iTree Science Changes – 2/2021

1) New carbon equations and new process to estimate carbon storage and sequestration using wood density
    a. Further Detail - See CarbonEquations_2020 document.
        i. Values will go up and down
    b. Applications impacted:
        i. Eco
        ii. Forecast
        iii. API (MyTree, Design, Planting)
    c. Reason
        i. To get more species/genus specific equations.
        ii. To adjust sequestration values for differing tree wood densities when an equation is not species specific.
2) Carbon equations are queried based on taxonomic hierarchy
    a. SAS used to lookup species, genus and then average all softwood or hardwood values
        i. This significantly impacts the carbon values in Eco
    b. Applications impacted:
        i. Eco
    c. Reason
        i. Increased accuracy
3) Tropical carbon equations based on location.
    a. When a project location is classified as tropical application defaults to tropical equations based on Dry, Moist or Wet designation. Users can opt to use the standard species specific equations.
    b. Applications impacted:
        i. Eco
        ii. Forecast
        iii. API (MyTree, Design, Planting)
    c. Reason:
        i. To account for the fact that carbon sequestration rates are more dependent on climate than species in tropical locations.
4) Annual DBH growth rates based on species specific slow, moderate, and fast growth rate classifications, matching to the method of forecast and API.
    a. Applications impacted:
        i. Eco
    b. Reason:
        i. To improve carbon sequestration estimates.
5) Leaf area and leaf biomass adjusted based on actual dieback not categorical condition classes.
    a. The maximum value between dieback and percent crown missing is used to adjust the values.
    b. Applications impacted:
        i. Eco
        ii. Forecast
        iii. API (MyTree, Design, Planting)

c. Reason
   i. Increased accuracy

d. Notes: SAS was using the percent dieback (not categorical condition codes) in the last couple releases, but for this one we changed it to percent canopy missing and that really changed the results because most trees have percent missing recorded even when there is 0% dieback. We have now reverted to dieback adjustment to along all codes.

6) Leaf biomass to area values queried based on taxonomic hierarchy
   a. Values impacted
      i. Leaf biomass, leaf area and leaf area index
      ii. Carbon storage/sequestration results for evergreen trees
   b. Applications Impacted:
      i. Eco
   c. Reason
      i. Increased accuracy

7) New shading coefficient values based on species and dbh.
   a. This change impacts the leaf biomass, leaf area and leaf area index values.
   b. Applications impacted:
      i. Eco
      ii. Forecast
      iii. API (MyTree, Design, Planting)
   c. Reason:
      i. To improve leaf area, leaf biomass and LAI estimates

8) In the leaf biomass/area calculation remove Beers Law which adjusted values based on crown competition.
   a. Applications impacted:
      i. Eco
      ii. Forecast
      iii. API (MyTree, Design, Planting)

9) Add leaf biomass to total tree biomass when a tree is evergreen or semi-evergreen.
   a. This will impact carbon storage/sequestration for evergreen and semi-evergreen trees
   b. Applications impacted:
      i. Forecast
      ii. API (MyTree, Design, Planting)
   c. Reason
      i. The carbon storage equations do not include leaf biomass.

10) Updated procedure for calculating leaf area if crown height is not between 1 and 12 or crown width is not between 1 and 14.
   a. This change impacts leaf area, leaf biomass, leaf area index and carbon storage for evergreen/semi-evergreen trees when either of these variables are out of range.
   b. Applications impacted:
      i. Eco
      ii. Forecast
      iii. API (MyTree, Design, Planting)
   c. Reason

          i. Initially forecast/API was changed mimic the Eco process in which values came from a lookup table based on shading factor and height to width ratio

          ii. Eco values were incorrect so the table was updated to also account for the adjusted crown height and crown width.

11) New crown width equations based on species groups (Westfall, 2020)
    a. Reason:
        i. To improve crown width calculations
    b. Applications impacted
        i. Forecast
        ii. API (MyTree, Design, Planting)

12) All SAS used common input files are lined up with location species database.
    a. SAS uses up-to-date files whenever location species database is updated.
    b. Applications impacted:
        i. Eco
    c. Reason
        i. To avoid out of date values in SAS

Additional iTree Updates

1) Corrected PM2.5 removal rate values for 109 locations
    a. This change will result in a significant increase in removal rates for these locations.
    b. Applications impacted:
        i. Forecast
        ii. API (MyTree, Design, Planting)
    c. Reason:
        i. Bug

2) Pollution, health incidence and hydrologic benefit values changed for 3 counties in the Puget Sound area.
    a. The values for these counties were updated based on the Puget Sound UTC analysis.
    b. Counties impacted:
        i. King
        ii. Pierce
        iii. Snohomish
    c. Applications impacted:
        i. Forecast (hydrologic benefits only)
        ii. API (MyTree, Design, Planting)
        iii. Landscape
        iv. Canopy
    d. Reason
        i. Underlying canopy data is more accurate (WA DNR).

3) Update the cost of electricity values for the US only to 2020.
    a. Applications impacted:
        i. Eco
        ii. Forecast

                  iii.   API (MyTree, Design, Planting)

4) Updated height at maturity values for several species.
   a. Applications impacted:
      i. Eco
      ii. Forecast
      iii. API (MyTree, Design, Planting)
   b. Reason – Values were too high for the species

5) Removal of Live Oak subgenus
   a. Calculated values could change when genus based averages are used.
   b. Applications impacted:
      i. Eco
      ii. Forecast
      iii. API (MyTree, Design, Planting)
   c. Reason
      i. Live oak is not an actual genus but just an evergreen oak

6) Additions to invasive species list
   a. Applications impacted:
      i. Eco

7) Additions to pest host list
   a. Applications impacted:
      i. Eco
      ii. Forecast

8) Changes to compensatory values in Canada
   a. Removal of duplicate values (average) and outliers.
   b. Applications impacted:
      i. Eco
   c. Reason – Outliers were skewing some results.

9) Changes to VOC values
   a. Removal of bioemissions outliers and changed genus values to average of all species.
   b. Applications impacted:
      i. Eco
   c. Reason – Outliers were skewing results.