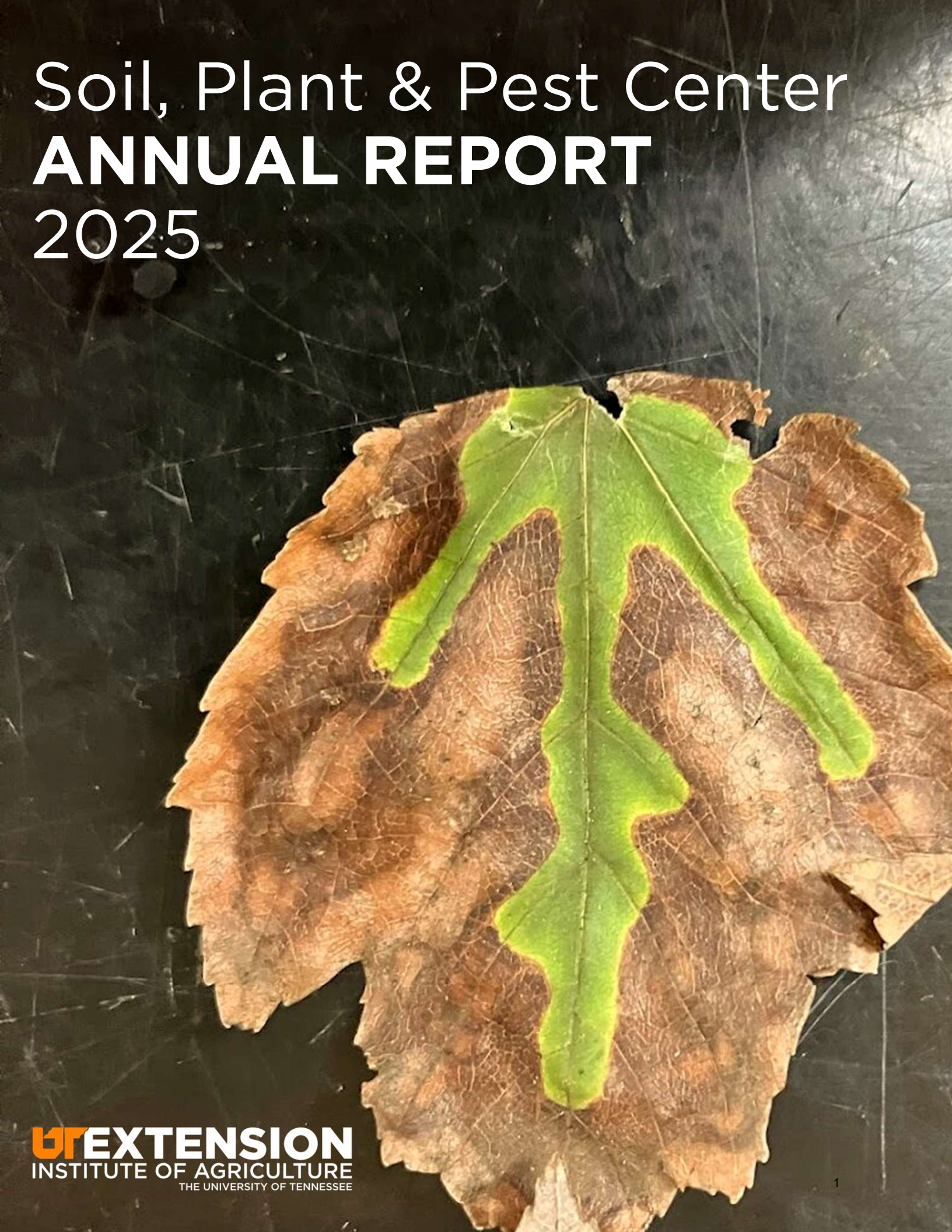
Soil, Plant & Pest Center
ANNUAL REPORT
2025



UTEXTENSION
INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

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SOIL TESTING

The Soil Testing Program at the UT Soil, Plant & Pest Center offers comprehensive laboratory analyses that help homeowners, farmers, and land managers understand the fertility, pH, nutrient balance, and overall condition of their soils. Through a variety of testing options, the Center provides targeted insights that support healthier plants and more efficient land stewardship. Clear sampling instructions, convenient submission sheets, and an online payment portal make the process accessible for Tennesseans across the state. The Soil Testing Program empowers clients with actionable, science-based guidance that supports productivity, cost effective management, and sustainable agriculture throughout Tennessee

SOIL TESTING SUMMARY

Robert Florence, Director

RESIDENTIAL AND PRODUCTION SOILS NUMBERS

In 2025, 16,733 soil samples were analyzed from across Tennessee, for 4,234 clients. Figure 1 provides the distribution of samples by county. Samples were a blend of residential lawns, landscape, gardens, commercial row crops, forage, vegetable production, and food plots. The largest number of submissions was 55% of the samples were from row crop or forage production, followed by 27% from residential lawns, landscapes, and gardens. Research samples comprised 11% of the samples. Figure 2 graphs the number of samples by type.

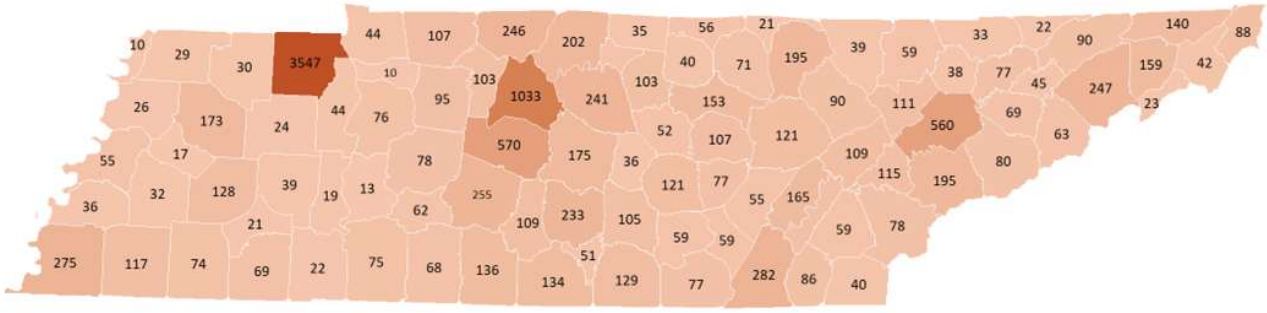

Figure 1. Distribution of soil sample submissions by county across Tennessee.

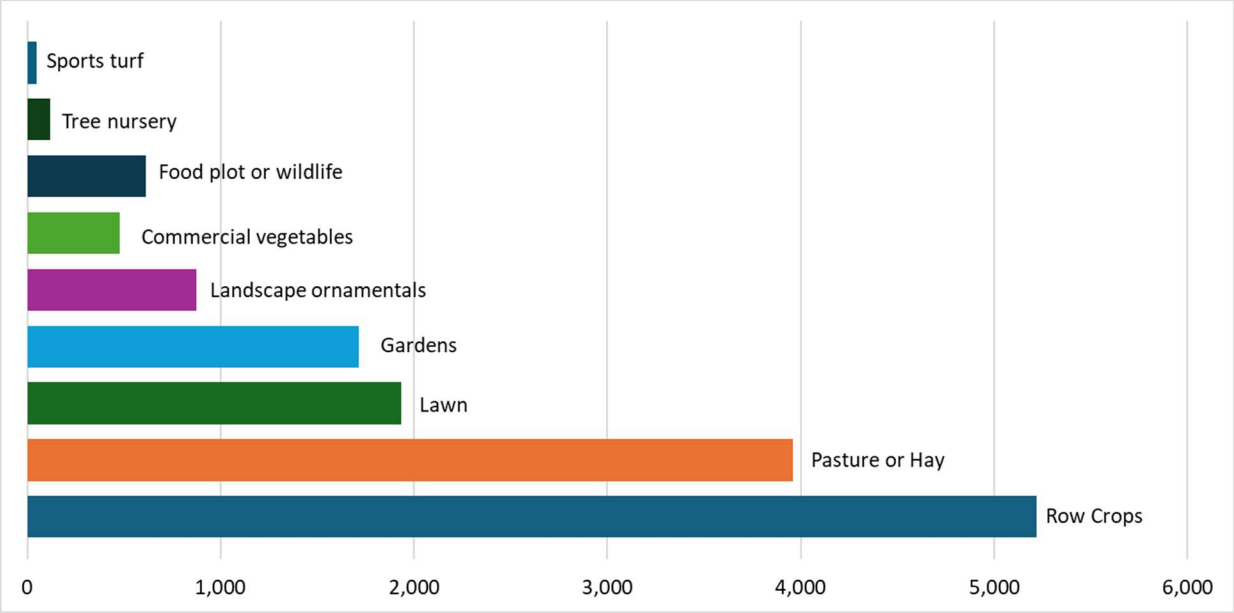

Figure 2. Number of samples by types, if a crop or plant code was given.

SOIL TEST VALUES

Median values of soil test values are presented for pH, phosphorus, and potassium by county in Figures 3,4, and 5, respectively. Soil pH was expected to be higher in the Nashville Geologic Basin area as those soils are built from phosphatic, limestone parent material.

Median soil pH was also observed to be higher in Knoxville, Chattanooga, and Memphis areas. An explanation for this may be that more lawns and gardens may receive more lime, since the cost to lime yards and gardens are not as much compared to acres of farm fields. The logistics of trucking tons of lime to large fields is also more prohibitive, compared to buying a 50-pound bag for residential soils.

Median soil phosphorus was observed to be higher in the Nashville Geologic Basin area as those soils are built from phosphatic, limestone parent material. Benton, Decatur, Van Buren, and Henderson Counties had a median soil test phosphorus value less than 31 pounds per acre. Above 31 pounds per acre is the value considered to be high, where no phosphorus fertilizer would be suggested to improve yield. Also, 25 counties had a median soil test phosphorus value above 120 pounds per acre, which is considered very high. This does not cause trouble with the plants, but these soils should be given care to prevent erosion into nearby water bodies.

Median soil potassium varied by county across the state. With 32 counties had a median potassium value less than 160 pounds per acre, which is the level at which no potassium fertilizer would be recommended for most crops and plants. No counties had a median soil test potassium value that was considered low.

Organic matter was graphed by crop category in figure 7. As expected, gardens (5.1%) and landscape beds (6.4%) had higher median organic matter value compared to other categories. Lawns had a median organic matter (4.5%) lower than landscape beds and gardens, but higher than row crops (3.3%) and forage production fields (3.7%). Row crops and forage production fields had a similar median organic matter but forage fields had a higher upper 75% quartile range.

Soil texture is not a common test asked to be performed, many TN soils feel heavy and most who test for texture are landscapers or contractors. However, 43% of the soils tested were Silt Loam, with the next two highest texture families being loam (19%) and Clay Loam (18%). Loamy sands (1% of samples) and sandy loams (2% of samples) were measured and are probably from areas near a large river.

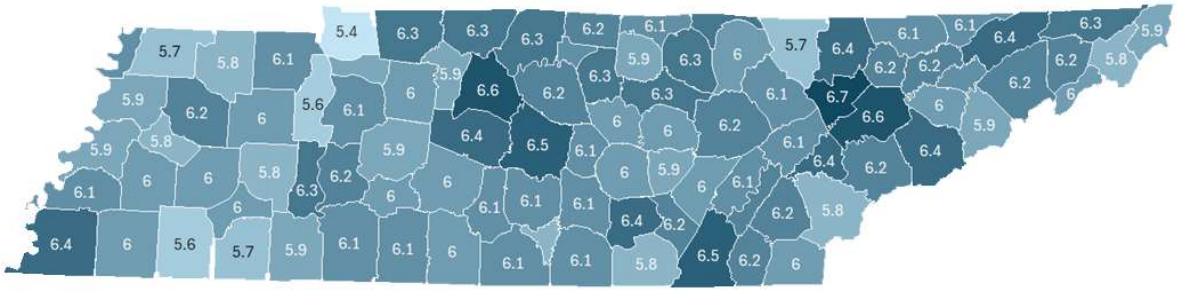

Figure 3. Median pH value of agricultural and horticultural samples in 2025 by county. For reference a below 6.1 will get a lime recommendation for most crops and plants. Soil pH was measured by the 1:1 soil:water method.

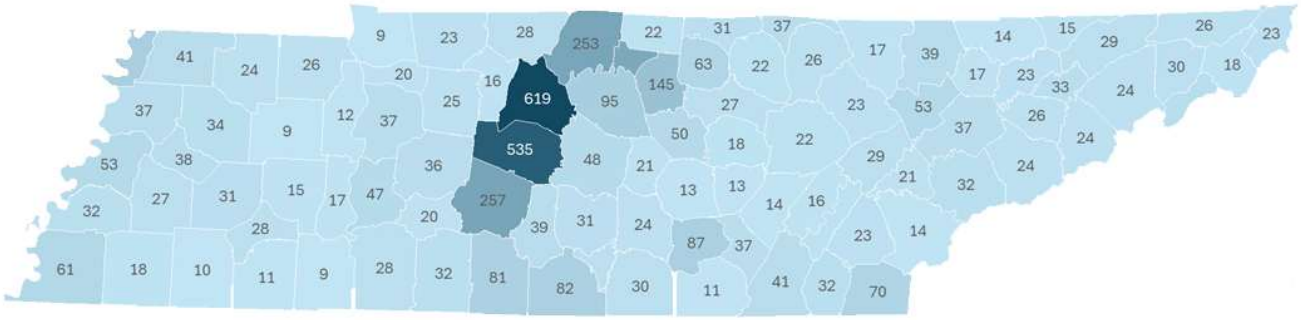

Figure 4. Median Mehlich-1 phosphorus test value *(in pounds per acre*) of agricultural and horticultural samples in 2025 by county. For reference a phosphorus soil test value above 30 pounds per acre would not get a phosphorus fertilizer recommendation for most crops and plants.

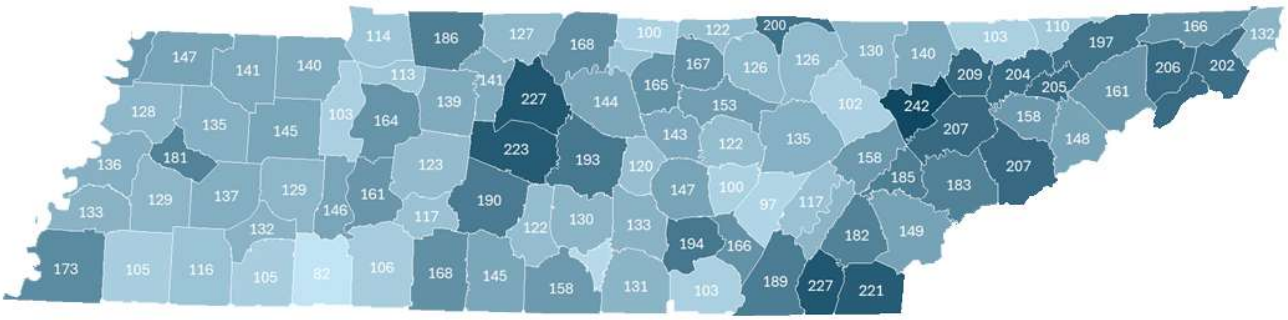

Figure 5. Median Mehlich-1 potassium value *(in pounds per acre*) of agricultural and horticultural samples in 2025 by county. For reference a potassium soil test value above 160 pounds per acre, would not get a potassium fertilizer recommendation for most crops and plants. Cotton would still get a potassium recommendation up to 280 pounds per acre.

Figure 6. Organic matter value ranges by category. The lines in the boxes represent the spread between the 25% quartile, median, and 75% quartile. Half of the samples tested higher than the median value and the other half below the median. Organic matter was measured by loss-on-ignition.

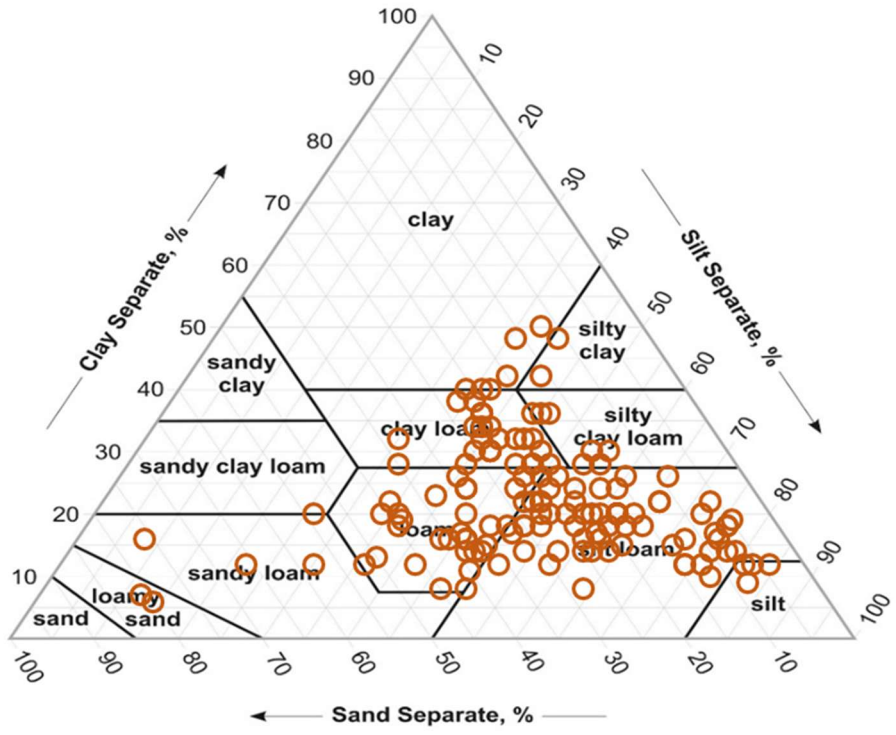

Figure 7. Texture of 145 TN soil samples with crop or plant codes, plotted out on the United States Department of Agriculture (USDA) Soil Textural Triangle. Soil texture was measured by hydrometer with sand at 40 seconds and silt at 24 hours.

PLANT DIAGNOSTICS

The Plant Diagnostic Laboratory in the Soil, Plant & Pest Center plays a vital role in supporting Tennessee's agricultural and plant health communities, including producers, researchers, homeowners, and landscape professionals. The laboratory provides accurate, science-based identification of plant diseases, insect pests, and other plant health issues across a wide range of systems, from crops to ornamentals, trees, and home gardens. By helping to identify the causes of plant injury, stakeholders can make informed, cost-effective management decisions that protect plant health, productivity, and the environment. This timely diagnostic support strengthens agricultural resilience while also enhancing the sustainability and health of managed and residential landscapes across Tennessee.

PLANT DIAGNOSTICS SUMMARY

Sylvia Moraes, Plant Diagnostician

SAMPLE SUBMISSIONS

The Diagnostic Laboratory processed 797 plant diagnostic samples representing 65 Tennessee counties. The top counties with the highest number of submissions were Davidson, Williamson, Hamilton, Knox, and Blount, respectively (Figure 1). Sample submissions were concentrated in the summer months, with peak volumes recorded in June (120 samples), July (111 samples), and August (100 samples).

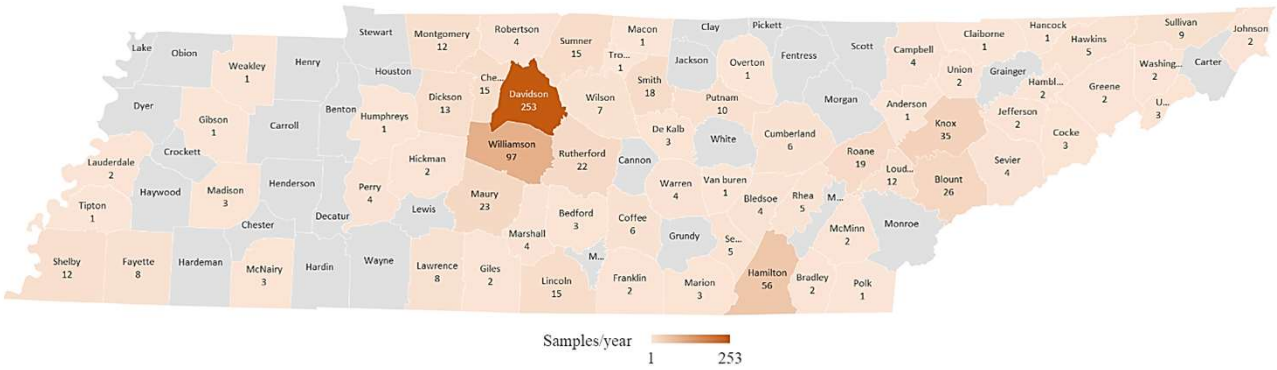

Figure 1. Distribution of diagnostic sample submissions across Tennessee counties. Counties shown in gray submitted no samples, while counties shaded in orange submitted samples; darker shades of orange indicate a higher number of submissions.

Landscapers were the primary submitters, contributing 243 samples and accounting for 30% of total submissions, followed by homeowners with 211 samples (26%). Extension agents submitted 179 samples, representing 22% of all submissions (Figure 2).

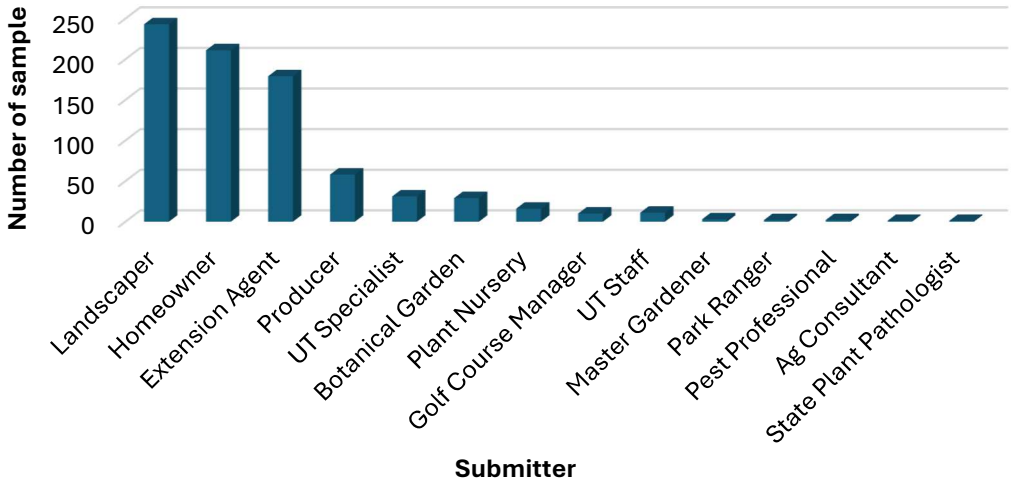

Figure 2. Number of plant and pest samples submitted by type of submitter.

Of the 797 total diagnoses provided by the diagnostic lab, 643 were based on physical samples submitted to the laboratory, while 154 were distance diagnostic requests. Among the 643 physical submissions, 108 included both plant material and accompanying images, which provided valuable contextual information and enhanced diagnostic accuracy. It is important to note that only extension agents are authorized to submit distance diagnostic requests.

DIAGNOSTIC INTERPRETATION

Of all diagnostic submissions, 84% involved plant disorders attributed to abiotic and/or biotic factors. An additional 8% consisted of insect identifications (not associated with a plant sample), plant identifications, or other determinations. In 5% of cases, no pathogen or pest was detected. These submissions likely represent healthy plants submitted for precautionary evaluation prior to installation in a new environment, cases in which an inappropriate plant part was provided, or situations involving abiotic stressors that could not be confirmed without additional testing. Insect identifications not associated with plant material most commonly involved indoor or related species, including carpet beetles, termites, ants, bed bugs, yellowjackets, springtails, silverfish, and spiders.

Cases attributed to abiotic causes included nutrient deficiencies, chemical toxicity, and weather-related stressors such as sunburn, frost injury, drought stress, and flooding damage. Among plant disorder diagnoses, biotic agents, including pathogenic fungi, bacteria, nematodes, viruses, insects, and mites, were most frequently identified, accounting for 76% of plant disorder cases. The remaining 7% were diagnosed as abiotic disorders. This proportion may underestimate the true contribution of abiotic stressors, as some samples without observable pathogens or pests (5% of total submissions) may have been affected by non-living factors. Approximately 4% of submitted samples were considered insufficient for diagnosis, primarily due to distance diagnostic submissions where only images were provided, or because of poor sample quality (e.g., dead or degraded tissue) (Figure 3). Among biotic cases, fungal pathogens were the predominant causal agents, representing approximately 66% of all biotic diagnoses, followed by arthropod infestations at 28%, including 25% insects and 3% mites (Figure 4).

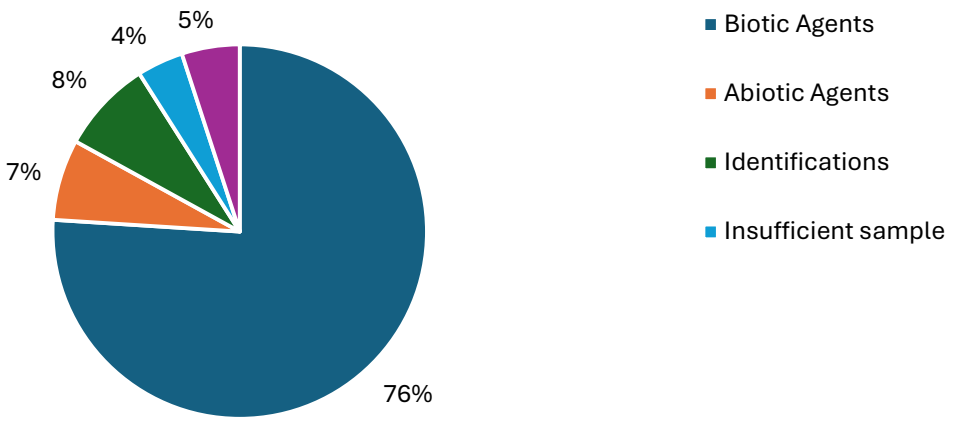

Figure 3. Distribution of diagnosed plant disorders by causal category.

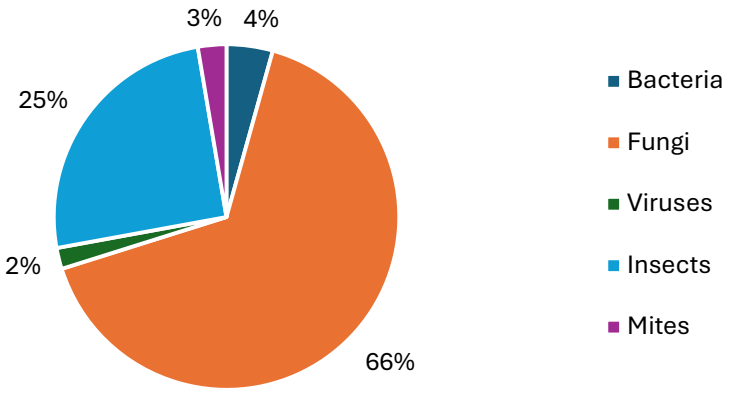

Figure 4. Proportion of major biotic plant health issues identified.

Ornamental plants, including woody trees and shrubs as well as herbaceous annuals and perennials, represented the predominant host category received by the diagnostic laboratory, accounting for 76% of total submissions. The remaining 24% consisted of grasses, fruit crops, vegetable crops, and agronomic crops. Agronomic crops include hemp, soybean, oat, tobacco, and related commodities; fruit crops, encompassing small fruits (e.g., blueberry, grape, strawberry) and tree fruits (e.g., plum, nectarine, apple); grasses, including pasture species and turfgrass; and vegetable crops, such as broccoli, pepper, tomato, and squash. Herbs (e.g., basil and lavender) are included within the vegetable crop category for reporting purposes (Figure 5).

A comprehensive list of plant hosts associated with abiotic and biotic disorders, and the pathogens and pests identified in 2025, is provided in Table 1.

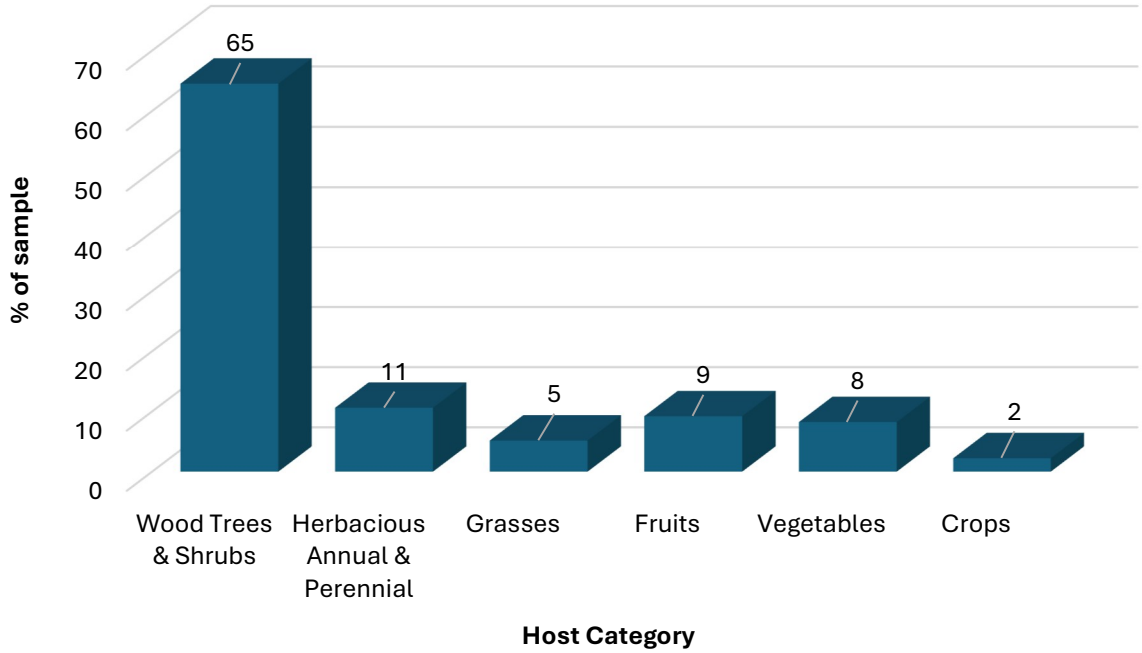

Figure 5. Host categories of samples received by the diagnostic laboratory.

Table 1. Host plants and associated diseases/disorders, pathogens, and pests identified.

HOST	DISEASE/DISORDER *abiotic/biotic*	PATHOGEN AND PEST
WOOD TREE & SHRUB		
Arborvitae	Abiotic	
	Arborvitae needle blight	*Phyllosticta thujae*
	Arborvitae leafminer	*Argyresthia thuiella*
	Bagworm	*Thyridopteryx ephemeraeformis*
	Cercospora Blight	*Cercospora sequoiae*
	Cicada egg-laying injury	Unidentified Cicada
	Dieback; canker	*Botryosphaeria* sp./spp.
	Juniper scale	*Carulaspis juniperi*
	Kabatina twig blight	*Kabatina thujae*
	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Phomopsis dieback	*Phomopsis* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Seiridium canker	*Seiridium unicorne*
	Spruce spider mite	*Oligonychus ununguis*
	Spider mite	*Tetranychus* sp./spp.
Azalea	Abiotic	
	Azalea lace bug	*Stephanitis pyrioides*
	Cercospora leaf spot	*Cercospora* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Barberry	Insect damage	Unidentified Insect
Basswood; Linden	Basswood leafminer	*Baliosus nervosus*
	Verticillium wilt	*Verticillium* sp./spp.
Birch	Anthracnose	*Cryptocline betularum*
Boxwood	Abiotic	
	Boxwood leafminer	*Monarthropalpus flavus*
	Boxwood mite	*Eurytetranychus buxi*
	Boxwood Volutella blight	*Volutella buxi*
	Dieback	*Colletotrichum theobromicola*
	Fusarium canker	*Fusarium* sp./spp.
	Macrophoma blight	*Macrophoma* sp./spp.
	Oystershell scale	*Lepidosaphes ulmi*
	Root rot	*Phytophthora* sp./spp.
Buckeye	Abiotic	Nutritional Disorder
	Guignardia Leaf Blotch	*Guignardia aesculi*
Butterfly Bush	Abiotic	Nutritional Disorder
Cedar	Arborvitae Needle Blight	*Phyllosticta thujae*
	Cedar-quince rust	*Gymnosporangium clavipes*
	Cicada egg-laying injury	Unidentified Cicada
	Dieback; Canker	*Diplodia* sp./spp.
	Juniper scale	*Carulaspis juniperi*
	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Seiridium Canker	*Seiridium* sp./spp.

Cherry	Abiotic	
	Bacterial canker	*Pseudomonas syringae*
	Cercospora leaf spot	*Cercospora* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
	Leaf spot; Shothole	*Blumeriella* sp./spp.
Cherry Laurel	Abiotic	
	Bacterial shothole	*Pseudomonas syringae*
	Abiotic	Bird damage
	Leaf spot; Shothole	*Blumeriella* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Wood boring insect damage	Unidentified Insect
Crabapple	Frogeye leaf spot; Black rot	*Botryosphaeria obtusa*
Crape Myrtle	Cicada egg-laying injury	Unidentified Cicada
	Crapemyrtle bark scale	*Acanthococcus lagerstroemiae*
Cypress	Abiotic	
	Cypress canker	*Lepteutypa cupressi*
	Dieback; canker; twig blight	*Botryosphaeria* sp./spp.
	Juniper scale	*Carulaspis juniperi*
	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Seiridium Canker	*Seiridium* sp./spp.
	Spruce spider mite	*Oligonychus ununguis*
Dogwood	Cicada egg-laying injury	Unidentified Cicada
	Dieback; canker; twig blight	*Botryosphaeria* sp./spp.
	Dogwood powdery mildew	*Erysiphe pulchra*
	Granulate Ambrosia beetle	*Xylosandrus crassiusculus*
	Phyllosticta leaf spot	*Phyllosticta* sp./spp.
	Spot anthracnose	*Elsinoe corni*
Elm	Anthracnose	*Colletotrichum* sp./spp.
	Black spot	*Stegophora ulmea*
	Cicada egg-laying injury	Unidentified Cicada
	Cladosporium leaf spot	*Cladosporium* sp./spp.
	Elm Pocket Gall Mite	*Aceria ulma*
	Powdery mildew	Unidentified Genus
	Psyllids	Family Psyllidae
	Woolly elm aphid	*Eriosoma americanum*
Falsecypress	Arborvitae Needle Blight	*Phyllosticta thujae*
	Phomopsis dieback	*Phomopsis* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Forsythia	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Fringetree	Cicada egg-laying injury	Unidentified Cicada
Hackberry	Beetles	Order Coleoptera
	Canker	*Hypoxylon* sp./spp.
Hawthorn	Cedar-quince rust	*Gymnosporangium clavipes*

Heavenly Bamboo	Cucumber mosaic (CMV)	Cucumovirus Cucumber Mosaic Virus
Hickory	Abiotic	
	Anthracnose	*Colletotrichum* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
	Fall webworm	*Hyphantria cunea*
	Gall	Unidentified Agent
	Hickory leaf stem gall aphid	*Phylloxera caryaecaulis*
	Lymantriid moth	*Dasychira meridionalis*
Holly	Abiotic	
	Black root rot	*Thielaviopsis basicola*
	Cicada egg-laying injury	Unidentified Cicada
	Cottony camellia scale	*Pulvinaria floccifera*
	Dieback; canker; twig blight	*Botryosphaeria* sp./spp.
	Fusarium root rot	*Fusarium* sp./spp.
	Leaf spot; Tar spot	*Rhytisma* sp./spp.
	Mulberry whitefly	*Tetraleurodes mori*
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Hydrangea	Abiotic	Sunburn, others
	Anthracnose	*Colletotrichum* sp./spp.
	Bacterial leaf spot	*Xanthomonas campestris*
	Bacterial leaf spot	*Xanthomonas* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
	Fungal leaf spot	*Cercospora hydrangeae*
	Hemlock-Hydrangea rust	*Pucciniastrum hydrangeae*
	Insect damage	Unidentified Insect
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Pythium root /crown rot	*Pythium* sp./spp.
	Scale insects	Order homoptera
	Viruse	Unidentified Virus
Juniper	Arborvitae Needle Blight	*Phyllosticta thujae*
	Cedar-apple rust	*Gymnosporangium juniperi-virginianae*
	Cedar-quince rust	*Gymnosporangium clavipes*
	Dieback; canker; twig blight	*Botryosphaeria* sp./spp.
	Juniper scale	*Carulaspis juniperi*
	Maskell scale	*Lepidosaphes pallida*
	Mites	Order Acari
	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Phomopsis tip blight	*Phomopsis juniperovora*
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Seiridium Canker	*Seiridium* sp./spp.
Leyland Cypress	Bagworm	*Thyridopteryx ephemeraeformis*
	Branch and tip blight	*Passalora sequoiae*
	Cicada egg-laying injury	Unidentified Cicada
	Juniper scale	*Carulaspis juniperi*
	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Seiridium canker	*Seiridium unicorne*

Lilac	Ascochyta blight	*Ascochyta* sp./spp.
	Bacterial blight	*Pseudomonas syringae*
	Butterflies; Moths	Order Lepidoptera
	Leaf spot	*Pseudocercospora* sp./spp.
	Rhizoctonia root rot	*Rhizoctonia* sp./spp.
Magnolia	Abiotic	
	Anthracnose	*Colletotrichum sp./spp.*
	Bacterial leaf blight	*Pseudomonas sp./spp.*
	Cicada egg-laying injury	Unidentified Cicada
	Dieback; canker; twig blight	*Botryosphaeria* sp./spp.
	Magnolia leafminer	*Phyllocnistis magnoliella*
	Magnolia scale	*Neolecanium cornuparvum*
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Powdery mildew	*Erysiphe* sp./spp.
	Sooty mold	Unidentified Genus
Maple	Abiotic	Genetic and nutritional disorders, others
	Canker	*Hypoxylon* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
	Maple anthracnose	*Aureobasidium apocryptum*
	Oleander scale	*Aspidiotus nerii*
	Phomopsis dieback	*Phomopsis* sp./spp.
	Phyllosticta leaf spot	*Phyllosticta* sp./spp.
	Powdery mildew	Unidentified Genus
	Verticillium wilt	*Verticillium* sp./spp.
Mimosa	Butterflies; Moths	Order Lepidoptera
Oak	Actinopelte leaf spot	*Tubakia dryina*
	Anthracnose	*Apiognomonia* sp./spp.
	Armillaria root rot	*Armillaria* sp./spp.
	Bacterial leaf scorch	*Xylella fastidiosa*
	Canker	*Hypoxylon* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
	Cylindrosporium leaf spot	*Cylindrosporium* sp./spp.
	Gall	Unidentified Agent
	Gall wasps	Family Cynipidae
	Insect gall	Unidentified Insect
	Oak lace bug	*Corythucha arcuata*
	Oak leaf blister	*Taphrina caerulescens*
	Oak Lecanium	*Parthenolecanium quercifex*
	Oak powdery mildew	*Erysiphe alphitoides*
	Oak stump borer	*Paranthrene simulans*
	Obscure scale	*Melanaspis obscura*
	Phomopsis dieback	*Phomopsis* sp./spp.
	Scarlet oak sawfly	*Caliroa quercuscoccineae*

Pine	Abiotic	White pine decline
	Black turpentine beetle	*Dendroctonus terebrans*
	Diplodia tip blight; canker	*Diplodia sapinea*
	Dothistroma needle blight	*Dothistroma pini*
	Pine leaf adelgid	*Pineus pinifoliae*
	Pine needle scale	*Chionaspis pinifoliae*
	Pine wilt nematode	*Bursaphelenchus xylophilus*
Privet	Alternaria leaf spot	*Alternaria* sp./spp.
	Rust mites	Order Acari
Redbud	Cicada egg-laying injury	Unidentified Cicada
	Vascular Streak Dieback	*Ceratobasidium theobromae*
	Verticillium wilt	*Verticillium* sp./spp.
Rhododendron	Cicada egg-laying injury	Unidentified Cicada
	Leaf spot	*Pseudocercospora* sp./spp.
Rose	Black spot (rose)	*Diplocarpon rosae*
	Botrytis blight	*Botrytis* sp./spp.
	Phomopsis dieback	*Phomopsis* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
	Powdery mildew	*Sphaerotheca* sp./spp.
	Roseslug (sawfly)	*Endelomyia* sp./spp.
	Viruses	Unidentified Virus
Sassafras	Granulate Ambrosia beetle	*Xylosandrus crassiusculus*
Serviceberry	Cedar-quince rust	*Gymnosporangium clavipes*
	Cicada egg-laying injury	Unidentified Cicada
Spice Bush	Bacterial leaf spot	*Xanthomonas* sp./spp.
Spruce	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Rhizosphaera needle cast	*Rhizosphaera kalkhoffii*
	Sirococcus needle blight	*Sirococcus* sp./spp.
	Stigmina needle blight	*Stigmina lautii*
Sycamore	Cicada egg-laying injury	Unidentified Cicada
	Flatid planthopper	*Ormenoides venusta*
	Powdery mildew	*Erysiphe* sp./spp.
Tulip Tree	Anthracnose	*Colletotrichum* sp./spp.
	Dieback; canker	*Botryosphaeria* sp./spp.
	Gall	Unidentified Agent
	Tuliptree scale	*Toumeyella liriodendri*
Viburnum	Bacterial leaf blight	*Pseudomonas* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
Willow	Cercospora leaf spot	*Pseudocercospora salicina*
	Willow Black Canker	*Glomerella miyabeana*
Yew	Abiotic	
	Cryptocline needle blight	*Cryptocline taxicola*
	Mealybugs	Family Pseudococcidae
	Pestalotiopsis needle blight	*Pestalotiopsis* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.

HERBACIOUS ANNUAL & PERENNIAL		
Autumn Fern	Pythium root/crown rot	*Pythium* sp./spp.
Anemone	Bacterial blight	Unidentified Bacteria
	Fourlined plant bug	*Poecilocapsus lineatus*
	Fusarium wilt	*Fusarium oxysporum*
	Powdery mildew	*Erysiphe* sp./spp.
	Rhizoctonia stem/root rot	*Rhizoctonia* sp./spp.
Chrysanthemum	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Cockscomb	Abiotic	Salt damage
Coneflower	Abiotic	
	Eriophyid mites	Family Eriophyidae
	Leaf beetles	Family Chrysomelidae
	Rhizoctonia stem rot	*Rhizoctonia* sp./spp.
Cotoneaster	Fire blight	*Erwinia amylovora*
Gardenia	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Geranium	Bacterial blight	*Xanthomonas* sp./spp.
	Rhizoctonia crown rot	*Rhizoctonia* sp./spp.
Hellebore	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Hollyhock	Mallow rust; hollyhock rust	*Puccinia malvacearum*
Hosta	Pythium root/crown rot	*Pythium* sp./spp.
	Slug damage	Unidentified Slug
Hoya	Viruses	Unidentified Virus
Ivy	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Lilyturf	Anthracnose	*Colletotrichum* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Milkweed	Rhizoctonia stem rot	*Rhizoctonia* sp./spp.
Million Bells	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Pachysandra	Leaf and stem blight	*Volutella pachysandrae*
Pansy	Botrytis blight	*Botrytis* sp./spp.
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Peony	Botrytis blight	*Botrytis* sp./spp.
	Insects damage	Unidentified insect
	Peony leaf blotch	*Cladosporium paeoniae*
	Phytophthora dieback	*Phytophthora* sp./spp.
	Powdery mildew	*Erysiphe* sp./spp.
Persian Buttercup	Fusarium wilt	*Fusarium oxysporum*
Petunia	Abiotic	
	Phytophthora crown/root rot	*Phytophthora* sp./spp.
Pinks	Anthracnose	*Colletotrichum* sp./spp.
	Rhizoctonia stem rot	*Rhizoctonia* sp./spp.
Poppy	Bacterial blight	*Xanthomonas* sp./spp.
Tulip	Fusarium basal rot	*Fusarium* sp./spp.
Camellia	Viruses	Unidentified Virus
Glossy Abelia	Sooty mold	Unidentified Genus
Hibiscus	Abiotic	

Lily	Pythium root/crown rot	*Pythium* sp./spp.
Loropetalum	Bacterial gall	*Pseudomonas savastanoi*
GRASS (PASTURE AND TURFGRASS)		
Bentgrass	Anthracnose basal rot	*Colletotrichum graminicola*
	Brown patch	*Rhizoctonia* sp./spp.
Bermudagrass	Brown patch	*Rhizoctonia* sp./spp.
	Helminthosporium leaf spot	*Helminthosporium* sp./spp.
	Take-all	*Gaeumannomyces graminis*
Bluegrass	Sod webworm	*Crambus albellus*
Fescue	Brown patch	*Rhizoctonia* sp./spp.
	Anthracnose	*Colletotrichum graminicola*
	Leaf rust; rust	*Puccinia* sp./spp.
	Mealybugs	Family Pseudococcidae
Turfgrass (mix)	Ascochyta blight	*Ascochyta* sp./spp.
	Brown patch	*Rhizoctonia* sp./spp.
	Dollar spot	*Clarireedia homoeocarpa*
Zoysia Grass	Large patch	*Rhizoctonia solani*
FRUIT		
Blueberry	Abiotic	
	Anthracnose fruit rot	*Colletotrichum gloeosporioides*
	Colletotrichum leaf spot	*Colletotrichum* sp./spp.
	Cicada egg-laying injury	Unidentified Cicada
Grape	Bacterial blight	*Xanthomonas* sp./spp.
	Black rot	*Guignardia bidwellii*
	Grape cane gallmaker	*Ampeloglypter* sp.
	Grape downy mildew	*Plasmopara viticola*
	Grape phylloxera	*Daktulosphaira vitifoliae*
Raspberry	Abiotic	
	Anthracnose	*Elsinoe* sp./spp.
	Fertilizer injury	Nutritional Disorder
	Raspberry Leaf spot	*Sphaerulina rubi*
Strawberry	Botrytis fruit rot	*Botrytis* sp./spp.
	Crown/root rot	*Phytophthora* sp./spp.
	Fusarium crown/root rot	*Fusarium* sp./spp.
	Fusarium wilt	*Fusarium* sp./spp.
	Insect damage	Unidentified Insect
	Neopestalotiopsis disease	*Neopestalotiopsis* sp.
	Phomopsis leaf blight	*Phomopsis obscurans*
	Powdery mildew	*Podosphaera macularis*
	Rhizoctonia stem/root rot	*Rhizoctonia* sp./spp.
Apple	Cicada egg-laying injury	Unidentified Cicada
	Frogeye leaf spot; black rot	*Botryosphaeria obtusa*
	Phomopsis canker	*Diaporthe perniciosa*
	White rot	*Botryosphaeria dothidea*
	Bitter rot	*Colletotrichum* sp./spp.

Apple (Continued)	Cedar-apple rust	*Gymnosporangium juniperi-virginianae*
	San jose scale	*Diaspidiotus perniciosus*
Ficus	Mites	Order Acari
Nectarine	Cicada egg-laying injury	Unidentified Cicada
	Oriental fruit moth	*Grapholita molesta*
	Plum Curculio	*Conotrachelus nenuphar*
Pawpaw	Anthracnose	*Colletotrichum* sp./spp.
	Verticillium wilt	*Verticillium* sp./spp.
Peach	Abiotic	Nutritional Disorder
	Brown rot	*Monilia fructicola*
	Cicada egg-laying injury	Unidentified Cicada
	Greater peachtree borer	*Synanthedon exitisoa*
	Gummosis	*Botryosphaeria dothidea*
	Leaf spot; shothole	*Blumeriella* sp./spp.
	Phomopsis dieback	*Phomopsis* sp./spp.
	Plum curculio	*Conotrachelus nenuphar*
Pear	Abiotic	
	Cedar-quince rust	*Gymnosporangium clavipes*
	Cicada egg-laying injury	Unidentified Cicada
	Dieback; canker	*Botryosphaeria* sp./spp.
	Fire blight	*Erwinia amylovora*
	Frogeye leaf spot; Black rot	*Botryosphaeria obtusa*
	Phoma leaf spot	*Phoma* sp./spp.
	Phomopsis dieback	*Phomopsis* sp./spp.
	Mite damage	Unidentified Mite
Pecan	Abiotic	
Persimmon	Leaf spot	*Pseudocercospora* sp./spp.
Plum	Bacterial leaf spot	*Xanthomonas* sp./spp.
VEGETABLE		
Bean	Bean anthracnose	*Colletotrichum lindemuthianum*
	Common bacterial blight	*Xanthomonas campestris*
Cucumber	Abiotic	
	Anthracnose	*Colletotrichum orbiculare*
	Aphids	Family Aphididae
	Viruse	Unidentified Virus
	Watermelon mosaic	Potyvirus Watermelon Mosaic Virus
	Zucchini yellow mosaic	Potyvirus Zucchini Yellow Mosaic
Eggplant	Aphids	Family Aphididae
	Flea beetles	Subfamily Alticinae
	Viruse	Unidentified Virus
Okra	Aphids	Family Aphididae
	Viruse	Unidentified Virus
Pepper	Abiotic	Chemical injury
	Anthracnose	*Colletotrichum* sp./spp.
	Pepper bacterial spot	*Xanthomonas campestris*

Pepper (Continued)	Pythium root/crown rot	*Pythium* sp./spp.
Pumpkin	Fusarium root/crown rot	*Fusarium solani*
Squash	Abiotic	
	Slug damage	Unidentified Slug
Tomato	Abiotic	Chemical injury, others
	Aphids	Family Aphididae
	Bacterial speck	*Pseudomonas syringae*
	Bacterial spot	*Xanthomonas* sp./spp.
	Early blight; leaf spot	*Alternaria solani*
	Fusarium root/crown rot	*Fusarium oxysporum*
	Leaf mold	*Fulvia fulva*
	Pythium damping off	*Pythium* sp./spp.
	Pythium root/crown rot	*Pythium* sp./spp.
	Root-knot nematodes	*Meloidogyne* sp./spp.
	Tomato russet mite	*Aculops lycopersici*
	Tomato spotted wilt	Tomato Spotted Wilt Virus
HERB		
Basil	Pythium root/crown rot	*Pythium* sp./spp.
Lavender	Phytophthora crown/root rot	*Phytophthora* sp./spp.
CROP		
Cotton	Fusarium wilt	*Fusarium* sp./spp.
	Pythium root/crown rot	*Pythium* sp./spp.
Hemp	Botrytis blight	*Botrytis* sp./spp.
	Pythium root/crown rot	*Pythium* sp./spp.
Soybean	Anthracnose	*Colletotrichum* sp./spp.
	Charcoal rot	*Macrophomina* sp./spp.
Oats	Cereal scab	*Fusarium graminearum*
	Smut	*Ustilago* sp./spp.
Tobacco	Abiotic	
	Black shank	*Phytophthora nicotianae*
	Frogeye leaf spot	*Cercospora nicotianae*
	Fusarium root rot	*Fusarium* sp./spp.
	Target spot	*Thanatephorus cucumeris*
	Tobacco etch (TEV)	Potyvirus Tobacco Etch Virus

FORAGE TESTING

The Soil, Plant & Pest Center partners with the UT Beef & Forage Center's NIRS Forage and Feed Nutritional Analysis Laboratory to provide accurate, research-based forage testing for producers. Using NIRS technology, the program quickly measures key nutritive factors including protein, fiber, digestibility, minerals, and energy values, giving producers practical information to guide feeding and management decisions. Annual lab certification with the National Forage Testing Association and utilizing the forage calibrations from the NIRS Consortium ensure reliable accurate results to our stakeholders. This collaboration combines strong laboratory capability with forage and livestock expertise to support nutrition, more efficient use of forage resources, and improved productivity for Tennessee farmers and researchers.

FORAGE TESTING SUMMARY

Bruno Pedreira, Director and Forage Specialist
David McIntosh, Coordinator and Researcher

SAMPLE SUBMISSIONS

The 2025 forage testing year reflected strong statewide activity, with a total of 1,449 samples submitted for laboratory analysis. In total submissions, 88 out of 95 Tennessee counties participated, and 21 other states sent samples to be analyzed with the Soil, Plant and Pest Center, with a total of 588 clients. The Tennessee counties sending samples are highlighted, providing excellent use of Extension programming and producer awareness of the importance of forage testing. The top five counties submitting samples were Greene (209), Fayette (74), Giles (70), Loudon (68), and Rutherford (66) (Figure 1). In addition, to enhance the testing availability, the Soil, Plant, and Pest Center analyzed 366 samples for nitrates and 124 for minerals. Research samples are not included in the reported totals.

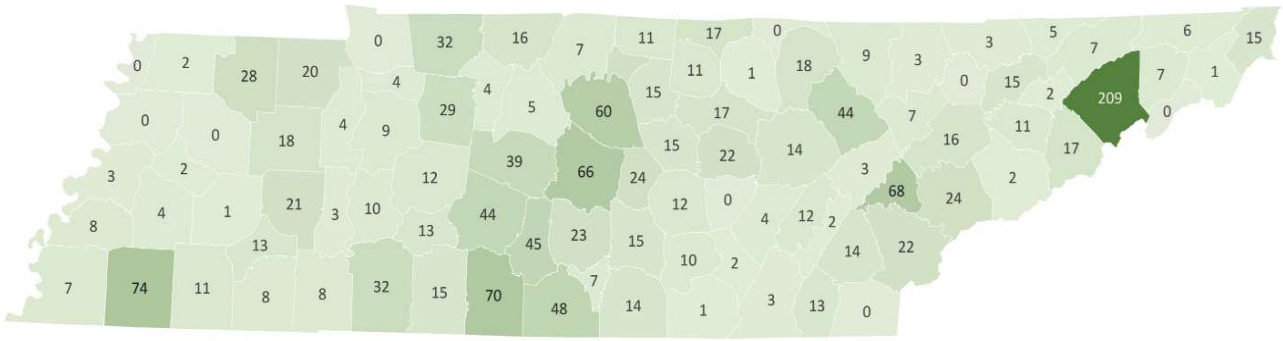

Figure 1. Producers' forage sample submissions by county in 2025.

HAY TYPE CLASSIFICATIONS

Hay continued to serve as the foundation of forage production, accounting for nearly 92% of all samples received. This overwhelming share reaffirmed the ongoing reliance on conventional dry-hay systems for long-term storage and winter-feeding programs. Haylage followed with 7% of the total, indicating limited use of wetter-preservation strategies among producers managing warm-season annuals, small grains, or forage systems where moisture control and fermentation quality are priorities. Corn silage accounted for only 1% of the submissions. Please note that forage type, ensiled categorization, and species are self-identified by the client at the time of submission.

Across all forage types (hay, haylage, silage, and fresh-cut), mixed grasses were by far the most common forage submitted, representing just over half of all forage analyses for the year (Figure 2). This dominance reflected the diverse botanical makeup typical of Tennessee pastures and hayfields, where cool-season perennials and volunteer species often grow together.

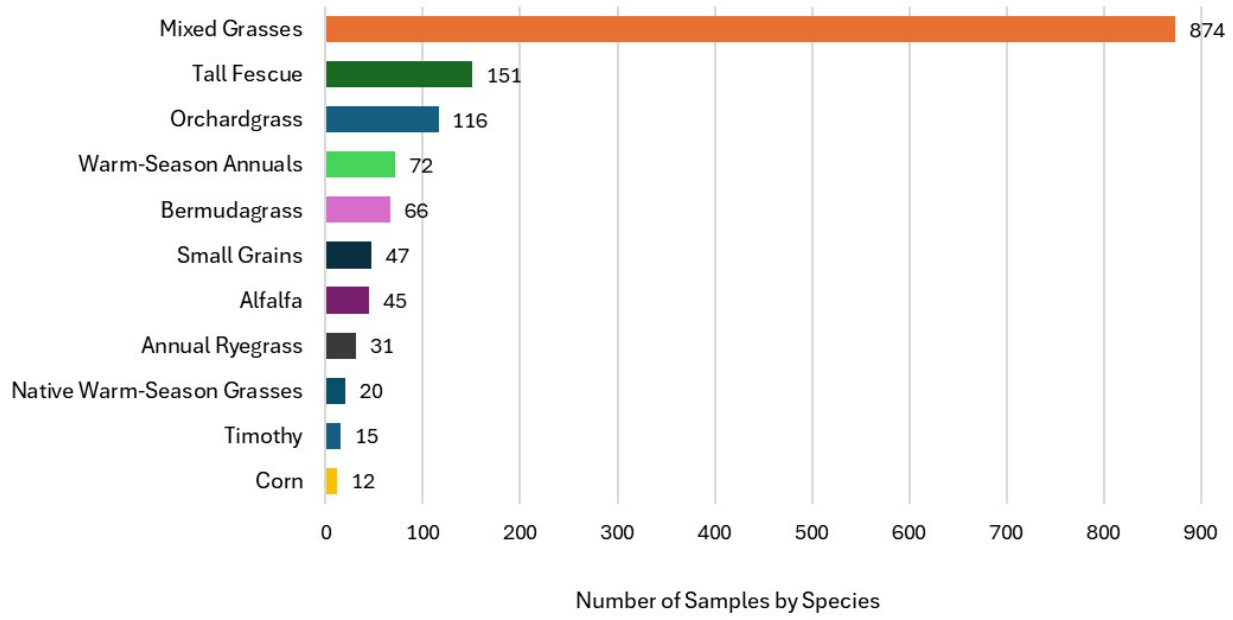

Figure 2. Number of forage sample by species submitted in 2025.

Cool-season forages, tall fescue and orchardgrass, followed with 18% of all submissions. The warm-season annuals provided 5% of submissions, highlighting their expanding role in summer forage production and the increasing interest in optimizing quality through timely harvest and nutrient testing. Forages such as alfalfa, native warm-season grasses, timothy, and small grains appeared in smaller but consistent numbers, demonstrating ongoing interest in niche or region-specific forage systems.

Haylage samples displayed a different pattern from hay. Small grains were the most popular ensiled forage, followed by annual ryegrass, then warm-season annuals (Table 1). Smaller numbers of native warm-season grass, perennial warm-season grasses, orchardgrass, and cool-season perennial grasses were received as well, showing that producers continue to tailor haylage systems to both seasonal conditions and feed quality goals. Corn silage submissions remained low.

FORAGE NUTRITIVE VALUES

Forage samples submitted over the year showed clear differences in nutritive value across preservation types and species. Forage samples were analyzed across four categories: fresh cut, hay, haylage, and silage (Table 1). For discussion purposes, crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), *in-vitro* true dry matter digestibility 48-hour (IVTDMD48), and total digestible nutrients (TDN) are presented by category and forages. Within hay, alfalfa shows the highest average crude protein and the lowest NDF, while crabgrass has the highest digestibility, and bermudagrass posts the highest TDN. Hay showed an important distinction between samples containing clover (158) and those without it (699), meaning that roughly 18.4% of hay samples included a clover component, a factor that can greatly influence CP levels and digestibility. Across all hay types, the dataset shows a consistent pattern: earlier-cut forages and preserved forages with better moisture management tend to test higher in digestibility and TDN. In haylage, annual ryegrass leads in digestibility, and orchardgrass trends highest in CP and

TDN. Corn silage stands out overall, with the highest digestibility and TDN of any material type. However, given that there are 30,000 acres of corn silage harvested in Tennessee (USDA/NASS 2024), this sampling provides a deficit in the samples submitted to the laboratory.

Table 1. Nutritive value by forage category and forages.

		%				
Type of Hay and Species	*Number of Samples*	*CP*	*ADF*	*NDF*	*IVTDMD48h*	*TDN*
Fresh cut	**10**	**15.1**	**34.6**	**60.1**	**75.2**	**62.4**
Mixed Grasses	9	15.6	34.7	60.6	74.7	62.3
Tall Fescue	1	11.1	33.7	55.9	79.5	63.4
Hay	**1326**	**11.4**	**38.3**	**63.8**	**69.7**	**58.5**
Alfalfa	45	18.2	35.3	42.9	75.8	61.6
Annual Ryegrass	11	9.5	43.1	68.2	63.3	53.4
Bermudagrass	66	11.2	35.0	66.6	67.7	61.9
Crabgrass	1	13.6	36.0	61.9	76.7	60.9
Mixed Grasses	841	10.7	39.0	64.9	68.7	57.7
Native Warm Season Grass	17	10.4	38.9	64.4	69.2	57.9
Orchardgrass	114	13.2	36.4	62.4	72.9	60.4
Small Grains	10	11.3	37.8	62.8	68.8	59.0
Tall Fescue	150	12.0	37.5	63.6	70.6	59.3
Timothy	15	9.1	35.2	60.0	75.5	61.8
Warm-Season Annuals	56	11.3	38.6	64.1	72.7	58.2
Haylage	**101**	**11.2**	**39.8**	**62.3**	**71.9**	**56.9**
Annual Ryegrass	20	11.7	39.3	60.6	76.1	57.4
Mixed Grasses	24	11.1	39.4	62.3	71.5	57.3
Native Warm Season Grass	3	11.7	41.5	67.1	68.0	55.2
Orchardgrass	2	12.4	37.5	63.7	71.4	59.4
Small Grains	37	10.7	39.3	61.8	71.5	57.5
Warm-Season Annuals	15	11.7	42.2	64.4	69.1	54.4
Silage	**12**	**8.6**	**26.3**	**48.1**	**82.4**	**71.1**
Corn	12	8.6	26.3	48.1	82.4	71.1
Total Samples	**1,449**					

*CP: crude protein, ADF: acid detergent fiber, NDF: neutral detergent fiber, IVTDMD48: in-vitro true dry matter digestibility 48-hour, and TDN: total digestible nutrients. Represented as 100%DM.

ASSESSMENT

In 2025, the submission pattern shows a notable gap: many of the lowest-quality forages are missing from the sample set. Because these lower-quality lots are often the most critical to test for ration balancing and supplementation decisions, their absence limits our understanding of feeding risk and true forage variability for the year. Overall, the year's forage data reflects a production system still grounded in hay while increasingly incorporating flexible preservation strategies such as haylage. Species diversity remained strong, and the continued presence of both cool and warm-season forages highlights producers' efforts to balance seasonal growth patterns, meet nutritional needs, and maintain resilience under changing conditions.

The nutritive value of hay produced each year underscores the need to expand forage-testing participation. Strengthening producer education and increasing the number and diversity of samples, especially lower-quality or weather-affected lots, would enhance ration balancing, improve supplementation strategies, support animal productivity, and ultimately promote more sustainable and profitable forage management statewide.

The year's results demonstrate both the potential for high-quality forage across seasons and the importance of regular testing. Submitting a broader range of forage lots would improve future assessments and allow for more accurate nutritional planning. These findings align with the peer-reviewed collaborative publication by McIntosh et al. (2025), which analyzed multi-year forage data across Tennessee. The study documented meaningful variability in forage nutritive value and persistent challenges in meeting livestock nutritional requirements during high-demand periods such as lactation, particularly when lower-quality forages dominate the ration. Despite this, Tennessee forages remain underrepresented in testing, limiting producers' ability to make fully informed management decisions, even though hay production alone (excluding corn silage) carries a value of $545,534,000 (USDA/NASS 2024).

McIntosh, D., B. Pedreira, K. Mason, and G. Bates. 2025. Quantitative Assessment of Forage Nutritive Value Using a Large Dataset: Implications for Cattle Production in Tennessee. J. NACAA. Vol, 18. Issue 1-June. ISSN 2158-9429.

U.S. Department of Agriculture, National Agricultural Statistics Service. (2026). *State agriculture overview: Tennessee*.