A Case Study of J&C Lumber:
Successes, Challenges, and Lessons Learned in Launching a Small-Scale Sawmill for Wildfire Recovery

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Executive Summary

The Dixie Fire of 2021 destroyed several communities in Plumas County, California, including Greenville, Canyondam, Indian Falls, Warner Valley, and the “north arm” area of Indian Valley. As a response, the locally-based 4th-generation logging company J&C Enterprises partnered with non-profit Sierra Institute for Community and Environment to develop a small sawmill on an industrial property owned by Sierra Institute in Crescent Mills, and founded the company J&C Lumber Inc. The goals of this initiative were to: 1) provide a much-needed outlet for fire-killed trees (particularly pine) from local properties and non-industrial forestland that otherwise had no outlet; 2) produce affordably priced lumber to be used by fire-affected communities in their rebuilding process; and 3) provide economic stimulus and jobs for the community in recovery.

Sawmill Overview

The J&C Lumber sawmill consisted of both a circular and band sawmill that worked in tandem to process burnt timber into lumber for a combination of wholesale and retail sales. Initial production targets were to generate 10-15 thousand board feet (MBF) per week of lumber, with a goal of growing production levels over time. Sawmill commissioning started in January 2022 and full operations began in May 2022.

Given the abundance of pine sawlogs following the Dixie Fire, and the lack of infrastructure on-site for kiln-drying and planing (both a requirement for graded lumber), the team first focused on supplying markets for ungraded, green, rough-sawn pine. Rough-sawn green pine 6x6s were sold to a wholesale outlet near Sacramento, and rough-sawn green pine, cedar, and Douglas-fir lumber were retailed locally, including to contractors and homeowners rebuilding structures lost to the Dixie Fire. Lumber for retail sales was not graded due to costs associated with hiring a grader being too high relative to the scale of production; instead, lumber could be used for construction of out-buildings, fencing, formworks, and exterior siding for rebuilding in the fire-affected communities.

J&C Lumber initially sourced sawlogs from hazard tree removal efforts led by J&C Enterprises on private parcels around the community—this work was directly funded by homeowners using their insurance payout funds. Logs were also sourced from fire recovery and reforestation site prep activities on non-industrial private forest lands funded by the Feather River Resource Conservation District, from small deck sales consisting of logs from fire cleanup activities on the Lassen National Forest, and from highway right-of-way hazard tree removal work performed by Caltrans. We estimate that in total, J&C Lumber sourced approximately 690 MBF of sawlogs from post-fire recovery activities on the local landscape (equivalent to approximately 153 log truck loads) and generated roughly 800 MBF of lumber.

The facility benefited from a variety of grant funding to offset costs of equipment purchases and de-risk the first several years of operations, including from Sierra Nevada Conservancy, the US Forest Service Wood Innovations Program, and the CAL FIRE Business and Workforce Development Program.

Challenges Faced

J&C Lumber ceased operations in 2024 due to a variety of challenges faced, including:

1. Volatile lumber markets following COVID19 impacts to the global supply chain and domestic lumber industry.
2. No building to cover its facility, restricting operations to spring-fall and limiting the operating windows to generate revenue.
3. Use of used old equipment led to many breakdowns and loss of productivity
4. Challenging financials for pine lumber markets
5. Limited log supply after year 2
6. Lack of a committed, full-time manager

Lessons Learned by J&C Lumber

Reflecting on the challenges faced by J&C Lumber taught us the following lessons learned related to sawmills operations:

1) Sawmills are a high-risk endeavor, and require significant capital resources to launch - which may not align with limited time for processing wood post-fire
2) Small-scale sawmills will be challenged to compete in traditional lumber markets
3) Production of value-added lumber products requires special considerations and built-up cash flow to ensure success
4) Log availability can be inconsistent and unreliable when surrounded by federal forestland and due to impacts of large-scale wildfires
5) Workforce was available, but trained workers with leadership potential was more challenging to find in a fire-affected community
6) The sawmill needed a paid, full-time leader to support operations and grow the company
7) Big ambitions, unrealistic business model

Recommendations

Given the lessons learned mentioned above, J&C Lumber offers the following recommendations in support of future wood products development in California:

Recommendations For Existing and Emerging Wood Utilizing Businesses:

- Keep product lines diversified and avoid business models that rely on consistent production to generate revenue
- Ensure flexibility in business structure to adapt to changing conditions
- Obtain guaranteed log supply
- Pursue cooperative approaches to wood products models

Policy Recommendations for Business Development and Support:

- Allow for flexibility in grant funding terms to the extent possible to accommodate inevitable changes in business plans by emerging businesses (and subsequent scope of works for grant funded projects)
- Focus efforts related to spurring development of wood utilization businesses on improving the business environment and de-risking market entry

- Pursue programmatic solutions or investment in market development opportunities that promote use of pine in building products
    - Explore additional new applications for mass timber panels made from pine lumber.
    - Empower local jurisdictions or other entities to pursue deregulation policies that support increased use of locally produced lumber (including pine), such as targeting a specific rule or regulation around lumber products.
- Elevation perspectives of wood products industry representatives and entrepreneurs in state and regional dialogues.

Policy Recommendations for Generating Log Supply:

- Support and build capacity of individual National Forests to offer long-term supply commitments for existing and emerging wood utilizing facilities, such as through increased use of Good Neighbor Authority.
- Encourage use of USFS Special Salvage Timber Sale Program to support small and emerging facilities, for deck sales and other post-fire tree removal work on federal lands following a wildfire.

Conclusion

J&C Lumber was challenged to continue operating after the fire recovery period due to lost productivity from breakdowns associated with used equipment, volatile lumber markets, unreliably log supply, and lack of a building to cover operations during the winter months; these factors all contributed to the facility closing in 2024. However, our team still reflects on the last several years as successful overall. We processed fire-killed sawlogs that otherwise had no outlet, created jobs and local economic stimulus during a period of disaster recovery, and learned myriad important lessons that hopefully will inform development of future work.

Drawing on our lessons learned, we encourage others to recognize that development of small and medium-sized sawmills at scale may not be a realistic solution to our state's overstocked forests, given the considerable risk an owner must take on and the already competitive nature of log and lumber markets. Lastly, we encourage those who coordinate and participate in regional dialogues around forest restoration and wood products infrastructure development to elevate perspectives of wood products entrepreneurs in these conversations, so that their expertise and lessons learned can help inform effective policy change in support of a resilient landscape.

Background

The Dixie Fire destroyed several communities in Plumas County, California, including the nearby town of Greenville, in the summer of 2021. As a response, the locally based 4th-generation logging company J&C Enterprises partnered with non-profit Sierra Institute for Community and Environment to develop a small sawmill on an industrial property owned by Sierra Institute in Crescent Mills, and founded the company J&C Lumber Inc. The goals of this initiative were to: 1) provide a much-needed outlet for fire-killed trees from local properties (particularly pine as existing sawmills in the region were flooded with salvage logs from their own industrial timberland and would not accept pine logs from outside sources); 2) produce affordably priced lumber to be used by fire-affected communities in their rebuilding process; and 3) provide economic stimulus and jobs for the community in recovery. From this vision, J&C Lumber Inc. was founded.

Through this partnership, the J&C team brought their wood products industry expertise to the table to lead development of a sawmill operation, while Sierra Institute provided access to the Crescent Mills Wood Products Campus to host the operation, managed permitting with the county, and leveraged funding to support initial project development. Funding was primarily sourced from an existing grant held by Sierra Institute with Sierra Nevada Conservancy (SNC) that was originally awarded to develop wood processing infrastructure in Plumas County; the extensive impacts of the Dixie Fire incentivized both Sierra Institute and SNC to ensure this grant could be applied toward post-fire recovery efforts, particularly to the J&C Lumber sawmill.

Sawmill Development

Given the immediate need to respond to post-fire timber salvage needs before burnt logs began to decay, the J&C Lumber team identified a need to quickly assemble equipment so that sawlogs could be processed as soon as possible. However, due to global supply chain issues in 2021 and 2022, all sawmill equipment dealers estimated a 2-3 year wait time for a new sawmill, and the cost (estimated to be ~$1M) to purchase a new sawmill and all its associated components for a full functioning facility at the desired scale of production would have exceeded the available budget. To avoid this long wait time, and to ensure the operation could immediately begin processing the abundance of fire-killed trees in the community within a realistic development budget, J&C Lumber began a nation-wide search for used sawmills and associated equipment.

Sawmill Design

By the fall of 2021, the Dixie Fire was declared 100% contained. At the same time, the project team purchased a used Mighty Mite circular sawmill and a used Wood-Mizer band mill to mill logs in tandem, using the circular saw to efficiently generate 16-foot cants[1] from whole sawlogs, and the band sawmill to re-saw these cants into dimensional lumber.

[1] A cant, in the context of milling and lumber, is a partially sawn log with at least one flat side that can either be used as raw material or can be further processed into small lumber pieces.

The Mighty Mite circular sawmill was selected due to J&C's familiarity with operating the Mighty Mite model, and because the robustness of the circular saw for removing bark could function as an alternative to a debarker, therefore avoiding the need to purchase additional equipment for log processing. A circular saw works well for rough cutting of cants, it can handle smaller rocks that might be embedded in the bark and has a cheaper blade and cuts faster than the band saw. The downside to a circular saw is that it results in a larger kerf[2], or more wood wasted in the cutting process due to the width of the saw blade. Another downside of the Mighty Mite is that it could only generate cants up to 16 feet long, which limited opportunities to participate in markets for longer beams and other longer length lumber products.

A band saw, on the other hand, is slower to cut but results in a more precise cut with a smaller kerf, wasting less wood and maximizing cutting efficiencies. A band saw was therefore deemed a great fit for re-sawing cants into smaller pieces.

This blended model of machines and mill types allowed the operation to have flexibility in product type generated and logs utilized so that the facility could stay competitive, and it maximized use of two small mills for what each was best designed for doing.

Other equipment procured included miscellaneous parts that were assembled for a green chain conveyor system, an edger, and a chop saw. Most contractors used to assemble the mills and associated equipment were based in the local area, including electricians and welders.

Log Supply

A significant impetus for starting the J&C Lumber sawmills was that the Dixie Fire and the 2020 North Complex Fire considerably impacted the local log markets as a large amount of private timberland burned in these fires. As a result, local sawmills, including Sierra Pacific Industries Quincy and Collins Pine Chester, became flooded with salvage logs from their own timberland, leaving little room for burnt sawlogs from other landowner types. To address this decline in local log processing capacity, J&C Enterprises and Sierra Institute launched J&C Lumber in Crescent Mills to generate a local outlet for material from post-fire recovery activities on non-industrial lands in Indian Valley.

J&C Lumber initially sourced sawlogs from homeowners insurance-funded hazard tree removal efforts led by J&C Enterprises on private parcels in Greenville, Indian Falls, Canyon Dam, and in the "North Arm" area of Indian Valley. J&C Lumber estimates that 400-500 thousand board feet (MBF) of sawlogs from this work were sent to J&C Lumber for processing and milling. Sawlogs from this work were readily available as hazard tree removal would have needed to occur regardless of having an outlet for the logs for safety reasons, and permitting for dead tree removal under "emergency conditions" on privately owned lands is a quick process via the

[2] A sawmill kerf is the width of wood that is removed from a log or board by a saw blade during the cutting process. A thicker saw blade will result in a wider kerf, which means more wood is converted into sawdust instead of lumber.

California Forest Practices Act. Ultimately, the existence of the J&C Lumber operation and the wood storage yard in Crescent Mills helped reduce costs to homeowners for hazard tree removal.

Photo 1. Commissioning the Mighty Mite sawmill in January 2022

Following completion of initial disaster response hazard tree-removal efforts, a portion of logs removed from salvage logging and reforestation site prep activities on private forested land in Greenville and adjacent communities were sent to the J&C sawmill; this post-fire salvage work was initially supported by American Forest Foundation's My Sierra Woods program, and later by the Feather River Resource Conservation District through the Emergency Forest Restoration Team Program. Other sawlogs came from a small half acre hazard tree removal project on the Plumas National Forest along Williams Valley Road in Greenville.

Additionally, Caltrans supplied sawlogs from hazard tree removal on private properties within the right of way along the "Greenville Grade" section of Highway 89, between Crescent Mills and Greenville. Due to permitting and legal concerns, Caltrans was unable to supply sawlogs from their right of way along US Forest Service managed lands.

Photo 2. Logs stored at the Crescent Mills site in January 2022.

Log Species

Most sawlogs sent to the J&C sawmill from hazard tree removal work consisted of ponderosa pine as this species is very prevalent at Indian Valley's elevation of about 3,500 feet. Pine also holds less value as a sawlog compared to Douglas-fir and cedar in northern California log markets, which made it challenging to find outlets for after the Dixie Fire. Without the J&C Lumber sawmill, it is likely that most pine logs from post-fire recovery efforts in the Indian Valley area would have been chipped, left in log decks, or left standing to decay on the landscape, turning into fuel for the next fire and hindering desired conditions for reforestation.

The J&C mill also procured cedar logs given that cedar lumber represents a higher value lumber product relative to pine. However, cedar is a lot less abundant in mixed conifer Sierra Nevada forests relative to pine, estimated to be at about 10% of a typical forest stand, making it a less reliable source of raw material.

Grant Funding

J&C Lumber benefited from a variety of state and federal grant funding to help de-risk initial operations. Initial development of J&C Lumber was made possible by funding from the Sierra Nevada Conservancy to Sierra Institute, which supported purchase and setup of the two sawmills and associated equipment.

In 2022, J&C Lumber received a USDA Forest Service Wood Innovations grant. The goal of this grant was to support the J&C sawmill in determining opportunities for supporting community recovery and utilizing burnt timber. More specifically, the grant was to expand local opportunities for utilization of green pine lumber for use in rebuilding Greenville and other fire-affected towns, such as molding for interior work, shelving, fencing, and other uses for boards.

In 2023, J&C Lumber secured a CAL FIRE Business and Workforce Development Grant to expand the sawmill to be able to generate specialty timbers for use in post-and-beam construction, which included purchase of a new sawmill capable of cutting lumber pieces greater than 16 feet in length. Production of specialty timbers would allow for the mill to generate products that are higher in value than in standard dimensional lumber markets, helping improve the economics of a small-scale sawmill. With this CAL FIRE funding, J&C Lumber purchased a Timber Buddy XP380 band sawmill and installed it on-site in early 2024.

Sawmill Operations and Lumber Sales

Sawmill commissioning started in January 2022, with operations beginning in May 2022. The initial business plan was to generate at least 10 thousand board feet (MBF) of lumber per week, with a goal of that value increasing over time, to be sold to both wholesale and retail lumber markets. Given the abundance of pine sawlogs and the lack of infrastructure for kiln-drying and planing (both a requirement for graded lumber), the team focused on identifying markets for ungraded, green, rough-sawn pine.

In the first season of operation from May to October 2022, J&C Lumber wholesaled roughly 70-80% of its lumber, allowing operations to consistently generate revenue. This arrangement also allowed the company to test markets and find a right-sized niche for its scale of production. Wholesale orders were filled for a building product distributor in Sacramento, for 6x6 rough-sawn, green (not dried) pine dimensional lumber. This distributor purchased rough-sawn pine products to further process into trim and moulding, used for interior finishing and other decorative features. As this distributor prefers to work with rough-sawn green lumber, lumber products from J&C Lumber were ideal for this customer. For this wholesale market, J&C Lumber worked to fill 2-3 lumber truck loads per week to deliver to Sacramento, roughly equivalent to 21-32 MBF per week (assuming 10.8 MBF per lumber truck load).

Beyond wholesale orders, J&C Lumber retailed 15-20% of its lumber locally. Retail products included rough-sawn green pine and cedar. Retail lumber was not graded due to high costs of hiring a grader relative to the scale of production, but could instead be used for construction of out-buildings, fencing, formworks, and siding that met California Wildland Urban Interface requirements for rebuilding in local fire-affected communities. Several local building contractors purchased lumber products from the mill to be used in rebuilding homes in the Greenville area, including for exterior siding.

Photo 3. J&C Lumber's cedar lumber featured in the exterior siding of this rebuilt house in downtown Greenville. Photo taken October 2024.

Photo 4. Attendees at the J&C Lumber ribbon cutting ceremony in May 2022. Credit to Margaret Garcia

Photo 5. California Secretary of Natural Resources Wade Crowfoot speaks at the J&C Lumber ribbon cutting ceremony, May 2022.

Photo 5. Ribbon cutting for the J&C Lumber sawmill, May 2022.

Market Development

To expand the sawmill's products beyond dimensional lumber and into value-added markets, the J&C Lumber team worked to identify market opportunities for specialty timbers, such as in post-and-beam timber frame construction. Initial market outreach for specialty timbers indicated that large timbers could be sold for as much as $3,000/MBF for pine timbers, whereas the wholesale market for rough-sawn pine was only yielding ~$500/MBF. Another benefit of expanding into this market is that the milling process for large timbers involves fewer cuts than dimensional lumber, therefore reducing production costs. Production of specialty timbers for this high-value market in theory could have improved the financial feasibility of a small sawmill, by avoiding the need to compete in the well-established traditional dimensional lumber market.

To do this, J&C pursued partnerships with architects, lumber yards, and other entities in the San Francisco Bay Area that sought to source sustainable building materials directly from producers to shorten the supply chain. J&C also worked with local businesses and designers to identify opportunities for incorporating J&C Lumber's products into building design for rebuilding businesses and other buildings in Greenville that burned in the Dixie Fire. This included engaging with local design-build company LMNOP Design Inc as part of its efforts to develop prefabricated mass timber housing units that could utilize pine 6x6 lumber produced by J&C Lumber. The idea behind these housing units being that they could be quickly assembled off-site, then transported to the housing site and installed in-place, particularly for areas of Plumas County experiencing a housing shortage since recent wildfires. A prototype structure was built using J&C Lumber's products, and preliminary plans for these structures were deemed acceptable by the Plumas County Building Official. However, with J&C Lumber ceasing operations due to lack of log supply commitments, this work is temporarily on hold. LMNOP Design Inc will continue to advance this model through its start-up, Timber Systems Inc.

Mill Successes

We estimate that development of the J&C Lumber sawmill injected at least $250,000 into the local rural economy through contractor and employee costs related to assembling and commissioning equipment and materials purchasing. Additionally, at its onset, the facility employed 6 full time employees, most of which lived locally in Indian Valley, or lived within the Plumas County area. Lastly, we estimate that over two years, J&C Lumber produced 800 MBF of lumber in total, the rough equivalent of utilizing 690 MBF of sawlogs from the local landscape.

Challenges

Once operational, J&C Lumber faced a variety of challenges that are summarized below:

Volatile Lumber Market

In 2021 and early 2022, lumber prices remained high following COVID19 impacts to the global supply chain and domestic lumber industry. These prices allowed for initial success with sale of rough-sawn green pine lumber products, particularly to the wholesale market in Sacramento, while maintaining 6 employees to keep the sawmill operating at a sufficient production level. However, these prices eventually dropped significantly (from $750/MBF for 6x6s to $500/MBF), hindering the financial viability of selling pine lumber to an outlet 3- hours haul time away from Crescent Mills given high transportation costs.

Without this reliable and consistent lumber market, the sawmill was challenged to continue operating at its scale of production. As a result, J&C Lumber eventually transitioned to retail-sales only, primarily for cedar lumber sold locally. This resulted in less production overall given that cedar logs are a lot less common in a typical mixed conifer forest stand.

No Building=No Winter Operations

While plans for future expansions and improvement of the sawmill included buildings or structures to house the sawmill, the team worked to set up the mill to be ready to operate as soon as possible given the time sensitive need for processing fire-killed logs to get ahead of inevitable log decay. Thus, all operations were outside, resulting in operating windows being limited to the summer season prior to winter weather and snowfall. This limited opportunity for the company to grow and continue operations at a level that consistently generated cash flow.

Photo 6. Finished lumber ready to fill orders, October 2022.

Old Equipment: Breakdowns and Lost Productivity

Equipment items for the original sawmill design were selected due to price and availability during the global supply chain crisis of 2021-2023. These machines worked as planned at first, but overtime began to break down, reducing production capacity and therefore reducing lumber sales, negatively impacting financials. The band sawmill eventually ceased working altogether, and the circular sawmill was relied on to generate both cants and lumber, increasing the maintenance needs and costs of the circular sawmill.

Challenging Financials and Limited Market Opportunities for Pine Lumber

With a decline in lumber prices and subsequent lower revenue from sales, seasonal limitations to operations, and lost productivity from equipment breakdowns, the sawmill continued operating but with very tight margins. This was further compounded by the inflation spike seen in the years following the COVID19 pandemic and global supply chain crisis, increasing prices of goods purchased by the mill.

In 2023, J&C downsized its operations as a result so that only two employees were needed to operate and run the sawmill (fortunately, those who were “laid off” from the mill were all offered logging-related jobs by J&C Enterprises, the mill’s partnering logging company), and all lumber sales were custom ordered and for cedar lumber only given the higher market value of cedar.

At its onset, the J&C Lumber team worked on local market development efforts in consultation with local engineers and builders to identify opportunities to incorporate pine in housing and building construction, given the abundance of pine sawlogs after the Dixie Fire. After initial outreach through recovery and redevelopment focused groups led by the Dixie Fire Collaborative, it became clear that the cost of engineering, materials, and labor for using pine lumber in the structural elements of a house were too high to warrant further pursuit of this opportunity; this is in part because of the new home construction industry in California already being designed around specifications of Douglas-fir and other fir lumber. For example, we found that most carpenters are already extensively trained in building with fir lumber for structural elements, and are accustomed to specific nail patterns, lumber sizes and cuts, and fasteners specific to fir lumber.

The use of pine lumber for shop, moulding, and other interior needs could have presented an opportunity for use of pine locally, but sales of pine were not high enough to sustain operations of a pine-focused sawmill.

Similarly, the J&C team initially aspired to eventually contract the services of a local lumber grader on an as-needed basis so that graded lumber could be sold for use in structural purposes. However, it became clear that the additional cost of hiring a lumber grader exceeded the market price for graded pine.

Limited Log Supply After Year 2

Post-fire hazard tree removal, salvage logging, and site prep for reforestation activities started to wind down in the greater Greenville area by late 2023. By this time, most private properties in the sawmill's vicinity that burned in the Dixie Fire had been treated, and remaining log decks or still-standing dead trees on untreated properties began to show signs of decay.

The J&C team met with Plumas National Forest (PNF) staff on several occasions to identify projects to source sawlogs from PNF's post-fire hazard tree removal needs, but due to PNF's limited staffing, funding availability, and how contracts for this work were packaged, these projects did not materialize. Additionally, during this time there were limited contract opportunities for "green" forest health projects on the PNF that involved removal of sawlogs that were within a reasonable haul distance to Crescent Mills.

Eventually, the lack of log supply let to reduced production, and not enough retail lumber orders could be filled to cover operating and even general overhead costs. As a result, specialty timber orders could also not be filled.

Lack of a Committed Full-time Manager

By combining the knowledge of many local individuals, including a retired logger, former sawmill operator, retired log buyer, building designer/architect, and a grant writer, and by leveraging the resources available from the family's logging company J&C Enterprises and the Sierra Institute, J&C Lumber had the experience and knowledge in-house to successfully launch itself. However, these individuals were either volunteers, retired, or already had full-time jobs or existing companies to manage. This arrangement worked at first, particularly after the Dixie Fire when enthusiasm and energy to generate meaningful good for the community was at its highest. But when the various challenges identified above emerged, it became clear that the company needed a committed, full-time leader to lead decision-making and guide the company through weathering the challenges.

Ultimately, we found that this type of individual with the knowledge, skillset, and availability to take on this position, is hard to come by in a fire-affected rural community such as Greenville where much of the community's housing stock and economic opportunity was lost in the fire.

Photo 7. Part of the J&C Lumber team discussing layout plans for the sawmill.

Lessons Learned by J&C Lumber from Operations of a Small-Scale Sawmill

Below we discuss key takeaways we learned from development and operations of the J&C Lumber facility; note that we offer recommendations to address challenges and lessons learned in the Recommendations section below.

1) **Sawmills are a high-risk endeavor, and require significant capital resources to launch - which may not align with limited time for processing wood post-fire**

Sawmill operations involve a high cost of doing business, including increasing costs of labor, parts, fuel, insurance, and repairs/maintenance needs. In addition, sawmills have tight operating margins and must stay productive as much as possible to stay profitable. These high costs are accompanied by low returns from standard dimensional lumber markets, posing a risk to the sawmill's financial feasibility should lumber prices unexpectedly change, especially for an emerging or new business.

J&C Lumber tried to maintain a meaningful number of jobs for the local workforce (with a goal of at least six jobs created) while successfully operating as a sawmill, but this model proved to be difficult for building cash flow when market prices for traditional dimensional lumber declined in 2023. Operations were also limited to summer months due to the mill being outside with no building cover.

With unreliable log supply, the team not only found it difficult to scale-up production and include a side for milling specialty timbers to improve the facility's economics, but also that overall operations were strained without consistent cash flow coming in. By late 2023 when lumber prices declined and log supply became less available, J&C Lumber was already in a cash-poor position, making it difficult to pivot and respond fast enough to these market changes.

We would be remiss to not discuss that humans have a strong desire to move quickly in a post-wildfire environment. We seek recovery to restore a sense of normalcy and achieve positive outcomes for the community and landscape, and the creation of J&C Lumber can certainly be attributed in part to trauma responses. While it could be argued that a quick development timeline for a sawmill was warranted given the abundance of burnt sawlogs in our community and the 2-4 year time limit for processing dead trees before they begin to rot following a wildfire, our team still likely moved too fast and too soon to launch a high-stakes operation. Successfully launching a sawmill requires capital resources on-hand and careful planning to ensure operational success, which does not always align with the timeline posed for log processing following a wildfire.

Instead, we suggest that future sawmills that launch in response to a wildfire stay small as an owner-operator model, so there is less at stake if log supply cannot be secured after the salvage period winds down post-fire.

2) **Small-scale sawmills will be challenged to compete in traditional lumber markets**

Due to the additional expense to grade lumber, and high costs of purchasing and installing dry kilns and a planer, it was not financially feasible to produce graded lumber at J&C Lumber's initial scale of production. We also found it to be challenging to turn a profit at a small-scale with traditional lumber markets, unless the sawmill could productively run all day; this was unrealistic given inevitable breakdowns associated with using older equipment.

Small-scale sawmills simply do not match the scale of the rest of the industry for participation in traditional lumber markets. Other well-established, much larger sawmills in northern California already produce dimensional graded lumber, and there is no sense in competing with these significantly higher capacity operations. Instead, small mills should focus on generating specialty products, such as large timbers that can be sold for a much higher price per board foot than standard dimensional lumber, and enter higher-value markets at a much smaller and custom-order scale.

3) **Production of value-added lumber products requires special considerations and built-up cash flow to ensure success.**

The J&C Lumber team sought to eventually generate value-added lumber products beyond standard dimensional lumber to avoid competition with production-scale sawmills. However, we eventually found that production of specialty timber products requires longer lead times to ensure adequate drying, special handling considerations, longer-term log supply commitments, and existing cash flow opportunities to sustain the business until these value-added products can be sold to the market.

For example, specialty timbers have a much higher market price than dimensional lumber (specialty timbers can sell for as much as $4000-5000/MBF, depending on the species), but these heavy timbers require at least a year to dry without a dry kiln, requiring the product be inventoried and stored prior to selling. This does not yield cash flow for many months; thus, the business needs sufficient revenue coming in to keep the business operating until the specialty timbers are dry and ready to be sold.

J&C Lumber held many conversations with a lumber yard in Napa County that was interested in developing a dowel-laminated timber production facility, as this company wants to source timbers from J&C Lumber. While initial conversations seemed promising over the market opportunity, J&C Lumber could not sit on the product while it was sufficiently dry without earning revenue in the meantime. To maintain a source of income, J&C Lumber continued to focus its effort on milling and selling cedar and pine retail lumber, which used up available log supply. This combined with the challenges of securing reliable log supply put the company in a position where it could not afford to manufacture special timbers and fill orders.

Prospective sawmill owners can learn from us by ensuring 3-5 years' worth of capital runway is in place to build into market viability, and to have an established market base for value-added products prior to production.

4) **Log availability can be inconsistent and unreliable when surrounded by federal forestland and due to impacts of large-scale wildfires**

The J&C Lumber sawmill was launched in response to an abundance of low-cost sawlogs that otherwise had no outlet, but it was the lack of available and affordable sawlogs in the third year after the Dixie Fire that eventually catalyzed the mill's end.

It's no secret that permitting is easier following a wildfire and when a state of emergency is issued from state and local governments, both for sawmill site development and forest management. Wildfires make sawlogs abundant, particularly from hazard tree removal efforts on private lands and in Caltrans and utility right of way corridors, therefore lowering delivered log prices and making market entry easier for an emerging sawmill. However, as the log market eventually normalized following several years of post-fire salvage, it became difficult to identify sources of logs at an affordable price – that is, not having to compete for sawlogs with larger well-established sawmills in the area.

Longer term, J&C Lumber planned to work with the Plumas and Lassen National Forest staff to identify sources of sawlogs either from post-fire work or "green" stewardship projects that larger sawmills may not have been interested This seemed especially pertinent given the state's goals to treat one million acres of forest annually by 2025, including on federally managed lands, as identified in the California Wildfire and Forest Resilience Action Plan.

It became clear that while the US Forest Service (USFS) Region 5 may be pushing its region to align with priorities set in the Wildfire and Forest Resilience Action Plan for annual treatment targets, these regional targets don't always match local USFS ranger district capacity or funding to implement this work. The result is that material from USFS projects is not consistently available and not a reliable source of sawlogs for a facility striving to utilize local wood.

5) **Workforce is available, but trained workers with leadership potential are more challenging to find in a fire-affected community.**

We found that general labor and mill operator positions were easy to fill; in fact, many J&C Lumber employees had previously worked at the SPI sawmill in Quincy and desired to work closer to home in Greenville and Indian Valley. There was therefore a minimal learning curve for job requirements and skills needed to work on-site among most employees.

On the other hand, we did find it challenging to fill and maintain supervisory positions with leadership potential to ensure that the sawmill stays productive, to prioritize maintenance during off-hours, and to reliably supervise workers overall.

Photo 8. A team meeting to discuss mill layout in November 2022.

6) The sawmill needed a paid, full-time leader to support operations and grow the company

The team that launched J&C Lumber possessed the experience and knowledge in-house to design and develop a sawmill, but this team consisted of people who were either retired or already had full time employment. The business therefore lacked a paid, committed, full-time leader to guide and grow the company over time. While ultimately J&C Lumber lacked the funds to properly pay and hire for such a position, it also became clear that an individual with this level of experience, knowledge, and potential was challenging to find in a fire-affected community that already struggled with limited job opportunities over the last several decades.

Moving forward, any wood processing venture should possess a full-time entrepreneurially minded leader to commit to the company's vision and help it adapt over time to market changes and other factors that might impact financial feasibility of such an operation.

7) Big ambitions, unrealistic business model

J&C Lumber was launched in part as an emergency response to the Dixie Fire, and the abundance of dead trees and sawlogs that needed to be removed for hazard purposes but with otherwise no place to go. The vision was great on paper – to bring back sawmilling capacity to a community that historically had a strong presence of sawmills, create jobs for a fire-affected community, process and value-add dead trees that might have been left to rot otherwise, support sustainable forest management activities in the surrounding landscape, and instill hope in a community recovering from the trauma that was the Dixie Fire. Through the challenges faced and lessons learned, what has become clear is that while the project was seemingly a great response to the Dixie Fire, it was ultimately too ambitious in that it tried to address a multitude of problems at once.

For example, while J&C Lumber is proud to have employed 7 workers at its early days, it eventually became clear that the revenue from the sawmill's production did not align with the costs associated with 7 employees. The right-sized mill might have only created 1-2 jobs, and while the result may have been less of an economic stimulus for the local community, it is important that creation of any number of jobs is seen as a success, particularly for rural communities in recovery from wildfire.

We encourage future wood products businesses developed in similar contexts (such as to help address the state's poor forest health and high wildfire risk crisis) to respond to market-based opportunities that are sustainable long-term, and avoid attempting to address multiple environmental and community needs such as improving forest health, decreasing wildfire risk, creating jobs in rural forested communities, and supporting wildfire recovery. Good deeds don't pay the bills, and a business needs to pay its bill to stay viable.

Recommendations to Support Future Wood Products Development in California

Reflecting on the last three years of the J&C Lumber endeavor and drawing on our lessons learned discussed earlier, the J&C Lumber team offers the following recommendations to prospective sawmill entrepreneurs as well as state agencies, non-profits, and others working to enhance the wood utilization infrastructure in California:

Existing and Emerging Wood Utilizing Businesses Recommendations:

1) **Keep product lines diversified and avoid business models that rely on consistent production to generate revenue**

Small-scale sawmills will be challenged to compete with well-established larger sawmills for sawlog prices. Even further, the traditional lumber markets for dimensional lumber are volatile and will likely not pay enough to de-risk initial investment in a facility. Instead, small sawmills should focus on production of specialty or value-added product, such as specialty timbers or other custom wood cuts.

2) **Ensure flexibility in business structure to adapt to changing conditions**

Expansion into value-added markets can take time to generate products and inventory, build the market, and generate cash flow. Emerging wood products businesses would benefit from low-to-no cost funding for keeping cash on hand to ensure the operation can stay nimble to changing market conditions or other factors that might require the business to change its course.

3) **Obtain guaranteed log supply**

While a strong market could lead to successful operating conditions for a wood products business, this point is meaningless without access to consistent and reliable log supply. Without supply, businesses cannot manufacture products and subsequently cannot build cash flow to support continued operations.

As discussed earlier, available sawlogs were abundant following the Dixie Fire, particularly on privately owned lands, thanks to an influx of funding from home insurance payouts and other disaster recovery related funds and efforts, and to relatively straightforward state permitting processes for tree removal on private lands under emergency conditions[3]. As a result, J&C Lumber could launch its facility with little concern over log supply for the first two years of its operations. As fire recovery work progressed in the Plumas County area, opportunities for log supply became harder to come by, both from fire affected landscapes and from green forest management practices. Without logs, J&C Lumber's could not sufficiently generate product and subsequent cash flow.

[3] See California Forest Practice Rules, Subchapter 7, Article 2, Section 1052. Emergency Notice

While fires can de-risk initial log supply, this reality does call into question the long-term sustainability of any wood processing that starts up in response to a wildfire if a supply of sawlogs is not guaranteed in the initial years following a wildfire. Should a sawmill owner who does not already own managed timberlands desire for its facility to operate long-term, considerable time should be invested early on to obtain longer-term supply.

4) **Pursue cooperative approaches to wood products models**

Small-scale wood utilization facilities could pursue cooperative business models to de-risk operations, like the Organic Valley dairies cooperative model that has proven successful for supporting small-scale producers of organic milk. By aggregating multiple wood processing facilities together, these operations could collectively build market demand for their products and lower operating costs through shared resources such as marketing and distribution/shipping. Other benefits of a cooperative could be reduced start-up risk for new facilities. A cooperative approach to wood processing will help facilities meet economies of scale while maintaining small-scale production.

Policy Recommendations:

1) **Allow for flexibility in the terms of grant funding to the extent possible to accommodate inevitable changes in business plans (and subsequent changes to scopes of work via grant-funding)**

There are several state and federal competitive grant funding programs available to the private sector for enhancing wood processing infrastructure and developing outlets for low-value wood, including equipment purchases. J&C Lumber benefited from two of these funding programs, including the CAL FIRE Business and Workforce Development Grant and a USFS Wood Innovations Program Grant. However, the methods to which companies are funded are limited in allowing operations to respond to unforeseen opportunities for business growth. For example, grant agreements can take at least 6-9 months to be executed after applications for funding are due– by this time, there may have already been changes in market conditions that require the business to adapt, which may not follow the specific scope of work described and budgeted in detail in the original grant application. Furthermore, changes to a grant agreement's budget typically require a more formal agreement modification which can take several months to process and be approved.

For small and emerging businesses, grant funding needs to be less focused on specific outcomes and deliverables, or it will hamstring the business rather than meet needs of business. Alternatively, if funding was structured in a way to invest in the project team and its vision rather than on specific deliverables, it could ensure the business could stay nimble and flexible to market conditions and other opportunities or challenges that emerge over time.

Thus, J&C Lumber found that these grants programs work best for existing businesses with strong operations and cash flow already built up to cover any down time associated with expanding operations further or replacing existing aging equipment. With their current structure,

these grant programs will continue to benefit larger businesses who are already in a strong cash position, but be less accessible to early stage start-ups; if the state is to prioritize growth and expansion of the wood products sector to advance sustainable forest management, including development of new businesses, and if grant funding programs will continue to be available, then these programs need to be designed to support businesses of all sizes.

2) **Focus efforts related to spurring development of wood utilization businesses on improving the business environment and de-risking market entry.**

While there is widespread recognition of the importance of developing outlets for wood products from forest management and forest restoration activities across California, this recognition needs to equally acknowledge the degree of risk associated with taking on wood-utilizing operations. State agencies, policy makers, and nonprofit organizations working in this space should focus efforts on de-risking market entry and improving the business environment for both existing and emerging facilities. Examples could include helping secure long-term wood supply from federally managed lands or encouraging market growth through developer tax incentives or tax credits for purchasing lumber from California-based small-scale producers.

Another option could be to launch programs that build market demand from small-scale producers, or support development of cooperatives or efforts that aggregate lumber generated by small-scale producers. This could be particularly relevant for fire-affected communities in forested areas with access to timber resources– following a wildfire event that burns a considerable number of homes, the town or a non-profit partner could set up a centralized lumber yard, purchase raw lumber product from producers, then sell the aggregated material directly to homeowners or contractors for re-building. This entity could leverage its own resources to pursue additional sources of funding such as via carbon credits, local tax subsidies, and economic development funds, and use other resources and mechanisms that would balance scales between commodity-based lumber market and small-scale producers, helping guarantee a market for small-scale producers.

3) **Pursue programmatic solutions or investment in market development opportunities that promote use of pine in building products**

Pine is a dominant tree species in the montane regions of California, and many forest management activities targeted to improve forest health, including post-fire recovery and tree removal activities, result in removal of pine logs. Pine logs used to have a much higher delivered log price[4], but in today's log markets in California it is considered one of the lowest valued species of trees by sawmills. Without a strong market for pine logs, efforts to promote *market-based* solutions to forest health challenges will be challenged and arguably unrealistic to achieve. To address this issue, state groups (such as the Joint Institute for Wood Products Innovation) and nonprofits working in the forest management and wood utilization space should consider investment in programs or activities that could spur market development for pine. We offer the following examples as potential options to achieve this:

[4] per personal communication with foresters and loggers in Plumas County.

3.1: Explore additional new applications for mass timber panels made from pine lumber.

While there is not currently a clear solution in current markets for mass timber products, there could be unexplored options in assembly types, connection details, and code requirements that could promote increased use of pine-based mass timber products in California.

3.2: Empower local jurisdictions or other entities to pursue deregulation policies that support increased use of locally produced lumber, such as targeting a specific rule or regulation around lumber products.

For example, in response to the Slater Fire (2020) Siskiyou County used Title 25 to pass an ordinance allowing for any lumber milled on-site of an Owner-Built Rural Home to be installed in the home without being subject to grading requirements of the California Building Code. This allowed local lumber, including pine, to more easily be used for rebuilding single-family homes that were lost in the Slater Fire. Butte County passed a similar ordinance in 2018. However, it should be noted that this is not a one-size-fits-all approach; local solutions to fire recovery or increasing the use of pine lumber will vary region to region, and it is up to local jurisdictions and their community partners to identify best opportunities to support local residents and lumber producers in wildfire recovery.

4) **Elevate perspectives of wood products industry representatives and entrepreneurs in state and regional dialogues**

From California's Wildfire and Forest Resilience Task Force to the Joint Institute for Wood Products Innovation and subsequent projects funded through these initiatives, advancing wood products development in response to overstocked forests and high risk of wildfire is a top priority in California policy. That said, to ensure that policy measures to address these problems are realistic and impactful, we urge these groups to seek perspectives from business owners working in the forest products sector. This could include prioritizing having a seat at the table or a place on relevant committees available for licensed timber operators, foresters, and wood products facility operators, and that their time to do so is compensated.

Recommendations Related to Log Supply:

1) **Support and build capacity of individual National Forests to offer long-term supply commitments for existing and emerging wood utilizing facilities.**

While USFS Region 5 representatives have committed to performing vegetation treatments on one million acres of forest per year, in our experience there remains to be a disconnect between this regional priority and individual ranger district capacity to implement projects and achieve this goal. Specific National Forests ranger districts, particularly in more rural areas, continue to struggle with maintaining staffing capacity to adequately plan and implement projects. Despite relatively newer efforts to use Master Stewardship Agreements to task partnering entities to implement projects on behalf of the USFS, these efforts continue to be bottlenecked by National Environmental Policy Act compliance and diminished agency funding.

While there of course are challenges to working efficiently within the systems in place for federal forest management by the USFS, it is unrealistic to expect massive changes in how this agency functions and manages land in the near future. To promote more efficient work on National Forest System lands within existing systems, the USFS should commit to more aggressive use of Stewardship Authority and Good Neighbor Authority (GNA), leveraging resources and staffing from local partners to plan and implement forest management projects. There could especially be ample opportunity to increase use of GNA given its limited use to date within California. As counties and tribes are eligible entities to enter into GNA with Forests, GNA could increase the extent of forest management activities implemented and allow for more local influence over federal forest management. If RCDs could be included as an eligible entity for use of GNA, and if the RCDs and counties could retain receipts from any timber sales under GNA to be reinvested into additional stewardship work, this could help build local capacity and accomplish more work across the landscape.

2) **Encourage use of USFS Special Salvage Timber Sale Program to support small and emerging facilities, for deck sales and other post-fire tree removal work on federal lands following a wildfire.**

The USFS adopted the Small Business Timber Sale Set-Aside Program in 1990, which is administered in cooperation with the Small Business Administration. Under the Set-Aside Program, the USFS must ensure that small businesses (defined as less than 500 employees for logging companies) receive a fair proportion of the total sales of government property. The USFS Special Salvage Timber Sale (SSTS) Program exists for very small businesses with fewer than 25 employees. The program is restricted to timber that is dead, down, or dying; the harvesting of which can help generate revenue for restoration and other activities. The Code of Federal Regulations (13 C.F.R. §121.508) outlines the standards and requirements of the SSTS program, including that the purchaser must be primarily engaged in the logging or forest products industry, must not employ more than 25 people, agree that it will manufacture a significant portion of the logs with its own employees, and agree that it will log the timber only with its own employees or other SSTS eligible business.

Prior to the decline of the timber industry in the 1990s, SSTS offerings were common on the Plumas and Lassen National Forests, helping create economic opportunity for local logging operators[5]. While much higher costs of doing business as a logging company today (relative to 30 years ago) may not result in similar successes if the SSTS program were to be brought back, the USFS should still consider offering timber or deck sales that provide access to more valuable logs and can support smaller and emerging businesses in rural towns.

[5] Personal communication with Plumas County-based loggers

Conclusion

In summary, J&C Lumber was challenged to successfully operate long-term due to lost productivity from breakdowns associated with used equipment, volatile lumber markets, unreliably log supply, and lack of a building to cover operations during the winter months. Through the challenges faced and lessons learned, what has become clear is that while the project was seemingly a great response to the Dixie Fire, it was ultimately too ambitious in that it tried to address a multitude of problems at once.

However, our team does not reflect on the last several years as ending in failure - rather, we see that success was achieved through processing of fire-killed sawlogs that otherwise had no outlet, creation of jobs and local economic stimulus during a period of disaster recovery, and through myriad important lessons learned that hopefully will inform development of future work.

Drawing on our lessons learned, we encourage others to recognize that development of a sawmill is a high-risk endeavor and therefore may not be a realistic solution to deploy at scale in response to our state's overstocked forests. Wood products businesses in California will be most successful when responding to market-based opportunities that are sustainable long-term.

Lastly, we encourage those who coordinate and participate in regional dialogues around forest restoration and wood products infrastructure development to elevate perspectives of wood products entrepreneurs in these conversations, so that their expertise and lessons learned can help inform effective policy change in support of a resilient landscape.