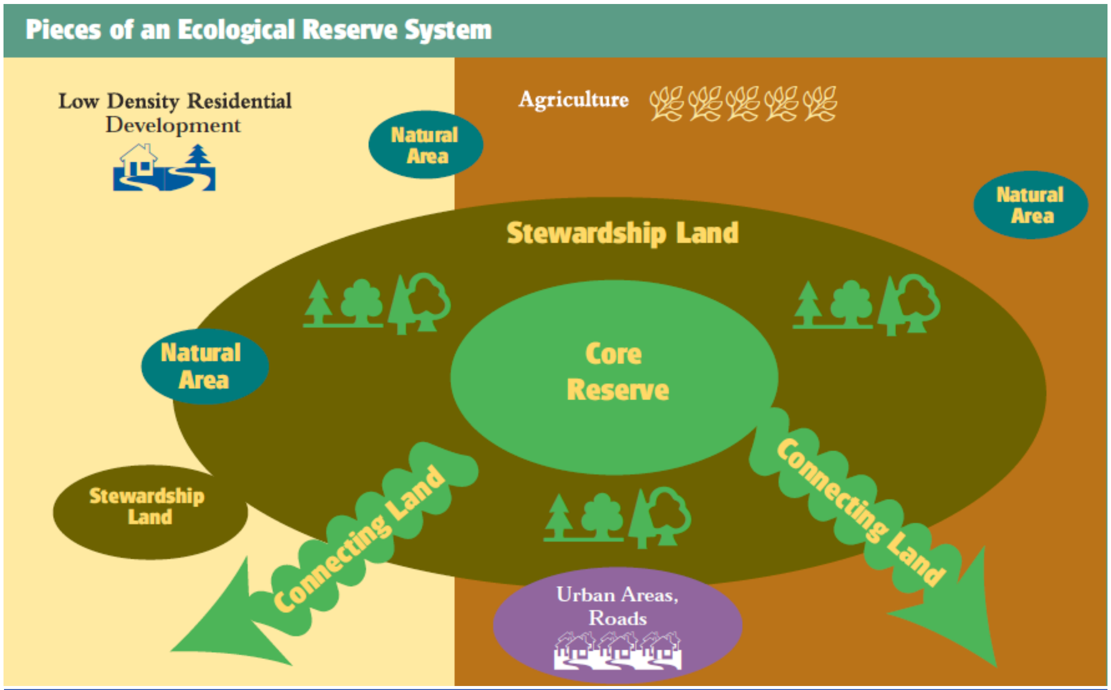
Wildlands Network Design© Methodology:



Each Wildlands Network Design (WND) is generated through a systematic process that adheres to five key principles:

1. Establish planning boundaries based on ecological features
2. Compile existing data on biological resources and identify those that are most representative of biodiversity
3. Set clear biodiversity conservation goals and carry out explicit and objective modeling and other analyses in support of those goals
4. Evaluate the degree to which conservation goals are currently being met in existing areas and identify new areas needed to meet those goals
5. Involve a broad array of stakeholders in design and implementation

Establish planning boundaries based on ecological features

Wildways© represent the first step of establishing boundaries based on ecological features: in this case, the major mountain and boreal regions of North America. There are several WNDs within Wildways. Although smaller than a Wildway, these WND planning areas are still millions of acres (or hectares) in size.

Since the mid-1990s there has been increasing agreement among conservation scientists as to the definitions, boundaries and utility of these ecological divisions, usually referred to as ecoregions. The Nature Conservancy has defined ecoregions for all of North America. A single ecoregion, or sometimes a combination of them, is a good planning scale for a WND. In many cases, The Nature Conservancy, and other groups, have carried out extensive planning within ecoregions, and Wildlands Network works closely with these groups to craft the WND for a given ecoregion or group of ecoregions.

Compile existing data on biological resources within the planning area and identify those that are most representative of biodiversity

There is general agreement among conservation scientists that three types, or tracks, of ecological data are needed to adequately represent biodiversity across a broad area.

1. Representative natural habitats or "environmental variation." Sometimes called the "coarse filter," this track of data encompasses the full spectrum of habitat types (e.g., vegetation, abiotic habitats, aquatic habitats), from the common to the uncommon. In mountainous areas, this is well represented by ecological land units (ELUs), unique combinations of geology, elevation and aspect.

2. Special elements. This second type of data encompasses occurrences of rare species and natural communities, particularly "hotspots" where such occurrences are concentrated. In contrast to the coarse filter in track 1, this track is sometimes referred to as the "fine filter" that ensures that known examples of high biodiversity value don't slip through the cracks. Examples may include wetland basins, cove forests, and mountain summits.

3. Focal Species. The third track identifies habitat requirements and population viability of a set of particularly important or representative species in a given planning area. Such focal species warrant special attention in conservation planning because they are not adequately captured by other considerations, such as coarse-scale representation of environmental variation or fine-scale special element occurrences (e.g., hotspots of diversity or rarity). A variety of characteristics can result in a species being considered a useful focal species for conservation planning,

including that they are: (1) functionally important to an extent out of proportion to their numerical abundance (keystone species); (2) common species that nevertheless are vulnerable and that are essential for maintaining biological diversity—foundation species—such as aspen in the West; (3) wide ranging, thus potentially acting as surrogates for other species that have similar habitat requirements (umbrella species); (4) sensitive to habitat quality (indicator species); and (5) charismatic (flagship species), thus encouraging public support for conservation initiatives. If sufficient habitat is maintained to support viable populations of a carefully selected suite of focal species over time, many other species may also be conserved.

Population viability analyses help predict the ability of a population to remain viable given demographic, genetic, environmental, and other variables (e.g., survival, fecundity, mortality risk, and habitat productivity) over specified periods of time and under various scenarios (e.g., changes in land cover, trapping pressures, and climate), though we are learning that "viable populations are insufficient when considering strongly interactive species (paper in review, by Eisenberg, Soulé, Estes, Honnold and Doad). Through such analyses, potential source (where births exceed deaths) and sink (where deaths exceed births) habitats can be predicted. These predictions can then help inform questions relevant to conservation planning such as: where are the high value habitats, how much area is needed to support optimal populations, and where are wildlife movement linkages needed?

When combined with emerging connectivity analysis tools, analyses of ecologically effective densities and distributions can provide insights into where wildlife movement linkages are needed.

There are of course multiple types of useful data. A group of scientific experts with knowledge of each track is needed to determine the precise elements, or features, in each track. Once determined, spatially explicit data on each of these features should be systematically collected for the planning area as whole and entering into a geographic information system (GIS). Often there are gaps in data availability for a given feature, which will highlight the need for additional analyses.

As part of the data collection process, spatial information should also be gathered on existing conservation areas and their degree of protection.

Where possible, spatial information on threats or human impacts on the landscape should also be gathered. Analytical tools such as the Human Footprint are well suited to this task. It also possible to carryout analyses of how human impacts will change over time

Set clear biodiversity conservation goals and carry out explicit and objective Wildlands Network Designs in support of those goals

Once data have been collected for the three tracks noted above – representation, special elements and focal species – there needs to be a way to determine which places on the landscape are most vital for conservation. This process is often called site selection. New computer tools, called site selection algorithms, have emerged in the last few years that allow researchers to determine which set of sites on the landscape contribute the most to the conservation of a full suite of ecological features. Marxan is a popular site selection algorithm and has been used by Wildlands Network (http://www.uq.edu.au/marxan/).

It is not practical to conserve 100% of all the features, so analysts must go through a goal-setting process to determine how much of a given feature the site selection algorithm will seek to capture. This may be a single goal, say 60% of a focal species source habitat, or it may be a range of goals. In any case, goal setting should be done in an explicit way.

Once goals have been set, most site selection algorithms then divide the planning area into similarly sized "planning units," often hexagons or squares. Usually there is an upper limit on the number of planning units that the software can accommodate. Data on the ecological features is loaded into the planning units and the algorithm is run.

Usually the algorithm is run 100 times, with millions of iterations in each run. Each run will yield a slightly different result. Those planning units that are selected in multiple runs are likely to be more ecologically valuable, or irreplaceable, than those selected less frequently.

The algorithms are designed to clump planning units together where possible, under the assumption that larger areas are better than smaller areas for conservation. The algorithm can also be "seeded" with existing protected areas by always selecting, or locking in, those planning units that encompass the protected areas. If two planning areas are similar in value, the algorithm will choose the one closer to the locked-in areas over ones that are farther away.

Using the site selection algorithm it is possible to isolate clumps or blocks of high irreplaceability planning units. These clumps are the fundamental building blocks of a WND. Further review by an expert panel, with input from other stakeholders, can help determine how those clumps should zoned or designated, that is, as core wild areas or as stewardship zones.

While the site selection algorithm and the focal species analysis can provide some insights into connectivity, new connectivity planning tools, such as CircuitScape (http://www.circuitscape.org/Circuitscape/Welcome.html) or FunConn (http://www.nrel.colostate.edu/projects/starmap/funconn_index.htm) may be better tools to identify wildlife linkages. As with site selection tools, the quality of the outputs will depend greatly on the data quality going in. These tools should also be applied in consultation with experts in the field.

Together, then, site selection and connectivity planning tools, in conjunction with extensive review and consultation, can yield a robust and defensible WND comprised of core wild areas, where natural processes are allowed to direct the ebb and flow of life; wildlife linkages, zones of shared use by humans and wildlife that allow for the unimpeded migration of species, genes, and natural processes across the land; and compatible-use/stewardship areas, which surround and buffer core wild areas and support vibrant and sustainable rural economies Evaluate the degree to which conservation goals are currently being met in existing areas and identify new areas needed to meet those goals.

Once a full WND has been developed, it can be compared against the existing conservation area system. It is likely that this will have been done throughout the WND development process in an informal way. It also possible that the current conservation system will have been incorporated into the design in explicit way by, for example, locking in existing strictly protected areas such as parks and wilderness areas into the site selection algorithm.

In any event, this comparison will identify gaps in the current conservation system that need to be filled. It also possible to overlay information about the current and future human impacts to identify which conservation gaps are the most threatened.

Involve a broad array of stakeholders in implementation

It is critical to involve regional stakeholders, scientific and otherwise, in the process of designing and implementing a network design. The draft network design should undergo a series of rigorous expert reviews before a final design is released. This process should be guided by a scientific advisory committee made up of committed scientists who are familiar with the region or with the Wildlands Network's scientific methods, who can guide and direct necessary research, fieldwork, and data collection by staff, interns, and volunteers. At the same time, we work closely with our partners to integrate the network design process with local and regional efforts to identify and protect conservation areas.

This entire systematic planning process, as adapted by the Wildlands Network, has been condensed into "A Checklist for Wildlands Network Designs."