Biased vs Unbiased Estimators;

Why do we divide with *n-1* the sample standard deviation?

Simple Explanation: it is not possible to obtain an estimate of σ from a sample size n=1, because there is no internal variation of *any* degree within such a sample. Having n-1 in the denominator reflects this impossibility, and therefore at least n=2 data points are needed if we want to make the formula work

In more detail: The different denominators arise from the theory of parameter estimation in statistics, whereby some random variable has a probability distribution with some parameter unknown, and it is calculated from a series of observations of outcomes of the random variable (the sample).

When estimating the standard deviation or variance when the mean is unknown, using n in the denominator results in a biased estimator (that is, one such that its expected value is not precisely the parameter that is being estimated); in fact, one can show that the expectation of the estimator for the variance ends up as $(n-1)/n * \sigma^2$, and thus by multiplying the original estimator by $n/(n-1)$ -- that is, using (n-1) as the denominator instead of n -- we obtain an unbiased estimator, i.e. with expectation σ^2, at the cost of a higher mean squared error.