If applicable, circle one <u>or mo</u> re aquatic features				
Running water	1	seep/trickle canal	very small brook (<0.5m)	small stream (0.5-2.0m)	large stream (2.0-5.0m)	river (>5m)
Standing water	2	pond/lake <50m² >50m²	for livestock <50m <sup>2</sup>  >50m <sup>2</sup>	marsh/bog <50m <sup>2</sup> (>50m <sup>2</sup>	seasonal occasional	permanent other

Management/Disturbance history (if applicable):

Year(s)	Disturbance Type (circle one)
1945	fire   wind   flood   drained   icestorm   logging: clear-cut) strip   selective logging
1983	fire   wind flood drained   icestorm   logging: clear-cut   strip   selective logging
	fire   wind   flood   drained   icestorm   logging: clear-cut   strip   selective logging
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FIGURE 13. Completed MAPS HSA Form H1

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# **NATIONAL VEGETATION CLASSIFICATION STANDARD ALLIANCE:** The MAPS HSA Code Supplement:

https://www.birdpop.org/docs/misc/HSA\_code\_supplement\_2022.pdf also provides regional lists of NVCS alliance level codes and one-line descriptions of the dominant species in those alliances. Use the NVCS Formation Code to limit the options, then choose the Alliance code that best describes the habitat being assessed. This space is for only the Alliance number (located in column H of the Excel database (e.g., A3725 or A3627).

# GENERAL DESCRIPTION OF HABITAT TYPE INCLUDING HABITAT AGE: A

description of the habitat type in your own words that includes major species, habitat age, disturbance history, etc. It is essential that you give a general description of the habitat type in the space provided. The following example was adapted from a station description provided by a MAPS station operator:

"Located along a small ridge between two valleys (approx. altitude in valleys is 150 m). This wooded area consists of oak (southern red predominates with some black and white), hickory, and poplar. Other species are Carolina buckthorn, ash, cherry, sweet gum, black gum, dogwood, etc. Vines are muscadine, poison ivy and rattan vine along with Japanese honeysuckle. Very little shrub undergrowth, mostly huckleberry/blueberry types."

**VEGETATIVE LAYERS PERCENT COVER:** Divide the vegetation within each habitat into three main layers; upperstory, midstory, and understory, based solely on their height as described below, and **enter the percentage cover**. The cover percentage should represent the percentage cover of the layer **within** the habitat type and **not** the percentage cover of the entire station.

For example, imagine a meadow that has shrubs dotted over it and reshape the area into a square, pushing the shrubs into one corner. Let us say, for instance, they cover approximately 7% of the entire area, then you would enter 7% onto the data sheet for the understory.

**Upperstory:** This vertical layer encompasses all vegetation above 15m from the ground, including coniferous or broad-leaved trees, vines, and epiphytic plants and lichens.

**Midstory:** This vertical layer encompasses all the vegetation between 5 and 15m above the ground, including saplings and tall shrubs as well as vines, epiphytic plants and lichens, and vegetation hanging down from the upperstory level.

**Understory:** This vertical layer includes vegetation found between 0.1 and 5m above the ground and includes mainly shrubs and small saplings. In addition, this layer may also contain herbaceous vegetation extending up from the ground cover layer.

**AVERAGE HEIGHT OF TREE CANOPY:** Enter the average height to the nearest 5m (or nearest 2m if the average height is less than 15m) of the tree canopy in the habitat type under consideration. Remember, trees are defined as woody, generally single-stemmed plants that are at least 5m tall at maturity. Do this regardless of whether the tree canopy extends into the upperstory, midstory, or only into the understory (see below). This can be achieved by drawing an imaginary line running through the tops the canopy whereby the area of the outlines of trees above the line equals the area of the gaps below it (*ignore gaps that reach the ground*). Estimates obtained using a clinometer are preferred but we understand that few stations have one. If you are working in a managed forest or woodland it is likely that the responsible land manager(s) can provide this information.

**AVERAGE HEIGHT OF SHRUBS**: Enter the average height to the nearest 0.5m of the shrubs (woody, generally multi-stemmed plants with a bushy appearance) in the habitat type under consideration. Note that when considering the understory vegetative layer (below), you will estimate the cover and pattern of all vegetation between 0.5 and 5m, regardless of whether it is comprised of trees (except trunks), shrubs, or herbaceous vegetation. Here, we are asking only for the average height of the shrubs.

**AVERAGE HEIGHT OF HERBACEOUS VEGETATION**: Enter the average height to the nearest 0.1m of the herbaceous (non-woody, vascular) vegetation, which includes graminoids (grass-like vegetation including grasses, sedges, rushes, etc.), forbs (broad-leaved herbaceous vegetation), ferns, and or non-vascular vegetation (mosses and lichens).

**NUMBER OF SNAGS**: Circle the number (0, <5, 5-15, >15) that best represents the number of snags present in the habitat type under consideration. **Snags are defined as dead woody stems greater than 1m in height and greater than 10cm in diameter.** 

GEOGRAPHIC FEATURES: Circle the features present within this habitat type.
Drainage – circle one option (well-drained or poorly-drained) that best represents the drainage characteristics of the habitat.
Slope – circle one option that best represents the topography of the habitat: flat, gently sloping, undulating or steep. This is a judgment call but not a difficult one.
Geography – indicate if the habitat is associated with a bottomland, hillside, ridgetop or plain.

**AQUATIC FEATURES:** Enter the percent cover of these features within each habitat type. Please note that these features should be indicated clearly on your station map. Let us consider the types of features individually:

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**Running water:** Running water courses range in width from a seep/trickle, to a very small brook (<0.5m), a small stream (0.5-2.0m), a large stream (2.0-5.0m), a river (>5.0m) or canal.

**Standing water:** Standing water includes ponds and lakes ( $<50m^2 \text{ or } >50m^2$ ), water catchment for livestock ( $<50m^2 \text{ or } >50m^2$ ), or marsh/bog areas ( $<50m^2 \text{ or } >50m^2$ ). Such water bodies may be permanent, seasonal (vernal pools) or occasional (flooded field). For example, if ponds occur within a meadow and normally have water in them year-round, then you would circle natural pond, permanent and the size category  $<50m^2$  or  $>50m^2$  (if both size classes occur circle both). If there is standing water at your station that does not fit any of these categories, circle other and write a brief description in the habitat description section.

**MANAGEMENT/DISTURBANCE HISTORY**: Circle the appropriate option(s) describing the type of management practice or disturbance, if any apply (e.g., Year(s): 1945-55 logging: clear-cut)). The logging patterns may be indicated by circling clear cut (of at least 1 hectare), selective (small patches <1 hectare in extent, or individual trees), or a strip of trees (removed for a powerline, for example).

A description of the management history should be included in the general description of the habitat above (e.g., I estimate that the area was probably logged in the late 1940's/early 1950's".) especially if the disturbance is not listed as one of the choices to be circled.