Obtain & Prepare Data

* Most recent **30m** Land Cover data for Washington State, USA from MRLC
  + Bring into ArcGIS and Clip data to 3mi2 (approx) bounding box east of the Cascades Mountain Range
    - Study area includes a portion of the Columbia Wildlife Refuge and adjacent farmland
      * Refuge is surrounded by development on all sides. Reservoir to north, farm/other development on other sides
      * Near former hanford nuclear site
    - Where most wildfires in the 2020 and 2021 seasons occurred
    - Originally planned for 75mi but turned out to be too big and crashed NetLogo
  + Reclassify land cover classifications
    - Any human development or structure -> Developed = *Ignition Sources*
      * Fires will start in fuel patches adjacent to developed patches
    - Any non-developed land -> Fuel
      * Delineate by “Wet Fuel” and “Dry Fuel” based on original land cover classification
    - Any water -> Water = *Barriers*
      * Water will inhibit fire spread
    - Once reclassified and clipped to study area
      * Had to split raster into 4, one for each land classification, to keep them as separate datasets for NetLogo
      * Reclassified such that the other 3 classifications were NODATA, so each layer contained JUST that specific classification
* Export clipped, reclassified study area rasters to Esri Grid File (.asc.

NetLogo Preparation

* Import clipped, reclassified land cover data into NetLogo using *gis:load-dataset* command
  + Set NetLogo world to 196x311 patches, size 2
    - Taken from clipped raster size
  + Ran into many errors trying to oad dataset. First it wouldnt recognize the projection of the data as compatible, regardless of PCS. To address, Updated .prj files with WKT of WGS GCS and did not work (turtles in space)
  + Thus, deleted all files and started from beginning with completely fresh 2019 NLCD file
    - Somehow file was corrupted so nuclear option, fresh data and fresh project file
      * Ensured data were solely in WGS 1984 GCS to avoid any projection issues
    - After 3 nuclear options, one 1 file (Dry Fuel) would load in. After reclassifying other data so 2,3 and 4 = 1, only Dry Fuel would not load in. Instead of attempting to fix it again, just filled background patches with yellow
* At this point, I had basic map of a portion Central Way

ABM Development

* Using the basic Fire Model found in the Model Library in NetLogo
  + Classify patches to these colors
    - Green - Wet Fuel
    - Yellow - Dry Fuel
    - Blue - Water
    - Red - Fire
    - Gray - Developed (towns, cities, roads, power lines)
* Agent/Turtle Behavior
  + Agents are Fire, both the ignition and spread
    - When “Start” is run, model will randomly select a fuel cell that is adjacent to a developed cell to start a fire
      * May select multiple ignition points simultaneously or a separate them by random timespans depending on time
    - Fire will look at neighboring patches and spread to one or more
      * Wet fuel will have a lower probability of spread, Dry fuel will have a high probability, developed with have some probability, water no probability
  + Successfully redesigned model where dry patches along the western edge that were next to developed patches were ignition points (4 patches)
* Model Improvement
  + Improved model by randomly selecting dry patches next to developed patches anywhere in the world to ignite, 1-6 patches selected in each run
    - Always around 97% burned
    - Expected
  + If initial development is successful then complexity will be added by adding variable sliders. Potential variables:
    - Precipitation
      * Created slider for precipitation, 0-10 inches
        + Region gets 5-10 annually
      * Based on amount of rainfall, randomly selected dry patches are converted to wet

Relevant Code (From Crooks)