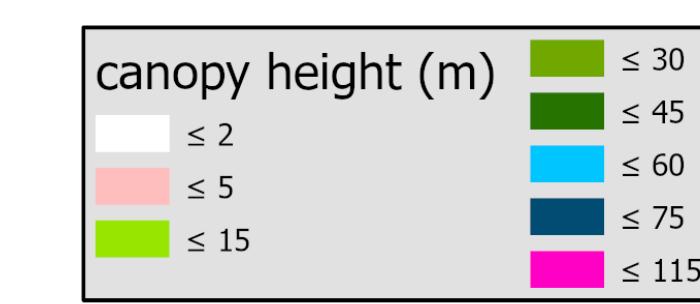
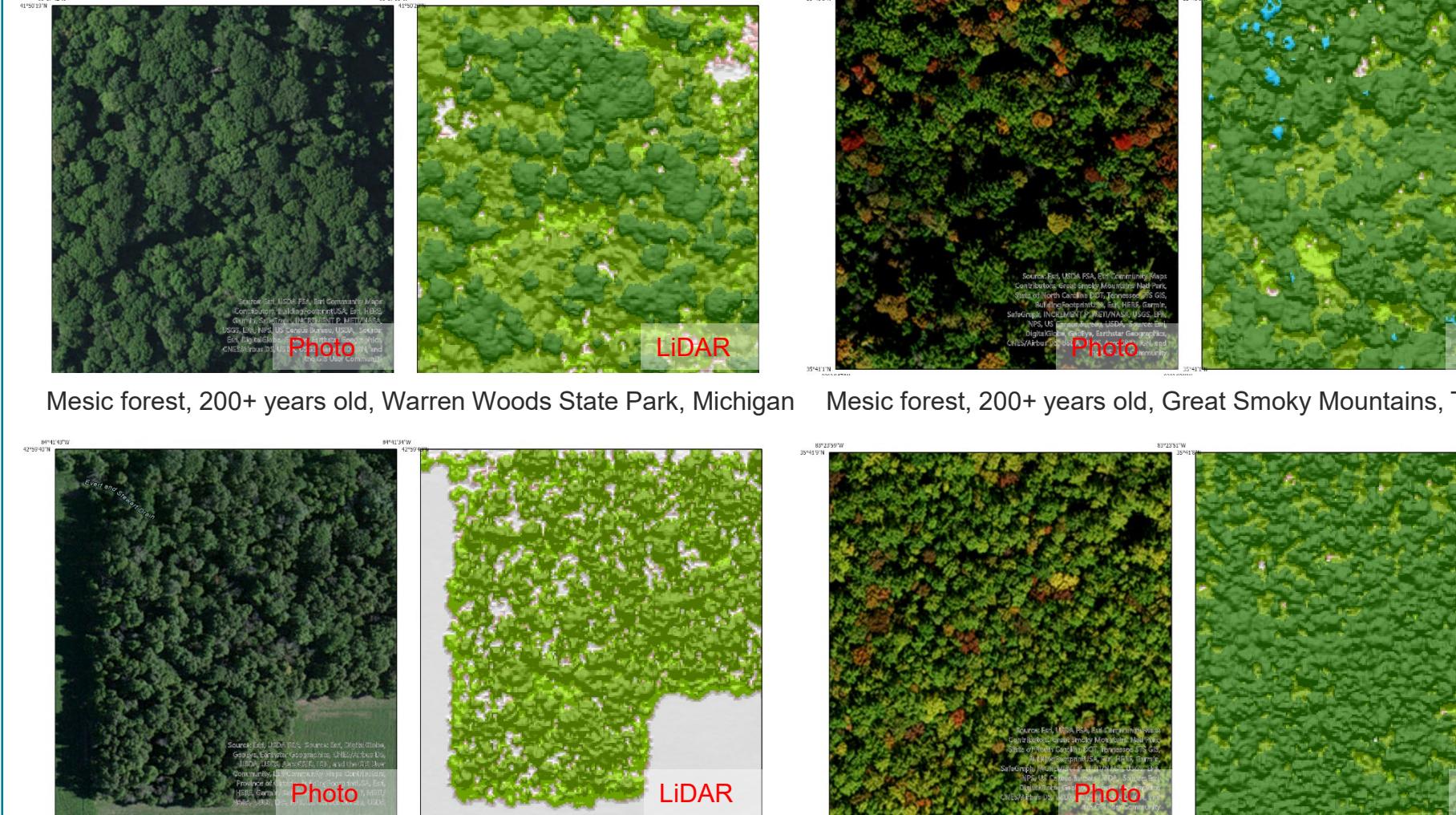


Utility of LiDAR in Ecological Site Descriptions

Greg Schmidt
Ecologist • Soil Survey Office • Grand Rapids, MI

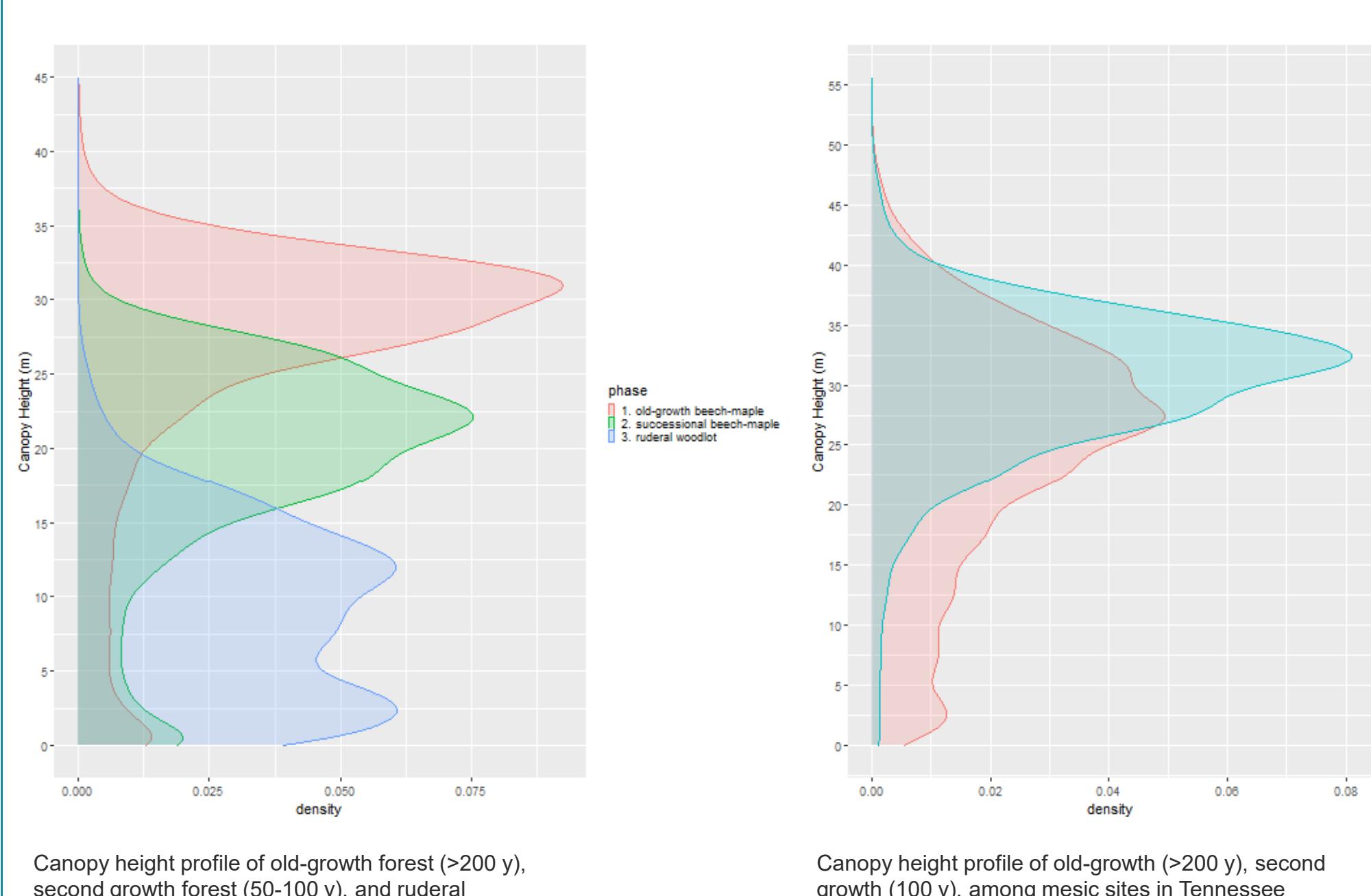
Soil scientists increasingly use bare-earth LiDAR derived digital elevation models for their extreme level of accuracy and precision for soil mapping, but less attention within the Soil and Plant Science Division is paid to other LiDAR derived products that focus on above surface features. There is enormous potential for LiDAR to assist ecologists in their vegetation inventories through canopy height models (CHM). In addition to commonly recorded canopy closure, and maximum canopy height, the spatial variability in height may be just as informative in characterizing communities that have acquired old-growth characteristics. We are working with the USFS to acquire a state-wide coverage CHM to screen potential sites for field inventory based on resemblance to old-growth reference conditions. In stands of the same age, composition, and soils, CHM can also reveal previously undocumented strong canopy height relationships to hillslope position and aspect, which may justify phasing map units in the future. The geographically continuous nature of CHMs makes prevailing canopy height more readily available and more interpretable than other productivity and biomass indicators such as site index. We are exploring potential vertical and horizontal vegetation structural indices to attribute to community phase descriptions and wildlife interpretations.

Old-growth vs. second growth

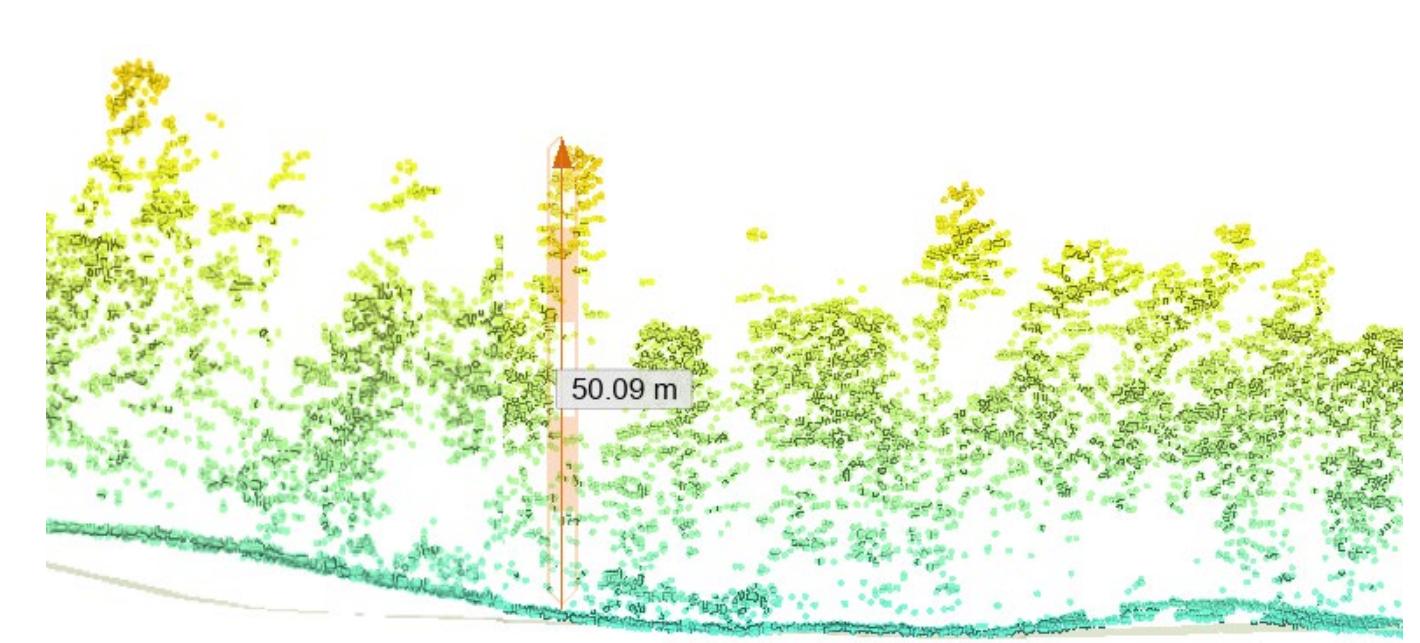


Each map on the left consists of alternating aerial photos and LiDAR canopy height models, of old-growth and newer growth mesic forests. Each map covers exactly 4 hectares.

- Young and old forests can be distinguishing by:
 - Michigan example: immature forest shorter than old growth forest.
 - Tennessee example: young mature forest is on average taller and more uniform in height (dominated by *Liriodendron*), while old-growth is more variable in height due to single tree canopy gaps and slightly more frequent large emergent crowns.



Metrics: Canopy vs. Crown Height Distribution



Possibly improvement to ESDs:
• Revised crown height distribution break points to represent full range of forest types across the US, and to help distinguish community phases differing mainly in structural maturity.

• Display key structural indices like median crown height and total tree or shrub cover more prominently on the State and Transition Model.

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2021 National Cooperative Soil Survey (NCSS)
National Conference • June 8-10, 2021

CROWN HEIGHT METRICS FOR SELECTED PLANT COMMUNITIES	Median Crown Width	25th Percentile Crown Height	Median Crown Height	75th Percentile Crown Height	Tallest Tree per Hectare	Tallest Tree per Hectare	Tallest Tree
Reference Vegetation							
Coast Redwood Forest, Humboldt Redwoods State Park, California	27.0	70.1	82.5	88.0	93.6	96.3	105.2
Sitka Spruce Forest, Olympic National Park, Washington	21.9	40.7	46.9	60.0	73.6	63.4	80.0
White Pine Forest, Hartwick State Park, Michigan	21.3	31.4	42.8	45.9	45.9	43.6	50.2
Tropical Rainforest, La Selva Biological Station, Costa Rica	25.6	28.4	31.6	36.1	40.6	37.7	47.6
Tropical Rainforest, El Yunque National Forest, Puerto Rico	23.0	23.9	26.4	29.7	33.4	31.1	38.0
Tropical Dry Forest, Guanica State Forest, Puerto Rico	10.7	6.8	7.6	8.8	10.2	9.9	12.7
Cove Hardwood Forest, Great Smoky Mountains, Tennessee	22.1	30.0	33.9	37.6	41.9	38.9	46.0
Beech-Magnolia Forest, Torreya State Park, Florida	21.1	26.8	22.8	33.6	37.1	34.2	39.3
Beech-Maple Forest, Warren Woods State Park, Michigan	22.9	29.2	32.0	33.5	35.3	34.1	43.1
Northern Hardwoods Forest, Manistee National Forest, Michigan	20.8	27.4	29.0	30.4	31.7	30.7	33.5
Broadleaf Evergreen Forest, San Gabriel Mountains, California	19.5	19.0	19.9	25.4	33.1	41.8	50.5
Oak-Chestnut Forest, Great Smoky Mountains, Tennessee	16.2	18.6	18.0	22.9	26.2	23.3	29.3
Sweetgum-Loblolly Pine Bottomland, Congaree National Park, South Carolina	20.7	23.7	24.6	31.0	35.2	34.0	43.0
Bald-cypress-Tupelo Swamp, Congaree National Park, South Carolina	21.8	29.8	31.8	33.6	35.4	34.0	41.5
Longleaf Pine Woodlands, Thomas County, Georgia	14.6	23.6	25.5	27.8	30.2	27.8	31.8
Oak-Pine Barrens, Allegan State Game Area, Michigan	14.1	13.7	14.3	17.7	20.4	17.4	21.6
Ponderosa Pine Woodland, Grand Canyon National Park, Arizona	9.9	8.1	9.4	11.1	14.6	15.3	20.9
Pinyon-Juniper Woodland, Grand Canyon National Park, Arizona	7.0	6.3	6.9	7.8	9.0	8.5	11.7
Subalpine Forest, Front Range, Colorado	10.7	13.3	16.5	18.4	20.8	20.8	26.4
Boreal Forest, Fairbanks, Alaska	6.5	6.4	7.5	8.5	9.9	9.6	15.8
Jack Pine Barrens, Huron National Forest, Michigan	7.7	6.6	7.6	8.2	8.8	7.6	8.9
Heath Bald, Great Smoky Mountains, Tennessee	7.3	6.7	7.8	10.2	16.5	12.7	20.3
Mesic Chapparal, San Gabriel Mountains, California	8.7	6.1	6.5	7.8	10.5	7.4	12.8
Joshua Tree Desert, Joshua Tree National Park, California	5.1	6.2	6.5	7.6	9.0	6.9	8.6

CANOPY vs CROWN COVER BY COMMON STRATUM CLASSES FOR SELECTED PLANT COMMUNITIES	Canopy Cover 0-2 m	Canopy Cover 2-5 m	Canopy Cover 5-10 m	Canopy Cover 10-15 m	Canopy Cover 15-30 m	Canopy Cover 30-45 m	Canopy Cover 45-60 m	Total Tree Cover	Crown Cover 0-2 m	Crown Cover 2-5 m	Crown Cover 5-10 m	Crown Cover 10-15 m	Crown Cover 15-30 m	Crown Cover 30-45 m	Crown Cover 45-60 m
Reference Vegetation															
Coast Redwood Forest, California	0.8	0.5	3.4	10.6	11.6	17.6	55.5	98.7	0.1	1.5	1.3	95.7			
Sitka Spruce Forest, Washington	12.6	4.8	10.0	22.8	26.6	13.8	9.5	82.6	0.5	1.6	15.1	24.1	41.4		
White Pine Forest, Michigan	0.9	0.4	2.2	44.1	50.9	1.5	98.7		0.9	62.1					
Tropical Rainforest, Costa Rica	1.6	1.9	10.4	51.7	32.4	1.9	96.5	0.8	16.5	69.3	9.8	0.1			
Tropical Rainforest, Puerto Rico	0.0	0.0	3.8	83.9	12.3	0.0	100.0	0.0	52.2	47.5	0.2				
Tropical Dry Forest, Puerto Rico	5.2	36.3	58.4				58.4	98.4							
Cove Hardwood Forest, Tennessee	2.0	3.0	11.5	43.6	38.8	1.2	95.0	0.8	7.8	74.1	12.4				
Beech-Magnolia Forest, Florida	0.4	0.7	10.0	61.4	27.5	0.0	98.9	0.3	26.7	71.6	0.3				
Beech-Maple Forest, Michigan	1.8	1.2	5.8	53.6	37.5		97.0	0.0	7.4	89.6					
Northern Hardwoods Forest, Michigan	0.3	0.1	0.3	84.8	14.6		99.6		41.6	58.0					
Broadleaf Evergreen Forest, California	1.1	1.4	29.7	58.5	9.2	0.2	97.5	8.5	57.3	28.1	3.7				
Oak-Chestnut Forest, Tennessee	0.2	1.0	31.5	66.3	1.0		98.8	13.1	78.9						