

ERI — Issues in Forest Restoration

## Public perceptions of forest restoration in the southwest— A synthesis of selected literature and surveys



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The Ecological Restoration Institute at Northern Arizona University is a pioneer in researching, implementing, and monitoring ecological restoration of southwestern ponderosa pine forests. These forests have been significantly altered over the last century, with decreased ecological and recreational values, near-elimination of natural low-intensity fire regimes, and greatly increased risk of large-scale fires. The ERI is working with public agencies and other partners to restore these forests to a more ecologically healthy condition and trajectory—in the process helping to significantly reduce the threat of catastrophic wildfire and its effects on human, animal, and plant communities.

cover photo: *Tunnel Springs prescribed fire, Flagstaff, spring of 2004.* Forest thinning and prescribed burning around inhabited areas is done both for community wildfire protection and to improve forest health. But with the benefits may come health concerns, visibility impairment, public safety issues, and diminished scenic and place value—the public nonetheless appears to understand and strongly support such work.

*Photo:* Peter Friederici

Ecological Restoration Institute  
Northern Arizona University  
Box 15017, Flagstaff AZ 86011-5017  
928.523.7182 • [www.eri.nau.edu](http://www.eri.nau.edu)

Authors: Jesse Abrams and Kimberly Lowe  
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## EXECUTIVE SUMMARY

The restoration of forest ecosystems is an important, yet sometimes controversial, practice. In recent years numerous studies have explored how the public perceives forest health, restoration, and fire; however, few analyses have summarized and compared results across studies. The purpose of this publication is to identify consistencies in the results of recent studies, assess the public's overall understanding of forest restoration issues, and evaluate areas of continuing controversy.

The information presented here is a synthesis of public survey research conducted throughout the country, with a primary focus on research conducted in the Southwest. We integrated a broad spectrum of literature in our evaluation, including peer-reviewed publications, gray literature, and unpublished studies. Each source was selected based on its focus and content area. We reached the following conclusions:

- Residents of the Southwest understand the ecological role of fire in southwestern forests, but many are uncomfortable with allowing wildfires to burn.
- The use of prescribed fire (fire introduced by managers under specified conditions to achieve management objectives) as a management tool is strongly supported.
- Residents of the Southwest are concerned about the possible impacts of smoke from prescribed fire and wildfire. However, most believe that smoke is an acceptable side effect of using prescribed fire to manage the region's forests.
- The use of mechanical thinning to reduce forest fuels and restore forest structure is widely supported.
- Residents of the Southwest are solidly opposed to old-growth logging and do not believe logging should drive the USDA Forest Service's budget. However, they are not consistently opposed to the removal of some larger trees during thinning operations.
- The Forest Service has earned a high level of public trust in its forest management, including the implementation of prescribed fire and mechanical thinning programs, in the Southwest.
- Government land managers and universities were chosen as top sources for public information regarding forest management.

## INTRODUCTION

Understanding public values, perceptions, and preferences is increasingly recognized as a crucial element of public land management.<sup>1</sup> Individuals who reside far from public forests, as well as those living nearby, expect to have their voices heard on a range of management issues, including restoration prescriptions and policies. Recent investigations have concluded that “[Resource management] policies and practices lacking societal acceptance and approval will ultimately fail” even if scientifically valid and economically feasible.<sup>2</sup> Therefore, the success of forest restoration in the Southwest is tied to an understanding of public opinions, including sources of disagreement and conflict.

A number of studies have been conducted in recent years to assess public opinion on issues related to restoration and fire management, yet they have not been readily accessible. This report synthesizes public opinion data on forest restoration-related issues in the Southwest (Arizona, Colorado, New Mexico, and Utah) in order to identify areas of agreement and disagreement and to outline future research needs. It is intended to provide guidance to forest managers, policy makers, and researchers in planning future treatments and research.

## HOW WE CONSTRUCTED THIS ANALYSIS

The information presented in the tables that follow is based exclusively on studies conducted in the Southwest. Additional results from studies focused on other geographic areas are included in the text in order to provide context for the information presented in the tables. To compare results across studies, we chose questions from different surveys that were fundamentally similar in terms of the questions asked and response categories given. The specific wordings of questions in the tables represent general summaries of the survey questions, and do not necessarily reflect the exact wordings as they originally appeared in the surveys.

In some cases, seemingly similar questions on different surveys resulted in dissimilar answers. There are several reasons why different surveys produce inconsistent responses to similar questions. The surveys included here were not all sampled from the same populations; some surveyed residents of an entire state, others surveyed only part of a state, and others included samples from several different states. Each survey is based on a sample of people, and it can be expected that different samples, even from the same population, will show some variation. Furthermore, the surveys were administered during different years, and public opinions change over time, particularly in response to important events or personal experiences. Finally, differences in the way a question is asked and differences in what response categories are given can have a big effect on the answers respondents give. These sources of variation should be considered when interpreting the results presented here. Unless otherwise indicated, differences noted in the text are statistically significant. Interested readers should consult the original literature for more information on each study.

## THE ROLE OF FIRE IN SOUTHWESTERN FORESTS

*Most people believe fire can, and does, play an important role in southwestern forest ecosystems.*

	Winter and Cvetkovich 2003			Ostergren 2005
	Arizona	Colorado	New Mexico	
Fire is a natural part of the forest ecosystem	82%	87%	85%	67%
Fire is not a natural part of the forest ecosystem	n/a	n/a	n/a	16%

Fire has been a natural and frequent occurrence in southwestern forests for millennia, but within the last century fire suppression has become a dominant forest management policy.<sup>3</sup> After decades of hearing the “Smokey Bear” message that all forest fires are bad, Americans are starting to hear a more nuanced message: fires can be beneficial or detrimental depending on conditions. Two recent studies found high levels of understanding for the natural role of fire in southwestern forests.<sup>4</sup> Differences in the way survey questions were asked may account for the variation in results.

Several other surveys indicate that residents of the Southwest have a fairly complex view of fire and understand that recent catastrophic fires are, at least in part, a consequence of decades of fire suppression. In one of the first studies of its kind, a 1981 survey showed that over two-thirds of Tucson, Arizona residents believed fires could have a beneficial effect on forests.<sup>5</sup> In a more recent survey, 79 to 87 percent of residents of the Southwest believed that many plants require occasional fire for new seedlings to sprout.<sup>6</sup> In 2003, 76 percent of residents of Arizona’s ponderosa pine belt believed the following statement was true: “We now have many damaging fires because fires were suppressed for many years.”<sup>7</sup> A 2005 poll showed 78 percent of Arizonans agreeing with the statement, “Not all forest fires are bad.”<sup>8</sup>

These findings show strong levels of understanding of the natural role of fire in southwestern forests and reflect a shift away from the belief that all forest fires are bad. This may help to explain the widespread support in the Southwest for the use of prescribed fire (fire introduced by managers under specified conditions to achieve management objectives). However, survey results presented elsewhere in this document suggest that people are not necessarily comfortable with allowing naturally ignited fires to burn freely.

## EXTINGUISHING ALL WILDFIRES

*There is disagreement over whether naturally ignited fires should ever be allowed to burn freely.*

	Ostergren 2005	Social Research Lab 2005
I believe wildfires should burn if no lives are threatened	39%	43%
I believe wildfires should not burn even if no lives are threatened	48%	47%

For decades, the U.S. Forest Service and many other land management agencies had a policy of extinguishing all fires. More recently, some National Forests, National Parks, and other public land units have allowed certain naturally ignited fires to burn as long as no lives or structures were threatened and the risk of the fire getting out of control was low. Two recent surveys examined whether or not residents of the Southwest support a policy of allowing wildfires (as opposed to prescribed burns) to burn if no human lives are at stake. In both cases a near-majority felt that all wildfires should be extinguished, even if no lives are threatened.<sup>9</sup>

However, other surveys have indicated greater support for allowing naturally ignited fires to burn. In a study examining Arizona, Colorado, and New Mexico residents' opinions on fire management, between 20 and 26 percent of those surveyed believed "All fires must be extinguished regardless of cost," while majorities in all three states agreed with the statement "We probably have to let some fires burn, but must protect residences."<sup>10</sup> Between six and 11 percent felt that fires should be allowed to burn naturally even if structures are at risk. A National Park study found that 33 percent of visitors to Grand Canyon National Park believed all fires should be prevented in National Parks.<sup>11</sup> In a 1981 survey of Tucson, Arizona residents, over 57 percent agreed with the statement, "Fires that are burning underbrush and debris, but not tall trees, should be allowed to burn as long as they're watched."<sup>12</sup>

These findings show some support for allowing naturally ignited fires to burn. However, two of the most recent surveys found lower levels of acceptance, perhaps because both used the word "wildfire" whereas previous studies did not. These mixed results contrast with studies showing consistently high support for prescribed fire, as discussed below.



## PRESCRIBED FIRE

*The majority of residents of the Southwest support using prescribed fire as a forest management tool to reduce wildfire risk and severity.*

	Delost 2001		Social Research Laboratory 2003	Brunson and Shindler 2004		
	Wildland- urban interface residents <sup>13</sup>	Non- wildland- urban interface residents		Arizona	Colorado	Utah
I support wide use of prescribed fire	69%	43%	76% <sup>14</sup>	46%	48%	37%
I support sparing use of prescribed fire	26%	49%		45%	45%	49%
I oppose prescribed fire	5%	8%	18%	5%	3%	6%
I believe prescribed fire reduces wildfire risk and severity	89%	88%	n/a	67%	67%	57%
I believe prescribed fire does <i>not</i> reduce wild- fire risk and severity	7%	6%	n/a	22%	21%	26%

Research demonstrates that prescribed fire can be very effective in reducing forest fuel loadings and has ecological benefits in many southwestern forests.<sup>15</sup> Therefore, prescribed fire is a common management tool in the Southwest. Survey results indicate strong support for using prescribed fire, with the majority of survey participants believing it will reduce wildfire risk and severity.<sup>16</sup>

Some surveys evaluated how personal characteristics or experiences influence perceptions regarding the issue of prescribed fire. Knowledge of prescribed fire's effects, and trust in the implementing agency, have been found to be particularly important factors influencing people's acceptance of its use.<sup>17</sup> Results from a 2002 survey, while not tested for statistical significance, suggest that support for prescribed fire did not differ between those who lived in metropolitan areas (86 percent support among Maricopa County, Arizona residents; 88 percent support among Pima County, Arizona residents) and those who lived in more rural areas (86 percent support).<sup>18</sup>

## SMOKE IMPACTS FROM PRESCRIBED FIRES

*The majority of respondents feel that smoke produced by prescribed fires is acceptable.*

	Delost 2001		Ostergren 2005
	Wildland-urban interface residents	Non-wildland urban interface residents	
I believe smoke from prescribed fire is acceptable	69%	56%	76%
I believe smoke from prescribed fire is <i>not</i> acceptable	16%	20%	12%

All fires, whether naturally ignited or prescribed, produce smoke. Air quality impacts from fires can affect visibility, aesthetics, public safety, and human health.<sup>19</sup> Two recent surveys found that residents of the Southwest generally believe that smoke from prescribed fires is acceptable.<sup>20</sup>

A recent study reported that 56 percent of the respondents in Yavapai County, Arizona, 37 percent of respondents on Colorado’s Front Range, and 58 percent of respondents in the Salt Lake City and Tooele, Utah suburbs rated smoke from prescribed fires as a “great” or “moderate” concern.<sup>21</sup> The remainder rated it as a “slight concern” or “not a concern.” In the aftermath of an escaped prescribed fire that reduced air quality in northern Utah, only 11 to 15 percent of affected residents agreed with the statement “Because of smoke, prescribed fire isn’t worth it.”<sup>22</sup> A survey administered in 2002 found that 82 to 83 percent of respondents in Arizona, Colorado, and New Mexico believed the statement “People have difficulty breathing due to poor air quality after a fire” was true.<sup>23</sup> Note that this question did not distinguish between prescribed fires and wildfires.

Residents of the Southwest are concerned about the possible impacts of smoke from prescribed fire and wildfire. However, most believe that smoke is an acceptable side effect of using prescribed fire to manage the region’s forests.

## MECHANICAL THINNING

*Residents of the Southwest support the use of mechanical thinning and believe it is effective in reducing the risk and intensity of wildfires.*

	Delost 2001		Brunson and Shindler 2004		
	Wildland- urban interface residents	Non- wildland- urban interface residents	Arizona	Colorado	Utah
I support wide use of mechanical thinning	79%	57%	61%	58%	43%
I support sparing use of mechanical thinning	20%	38%	27%	25%	36%
I oppose mechanical thinning	2%	3%	4%	6%	9%
I believe mechanical thinning reduces wildfire risk and intensity	90%	82%	73%	74%	61%
I believe mechanical thinning does <i>not</i> reduce wildfire risk and intensity	1%	2%	10%	11%	23%

Recent surveys have found strong public support for the use of mechanical thinning in reducing forest fuels and restoring forest structure, though levels of support appear to vary among different locations and contexts.<sup>24</sup> In one recent study, Utah residents were less supportive of mechanical thinning, and less likely to believe in its effectiveness, than Colorado or Arizona residents.<sup>25</sup> Another survey reported differences in both acceptance of thinning and beliefs in its effectiveness between wildland-urban interface and non-wildland-urban interface residents.<sup>26</sup> It also concluded that very few respondents were concerned with the effects of mechanical thinning on soil erosion or water quality, soil compaction, ecosystem damage, recreational opportunities, scenic beauty, wildlife habitat, and native plant growth. A 2001 survey recorded positive attitudes toward, and approval of, mechanical thinning among both permanent and seasonal residents of western Colorado, with no significant differences between homeowner types.<sup>27</sup> A 1998 survey found positive attitudes toward mechanical thinning as a means of performing restoration in the Mt. Logan Wilderness Area in northern Arizona.<sup>28</sup> Taken together, these studies show that the use of mechanical thinning as a management tool has widespread support among residents of the Southwest.

## REMOVING LARGE-DIAMETER TREES

*Residents of the Southwest want old-growth forests protected but do not consistently agree whether it is acceptable to remove “large-diameter” trees.*

	Behavior Research Center 2002	Social Research Laboratory 2003	Social Research Laboratory 2005	Ostergren 2005
It is acceptable to remove large trees during thinning operations	12%	44%	46%	55%
It is <i>not</i> acceptable to remove large trees during thinning operations	67%	36%	34%	30%

Removing large-diameter trees during thinning operations has become a controversial issue for forest managers around the country. Restoration treatments, as well as fuel reduction operations, often include the removal of trees in a range of size classes. There is no universally accepted definition of “large-diameter,” and disagreement exists as to whether large trees should ever be removed during thinning treatments. A related issue concerns the removal of old-growth trees, which are usually not only large in size, but also centuries old.

Public opinion regarding the removal of large-diameter trees was evaluated in four recent surveys.<sup>29</sup> One study documented majority support for focusing on thinning smaller brush and trees rather than on cutting large trees. In the three other surveys, more respondents supported large tree removal than opposed it. These varying results are likely due to differences in the way each survey asked this question. For example, only one of the four studies actually defined “large-diameter tree” (in this case, a tree over 16 inches in diameter).<sup>30</sup>

In a 2002 survey, 76 percent of Arizonans felt that it was important to save old-growth southwestern forests.<sup>31</sup> Another Arizona survey found that 79 percent believed the Forest Service’s budget should not depend on how much commercial timber is produced.<sup>32</sup>

These results suggest that people may accept thinning of large trees, depending on the context and how “large tree” is defined. Residents of the Southwest are solidly opposed to old-growth logging and do not believe logging should drive the Forest Service’s budget, but are not consistently opposed to the removal of some larger trees during thinning operations.

## TRUST IN THE FOREST SERVICE

*There are high levels of public trust in the Forest Service to manage southwestern forests responsibly.*

	Delost 2001 (prescribed fire)		Delost 2001 (mechanical thinning)		Social Research Laboratory 2005 (overall management)
	Wildland- urban interface residents	Non wildland- urban interface residents	Wildland- urban interface residents	Non wildland- urban interface residents	
I trust the Forest Service to manage responsibly	70%	71%	75%	78%	72%
I do <i>not</i> trust the Forest Service to manage responsibly	15%	11%	10%	8%	19%

Public trust in land management agencies has been recognized as an important factor influencing the acceptability of management actions.<sup>33</sup> Two recent Arizona surveys found high levels of public trust in the Forest Service’s overall forest management and in the implementation of its prescribed fire and mechanical thinning programs.<sup>34</sup>

Other surveys have addressed similar topics. One recent study measured public trust in the Forest Service along an eight-point scale (1 = “You do not trust the Forest Service at all”; 8 = “You trust the Forest Service completely”).<sup>35</sup> Average scores for respondents from Arizona, Colorado, and New Mexico were 6.3, 6.1, and 5.8, respectively. These values indicate a relatively high level of trust for the Forest Service. High levels of public trust in the Southwest contrast with levels of trust elsewhere in the country. A 2000 survey of northeast Oregon residents found only 43 percent trusted the Forest Service with a prescribed fire program and 52 percent with a mechanical thinning program.<sup>36</sup>

A recent study focusing on California, Michigan, and Florida found support for the notion that public trust in government land managers is associated with perceived agency competence as well as with perceived risks and benefits of proposed actions.<sup>37</sup> Despite the range of controversial issues confronting the Forest Service, residents of the Southwest report high levels of trust in the agency’s management of forestlands, and specifically in its implementation of prescribed fire and thinning programs.

## SOURCES FOR PUBLIC INFORMATION

*Government land managers and universities were selected as the most credible sources for public information on forest health issues.*

	Social Research Laboratory 2003	Social Research Laboratory 2005
Government land managers	33%	29%
Universities	31%	37%
Environmental groups	20%	20%
Businesses	n/a	2%
Timber companies	6%	n/a
Newspapers	n/a	3%
Television	n/a	2%

Learning about forest health issues from a credible, accurate, and unbiased source is important. The public obtains information through a variety of avenues, each with its own objectives and perspectives. Results from the 2003 and 2005 Grand Canyon State Surveys show that the majority of respondents believe government land managers and universities provide the most credible information on forest management.<sup>38</sup> Note that respondents were asked to choose only one source as the most persuasive (in 2003) or most accurate (in 2005).

A recent study examined trust in information sources in the Pacific Northwest.<sup>39</sup> It found that 84 percent of survey respondents rated university researchers as “trustworthy,” while newspapers and magazines, TV and radio programs, and environmental groups were considered trustworthy by 53, 49, and 25 percent, respectively. Other surveys evaluated where the public prefers to get its information on forestry issues. Survey participants in Arizona ranked newspapers (33 percent) and the Forest Service (28 percent) as the most preferred information sources, while only 14 percent selected television and nine percent radio.<sup>40</sup> Magazines, the Internet, and nonprofit organizations were rarely selected in this survey, with fewer than six percent of respondents selecting each of these options.

## CONCLUSIONS

The results synthesized in this publication point to areas of agreement and disagreement in the public debate over forest restoration. The Forest Service, which manages most of the forestland in the Southwest, has earned a high level of public trust in its management of the National Forests. Mechanical thinning and prescribed fire, two major tools in fuel reduction and forest restoration, are also widely supported by the public, and the smoke effects from prescribed fire are seen as an acceptable consequence of using this management approach. The public has a fairly advanced understanding of the natural role of fire in southwestern forests, with most residents believing fire can have beneficial effects on forest ecosystems.

At the same time, clarity and agreement are lacking regarding some elements of public debate. Surveys point to varying results regarding the acceptability of allowing naturally ignited fires to burn freely. Some studies show majority support for this practice, while others do not. Equally inconclusive are the data on the acceptability of removing large-diameter trees, with some studies pointing to broad opposition and others showing majority support for some removal of large trees. It is likely that public sentiment on both of these topics depends greatly on specific situations. Answers to questions such as “Where will fire be allowed to burn?” “What resources might be at risk?” “How is a large-diameter tree defined and how many will be removed?” and “What is the justification for removing these larger trees?” will no doubt influence public opinion. More research is needed to investigate the nuances of these important issues. Future research is also needed to examine the relationships between demographic variables (for example, age, income, ethnicity, and education) and opinions on forest restoration, particularly at a time when the population of the Southwest is rapidly changing.

**APPENDIX:  
PUBLIC OPINION SURVEYS IN THE SOUTHWEST USED IN THIS REPORT.**

Study	Type of publication	Year of survey	Geographic scope	Number of surveys returned (n)
Behavior Research Center (2002)	White paper	2002	AZ	703
Brunson and Shindler (2004)	Peer-reviewed, published	2002	Yavapai County, AZ; Boulder and Larimer counties, CO; Tooele and portions of Salt Lake and Utah counties, UT; also a site in OR	173 (AZ); 164 (CO); 203 (UT)
Brunson and Evans (2005)	Peer-reviewed, published	2003–2004	Utah, Salt Lake, and Wasatch counties, UT	270
Cortner et al. (1984)	Peer-reviewed, published	1981	Tucson, AZ metropolitan area	1200
Delost (2001)	Master's thesis	2000	AZ	464
DeMillion (1999)	Master's thesis	1998	Communities in the vicinity of Mount Logan Wilderness, AZ	408
Muleady-Mecham et al. (2004)	Peer-reviewed, published	2001	Visitors to Grand Canyon National Park, AZ	4618
Ostergren (2005)	White paper	2003	Ponderosa pine belt in Arizona	693
Ostergren and Ruther (2005)	Peer-reviewed, published	2003	Ponderosa pine belt in Arizona	693
Social Research Laboratory (2003)	White paper	2003	AZ	610
Social Research Laboratory (2005)	White paper	2005	AZ	423
Vogt (2002)	Peer-reviewed, published	2001	Vicinity of Grand Mesa, Uncompahgre, and Gunnison National Forests in CO; also sites in CA and FL	320 (CO)
Winter and Cvetkovich (2003)	White paper	2002	Arizona, Colorado, and New Mexico; also sampled California	ca. 400 in each state (AZ, CO, NM)



## NOTES

- 1 Kennedy and Thomas 1995; Shindler et al. 2002a.
- 2 Shindler et al. 2002a.
- 3 Covington 2003.
- 4 Ostergren 2005; Winter and Cvetkovich 2003.
- 5 Cortner et al. 1984.
- 6 Brunson and Shindler 2004.
- 7 Ostergren 2005.
- 8 Social Research Laboratory 2003.
- 9 Ostergren 2005; Social Research Laboratory 2005.
- 10 Winter and Cvetkovich 2003.
- 11 Muleady-Mecham et al. 2004.
- 12 Cortner et al. 1984.
- 13 The term “wildland-urban interface” refers to the region where homes and other structures meet forest or wildland fuels. Residents of these areas face higher risks of life and property loss due to wildfire than do non-wildland-urban interface residents.
- 14 The 2003 Social Research Laboratory study did not distinguish between “widespread” and “sparing” use of prescribed fire, it simply asked respondents whether they “favor” or “oppose” controlled burns. For this reason, the two categories of support are combined here.
- 15 Covington et al. 1997; Harrington 1996; Pollet and Omi 2002.
- 16 Brunson and Shindler 2004; Delost 2001; Social Research Laboratory 2003.
- 17 Shindler et al. 2002a; Manfredo et al. 1990.
- 18 Behavior Research Center 2002.
- 19 Barkmann 2003.
- 20 Delost 2001; Ostergren 2005.
- 21 Brunson and Shindler 2004.
- 22 Brunson and Evans 2005.
- 23 Winter and Cvetkovich 2003.
- 24 Brunson and Shindler 2004; Delost 2001.
- 25 Brunson and Shindler 2004.
- 26 Delost 2001.
- 27 Vogt 2002.
- 28 DeMillion 1999.
- 29 Behavior Research Center 2002; Ostergren 2005; Social Research Laboratory 2003, 2005.
- 30 Social Research Laboratory 2005.
- 31 Behavior Research Center 2002.
- 32 Ostergren and Ruther 2005.
- 33 Winter et al. 2004.
- 34 Delost 2001; Social Research Laboratory 2005.
- 35 Winter and Cvetkovich 2003.
- 36 Shindler and Toman 2003.
- 37 Winter et al. 2004.
- 38 Social Research Laboratory 2003, 2005.
- 39 Shindler et al. 2002b.
- 40 Ostergren and Ruther 2005.

## REFERENCES

- Barkmann, G. 2003. Air quality and smoke management. Pp. 371-396 in *Ecological restoration of southwestern ponderosa pine forests*, ed. Peter Friederici. Washington, D.C.: Island Press.
- Behavior Research Center. 2002. Public opinion on forest management in Arizona. Prepared for Southwest Forest Alliance, Sierra Club Grand Canyon Chapter, and The Center for Biological Diversity. Phoenix, Arizona. 13 pp.
- Brunson, M. W., and B. A. Shindler. 2004. Geographic variation in social acceptability of wildland fuels management in the western United States. *Society and Natural Resources* 17:661–678.
- Brunson, M. W., and J. Evans. 2005. Badly burned? Effects of an escaped prescribed burn on social acceptability of wildland fuels treatments. *Journal of Forestry* 103(3):134–138.
- Cortner, H. J., M. J. Zwolinski, E. H. Carpenter, and J. G. Taylor. 1984. Public support for fire-management policies. *Journal of Forestry* 82(6):359–361.
- Covington, W. W., P. Z. Fulé, M. M. Moore, S. C. Hart, T. E. Kolb, J. N. Mast, S. S. Sackett, and M. R. Wagner. 1997. Restoring ecosystem health in ponderosa pine forests of the Southwest. *Journal of Forestry* 95(4):23–29.
- Covington, W. W. 2003. The evolutionary and historical context. Pp. 26–47 in *Ecological restoration of southwestern ponderosa pine forests*, ed. Peter Friederici. Washington, D.C.: Island Press.
- Delost, J. 2001. Public attitudes toward forest restoration methods in Arizona. M.S. thesis, Northern Arizona University, Flagstaff, Arizona. 104 pp.
- DeMillion, M. A. 1999. Mount Logan Wilderness reference condition and social preferences for ecological restoration. M.S. thesis, Northern Arizona University, Flagstaff, Arizona. 120 pp.
- Harrington, M. G. 1996. Prescribed fire applications: Restoring ecological structure and process in ponderosa pine forests. P. 41 in *The use of fire in forest restoration*, ed. C. C. Hardy and S. F. Arno. General Technical Report INT-341. Ogden, Utah: USDA Forest Service.
- Kennedy, J.J. and J.W. Thomas. 1995. Managing natural resources as social value. Pp. 311–321 in *A new century for natural resources management*, ed. R.L. Knight and S.F. Bates. Washington, D.C.: Island Press.
- Manfredo, M.J., M. Fishbein, G.E. Haas, and A.E. Watson. 1990. Attitudes toward prescribed fire policies: The public is widely divided in its support. *Journal of Forestry* 88(7): 19-23.

- Muleady-Mecham, N. E., M. E. Lee, and B. D. Burch. 2004. A public opinion survey on wildland fire in Grand Canyon National Park. *The George Wright Forum* 21(4):12–21.
- Ostergren, D. M., and E. J. Ruther. 2005. In press. Public knowledge, opinion and support of forest restoration: A survey of residents in northern Arizona. In Proceedings of the 7th Biennial Conference of Research on the Colorado Plateau, ed. C. van Riper III and D. J. Mattson. Tucson, Arizona: University of Arizona Press.
- Ostergren, D. M. 2005. Fact book for a survey of ponderosa pine ecosystem residents on forest restoration and mountain lions. Flagstaff, Arizona: Northern Arizona University, Ecological Restoration Institute. 193 pp.
- Pollet, J., and P. N. Omi. 2002. Effect of thinning and prescribed burning on crown fire severity in ponderosa pine forests. *International Journal of Wildland Fire* 11:1–10.
- Social Research Laboratory at Northern Arizona University. 2003. Forests are unhealthy, say Arizonans; forest thinning and controlled burns supported. Press release, December 3, 2004. Accessed online at [www4.nau.edu/srl/PressReleases/SRL%20Press%20Release%20-%20Forest%20Health.pdf](http://www4.nau.edu/srl/PressReleases/SRL%20Press%20Release%20-%20Forest%20Health.pdf).
- Social Research Laboratory at Northern Arizona University. 2005. Arizonans support increased public funding for forest restoration. Press release, May 12, 2005. Accessed online at [www4.nau.edu/srl/PressReleases/Press%20Release%20%20Arizona%20Forests.pdf](http://www4.nau.edu/srl/PressReleases/Press%20Release%20%20Arizona%20Forests.pdf).
- Shindler, B., M. Brunson, and G.H. Stankey. 2002a. Social acceptability of forest conditions and management practices: A problem analysis. General Technical Report PNW-GTR-537. Portland, Oregon: USDA Forest Service.
- Shindler, B., J. Wilton, and A. Wright. 2002b. A social assessment of ecosystem health: Public perspectives on Pacific Northwest forests. Corvallis, Oregon: Oregon State University, Department of Forest Resources. 110 pp.
- Shindler, B., and E. Toman. 2003. Fuel reduction strategies in forest communities: A longitudinal analysis of public support. *Journal of Forestry* 101(6):8–15.
- Vogt, C. 2002. Seasonal and permanent homeowners' past experiences and approval of fuels reduction. Pp. 63-73 in Homeowners, communities, and wildfire: Science findings from the National Fire Plan. Proceedings of the Ninth International Symposium on Society and Resource Management; 2002 June 2–5; Bloomington, Indiana, ed. P.J. Jakes. General Technical Report NC-231. St. Paul, Minnesota: USDA Forest Service.
- Winter, P. L., and G. T. Cvetkovich. 2003. A study of southwesterners' opinions on the management of wildland and wilderness fires. Fire management version. Riverside, California: USDA Forest Service. 28 pp.
- Winter, G., C. A. Vogt, and S. McCaffrey. 2004. Examining social trust in fuels management strategies. *Journal of Forestry* 102(6):8–15.