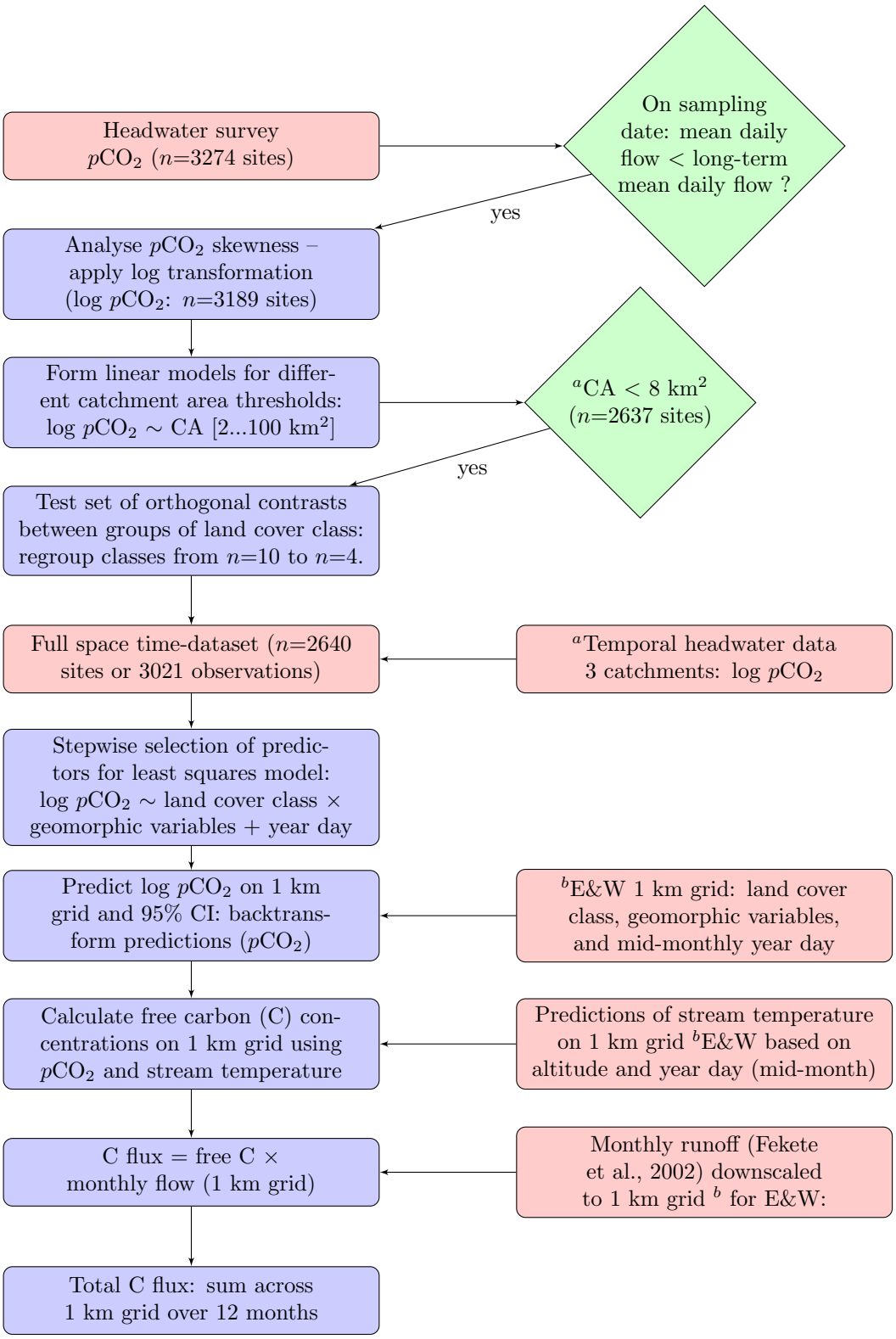
Headwater survey
pCO_2 (n=3274 sites)
On sampling date: mean daily flow < long-term mean daily flow ?
yes
Analyse pCO_2 skewness – apply log transformation (log pCO_2: n=3189 sites)
Form linear models for different catchment area thresholds: log pCO_2 ~ CA [2...100 km^2]
^{a}CA < 8 km^2 (n=2637 sites)
yes
Test set of orthogonal contrasts between groups of land cover class: regroup classes from n=10 to n=4.
Full space time-dataset (n=2640 sites or 3021 observations)
^{a}Temporal headwater data 3 catchments: log pCO_2
Stepwise selection of predictors for least squares model: log pCO_2 ~ land cover class × geomorphic variables + year day
Predict log pCO_2 on 1 km grid and 95% CI: backtransform predictions (pCO_2)
^{b}E&W 1 km grid: land cover class, geomorphic variables, and mid-monthly year day
Calculate free carbon (C) concentrations on 1 km grid using pCO_2 and stream temperature
Predictions of stream temperature on 1 km grid ^{b}E&W based on altitude and year day (mid-month)
C flux = free C × monthly flow (1 km grid)
Monthly runoff (Fekete et al., 2002) downscaled to 1 km grid ^{b} for E&W:
Total C flux: sum across 1 km grid over 12 months