Recommended guidelines for Scale, Precision, and Evaluation Units with the LPC CHAT

Current guidelines for the creation of habitat sampling evaluation units

1) Evaluation units (EU) are created from the intersection of management based on Common Land Unit (CLU) data layer (and manually identified fences) and Ecological Site Descriptions (ESD) polygons generated by soil type. The resulting Eval Unit polygons are then manually adjusted to reflect unique vegetation communities within distinct management areas.

2) Disconnected ESD's with the same rank (1-5) within a management unit are considered the same EU and only need to be sampled once. An example would be multiple lowland depressions with an ESD= 2 within a surrounding upland pasture with an ESD= 5. In This case, only one of the depression areas would need to be sampled.

3) Evaluation units less than 5 acres due to ESD delineations should be merged with the largest adjacent EU within that management unit. ESD's are not merged across management units (fences/roads). Note that multipart evaluation units (i.e. multiple lowland depressions) can be individually less than 5 acres, as long as the sum of the pieces is greater than 5 acres. If the sum of all the pieces is less than 5 acres, the lowland pieces would be absorbed into the larger upland evaluation unit.

4) Fences and roads (county roads, state highways, and federal interstates usually have fences) create new evaluation units since the vegetation conditions can be different as a result of different management on the other side. Private roads may or may not create separate evaluation units, it depends if there is also a fence.

5) Evaluation units created by fence lines/roads can be less than 5 acres. *see proposal 1

6) If the buffered impact area is mostly in cropland such that the non-crop area is less than 5 acres, no field assessment is needed. In these cases, the non-crop acreage is added to the cropland area and the cost is then calculated based on this new merged acreage.

7) Existing impact areas that influence the evaluation unit to create an un-impacted area less than 5 acres does not negate sampling in that unit. The 5 acres minimum size for evaluation units is for ESD aggregation, not determining if sampling is needed based on the un-impacted area of an evaluation unit. All evaluation units regardless of size need sampling. *see proposal 2

8) All evaluation units regardless of size receive one transect to be placed in a representative area by the field crew. The transect location can be in an existing infrastructure's impact buffer, but it should not be in/on the immediate vegetative effects of that feature (not in a road ditch or on an adjacent well pad).

Issues and questions incurred due to evaluation unit sampling protocol

Is there a size at which an evaluation unit is too small and does not need sampling? There are two main scenarios to consider:

1) Buffer crosses a fence road and creates adjacent but small slivers and/or inaccessible areas

Small evaluation unit slivers created from the impact buffer crossing a fence. Is it necessary to sample very small areas, what if there is no access to the site across the fence? Could we merge the unit across the fence and just include its acreage in the sampled unit area? Is there a size threshold at which point one of these options would be ok? This process is already done for ESD's less than 5 acres where the smaller evaluation unit is merged with larger neighbor. It is also done for evaluation units less than 5 acres where the rest of the impact area is cropland. In these cases the grassland sliver is merged with the cropland area and the impacts calculated.

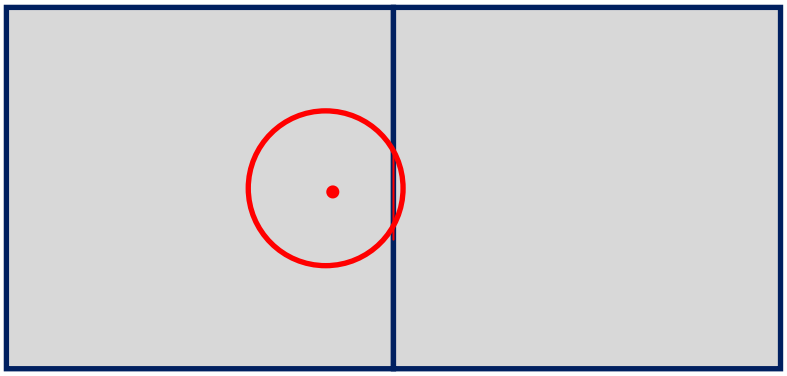


Figure 1. Hypothetical impact buffer creating a small evaluation unit across the fence

It is proposed that for impact buffers that "spill over" management units to create evaluation units less than 5 acres these sliver units get handled the same way small ESD units and pieces of grassland adjacent to cropland do. It is proposed that the sliver less than 5 acres would be merged with the larger unit across the fence and the resulting combined acreage used to calculate the impact units and costs. For evaluation units over 5 acres that extend over a fence/road, they would require sampling. For units that are not sampled for whatever reason (no access), the Habitat Evaluation Guide (HEG) value for that site (normally determined via field work) will be determined based an estimated HEG score as calculated in Table 1.

2) Isolated slivers created after most of the buffer is erased by existing impacts.

A nearby existing impacts could erase 99% of the impact area of a project leaving very small un-impacted areas. Current policy dictates the entire area is the evaluation unit, and it would get sampled with the HEG score then applied to the remaining un-impacted acreage. The question is, if the HEG is only going to be applied to 3 acres or .25 acres is it worth the time/effort? Additionally, companies have frequently mis-understood the 5 acre minimum unit rule and thought it applied to the unimpcted acreage and questioned the necessity to sample such a small area.

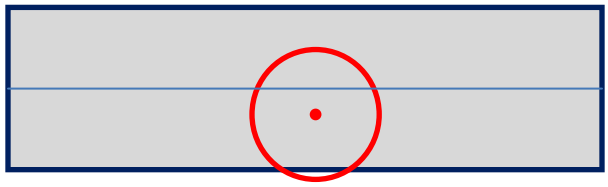


Figure 2a. Hypothetical existing infrastructure impact buffer strip that would result in only a very small area of new impact.

It is proposed that for point impacts (wells, tank batteries, turbines) if the remaining new impact area will be less than 5 acres after existing impact buffers are accounted for, then that projects impacts will be calculated based on the estimated HEG per table 1. If the developing company does not like this calculated cost, they are able to conduct a field assessment and obtain an actual HEG.

The application of this option will only be applied after the company has confirmed that the impacts in the GIS are accurate. Some infrastructure can be assessed from imagery and the company is accountable for confirming that infrastructure. For a well next to a highway that only has 2 acres not in the highway buffer, it is pretty easy to know that highway is still there. For other structures, it remains the responsibility of the company to review and confirm via site knowledge, imagery, or a site visit the accuracy of the infrastructure impacts.

2b) Would a short stretch of distribution line that has a small effective impact area need field assessment? If the un-impacted span is 50 meters it would have an impact of 0.25 acres sandwiched between two impact areas. This situation could also arise from a point impact (well or turbine) being nested between two or more existing infrastructure features.

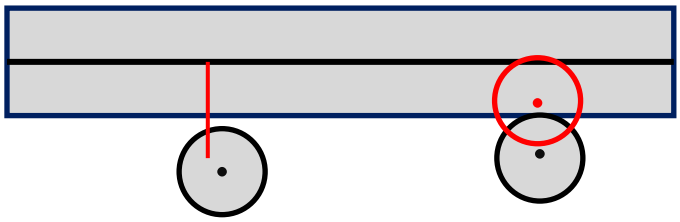


Figure 2b. Hypothetical view of new impacts between two existing impact buffers. The result is only a very small new impact area that is not erased.

It is proposed that for small linear impacts (distribution lines, private roads) if the remaining new impact span will be less than 50 meters (impact area of 0.25 acres) after existing impact buffers are accounted for, then that projects impacts may be calculated based on the estimated HEG per table 1. If the developing company does not like this calculated cost, they may conduct a field assessment and obtain an actual HEG.

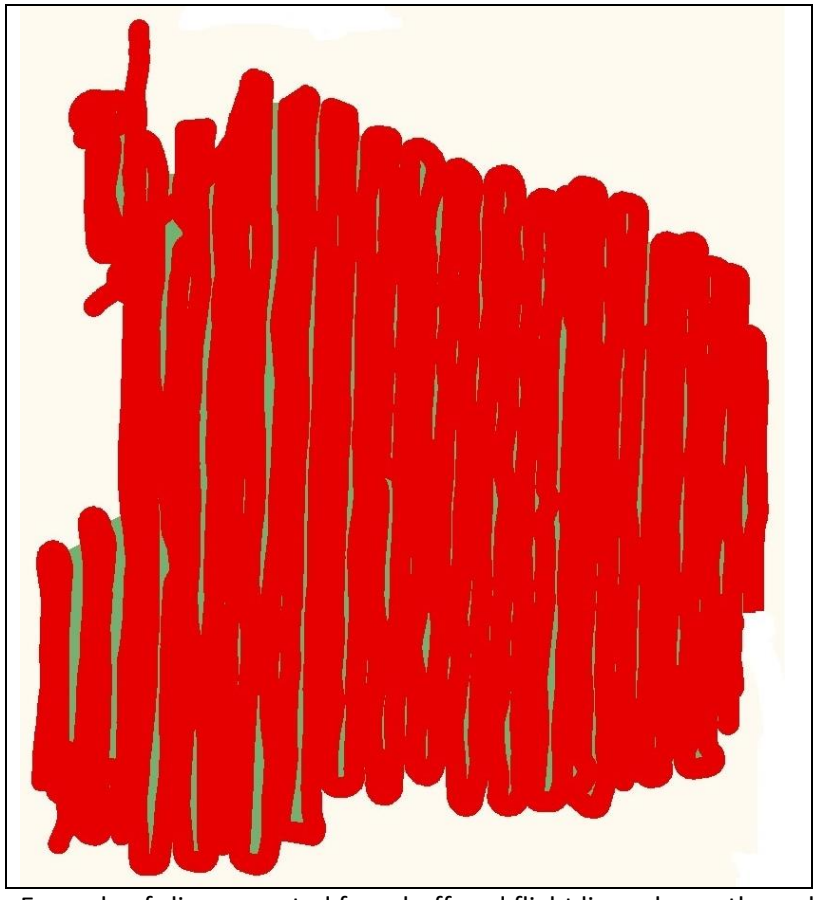
The application of this option will only be applied after the company has confirmed that the impacts in the GIS are accurate. Some infrastructure can be assessed from imagery and the company is accountable for confirming that infrastructure. For a well next to a highway that only has 2 acres not in the highway buffer, it is pretty easy to know that highway is still there. For other structures, it remains the responsibility of the company to review and confirm via site knowledge, imagery, or a site visit the accuracy of the infrastructure impacts.

For consistency, this process of estimating impact costs for small linear impacts would be extended to any private road or distribution line impact length 50 meters or less (not just remaining sliver between existing impacts). For these short lengths, companies would have the choice of using the HEG estimation table instead of field work. Allowing estimated HEG costs for small impact areas (less than 50 meters or 0.25 acres) would save GIS and field time while still ensuring habitat impacts are mitigated for.

For LPC surveys and survey coverage of proposed project areas.

Survey coverage

For aerial transects designed to be 400 meters apart (200 meter buffer each side of transect), it is recognized that some drift in flight lines does occur. In instances where the buffered flight lines leave small slivers of un-surveyed area due either to drift or avoidance of features including stock yards or farm house, the full extent of the proposed survey area be considered as surveyed. The total missing area from drift cannot be more than 1% of the total proposed survey area. Due to the complexity of the drift gaps, combined with allowable gaps over houses, cattle yards…, setting a straight area/percentage surveyed would be very difficult to implement. It is recommended that a guideline of 1% be used at the discretion of WAFWA so that individual locations and conditions can be considered. This allowance does not cover large gaps from skipped lines or large deviations in course over reasonable habitat and these will remain as un-surveyed areas.



Example of slivers created from buffered flight lines shown through as the green background.

Ground LPC listening surveys:

For surveys conducted by ground listening points, those survey locations should be created to avoid gaps in coverage once the 1 mile buffer is applied that relates to the detection range. There is negligible spatial error in the GPS location of observation points (especially at road intersections), therefore any gaps between buffered listening observation coverage will remain as gaps in the surveyed area.

Survey coverage of proposed project areas

For proposed projects being assessed with a 1.25 mile buffer for complete survey coverage, it is currently required that 100% of the 1.25 mile buffered area (3,136 acres) be covered by surveys. Experience has shown that there are occasionally small gaps in survey coverage across this 1.25 mile buffer area and that often these gaps are in areas very unlikely to harbor LPC.

It is proposed that if the entire 1.25 mile buffer is covered except a total of less than 15 acres or 0.5% of the total survey area (whichever is less), then that area be considered fully surveyed. Additionally, the un-surveyed area needs to be in areas with less than 50% potential habitat suitability or in existing impact buffers to provide confidence that these survey gaps did not occur in prime LPC habitat. Data on current lek locations shows that of the 2098 leks observed in the last 10 years, only 116 (5.5%) were in areas with less than 50% grasslands within 1 mile. This proposal is in line with recent individual review requests from industry to WAFWA and the USFWS to grant allowances on projects where most of the project was surveyed except small areas over low quality habitat and is meant to provide definitive qualifiers to the process to assist in any reviews.

Scale, resolution, spatial precision, and minimum mapping units

In the mapping and spatial analysis domain the issue of scale is a topic commonly referred to but often left undefined. For maps, scale is the ratio of map units to real world ground units (1 inch:24,000 inches). It is often also referenced as the minimum scale at which a maps detail is considered reliable as small features may not be represented and/or feature representation becomes inconsistent with reality. While still very relevant to many mapping projects, it is harder to define scale for digital GIS projects where the map scale can change depending on the zoom and view extent and the layers being displayed may be from different sources and have different accuracy thresholds.

Resolution typically refers to the pixel grain of raster data or the smallest definable feature (also called minimum mapping unit or MMU). For raster layers, the pixel is also the MMU, but in vector data, the MMU is often courser then could be possible. This difference for vector data is due to the fact that it is often digitized from high resolution imagery or derived from precise GPS locations, but when being digitized there is a level of generalization that occurs. An example would be that it is generally the forest that is digitized not every individual tree. In the SGP CHAT there several raster layers including 1 meter percent canopy, 30 meter land cover, and 250 meter MODIS satellite data. Within the vector line/polygon datasets, resolution and MMU vary from 1 mile hexagons, field boundary delineations, and soil ecological site descriptions (ESD's) down to exact mapped locations of infrastructure like roads, well and wind turbines. Furthermore, the spatial precision at which all these features are mapped also varies. The new wind turbine and well point locations are generally very precise, while the roads and soil ESD lines may be off a bit from reality.

The CHAT categories have a resolution MMU of 1 square mile, but the infrastructure layers are much more detailed and precise. As a result of this broad variation of resolution and precision of data going into the SGP CHAT combined with the fact that it is an interactive digital dataset that allows users to zoom into an area thereby changing the scale, it would be very difficult to label the CHAT as a whole with a single scale resolution.

Despite the inconsistencies in inputs and the difficulty in applying an overarching label on the scale or precision of the CHAT, it is very important to set up some basic qualifiers to help guide decisions. It has happened that a well has been plotted and field work done, only to later find out that the well location needs to move a bit. Does the field work need to be redone if it only moves 10 meters, what about 50 meters? Is our confidence in the precision of the ESD line sufficient to say that a 10 meter shift to the north now requires new field work because part of the evaluation unit is now in a neighboring ESD and the vegetation there is indeed different? Similarly, is the precision of the impact avoidance buffer precise enough to say that by shifting over 10 meters that this patch of habitat is now not going to be used and the originally impacted location will now become useful again to LPC? There is no clear answer to these questions, yet definitive answers and guidelines need to be made.

It is proposed that for point impact features and transmission lines that spatial adjustments in their location of 50 meter or less (1/4th of a well impact buffer) not constitute a significant change in location and the site can remain mapped and assessed per the original location. The new impact location would still be towards the center of the impact buffer and therefor the original impact buffer and associated field work would still be representative. For changes in location greater than 50 meters, new evaluation units would be created and new field work could be required. This 50 meter precision level would not apply for distribution lines and private roads that are linear impacts and only have a 10 meter buffer. New location data (and probably new field assessments) would be needed if there are changes in the location of distribution lines or private roads.

Useful references on scale and minimum mapping units:

http://coast.noaa.gov/geozone/resolution-vs-minimum-mapping-unit-size-does-matter/#.VYxf4EaAvdV

http://www.evergladeshub.com/lit/pdf09/Rutchey09LscapeEcol-106-MappingEGresto.pdf

Tables 1. A matrix for identifying a HEG value for units that were not sampled. Y axis of this matrix uses the known ESD value for that site and scales it to an estimated HEG 1-3 value. The X axis is the percent potential habitat within 1 mile (HEG 4). These two HEG values are multiplied together to get an overall site HEG, just as if it were sampled, that can then be applied into the normal impact calculation formula.

		HEG 4 score									
LPC ESD	HEG 1-3	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Cropland	0.05	0.005	0.01	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.05
1	0.25	0.025	0.05	0.075	0.1	0.125	0.15	0.175	0.2	0.225	0.25
2	0.35	0.035	0.07	0.105	0.14	0.175	0.21	0.245	0.28	0.315	0.35
3	0.65	0.065	0.13	0.195	0.26	0.325	0.39	0.455	0.52	0.585	0.65
4	0.85	0.085	0.17	0.255	0.34	0.425	0.51	0.595	0.68	0.765	0.85
5	1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1