

GIS FOR THE NATION

Proposed Data Sharing Information Model for Local, State, Tribal, and National Data Themes

data themes

Emergency Operations

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Incidents, damage, operations, and safety locations – damage locations, road closures, evacuation routes, shelters, contamination zones, fire boundaries
Emergency response, Homeland Security, and national preparedness
Local, state, and federal agencies
Points, lines, polygons, annotation
Operations must often be vertically integrated with structures, roads, administrative boundaries, and other geographic features.
Incident name, organization, address, points of contact, start and end dates.

Structures/Critical Infrastructure

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Structure locations, building footprints, Point locations for building centroids, entrances, and driveway entrances. Building complexes. Often includes 3D representations of structures.
Tax assessment, planning, emergency response, critical infrastructure protection
Federal, state, local government, HAZUS
Points, lines, polygons, annotation
Often, structure location points must be located along or within the buildings they represent.
Address, name, points of contact, HAZUS attributes, important to record associated address and structure names. For critical infrastructure, emergency contact information, level of risk, and additional facility details.

Governmental Units

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Administrative areas, census units, and management jurisdictions for local governments, states, federal agencies, and Native American organizations
Administrative and legal boundaries
Federal, state, and local government, U.S. Census
Polygons
Unit boundaries often must be vertically integrated and follow along the boundaries of other features such as road centerlines, parcels, and rivers. Areas must not self-overlap; census areas must tessellate.
Managing agency, name, FIPS code, uses, demographic characteristics

Utilities

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

The key components of water, wastewater, electrical, telecommunications, and pipeline networks.
Transmission and distribution maps, emergency response, critical infrastructure protection
Local utilities
Lines, points, areas, annotation
Integrates within the parcel and land base (building footprints, curb lines, and other structures).
Equipment type, size, date installed, ownership, connectivity

Addresses and Names

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Address ranges along street centerlines (DIME style addresses) as well as address point locations for building entrances. Also includes place names for key landmarks, geographic zones, and locations.
Geocoding, route planning
Local, state, and federal government, commercial sources
Points, lines, polygons, annotation
Address points must fall within buildings and parcels
Address, address styles, alternative addresses, address relationship to each feature representation (e.g., to parcels, building centroids, building entrances, points-of-interest, and to street centerlines)

Transportation

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

At the neighborhood level: curb-lines, street centerlines, rail, commuter lines, bus and other transportation route lines; transportation ports and stations as polygons. At city and above, street centerlines, and public transportation routes as lines, transportation ports and stations as polygons.
Bases, transportation planning and analysis, emergency route planning.
City and county government, State DOTs, commercial sources
Lines, junctions, polygons, annotation
Road segments must connect
Street names, address ranges, road class, roadway characteristics, optional navigation and linear referencing characteristics, jurisdiction for law enforcement and emergency response.

Cadastral

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Tax parcels, ownership parcels and parcel corners. Also includes key features that integrate into the land fabric such as zoning, rights, interests, and easements.
Tax mapping, surface ownership maps, PLSS reference maps
Local, state, tribal, and federal government, BLM
Points, lines, polygons, annotation
Parcels and corners integrate with survey and legal description fabrics, many other data themes are referenced to the cadastre.
PIN, Owner, assessed value, improvements, rights, interests, encumbrances, survey characteristics.

Hydrography

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Hydro points, lines, and polygons, Watersheds, coastlines, and drainage areas. Connectivity and channel profiles for hydrological analysis. Integrates with high resolution (3M) DEM.
Surface water and features for moving, storing, and managing water. Base mapping. Includes support for hydrologic analysis.
Local and state water management agencies. Local and state governments, Federal agencies including USGS, FEMA, NOAA, EPA.
Lines, points, polygons, and annotation
Spatially integrated into landscape and terrain. Stream and water system connectivity is critical. Stream gage stations should snap onto the hydro network.
Hypography, elevation, and hydrography datasets should be vertically integrated.
Identification, names, hydrologic properties, relationship to landscape features.

Environmental

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Includes physical features and landform characteristics such as geology, soils, slope, aspect, vegetation, and floodplains as well as weather/climate. Also includes hazards and events (such as earthquakes, volcanic activities, and natural disasters). Also, environmental monitoring sensors and associated measurements (such as stream gauges, weather stations, and air quality monitoring sensors).
Soil maps, geology maps, environmental monitoring, permitting, spatial modeling, and analysis.
Federal agencies such as USDA-NRCS, EPA, USGS, also state and local government
Polygons, points, annotation
Landform layers should be vertically integrated and attribute combinations should be consistent.
Environmental landscape classification, hazard areas. Need time series information for weather, stream gauges, and other sensors.

Land Use/Land Cover

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Area units that define the primary ways in which land is used (e.g., urban, rural, agricultural, range, forest, and so on)
Land cover maps, planning, zoning
Derived from remotely sensed data or captured at the parcel level
Polygons, raster dataset
Land use and land cover are integrated with other key layers depending upon the geographic level. See collection guidelines.
Land use classification of parcels for local and regional planning. Also, includes land use/land cover classification of raster imagery for smaller scale analysis such as natural resource management in a state or region.

Base Map

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Currently includes the use of existing map sheets as scanned background maps. New cartographic specifications should be developed for map series at a range of targeted map scales. For example, a national map series for scales of 1:25,000, 1:100,000, 1:250,000, and 1:1,750,000 as well as a set of local map scales for coverage in urban areas and important rural areas of 1:50,000.
Digital Base Map Graphics, scanned NOAA charts. Consistent presentation of national maps as well as for each state and for cities.
All other data themes should be collected in order to meet these cartographic needs along with other application needs.
Points, lines, polygons, annotation, rasters, and cartographic representations.
Overlays and other cartographic conflicts should be minimized in map representations.
Text labels, place names, feature representations, cartographic elements, feature classifications, consistent symbology, map guidelines, map series designs and specifications.

Elevation

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Includes surface elevation and bathymetric observations (such as LIDAR point collections, hydrographic surveys, and other 3-D surveys) as well as derived digital elevation datasets for surface terrain, such as DEMs.
Viewshed analysis, surface distance calculation, and resource flows. Environmental and water resources planning and analyses. General purpose mapping.
LIDAR, sonar, surveys, and other remotely sensed data
Elevation points, contour lines, TNS, DEMs, and hillshades
Elevation is related to hydro and orthophotography datasets
Elevation at a given location, Navigational bathymetry, slope, aspect, historical changes in elevation/bathymetry

Imagery

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

The primary focus is on high resolution digital orthophotography coverage collected at periodic time intervals. Also, includes government generated products (such as USGS Digital scanned map sheets (ADRGs), AVIRIS Hyper-spectral, Landsat, Spot Image; commercial satellite imagery (such as Space Imaging IKONOS, Digital Globe QuickBird, OrbImage OrbView); and specialized satellite/sensor applications (such as AVHRR, MODIS, PIRS, GOSAT)
Aerial photography and satellite imagery as reference data
Various Remote Sensors
Raster
Many other datasets should align with or be derived from imagery
Color, elevation, georeferencing models including stereo, cloud cover/time and other metadata.

Geodetic Control

Feature types
Map use
Data source
Representation
Spatial relationships
Information needs

Survey control network for local, regional and national geodetic referencing. For neighborhood and city level geographies, control can be represented by the cadastral framework which is part of the cadastral data theme.
Common coordinate reference for all other geographic features
National Geodetic Survey (NGS) and partners
Points, annotation
Cadastral data should be tied to geodetic control. Orthoimagery and LIDAR should be tied to the control. GPS ground stations networks and transportation networks may also be referenced to geodetic control.
Identification, monuments, survey locations, survey order, metadata for coordinate systems including vertical and horizontal datums.

scales of use

national/state



regional/county



city



neighborhood



guidelines

Operations features should be collected at the appropriate scale for each specific activity or incident. GPS field collection or interpretation from imagery preferred for data capture. Grid map location descriptions are also useful.

High accuracy required for neighborhood and city level maps. Should be captured and represented to fit on the orthoimagery base.

High accuracy required. Units can span across a range of map scales from 1:10,000 or 1:25,000 in cities and up to 1:250,000 in regions and states. Must be vertically integrated with the base features they are derived from, along with other governmental units.

Accurate relative to cadastral and transportation data. Typical data capture scales are from 1:2,500 to 1:6,000. Accurate, shared local/state land base required for integration with other GIS Datasets.

Address and name information will be associated with features that are collected at neighborhood extents for building entrances, structures, parcels, and landmarks. Addresses and names will also be collected for addressable features – such as for street centerline representations and place name locations. Names should also be collected for governmental and other administrative boundary units and for key landform/geographic features.

Centerlines for addressing and navigation purposes, larger scale representations provide more detailed infrastructure and network characteristics. Roads should follow a simple centerline with address range approach at local and state levels. Identification and segmentation decisions are important for multiple scales.

Primarily collected at neighborhood scales using survey techniques. At the neighborhood level, the parcel is the primary mapping unit. City and county level representations are important to identify and distinguish city blocks and to highlight government and private lands. At regional levels, it is important to depict the national cadastral fabric (such as PLSS) and the surface management agency.

Regional, state, and national analysis at 100k resolution to 25k resolution. Local needs dictate better than 25k resolution, especially in flood prone or coastal areas. Hydrologic network and channel representations are important to support analytical use.

Collected at city levels or 1:25,000 map scales. Vertical integration of landform polygons is important to ensure consistency in environmental classification and modeling.

Collected at city levels as attributes on parcels and administrative land units using APA Landbase Classification System. Collected as raster data at scales of 1:50,000 or smaller typically using the Anderson classification system, but this classification should integrate with the environmental landform layers.

Includes scanned maps and cartographic elements. Nationwide Base map products:
1:25,000
1:100,000
1:250,000
1:1,750,000
Cities and Other Special Areas:
1:5,000 to engineering scales

Resolution to support 5 meter DEM products that can be used for 2-foot contours nation-wide. In low-lying, flat areas such as along coastal areas of the Southeastern U.S., finer resolution DEMs supporting at least 1 foot contours should be collected and maintained. Coastal areas should coordinate with guidelines and projects of the NOAA Coastal Services Center project guidelines which vary based on location and vertical datum. Bathymetric data for coastal areas should be of comparable accuracy to terrain elevation data.

Orthoimagery should be collected for populated areas at 6 inch to 1 foot resolution every two years using the same control as the cadastral data. Statewide coverage should be collected at 1 meter or better resolution every two years.

Geodetic control provides the basic reference for other data according to NGS specifications for identification and capture.

geographic datasets

Point feature class
Incident Point
Subtypes are Marine Incident, Air Incident, Civil Disturbance Incident, Rail Incident, Fire Incident, Vehicle Incident, Criminal, Activity Incident, Geologic, Hydro-Meteorological, Infestation, Public Health, and Agriculture Animal Health.

Polygon feature class
Access Area
Subtypes are Access, Evaluation

Polygon feature class
Alert Area

Line feature class
Incident Line
Subtypes are Marine Incident, Air Incident, Civil Disturbance Incident, Rail Incident, Fire Incident, Vehicle Incident, Criminal, Activity Incident, Geologic, Hydro-Meteorological, Infestation, Public Health, and Agriculture Animal Health.

Point feature class
Access Point
Subtypes are Access, Evaluation

Point feature class
Damage Assessment

Polygon feature class
Incident Area
Subtypes are Marine Incident, Air Incident, Civil Disturbance Incident, Rail Incident, Fire Incident, Vehicle Incident, Criminal, Activity Incident, Geologic, Hydro-Meteorological, Infestation, Public Health, and Agriculture Animal Health.

Point feature class
Search, Rescue Point

Point feature class
Emergency Facilities

Point feature class
Facility Site Point
Subtypes are Information and Communication, Government and Military, Transportation Facilities, Energy, Banking and Finance, Emergency Response and Law Enforcement, Mail and Shipping, Industry, Building General, Weather, Commercial and Retail, Agriculture, Food, and Livestock, Education, Health and Medical, Public Attractions and Landmark, Buildings, Water Supply and Treatment

Polygon feature class
Structure, DDD
Subtypes are Information and Communication, Transportation Facilities, Emergency Response and Law Enforcement, Energy, Mail and Shipping, Government and Military, Education, Agriculture, Food and Livestock, Health and Medical, Building General, Public Attractions and Landmark, Buildings, Water Supply and Treatment

Point feature class
Structure Point
Subtypes are Water Supply and Treatment, Energy, Banking and Finance, Mail and Shipping, Government and Military, Transportation Facilities, Agriculture, Food and Livestock, Commercial and Retail, Information and Communication, Public Attractions and Landmark, Buildings, Water Supply and Treatment, Education, Emergency Response and Law Enforcement, Health and Medical, Building General

Relationship class
Structure, PointHasAirport_Detail
One-to-many

Relationship class
Structure, PointHasBridge_Detail
One-to-many

Relationship class
Structure, PointHasRunway_Detail
One-to-many

Relationship class
Structure, PointHasWastewater_Detail
One-to-many

Table
Airport_Detail

Table
Bridge_Detail

Table
Runway_Detail

Table
Wastewater_Detail

Polygon feature class
Administrative Area

Polygon feature class
Census Area

Polygon feature class
Jurisdiction

Point feature class
Boundary Point

Polygon feature class
Governmental

Polygon feature class
NativeReservation

Polygon feature class
Utility Area

Point feature class
Utility Structure

Line feature class
Utility Line

Point feature class
Utility Point

Table
Street Name

Relationship class
Street, NameHasAddressPoints
One-to-many

Relationship class
Street, NameHasRoad_Segments
One-to-many

Point feature class
Address Point

Point feature class
Airport

Line feature class
Curb Line

Line feature class
Road Segment

Point feature class
Transport Junction

Polygon feature class
Transport Station Port

Polygon feature class
Airport Surface

Line feature class
Trail Segment

Polygon feature class
Transport Activity

Point feature class
Transport NavAid

Line feature class
Transport Structure

Line feature class
Rail Feature

Line feature class
Waterway

Annotation feature class
Street Name Anno

Line feature class
Transport Route

Point feature class
Transport Ref Point

Point feature class
Corner

Polygon feature class
City Block

Polygon feature class
Parcel

Polygon feature class
Regulated Use

Polygon feature class
Zoning

Point feature class
NHDPoint
Subtypes are Lock Chamber, WaterintakeOutflow, Gate, Reservoir, Well, Rock, Waterfall, Aquifer, Springflow, Geoglyph, Statue, Shrine

Polygon feature class
NHDArea
Subtypes are Lock Chamber, Wash, Canal/Ditch, Area of Complex Channel, Area to be Submerged, Spillway, Dam/Bridge, Bridge, Sea/Ocean, WaterintakeOutflow, Freshwater, Bay/Inlet, Special Use Zone, Hazard Zone, Submerged Stream, Inundation Area, Plume, Streamflow, Rapids

Line feature class
NHDFlowline
Subtypes are Canal/Ditch, Connector, Pipeline, Coastline, Stream/Inlet, Artificial/Path

Polygon feature class
NHDWaterBody
Subtypes are Ice Mass, Playa, Reservoir, Estuary, Lake/Inlet, Swamp/Marsh

Polygon feature class
Environmental Hazard

Polygon feature class
Groundwater Aquifer

Polygon feature class
Hazard Area

Polygon feature class
Soil

Polygon feature class
Open Space

Point feature class
Environmental Monitoring

Polygon feature class
Groundwater Recharge

Polygon feature class
Hazard Point

Polygon feature class
Species Location

Polygon feature class
Vegetation

Polygon feature class
Floodplain

Point feature class
Groundwater Well

Polygon feature class
Noise Area

Polygon feature class
Surficial Geology

Polygon feature class
Weather

Polygon feature class
Land Cover

Polygon feature class
Parcel

Line feature class
Noise Contour

Point feature class
Geo Landform Point

Polygon feature class
Geo Landform

Raster
NauticalChart

Raster
TopographicMap

Line feature class
Elevation Contour

Point feature class
Spot Elevation

Raster
Bathymetry

Raster
DigitalElevationModel

Raster
Orthophoto

Point feature class
Geodetic Control Point