Lumber Grading in New Mexico

A Background Report

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November 2022

Introduction

This report has been prepared in support of the U.S. Forest Service, Collaborative Forest Restoration Program (CFRP) project, *Expanding Market Opportunities for New Mexico Wood*[1]. This project was funded for three years under the CFRP and aims to expand market demand and opportunities for small wood products derived from forest restoration treatments in New Mexico. The project highlights *Source Verified GoodWood®*, a forest source verification program that verifies wood from federal, state, tribal, and private lands is legally and responsibly harvested for the purpose of forest restoration and/or resource protection.

The current effort focuses on expanding or creating access to three separate but related wood markets:

- Qualifying GoodWood for use in New Mexico and national green building programs.
- Continuing to update formerly accepted viga span charts and seek to have them qualified statewide in New Mexico's building code regulations for accepted use in our unique historic building style.
- Developing an affordable lumber, beam, and viga grading program to allow small diameter trees harvested from New Mexico's forests to be used for structural building use within our state.

The benefits of expanding access to the first two markets are limited without access to an affordable lumber grading program.

This report provides background information in support of the investigation and implementation of the described lumber grading program. It is organized into four parts. Background information is provided on the general topics of lumber grading and building codes assuming that some readers may not have any knowledge in these areas. The practical aspects of lumber grading in New Mexico are described as well as recommendations for making lumber grading affordable for small producers.

Executive Summary

The NM Building Residential Building Code (NMAC 14.7.3) requires graded lumber for all load-bearing applications. Sawn lumber as well as rough sawn lumber, timbers and vigas used for any load bearing application must "be identified by a grade mark of an *approved* lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber-grading or inspection agency meeting the requirements of this section. A grading report issued by an engineer or architect will be accepted." All grade stamping in New Mexico is done by a certified grader under the direct control of Timber Product Inspection (TPI).

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[1] *Planning: Expanding Opportunities for New Mexico Wood*, Grant No 21-DG-11030000-010; CFRP Project Number: 11-16 Rev.

Feedback from small producers has indicated that the cost and time required to have lumber graded exceeds the increase in value, especially when the outcomes of the grading are uncertain. Lumber grading services are transient or on-demand for small producers. The cost is based on the amount of material to be graded and the distance the grader must travel; the time-frame is subject to the availability of a certified grader. The result is that small producers sell ungraded wood to local lumber yards where it is sorted and graded and ultimately sold at a premium price. However, the increased price does not lead to significant profit for the local lumberyard as they are paying five to six thousand dollars per year for rotational grading services.

Alternatively, wood that is construction quality is sold at a lower price and used for a lesser purpose. Having affordable grading could increase the value of products being sold by small sawmill operators and local retail lumber yards and incentivize the production of higher quality lumber. In addition, the money going to TPI for lumber grading services could be retained in our local communities.

This investigation looked at reducing the cost of transient grading through employee training and collaboration. There could be some benefit by increasing the efficiency of transient grading, but these benefits would be limited and would likely require coordination and collaboration that exceeds the current organizational capacity of small producers in the state. In casual conversations, small sawmill owners and retail lumber yards indicate that there would be no reduction in cost for grading regardless of efficiency. With only one grading service available, there is no incentive for costs to be lowered based on efficiency.

More promising may be an effort may be to follow the leads of other states such as New Hampshire, Tennessee and Wisconsin who passed laws to allow small mill operators to be affordably licensed to grade *local* lumber for *local* use.

Such a law could be incorporated into the next revision of New Mexico's residential building code. The State of New Mexico last updated its residential building code in 2015. An update is likely to occur soon. An update in the code could provide an opportunity to incorporate a "Native Lumber Law" into New Mexico's residential building code. This investigation provides recommendations for training to occur in the near term while working to incorporate a native timber law into the next revision of the New Mexico Residential Building Code.

Part 1 – Background

Lumber and Lumber Grading

Lumber is a wood product, sawn and shaped from timbers of harvested trees. By its nature, wood is not of uniform consistency and therefore will contain defects that may impact the structural and aesthetic characteristics of lumber. In the U.S., lumber is assigned a grade which defines define the quality and value of the lumber product and its suitability for various uses.

This investigation focuses on softwoods which come from the harvesting of coniferous trees (gymnosperms), commonly referred to as evergreens. Most processed lumber is made from softwoods; it is more abundant and tends to have a straighter grain, making it suitable for use in

construction framing lumber and building components such as windows and doors. In New Mexico ponderosa pine and Douglas-fir are the most common lumber producing species.

The American Lumber Standard Committee (ALSC) serves as the body that developed and maintains the American Softwood Lumber Standard PS 20 under auspices of the U.S. Department of Commerce.

Softwood lumber is typically graded as construction lumber, which may be further subdivided into stress-graded, nonstress-graded, and appearance lumber. Appearance lumber is judged mainly by the overall visual quality, whereas stress-graded or nonstress-graded lumber is more concerned with the structural integrity of the wood. Retail lumberyards typically sell nonstress-graded and appearance lumber, which is collectively referred to as "yard lumber". Lumber is graded after the drying and surfacing operations are completed and is based on both the size and number of defects appearing on the better side of the piece.

Stress-Graded Lumber Grades

Softwoods that are stress-graded are used as beams, posts, studs, rafters, and joists, for example, where the material is functioning in a load-bearing capacity and working stresses will be applied. The stress gradings may be determined either by visual means or through mechanical testing according to ASTM standards and procedures, establishing standard working values for mechanical properties such as the modulus of elasticity and the bending moment. These pieces are referred to as structural lumber.

Table 1- Lumber Grades for Stress-Graded Lumber

Lumber Grades for Stress-Graded Lumber		
Designation	Grade	Description /Uses
Structural Light Framing	Select Structural	For sizes 2"x2" through 4"x4". Whenever high-strength design values are required, form example with engineered wood trusses.
	No. 1 & BTR	
	No. 1	
	No. 2	
	No. 3	
Light framing	Construction	For sizes 2"x2" through 4"x4". Framing applications such as wall frames, cripples, sills, plates, and blocking.
	Standard	
	Utility	
Stud	Stud	For sizes 2"x2" through 4"x18". This grade applies for lumber in vertical use as in a load bearing wall application.
Structural Joists & Planks	Select Structural	For sizes 2"x 5" through 4"x18". Applications include larger lumber serving as floor and ceiling joists, rafters, headers, and trusses, for example.
	No. 1 & BTR	
	No. 1	
	No. 2	
	No. 3	
Reference source: https://www.wwpa.org/western-lumber/structural-lumber/dimensional-lumber		

Appearance Lumber Grades

With appearance lumber, there is additional emphasis on the physical look of the lumber given that it may be exposed once installed, e.g. used to make softwood furniture. The highest grade of appearance lumber is designated as finish, followed by selects and common. There is some variation in these terms and grades depending on the agency responsible.

Table 3 below shows the grade designations for select and common softwoods:

Table 2 - Lumber Grades for Select and Common Appearance Lumber

Lumber Grades for Select and Common Appearance Lumber		
Grade	Designation	Description
A	Select	Does not exhibit knots, splits, or visible defects.
B	Select	A few small visible defects.
C	Select	Small knots, but one side may be completely clear of defects.
D	Select	May contain pin knots and other small blemishes.
1	Common	Contains small knots that give an overall knotty appearance as with knotty pine boards. Knots are tight and are unlikely to fall out.
2	Common	Have tight knots but larger in size than the No. 1 Common.

Nonstress Lumber Grades

For nonstress lumber pieces (a common example being the "2-by") which is less than 2" thick and greater than nominal 2" in width, the grades are shown in Table 1 below:

Table 3 - Lumber Grades for Common (nonstress-graded) Lumber

Lumber Grades for Common (nonstress-graded) Lumber			
Grade	Designation	Description	Typical Uses
No. 1	Construction	Contains moderate number of tight knots. Paints well.	Siding, shelving, paneling
No. 2	Standard	Contains larger and more numerous knots. Will accept paint fairly well.	Similar uses to No. 1
No. 3	Utility	Contains splits and knotholes. Will not accept paint well.	Sheathing, subflooring, crate construction
No. 4	Economy	Contains numerous splits, knotholes, and similar defects, which large areas of waste wood. Will not paint well.	Sheathing, subflooring, creation of forms for concrete work
No. 5	Economy	Contains the largest amount of waste areas and courser defects.	Similar uses to No. 4

Understanding the Softwood Grade Stamp[2]

In the softwood industry grade stamps provide the buyer, building inspector, or other interested parties with five pieces of important information.

1. **Trademark**- identity of grading agency quality supervision
2. **Mill identification**- product manufacturer name, brand, or assigned mill number
3. **Grade designation**- i.e., No. 2 or Stud Grade
4. **Species**- individual species or combination
5. **Seasoning**- moisture content classification at time of surfacing
    a. **S-Dry**- 19% maximum moisture content
    b. **MC 15**- 15% maximum moisture content
    c. **KD**- kiln dried to moisture content indicated in grading rules
    d. **S-GRN**- over 19% moisture content (unseasoned)
    e. **HT**- heat treated

The most common types of grade marking are[3]:

- Hammer-branding and Certificate of Inspection – A non-ink impression of the grade is hammered onto each piece and a certificate is completed that provides detailed information of the inspection. No additional stamping fees are required,
- Ink Stamping – An official ink stamp is applied to the face or end of each piece signifying the grade, species, moisture condition, agency logo, and inspector number. Additional fees may be applied should special ink stamps be required.
- Certificate of Inspection – Used in cases where only the certificate that provides detailed information of the inspection is required by the local building code authority. No marks are placed on individual pieces.

Lumber Grading – Laws and Regulations

U.S. Building Codes[4]

In the U.S. Building Codes typically fall under the purview of state and local governments. These codes are not developed from scratch but start with common draft language called a *model code.* The model codes aim to safeguard occupants by specifying fire safety and evacuation requirements as well as the level of hazard (wind, rain, snow etc.) a building should withstand. These codes are produced primarily by the non-profit International Code Council (ICC). The codes incorporate

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[2] The description of a grade stamp was summarized from How To Get Your Lumber Grade Stamped | Wood-Mizer USA (Cassens, Dan)

[3] How to get timbers grade stamped — Local Wood WORKS (Burnett, 2018)

[4] The summary of U.S. Building codes was condensed from the National Institute of Standards and Measures web page Understanding Building Codes | NIST (National Institute of Standards and Technology, 2022)

consensus building standards specifying the design practices associated with a broad array of building elements.

Standards are the building blocks of the model code so updating code usually begins with upgrading standards. Committees within standards organizations (ASTM International, National Fire Protection Association, American Society of Civil Engineers, etc.) that produce consensus standards follow the guidelines defined by the American National Standards Institute (ANSI). These guidelines call for balanced representation among parties including builders, manufacturers, building officials, researchers, and others. New versions of standards are published on a regular schedule, generally every three to six years. Building standards committees generally write standards with the intent that they become a component of a model code. The ICC's model codes which include separate codes for residences (the International Residential Code (IRC) and for new and existing commercial buildings (International Business Code (IBC)) are developed and updated every three years following extensive review and comments periods and public hearings. The IRC was last updated in 2021 and reflects changes made in 2003 – 2018 and further changes approved by the ICC Code Development Process through 2019 (ICC, 2021).

New Mexico Building Codes

Model codes do not become the law of the land until they are adopted into code by local lawmakers. New Mexico's building codes were last updated in 2015 based on the 2015 IRC.

The NM Building Residential Building Code (NMAC 14.7.3) requires graded lumber for all load-bearing applications. Sawn lumber as well as rough sawn lumber, timbers and vigas[5] used for any load bearing application must "be identified by a grade mark of an *approved* lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber-grading or inspection agency meeting the requirements of this section. A grading report issued by an engineer or architect will be accepted."

There are 24 accredited grading agencies operating under the ALSC and the Board of Review in the U.S and Canada[6]. All lumber grading is conducted by one of these agencies. All lumber graders are certified and under the direct control of one of these agencies. Timber Product Inspection (TPI) provides grading services in New Mexico. All grade stamping is done by certified graders working under the direct control of TPI.

[5] New Mexico Residential Building Code, (1) Section R602.1.3 Structural log members (Construction Industries Division, 2011)

[6] List of accredited grading agencies.
https://alsc.org/uploaded/LumberProgram_facsimile%20August%202022.pdf (ALSC, 2022)

Part 2 – Lumber Grading in New Mexico

Lumber Grading in New Mexico

Lumber is graded in New Mexico following the *Western Lumber Grading Rules;* published by the Western Wood Products Association (WWPA). Large lumberyards are inspected in an ongoing rotation and costs are incorporated into pricing. Small sawmills and lumber yards in rely on on-demand or "transient" lumber grading services. The cost for these services depends on the amount of lumber to be inspected and the distance an inspector must travel. Timeframes for inspection vary based on location and grader availability.

All lumber, beams, vigas and timbers used in load bearing applications must be grade stamped or have an engineer's or architect's certificate.

Economic Impact of Graded vs. Ungraded Lumber

While the increase in value may not warrant grading for a small producer the economic impact of not grading lumber reverberates as the ungraded lumber moves through the supply chain. In a 2007 report prepared by Gordon West (Owner SCW and president of Gila WoodNet), Mr. West cited the following example: "*Recently, a CID* [Construction Inspection Division] *staff person informed a local builder that logs from Santa Clara Woodworks (Grant County, NM) could not be used to build a cabin, since the logs were not graded or approved. This particular cabin would have used approximately 200 trees from restoration thinning on the Silver City District of the Gila National Forest. The raw log value to Gila WoodNet would have been $6,000. The value added by SCW (a two-person operation) would have been $40,000. SCW has the capacity to produce five such cabins each year, potentially contributing $30,000 annually to GWN's smallwood sales and $200,000 in value added annually to the local economy. Instead, this business activity is going to large companies in Montana and other states, and to Canada.*"

Mr. West went on to extrapolate those losses to a variety of load-bearing wood products such as rough sawn lumber, beams, timbers, and trusses. He believed it equated to a conservative estimate of $1.5 million annual loss within the industry and a $10 million total loss in state-wide economic impact. While this was not a economic impact analysis, his professional opinion bears weight.

The costs may be small within the total economic impact of the home building industry; however, these costs are specific to small mills and lumber yards in small communities in rural New Mexico. The economic impact is more significant in this socioeconomic context. Further, when we add value and increase the demand for wood derived from forest restoration projects, we increase the amount of our forest and watershed landscapes that can be restored and protected.

Part 3 – Opportunities for Reducing the Cost of Grading Lumber

Reducing the Costs for Transient Inspections

Theoretically, small producers could reduce the costs for inspections by acquiring training to enable them to sort and inspect lumber to be graded on site and coordinating their needs when requesting transient inspections to reduce the time and travel for graders.

Training can be provided on-site at a cost of approximately $4,000 for the 4-day training, plus travel. This training provides the knowledge necessary to grade dimensional products but does not provide an avenue in which you can obtain certification or grade mark these products without an accredited 3rd party monitor under the ALSC[7].

The cost for training could be off-set by increasing the number of participants. Opportunities include:

- Convening a course in coordination with New Mexico Forest and Watershed Restoration Institute at Highlands University.
- Small producers cost-share a course at one location.
- Small producers cost-share the training and certification of a shared grader.

As previously noted, small producers were skeptical that any efficiency on their end would reduce the costs of transient grading. However, such training may improve their ability to accurately price their products.

Creating a Grading System Specific to New Mexico

A longer-term solution may be to follow the leads of other states such as New Hampshire, Tennessee and Wisconsin who passed laws to allow small mill operators to be affordably licensed to grade *local* lumber for *local* use. These programs are all limited to softwood dimension lumber.

New Hampshire[8]

Under RSA 434:59-61, the Grading and Certification or Stamping of Native Lumber (AKA the *New Hampshire Native Lumber Law),* sawmills can self-certify softwood lumber they produce and sell directly to an end-user for use in a structure that requires, by code, the use of graded and stamped softwood lumber. To be eligible to issue Native lumber Certificates a sawmill must:

- Register with the New Hampshire Division of Forests and Lands.
- Complete a self-study course and pass the test administered by the University of New Hampshire Cooperative Extension Service.
- Receive a permit from the New Hampshire Department of Agriculture.

The certificate serves as an alternative to using grade-stamped lumber. The certificate is issued to the purchaser with each load of native lumber and a copy of the certificate is filed with the building permit application if required. The following information is provided on the certificate:

- Species

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[7] 11/04/2022, personal communication *to:* M.E. Rodriguez, Promise PCES, LLC *from:* Tad Cleve, Vice President of UPD and Technical Services, Timber Products Inspection, Inc. (Cleve, 2022)

[8] https://extension.unh.edu/resource/new-hampshire-native-lumber-law (UNH Cooperative Extension, 2022)

- Quantity
- Address where the lumber will be used.
- Whether it is green or dry
- Sawmill name
- Grader name
- Date of sale

Sawmills are not required to stamp native lumber; stamping is optional. Regardless a certificate must accompany each load. Each load is specific to the purchaser and end use structure.

The grader must renew the permit every five years. A grader is responsible for the certificate accuracy, but also represents the mill providing the lumber. A permitted grader from one mill can issue a certificate for another mill provided the other sawmill has registered and met the provisions of the NH Native Lumber Law.

Tennessee[9]

43-28-313. Tennessee Native Species Lumber Act ("The TNSL Act") provides the opportunity for sawyers in Tennessee to be trained to certify that the lumber they manufacture meets the requirements for structural lumber without the usual grade stamp or engineer's approval. The rules for the TNSL specifically note that TNSL Act lumber is not an equivalent for grade stamping and prohibit labeling in a way to mimic or imply that the lumber has been grade stamped under the ASLS.

The rules also provides that the building code inspector has the ultimate authority and responsibility to approve the materials used in the structure.

The program is open to sawmill owners and their employees. The participant must complete a one-day course and pass a test. Recertification is required every two years.

When a sawmill sells lumber under the TNSL Act, they must provide a written summary for the lumber that includes the following:

1) A declaration that the lumber has been graded by a certified grader (under the TNSL Act) to meet or exceed the specification for the TNSL Act Grade #2 and Better[10].
2) The name of the wood species, and its design value group.
3) The quantity of lumber, the date(s) it was cut and graded, and the name of the grader and the sawmill.
4) The size (nominal or actual), whether it is rough-sawn or surface/planed, and the moisture content of the lumber when graded.

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[9] https://fwf.tennessee.edu/wp-content/uploads/sites/24/2022/10/Tennessee-Native-Species-Lumber-Act-Grading-Rules.pdf (TDA, 2022)

[10] Dimension lumber only: 2" to 4" nominal thickness, 2" and wider

Wisconsin[11]

The 2007 Wisconsin Act 208 relates to the exemption from construction standards for certain load-bearing dimension lumber and establishing a training program in the grading of lumber. Lumber can be equivalent to No. 2 grade, stud grade or utility grade. This grading system does not apply to boards (less than nominal 2-inch thickness), or lumber designated as timbers which are often 5 inches thick or thicker.

The act includes that the person milling the lumber can only sell the lumber to the person who will occupy the residence or a person acting on their behalf. The person milling the lumber provides a written certification that the lumber being sold meets the requirements of the specific Wisconsin Local Use Dimension Lumber grades as appropriate. Stamping of Local Use Lumber is prohibited. The seller must also provide:

- A copy of the grader's certification
- The number of pieces and total volume within each grade/grouping
- Whether the lumber is green or dry
- Clear designation of the lumber as "Surfaced Lumber", "Sawn-to-Size Lumber", or "Rough Lumber"

The University of Wisconsin in cooperation with the Department of Natural Resources established the program for certification/recertification. Local Use Lumber graders must complete a one-day course and pass a test. Recertification is required every five years. The Act also allows specific experience or education in lieu of completing the training course (passing the test would still be required.)

Part 4 - Recommendations

Currently lumber produced by small sawmills in New Mexico is either not being sold for load-bearing purposes or is only being used as load-bearing lumber after being sold by the small producer. Small lumber yards that have the product graded, lose much of the profit due to the cost of grading. Having lumber graded at the local sawmill or lumber yard would:

- Increase the amount of wood being used for its highest potential.
- Increase the economic impact of wood manufacturing within small, rural New Mexico communities.
- Support Source Verified GoodWood efforts to add value to and increase the demand for wood from forest restoration projects especially green building projects and the use of vigas as load-bearing elements.

[11] https://dnr.wisconsin.gov/sites/default/files/topic/ForestBusinesses/LmbrGrdngHndbk.pdf (Govett)

This investigation found a short-term and long-term approach to making lumber grading more affordable for small producers:

Short-term

Currently the NMFWRI, the Highlands University Forestry Dept., Luna Community College and others have been in discussions about creating various forest certification programs ranging from short courses on specific skills to a more comprehensive certification course that would take longer and provide a larger range of skills. Lumber grading is not one of the topics being considered but perhaps there would be interest in developing a one-day course aimed at:

- Ensuring wood is sawn to achieve its highest value,
- To better prepare small producers for inspections, increasing the efficiency of onsite grading,
- To increase knowledge and expertise to sort lumber and acquire a better price at the lumber yard.
- Prepare participants for certification if/when a native lumber program is enacted in New Mexico.
- Increase support for a local lumber law.

Task: Engage with the ongoing discussions. Reach out to the training and certification leads in New Hampshire, Tennessee, and Wisconsin.

Long-term

Work to incorporate a native lumber law into the next update of New Mexico's residential building code. The program should aim to certify New Mexico graders to grade and sell lumber, beams, timbers, and vigas for local use.

Begin by engaging stakeholders that can inform the drafting of the proposed code, advocate for its passage, and support and fund implementation. The stakeholder makeup should be a diverse mix of technical experts, advocators, funders. Suggestions are listed below.

- New Mexico Forest and Watershed Restoration Institute (NMFWRI) – Operating out of Highlands University, NMFWRI engages government agencies, academic and research Institutions, land managers and the interested community in addressing forest management issues.
- Luna Community College – Luna is implementing a Wildfire Resiliency Training Center to support, recovery, mitigation and planning for communities impacted by natural disasters. Luna is also partnering with NMFWRI, creating the Heritage Trades Academy, and plan to build on the curriculum, including adobe, wood, rock, and music.
- USFS Wood Innovations Program - The USDA Forest Service Wood Innovations Program expands and creates markets for wood products and wood energy that support long-term, sustainable management of National Forest System lands and other forest lands. The program has two national competitive grants programs, as well as project activities funded under discretionary agreements and annual work plans.

- New Mexico State Forestry - The New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Forestry Division was created in 1957 to address the critical needs of our state's forests and watersheds.
- New Mexico Construction Inspection Division (CID) - The CID is responsible for ensuring that construction is performed in a safe, competent, and professional manner; licensing contractors and enforcing licensing laws, and enforcing the laws, regulations, and standards governing construction contracting in a fair and uniform manner;
- Build Green New Mexico (BGNM) - The BGNM Program is a nationally recognized standards and Third-Party Certification program, which can help builders meet new market demands.
- Santa Fe Area Home Builders Association (SFAHBA) - The Santa Fe Area Home Builders Association represents and serves the diversified needs of their members and the community. The SFAHBA promotes safe, quality, cost-effective, and affordable housing. They work to effectively enact or positively influence legislation and regulations to promote affordable housing, construction innovation, and keeping the industry economically viable.
- Regional Development Corporation (RDC) - is a private non-profit 501(c) 3 organization dedicated to improving economic development in Northern New Mexico.
- Source Verified GoodWood (SVGW) – Aims to create healthier, more resilient forests through verification of sustainably harvested and managed products.
- Source Verified GoodWood Members and others in the wood products industry – Small sawmill and small lumber mill owners along with harvesters and processors can offer insight to create and/or evaluate a "Native Lumber" law and program.
- Existing program leaders in NH, TN, and WI.

The SVGW team should draft a final list of potential stakeholders and reach out through the distribution of an invitation to participate in this effort. The invitation should be tailored to each individual and include a briefing on the purpose and need for action, the reason they are being invited to participate, and what we are expecting them to provide, and a timeframe we would expect to take action.

Next steps can be based on their responses.

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