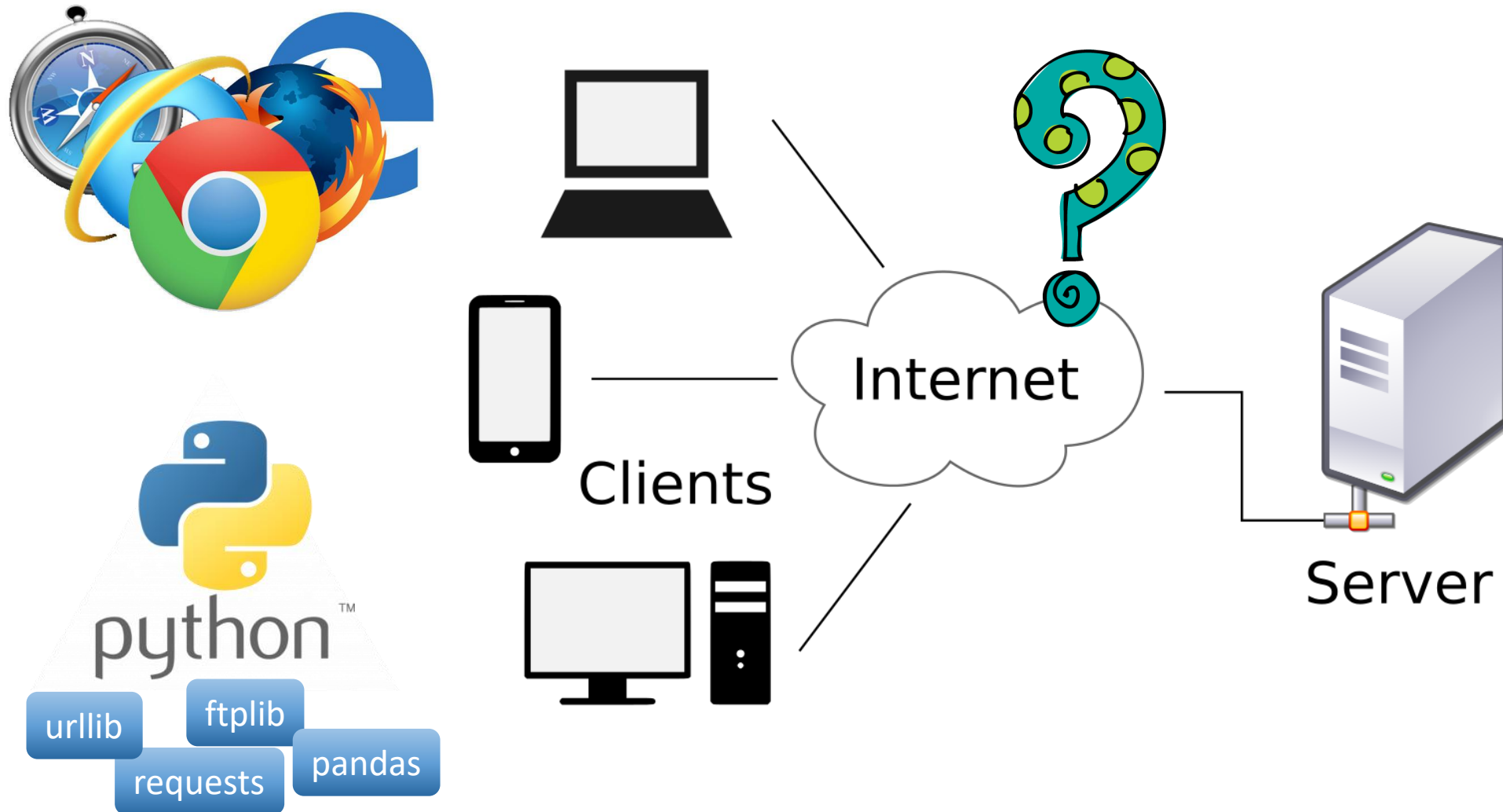


# Web GIS 2: Cloud-based GIS

ENV 859 – Advanced GIS

Fay 2017

# Client-Server relationship



# Web services

The screenshot shows a web browser window with a single tab titled 'nicholas school of the environment'. The address bar is highlighted with a black box and contains the text 'Secure | https://www.google.com/search?q=nicholas+school+of+the+environment'. Below the address bar is the Google search interface. The search bar contains the text 'nicholas school of the environment'. To the right of the search bar are icons for voice search and image search, and a 'Sign in' button. Below the search bar are tabs for 'All', 'Maps', 'News', 'Images', 'Videos', 'More', 'Settings', and 'Tools'. The 'All' tab is selected. The search results show 'About 2,240,000 results (1.22 seconds)'. The first result is 'Nicholas School of the Environment - Duke University' with the URL 'https://nicholas.duke.edu/'. Below the URL is a description: 'Clone of Nicholas Homepage Slideshow - w-links - homePAGE ... featured videos. One on One: Nicholas School's DEL-MEM (Online) Program screenshot ...'. To the right of the first result is a map showing the location of the Nicholas School of the Environment. Below the map are two buttons: 'See photos' and 'See outside'. Below the map and buttons is a section titled 'Nicholas School of the Environment' with the text 'University in Durham, North Carolina'. To the right of this text are two buttons: 'Website' and 'Directions'. Below this section is a link 'More results from duke.edu »'. To the right of the first result are two columns of links. The left column contains 'Master's' (On-campus master's students also have the opportunity to earn a ...), 'Academic Programs' (The Nicholas School offers undergraduate, graduate, and ...), and 'Faculty Directory' (Randolph K. Repass and Sally-Christine Rodgers University ...). The right column contains '(MEM) concentration in ...' (The Business and Environment (BE) program is designed to ...), 'Nicholas School Community' (The Nicholas School is home to more than 150 core and ...), and 'Environmental Sciences' (The Nicholas School cooperates with the ... four undergraduate ...).

Secure | <https://www.google.com/search?q=nicholas+school+of+the+environment>

Google nicholas school of the environment

All Maps News Images Videos More Settings Tools

About 2,240,000 results (1.22 seconds)

**Nicholas School of the Environment - Duke University**  
<https://nicholas.duke.edu/> ▼  
Clone of **Nicholas** Homepage Slideshow - w-links - homePAGE ... featured videos. One on One: **Nicholas School's** DEL-MEM (Online) Program screenshot ...

**Master's**  
On-campus master's students also have the opportunity to earn a ...

**Academic Programs**  
The Nicholas School offers undergraduate, graduate, and ...

**Faculty Directory**  
Randolph K. Repass and Sally-Christine Rodgers University ...

[More results from duke.edu »](#)

**(MEM) concentration in ...**  
The Business and Environment (BE) program is designed to ...

**Nicholas School Community**  
The Nicholas School is home to more than 150 core and ...

**Environmental Sciences**  
The Nicholas School cooperates with the ... four undergraduate ...

**Duke**  
NICHOLAS SCHOOL OF THE ENVIRONMENT

See photos See outside

**Nicholas School of the Environment**  
University in Durham, North Carolina

[Website](#) [Directions](#)

The Nicholas School of the Environment is

<http://imgtfy.com/?q=nicholas+school+of+the+environment>

# NWIS: A more complex example

- Go to the NWIS web site that we used to download data for one of our first tutorials:

<http://waterdata.usgs.gov/nwis>

- Click on the **Real-time data** button, then



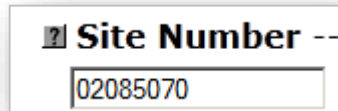
A rectangular button with a purple border and the text "Build Real-Time Table" in purple.

- Next, check **Site Number** and click **Submit**



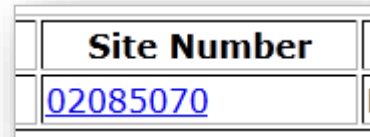
A form titled "Site Identifier --" with two radio button options: "Site Name" (unchecked) and "Site Number" (checked).

- In the next page, enter the site number **02085070**, accept all the other defaults, and click the **Submit** button.



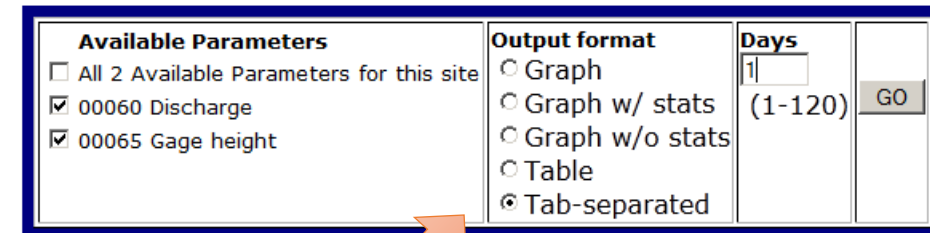
An input field labeled "Site Number --" containing the text "02085070".

- In the next page, click the link in the Site Number column of the table.



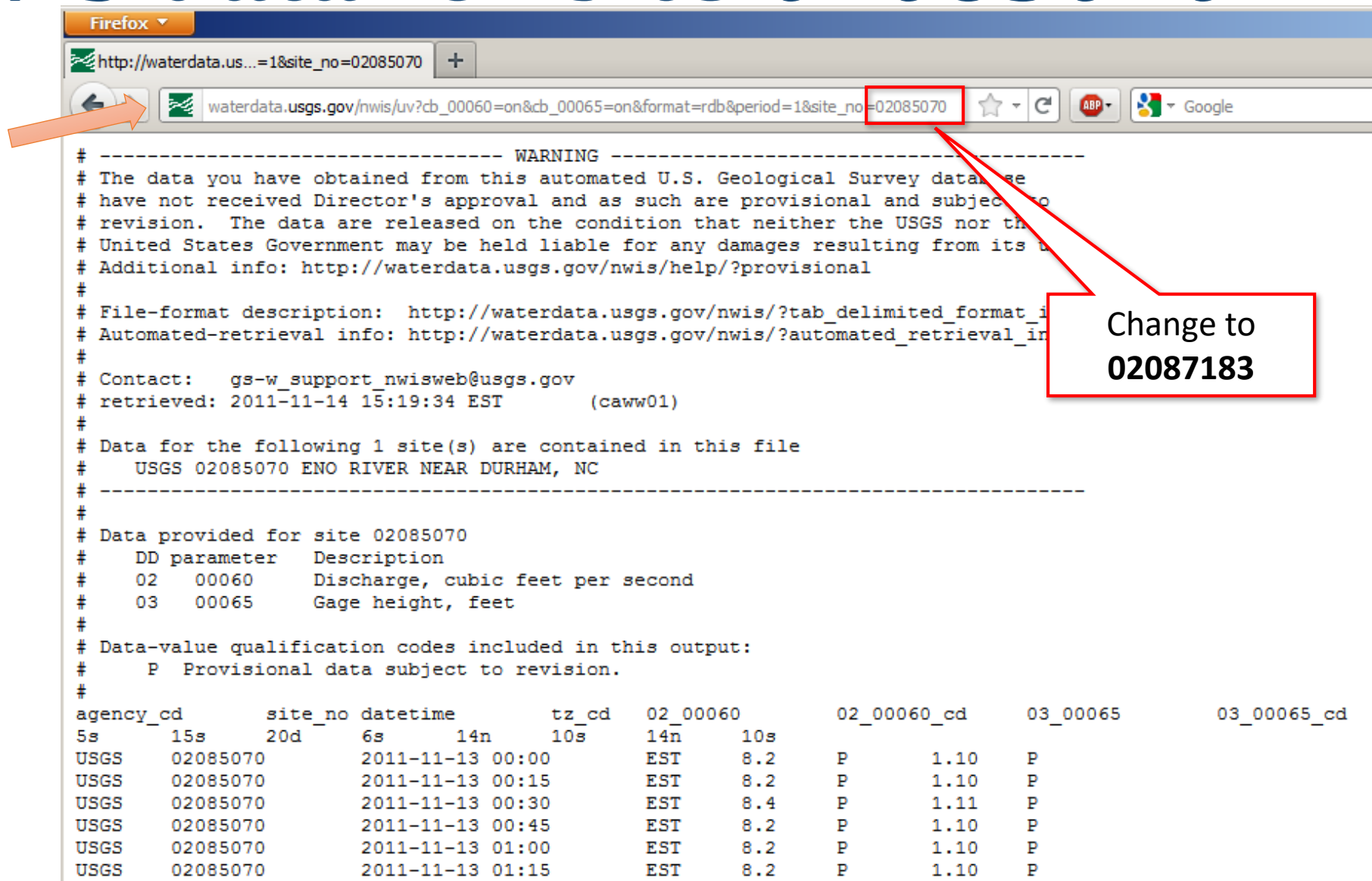
Site Number
<a href="#">02085070</a>

- In the next page, change 'Output Format' to Tab-Separated and 'Days' to 1. Then hit GO.



A form with three main sections: "Available Parameters" with checkboxes for "All 2 Available Parameters for this site" (unchecked), "00060 Discharge" (checked), and "00065 Gage height" (checked); "Output format" with radio buttons for "Graph", "Graph w/ stats", "Graph w/o stats", "Table", and "Tab-separated" (selected); and "Days" with a text input field containing "1" and a range "(1-120)". A "GO" button is on the right. An orange arrow points to the "Tab-separated" option.

# NWIS data for site 02085070



Firefox

http://waterdata.usgs.gov/nwis/uv?cb\_00060=on&cb\_00065=on&format=rdb&period=1&site\_no=02085070

waterdata.usgs.gov/nwis/uv?cb\_00060=on&cb\_00065=on&format=rdb&period=1&site\_no=02085070

WARNING

The data you have obtained from this automated U.S. Geological Survey data release have not received Director's approval and as such are provisional and subject to revision. The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its use. Additional info: <http://waterdata.usgs.gov/nwis/help/?provisional>

File-format description: [http://waterdata.usgs.gov/nwis/?tab\\_delimited\\_format\\_info](http://waterdata.usgs.gov/nwis/?tab_delimited_format_info)

Automated-retrieval info: [http://waterdata.usgs.gov/nwis/?automated\\_retrieval\\_info](http://waterdata.usgs.gov/nwis/?automated_retrieval_info)

Contact: [gs-w\\_support\\_nwisweb@usgs.gov](mailto:gs-w_support_nwisweb@usgs.gov)

retrieved: 2011-11-14 15:19:34 EST (caww01)

Data for the following 1 site(s) are contained in this file

USGS 02085070 ENO RIVER NEAR DURHAM, NC

Data provided for site 02085070

DD	parameter	Description
02	00060	Discharge, cubic feet per second
03	00065	Gage height, feet

Data-value qualification codes included in this output:

P Provisional data subject to revision.

agency_cd	site_no	datetime	tz_cd	02_00060	02_00060_cd	03_00065	03_00065_cd	
5s	15s	20d	6s	14n	10s	14n	10s	
USGS	02085070		2011-11-13 00:00	EST	8.2	P	1.10	P
USGS	02085070		2011-11-13 00:15	EST	8.2	P	1.10	P
USGS	02085070		2011-11-13 00:30	EST	8.4	P	1.11	P
USGS	02085070		2011-11-13 00:45	EST	8.2	P	1.10	P
USGS	02085070		2011-11-13 01:00	EST	8.2	P	1.10	P
USGS	02085070		2011-11-13 01:15	EST	8.2	P	1.10	P

# Dissecting the URL



<http://waterdata.usgs.gov/nwis>

the web-service provider

[uv](#)

the name of the service

[cb\\_00060=on](#)

include discharge data in the output

[cb\\_00065=on](#)

include gage height data in the output

[format=rdb](#)

list the output as a tab-separated

[period=1](#)

days to include in the output table

[site\\_no=02085070](#)

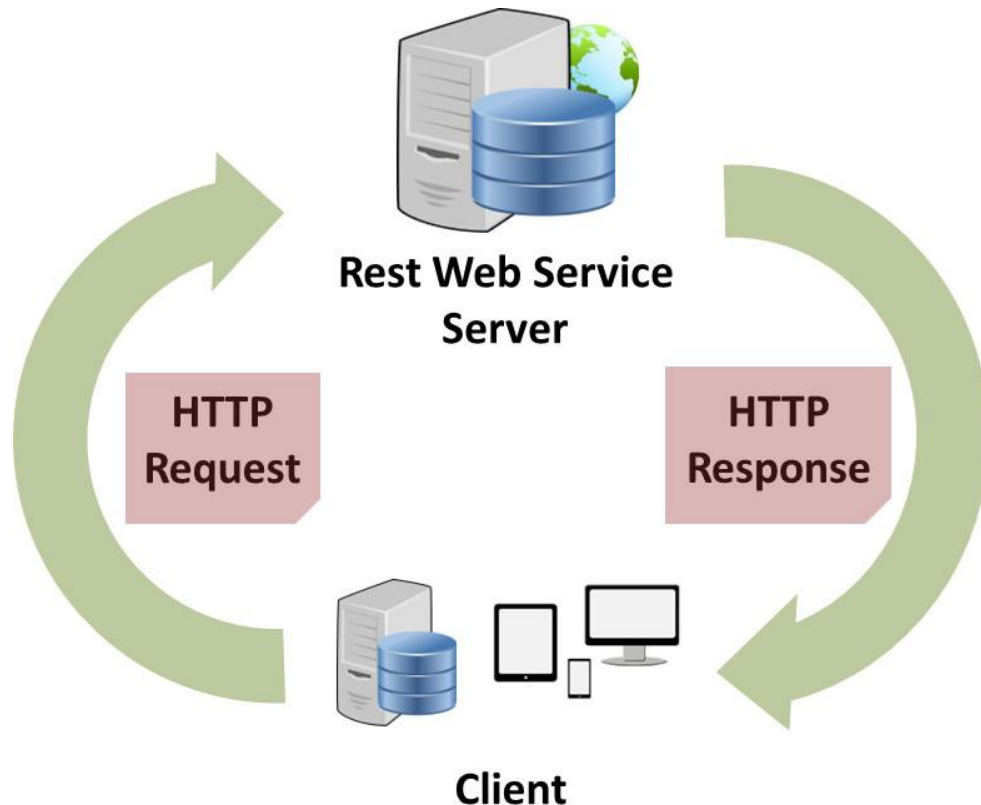
the site number

Parameters

*Parameter lists begin with a “?” and items are separated by “&”...*

# REpresentational State Transfer

<https://www.codecademy.com/articles/what-is-rest>



1. **Client** sends a **request** (e.g. via URL) to server
2. **Server** interprets the request, generates a **response**, and passes it back to the client

Requests *and* responses are all **text** objects passed via **HTTP**.



# Application Programming Interface

## An API is:

- A formalized set of instructions for communicating between a client and server...

## An API “call” consists of:





- The address of the server <https://api.census.gov/data/2016/acs/>
- The name of the service [acs1](#)
- Parameters of the request [get=NAME,B01001\\_001E&for=state:\\*&key=...](#)


[https://api.census.gov/data/2016/acs/acs1?get=NAME,B01001\\_001E&for=state:\\*](https://api.census.gov/data/2016/acs/acs1?get=NAME,B01001_001E&for=state:*)



# NEON Data API

<http://data.neonscience.org/data-api>

  [DATA PORTAL](#) [EXPLORE DATA](#) [DOWNLOAD DATA](#) [RESOURCES](#) [CONTACT US](#)   [SIGN IN](#)

 > [Download Data](#) > [API](#)

## NEON Data API

The free [NEON API](#) can be used by anyone to quickly access NEON data and information about our data products and sampling locations. Scroll down to expand and interact with the example API calls.

**How it works:** This API (Application Program Interface) provides a simple means of constructing URLs that return information in a common machine-readable format, [JSON \(JavaScript Object Notation\)](#). To learn more, visit the NEON Data Portal's [FAQ](#), our [GitHub repository](#), or our [Using the NEON API tutorial](#).

**Tell us what you think:** If you have design ideas, functionality requests, bug notes, examples of how you used the API, or anything else you would like us to know, please [file an issue](#) and tell us about it! This API is an early release and will absolutely change in the future as we receive feedback from the community on how to improve it.

### Example API Calls

Expand the options below, click GET, and then click TRY IT OUT to see example calls.

# Regulations.gov API

<https://regulationsgov.github.io/developers/>

## Regulations.gov API docs

Overview

API Basics

Interactive API

Field References

API Key

Blog

Regulations.gov offers a GET API with three main operations: Document, Documents, and Docket. These operations can be used to search for a single document, a list of documents, or dockets. To begin, you must obtain an [API Key](#).

### Searching for documents

You can search for a list of documents based on the criteria passed by using the endpoint `https://api.data.gov/regulations/v3/documents`. The search operation supports keyword searches as well as navigation-style searching based on a number of available parameters.

### Searching for a document

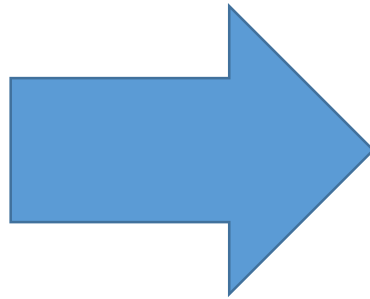
In order to obtain more details about a single document, you can use the endpoint

# JavaScript Object Notation - JSON

[http://sampleserver3.arcgisonline.com/ArcGIS/rest/services/Hurricanes/NOAA\\_Tracks\\_1851\\_2007/MapServer/](http://sampleserver3.arcgisonline.com/ArcGIS/rest/services/Hurricanes/NOAA_Tracks_1851_2007/MapServer/)

find?

searchText=KATRINA  
&contains=true  
&searchFields=  
&sr=  
&layers=0  
&layerdefs=  
&returnGeometry=true  
&maxAllowableOffset=  
&f=pjson



```
{
  "results" : [
    {
      "layerId" : 0,
      "layerName" : "Hurricane Tracks 1851-2007",
      "displayFieldName" : "NAME",
      "foundFieldName" : "Name",
      "value" : "KATRINA",
      "attributes" : {
        "OBJECTID" : "28739",
        "Shape" : "Polyline",
        "Hurricane ID" : "1078",
        "Name" : "KATRINA",
        "Latitude" : "16.9",
        "Longitude" : "-81.2",
        "Wind Speed" : "25",
        "Pressure" : "1005",
        "Category" : "TD",
        "Basin" : "North Atlantic",
        "Date" : "11/3/1981"
      }
    },
    {
      "layerId" : 0,
      "layerName" : "Hurricane Tracks 1851-2007"
```

# Demo time! Using APIs in Python

<https://github.com/ENV859/UsingAPIs>

## APIs to get data...

- Revisiting NWIS stream gage data – as an API
- Grabbing species location data using the USGS's *BISON* API
- Grabbing spatial data from an ESRI API

## APIs to *process* data...

- Geocoding