Discussion Paper

Local Habitat Assessment: Habitat Analysis Techniques for Counties, Watersheds and other Planning Areas

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Introduction

To inform local land use planning, Washington Department of Fish and Wildlife (WDFW) has developed a suite of habitat analysis tools, referred to collectively as the Local Habitat Assessment (LHA). The LHA can be tailored to a particular planning scale, such as an entire county, large or small watershed, or a subarea. This discussion paper is meant to familiarize users of the LHA with the science and data used for the assessment.

The County or Watershed LHA tool is a geographic information system (GIS)-based technique to evaluate relative habitat value over broad areas. Results can be combined with other landscape characterization methods, such as Washington Department of Ecology's watershed characterization methodology, as well as with local government parcel and infrastructure data sets. These combinations, or overlays, can provide important context for land use decisions, ideally reducing unintended environmental consequences in the planning process.

Spatial Scale

An understanding of spatial scale is important. Broad scale analysis implies that the data are collected for, and applied to, a wide area, on the order of several hundreds of square miles or more, such as a county or an entire water resource inventory area (WRIA). A mid-scale area would be a small watershed, or a planning subarea encompassing tens of square miles. Fine scale would refer to a subdivision or a particular parcel, ranging from less than an acre up to a few square miles. Figure 1, below, shows how the scales are related.

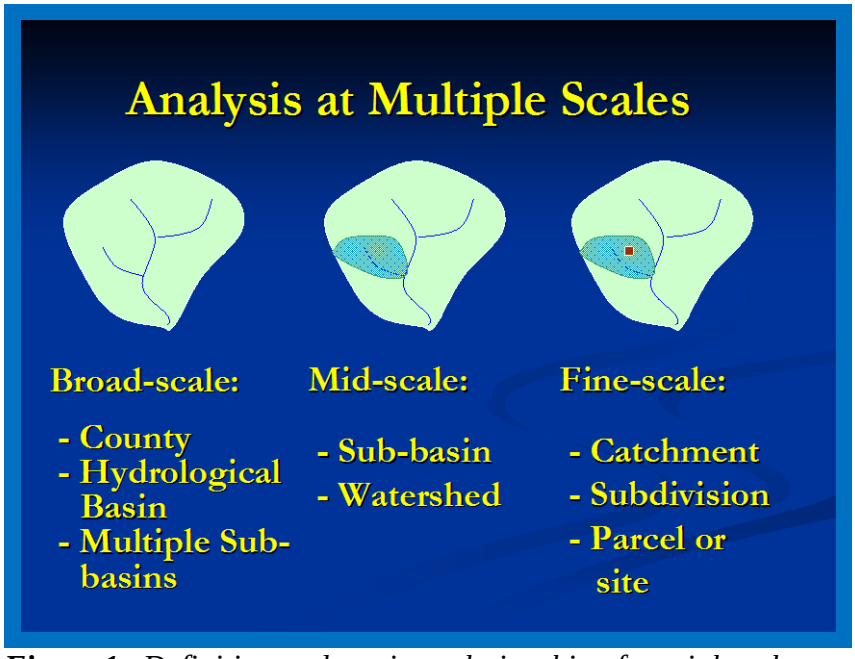

Figure 1. *Definition and nesting relationship of spatial scales*

County land use planning and regulation ultimately involves all three scales – goals and zoning across the broad scale and mid-scale, with final decisions on development at the fine scale. With County or Watershed LHA, WDFW can provide information directly applicable at the broad scale, and can also help interpret the use of LHA results to inform mid- and fine-scale decisions.

Developing the LHA

Assessment scores produced by the LHA are built up from an analysis of indicators representing the presence, diversity, and sensitivity of wildlife, the quality of habitat, and level of human development. The final results are shown as a map, color-coded to indicate a composite score representing wildlife habitat values across the landscape. An example of the map developed for Kitsap County is shown in Figure 2, and a Watershed LHA developed for Birch Bay, Whatcom County in Figure 3, below.

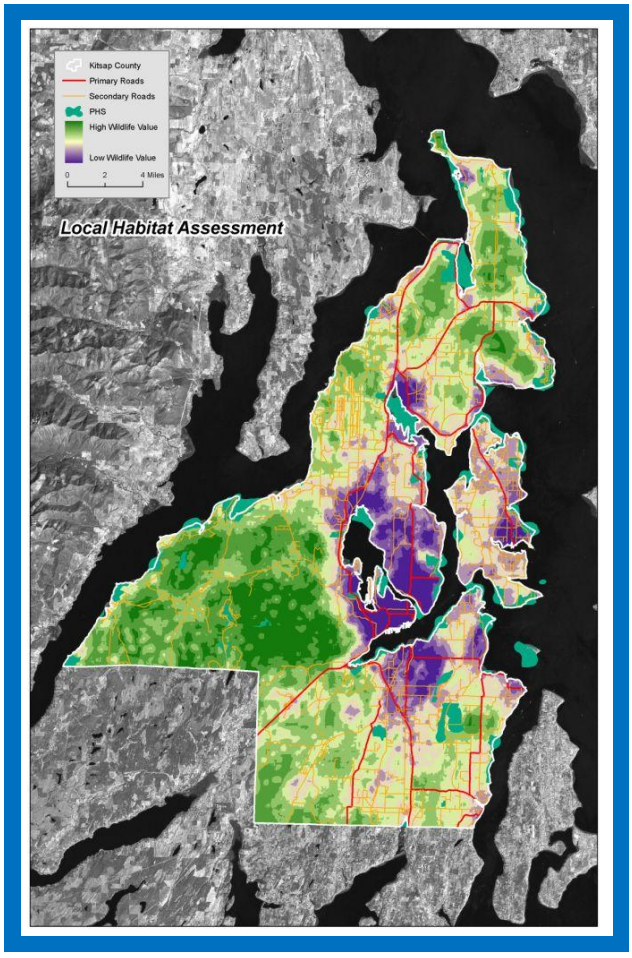

Figure 2. *Local Habitat Assessment for Kitsap County.*

Dark green shows the highest value habitats, grading to dark purple as the lowest.

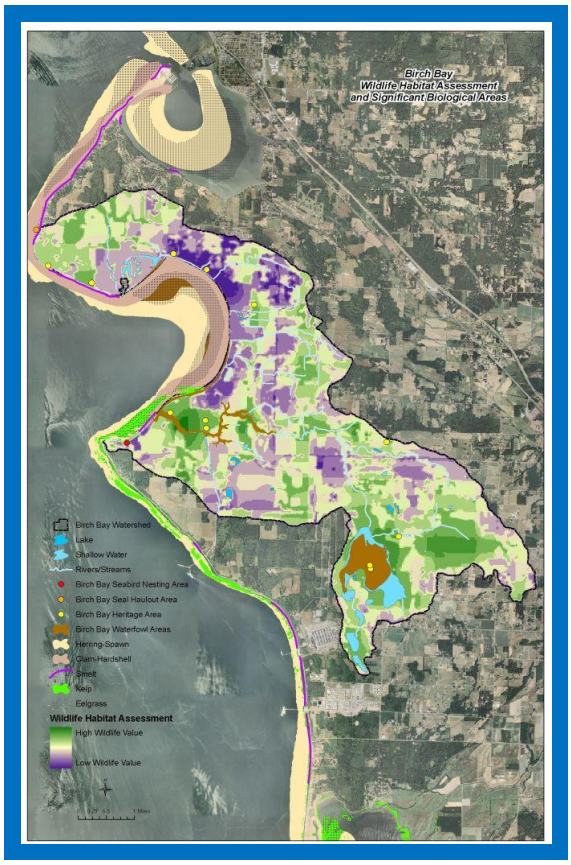

Figure 3. *Watershed LHA for the Birch Bay watershed, in Whatcom County.*

The LHA uses four basic data layers: Ecoregional Assessments, WDFW's Priority Habitats and Species (PHS) data, land use/land cover, and a road network coverage. The main assumption underlying the LHA is that the most valuable habitats are where wildlife is known to occur, especially in vulnerable concentrations, where natural vegetation is intact, and where human impacts are relatively small.

Ecoregional Assessments

The Washington Department of Fish and Wildlife, Washington Department of Natural Resources, and The Nature Conservancy developed Ecoregional Assessments (EAs) to identify priority areas important for preserving biodiversity. Data incorporated into the EAs include wildlife occurrence records and a detailed classification of habitat types. The LHA uses EA scores emphasizing species richness and resource irreplaceability. Because the Ecoregional Assessments were developed with coarse mapping units, WDFW interpolates the data prior to their use, as shown below in Figure 3.

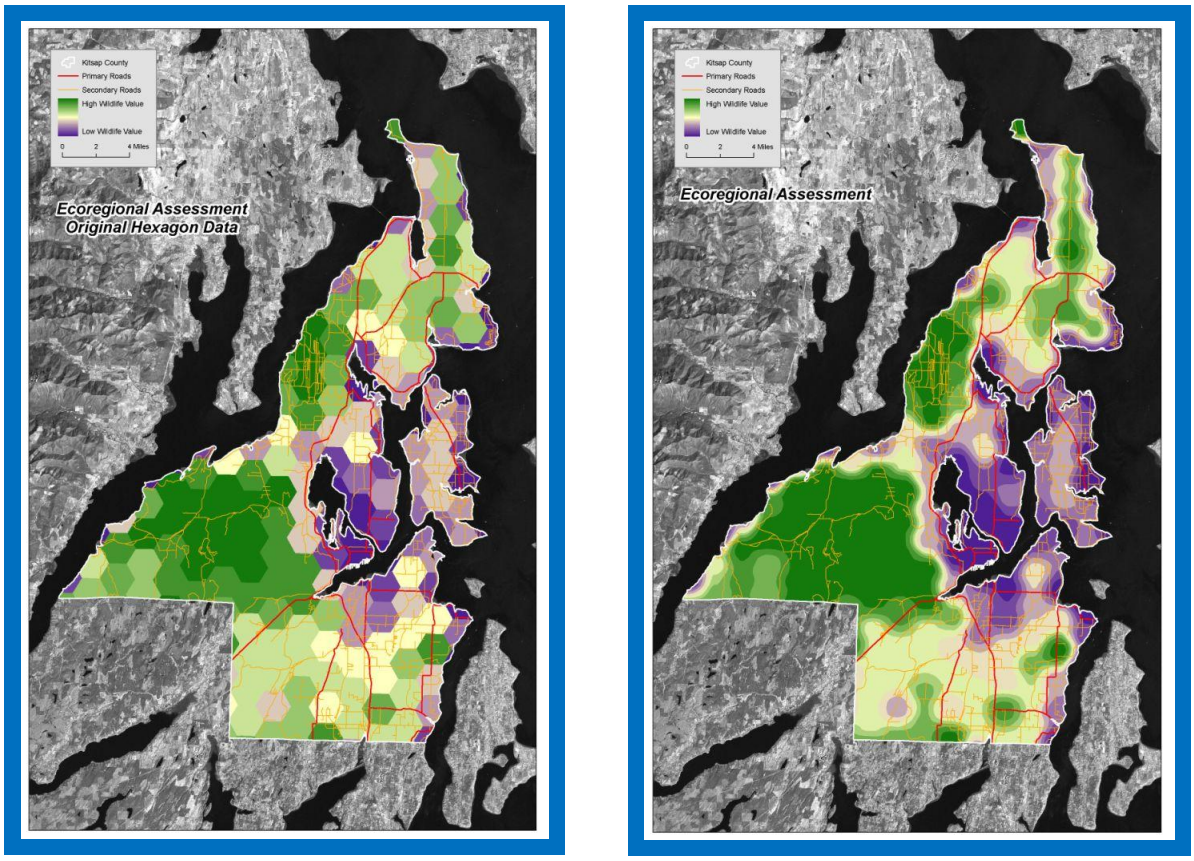

Figure 3. *Example of Ecoregional Assessment coverage data and interpolation*

Priority Habitats and Species

WDFW's Priority Habitats and Species (PHS) data are drawn from multiple agency databases of species and habitat locations. Among these is a species occurrence coverage, showing point locations of documented wildlife use, such as heron nest sites, or eagle winter roosts. These data points are a major component of the Ecoregional Assessment scores, and are incorporated in the LHA through the EA data layer. In addition, the polygon layer within the PHS database identifies locations of groupings of animals sensitive to disturbance, such as waterfowl concentration areas, as well as rare or critical habitat types, such as bat caves or eelgrass beds. Because of the known value of these areas, they are given the highest habitat ranking within the LHA.

Land Use/Land Cover

Known wildlife occurrence is the strongest indicator of habitat value in the LHA. However, WDFW has not been able to document all occurrences across the landscape. Moreover, animals move, and areas not occupied at one point of time may be used at a later date. Therefore, it is important to have other indicators of habitat quality incorporated in the assessment. Usually derived from satellite-collected data, the land use/land cover layer is useful for delineating patches of relatively undisturbed natural vegetation, as well as showing the intensity of human development. For Western Washington, which was mostly forested prior to European settlement, the LHA gives the highest ranking score to forest, wetlands, and natural prairie, when discernible. Agricultural lands get mid- to high-level scores, since fields, pastures, and hedgerows can provide wildlife benefit. Residential, commercial, or industrial development get a low score.

Road Density

Relative to many other features of the human environment, roads are often highly detrimental to wildlife. In addition to the direct loss of habitat from their construction, roads create partial or complete barriers to wildlife movement, so that habitats become disconnected and increasingly fragmented. Roads can also cause significant direct mortality, especially for small animals.

Within the LHA, weighted road density is used as an indicator for decreasing habitat value. WDFW applies simple weighting factors, based on available subsidiary data. Traffic intensity is the best measure, but road class (interstate, state, county, logging) and size are also usable, since these parameters are related to intensity of use. The underlying assumptions for using road density are that the level of impact varies directly with the number of road miles nearby, and with the traffic volume (number of cars/hour).

Interpreting the LHA Results

LHA results are shown in a map of the analysis area, like Figure 2, above, that is color-coded to represent the relative habitat value of all points on the landscape. The map shows patterns across the landscape. Large, connected patches of highly valued habitats are easy to pick out, as are the interspersions of farmland and forest. Roads and their impact are evident. Relatively well connected habitat can be identified, as can significant connectivity barriers.

The assessment is a general ranking of value, not uniquely focused on threatened and endangered species, and having no inherent preference among mammals, birds, amphibians, and reptiles. As a land-based model, the LHA shown above does not directly evaluate the quality of instream or all nearshore habitat. However, the LHA can

be combined with other data sources that address freshwater and nearshore biodiversity and ecosystem processes, resulting in a more comprehensive assessment.

Mid-scale Analysis

To develop a more focused understanding of habitat in watersheds or planning subareas measuring up to several tens of square miles, WDFW can supplement the County or Watershed LHA with other wildlife habitat characterizations, based on the life needs of a set of focal species or species groups. This approach allows a concentrated view of the actual habitat features that the animals rely on to persist, and on the particular human activities occurring in the area that stress wildlife. It supports development of a more robust set of recommendations for assuring the persistence of local wildlife over time.

A successful characterization requires the set of focal species to be representative of the much broader range of animals that live in the area. The set should cover all habitat types and all taxa groups (birds, mammals, amphibians and reptiles, and fish, if applicable). Herbivores, insectivores, and carnivores should all be represented. In addition, to the greatest extent possible, WDFW biologists try to integrate local expertise and preference in choosing focal species, by holding a local workshop or pursuing individual consultations.

To perform the analysis for each focal species or species group, GIS is used to depict where on the landscape the critical life needs of those animals can be met. Taken together, results of these analyses can determine if there are specific parts of the area that are more critical for protection or restoration, and by contrast those that are more suitable for development. They can also distinguish between a landscape rich in supportive habitats for each species group, and one where certain habitat features are becoming more limited. Examples from mid-scale work in the Birch Bay (Whatcom County) watershed can demonstrate this analysis process.

An important focal species group covered in the Birch Bay study was open grassland-dependent birds. Short-eared Owl, Northern Harrier, and Western Meadowlark were collectively used to represent this group. The related GIS analysis, shown below in Figure 5, used landcover data to delineate connected patches of grasslands, shrub-scrub wetlands, and forested edge that were at least 50 acres, and those greater than 200 acres.

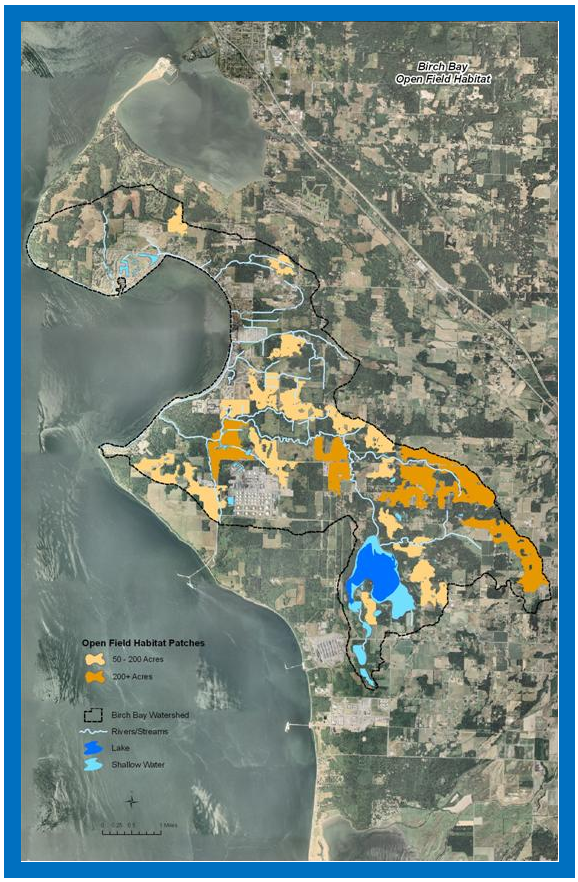

Figure 5. *Mid-scale analysis – habitat availability for open grassland-dependent birds. Western Meadowlark require patches of at least 50 acres, Short-eared Owl need patches greater than 200 acres.*

This analysis showed that the southern half of the watershed contains abundant habitat needed by these birds. It also led directly to the recommendation that a voluntary conservation program undertaken by local citizens and Whatcom County should include protective measures for these habitat types.

A second analysis that can demonstrate this mid-scale approach is shown below, in Figure 6. Pond-breeding amphibians, represented here by Red-legged Frog, need connected complexes of ponds and wetlands, associated with upland areas that the animals use outside of breeding season. These frogs typically travel a mile or more away from breeding ponds in their regular seasonal patterns. The associated GIS analysis depicts the overall connectivity of habitat for the animals by calculating the effect of houses, roads, and other impediments to movement away from the breeding areas.

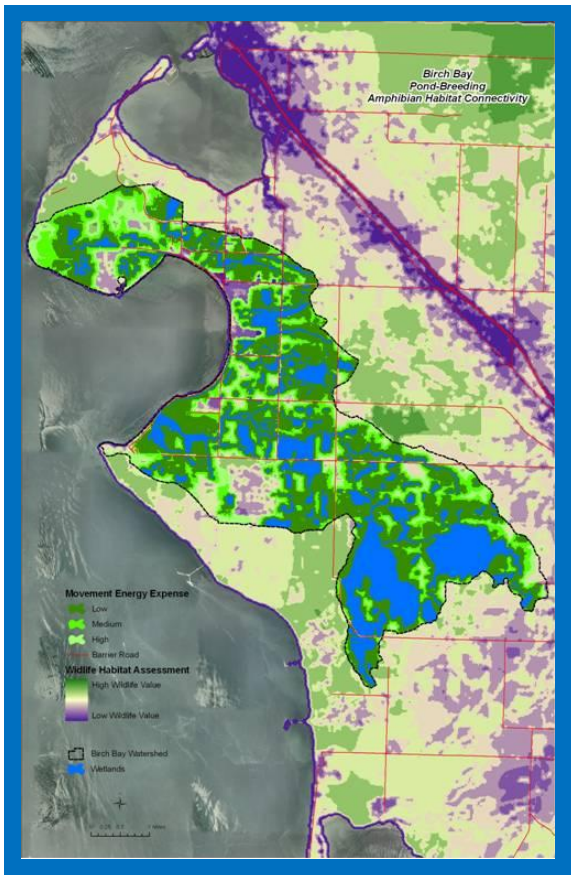

Figure 6. *Amphibian connectivity within the Birch Bay Watershed. Roads shown in red are considered complete barriers to amphibian movement, because of traffic intensity. Otherwise, all green areas are considered to be connected.*

Because of the Birch Bay Watershed's high percentage of land area covered by wetlands, and its relatively low development intensity, there is a high degree of habitat connectivity for amphibians. Only the busier roads, shown in red, currently interrupt the connectivity and fragment this habitat into smaller patches. Even with this impact, the southeast corner of the watershed contains a very large block of connected area that can serve as core habitat to assure the persistence of these animals. In addition, the analysis points out that the most effective conservation measures involve the road network, such as: employing traffic softening measures to lower impacts on roads within connected patches; incorporating measures within the local transportation plan to focus traffic into a few major corridors; in conjunction with scheduled maintenance, designing replacement culverts to accommodate amphibian and reptile passage under existing roads.

These mid-scale analyses are based on an extensive background of scientific literature covering the habitat needs of particular species, as well as their responses to various features of human development, such as development density and traffic intensity. In successfully characterizing the wildlife landscape, the first layer of questions addresses the life needs of the animals. What habitat type or types are needed? Is there a particular way that different habitats need to be juxtaposed? What are the necessary patch sizes? The second layer of questions concerns human-induced stressors. At what development density is persistence of a particular species at risk? How do houses and roads affect connectivity for the focal species? Together, the answers to these and other similar questions help give a picture of how well the landscape is functioning, and provide a

guide for protection and restoration activities that can raise the probability of maintaining biodiversity over time.

Habitat Focus Area Delineation

One desirable result of the multiple analyses is the ability to see if one part of a subarea appears to provide good habitat for all or most of the focal species. When this occurs, this identifies a part of the landscape that is naturally suited to serve as a habitat focus area, where the community's existing biodiversity can be most effectively preserved over time. Management emphasis within a habitat focus area would be to minimize further fragmentation and to enhance connectivity when opportunities arise. Such an area could be used preferentially for incentive-based programs, such as trading of development rights (TDR), and public benefit rating systems, or as receiving areas for off-site mitigation. In any case, having the information would allow a clearer balancing of development planning by local citizens and decision-makers.

Conclusion

The LHA is designed to be flexible and responsive to the needs of a particular planning application and can include data sources that may be unique to a given area. The LHA is a science-based tool that provides a picture of the landscape as it exists today from a wildlife perspective. Applying LHA results to local planning, development and conservation decisions takes discussion among the multiple local stakeholders responsible for shaping a county or watershed's future.