Montana Challenge: Forest Management and the Forest Products Industry

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November 26, 2007

This report deals primarily with the period from 1945 to 2005. For more current information on the condition of Montana's forest products industry see: http://www.bber.umt.edu/forest/

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MONTANA CHALLENGE

Introduction

Demographic and attitudinal changes in Montana since the mid-twentieth century have shifted a common view of natural resources as commodities more toward one of natural resources as amenities. That these changes have brought controversy in the management of forests was perhaps inevitable. Ironically, reaction to past practices now limits the potential of forest management to enhance and protect forest amenities and wildlife habitat, provide employment, and maintain an important piece of Montana's iconic lifestyle. Because ecological conditions, the size and intensity of wildfires, and society's perception of forests have changed over the past half-century, management must also change. Montana's challenge is to integrate these dynamic factors into forest management in ways that recognize and capture the ecological, economic, and social values and opportunities they represent. After decades of conflict over how to manage forests, disparate groups are coming to recognize significant areas of overlapping interests and concerns, including wildlife habitat, wildfire hazard, ecological restoration, and a viable forest industry. The time is ripe to work toward these common goals, because an all-hands-on-deck effort is needed to meet the challenges posed by today's deteriorating forest conditions and declining industry infrastructure. If such an effort can succeed, Montana is the place, because its citizens are passionate about their forests and the resources and values they provide. And despite its geographical breadth, Montana is a still a big "small town," where people know politicians by their first name and individuals or small groups can make a difference.

The objective of this chapter is to chronicle a half-century of change in forest management, fire management, and the forest products industry in Montana, and document fundamental changes in forest conditions over a similar period. We will also demonstrate the crucial role and unique features of active management aimed at restoring and sustaining the state's unparalleled wildlife habitat, fire-prone forests, and wood products infrastructure. To tell this complex story, we first must turn the clock back and look at how the past has shaped current forest conditions and future needs. It is critical to consider the circumstances associated with management in the past, because some earlier approaches are understandable in the context of their times. Gradually deteriorating forest conditions and changing societal views underscore the need for different management strategies today to preempt potentially irreversible forest changes and loss of infrastructure.

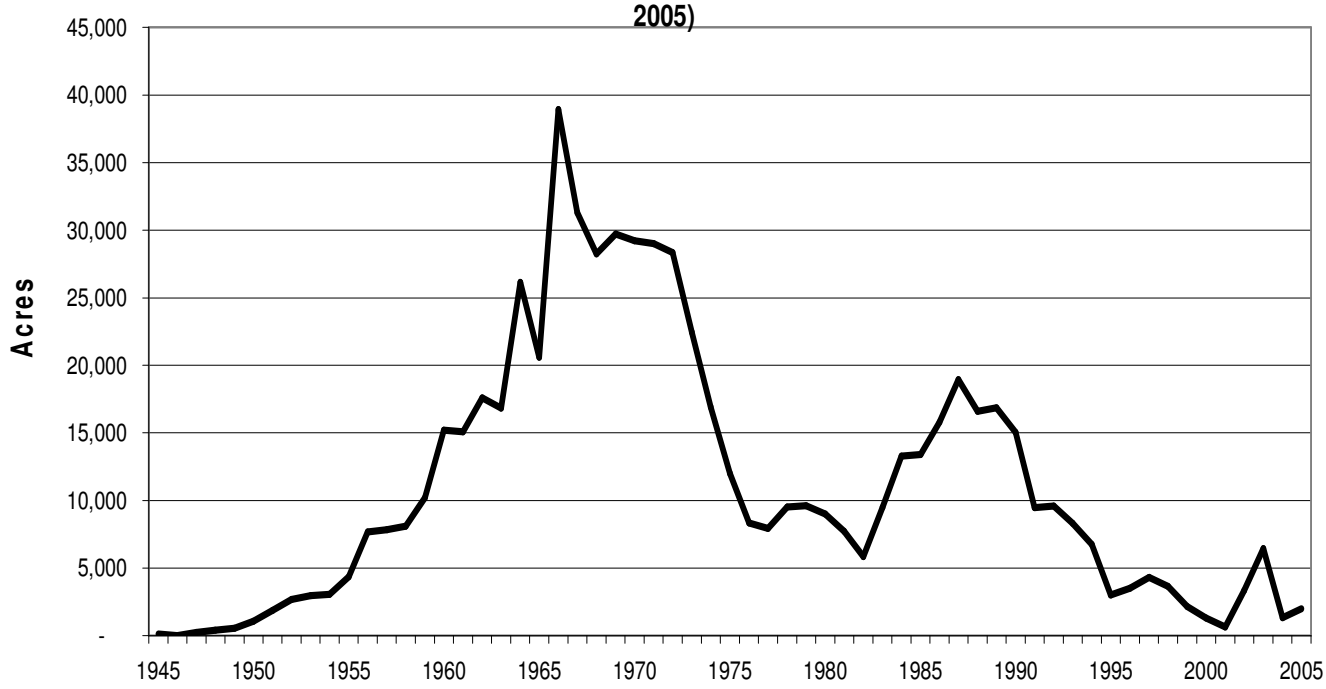
FOREST MANAGEMENT (1900 – Present)

Through the first half of the 1900s, various forms of partial cutting dominated harvest on the national forests, but these rarely removed more than about two-thirds of a stand's merchantable volume. Surprisingly little clearcutting as such took place on national forest lands prior to about 1950 (Clary 1986). However, a fundamental transition in management occurred in the mid-1900s due to burgeoning post-war demand for wood products, and the coincident arrival of a western spruce bark beetle epidemic. Beginning in the 1950s, clearcutting emerged as the dominant method for harvesting timber on national forests in Montana. Forest managers were motivated to salvage beetle-killed timber while it still had value, and to get low-vigor, old-growth stands "under management" by replacing them with healthy young stands – often plantations. This was the era of Weyerhaeuser ads in national magazines and the period in which professional forest management came into its own. University forestry curricula focused on

efficient methods for growing and harvesting timber, mimicking European approaches to forest management that had developed in response to a timber famine. Timber products were needed to fuel the nation's building boom, and environmental concerns were few. High timber harvest levels also necessitated a significant and dispersed milling infrastructure to process logs into lumber, providing good jobs in numerous communities across the state, particularly in western Montana. However, extensive road-building was required to access harvest areas. Roads were pushed into the upper reaches of forested watersheds, often parallel and adjacent to the streams themselves, and sometimes straightening significant stream sections. Road-building activities, coupled with harvest-related soil disturbances and post-treatment dozer scarification of harvest units, contributed silt to nearby streams. Some drainages were harvested beyond their recommended hydrological limits. Deposition of silt in certain prime spawning areas impacted reproduction of bull trout (Fraley and Shepard 1989), a species currently considered threatened. Dense road networks also fragmented grizzly bear habitat in some drainages, leading to reduced habitat availability for the bear and increased mortality (Mace et al, 1996). Rectangular clearcuts were the norm, allowing for economically efficient project layout and timber harvest. However, the ecological and esthetic impacts of these practices did not go unnoticed given the ever-increasing number of people recreating in the woods. What had been nascent environmental awareness in the 1960s became a full-blown movement a few short years later. The effectiveness and clout of this movement became manifest with passage of the National Environmental Protection Act (1969), Endangered Species Act (1973), National Forest Management Act (1976), and the Clean Water Act (1977) within a 10-year period. Collectively, these landmarks in environmental legislation brought about a change in the kind and extent of management. Management emphasis on the national forests gradually shifted from timber production toward ecological and amenity values, and clearcutting fell dramatically after the

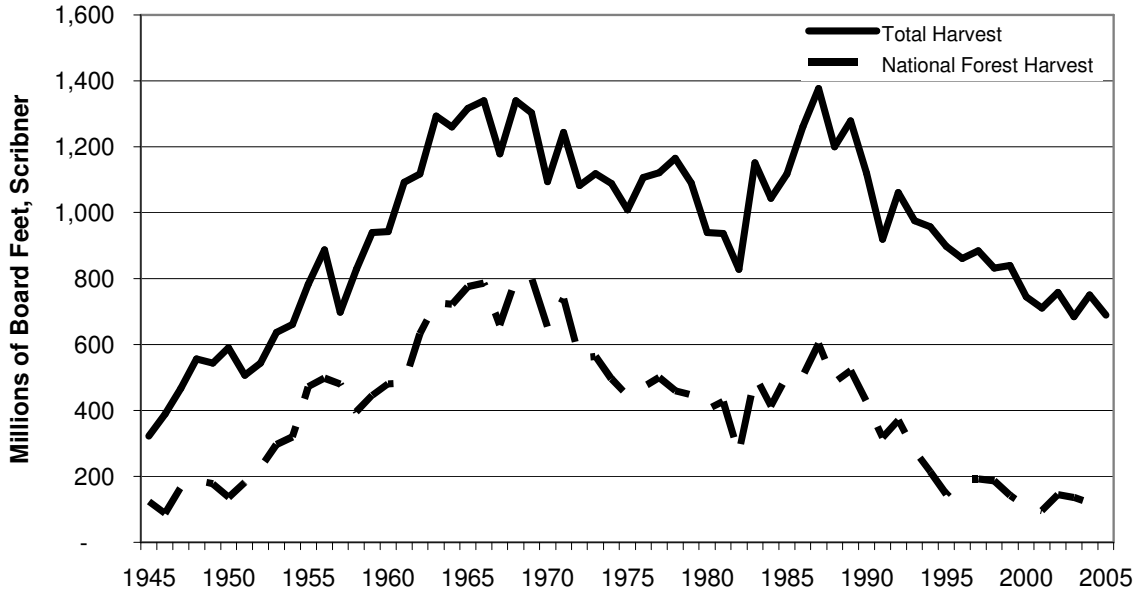
early 1990s. For example, clearcutting averaged 26,600 acres annually on Montana's national forests from 1966 to 1975, a figure that declined by about 90 percent to only 2870 acres annually for the period 1996-2005 (Figure 1).

Figure 1: Annual Acres Harvested by Clearcuting on National Forests in Montana (1945-2005)



The volume of timber cut from Montana's national forests also declined dramatically beginning about 1990, dropping from an average annual harvest of 680 MMBF (million board feet) in the 1960s, to 240 MMBF in the 1990s, to only about 125 MMBF per year from 2000-2005 (Figure 2). While the heavy cutting of the 1960s produced large volumes of wood, it was socially unacceptable and therefore not a viable option for future management. The light cutting in recent years produces too little volume to maintain a healthy and diverse timber-processing infrastructure. Such infrastructure is critical to provide markets for the small and medium-sized trees that must be removed to sustain resilient forest conditions and provide ecosystem services and the resources society needs.

Figure 2: Annual Total and National Forest Timber Harvest in Montana (1945-2005)

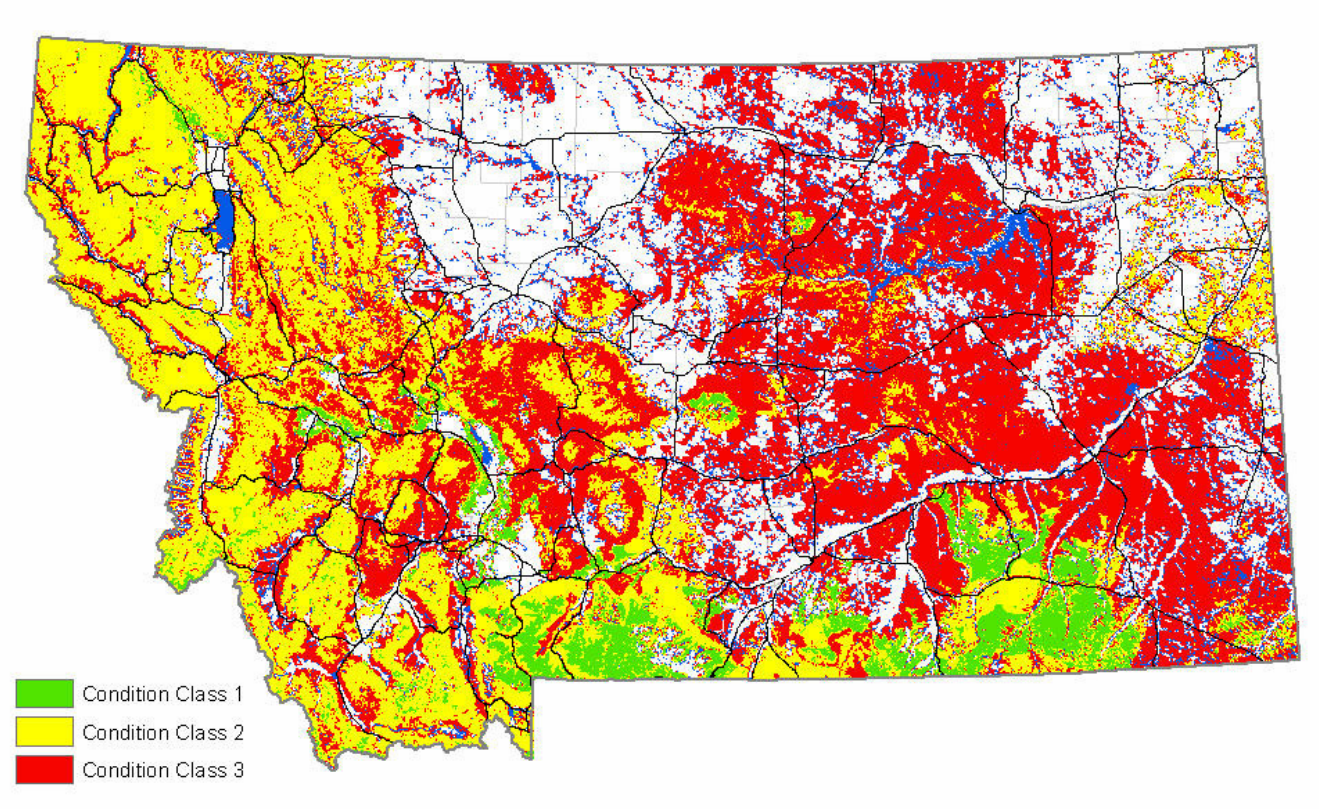


Since about 1990, national forest managers have favored relatively non-controversial thinning treatments that remove smaller trees. While necessary, these treatments are often inadequate to reduce crown fire hazard and severe stress in overcrowded forests, or to meet the light requirements for regenerating shade-intolerant trees such as ponderosa pine and western larch. Such treatments also yield relatively low volumes of raw material for Montana's forest products industry. Indeed, about two-thirds of the reduction in total harvest volume from Montana's forests in the decade of the 1990s was due to reduced harvest levels on federal lands (Figure 2). Projects designed to address declining ecological conditions on federal lands necessarily require broader scientific and disciplinary input than in the past; however, treatments employed in these projects must still meet the physiological needs of the species in question. If projects are conducted at a scale commensurate with the scale of the ecological decline, the material removed as a byproduct of restoration treatments should be adequate to meet current infrastructure needs (Keegan et al. 2004).

Ecological conditions in Montana's forests contrast sharply with the conditions that prevailed under natural disturbance regimes. Sustainable forest conditions (Fire Regime Condition Class 1 – FRCC1) are considered within the natural range of conditions in terms of vegetation characteristics, fuels, and fire frequency and severity (Hann and Bunnell 2001). Many of today's forests manifest moderate departure (Fire Regime Condition Class 2) to high departure (Fire Regime Condition Class 3) from sustainable conditions, as evidenced by invasive understory species, increased composition of shade-tolerant trees, high fuel loadings, and altered fire frequency, pattern, and severity (Figure 3). Broadscale departure from sustainable conditions indicates a forest at risk of losing key ecosystem components (e.g., wildlife habitat, old growth, soils, and keystone species such as whitebark pine). These risks are further magnified under climate change scenarios.

High density in many of today's forests negatively affects tree water status, nutrient availability, and production of protective chemicals (Waring and Pitman 1985), leaving stressed trees vulnerable to insects and disease. These effects are especially detrimental to remnant old-growth ponderosa pines (Biondi 1996; Fiedler 2000). At the stand or forest level, increased density and structural complexity also contribute to more intense wildfires. Larger and more frequent fires, ongoing beetle epidemics, and gradual replacement of pines and larch with fir are testimony that forests are changing in undesirable and sometimes unsustainable ways. These changes threaten unique habitat on which some wildlife depend, and the scenic landscapes that are integral to the Montana outdoor experience.

Figure 3. Fire Regime Condition Classes in Montana. Condition Class 1 – resilient to disturbance; Condition Class 2 – moderately altered conditions, moderate risk; Condition Class 3 – significant departure from sustainable conditions, key ecosystem components at risk.



FIRE MANAGEMENT (1900 – Present)

Beginning about a century ago, the articulated American view of fire was much the same as the European view – fire had no place in the forest. In the late 1800s, a forest inspector named John Leiberg conducted an extensive forest survey in a vast area called the Bitterroot Forest Reserve. His blunt assessment would soon become the institutional view "The after effects of fire in this region are various, but are always evil, without a single redeeming feature" (Leiberg 1899). Fire was understandably seen as an unnatural and destructive force in the European context of scarce wood and moist climate – a view that was readily adopted in the United States. Fire killed trees and made the forest black, and as such had no perceived benefits. In 1908, the U.S. Forest Service developed a primary mission – funded by Congress – to suppress forest fires

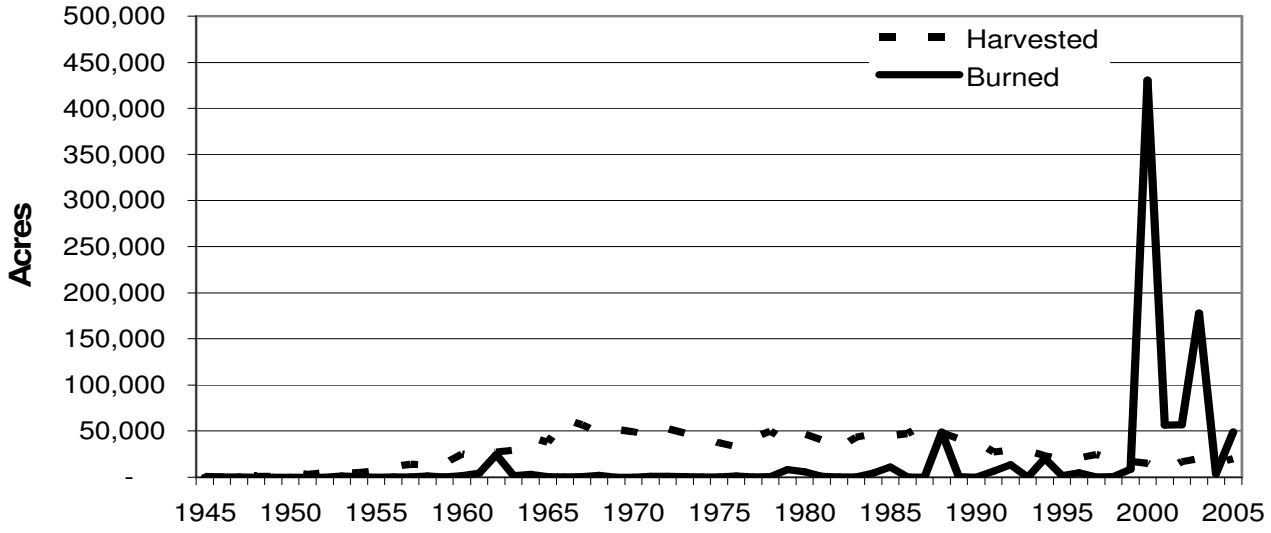
and prevent any use of fire as a management tool (Arno and Fiedler 2005). "Out-by-10:00 am" became the firefighter's mantra and the centerpiece of U.S. fire policy – fire in any form was to be stopped immediately and at all costs. Timber products were needed to fuel the nation's building boom, and forest fires could only compromise the amount or efficiency of wood removal. Wildfires were also perceived as destroying wildlife and their habitat.

The view of fire as Public Enemy Number 1 remained a popular one through most of the twentieth century, but another view began to emerge. In the latter 1900s, the developing science of forest ecology brought about a new understanding of the critical role of fire in forest succession and renewal, and with it the need to change management to accommodate this new knowledge. Forest ecologists began to decipher the historical role of fire, and the existence of different kinds of fire in different kinds of forest. Dry, low-elevation forests are in the *understory* fire regime, characterized by frequent, low-intensity fires. Moist and high-elevation forests are in the *stand-replacement* fire regime, characterized by intense crown fires occurring at intervals of one to several centuries. Mid-elevation forests on moderate sites are characterized by the *mixed* fire regime, which includes aspects of the understory and stand-replacement regimes in a fine-scaled mosaic of different burning intensities. The trees and understory vegetation characteristic of each regime are adapted to the associated frequency and intensity of fire. This understanding revealed that the near century-long policy of suppressing fires is highly unnatural in lower-elevation ponderosa pine and dry mixed conifer forests in the understory fire regime. Frequent surface fires historically thinned these forests, recycled nutrients, stimulated regeneration and growth of fire-dependent species, and prevented fuels from accumulating on the forest floor. Absent fire, fuel buildups and forest densification lead to uncharacteristically large and intense wildfires. The impacts of such fires are now being felt with increasing regularity. Severe "fire years" of 1988, 1994, 2000, and 2003 attest to the changing conditions and

increasing fire hazard in Montana's forests.

A dramatic example of recent changes in the number of acres burned by wildfire is illustrated in Figure 4. No single year between 1945 and 1999 resulted in more than 50,000 acres being burned, yet this acreage was surpassed four times from 2000 - 2005 (Figure 4). These changes are also evident when comparing acres harvested vs acres burned over the same period.

Figure 4: Annual Acres Harvested vs. Acres Burned by Wildfire on National Forests in Montana (1945-2005)



Acres of timber harvested in Montana exceeded acres burned by wildfire in all years from 1945-1999, with the exception of 1946 and 1988, when harvested and burned acres were virtually equal. In contrast, acres burned on the national forests far exceeded acres harvested in five of the six years from 2000-2005.

Fire has been the dominant natural process shaping western forests for millennia – so fire is not new. However, effects of recent large and intense burns illustrate the increasing vulnerability of some of the state's forests to wildfire. Fires that historically killed mainly small trees, patches of trees, or thin-barked, long-crowned species now scorch extensive areas of fire-

resistant and fire-vulnerable species alike. Despite being easily killed by fire, species such as lodgepole pine, true firs, Engelmann spruce, western redcedar, and the hemlocks have mechanisms or strategies for regenerating themselves after intense, stand-replacement fires. Serotinous cones, light-weight seeds capable of disseminating long distances, and affinity for moist, protected sites are examples of adaptations that allow fire-vulnerable species to survive, escape, or recolonize after large or intense wildfire events. Fire-resistant ponderosa pine, in contrast, depends on thick bark, deep roots, large buds, long heat-deflecting needles, and high, open crowns to not only survive but thrive in the understory fire regime. However, these adaptations provide no protection for surviving intense crown fires. This vulnerability, combined with heavy seeds that only disperse about the width of a football field, leaves Montana's ponderosa pine forests at risk to deforestation following today's increasingly large, severe wildfires (Figure 5). Ironically, because of altered conditions, ponderosa pine forests are now vulnerable to the very process (fire) to which they are historically adapted.

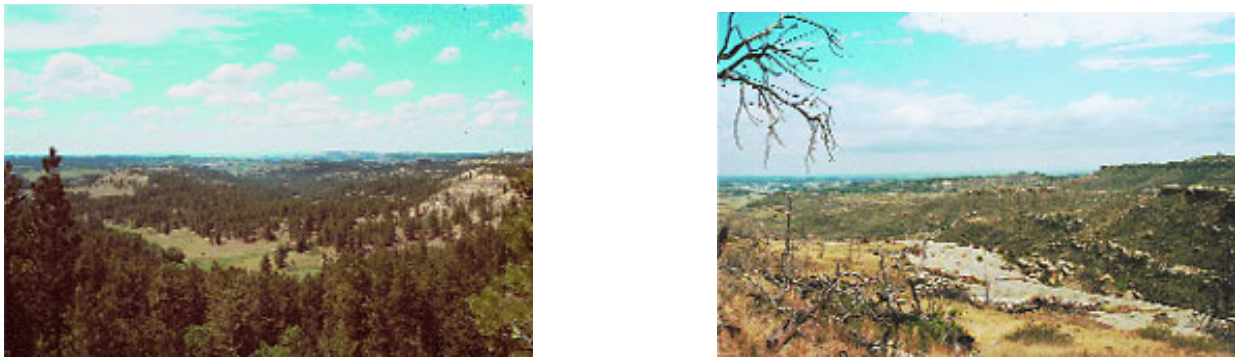


Figure 5. A) Ponderosa pine forest in central Montana in 1982, two years before being burned in the Hawk Creek wildfire. B) Approximately the same viewpoint, 14 years after being burned in the 170,000-acre Hawk Creek wildfire. The area remains essentially deforested today.

A recent statewide analysis of forest conditions in Montana found that about 80 percent of the nine million acres of forests adapted to understory or mixed fire regimes now rate moderate/high hazard for crown fire (Figure 6; Fiedler et al. 2003). Ecologists use the term "range of natural variability" to indicate the range of ecological conditions to which a given type of forest and associated biota are adapted. The dense, stressed conditions in many drier forests put them outside this range, leaving them vulnerable to unprecedented impacts from drought, fire, and insects. Today's broadscale departures from sustainable forest conditions are especially troubling given the scenario of global climate change. Forest communities within the range of natural variability are more likely to be resilient to the unknown – and perhaps unprecedented – climatic changes of the future than those that are not.

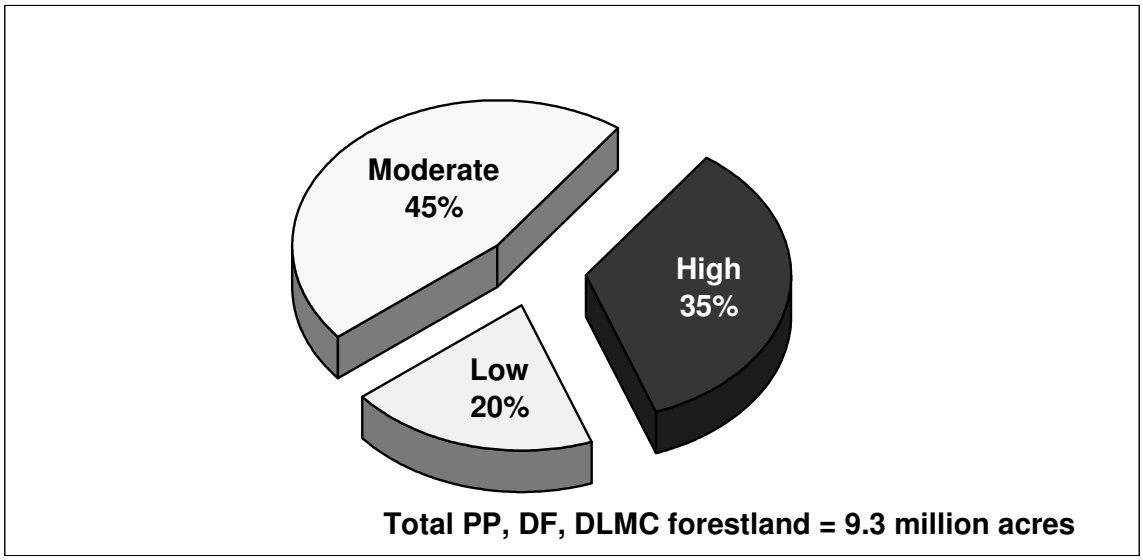


Figure 6. Proportion of Montana's fire-adapted forest types (i.e., ponderosa pine (PP)/Douglas-fir (DF)/dry lower mixed conifer (DLMC)) rated low, moderate, or high for crown fire hazard.

MONTANA'S FOREST PRODUCTS INDUSTRY (1945 – 2000)

Introduction

Montana's forest products industry is the largest component of manufacturing in the state and includes timber processing facilities such as sawmills, plywood plants, log home and post-and-pole plants, log furniture and cedar products manufacturers, the logging sector, and facilities utilizing residue from timber processors. These residue-based facilities include a pulp and paper mill, a medium density fiberboard plant, a particleboard plant, several pelletized wood fuel and other energy facilities, and producers of decorative bark, landscaping material, and animal bedding. Annual sales of the primary sector average over a billion dollars (fob the producing mill), and secondary processing of primary wood products generates an additional $200 million plus in output value (Keegan et al. 2004a and Keegan et al. 2006). Approximately 10,000 people currently work in Montana's forest products industry and these workers earned approximately $370 million in labor income in 2000. These figures represented approximately 2 percent of Montana's nonfarm workforce and 3 percent of worker earnings in the state in 2000, respectively. When examined as a percent of basic industries that inject new funds into an area, the forest products industry accounts for 9 percent of the state's economic base.

The size and nature of the industry has varied considerably over the last half century in terms of employment and workers earnings and their contribution to state and local economies. These changes and trends are detailed in the subsequent sections for two periods: 1945 -1969 and 1969-2000.

1945-1969

In the period from World War II through the 1950s, timber harvest, employment, and sales value in Montana's forest industry more than doubled (Figures 7, 8, and 9) and (Keegan et al. 2006).

Figure 7: Montana's Forest Industry Employment, 1945-2000

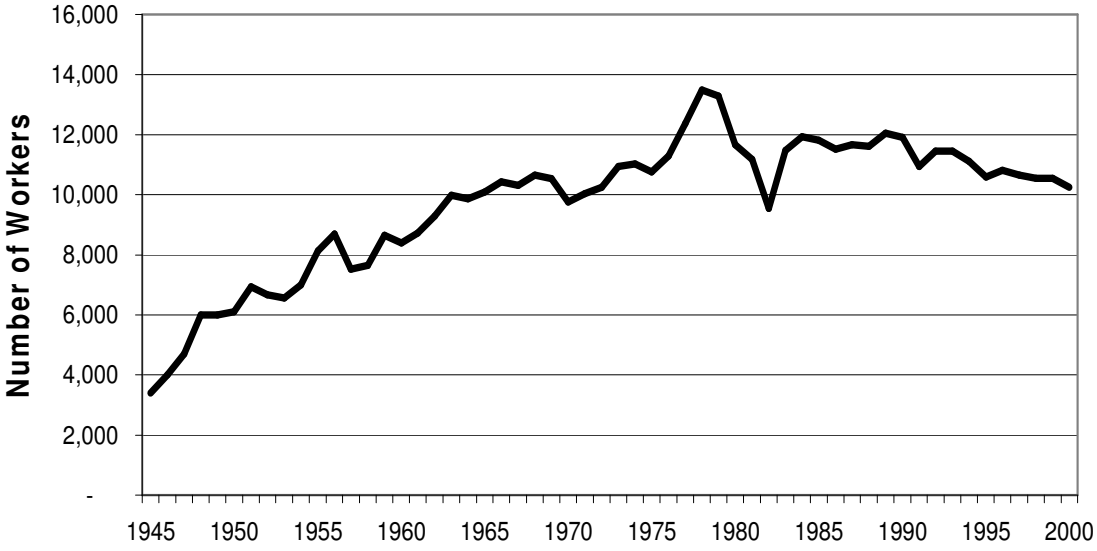


Figure 8: Montana's Timber Harvest by Ownership, 1945-2005

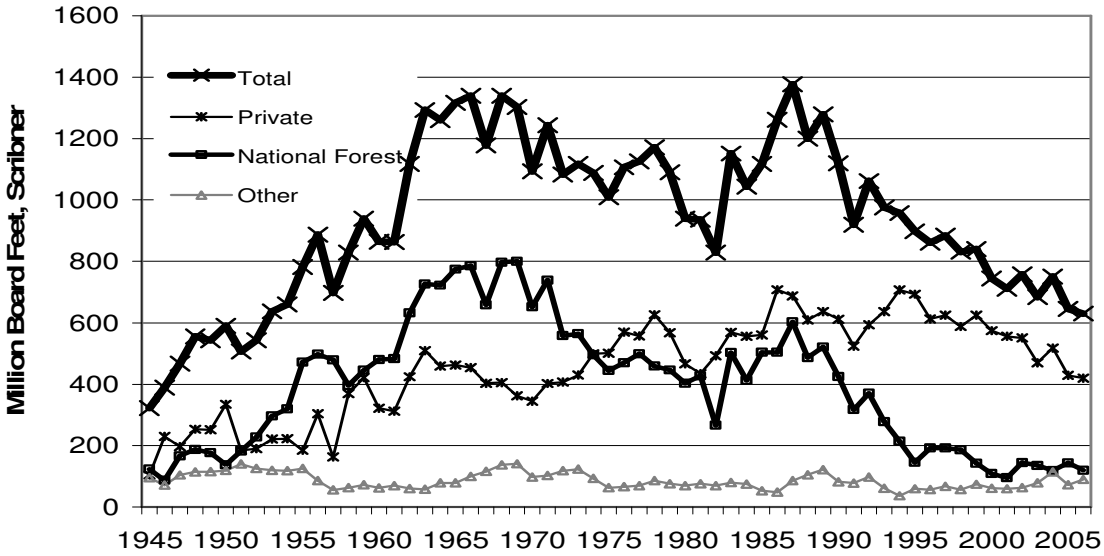
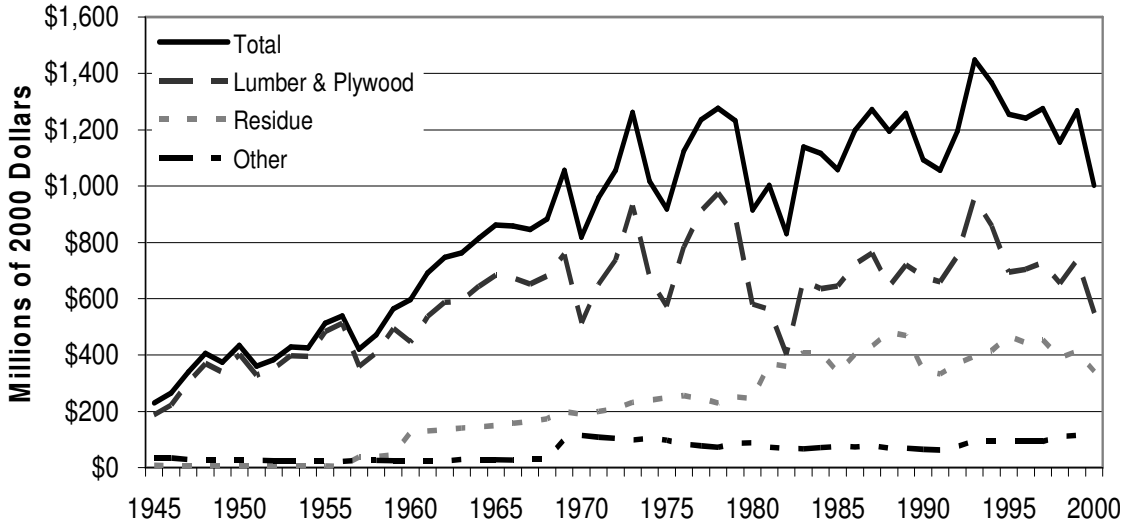
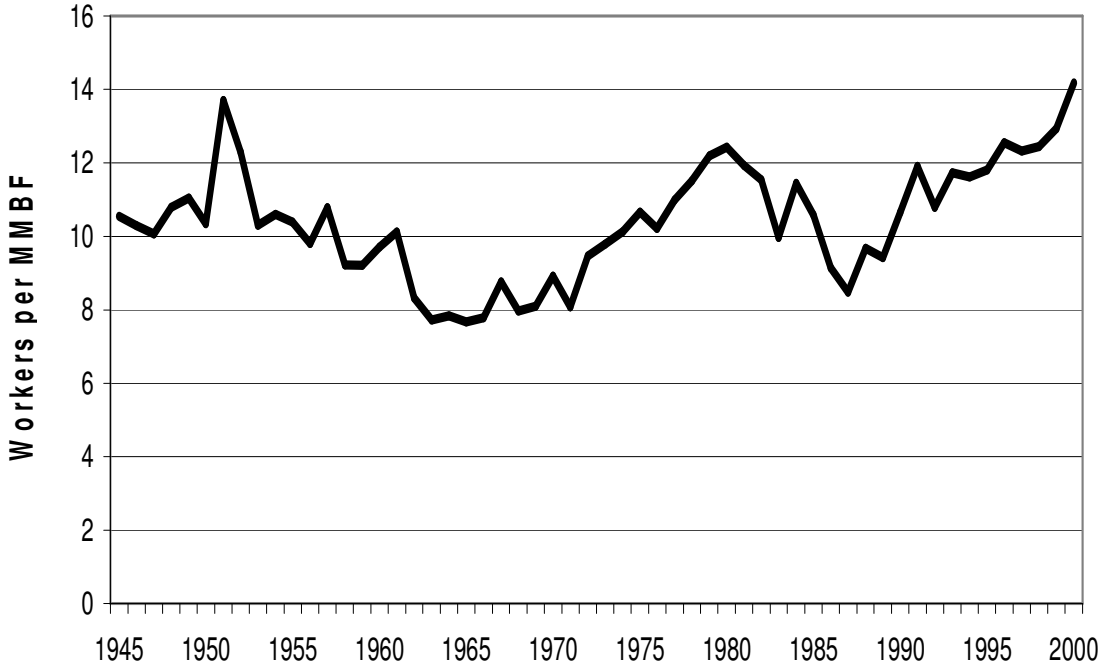


Figure 9: Sales Value of Montana's Primary Wood and Paper Products, 1945-2000



Although diversification of Montana's forest products industry began in the 1950s with pulp and paper and plywood, the industry during this period was concentrated in the sawmill sector. The overriding factor stimulating increased employment from 1945 through the late 1960s was a continued increase in the volume of timber harvested and then processed by sawmills, with the 1963-1967 period being the highest five-year harvest on record (Figure 8) . Lumber production increased from 342 MMBF lumber tally in 1945 to nearly 1.4 billion board feet in the late 1960s (Hutchinson and Kemp 1952; Western Wood Products Assn. 1970). The forest products industry during this period of rapid employment growth (Figure 7) was actually becoming less labor intensive as fewer but larger mills replaced numerous small mills (Figure 10)

Figure 10: Montana's Forest Industry Employment per Million Board Feet of Timber Harvest



As Montana forest industry employment increased from approximately 3,400 workers in 1945 to about 10,000 workers in the late 1960s, the industry increased in importance to state and local economies as illustrated by its increased contribution to the economic base. During this period, the major basic industries in Montana were agriculture, mining, manufacturing (including forest products), railroads, tourism, and the federal government. Agriculture, mining, and railroads all suffered substantial job losses in the 1950s and 1960s, while the forest products industry was the fastest-growing major basic industry in the State and was responsible for much of the growth in Montana's basic industries. The forest products industry's contribution to Montana's economic base increased from approximately 4 percent in the late 1940s to about 10 percent during the 1960s (Flowers et al. 1993).

Growth of the forest products industry had very dramatic impacts on Montana's western counties - the portions of the State most dependent on the industry - leading to a transformation in which manufacturing replaced agriculture as the dominant industry in western Montana (Johnson 1972). Given that portions of other major components of western Montana's economic base, such as transportation and the federal government, were linked to the forest products industry, close to 50 percent of western Montana's economic base was directly related to forest products by the late 1960s.

1969-2000

By the end of the 1960s, with almost continuous growth since WWII, the forest products industry had emerged as one of Montana's most important industries and was the major industry in western Montana. However, the subsequent three decades saw periods of extreme contrast for the industry with impacts and implications for the overall economy. The 1970s featured expanded markets and revenue, and strong increases in employment while the 1980s were characterized by weak product markets and a changing timber resource. In contrast, limited timber availability and generally higher but very volatile prices exerted the major influences in the 1990s.

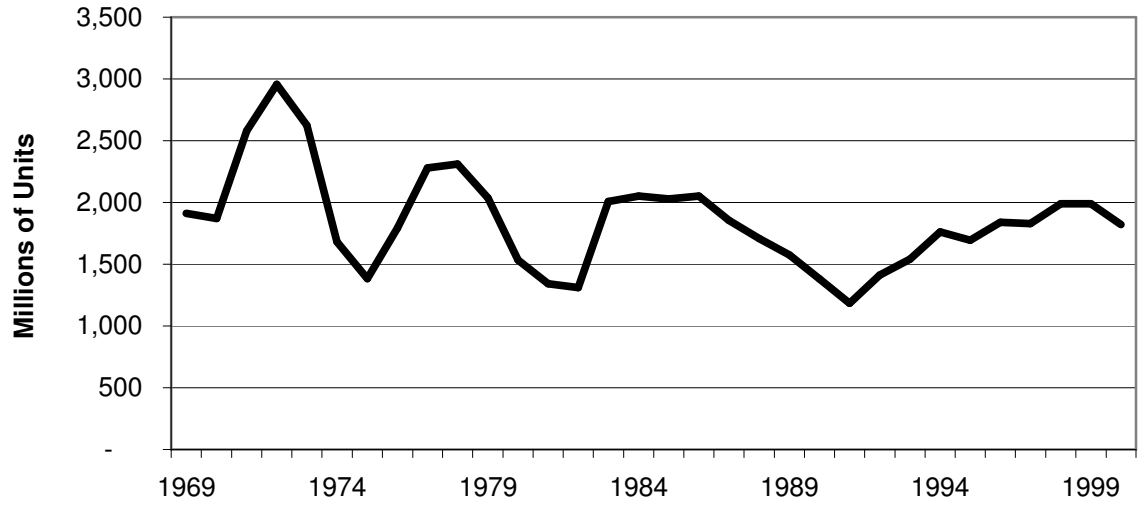
The 1970s saw diversification and strong markets, which led to increases in sales value and employment (Figures 7 and 9). Unlike the previous 25 years when employment growth was driven by increases in timber harvest, during the 1970s Montana's forest products industry actually became more labor intensive (Figure 10). Employment increased 30 percent to more than 13,000 workers despite a 16 percent decrease in the timber harvest from the 1969 level of

1,302 MMBF to 1,090 MMBF in 1979 (Figures 7 and 8). Factors contributing to the increase in labor intensity include (Keegan et al. 2001):

- Expanded use of residues from sawmills and plywood plants due to the construction of a particleboard plant and a medium density fiberboard plant, as well as expansion of the pulp and paper mill;
- Expansion of more labor-intensive industries, such as plywood and log homes;
- Increased land management activities such as thinning; and
- Very strong markets for wood products, particularly in the late 1970s.

The strong markets of the late 1970s collapsed as a new decade ensued. Sharp drops in the U.S. housing and construction industries resulted from the "double dipper" recessions of the early '80s (Figure 11). The forest products industry entered into a difficult period that lasted about six years. Employment fell to less than 9,500 workers in 1982 as harvest and production levels fell. By 1984, wood products consumption in the United States hit record levels, but low prices persisted, due largely to increased imports of Canadian softwood lumber made competitive by the very high value of the U.S. dollar. Markets improved in the last half of the 1980s with continued high consumption and a lower valued U.S. dollar. Harvest levels in Montana began to rise in 1983 and continued upward into the last half of the 1980s. In 1987, harvest levels were higher than those of the late '60s and early '70s.

Figure 11: United States Housing Starts, 1969-2000



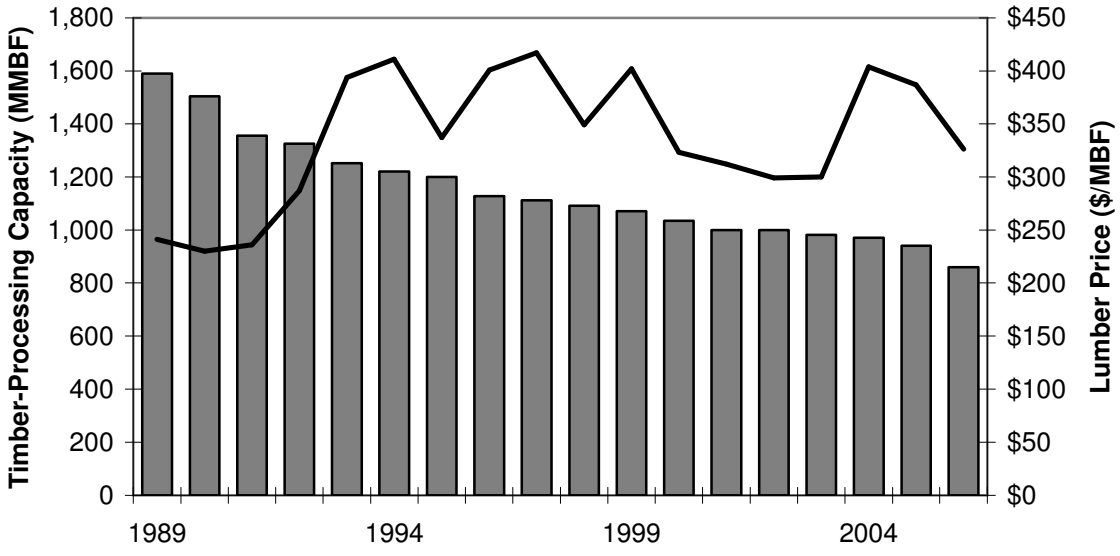
Employment, however, did not increase correspondingly. From its peak in 1978 of about 13,500 workers, the annual average for the last half of the 1980s was 11,645 workers. Decreases in employment were largely due to cost-cutting efforts and mechanization prompted by competitive market conditions and the availability of new technology, including a shift to less labor-intensive manufacturing facilities (e.g., sawmills for processing small diameter timber).

Following a national recession in 1990 and 1991, the forest products markets of the 1990s were high, albeit, volatile. The major factor impacting the industry in both Montana and North America during this period was not national economic conditions but rather widespread reductions in federal timber availability, particularly in the western United States. Federal timber harvest in the western U. S. fell by more than 80 percent during the 1990s. Harvest from federal lands in Montana declined by more than 70 percent during this period, causing total harvest to decrease by 30 percent (Figure 8). The declines in harvest resulted from appeals and litigation of timber sales, increased efforts to protect threatened and endangered species, cumulative impacts of historical logging and road building, and national forest budget levels (Keegan et al. 2001).

Driven by this decrease, there was a loss in milling infrastructure in Montana and the capacity of Montana's mills to process timber declined by thirty percent in the 1990s (Figure 12).

The decline in federal timber harvest led to reduced capacity and production throughout the western United States, and the scale and abruptness of the change had impacts in national and international wood product markets. When construction rebounded in 1992 and 1993, prices jumped to record or near record levels through much of the remaining 1990s (Figure 12).

Figure 12: Montana Timber-Processing Capacity and U.S. Lumber Prices



Montana's forest products industry again became more labor intensive (Figure 10). During the last half of the 1980s, employment per MMBF Scribner harvested averaged 9.5 workers. However, beginning in 1990, labor intensity began to increase, approaching 13 workers per MMBF Scribner harvested by the end of the decade, with a ten-year average of nearly 12 workers per MMBF.

This increase in labor intensity was the result of several factors (Keegan et al. 2001):

- Very high prices for much of the period made it economically feasible to use more labor to recover maximum value from the timber and also to use lower quality timber, which required more labor to harvest and process;
- Increased use of raw timber from other states and Canada;
- More labor-intensive harvesting practices due to environmental and aesthetic considerations; and
- Growth in more labor-intensive sectors such as log home production, and increased secondary wood products manufacturing.

The increase in labor intensity in Montana's forest products industry helped to mitigate the impacts of limited timber availability. By 1993 and 1994, Montana's timber harvest had dropped 25 percent from the average annual harvest of the last half of the 1980s; however, employment levels rivaled those of the late 1980s at around 11,500 workers.

Not every year in the remainder of the 1990s saw good prices, and global markets exerted a growing positive and negative influence on the U.S. and Montana's forest products industry. In 1995, lumber prices fell due to a slowdown in U.S. and international economies and rising imports of Canadian lumber. After the decline in 1995, lumber prices increased sharply, reaching high levels in the last half of 1996 and the first half of 1997. The increases were due primarily to a much-improved U.S. economy, improved overseas markets, and restrictions on Canadian softwood lumber entering the United States. In the second half of 1997, the U.S. economy remained strong but Japan and a number of other Asian countries experienced sharp declines in economic activity.

By 1998, the Asian financial crisis had expanded and lumber prices continued to fall. However, Montana's forest products industry fared better than expected because of mild winter and spring weather that allowed above-normal levels of logging. Production increased slightly

compared to 1997, with employment levels remaining essentially unchanged. Favorable conditions continued in 1999 with a stronger than expected U.S. economy and some improvement in the global economy. This led to 10 to 20 percent increases in lumber and plywood prices in 1999 compared to 1998. Nonetheless, continued impacts from limited timber availability led to mill closures and capacity losses, and in 1999 forest industry employment declined to approximately 10,800 workers. The year 2000 started out well for the forest products industry, with relatively high lumber prices during the first two months of the year. However, lumber prices fell sharply in mid-March and remained low for the rest of the year. An unprecedented spike in spot market electricity prices also impacted a number of major facilities. Curtailments and permanent closures across western Montana resulted in reduced forest industry employment to about 10,250.

The more labor-intensive nature of the forest products industry in the 1990s led to declines in employment that were much smaller, in percentage terms, than the declines in timber harvest. From the late 1980s to the last half of the 1990s, employment fell by approximately 8 percent, while harvest levels fell by more than 30 percent.

The Forest Products Industry and the Montana Economy

Estimates of employment and labor income in Montana's forest products industries are based on three standard industrial classifications (SIC) as defined by the U.S. Office of Management and Budget. The three classifications, which closely correspond to the forest products industry, are (SIC) 08-Forestry, (SIC) 24-Lumber and Wood Products, and (SIC) 26-Paper and Allied Products. Employment and labor income data reported here are taken from the Regional Economic Information System (REIS), published by the U.S. Department of Commerce, Bureau of Economic Analysis.

The correspondence of these industrial classifications is not exact, and gives a conservative representation of forest industry employment and labor income. A number of activities involving several thousand workers associated with forest products are not included in these categories, including log hauling by independent truckers; truck or rail transport of logs, wood fiber, or finished products; and timber product management activities by government employees. Conversely, some workers in the secondary industry that are not related to Montana's or the region's timber resources are included in these categories. These workers activities, such as truss manufacturing, are more closely related to the region's construction activity.

Labor Income

Inflation-adjusted (2000 dollars) labor income over the past 30 years has followed the same general trend as employment, although year-to-year changes have tended to be greater. When the economy is booming, employees are frequently paid bonuses or given raises, but new employees may or may not be hired. Conversely, as the economy slows, changes in labor income due to shortened workweeks or temporary curtailments may be much larger than changes in employment; the workers are still employed but their incomes are lower.

Both forest industry labor income and employment peaked in 1978. However, labor income increased 15 percent from its 1977 level of $497 million to $572 million, while employment increased 9 percent, from 12,365 workers in 1977 to 13,494 workers in 1978. After increasing throughout most of the 1970s, labor income fell during the recessions of the early 1980s, reaching a low in 1982 of $332 million. For the remainder of the '80s and up through 1993, labor income remained relatively stable, averaging $410 million per year before starting to decline in 1994. Over the next six years, labor income averaged $357 million per year, a 12 percent drop from the late '80s and early '90s, with the lowest level occurring in 1996 when

labor income fell to $335 million. Again, employment declined by a much lower percentage (6 percent). From 1997 to 1999, labor income rose slightly. However, labor income fell from roughly $370 million in 1999 to an estimated $364 million in 2000. This drop largely resulted from reductions in the number of hours worked due to the temporary curtailments caused by the summer's wildfires, low lumber prices, and limited timber availability.

Basic Industries and Trends in the State and Regional Economies

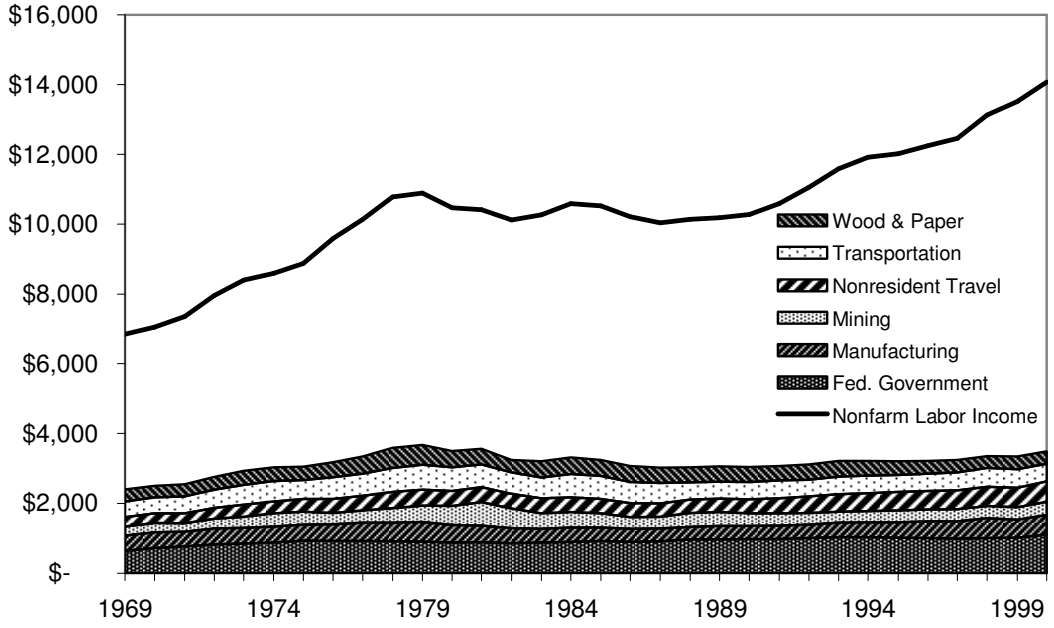
Changes in the Montana and western Montana economies for the period 1969-2000 are reported in the context of an economic base approach. This approach to regional economic analysis follows that presented in peer reviewed publications and is used by Dr. Paul E. Polzin of BBER to analyze long- and short-run changes in Montana's economy (Polzin 1988,1990, and 2006). The economic base of a region consists of industries whose economic activity is dependent on factors external to the state or local economy. These "basic" industries are important to an economy because they have the potential to inject new funds by way of payrolls, taxes, and purchases of local goods and services. Changes in these industries have a strong influence on trends in the overall economy because they also stimulate changes in the derivative or non-basic sectors. The derivative sectors are composed of firms that depend largely upon local business conditions; that is, they sell their products to local households, businesses, and individuals. Almost all local services (like drycleaners, grocery stores, and restaurants) are identified as non-basic because they depend almost entirely on local factors. Basic industries tend to be more insulated from local economic fluctuations since their products or services are generally sold in outside markets or they are otherwise dependent on outside funds.

The designation of an industry or industry component as basic or derivative can vary by region and over time. In some areas, certain service industries, as well as some construction activity, are also basic industries. However, the bifurcation of these industries into basic or

derivative can be difficult without looking at individual firms and may change substantially from year to year. Therefore, at the state level we define Montana's basic industries as wood and paper products manufacturing, other manufacturing industries (with the exception of printing and publishing; and stone, clay, and glass), railroad and truck transportation, nonresident travel, the federal government (including military and civilian personnel), mining, and agriculture. Because of the volatility of agriculture, total and basic nonfarm labor income is used to measure trends and activity in Montana's economy. Labor income serves as a good measure of overall economic activity in Montana.

During the 1970s, Montana experienced a period of significant economic growth (Figure 13). Nonfarm labor income climbed steadily with only a slight slowdown corresponding to the recession in 1974-1975, increasing more than 50 percent over the course of the decade. Most of Montana's basic industries grew substantially during this time with only minor fluctuations.

Figure 13: Nonfarm Labor Income and Labor Income In Nonfarm Basic Industries,Montana:1969-2000



The 1980s were a period of little or no overall economic growth for Montana. The first part of the decade (1981-82) featured a severe "double-dip" recession, the worst since WWII. Montana's economy struggled for the rest of the decade; inflation adjusted nonfarm labor income in 1989 was about 3 percent less than in 1980, influenced strongly by a 13 percent decline in nonfarm basic labor income. The poor performance of Montana's economy during the '80s was seen in almost all basic industries; the only sector to increase throughout the period was the Federal government. The 1990s once again saw significant growth in Montana's economy. Nonfarm labor income increased 37 percent from 1990 to 2000, with labor income in basic industries increasing by approximately 15 percent.

Looking back at the 1970s and 1980s, economic trends in the state economy were highly correlated with and influenced by trends in Montana's basic industries (Figure 13). During the 1990s proportional growth in the overall economy was substantially greater than in the basic industries. In the 1970s and 1980s nonfarm basic industries accounted for 34 and 31 percent of total nonfarm labor income respectively. During the 1990s, basic industries accounted for approximately 27 percent of total labor income; in 2000, 25 percent of labor income was in basic industries.

Although changes in basic activity almost always have measurable impacts on the derivative sector, there may be changes in the derivative industries (as defined in this report) that are not associated with corresponding changes in the basic industries. These factors help explain the 37 percent increase in nonfarm labor income that occurred from 1990 to 1999 while labor income in Montana's basic industries grew by only about 15 percent.

Among these factors are:

- Construction labor income at the state level is included in nonfarm labor income but is not included as a basic industry. Construction activity increased substantially in the 1990s, much

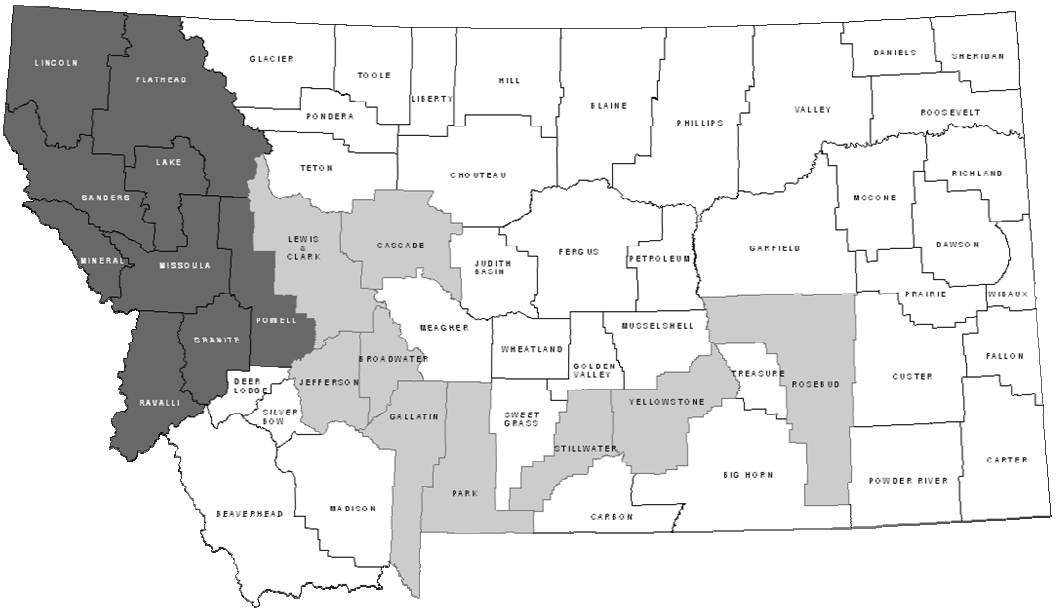
of that increase may have been basic, such as federal highway funding or second home construction by non-residents. Also, some of it may be associated with basic industries, such as plant construction or expansion. Moreover, construction was abnormally low in the 1980s due to the weak economy; therefore, there may have been some catch-up construction in the 1990s.

- Structural changes are causing growth associated with, but not immediately identified with, changes in basic industries. For example, the use of business and temporary service firms has increased, not only for lawyers and accountants but also for production workers. This means that some employment and labor income formerly reported in basic industries is now reported in derivative service sectors.
- Large increases in labor income also occurred in other derivative industries, such as retail trade; finance, insurance, and real estate (F.I.R.E); and services. By necessity, our analysis of the economic base at the state level is done on an industry basis; a more detailed analysis would require firm-level data to make reasonable geographic allocations of sales to identify basic components of the derivative industries. Consequently, there are firms in the economy that are classified as derivative that would likely be included in the economic base if looked at on a firm-by-firm basis, thus making the magnitude of economic activity in the basic industries appear smaller and, conversely, the derivative sector seem larger.
- Changes in the spending habits of the population can also cause increases in certain derivative industries. For example, as the population ages, a higher proportion of income is spent on health care and personal services.
- The late 1990s saw unprecedented increases in measured labor productivity with the largest increases in manufacturing (including forest products) and mining. These are significant components of Montana's basic industries.

The Forest Products Industry and Regional Economies in Montana

After increasing dramatically in the 25 years following WWII, to approximately 13 percent, the contribution of Montana's forest products industry to the state's economic base continued to increase through the 1970s and 1980s, reaching approximately 16 percent in the late 1980s. During the 1990s, the share of Montana's forest products industry in the economic base fell to approximately 10 percent. Though over 40 of Montana's 56 counties have a consistent timber harvest, more than 80 percent of labor income and employment occurs in nine western Montana counties[1] where it constitutes a major component of the economic base (Figure 14). In addition, the forest products industry accounts for a measurable part of the economic base in several counties in central and southeastern Montana, contributing at least $1 million in labor income in each of nine counties in that region.

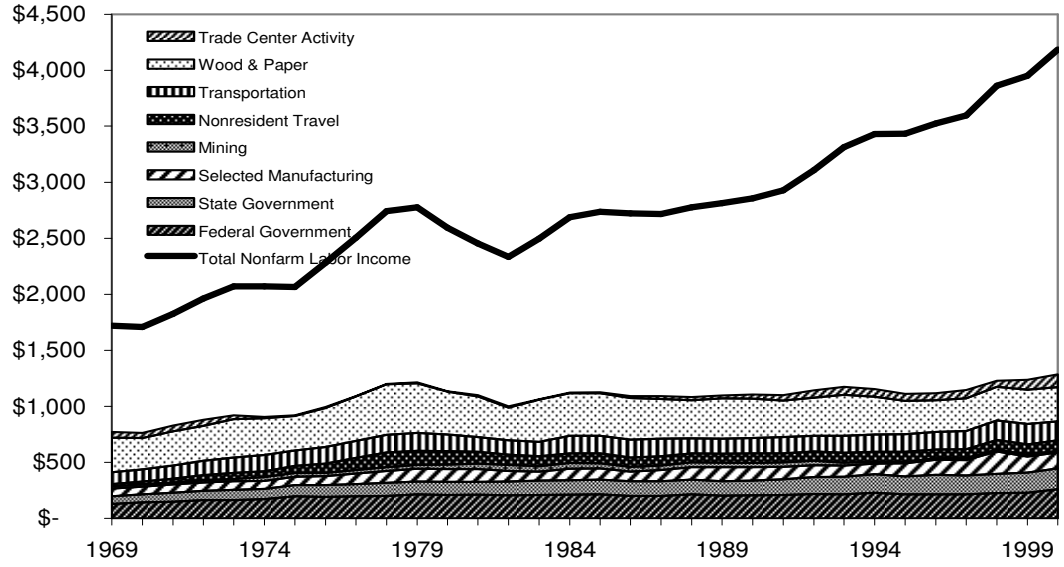
Figure 14: Montana Counties with Substantial Wood Products Employment



[1] Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Powell, Ravalli, and Sanders counties.

Western Montana: In evaluating the role of the forest products industry in western Montana, we have attempted to more precisely define that region's economic base by including sectors that are not basic at the state level, but are part of the economic base at the regional level due to their concentration. These components were identified as basic following the definitions used by the Bureau of Economic Analysis, and their magnitude was estimated using economic base theory and the calculation of location quotients for the individual industries. In addition to the industries that were defined as basic at the state level, the regional economic base also includes state and tribal government, as well as some trade center-related activity, such as components of health and business services, retail trade, and construction. Retirement payments were also examined, but they were not found to be a net source of funds for the region. Until about 1990, the condition of the overall economic base in the nine western counties largely mirrored what was occurring in the basic industries. Given this definition, the share of western Montana's basic labor income provided by the forest products industry ranged from nearly 40 percent in the late 1960s to 24 percent at the close of the century (Figure 15).

Figure 15: Nonfarm Labor Income and Labor Income In Basic Industries: Western Montana, 1969-2000



SUMMARY

Forest Industry in Transition

The development of Montana's forest products industry in the decades following WWII brought substantial increases in employment and high-paying logging, manufacturing, and transportation jobs to communities throughout the state. Growth of the forest products industry through the 1970s was an important element in expanding the state's economy, but a defining event in western Montana. The industry's development was largely responsible for the transformation in which manufacturing replaced agriculture as the "dominant industry" in western Montana (Johnson 1972). The western Montana economy has diversified in many ways since that period. While the forest products industry remains a large component of the region's economic base, it does not exert the overwhelming influence seen previously.

A healthy and diverse forest products industry plays a particularly important role given today's changing economy, forest conditions, and public interest. It can provide markets for material removed in a variety of forest management treatments. For example, fire hazard reduction treatments that involve removing increased volumes of small trees may not be feasible without a pulpwood or stud-log market. Receipts from selling timber products translate into personal income for private landowners, revenue to the school trust from harvests on state lands, and revenue to cover costs of wildlife habitat improvements, road reclamation, fire hazard reduction, or timber stand improvements from federal land stewardship projects. While sawtimber volumes traditionally drove forest management decisions on federal lands, trees removed today are often byproducts of treatments aimed at reducing fuels or restoring more sustainable forest conditions.

Availability of diverse markets provides landowners a range of outlets for the materials removed in treatments, affording them broader management opportunities and a financial

incentive to maintain forest lands intact, rather than subdividing them. A viable industry includes the trained work force and appropriate equipment to implement today's often-complex, low-impact treatments, and the milling infrastructure to utilize and add value to trees harvested as byproducts of treatments. The industry's ability to maintain and upgrade infrastructure is key to treating large areas of deteriorating forest conditions on public lands. Yet, nearly one-third of the state's timber milling infrastructure was lost in the 1990s due to declines in federal timber offerings, followed by further declines driven by lower harvest on private lands and weak market conditions for some products (Keegan et al. 2004b, and 2006).

High wildfire hazard, ongoing insect epidemics, expanding tree disease infections, and continuing closure of the state's timber processing facilities provide a sobering backdrop to a citizenry that desires good-paying jobs and values its rural culture, unique wildlife heritage, and a healthy, attractive natural environment within which to live, work, and recreate. Indeed, healthy forests, rangelands, wildlife populations, and clean water are fundamental to Montanans' quality of life and economic wellbeing in the future. These seemingly incongruous realities are the crux of the Montana Challenge. What, then, to do? Two working examples may provide useful models for the ecologically-based, socially-acceptable, and resource productive forest management that will be needed in Montana's future.

The Flathead Indian Reservation Model

About a decade ago, the Salish and Kootenai tribes embarked on a visionary approach to forest planning on the Flathead Indian Reservation (FIR) in west-central Montana. The Flathead Reservation includes about 400,000 acres of forest, ranging from dry ponderosa pine forests at low elevations to mixed conifer forests at mid-elevations to spruce-fir and whitebark pine forests near the crest of the Mission Range. Wildlife, scenic, cultural, and spiritual aspects of these forests are all highly valued by the Salish and Kootenai tribes. So too are the natural resources

and the associated revenue they provide, and the potential they hold for management to further the tribes' long-term goals for wildlife habitat and grassland restoration. Their approach to forest management planning uses the dominant natural disturbance regime (i.e., frequent understory fires, occasional mixed-intensity fires, or stand-replacement fires) as a framework for selecting the kind and intensity of management treatments appropriate for a given area. Their long-term goal is to create sustainable forest conditions in terms of stand densities, structures, and species compositions and generate moderate timber volumes. Silvicultural cutting treatments and prescribed burning are primary management tools or "disturbances" used by FIR managers to achieve these goals. Products of this management approach are forests resilient to unnaturally severe fire, restored grasslands, and improved wildlife habitat. The associated 20 MMBF of annual timber harvest contributes significantly to tribal employment and economic well-being, and is accomplished within the natural disturbance regime framework specified in the forest plan.

The Blackfoot Challenge

The Blackfoot Challenge is a unique collection of ranchers, loggers, landowners, conservation organizations, recreationists, local residents, and public agency officials who have organized to preserve the natural and cultural legacies of the past but also to shape the future of the Blackfoot Valley. Features prized by all are the relatively undeveloped river system, expansive cattle ranches, timbered mountains, diverse wildlife, and rural lifestyles. The activities of the Blackfoot Challenge are not an exercise in idealism, but rather recognition that the future of the Valley depends both on its natural features and its people making a living on a productive and beautiful landscape, one that provides timber, grazing, hunting, fishing, rafting, and sight-seeing, among others. The intent is that all traditional land uses be supported, subdivision be minimized, and a Community Forest be established that provides multiple

benefits – resource and amenity – and helps support the local forest products industry. The Blackfoot Challenge is a local, grassroots (non-governmental) organization of like-minded citizens relative to the value of community and place. While some aspects of the Blackfoot Challenge are unique, many are transportable to other areas where people are willing to work to maintain natural landscapes, functioning wildlife habitat, and the traditional land uses that can be compatible with both.

Forest Management in Transition

Forest management is an integral part of Montana's economy, social fabric, and efforts to address forests at risk, and as such remains key to the state's future. On federal lands, management must focus on restoring sustainable conditions and reducing wildfire hazard, particularly in the face of a changing climate. The timber generated as byproducts of these activities is also crucial to retaining critical mass in the state's harvesting and processing infrastructure Many of the state's forests are undergoing fundamental changes in terms of increasing fire hazard and successional change to more disease-prone species – changes that are unprecedented, but likely not irreversible. While the heavy cutting and road-building in the 1960s to1980s and the light cutting since the mid-1990s are understandable in the context of their times, neither approach addresses these concerns. Moreover, both management approaches have significant negative implications for sustaining forest ecosystem health and the wood-processing infrastructure that is critical to Montana's future. Surveys conducted by the Bureau of Business and Economic Research show that most people recognize the problems associated with the state's forests, and most agree on the general principles for addressing them. Management based on these principles could provide significant long-term benefits to both

forests and people, and as such, should be an integral part of Montana's changing but still wildland-based future.

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