DSHVM Vegetation Parameters

Provided below is a list of the DHSVM vegetation parameters with brief descriptions and references from where they have come from in the past. The values in parenthesis are either the parameter units or the possible values.

1. VEGETATION DESCRIPTION: description of vegetation type

2. OVERSTORY PRESENT: whether an overstory is present (TRUE or FALSE)

3. UNDERSTORY PRESENT: whether an understory is present (TRUE or FALSE)

The following set of eleven parameters (inclusive of SNOW INTERCEPTION EFF) only apply to the overstory layer (if there is one).

4. FRACTIONAL COVERAGE: fractional coverage of overstory (0-1)
The fraction of total area occupied by the overstory. The understory is assumed to completely cover the ground for all cells that have an understory.

5. TRUNK SPACE: distance from the ground surface to the start of the crown (0-1, fraction of total height)

6. AERODYNAMIC ATTENUATION: canopy attenuation coefficient for wind profile
   This is the extinction coefficient, n, in equation A2 of Wigmosta et. al. (1994).

7. RADIATION ATTENUATION: radiation attenuation by the overstory
   This is the canopy attenuation coefficient, k, in equation 18 of Wigmosta et. al. (1994). Based on Pascal Storck’s field work, short wave radiation beneath the canopy, \( \tau \), can be estimated as 10-20% of that with no canopy.

Parameters 8 through 12 do not need to be specified when canopy radiation attenuation mode is FIXED.

8. HEMI FRACT COVERAGE: fraction of the hemisphere that is visible for each layer (0-1)

9. CLUMPING FACTOR: clumping factor of overstory

10. LEAF ANGLE A: leaf angle distribution parameter for overstory

11. LEAF ANGLE B: leaf angle distribution parameter for overstory

12. SCATTERING PARAMETER: scattering parameter (0.7-0.85) for overstory

The next three parameters (13-15) are from Pascal Storck’s dissertation based on field work in the Umpqua National Forest in Oregon.

13. MAX SNOW INT CAPACITY: maximum snow interception capacity for the overstory (m of water equivalent)
14. MAX RELEASE DRIP RATIO: ratio of mass release to meltwater drip from intercepted snow (0-1)

15. SNOW INTERCEPTION EFF: efficiency of snow interception process (0-1)
This is the percentage of snowfall intercepted until the MAX SNOW INT CAPACITY has been met.

16. IMPERVIOUS FRACTION: impervious fraction (0-1)

Parameters 17 - 22 vary with the layer (overstory and/or understory). The overstory is specified first, followed by the understory.

17. HEIGHT: Height of each vegetation layer (m)

18. MAXIMUM RESISTANCE: Maximum stomatal resistance for each vegetation layer (s/m)
19. MINIMUM RESISTANCE: Minimum stomatal resistance for each vegetation layer (s/m)
Reference: Table 1 of Wigmosta et al. (1994) references Kaufmann (1982), Alexander et al. (1985), Hunt et al.(1991), and Dickinson et al. (1986).

20. MOISTURE THRESHOLD: soil moisture threshold above which soil moisture does not restrict transpiration for each vegetation layer (0-1)
This is $\theta^*$ in equation 16 of Wigmosta et al. (1994). Maidment (1993) estimates this, referred to as $\theta_d$, as 50 to 80 percent of the field capacity.
Reference: Maidment (1993)

21. VAPOR PRESSURE DEFICIT: vapor pressure deficit threshold above which stomatal closure occurs for each vegetation layer (Pa)
This is $c_d$ in equation 14 of Wigmosta et al. (1994).
Reference: Wigmosta et al. (1994)

22. RPC: fraction of shortwave radiation that is photosynthetically active for each layer
Wigmosta et al. (1994) states this is the light level where $r_s = 2r_{s\text{min}}$ (equation 12).
Reference: Table 1 of Wigmosta et al. (1994) references Dickenson et al. (1991)

23. NUMBER OF ROOT ZONES: number of rooting zones
This should be the same as the number of root zone layers in the soil section.

24. ROOT ZONE DEPTHS: thickness of soil layers (m)

25. OVERSTORY ROOT FRACTION: fraction of the roots of the overstory in each root zone layer
26. UNDERSTORY ROOT FRACTION: fraction of the roots of the understory in each root zone layer
The order in which this should be specified is: fraction of roots in top layer, fraction of roots in second layer, etc. For each vegetation layer, the sum of the root fractions in the different root zones must be equal to one.
27. OVERSTORY MONTHLY LAI: overstory leaf area index (one-sided) for each month (Jan-Dec)
28. UNDERSTORY MONTHLY LAI: overstory leaf area index (one-sided) for each month (Jan-Dec)
Reference: Table 1 in Wigmosta et. al. (1994) references Kaufmann et. al. (1982). This can also be based on satellite data. One source for this is the LDAS project (http://ldas.gsfc.nasa.gov/) which is based on the global Myneni (1997) data set.

29. OVERSTORY MONTHLY ALBEDO: overstory albedo for each vegetation for each month (Jan-Dec)
30. UNDERSTORY MONTHLY ALBEDO: understory albedo for each vegetation for each month (Jan-Dec)
Reference: Eagleson (2003) includes some values. This can be based on remote sensing data.
References


