

Evaluating Vegetation Management Practices for Woody and Herbaceous Vegetation Phase III



Prepared by:
Davey Resource Group,
a division of The Davey Tree Expert Company

Prepared for:
The Ohio Department of Transportation,
Office of Statewide Planning & Research

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To train ODOT staff to recognize trees along the right-of-way that may be hazardous, identify trees that may be of a species-specific concern for vegetation management objectives, make pruning cuts based on industry standards, and oversee the tree work of others, including contractors. Empowering ODOT staff with arboriculture knowledge will make state highways safer, trees healthier and more aesthetically pleasing, and should reduce complaints about poor tree care practices.			
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Prepared in cooperation with the Ohio Department of Transportation
and U.S. Department of Transportation, Federal Highway Administration

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This report does not constitute a standard, specification, or regulation.

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Project Background

Phase III of the *Evaluating Vegetation Management Practices for Woody and Herbaceous Vegetation* research project arose directly from the findings of Phase I and the recommendations from Phase II. Ohio Department of Transportation (ODOT) is challenged with managing vegetation along over 43,000 lane miles of roads throughout Ohio’s diverse landscapes. Due to the complexity of management requirements and the magnitude of land that ODOT maintains, the task of managing the rights-of-way is complicated and difficult. Among the primary challenges are rising demands for all road and roadside maintenance services, increased operational costs, reduced staff, regulatory restrictions, and public perception. Current vegetation management practices employ primarily mechanical methods utilizing limited equipment resources, with limited use of herbicides and plant growth regulators (PGR) to control unwanted vegetation and turf height.

Across the state, managers and staff perform a variety of vegetation management tasks to facilitate safe passage on roadways. However, ODOT Districts often encounter obstacles, including equipment and staff challenges that hinder their efforts to proactively respond to vegetation management needs. The major challenges found during Phase I and Phase II are: decentralized and disproportionate distribution of vegetation management equipment; lack of trained/experienced staff; lack of readily available technical resources in the Districts; lack of up-to-date and specific vegetation management guidance; and limited staff and budget resources, which must be prioritized and allocated to roadway (not roadside) maintenance and safety projects.

The purpose of the overall research project was to identify and evaluate vegetation management practices ODOT Districts can implement to increase efficiency and cost-effectiveness of roadside maintenance activities that improve worker safety, foster safe highway use by the traveling public, and improve roadside aesthetics. ODOT needs a Roadside Integrated Vegetation Management (RIVM) program that places safety and environmental stewardship first while also being more innovative and adaptive.

Davey Resource Group, a division of The Davey Tree Expert Company (Davey Resource Group), was selected by ODOT to conduct this research project. This project consisted of three phases. Phase I included investigating ODOT’s current vegetation management practices and researching other tools and techniques that would result in greater efficiencies, increased safety, and improved aesthetics. Phase II included field testing selected chemical and mechanical vegetation management methods, and recommendations for implementation and improvement of ODOT’s

RIVM program. Phase III consisted of arboricultural training and professional development for ODOT staff as recommended in Phase II.

The research in Phase I determined that a lack of use of industry-specific, innovative tools and techniques by ODOT could be causing operational inefficiencies that increase the labor costs or time needed to perform roadside vegetation maintenance tasks, as well as the number of maintenance cycles needed for each growing season. These operational inefficiencies over time increase ODOT's cost to manage vegetation along Ohio's state rights-of-way.

Our research also determined that other DOTs and private companies have developed a number of industry-specific, innovative vegetation management programs that result in greater efficiencies, increased safety, and improved aesthetics. Therefore, it was proposed that if ODOT made significant changes in its herbicide use program, trained staff to more quickly identify problems and issues, and utilized equipment more effectively and properly, major gains in efficiency and effectiveness would be realized, and costs reduced in both the short and long term.

Based on the results of Phase I research findings, field testing was recommended to thoroughly analyze which techniques would gain ODOT the greatest efficiencies and overall return on investment. The best vegetation management practices as determined in Phase I research and consultation from ODOT's Technical Advisory Panel for the project moved forward into Phase II field testing.

For Phase II, the following areas were targeted to improve existing ODOT vegetation management operations:

- *Chemical Applications:* Increase broadleaf herbicide and plant growth regulator use and utilize a targeted application and follow-up treatment schedule to control noxious and invasive weeds, decrease the frequency of turf mowing, brush maintenance and removal, tree trimming and removal, and maintain bare ground where needed.
- *Mechanical Solutions:* Purchase new equipment and more efficiently use existing equipment to perform vegetation maintenance tasks more quickly and safely.
- *Training and Communication:* Provide training to vegetation management personnel on plant identification, herbicide selection, rates and timing, and encourage communication among counties and districts to streamline operations regarding vegetation management practices across the state.

Through this testing, sufficient information was gathered and analyzed to make recommendations for implementation to improve ODOT's vegetation management program.

As a result of the Phase II findings, it was recommended that ODOT implement a comprehensive, proactive RIVM program based on plant life-cycles to improve safety, effectiveness, and efficiency. Phase II also identified arboricultural training as a need of ODOT staff to implement a proactive RIVM program. The specific training recommended included gaining arboricultural skills to identify trees and assess hazard trees, perform proper pruning, and have oversight from an in-house International Society of Arboriculture (ISA) certified arborist.

Therefore, Phase III involved the development and implementation of a formalized training program in basic and professional arboriculture for ODOT staff across the state.

Research Context

At the onset of Phase III, ODOT did not have roadside vegetation management staff formerly trained in basic or professional arboriculture. Because staff did not have arboriculture training, it was more difficult for ODOT staff to recognize trees along the right-of-way that may be hazardous, to identify trees that may be of a species specific concern for vegetation management objectives, to make pruning cuts based on industry standards, and to oversee the tree work of others, including contractors. Empowering ODOT staff with arboriculture knowledge will make state highways safer, trees healthier and more aesthetically pleasing, and should reduce complaints about poor tree care practices.

The goal of the Phase III project is to improve ODOT's ability to properly perform tree-related maintenance tasks along state highways.

The objectives of this project include providing the following training programs for select ODOT staff:

- *Basic arboricultural training.* The program was two days in length and performed once in the summer during the leaf on conditions and once in the winter during leaf off conditions. At four different training sites, ODOT roadside vegetation management staff members were taught to:
 - identify hazard trees that may impact Ohio's roadways in both leaf off and leaf on conditions
 - identify ash trees and 5 common Ohio tree genera in both leaf off and leaf on conditions
 - make proper pruning cuts
- *Professional arboricultural certification training.* The program was offered to select ODOT staff to enable them to be better prepared to take the International Society of Arboriculture (ISA) Certified Arborist® exam, and to confidently oversee and judge tree work performed by other ODOT roadside vegetation management staff and contractors.

Research Approach

Davey Resource Group project staff worked in partnership with ODOT staff to determine the content, timing, and locations for the arboricultural training projects. The basic arboricultural training program included hazard tree identification, common Ohio tree genera identification, and tree pruning training. The professional training included preparation for the ISA certified arborist exam. All training was performed by Davey Resource Group’s Certified Arborists who had the additional professional qualifications of Municipal Specialist and Tree Risk Assessment Qualified.

Basic Arboricultural Training: Hazard Tree, Tree Identification, and Proper Pruning

Davey Resource Group developed a two-day training program for up to 20 people to be completed two separate times — one during leaf off conditions and one during leaf on conditions since ODOT staff perform tree work during all seasons and trees look different in the summer and winter seasons. See Appendix A for training sign-in sheets and detailed agendas. One review opportunity of the training materials was provided to ODOT. The material presented was intended to teach ODOT roadside vegetation management staff to:

- *Identify hazard trees*—The training was accomplished using PowerPoint slides and pictorial handouts during a three-hour presentation; both classroom and in-the-field training sessions were held.
- *Identify ash trees and five common or troublesome Ohio tree genera.* The tree identification training was accomplished using PowerPoint slides and pictorial handouts during a one-hour presentation; both classroom and in-the-field training sessions were held. Learn basic, proper pruning techniques. Tree pruning training included instruction and demonstrations of where to cut limbs to decrease decay, reduce sprouting/grow back, and how to thin reduce and raise trees. PowerPoint slides and pictorial handouts were used to teach staff to recognize what type of pruning is needed and how best to accomplish the pruning. No actual pruning was done during this three-hour session which included classroom and field training.

Training Locations

Location	Leaf Off Training	Leaf On Training
District 1 1885 North McCullough Street Lima, Ohio 45801	January 25, 2017	June 29, 2017
District 4 2088 Arlington Road Akron, Ohio 44306	January 24, 2017	June 21, 2017
District 5 6490 Glenn Highway Cambridge, Ohio 43725	February 14, 2017	June 22, 2017
District 8 505 South State Route 741 Lebanon, Ohio 45036	February 8, 2017	June 28, 2017

Professional Arboricultural Training: Preparation for the ISA Certified Arborist Exam

Davey Resource Group developed a four-day Certified Arborist® test preparation training program for up to 20 participants. ODOT, with Davey's guidance, selected participants that met the ISA qualifications to take the certified arborist exam. ODOT purchased the Certified Arborists' Certification Study Guide for all participants and secured the training facility. Additionally, ODOT worked with the Ohio Chapter, International Society of Arboriculture to arrange a proctored Certified Arborist test, which was held on June 1, 2017 at ODOT Aviation-Don Scott Airfield training facility in Columbus.

The Certified Arborist® test preparation training was held at ODNR's Morse Road office complex on May 9, 16, 23, and 24, 2017 and the material presented was intended to:

- Teach participants about the practice of arboriculture
- Prepare participants to take the ISA's Certified Arborist® exam

Course participants were expected to study outside of the classroom and attendance was not a guarantee of passing of the exam. See Appendix B for training sign-in sheets and a detailed agenda.

Research Findings and Conclusions

The arboricultural training sessions benefited ODOT in the following ways:

- Staff has been trained to identify hazardous trees along the right-of-way, enabling ODOT to plan for appropriate and timely mitigation of road hazards.
- Staff has knowledge and reference materials to identify the five most common or troublesome Ohio trees by genus, as well as ash trees. This knowledge will allow ODOT to proactively manage trees by prescribing species-specific maintenance regimes, and by recognizing ash trees, trees that are dying in large numbers along state highways due to the emerald ash borer.
- Staff has training on how to make proper tree pruning cuts which should reduce limb and trunk decay, slow re-sprouting or regrowth, and improve the appearance of highway trees.
- Select ODOT staff has gained comprehensive tree physiology, plant health care, urban forest management, risk tree assessment, and other arboricultural knowledge, and is prepared to sit for the ISA Certified Arborist® exam. As of the date of this report, 9 of 15 participants have successfully passed the ISA Certified Arborist® exam and the remaining six are planning to retake the exam again in the fall of 2017. Having staff with knowledge of industry standards will help ODOT properly perform tree pruning and removal, improving the results of tree maintenance activities, increasing operational efficiency, and reducing complaints by travelers along highways where tree work was performed.

Recommendations for Implementation

Training does more than just educate workers. Training supports professional development and job advancement and positively influences attitudes and morale. It encourages timely and more appropriate decision-making on the local level and can result in higher quality work, fewer accidents, and less equipment damage and repairs.

ODOT should continue its dedication to staff development, and formalize additional arboricultural training into a yearly program to improve job-site practices and tree work at the District level. This should also include opportunities for ISA Certified Arborists® to obtain the required continuing education units to maintain their certification status.

An expanded program should include hands-on training for:

- ANSI A300 tree pruning
- maintenance and protection standards
- tree risk assessment
- insect and disease diagnosis and management
- felling techniques
- basic roping, rigging, aerial rescue, and specialized equipment use
- calibration of equipment
- safety training on topics such as chainsaw drop starts, pinched saws, and kick-backs; how to control the fall of a tree; making notches, hinges, and back cuts; chipper safety; and aerial rescue

Given the labor- and equipment-intensive nature of tree maintenance work and the high-risk potential to ODOT staff and the traveling public, the following recommendations are made for staff and job sites where mature trees are being maintained or removed:

- Assign a qualified and experienced foreman, preferably a Certified Arborist®, to the job site to keep crew members safe and productive with assigned jobs.
- Provide the opportunity for ODOT maintenance staff to watch a professional tree crew at work. Observe how a tree maintenance project is a carefully planned team effort where everyone has a specific task, making sure they stay clear of each other when working, and there is very little time where something is not getting accomplished by every crew member.

Training is also recommended for additional ODOT staff so that they can acquire professional credentials that are now the recommended minimum standards in the industry. These credentials include ISA Certified Tree Worker Climber Specialist, Tree Worker Aerial Lift Specialist, and Tree Risk Assessment Qualification.

Bibliography

Lilly, S.J. 2010. *Arborists' Certification Study Guide*, 3rd ed. Champaign: International Society of Arboriculture.

Appendix A
Basic Arboricultural Training Agendas and Sign-in Sheets



*Evaluating Vegetation Management Practices for
Woody and Herbaceous Vegetation – Phase III
2017 Leaf Off and Leaf On Training Agenda*

Morning Classroom Session (3, One-Hour Sessions)

1. Tree ID – Bark and Buds

What to look for and how to confirm ID using multiple characteristic features

- Tree form
- Branch pattern
- Bark
- Buds
- Fruit
- Smell and other clues

Common Ohio Trees: For each tree group: height, width, and habitat (where to find) is covered for each tree

- **Ash:** EAB and plight of ash and tree risk
 - White ash
 - Green ash
- **Maple:** The most common tree – ID relies on keying in on each “what to look for category”
 - Red maple
 - Silver maple
 - Sugar maple
 - Boxelder/ash leaf maple
 - Norway maple – invasive!
- **Oak:** The difference between white oak and red oak groups based on buds and oak wilt and pruning
 - Pin oak
 - Northern red oak
 - Black oak
 - Shingle oak
 - White oak
 - Swamp white oak
- **Elm:** Dutch elm disease and how it relates
 - American elm
 - Slippery elm
 - Siberian elm
- **Black Locust:** Early successional on newly cleared areas
- **Black Cherry:** Common in woodlands and seeds distributed by wildlife

2. Tree Risk

Focus on Targets on Structures – Introduce ISA BMP system

Introduction to Tree Risk

- **Risk:** The combination of the likelihood of an event (tree failure) and severity of the potential consequences (what happens if that tree failure hits a target). Risk is characterized by combining the probability of failure with the consequence of failure to determine overall risk rating.
- **Tree Risk Assessment:** The systematic process to identify, analyze, and evaluate tree risk.
 - Tree risk assessments need to be evaluated to prioritize risk
- **Targets:** Or Risk Targets are people, property, or activities that could be injured, damaged, or disrupted by a tree. Targets include: people, cars, equipment, workers, infrastructure, and signs (etc.).

Tree Risk Factors

- **Conflict:** Trees may cause problems unrelated to their probability of failure. In some cases trees produce objectionable roots, branches, fruit, leaves, or flowers for example. Those features of a tree could cause issues such as: sight distance limitations, shading of pavement, excessive litter creating roadway hazard, or trees growing in conflict with infrastructure.
- **Failures:** Tree failure is the breakage of stems, branches, or roots or loss of mechanical support from the root system (which is harder to detect). Structural failures occur when the forces acting on a tree exceed the strength of the tree structure of the soil that supports that tree.
 - Even a structurally sound tree can fail when a load or force is applied that exceeds the strength of one or more of its parts.
 - Most tree failures involve a combination of structural defects or characteristics such as the presence of decay or poor structure or an unusual weather event.
- **Common Defects that Increase Potential for Failure**
 - Dead parts
 - Broken branches or hangers
 - Cracks
 - Weakly attached branches (included bark) and co-dominant stems
 - Cavities or decayed wood
 - Unusual tree architecture - lean, balance branch distribution, lack of taper
 - Loss of root support
- **Conditions that Contribute to Tree Failure**
 - Insects/disease
 - Improper pruning
 - Saturated soils
 - Extended drought
 - Ice or wet snow branch loading
 - Prevailing winds

Level 1 Tree Risk Inspection – Limited Visual Inspection Process

- Define the scope, process, route, and selection criteria for trees.
- Perform limited visual inspection (windshield).
- Identify trees having imminent or probable potential failure.
- If failure is imminent and a high value target is present, report this tree as soon as possible. Immediate restriction of target zone may be required.
- Identify trees that require further, or a more detailed inspection.
- Record tree locations, species, estimated size, and recommendations for risk reduction.

Risk Scenario Pictures

When performing a level one inspection, obvious (common) defects will indicate a higher probability of failure is likely. Performing a risk assessment will help managers prioritize trees with highest level of risk when time and budgets are limited.

3. Basic Pruning

Introduction

- What is pruning vs removal or topping
- Basic limb anatomy - branch collar, branch bark ridge, branch crotch
- How trees heal after pruning and compartmentalize decay

Safety

- Refer to ANSI A300 for all safety standards

Prune to Reduce Sprouting - Natural Target Pruning

- Proper cuts vs improper cuts (what to do vs. what not to do)
- Effects of Proper Pruning
 - Promotes healing, limits decay, limits future failure
- Effects of Improper Pruning
 - Do not remove limb with diameter greater than $\frac{1}{3}$ tree trunk diameter
 - Do not remove more than 30% of the crown at one time
 - Do not top, leave stubs, injure trunk, or cause bark tears

Types of Pruning

- General Arboriculture: Common Pruning Techniques for health, safety, aesthetics
- Reduce – Pruning to decrease height and/or spread
- Clean – Selective pruning to remove one or more of the following non-beneficial parts: dead, diseased, and/or broken branches
- Thin – Pruning to reduce density of live branches
- Raise – Pruning to provide vertical clearance
- Structural – Selective pruning to improve the branch architecture on young and medium aged trees

ODOT Pruning

- Storm damage – tree clean, reduce, thin, structural
- Risk – tree clean, structural, reduce, thin
- Clearance – raise, reduce
- Infrastructure – raise
- Sunlight – thin, reduce, raise
- Site Distance – raise, reduce, thin

Equipment Care

- Basic Maintenance - clean, sharp, working well
- Sterilization to prevent spread of disease

Species Specific

- Ash - do not prune, remove
- Maple - watch bark tears
- Oak - do not prune from May-Sept without sterilizing equipment
- Elm - Dutch elm disease
- Black Locust - common to areas where trees should not be growing - consider removal
- Black Cherry - known decay problems with improper pruning

Proper Pruning Demonstration Log

Afternoon Field Session (Three-Hour Session)

Interactive Field Demonstration of Morning Lessons

1. **Tree Identification**
2. **Hazardous Tree Identification**
3. **Basic Pruning**

Tree Assessment - Winter

Course Time: 01/24/17 8:30AM

District 4, Carnation Room, 2088 S. Arlington Rd., Akron, OH 44306

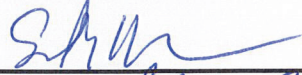
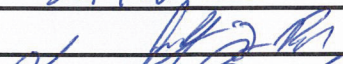
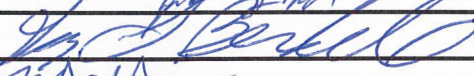
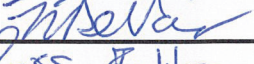
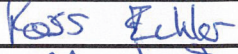
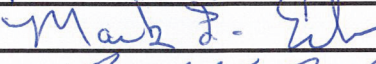
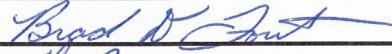
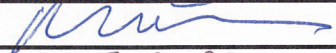
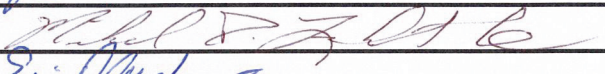
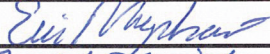
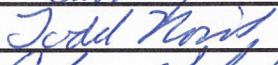

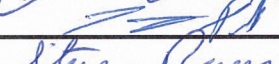
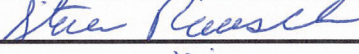
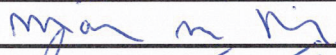
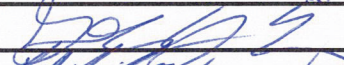
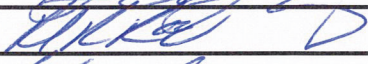

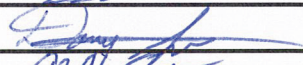
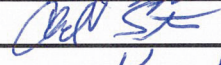
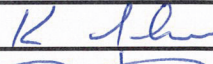
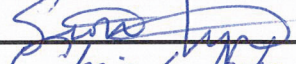
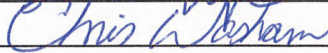
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0003	ACEVSKI, COLTON J	
0003	BUTLER, PAMELA S	<i>Pamela Butler</i>
0005	FINLEY, JOSEPH A	<i>Joe Finley</i>
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Shane Pacholke
William Gajewski
Ron Dessu
Kirk Jackson
Frank Hudak
Victor Edwards
Evan Benedict
FRANK DELGUYO
Nate Landis
John Geiger

Tree Assessment - Winter

Course Time: 01/25/17 8:30AM

District 1, Room 39, 1885 N. McCullough St., Lima, OH 45801

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0006	ASHER, SETH D	
0006	BECK, JUSTIN L	
0001	BENDELE, GARY L	
0001	DEVAUX, NAYLAN R	
0002	ECHLER, ROSS W	
0007	ERB, MARK L	
0006	FOUT, BRAD D	
0002	ISAACSON, RONALD C	
0001	LICHTLE, MICHAEL D	
0002	MAYNHART, ERIC R	
0001	NOIROT, TODD M	
0001	O'FLAHERTY, CHRISTOPHER R	
0001	PIEHL, JEROMY R	
0001	RAUSCH, STEVEN B	
0002	RICH, MARY M	
0006	RIGSBY, GREGORY S	
0002	ROE, RICK R	
0002	SCHLEGEL, ERIC L	
0007	SPECK, DOUGLAS R	
0003	STARNER, CHAD A	
0001	THIERY, KEVIN M	
0002	TYSON, SCOTT W	
0001	WASHAM, CHRISTOPHER R	

Tree Assessment - Winter

Course Time: 02/08/17 8:30AM


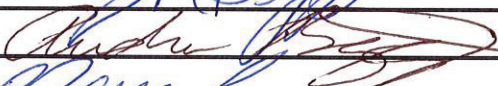

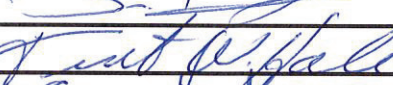
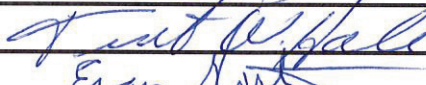
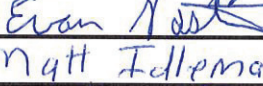
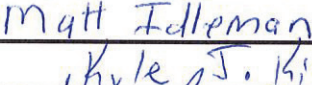
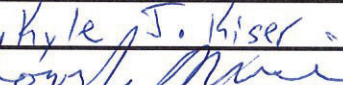
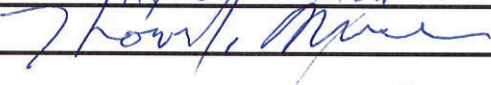
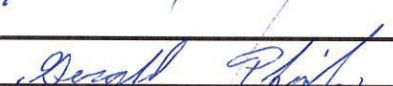

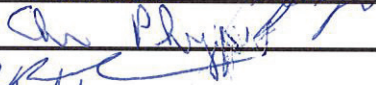
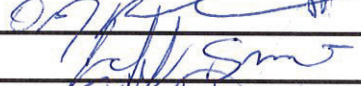
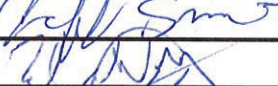

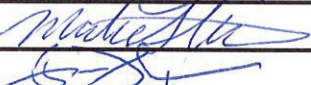
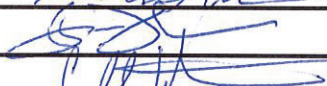
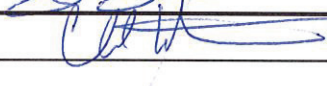

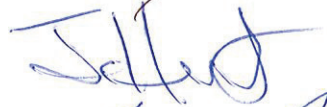
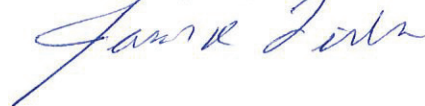
District 8, Conference Rooms E, & F, 505 South SR 741, Lebanon, OH 45036

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0008	ASHLEY, OVA L	
0008	BAKER, GUY A	<i>Guy A Baker</i>
0006	BLACKFORD, MITCHELL R	<i>Mitch Blackford</i>
0008	BOYSEL, ADAM R	<i>Adam Boyse</i>
0007	CARAWAY, ROY T	<i>Roy T Caraway</i>
0008	COOPER, ROBIN J	<i>Robin J. Cooper</i>
0008	ECK, STEVEN E	<i>Steve Eck</i>
0007	EGBERT, RYAN M	<i>Ryan M Egbert</i>
0008	FOUST, PATRICK H	<i>Patrick Foust</i>
0009	FULTON, CHRISTOPHER G	<i>Chris Fulton</i>
0009	FUSSNECKER, STEPHEN L	<i>Steve Fussnecker</i>
0009	GAMPP, BARRY R	<i>Barry Gampp</i>
0008	GLOVER, GREGORY R	<i>Greg Glover</i>
0009	GROOMS, KENNETH L	<i>Kenneth Grooms</i>
0009	HAYES, MATTHEW W	<i>Matthew Hayes</i>
0007	HEATH, SCOTT H	<i>Scott H Heath</i>
0008	MAILHOT, JAMIE C	<i>Jamie Mailhot</i>
0009	MAY, WAYNE	<i>Wayne May</i>
0008	MCQUEEN, RICKY J	<i>Ricky McQueen</i>
0008	MEDLEY, MATTHEW S	<i>Matthew S Medley</i>
0007	NEFF, DEAN P	<i>Dean P Neff</i>
0006	RICE, MARSHALL S	<i>Marshall S Rice</i>
0008	RINEHART, DARREN L	<i>Darren L Rinehart</i>
0006	ROSTORFER, JEREMY S	<i>Jeremy S Rostorfer</i>
0007	SHAW, RAY D	<i>Ray D Shaw</i>
0008	SMITH, BRIAN M	<i>Brian M Smith</i>
0009	WARD, RICK A	<i>Rick A Ward</i>
0009	WIGET, WILLIAM A	<i>William A Wiget</i>
0008	WILHELM, KENT A	<i>Kent A Wilhelm</i>
0006	WISE, DANIEL S	<i>Daniel S Wise</i>
	SCHUBERT Russell	<i>Russell Schubert</i>

Tree Assessment - Winter

Course Time: 02/14/17 8:30AM

District 5, Guernsey County Garage, 6490 Glenn Hwy., Cambridge, Ohio 43725

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0010	BIGGS, EMERY M	
0010	BRIGGS, ANDREW L	
0005	CRANE, MARVIN D	
0010	DURST, JAMES W	
0010	HALE, TIMOTHY W	
0005	HASTINGS, EVAN	
0010	IDLEMAN, MATTHEW K	
0005	KISER, KYLE J	
0011	MISENER, THOMAS J	
0010	PARKS, JAMES H	
0005	PFEIFER, GERALD R	
0005	PHIPPS, CHRISTOPHER L	
0005	POWELL, OTIS J	
0010	SMITH, JEFFREY D	
0010	STARLING, BRADLEY A	
0011	STUBER, MICHAEL E	
0011	THOMPSON, JOSEPH C	
0011	WATSON, CHAD A	
0010	Archer, Jonathan R	
	Joel Hunt	
0010	Jason Fisher	

Tree Assessment - Summer

Course Time: 06/28/17 8:00AM

District 8, Conference Rooms E, F, & G, 505 South State Route 741, Lebanon, OH 45036

SPRC	Full Name	Signature
0008	ASHLEY, OVA L	<i>Ova Ashley</i>
0008	BAKER, GUY A	<i>Guy Baker</i>
0010	BIGGS, EMERY M	<i>Emery Biggs</i>
0008	BOYSEL, ADAM R	<i>Adam Boyse</i>
0010	BRIGGS, ANDREW L	<i>Andrew Briggs</i>
0007	CARAWAY, ROY T	<i>Roy Caraway</i>
0008	COOPER, ROBIN J	<i>Robin Cooper</i>
0008	ECK, STEVEN E	<i>Steve Eck</i>
0007	EGBERT, RYAN M	<i>Ryan Egbert</i>
0008	FOUST, PATRICK H	<i>Patrick Foust</i>
0009	FULTON, CHRISTOPHER G	
0009	FUSSNECKER, STEPHEN L	
0009	GAMPP, BARRY R	
0008	GLOVER, GREGORY R	
0009	GROOMS, KENNETH L	<i>Kenneth Grooms</i>
0010	HALE, TIMOTHY W	<i>Timothy Hale</i>
0009	HAYES, MATTHEW W	<i>Matthew Hayes</i>
0007	HEATH, SCOTT H	<i>Scott Heath</i>
0008	MAILHOT, JAMIE C	
0009	MAY, WAYNE	<i>Wayne May</i>
0008	MCQUEEN, RICKY J	<i>Ricky McQueen</i>
0008	MEDLEY, MATTHEW S	<i>Matthew Medley</i>
0007	NEFF, DEAN P	<i>Dean Neff</i>
0006	RICE, MARSHALL S	<i>Marshall Rice</i>
0008	RINEHART, DARREN L	<i>Darren Rinehart</i>
0007	SHAW, RAY D	<i>Ray Shaw</i>
0008	SMITH, BRIAN M	<i>Brian Smith</i>
0010	SMITH, JEFFREY D	<i>Jeff Smith</i>
0007	SPECK, DOUGLAS R	<i>Doug Speck</i>
0009	WARD, RICK A	<i>Rick Ward</i>
0009	WIGET, WILLIAM A	<i>William Wiget</i>
	SCHUBERT Russell	<i>Russell Schubert</i>
	Lewis, Scott	<i>Scott Lewis</i>

Tree Assessment - Summer

Course Time: 06/28/17 8:00AM

District 8, Conference Rooms E, F, & G, 505 South State Route 741, Lebanon, OH 45036

SPRC

Full Name

Signature

0008


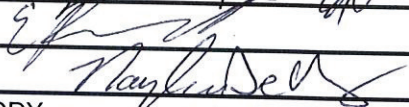
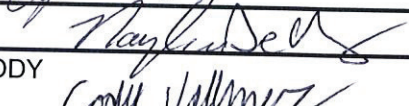
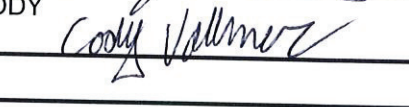

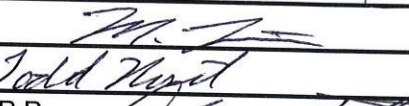
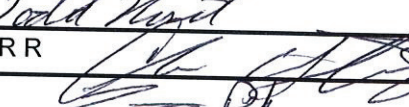
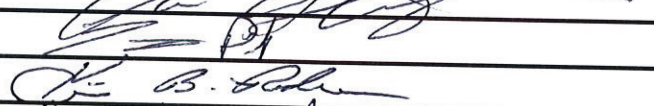
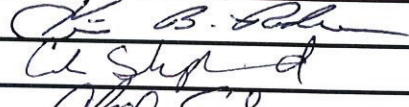
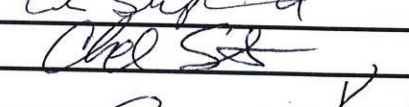
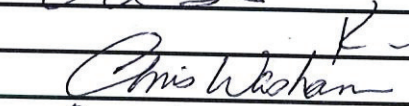
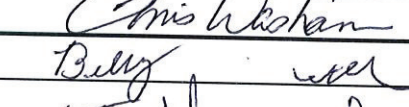
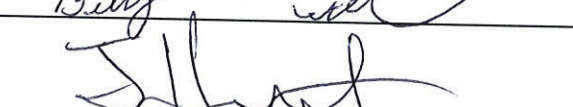


WILHELM, KENT A



Tree Assessment - Summer

Course Time: 06/29/17 8:00AM

District 1, Room 39, 1885 North McCullough Street, Lima, OH 45801

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0003	ACEVSKI, COLTON J	
0001	BENDELE, GARY L	
0003	BENEDICT, EVAN S	
0001	DEVAUX, NAYLAN R	
0003	GROESBECK-VOLLMER, CODY W	
0003	JACOBCEK, STEVEN T	
0001	LICHTLE, MICHAEL D	
0003	LINDEMAN, MICHAEL S	
0001	NOIROT, TODD M	
0001	O'FLAHERTY, CHRISTOPHER R	
0001	PIEHL, JEROMY R	
0003	RADER, KEVIN B	
0003	SHEPHERD, COLE S	
0003	STARNER, CHAD A	
0001	THIERY, KEVIN M	
0001	WASHAM, CHRISTOPHER R	
0003	WORKMAN, BILLY A	
0013	Hunt, Joel	

Tree Assessment - Summer

Course Time: 06/21/17 8:00AM

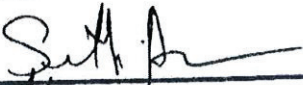
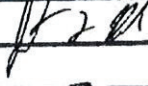
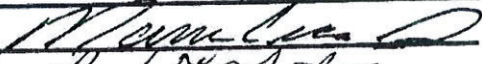








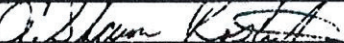


District 4, Cardinal Room, 2088 South Arlington Road, Akron, OH 44306

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0012	DESZCZ, RICHARD J	<i>Crew leader Training in D-12</i>
0012	GAJEWSKI, WILLIAM E	<i>W E Gajewski</i>
0012	HUDAK, FRANK G	<i>Frank Hudak D-12</i>
0004	NAPOLI, TONY S.	<i>Tony Napoli</i>
0004	POAGE, LARRY A	<i>Larry Poage</i>
0003	STEPHENS, BRIAN D	<i>B.D. Stephens</i>
0011	STUBER, MICHAEL E	<i>Michael Stuber</i>
0011	THOMPSON, JOSEPH C	<i>Joseph Thompson</i>
0004	TYLER, TIM M	<i>Tim Tyler</i>
0004	VANCE, DENNIS H	<i>Dennis Vance</i>
0011	WATSON, CHAD A	<i>Chad Watson</i>
	<i>Lucas, Scott</i>	<i>Scott Lucas</i>


Tree Assessment - Summer

Course Time: 06/22/17 8:00AM

District 5, Guernsey County Garage, 6490 Glenn Hwy., Cambridge, Ohio 43725

SPRC	Full Name	Signature
0006	ASHER, SETH D	
0006	BECK, JUSTIN L	
0006	BLACKFORD, MITCHELL R	
0005	CRANE, MARVIN D	
0006	FOUT, BRAD D	
0005	HASTINGS, EVAN	
0010	IDLEMAN, MATTHEW K	
0005	KISER, KYLE J	
0010	PARKS, JAMES H	
0005	PFEIFER, GERALD R	
0005	PHIPPS, CHRISTOPHER L	
0005	POWELL, OTIS J	
0006	ROSTORFER, JEREMY S	
0010	STARLING, BRADLEY A	
0006	WISE, DANIEL S	

Cook, JAMES



Appendix B
Professional Arboricultural Training
Agendas and Sign-in Sheets



Arborist Training Agenda – Class 1

Certified Arborist Prep Course

Chapters 1 through 5

Tuesday May 9th, 2017

Natural Resources Complex 2045 Morse Road Columbus, OH

Morning Session

8:30 a.m. – 10:00 a.m. Chapters 1 and 2

1. **TREE BIOLOGY**
 - ANATOMY
 - PHYSIOLOGY

2. **TREE ID**
 - PLANT CLASSIFICATION, NOMENCLATURE
 - ID PRINCIPLES
 - USING A KEY

10:00 a.m. – 10:15 a.m. Break

10:15 a.m. – 12:00 p.m. Chapters 3 and 4

3. **SOIL SCIENCE**
 - PHYSICAL, CHEMICAL PROPERTIES
 - MOISTURE AND PLANT GROWTH
 - URBAN SOIL, SOIL IMPROVEMENT

4. **WATER MANAGEMENT**
 - TREES AND WATER
 - IRRIGATION, WATER CONSERVATION
 - FLOODING, DRAINAGE

12:00 p.m. – 1:00 p.m. Lunch—Participants Provide Own Lunch

Afternoon Session

1:00 p.m. – 2:30 p.m. Chapter 5

5. **TREE NUTRITION AND FERTILIZATION**
 - TREE REQUIREMENTS
 - FERTILIZER
 - SOIL AND PLANT UPTAKE
 - ANALYSIS AND PRESCRIPTION

2:30 p.m. Adjourn



Arborist Training Agenda – Class 2

Certified Arborist Prep Course

Chapters 6 through 10

Tuesday May 16, 2017

Natural Resources Complex, 2045 Morse Road Columbus, OH H-2 Conference Room

Morning Session

8:30 a.m. –10:00 a.m. Chapters 6 and 7

6. TREE SELECTION

- MATCHING TREE AND SITE
- SELECTING TREES AT NURSERY

7. INSTALLATION AND ESTABLISHMENT

- PLANT SELECTION
- PLANTING TECHNIQUES, PLANTING SPECIFICATIONS
- TRANSPLANTING
- EARLY CARE

10:00 a.m.–10:15 a.m. Break

10:15 a.m.–12:00 p.m. Chapters 8 and 9

8. PRUNING

- PRUNING OBJECTIVES
- BRANCH ATTACHMENT
- PRUNING CUTS
- STRUCTURAL PRUNING
- PRUNING MATURE TREES
- PRUNING METHODS
- SPECIALTY PRUNING, WOUND DRESSING, TOOLS
- TIMING
- GROWTH REGULATOR

9. TREE SUPPORT AND LIGHTNING PROTECTION

- STATIC CABLE SYSTEMS
- DYNAMIC SUPPORT SYSTEMS
- BRACING
- GUYING
- PROPPING
- INSPECTION AND MAINTENANCE
- LIGHTNING PROTECTION SYSTEM
- LIGHTNING AND TREES
- CANDIDATES FOR PROTECTION
- INSPECTION AND MAINTENANCE

12:00 p.m.–1:00 p.m. Lunch—Participants Provide Own Lunch

Afternoon Session

1:00 p.m.–2:30 p.m. Chapter 10

10. DIAGNOSIS AND PLANT DISORDERS


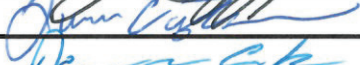
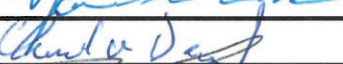


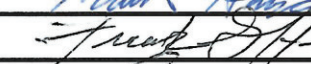









- GENERAL DIAGNOSIS PRINCIPLES
- TREE STRESS
- ABIOTIC DISORDERS
- BIOTIC DISORDERS
- EXOTIC PESTS
- GETTING LABORATORY ASSISTANCE

2:30 p.m. Adjourn

Certified Arborist - Day 1

Course Time: 05/09/17 8:30AM

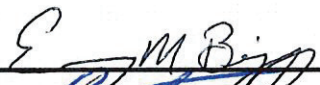
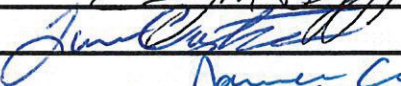
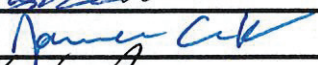
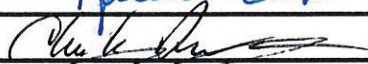
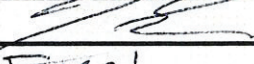

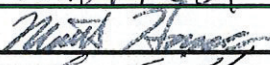
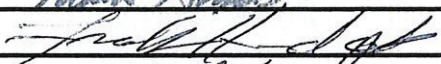


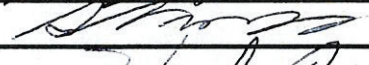
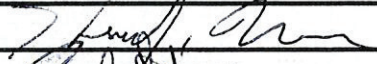
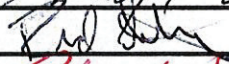


ODNR, Conference Room H-2, 2045 Morse Road, Columbus, OH 43229

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0010	BIGGS, EMERY M	
0002	CASTILLO, JUAN P	
0022	COOK, JAMES H	
0005	DAWSON, CHARLES W	
0004	EMIGH, JACOB C	
0008	FREEL, THOMAS W	
0009	HAYES, MATTHEW W	
0012	HUDAK, FRANK G	
0002	LEACH, MICHAEL K	
0003	LINDEMAN, MICHAEL S	
0008	LOVELACE, MICHAEL J	
0022	LUCAS, SCOTT E	
0011	MISENER, THOMAS J	
0008	SMITH, BRIAN M - CMPT - Dropped out	
0010	STARLING, BRADLEY A	
0001	WASHAM, CHRISTOPHER R	
0006	WISE, DANIEL S	

Certified Arborist - Day 2

Course Time: 05/16/17 8:30AM


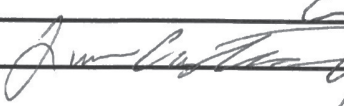

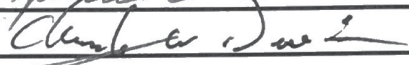

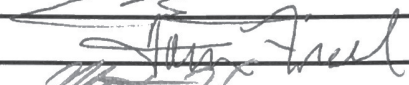

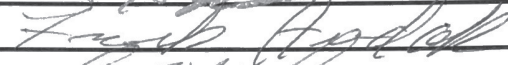

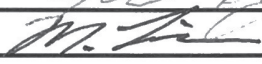
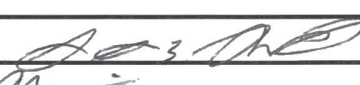


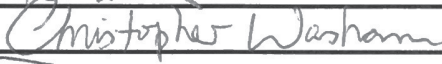
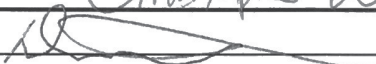
ODNR, Conference Room H-2, 2045 Morse Road, Columbus, OH 43229

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0010	BIGGS, EMERY M	
0002	CASTILLO, JUAN P	
0022	COOK, JAMES H	
0005	DAWSON, CHARLES W	
0004	EMIGH, JACOB C	
0008	FREEL, THOMAS W	
0009	HAYES, MATTHEW W	
0012	HUDAK, FRANK G	
0002	LEACH, MICHAEL K	
0003	LINDEMAN, MICHAEL S	
0022	LUCAS, SCOTT E	
0011	MISENER, THOMAS J	
0010	STARLING, BRADLEY A	
0001	WASHAM, CHRISTOPHER R	
0006	WISE, DANIEL S	

Certified Arborist - Day 3

Course Time: 05/23/17 8:30AM



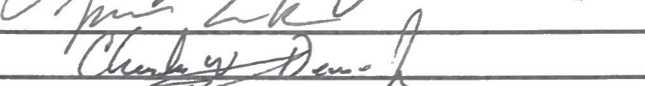
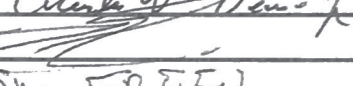
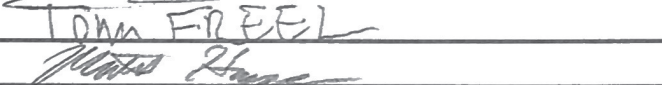
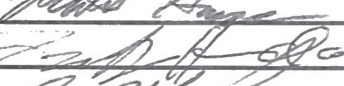




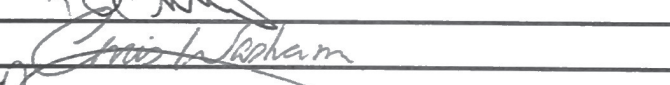




ODNR, Conference Room H-2, 2045 Morse Road, Columbus, OH 43229

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0010	BIGGS, EMERY M	
0002	CASTILLO, JUAN P	
0022	COOK, JAMES H	
0005	DAWSON, CHARLES W	
0004	EMIGH, JACOB C	
0008	FREEL, THOMAS W	
0009	HAYES, MATTHEW W	
0012	HUDAK, FRANK G	
0002	LEACH, MICHAEL K	
0003	LINDEMAN, MICHAEL S	
0008	LOVELACE, MICHAEL J	
0022	LUCAS, SCOTT E	
0011	MISENER, THOMAS J	
0010	STARLING, BRADLEY A	
0001	WASHAM, CHRISTOPHER R	
0006	WISE, DANIEL S	

Certified Arborist - Day 4

Course Time: 05/24/17 8:30AM

ODNR, Conference Room H-2, 2045 Morse Road, Columbus, OH 43229

<u>SPRC</u>	<u>Full Name</u>	<u>Signature</u>
0010	BIGGS, EMERY M	
0002	CASTILLO, JUAN P	
0022	COOK, JAMES H	
0005	DAWSON, CHARLES W	
0004	EMIGH, JACOB C	
0008	FREEL, THOMAS W	
0009	HAYES, MATTHEW W	
0012	HUDAK, FRANK G	
0002	LEACH, MICHAEL K	
0003	LINDEMAN, MICHAEL S	
0008	LOVELACE, MICHAEL J	
0022	LUCAS, SCOTT E	
0011	MISENER, THOMAS J	
0010	STARLING, BRADLEY A	
0001	WASHAM, CHRISTOPHER R	
0006	WISE, DANIEL S	