Perennia
Nova Scotia's Food Development Agency

2025 Post-Drought Wood Analysis Investigation:
Local Research Findings and Practical Lessons for Apple Growers

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Background

The 2025 extreme drought left its mark on fruit quality, yet tree-level effects were more difficult to detect. Growers finished the season with more questions than answers—what was happening inside the tree, what was stored for next year, and what does this mean for the 2026 crop? Through collaboration with local growers, Scotian Gold, and AAFC researcher Harrison Wright, we set out to shed light on these unknowns. This report brings together what broad research already tells us and what our local investigation revealed.

How Trees Normally Function – and How Drought Changes the Rules

Fall is the tree's opportunity to bank resources. During this time, soluble sugars and starches—nonstructural carbohydrates—accumulate in woody tissues, and nitrogen is withdrawn from leaves before they drop. These reserves supply the energy needed for early spring growth, well before photosynthesis or root uptake can meet demand. By 2–4 weeks after bloom, demand peaks as shoots, fruit, and new tissues compete intensely for carbohydrates.

Drought influences the reserves that fuel early-season growth. As water stress increases, trees conserve moisture by closing stomata and rolling leaves, slowing growth and limiting resources to fruits and shoots. Soluble sugars become essential for maintaining cell function, and apple trees are particularly effective at accumulating them. With prolonged drought, carbohydrates are diverted away from growth and toward survival, altering how the tree allocates its resources even though some photosynthesis continues.

In spring, healthy trees produce a leaf canopy post-bloom that quickly generates new carbohydrates to replenish reserves. These new carbohydrates are thought to drive fruit set, while stored reserves impact the underlying bud and tree health.

When drought exceeds a tree's ability to adapt, weak growth and decline can occur due to carbon starvation or disrupted water flow. These shortages are often noticed after bloom, when carbohydrate demand is highest.

What Our Local Spur Sampling Showed

Wood analysis can offer a snapshot of nonstructural carbohydrates and stored nutrients. On December 18, 2025 we collected 35 samples (100 spurs each) from 18 orchard blocks, representing a wide range of stress levels, two varieties (Honeycrisp and Ambrosia), irrigation practices, and crop loads. Despite this diversity, the results were remarkably consistent. Samples were analyzed by A&L Labs.

Carbohydrates:

- Soluble sugars were elevated across every sample.
- Starch levels stayed within normal ranges.
- Total carbohydrate potential increased.
- In 2025, higher total carbohydrates were observed relative to AAFC's data from 2024 (sampled in early November), reflecting reduced growth and a strong stress-response shift.

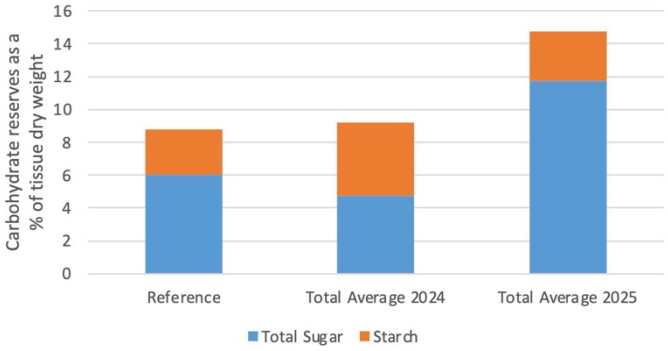

Figure 1. Results from two years of Honeycrisp spur-wood analysis compared with the laboratory reference value. The 2025 samples, collected on December 18 after extreme drought, show elevated total carbohydrates. The 2024 samples, collected in early November, were provided by Harrison Wright (AAFC).

Nutrients:

- Nitrogen levels were near normal in most samples—drought limited uptake but also reduced shoot growth, creating a balancing effect.
- Potassium, and magnesium were slightly lower but still within normal ranges. Phosphorous levels decreased by about 30%, leading to the low result.
- Calcium responses varied by variety: Honeycrisp rose to normal levels, Ambrosia was high, while severely stressed sites showed reduced calcium and lower dry matter.
- Regional patterns persisted: elevated zinc and manganese, deficient copper, and drought-year increases in iron.

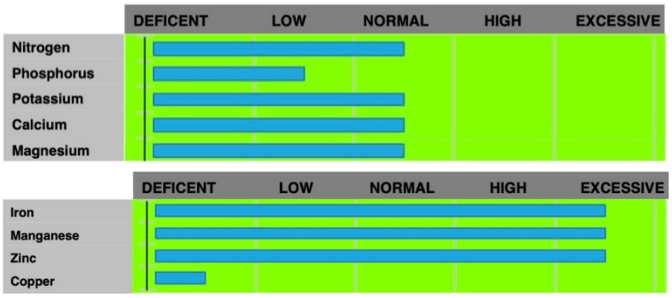

Figure 2. Select results from spur samples collected on December 18, 2025, and submitted to A&L Labs for wood analysis. The lab data have been combined to provide a visual summary of results across all samples.

Variety, Crop Load, and Irrigation Effects:

- Ambrosia and Honeycrisp responded similarly, reinforcing drought-driven trends.
- In biennial trees, those carrying a heavy crop in their ON year were not more negatively affected by drought than trees in their OFF year.
- In a small analysis of three Ambrosia sites irrigated following drought stress, irrigation was associated with higher nitrogen but lower calcium, iron, and sugar levels compared with drought-stressed trees, suggesting that management reduced the intensity of the drought impact.
- Harvested trees had higher starch reserves; unharvested trees had the lowest starch of all samples. However, total carbohydrates were high in both situations and the nonstructural carbohydrates are readily interconverted.

What We Still Don't Know

Spur samples tell only part of the story. Root and shoot reserves were not measured due to funding and time constraints. Also, young, non-bearing trees were not sampled. Leaf loss complicates interpretation, because we don't know if resources were remobilized prior to leaf drop. Aboveground tissues behaved as expected, accumulating sugars, but root starch remains a major unknown.

Implications for Fruit Set and the 2026 Season

By two weeks after full bloom, trees shift from relying on reserves to depending on current photosynthesis. Reserves influence bud health, not fruit set directly. Buds were formed early last season, so they are present, though their strength may vary. Nitrogen reserves appear adequate heading into bloom. June drop will depend largely on weather during the thinning window.

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Drought effects are rarely straightforward. Reduced uptake and reduced growth can create opposing trends, and elevated spur sugars reflect the tree's survival strategy. Encouragingly, perennial species—including our regional maple syrup producers—show that trees can access reserves produced over multiple years.

Management Priorities for 2026

Aim for recovery, not maximum yield.

Pruning:

- Avoid removing too much storage tissue.
- Focus on weak wood, watersprouts, and structural corrections.
- Spur prune where possible.

Nutrition:

- Avoid applying excessive nitrogen when trees are stressed post-drought. While trees are in recovery we do not wish to produce more vigorous growth than the tree can support.
- Foliar nutrients may have value, but leave untreated trees to compare.
- Apply early season granular fertilizer to support root uptake once root growth resumes.

Thinning:

- Monitor bud strength closely; weak buds may not set.
- Reduce crop load on stressed trees.

Irrigation:

- Avoid overwatering, which can reduce colour and keeping quality.

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