

## Forests on the Edge

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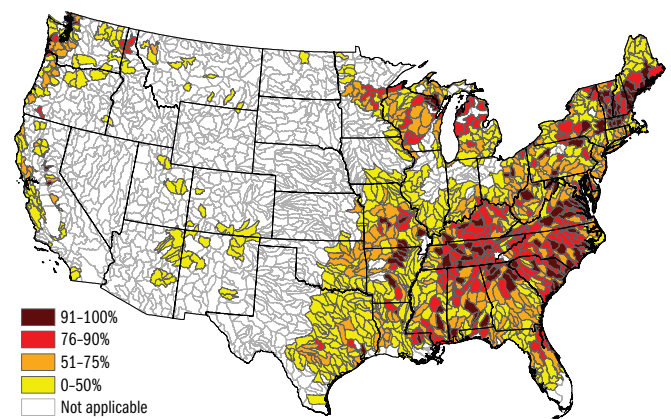
America's 423 million acres of private forest represent more than half of all forests nationwide and provide critical benefits to the American public. These benefits include goods, such as food and wood fiber, and critical services, such as air and water purification, flood and climate regulation, forest carbon storage, wildlife habitat, open space, and opportunities for outdoor recreation. In certain areas of the country, ecosystem service flows and ecosystem functions of private forests are affected by increasing levels of housing development. There is great variability in development trends across the United States. For example, the largest increases in developed area between 1982 and 1997 were in the South, along with the most forest land converted to developed uses; coastal areas experience a disproportionate level of development (Alig, 2006). Urban and developed areas in the United States are projected to continue to expand substantially, in line with the projected U.S. population increase of more than 120 million people over the next 50 years and higher average levels of personal income (Alig and Plantinga 2004, Alig et al. 2004). Development on forest land can further exacerbate impacts from other pressures such as insect pests and disease, air pollution, and fire.

The Forests on the Edge project uses geographic information systems (GIS) techniques to highlight areas across the country where private forest ecosystem goods and services, such as timber, wildlife habitat, and water quality, might be affected by increased housing development and other factors (Stein et al. 2005, Stein et al. 2004). The project has also identified areas where increases in housing density on private lands adjacent to national forests and grasslands might affect recreation, wildlife, water resources, and other important public benefits (Stein et al. 2007). The project is sponsored by the Forest Service State and Private Forestry Deputy Area as a joint project with the Research and Development Deputy Area.

### Impacts of Housing Development on Ecosystem Services From Private Forests

Increases in housing density and associated development on rural forest lands can be linked to numerous changes to private forest services across watersheds, including decreases in native wildlife; changes in forest health; and reduced water quality, forest carbon storage, timber production,

and recreational benefits (Stein et al. 2005). Watersheds where future housing development (from 2000 to 2030) on rural lands is most likely to affect private forest cover are concentrated in southern Maine and the Southeast, including Virginia, North Carolina, South Carolina, Tennessee, and Kentucky (fig. 3c.1) (Stein et al. In Press).



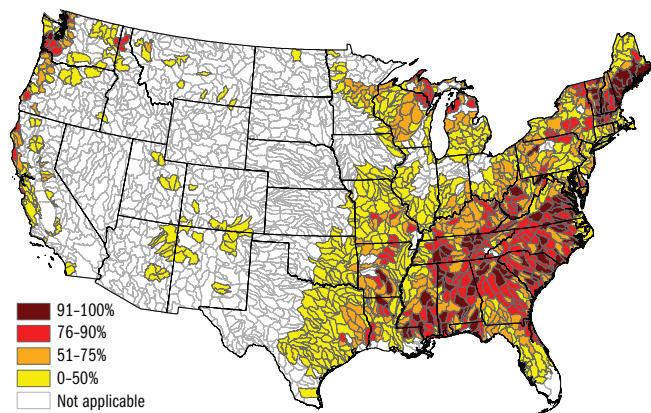
**Figure 3c.1.** Percentile rankings of watersheds with respect to percent of private forest land predicted to experience increased housing density by 2030.

### Timber Production

Private forest lands make a substantial contribution to America's timber resources, accounting for 92 percent of all timber harvested on timber land in the United States in 2006 (appendix C, table 35). Increased housing density on private forests can contribute to lower rates of timber harvesting, decreases in regional timber supply over the longer term, reduced private forest management and investment, and reduced commercial forestry (Kline et al. 2004, Munn et al. 2002, Wear et al. 1999). In some places, a variety of interacting factors, in addition to housing development, may contribute to declines in forest management and harvest, including inherent site productivity, national and international markets, stumpage prices, and regulation (Egan et al. 2007, Kline and Alig 2005).

As displayed in Figure 3c.2, watersheds where private forest timber production could be most affected by future housing development are located in New England and throughout the Southeast. This concentration is not surprising given

that the Southeast has been described as having the highest rate of urban development in the country (Alig and Plantinga 2004, Alig et al. 2004, Macie and Hermansen 2003) and that private forests in the South provide the bulk of our Nation's timber supplies (Haynes 2007).



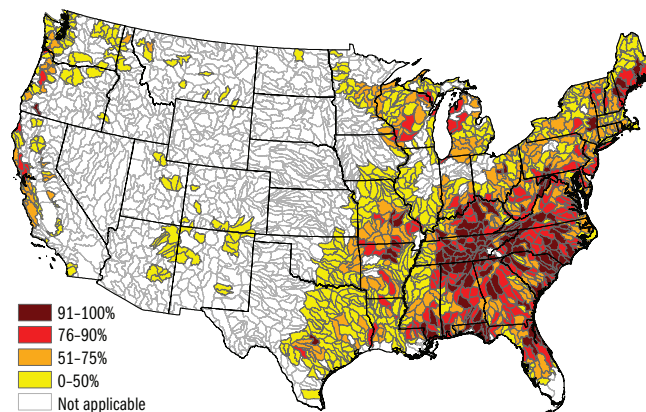
**Figure 3c.2.** Percentile rankings of watersheds with respect to predicted threat to timber supply of increased housing density on private rural forest lands by 2030.

### At-Risk Species Habitat

Private forests provide critical habitat for many species. Increased housing development on rural private forests can have many implications for at-risk species<sup>1</sup>. Populations of at-risk species may disappear, decline, or become more vulnerable with changes in the presence and distribution of private forest habitats (Robles et al., in press). Loss of habitat is highly associated with at-risk species that have declining populations, and it presents the primary obstacle for their recovery (Donovan and Flather 2002, Kerr and Deguise 2004). Decreases in habitat quality associated with housing development and roads can lead to declines in biodiversity (Houlahan et al. 2006), creation of barriers to movement (Jacobson 2006), and increases in predation (Kurki et al. 2000, Woods et al. 2003). Habitat degradation can also contribute to declines in fish numbers (Ratner et al. 1997).

As displayed in Figure 3c.3, watersheds where housing development on private forests is projected to affect the habitat of the greatest numbers of at-risk species are located primarily in the Southeast, and, in particular, in North Carolina, South Carolina, Kentucky, Tennessee, and Arkansas.

<sup>1</sup> At-risk species are defined as species that have been observed by an authoritative source within at least the past 50 years and are either (1) federally designated under the Endangered Species Act (endangered, threatened, candidate, proposed) or (2) designated as critically imperiled, imperiled, or vulnerable according to the NatureServe Conservation Status Ranking system (G1/T1- G3/T3).



**Figure 3c.3.** Percentile rankings of watersheds with respect to predicted threat to at-risk species from increased housing density on private rural forest lands by 2030.

### Additional Forests on the Edge Assessments of Private Forests

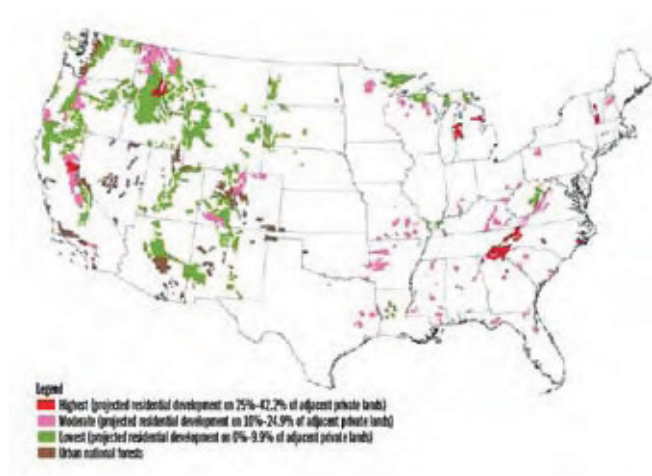
Detailed descriptions of the assessments explained here and additional private forest assessments will be available in upcoming publications and on the Forests on the Edge Web site (<http://www.fs.fed.us/openspace/FOTE/>) in 2009.

### Assessment of Development Adjacent to National Forests and Grasslands

Encompassing about 192 million acres (147 million forest acres), the national forests and grasslands managed by the Forest Service account for about 8.5 percent of total U.S. land area and provide critical social, ecological, and economic benefits to the Nation. Many of America's national forests and grasslands—collectively called the National Forest System (NFS)—face increased risks and alterations from escalating housing development on private rural lands along their boundaries. For example, many wildlife species that inhabit NFS lands also depend on adjacent private lands and can be affected by degradation of private land habitat. Increased housing development can impact the public's access to NFS lands, increase wildfire ignitions and management costs, reduce water quality, and introduce insects and diseases. A more detailed discussion of these implications can be found in Stein et al. (2007).

The Forests on the Edge study projects housing density increases from 2000 to 2030 on private rural lands adjacent to the external boundaries of all national forests and grasslands across the conterminous United States. Some 21.7 million acres (about 8 percent) of rural lands located within 10 miles of the NFS boundaries are projected to undergo increases in housing development by 2030 (Stein et al. 2007).

As depicted in Figure 3c.4, national forests and grasslands with the greatest percentages of surrounding private lands projected to experience increased housing density are scattered throughout the United States but are found primarily in the East. National forests and grasslands in red are those for which at least 25 percent of private lands within 10 miles are projected to experience increased housing density. Note that areas shown in brown are designated “urban national forests” that were not identified in this study as likely to experience significant increases in rural residential development. Housing densities near the borders of these forests may already be higher than the rural densities that are the focus of this study.



**Figure 3c.4.** National Forest System lands with boundaries within 10 miles of rural private lands that are projected to experience increased housing density by 2030.

Each of 13 national forests and grasslands is projected to have more than one-half million acres of adjacent private rural lands experience increased housing density (table 3c.1). Such development and accompanying landscape fragmentation pose substantial challenges for the management and conservation of the ecosystem services provided by NFS lands and the critical ecosystem goods and services they provide.

National forest or grassland <sup>a</sup>	Main State	Adjacent rural private land projected to experience housing density increases (thousand acres)
George Washington-Jefferson	Virginia	1,424
Mark Twain	Missouri	1,326
Chattahoochee-Oconee	Georgia	1,176
National forests in North Carolina <sup>b</sup>	North Carolina	1,073
National forests in Mississippi <sup>c</sup>	Mississippi	1,071
National forests in Alabama <sup>d</sup>	Alabama	963
Huron-Manistee	Michigan	834
Francis Marion-Sumter	South Carolina	720
Ozark-St. Francis	Arkansas	702
Daniel Boone	Kentucky	650
National forests in Texas <sup>e</sup>	Texas	596
Green Mountain and Finger Lakes	Vermont, New York	590
Cherokee	Tennessee	544

**Table 3c.1.** National Forest System lands with more than 500,000 acres of adjacent rural private land (within 10 miles) projected to experience increased housing by 2030.

<sup>a</sup> Figures reported for individual national forests in this table should not be combined because of the potential for double counting of residential development around national forests that are close to each other.

<sup>b</sup> Croatan, Uwharrie, Pisgah, and Nantahala National Forests.

<sup>c</sup> Bienville, Chickasawhay, Delta, Desoto, Holly Springs, Homochitto, and Tombigbee National Forests.

<sup>d</sup> Bankhead, Conecuh, Talladega and Tuskegee National Forests.

<sup>e</sup> Angelina, Davy Crockett, Sabine, and Sam Houston National Forests.

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