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Prefabricated Log Homes and Complementary Products in Western Montana[1]
Organization for Economic Cooperation and Development
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1. Description

Genesis: During the Great Depression (1930s) the Civilian Conservation Corp (CCC) was established by the U.S. government to create jobs and teach skills. One place it operated was in the Rocky Mountain forests. When the CCC wound down in 1938, a few entrepreneurial corpsmen discovered a market in log homes. In 1946, National Log Construction established a milled log home company in the state of Montana, which generated new markets and businesses and ultimately expanded in size. Prior to that time, companies made log cabins but not family-size homes.

The heart of the log-building cluster is Montana's Bitterroot Valley, which traverses the length of Ravalli County in the southeastern part of the state. Other log home builders, post and pole companies, furniture builders, and suppliers, however, are scattered throughout the densely forested rocky mountains from the Lake Flathead region 100 miles to the north to Bozeman 100 miles to the west. The largest concentration of this sub-cluster can be found along I-93, sometimes called "Log Home Alley" (Table). Log homes can be seen in the assembly stage all along that route. From 1988 to 1998 production more than doubled in constant dollars (boosted by 37 new companies between 1993 and 1998) and has held its own through the recent recession.[2] The value added to the finished product is about three times the cost of raw wood. In Ravalli County, despite the reductions in logging activity on national forest land, 75 percent of all of its manufacturing employment is in lumber and wood products.

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[1] This report was supported by the OECD. It is summarized in the OECD publication Networks, *Partnerships, Clusters and Intellectual Property Rights: Opportunities and Challenges for Innovative SMEs in a Global Economy*, Published for the 2nd OECD Conference of Ministers Responsible for Small and Medium-Sized Enterprises. Istanbul, Turkey 3-5 June 2004.

[2] Charles E. Keegan III, "Montana's Log Home Industry: Developments over the last three decades", *Montana Business Quarterly*, Winter 2000, p. 3.

Table: Regional copncentrations

Prefabricated Log Homes	Employees	LQ*	Firms	LQ*
West	479	**23.9**	28	**24.4**
Southwest	59	**3.9**	9	**9.5**
South Central	11	0.7	5	**6.2**
North Central	32	**3.3**	3	**5.2**
East	0	0.0	0	0.0

* Location quotient

The companies operate as a high value added cluster within the state's wood products and more general forest products sectors, which include the loggers, sawmills, paper mills and other value added wood manufacturers. Log homes are 25 – 30 percent more expensive than a stick frame home. The cluster consists of 45 primary home builders, nearly all of whom are locally owned and small or mid-sized, and more than 40 companies that make compatible structural parts such as doors, beams, windows, staircases, gates, and roofs plus log and other western-style furniture. There are two basic types of homes, milled-log and authentic log. The former, which constitutes about 95 percent of production, uses logs that have been machined to fit together, and the latter are notched and matched by hand—and therefore much more expensive. Milled homes use 8 to 16-foot logs while authentic log homes use up to 40-foot logs.

Institutional stakeholders include various educational institutions. The School of Business at the University of Montana in Missoula conducts economic and marketing studies for the cluster and Montana State University at Bozeman's agricultural and engineering colleges support process development, testing, and management. The Montana School of Log Building located in Three Forks west of Bozeman is now 25 years old. The school trains people in construction methods and businesses operations. The engineers at the Montana Manufacturing Extension Center located at Montana State University assist manufacturers with a range of technical and organizational problems.

2. Key Features

This cluster has only recently been targeted by the state government as a specific cluster. This was the result of a cluster analysis conducted in 2003 by Regional Technology Strategies. Past policies have been driven more by traditional sector policies, some of which have involved government support. Innovation, however, has come from entrepreneurial owners and workers, not research institutions.

Innovation: Despite very large federal investments in applied research and development in state universities from the U.S. Department of Agriculture, the main source of innovation has been from entrepreneurs within the cluster. The engineering properties regarding, for example, warping and cracking were not understood and codified until the 1970s. Before that there were no building codes for log homes. In 1972, an entrepreneur (Alpine Log Homes) reinvented the log home industry by finding a better way to use more authentic Montana handcrafted logs. His innovation was to prefabricate niche log homes out of these rough, and longer than standard, logs in modules at a single site, disassemble and ship them, and reassemble them on site. He developed the techniques, codebooks, engineering standards, and chinking methods. This innovative company proved to be a wellspring of entrepreneurship as employees of the company left to start other new companies in Montana. Other innovations are embedded in the artistic content and customized nature of the product. Specialty suppliers, such as Artisan Doors, are able to supply individually designed components.

Other innovations occur among highly specialized firms that either supply or complement the cluster\ or that require similar skills. A number of successful artisans are using the same wood the log home builders use to make artistic wood products linked to the local cultural environment, including bows and arrows, totem poles, and chain saw cut figures.[3]

Social Capital

In a close-knit community like the Bitterroot Valley, "everybody knows everybody" in the industry.[4] As one owner told the author, "we used to think we were all enemies…now the best thing about our organizations are in learning what someone else is doing and what may be beneficial to you. [We] still compete but understand the value of cooperation." Another owner added "it just helps to talk to other people about problems and possible solutions." Sawmills develop long-term network-type relationships with loggers, loggers with haulers, and log homebuilders with design and engineering firms. Most of the association occurs when the local development agency organizes workshops, through chamber of commerce events, or in association sponsored events. In the Bitterroot Valley, for example, a "leads" group of business people meets semi-monthly, exchanges business leads and information, and looks for networking opportunities.

Suppliers

Access to raw materials and supplies are important elements of this cluster, largely because the costs of transporting lumber are high and the use of native materials contributes to a form of regional branding that can increase a product's market value. The proximity of the lodgepole pine forests and logging is in part why the cluster developed in Montana. A log home requires from 50 to several hundred logs, with an average of about 200 logs per home. Timber harvests from federal, state, and private lands represent the state's most important asset. In 1998, 71 percent came from private lands, 26 percent from public lands, and 3 percent from tribal lands. Sources of lumber have been shifting over the past

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[3] Andy Smetanka, "Out of the Woodwork," *Missoula Independent* 15 (No. 5., January 29, 2004), 14:15.

[4] Much of the information came from personal and telephone interviews in 2003 and 2004 and from meetings in which the authors participated.

decade from public to private lands.[5] This marks a drop from about 40 percent in 1976 to about 20 percent in 2001. Total harvests also have decreased sharply—from 1.2 billion board feet in 1988 to 1 billion in 1993 and 962 million in 1998. House logs and pulpwood relied the heaviest on public forests, with 50 percent and 57 percent respectively taken from federal and state forests. In 1993, 83 percent of pulpwood came from public lands.

Design and engineering freelancers and companies comprise another important part of the supply chain. Although the larger firms have designers and architects on staff, most companies rely on regional expertise to contract their design work. Nearly all firms contract out the engineering review of the designs to local people. The chinking material and technology also is particularly critical to this cluster, and local technical sales representatives work closely with the builders, including training workers in the application of these technologies. Other local firms supply windows, gates, and moldings.

Transportation

Transportation is vital to the movement of very large products, from raw logs to disassembled log homes, and good roads must be maintained Finding and acquiring the high quality logs needed can be an expensive process, even given the proximity to forests. The two issues are getting the logs and shipping the pre-built homes. For the first, companies rely on both trucks and air. Much of the best timber is deep in the forest with no road access. The harvesting of logs in Montana often (about 25 percent) requires helicopters to get them to a road access point, and then they have to be moved by truck. Logs also are purchased from Canada and trucked south to the prefabrication sites. Fortunately, Montana has a good road system, but transportation adds considerably to the cost of the raw materials.

The costs of transporting the completed homes to the customers' building sites is also high, since about 86 percent of log homes are sold out of state. Companies use independent trucking companies with flatbed trailers to ship disassembled homes. The cost of shipping a log home is about $1 per loaded mile. Milled-log homes are easier to ship than authentic log homes because the former use shorter standardized sections that can be bundled.

Marketing

Most log home companies sell through networks of independent dealers. The dealers arrange financing and may contract to erect the house. Only the largest companies have full-time personnel to work with dealers. There are a large number of magazines dedicated to log homes and to mountain living in which Montana firms are prominent.

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[5] Charles E. Keegan III, et al., *Montana's Forest Products Industry: A descriptive analysis, 1969 - 2000*, 2001, Table 10, p. 26.

The market for the homes must extend well beyond Montana, since there is not enough local population to provide sufficient housing starts. The potential expansion of the market is not unlimited, however. While log home builders do sell to customers overseas who have sought them out, the builders do not actively market overseas because of transportation issues and costs.

Labor and Skills

The cluster has low entry requirements for formal education. As in most clusters, companies look for people with some experience or who are mature (over age 25) and committed to learning the business. Companies try to keep labor costs down, since the homes are more expensive to build than stick frame homes. Relevant educational credentials are not considered very important to employers, perhaps because programs that award them are rare or because the educational requirements are more easily learned on the job. However, this does not mean that the work does not require good basic, analytical, and problem solving skills. As the tasks become more selective, mechanized, and computerized, employees need technical skills plus they are expected to acquire a trade association certification as an Accredited Logging Professional, which has to be maintained annually. Some of the new entrants do have some college education, but usually not explicitly linked to the cluster.

3. Results to Date

There has been no systematic overall cluster-targeted "programme" until 2004. This cluster developed as a result of private sector investment decisions, not public policy interventions—as are nearly all clusters. But results from certain cluster-specific interventions that developed in response to demand and an emerging strategy to strengthen the cluster can be described. The Montana Manufacturing Extension Center, the Agricultural Extension Service, and the University of Montana Business School as examples, have all helped individual companies in various ways—the first with direct assistance to companies, the last with research and information about markets and the industry, and the agriculture extension service with some of both.

The Montana Logging Association, which conducts employee accreditation workshops, recently (2003) formed a joint task force with the University of Montana at Missoula's College of Technology to identify the new skill needs and develop a Western Montana Logging Program for incumbent workers. The tentative plan is similar to the U.S. Department of Labor's Regional Skill Alliance program, where groups of companies select employees to be trained along with employees of other companies. Once in place, each module of training will result in a certificate of completion, and these will accumulate towards a recognized industry credential. The content will include basic skills including computer and electronics, knowledge of wood species and economics, forest stewardship, use of special equipment including hydraulics, diesel, and computerized, and fire fighting

The most important cluster-based initiatives, however, are still on the horizon as the state implements the plan for the cluster that was completed and launched in May 2003. The first steps are focusing on improving targeted education and training and on building and empowering a leadership cluster council for all wood-based enterprises to assume responsibility for identifying issues and setting priorities.

4. Factors that contributed to Program Success

Capital is available and local banks seem to understand and appreciate the industry, participate in its associations, and are able to meet most of the demands for venture and working capital. One owner assured the author that "we've always used the local bank and they've never failed to help us." Another said "local banks have assisted this family business for more than 60 years." Not all got the same response though. One owner of an expanding company in the Northwest rated capital as very, very tight and hoped that as the economy improves it will loosen.

Since incomes are high and the work lends itself to entrepreneurial and creative people, it is an attractive career. Workers can often find more innovative ways to achieve a desired outcome. As one manager said, "everyone [who works for us] is some sort of artist in his own right". As in many parts of the country, work ethic is a problem when hiring young people. They lack the appropriate attitude to deal with customers and often do not understand the business context.

5. Difficulties Faced

Competition
While competition comes from other mountain and forested states, the newest competition is from outside the U.S. Nationally, the manufacture of furniture has seen a precipitous decline (more than 13 percent in employment in 2001-2002), due in large part to competition from China—which has built more furniture plants in the last three months than the U.S. has in the past ten years.[1] Yet Montana may be in better shape than most other states to survive and even grow because it has developed and maintained advantages with certain niche markets related, for example, to an outdoors, recreation-oriented, and rustic frontier-style design. The state also has a large regional market for agriculture related needs in both custom and mass-produced products for homes, ranches, and farms.

Access to raw lumber
This is the biggest problem the industry now faces. Logging activity in the forests in and around the Bitterroot Valley fell by more than 50 percent today, compared with the average of the volatile decade of the 1980's, in part because the earlier level could not be maintained without degrading the forests. The companies now purchase about 90 percent of their raw lumber from Canada. At least one of the

larger log home companies has been able to take advantage of the lack of accessible local timber by arranging a 10-year contract with the Canadian government to own a large tract of timber. If they have a surplus, they can then sell raw lumber to their competitors in the Bitterroot Valley at a profit. Part of the arrangement with the Canadian government includes the concessions of building a log home plant in Canada and employing Canadian workers.

Some of the lumber goes directly to log home manufacturers. Other ingredients used in the final products include chinking materials, sealants, paints and finishes, bolts or spikes, metal hinges, fasteners, and stampings, and adhesives and sealants. All of the prior mentioned ingredients tend to be more standardized and easily purchased from anywhere in the world.

Labor shortages

There are selected shortages of certain skills in the labor pool—such as workers who know how to program, modify, and repair computer numerically controlled equipment that is being used by an increasing number of companies. When equipment breaks down, according to one owner, "considerable time is lost waiting for qualified repair personnel—who sometimes have to be brought in from Canada. " Another skill that requires higher levels of education is operating AutoCAD and the 3D versions.

One log home company describes the skill curve of the labor pool in the Bitterroot Valley as a bathtub, with a high number of unskilled workers and well-skilled workers at each end, but a low number of semi-skilled or trainable workers in the middle. It is these semi-skilled or trainable workers with technical aptitude that this cluster needs.

Unpredictability of Raw Materials

One challenge named most often is the reduction in and unpredictability of the supply of timber from the state. It affects the logging companies and mills most severely because the sectors that use wood can purchase from Canada or Idaho, although it become less convenient and sometimes more costly.

An example of the unpredictability of timber supply is the 300 acres of dead standing timber (killed by forest fires) in the region that are currently tied up in litigation. As the litigation procedure continues, the timber is rotting.

The unpredictability makes it difficult for companies to make capital investment decisions and modernize. One result is that some companies are moving production across the Canadian border where logs are more accessible.

6. Bologna Charter

This log home cluster, although operating with no knowledge of the Bologna Charter, operates largely within that policy framework. While the State of Montana has long recognized the contribution of the industry to the state's economy and "brand", in 2003 Montana officially recognized it as a specialized sub-cluster within the larger wood products cluster but with special attention to the log home industry because of its special potential for growth and export. This is leading to a process for organizing private sector (mainly SME) leadership and more explicit policies to address certain needs.

Effective strategies (outlined below) were proposed for the growth and competitiveness of the parent wood cluster with the help of consultants led by Regional Technology Strategies, Inc. The strategies were designed to address the factors outlined in the Bologna Charter that were acknowledged as beneficial to SME competitiveness. Factors addressed were:

a) effective access to financial markets (Strategies 1 and 4);

b) b) education and human resource management policies and programs that foster an innovative and entrepreneurial culture in a lifelong learning context (Strategies 2, 3, and 6);

c) c) an environment that supports the development and diffusion of new technologies for and by SME's (Strategies 1, 2, 3 and 6); and

d) d) strengthening public-private partnerships and political and social dialogue involving territorial and institutional actors as a tool for exchange of information, utilization of knowledge and elaboration of policy (Strategies 2 and 5).

A Wood Products Cluster Leadership Council, which will meet for the first time in March 2004, will take the lead in planning and following through with the implementation of the strategies. The March meeting will include two log home builders. A planning meeting among key stakeholders called by the Governor's office and held in the State Capitol at Helena in January 2004 prepared the organizing framework. Much of the leadership responsibility will rest with the Montana Manufacturing Extension Center (MMEC), which is part of a national effort to help SMEs—but whose budget for 2005 the U.S. Congress reduced by 63 percent.

In addition, the Bitterroot Workforce System Community Development Team, a partnership between state and local government and quasi-governmental agencies that support economic development, hosted a meeting on February 19, 2004 to discuss cluster based workforce challenges in the region, which are focusing on the wood industry but also looking for opportunities for diversification.

Strategy 1-- Establish a one-stop resource center for the wood cluster
The Center would be a storehouse of information and act as broker to other agencies that meet particular needs. *Create and staff a Wood Competitiveness Center to work with existing associations to organize and coordinate information and expertise for easy access and to fill gaps in services.*

Plans are underway to use a congressional "earmark" (.i.e., set aside) to create a resources center for the wood cluster that would have particular expertise within the subsidiary log home cluster.

Strategy 2-- Organize learning and training networks
Since small firms in any industry rarely are able to support training, a common, cost-effective solution is to organize training for groups of employers. *Provide modest incentives to the MMEC and to industry organizations to broker, and to firms to participate in, networks for problem solving or for developing their workers' skills.*

Based on previous efforts within the U.S. Manufacturing Extension Partnership(MEP) to use networks as ways to enhance SMEs, the managing entity for the cluster, the MMEC (part of the MEP), intends to encourage networking.

Strategy 3-- Establish branding and a Montana Design Center
The combined creativity, experience and knowledge of artists and wood crafters working together to create a distinctive, high quality brand style, could be the key to forging an easily-marketable niche for Montana products. *Establish a Montana Wood Design Center as a marketing and educational center with staff and a rotating short-term resident expert.*

This is already underway. The College of Technology in Great Falls and Bozeman have developed a proposal for a new program offering an Associate of Applied Science degree in Montana Craft Design and Marketing. During the first year of the 2-year program, students explore American crafts ranging from wood, textile, metal, and clay to mixed media and uniquely Western craft. An exceptional feature of the program will be partnerships between the school and regional artisans, local museums, and galleries. During the second year of study, students continue to develop as artisans while they learn the business of the arts through business and marketing courses.

Strategy 4-- Create a competitive research and innovation grant program to identify new uses or markets for forest products
Such a program might be used, for example, to find new uses for small diameter wood or to find niche markets. *This program may be best managed by a university but must have a simple application process, with peer review by industry people rather than academics, to attract companies and non-academic individuals.*

This is still on the drawing boards but under consideration.

Strategy 5-- Make Montana parks, roads, and tourism offices showcases for Montana wood
Logs should be the standard for state supported buildings related to tourism and the interiors should reflect the best of Montana art and design. *Require that Montana wood be used for all state park facilities and transportation structures; designer wood products should be used where possible.*

No plans for implementation yet.

Strategy 6-- Incubate new creative wood based enterprises
Incubators can provide low cost space to develop a product and process within a supportive environment among firms with similar interests and possibly similar markets. *Establish two incubators for secondary wood products companies in areas with large concentrations of wood manufacturing.*
This is viewed as important but more difficult for log homes because of space requirements. The state does, however, recognize the need for entrepreneurial support policies for the cluster and is exploring various options.

7. Summary and key lessons

This cluster, though relatively small, is important to the state of Montana because of its potential for expanded markets associated with growing interest in vacation homes in the U.S. and a distinctive state brand. As the economy has improved in recent months, the disposable income to purchase unique, high-cost homes has increased for potential customers. While companies produce log homes in many parts of the U.S., Montana has developed the highest concentrations and strongest reputation. The issue of access to raw material is as yet unsolved, but factors that can be controlled, such as worker training, support of innovation and entrepreneurship, and access to financing and technical expertise are being actively strengthened. Capturing a larger slice of this high-end market is being vigorously pursued with a concerted private-public effort addressing these factors. Although the cluster has developed with minimal public sector support—as have most successful clusters around the world—with growing competition, the state now realizes that it has the ability to catalyze faster growth with selective interventions.

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[1] Denise Becker, "The Fight to Furnish," *Greensboro News & Record*, March 1, 2003.