The human footprint in the West

THE HUMAN FOOTPRINT IN THE WEST—A LARGE-SCALE analysis of human impacts—is interesting for at least two reasons. First, the statistics that the investigators, Leu et al. (2008), provide are themselves interesting: The human footprint (i.e., spatial effects of anthropogenic features such as rest areas, campgrounds, oil and gas wells, landfills, interstates, highways, secondary roads, railroads, power lines, irrigation canals, agricultural lands, and urban areas) covers 13% of the western United States. Agricultural lands (9.8%) dominate, followed by populated areas (1.9%) and secondary roads (1.1%); interstate rest stops are the least dominant anthropogenic feature (0.003%). In order to investigate spatial patterns of the human footprint, the authors (2008) developed a classification system with increasing anthropogenic disturbances from 1 to 10; they later "clumped" these classes to highlight patterns. Low-intensity human footprint classes 1–3 cover the majority (48%) of the western United States. Medium-intensity classes 4–7 cover 45%. High-intensity classes 8–10 cover 7%.

Statistics of "intensity areas" can be spatially compared with the National Park Service Inventory and Monitoring networks. The "top 3" areas with the highest-intensity human footprint are (1) Puget Trough–Willamette Valley–Georgia Basin, which corresponds to the North Coast and Cascades Network and the Klamath Network; (2) Great Central Valley, which corresponds to the Sierra Nevada Network; and (3) California South Coast, which corresponds to the Mediterranean Coast Network. The "top 3" areas with the least intense human footprint are (1) Utah–Wyoming Rocky Mountains, which corresponds to the Greater Yellowstone Network; (2) Canadian Rocky Mountains, which corresponds to the Rocky Mountain Network; and (3) Mojave Desert, which corresponds to the Mojave Desert Network (see Leu et al. 2008, fig. 5, p. 1128). In addition, the analysis found that rivers of the western United States were more heavily affected by the human footprint than were lakes. Federal landholdings least affected by anthropogenic features and activities were those of the U.S. Fish and Wildlife Service, Department of Defense, and National Park Service, which together covered 5.3% of the western United States. Those landholdings most affected by the human footprint were Bureau of Reclamation, state, and private lands, which together covered 46.3% of this area.

Second, the human footprint is interesting to resource managers because many of the "reference locations" in the classification system are national parks. Yellowstone and Death Valley national parks are class 1 reference locations, Mount Rainier National Park is class 2, and Rocky Mountain National Park is class 3. For comparison, agricultural areas in the Snake River Plain (Idaho) and Napa Valley (California) are class 8. Los Angeles, California;

Boise, Idaho; and agricultural areas south of Fresno, California, are class 10.

The human footprint in the West is also useful; notably, investigators have made their data set available for download at http://sagemap.wr.usgs.gov. This SAGEMAP Web site is maintained by the U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Snake River Field Station, in Boise, Idaho. Moreover, applications of the human footprint to the National Park System are plentiful. Take, for example, the data set of synanthropic predators (species that benefit from human activities), like corvids, house cats (*Felis silvestris catus*), and domestic dogs (*Canis lupus familiaris*). According to Leu et al. (2003), investigators are modeling human activities that benefit synanthropic predators in order to understand the top-down interaction between predators and prey, in particular shrubland species of concern such as greater sage grouse (*Centrocercus urophasianus*). According to the investigators, "power lines are used by common ravens (*Corvus corax*) and raptors for nesting and for hunting perches. Human impacts in rural areas, including agriculture, landfills, and recreational sites, often provide abundant and new food sources which potentially increase the numbers of common ravens, American crows (*Corvus brachyrhynchos*), black-billed magpies (*Pica hudsonia*), brown-headed cowbirds (*Molothrus ater*), and red foxes (*Vulpes vulpes*)" (Leu et al. 2003, p. 1). Furthermore, linear features such as railroads, primary and secondary roads, and irrigation canals enhance the movements of synanthropic predators into previously unused regions; they also facilitate the spread of invasive plant species. Therefore, these features are useful for mapping potential invasions. In addition, the human footprint provides a graphic representation of habitat fragmentation, on the one hand, and connectivity, on the other. These data would allow managers to map anthropogenic features that act as barriers to species movement or dispersal. Finally, using the human footprint, resource managers could investigate how species of concern have responded (in distribution and abundance) to particular features or the cumulative impact of human presence on the landscape.

References

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