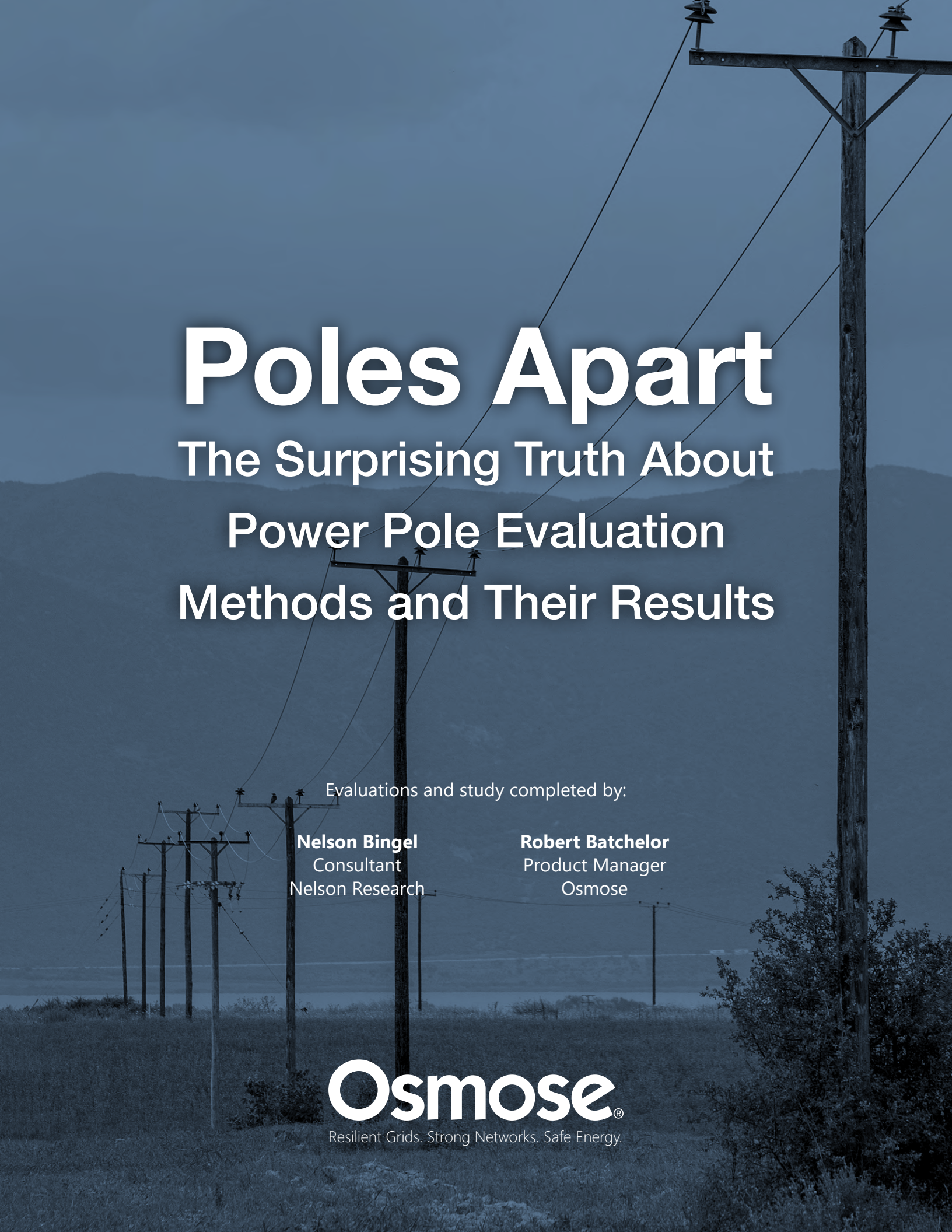

Poles Apart

The Surprising Truth About Power Pole Evaluation Methods and Their Results

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Resilient Grids. Strong Networks. Safe Energy.

What's the best way to assess and maintain your utility's pole assets? For many electric utilities, the decision has been guided without strong empirical data to back the choice of inspection process.

To provide the industry with more current insights, Osmose just completed a robust, comparative study of multiple combinations of pole inspection methods to recalibrate which approaches provide the most reliable results for the circumstances and budget available. The findings of the Osmose study suggest that it is time for utilities to reassess their approach to pole plant asset management programs.

Healthy utility poles are essential for delivering electricity and communication services to customers. While utility poles may look resilient above the surface, they are subjected to climatic and soil conditions that most often cause unseen decay below the groundline.

There is growing concern about the condition of these assets, and rightfully so, as the U.S. grid infrastructure continues to age. The average wooden utility pole without any groundline inspection, paired with the application of preservative treatment, deteriorates to a "reject" status between 45 to 50 years of service. This means that by the time a population of poles is between 45 and 50 years old, half of the poles will have a remaining strength that is below code requirements due to groundline decay. The average age of wood-based grid infrastructure in the U.S. is about 40 years old.

45 to 50 years

average wood pole service life without inspection and treatment

40 years

average age of wood utility pole infrastructure in the United States

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The key to efficiently managing the utility wood pole plant is the ability to correctly differentiate poles without decay from decayed poles that can stay in service (decayed but serviceable) and decayed poles that must be reinforced or replaced (reject poles) per the National Electrical Safety Code (NESC). Correct identification of a pole's condition into these categories reduces risk and allows the application of preservative treatments to mitigate decay and extend the asset's life.

The understood effectiveness for different types of inspection processes has evolved over the years as technology, inspection methods, and industry knowledge continue to develop. Interestingly, there has never been such an extensive scientific field study with data to validate published expectations until now. Endeavoring to build and expand on previous studies and experience in the field, Osmose sought to bring specific data to wood pole inspection programs that had not been researched to this degree before.

For decades, Osmose has been the nationwide authority for evaluating wood utility poles, visiting five million poles in the United States each year across all climates and conditions. The company's widespread presence has led to the use of a variety of combinations of inspection methods that result in a variety of processes used across various environmental conditions. As industry leaders, Osmose researchers understood that they were in a unique position to scientifically quantify the effectiveness of traditional wood pole evaluation methods.

In this study, the condition of each pole was evaluated after each additional method was added to the process including multiple types of partial excavation.

EVALUATION METHODS

Each inspection technique, or program type, has a different level of effectiveness with respect to identifying rejects.

Visual

Sound

Bore

Partial Excavate

Full Excavate

Rigorous Study Leads to Reliable Industry Benchmarks

Beginning in February 2021, Osmose began an ambitious study to quantitatively measure the effectiveness of combinations of utility pole evaluation methods over the course of a two-year labor-intensive study across the United States. Over 13,000 poles were visited, with more than 80,000 different inspections performed, **leading to the largest collection of effectiveness data for traditional inspection methods ever assembled**.

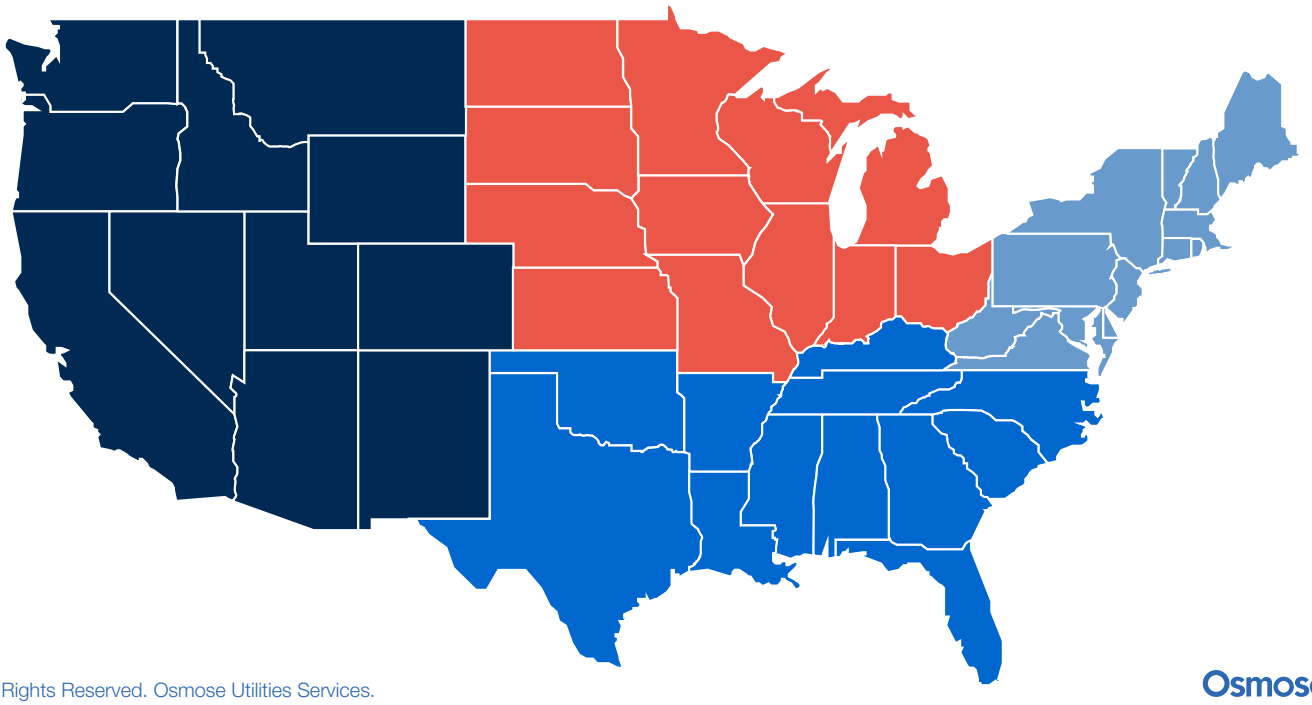
The overall goal was to provide Osmose and the industry with reliable benchmarks for the effectiveness of different inspection processes to correctly identify groundline condition as:

1. No decay
2. Decayed but serviceable (DBS)
3. A reject

13,000+
poles visited

80,000+
inspections performed

	Poles	Inspections
West	5,600	32,000
South	3,500	26,000
Midwest	2,100	12,000
Northeast	1,600	12,000



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The study was executed across four regions in the United States and included the two species types used for utility poles today, thick and thin sapwood. These species types have very different primary decay patterns:

- Thick sapwood species, primarily southern yellow pine, typically decay from the outside-in below ground.
- Thin sapwood species, Douglas fir, western red cedar, and lodge pole pine, typically decay from the inside-out below ground.

The performance of the inspection methods was separated by thin and thick sapwood since the primary decay patterns drastically impact the effectiveness of the different methods.

A single blind process was employed in the study:

- The first pass crew performed the bevy of combinations of inspection methods: visual assessment, sounding, boring, and 1-sided pull backs and partial excavations. In addition, 2-sided pull backs and partial excavations were performed for thick sapwood. Thin sapwood species also had a 1-sided deep partial excavation performed.
- The second crew performed the full excavate and treatment inspection process.

Each crew had no knowledge of the other's results, preventing bias. The first pass trained inspector determined the no-decay, DBS, or reject condition for each pole at each additional step of the inspection processes (over 80,000 inspections). Using only the decay that could be detected and measured with each step, the crew utilized Osmose propriety software, StrengthCalc®, to estimate remaining strength.

THIN SAPWOOD

THICK SAPWOOD

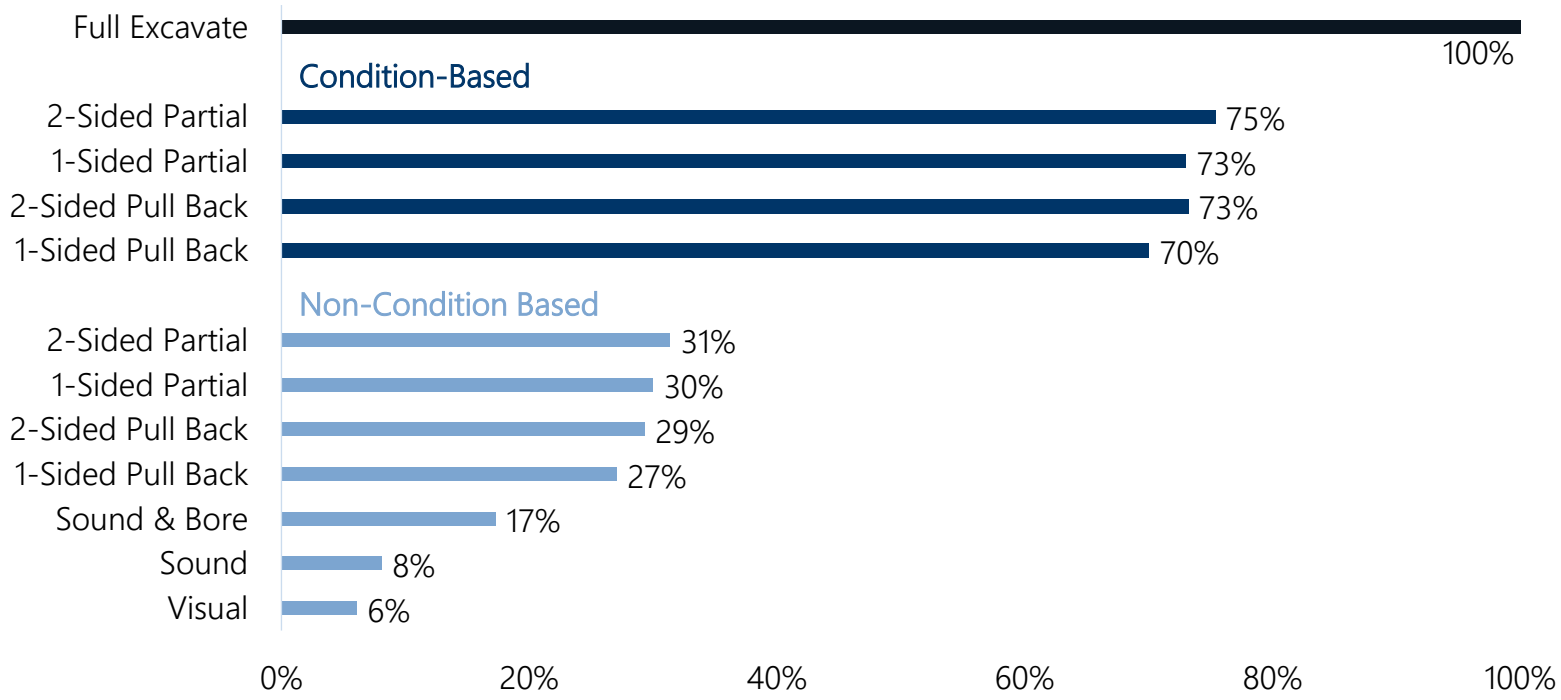
The Study Considers Condition-Based and Non-Condition Based Programs

Some pole owners specify an inspection process to start with a combination of fewer inspection methods than the comprehensive full excavation process. However, if decay is detected or expected at any point of the original inspection methods, a **condition-based program** calls for the crew to continue inspecting to the full excavate process. If the specification does not require additional inspection after detecting or expecting decay, the trained inspector makes the pole condition call based only on the specified combination of methods, which is known as a **non-condition-based program**.

For example, if a customer requested a 1-sided partial program, the trained inspector would perform the visual assessment, sound and bore process, and excavate an 8 inch x 8 inch area on one side of the pole. If the trained inspector identified some surface decay in the excavated area, a condition-based program would require the trained inspector to proceed to full excavation of down to 18 inches around the pole to more accurately determine the extent of the decay and the serviceability of the pole. For a non-condition-based program, the inspection would end with whatever identification of decay was determined by the partial process.

Osmose included both condition-based and non-condition-based results for partial programs in the study to understand the value of each program type.

Inspection Effectiveness in Thick Sapwood Results



The thick sapwood reject effectiveness chart shows the percent of full excavate groundline rejects found by each inspection process, all of which identified over 500 reject poles. The thick sapwood pole species in these results include southern yellow pine and northern pine.

Since shell rot is the primary mode of decay and strength loss in thick sapwood species, the most important measure of determining decay presence is physical assessment of the below ground outside surface of the pole. This can be seen most pronounced in the difference between the condition-based and non-condition-based partial excavate programs. The condition-based partial excavate programs identified approximately 40% more groundline rejects than the non-condition-based partial excavate programs.

Regardless of conditionality, there is very little difference between the average reject effectiveness of all four partial processes. Additionally, all average reject effectiveness results for the visual, sound, and sound and bore processes are less than 20%.

While the graph displays full excavate inspection effectiveness at 100%, that number was used as the baseline number of rejects for this study. It is unlikely that field performance will find 100% of groundline rejects due to various field conditions.

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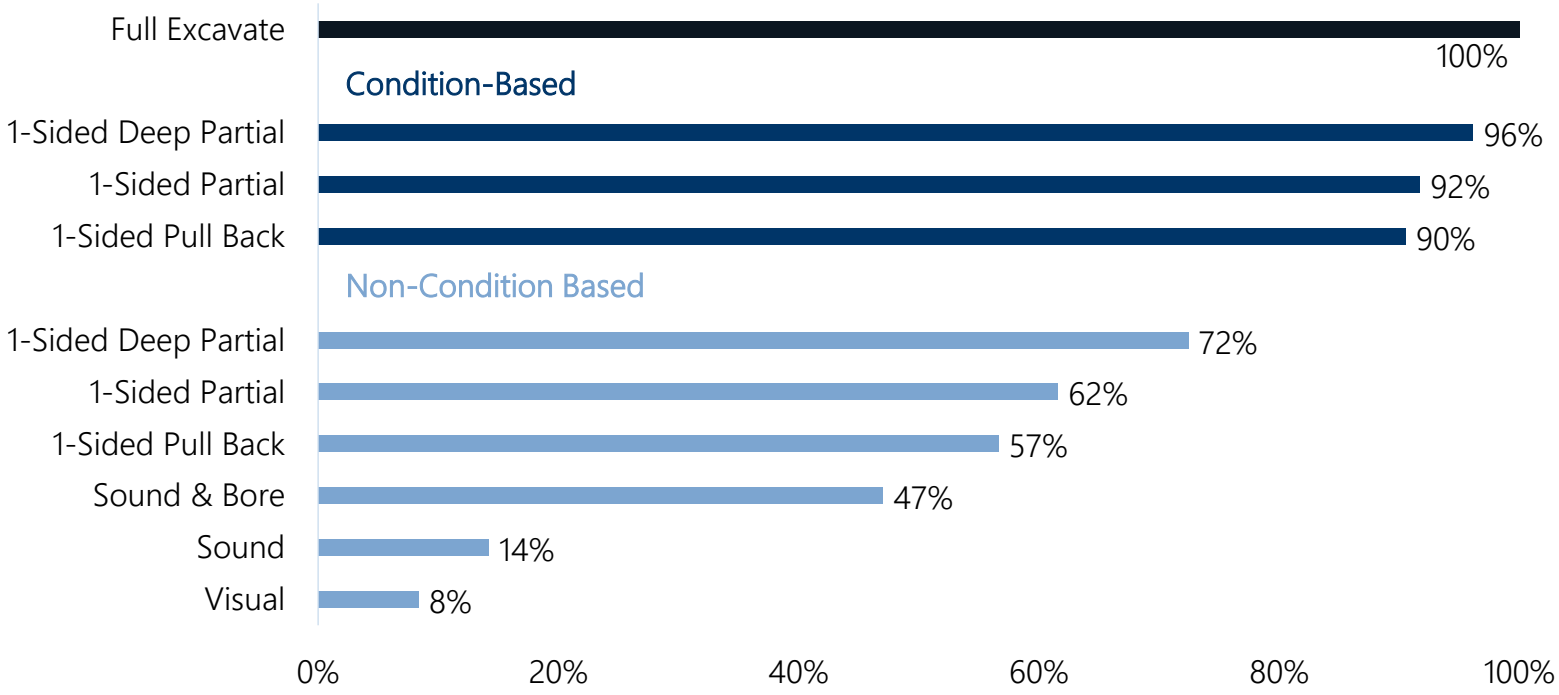
Inspection Effectiveness in Thin Sapwood Results



The thin sapwood reject effectiveness chart shows the percent of groundline rejects found by full excavate for each of the other inspection processes all of which identified over 250 reject poles. The thin sapwood pole species in these results include Douglas fir, western red cedar, and lodge pole pine.

Similar to the thick sapwood results, the condition-based partial excavate processes for thin sapwood species had an average reject effectiveness that was superior to the non-condition based inspections by a margin of 20% to 30%. However, in thin sapwood species, there is more differentiation between the non-condition-based partials, with the 1-sided deep partial being markedly superior to the 1-sided pullback.

This difference does not equally translate to the condition-based partial programs, which are all very similar in reject effectiveness. Additionally, the sound and bore process in thin sapwood species has a higher average reject effectiveness than in thick sapwood species, with the visual and sound processes still showing an average reject effectiveness of less than 20%.

Similar to thick sapwood, 100% effectiveness for thin sapwood is a baseline for the study, and it is unlikely that field performance will find 100% of groundline rejects due to various field conditions.

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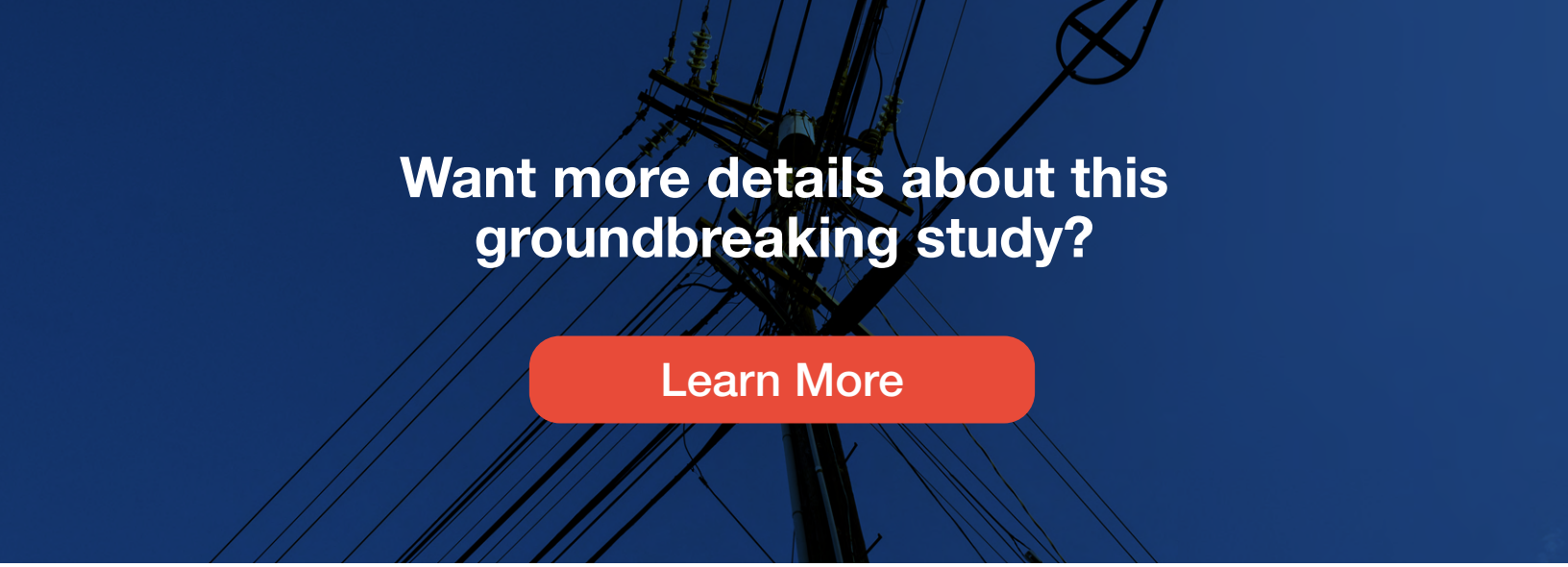


Want more details about this groundbreaking study?

Learn More

Conclusion

As utilities strive to bring the best value to their customers and their shareholders, finding the proper balance between the additional cost of increased rigor in the inspection process and the costs of missing rejects in a utility's wood pole plant can feel like a guessing game.

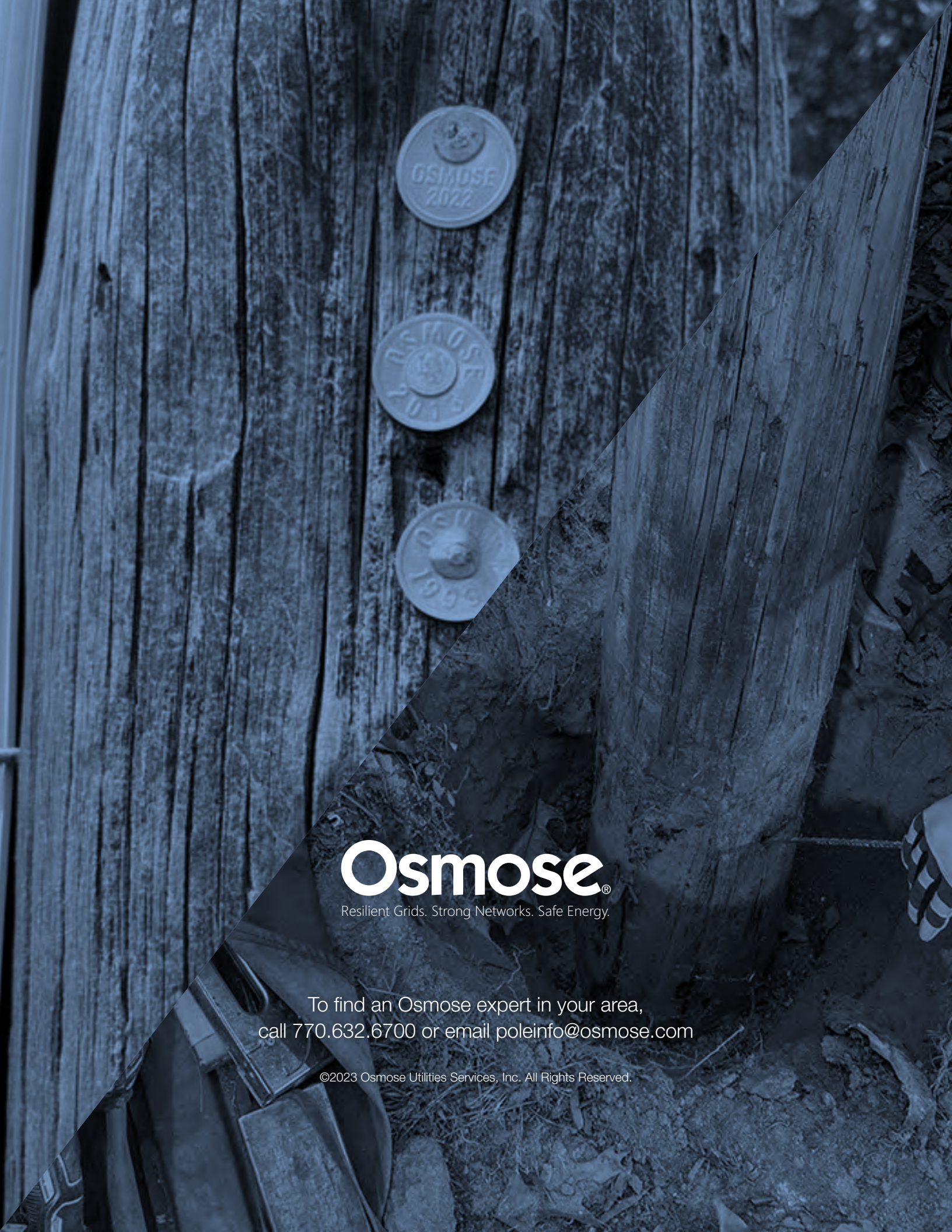
With this study, Osmose has provided an updated, quantified view of the differences in the effectiveness of various combinations of standard industry methods of utility pole inspection. This study recontextualizes the average groundline reject effectiveness for all inspection processes in thick and thin sapwood species using a research program never before conducted in the wood pole inspection industry. Osmose can now provide the realistic average reject effectiveness values for each process anywhere in the United States.

While the most effective inspection process available in any species is still a full excavate inspection, these results provide data-based comparisons to better understand the average reject effectiveness of any combination of other inspection methods. Additionally, by comparing these processes against the full excavate inspection, the gold standard of inspection in the utility industry, Osmose has created a benchmark that any future inspection method can be measured against.

For thick sapwood species, there is so little difference between the most common partials, pole owners should prioritize the most operationally efficient partial program moving forward. Additionally, non-condition-based partials and sound and bore processes performed so poorly that their very existence as viable inspection programs are in question.

Conversely, for thin sapwood poles, condition-based partials performed almost as well as the full excavate inspection in finding groundline rejects, with the non-condition-based partials and sound and bore processes providing some lower level of performance.

Interested in seeing for yourself whether your utility's approach to wood pole inspection still holds up? Contact Osmose directly to learn more.



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