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Fire and Forethought: Fire Effects Syntheses are a Powerful Tool for Planning and Management Across Resource Fields



A worker with The Nature Conservancy sets a prescribed burn to consume invasive Scotch broom and other invasive plants covered by Species Reviews in the FEIS database. (Photo by Sgt. Austan R. Owen, U.S. Army.)

Greek mythology tells of two races that came before humans: the gods and the Titans. Prometheus, who was one of the Titans, not only created the first man but also stole fire from the gods and gave it to humankind. The name Prometheus comes from the Greek word for “forethought,” which also translates as “careful thinking and planning.”

Today, a commitment like that of Prometheus drives the Rocky Mountain Research Station’s Fire Effects Information System (FEIS) team. Their goal is to provide information on fire for managers. This team of ecologists compiles and synthesizes information about fire regimes and fire effects on plants, lichens, and animals. Their collection of peer-reviewed publications

SUMMARY

The Rocky Mountain Research Station’s Fire Effects Information System (FEIS) team synthesizes information about wildland fires, their history in U.S. ecosystems, and their effects on U.S. wildland plants, lichens, and animals. Found at www.feis-crs.org/feis/, FEIS publications can be used for many purposes, including land use planning, restoration and rehabilitation planning, wildlife and range projects, and related environmental assessments and impact statements. While traditionally used for fire management decisions, FEIS can also be used for NEPA, restoration, and other planning needs by managers in other resource fields, including wildlife, plants, soils, hydrology, and roads. The main benefits are time savings and the unique knowledge that comes from the FEIS team’s synthesis skills, as they identify patterns and inconsistencies in information and show areas where further research is needed. While FEIS is based on literature that dates back more than 100 years and its published Species Reviews go back more than 20 years, the system is especially relevant today due to the overwhelming amount of information available online as well as emerging information on fire’s interactions with climate change, invasive species, and other disturbances such as drought and flooding. Recent upgrades to FEIS include more powerful search functions and the addition of Fire Regime Reports and Syntheses, which provide insight and value to land managers on historical patterns of fire occurrence and current changes in fuels and fire regimes.

“There’s more information available than ever before and yet there are fewer staff on the ground,” Smith says. “We help land and resource managers be more efficient at finding and using information.”

is online at www.feis-crs.org/feis. FEIS publications are based on thorough literature searches, often supplemented with insights from field scientists and managers. The publications can be used for land use planning, restoration and rehabilitation planning, wildlife and range projects, and related environmental assessments and impact statements.

According to ecologist and FEIS team leader Jane Kapler Smith, FEIS is a valuable resource for land and resource managers who frequently find themselves caught between increased responsibilities and dwindling resources. “There’s more information available than ever before and yet there are fewer staff on the ground,” Smith says. “We help land and resource managers be more efficient at finding and using information.”

FIRE APPLICATIONS AND BEYOND

Today, roughly half of all fire-related environmental impact statements prepared by federal wildland managers cite FEIS. But Smith sees enormous potential for increased use of the system—especially beyond fire management. “I’d say that about 40% of the fuel and fire managers out there use FEIS regularly and the rest have a vague familiarity with the system. In fact, FEIS

users very quickly get addicted because it’s so rich in information,” Smith says. “But I also talk to wildlife managers as well as managers for soils, hydrology, and roads who are amazed to find out that FEIS exists. A typical comment I get from those managers is, ‘This is a great resource for finding background information ... and it helps me feel informed when I go to interdisciplinary team meetings!’”

Longtime FEIS user Mary Lata agrees that FEIS is a go-to resource. A fire ecologist for the USDA Forest Service in Arizona, Lata says, “I’ve been a lead instructor for the Rx310: Introduction to Fire Effects training session for about 10 years now, and we always have a section

on FEIS. We require the students to use it in the pre-work and for their final project as well. It’s that good. We think that all resource managers, not just fire managers, need to know about it and how to use it.”

The main value of FEIS publications for land and resource managers is that the publications synthesize an often huge volume of scientific information on a given subject. This results in a major time savings for managers. Smith explains, “It’s so much more than an annotated bibliography. People sometimes say ‘I could just do a Google search or a Google Scholar search.’ But land managers don’t have time to go through thousands of hits. The FEIS database is a place where the manager in the field finds the results of months of work by a professional ecologist who compiled information, pulled out the most relevant aspects, and documented exactly where each fact came from.”

Home

Find Species Reviews

or

or

Find Fire Studies

or

or

Find Fire Regimes

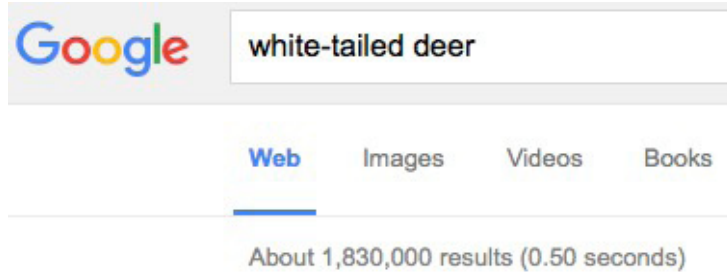
or

or

Search Citation Database

The new FEIS website, released on September 1, 2015 provides a wide variety of search options, allowing users to search by species, geographic location, and other conditions. (Image source: www.feis-crs.org/feis)





Faced with an overwhelming amount of online information, land and resource managers can rely on FEIS to filter, compile, and synthesize the knowledge relevant to fire and other management issues. (Image source: Google.com.)



White-tailed deer feeding in native prairie after prescribed fire in South Dakota. The white-tailed deer Species Review cites 470 references. (Photo courtesy of Charlie Barker, Wind Cave National Park.)

THE MEANING OF “SYNTHESIZE”

The word “synthesize” has several meanings, but one definition is especially applicable to FEIS: “to combine a number of things into a coherent whole.” According to Robin Innes, an ecologist writer on the FEIS team, “Synthesizing at FEIS basically starts with me or the other team members reading lots of information. For the white-tailed deer Species Review there were more than 10,000 published articles available. I

“By pulling together different published resources and looking for patterns, I am creating new knowledge that can be applied to management” says ecologist and FEIS writer Robin Innes.

pull the ones that are relevant and take notes. Then I find patterns, inconsistencies, and areas for further research. By pulling together different published resources and looking for patterns, I am creating new knowledge that can be applied to management.”

A key part of this process is identifying what is not yet known and describing

uncertainty about information. Innes describes this as “hedging.” “You need to know when to say ‘It depends,’” she explains. “It’s why we make sure that we explain the geographic limitations of specific research,” so land and resource managers know that a study’s results may only apply within a certain climate, geographical area, or environment. This also gives land managers a cue about when they may need to collect monitoring data or conduct their own research; it helps them focus their efforts where they are most needed.

REFERENCES FROM GIFFORD PINCHOT TO 2015

Back in 1985, FEIS was created to help make sense of an overwhelming volume of fire ecology research from North America. The searchable FEIS database came into existence a year later. According to Smith, the Fire Effects Library, which provides the literature basis for FEIS publications, has grown significantly from its early days: In 1990 the library contained about 7,000 references; today it contains approximately 60,000. The FEIS database has grown too, currently containing approximately 1,100 Species Reviews, 150 Fire Studies, and 200 Fire Regime Reports, including 13 accompanied by full Fire Regime Syntheses—with more underway.

The Fire Effects Library is also impressive from a historical perspective. Some of its references date back more than 100 years, including materials written by Gifford Pinchot, the first chief of the U.S. Forest Service. But today the literature collection and the syntheses published in FEIS are more relevant than ever. According to Smith, “Our understanding of disturbance ecology is much more sophisticated than before. Fire is an important issue, but land and resource managers need to integrate information on fire with information on



To better understand tundra landscapes, Alaska land managers are using the FEIS Alaskan Tundra Fire Regime Synthesis. (Photo source: USDA Forest Service)



California black oak resprouting after wildfire. The FEIS Species Review describes several causes for the decline of this species, including lack of fire. (Photo by Ilana Abrahamson)

other disturbances like insects, drought, and flooding. Our syntheses, especially on fire regimes, can help with that.”

THE NEW AND IMPROVED VERSION

After several years of development, the FEIS database and website have recently undergone significant revisions. The new user interface, introduced on September 1, is searchable by species name and many other criteria, including map location, plant community, and federal agency. Users can use the website to search for:

- **Species Reviews:** syntheses of information on plant, lichen, and animal species' life history, ecology, and relationships to fire. Species Reviews are available for more than 1,200 species from throughout the United States, including approximately 180 invasive plant species.
- **Fire Regime Reports and Syntheses:** Fire Regime Reports provide basic

information on all fire regimes in the United States. Fire Regime Syntheses flesh out these Reports with extensive information on historical patterns of fire occurrence, extent, and severity; they also address current changes in fuels and fire regimes, which may be caused by climate change or disturbances other than fire. Fire Regime Syntheses have been completed for Alaska and Hawaii and are being developed for the rest of the United States.

- **Fire Studies:** summaries of fire research projects at specific locations. These studies supplement Species Reviews and Fire Regime Syntheses with detailed descriptions of site characteristics, burning conditions, fire behavior, and fire effects from particular research projects.
- **Citations:** A searchable database, the Citation Retrieval System (www.feis-crs.org), contains citations for all references in FEIS publications and the Fire Effects Library.

A HISTORY OF COLLABORATION

Based in the Rocky Mountain Research Station's Fire, Fuel, and Smoke Science Program in Missoula, Montana, the FEIS team works closely with many partners, including the Joint Fire Science Program, the Interagency Fuels Committee, the Bureau of Land Management, and the interagency collaborative group LANDFIRE (described in more detail on page 6), which recently helped FEIS develop the Fire Regime Reports on nearly 200 plant communities.

An organization that has supported FEIS operations for more than 15 years is the Washington Office of Fire and Aviation Management. According to Frankie Romero, fire use and fuels specialist for the organization, “The syntheses that FEIS provides save countless hours over the long haul. Any time there is a particular species of concern, land managers are going to want to consider



“We always ask land managers for their suggestions on what to add or update,” Innes says.

the impact of a land or resource management decision. The spotted owl and sage-grouse have been recent examples. With FEIS, managers can feel confident that they have the information they need to make a decision. FEIS is the place we start when doing analysis.”

The FEIS team listens carefully to land and resource managers who request additional resources or updates on specific topics, such as invasive plants and endangered species. “We always ask land managers for their suggestions on what to add or update,” Innes says. “For example, we’re working on a sage-grouse species update” in response to the Sage-Grouse and Endangered Species Conservation and Protection Act of 2014, “as well as several ponderosa pine Fire Regime Syntheses, in response to specific requests from land and resource managers.”

Another example is the Florida scrub jay, a federally threatened species and the only bird endemic to the state of Florida. In response to managers’ requests, the FEIS Species Review on this species was completely rewritten in 2012 from the original 1992 publication. According to Matthew Trager, National Environmental Policy Act coordinator for National Forests in Florida, “The Ocala National Forest has the largest



Fire in boreal mixed woods, Yukon-Charley Rivers National Preserve, Alaska. Fire Regime Syntheses on Alaskan forest and woodland communities were recently published in FEIS. (Photo: National Park Service.)

population of scrub jays anywhere, so all land management decisions for Ocala scrub habitat have to take the scrub jay into consideration. Not only was the FEIS Species Review thorough and useful, it was great to have all the information in one place. It was pretty technical but it could be understood by non-scientists as well, so we can use the report in support of management decisions like planning prescribed fires. That’s always a challenge in places like the Ocala National Forest that are very close to populated areas.”

LOOKING FORWARD, LOOKING BACK

Jane Kapler Smith is in a great position to consider FEIS—both its past and its future: After 24 years working with FEIS, she’s retiring at the end of October.



The FEIS scrub jay Species Review helps local managers plan for prescribed burns in the Ocala National Forest. (Photo by Christina Macon, Florida Department of Environmental Protection)

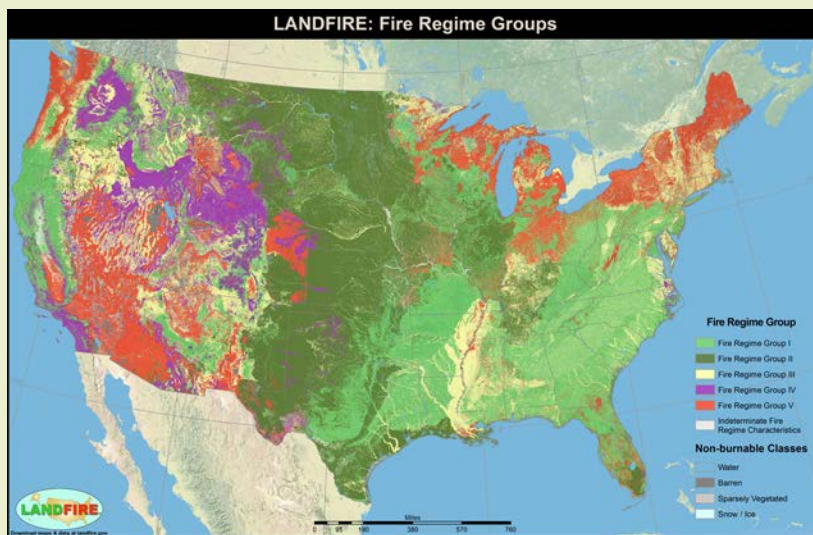


A Brief Look: The LANDFIRE Program

LANDFIRE, or Landscape Fire and Resource Management Planning Tools, is a shared program between the USDA Forest Service's wildland fire management programs and the U.S. Department of the Interior. Created in 2004, LANDFIRE develops quantitative vegetation models and ecological descriptions for all major vegetation systems in the United States, as well as a suite of GIS tools that help landscape and resource managers make decisions.

According to Kori Blankenship, a fire ecologist with The Nature Conservancy who works for the LANDFIRE program, "LANDFIRE provides vegetation and fire information across the country—it's a unique product driven by collaboration between several agencies and The Nature Conservancy. Among other things, the LANDFIRE vegetation models can help land managers decide where and how restoration work can be done to get the most bang for their buck. LANDFIRE and FEIS worked on a product that brought together elements of what both groups have to offer: LANDFIRE's quantitative vegetation models provided information on ecosystems and fire regimes that FEIS combined with other resources to come up with their Fire Regime Reports and detailed Fire Regime Syntheses."

Additional information on LANDFIRE and its research efforts can be found at www.conservationgateway.org (search for "LANDFIRE") and www.landfire.gov.



The LANDFIRE program has worked closely with the FEIS team to add hundreds of Fire Regime Reports to the FEIS database. (Source: LANDFIRE.)

"I like the story of Prometheus, with its combination of fire and planning," Smith says. "But my model has always been the Roman god Janus, who looked backward in order to look forward. At FEIS, we look back to the literature of more than 100 years and the experience

of the managers we work with so we can help managers apply this legacy of information as they plan—as they give forethought to the future of our wildlands."

One interesting fact about Janus is that the doors to his temples were kept open during times of war but closed during

times of peace—and his temples had no dedicated priests. Fortunately for U.S. land and resource managers, the doors to the online FEIS database are always open and the system is faithfully maintained by a team of professional ecologists. "I have this brilliant team of people," Smith says. "I let them be ecologists while I manage relationships with various administrative groups. A replacement for me will be hired eventually, but even now I'm leaving FEIS in good hands."

For more information on FEIS or for suggestions, requests, corrections—"or to send fan mail, which is always appreciated," Smith says—go to www.feis-crs.org/feis/ or email jfryer@fs.fed.us.

KEY FINDINGS

- The Fire Effects Information System (FEIS) provides users with a single place to look for scientific information on fire's relationships with plant, lichen, and animal species and the management implications of that knowledge. FEIS also includes reports on fire regimes throughout the United States, selected studies on fire effects, and access to a database of references on fire ecology that date back more than 100 years.
- FEIS publications are added and updated in response to requests from land and resource managers for syntheses of the latest scientific findings.
- The ecologists on the FEIS team synthesize the available scientific knowledge into thoroughly documented Species Reviews, Fire Studies, and Fire Regime Syntheses.
- FEIS publications point out patterns, inconsistencies, and gaps in scientific information so readers can identify areas of uncertainty in planning, and determine information they may need from further research and monitoring.

MANAGEMENT APPLICATIONS

- Land and resource managers must make decisions on fire and other resource management issues based on an understanding of a place, and the interactions between its history and species. They need information from a vast and rapidly increasing amount of research while they are faced with shrinking budgets and staff, which require them to do more with less.
- The Fire Effects Information System (FEIS) provides managers with an exhaustively researched, frequently updated collection of publications that cover research on fire effects and fire regimes. This online database can help them make decisions and allocate resources.
- FEIS publications can be used for fire management decisions and also for land use planning, restoration and rehabilitation planning, wildlife and range projects, and related environmental assessments.

FURTHER READING

Smith, Jane Kapler. **Strengthening syntheses on fire: increasing their usefulness for managers.** 2015. Gen. Tech. Rep. RMRS-GTR-337. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. www.treeseearch.fs.fed.us/pubs/49069.

Gucker, Corey L.; Zouhar, Kris; Smith, Jane Kapler; Stone, Katharine R. 2012. **Characteristics of information available on fire and invasive plants in the eastern United States.** Fire Ecology. t

Smith, Jane Kapler. 2010. **Fire effects information system: new engine, remodeled interior, added options.** Fire Management Today. 70(1):44-47. www.treeseearch.fs.fed.us/pubs/40370.

Anjozian, Lisa-Natalie. 2009. **The Fire Effects Information System: How a superhero database comes to save the day.** Fire Science Brief. Boise, ID: National Interagency Fire Center. Volume 42. 6 p. www.firescience.gov/projects/briefs/00-1-2-09-FSBrief42.pdf.

Zouhar, Kristin; Munger, Gregory T.; Smith, Jane Kapler. 2008. **Gaps in scientific knowledge about fire and nonnative invasive plants.** In: Zouhar, Kristin; Smith, Jane Kapler; Sutherland, Steve; Brooks, Matthew L., eds. Wildland fire in ecosystems: fire and nonnative invasive plants. Gen. Tech. Rep. RMRS-GTR-42-vol. 6. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 243-259. www.treeseearch.fs.fed.us/pubs/32679.

Smith, Jane Kapler; Howard, Janet; McWilliams, Jack. 2004. **Focus on invasive plants in the Fire Effects Information System.** In: Engstrom, R. T.; Galley, K. E. M.; de Groot, W. J., eds. *montane ecosystems*; 2001 October 15-18; Kananaskis Village, Alberta, Canada. Tallahassee, FL: Tall Timbers Research Station: 137-140. <https://cfs.nrcan.gc.ca/publications?id=25123>.



WRITER'S PROFILE

Brian Cooke is a science writer for the Rocky Mountain Research Station in Fort Collins, Colorado. He received a bachelor's degree in journalism-science writing with a minor in geology from Lehigh University in Bethlehem, Pennsylvania. Brian's work has included articles for the National Park Service, website writing for various environmental services companies, and proposal writing and editing for a Bureau of Land Management contractor.

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SCIENTIST PROFILES

The following scientists and FEIS team members were instrumental in the creation of this Bulletin.



Jane Kapler Smith is an ecologist for the Fire Modeling Institute in the Fire, Fuel, and Smoke program of RMRS in Missoula, Montana, and team leader for the Fire Effects Information System. She is co-developer of the FireWorks educational program for students in grades 1-12 and author of syntheses on technical writing and fire ecology. As leader of the FEIS team for 24 years, Jane has focused on synthesizing scientific knowledge for land and resource managers. She has taught biology, biostatistics, and technical writing. Jane has a B.A. from Alverno College, Milwaukee, Wisconsin, and an M.S. in Forest Ecology from Colorado State University.



Robin Innes is an ecologist for the Fire Modeling Institute in the Fire, Fuel, and Smoke program of RMRS. Based in New Hampshire, Robin writes and edits syntheses of scientific information for the Fire Effects Information System. Robin has a bachelor's degree in wildlife management from the University of New Hampshire and a master's degree in ecology from the University of California, Davis. Prior to working for FEIS, Robin managed several ecological research projects, including a large-scale, collaborative project that evaluated effects of land management practices on plants and animals.



Janet Fryer is an ecologist who edits and writes for the Fire Modeling Institute in the Fire, Fuel, and Smoke program of RMRS in Missoula, Montana. She received a master's degree in plant ecology from the University of Montana and a bachelor's degree from California State University, Stanislaus. She has written more than 100 syntheses for the Fire Effects Information System, including Species Reviews of whitebark pine and quaking aspen and Fire Regime Syntheses of Alaskan black spruce and California riparian communities.



Kris Zouhar is an ecologist for the Fire Modeling Institute in the RMRS Fire, Fuel, and Smoke program. As a writer and editor for FEIS and the General Technical Report, "Wildland Fire in Ecosystems: Fire and Nonnative Invasive Plants," Kris has specialized in synthesizing information on fire and nonnative invasive species for more than 10 years. Now she writes and edits literature reviews on native species' relationship with fire, and historical fire regimes in native plant communities. Kris earned a master's degree from the University of Montana, where she studied the effects of fire on soil nitrogen dynamics.



Ilana Abrahamson is an ecologist for the Fire Modeling Institute in the Fire, Fuel, and Smoke program of RMRS. Ilana writes two products for the Fire Effects Information System: literature reviews of plant species' relationships with fire, and syntheses that describe historical and current fire regimes of plant communities in specific regions. Ilana also writes and edits hands-on activities for the FireWorks curriculum, which teaches students about the science of wildland fire. Ilana has a bachelor's degree in environmental studies from the State University of New York at Binghamton and a master's degree in forestry from the University of Montana.

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Shannon Murphy is an ecologist for the Fire Modeling Institute in the Fire, Fuel, and Smoke program of RMRS. Based in Missoula, Shannon writes and edits three products for the Fire Effects Information System: literature reviews of plant and wildlife species' relationships with fire, fire studies that describe a particular fire in detail and its effects on vegetation, and syntheses that describe historical and current fire regimes of plant communities in specific regions. Before joining FEIS in 2015, Shannon worked in disturbance ecology research, specifically with plant pathogens in California forests. Shannon has a bachelor's degree in integrative biology and forestry from the University of California, Berkeley, and a master's degree in ecology from the University of California, Davis.



Eva Masin is a library specialist for the Fire Modeling Institute in the Fire, Fuel, and Smoke program of RMRS. Eva locates information on fire ecology in the scientific literature, accessions articles, books, and other publications into the Fire Effects Library, keywords references, and maintains data on references in the Citation Retrieval System. She edits bibliographies for FEIS publications. Eva also assists with the FireWorks conservation education program and helps organize tours for Fire Lab visitors. Eva earned her bachelor's degree at the Evergreen State College in Olympia, Washington, and later completed a master's degree in resource conservation at the University of Montana, Missoula.

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