

## EXECUTIVE SUMMARY

With this release of EJScreen 2.1, EPA continues to provide a nationally consistent dataset and approach for combining environmental and socioeconomic indicators. This summary provides an overview of changes and enhancements to the dataset, application, and associated technical descriptions. For the information on EJScreen 2.0, please refer to the previous version of Executive Summary. Also please refer to the [EJScreen Technical Documentation, September 2019](#) for details about the tool's underlying environmental justice (EJ) concepts, data source choices, and supporting research.

## SUMMARY OF CHANGES

The summary of changes for EJScreen 2.1 includes the version numbering methodology, the geographic framework, and the source updates for the Pollution and Sources and the Socioeconomic Indicators.

- **Version Numbers:**
  - This is the release for EJScreen 2.1. The previous release version was EJScreen 2.0.
- **Geographic Framework:**
  - The geographic framework for EJScreen was built from 2020 Census TIGER/Line data for all 50 states, the District of Columbia, and Puerto Rico.
  - The socioeconomic data source is US Census Bureau's American Community Survey (ACS) 2016-2020 5-Year Estimates (ACS 2020).
  - There are a total 242,335 block groups.
  - The application defines the spatial reference as "WGS 1984 Web Mercator (Auxiliary Sphere)."
  - The US Territories of American Samoa, Commonwealth of the Northern Mariana Islands (CNMI), Guam, and the US Virgin Islands are included in the application. American Samoa, CNMI, and Guam use 2013 Census Place boundaries. The US Virgin Islands use 2013 Census Estate boundaries. The territories data provides an additional 605 records.
  - The EJ Indexes National Percentiles include only the geographic features and identifiers, while the EJ Indexes State Percentiles are calculated where the corresponding environmental data are available (see the US Territories section for details).
  - Census block centroids with population-weights have been updated. These block points and associated populations and block group weights are derived from [2020 Decennial Census P.L. 94-171 Redistricting data](#).
- **Pollution and Sources changes:**
  - Update of Superfund—new Superfund source data was extracted on April 26, 2022.
  - Update of Risk Management Plan (RMP) Facilities—new RMP facility source data was extracted on April 26, 2022.
  - Update of Hazardous Waste—new Treatment, Storage, and Disposal Facility (TSDF) and

## EJScreen Technical Document Appendix – October 2022

Biennial Report (BR) 2019 source datasets were extracted on April 26, 2022.

- Update of Underground Storage Tanks (UST)—new UST source data was provided on July 7, 2022.
- Update of Lead Paint—upgraded to ACS 2020 source.
- Note that all other Environmental Indicator sources are unchanged from EJScreen 2.0.
- **Socioeconomic Indicator changes:**
  - All indicators have been upgraded to ACS 2020.
  - All territories' socioeconomic data are from the Census 2010 Demographic Profile Summary File for each territory, using the Place summary level for American Samoa, CNMI, and Guam, and Estates summary level for US Virgin Islands. The Demographic Profiles were published in 2014 by the US Census Bureau.
- **Adding Supplemental Indexes:**
  - EJScreen 2.1 provides Supplemental Indexes for use in decision making where the use of racial/ethnic data is not appropriate. The Supplemental Indexes are included to provide an alternative view of EJ communities using a broader set of indicators.
  - The Supplemental Demographic Index uses five socioeconomic and health indicators and is calculated as the average of the five indicators:
    - Low Life Expectancy—Life Expectancy at Birth from Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS)
    - Low Income—ACS 2020
    - Unemployment Rate—ACS 2020
    - Limited English Speaking—ACS 2020
    - Less Than High School Education—ACS 2020
  - The Supplemental Demographic index is used to produce Supplemental indexes for each of the 12 Environmental Indicators included in EJScreen.
- **Methodology Change for Computing EJ Index:**
  - The equation for EJ Index calculations has been improved and is as follows so that the maximum EJ Index cannot exceed 100:
$$EJ\ Index = Demographic\ Index \times Normalized\ Environmental\ Indicator$$
Note that a normalized Environmental Indicator may have a different value at state or national level.
  - Normalized Environmental Indicator source data using percentiles.
  - There are three changes when comparing this to EJScreen 2.0 calculation:
    - No more using difference between the US mean and each block group demographic index, which is the average of “People of Color” and “Low Income”
    - No more weighting by block group population
    - Replacing Environmental Indicator raw value with Percentile of Environmental Indicator.
- **Methodology Change for Computing Percentiles:**
  - Percentiles are now unweighted. Previously, percentiles were weighted by population at each block group.

- Percentile ties now use a floor method, instead of a ceiling method. This produces lowest value for ties instead of highest value for ties.
- **Adding EJ Index and Supplemental Index Exceedances:**
  - EJScreen 2.1 provides users with a new capability of specifying custom areas of concern based on Percentile bins tabulated for the 12 EJ Indexes. The dataset is built by aggregating the occurrences of each percentile from 0 to 100 for all 12 indexes.
  - Thresholds maps can be generated based on user-specified percentile ranges and a user-specified set of indexes.
- **Adding Indexes Threshold Map Widget:**
  - The new Threshold Map Widget provides a tool for users to produce custom threshold maps based on the exceedance data. The tool allows the user to select data type (EJ Index or Supplemental Index); data source (US or State percentiles); Index Percentile Range; and individual EJ Indexes.

## EJSCREEN DATA ELEMENT DESCRIPTIONS

This section provides a summary of all EJScreen data elements, including data sources and definitions for the EJ Indexes, Supplemental Indexes, Environmental Indicators, and Socioeconomic Indicators. Two different demographic indexes are computed and are used to calculate EJ Indexes and Supplemental Indexes. The first demographic index is an average of low income and people of color and is referred to as two-factor demographic index. The two-factor demographic index section below is an excerpt from the EJScreen Technical Documentation for the completeness of this document. The supplemental demographic index is an average of low income, low life expectancy, unemployment rate, limited English speaking (which used to be called linguistically isolated), and less than high school education. The existing data elements and new elements are listed separately below.

### Refreshed Two-Factor Demographic Index

The demographic index in EJScreen is created by using two demographic indicators: low income and people of color (referred to as two-factor). The US Census Bureau does not provide tabulation of low income residents by race/ethnicity at the block group level. Therefore, in an effort to characterize the percentage of potentially susceptible/vulnerable individuals, the socioeconomic index is calculated by taking the average between the percentage of low income and the percentage of people of color for a block group.

EJScreen defines low income as “Individuals in households with Ratio of Income to Poverty < 2.0.” EJScreen defines people of color as “Total Population – Non-Hispanic White Population.” The current version of EJScreen uses data from the Census Bureau’s ACS 2016-2020 5-year Summary.

## Supplemental Demographic Index

In addition to the two-factor demographic index, EJScreen provides a Supplemental Demographic Index to conduct additional analysis where the use of racial/ethnic data is not appropriate. The Supplemental Demographic Index is the average of the following five indicators:

- **Low Life Expectancy**—Life Expectancy at Birth from CDC, NCHS:  
 $\% \text{ Low Life Expectancy is defined as } "1 - (\text{Life Expectancy} / \text{Max Life Expectancy})"$   
*Note: this is derived from the CDC life expectancy at birth data using the formula above.*
- **Low Income**—ACS 2016-2020 5-year Summary. Defined as “Individuals in households with Ratio of Income to Poverty < 2.0.”
- **Unemployment Rate**—ACS 2016-2020 5-year Summary. Defined as “Percent of Unemployed Workers age 16 and over in the civilian labor force.”
- **Limited English Speaking**—ACS 2016-2020 5-year Summary. Defined as “Households in which no one 14 and over speaks English only or speaks a language other than English at home and speaks English very well.”
- **Less Than High School Education**—ACS 2016-2020 5-year Summary. Defined as “Persons aged 25 and over who have an education level of less than high school.”

Here is the formula for computing the supplemental index:

**Supplemental Demographic Index = (% Low Life Expectancy + % Low Income + % Unemployment Rate + % Limited English Speaking + % Less Than High School Education) / 5**

Note that the CDC Life Expectancy data are available for about 90% of the country. For the areas where the Life Expectancy data are not available, the supplemental demographic index becomes the average of four indicators instead of five, which is calculated as “(% Low Income + % Unemployment Rate + % Limited English Speaking + % Less Than High School Education) / 4”.

## Twelve Refreshed EJ Indexes

- **Air Toxics Cancer Risk**—The indicator is lifetime inhalation cancer risk from EPA’s Air Toxics Data Update compiled for 2017. *EJ Index = Percentile of Air Toxics Cancer Risk x Demographic Index*
- **Air Toxics Respiratory Hazard Index (HI)**—The indicator is ratio of exposure concentration to Reference Concentration from EPA’s Air Toxics Data Update compiled for 2017. *EJ Index = Percentile of Air Toxics Respiratory Hazard Index (HI) x Demographic Index*
- **Diesel Particulate Matter**—The indicator is concentration ( $\mu\text{g}/\text{m}^3$ ) of diesel particulate matter (PM) from EPA’s Air Toxics Data Update compiled for 2017. *EJ Index = Percentile of Diesel Particulate Matter x Demographic Index*
- **Particulate Matter 2.5**—The indicator is annual average concentration ( $\mu\text{g}/\text{m}^3$ ) of inhalable PM that are 2.5 micrometers or smaller, from EPA’s Office of Air Quality Planning and Standards (OAQPS) compiled for 2018. *EJ Index = Percentile of Particulate Matter 2.5 x Demographic Index*

## EJScreen Technical Document Appendix – October 2022

- **Ozone**—The indicator is summer seasonal average of daily maximum 8-hour concentration in air (ppb), from EPA’s OAQPS compiled for 2018. *EJ Index = Percentile of Ozone x Demographic Index*
- **Lead Paint**—The indicator is percentage of housing units built before 1960, from Census Bureau’s ACS 2016-2020 5-year Summary. *EJ Index = Percentile of Lead Paint x Demographic Index*
- **Traffic Proximity**—The indicator is count of vehicles (average annual daily traffic) at major roads within 500 meters (or nearest neighbor outside 500 meters), divided by distance in kilometers (km). Highway segments are from the Highway Performance Monitoring System (HPMS) lines and Annual Average Daily Traffic (AADT) counts from the 2019 HPMS release, Federal Highway Administration. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Traffic Proximity x Demographic Index*
- **RMP Facility Proximity**—The indicator is count of RMP facilities within 5 km (or nearest neighbor outside 5 km), divided by distance. RMP facilities are pulled from EPA’s Facility Registry Service (FRS) by selecting facilities included in the RMP National Program System. The source data was pulled on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of RMP Facility Proximity x Demographic Index*
- **Hazardous Waste Proximity**—The indicator is count of hazardous waste facilities within 5 km (or nearest neighbor outside 5 km), divided by distance. The set of facilities is composed of operating TSDFs from RCRAInfo and Large Quantity Generators (LQGs) from the 2019 BR. The source data was pulled on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Hazardous Waste Proximity x Demographic Index*
- **Superfund Proximity**—The indicator is count of proposed and final National Priorities List (NPL) sites within 5 km (or nearest distance outside 5 km), divided by distance. Source data was pulled from Superfund Enterprise Management System (SEMS) database on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Superfund Proximity x Demographic Index*
- **Wastewater Discharge**—The indicator is toxicity-weighted stream concentrations divided by distance in km. The wastewater discharge indicator uses pollutant loadings from the Discharge Monitoring Report (DMR) Loading Tool along with the Risk-Screening Environmental Indicators (RSEI) model to estimate concentrations of pollutants in downstream water bodies and derive a toxicity-weighted concentration. The source data is from 2019. The source RSEI modeled results were provided by EPA’s Office of Pollution Prevention and Toxics (OPPT) on March 15, 2021. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Wastewater Discharge x Demographic Index*
- **Underground Storage Tanks**—The indicator is derived from the weighted sum of active leaking USTs (LUSTs) and the sum of active and temporarily out of service USTs divided by the buffered areas of 2019 block groups. Provided by EPA’s Office of Underground Storage Tanks on July 7, 2022, the UST indicator is calculated using the sum of LUSTs (multiplied by a factor of 7.7) and the number of USTs within a 1,500-foot buffered block group. That number is then divided by the area of the buffered block group in km<sup>2</sup>. The 7.7 multiplier is derived from the average

number of active USTs divided by the average number of LUSTs in the US backlog (cleanups remaining) from 2011-2020. A 1,500-foot buffer is used as a radius of influence for the benzene plume migration to encompass USTs/LUSTs near block groups that could potentially be affected by a release. *EJ Index = Percentile of Underground Storage Tanks x Demographic Index*

### Supplemental Indexes

- **Air Toxics Cancer Risk**—The indicator is lifetime inhalation cancer risk from EPA’s Air Toxics Data Update compiled for 2017. *EJ Index = Percentile of Air Toxics Cancer Risk x Supplemental Socioeconomic Index*
- **Air Toxics Respiratory Hazard Index (HI)**—The indicator is ratio of exposure concentration to Reference Concentration from EPA’s Air Toxics Data Update compiled for 2017. *EJ Index = Percentile of Air Toxics Respiratory Hazard Index (HI) x Supplemental Socioeconomic Index*
- **Diesel Particulate Matter**—The indicator is concentration ( $\mu\text{g}/\text{m}^3$ ) of diesel PM from EPA’s Air Toxics Data Update compiled for 2017. *EJ Index = Percentile of Diesel Particulate Matter x Supplemental Demographic Index*
- **Particulate Matter 2.5**—The indicator is annual average concentration ( $\mu\text{g}/\text{m}^3$ ) of inhalable PM that are 2.5 micrometers or smaller, from EPA’s OAQPS compiled for 2018. *EJ Index = Percentile of Particulate Matter 2.5 x Supplemental Demographic Index*
- **Ozone**—The indicator is summer seasonal average of daily maximum 8-hour concentration in air (ppb), from EPA’s OAQPS compiled for 2018. *EJ Index = Percentile of Ozone x Supplemental Demographic Index*
- **Lead Paint**—The indicator is percentage of housing units built before 1960, from Census Bureau’s ACS 2016-2020 5-year Summary. *EJ Index = Percentile of Lead Paint x Supplemental Demographic Index*
- **Traffic Proximity**—The indicator is count of vehicles (average annual daily traffic) at major roads within 500 meters (or nearest neighbor outside 500 meters), divided by distance in km. Highway segments are from the HPMS lines and AADT counts from the 2019 HPMS release, Federal Highway Administration. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Traffic Proximity x Supplemental Demographic Index*
- **RMP Facility Proximity**—The indicator is count of RMP facilities within 5 km (or nearest neighbor outside 5 km), divided by distance. RMP facilities are pulled from EPA’s FRS by selecting facilities included in the RMP National Program System. The source data was pulled on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of RMP Facility Proximity x Supplemental Demographic Index*
- **Hazardous Waste Proximity**—The indicator is count of hazardous waste facilities within 5 km (or nearest neighbor outside 5 km), divided by distance. The set of facilities is composed of operating TSDFs from RCRAInfo and LQGs from the 2019 BR. The source data was pulled on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Hazardous Waste Proximity x Supplemental Demographic Index*
- **Superfund Proximity**—The indicator is count of proposed and final NPL sites within 5 km (or nearest distance outside 5 km), divided by distance. Source data was pulled from SEMS

database on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Superfund Proximity x Supplemental Demographic Index*

- **Wastewater Discharge**—The indicator is toxicity-weighted stream concentrations divided by distance in km. The wastewater discharge indicator uses pollutant loadings from the DMR Loading Tool along with the RSEI model to estimate concentrations of pollutants in downstream water bodies and derive a toxicity-weighted concentration. The source data is from 2019. The source RSEI modeled results were provided by EPA's OPPT on March 15, 2021. The proximity analysis was rerun using the 2020 block population weights table. *EJ Index = Percentile of Wastewater Discharge x Supplemental Demographic Index*
- **Underground Storage Tanks**—The indicator is derived from the weighted sum of active LUSTs and the sum of active and temporarily out of service USTs divided by the buffered areas of 2019 block groups. Provided by EPA's Office of Underground Storage Tanks on July 7, 2022, the UST indicator is calculated using the sum of LUSTs (multiplied by a factor of 7.7) and the number of USTs within a 1,500-foot buffered block group. That number is then divided by the area of the buffered block group in km<sup>2</sup>. The 7.7 multiplier is derived from the average number of active USTs divided by the average number of LUSTs in the US backlog (cleanups remaining) from 2011-2020. A 1,500-foot buffer is used as a radius of influence for the benzene plume migration to encompass USTs/LUSTs near block groups that could potentially be affected by a release. *EJ Index = Percentile of Underground Storage Tanks x Supplemental Demographic Index*

### Twelve Refreshed Environmental Indicators

- **Air Toxics Cancer Risk**—Lifetime inhalation cancer risk from EPA's Air Toxics Data Update compiled for 2017.
- **Air Toxics Respiratory Hazard Index (HI)**—Ratio of exposure concentration to Reference Concentration from EPA's Air Toxics Data Update compiled for 2017.
- **Diesel Particulate Matter**—Concentration ( $\mu\text{g}/\text{m}^3$ ) of diesel PM from EPA's Air Toxics Data Update compiled for 2017.
- **Particulate Matter 2.5**—Annual average concentration ( $\mu\text{g}/\text{m}^3$ ) of inhalable PM that are 2.5 micrometers or smaller, from EPA's OAQPS compiled for 2018.
- **Ozone**—Summer seasonal average of daily maximum 8-hour concentration in air (ppb), from EPA's OAQPS compiled for 2018.
- **Lead Paint**—Percentage of housing units built before 1960, from Census Bureau's ACS 2016-2020 5-year Summary. Uses the ACS table B25034, "Year Structure Built."
- **Traffic Proximity**—Count of vehicles (average annual daily traffic) at major roads within 500 meters (or nearest neighbor outside 500 meters), divided by distance in km. Highway segments are from the HPMS lines and AADT counts from the 2019 HPMS release, Federal Highway Administration. The proximity analysis was rerun using the 2020 block population weights table.
- **RMP Facility Proximity**—Count of RMP facilities within 5 km (or nearest neighbor outside 5 km), divided by distance. RMP facilities are pulled from EPA's FRS by selecting facilities included in the RMP National Program System. The source data was pulled on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table.

## EJScreen Technical Document Appendix – October 2022

- **Hazardous Waste Proximity**—Count of hazardous waste facilities within 5 km (or nearest neighbor outside 5 km), divided by distance. The set of facilities is composed of operating TSDFs from RCRAInfo and LQGs from the 2019 BR. The source data was pulled on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table.
- **Superfund Proximity**—Count of proposed and final NPL sites within 5 km (or nearest distance outside 5 km), divided by distance. Source data was pulled from SEMS database on April 26, 2022. The proximity analysis was rerun using the 2020 block population weights table.
- **Wastewater Discharge**—Toxicity-weighted stream concentrations divided by distance in km. The wastewater discharge indicator uses pollutant loadings from the DMR Loading Tool along with the RSEI model to estimate concentrations of pollutants in downstream water bodies and derive a toxicity-weighted concentration. The source data is from 2019. The source RSEI modeled results were provided by EPA’s OPPT on March 15, 2021. The proximity analysis was rerun using the 2020 block population weights table.
- **Underground Storage Tanks**—Derived from the weighted sum of active LUSTs and sum of active and temporarily out of service USTs divided by the buffered areas of 2019 block groups. The UST indicator is calculated using the sum of LUSTs (multiplied by a factor of 7.7) and the number of USTs within a 1,500-foot buffered block group. That number is then divided by the area of the buffered block group in km<sup>2</sup>. The 7.7 multiplier is derived from the average number of active USTs divided by the average number of LUSTs in the US backlog (cleanups remaining) from 2011-2020. A 1,500-foot buffer is used as a radius of influence for the benzene plume migration to encompass USTs/LUSTs near block groups that could potentially be affected by a release. The data was provided by EPA’s Office of Underground Storage Tanks on July 7, 2022.

### Eight Refreshed Socioeconomic Indicators

- **Demographic Index**—Calculated by taking the average between the percentage of low income and the percentage of people of color for a block group. EJScreen defines low income as “Individuals in households with Ratio of Income to Poverty < 2.0.” EJScreen defines people of color as “Total Population – Non-Hispanic White Population.” The current version of EJScreen uses data from the Census Bureau’s ACS 2016-2020 5-year Summary.
- **People of Color**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Total Population – Non-Hispanic White Population.” Uses the ACS table B03002, “Hispanic or Latino Origin by Race.”
- **Low Income**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Individuals in households with Ratio of Income to Poverty < 2.0.” Uses the ACS table C17002, “Ratio of Income to Poverty Level in the Past 12 Months.”
- **Limited English Speaking**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Households in which no one 14 and over speaks English only or speaks a language other than English at home and speaks English very well.” Uses the ACS table C16002, “Household Language by Household Limited English Speaking Status.”
- **Less Than High School Education**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Persons aged 25 and over who have an education level of less than high



school.” Uses the ACS table B15002, “Sex by Educational Attainment for the Population 25 Years and Over.”

- **Under Age 5**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Persons Under Age 5.” Uses the ACS table B01001, “Sex by Age.”
- **Over Age 64**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Persons Over Age 64.” Uses the ACS table B01001, “Sex by Age.”
- **Unemployment Rate**—Derived from Census Bureau’s ACS 2016-2020 5-year Summary. Defined as “Percent of Unemployed Workers age 16 and over in the civilian labor force.” Uses the ACS table B23025, “Employment Status for the Population 16 Years and Over.”

### One New Socioeconomic Indicator

- **Low Life Expectancy**—The new indicator was added for use in the Supplemental Indexes dataset only. It is derived from [Life Expectancy at Birth from CDC, National Center for Health Statistics](#) using the formula of % Low Life Expectancy is defined as “ $1 - (\text{Life Expectancy} / \text{Max Life Expectancy})$ ”. The following processing steps were used to bring the data into EJScreen:
  - The source is Census 2015 Tract-level data, so it was first converted to 2010 tracts using the Census 2010 to 2015 relationship table.
  - 2010 tracts were then converted to 2020 tracts using the Census 2010 to 2020 relationship table.
  - Low Life Expectancy values were assigned to each child 2020 block group within the same Census tract.

## OTHER DATA ELEMENT DESCRIPTIONS

This section describes additional datasets now available in EJScreen. They include Health Disparities (Low Life Expectancy, Heart Disease, and Asthma); Climate Change-related (Wildfire Risk and Flood Risk); and Sensitive Communities (Colonias from US Department of Housing and Urban Development [HUD], Texas, and New Mexico).

### Health Disparities Data

- **Low Life Expectancy**—Average life expectancy data developed as a collaboration between NCHS, the National Association for Public Health Statistics and Information Systems (NAPHSIS), and the Robert Wood Johnson Foundation. This data is available at the tract level. Source: [U.S. Small-area Life Expectancy Estimates Project \(USALEEP\)](#)
- **Heart Disease**—Heart disease prevalence among adults aged 18 years or older. The term “heart disease” refers to several types of heart conditions. This data is available at the tract level. Source: [CDC Places Data](#)
- **Asthma**—Asthma prevalence among adults aged 18 or older. This data is available at the tract level. Source: [CDC Places Data](#)

### Wildfire and Flood Risk from First Street

- **Wildfire Risk**—The household risk of wildfire exposure under 2022 weather conditions as modeled by the First Street Foundation. Source: <https://firststreet.org/>
- **Flood Risk**—The household risk of flooding under 2022 weather conditions as modeled by the First Street Foundation. Source: <https://firststreet.org/>

### Colonias Data

HUD defines colonias as rural communities in close proximity to the US-Mexico border that lack access to basic services such as water, sewer, or housing. There are three colonias services used in EJScreen 2.1, which were published by HUD, the state of Texas, and EPA. The Colonias Communities layer, published by HUD, depicts the locations of colonias communities in Arizona, California, New Mexico (NM), and Texas (TX). The TX State Colonias layer, published by the Texas Office of the Attorney General, shows the colonias areas within Texas. The NM State Colonias layer, which was downloaded from the University of New Mexico Bureau of Business and Economic Research and published by EPA, depicts the colonias areas within New Mexico.

- Colonias Communities (HUD). Source: <https://hudgis-hud.opendata.arcgis.com/datasets/HUD::colonias-communities/about>
- Texas State Colonias. Source: <https://www.texasattorneygeneral.gov/divisions/colonias>
- New Mexico State Colonias. Source: <https://bber.unm.edu/data/colonias/>

## EJSCREEN ENHANCEMENT

A new widget, Indexes Threshold Map Widget, is now available in EJScreen 2.1. It allows users to investigate a potential hotspot with user-specified criteria based on all 12 EJ Indexes. It works with EJScreen Indexes and Supplemental Indexes.

### Indexes Threshold Map Widget

EJScreen 2.1 provides users with a new capability of specifying custom areas of concern based on Percentile bins tabulated for the 12 EJ Indexes.

- The new Threshold Map Widget is a tool for users to produce custom threshold maps. The tool allows the user to select:
  - Data type—EJ Index or Supplemental Index
  - Data source—US or State Percentiles
  - Index Percentile Range
  - All indexes or user-selected subset of indexes
- The tool uses data built from these EJScreen Index datasets:
  1. National Percentiles built based on the two-factor Demographic Index
  2. State Percentiles built based on the two-factor Demographic Index
  3. National Percentiles built based on the Supplemental Demographic Index

4. State Percentiles built based on the Supplemental Demographic Index
- Datasets include these elements:
  1. 12 Calculated EJ Index Percentiles
  2. 101 Percentile bin counters (0 to 100)

## DATA PROCESSING CHANGES

This section describes the changes to the data processes for EJScreen 2.1. These changes include Tract-based conversion to 2020 geographies, proximity calculations using new 2020 block data, new demographic index formula, and new percentiles methodology.

- **Environmental Indicators with Tract-based sources remapped to 2020 block groups**—Steps are:
  - 2019 to 2010 tract assignment
  - 2019 to 2020 tract assignment using Census 2010 to 2020 Relationship file
  - Tract to block group assignments using parent-child method.
- **Proximity Calculations**—block group proximity scores for Traffic, Superfund, RMP, Hazardous Waste, and Wastewater Discharge are calculated with the new Census block data from [2020 Decennial Census P.L. 94-171 Redistricting data](#).
- **EJ Indexes Formula**—for EJScreen 2.1, the equation for EJ Index calculations is as follows so that the maximum EJ Index cannot exceed 100:

$$EJ\ Index = Percentile\ of\ Environmental\ Indicator \times Demographic\ Index$$

Note that a normalized Environmental Indicator may have a different value at state or national level.

- Normalized Environmental Indicator source data using percentiles.
- There are three changes when comparing this to EJScreen 2.0 calculation:
  - No more using difference from the US mean and each block group demographic index, which is the average of “People of Color” and “Low Income”
  - No more weighting by block group population
  - Replacing Environmental Indicator with Percentile of Environmental Indicator.
- **Percentiles Methodology**—For EJScreen 2.1, there are two major changes to how percentiles are determined:
  - Percentiles are now unweighted. Previously, percentiles were weighted by population at each block group.
  - Percentile ties now use a floor method, instead of a ceiling method. This produces lowest value for ties instead of highest value for ties. This allows for reporting of percentiles that better represent unusual data distributions. For example, in West Virginia, the demographic indicator “Limited English Speaking” has a value of 0 for 1,506 out 1,639 block groups. Using the old method, this yields a percentile of 91, but using the new method, 0 yields a percentile of 0.

## US Territories

Four more US Territories were added to EJScreen: American Samoa, CNMI, Guam, and the US Virgin Islands (Puerto Rico was already included in EJScreen). American Samoa, CNMI, and Guam use 2013 Census Place boundaries. The US Virgin Islands use 2013 Census Estate boundaries. The territories data provides an additional 605 records. The four new territories have State percentiles data and do not have National percentiles.

### Data Sources:

- Census boundaries (Places, Estates, and Counties) are from Cartographic Boundary files, 2013, 1:500K scale.
- Demographic data—2010 Demographic Profiles of Island Areas published in 2014.

### Processing Steps:

- The block population weight table was generated based on distributing 2010 population for Estate or Place boundaries.
- Build demographic indicator tables by extracting the Place/Estate summary level data from the Demographic Profiles. Indicators include: % people of color; % low income; % limited English speaking; % less than high school education; % under age 5; and % over age 64
- Calculate demographic index: (%people of color + %low income) / 2
- Collect all the available environmental data sources
- Calculate EJ Indexes.

### The EJ Index availability for the Territories:

	<b>American Samoa</b>	<b>CNMI</b>	<b>Guam</b>	<b>US Virgin Islands</b>
Particulate Matter 2.5	No	No	No	No
Ozone	No	No	No	No
Diesel Particulate Matter	No	No	No	No
Air Toxics Cancer Risk	No	No	No	No
Air Toxics Respiratory HI	No	No	No	No
Traffic Proximity	No	No	No	No
Lead Paint	Yes	Yes	Yes	Yes
Superfund Proximity	No	No	Yes	Yes
RMP Facility Proximity	Yes	No	Yes	Yes
Hazardous Waste Proximity	No	No	Yes	Yes
Underground Storage Tanks	Yes	Yes	Yes	Yes
Wastewater Discharge	No	No	No	No

## REPORT CHANGES

The following changes have been made to the standard chart and reports in EJScreen:

- **Removed Statistics by EPA Region**—EPA Regional statistics are no longer provided in EJScreen. Previous versions of EJScreen provided charts and statistical reports for all reporting elements by National, State, and Regional statistics. National and State charts and statistical reports remain in EJScreen.
- **Revised Percentile Methodology**—Percentile ties now use a floor method, instead of a ceiling method. This produces lowest value for ties instead of highest value for ties.
- **Increased Rounding Precision**—The number of decimal places was increased from six to nine to handle small values from the Wastewater Discharge dataset.
- **Revised the “Population by Language Spoken at Home” Report**—Due to changes in the ACS source table for language spoken, this portion of the report provides a smaller set of languages and language categories, as follows:
  - English
  - Spanish
  - French, Haitian, or Cajun
  - German or other West Germanic
  - Russian, Polish, or other Slavic
  - Other Indo-European
  - Korean
  - Chinese (including Mandarin, Cantonese)
  - Vietnamese
  - Tagalog (including Filipino)
  - Other Asian and Pacific Island
  - Arabic
  - Other and Unspecified
  - Total Non-English

## DATA SOURCE AND TERMINOLOGY CHANGES

Over the years, some of EJScreen’s technical use of data and methods changed. Table 1 – Table 4 summarize the important changes. Table 5 provides the details on how closely each Environmental Indicator in EJScreen approximates actual estimated risk. Table 6 summarizes the sources and effective data years in all Environmental Indicators in EJScreen.

**Table 1. EJScreen Terminology Changes**

Old Term	New Term
Linguistically Isolated	Limited English Speaking

## EJScreen Technical Document Appendix – October 2022

**Table 2. EJScreen Environmental Indicator Changes**

Old Indicator	New Indicator
Particulate Matter 2.5	Particulate Matter 2.5
Ozone	Ozone
2017 Air Toxics Cancer Risk	Air Toxics Cancer Risk
2017 Air Toxics Respiratory HI	Air Toxics Respiratory HI
2017 Diesel Particulate Matter	Diesel Particulate Matter
Traffic Proximity	Traffic Proximity
Lead Paint	Lead Paint
Superfund Proximity	Superfund Proximity
RMP Facility Proximity	RMP Facility Proximity
Hazardous Waste Proximity	Hazardous Waste Proximity
Underground Storage Tanks	Underground Storage Tanks
Wastewater Discharge	Wastewater Discharge

**Table 3. EJScreen Socioeconomic Indicator Changes**

Old Indicator	New Indicator
Demographic Index	Demographic Index
N/A	Supplemental Demographic Index
People of Color	People of Color
Low Income	Low Income
Unemployment Rate	Unemployment Rate
Linguistically Isolated	Limited English Speaking
Less Than High School Education	Less Than High School Education
Under Age 5	Under Age 5
Over Age 64	Over Age 64

**Table 4. EJScreen Environmental Justice Index Changes**

Old Index	New Index
Particulate Matter 2.5	Particulate Matter 2.5
Ozone	Ozone
2017 Air Toxics Cancer Risk	Air Toxics Cancer Risk
2017 Air Toxics Respiratory HI	Air Toxics Respiratory HI
2017 Diesel Particulate Matter	Diesel Particulate Matter
Traffic Proximity	Traffic Proximity
Lead Paint	Lead Paint
Superfund Proximity	Superfund Proximity
RMP Facility Proximity	RMP Facility Proximity
Hazardous Waste Proximity	Hazardous Waste Proximity
Underground Storage Tanks	Underground Storage Tanks
Wastewater Discharge	Wastewater Discharge

## EJScreen Technical Document Appendix – October 2022

**Table 5. Types of Pollution and Sources (Environmental Indicators) Included in EJScreen**

Indicator	Place on Exposure– Risk Continuum	Key Medium	
<b>Air Toxics Cancer Risk</b> Lifetime inhalation cancer risk	Risk/Hazard	Air	
<b>Respiratory Hazard Index</b> Ratio of exposure concentration to Reference Concentration (RfC)			
<b>Diesel Particulate Matter</b> ( $\mu\text{g}/\text{m}^3$ )	Potential Exposure		Air
<b>Particulate Matter 2.5</b> Annual average ( $\mu\text{g}/\text{m}^3$ )			
<b>Ozone</b> Summer seasonal average of daily maximum 8-hour concentration in air (ppb)			Dust/ Lead Paint
<b>Lead Paint</b> Percentage of housing units built before 1960			
<b>Traffic Proximity</b> Count of vehicles (average annual daily traffic) at major roads within 500 meters (or nearest neighbor outside 500 meters), divided by distance in kilometers (km), calculation performed within 3km of roads	Proximity/Quantity	Air/ Other	
<b>RMP Facility Proximity</b> Count of facilities within 5 km (or nearest neighbor outside 5 km), divided by distance		Waste/ Water/ Air	
<b>Hazardous Waste Proximity</b> Count of major TSDFs and BR LQGs within 5 km (or nearest neighbor outside 5 km), divided by distance			
<b>Superfund Proximity</b> Count of proposed and listed NPL sites within 5 km (or nearest neighbor outside 5 km), divided by distance			
<b>Wastewater Discharge</b> Toxicity weighted stream concentrations divided by distance in kilometers (km), calculation performed with 3km of streams		Water	
<b>Underground Storage Tanks</b> Weighted count of USTs per sq. km	Proximity/Quantity	Land/Water	

## EJScreen Technical Document Appendix – October 2022

**Table 6. Summary Table of Pollution and Sources**

Key Medium	Indicator	Details	Source	Data Year
Air	Air Toxics Cancer Risk	Lifetime cancer risk from inhalation of air toxics	EPA Air toxics data, retrieved 2021 <a href="https://www.epa.gov/AirToxScreen/2017-airtoxscreen-assessment-results">https://www.epa.gov/AirToxScreen/2017-airtoxscreen-assessment-results</a>	2017
Air	Air Toxics Respiratory HI	Air toxics respiratory hazard index (ratio of exposure concentration to health-based reference concentration)	EPA Air toxics data, retrieved 2021 <a href="https://www.epa.gov/AirToxScreen/2017-airtoxscreen-assessment-results">https://www.epa.gov/AirToxScreen/2017-airtoxscreen-assessment-results</a>	2017
Air	Diesel Particulate Matter	Diesel particulate matter level in air, $\mu\text{g}/\text{m}^3$	EPA Air toxics data, retrieved 2021 <a href="https://www.epa.gov/AirToxScreen/2017-airtoxscreen-assessment-results">https://www.epa.gov/AirToxScreen/2017-airtoxscreen-assessment-results</a>	2017
Air	Particulate Matter 2.5	PM <sub>2.5</sub> levels in air, $\mu\text{g}/\text{m}^3$ annual avg. (2018)	EPA, OAR (fusion of model and monitor data). For methods, see EPA Report EPA-454/S-15-001 <a href="https://www.epa.gov/green-book/green-book-pm-25-2012-area-information">https://www.epa.gov/green-book/green-book-pm-25-2012-area-information</a>	2018
Air	Ozone	Ozone summer seasonal avg. of daily maximum 8-hour concentration in air in parts per billion (2018)	EPA, OAR (fusion of model and monitor data). For methods, see EPA Report EPA-454/S-15-001 <a href="https://www.epa.gov/green-book/green-book-8-hour-ozone-2015-area-information">https://www.epa.gov/green-book/green-book-8-hour-ozone-2015-area-information</a>	2018



## EJScreen Technical Document Appendix – October 2022

Key Medium	Indicator	Details	Source	Data Year
Air/other	Traffic Proximity	Count of vehicles (AADT, avg. annual daily traffic) at major roads within 500 meters, divided by distance in meters (not km), calculation performed within 3 km of roads	Calculated from 2019 US DOT traffic data, retrieved 2021 <a href="https://geo.dot.gov/server/services">https://geo.dot.gov/server/services</a>	2019
Dust/lead paint	Lead Paint	Percent of housing units built pre-1960, as indicator of potential lead paint exposure	Calculated based on Census/ACS data, retrieved 2021 <a href="https://www.census.gov/programs-surveys/acs/data/summary-file.html">https://www.census.gov/programs-surveys/acs/data/summary-file.html</a>	2016-2020
Waste/air/water	RMP Facility Proximity	Count of RMP (potential chemical accident management plan) facilities within 5 km (or nearest one beyond 5 km), each divided by distance in kilometers	Calculated from EPA RMP database, retrieved 04/26/2022 <a href="https://www.epa.gov/rmp/riisk-management-plan-rmp-rule-overview">https://www.epa.gov/rmp/riisk-management-plan-rmp-rule-overview</a>	2022
Waste/air/water	Hazardous Waste Proximity	Count of TSDFs and BR LQGs (hazardous waste management facilities) within 5 km (or nearest beyond 5 km), each divided by distance in kilometers	Calculated from EPA RCRAInfo database, retrieved 04/26/2022 and 2019 BR retrieved 04/26/2022 <a href="https://www.epa.gov/hwpermitting/reference-document-hazardous-waste-treatment-storage-and-disposal-facilities">https://www.epa.gov/hwpermitting/reference-document-hazardous-waste-treatment-storage-and-disposal-facilities</a>  <a href="https://rcrapublic.epa.gov/rcrainfoweb/action/modules/brr/summary/view">https://rcrapublic.epa.gov/rcrainfoweb/action/modules/brr/summary/view</a>	2022
Waste/air/water	Superfund Proximity	Count of proposed and listed NPL sites within 5 km (or nearest one beyond 5 km), each divided by distance in kilometers	Calculated from EPA SEMS database, retrieved 04/26/2022 <a href="http://cumulis.epa.gov/supercpad/cursites/srchsites.cfm">http://cumulis.epa.gov/supercpad/cursites/srchsites.cfm</a>	2022

## EJScreen Technical Document Appendix – October 2022

Key Medium	Indicator	Details	Source	Data Year
Water	Wastewater Discharge	Toxicity-weighted stream concentrations at stream segments within 500 meters, divided by distance in kilometers (km), calculation performed within 3km of streams	Calculated from RSEI modeled toxicity-weighted stream concentrations, created 03/2021 <a href="https://www.epa.gov/rsei">https://www.epa.gov/rsei</a>	2019
Land/ Water	Underground Storage Tanks	Weighted count of USTs per sq. km	Provided by EPA Office of Underground Storage Tanks, 07/07/2022 <a href="https://www.epa.gov/ust">https://www.epa.gov/ust</a>	2022
<p><b>Note:</b> EJScreen’s EJ Indexes also include demographic information that is obtained from the US Census Bureau’s ACS.</p>				