Methods text for mapping Washington Dungeness crab vertical lines using logbook data

For the purposes of determining risk of entanglement for whales and turtles, we wish to quantify Dungeness crab fishing effort. The relevant metric for risk in this context is the density of vertical lines connecting crab traps to surface buoys. For their draft Conservation Plan, WDFW desired this information in 15-day intervals at as fine a spatial grain as possible.

Raw logbook data include the start and end locations of a ‘string’ of traps on the date they were set and the total number of traps used on each string. We analyzed these data in three steps.

* First, we assigned traps to specific points along each string by assuming they were evenly spaced along a line defined by the start and end points of each string. Using NGDC composite bathymetry to provide a depth for each point, we excluded any traps on land (depth>0) or in greater than 100m water.
* Second, we assigned each trap to a 5km cell on a custom-developed vector grid.
* Third, we mapped the traps.
  + How do we avoid double-counting traps? When we sum up traps within a grid cell across some period of days, we run the risk of counting traps more than once (because, as you know, the logbooks don't report the moving or removal of traps, AND the traps themselves are not individually-identifiable or labeled). SO, we have to decide how to summarize trap density. At Jameal's suggestion, what I've done thus far is apply an averaging approach. You'll see it in the notes in the R script. You don't have to do anything with it now, but I want to flag this calculation as an important one to return to.