Quality Measurements

- Water
  - Get sensor to measure turbidity and TDS
    - https://www.dfrobot.com/product-1662.html
    -
  - Turbidity measures water clarity so activity could be testing clear water and dirty water, could dump dirt in a cup
  - TDS measures total dissolved solids in water so activity could be comparing normal water with salt water

  - https://www.instructables.com/Arduino-Water-Quality-Monitoring-System/
  - https://www.dfrobot.com/blog-679.html
  - https://forum.arduino.cc/t/turbidity-sensor-coding/384299/4
  - Turbidity Sensor: https://www.digikey.com/en/products/detail/dfrobot/SEN0189/6588606?utm_adgroup=&utm_source=google&utm_medium=cpc&utm_campaign=PMax%20Shopping_Product_Low%20ROAS%20Categories&utm_term=&utm_content=&utm_id=go_cmp-20243063506_adg-_ad-__dev-c_ext-_prd-6588606_sig-Cj0KCQjwpNuyBhCuARIsANJqL9Ou-MuPYDVIBFT3V3QL1libeIgehK2LqvQ_vwl-1G9w2i3gY5Rru8MaAkSGEALw_wcB&gad_source=1&gclid=Cj0KCQjwpNuyBhCuARIsANJqL9Ou-MuPYDVIBFT3V3QL1libeIgehK2LqvQ_vwl-1G9w2i3gY5Rru8MaAkSGEALw_wcB

- Air
  - Get CO2 sensor
    - https://www.amazon.com/Infrared-0-5000ppm-Monitor-Dioxide-MH-Z19B/dp/B07L6QZDK7
    - https://www.amazon.com/dp/B0B7MBM7RN/ref=sspa_dk_detail_1?psc=1&pd_rd_i=B0B7MBM7RN&pd_rd_w=sofyc&content-id=amzn1.sym.f734d1a2-0bf9-4a26-ad34-2e1b969a5a75&pf_rd_p=f734d1a2-0bf9-4a26-ad34-2e1b969a5a75&pf_rd_r=NZS18YCCKMJYE7NSR8QX&pd_rd_wg=OdHe2&pd_rd_r=14ef06bb-fd22-420d-b72e-f1cc69cb9396&s=industrial&sp_csd=d2lkZ2V0TmFtZT1zcF9kZXRhaWw
  - Test current V1.1 around campus and downtown to see if there is a measurable difference
    - Test inconclusive, reading didn't change much throughout golden but did change closer to denver
  - Add ppm measurement
  - Test activity where you put sensor in a container with alcohol
  - Find out exactly what MQ-135 sensor is doing and what the values mean
  - Useful Articles
    - https://pubs.acs.org/doi/10.1021/acs.jchemed.8b00473
    - https://www.co2meter.com/blogs/news/carbon-dioxide-indoor-levels-chart

- Noise
  - Get better sound sensor
  - Sound Sensor:

https://www.digikey.com/en/products/detail/seeed-technology-co.,-ltd/101020023/5482608?utm_adgroup=&utm_source=google&utm_medium=cpc&utm_campaign=PMax%20Shopping_Product_Low%20ROAS%20Categories&utm_term=&utm_content=&utm_id=go_cmp-20243063506_adg-_ad-__dev-c_ext-_prd-5482608_sig-Cj0KCQjwpNuyBhCuARIsANJqL9PefB6K_2OM-sI8TE6gV2Mtk7SoQqVrEP_rfvyehfuA-KaiQBIEwiUaAl6SEALw_wcB&gad_source=1&gclid=Cj0KCQjwpNuyBhCuARIsANJqL9PefB6K_2OM-sI8TE6gV2Mtk7SoQqVrEP_rfvyehfuA-KaiQBIEwiUaAl6SEALw_wcB

- Update code to measure sound level more accurately and convert it to dB scale
- Calibrate the sensor so it is more accurate
- Walk around downtown to see if you can make meaningful measurements

- Soil
  - Test soil sensor using arduino
  - Activity could be putting dirt in a cup and have them pour water in it until the sensor gives the green signal
  - https://projecthub.arduino.cc/nikolaiapalis/simple-soil-moisture-sensor-ec23c7
- LED bar graph circuits
  - https://www.nutsvolts.com/magazine/article/led-graph-circuits
  - https://www.youtube.com/watch?app=desktop&v=fYucJgqQYuA&ab_channel=SteveGarratt
  - https://www.youtube.com/watch?v=DvmW-cX00Kg&ab_channel=learnelectronics

Renewables

- Wind
  - Find small wind turbine that can be used with arduino
    - https://www.amazon.com/Sntieecr-Mini-Generator-Motors-3V-12V-DC-Motor-Generator-Educational-Experiment/dp/B0922N8MCR/ref=cm_cr_arp_d_product_top?ie=UTF8&th=1
  - Write code to measure power output and power produced over a certain time period
    - https://www.instructables.com/The-Interactive-Windmill/
  - Explore solar tower with pinwheels at the top

- Solar
  - Test solar panel from Dr. Wakin
  - Find small solar cell
    - https://www.amazon.com/Kanayu-Panels3V-Polycrystalline-Photovoltaic-Flashlight/dp/B0C8NTZ3QG/ref=asc_df_B0C8NTZ3QG/?tag=hyprod-20&linkCode=df0&hvadid=693071376145&hvpos=&hvnetw=g&hvrand=5896674820081796017&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9028824&hvtargid=pla-2204166224113&psc=1&mcid=8d8316b55de23221a8824f95c3d8d3ca&gad_source=1
  - Write code to measure power output and power produced over a time period
  - Explore solar ovens

- Helpful Articles
    - https://dronebotworkshop.com/dc-volt-current/
    - https://www.instructables.com/Voltage-Measurement-Using-Arduino/
    - https://www.youtube.com/watch?v=LSBpb18zcp0&ab_channel=SimplyPut
- Arduino options
    - https://www.amazon.com/ATmega328P-Microcontroller-Compatible-Electronics-Development/dp/B09J8RLJ5L/ref=sr_1_10?dib=eyJ2IjoiMSJ9.UR9t6Z2D5rIVJIr8NPSrk3wUQkkYYp4UX0eOYfAC6mwlJF73JhGFaxTNEDFvUIqWPgeNkVjYwVXBALU47xJ0xvi7CT5XbxYEqL5t12Trm1HLCTSvc0L4uxYaLL-IuQPe1-iDIjoYElu_dsMvnMaqKvuwfSUajg9tvCay_7QViuyxt_xPQEXgX40EqcwD6HeCJTdQJ4VSUO41Pda21-VXxnfZ0cybLqxRst1vnhCsvnw.yWfHsZYg-7f96hDMgvpwp35fmo2oaIxVkVsqckT0nvk&dib_tag=se&hvadid=616863312120&hvdev=c&hvlocphy=9028824&hvnetw=g&hvqmt=e&hvrand=6722845733262545369&hvtargid=kwd-15608517219&hydadcr=24663_13611861&keywords=arduino%2Bnano&qid=1719433974&sr=8-10&th=1
    -

Wildfire Risk Assessment

- Find wind speed sensor
    - https://www.amazon.com/Fxhan-Speed-Sensor-Measurement-Generation/dp/B09F3FN84T/ref=sr_1_8?dib=eyJ2IjoiMSJ9.YJY15rZcA8OkhLs38sAkK_NowK5Vc77KnqNKv8sGOQpKgRpf8Ezy1lVoKZKbS-CPyrX_sFEZ5K0GJJti4DGfqlUUaiuzejLgS8lcpgsIjtqys_FwWzOYXjvDo3j6V7cKE_-J9r8YIO9h0ZS1nBUsM_8IuaZmYkLYE2eWxDyOFOw2vnUKpTnMT4AtEJb_WoER0meRVCtAyX0af78X2nGT6Qf-onBZ2u3G4GoRIwTvzfo.LRF1s-83VckeQf2g6cY743MxOI05Y7aV49Wy8x6RiUY&dib_tag=se&hvadid=557525976601&hvdev=c&hvlocphy=9028825&hvnetw=g&hvqmt=e&hvrand=11623541863317929952&hvtargid=kwd-35578737524&hydadcr=18009_13447378&keywords=arduino+wind+sensor&qid=1719242713&sr=8-8
    - https://www.aliexpress.us/item/3256805935576816.html?src=google&gatewayAdapt=glo2usa
    - https://www.aliexpress.us/item/3256805907008585.html?spm=a2g0o.detail.pcDetailTopMoreOtherSeller.4.319eKVutKVut4z&gps-id=pcDetailTopMoreOtherSeller&scm=1007.40050.354490.0&scm_id=1007.40050.354490.0&scm-url=1007.40050.354490.0&pvid=9a5f083c-4e3e-4129-bf32-c42de80fa8d0&_t=gps-id:pcDetailTopMoreOtherSeller,scm-url:1007.40050.354490.0,pvid:9a5f083c-4e3e-4129-bf32-c42de80fa8d0,tpp_buckets:668%232846%238115%232000&pdp_npi=4%40dis%21USD%2112.11%216.30%21%21%2112.11%216.30%21%402101cff817192433546455921e39f9%211200003570384461 8%21rec%21US%21%21AB&utparam-url=scene%3ApcDetailTopMoreOtherSeller%7Cquery_from%3A
    - https://www.aliexpress.us/item/3256805313989326.html?spm=a2g0o.productlist.main.7.43ddva7Sva7SXQ&algo_pvid=a237cfdb-1c77-4cc5-bc78-dc89f2f804d7&aem_p4p_detail=202406240842349315233561155020000345322&algo_exp_id=a237cfdb-1c77-4cc5-bc78-dc89f2f804d7-3&pdp_npi=4%40dis%21USD%2126.42%2113.21%21%21%2126.42%2113.21%21%402101e5f11719243754401110 1e4233%211200003332590686 2%21sea%21US%210%21AB&curPageLogUid=SEWET0KIL5Gm&utparam-url=scene%3Asearch%7Cquer

y_from%3A&search_p4p_id=20240624084234931523356115502000034532
2_1

- Measure wind speed, humidity, temperature
- Calculate fire risk
- https://github.com/TheESTest/Weather_Station/blob/main/Wind_Speed_And_Direction.ino
- https://www.elationsportstechnologies.com/post/emt-conduit-mounted-weather-station-wind-sensors

Explore other options for activities that are simpler and not as technical