

Prior disturbance legacy effects on plant recovery post-high-severity wildfire

www.nrfirescience.org/resource/23214

Large, high-severity wildfires are an important component of disturbance regimes around the world and can influence the structure and function of forest ecosystems. Climatic changes and anthropogenic disturbances have altered global disturbance patterns and increased the frequency of high-severity wildfires worldwide. While the...

Author(s): Elle J. Bowd, David Blair, David B. Lindenmayer

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

Spatial scale in prescribed fire regimes: an understudied aspect in conservation with examples from the southeastern United States

www.nrfirescience.org/resource/22527

The idea that not all fire regimes are created equal is a central theme in fire research and conservation. Fire frequency (i.e., temporal scale) is likely the most studied fire regime attribute as it relates to conservation of fire-adapted ecosystems. Generally, research converges on fire frequency as the primary filter in plant...

Author(s): David Mason, Marcus A. Lashley

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

The propagule doesn't fall far from the tree, especially after short-interval, high-severity fire

www.nrfirescience.org/resource/22555

Subalpine forests that historically burned every 100–300 yr are expected to burn more frequently as climate warms, perhaps before trees reach reproductive maturity or produce a serotinous seedbank. Tree regeneration after short-interval (<30-yr) high-severity fire will increasingly rely on seed dispersal from unburned...

Author(s): Nathan S. Gill, Tyler J. Hoecker, Monica G. Turner

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

Wildland fire reburning trends across the US West suggest only short-term negative feedback and differing climatic effects

www.nrfirescience.org/resource/20940

Wildfires are a significant agent of disturbance in forests and highly sensitive to climate change. Short-interval fires and high severity (mortality-causing) fires in particular, may catalyze rapid and substantial ecosystem shifts by eliminating woody species and triggering conversions from forest to shrub or grassland ecosystems....

Author(s): Brian Buma, Shelby A. Weiss, Kathy Geier-Hayes, Melissa S. Lucash

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Identifying opportunities for the use of broadcast prescribed fire on Colorado's Front Range

www.nrfirescience.org/resource/20791

Increasing the pace and scale of fuel treatments to protect social and ecological values from severe wildfire is a major initiative of numerous land management agencies, organizations, and collaborative groups throughout the western United States, including the Colorado Front Range. Broadcast

prescribed fire is a relatively low-cost...

Author(s): Rob Addington, Brian G. Tavernia, Michael D. Caggiano, Matthew P. Thompson, Jason D. Lawhon, John S. Sanderson

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Fire and rain are one: extreme rainfall events predict wildfire extent in an arid grassland

www.nrfirescience.org/resource/21749

Assessing wildfire regimes and their environmental drivers is critical for effective land management and conservation. We used Landsat imagery to describe the wildfire regime of the north-eastern Simpson Desert (Australia) between 1972 and 2014, and to quantify the relationship between wildfire extent and rainfall. Wildfires...

Author(s): Elise M. Verhoeven, Brad R. Murray, Christopher R. Dickman, Glenda M. Wardle, Aaron C. Greenville

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Repeated Fire Shifts Carbon and Nitrogen Cycling by Changing Plant Inputs and Soil Decomposition Across Ecosystems

www.nrfirescience.org/resource/21604

Fires shape the biogeochemistry and functioning of many ecosystems, and fire frequencies are changing across much of the globe. Frequent fires can change soil carbon (C) and nitrogen (N) storage by altering the quantity and chemistry of plant inputs through changes in plant biomass and composition as well as altering decomposition...

Author(s): Adam F. A. Pellegrini, Sarah E. Hobbie, Peter B. Reich, Ari A. Jumpponen, E.N. Jack Brookshire, Anthony C. Caprio, Corli Coetsee, Robert B. Jackson

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

An evaluation of remotely sensed indices for quantifying burn severity in arid ecoregions

www.nrfirescience.org/resource/20874

It is sometimes assumed the sparse and low statured vegetation in arid systems would limit the effectiveness of two remote-sensing derived indices of burn severity: the difference Normalised Burn Ratio (dNBR) and relativised difference Normalised Burn Ratio (RdNBR). We compared the relationship that dNBR, RdNBR and a ground-based...

Author(s): Robert C. Klinger, Randy McKinley, Matthew L. Brooks

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Systematic review and meta-analysis of fire regime research in ponderosa pine (Pinus ponderosa) ecosystems, Colorado, USA

www.nrfirescience.org/resource/20356

Background: Forest management, especially restoration, is informed by understanding the dominant natural disturbance regime. In many western North American forests, the keystone disturbance is fire, and a plethora of research exists characterizing various fire regime parameters, although often only one or two parameters are...

Author(s): Shawn T. McKinney

Year Published: 2019
Type: Document
Book or Chapter or Journal Article

The species diversity x fire severity relationship is hump?shaped in semiarid yellow pine and mixed conifer forests

www.nrfirescience.org/resource/20255

The combination of direct human influences and the effects of climate change are resulting in altered ecological disturbance regimes, and this is especially the case for wildfires. Many regions that historically experienced low–moderate severity fire regimes are seeing increased area burned at high severity as a result of...

Author(s): Clark Richter, Marcel Rejmánek, Jesse E. D. Miller, Kevin R. Welch, JonahMaria Weeks, Hugh Safford

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Wildfire detection and communication-aerospace applications-trade study

www.nrfirescience.org/resource/19177

Wildfires have increased in frequency, duration, and intensity worldwide. Climate change, drought, and other factors have not only increased susceptibility to wildfires, but have also increased the duration of the season. There are a number of factors affecting wildfires: detection, speed of communication/response time, resources/...

Author(s): Setrige W. Crawford, Kamran Eftekhari Shahroudi

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Improving long-term fuel treatment effectiveness in the National Forest System through quantitative prioritization

www.nrfirescience.org/resource/19015

Predicting the efficacy of fuel treatments aimed at reducing high severity fire in dry-mixed conifer forests in the western US is a challenging problem that has been addressed in a variety of ways using both field observations and wildfire simulation models. One way to describe the efficacy of fuel treatments is to quantify how...

Author(s): Ana M. G. Barros, Alan A. Ager, Michelle A. Day, Palaiologos Palaiologou

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Wildfire impacts on freshwater detrital food webs depend on runoff load, exposure time and burnt forest type

www.nrfirescience.org/resource/20427

In the last decades, land-use changes have made Mediterranean forests highly susceptible to wildfires, which can cause several impacts not only on burnt areas, but also on adjacent aquatic ecosystems. Post-fire runoff from burnt areas may transport toxic substances to streams by surface runoff, including polycyclic aromatic...

Author(s): Francisco Carvalho, Arunava Pradhan, Nelson Abrantes, Isabel Campos, Jan J. Keizer, Fernanda Cássio, Cláudia Pascoal

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Contributions of fire refugia to resilient ponderosa pine and dry mixed-conifer forest landscapes

www.nrfirescience.org/resource/20352

Altered fire regimes can drive major and enduring compositional shifts or losses of forest ecosystems. In western North America, ponderosa pine and dry mixed-conifer forest types appear increasingly vulnerable to uncharacteristically extensive, high-severity wildfire. However, unburned or only lightly impacted forest stands that...

Author(s): Jonathan D. Coop, Timothy J. DeLory, William M. Downing, Sandra L. Haire, Meg A. Krawchuk, Carol Miller, Marc-Andre Parisien, Ryan B. Walker

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Fire patterns in piñon and juniper land cover types in the Semiarid Western United States from 1984 through 2013

www.nrfirescience.org/resource/18084

Increases in area burned and fire size have been reported across a wide range of forest and shrubland types in the Western United States in recent decades, but little is known about potential changes in fire regimes of piñon and juniper land cover types. We evaluated spatio-temporal patterns of fire in piñon and juniper land cover...

Author(s): David Board, Jeanne C. Chambers, Richard F. Miller, Peter J. Weisberg

Year Published: 2018

Type: Document

Technical Report or White Paper

From the stand-scale to the landscape-scale: predicting the spatial patterns of forest regeneration after disturbance

www.nrfirescience.org/resource/17733

Shifting disturbance regimes can have cascading effects on many ecosystems processes. This is particularly true when the scale of the disturbance no longer matches the regeneration strategy of the dominant vegetation. In the yellow pine and mixed conifer forests of California, over a century of fire exclusion and the warming climate...

Author(s): Kristen L. Shive, Haiganoush K. Preisler, Kevin R. Welch, Hugh Safford, Ramona J. Butz, Kevin L. O'Hara, Scott L. Stephens

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Fine-scale spatial climate variation and drought mediate the likelihood of reburning

www.nrfirescience.org/resource/21736

In many forested ecosystems, it is increasingly recognized that the probability of burning is substantially reduced within the footprint of previously burned areas. This self-limiting effect of wildland fire is considered a fundamental emergent property of ecosystems and is partly responsible for structuring landscape heterogeneity...

Author(s): Sean A. Parks, Marc-Andre Parisien, Lisa M. Holsinger, L. Scott Baggett, Carol Miller

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Land surveys show regional variability of historical fire regimes and structure of dry forests of the western USA

www.nrfirescience.org/resource/16421

An understanding of how historical fire and structure in dry forests (ponderosa pine, dry mixed conifer) varied across the western USA remains incomplete. Yet, fire strongly affects ecosystem services, and forest restoration programs are underway. We used General Land Office survey reconstructions from the late-1800s across 11...

Author(s): William L. Baker, Mark A. Williams

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Quantifying variance across spatial scales as part of fire regime classifications

www.nrfirescience.org/resource/17942

The emergence of large-scale fire classifications and products informed by remote sensing data has enabled opportunities to include variability or heterogeneity as part of modern fire regime classifications. Currently, basic fire metrics such as mean fire return intervals are calculated without considering spatial variance in a...

Author(s): Rheinhardt Scholtz, Samuel D. Fuhlendorf, Sherry A. Leis, Joshua J. Picotte, Dirac Twidwell

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Effects of climate change and climate-altered fire regimes on whitebark pine populations - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17562

As climate change alters global fire regimes, fire and forest managers must prioritize management actions that simultaneously protect sensitive resources and allow fire to maintain its ecological role. Over the last twenty years, this task has become more difficult, as increased fire severity and season length have caused...

Author(s): Diana F. Tomback, Elizabeth R. Pansing

Year Published: 2018

Type: Document

Technical Report or White Paper

Interacting effects of fire severity, time since fire and topography on vegetation structure after wildfire

www.nrfirescience.org/resource/16674

Fire is an important disturbance in forest ecosystems globally. Many of the effects of fire on forest processes are mediated through effects on vegetation structure. Understanding how fire properties, fire regimes and environmental variation interact to affect structure is required in the face of predictions of increasing size and...

Author(s): Michelle Bassett, Steven W.J. Leonard, Evelyn K. Chia, Michael F. Clarke, Andrew F. Bennett

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Effects of accelerated wildfire on future fire regimes and implications for the United States federal fire policy

www.nrfirescience.org/resource/16267

Wildland fire suppression practices in the western United States are being widely scrutinized by policymakers and scientists as costs escalate and large fires increasingly affect social and ecological values. One potential solution is to change current fire suppression tactics to intentionally increase the area burned under...

Author(s): Alan A. Ager, Ana M. G. Barros, Haiganoush K. Preisler, Michelle A. Day, Thomas A. Spies, John D. Bailey, John P. Bolte

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Fire regimes of ponderosa pine communities in the Black Hills and surrounding areas

www.nrfirescience.org/resource/16433

Wildfire is an important disturbance in ponderosa pine communities in the Black Hills and surrounding areas. Effective management of these communities requires an understanding of historical fire regimes. This review provides a synthesis of the available scientific literature on historical patterns and contemporary changes in fuels...

Author(s): Shannon K. Murphy

Year Published: 2017

Type: Document

Synthesis

Deciphering the complexity of historical fire regimes: diversity among forests of western North America

www.nrfirescience.org/resource/16313

Wildfire is a key disturbance agent in forests worldwide, but recent large and costly fires have raised urgent questions about how different current fire regimes are from those of the past. Dendroecological reconstructions of historical fire frequency, severity, spatial variability, and extent, corroborated by other lines of...

Author(s): Lori D. Daniels, Larissa L. Yocom Kent, Rosemary L. Sherriff, Emily K. Heyerdahl

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Spatial interpolation and mean fire interval analyses quantify historical mixed-severity fire regimes

www.nrfirescience.org/resource/15005

Tree-age data in combination with fire scars improved inverse-distance-weighted spatial modelling of historical fire boundaries and intervals for the Darkwoods, British Columbia, Canada. Fire-scarred trees provided direct evidence of fire. The presence of fire-sensitive trees at sites with no fire scars indicated fire-free periods...

Author(s): Gregory A. Greene, Lori D. Daniels

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Fire regimes of Northern Rocky Mountain ponderosa pine communities

www.nrfirescience.org/resource/14602

Hundreds of articles are published about wildland fires in Northern Rocky Mountain ponderosa pine communities. The author of this FEIS synthesis reviewed over 300 publications on historical and contemporary fuel loads, stand structure, and fire regimes in ponderosa pine communities. Most studies found that prior to fire exclusion,...

Author(s): Janet L. Fryer
Year Published: 2016
Type: Document
Synthesis, Technical Report or White Paper

Reburn distribution and fire-on-fire perimeter interactions in the U.S. Northern Rockies 1900-2014

www.nrfirescience.org/resource/19969

No abstract available.

Author(s): Justin Barton Lauer
Year Published: 2016
Type: Document
Dissertation or Thesis

Replacing time with space: using laboratory fires to explore the effects of repeated burning on black carbon degradation

www.nrfirescience.org/resource/19123

Soil organic matter plays a key role in the global carbon cycle, representing three to four times the total carbon stored in plant or atmospheric pools. Although fires convert a portion of the faster cycling organic matter to slower cycling black carbon (BC), abiotic and biotic degradation processes can significantly shorten BC...

Author(s): Wade T. Tinkham, Alistair M. S. Smith, Philip E. Higuera, Jeff A. Hatten, Nolan W. Brewer, Stefan H. Doerr
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Spatial and temporal variations of fire regimes in the Canadian Rocky mountains and foothills of southern Alberta

www.nrfirescience.org/resource/14701

Like many fire-adapted ecosystems, decades of fire exclusion policy in the Rocky Mountains and Foothills natural regions of southern Alberta, Canada are raising concern over the loss of ecological integrity. Departure from historical conditions is evaluated using median fire return intervals (MdfRI) based on fire history data from...

Author(s): Michael D. Flannigan, Brad C. Hawkes, Marc-Andre Parisien, Marie-Pierre Rogeau, Rick Arthur
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Fire regimes of quaking aspen in the mountain west

www.nrfirescience.org/resource/11975

Quaking aspen (*Populus tremuloides* Michx.) is the most widespread tree species in North America, and it is found throughout much of the Mountain West (MW) across a broad range of bioclimatic regions. Aspen typically regenerates asexually and prolifically after fire, and due to its seral status in many western conifer forests, aspen...

Author(s): Douglas J. Shinneman, William L. Baker, Paul C. Rogers, Dominik Kulakowski
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Historical fire regimes, reconstructed from land-survey data, led to complexity and fluctuation in sagebrush landscapes

www.nrfirescience.org/resource/11972

Sagebrush landscapes provide habitat for Sage-Grouse and other sagebrush obligates, yet historical fire regimes and the structure of historical sagebrush landscapes are poorly known, hampering ecological restoration and management. To remedy this, General Land Office Survey (GLO) survey notes were used to reconstruct over two...

Author(s): Beth E. Bukowski, William L. Baker

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Landscape composition in aspen woodlands under various modeled fire regimes

www.nrfirescience.org/resource/12114

Quaking aspen (*Populus tremuloides*) is declining across the western United States. Aspen habitats are diverse plant communities in this region and loss of these habitats can cause shifts in biodiversity, productivity, and hydrology across spatial scales. Western aspen occurs on the majority of sites seral to conifer species, and...

Author(s): Eva K. Strand, Stephen C. Bunting, Lee A. Vierling

Year Published: 2012

Type: Document

Conference Proceedings

The human dimension of fire regimes on Earth

www.nrfirescience.org/resource/190

Humans and their ancestors are unique in being a fire-making species, but 'natural' (i.e. independent of humans) fires have an ancient, geological history on Earth. Natural fires have influenced biological evolution and global biogeochemical cycles, making fire integral to the functioning of some biomes. Globally, debate rages...

Author(s): David M. J. S. Bowman

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Multi-scale controls of historical forest-fire regimes: new insights from fire-scar networks

www.nrfirescience.org/resource/8298

Anticipating future forest-fire regimes under changing climate requires that scientists and natural resource managers understand the factors that control fire across space and time. Fire scars-proxy records of fires, formed in the growth rings of long-lived trees-provide an annually accurate window into past low-severity fire...

Author(s): Donald A. Falk, Emily K. Heyerdahl, Peter M. Brown, Calvin A. Farris, Peter Z. Fule, Donald McKenzie, Thomas W. Swetnam, Alan H. Taylor, Megan L. Van Horne

Year Published: 2011

Type: Document

Book or Chapter or Journal Article, Synthesis

Large fire locations by Fire Regime Condition Classes 2 and 3 for all historical natural fire regimes

www.nrfirescience.org/resource/11510

A map of large fires across the western United States.

Author(s): Wendel J. Hann
Year Published: 2008
Type: Document
Research Brief or Fact Sheet

Simulation of the consequences of different fire regimes to support wildland fire use decisions

www.nrfirescience.org/resource/11429

The strategy known as wildland fire use, in which lightning-ignited fires are allowed to burn, is rapidly gaining momentum in the fire management community. Managers need to know the consequences of an increase in area burned that might result from an increase in wildland fire use. One concern of land managers as they consider...

Author(s): Carol Miller
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

CCE fire regimes and their management

www.nrfirescience.org/resource/8369

A spectacular forest in the center of the Crown of the Continent Ecosystem (CCE) cuts a 15- by 5-km swath along the Flathead River's South Fork around Big Prairie in the middle of the Bob Marshall Wilderness Area in Montana (Figure 13- 1). This wide valley bottom, which contains two patches (of about 1,000 ha each) of the last...

Author(s): Robert E. Keane, Carl H. Key
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Ecological science relevant to management policies for fire-prone forests of the western United States, Society for Conservation Biology scientific panel of fire in western U.S. forests

www.nrfirescience.org/resource/11190

Fire is a primary natural disturbance in most forests of western North America and has shaped their plant and animal communities for millions of years. Native species and fundamental ecological processes are dependent on conditions created by fire. However, many western forests have experienced shifts in wildfire regimes and forest...

Author(s): Reed F. Noss, Jerry F. Franklin, William L. Baker, Tania L. Schoennagel, Peter B. Moyle
Year Published: 2006
Type: Document
Technical Report or White Paper

Variation in fire regimes of the Rocky Mountains: implications for avian communities and fire management

www.nrfirescience.org/resource/8144

Information about avian responses to fire in the U.S. Rocky Mountains is based solely on studies of crown fires. However, fire management in this region is based primarily on studies of low-elevation ponderosa pine (*Pinus ponderosa*) forests maintained largely by frequent understory fires. In contrast to both of these trends, most...

Author(s): Victoria A. Saab, Hugh D. W. Powell, Natasha B. Kotliar, Karen R. Newlon
Year Published: 2005
Type: Document
Book or Chapter or Journal Article, Synthesis

Mapping relative fire regime condition class for the western United States

www.nrfirescience.org/resource/10991

In 1999, a coarse-scale map of Fire Regime Condition Classes (FRCC) was developed for the conterminous United States (US) to help address contemporary fire management issues and to quantify changes in fuels from historical conditions. This map and its associated data have been incorporated into national policies (National Fire Plan...

Author(s): James P. Menakis, Melanie Miller, Thomas Thompson

Year Published: 2004

Type: Document

Conference Proceedings

Using simulation to map fire regimes: an evaluation of approaches, strategies, and limitations

www.nrfirescience.org/resource/7951

Spatial depictions of fire regimes are indispensable to fire management because they portray important characteristics of wildland fire, such as severity, intensity, and pattern, across a landscape that serves as important reference for future treatment activities. However, spatially explicit fire regime maps are difficult and...

Author(s): Robert E. Keane, Geoffrey J. Cary, Russell A. Parsons

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

Mapping the cheatgrass-caused departure from historical natural fire regimes in the Great Basin, USA

www.nrfirescience.org/resource/11490

Cheatgrass (*Bromus tectorum*) is an exotic grass that has increased fire hazard on millions of square kilometers of semi-arid rangelands in the western United States. Cheatgrass aggressively out competes native vegetation after fire and significantly enhances fire size and frequency. To evaluate the effect of cheatgrass on historical...

Author(s): James P. Menakis, Dianne Osborne, Melanie Miller

Year Published: 2003

Type: Document

Conference Proceedings

The role of climate and vegetation change in shaping past and future fire regimes in the northwestern U.S. and the implications for ecosystem management

www.nrfirescience.org/resource/8382

Fire is an important part of the disturbance regimes of northwestern US forests and its role in maintaining and altering forest vegetation is evident in the paleoecological record of the region. Long-term reconstructions of Holocene fire regimes, provided by the analysis of charcoal, pollen, and other fire proxies in a network of...

Author(s): Cathy L. Whitlock, Sarah L. Shafer, Jennifer R. Marlon

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

The influence of fire interval and serotiny on postfire lodgepole pine density in Yellowstone National Park

www.nrfirescience.org/resource/8259

The time interval between stand-replacing fires can influence patterns of initial postfire succession if the

abundance of postfire propagules varies with prefire stand age. We examined the effect of fire interval on initial postfire lodgepole pine (*Pinus contorta* var. *latifolia* Engelm.) density in Yellowstone National Park (YNP)...

Author(s): Tania L. Schoennagel, Monica G. Turner, William H. Romme

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

Mixed-severity fire regimes in the Northern Rocky Mountains: consequences of fire exclusion and options for the future

www.nrfirescience.org/resource/8426

Findings from fire history studies have increasingly indicated that many forest ecosystems in the northern Rocky Mountains were shaped by mixed-severity fire regimes, characterized by fires of variable severities at intervals averaging between about 30 and 100 years. Perhaps because mixed-severity fire regimes and their resulting...

Author(s): Stephen F. Arno, David J. Parsons, Robert E. Keane

Year Published: 2000

Type: Document

Conference Proceedings, Synthesis

Fire regimes on andesitic mountain terrain in northeastern Yellowstone National Park, Wyoming

www.nrfirescience.org/resource/8196

A fire history investigation was conducted for three forest community types in the Absaroka Mountains of Yellowstone National Park, Wyoming. Master fire chronologies were based on fire-initiated age classes and tree fire scars. The area's major forest type, lodgepole pine (*Pinus contorta* Dougl. var. *latifolia*) ecosystems, revealed a...

Author(s): Stephen W. Barrett

Year Published: 1994

Type: Document

Book or Chapter or Journal Article