



# *ESIP Summer Meeting 2019*

## *Advancing spatial and temporal aspects of schema.org*

Charles Vardeman, Adam Shephard and Doug Fills  
[cvardema@nd.edu](mailto:cvardema@nd.edu)



UNIVERSITY OF NOTRE DAME  
CENTER FOR RESEARCH COMPUTING

# Schema.org Neon Vocamp's

**Charles Vardeman and Jane  
Wyngaard, UND**

**Christine Laney and Tom Gulbransen,  
NEON/Battelle**

**Adam Shepherd, BCO-DMO/Woods  
Hole Oceanographic Institution**

**Doug Flls, Consortium for Ocean  
Leadership**

# Cyberinfrastructure Center of Excellence Pilot

**Ewa Deelman**, USC (PI)

Co-PIs:

**Anirban Mandal**, RENCi

**Jarek Nabrzyski**, Notre Dame University

**Valerio Pascucci** and **Rob Ricci**,  
University of Utah

# Session Theme

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**PROBLEM:** schema.org is currently inconsistent with standards organizations (W3C, OGC) representations of spatial and temporal information. This session will bring together data curators, conceptual modelers and ontologists to formulate solutions for extending schema.org's approach to spatial and temporal descriptions.

## Thrust:

Team members:

Anirban Mandal, Laura Christopherson, Erik Scott, Ilya Baldin, Paul Ruth

# Agenda

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- Interactive vocamp unconference style session
  - schema.org place
  - connection to existing standards
  - schema.org spatial definitions
-

# Bioschemas.org as a model?



[Home](#) [Getting Started](#) [Specifications](#) [Deploy & Develop](#)

## What is Bioschemas?

Bioschemas aims to improve the Findability of data in the life sciences. It does this by encouraging people in the life sciences to use Schema.org markup in their websites so that they are indexable by search engines and other services. Bioschemas encourages the consistent use of markup to ease the consumption of the contained markup across many sites. This structured information then makes it easier to discover, collate, and analyse distributed data.

Bioschemas is making two main contributions:

1. Proposing [new types and properties](#) to Schema.org to allow for the description of life science resources.
2. [Profiles](#) over the Schema.org types that identify the essential properties to use in describing a resource.

Bioschemas started as a community effort in November 2015. It operates as an open community initiative with [representatives](#) from a wide variety of institutions. You are welcome to [join the community](#).

## Schema.org

[Schema.org](#) is a community effort supported by the main search engines, and is already widely implemented across the web.

# Bioschemas.org Profiles

Name	Group	Use Cases	Cross Walk	Task & Issues	Examples	Live Deploys
<a href="#"><u>DataCatalog</u></a> (v0.3) 01 July 2019	<a href="#"><u>Data Repositories</u></a>					
<a href="#"><u>Dataset</u></a> (v0.3) 14 June 2019	<a href="#"><u>Datasets</u></a>					
<a href="#"><u>Event</u></a> (v0.1) 05 July 2018	<a href="#"><u>Events</u></a>					
<a href="#"><u>Sample</u></a> (v0.2) 10 November 2018	<a href="#"><u>Samples</u></a>					
<a href="#"><u>Taxon</u></a> (v0.3) 10 November 2018	<a href="#"><u>Biodiversity</u></a>					
<a href="#"><u>Tool</u></a> (v0.1) 07 March 2018	<a href="#"><u>Tools</u></a>					
<a href="#"><u>TrainingMaterial</u></a> (v0.2) 05 July 2018	<a href="#"><u>Training</u></a>					

# Bioschemas “Type Extensions”

Name	Group	Task & Issues
<u><a href="#">BioChemEntity</a></u> (v0.7-RC) 2019-06-14	<u><a href="#">Biological Entities</a></u>	
<u><a href="#">BioSample</a></u> (v0.1-RC) 2019-06-14	<u><a href="#">Samples</a></u>	
<u><a href="#">ChemicalSubstance</a></u> (v0.2-RC) 2019-06-14	<u><a href="#">Chemicals</a></u>	
<u><a href="#">Gene</a></u> (v0.2-RC) 2019-06-14	<u><a href="#">Genes</a></u>	
<u><a href="#">MolecularEntity</a></u> (v0.2-RC) 2019-06-14	<u><a href="#">Chemicals</a></u>	
<u><a href="#">Protein</a></u> (v0.2-RC) 2019-06-14	<u><a href="#">Proteins</a></u>	
<u><a href="#">Taxon</a></u> (v0.3-RC) 2019-06-14	<u><a href="#">Biodiversity</a></u>	

# Geoschemas.org Types?

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What would be the equivalent “Types” for geoschemas.org that are not covered by schema.org?

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schema.org

Home **Schemas** Documentation

## Place

[Thing](#) > [Place](#)

Entities that have a somewhat fixed, physical extension.

[\[more...\]](#)

Property	Expected Type	Description
<b>Properties from <a href="#">Place</a></b>		
<a href="#">additionalProperty</a>	<a href="#">PropertyValue</a>	A property–value pair representing an additional characteristics of the entity, e.g. a product feature or another characteristic for which there is no matching property in schema.org.  Note: Publishers should be aware that applications designed to use specific schema.org properties (e.g. <a href="http://schema.org/width">http://schema.org/width</a> , <a href="http://schema.org/color">http://schema.org/color</a> , <a href="http://schema.org/gtin13">http://schema.org/gtin13</a> , ...) will typically expect such data to be provided using those properties, rather than using the generic property/value mechanism.
<a href="#">address</a>	<a href="#">PostalAddress</a> or <a href="#">Text</a>	Physical address of the item.
<a href="#">aggregateRating</a>	<a href="#">AggregateRating</a>	The overall rating, based on a collection of reviews or ratings, of the item.
	<a href="#">LocationFeatureSpecification</a>	An amenity feature (e.g. a characteristic or service) of the Accommodation. This generic

## Landform

[Thing](#) > [Place](#) > [Landform](#)

A landform or physical feature. Landform elements include mountains, plains, lakes, rivers, seascape and oceanic waterbody interface features such as bays, peninsulas, seas and so forth, including sub-aqueous terrain features such as submersed mountain ranges, volcanoes, and the great ocean basins.

[more...]

Property	Expected Type	Description
<b>Properties from <a href="#">Place</a></b>		
<a href="#">additionalProperty</a>	<a href="#">PropertyValue</a>	A property–value pair representing an additional characteristics of the entity, e.g. a product feature or another characteristic for which there is no matching property in schema.org.  Note: Publishers should be aware that applications designed to use specific schema.org properties (e.g. <a href="http://schema.org/width">http://schema.org/width</a> , <a href="http://schema.org/color">http://schema.org/color</a> , <a href="http://schema.org/gtin13">http://schema.org/gtin13</a> , ...) will typically expect such data to be provided using those properties, rather than using the generic property/value mechanism.
<a href="#">address</a>	<a href="#">PostalAddress</a> or <a href="#">Text</a>	Physical address of the item.
<a href="#">aggregateRating</a>	<a href="#">AggregateRating</a>	The overall rating, based on a collection of reviews or ratings, of the item.

# schema.org/BodyOfWater

schema.org

Custom Search



Home

Schemas

Documentation

## BodyOfWater

[Thing](#) > [Place](#) > [Landform](#) > [BodyOfWater](#)

A body of water, such as a sea, ocean, or lake.

[more...]

Property	Expected Type	Description
Properties from <a href="#">Place</a>		
<a href="#">additionalProperty</a>	<a href="#">PropertyValue</a>	A property–value pair representing an additional characteristics of the entity, e.g. a product feature or another characteristic for which there is no matching property in schema.org.  Note: Publishers should be aware that applications designed to use specific schema.org properties (e.g. <a href="http://schema.org/width">http://schema.org/width</a> , <a href="http://schema.org/color">http://schema.org/color</a> , <a href="http://schema.org/gtin13">http://schema.org/gtin13</a> , ...) will typically expect such data to be provided using those properties, rather than using the generic property/value mechanism.
<a href="#">address</a>	<a href="#">PostalAddress</a> or <a href="#">Text</a>	Physical address of the item.
<a href="#">aggregateRating</a>	<a href="#">AggregateRating</a>	The overall rating, based on a collection of reviews or ratings, of the item.
	<a href="#">LocationFeatureSpecification</a>	An amenity feature (e.g. a characteristic or service) of the Accommodation. This generic

# Schema.org Landform Limited Subtypes

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## More specific Types

- BodyOfWater
  - Continent
  - Mountain
  - Volcano
-

# Schema.org/Place and “Geo” Type

<a href="#"><u>faxNumber</u></a>	<a href="#"><u>Text</u></a>	The fax number.
<a href="#"><u>geo</u></a>	<a href="#"><u>GeoCoordinates</u></a> or <a href="#"><u>GeoShape</u></a>	The geo coordinates of the place.
<a href="#"><u>geoContains</u></a>	<a href="#"><u>GeospatialGeometry</u></a> or <a href="#"><u>Place</u></a>	Represents a relationship between two geometries (or the places they represent), relating a containing geometry to a contained geometry. "a contains b iff no points of b lie in the exterior of a, and at least one point of the interior of b lies in the interior of a". As defined in <a href="#"><u>DE-9IM</u></a> .
<a href="#"><u>geoCoveredBy</u></a>	<a href="#"><u>GeospatialGeometry</u></a> or <a href="#"><u>Place</u></a>	Represents a relationship between two geometries (or the places they represent), relating a geometry to another that covers it. As defined in <a href="#"><u>DE-9IM</u></a> .
<a href="#"><u>geoCovers</u></a>	<a href="#"><u>GeospatialGeometry</u></a> or <a href="#"><u>Place</u></a>	Represents a relationship between two geometries (or the places they represent), relating a covering geometry to a covered geometry. "Every point of b is a point of (the interior or boundary of) a". As defined in <a href="#"><u>DE-9IM</u></a> .
<a href="#"><u>geoCrosses</u></a>	<a href="#"><u>GeospatialGeometry</u></a> or <a href="#"><u>Place</u></a>	Represents a relationship between two geometries (or the places they represent), relating a geometry to another that crosses it: "a crosses b: they have some but not all interior points in common, and the dimension of the intersection is less than that of at least one of them". As defined in <a href="#"><u>DE-9IM</u></a> .
<a href="#"><u>geoDisjoint</u></a>	<a href="#"><u>GeospatialGeometry</u></a> or <a href="#"><u>Place</u></a>	Represents spatial relations in which two geometries (or the places they represent) are topologically disjoint: they have no point in common. They form a set of disconnected geometries." (a symmetric relationship, as defined in <a href="#"><u>DE-9IM</u></a> )
	<a href="#"><u>GeospatialGeometry</u></a> or <a href="#"><u>Place</u></a>	Represents spatial relations in which two geometries (or the places they represent) are

The Geo 'type'  
relates a 'geometry'  
value description to  
a Place

## geo

[Thing](#) > [Property](#) > [geo](#)

The geo coordinates of the place.

[\[more...\]](#)

### Values expected to be one of these types

[GeoCoordinates](#)

[GeoShape](#)

### Used on these types

[Place](#)

### Examples

#### Example 1

[Without Markup](#) [Microdata](#) [RDFa](#) [JSON-LD](#)

This example is in microdata only.

#### Example 2

[Without Markup](#) [Microdata](#) [RDFa](#) [JSON-LD](#)

```
<script type="application/ld+json">
{
  "@context": "http://schema.org",
  "@type": "Place",
  "geo": {
    "@type": "GeoCoordinates",
    "latitude": "40.75",
    "longitude": "73.98"
  },
  "name": "Empire State Building"
}
</script>
```

# schema.org GeoShapes

schema.org

Custom Search



[Home](#) [Schemas](#) [Documentation](#)

## GeoShape

[Thing](#) > [Intangible](#) > [StructuredValue](#) > [GeoShape](#)

The geographic shape of a place. A GeoShape can be described using several properties whose values are based on latitude/longitude pairs. Either whitespace or commas can be used to separate latitude and longitude; whitespace should be used when writing a list of several such points.

[\[more...\]](#)

Property	Expected Type	Description
<b>Properties from <a href="#">GeoShape</a></b>		
<a href="#">address</a>	<a href="#">PostalAddress</a> or <a href="#">Text</a>	Physical address of the item.
<a href="#">addressCountry</a>	<a href="#">Country</a> or <a href="#">Text</a>	The country. For example, USA. You can also provide the two-letter <a href="#">ISO 3166-1 alpha-2 country code</a> .
<a href="#">box</a>	<a href="#">Text</a>	A box is the area enclosed by the rectangle formed by two points. The first point is the lower corner, the second point is the upper corner. A box is expressed as two points separated by a space character.
<a href="#">circle</a>	<a href="#">Text</a>	A circle is the circular region of a specified radius centered at a specified latitude and longitude. A circle is expressed as a pair followed by a radius in meters.
<a href="#">elevation</a>	<a href="#">Number</a> or <a href="#">Text</a>	The elevation of a location ( <a href="#">WGS 84</a> ). Values may be of the form 'NUMBER UNITOFMEASUREMENT' (e.g., '1,000 m', '3,200 ft') while numbers alone should be assumed to be a value in meters.
<a href="#">line</a>	<a href="#">Text</a>	A line is a point-to-point path consisting of two or more points. A line is expressed as a series of two or more point objects separated by space.
<a href="#">polygon</a>	<a href="#">Text</a>	A polygon is the area enclosed by a point-to-point path for which the starting and ending points are the same. A polygon is expressed as a series of four or more space delimited points where the first and final

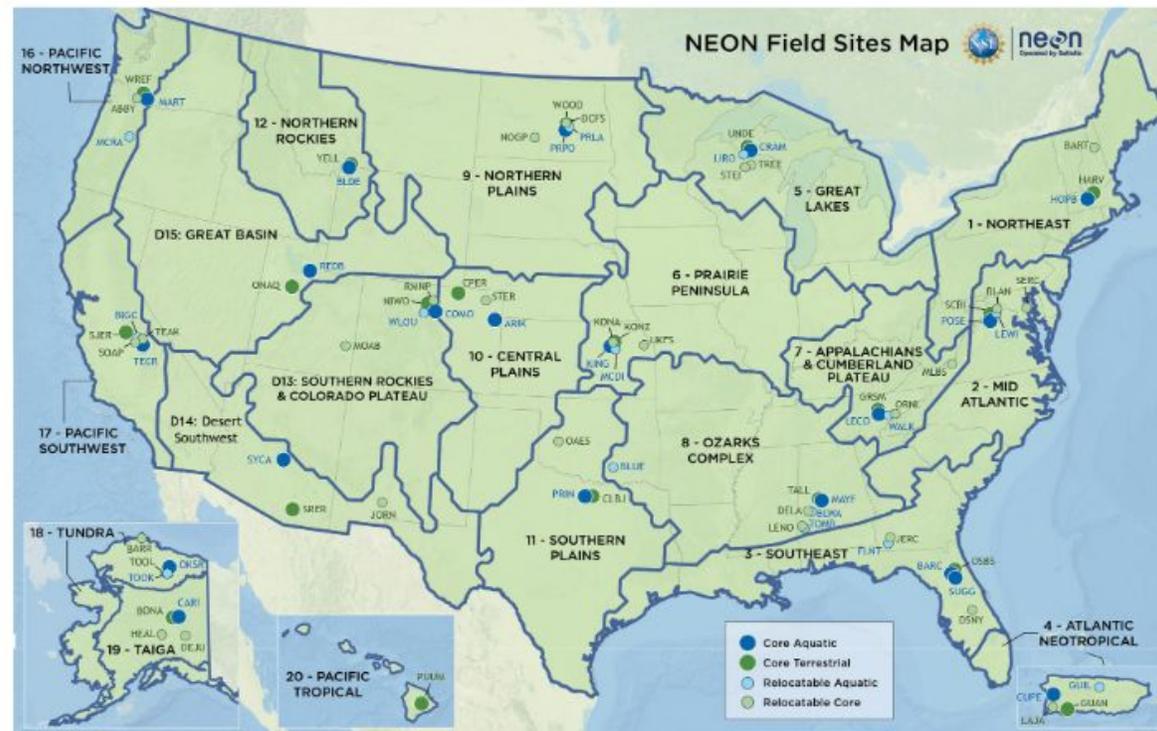
So, why does this matter for  
“Dataset” search?

---

# Example from NEON

## NEON Domains

NEON field sites are placed throughout 20 ecoclimatic domains that represent regions of distinct landforms, vegetation, climate and ecosystem dynamics. The observatory's regional domain approach is designed to statistically represent ecological, physical and biological variability across the continent. Domains range from the Tundra and Taiga in Alaska, to the Atlantic Neotropical in Puerto Rico and the Pacific Neotropical in Hawaii. Data collection methods are also divided between terrestrial field sites and aquatic field sites.



The National Ecological Observatory Network is a major facility funded by the National Science Foundation and operated by Esri. Any opinions, findings and conclusions or recommendations expressed in this material do not necessarily reflect the views of the National Science Foundation. © 2015

# NEON example field-site



neon  
Operated by Battelle



ABOUT

DATA COLLECTION

FIELD SITES

DATA

RESOURCES

COMMUNITY

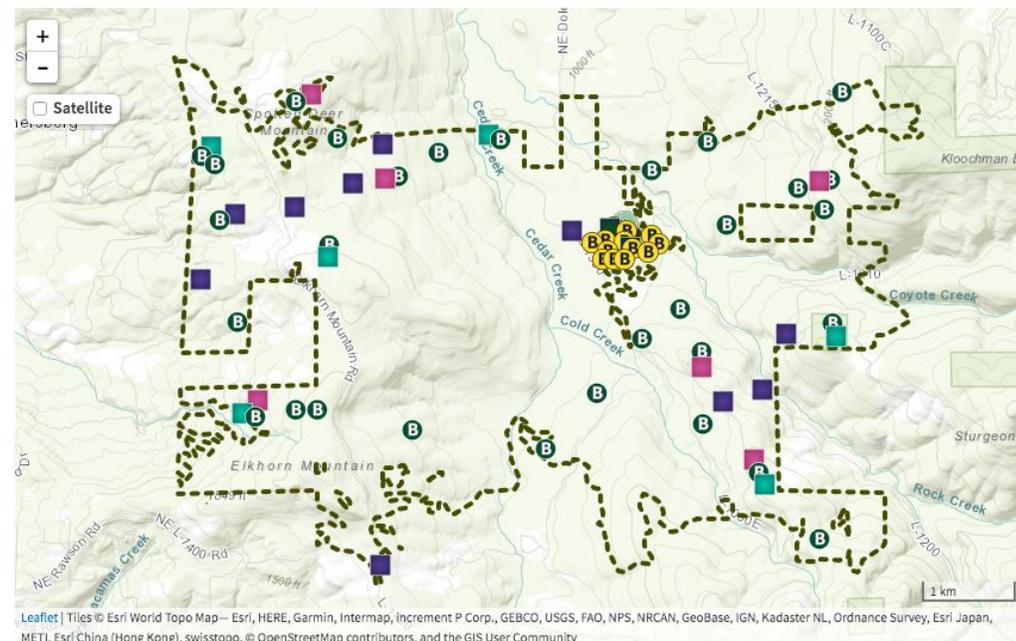
OPPORTUNITIES



Field Sites > Field Sites Map > Abby Road - ABBY

## Abby Road - ABBY

Relocatable Terrestrial | Washington | D16: Pacific Northwest



Leaflet | Tiles © Esri World Topo Map— Esri, HERE, Garmin, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

This map depicts the spatial layout of this field site. Please note that some locations may have moved over time due to logistics, safety and science requirements. This map was updated on April 23, 2019

### Map Legend

Click the check boxes to filter results on the map

- NEON Sampling Boundaries
- Tower Airshed Boundary
- Tower Location

#### Distributed Plot Types

- Distributed Base Plot
- Distributed Bird Grid
- Distributed Mammal Grid
- Distributed Mosquito Plot
- Distributed Tick Plot

#### Tower Plot Types

- Tower Base Plot
- Tower Phenology Plot

BROWSE DATA

# Rich Information on Landing Pages

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## Overview

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The Abby Road (ABBY) field site is located in Yacolt Burn State Forest which is approximately 30 miles from Vancouver, WA and Portland, OR. Yacolt Burn State Forest is a relatively young growth industrial timber production forest. The Washington Department of Natural Resources (DNR) also allows an array of recreational activities including mountain biking, hiking and camping.

**Total planned data products for this site: 112**

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## Site Host & Access

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### **Site Host:**

Washington Department of Natural Resources

### **Is additional non-NEON research allowed at this site?:**

No additional research is allowed in this area at this time. The site hosts have only permitted NEON research activities and are not open to additional research.

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# Site Characteristics

Site characteristics require deeper conceptualization

<https://www.neonscience.org/field-sites/field-sites-map/ABBY>

## Site Characteristics

 <b>Latitude/Longitude:</b> 45.76243, -122.33033	<b>Dominant NLCD Classes:</b> Evergreen Forest Grassland/Herbaceous Shrub/Shrub
 <b>Elevation:</b> 363 m	
 <b>Mean Annual Temperature:</b> 8C/46.4F	
 <b>Mean Annual Precipitation:</b> 2530 mm	

Sampling plots at ABBY have been established across a mixed landscape of timber plantations ranging from clear cut stands to stands planted in the mid-1960s. Several recreational paths actually cross through the field site.

## Site History

Yacolt Burn State Forest is named for the dozens of wildfires that ravaged Clark, Cowlitz and Skamania counties in southwest Washington during September 1902. With no organized system for fighting wildfires, the fires spread across nearly 239,000 acres and caused 38 deaths and widespread property losses. An extended period of hot, dry weather; high wind; an over-accumulation of timber harvest slash; and human carelessness are among the frequently cited causes of these fires. In response, the Washington Legislature established a state fire warden the following year. In 1908, private landowners formed the Washington Fire Protection Association and funded a system of fire wardens and a program of fire prevention on private lands.

The DNR replanted the forests and has maintained the area as working forest in order to:

- Protect the long-term health of the forest's ecosystems
- Generate revenue for the state
- Provide safe, sustainable, and enjoyable recreational opportunities

## Site-specific Topics

- Located in the foothills of the Cascade Mountains in a young forest, ABBY field site provides an interesting comparison to NEON's WREF site which is located in a nearby old growth forest that is primarily used for research.
- Urban growth west of ABBY since the early 2000s has also brought neighborhoods closer to the forest. This growth has increased the demand for a variety of recreational activities. Urban planning is an active component of the land management of this ecosystem.

## Vegetation and Soil

The dominant tree species are Douglas Fir which have been planted by the DNR since the Yakolt Burn in 1902. Many shrubs grow in the forest understory, including salal, Oregon-grape, red and big huckleberries, and west coast rhododendron. Dozens of plant species grow on the forest floor, including queencup beadlily, vanilla leaf, bracken fern, beargrass, twinflower, trillium, and little pipsissewa.

## Climate

Typical of the Northwest, ABBY experiences very wet falls, winters, and springs; and very dry summers. The nearby Columbia River Gorge affects the valley's climate, contributing to strong

# Is it Abbey road or Abby Road?



abby road



All Images Maps Videos News More Settings Tools

About 159,000,000 results (1.10 seconds)

Showing results for **abbey road**  
Search instead for **abby road**

## Abbey Road - Wikipedia

[https://en.wikipedia.org/wiki/Abbey\\_Road](https://en.wikipedia.org/wiki/Abbey_Road)

**Abbey Road** is the eleventh studio album by English rock band the Beatles, released on 26 September 1969 by Apple Records. The recording sessions for the album were the last in which all four Beatles participated.

Length: 47:03 Genre: Rock

Label: Apple Released: 26 September 1969 (UK); 1 October ...

Abbey Road, London · Abbey Road Studios · Abbey Road (disambiguation)

## Abbey Road Studios (@AbbeyRoad) · Twitter

<https://twitter.com/AbbeyRoad>

We've been delighted to have the award-winning @NigelHeath in residence in our Mix Stage, mixing the sound for the highly anticipated @DowntonAbbey movie. Nigel pictured here in the Mix Stage with co-mixer, Brad Rees (@B\_Rees).  
<pic.twitter.com/SUbyCkY...>

13 mins ago

"There would literally be someone ringing up to ask, 'Are you dead?'" - @PaulMcCartney on how he buried the 'Paul is dead' rumour surrounding the 'Paul Is Live' album cover in the run up to the release of his 1993 live album, remastered at Abbey Road: <bit.ly/2XxVCyR>  
<pic.twitter.com/TfQRmC3...>

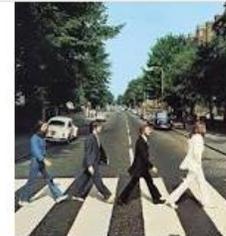
4 hours ago

In the latest edition of @MusicTechMag's 'Ask Abbey Road' Q&A series, your questions have been put to senior recording engineer, Andrew Dudman. Take a look on our #ProductionHub: <abbeyroad.com/productio...>  
<pic.twitter.com/g7G0VgY...>

23 hours ago

## Abbey Road

Studio album by The Beatles



96% liked this album

Google users



## Available on

YouTube

Apple Music

Spotify

More music services

Abbey Road is the eleventh studio album by English rock band the Beatles, released on 26 September 1969 by Apple Records. The recording sessions for the album were the last in which all four Beatles participated. [Wikipedia](#)

Artist: [The Beatles](#)

Release date: September 26, 1969

Studio: EMI, Olympic and Trident Studios, London

Recorded: 22 February – 20 August 1969

“These aren’t the droids you are  
looking for...”

---

“These aren’t the ~~droids~~ **concepts** you are  
looking for...”

---

# Competency Questions?

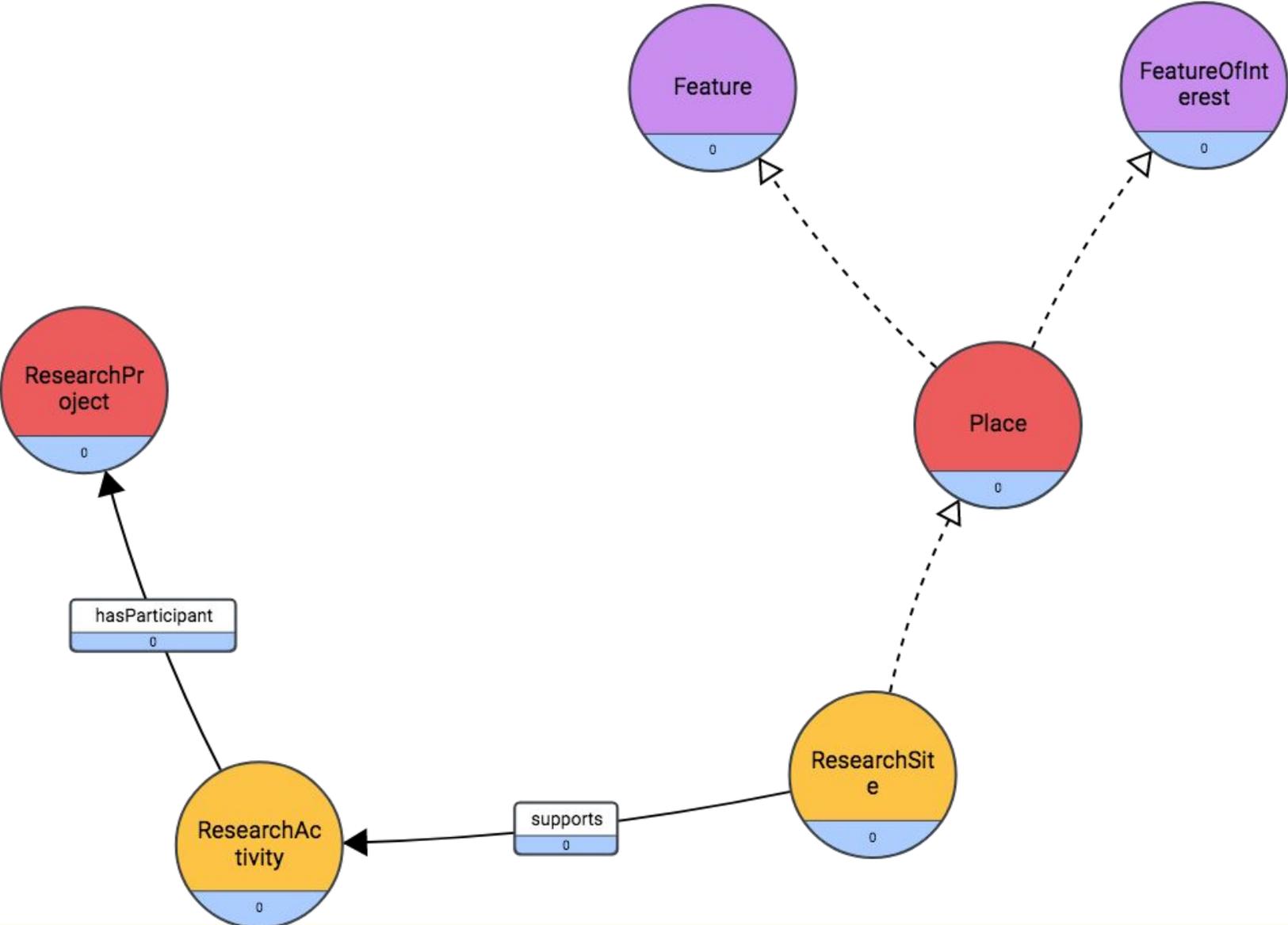
---

How might a research look  
for a dataset product?

## Questions

- Co-ordinates (various projections and format)
- Country, State/Province
- Ecological region type or Biome
- Land type classification
- Heat zone
- Habitat
- NEON site name
- NEON domain
- NEON 4 letter code
- USGS GNIS feature name (or not GNIS)

# Strawman Pattern



# schema.org/ResearchProject



schema.org

[Home](#) [Schemas](#) [Documentation](#)

## ResearchProject

This term is proposed for full integration into Schema.org, [pending](#) implementation feedback and adoption from applications and websites.

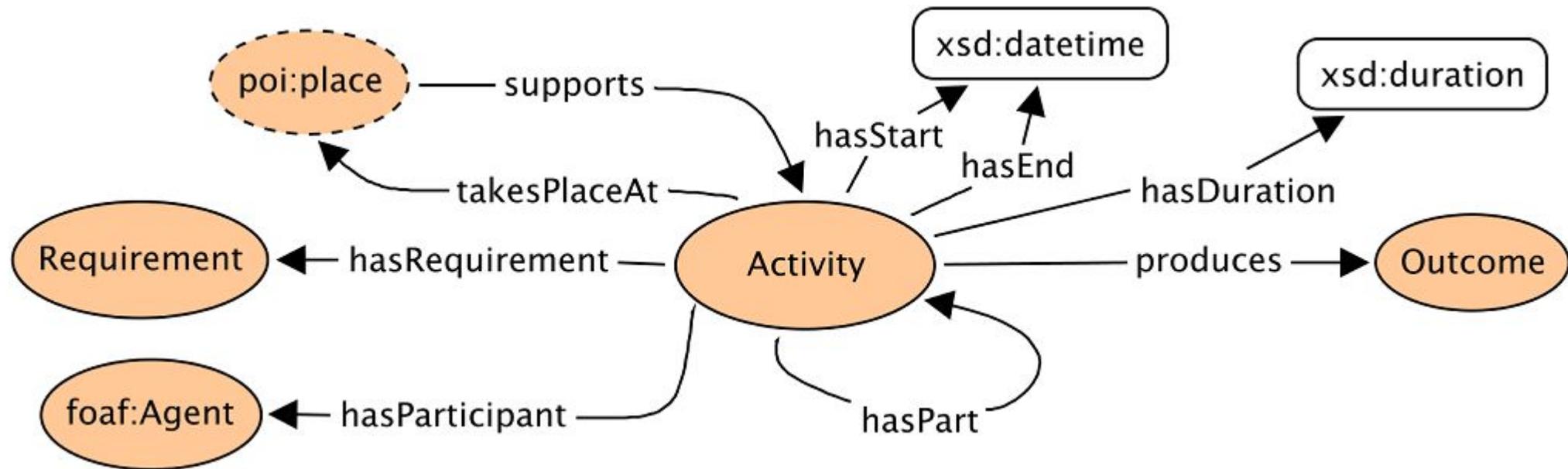
[Thing](#) > [Organization](#) > [Project](#) > [ResearchProject](#)

A Research project.

[\[more...\]](#)

Property	Expected Type	Description
<b>Properties from <a href="#">Organization</a></b>		
<a href="#">actionableFeedbackPolicy</a>	<a href="#">CreativeWork</a> or <a href="#">URL</a>	For a <a href="#">NewsMediaOrganization</a> or other news-related <a href="#">Organization</a> , a statement about public engagement activities (for news media, the newsroom's), including involving the public – digitally or otherwise -- in coverage decisions, reporting and activities after publication.
<a href="#">address</a>	<a href="#">PostalAddress</a> or <a href="#">Text</a>	Physical address of the item.
<a href="#">aggregateRating</a>	<a href="#">AggregateRating</a>	The overall rating, based on a collection of reviews or ratings, of the item.
<a href="#">alumni</a>	<a href="#">Person</a>	Alumni of an organization. Inverse property: <a href="#">alumniOf</a> .
<a href="#">areaServed</a>	<a href="#">AdministrativeArea</a> or <a href="#">GeoShape</a> or <a href="#">Place</a> or <a href="#">Text</a>	The geographic area where a service or offered item is provided. Supersedes <a href="#">serviceArea</a> .
<a href="#">award</a>	<a href="#">Text</a>	An award won by or for this item. Supersedes <a href="#">awards</a> .
<a href="#">brand</a>	<a href="#">Brand</a> or <a href="#">Organization</a>	The brand(s) associated with a product or service, or the brand(s) maintained by an organization or business person.
	<a href="#">ContactPoint</a>	A contact point for a person or organization. Supersedes

# Activity ODP



# OGC API - Features

## OGC API - Features

This GitHub repository contains [OGC's](#) standard for querying geospatial information on the web, "OGC API - Features".

OGC API standards define modular API building blocks to spatially enable Web APIs in a consistent way. [OpenAPI](#) is used to define the reusable API building blocks with responses in JSON and HTML.

The OGC API family of standards is organized by resource type. OGC API Features specifies the fundamental API building blocks for interacting with features. The spatial data community uses the term 'feature' for things in the real world that are of interest.

If you are unfamiliar with the term 'feature', the explanations on [Spatial Things, Features and Geometry](#) in the W3C/OGC Spatial Data on the Web Best Practice document provide more detail.

## Overview

OGC API Features provides access to collections of geospatial data.

```
GET /collections
```

Lists the collections of data on the server that can be queried ([7.13](#)), and each describes basic information about the geospatial data collection, like its id and description, as well as the spatial and temporal extents of all the data contained

```
GET /collections/buildings/items?bbox=160.6,-55.95,-170,-25.89
```

Requests all the data in the collection "buildings" that is in the New Zealand economic zone. The response format (typically HTML or a [GeoJSON](#) feature collection, but GML is supported, too, and extensions can easily supply others) is determined using [HTTP content negotiation](#).

Data is returned in pageable chunks, with each response containing a `next` link as many collections are quite large. The core specification supports a few basic filters, in addition to the `bbox` filter above, with extensions providing more advanced options ([7.15](#)).

```
GET /collections/{collectionId}/items/{featureId}
```

Returns a single 'feature' - something in the real-world (a building, a stream, a county, etc.) that typically is described by a geometry plus other properties. This provides a stable, canonical URL to link to the 'thing' ([7.16](#)).

# Spatial Data on the Web

## Spatial Data on the Web Best Practices

W3C Working Group Note 28 September 2017



**This version:**

<https://www.w3.org/TR/2017/NOTE-sdw-bp-20170928/>

**Latest published version:**

<https://www.w3.org/TR/sdw-bp/>

**Latest editor's draft:**

<https://w3c.github.io/sdw/bp/>

**Previous version:**

<https://www.w3.org/TR/2017/NOTE-sdw-bp-20170511/>

**Editors:**

Jeremy Tandy, [Met Office](#)

Linda van den Brink, [Geonovum](#)

Payam Barnaghi, [University of Surrey](#)

**Contributors:**

Phil Archer

Jon Blower

Newton Calegari

Byron Cochrane

Simon Cox

François Daoust

Andreas Harth

Bart van Leeuwen

Josh Lieberman

Chris Little

Andy Mabbett

Peter Parslow

Ed Parsons

Andrea Perego



## NOTE

Although we have borrowed the description of Spatial Thing from [W3C-BASIC-GEO], the formal [RDF-SCHEMA] definition of w3cgeo:SpatialThing doesn't quite suit our purpose as there is the potential for confusion about whether it is *disjoint* from geometry. The definition of geosparql:Feature, which is derived from the [ISO-19109] definition of Feature, is a better semantic fit for Spatial Thing as it is explicitly specified as being disjoint from geosparql:Geometry.

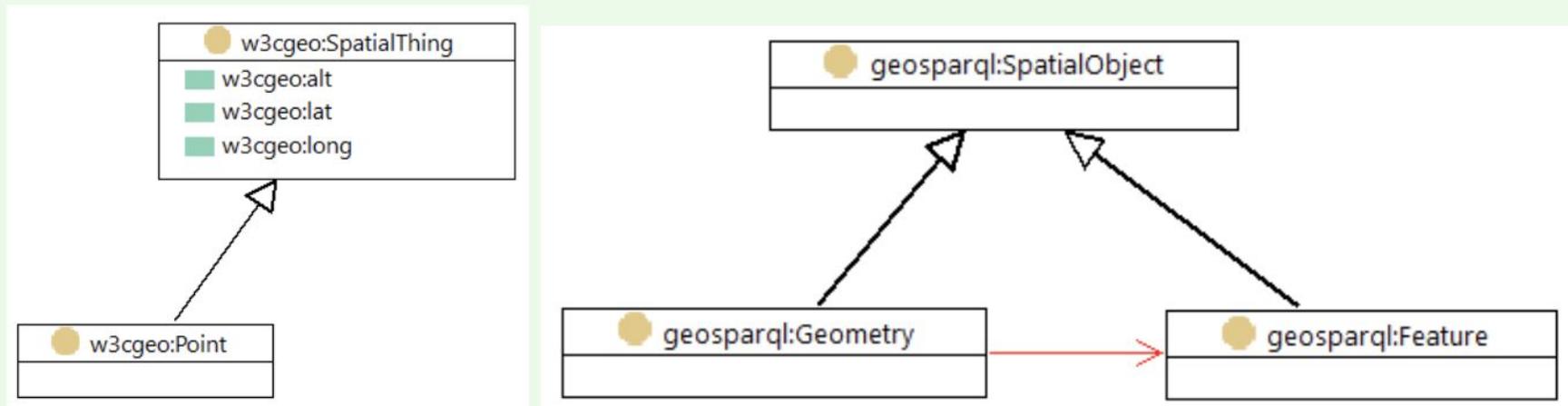


Figure 1 The main classes from [W3C-BASIC-GEO] and [GeoSPARQL] compared - pseudo-UML notation. The red arrow indicates 'disjoint classes'.

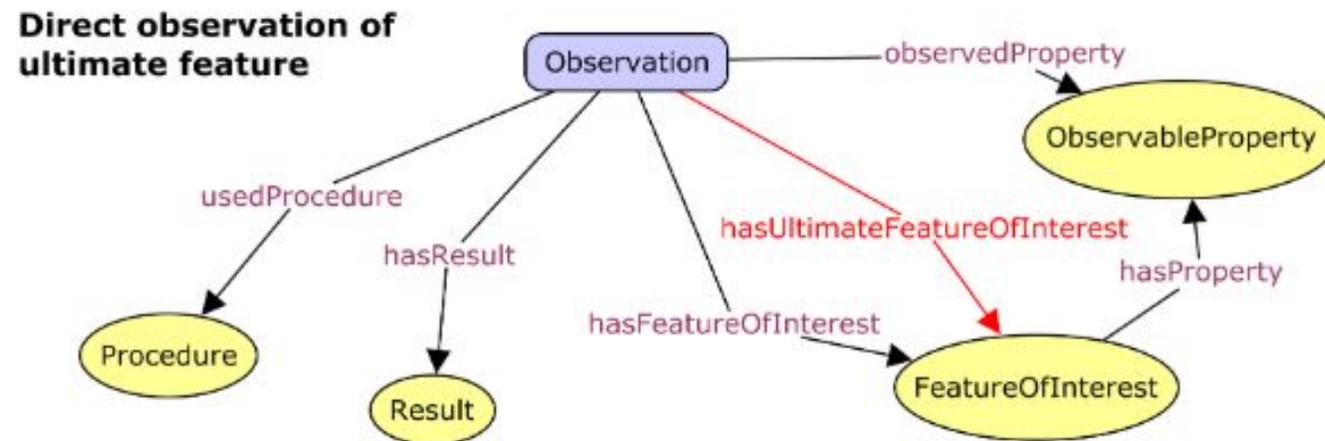
# Feature of Interest

## 1. Introduction

*This section is non-normative.*

Sensors are a major source of data available on the Web today. While sensor data may be published as mere values, searching, reusing, integrating, and interpreting these data requires more than just the observation results. Of equal importance for the proper interpretation of these values is information about the studied feature of interest, such as a river, the observed property, such as flow velocity, the utilized sampling strategy, such as the specific locations and times at which the velocity was measured, and a variety of other information. OGC's Sensor Web Enablement standards [ [OandM](#) ], [ [SensorML](#) ] provide a means to annotate sensors and their observations. However, these standards are not integrated and aligned with W3C Semantic Web technologies and Linked Data in particular, which are key drivers for creating and maintaining a global and densely interconnected graph of data. With the rise of the Web of Things and smart cities and homes more generally, actuators and the data they produce also become first-class citizens of the Web. Given their close relation to sensors, observations, procedures, and features of interest, it is desirable to provide a common ontology that also includes actuators and actuation. Finally, with the increasing diversity of data and data providers, definitions such as those for sensors need to be broadened, e.g., to include social sensing. The following specifications introduce the new Semantic Sensor Network (SSN) and Sensor, Observation, Sample, and Actuator (SOSA) ontologies that are set out to provide flexible but coherent perspectives for representing the entities, relations, and activities involved in sensing, sampling, and actuation. SOSA provides a lightweight core for SSN and aims at broadening the target audience and application areas that can make use of Semantic Web ontologies. At the same time, SOSA acts as minimal interoperability fall-back level, i.e., it defines those common classes and properties for which data can be safely exchanged across all uses of SSN, its modules, and SOSA.

# FOI and Observation



# geosparql:Geometry?

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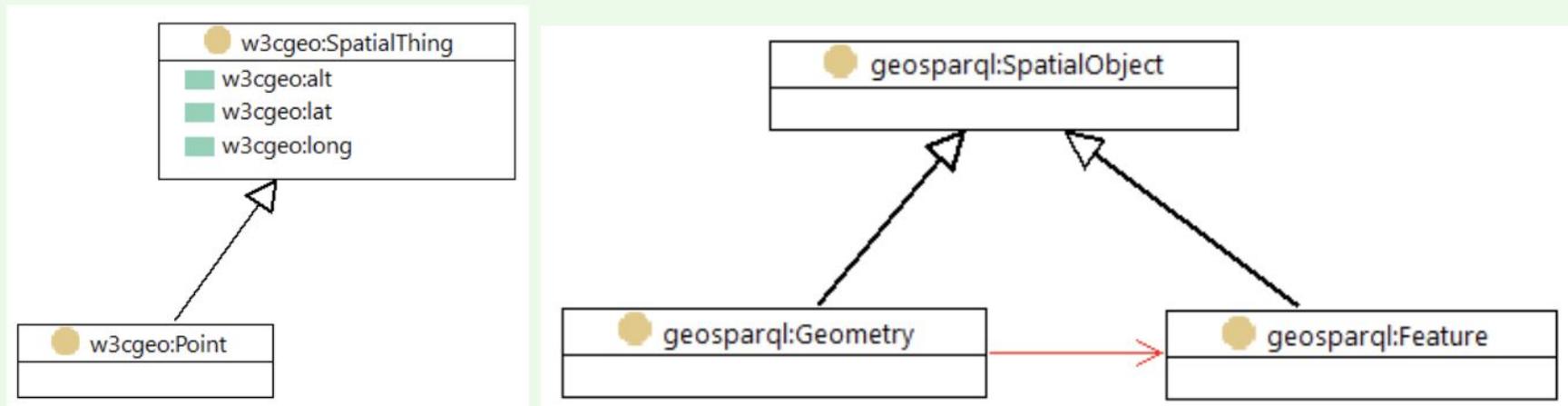


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# GeoJSON(LD), GeoShape or Geosparql?



charlesvardeman commented on Jan 28



This is a followup from <https://github.com/earthcubearchitecture-project418/p418Vocabulary#describing-a-datasets-spatial-coverage> topic. Specification of spatial geometries as Linked Data has several approaches, that I think (but could be wrong) are not necessarily compatible. The OGC [ELFIE](#) draft technical report states:

"GeoJSON-LD [<http://geojson.org/geojson-ld/>] was seen as a logical solution, but as described in the outstanding issues for GeoJSON-LD, nested GeoJSON coordinate arrays are not supported by JSON-LD parsers. Additionally, the schema.org geometry schema was seen as under specified in that among other reasons, it does not provide a default coordinate reference system or a mechanism to declare one. For this reason, the GeoSPARQL well known text format was included providing a precise and JSON-LD compatible geometry format. However, provided the technical limitations listed below, if some logical assumptions are made for the use of schema.org geometry (schema:GeoShape [<https://schema.org/GeoShape>]), it can be used to satisfy the basic geometry preview use case with significantly lower technical overhead than support for the full well known text standard. Further work should look more closely at this issue in an attempt to reconcile and provide guidance."

I think some of this is resolved in the proposed [JSON-LD 1.1](#) with "bbox": {"@container": "@list"} that creates ordered arrays. The alternative used by GeoSPARQL and several OGC projects is to use WKT string representations which work well with linked data tools (spatial extensions in triple stores) but break web-based toolsets like leaflet and openlayers. Although there are workarounds by adding wkt string to geojson translators in javascript code.

<https://github.com/ESIPFed/science-on-schema.org/issues/8>

# Example from ELFIE

```
# This is only an example and probably not syntatically correct.
{
  "@context": [
    "https://opengeospatial.github.io/ELFIE/json-ld/elf.jsonld",
    "https://opengeospatial.github.io/ELFIE/json-ld/hyf.jsonld",
  ],
  {
    "gsp": "http://www.opengeospatial.org/standards/geosparql/",
    "geojson": "https://purl.org/geojson/vocab#",
    "coordinates": {
      "@id": "geojson:coordinates",
      "@container" : "@list",
      "@values" : {
        "@type" : "geojson:Coordinate",
        "@container" : "@set",
        "@values" : [
          {"@type" : "xsd:double", "@id": "geo:longitude"},
          {"@type" : "xsd:double", "@id": "geo:latitude"}
        ]
      }
    }
  },
  "geo": {
    "@type": "schema:GeoCoordinates",
    "schema:latitude": 43.2022,
    "schema:longitude": -89.5302
  },
  "gsp:hasGeometry": {
    "@type": "gsp:Geometry",
    "gsp:asWKT": "POINT (-89.53022 43.20225)"
  },
  "@graph" : [{
    "@id" : "geojson:Point",
    "coordinates" : [
      -89.53022
      43.20225
    ]
  }
  ]
}
```

# Alternative Geometry Specification?

```
{
  "@context": "http://schema.org/",
  "@type": "Dataset",
  "name": "XYZ",
  ...
  "spatialCoverage": {
    "@type": "Place",
    "geo": {
      "@type": "GeoShape",
      ...
    },
    "additionalProperty": [
      {
        "@type": "PropertyValue",
        "additionalType": "http://www.wikidata.org/entity/Q161779",
        "name": "Spatial Reference System for Dataset: XYZ",
        "propertyID": "SRS",
        "value": "http://www.opengis.net/def/crs/OGC/1.3/CRS84",
      }, {
        "@type": "PropertyValue",
        "additionalType": "http://www.wikidata.org/entity/Q4018860",
        "name": "Well-Known Text for Dataset: XYZ",
        "propertyID": "WKT",
        "value": "POLYGON ((-75.8183 -68.4817, -68.5033 -68.4817, -68.5033 -65.08, -75.81"
      }
    ]
  }
}
```