## Process

1. Import data from files and URLs
2. Convert point and line features to polygons using the Buffer tool
   1. Rivers, Stems, and Tributaries (10ft buffer)
   2. Springs (10ft buffer)
   3. Streams (0.5ft buffer) - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5807321/>
   4. Central Arizona Project (80ft buffer) - <https://www.cap-az.com/about/faq/#:~:text=How%20wide%20is%20the%20canal,80%20feet%20across%20the%20bottom>.
3. Calculate an “Item” field for each layer that indicates the environmental indicator category and the name of the feature
   1. Naming Convention: ‘Environmental Indicator Category (Subcategory) – Item Name’
4. Clip each layer to the sun cloud region
5. Field formatting
   1. Drop fields that we don’t need from each layer
   2. Rename fields
   3. Add “Source” and “Category” fields to each layer
   4. Do any additional field calculation and formatting to create a consistent data structure across layers
6. Merge Layers (match
   1. Merge each layer within each environmental indicator category
   2. Merge each environmental indicator category layer in to one NEPA layer
7. 29,636 features
8. Take the counties layer and dissolve it so that we have the shape of the sun cloud boundary – use the clip tool to clip all of the layers that are only displaying the features that are within the boundary
9. Remove the linear features (Rivers, Stems, Tributaries, Streams) and put them in their own layer
   1. These will not be counted in the count overlapping features tool because it would make too many polygons
10. Run Count Overlapping features to create a layer that provides the count of features within each polygon’s geography – it will show where there are multiple overlapping indicators
11. Save all 3 layers into the nepa final geodatabase
    1. NEPA Feature Count Layer
    2. NEPA Features layer
    3. Rivers, Stems, Tributaries, and Streams layer

## Data Layers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Layer | Description | Type | Source |
| Water Resources | Lakes and Reservoirs | This polygon cover consists of all the lakes in Arizona. | Polygon | [University of Arizona Institutional Repository](https://uair.library.arizona.edu/item/292543/browse-data/Water) |
| Major Rivers, Main Stems, Primary and Secondary Tributaries | Data layer depicts all rivers and streams. | Line |
| Springs | This coverage consists of spring locations in Arizona. | Point |
| Streams | This coverage consists of stream locations in Arizona. | Line |
| Recharge Areas | Depicts geographic boundaries of recharge areas. | Polygon |
| Central Arizona Project | Depicts the Central Arizona Project aqueduct. | Line |
| Sole Source Aquifers (SSA) | SSAs supply at least 50% of the drinking water consumed in the area overlying the aquifer. These areas may have no alternative drinking water source(s) that could physically, legally and economically supply all those who depend on the aquifer for drinking water. | Polygon | [EPA](https://catalog.data.gov/dataset/epa-sole-source-aquifers) |
| Air Quality | Lead | Lead particulate matter level in air in micrograms per cubic meter (µg/m3). | Polygon | [EPA EJ Screen Indexes](https://catalog.data.gov/dataset/ejscreen-indexes-2019-public-release) |
| PM 2.5 | Particulate matter (PM2.5) levels in air, micrograms per cubic meter (µg/m3) annual average. |
| Ozone | Ozone summer seasonal avg. of daily maximum 8-hour concentration in air in parts per billion. |
| Archaeological and Natural Heritage Resources | National Historic Landmarks and Historic Places | Districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture. | Polygon | [National Register of Historic Places](https://irma.nps.gov/DataStore/Reference/Profile/2210280/) |
| Critical Habitats | Critical habitats | Critical habitats designated by the U.S. Fish and Wildlife Service for all threatened species and endangered species under the Endangered Species Act, with certain specified exceptions. | Polygon | [US Fish and Wildlife Service](https://ecos.fws.gov/ecp/report/table/critical-habitat.html) |
| Important Bird Areas |  | Polygon | [Audubon Society](https://library-audubon.hub.arcgis.com/datasets/9217fd74cf8b4e47bd2d77720a757873/explore?layer=0&location=39.391901%2C65.812499%2C3.58) |
| Wilderness Area | Boundary line features depicting the Arizona BLM NLCS Wilderness Area Boundaries | Polygon | [Bureau of Land Management](https://gis.blm.gov/azarcgis/rest/services/nlcs/BLM_AZ_WLD/FeatureServer/0) |
| Priority Linkage Zones | Biologists, engineers, planners and land managers from nine public agencies have worked together since 2004 to identify large blocks of protected habitat, the potential wildlife movement corridors through and between them, the factors that could possibly disrupt these linkage zones and opportunities for conservation. The assessment document (below) and map are the initial efforts to identify potential linkage zones that are important to Arizona’s wildlife and natural ecosystems. This is only the first step in a continuing process of defining critical habitat connectivity areas. This nonbinding document and map serve as an informational resource to planners and engineers, providing suggestions for the incorporation of these linkage zones into their management planning to address wildlife connectivity at an early stage of the process. If considerations for wildlife connectivity can be integrated into regional planning and projects early in the process, the linkage areas (or some portion of them) have the potential to be maintained or conserved during this time of growth and development. Recognizing that habitat connectivity is a landscape issue involving multiple land jurisdictions, this workgroup has engaged in unprecedented cooperation and facilitated discussions and partnerships to help ensure a unified approach to wildlife linkage conservation and management. This reinforces the commitment to and efficiency of wildlife connectivity measures undertaken by all stakeholders, using research and adaptive management in ongoing evaluations of those measures. | Polygon | [AZ DOT](https://azdot.gov/business/environmental-planning/programs/wildlife-linkages) |
| Priority Linkage Zones across Habitat | Polygon |
| Conservation Priority Areas | This contains geographic information pertaining to priority conservation areas in western North America. The region encompasses a sequence of mountain ranges, including the Rocky Mountains, that form the backbone or spine of the western North America, along with the surrounding deserts and semi-arid lands. Priority conservation areas (conservation areas) are geographic areas that have been selected because of the sensitive biological species, habitats, and features (targets) that are known to occur in these areas. Conservation, protection, and management actions within these areas should be prioritized in order to ensure persistence and survival of these sensitive biological features. | Polygon | [AZ Conservation Areas](https://azconservation.org/project/natural_infrastructure_data_sources/) |
| Grasslands | The grassland assessment identifies high-quality native grasslands in Arizona, New Mexico, and northern Mexico. This assessment was conducted by TNC, the Bureau of Land Management, the Natural Resources Conservation Service, the U.S. Forest Service, the University of Arizona, and the Arizona State Land Department. For the natural infrastructure composite layer, we excluded priority grasslands from the Apache Highlands ecoregion, which are accounted for in the ecoregional assessment core habitat layer. | Polygon |
| Grazing Allotments | This polygon feature class is part of a multi-purpose dataset. It will aid in the administration of these grazing allotments under the Bureau of Land Management's (BLM's) grazing program, and also in scientific, integrated land use planning or other activities that would affect, or be affected by, livestock grazing. | Polygon | [Bureau of Land Management](https://hspartner.maps.arcgis.com/home/item.html?id=b81b0e4909934f2da26a1ee452d5c64a&sublayer=0) |
| Tribal Lands | American Indian and Alaska Native Land Area Representation (AIAN-LAR) | The American Indian/Alaska Native/Native Hawaiian (AIANNH) Areas Shapefile includes the following legal entities: federally recognized American Indian reservations and off-reservation trust land areas, state-recognized American Indian reservations, and Hawaiian home lands (HHLs). The statistical entities included are Alaska Native village statistical areas (ANVSAs), Oklahoma tribal statistical areas (OTSAs), tribal designated statistical areas (TDSAs), and state designated tribal statistical areas (SDTSAs). Joint use areas are also included in this shapefile refer to areas that are administered jointly and/or claimed by two or more American Indian tribes. The Census Bureau designates both legal and statistical joint use areas as unique geographic entities for the purpose of presenting statistical data. Note that tribal subdivisions and Alaska Native Regional Corporations (ANRCs) are additional types of American Indian/Alaska Native areas stored by the Census Bureau, but are displayed in separate shapefiles because of how they fall within the Census Bureau's geographic hierarchy. The State of Hawaii's Office of Hawaiian Home Lands provides the legal boundaries for the HHLs. The boundaries for ANVSAs, OTSAs, and TDSAs were delineated for the 2010 Census through the Tribal Statistical Areas Program (TSAP) by participants from the federally recognized tribal governments. The Bureau of Indian Affairs (BIA) within the U.S. Department of the Interior (DOI) provides the list of federally recognized tribes and only provides legal boundary information when the tribes need supporting records, if a boundary is based on treaty or another document that is historical or open to legal interpretation, or when another tribal, state, or local government challenges the depiction of a reservation or off-reservation trust land. | Polygon | [U.S. Census Bureau, Department of Commerce](https://catalog.data.gov/dataset/tiger-line-shapefile-2018-nation-u-s-current-american-indian-alaska-native-native-hawaiian-area) |

Old Notes

1. Identify if any of the layers are within the project location’s boundaries or within a certain distance of the project location.
2. Weight each layer to generate a score that would indicate environmental impact
3. Based on the score, recommend a particular NEPA review process.
4. Overlay exercise – create a polygon layer that could look like a chloroplath or topographic map
   1. Would provide the geographic context for the project location – or within a certain distance of the project location
   2. Would need to go through the list of the layers

**Data Layer Development**

* Dissolve tool
  + There is a tool where you can convert a line into a polygon but it doesn’t always work
  + Might want different geometry type layers
    - Develop Jupiter notebook for arcgis pro so that it is repeatable – fully automated. Can document text as well and explain the process
    - The spatial reference code is in the documentation – check that
* How do I see that changes happening in arcgis as I’m coding in visual studio
* Process
  + Create ArcGIS Project
  + Code in ArcGIS Pro
* Stored Data
  + Store it if it’s not easily reproducible – but we want the repository to be light so if you can write a line of code that will pull the data from source, then do that if you can
* Immediate Next Steps
  + Apply to AZGEO access – it is the arizona’s hub
    - We have to have accounts so that we can publish the data
    - Once they create a user account, we have to send another request to get a developer account
* Structure
  + Repository: create NEPA folder – within this folder, create a Jupiter Notebook file,
    - Output: NEPA data layer will be published to AZGEO so mark can review it
  + ArcGIS Pro: connect to the NEPA folder so you can access the notebook
    - Created a Jupyter notebook within the arcgis project that sits in the repository
      * Can open this notebook in visual studio code to do any of the edits
      * Document every step
* First step
  + Write the code that will pull the data down from the sources – refer to it
    - Look at other peoples code as example
    - More of a reference layer
  + Just ping Ahjung as things come up – technical questions specifically.
    - Give mark the status upadtes

Need Feature Servers not Map Servers

* Go back and find new data for the ArcGIS Pro Project Items
* Go to the maps and find the source layer URL and then use the export features function to create a local copy of your geodatabase – document where you are getting the link (include the URL of the hosted features layer)
  + Note that this must be done with the feature layers not the map server

Merge everything into a single layer with the merge source indicating the original layer source