MassEnviroScreen Indicators glossary

Pollution and Climate Burden

Environmental exposures

- **Ozone concentrations**: Maximum 8-hour average model predictions in parts per billion (ppb) over the U.S. for ozone for any month in 2021 at census tract centroids. All census block groups received the same Ozone measure as the census tract in which they are contained. Source: U.S. Environmental Protection Agency (EPA) Bayesian Space-time Downscaling Fusion Model (Downscaler) via EJScreen 2024. https://www.epa.gov/hesc/rsig-related-downloadable-data-files#output
- **PM2.5 concentrations**: 24-hour average particulate matter that is less than or equal to 2.5 micrometers in diameter (PM2.5) concentrations in parts per million (ppm) during 2021 at census tract centroids. All census block groups received the same PM2.5 measure as the census tract in which they are contained. Source: U.S. Environmental Protection Agency (EPA) Bayesian Space-time Downscaling Fusion Model (Downscaler) via EJScreen 2024. https://www.epa.gov/hesc/rsig-related-downloadable-data-files#output
- **Nitrogen dioxide (NO2) concentrations**: average annual nitrogen dioxide (NO2) levels expressed as part per billion (by volume) for 2020 at 1km grid resolution, aggregated to census block groups using mean pixel values. Source: NASA's Health and Air Quality Applied Sciences Team (HAQAST) - Nitrogen Dioxide Surface-Level Annual Average Concentrations V1 via EJScreen 2024. https://disc.gsfc.nasa.gov/datasets/SFC_NITROGEN_DIOXIDE_CONC_1/summary?keywords=TROPOMI%20NO2
- **Diesel PM**: Diesel particulate matter (PM) level in air, in micrograms per cubic meter ($\mu g/m^3$) for 2020 at census tract centroid. All census block groups received the same Diesel PM measure as the census tract in which they are contained. Source: U.S. Environmental Protection Agency (EPA) Air Toxics Screening Assessment via EJScreen 2024. https://www.epa.gov/AirToxScreen
- **Drinking water non-compliance**: Safe Drinking Water Act (SDWA) compliance performance of a community water system (CWS) serving a census block group population. The drinking water non-compliance indicator is only applicable to households that get their drinking water from a CWS, which are subject to National Primary Drinking Water Regulations (NPDWRs) under the SDWA. The indicator excludes households on private wells, for example, which are not regulated by the

EPA. The indicator reflects compliance performance for the last 5-years (2019 Q4-2023 Q4). Scores are only given to water systems for violations that have not been returned to compliance. Source: EJScreen 2024

- **Children's Lead Risk from Housing**: Potential risk for lead exposure in children living in low-income communities with older housing. Percentage of households within a census tract with likelihood of lead-based paint (LBP) hazards from the age of housing (1979 or earlier) combined with the percentage of households that are both low-income (household income less than 80% of the county median family income) and have children under 6 years old (5-year estimates 2017-2021). All census block groups received the same percentage as the census tract in which they are contained. Source: U.S. Department of Housing and Urban Development Comprehensive Housing Affordability Strategy data. https://www.huduser.gov/portal/datasets/cp.html
- **Toxic Releases from facilities**: Average annual Risk-Screening Environmental Indicators (RSEI) modeled toxicity-weighted concentrations in air of Toxics Release Inventory (TRI) listed chemicals to census block groups. Source: EPA Risk-Screening Environmental Indicators (RSEI) model Geographic Microdata via EJScreen 2024. https://www.epa.gov/rsei/rsei-geographic-microdata-rsei-gm
- **Proximity to heavy traffic**: Count of vehicles (annual average daily traffic [AADT]) at major roads within 10 kilometers (km), divided by distance in km. The traffic proximity indicator is based on AADT count divided by distance in meters from the Census block centroid. The proximity score is based on the traffic within a search radius of 10 km. The closest traffic is given more weight, and the distant traffic is given less weight, through inverse distance weighting. The traffic proximity indicator values for each block centroid are averaged to the census block group in which they are contained.

Environmental effects

- **Pollution cleanup sites**: Sum of weighted sites within each census block group, adapted from methodology used for CalEnviroScreen. Sites were scored on a weighted scale of 0 to 12 in consideration of both the site type and status. Higher weights were applied to Superfund, state response sites, and cleanups compared to evaluations, for example. Similarly, higher weights were applied to sites that are undergoing active remediation and oversight, relative to those with little or no state involvement. The weights for all sites were adjusted based on the distance they fell from populated census blocks. Sites further than 1000m from any populated census block were excluded from the analysis. Site weights were adjusted by multiplying the weight by 1 for sites less than 250m, 0.5 for sites 250-500m, 0.25 for

sites 500-750m, and 0.1 for sites 750-1000m from the nearest populated census blocks within a given census block group. Each census block group was scored based on the sum of the adjusted weights. Summed census block group scores were sorted and assigned percentiles based on their position in the distribution. The table below shows the weights for each site type.

Weighting Matrix for Cleanup Sites

Site Type	Status		
	Low • Certified • Completed • No Further Action	Medium • Inactive – Needs Eval. • Inactive • Certified Operation & Maintenance – Land Use Restrictions • Certified Operation & Maintenance	High • Active • Backlog • Inactive – Action Required
Low • Evaluation • Historical • Military Eval	**0**	**4**	**6**
Medium • Corrective Action • School Cleanup • Voluntary Cleanup • Tiered Permit	**1**	**7**	**9**
High • State Response • Superfund	**2**	**10**	**12**

Active: Identifies that an investigation and/or remediation is currently in progress and that DEP is actively involved, either in a lead or support capacity.

Certified Operation and Maintenance (O&M): Identifies sites that have certified cleanups in place but require ongoing O&M activities.

Certified: Identifies completed sites with previously confirmed releases that are subsequently certified by DEP as having been remediated satisfactorily under DEP oversight.

Corrective Action: Identifies sites undergoing "corrective action," defined as investigation and cleanup activities at hazardous waste facilities (either Resource Conservation and

Recovery Act (RCRA) or State-only) that either were eligible for a permit or received a permit. These facilities treat, store, dispose and/or transfer hazardous waste.

Evaluation: Identifies suspected, but unconfirmed, contaminated sites that need or have gone through a limited investigation and assessment process. Includes brownfield sites.

Inactive – Action Required: Identifies non-active sites where DEP has determined that a removal or remedial action or further extensive investigation is required.

Inactive - Needs Evaluation: Identifies inactive sites where DEP has determined an evaluation is required.

No Further Action: Identifies completed sites where DTSC determined after investigation, generally a PEA (an initial assessment), that the property does not pose a problem to public health or the environment.

School Cleanup: Identifies proposed and existing school sites that are being evaluated by DEP for possible hazardous materials contamination at which remedial action occurred.

State Response: Identifies confirmed release sites where DEP is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk. This include 21E sites.

Superfund: Identifies sites where the US EPA proposed, listed, or delisted a site on the National Priorities List (NPL).

Tiered Permit Sites: These facilities manage waste not regulated under RCRA, but regulated as a hazardous waste by the State of Massachusetts.

Voluntary Cleanup: Identifies sites with either confirmed or unconfirmed releases, and the project proponents have requested that DEP oversee evaluation, investigation, and/or cleanup activities and have agreed to provide coverage for DEP's costs.

Data sources: Superfund National Priorities List polygons from US EPA Office of Land and Emergency Management (OLEM) at https://edg.epa.gov/data/PUBLIC/OLEM/OLEM-OSRTI/NPL_Boundaries.zip; Brownfields sites from US EPA Assessment, Cleanup and Redevelopment Exchange System (ACRES) at https://catalog.data.gov/dataset/acres-brownfields-properties; MA DEP 21E sites from MassGIS at https://www.mass.gov/info-details/massgis-data-massdep-tier-classified-oil-andor-hazardous-material-sites-mgl-c-21e; MA DEP AUL sites from MassGIS at https://www.mass.gov/info-details/massgis-data-massdep-oil-andor-hazardous-material-sites-with-activity-and-use-limitations-aul;

- **Groundwater threats**: Sum of weighted scores for sites within each census block group, adapted from methodology used for CalEnviroScreen. Sites include USTs and

facilities with groundwater discharge permits. The weights for all sites were adjusted based on their distance from populated census blocks. Sites further than 1000m from any populated census block were excluded from the analysis. Site weights were adjusted by multiplying the weight by 1 for sites less than 250m, 0.5 for sites 250-500m, 0.25 for sites 500-750m, and 0.1 for sites 750-1000m from the nearest populated census blocks within a given block group. Sites outside of a census block group, but less than 1000m from one of that block group's populated blocks were similarly adjusted based on the distance to the nearest block from that block group. Each census block group was scored based on the sum of the adjusted weights for sites it contains or is near. Data sources: US EPA's UST Finder data is a national composite of leaking underground storage tanks, underground storage tank facilities, and underground storage tanks as of 2018-2021. Data downloaded via ArcGIS Pro at https://epa.maps.arcgis.com/home/item.html?id=5a3ae0ed53564b6fa519f08e30e79e93; MA DEP Groundwater Discharge Permits from MassGIS at https://www.mass.gov/info-details/massgis-data-massdep-groundwater-discharge-permits.

Weighting Matrix for Groundwater Threats

Site Type	Status	Weight
Groundwater Discharge Permit Facilities	Active	5
	Inactive	2
UST Sites	Open	3
	No Further Action	3
	Unknown	3

- **Hazardous waste generators and facilities**: Sum of weighted permitted hazardous waste facilities, and hazardous waste generators within each census block group. The weights for all facilities were adjusted based on the distance they fell from populated census blocks. All facilities further than 1,000m from any populated census block were excluded from the analysis. Site weights were adjusted by multiplying the weight by 1 for facilities less than 250m, 0.5 for sites 250-500m, 0.25 for sites 500-750m, and 0.1 for sites 750-1000m from the nearest populated census blocks within a given tract. Facilities outside of a census tract, but less than 1000m from one of that tract's populated blocks were similarly adjusted based on the distance to the nearest block from that tract. Each census tract was scored based on the sum of the adjusted weights for sites it contains or is near. Data sources:

MassDEP Major Facilities from MassGIS at https://www.mass.gov/info-details/massgis-data-massdep-major-facilities.

Weighting Matrix for Permitted Hazardous Waste Facilities, Hazardous Waste Generators, and Chrome Plating Facilities

Permitted Hazardous Waste Facilities

	Weight	Activity or Status
Facility Activity (base weight)	10	Landfill
	7	Treatment
	4	Storage
	2	Post-closure
Permit Type (additional weight)	1	Large facilities
	1	Non-RCRA facilities
	2	RCRA facilities

Hazardous Waste Generators

Generator Type	Weight	Quantity of Waste
Large Quantity Hazardous Waste Generators	0.1	< 100 tons/yr
	0.5	100 – 1,000 tons/yr
	2	>1,000 tons/yr

- **Solid waste sites and facilities**: Sum of weighted solid waste sites and facilities. The weights for all sites, including the large landfill perimeters, were adjusted based on the distance they fell from populated census blocks. Sites further than 1000m from any populated census block were excluded from the analysis. Site weights were adjusted by multiplying the weight by 1 for sites less than 250m, 0.5 for sites 250-500m, 0.25 for sites 500-750m, and 0.1 for sites 750-1000m from the nearest populated census blocks within a given census block group. Sites outside of a census block group, but less than 1000m from one of that tract's populated blocks were similarly adjusted based on the distance to the nearest populated block from that block group. Each census block group was scored based on the sum of the adjusted weights for sites it contains or is near. Summed census block group scores were sorted and assigned percentiles based on their position in the distribution. Data sources: MassDEP Solid Waste Diversion and Disposal layer (through 2016) from MassGIS at https://www.mass.gov/info-details/massgis-data-massdep-solid-waste-diversion-and-disposal.

Weighting Matrix for Solid Waste Sites and Facilities

Category	Site of Facility Type
Solid Waste Landfill or Construction, Demolition and Inert (CDI) Debris Waste Disposal (active)	8
Solid Waste Disposal Site (closed, closing, inactive)	1
Composting	4
Waste Tire	4

- **Impaired Water Bodies**: Summed number of pollutants across all water bodies designated as impaired within the area, adapted from methodology used for CalEnviroScreen. The number of pollutants listed in streams or rivers that fell within 1 kilometer (km) or 2 km respectively of a census block group's populated blocks were counted. The 2 km buffer distance was applied to major rivers (>100 km in length). The 1 km buffer distance was applied to all smaller streams/rivers. The number of pollutants listed in lakes, bays, estuaries or shoreline that fell within 1 km or 2 km of a census block group's populated blocks were counted. The 2 km buffer distance was applied to major lakes or bays greater than 25 square kilometers in size. The 1 km buffer distance was applied for all other lakes/bays. The two pollutant counts were summed for every census block group. Each census block group was scored based on the sum of the number of individual pollutants found within and/or bordering it. For example, if two stream sections within a census block group were both listed for the same pollutant, the pollutant was only counted once. Summed census block group scores were sorted and assigned percentiles based on their position in the distribution. Data sources: MassDEP 2022 Integrated List of Waters (305(b)/303(d)) from MassGIS at https://www.mass.gov/info-details/massgis-data-massdep-2022-integrated-list-of-waters-305b303d.

Climate risks

- **Drought**: Sum of weekly total percent of an area experiencing a severe, extreme, or exceptional drought (categories D2, D3, or D4), adapted from Colorado EnviroScreen. These levels of drought imply some level of voluntary or mandated water use restrictions and observable damage or loss of pasture and crops. The U.S. Drought Monitor reports the percentage of each county experiencing each of the six drought levels (None, D0, D1, D2, D3, and D4) each week. The sum of areas experiencing D2, D3, D4 level droughts was calculated weekly across all weeks from January 2019 to December 2024. The sum of the weekly drought values across that

time period was used to define the Drought measure. All census block groups received the Drought value for the county in which they are located. Data Source: U.S. Drought Monitor 2019-2024 https://droughtmonitor.unl.edu/Data.aspx

- **Wildfire risk**: Wildfire Hazard Potential for the United States, version 2023. The mean wildfire hazard potential within each geographic area is used as the Wildfire risk score, adapted from Colorado EnviroScreen. Wildfire Hazard Potential (WHP) is provided as a 270-meter resolution raster. The mean WHP of all pixels or raster grid cells falling within each census block group were calculated. Data Source: U.S. Department of Agriculture (USDA), U.S. Forest Service (USFS) https://www.fs.usda.gov/rds/archive/catalog/RDS-2015-0047-4
- **Flood risk**: Percentage of each geographic area where there is at least a one percent chance of flooding annually, adapted from Colorado EnviroScreen. The area of all features within the 1% Annual Chance Flood Hazard within each census block group was divided by the total area of the census block group. If no flood areas were found within the census block group, a value of zero was used. Data sources: FEMA National Flood Hazard Layer from MassGIS at https://www.mass.gov/info-details/massgis-data-fema-national-flood-hazard-layer
- **Extreme heat**: Average number of days between May and September from 2019 through 2023 in which daily high temperature exceeded the 90th percentile of historical daily high temperatures, adapted from Colorado EnviroScreen. The mean number of extreme heat days between 2019-2023 was available at the census tract and county level. All census block groups received the Extreme heat days value for the census tract in which they are located. Data Source: National Environmental Public Health Tracking Network via the U.S. Centers for Disease Control (CDC), Heat & Heat Related Illness (HRI), Historical Temperature & Heat Index, 2019-2023 https://ephtracking.cdc.gov/

Population Characteristics

Sensitive populations

- **Pediatric asthma**: Pediatric asthma prevalence per 100 students (K-8) by school and community for years 2017 to 2023. Values provided by municipality (i.e., city or town). All census block groups received the prevalence value for the municipality in which they are located. Data source: Massachusetts Environmental Public Health Tracking at https://matracking.ehs.state.ma.us/Health-Data/Asthma/index.html

- **Adult high blood pressure**: Prevalence of high blood pressure among adults from 2024. Data provided a census tract level. All census block groups received the prevalence value for the census tract in which they are located. Data source: CDC PLACES Health Outcomes at https://data.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh/about_data
- **Adult cancer**: Prevalence of cancer (non-skin) or melanoma among adults from 2024. Data provided a census tract level. All census block groups received the prevalence value for the census tract in which they are located. Data source: CDC PLACES Health Outcomes at https://data.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh/about_data
- **Low birth weight infants**: Percentage of live births that were low or very low birth weight for 2013 to 2022. Data provided at municipality level (i.e., town or city). All census block groups received the prevalence value for the municipality in which they are located. Data source: Massachusetts Department of Public Health Birth Outcomes Data of Massachusetts Residents at https://www.mass.gov/info-details/birth-outcomes-data-of-massachusetts-residents
- **Low life expectancy**: Average life expectancy. 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 – (Life Expectancy / Max Life Expectancy)". Source: U.S. Small-area Life Expectancy Estimates Project (USALEEP) via EJScreen 2024.

Socioeconomic factors

- **Adults without a high school diploma**: Percent of people age 25 or older in a block group whose education is less than a high school diploma. The ACS education information is captured in the table Sex by Educational Attainment for the Population 25 Years and Over (ACS Table ID: B15002) at the census block group level. Data source: US American Community Survey 5-year Estimates for 2019 – 2023.
- **Housing burdened low income households**: Percent of households that are both low income (making less than 80% of the HUD Area Median Family Income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs). Data provided at census tract level. All census block groups received the percentage value for the census tract in which they are located. Data source: US Department of Housing and Urban Development CHAS (Comprehensive Housing Affordability Strategy) at https://www.huduser.gov/portal/datasets/cp.html
- **Linguistic isolation**: Percentage of limited English-speaking households, (2019-2023). A limited English speaking household is defined as a household in which no one age 14 or over speaks English at least "very well" as reported in the U.S. Census

Bureau's ACS. The ACS limited English speaking household information is captured in the table Household Language by Household Limited English Speaking Status (ACS Table ID: C16002) at the census block group level. Data source: US American Community Survey 5-year Estimates for 2019 – 2023

- **Poverty**: Percent of household whose income is less than or equal to twice the poverty level (2019 – 2023). For example, a household of four with a reported $40,000 total annual income is lower than twice the poverty threshold of $59,900 ($29,950 is the poverty threshold defined by the U.S. Census Bureau for 2022). The poverty level is a national number and the same across all geographic regions. To accommodate differences in the varying costs of living across the United States and other factors, analysts typically use twice the poverty level to capture low-income households, especially in high-cost areas. The ACS low income information is captured in the table Ratio of Income to Poverty Level in the Past 12 Months (ACS Table ID: C17002). Data source: US American Community Survey 5-year Estimates for 2019 – 2023.
- **Unemployment**: Percentage of the population over the age of 16 that is unemployed and eligible for the labor force. Excludes retirees, students, homemakers, institutionalized persons except prisoners, those not looking for work, and military personnel on active duty (5-year estimate, 2019-2023). The ACS unemployment information is captured in the table Employment Status for the Population 16 Years and Over (Table ID: B23025). Data source: US American Community Survey 5-year Estimates for 2019 – 2023.