

Science

FINDINGS

INSIDE

Mapping Populations and Fuels Treatments . . . 3
Interviews Provide Context 3
Integrating Environmental Justice Into Planning 4
Moving Forward. 5

“Science affects the way we think together.”
Lewis Thomas

Reducing Fuels and Advancing Equity: Incorporating Environmental Justice Into Hazardous Fuels Management



A prescribed burn in the Colville National Forest, Washington, prevents fuels from accumulating that could otherwise support a wildfire. Researchers conducted a spatial analysis to determine if the benefits of fuels reduction projects on 12 national forests were experienced equitably across nearby communities. USDA Forest Service photo.

IN SUMMARY

In 1994, an executive order on environmental justice directed federal agencies to identify and address any disproportionately high adverse effects their actions and policies may have on the health and environment of minority and low-income populations.

Until recently, a suitable procedure did not exist for assessing natural resource management activities through the lens of environmental justice at the implementation scale. Researchers Mark Adams and Susan Charnley with the USDA Forest Service, Pacific Northwest Research Station developed an analytical method to do this. The method facilitates analysis of the relationship between past forest management activities and the locations of minority and low-income communities. Land managers can then incorporate the findings when scoping locations for future projects.

The researchers used this method to assess the distribution of benefits to local populations created by 10 years of fuels management on 12 national forests in the Western United States. They found that, for the most part, the 12 national forests equitably distributed benefits from fuels reduction projects. However, each forest had one or more “hotspots” where a localized lack of benefit for concentrated racial or ethnic minority populations raised environmental justice concerns. Interviews with Forest Service managers provided insight into why hotspots occurred and revealed how environmental justice could be more effectively integrated into land management procedures.

Management actions on a national forest can affect neighboring communities. Reducing hazardous fuels near the forest boundary, for example, can lessen the fire risk to the neighboring community. But communities near national forests are not all alike, as racial, ethnic, and income characteristics vary. If minority and low-income residents living near national forests are not receiving the benefits of reduced fire risk from fuels treatments, then they may be especially vulnerable to fire losses compared to other residents.

In 1994, President Clinton signed an executive order on environmental justice. Executive

Order 12898 directs federal agencies to identify and address “disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” The executive order also instructs federal agencies to ensure that these populations are neither excluded from nor denied benefits of the programs they manage.

Although Executive Order 12898 was signed 27 years ago, a suitable procedure for assessing whether natural resource management actions affect different kinds of neighboring residents differently had never been developed. Aware

EXECUTIVE ORDER 12898:

Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, issued by President Bill Clinton, 1994

“To the greatest extent practicable and permitted by law, ... each U.S. government agency has been charged with making environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations...” (§1-101, 59 Fed. Reg. 7629, 1994)

of this, researchers Mark Adams and Susan Charnley decided to do something about it.

“We went into this thinking ‘how can we help managers get ahead of this issue?’” says Adams, a geographer who brought analytical mapping skills to the project. He is a research fellow with the USDA Forest Service, Pacific Northwest (PNW) Research Station through the Oak Ridge Institute for Science and Education’s postdoctoral fellowship program.

Adams and Charnley, a research social scientist with the PNW Research Station, developed a method to precisely identify low-income and minority populations that may be

Key Findings

- A new method for integrating spatial data from natural resource management activities with demographic data from the U.S. Census Bureau makes it possible to identify minority populations that may be disproportionately adversely affected by or may fail to receive an equitable share of benefits from land management activities.
- Minority populations were generally not excluded from receiving an equitable share of the risk reduction benefits created by 10 years of fuels treatments on 12 national forests in the Western United States.
- “Hotspots,” where racial or ethnic minority populations living near national forests received little or no benefit from fuels treatments sometimes occurred. Interview research found that some hot spots did raise environmental justice concerns, but these were unintentionally produced in pursuing other management objectives.
- Most Forest Service staff interviewed for the project were unfamiliar with both the executive order on environmental justice and the agency’s guidance for considering the environmental justice implications of management actions. Only a few considered the characteristics of neighboring populations when planning fuels reduction work, and they did so informally.

disproportionately adversely affected by land management activities.

“The Forest Service invests several hundred million dollars in fuels projects every year, but how are the benefits distributed among nearby populations?” asks Charnley. “Are we just doing these treatments where we have the loudest voices? Or is there equity, given the environmental justice executive order?”

Social science research from different communities in the United States finds that vulnerability to wildfire can manifest in multiple ways: fewer resources for creating “defensible space” around a property to prepare it for surviving a

fire; fewer firefighting resources in the community; greater difficulty managing household income disruptions caused by an evacuation or loss of a home; and less ability to obtain home insurance to facilitate postfire recovery.

This body of research concludes that low-income populations are almost always more vulnerable to wildfire than those with median or high incomes, and that populations with large proportions of minorities are commonly (though not always) also lower income. For these populations, the benefit of reduced wildfire risk from fuels management by federal agencies has heightened importance.



A stand in the Fremont-Winema National Forest, Oregon, where prescribed fire was used to reduce accumulated fuels. USDA Forest Service photo.

Purpose of PNW Science Findings

To provide scientific information to people who make and influence decisions about managing land.

PNW Science Findings is published monthly by:

Pacific Northwest Research Station
USDA Forest Service
P.O. Box 3890
Portland, Oregon 97208

Send new subscription and change of address information to:

SM.FS.pnw_pnwpubs@usda.gov

Rhonda Mazza, editor; rhonda.mazza@usda.gov

Jason Blake, layout; jason.p.blake@usda.gov

To find Science Findings online, visit
<https://www.fs.usda.gov/pnw/>
and click on **Publications**.

To become a digital subscriber visit:
<https://www.fs.usda.gov/pnw/publications/subscriptions.shtml>



United States
Department
of Agriculture



Forest
Service

Mapping Populations and Fuels Treatments

To determine if the benefits of a fuels treatment program are equitably distributed, one needs to know the characteristics of populations that could potentially benefit from the treatments in relation to the national forest lands that are actually treated.

Adams and Charnley developed a method to do this. They assembled demographic data on populations neighboring national forest lands, conducted geographic information system (GIS) spatial analyses, and interviewed forest managers. Although their study focuses specifically on fuels reduction, this method can be used to assess the environmental justice implications of many different land management activities. It is also applicable in both rural and urban contexts.

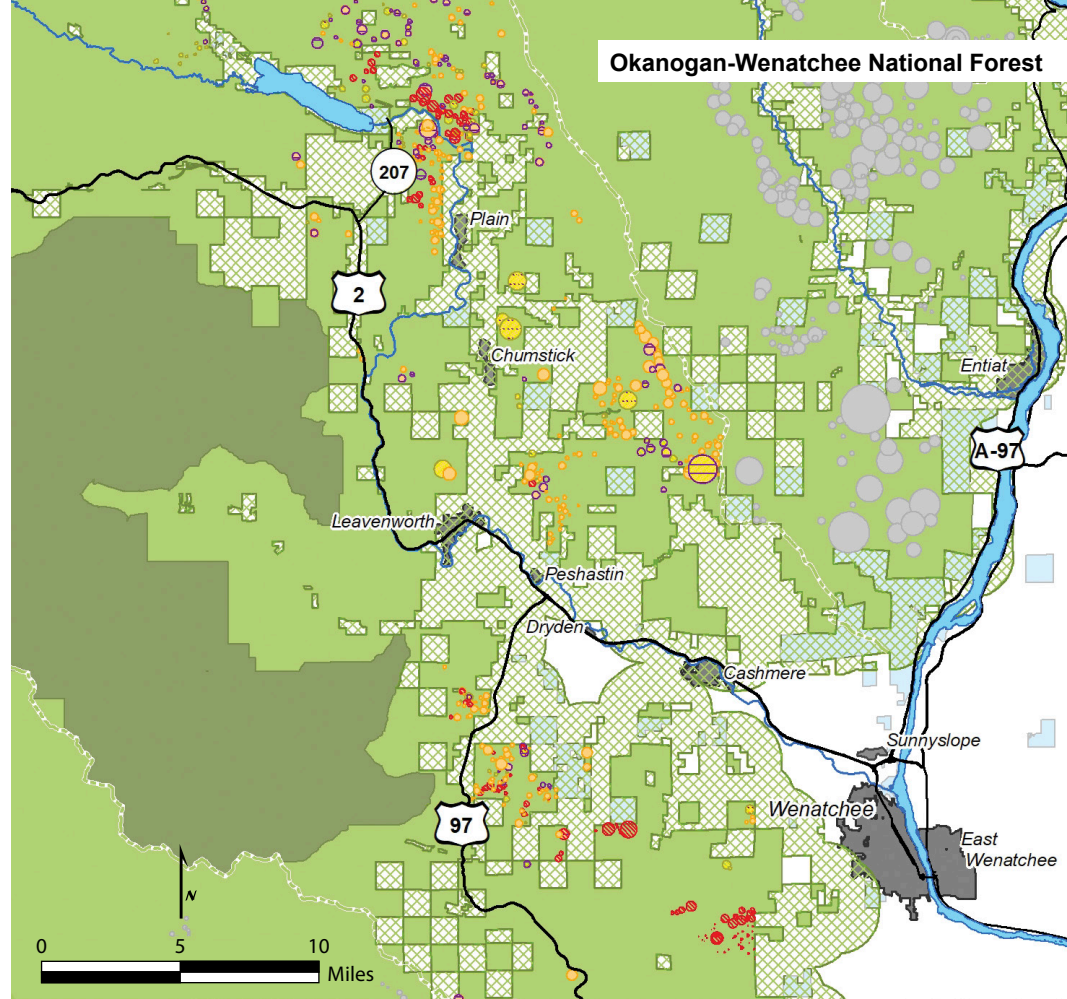
Quantifying environmental justice impacts in rural areas is challenging. The main source of demographic data, the U.S. Census Bureau's American Community Survey (ACS), cannot accurately characterize small populations dispersed over large areas, as is typical of rural populations, because the data are estimated from small population samples. Additionally, the wildfire risk reduction benefits of fuels treatments are limited to a relatively narrow zone adjacent to national forest lands. This zone poorly matches the geography of survey data units, which may encompass hundreds of square miles or more in rural areas.

To overcome these challenges, Adams designed a method for integrating demographic data from the decennial census with Forest Service management data in a GIS, so that the spatial concentration of fuels reduction benefits and racial or ethnic minority populations could be directly compared.

"The strength of our quantitative methodology is that it addresses limitations in ACS data that are often poorly understood, leading to potential misuse," Adams says.

Executive Order 12898 refers to both minority and low-income populations, but income data that fit the scale of fuels management are not available from the decennial census. As a proxy, Adams used renter-occupied housing. The spatial analysis for renters closely overlapped with nonwhite population and so subsequent analysis focused solely on race and ethnicity.

The researchers first analyzed the spatial patterns created by 10 years' worth of fuels treatments in dry, mixed-conifer forests on 12 national forests in five western states. Next, they mapped a 1.5-mile zone adjacent to national forest lands where potential treat-



Wenatchee River Ranger District hazardous fuels reduction activity records: 2006–2015

- Prescribed burn
- Mechanical
- Thin: fuels reduction
- Thin: commercial
- Fuels activity, other district

Land ownership

- USFS—Okanogan-Wenatchee National Forest
- USFS wilderness
- Washington State lands

Management context

- Community boundary
- 1.5-mile fuels reduction effect zone



Map of fuels reduction activities in the Okanogan-Wenatchee National Forest, Washington. People living within the 1.5-mile fuels reduction effect zone (cross-hatched area) may benefit from a reduced risk of wildland fire loss. Fuels reduction activities are depicted as circles sized to the acreage treated; the actual treated area is not circular. USDA Forest Service map by Mark Adams.

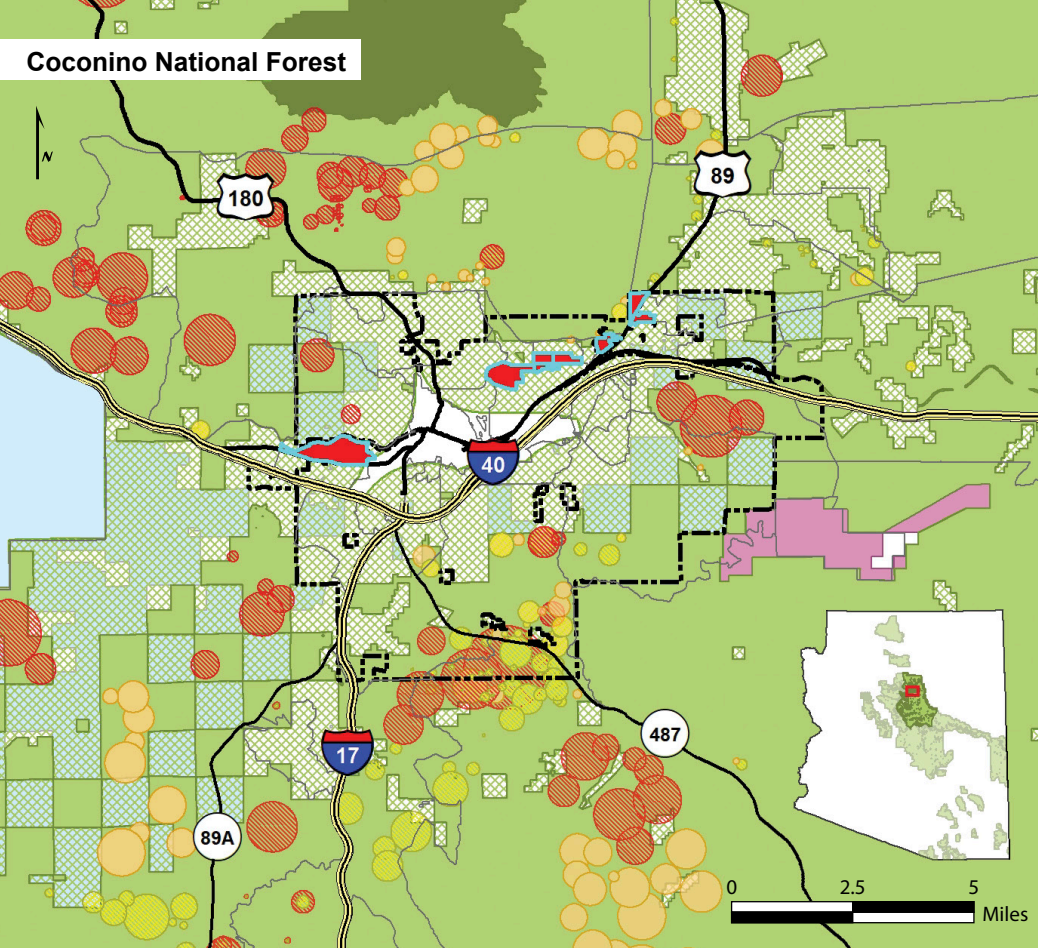
ments could reduce the likelihood of extreme fire behavior and thus reduce the risk of a home loss. The spatial analysis identified locations within the risk reduction zone where the benefits of actual fuels treatments tended to concentrate and compared those to locations with concentrations of racial and ethnic minority populations within the zone. If minority populations and fuels treatment benefits always concentrated in separate locations, that would suggest forest managers consistently treated fuels in locations where neighboring racial minority populations could not benefit from them.

Each national forest was analyzed independently so that conclusions about potential impacts were appropriate to the scale of decisionmaking authority that could change fuels management practices.

None of the 12 national forests systematically failed to provide an equitable distribution of benefits from fuels reduction projects. However, the analysis flagged at least one "hotspot," a local concentration of minority population that may not have received an equitable allocation of fuels treatment benefits, on each forest in the study.

Interviews Provide Context

Adams and Charnley interviewed Forest Service staff to learn how fuels managers made decisions, the extent of their knowledge of environmental justice, whether they engaged with community members in planning and implementing fuels reduction activities, and if they considered characteristics of neighboring populations when planning fuels projects. The interviews focused equally on



Flagstaff Ranger District hazardous fuels reduction activity records: 2006–2015

- Prescribed burn
- Thin: hazardous fuels reductions
- Thin: pre- / commercial

Land ownership

- USFS—Coconino National Forest
- Other national forest
- USFS wilderness
- National Park Service
- Arizona state lands

Management context

- 1.5-mile fuels reduction effect zone
- Flagstaff, AZ city limit
- Census data unit

“Hotspot”

- High concentration of minority population and negligible fuels reduction benefit

Map of fuels reduction activities in the Coconino National Forest surrounding the city of Flagstaff, Arizona. Analysis revealed that neighborhoods in western and northern parts of the city were potential environmental justice hotspots (red areas outlined in blue). USDA Forest Service map by Mark Adams.

ranger districts with and without hotspots to determine whether there were decisionmaking tendencies that appeared to be unique to places with hotspots. Interviews were designed to determine whether mapped hotspots were reliable indicators of environmental justice issues.

“Every forest had at least one location where minority populations were somewhat concentrated and received little or no benefit from the agency’s efforts to reduce the fuel hazard,” Adams says. “But when you talk to managers, you might hear that fuel conditions in that area are good, that there wasn’t a need to reduce fuels. It’s very difficult to learn that without doing interviews.” Most hotspots appearing in the maps did not raise environmental justice concerns for this or similar reasons. But a few did.

For example, in one flagged area, nearly half of all nonwhite residents living close enough to the national forest to benefit from fuels reduction by that forest resided in one small part of a single neighboring city. The forest’s fuels staff

accomplished considerable fuels reduction work on the ranger district surrounding the city during the study period. However, most fuels treatments were completed in portions of the district north of the city. The benefits of these north-side treatments accrued to residents that are mostly white and relatively high income. Other areas of the district where treatments could have benefited the concentrated minority population were largely untreated during the study period.

Interviews with agency managers revealed that treating fuels in the location where the minority population could receive the benefit was very difficult because of fragmented national forest ownership, steep topography, limited roads, and prevailing winds that would push smoke from prescribed fires directly into the city’s population center.

Confronted with the difficulty of completing fuels work in this location and possessing a strong desire to achieve significant overall fire risk reduction on the lands they manage,

this forest’s fuels staff decided to focus on the forest lands north of the city where they were confident that they could accomplish much more. The staff recognized the presence of a disproportionately large minority population neighboring the untreated area, but, according to Adams, they had not considered that community characteristic as a decisionmaking factor in planning fuels projects.

Multiple interviewees responded similarly. They said they generally did not think about environmental justice issues, such as fair distribution of wildfire risk-reduction benefits when planning fuels projects. A few said they considered the characteristics of local populations as they strategized future fuels work but did so informally. Their considerations were neither systematic nor directed by a supervisor.

Integrating Environmental Justice Into Planning

A statement of expected environmental justice impact is required as part of a National Environmental Policy Act (NEPA) analysis of a proposed management action. However, the Forest Service guidance for how to perform an assessment that would support such a statement of impact is ill-suited to evaluating specific project activities such as fuels reduction.

By the time managers complete the NEPA process for a fuels project, they may have already made multiple decisions leading to their proposed actions based primarily on biophysical factors, Adams explains. Revelations of environmental justice concerns in the latter stages of NEPA might not result in changes to the proposed actions.

Including environmental justice as one consideration at the start of the project planning process would provide managers with more flexibility to design projects that direct a proportionate share of benefits toward nearby low-income and minority communities.

“The protocol that we developed for determining who is living around national forests and characterizing potential environmental justice impacts of Forest Service management activities could be adapted and applied on other national forests to do environmental justice assessment as part of project planning and development,” says Charnley.

The general lack of awareness of environmental justice issues among the Forest Service staff interviewed for the study suggests that more collaboration with low-income and minority communities is needed in the public engagement process for forest management decisionmaking.

Catherine Doyle-Capitman, a social scientist with the Forest Service’s Ecosystem Management Coordination staff in

Washington, D.C., believes the method Adams and Charnley developed can elevate environmental justice in forest planning by helping the agency identify where underserved and minority communities exist in proximity to National Forest System lands.

“We should include those communities early and often,” Doyle-Capitman says. “Starting with understanding where the vulnerable communities are, then increasing understanding of their particular vulnerabilities, and their needs and desires, and how our management might affect them positively or negatively.”

Moving Forward

In January 2021, President Biden issued Executive Order 14008 directing federal agencies to develop an environmental justice scorecard. The scorecard will list performance measures that agencies plan to use for tracking how successfully they are addressing environmental justice issues. Proposed measures will be posted for public viewing in 2022.

Adams is part of the Forest Service’s environmental justice steering committee. The committee is considering creating baseline environmental justice population maps and datasets for national forest units across the country similar to those Adams created for the Northwest Forest Plan modernization team.

LAND MANAGEMENT IMPLICATIONS

- Identifying low-income and minority populations and their interests at the beginning of the project development process would give natural resources managers more flexibility to weigh environmental justice equally with other factors in decisionmaking.
- Early consideration of environmental justice in planning could improve outreach to and collaboration with low-income and minority communities in developing forest management projects. Doing so could help build trust with people historically underrepresented in collaborative national forest management processes and increase awareness about environmental justice issues among agency staff.
- The methods developed in this study can be used to identify potential disproportionate impacts from a variety of Forest Service management actions on nearby populations, such as smoke from prescribed fire, invasive species control, and herbicide spraying. The methods can also be used by other federal land management agencies.

The modernization team is a joint effort between the Forest Service’s Pacific Northwest Region (R6) and the Pacific Southwest Region (R5) and is guiding the revision of land management plans for five forests in northern California and southern Oregon. Adams adapted his method to create maps the team can use to plan a strategy for engaging minority and low-income populations that have typically not been reached in past public participation efforts.

Once these populations are identified, managers can also readily map the distribution of

public benefits from past accomplishments of specific programs, such as fuels or water quality management; evaluate whether low-income and minority populations have been equitably served in comparison to other populations; and consider incorporating potential remedies for any perceived past inequity as a decision criterion at parity with resource conditions when planning future work programs.

Further Reading

Adams, M.D.O.; Charnley, S. 2018.

Environmental justice and U.S. Forest Service hazardous fuels reduction: a spatial method for impact assessment of federal resource management actions. *Applied Geography*. 90: 257–271. <https://www.fs.usda.gov/treearch/pubs/55706>.

Adams, M.D.O.; Charnley, S. 2020. The environmental justice implications of managing hazardous fuels on federal forest lands. *Annals of the American Association of Geographers*. 110(6): 1907–1935. <https://www.fs.usda.gov/treearch/pubs/61406>.

Charnley, S.; Jaworski, D.; Huber-Stearns, H. [et al.]. 2018. Environmental justice, low-income, and minority populations, and forest management in the Northwest Forest Plan area. Chapter 10. In: Spies, T.A.; Stine, P.A.; Gravenmier, R.; Long, J.W.; Reilly, M.J., tech. cords. Synthesis of science to inform land management within the Northwest Forest Plan area. Gen. Tech. Rep. PNW-GTR-966. Portland, OR: U.S. Department of Agriculture, Forest Service Pacific Northwest Research Station: 809–849. <https://www.fs.usda.gov/treearch/pubs/56332>



Collaborative group members and local residents tour areas of the Eldorado National Forest, California, where fuels reduction treatments are underway. USDA Forest Service photo by Paul Wade.

Writer’s Profile

Josh McDaniel, a science writer based in Colorado, contributed to this article. He can be reached at mmcdaniel24@gmail.com.



U.S. Department of Agriculture
Pacific Northwest Research Station
1220 SW Third Avenue
P.O. Box 3890
Portland, OR 97208-3890

Official Business
Penalty for Private Use, \$300

Scientist Profiles



MARK D. O. ADAMS is a research geographer at the Pacific Northwest Research Station, appointed through the Oak Ridge Institute for Science and Education postdoctoral fellowship program. His research examines how natural resource management is related to social change in communities. Adams earned a Ph.D. in geography from the University of Wisconsin-Madison.

Adams can be reached at:

USDA Forest Service
Pacific Northwest Research Station
620 SW Main Street Suite 502
Portland, OR 97205

E-mail: mark.adams1@usda.gov



SUSAN CHARNLEY is a research social scientist whose research investigates how forests and rangelands in the American West can be managed to support rural community well-being and natural resource-based livelihoods while fostering ecosystem health and resilience.

Charnley can be reached at:

USDA Forest Service
Pacific Northwest Research Station
620 SW Main Street Suite 502
Portland, OR 97205

E-mail: susan.charnley@usda.gov