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A Technique for Selecting Research Natural Areas.

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Abstract: The USDA Forest Service has a long-established program to identify areas in national forests for designation as protected Research Natural Areas (RNAs). One of the goals is to protect high quality examples of regional ecosystems for the purposes of maintaining biological diversity, conducting nonmanipulative research and monitoring, and fostering education. When RNA designation conflicts with other land uses, difficult choices must be made about the best number and location of sites. We addressed this problem by adapting a classic mathematical optimization formulation from the location science literature. The formulation was an integer optimization model for selecting the set of RNAs that maximized the number of regional ecosystems and natural communities represented subject to an upper bound on the total area covered by the sites in the selected set. We demonstrate this modeling approach with an application in the Superior National Forest in northeastern Minnesota. The model quickly generated information about the trade-offs between different protection goals. This modeling approach can be used to guide RNA selection on other Federal lands as well as protection strategies for other open space, green space or natural areas.

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