Water Data Explorer

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CHAPTER

ONE

WATER DATA EXPLORER (WDE)

1.1 Introduction

In recent years, there has been a growing recognition of the need for standardized ways of sharing water data on the web. In response to this need, the Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI) Hydrologic Information System (HIS) has been developed along with the standardized WaterOneFlow web services and WaterML data exchange format. To access data that are shared using the WaterOneFlow services and WaterML format, tools already exist such as the Microsoft Windows HydroDesktop software , WaterML R package, and the web-based CUAHSI HydroClient which serves as an access point to the CUAHSI HIS database.

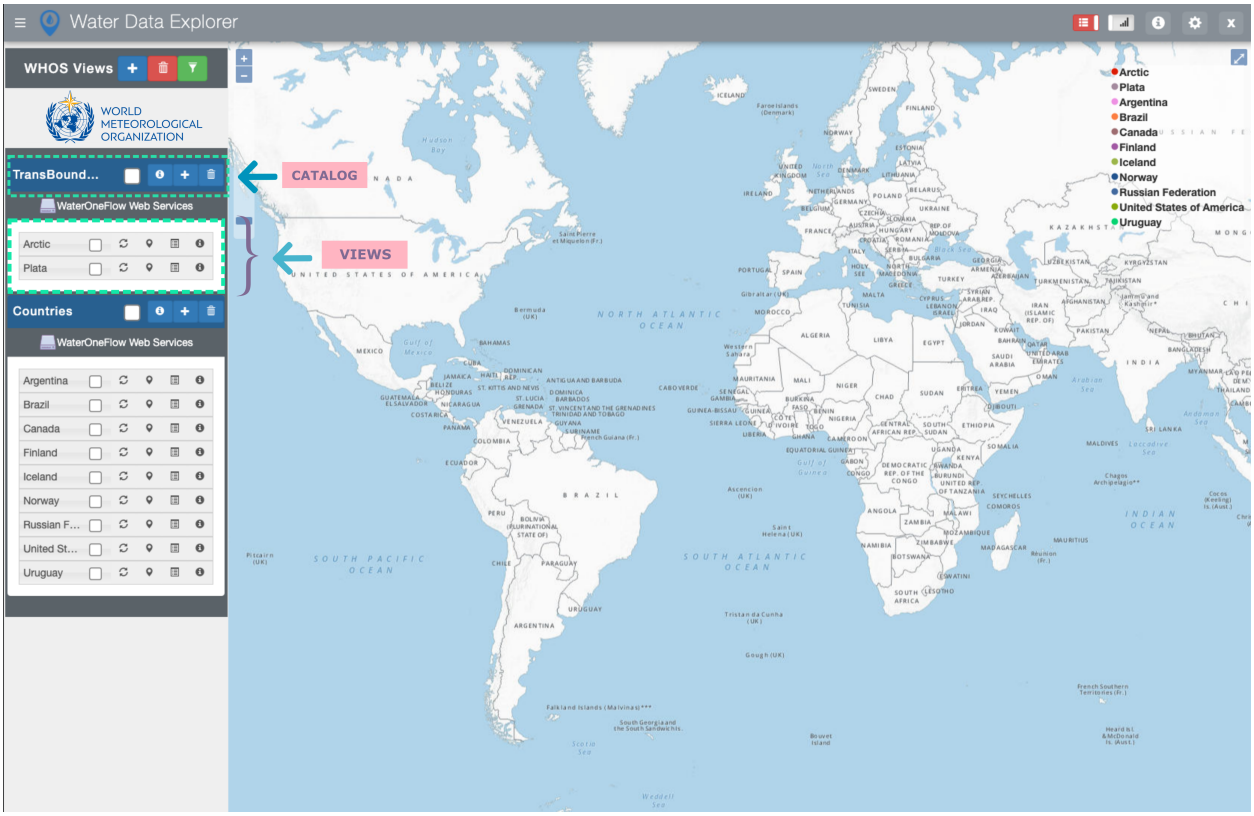
Water Data Explorer (WDE) is a newly developed web-based tool allowing a broad range of users to discover, access, visualize, and download data from any Information System that makes available water data in WaterML format through WaterOneFlow services. WDE is designed in a way that allows users to customize it for local or regional web portals.

1.2 WDE Overview

WDE is an open-source web application providing users with the functionalities of data discovery, data access, data visualization, and data downloading from any Information System that makes available water data in WaterML format through WaterOneFlow web services. WDE can be installed by any organization and requires minimal server space.

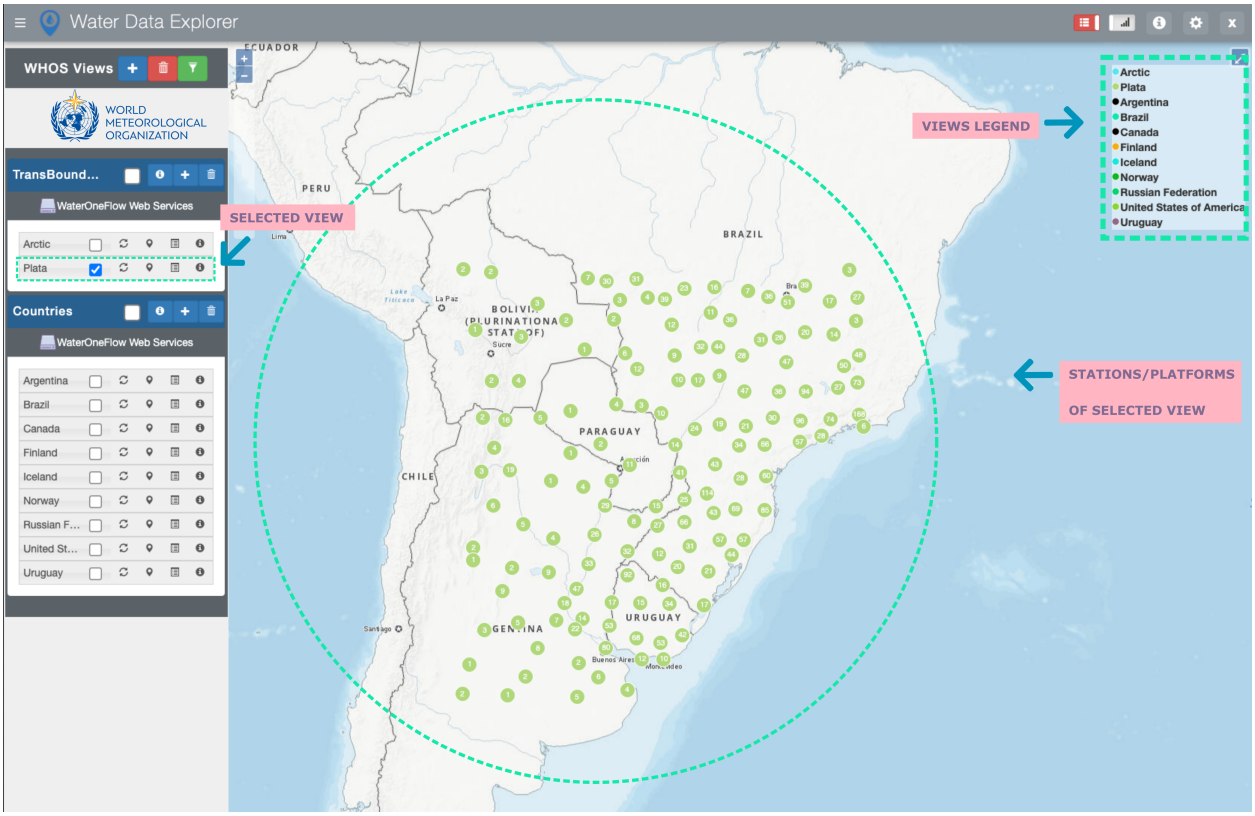
1.2.1 User Interface

To organize and manage various WaterOneFlow web services, WDE uses Data Views that are organized in Catalogs.

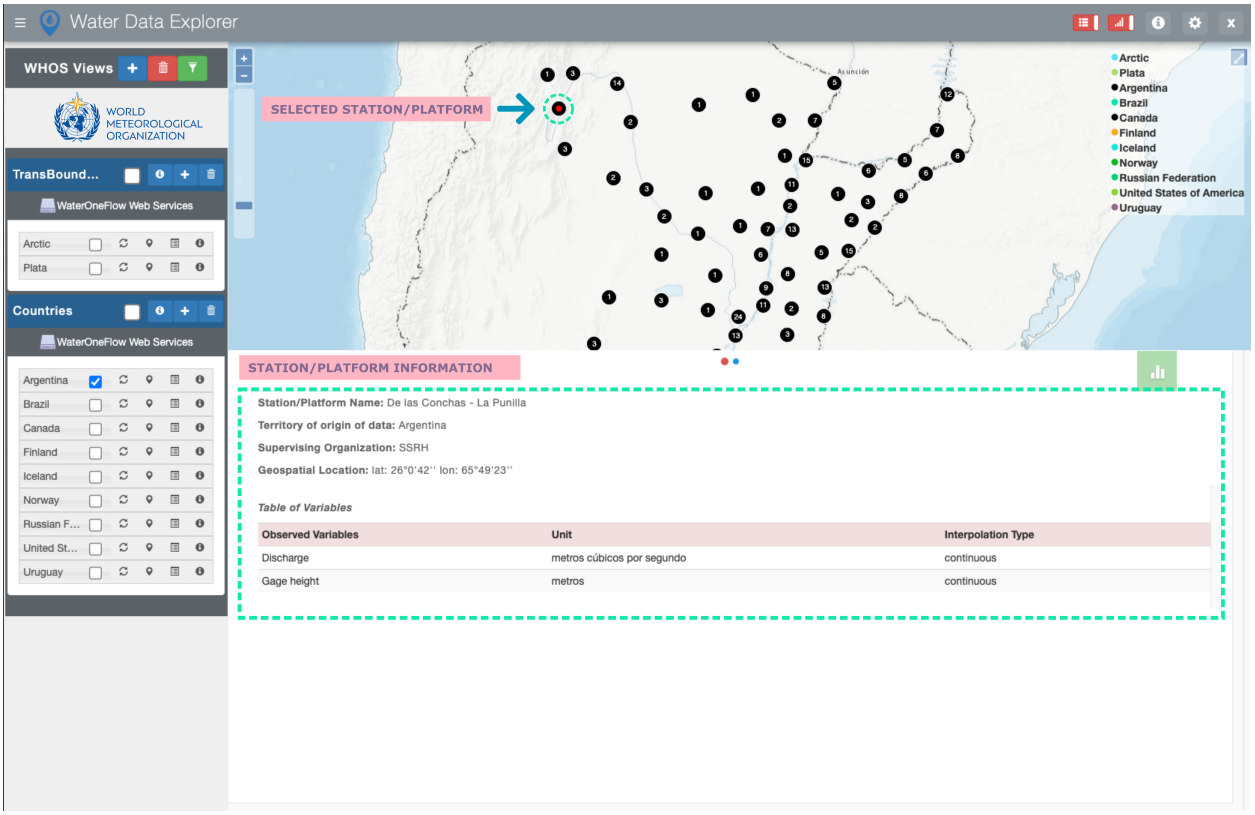


Each Data View contains a set of data that is accessible through a specific WaterOneFlow web service.

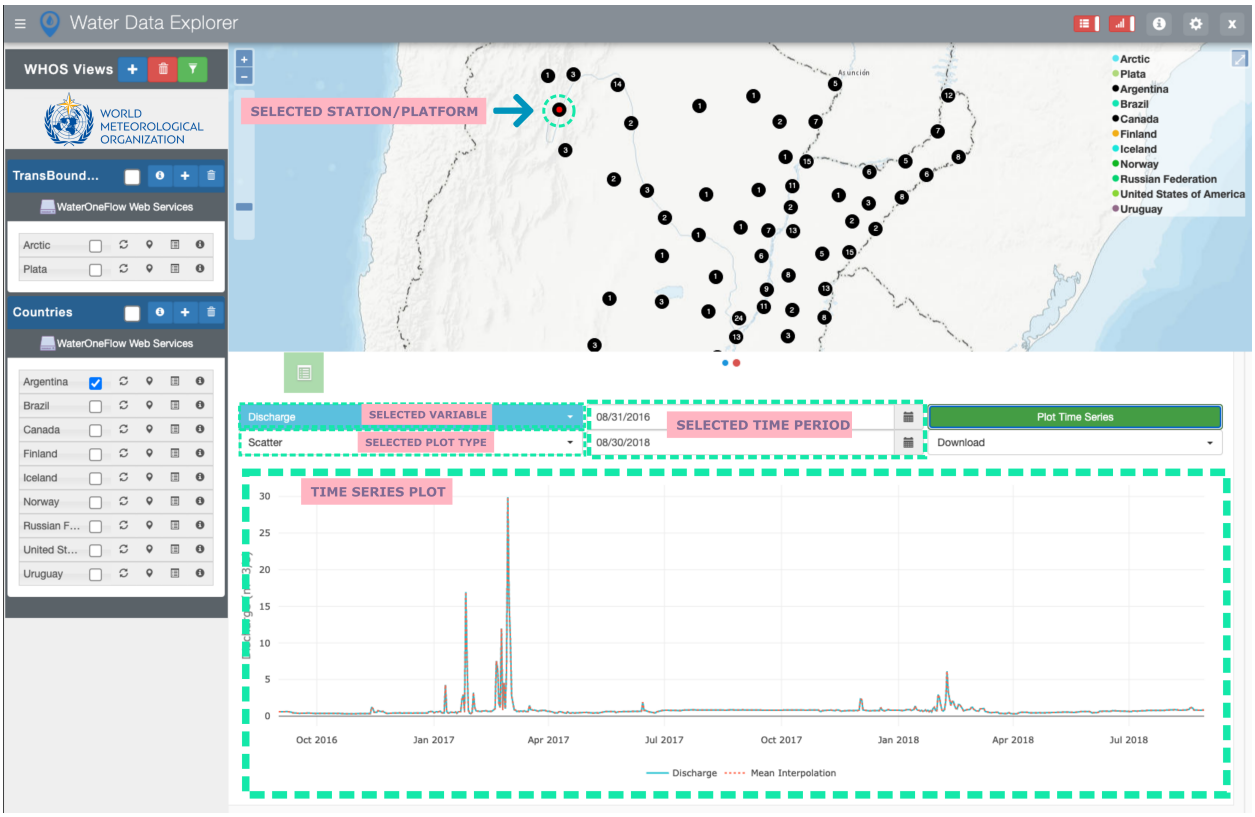
The stations for which data are accessible through a specific Data View are displayed on the WDE map interface along with a legend of the respective Data Views.



For each Station/Platform, a set of metadata is available in the Graphs Panel of the WDE User Interface. Also, for each Station/Platform, a table of observed variables is available and includes variable names, units, and interpolation types.



Station/Platform time series data can be plotted as “Scatter” or “Whisker and Box” plots, and be downloaded in CSV, OGC NetCDF , OGC WaterML 2.0 , and CUAHSI WaterML 1.0 formats for any available time period of interest in the Time Series Plots section.



1.2.2 Installation

WDE can be installed in production services through a Docker image or directly on a server .

Docker

Docker Image: byuhydro/wde

The WDE docker image installation has support for different types of architectures:

Two Images: one PostgreSQL image and WDE image.

- Using a docker-compose.yml to run both containers declaring environment variables:

```
docker-compose up
```

- Running two different containers with a file containing the environment variables:

```
docker run --name postgres -e POSTGRES_PASSWORD=passpass -p 5432:5432 -d postgres

docker run -it --env-file env.txt -p 80:80 byuhydro/wde
```

One Image: one WDE image connected to a local instance of PostgreSQL or an Amazon RSD postgreSQL database.

- Using local instance of PostgreSQL with a file containing the environment variables:

```
docker run -it --env-file env.txt -p 80:80 byuhydro/wde
```

- Using an Amazon RSD postgreSQL database with a file containing the environment variables:

```
docker run -it --env-file env.txt -p 80:80 byuhydro/wde
```

Note: Currently there is only support for AWS if an cloud based database is used.

Note: env.txt sample files can be found in here

Regular Production Installation

When installing WDE using the regular installation process in a production env, you will need to install the Tethys Platform first and then install WDE app. Follow this guide for an step by step process.

Regular Development Installation

WDE can also be installed in your local computer without the need to do a production installation in any server. You will need to install the Tethys Platform first and then WDE app.

- Use this guide to install the Tethys Platform.
- Use this guide to install WDE in the Tethys Platform.

1.2.3 Developers

WDE has been developed by Elkin Giovanni Romero Bustamante at Brigham Young University's (BYU) Hydroinformatics laboratory with the support of the World Meteorological Organization. The BYU's Hydroinformatics laboratory focuses on delivering different software products and services for water modelling. Some of the most important works include: Global Streamflow Forecast Services API , creation of the Tethys Platform , and Hydroserver Lite . The most recent publications and works can be found on the BYU Hydroinformatics website.

1.2.4 Source Code

The WDE source code is available on Github:

- https://github.com/BYU-Hydroinformatics/Water-Data-Explorer

Note: Please feel free to contribute.

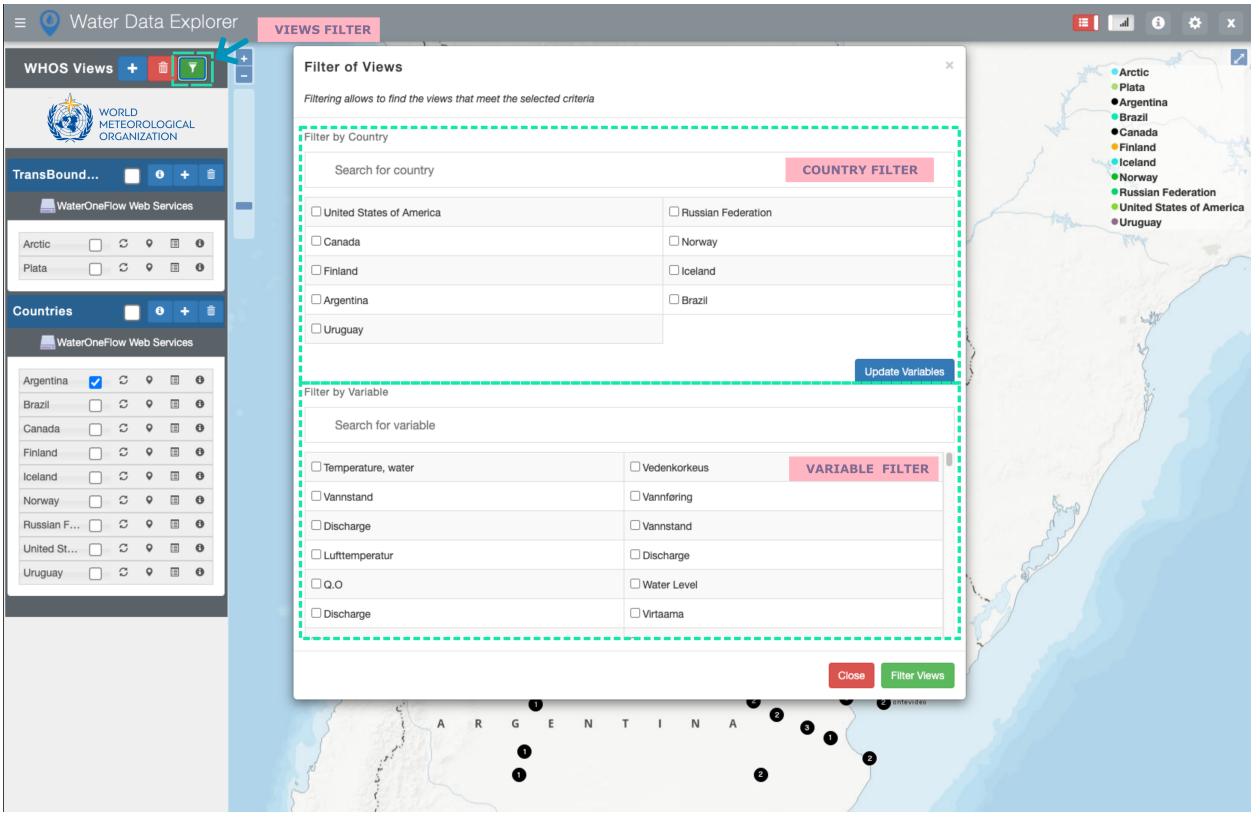
CHAPTER

TWO

WDE USER FUNCTIONALITIES

2.1 Data Discovery

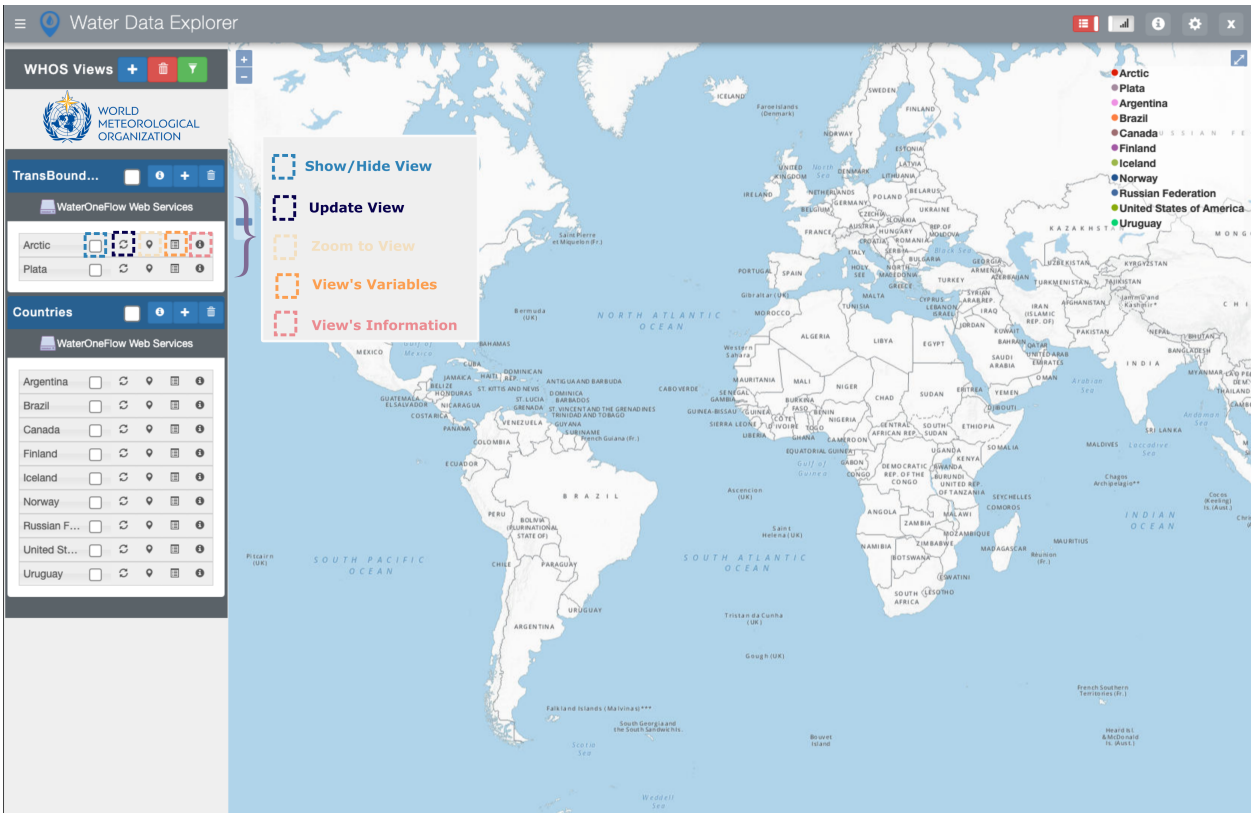
The user can filter the available Views by countries and variables of interest by using the icon.



Note: The user can update the variables to only display the variables of the selected countries in the country filter portion by using the Update Variables button.

To display the available stations/platforms of a specific View on the map, the user should use the "Show/Hide View" icon. To see the available variables of a specific View, the user should use the icon. To display the information about a specific View including description, endpoint, and list of stations as well as the available analysis tools, the user should use the icon. To zoom to a specific View on the map, the user should use the icon.

Note: To have the data and information of a specific View up to date, the user should update the View by using the ⟳ icon.

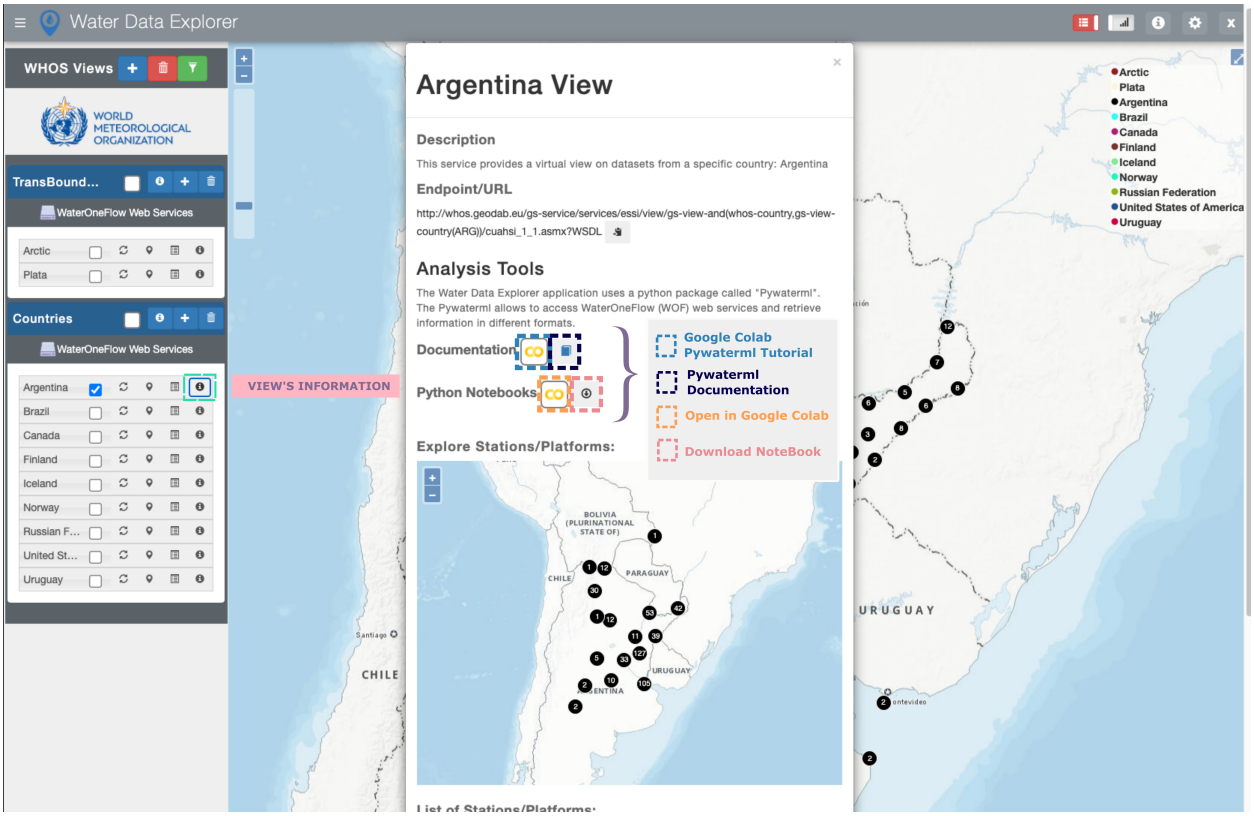


2.2 Data Analysis

WDE application uses a python package called “Pywaterml”. The Pywaterml allows access to WaterOneFlow (WOF) web services and retrieves information in different formats. The Pywaterml can be used in Python Notebook.

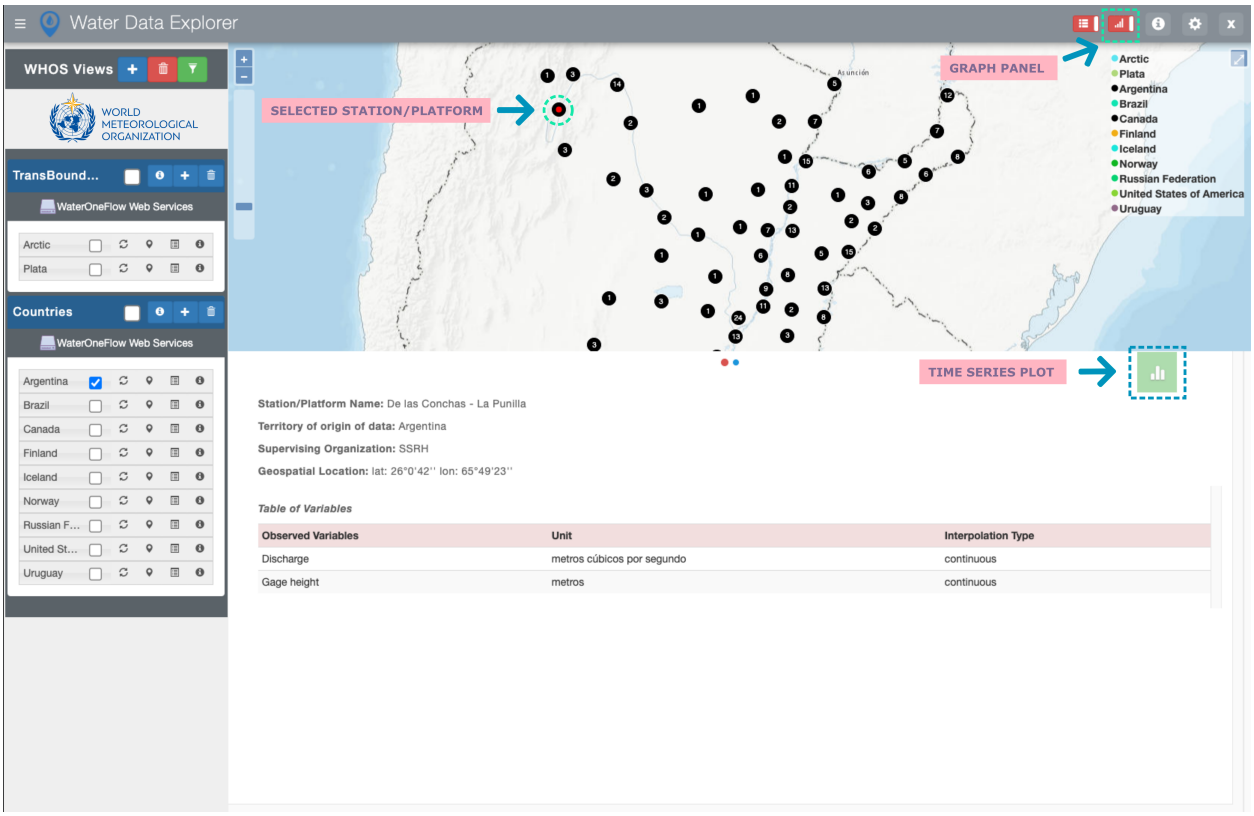
Users can open a Python notebook tutorial and the Pywaterml documentation by using the and icons.

For a selected View, users can open a Python notebook template in Google Colab. The Python notebook can also be downloaded for a specific station/platform and a specific variable.



2.3 Time Series Visualization and Downloading

To visualize and download time series available for a specific station, the user should select the station of interest on the WDE map interface, that triggers the opening of the WDE Graphs Panel at the bottom of the application. To select the time series of interest to be visualized or downloaded, the user should select the icon on the top right of the Graphs Panel.



Note: User can hide or show the Graphs Panel by means of the icon on the right of the application header. In the opened window, the user can select a variable of interest, plot type, and time period of interest.

Note:

WDE uses the Plotly library which provides the menu above, to allow users to download plots in PNG format, pan to, zoom in/out, and autoscale plots.

CHAPTER

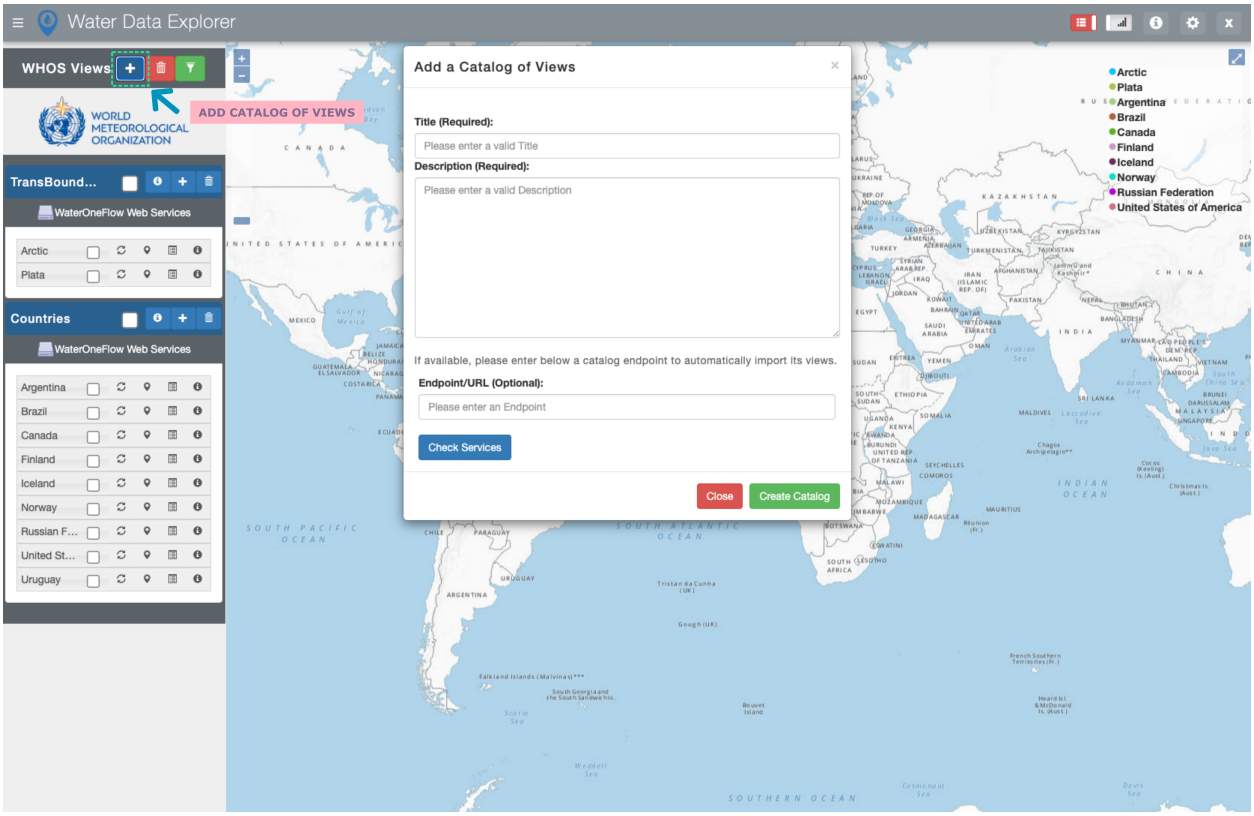
THREE

WDE ADMIN FUNCTIONALITIES

The WDE admin functionalities are only available for the WDE administrators.

3.1 Adding and Deleting Data Catalogs and Views

To add Catalogs, administrators should use the + icon to access the "Add a Catalog of Views" menu.



In this menu, to add a new Catalog of Views, administrators should enter its title, description, and endpoint if available.

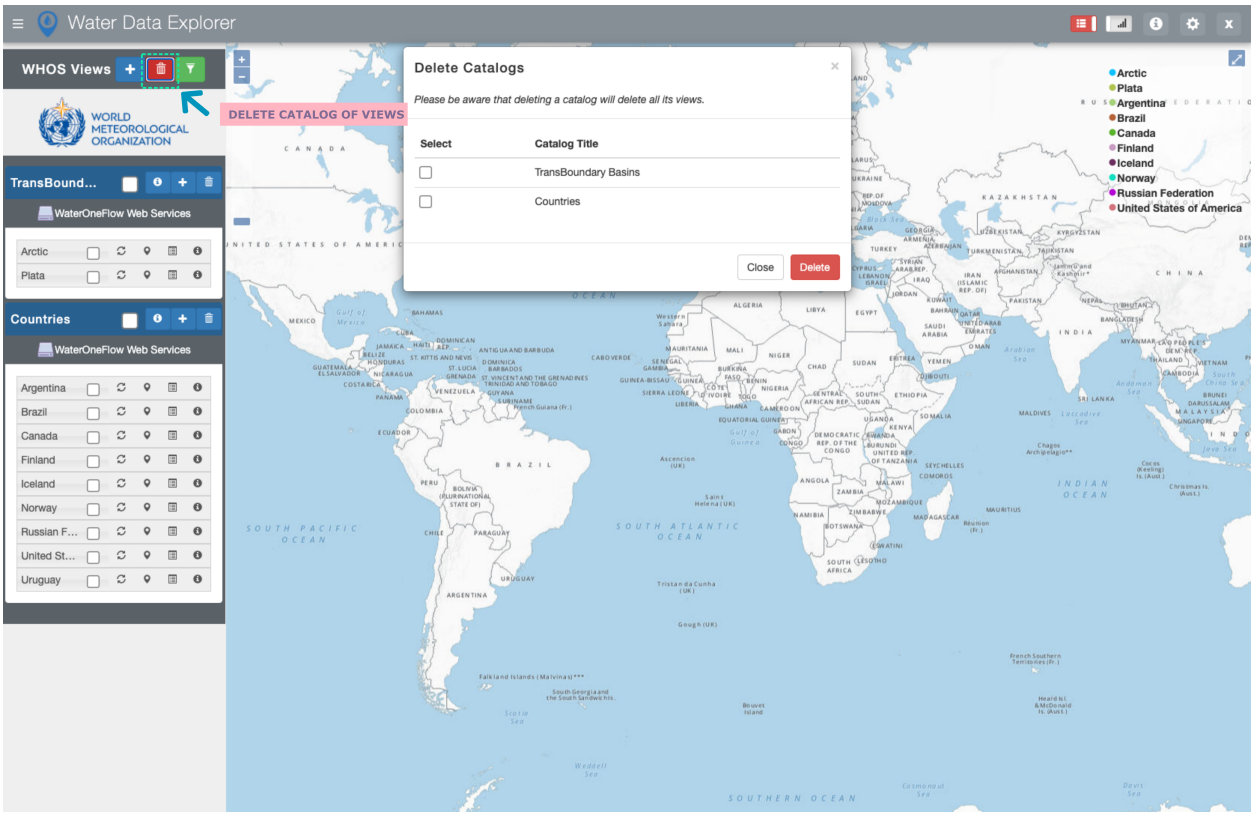
Endpoint/URL (Optional):

Please enter an Endpoint

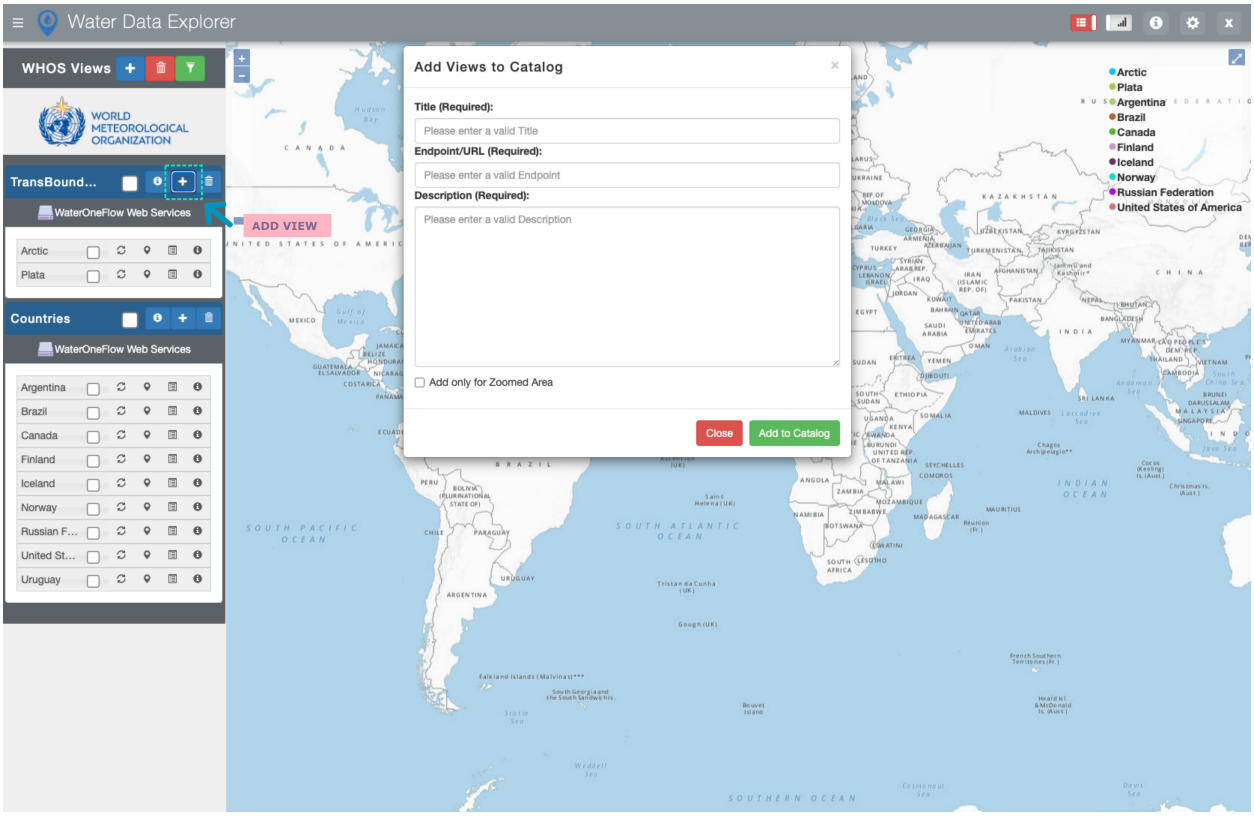
Note:

To add a Catalog that is already published and accessible through WaterOneFlow web services, administrators should enter the Catalog endpoint to automatically import its Views. Administrators can check the available Views by using the Check Services button.

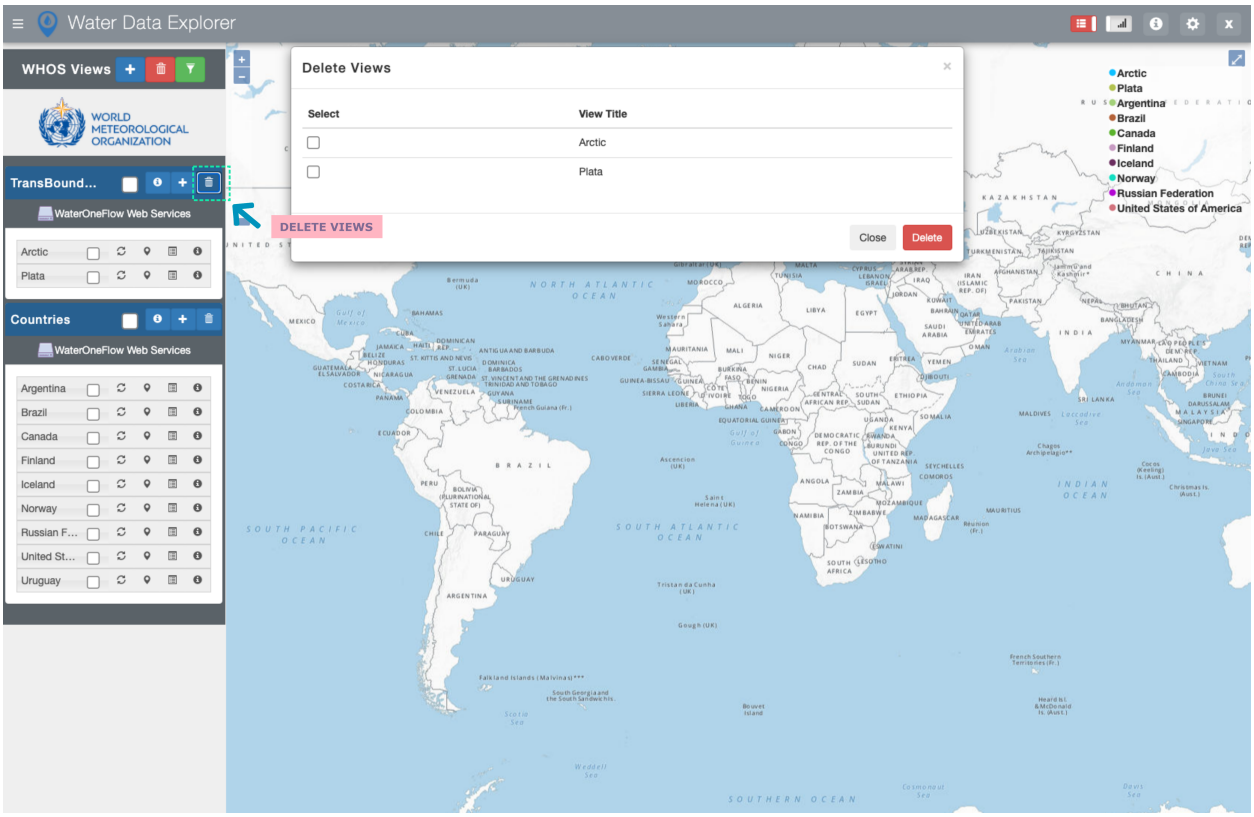
To delete Catalogs, administrators should use the icon to access the "Delete Catalogs" menu and select the Catalog to be deleted.



To add Views to a specific Catalog, administrators should use the icon to the right of the Catalog's title to access the "Add Views to Catalog" menu.

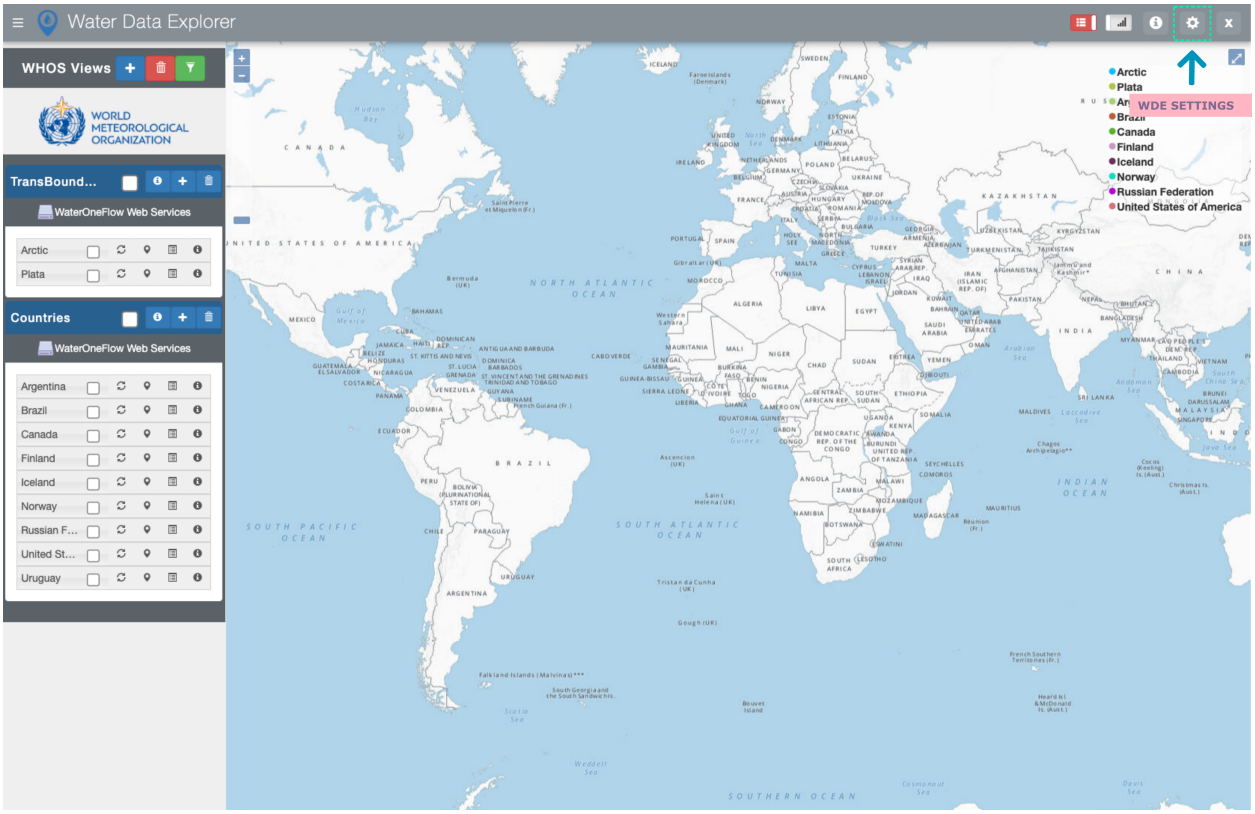


To delete Views, administrators should use the icon to access the "Delete Views" menu and select the View to be deleted.



3.2 Customizing the WDE User Interface

Administrators can customize the WDE user interface by selecting the icon.



In the settings window, administrators can customize the name of the institution/system that provides Catalogs/Views to the WDE. Administrators can also customize the institution/system logo, as well as the boundaries of the WDE map interface. These customizations are available in the Custom Settings table.