Supplementary Information
Promoting transdisciplinary assessment of nature-based solutions through a novel sustainability tool

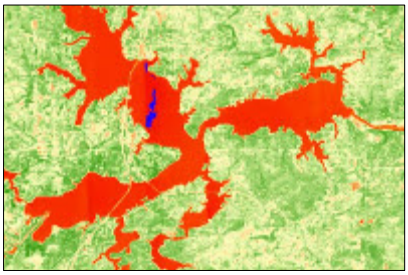
Contents of this file:

This document contains the static contents of the Item Description web-page for each Esri Living Atlas of the World dataset referenced in the NBS-Geo web mapping application. These contents were collected on May 22, 2021 and may change in the future. The data descriptions, attributions, and REST URLs are archived here to showcase the types of information used for multi-functional NBS planning and serve as a foundation for future web-based data frameworks aimed at integrating the domains of hydrology, environment, sociology, and ecology in light of future climate and land use changes. The links contained here within may also be used as additional source references for dataset backgrounds, methodologies, assumptions, and usages, as provided by the data content creator.

The order of dataset descriptions follows Table 2 in the main article.

1. Vegetation Index
2. Imperiled Species
3. Open Spaces
4. Intact Habitat Cores
5. Air Quality, $PM_{2.5}$
6. Opportunity Zones
7. Social Vulnerability
8. Health Statistics
9. Urban Heat Islands
10. Building Footprints
11. Soils Erodability
12. Crime Index
13. Transportation Noise
14. Temperature Anomaly (2040-2059)
15. Precipitation Anomaly (2040-2059)
16. Land Cover Change (2050)
17. Environmental Facilities
18. Air Quality Monitors
19. Stream Gauges
20. Flood Hazard Areas
21. Dam Inventory
22. Wetlands
23. Rainfall
24. Soils Hydrology
25. Terrain Elevation
26. Land Cover
27. Impervious Cover

1: USA NAIP Imagery: NDVI



This NDVI imagery layer features recent high-resolution (1m or better) aerial imagery for the continental United States, made available by the USDA Farm Services Agency.

Created: Jun 30, 2014. Updated: Nov 4, 2020. Accessed: May 22, 2021.

Description:
This Normalized Difference Vegetation Index (NDVI) imagery layer features recent high-resolution (1m or better) aerial imagery for the continental United States, made available by the USDA Farm Services Agency. The National Agriculture Imagery Program (NAIP) acquires aerial imagery during the agricultural growing seasons in the continental United States. Approximately half of the US is collected each year and each state is typically collected every other year.

This imagery layer is updated annually as new imagery is made available. The NAIP program aims to make the imagery available to governmental agencies and to the public within a year of collection. The imagery is published in 4-bands (Red, Green, Blue, and Near Infrared) where available. Additional NAIP renderings include Natural Color and Color Infrared.

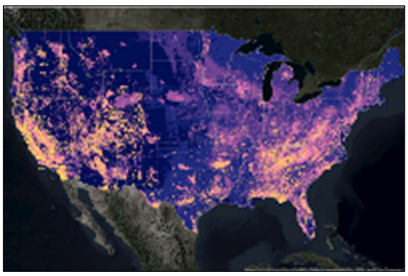
This imagery layer currently includes NAIP 2010-2019 imagery, most recently updated to include NAIP 2019 imagery for 23 states. You can discover and access other maps and layers available for NAIP through the Living Atlas of the World and through the NAIP Imagery group.

All imagery in this layer is sourced from the NAIP Registry of Open Data on AWS.

Credits (Attribution): Esri, USDA Farm Service Agency

REST URL: https://naip.arcgis.com/arcgis/rest/services/NAIP/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=aa9c87d6f17b452296252bd75005f6a4

2: Summed Range-size Rarity of Imperiled Species



Summed range-size rarity of species in the lower 48 United States that are protected by the Endangered Species Act and/or considered to be in danger of extinction.

Created: Feb 4, 2020. Updated: Mar 23, 2021. Accessed: May 22, 2021.

Description:
This map displays the summed range-size rarity of species in the lower 48 United States that are protected by the Endangered Species Act and/or considered to be in danger of extinction. It is part of the Map of Biodiversity Importance (MoBI) data collection, a series of maps that identify areas of high importance for protecting species from extinction in the contiguous United States.

Building on habitat suitability models for 2,216 of the nation's most imperiled species, and information on range size and degree of protection derived from those models, the MoBI project provides a series of maps

that can help inform conservation efforts. This map depicts summed range-size rarity for Critically Imperiled (categorized by NatureServe as "G1"), Imperiled ("G2"), and ESA-listed (i.e., full species listed as Endangered or Threatened under the Endangered Species Act) species in the following groups:

- Vertebrates (birds, mammals, amphibians, reptiles, freshwater fishes; 309 species)
- Freshwater invertebrates (mussels and crayfishes; 228 species)
- Pollinators (bumblebees, butterflies, and skippers; 43 species)
- Vascular plants (1,636 species)

High values identify areas where species with very small ranges (and thus fewer places where they can be conserved) are likely to occur; the presence of multiple imperiled species contributes to higher scores.

Habitat models for most species were generated using the random forest algorithm with (1) NatureServe Network, USGS BISON, and other sources of population and locality data and (2) environmental predictors representing terrain, climate, land cover, soils, and hydrology. The modeling resolution for terrestrial species was either 30 m (most species) or 330 m (some wide-ranging species). Models for aquatic species used the medium resolution National Hydrography Dataset (NHD) as the modeling unit. For species not amenable to random forest modeling, habitat maps were derived by buffering locality data and/or building simple deductive models based on habitat information. NatureServe converted habitat maps to a 990-m raster to provide a consistent unit of aggregation and avoid revealing the precise location of sensitive species. Range-size rarity for each species is the inverse of the total area mapped as habitat (using the 990-m raster). Summed range-size rarity is the sum of the range-size rarity values for all species with habitat that overlaps a cell. These data layers are intended to identify areas of high potential value for on-the-ground biodiversity protection efforts. As a synthesis of predictive models, they cannot guarantee either the presence or absence of imperiled species at a given location. For site-specific decision-making, these data should be used in conjunction with field surveys and/or documented occurrence data, such as is available from the NatureServe Network.

Credits (Attribution): NatureServe Network 2020

REST URL: https://landscape12.arcgis.com/arcgis/rest/services/
USA_CONUS_imperiled_species_rangesize_rarity_All/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=573503885ed24739ac658b263edd632c

3: USA Protected Areas – GAP Status 1-4



This layer displays all lands contained in the Protected Areas Database of the United States.

Created: Jan 31, 2017. Updated: May 5, 2021. Accessed: May 22, 2021.

Description:
The Protected Areas Database of the United States provides a comprehensive map of lands protected by government agencies and private land owners. This database combines federal lands with information on state and local government lands and conservation easements on private lands to create a powerful resource for land-use planning.

Dataset Summary
Phenomenon Mapped: Areas mapped in the Protected Areas Data base of the United States
Units: Meters, Cell Size: 30.92208102 meters, Source Type: Discrete
Pixel Type: 8-bit unsigned integer
Data Coordinate System: WGS 1984, Mosaic Projection: Web Mercator Auxiliary Sphere
Extent: 50 United States plus Puerto Rico, the US Virgin Islands, the Northern Mariana Islands and other Pacific Ocean Islands.
Source: USGS National Gap Analysis Program PAD-US version 2.1
Publication Date: September 2020
ArcGIS Server URL: https://landscape10.arcgis.com/arcgis/
This layer displays lands mapped in Protected Areas Database of the United States version 2.0 created by the USGS National Gap Analysis Program. This layer displays all four GAP Status classes:

- GAP Status 1 - Areas managed for biodiversity where natural disturbances are allowed to proceed
- GAP Status 2 - Areas managed for biodiversity where natural disturbance is suppressed
- GAP Status 3 - Areas protected from land cover conversion but subject to extractive uses such as logging and mining
- GAP Status 4 - Areas with no known mandate for protection

The source data for this layer are available here. A feature layer published from this dataset is also available. The service behind this layer was published with 8 functions allowing the user to select different views of the service. Other layers created from this service using functions include:

- USA Protected Areas
- USA Protected from Land Cover Conversion
- USA Unprotected Areas
- USA Protected Areas - Gap Status 1
- USA Protected Areas - Gap Status 2
- USA Protected Areas - Gap Status 3
- USA Protected Areas - Gap Status 4

Credits (Attribution): USGS, Esri

REST URL: https://landscape10.arcgis.com/arcgis/rest/services/USA_Protected_Areas/ImageServer
Page URL: https://arcgis.com/home/item.html?id=5929d41b496f4747ba6a7f588ca618a9

4: Intact Habitat Cores



This layer represents modeled Intact Habitat Cores, or minimally disturbed natural areas. It was created as part of Esri's Green Infrastructure Initiative and is one of five companion layers that can be used for Green Infrastructure Planning.

Created: May 11, 2017. Updated: Jul 7, 2017. Accessed: May 22, 2021.

Description:
This layer was created as part of Esri's Green Infrastructure Initiative and is one of five newly generated companion datasets that can be used for Green Infrastructure (GI) planning at national, regional, and more local scales. If used together, these layers should have corresponding date-based suffixes

(YYYYMMDD). The corresponding layer names are: Intact Habitat Cores, Habitat Connectors, Habitat Fragments, Habitat Cost Surface, and Intact Habitat Cores by Betweenness. These Esri derived data, and additional data central to GI planning from other authoritative sources, are also available as Map Packages for each U.S. State and can be downloaded from the Green Infrastructure Data Gallery.

This layer represents modeled Intact Habitat Cores, or minimally disturbed natural areas at least 100 acres in size and greater than 200 meters wide. Esri created these data following a methodology outlined by the Green Infrastructure Center Inc. These data were generated using 2011 National Land Cover Data. Cores were derived from all "natural" land cover classes and excluded all "developed" and "agricultural" classes including crop, hay and pasture lands. The resulting cores were tested for size and width requirements (at least 100 acres in size and greater than 200 meters wide) and then converted into unique polygons. This process resulted in the generation of over 550,000 cores. Cores were then overlaid with a diverse assortment of physiographic, biologic and hydrographic layers to populate each core with attributes (53 in total) related to the landscape characteristics found within. These data were also compiled to compute a "core quality index", or score related to the perceived ecological value of each core, to provide users with additional insight related to the importance of each core when compared to all others. See this map image layer for a version that includes popups and ability to query the data.

The source data used to derive this attribution is as follows:

- Number of endemic species (Mammals, Fish, Reptiles, Amphibians, Trees) (Jenkins, Clinton N., et. al, (April 21, 2015) US protected lands mismatch biodiversity priorities, PNAS vol.112, no. 16)
- Priority Index areas: Endemic species, small home range size and low protection status. (Jenkins, Clinton N., et. al, (April 21, 2015) US protected lands mismatch biodiversity priorities, PNAS vol.112, no. 16)
- Unique ecological systems (based upon work by Aycrig, Jocelyn L, et. al. (2013) Representation of Ecological Systems within the Protected Areas Network of the Continental United States. PLos One 8(1):e54689). New data constructed by Esri staff, using TNC Ecological Regions as summary areas.
- Ecologically relevant landforms (Theobald DM, Harrison-Atlas D, Monahan WB, Albano CM (2015) Ecologically-Relevant Maps of Landforms and Physiographic Diversity for Climate Adaptation Planning. PLoS ONE 10(12): e0143619. doi:10.1371/journal.pone.0143619 ,
- Local Landforms (produced 3/2016) by Deniz Basaran and Charlie Frye, Esri, 30 m* resolution. "Improved Hammond's Landform Classification and Method for Global 250-m Elevation Data" by Karagulle, Deniz; Frye, Charlie; Sayre, Roger; Breyer, Sean; Aniello, Peter; Vaughan, Randy; Wright, Dawn, has been successfully submitted online and is presently being given consideration for publication in Transactions in GIS. *We scaled the neighborhood windows from the 250-meter method described in the paper, and then applied that to 30-meter data in the U.S.
- National Elevation Dataset, USGS, 30 m resolution
- NWI – National Wetlands Inventory " Classification of Wetlands and Deepwater Habitats of the United States". U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31 , U.S. Fish and Wildlife Service, Division of Habitat and Resource Conservation (prepared 10/2015)
- NLCD 2011 – National LandCover Database 2011 (downloaded 1/2016) Homer, C.G., et. al. 2015,Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v. 81, no. 5, p. 345-354
- NHDPlusV2 Received from Charlie Frye, Esri 3/2016. Produced by the EPA with support from the USGS.
- gSSURGO –Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Accessed 3/2016, 30 m resolution
- GAP Level 3 Ecological System Boundaries (downloaded 4/ 2016) NOAA CCAP Coastal Change Analysis Program Regional Land Cover and Change–downloaded by state (3/2016) from: C-CAP FTP Tool, see Description of this 30 m resolution, 2010 edition of data
- NHD USGS National Hydrography Dataset
- TNC Terrestrial Ecoregions (downloaded 3/2016)
- 2015 LCC Network Areas

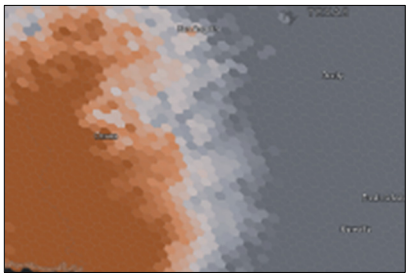
Evaluation:
The creation of a national core quality index is a very ambitious objective, given the extreme variability in ecosystem conditions across the United States. The additional attributes were intended to provide flexibility in accommodating regional or local environmental differences across the U.S.
Scripts for constructing local cores and scoring them using the Green Infrastructure Center's methodology are available on Esri's Green Infrastructure web site.

Two general approaches were used in the developing core quality index values. The first (default) follows the guidance of the Green Infrastructure Center's scoring approach developed for the southeastern US where size of the core is the primary determinant of quality. The second; Bio-Weights puts more emphasis on bio-diversity and uniqueness ecosystem type and de-emphasizes slightly the importance of core size. This is to compensate for the very large intact core habitat areas in the west and southwest which also have comparatively low biodiversity values.

Credits (Attribution): Green Infrastructure Center Inc., Esri

REST URL:
https://tiles.arcgis.com/tiles/nGt4QxSblgDfeJn9/arcgis/rest/services/GICores03_05_All_Cores/MapServer
Page URL: https://www.arcgis.com/home/item.html?id=0d2f35395c3c43ecb7685df9be63dd84

5: USA Particulate Matter (PM) 2.5



This layer contains particulate matter 2.5 (PM 2.5) air quality data for the US between 1998 and 2016 based on NASA SEDAC gridded data. The data is aggregated to states, counties, 116th congressional districts, and 50km hex bins.

Created: Apr 10, 2020. Updated: May 14, 2020. Accessed: May 22, 2021.

Description:
This layer shows particulate matter in the air sized 2.5 micrometers of smaller (PM 2.5). The data is aggregated from NASA Socioeconomic Data and Applications Center (SEDAC) gridded data into state, county, congressional district (116th) and 50 km hex bins. The unit of measurement is micrograms per cubic meter. The data is averaged for each year and over the the 19 years to provide an overall picture of air quality in the United States, including Puerto Rico. A space time cube was performed on a multidimensional mosaic version of the data in order to derive an emerging hot spot analysis. The county and state layers provide a population-weighted PM 2.5 value to emphasize which areas have a higher human impact. Each layer has been enriched with a set of 2019 US demographic attributes (excluding Puerto Rico) apportioned to the geography in order to map patterns alongside each other.

Citations:
van Donkelaar, A., R. V. Martin, M. Brauer, N. C. Hsu, R. A. Kahn, R. C. Levy, A. Lyapustin, A. M. Sayer, and D. M. Winker. 2018. Global Annual PM2.5 Grids from MODIS, MISR and SeaWiFS Aerosol Optical Depth (AOD) with GWR, 1998-2016. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4ZK5DQS. Accessed 1 April 2020
van Donkelaar, A., R. V. Martin, M. Brauer, N. C. Hsu, R. A. Kahn, R. C. Levy, A. Lyapustin, A. M. Sayer, and D. M. Winker. 2016. Global Estimates of Fine Particulate Matter Using a Combined Geophysical-Statistical Method with Information from Satellites. Environmental Science & Technology 50 (7): 3762-3772. https://doi.org/10.1021/acs.est.5b05833.

Boundaries:

- 50km hex bins generated using the Generate Tessellation tool
- States and counties come from 2018 TIGER boundaries with coastlines clipped
- 116th Congressional Districts come from this ArcGIS Living Atlas layer

Data processing notes:

1. NASA's GeoTIFF files for 19 years (1998-2016) were first brought into ArcGIS Pro 2.5.0 and put into a multidimensional mosaic dataset.
2. For each geography level, the following was performed:
    1. Zonal Statistics were run against the mosaic as a multidimensional layer.
    2. A Space Time Cube was created to compare the 19 years of PM 2.5 values and detect hot/cold spot patterns. To learn more about Space Time Cubes, visit this page.
    3. The Space Time Cube is processed for Emerging Hot Spots where we gain the trends and hot spot results.
    4. The Enrich tool was run to add 2019 Esri demographic and 2014-2018 ACS attributes to the geographies. Attributes such as population, poverty, minority population, and others were added to the layer.
3. To create the population-weighted attributes on the state and county layers, the hex value population values were used to create the weighting.
    1. Within each hex bin, the total population figure and average PM 2.5 were multiplied.
    2. The hex bins were converted into centroids and summarized within the state and county boundaries.
    3. The summation of these values were then divided by the total population of each state/county. This population value was determined by summarizing the population values from the hex bins within each geography.

Credits (Attribution): Green Infrastructure Center Inc., Esri

REST URL:
https://tiles.arcgis.com/tiles/nGt4QxSblgDfeJn9/arcgis/rest/services/GICores03_05_All_Cores/MapServer
Page URL: https://www.arcgis.com/home/item.html?id=6f250198d8e4461db70a1b5f055172fb

6: Qualified Opportunity Zones



This feature layer, utilizing data from the U.S. Department of the Treasury, depicts all opportunity zones in the United States.

Created: Jul 29, 2020. Updated: May 2, 2021. Accessed: May 22, 2021.

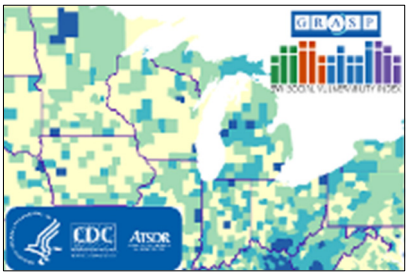
Description:
This feature layer, utilizing data from the U.S. Department of the Treasury, depicts all Qualified Opportunity Zones in the United States. Qualified Opportunity Zones were created under the 2017 Tax Cuts and Jobs Act to stimulate the economic development and job creation, by incentivizing long-term investments in low income neighborhoods. There are more than 8,760 Qualified Opportunity Zones located in all 50 states, the District of Columbia, and five United States territories. Investors can defer tax on any prior gains invested in a Qualified Opportunity Fund (QOF) until the earlier of the date on which the investment in a QOF is sold or exchanged or until December 31, 2026.

Data downloaded from: Opportunity Zones Resources ; For more information: Opportunity Now

Credits (Attribution): U.S. Department of the Treasury

REST URL:
https://services2.arcgis.com/FiaPA4ga0iQKduv3/arcgis/rest/services/Opportunity_Zones_1/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=c28056bb1d374d35936224b20f951b4a

7: CDC Social Vulnerability Index 2018



2018 Social Vulnerability Index (SVI). Created by the Centers for Disease Control and Prevention (CDC) / Agency for Toxic Substances and Disease Registry (ATSDR) / Geospatial Research, Analysis, and Services Program (GRASP).

Created: Mar 16, 2020. Updated: Mar 18, 2020. Accessed: May 22, 2021.

Description:

- **This feature layer visualizes the 2018 overall SVI for U.S. counties and tracts**
- **Social Vulnerability Index (SVI) indicates the relative vulnerability**
- **15 social factors grouped into four major themes**
- **Index value calculated for each county for 15 factors, four major themes, and the overall rank**

What is CDC Social Vulnerability Index?
ATSDR's Geospatial Research, Analysis & Services Program (GRASP) has created a tool to help emergency response planners and public health officials identify and map the communities that will most likely need support before, during, and after a hazardous event.

The Social Vulnerability Index (SVI) uses U.S. Census data to determine the social vulnerability of every county and tract. CDC SVI ranks each county and tract on 15 social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes:

- Socioeconomic
- Housing Composition and Disability
- Minority Status and Language
- Housing and Transportation

Variables
For a detailed description of variable uses, please refer to the full SVI 2018 documentation.

Rankings
We ranked counties and tracts for the entire United States against one another. This feature layer can be used for mapping and analysis of relative vulnerability of counties in multiple states, or across the U.S. as a whole. Rankings are based on percentiles. Percentile ranking values range from 0 to 1, with higher values indicating greater vulnerability. For each county and tract, we generated its percentile rank among all counties and tracts for 1) the fifteen individual variables, 2) the four themes, and 3) its overall position.

Overall Rankings:
We totaled the sums for each theme, ordered the counties, and then calculated overall percentile rankings. Please note: taking the sum of the sums for each theme is the same as summing individual variable rankings.

The overall tract summary ranking variable is RPL_THEMES.

Theme rankings:
For each of the four themes, we summed the percentiles for the variables comprising each theme. We ordered the summed percentiles for each theme to determine theme-specific percentile rankings. The four summary theme ranking variables are:

- Socioeconomic theme - RPL_THEME1
- Housing Composition and Disability - RPL_THEME2
- Minority Status & Language - RPL_THEME3
- Housing & Transportation - RPL_THEME4

Flags
Counties in the top 10%, i.e., at the 90th percentile of values, are given a value of 1 to indicate high vulnerability. Counties below the 90th percentile are given a value of 0. For a theme, the flag value is the number of flags for variables comprising the theme. We calculated the overall flag value for each county as the total number of all variable flags.

SVI Informational Videos
Introduction to CDC Social Vulnerability Index (SVI)
Methods for CDC Social Vulnerability Index (SVI)

More Questions?
CDC SVI 2018 Full Documentation
SVI Home Page
Contact the SVI Coordinator

Credits (Attribution): Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry/ Geospatial Research, Analysis, and Services Program

REST URL: https://services3.arcgis.com/ZvidGQkLaDJxRSJ2/arcgis/rest/services/CDC_Social_Vulnerability_Index_2018/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=cbd68d9887574a10bc89ea4efe2b8087

8: County Health Rankings 2020



This feature layer contains 2020 County Health Rankings data for nation, states, and counties. Includes measures of health factors (e.g., uninsured, child poverty, physical inactivity) & health outcomes (e.g., life expectancy, low birth weight).

Created: Mar 24, 2020. Updated: Jun 22, 2020. Accessed: May 22, 2021.

Description:
The County Health Rankings, a collaboration between the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute, measure the health of nearly all counties in the nation and rank them within states. This feature layer contains 2020 County Health Rankings data for nation, state, and county levels. The Rankings are compiled using county-level measures from a variety of national and state data sources.

Some example measures are:

- adult smoking, physical inactivity
- flu vaccinations
- child poverty
- driving alone to work

To see a full list of variables, as well as their definitions and descriptions, explore the Fields information by clicking the **Data tab** here in the Item Details. These measures are standardized and combined using scientifically-informed weights.

"By ranking the health of nearly every county in the nation, County Health Rankings & Roadmaps (CHR&R) illustrates how where we live affects how well and how long we live. CHR&R also shows what each of us can do to create healthier places to live, learn, work, and play – for everyone."

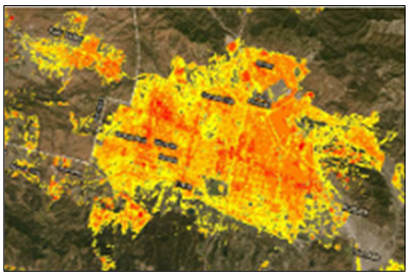
Some **new features of the 2020 Rankings data** compared to previous versions:

- More race/ethnicity categories
- Reliability flags that to flag an estimate as unreliable
- 5 new variables: math scores, reading scores, juvenile arrests, suicides, and traffic volume

Credits: University of Wisconsin Population Health Institute, Robert Wood Johnson Foundation

REST URL:https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/
services/CountyHealthRankings2020_WFL1/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=c514eddc6d584e85bc2f90be25305fc8

9: Urban Heat Islands for U.S. Cities



This image service contains the relative heat severity for every pixel for every city in the United States. This 30-meter raster was derived from Landsat 8 imagery band 10 (ground-level thermal sensor) from the summers of 2018 and 2019.

Created: Sep 13, 2019. Updated: Nov 26, 2019. Accessed: May 22, 2021.

Description:
This layer contains the relative heat severity for every pixel for every city in the United States. This 30-meter raster was derived from Landsat 8 imagery band 10 (ground-level thermal sensor) from the summers of 2018 and 2019.

Federal statistics over a 30-year period show extreme heat is the leading cause of weather-related deaths in the United States. Extreme heat exacerbated by urban heat islands can lead to increased respiratory difficulties, heat exhaustion, and heat stroke. These heat impacts significantly affect the most vulnerable—children, the elderly, and those with preexisting conditions.

The purpose of this layer is to show where certain areas of cities are hotter than the average temperature for that same city as a whole. Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the city), and 5 being a severe heat area (significantly above the mean for the city). The absolute heat above mean values are classified into these 5 classes using the Jenks Natural Breaks classification method, which seeks to reduce the variance within classes and maximize the variance between classes. Knowing where areas of high heat are located can help a city government plan for mitigation strategies.

This dataset represents a snapshot in time. It will be updated yearly, but is static between updates. It does not take into account changes in heat during a single day, for example, from building shadows moving. The thermal readings detected by the Landsat 8 sensor are surface-level, whether that surface is the ground or the top of a building. Although there is strong correlation between surface temperature and air temperature, they are not the same. We believe that this is useful at the national level, and for cities that don't have the ability to conduct their own hyper local temperature survey. Where local data is available, it may be more accurate than this dataset.

Dataset Summary
This dataset was developed using proprietary Python code developed at The Trust for Public Land, running on the Descartes Labs platform through the Descartes Labs API for Python. The Descartes Labs platform allows for extremely fast retrieval and processing of imagery, which makes it possible to produce heat island data for all cities in the United States in a relatively short amount of time.

What can you do with this layer?
This layer has query, identify, and export image services available. Since it is served as an image service, it is not necessary to download the data; the service itself is data that can be used directly in any Esri geoprocessing tool that accepts raster data as input.

Other Sources of Heat Island Information
Please see these websites for valuable information on heat islands and to learn about exciting new heat island research being led by scientists across the country:

EPA's Heat Island Resource Center: https://www.epa.gov/heat-islands/heat-island-resources
Dr. Ladd Keith, University of Arizona: https://www.laddkeith.com/
Dr. Ben McMahan, University of Arizona: https://www.climas.arizona.edu/about/people/ben-mcmahan
Dr. Jeremy Hoffman, Science Museum of Virginia: http://jeremyscotthoffman.com/about-me-shift#about
Dr. Hunter Jones, NOAA: https://cpo.noaa.gov/News/News-Article/ArtMID/6226/ArticleID/971/CPOs-Hunter-Jones-delivers-keynote-on-Climate-and-Extreme-Heat-at-Design-for-Risk-Reduction-Symposium-in-NYC
Daphne Lundi, Senior Policy Advisor, NYC Mayor's Office of Recovery and

Resiliency: https://youtu.be/sAHlqGDU0_4

Credits (Attribution): The Trust for Public Land, Descartes Labs, USGS

REST URL: https://server4.tplgis.org/arcgis4/rest/services/National_UHI/city_heat_islands/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=4f6d72903c9741a6a6ee6349f5393572

10: OpenStreetMap Buildings for North America



This feature layer provides access to OpenStreetMap buildings data for North America, which is updated frequently. Zoom in to large scales (e.g. 1:10k) to see the building features display. Click on feature for popup.

Created: Dec 20, 2019. Updated: Apr 14, 2021. Accessed: May 22, 2021.

Description:
This feature layer provides access to OpenStreetMap (OSM) buildings data for North America, which is **updated every 1 minute** with the latest edits. This hosted feature layer view is referencing a hosted feature layer of OSM polygon (closed way) data in ArcGIS Online that is updated with minutely diffs from the OSM planet file. This feature layer view includes building features defined as a query against the hosted feature layer (i.e. building is not blank).

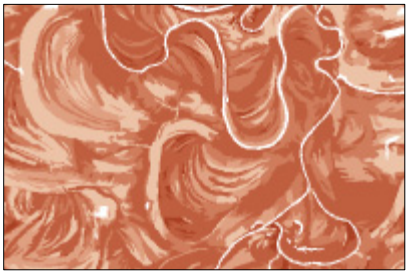
In OSM, a building is a man-made structure with a roof, standing more or less permanently in one place. These features are identified with a building tag. There are thousands of different tag values for building used in the OSM database. In this feature layer, unique symbols are used for several of the most popular building types, while lesser used types are grouped in an "other" category.

Zoom in to large scales (e.g. Streets level or 1:10k scale) to see the building features display. You can click on a feature to get the name of the building (if available). The name of the building will display by default at large scales (e.g. Street level of 1:5k scale). Labels can be turned off in your map if you prefer.

Credits (Attribution): © OpenStreetMap contributors

REST URL:
https://services6.arcgis.com/Do88DoK2xjTUCXd1/arcgis/rest/services/OSM_Buildings_NA/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=8573b205d20d4be38b6e11eb05dd151b

11: USA SSURGO – Erodibility Factor



Soil erodibility factor quantifies the susceptibility of soils to erosion and is used as a key input to the Universal Soil Loss Equation and other erosion models.

Created: Jun 19, 2017. Updated: May 19, 2021. Accessed: May 22, 2021.

Description:
Soil erodibility factor, also known as K factor, is one of the 5 inputs to the Universal Soil Loss Equation. Soil erodibility factor quantifies the susceptibility of soil particles to detachment and movement by water. For more information on how soil erodibilty factor is calculated see the National Soil Survey Handbook.

The Universal Soil Loss Equation is a mathematical model commonly used to estimate soil erosion rates. Originally designed for the management and conservation of farmland soils, the USLE is now used for a variety of other projects such as managing non-point pollution and sediment load in streams. In the United States, the equation is frequently used by federal agencies. For example federal regulations require that the Department of Agriculture identify highly erodible land based on the Universal Soil Loss Equation and its derivative models.

Dataset Summary:
Phenomenon Mapped: Erodibility factor
Units: None
Cell Size: 30 meters
Source Type: Discrete
Pixel Type: Unsigned integer
Data Coordinate System: USA Contiguous Albers Equal Area Conic USGS version (contiguous US, Puerto Rico, US Virgin Islands), WGS 1984 Albers (Alaska), Hawaii Albers Equal Area Conic (Hawaii), Western Pacific Albers Equal Area Conic (Guam, Marshall Islands, Northern Marianas Islands, Palau, Federated States of Micronesia, and American Samoa)
Mosaic Projection: Web Mercator Auxiliary Sphere
Extent: Contiguous United States, Alaska, Hawaii, Puerto Rico, Guam, US Virgin Islands, Marshall Islands, Northern Marianas Islands, Palau, Federated States of Micronesia, and American Samoa
Source: Natural Resources Conservation Service
Publication Date: July 2020
ArcGIS Server URL: https://landscape11.arcgis.com/arcgis/

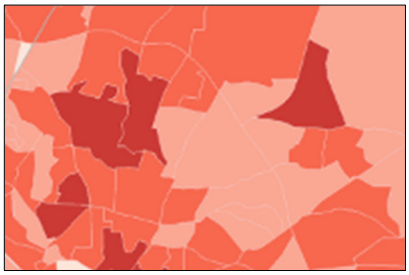
Data from the gNATSGO database was used to create the layer for the contiguous United States, Alaska, Puerto Rico, and the U.S. Virgin Islands. The remaining areas were created with the gSSURGO database (Hawaii, Guam, Marshall Islands, Northern Marianas Islands, Palau, Federated States of Micronesia, and American Samoa).

This layer is derived from the 30m (contiguous U.S.) and 10m rasters (all other regions) produced by the Natural Resources Conservation Service (NRCS). This field was calculated by selecting the least transmissive horizon of the dominant component for each mapunit. The values are in units of Micrometers per second (μm/s).

Credits (Attribution): USDA NRCS, Esri

REST URL: https://landscape11.arcgis.com/arcgis/rest/services/USA_Soils_Erodibility_Factor/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=ac1bc7c30bd4455e85f01fc51055e586

12: USA Crime Index



This layer shows the total crime index in the U.S. in 2020, by state, county, ZIP Code, tract, and block group.

Created: Apr 29, 2015. Updated: Feb 10, 2021. Accessed: May 22, 2021.

Description:
This layer shows the total crime index in the U.S. in 2020 in a multi-scale map (by state, county, ZIP Code, tract, and block group).

The pop-up is configured to include the following information for each geography level:

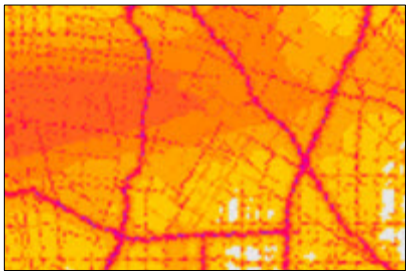
- Total crime index
- Personal and Property crime indices
- Sub-categories of personal and property crime indices

The values are all referenced by an index value. The index values for the US level are 100, representing average crime for the country. A value of more than 100 represents higher crime than the national average, and a value of less than 100 represents lower crime than the national average. For example, an index of 120 implies that crime in the area is 20 percent higher than the US average; an index of 80 implies that crime is 20 percent lower than the US average.

Credits (Attribution): Esri, AGS

REST URL:
https://demographics5.arcgis.com/arcgis/rest/services/USA_Crime/MapServer?ts=1429806138741
Page URL: https://www.arcgis.com/home/item.html?id=b3802d8a309544b791c2304fece864dc

13: National Transportation Noise Map



The noise map facilitates the tracking of trends in transportation-related noise, by mode, and collectively for multiple transportation modes. The data allow viewing the national picture of potential exposure to aviation and highway noise.

Created: Mar 28, 2017. Updated: Mar 28, 2017. Accessed: May 22, 2021.

Description:
The noise map facilitates the tracking of trends in transportation-related noise, by mode, and collectively for multiple transportation modes. The data allow viewing the national picture of potential exposure to aviation and highway noise. The data also allow viewing of the potential exposure at the state or county level.

The National Transportation Noise Map is an addition to the National Transportation Atlas Database (NTAD), a set of nationwide geographic databases of transportation facilities, networks, and associated infrastructure available from the BTS Geospatial Data Catalog. The layers will be updated on an annual basis, and future versions of the National Transportation Noise Map are envisioned to include

additional transportation noise sources, such as rail and maritime. The BTS map contains aircraft and road noise inventory data provided as web map services (WMS) for use with Geographic Information Systems (GIS), computer programs that can store, analyze, and present spatial or geographic data.

The geospatial data provides a basis for understanding what-if scenarios and helping policy makers to prioritize noise-related transportation investments. Using the National Transportation Noise Map data, BTS highlighted the percentage of total U.S. resident population that had the potential to be exposed to the following *A-weighted 24-hour equivalent sound levels (LAEQ)* (a-weighted, average sound level for the day) from aviation and Interstate road noise in the year 2014.

Notes:
1. 24-hour equivalent sound level (LAEQ) is the (logarithmic) average of sound energy over a 24 hour period. A-weighting is a correction applied to sound levels to better reflect the way the human ear hears sound. A-weighted sound levels are described by the unit dBA (a-weighted decibel).
2. While only National Highway System Interstates are included in the estimate of percentage of population affected by road noise, additional road types are included in the dataset. See the documentation for more information.
3. The acoustics modeling used in the National Transportation Noise Map represents a worst-case scenario, and shielding effects are not included in the model. Please see documentation for a full list of acoustic modeling assumptions.

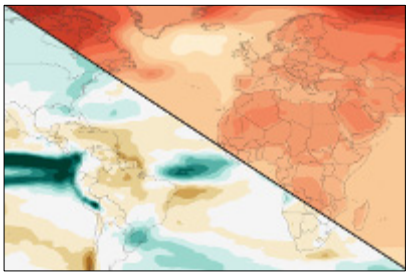
Source:
Sources: U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Noise Map; U.S. Census Bureau, 2014 American Community Survey 5-year Estimates; National Institute on Deafness and Other Communication Disorders, I Love What I Hear! Common Sounds, available at: https://www.nidcd.nih.gov/health/i-love-what-i-hear-common-sounds.

This national, multimodal transportation noise mapping initiative used data sources from the Federal Aviation Administration (FAA) and Federal Highway Administration (FHWA) to create a comprehensive map of noise levels. The FAA's Aviation Environmental Design Tool was used to model the average number of daily flight operations from airports across the country, excluding airports with exclusively military operations. To determine daily road noise data, algorithms from the FHWA's Traffic Noise Model were used in conjunction with data from the Highway Performance Monitoring System to obtain the average daily noise levels for automobiles, medium trucks, and heavy trucks. The acoustics modeling used in developing these noise layers uses conservative, simplified methods, and only considers transportation noise (no other ambient noise sources). Documentation on the modeling assumptions is available at https://maps.bts.dot.gov/noise/. The noise data in the layers should be used for the purpose of tracking trends, not for assessing impacts. This data release represents the first year of data that can be used to analyze future trends.

Credits (Attribution): USDOT - Bureau of Transportation Statistics

REST URL:
https://maps.bts.dot.gov/arcgis/apps/webappviewer/index.html?id=a303ff5924c9474790464cc0e9d5c9fb
Page URL: https://www.arcgis.com/home/item.html?id=f71a723424aa443fa936ead5907510c3

14-15: Climate Models: 2040-2059 Analyses High Emissions (RCP 6.0)



Feature layer showing projected temperature and precipitation anomaly for RCP 6.0 from 2040 to 2059 using a CMIP5 multimodel ensemble of ten climate models.

Created: May 31, 2019. Updated: Dec 17, 2019. Accessed: May 22, 2021.

Description:
These layers were generated from data associated with the Learn ArcGIS Lesson "Explore Future Climate Projections." A projected climate anomaly is the difference between current climate, or "baseline" conditions, and a future climate scenario, or "projection". This layer contains contoured features representing annual precipitation (mm) and temperature (°C) anomalies. These are computed for 2040 to 2059 using a scenario called "RCP 8.5". In this case the baseline conditions are from 1986 to 2005.

Climate Models and RCPs
RCPs (Representative Concentration Pathways) represent the ratio of energy absorbed by the Earth's atmosphere to the energy reflected back into space in watts per square meter. Climate scientists call this radiative forcing. As levels of greenhouse gasses increase or decrease in the atmosphere, radiative forcing values will correspondingly increase or decrease. As radiative forcing values increase, the atmosphere becomes warmer because more energy (heat) is retained in the atmosphere.

In 2014, the IPCC (Intergovernmental Panel on Climate Change) adopted four standard RCPs: 2.6, 4.5, 6.0, and 8.5 W/m2. These scenarios give us a range from best case (2.6) to worst (8.5) for greenhouse gasses being emitted into the atmosphere by human and natural sources. RCP 6.0 is a "stabilization" scenario where radiative forcing levels stabilize without exceeding 6.0 W/m2 by 2100 (Van Vuuren, D.P., et al., 2011). Scenario 6.0 is considered to be a realistic possibility.

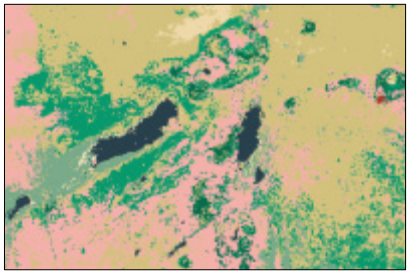
Global climate projections are produced by general circulation models (GCMs). This particular layer was derived from the mean results of 10 of the best GCMs, called a multi-model ensemble (MME). Esri partnered with the Research Applications Laboratory (RAL) from the National Center for Atmospheric Research (NCAR) to select the model members.

About Annual and Monthly Climate Projection Data
It is important to understand whether climate projection data is expressed on an annual, monthly, or even daily basis. Annual data represents the overall change for the entire year, and does not include variations that occur seasonally, monthly, or daily. Thus, annual projections cannot provide a basis to calculate the number of heating or cooling days in a given year. In fact, monthly data is not suitable for that task either. Thus, it is fair to ask, what can annual climate projection data tell us, especially when averaged over a 20 year period? Mostly these layers can be used to determine large scale patterns and trends of change.

Credits (Attribution): NCAR and Esri

REST URL: https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/2040_2059_Analyses_RCP_6_0/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=97c47837d64a4be28703ebfe98fd90c5

16: Land Cover 2050



Predicted land cover for each region for year 2050, generated by Clark University. The predictions were modeled at a continental level and brought together into a single world map.

Created: May 13, 2021. Updated: May 20, 2021. Accessed: May 22, 2021.

Description:
Use this regional model layer when performing analysis within a single continent. This layer displays a single global land cover map that is modeled by region for the year 2050 at a pixel resolution of 300m. ESA CCI land cover from the years 2010 and 2018 were used to create these predictions.

Variable mapped: Projected land cover in 2050.
Data Projection: Cylindrical Equal Area
Mosaic Projection: Cylindrical Equal Area
Extent: Global
Cell Size: 300m
Source Type: Thematic
Visible Scale: 1:50,000 and smaller
Source: Clark University
Publication date: April 2021

What you can do with this layer?

This layer may be added to online maps and compared with the ESA CCI Land Cover from any year from 1992 to 2018. To do this, add Global Land Cover 1992-2018 to your map and choose the processing template (image display) from that layer called "Simplified Renderer."

This layer can also be used in analysis in ecological planning to find specific areas that may need to be set aside before they are converted to human use.

Links to the six Clark University land cover 2050 layers in ArcGIS Living Atlas of the World:
There are three scales (country, regional, and world) for the land cover and vulnerability models. They're all slightly different since the country model can be more fine-tuned to the drivers in that particular area. Regional (continental) and global have more spatially consistent model weights. Which should you use? If you're analyzing one country or want to make accurate comparisons between countries, use the country level. If mapping larger patterns, use the global or regional extent (depending on your area of interest).

Land Cover 2050 World
Land Cover 2050 Regional
Land Cover 2050 Country
Land Cover Vulnerability Change 2050 World
Land Cover Vulnerability Change 2050 Regional
Land Cover Vulnerability Change 2050 Country

What these layers model (and what they don't model):
The model focuses on human-based land cover changes and projects the extent of these changes to the year 2050. It seeks to find where agricultural and urban land cover will cover the planet in that year, and what areas are most vulnerable to change due to the expansion of the human footprint. It does not predict changes to other land cover types such as forests or other natural vegetation during that time period unless it is replaced by agriculture or urban land cover. It also doesn't predict sea level rise unless the model detected a pattern in changes in bodies of water between 2010 and 2018. A few 300m pixels might have changed due to sea level rise during that timeframe, but not many.

The model predicts land cover changes based upon patterns it found in the period 2010-2018. But it cannot predict future land use. This is partly because current land use is not necessarily a model input. In this model, land set aside as a result of political decisions, for example military bases or nature reserves, may be found to be filled in with urban or agricultural areas in 2050. This is because the model is blind to the political decisions that affect land use.

Quantitative Variables

- Biomass
- Crop Suitability
- Distance to Airports
- Distance to Cropland 2010
- Distance to Primary Roads
- Distance to Railroads
- Distance to Secondary Roads
- Distance to Settled Areas
- Distance to Urban 2010
- Elevation
- GDP
- Human Influence Index
- Population Density
- Precipitation
- Regions
- Slope
- Temperature

Qualitative Variables

- Biomes
- Ecoregions
- Irrigated Crops
- Protected Areas
- Country
- Rainfed Crops
- Soil Classification
- Soil Depth
- Soil Drainage
- Soil pH
- Soil Texture

Index to land cover values in this dataset:
The Clark University Land Cover 2050 projections display a ten-class land cover generalized from ESA Climate Change Initiative Land Cover.

1 Mostly Cropland
2 Grassland, Scrub, or Shrub
3 Mostly Deciduous Forest
4 Mostly Needleleaf/Evergreen Forest
5 Sparse Vegetation
6 Bare Area
7 Swampy or Often Flooded Vegetation
8 Artificial Surface or Urban Area
9 Surface Water
10 Permanent Snow and Ice

Credits (Attribution): Clark University

REST URL: https://earthobs3.arcgis.com/arcgis/rest/services/Land_Cover_Projection_2050/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=3cce97cba8394287bcaf60f7618a5500

17: Facility Registry Service (FRS) Interests



The purpose of this web feature service is to provide users with access to information stored in FRS. The information in FRS may be used to track sites, facilities, or areas of environmental interest.

Created: Jul 8, 2020. Updated: May 3, 2021. Accessed: May 22, 2021.

Description:
This downloadable data package consists of location and facility identification information from EPA's Facility Registry Service (FRS) for all sites that are available in the FRS individual feature layers. The layers comprise the FRS major program databases, including: Assessment Cleanup and Redevelopment Exchange System (ACRES) : brownfields sites ; Air Facility System (AFS) : stationary sources of air pollution ; ICIS-AIR (AIR) : stationary sources of air pollution; Bureau of Indian Affairs (BIA) : schools data on Indian land; Base Realignment and Closure (BRAC) facilities; Clean Air Markets Division Business System (CAMDBS) : market-based air pollution control programs; Comprehensive Environmental Response, Superfund Enterprise Management System (SEMS): hazardous waste sites; Integrated Compliance Information System (ICIS) : integrated enforcement and compliance information; National Compliance Database (NCDB) : Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Toxic Substances Control Act (TSCA); National Pollutant Discharge Elimination System (NPDES) module of ICIS : NPDES surface water permits; Radiation Information Database (RADINFO) : radiation and radioactivity facilities; RACT/BACT/LAER Clearinghouse (RBLC) : best available air pollution technology requirements; Resource Conservation and Recovery Act Information System (RCRAInfo) : tracks generators, transporters, treaters, storers, and disposers of hazardous waste; Toxic Release Inventory (TRI) : certain industries that use, manufacture, treat, or transport more than 650 toxic chemicals; Emission Inventory System (EIS) : inventory of large stationary sources and voluntarily-reported smaller sources of air point pollution emitters;

countermeasure (SPCC) and facility response plan (FRP) subject facilities; Electronic Greenhouse Gas Reporting Tool (E-GGRT) : large greenhouse gas emitters; Emissions and; Generation Resource Integrated Database (EGRID) : power plants. The Facility Registry Service (FRS) identifies and geospatially locates facilities, sites or places subject to environmental regulations or of environmental interest. Using vigorous verification and data management procedures, FRS integrates facility data from EPA's national program systems, other federal agencies, and State and tribal master facility records and provides EPA with a centrally managed, single source of comprehensive and authoritative information on facilities. This data set contains the FRS facilities that link to the programs listed above once the program data has been integrated into the FRS database. Additional information on FRS is available at the EPA website https://www.epa.gov/enviro/facility-registry-service-frs. Included in this package are a file geodatabase, Esri ArcMap map document and an XML file of this metadata record. Full FGDC metadata records for each layer are contained in the database.

Credits (Attribution): This EPA Geospatial data set is generated from the following national environmental programs: Superfund National Priorities List (NPL) from the Superfund Enterprise Management System (SEMS); Resource Conservation and Recovery Act (RCRA); Air Facility System (ICIS-AIR) Major dischargers of air pollutants; Toxics Release Inventory (TRI) Program for 2004 - 2008 TRI Reporters [TRIS]; National Pollutant Discharge Elimination System (NPDES) facilities from Integrated Compliance Information System [ICIS]; Assessment, Cleanup and Redevelopment Exchange System [ACRES]; Section Seven Tracking System [SSTS] for the Pesticide Program as well as the State programs.

REST URL:
https://services.arcgis.com/cJ9YHowT8TU7DUyn/arcgis/rest/services/FRS_INTERESTS/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=cdff193a3e3743a5bc770e2743f215b3

18: AirNow Air Quality Monitoring Site Data



This US EPA feature layer is updated hourly and reflects the latest hour of air quality data received from monitoring sites that report to AirNow.

Created: Apr 2, 2019. Updated: Sep 28, 2020. Accessed: May 22, 2021.

Description:
This United States Environmental Protection Agency (US EPA) feature layer represents monitoring site data, updated hourly concentrations and Air Quality Index (AQI) values for **the latest hour** received from monitoring sites that report to AirNow.

Map and forecast data are collected using federal reference or equivalent monitoring techniques or techniques approved by the state, local or tribal monitoring agencies. To maintain "real-time" maps, the data are displayed after the end of each hour. Although preliminary data quality assessments are performed, the data in AirNow are not fully verified and validated through the quality assurance procedures monitoring organizations used to officially submit and certify data on the EPA Air Quality System (AQS).

This data sharing, and centralization creates a one-stop source for real-time and forecast air quality data. The benefits include quality control, national reporting consistency, access to automated mapping methods, and data distribution to the public and other data systems.

The U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, National Park Service, tribal, state, and local agencies developed the AirNow system to provide the public with easy access to national air quality information. State and local agencies report the Air Quality Index (AQI) for cities across the US and parts of Canada and Mexico.
AirNow data are used only to report the AQI, not to formulate or support regulation, guidance or any other EPA decision or position.

About the AQI
The Air Quality Index (AQI) is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles (often referred to as "particulate matter") are the two pollutants that pose the greatest threat to human health in this country.

A number of factors influence ozone formation, including emissions from cars, trucks, buses, power plants, and industries, along with weather conditions. Weather is especially favorable for ozone formation when it's hot, dry and sunny, and winds are calm and light. Federal and state regulations, including regulations for power plants, vehicles and fuels, are helping reduce ozone pollution nationwide.

Fine particle pollution (or "particulate matter") can be emitted directly from cars, trucks, buses, power plants and industries, along with wildfires and woodstoves. But it also forms from chemical reactions of other pollutants in the air. Particle pollution can be high at different times of year, depending on where you live. In some areas, for example, colder winters can lead to increased particle pollution emissions from woodstove use, and stagnant weather conditions with calm and light winds can trap PM2.5 pollution near emission sources. Federal and state rules are helping reduce fine particle pollution, including clean diesel rules for vehicles and fuels, and rules to reduce pollution from power plants, industries, locomotives, and marine vessels, among others.

How Does the AQI Work?
Think of the AQI as a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy-at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Understanding the AQI
The purpose of the AQI is to help you understand what local air quality means to your health. To make it easier to understand, the AQI is divided into six categories:

Each category corresponds to a different level of health concern. The six levels of health concern and what they mean are:

- "Good" AQI is 0 to 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- "Moderate" AQI is 51 to 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- "Unhealthy for Sensitive Groups" AQI is 101 to 150. Although general public is not likely to be affected at this AQI range, people with lung disease, older adults and children are at a greater risk from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air.
- "Unhealthy" AQI is 151 to 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
- "Very Unhealthy" AQI is 201 to 300. This would trigger a health alert signifying that everyone may experience more serious health effects.
- "Hazardous" AQI greater than 300. This would trigger a health warnings of emergency conditions. The entire population is more likely to be affected.

AQI colors
EPA has assigned a specific color to each AQI category to make it easier for people to understand quickly whether air pollution is reaching unhealthy levels in their communities. For example, the color orange means that conditions are "unhealthy for sensitive groups," while red means that conditions may be "unhealthy for everyone," and so on.

Credits (Attribution): US EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards (OAQPS)

REST URL: https://services.arcgis.com/cJ9YHowT8TU7DUyn/arcgis/rest/services/Air%20Now%20Current%20Monitor%20Data%20Public/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=2d718d2733a74d1689d72b922c0ac4f4

19: Live Stream Gauges



Stream gauge observations of stage height and discharge contributed by the GIS community.

Created: Jan 22, 2021. Updated: Feb 23, 2021. Accessed: May 22, 2021.

Description:
Information on the amount of water flowing in streams and rivers is critical to the management of water resources, emergency response to flooding, fisheries management, and many other uses. This layer provides access to near real-time stream gauge readings compiled from a variety of agencies and organizations.

Dataset Summary
The Live Stream Gauges layer contains near real-time measurements of water depth from multiple reporting agencies recording at sensors across the world. This layer updates every hour. Flow forecasts are provided where available. These sensor feeds are owned and maintained by the GIS community via the Community Maps Program. For details on the coverage in this map and to find out how to contribute your organization's gauges, please email environment@esri.com.

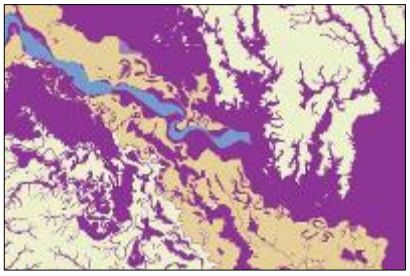
Contributors to the Live Stream Gauges Service:

1. United States Geological Survey (USA)
2. National Weather Service (USA)
3. Washington State Department of Ecology (USA)
4. San Joaquin County (USA)
5. Maricopa County Flood Control District (USA)
6. Minnesota Department of Natural Resources (USA)
7. PEGELONLINE (Germany)
8. Bureau of Meteorology (Australia)
9. Horizons Regional Council (New Zealand)
10. Environment Agency (UK)
11. Nebraska Department of Natural Resources (USA) -
12. Iowa Flood Center (USA) -
13. Oregon Water Resource Department (USA) -
14. Dartmouth Flood Observatory (Global) -
15. Meteorological Service of Canada (Canada) -

Credits (Attribution): USGS, NOAA and the GIS Community

REST URL: https://services9.arcgis.com/RHVPKKiFTONKtxq3/arcgis/rest/services/Live_Stream_Gauges_v1/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=81c5a9f2a2704d54a49042a44eefa5d3

20: USA Flood Hazard Areas



This layer displays Flood Hazard Areas from the Flood Insurance Rate Map created by the Federal Emergency Management Agency.

Created: Oct 3, 2018. Updated: Dec 15, 2020. Accessed: May 22, 2021.

Description:
The Federal Emergency Management Agency (FEMA) produces Flood Insurance Rate maps and identifies Special Flood Hazard Areas as part of the National Flood Insurance Program's floodplain management. Special Flood Hazard Areas have regulations that include the mandatory purchase of flood insurance.

Dataset Summary
Phenomenon Mapped: Flood Hazard Areas, **Cell Size:** 30 meters
Source Type: Thematic, **Pixel Type:** Unsigned integer

Data Coordinate System: USA Contiguous Albers Equal Area Conic USGS version (contiguous US, Puerto Rico, US Virgin Islands), WGS 1984 Albers (Alaska), Hawaii Albers Equal Area Conic (Hawaii), Western Pacific Albers Equal Area Conic (Guam, Northern Marianas Islands and American Samoa)
Mosaic Projection: Web Mercator Auxiliary Sphere
Extents: Contiguous United States, Alaska, Hawaii, Puerto Rico, Guam, US Virgin Islands, Northern Marianas Islands and American Samoa.
Source: Federal Emergency Management Agency (FEMA)
Publication Date: August 31, 2020
ArcGIS Server URL: https://landscape11.arcgis.com/arcgis/

This layer is derived from the August 31, 2020 version Flood Insurance Rate Map feature class S_Fld_Haz_Ar. The vector data was aggregated into eight classes based on symbology used by FEMA and criteria provided by FEMA, then it converted to raster from these eight classes using the Polygon to Raster tool and the "MAXIMUM_COMBINED_AREA" option.

Credits (Attribution): FEMA, Esri

REST URL: https://landscape11.arcgis.com/arcgis/rest/services/USA_Flood_Hazard_Areas/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=11955f1b47ec41a3af86650824e0c634

21: National Inventory of Dams



This feature layer, utilizing U.S. Army Corps of Engineers data, portrays dams within the United States, Puerto Rico and Guam.

Created: May 28, 2020. Updated: May 18, 2021. Accessed: May 22, 2021.

Description:
This feature layer, utilizing U.S. Army Corps of Engineers (USACE) data, portrays dams within the United States, Puerto Rico and Guam. The National Inventory of Dams (NID) consists of dams meeting at least one of the following criteria:

- High hazard potential classification - loss of human life is likely if the dam fails.
- Significant hazard potential classification - no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
- Equal or exceed 25 feet in height and exceed 15 acre-feet in storage.
- Equal or exceed 50 acre-feet storage and exceed 6 feet in height.

The goal of the NID is to include all dams in the United States that meet these criteria. In most cases, dams within the NID criteria are regulated (construction permit, inspection, and/or enforcement) by federal or state agencies, who have basic information on the dams within their jurisdiction. USACE resolves duplicative and conflicting data from the 68 data sources, which helps obtain the more complete, accurate, and updated NID. Historically, the NID has been published every two years. Starting in 2019, the NID will be updated annually.

Data source: National Inventory of Dams > General Public > Downloads (Public)
For more information, please visit: National Inventory of Dams

This data set is part of the Office of Management and Budget's Circular A-16 "Water - Inland". OMB Circular A-16 is a federal government circular created to provide guidance for federal agencies that create, maintain or use spatial data directly or indirectly.

Credits (Attribution): U.S. Army Corps of Engineers (USACE)

REST URL: https://services2.arcgis.com/FiaPA4ga0iQKduv3/arcgis/rest/services/National_Inventory_Dams_1/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=eb00145cf8af416babe7b6a7458f7966

22: USA Wetlands



This feature layer displays wetlands of the United States from the National Wetlands Inventory produced by the US Fish and Wildlife Service.

Created: Apr 4, 2019. Updated: Mar 24, 2021. Accessed: May 22, 2021.

Description:
Wetlands are areas where water is present at or near the surface of the soil during at least part of the year. Wetlands provide habitat for many species of plants and animals that are adapted to living in wet habitats. Wetlands form characteristic soils, absorb pollutants and excess nutrients from aquatic systems, help buffer the effects of high flows, and recharge groundwater. Data on the distribution and type of wetland play an important role in land use planning and several federal and state laws require that wetlands be considered during the planning process. The National Wetlands Inventory (NWI) was designed to assist land managers in wetland conservation efforts. The NWI is managed by the US Fish and Wildlife Service.

Dataset Summary
Phenomenon Mapped: Wetlands, **Coordinate System:** Web Mercator Auxiliary Sphere
Extent: 50 United States plus Puerto Rico, the US Virgin Islands and the Northern Mariana Islands
Visible Scale: The data is visible at scales from 1:144,000 to 1:1,000
Resolution/Tolerance: 0.0001 meters/0.001 meters
Number of Features: 34,954,623 diced, after applying a 50,000 vertex limit to original set 34,950,653 features
Feature Limit: 10,000, **Source:** U.S. Fish and Wildlife Service
Publication Date: September 29, 2020, **ArcGIS Server URL:** https://landscape11.arcgis.com/arcgis/

This layer was created from the September 29, 2020 version of the NWI. This layer includes attributes from the original dataset as well as attributes added by Esri for use in the default pop-up and to allow the user to query and filter the data.

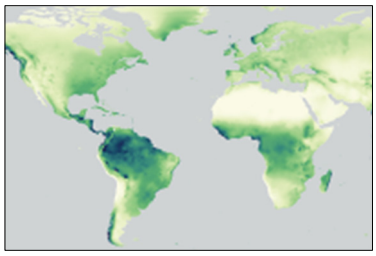
NWI derived attributes:
Wetland Code - a code that identifies specific attributes of the wetland
Wetland Type - one of 8 wetland types
Area - area of the wetland in acres

Codes, names, and text fields were derived from the publication Classification of Wetlands and Deepwater Habitats of the United States.

Credits (Attribution): USFWS, Esri

REST URL: https://landscape11.arcgis.com/arcgis/rest/services/USA_Wetlands/FeatureServer
Page URL: https://www.arcgis.com/home/item.html?id=1f2cb14aa91b41efbd01d676a6e289b4

23: Annual Average Precipitation



This image services displays global mean precipitation estimates from WorldClim at 5-square-km resolution.

Created: Mar 24, 2021. Updated: Apr 28, 2021. Accessed: May 22, 2021.

Description:
WorldClim 2.1 provides downscaled estimates of climate variables as monthly means over the period of 1970-2000 based on interpolated station measurements. Here we provide analytical image services of precipitation for each month along with an annual mean. Each time step is accessible from a template.

Time Extent: Monthly/Annual 1970-2000, **Units:** mm/month
Cell Size: 2.5 minutes (~5 km), **Source Type:** Stretched, **Pixel Type:** 16 Bit Integer
Data Projection: GCS WGS84, **Mosaic Projection:** GCS WGS84, **Extent:** Global, **Source:** WorldClim v2.1

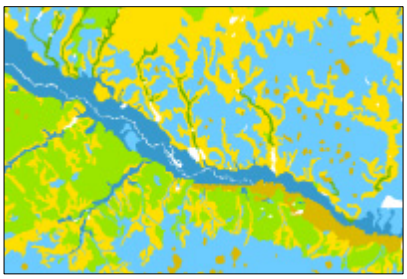
Using Processing Templates to Access Time:
There are 13 processing templates applied to this service, each providing access to the 12 monthly and 1 annual mean precipitation layers. To apply these in ArcGIS Online, select the Image Display options on the layer. Then pull down the list of variables from the Renderer options. Click Apply and Close. In ArcGIS Pro, go into the Layer Properties. Select Processing Templates from the left-hand menu. From the Processing Template pull down menu, select the version to display.

What can you do with this layer?
This layer may be added to maps to visualize and quickly interrogate each pixel value. The pop-up provides a graph of the time series along with the calculated annual mean value. This layer can be used in analysis. For example, the layer may be added to ArcGIS Pro and an area count of precipitation may be produced for a feature dataset using the zonal statistics tool. Statistics may be compared with the statistics from month to month to show seasonal patterns. To calculate precipitation by land area, or any other analysis, be sure to use an equal area projection, such as Albers or Equal Earth.

Source Data: The datasets behind this layer were extracted from GeoTIF files produced by WorldClim at 2.5 minutes resolution. The mean of the 12 GeoTIFs was calculated (annual), and the 13 rasters were converted to Cloud Optimized GeoTIFF format and added to a mosaic dataset. **Citation:** Fick, S.E. and R.J. Hijmans, 2017. WorldClim 2: new 1km spatial resolution climate surfaces for global land areas. International Journal of Climatology 37 (12): 4302-4315.

REST URL: https://earthobs3.arcgis.com/arcgis/rest/services/Mean_Precipitation_WorldClim/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=e6ab693056a9465cbc3b26414f0ddd2c

24: USA SSURGO – Soil Hydrologic Group



This layer displays hydrologic soil group in seven classes that describe the rate that the soil absorbs rainfall.

Created: Jun 19, 2017. Updated: May 19, 2021. Accessed: May 22, 2021.

Description:
When rain falls over land, a portion of it runs off into stream channels and storm water systems while the remainder infiltrates into the soil or returns to the atmosphere directly through evaporation.
Physical properties of soil affect the rate that water is absorbed and the amount of runoff produced by a storm. Hydrologic soil group provides an index of the rate that water infiltrates a soil and is an input to rainfall-runoff models that are used to predict potential stream flow.
For more information on using hydrologic soil group in hydrologic modeling see the publication Urban Hydrology for Small Watersheds (Natural Resources Conservation Service, United States Department of Agriculture, Technical Release–55).

Dataset Summary
Phenomenon Mapped: Soil hydrologic group
Units: Classes, **Cell Size:** 30 meters
Source Type: Discrete, **Pixel Type:** Unsigned integer
Data Coordinate System: USA Contiguous Albers Equal Area Conic USGS version (contiguous US, Puerto Rico, US Virgin Islands), WGS 1984 Albers (Alaska), Hawaii Albers Equal Area Conic (Hawaii), Western Pacific Albers Equal Area Conic (Guam, Marshall Islands, Northern Marianas Islands, Palau, Federated States of Micronesia, and American Samoa)
Mosaic Projection: Web Mercator Auxiliary Sphere
Extent: Contiguous United States, Alaska, Hawaii, Puerto Rico, Guam, US Virgin Islands, Marshall Islands, Northern Marianas Islands, Palau, Federated States of Micronesia, and American Samoa
Source: Natural Resources Conservation Service
Publication Date: July 2020, **ArcGIS Server URL:** https://landscape11.arcgis.com/arcgis/

Data from the gNATSGO database was used to create the layer for the contiguous United States, Alaska, Puerto Rico, and the U.S. Virgin Islands. This layer is derived from the 30m (contiguous U.S.) and 10m rasters (all other regions) produced by the Natural Resources Conservation Service (NRCS). The value for hydrologic group is derived from the gSSURGO map unit aggregated attribute table field Hydrologic Group - Dominant Conditions (hydgrpdcd).

The seven classes of hydrologic soil group followed by definitions:

- **Group A** - Group A soils consist of deep, well drained sands or gravelly sands with high infiltration and low runoff rates.
- **Group B** - Group B soils consist of deep well drained soils with a moderately fine to moderately coarse texture and a moderate rate of infiltration and runoff.
- **Group C** - Group C consists of soils with a layer that impedes the downward movement of water or fine textured soils and a slow rate of infiltration.
- **Group D** - Group D consists of soils with a very slow infiltration rate and high runoff potential. This group is composed of clays that have a high shrink-swell potential, soils with a high water

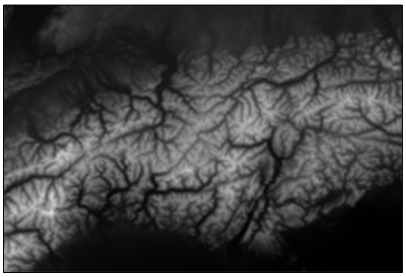
table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material.

- **Group A/D** - Group A/D soils naturally have a very slow infiltration rate due to a high water table but will have high infiltration and low runoff rates if drained.
- **Group B/D** - Group B/D soils naturally have a very slow infiltration rate due to a high water table but will have a moderate rate of infiltration and runoff if drained.
- **Group C/D** - Group C/D soils naturally have a very slow infiltration rate due to a high water table but will have a slow rate of infiltration if drained.

Credits (Attribution): USDA NRCS, Esri

REST URL:
https://landscape11.arcgis.com/arcgis/rest/services/USA_Soils_Hydrologic_Group/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=be2124509b064754875b8f0d6176cc4c

25: Terrain



A multi-resolution world elevation layer providing access to elevation values for use in analysis with functions for slope, aspect, and hillshade.

Created: Jul 4, 2013. Updated: Mar 24, 2021. Accessed: May 22, 2021.

Description:
This dynamic World Elevation Terrain service provides numeric values representing ground surface heights, based on a digital terrain model (DTM). The ground heights are based on multiple sources. Heights are orthometric (sea level = 0), and water bodies that are above sea level have approximated nominal water heights.

What can you do with this layer?
Use for Visualization: This layer is generally not optimal for direct visualization. By default, 32 bit floating point values are returned, resulting in higher bandwidth requirements. Therefore, usage should be limited to applications requiring elevation data values. Alternatively, client applications can select from numerous additional functions, applied on the server, that return rendered data. For visualizations such as multi-directional hillshade, hillshade, elevation tinted hillshade, and slope, consider using the appropriate server-side function defined on this service.

Use for Analysis: Yes. This layer provides data as floating point elevation values suitable for use in analysis.

Note: This image services combine data from different sources and resample the data dynamically to the requested projection, extent and pixel size. For analyses using ArcGIS Desktop, you can filter a dataset, specify the projection, extent and cell size using the Make Image Server Layer geoprocessing tool.

Server Functions: This layer has server functions defined for the following elevation derivatives. In ArcGIS desktop, server function can be invoked from Layer Properties - Processing Templates.

- Slope Degrees, Slope Percentage
- Aspect
- Ellipsoidal height
- Hillshade
- Multi-Directional Hillshade
- Dark Multi-Directional Hillshade
- Elevation Tinted Hillshade
- Slope Map
- Aspect Map

Data Sources and Coverage: This layer is compiled from a variety of best available sources from several data providers. To see the coverage and extents of various datasets comprising this service in an interactive map, see Elevation Coverage Map.

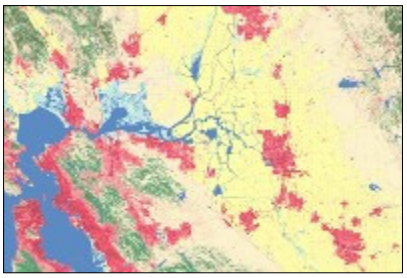
Mosaic Method: This image service uses a default mosaic method of "By Attribute", using Field 'Best' and target of 0. Each of the rasters has been attributed with 'Best' field value that is generally a function of the pixel size such that higher resolution datasets are displayed at higher priority. Other mosaic methods can be set, but care should be taken as the order of the rasters may change. Where required, queries can also be set to display only specific datasets such as only NED or the lock raster mosaic rule used to lock to a specific dataset.

Accuracy: The accuracy of these services will vary as a function of location and data source. Please refer to the metadata available in the services, and follow the links to the original sources for further details. An estimate of CE90 and LE90 are included as attributes, where available.

Credits (Attribution): Airbus, USGS, NGA, NASA, CGIAR, NLS, OS, NMA, Geodatastyrelsen, GSA, GSI and the GIS User Community

REST URL: https://elevation.arcgis.com/arcgis/rest/services/WorldElevation/Terrain/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=58a541efc59545e6b7137f961d7de883

26: USA NLCD Land Cover



This layer displays a time series of land cover for the United States from the National Land Cover Database (NLCD), at various intervals from 2001 to present.

Created: Jun 5, 2019. Updated: Oct 21, 2020. Accessed: May 22, 2021.

Description:
Land cover describes the surface of the earth. This time-enabled service of the National Land Cover Database groups land cover into 20 classes based on a modified Anderson Level II classification system. Classes include vegetation type, development density, and agricultural use. Areas of water, ice and snow and barren lands are also identified.

This layer displays land cover for the years 2001, 2004, 2006, 2008, 2011, 2013 and 2016 for the conterminous United States. The layer displays land cover for Alaska for the years 2001, 2011, and 2016. For Puerto Rico

there is only data for 2001. Hawaii, Esri reclassed land cover data from NOAA Office for Coastal Management, C-CAP into NLCD codes. These reclassed C-CAP data are available for Hawaii for the years 2001, 2005, and 2011.

The National Land Cover Database products are created through a cooperative project conducted by the Multi-Resolution Land Characteristics Consortium (MRLC). The MRLC Consortium is a partnership of federal agencies, consisting of the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, the U.S. Forest Service, the National Park Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management and the USDA Natural Resources Conservation Service.

Time Series

This layer is served as a time series. To display a particular year of land cover data, select the year of interest with the time slider in your map client. You may also use the time slider to play the service as an animation. We recommend a one year time interval when displaying the series. If you would like a particular year of data to use in analysis, be sure to use the analysis renderer along with the time slider to choose a valid year.

North America Albers Projection

This layer is served in North America albers projection. Albers is an equal area projection, and this allows users of this service to accurately calculate acreage without additional data preparation steps. This also means it takes a tiny bit longer to project on the fly into web mercator, if that is the destination projection of the service.

Processing Templates
Cartographic Renderer - The default. Land cover drawn with Esri symbols. Each year's land cover data is displayed in the time series until there is a newer year of data available.

Cartographic Renderer (saturated) - This renderer has the same symbols as the cartographic renderer, but the colors are extra saturated so a transparency may be applied to the layer. This renderer is useful for land cover over a basemap or relief.

MRLC Cartographic Renderer - Cartographic renderer using the land cover symbols as issued by NLCD (the same symbols as is on the dataset when you download them from MRLC).

Analytic Renderer - Use this in analysis. The time series is restricted by the analytic template to display a raster in only the year the land cover raster is valid. In a cartographic renderer, land cover data is displayed until a new year of data is available so that it plays well in a time series. In the analytic renderer, data is displayed for only the year it is valid. The analytic renderer won't look good in a time series animation, but in analysis this renderer will make sure you only use data for its appropriate year.

Simplified Renderer - NLCD reclassified into 10 broad classes. These broad classes may be easier to use in some applications or maps.

Forest Renderer - Cartographic renderer which only displays the three forest classes, deciduous, coniferous, and mixed forest.

Developed Renderer - Cartographic renderer which only displays the four developed classes, developed open space plus low, medium, and high intensity development classes.

USA NLCD Land Cover service classes with corresponding index number (raster value):
11. Open Water - areas of open water, generally with less than 25% cover of vegetation or soil.
12. Perennial Ice/Snow - areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover.
21. Developed, Open Space - areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
22. Developed, Low Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
23. Developed, Medium Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
24. Developed High Intensity - highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
31. Barren Land (Rock/Sand/Clay) - areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
41. Deciduous Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
42. Evergreen Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
43. Mixed Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.
51. Dwarf Scrub - Alaska only areas dominated by shrubs less than 20 centimeters tall with shrub canopy typically greater than 20% of total vegetation. This type is often co-associated with grasses, sedges, herbs, and non-vascular vegetation.
52. Shrub/Scrub - areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
71. Grassland/Herbaceous - areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
72. Sedge/Herbaceous - Alaska only areas dominated by sedges and forbs, generally greater than 80% of total vegetation. This type can occur with significant other grasses or other grass like plants, and includes sedge tundra, and sedge tussock tundra.
73. Lichens - Alaska only areas dominated by fruticose or foliose lichens generally greater than 80% of

total vegetation.
74. Moss - Alaska only areas dominated by mosses, generally greater than 80% of total vegetation.
Planted/Cultivated
81. Pasture/Hay - areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
82. Cultivated Crops - areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
90. Woody Wetlands - areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
95. Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Credits (Attribution): MRLC.gov

REST URL: https://landscape10.arcgis.com/arcgis/rest/services/USA_NLCD_Land_Cover/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=3ccf118ed80748909eb85c6d262b426f

27: USA NLCD Impervious Surface Time Series



Time series (2001-2016) showing the percent imperviousness of USA land surfaces produced by the Multi-Resolution Land Characteristics Consortium (MRLC) for the National Land Cover Database (NLCD).

Created: Sep 26, 2019. Updated: Aug 27, 2020. Accessed: May 22, 2021.

Description:
Impervious surfaces are surfaces that do not allow water to pass through. Examples of these surfaces include highways, parking lots, rooftops, and airport runways. Instead of allowing rain to pass into the soil, impervious surfaces cause water to collect at the surface, then run off. An increase in impervious surface area causes an increase of water volume which needs to be managed by stormwater systems. With the flow come pollutants, which collect on impervious surfaces then discharge with the runoff into streams and the ocean. Runoff water does not enter the water table, and that can cause other management issues, such as interruptions in baseline stream flow.

The NLCD imperviousness layer represents urban impervious surfaces as a percentage of developed surface over every 30-meter pixel in the United States. The layer is organized into a time series with years 2001, 2006, 2011, and 2016, for the lower 48 conterminous US states. This information may be used in conjunction with the USA NLCD Land Cover layer.

Time Series

By default, this service will appear in your client with a time slider which allows you to play the series as an animation. The animation will advance year by year, but the layer only changes appearance every five

years, in 2001, 2006, 2011, and 2016. To select just one year in the series, first turn the time series off on the time slider, then create a definition query on the layer which selects only the desired year.

Time Series Descriptor

MRLC issued a set of companion rasters with this impervious surface layer showing the reason why each pixel is impervious. This companion layer, called the Developed Imperviousness Descriptor, is not currently available in this map service. The descriptor layer identifies types of roads, core urban areas, and energy production sites for each impervious pixel to allow deeper analysis of developed features. The descriptor layer may be downloaded directly from MRLC and added to ArcGIS Pro.

Dataset Summary

Phenomenon Mapped: The proportion of the landscape that is impervious to water
Units: Percent
Cell Size: 30 meters
Source Type: Discrete
Pixel Type: Unsigned integer
Data Coordinate System: North America Albers Equal Area Conic
Extent: Contiguous United States
Source: Multi-Resolution Land Characteristics Consortium
Publication Date: 2019
ArcGIS Server URL: https://landscape10.arcgis.com/arcgis/

The National Land Cover Database products are created through a cooperative project conducted by the Multi-Resolution Land Characteristics Consortium (MRLC). The MRLC Consortium is a partnership of federal agencies, consisting of the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, the U.S. Forest Service, the National Park Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management and the USDA Natural Resources Conservation Service.

Credits (Attribution): USGS, Esri

REST URL: https://landscape10.arcgis.com/arcgis/rest/services/
USA_NLCD_Impervious_Surface_TimeSeries/ImageServer
Page URL: https://www.arcgis.com/home/item.html?id=1fdbb561c58b45c58f8f966c00c78ae6