Benefits of Trees

CHARLOTTESVILLE AREA TREE STEWARDS

TREE STEWARD TRAINING CLASS

2026

Trees Are Vital

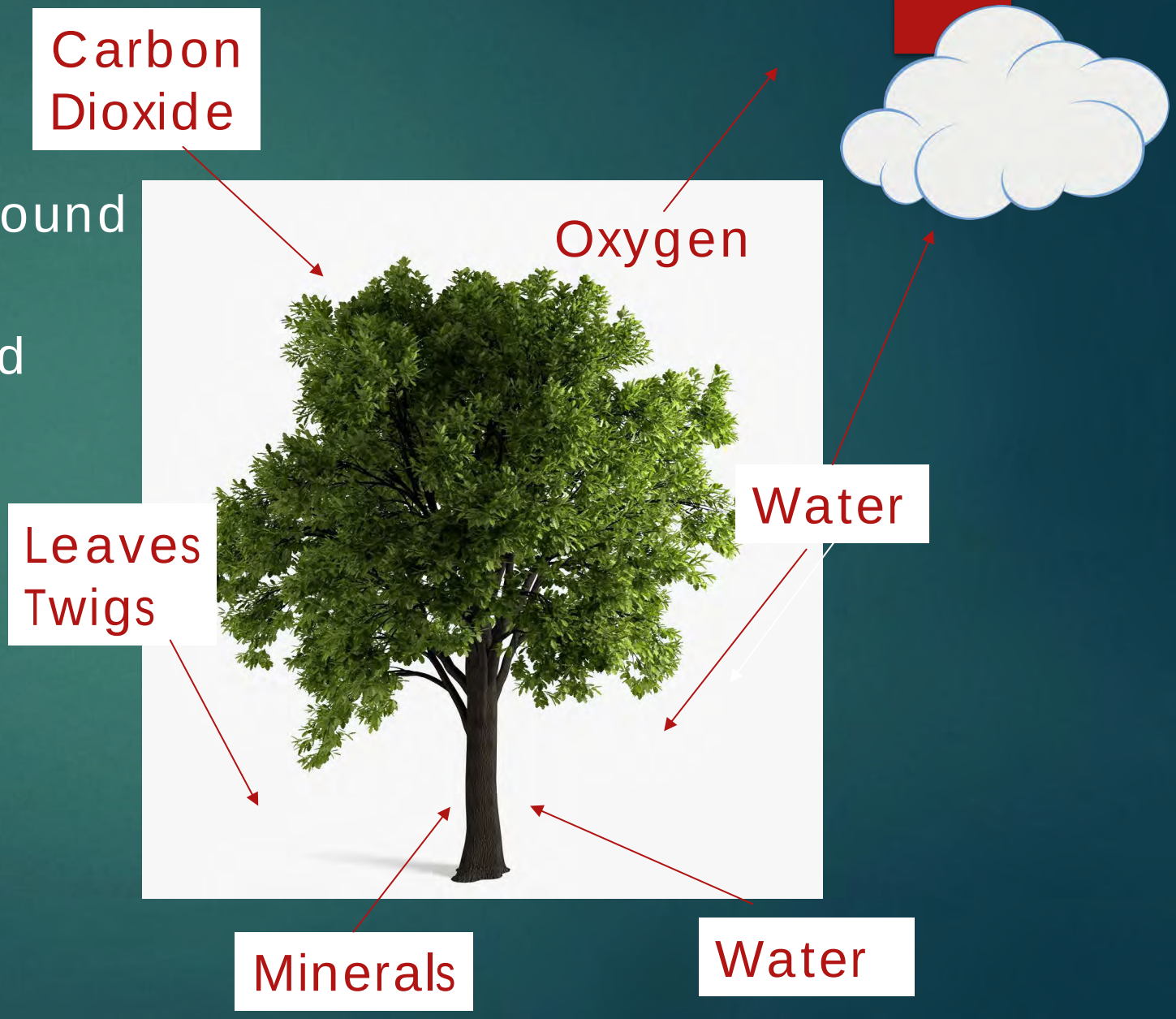
- Combat Global Warming
- Air Quality
- Water Quality
- Wildlife Habitat
- Human Health & Wellbeing

Tree Are Made of Air

- Photosynthesis
  - CO_2 Turned into Tree Tissues
  - Oxygen is Released
  - Water is Released
- Roots Take Up Water
- Water Moves Up To Leaves
- Minerals Dissolved in Water

Trees - Recyclers

- Leaves and Twigs Fall to the Ground & Return Carbon & Minerals
- Water is Taken From the Ground & Returned via Transpiration



Global Warming – Trees Seen as Mitigators

- CO_2 Absorbed by Trees (Sink)
- Deciduous AND Evergreens

- Young Trees
  - Absorb 13 lbs of CO_2/year
- 10 Year Old Tree
  - Absorb 48 lbs of CO_2/year
  - Release - O_2 for 2 people/year

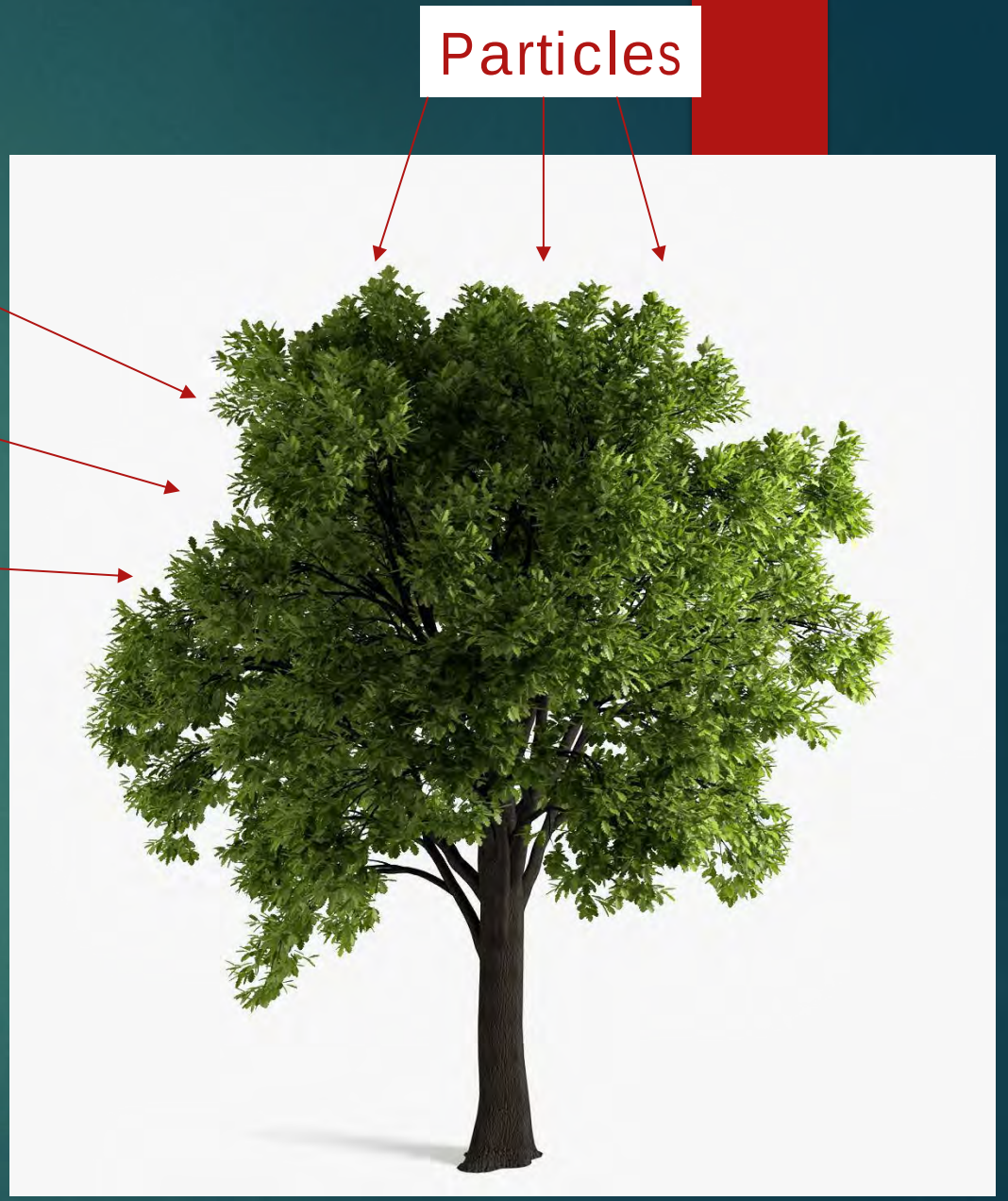
Trees – Micro-Environmental Effect

- Trees Provide Shade – Block Sun's Rays
  - Decreased Temperature 10 degrees or more
- Trees Transpire
  - Water Vapors Released into the Air
  - Cooling Effect: 2-10 degrees

Trees Clean the Air

- Leaves Absorb Gases: NO_2, SO_2, O_3
- Particulate Matter Collected on Leaves
  - Intercept 7-24%
- Heavy Metals – Lead, Cadmium
- Rain Water Washes Particles Down
- Washed Pollutants Absorbed Into Ground

- US trees remove over 17 million metric tons of air pollution per year. Arbor Day
- Particulate Matter: Asthma, Lung Disease, Cancer



Trees and Water Quality

- Water Runoff Control
- Water Pollution Control
- Riparian Buffer
- Storm Water Management

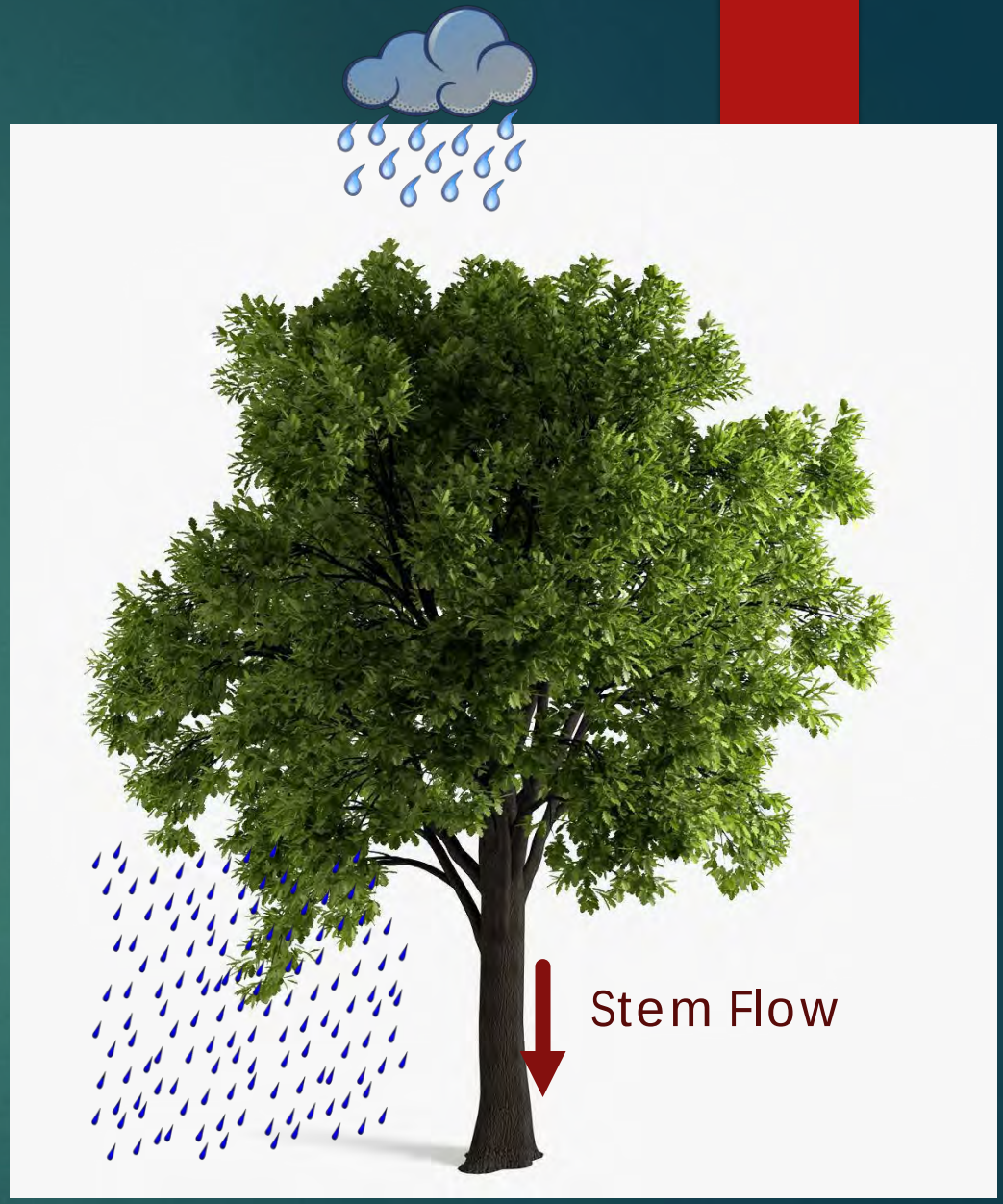
Trees – Mitigate Run-Off

Heavy Rain Collected By Leaves, Twigs, Branches (*Dynamic Retention*)

Collected Rainwater Flows Down Branches to Trunk to Ground (*Stem Flow*)

Water Falling Between Leaves (*Throughfall*)

Increased Absorption into Ground Water



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Dynamic Retention

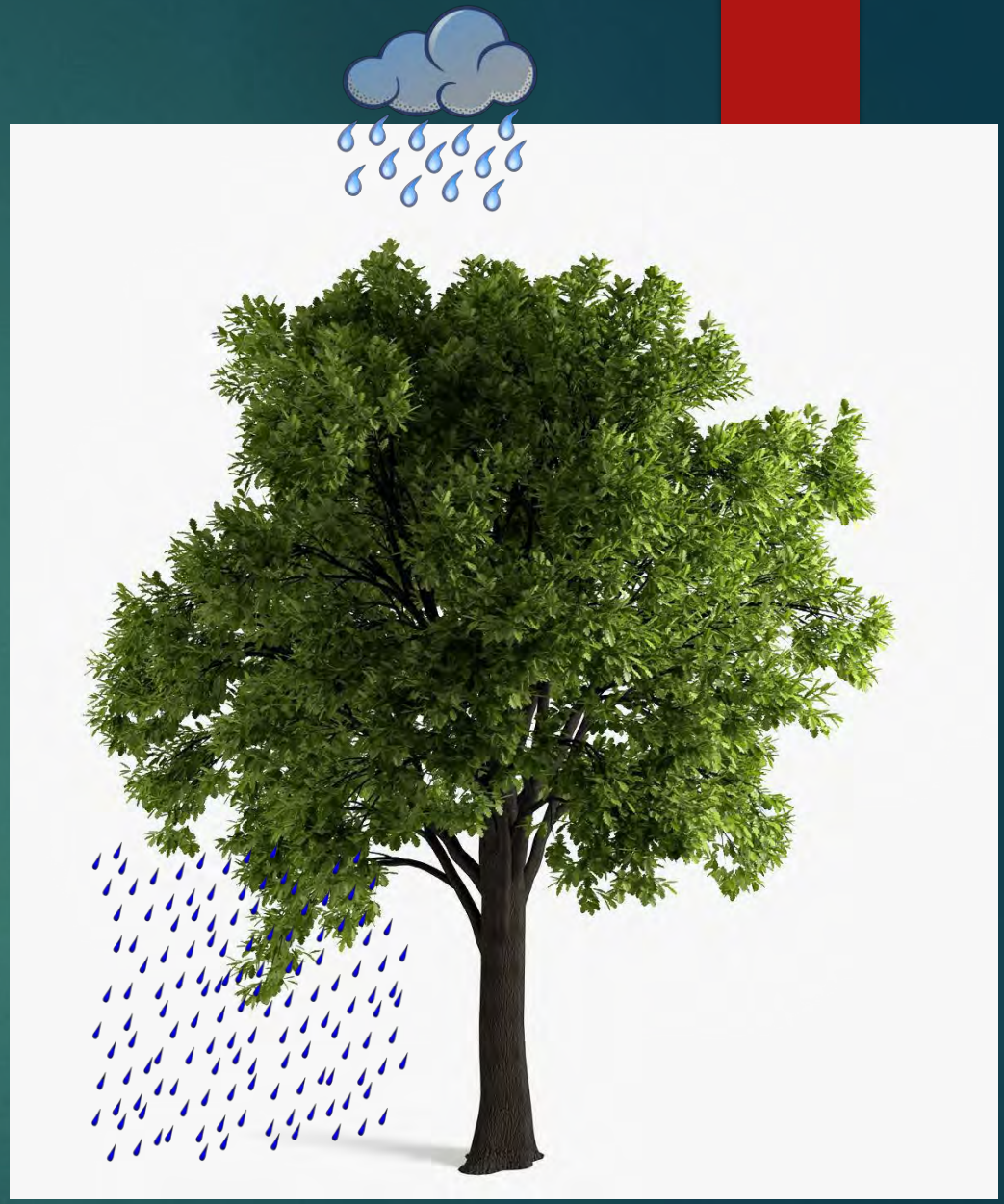
Water Retention on Leaves

- Deciduous Trees – 17-25%
- Conifers – 30%

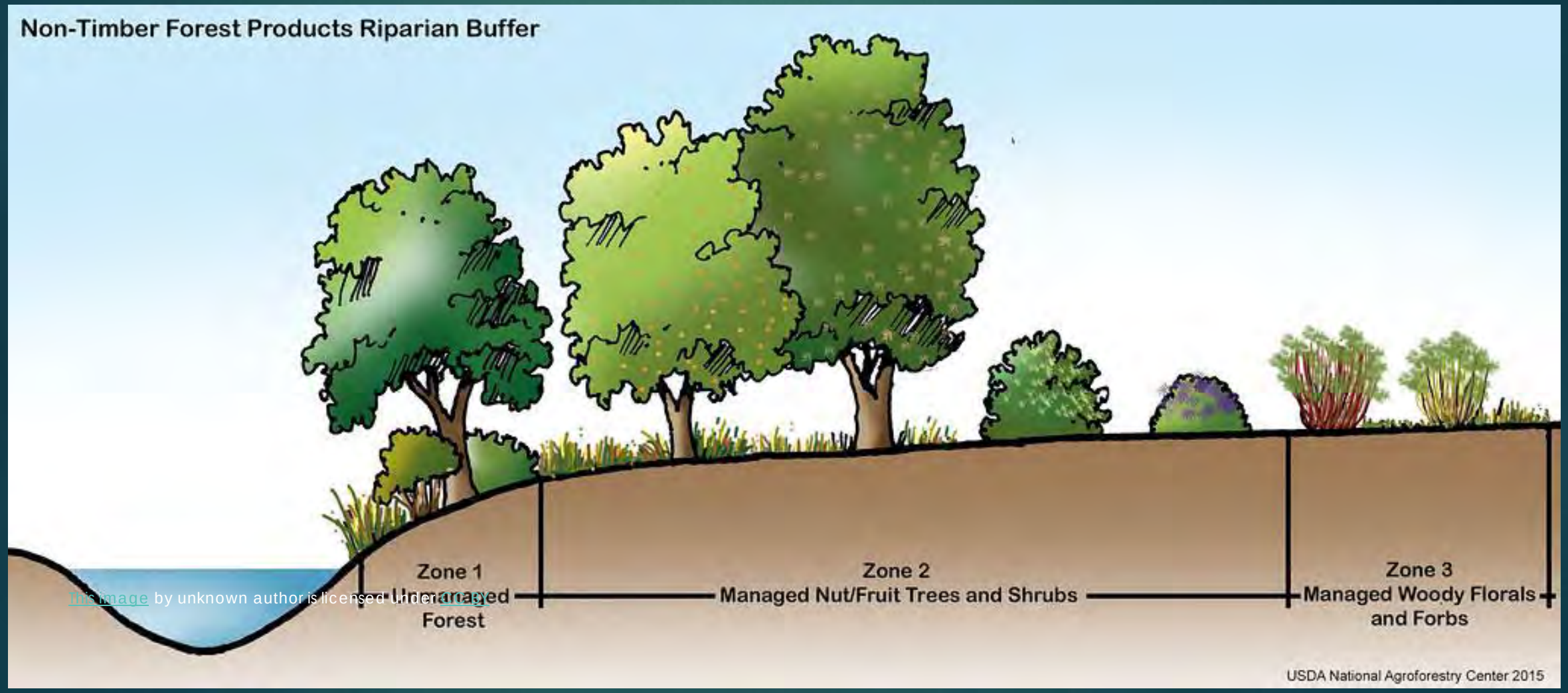
Retained Water Evaporates or Drips Down

Through Flow

- Decrease Volume/Intensity Under Canopy
  - Deciduous Trees – 35-61%
  - Conifers – 20-72%
- Increases Retention Beneath Tree
- Increased Absorption into Ground Water



Trees – Water Quality – Riparian Buffers



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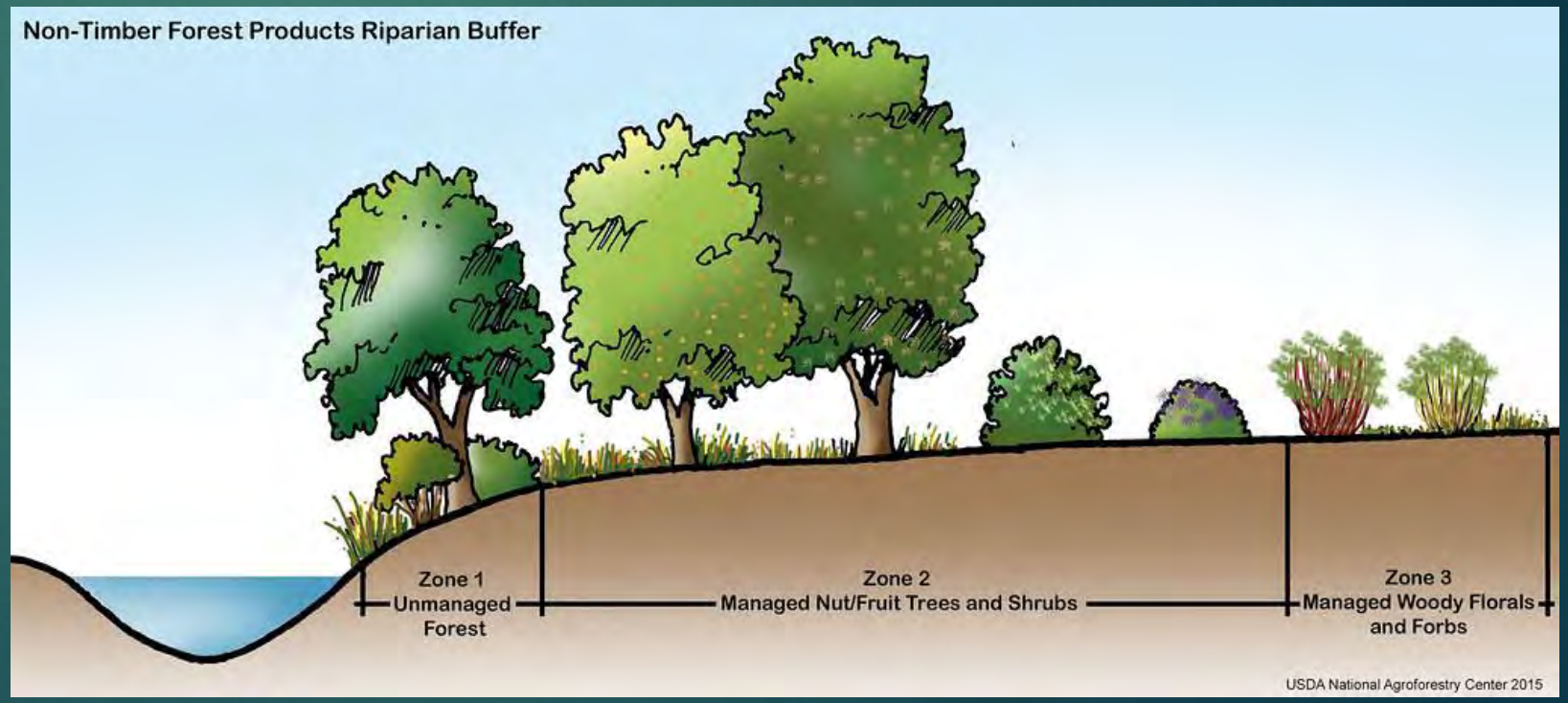
Trees – Water – Riparian Buffer

- Most Effective if Stratified (Trees, Bushes, Sedges, Grasses)
- Flood Resistant Plants
- Roots Stabilize Soil Along Banks
- Buffer (Trees, Bushes, etc.) Minimize Silt Flow Into Streams
- Minimize Pollutant Flow



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Rain Gardens Control Storm Run-off

WA State University

- Filter Pollutants
- Recharge Groundwater
- Create Bird & Butterfly Habitat
- Remove Standing Water from Yard

Bioswales --- Linear Rain Gardens

Trees – Environmental Saviors

- Global Warming – Macro/MicroEffects
- Absorption of Noxious Gases and CO_2
- Absorption of Particulate Matter
- Emit Oxygen
- Control Impact of Rainfall
  - Minimize Runoff
  - Maximize Ground Water Recharge
- Minimize Pollution of Water
  - Minimize Silt Deposition
  - Minimize Pollutant Chemicals

“Healing Effect of Trees”

- Decrease Blood Pressure
- Decrease Stress (Cortisol Levels)
- Improves Immune Function
- Decreases C-reactive Proteins – Factor Associated with Inflammation
- Improves Recovery from Disease/Surgery
- Increase Energy
- Results in Better Sleep
- Restores Brain Function

Evidence???

- Streets with Good Tree Canopy – Less Crime
  Chicago Study: 10% Increase in Tree Canopy
  12 % Decrease in Crime
  Healthier Environment? Increased O2, Less Pollution
  Greater Outdoor Activity???

- St. Louis program put 18,000 trees in low canopy neighborhood
  - Following year inhabitants had lower levels of inflammatory factors

- Home Values are Greater with Those With Trees and Near Parks
- Shopping Areas with Trees – Greater Business

Attention Restoration Theory

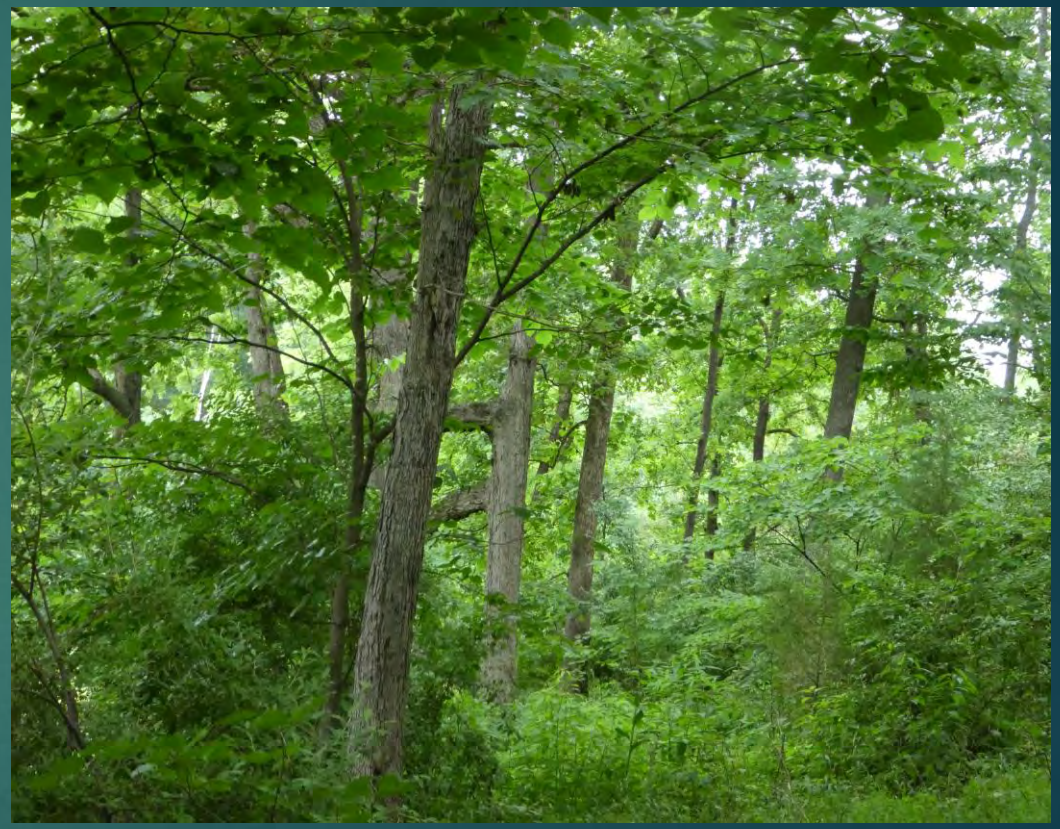
- University of Michigan study on attention and memory testing
  - Students walked in a forested area or in an urban area
  - Tested before and after and also repeated switching the sites
  - Students that walked in the forested areas scores boosted by 20%
- Another investigator checked the brain waves of similar students
  - Students who walked in nature had lower brain waves immediately after. But higher spikes when working on the tests
- Walking in nature rests/restores the brain so that when tested can perform more efficiently and stronger

Science????

- Increase Oxygen Levels --- Improve Health
- Trees Release Phytonicides, Terpenes
  - Tree Defensive Compounds: Bacteria, Fungi and Insects
  - In Humans
    - Decrease Blood Pressure, Anxiety, Heart Rate
    - Increases in Natural Killer Cells
    - Improve Brain Function????

Human Benefits – Phytonicids/Terpenes

- Increase Immune Function
  - Anticancer Factors
  - Natural Killer Cells
- Lower Blood Pressure
- Reduced Depression, Anxiety
- Reduced Stress Hormone Levels
- Improved Memory, Attention, Mood
- Improved Sleep
- Faster Recovery from Surgery and Illness



Forest Bathing – Shinrin-Yoku

- Find a Spot
- Engage your senses
- Take it slow
- Do other things:
  - Yoga, Tai chi, Meditation
  - Picnic, Looks at the Plants
- Enjoy the Silence

"Take in the Atmosphere of the Forest"

Universal Declaration of the Rights of Trees

- Drafted in France in 2018 & 2019
- Adopted in many communities around the World
- Terrasse-Vaudreuil in Canada
  - Prioritize Canopy Protection Across all Municipal Planning
  - Review of Regulations and Strengthen Tree Protection
  - Distribute Trees to Schools, Businesses and Residents
  - Advocate for Species Diversity

"Trees Need Someone To Speak Up For Them"

What Should We Do ?

Value & Enjoy Our Trees, Parks, Forests

- Plant More Trees
- Maintain and Care for Mature Trees
- Maintain/Increase Parks & Greenways
- Support Riparian Buffers/Rain Gardens
- Rethink Our Yards
- Educate, Educate, Educate