Sierra Pacific Industries Response to Tree Mortality

Tim Tate

South-Sierra Area Manager

Timberlands

SCOPE AND HISTORY OF THE PROBLEM

- Pine mortality begins to appear in Tuolumne and Calaveras Counties early in **2014** at lower elevations. Symptoms were mostly apparent. Relatively small infestation centers.

- Pine mortality intensifies in **2015**. Symptoms not always apparent. Infestation centers of 10 – 30 acres become common.

  SPI Sonora and Martell Districts combined insect salvage percentage of total harvest = **39**%.

- Pine mortality becomes widespread in **2016**. Many areas where fully infested trees show no pitch tubes. Some infestation centers in excess of 100 – 200 acres. White fir mortality increases.

  SPI Sonora and Martell Districts combined insect salvage percentage of total harvest = **78**%.

- **2017** - Pine mortality decreases to levels <5% of those in 2016 while white fir mortality increases.

  SPI Sonora and Martell Districts combined insect salvage percentage of total harvest = **46**%.

Dunlap Area (Highway 180) February 5, 2015

On-going Fade in Operation Area – July 12, 2016

Camp 8 Area (Tuolumne County) – July 25, 2016

Blue Mountain Area (Calaveras County)
October 5, 2016

MANAGEMENT IN A CHANGING WORLD

What can we do now and in the future to mitigate another tree mortality event of this magnitude?

Salvage: Quickly and Thoroughly

Stand Composition

Spacing/Stocking Levels

Changing our thinking about matching parent seed to planting sites

Salvaging Done under Drought Mortality Exemption 1038 (k)

Quickly

Thoroughly

Maintain and Establish Proper Stand Diversity

For Wild Stands with Selection or Fuelbreak treatment:

- Good stand maintenance with weaker trees removed
- In fuelbreaks control understory with herbicides and burning

In Plantations provide for species diversity:

Example – SPI's establishment of new forest in the Rim Fire footprint

2.3 million seedlings planted

Ponderosa pine:	35 %
Sugar pine:	21%
Douglas-fir:	24%
White fir:	8%
Incense cedar:	10%
Giant sequoia:	2%

Diversity Matters !

Maintain Realistic Stocking Levels (then thin some more)

Greatest pine mortality in pure Ponderosa pine legacy plantations (20 - 45 years old) without proper PCT or commercial thinning.

- PCT Spacing:

  16 feet >>> 18+ feet (20 feet if pine)

- Commercial Thinning:

  27 feet >>> 29+ feet

- GTR 220 Treatment ?

Matching Stock to the Site

Conventional Practice:

- Moving stock up or down 500 feet was “OK”
- Not always enough attention paid to aspect and micro climate

Our New World:

- Never moving stock down, purposely moving stock up
- Consider placing parent stock from ridges or south aspects on north aspects
- Matching parent stock climate to new site

Making Lemonade out of Lemons

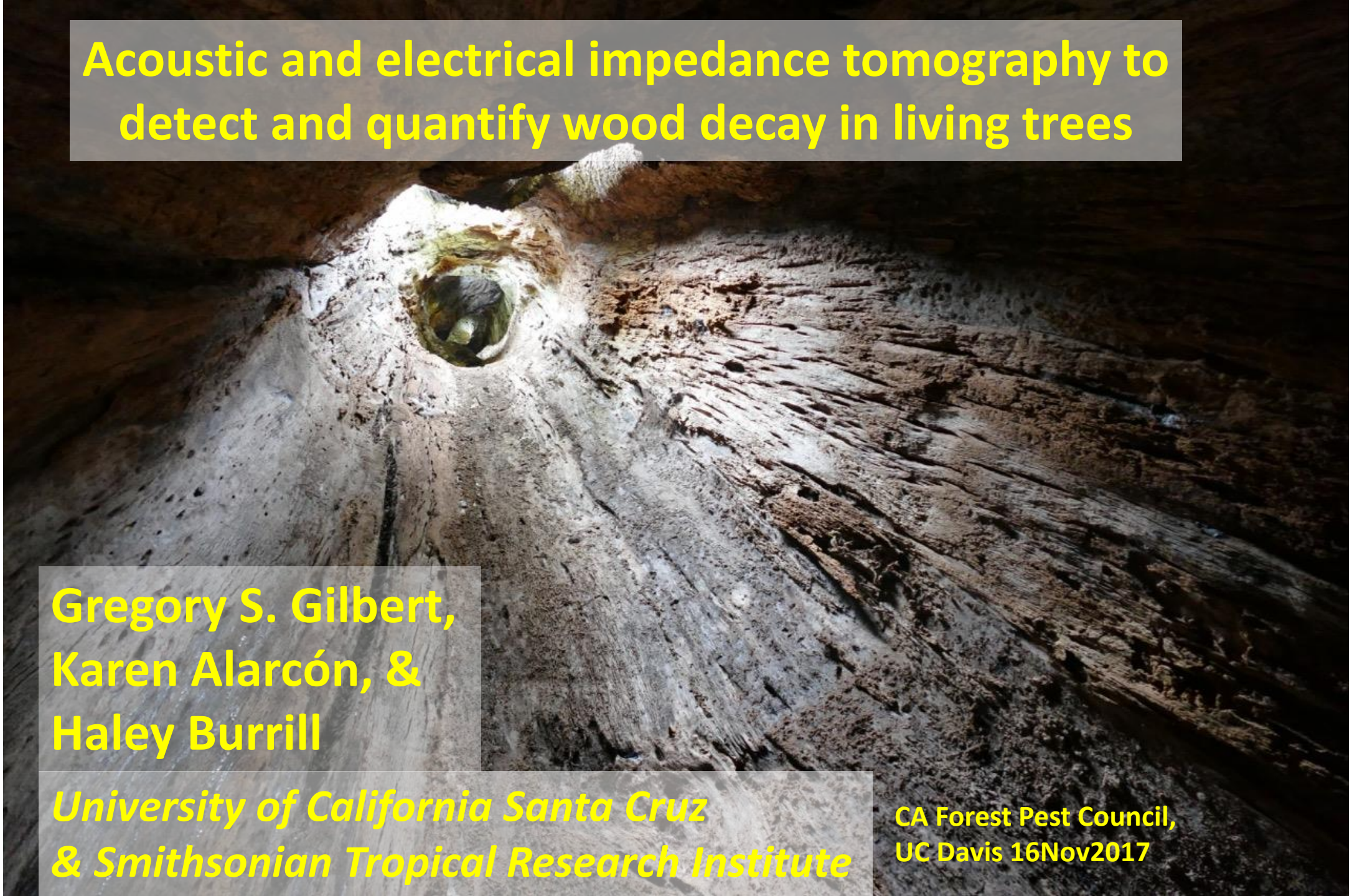
“Rare & Beautiful”


Discussion


Break
Cal Fire

Diagnostic Tools for Assessing Tree Health

Acoustic and electrical impedance tomography to detect and quantify wood decay in living trees



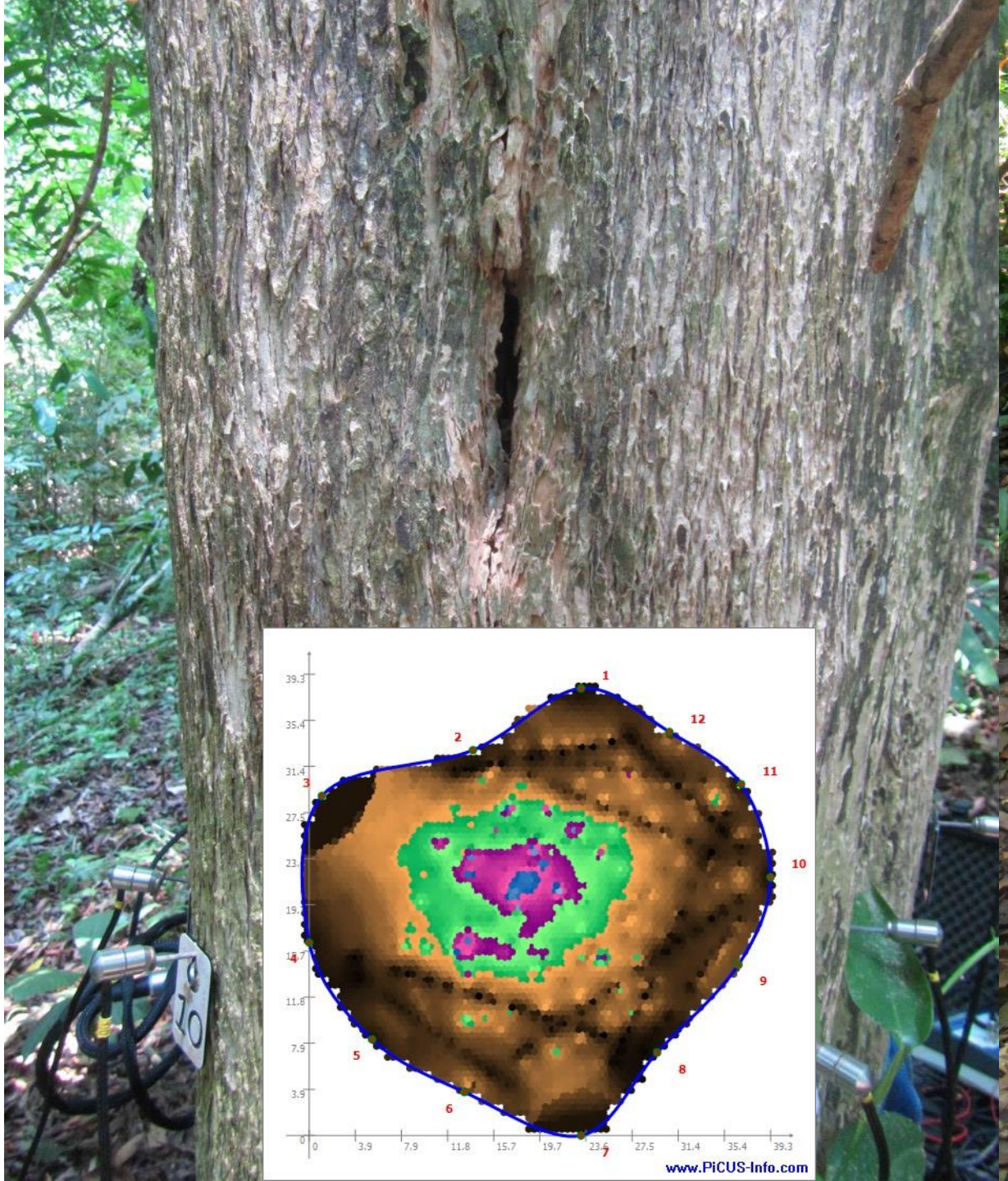
Gregory S. Gilbert,
Karen Alarcón, &
Haley Burrill

University of California Santa Cruz
& Smithsonian Tropical Research Institute

CA Forest Pest Council,
UC Davis 16Nov2017

Wood-decay by
lignicolous pore fungi

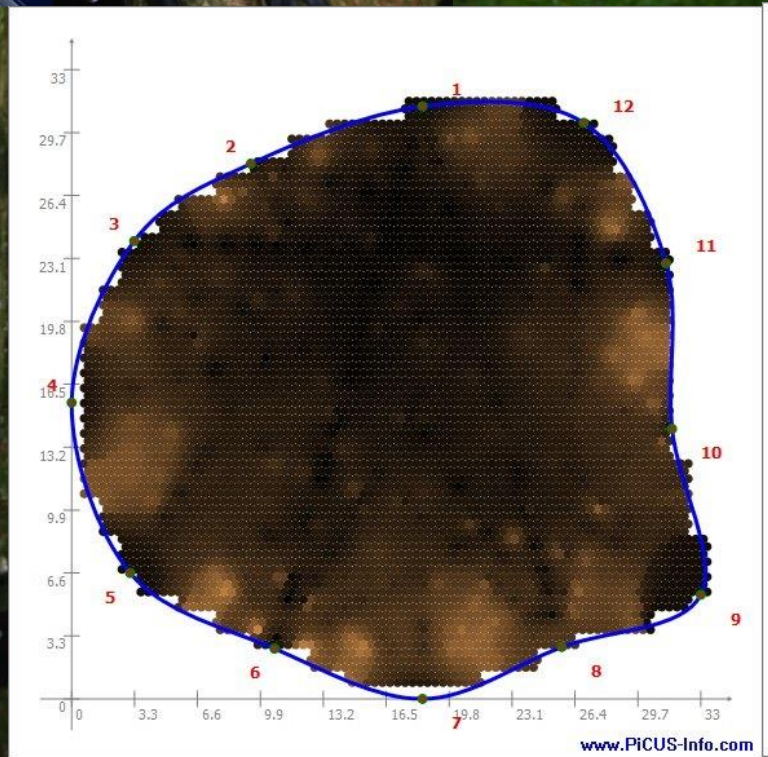
Root-rot, butt-rot,
heart-rot, branch decay

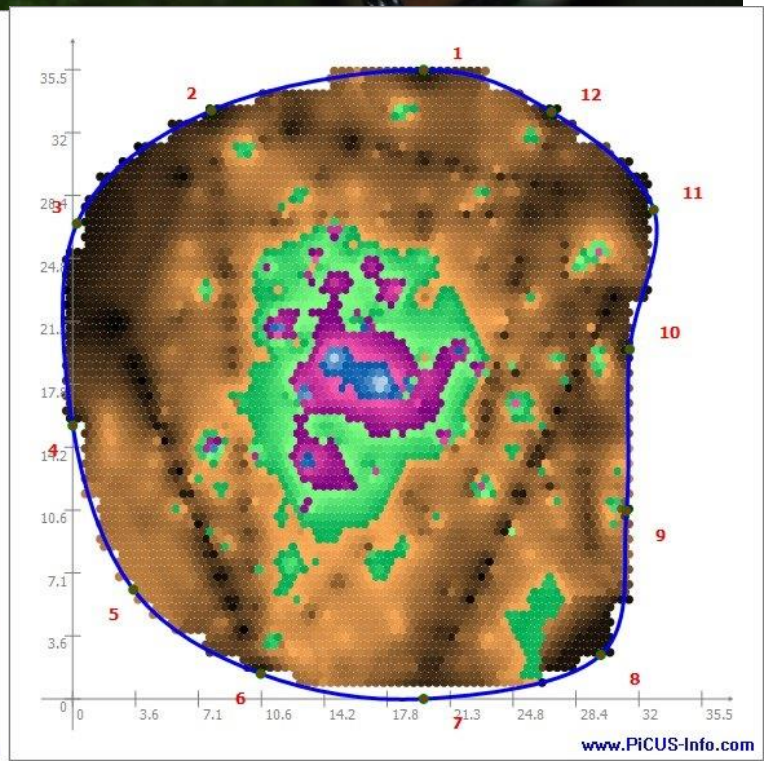


www.PiCUS-Info.com

www.PiCUS-Info.com

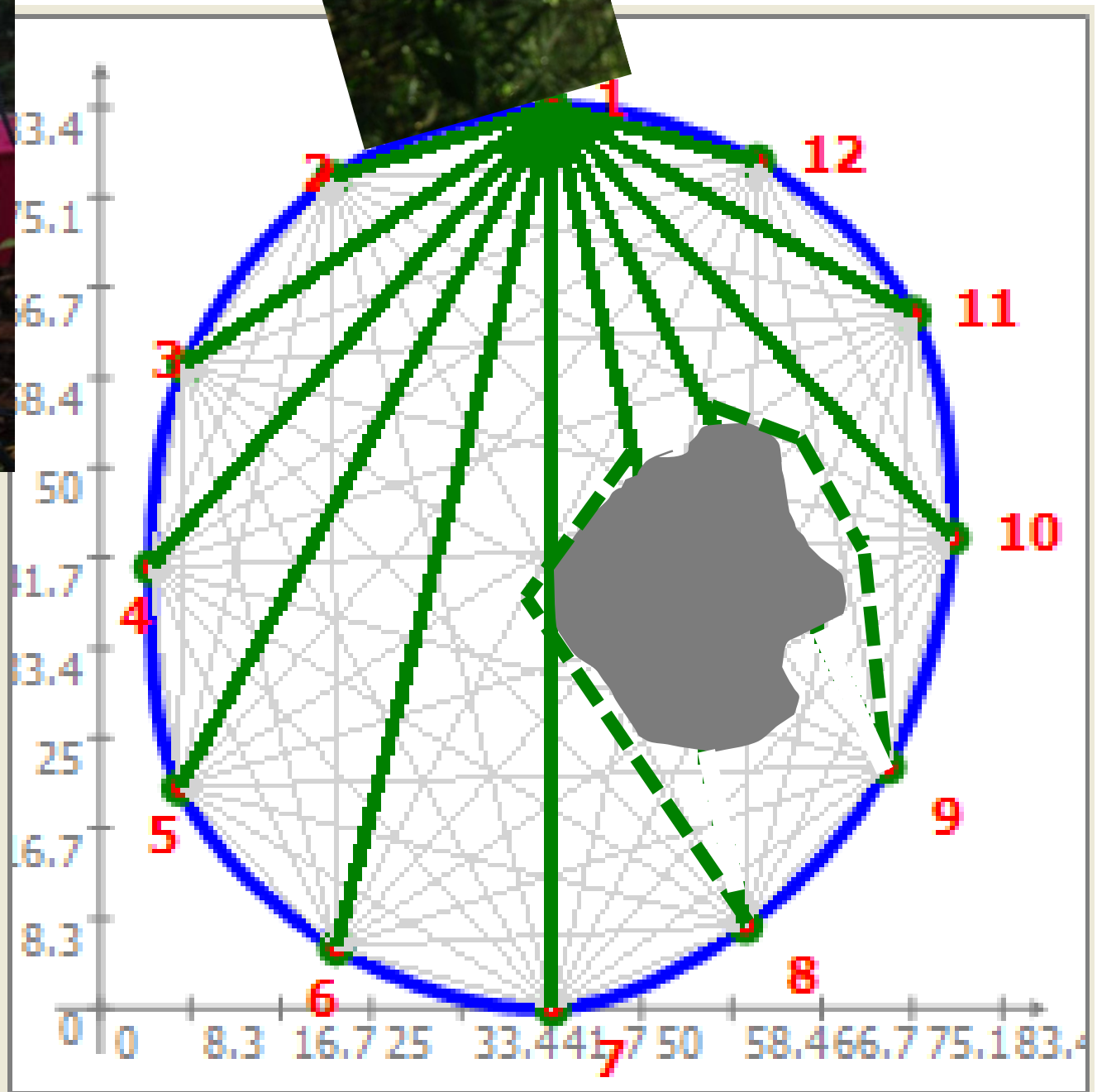
Picus 3 Sonic Tomography
Argus Electronic

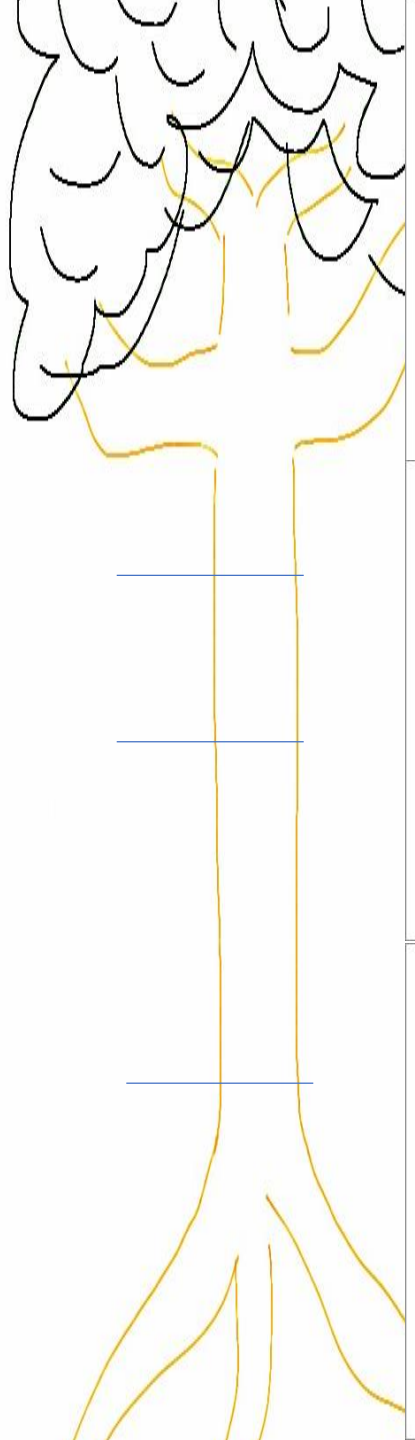


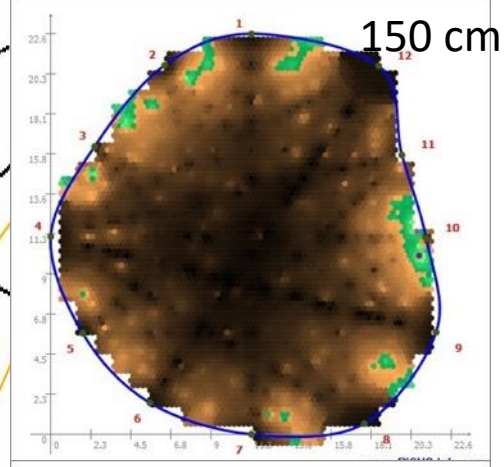


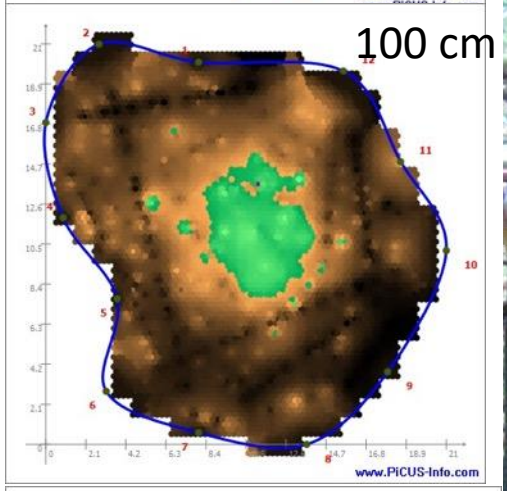
Time of flight for sound to pass to each sensor

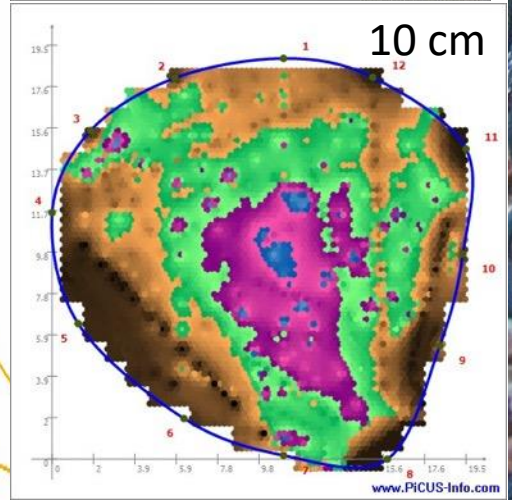
Slower than expected for that tree when there is decay






150 cm


100 cm
www.PiCUS-Info.com


10 cm
www.PiCUS-Info.com


Guarea guidonea
10 cm

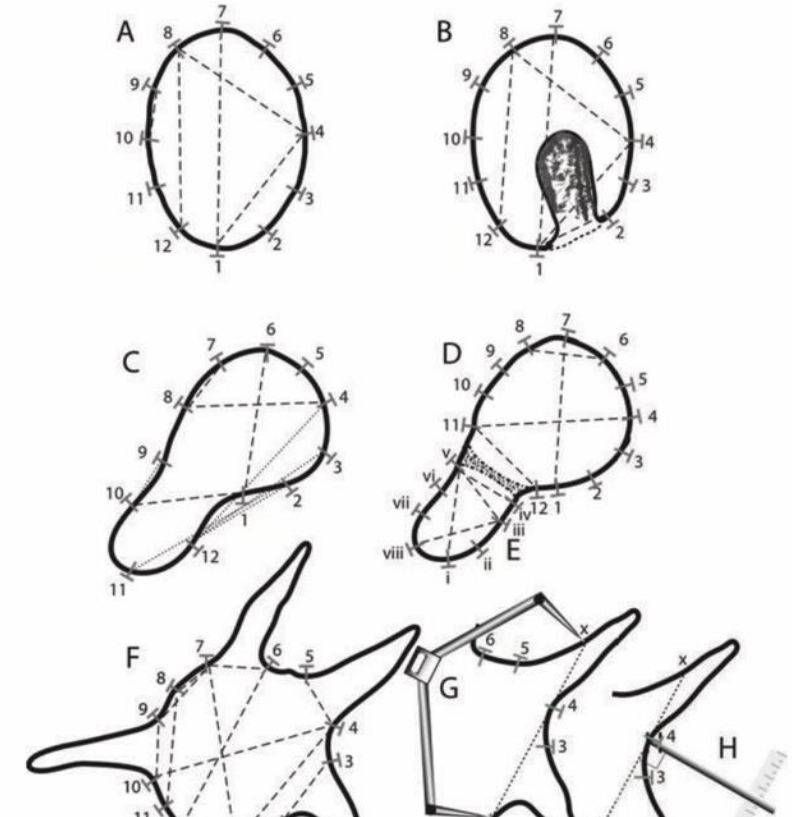
Applications in Plant Sciences

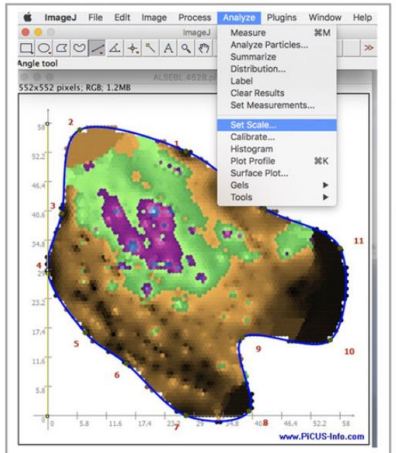
Applications in Plant Sciences 2016 4(12): 1600060

PROTOCOL NOTE

USE OF SONIC TOMOGRAPHY TO DETECT AND QUANTIFY WOOD DECAY IN LIVING TREES[1]

GREGORY S. GILBERT[2,3,14], JAVIER O. BALLESTEROS[2], CESAR A. BARRIOS-RODRIGUEZ[2], ERNESTO F. BONADIES[2], MARJORIE L. CEDEÑO-SÁNCHEZ[2], NOHELY J. FOSSATTI-CABALLERO[2], MARIAM M. TREJOS-RODRÍGUEZ[2], JOSÉ MOISES PÉREZ-SUÑIGA[2], KATHARINE S. HOLUB-YOUNG[2], LAURA A. W. HENN[3], JENNIFER B. THOMPSON[3], CESAR G. GARCÍA-LÓPEZ[4], AMANDA C. ROMO[4]

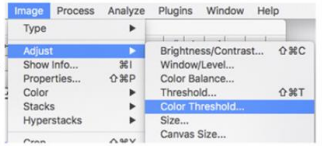


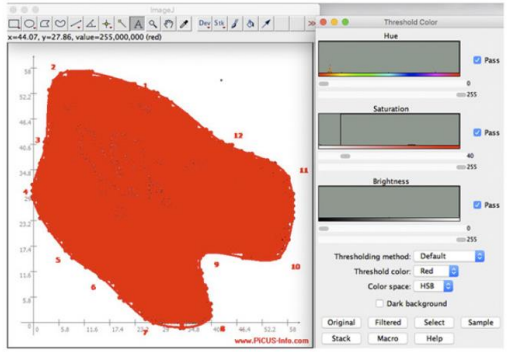


Steps 2-3. With your tomography jpg open in ImageJ, use the Freehand line tool to draw a line from the 0 point to the top tick mark (here 58) on the vertical axis. Click on then position the cross hairs over the 0,0 point. Click and hold, dragging upward until the cross hairs cover the tick at 58, then release. This creates the yellow line. Then choose Analyze > Set Scale from the menu.

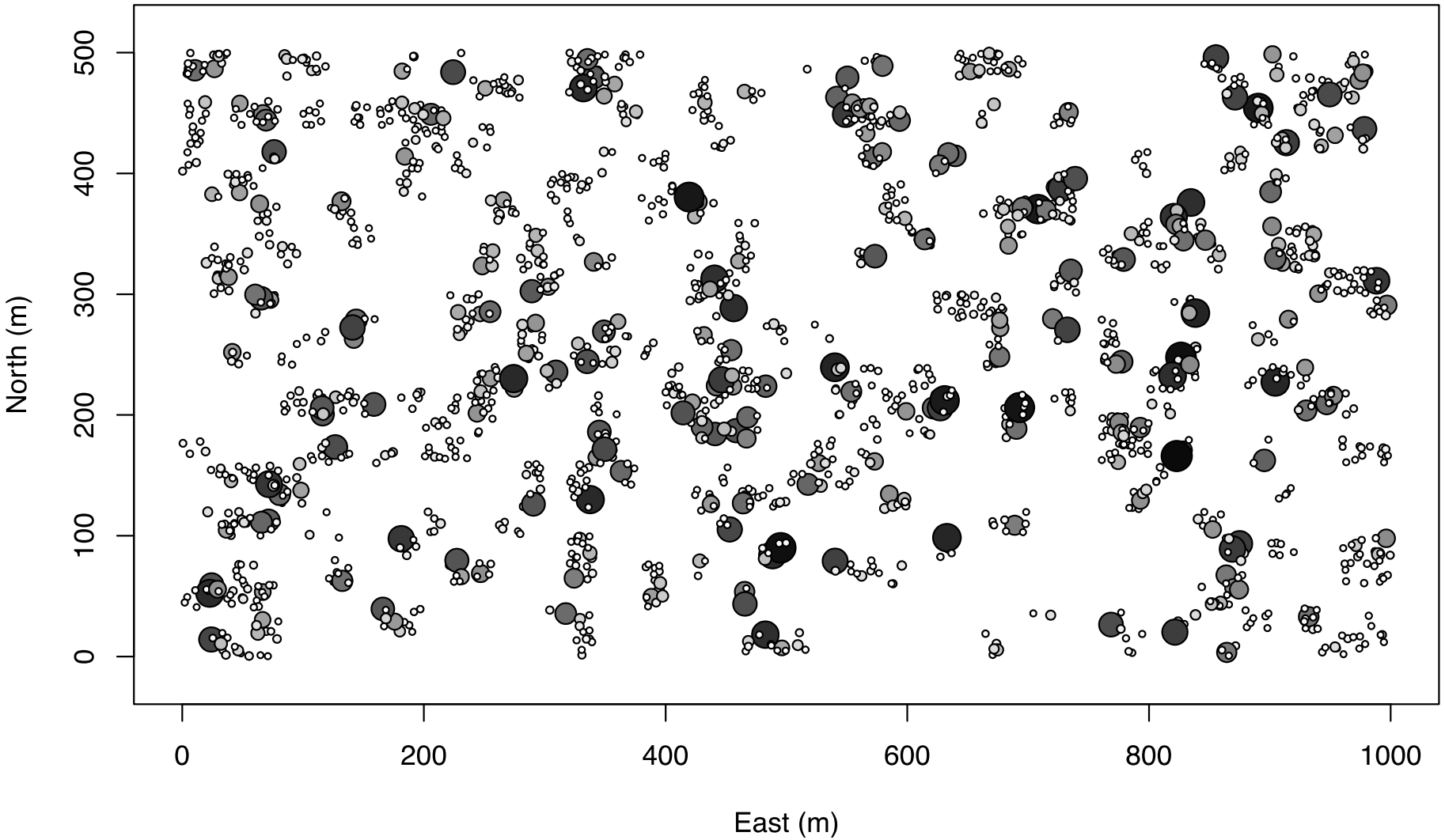
Step 4. In the Set Scale window, replace the Known distance with the length of the line you just drew in cm. In this case it is 58 (the value of the top tick mark). Check the Global box so that pixels/cm scale setting is applied in both the x and y directions.

Steps 5-6. Select Image > Adjust > Color Threshold from the menu to bring up the Threshold Color window. Set Color space to HSB. Drag the sliders to set the threshold values to Hue: 0, 255; Saturation: 40,255; Brightness: 0, 255. Click "Select", and the red changes to a yellow outline.

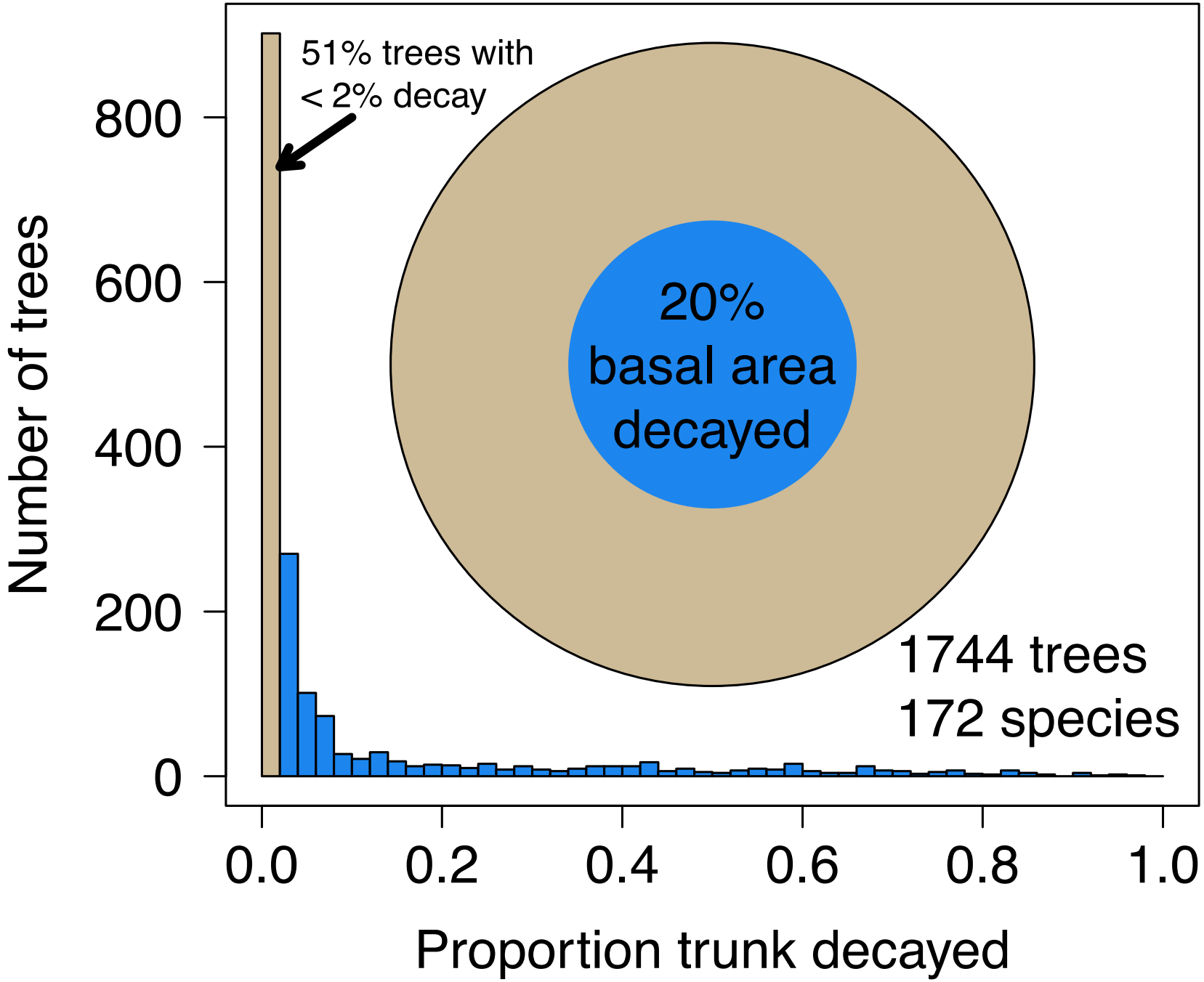


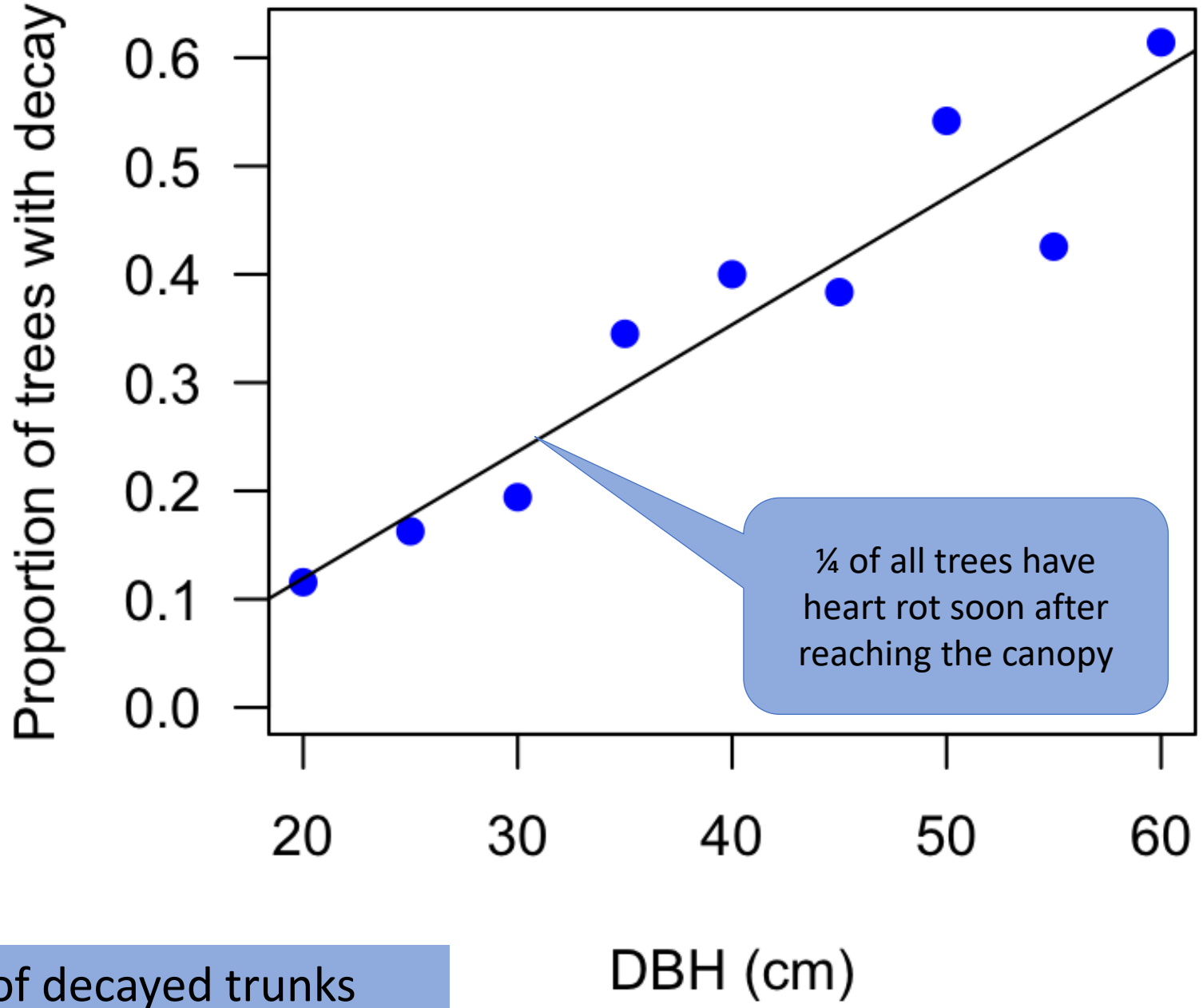


Severity of trunk decay in living trees on BCI 50-ha plot



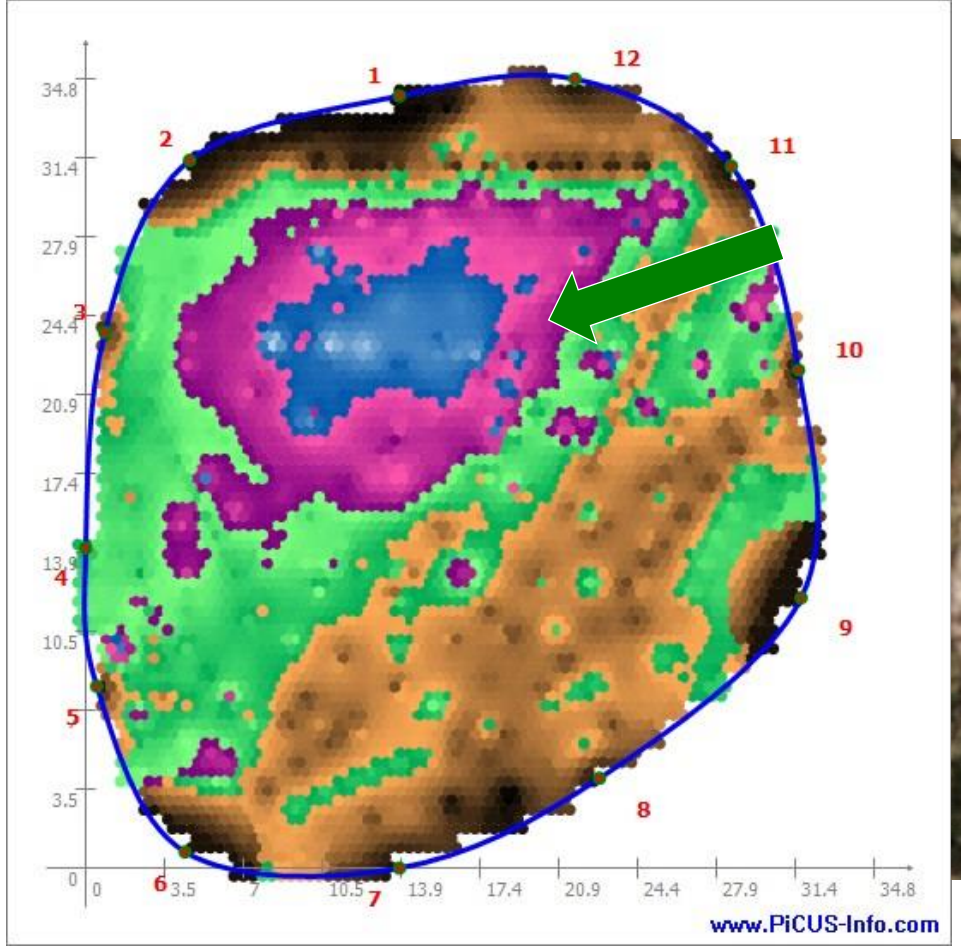
Picus3 tomography scans of 1744 trees
with dbh ≥ 20 cm from 172 species


51% trees with
< 2% decay
20%
basal area
decayed
1744 trees
172 species
Number of trees
0
200
400
600
800
0.0
0.2
0.4
0.6
0.8
1.0
Proportion trunk decayed



12% of decayed trunks had visible fungi

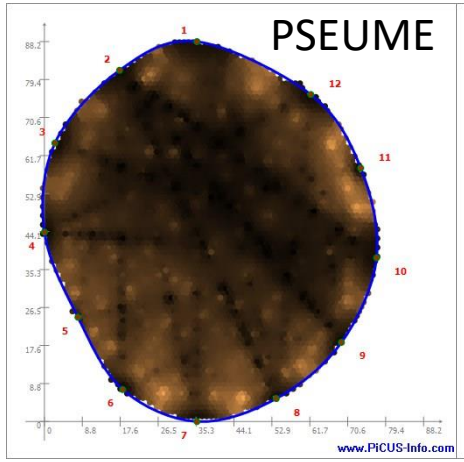
Decay Biopsies

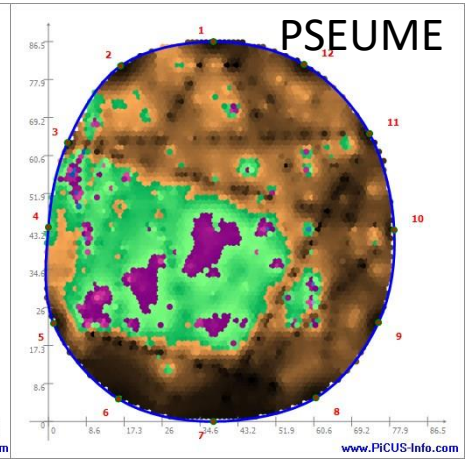


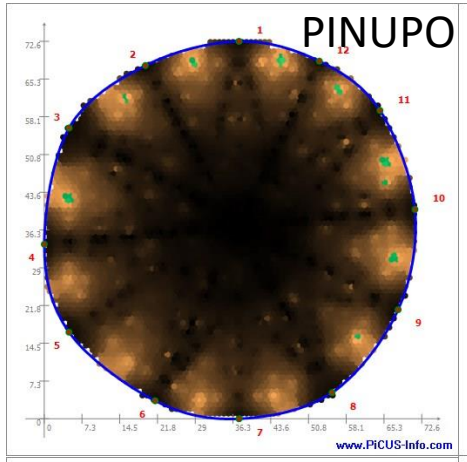
Illumina sequencing (ITS)

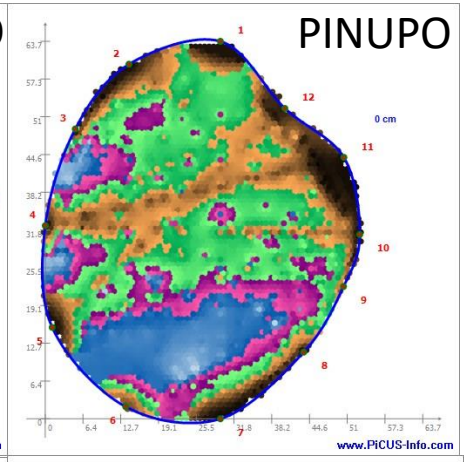
Pure cultures of fungi from wood

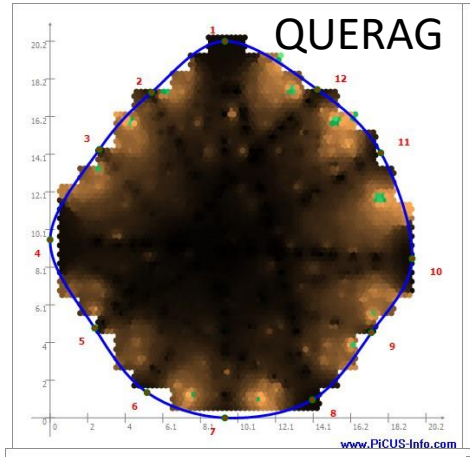
On the UC Santa Cruz Forest Ecology Research Plot (ferp.ucsc.edu)

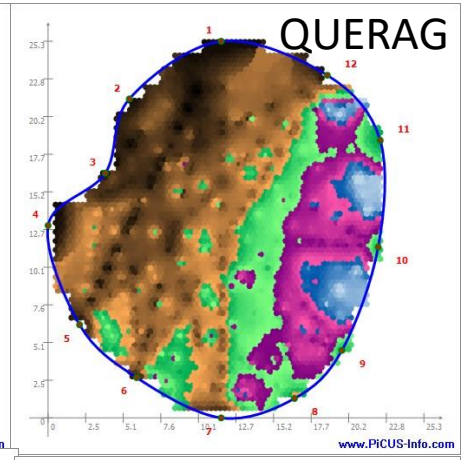


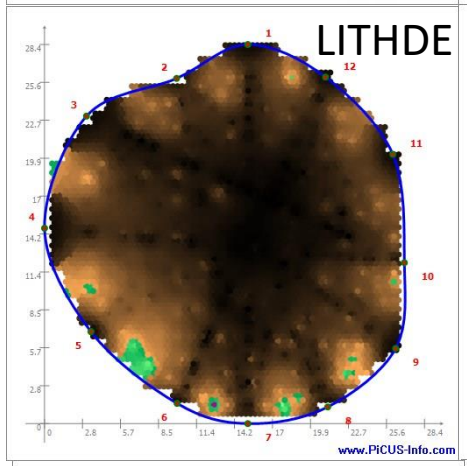


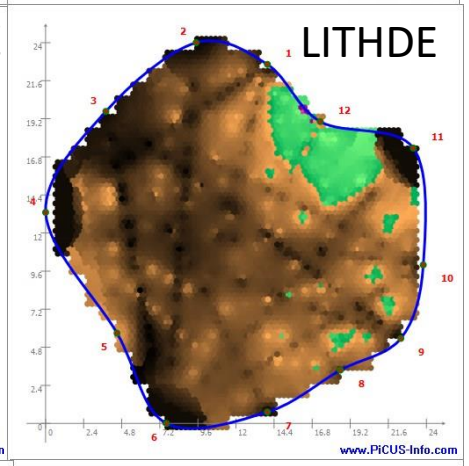


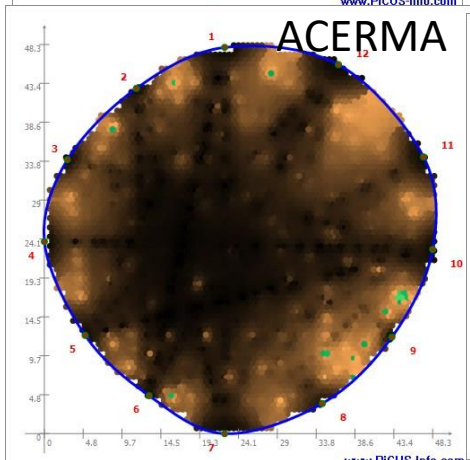


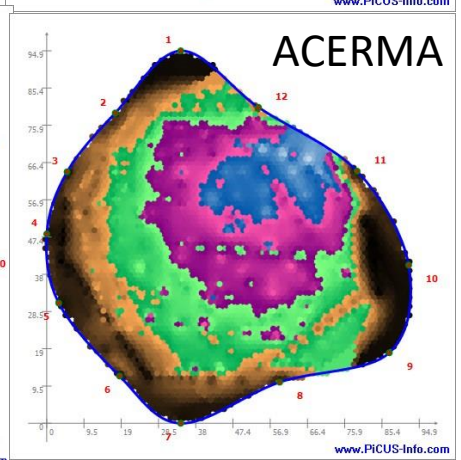


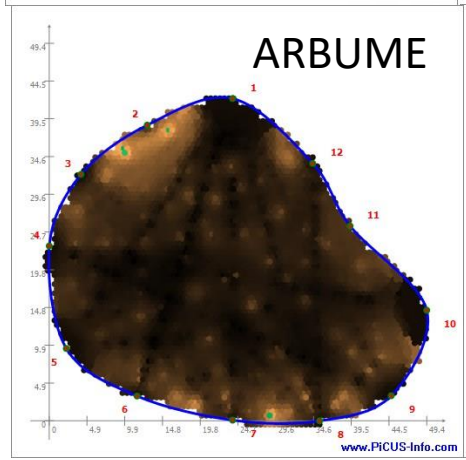


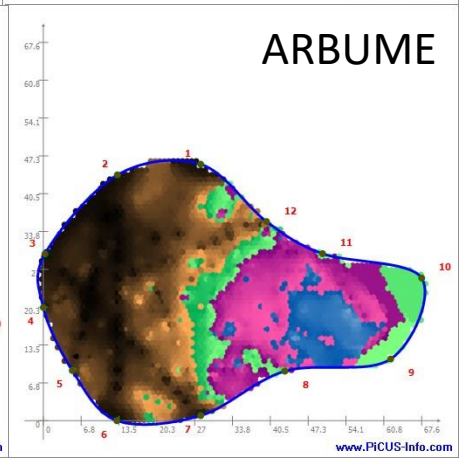






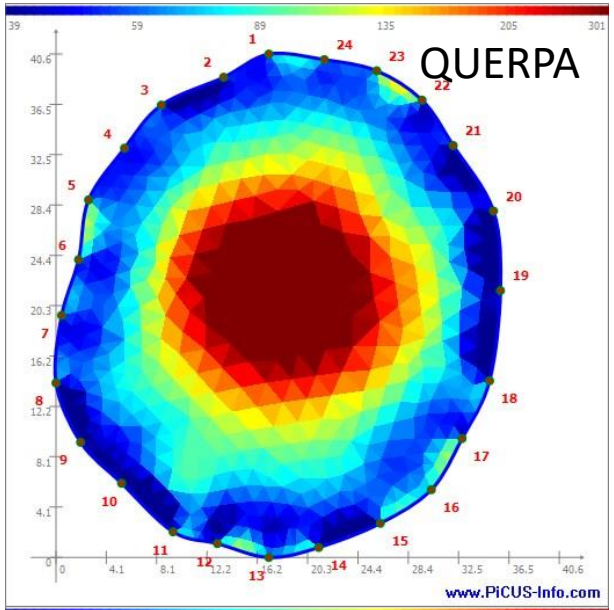


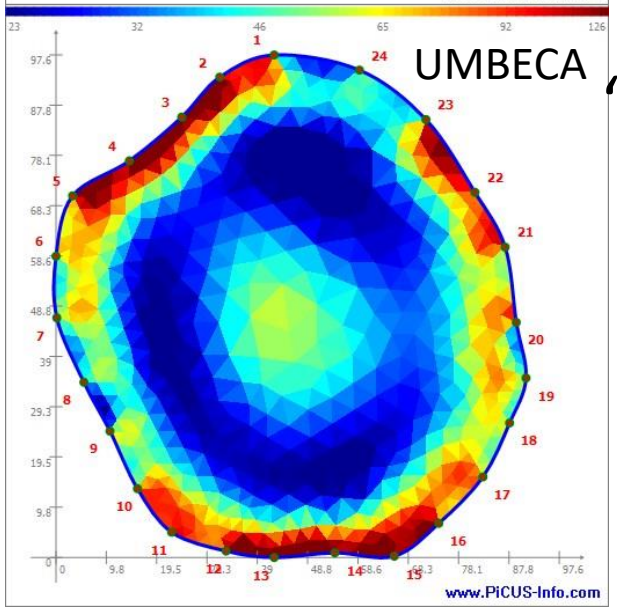


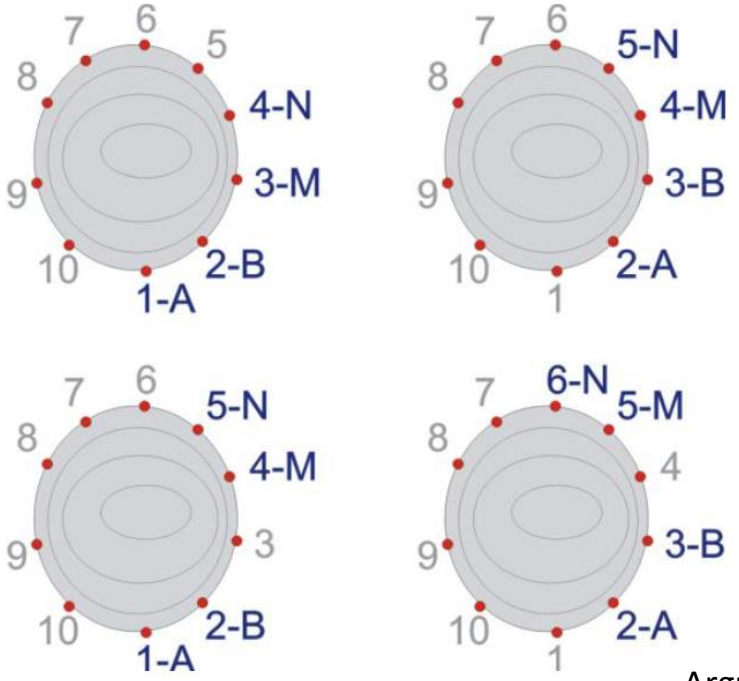


Electrical impedance tomography

Treetronic, Argus Electronics







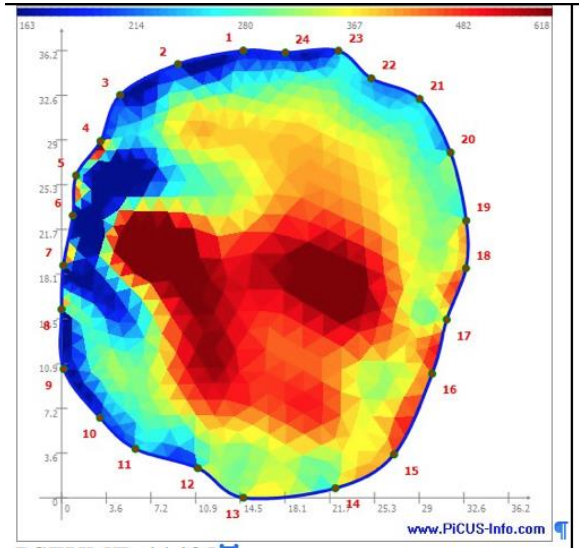
Argus

“Healthy” patterns differ among species

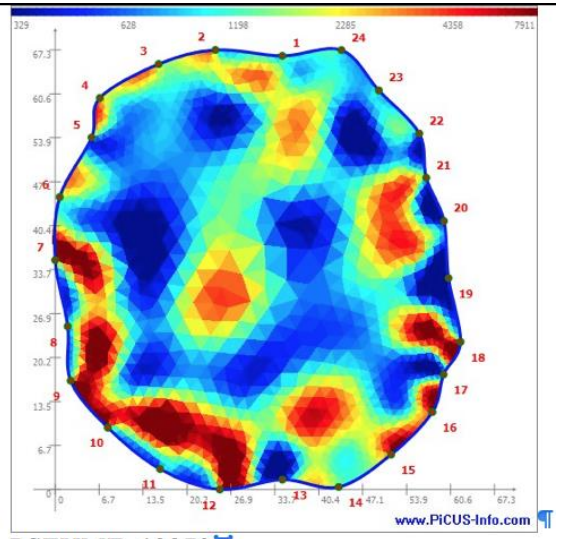
Low moisture content

High moisture content

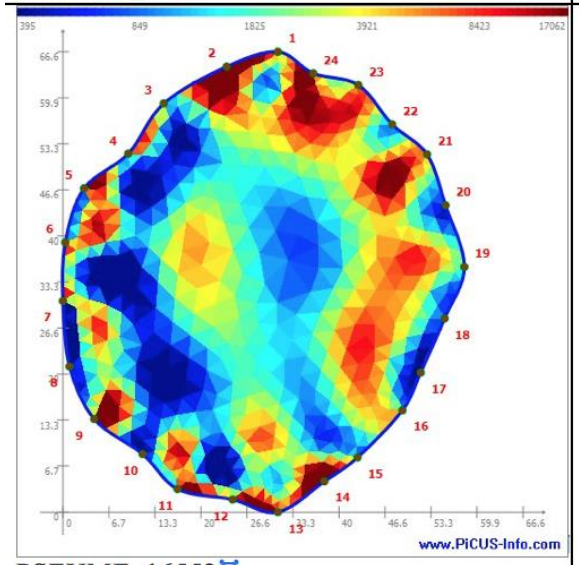
Four apparently healthy Douglas firs



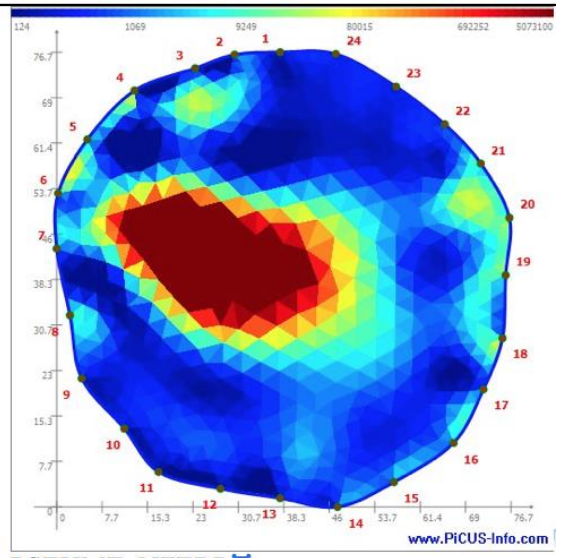
PSEUME_11495



PSEUME_13270



PSEUME_16552



PSEUME_NFERP

Low moisture content

High moisture content

Entender para Planificar

Arborización de la Ciudad de Panamá

ALCALDÍA DE PANAMÁ

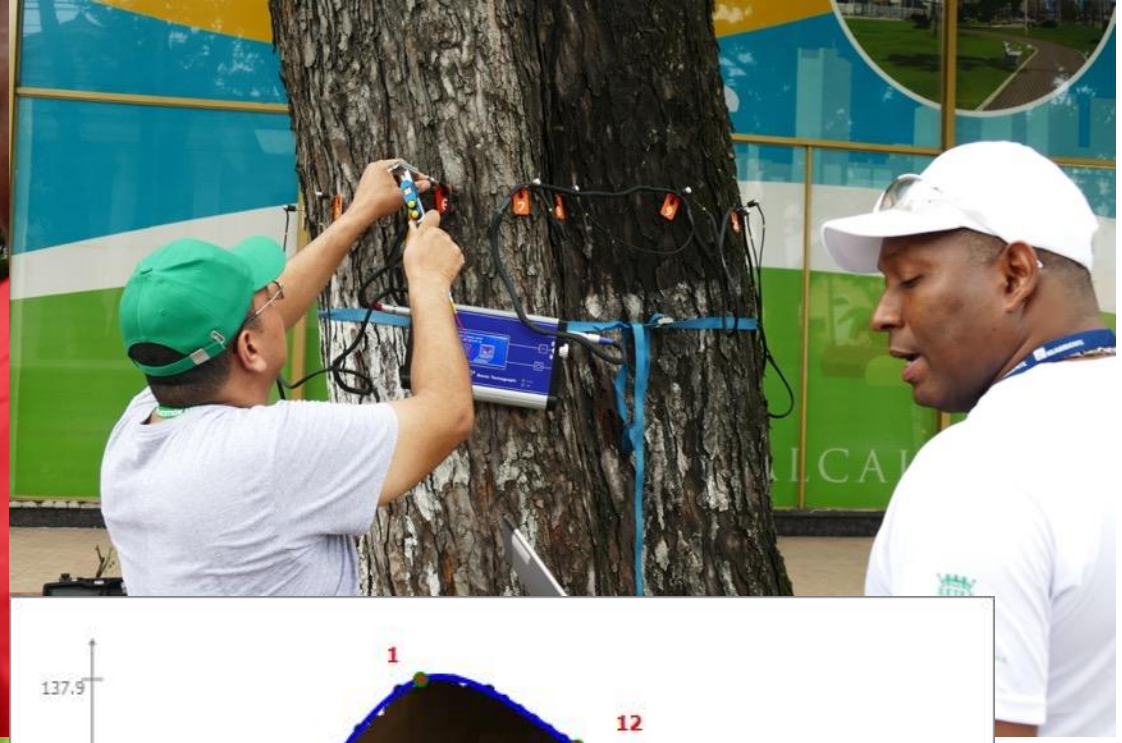
Dirección de Gestión Ambiental

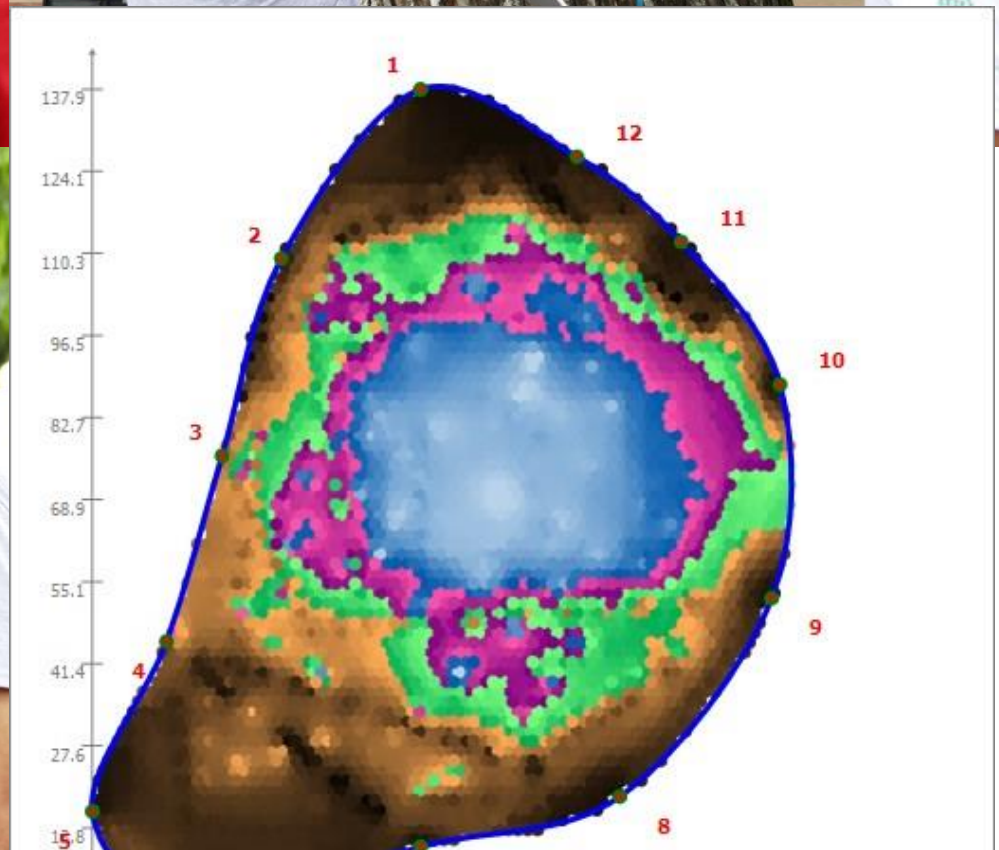
Inventario en el Corregimiento de Bella Vista

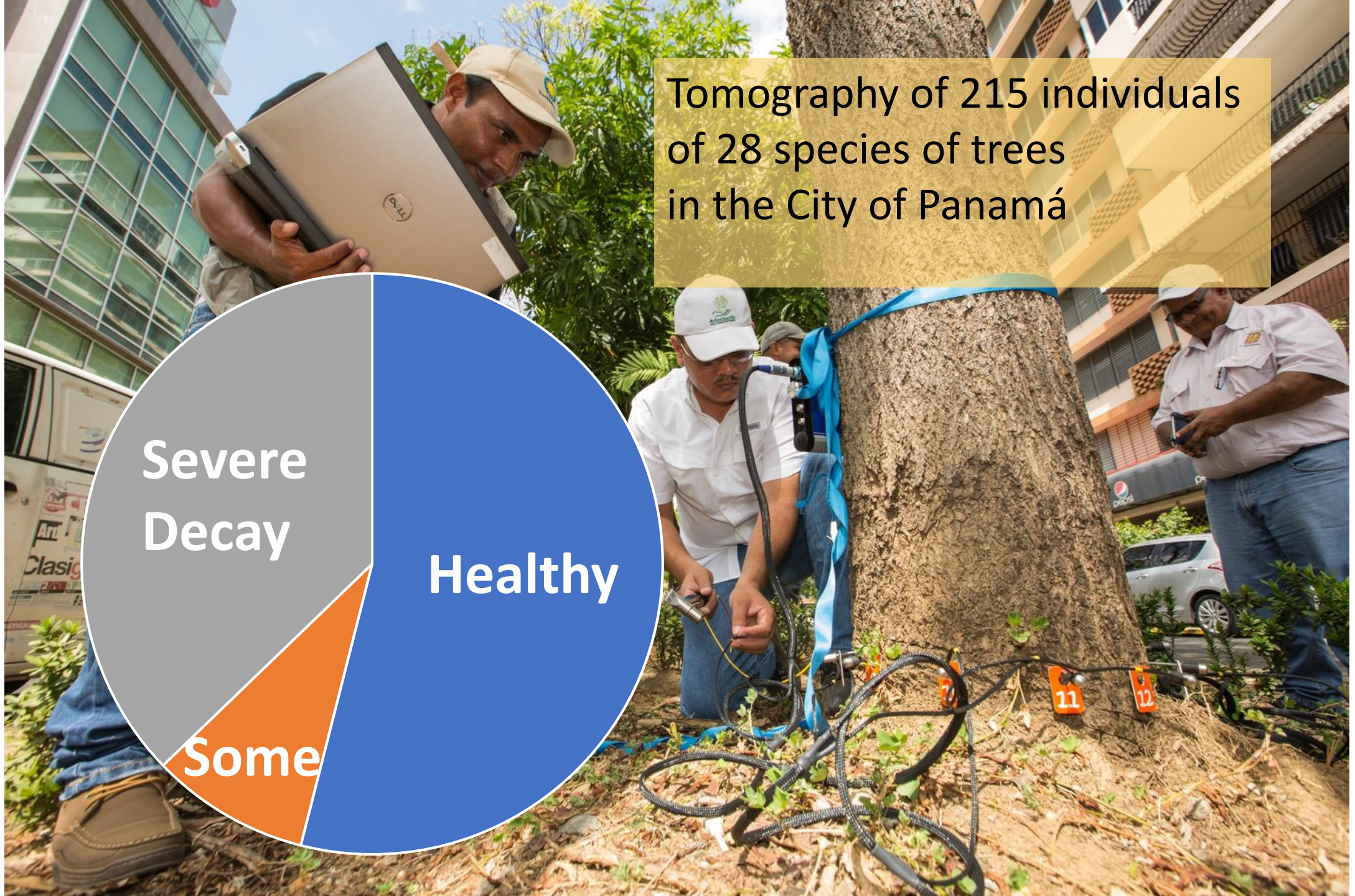
courtesy Ennio Arce

Árboles Enfermos

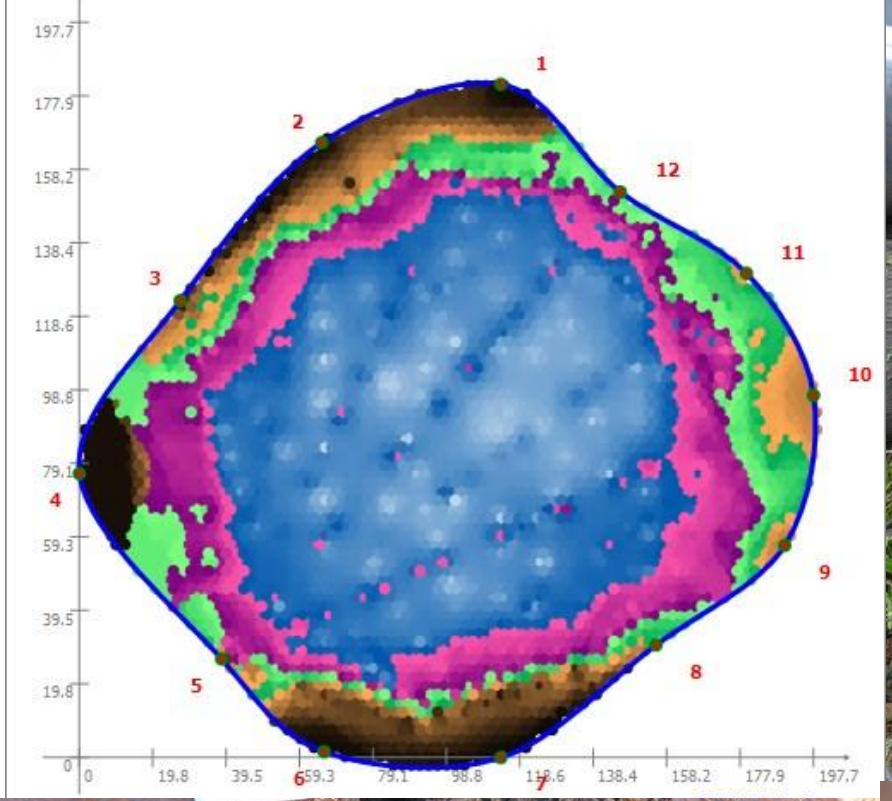
Etiqueta	Total	%
Si	1,544	33
Arboles Muertos	42	1
No	3,036	66
Total	4,622	100




1
12
11
10
9
8
5
4
3
2
137.9
124.1
110.3
96.5
82.7
68.9
55.1
41.4
27.6


Tomography of 215 individuals
of 28 species of trees
in the City of Panamá
Severe
Decay
Some
Healthy

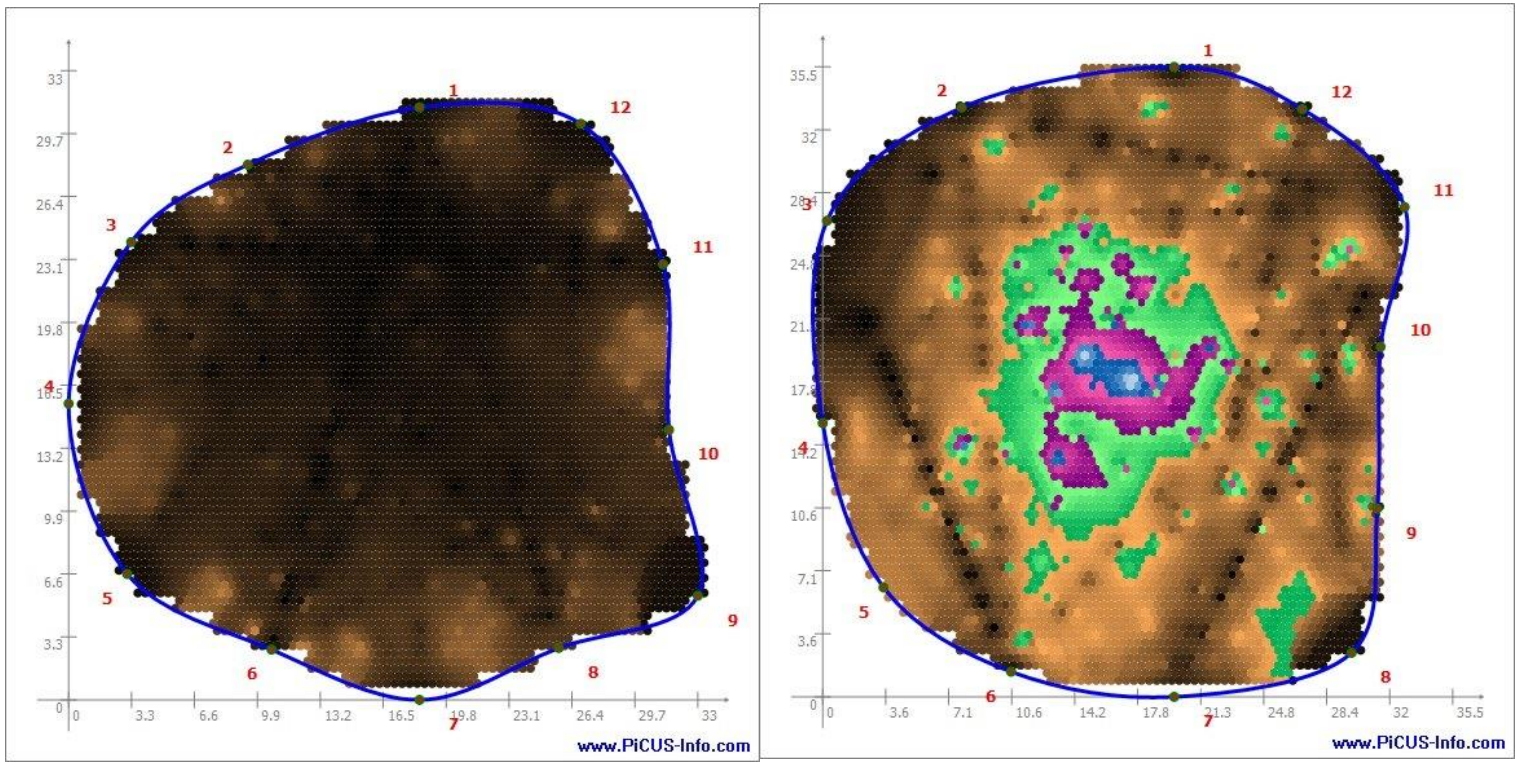

AVISO COMUNITARIO
RESULTADOS DEL ESTUDIO DE TOMOGRAFÍA DEL ÁRBOL COROTÚ, CALLE 48
Fecha de evaluación: 29 Mayo 2017
Ubicación: Calle Uruguay final
Árbol # 4211 Enterolobium cyclocarpum (Fabaceae)
Nombre común: Corotú
Evaluación general de pudrición del tronco: Muy Severo
Estatus visual del árbol: Hueco
Observaciones sobre el árbol: Pudrición de la corteza. Ficus obtusifolia creciendo en la copa al igual que otro Ficus sp. Bromelias en la copa. Tendido eléctrico pasando por el medio de la copa. Daños aéreos. Desprendimiento de corteza. Múltiples epifitas.
Notas sobre la tomografía: A 50 cm mostro un hueco grande con pudrición severa y muy poca madera sana. A 130 cm mostro un gran hueco hacia el centro del tronco y pudrición severa.
Asociados visibles: Comejenes, Hormigas, Lianas y Epifitas
Diámetro a 1.3m (DBH): 6070 mm
Nivel(es) de tomografía: 130 cm y 50 cm
Pudrición a 130cm: hueco avanzada primaria
Pudrición a 50cm: hueco avanzada primaria
Fotos del árbol: 1463-1474
Evaluadores: AR AC JF MP JB
FOTOGRAFÍA: ÁRBOL COROTÚ- CALLE 48 Y ESTUDIO DE TOMOGRAFÍA
Debido a los resultados de la tomografía realizada por la Alcaldía de Panamá al árbol Corotú, los cuales evidencian un severo deterioro, y por consiguiente, un peligro para la población, se procederá a su remoción en los próximos días.
Esta decisión ha sido aprobada por
Municipio de Panamá,
Dirección de Gestión Ambiental,
Resolución-ITP-DGA-011-2017.
Informe de la Alcaldía de Panamá
SANO
COMENZANDO A DAÑARSE
HUECO
PODRIDO


197.7
177.9
158.2
138.4
118.6
98.8
79.1
59.3
39.5
19.8
0
0
19.8
39.5
59.3
79.1
98.8
118.6
138.4
158.2
177.9
197.7
1
2
3
4
5
6
7
8
9
10
11
12

Picus 3 sonic tomography – a useful tool to detect structural decay and damage across many species
Applications in Plant Sciences 2016 4(12):1600060

Treetronic electrical impedance tomography – potential to detect incipient problems when well calibrated for particular species

Argus Electronic gmbh http://www.argus-electronic.de/



Gregory S. Gilbert, Dept. Environmental Studies, University of California Santa Cruz
https://greggilbertlab.sites.ucsc.edu/ ggilbert@ucsc.edu