

Supplement S5

March 1, 2021

1 Prescribed root depths

Rooting depths were fixed to 2m, similar as the model runs of LPJ-GUESS. Here, a comparison is made between the different runs of the VOM.

1.1 Timeseries of modelled fluxes

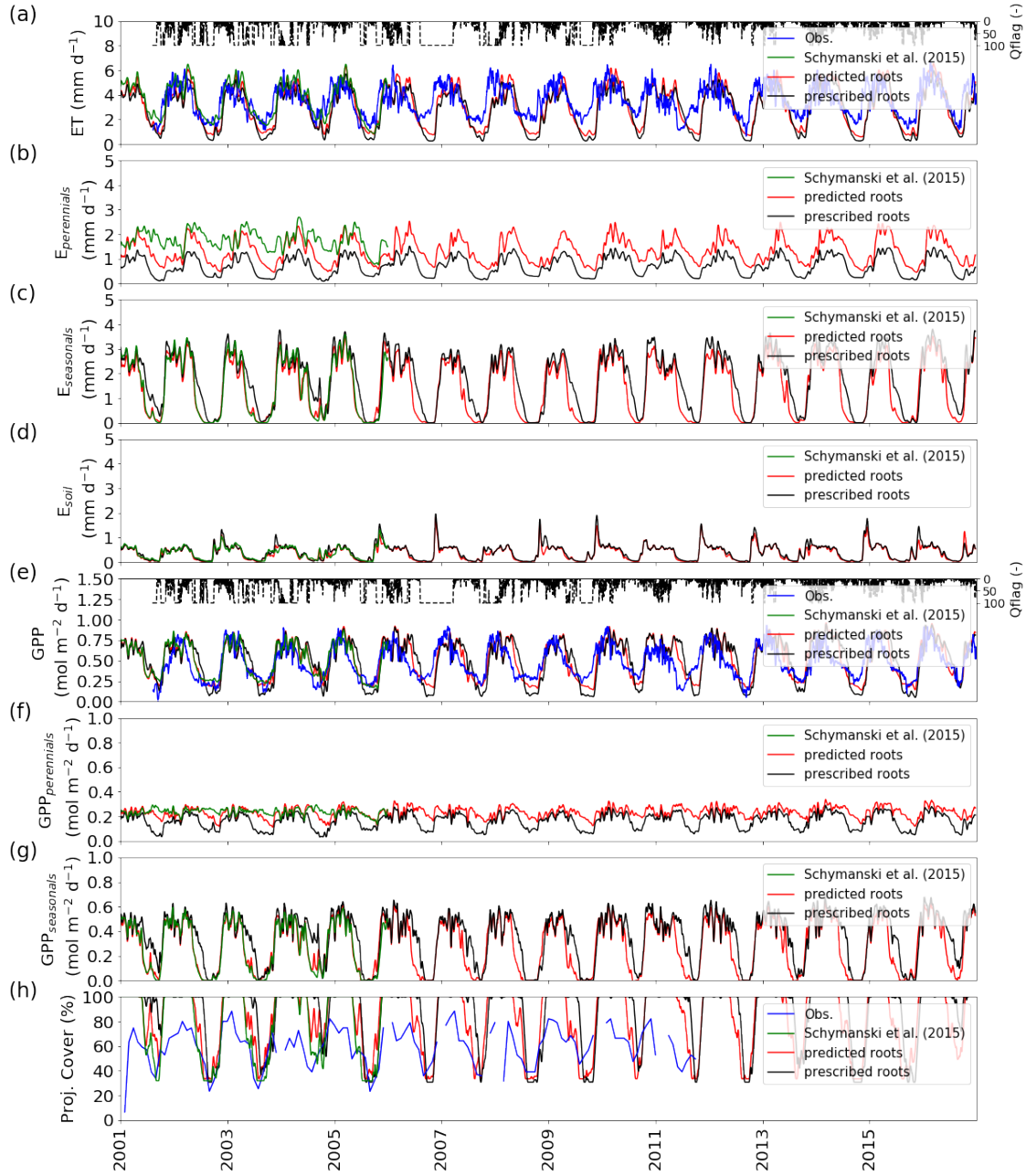


Figure S5.1. Results for Howard Springs from 2001-2016 (subset from 1980-2016) for a) ET, b) transpiration perennials (trees), c) transpiration seasonals (grasses), d) soil evaporation, e) GPP, f) GPP perennials (trees), g) GPP seasonals (grasses), all smoothed with a moving average of 7 days, for the VOM with predicted roots (red), prescribed roots (black), and fluxtower observations (blue). Results of Schymanski et al. (2015) are shown in green. The daily average quality flags of the fluxtower observations are shown in dashed lines with a value of 100 when a day is completely gap-filled and 1 when it is observed.

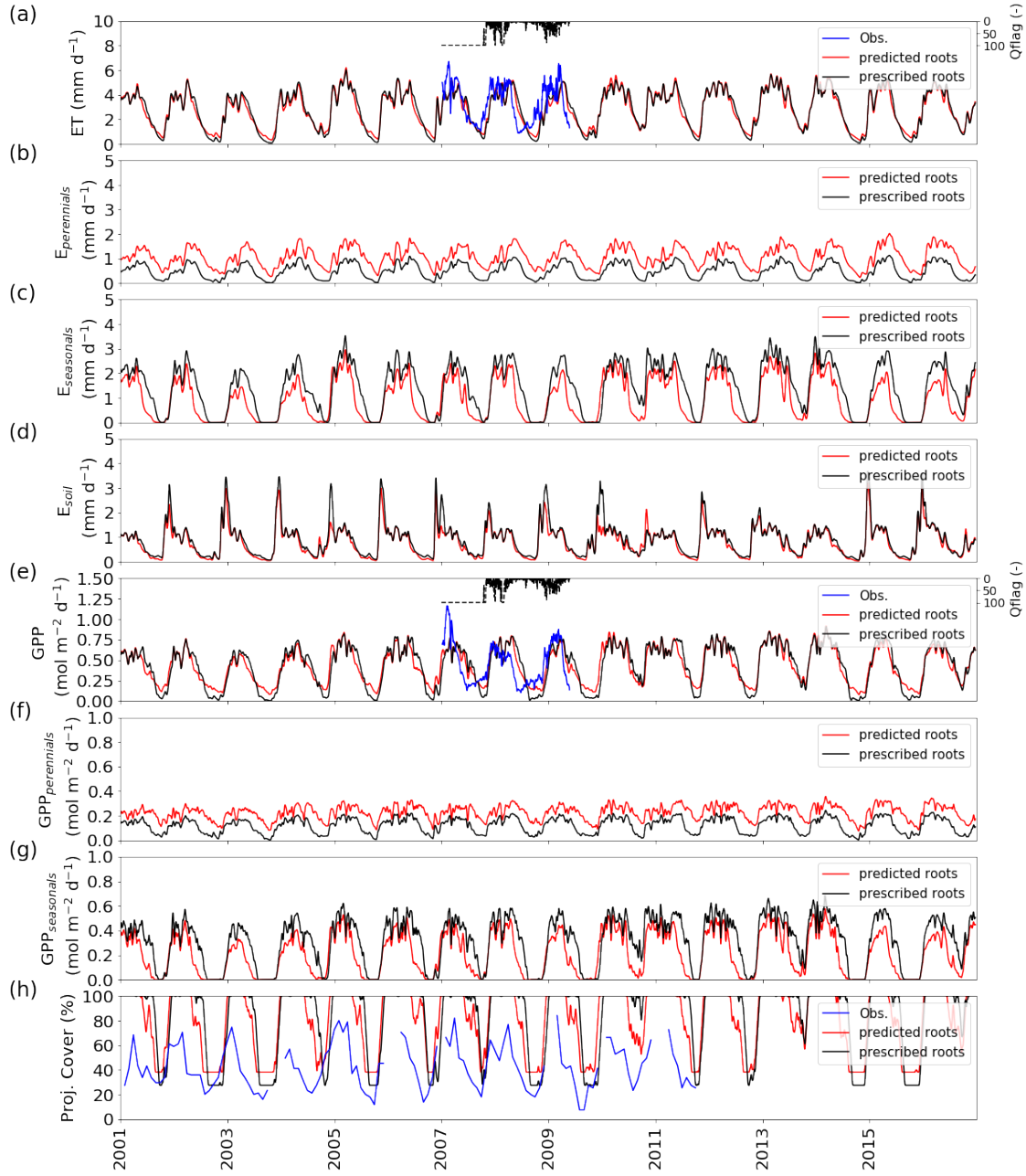


Figure S5.2. Results for Adelaide River from 2001-2016 (subset from 1980-2016) for a) total ET, b) transpiration perennials (trees), c) transpiration seasonals (grasses), d) soil evaporation, e) total GPP, f) GPP perennials (trees), g) GPP seasonals (grasses), all smoothed with a moving average of 7 days, for the VOM with predicted roots (red), prescribed roots (black), and fluxtower observations (blue). The daily average quality flags of the fluxtower observations are shown in dashed lines with a value of 100 when a day is completely gap-filled and 1 when it is observed.

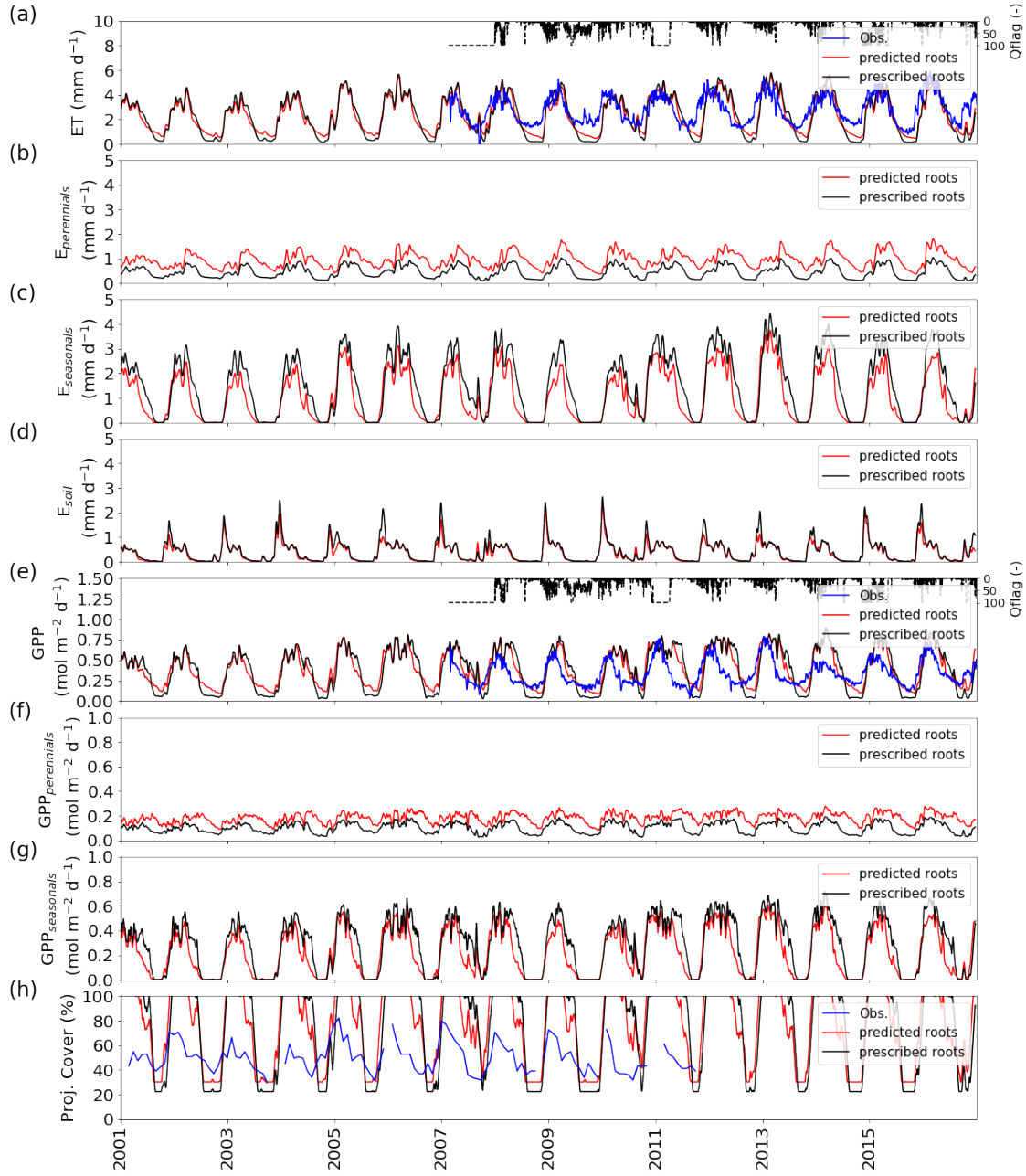


Figure S5.3. Results for Daly Uncleared from 2001-2016 (subset from 1980-2016) for a) total ET, b) transpiration perennials (trees), c) transpiration seasonals (grasses), d) soil evaporation, e) total GPP, f) GPP perennials (trees), g) GPP seasonals (grasses), all smoothed with a moving average of 7 days, for the VOM with predicted roots (red), prescribed roots (black), and fluxtower observations (blue). The daily average quality flags of the fluxtower observations are shown in dashed lines with a value of 100 when a day is completely gap-filled and 1 when it is observed.

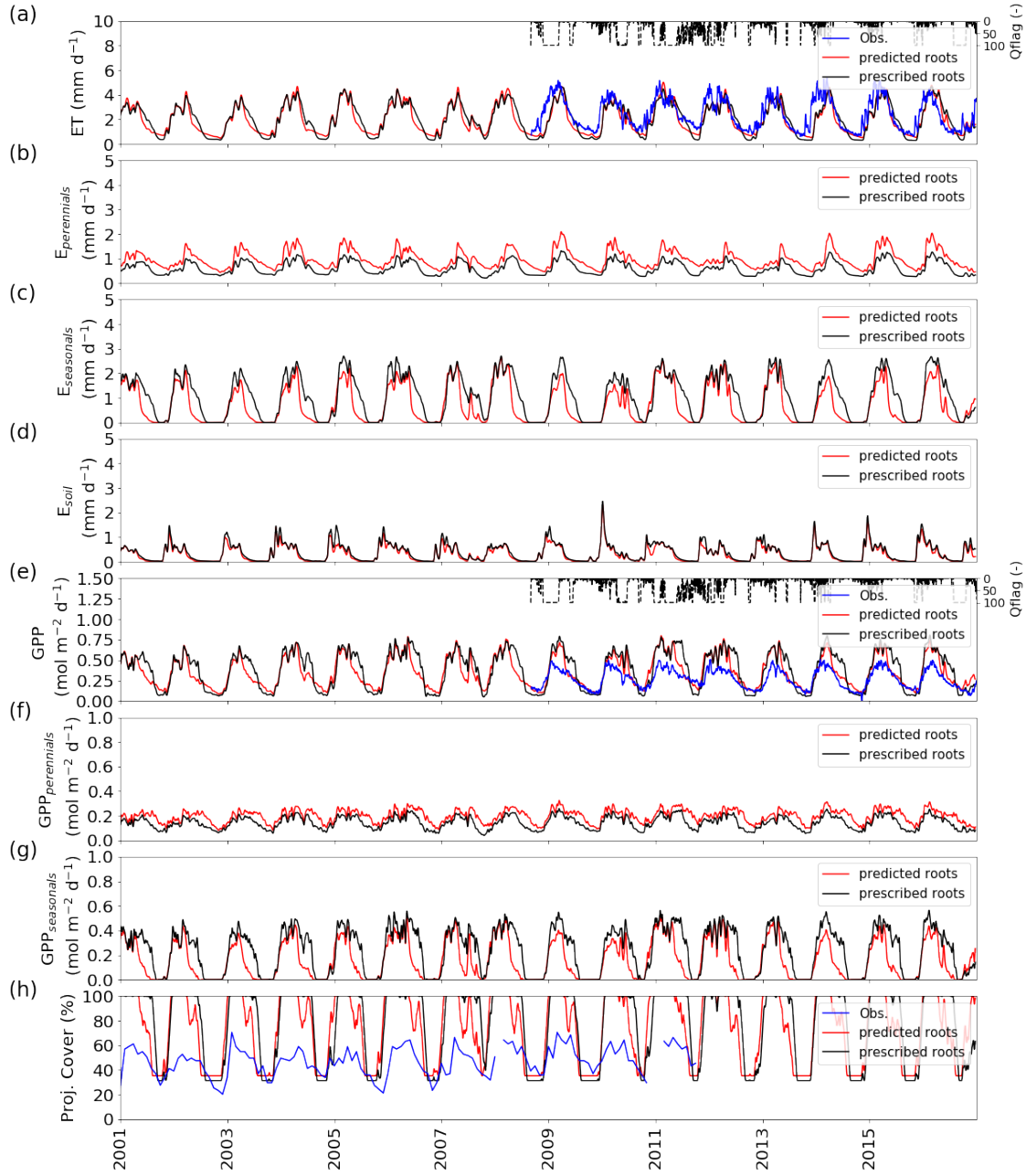


Figure S5.4. Results for Dry River from 2001-2016 (subset from 1980-2016) for a) total ET, b) transpiration perennials (trees), c) transpiration seasonals (grasses), d) soil evaporation, e) total GPP, f) GPP perennials (trees), g) GPP seasonals (grasses), all smoothed with a moving average of 7 days, for the VOM with predicted roots (red), prescribed roots (black), and fluxtower observations (blue). The daily average quality flags of the fluxtower observations are shown in dashed lines with a value of 100 when a day is completely gap-filled and 1 when it is observed.

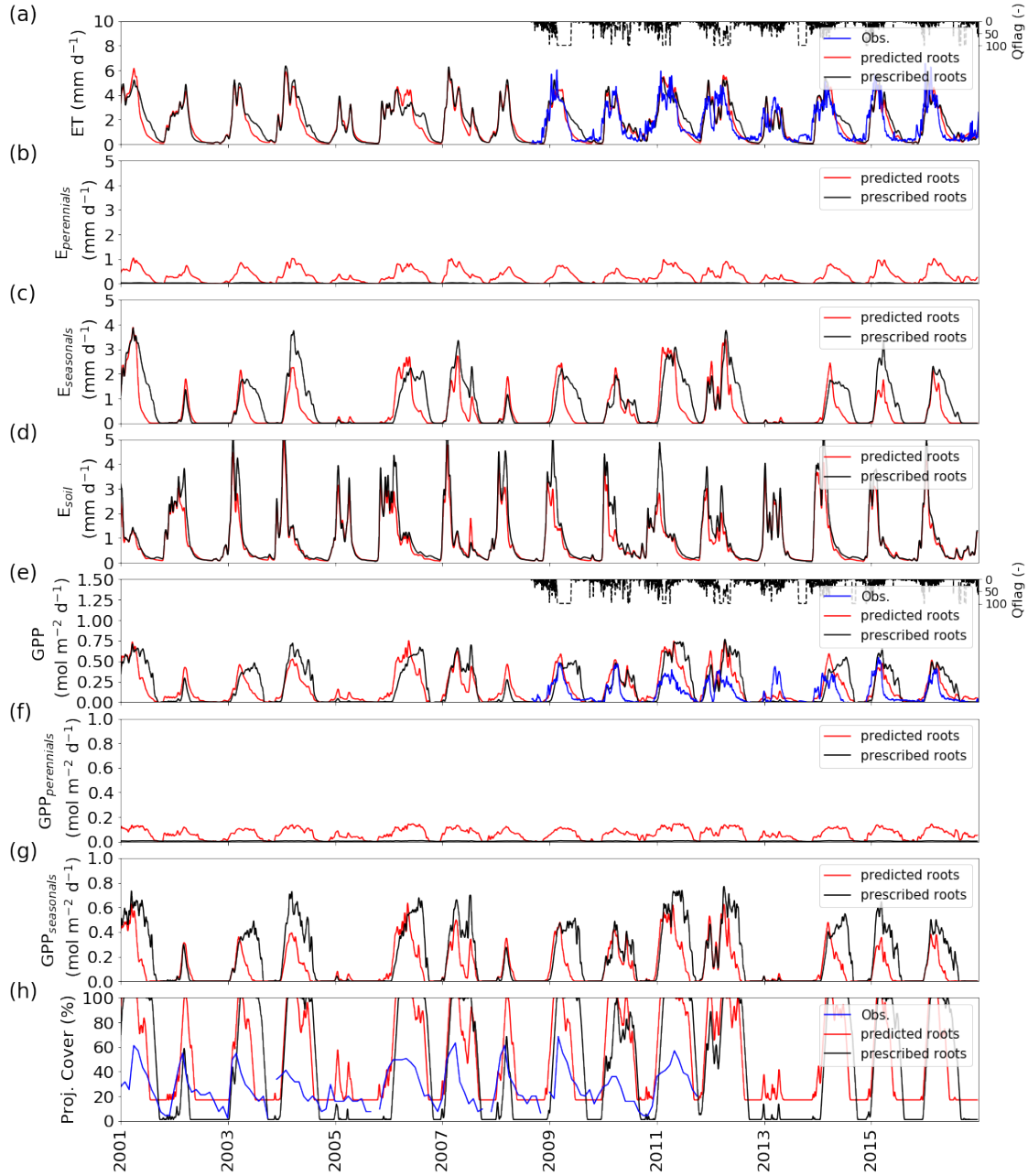


Figure S5.5. Results for Sturt Plains from 2001-2016 (subset from 1980-2016) for a) total ET, b) transpiration perennials (trees), c) transpiration seasonals (grasses), d) soil evaporation, e) total GPP, f) GPP perennials (trees), g) GPP seasonals (grasses), all smoothed with a moving average of 7 days, for the VOM with predicted roots (red), prescribed roots (black), and fluxtower observations (blue). The daily average quality flags of the fluxtower observations are shown in dashed lines with a value of 100 when a day is completely gap-filled and 1 when it is observed.

1.2 Partitioning fluxes

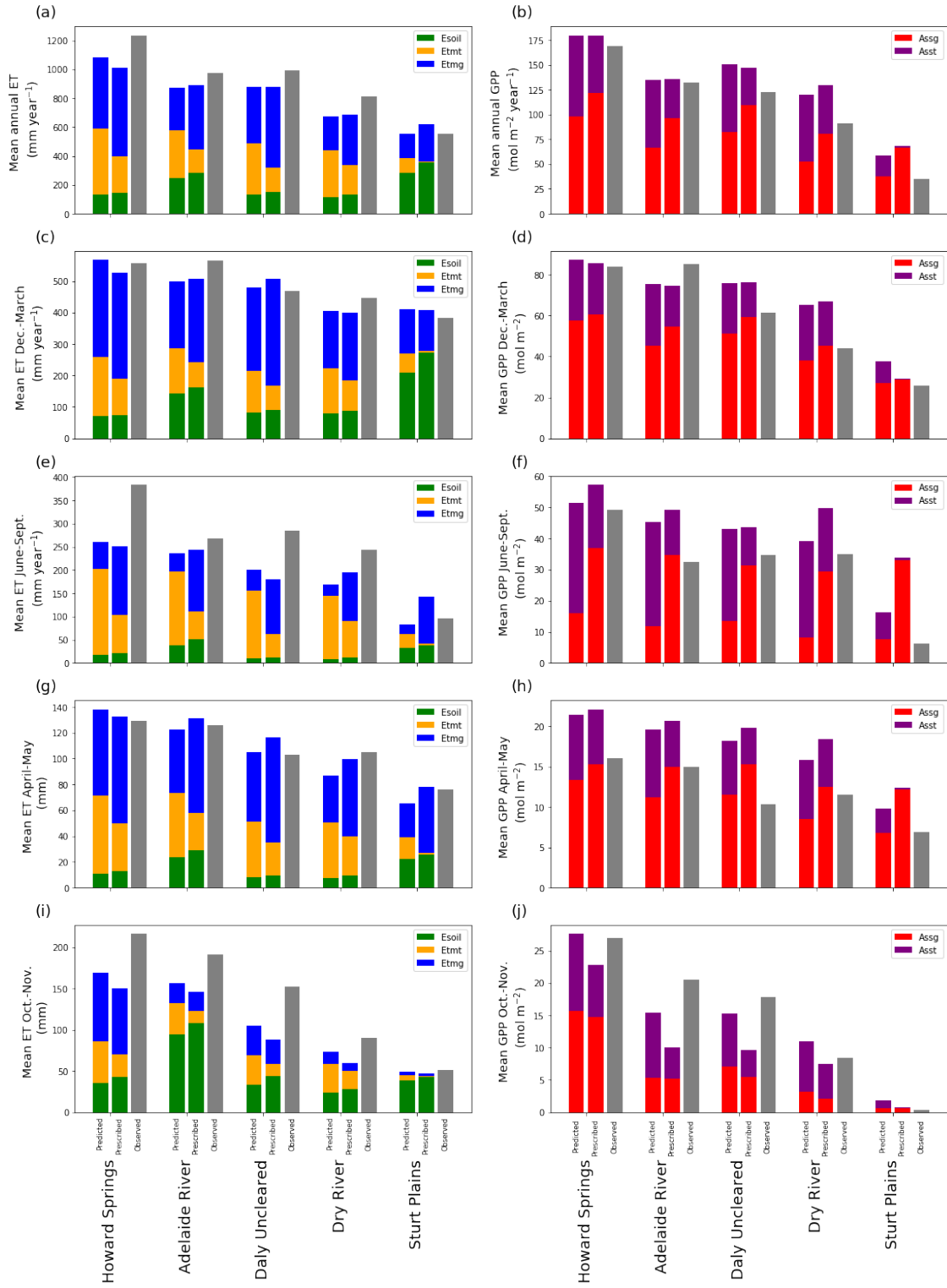


Figure S5.6. Partitioning of the fluxes for a) evapo-transpiration (ET) and b) gross primary produc-

tivity (GPP), flux tower observations are shown in gray.

The prescribed roots always give higher values of grass assimilation and grass transpiration for all sites.

1.3 Parameters

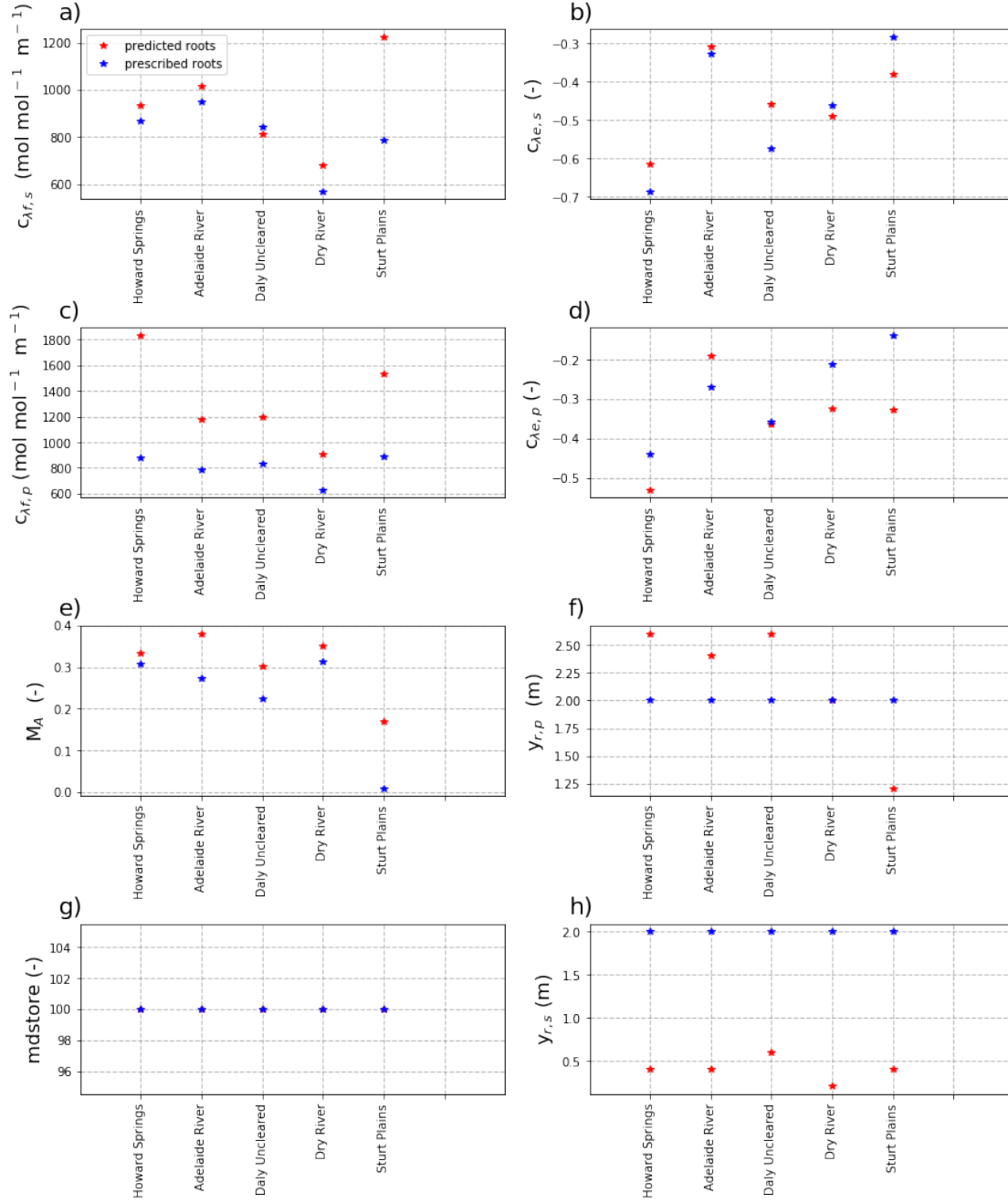


Figure S5.7. Optimal vegetation parameters for prescribed roots (blue) and predicted roots (red) , for a) and b) the two parameters $c_{\lambda f,s}$ and $c_{\lambda e,s}$ effecting the water use for perennial vegetation, c) and d) the two parameters $c_{\lambda f,p}$ and $c_{\lambda e,p}$ effecting the water use for seasonal vegetation, e) vegetation cover of the perennial vegetation $M_{A,p}$, f) the rooting depth for the perennial vegetation $y_{r,p}$ and g) the plant water storage (fixed) and h) the rooting depth for the seasonal vegetation $y_{r,s}$.

1.4 Relative errors

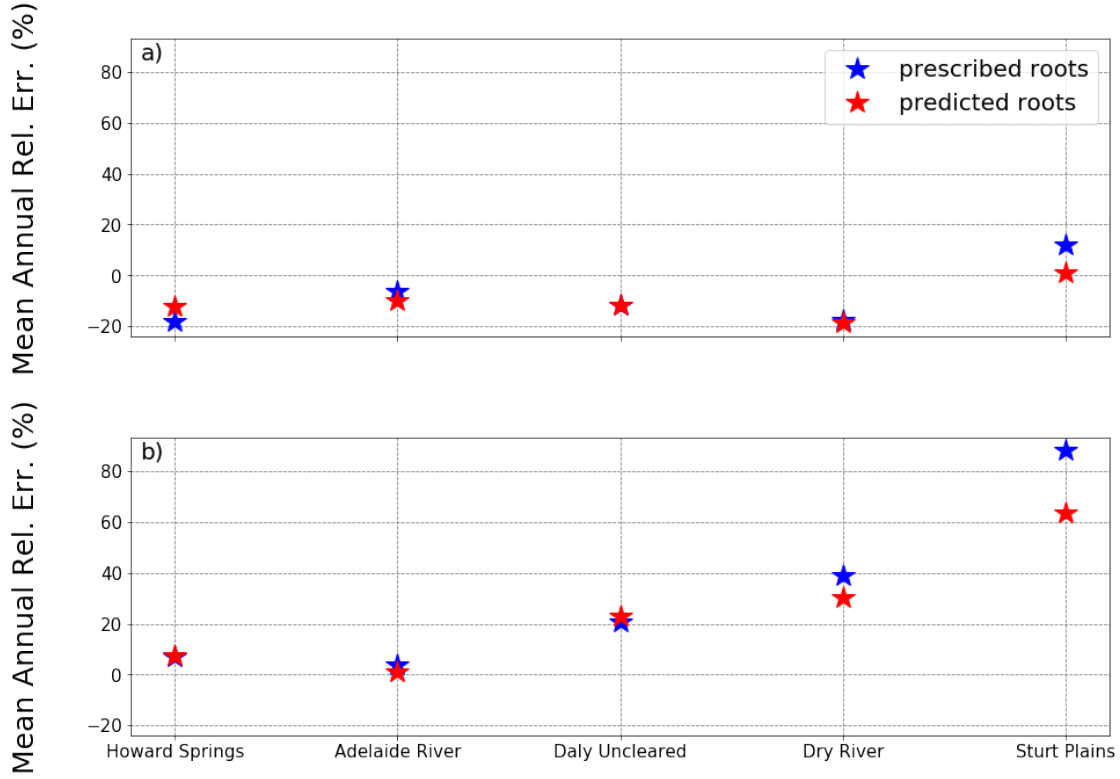


Figure S5.8. The relative errors between the mean annual fluxes for a) evapo-transpiration (ET) and b) gross primary productivity (GPP), with prescribed roots in blue and predicted roots in red.