River Morphology Information System

(RIMORPHIS)

Cyberinfrastructure Overview

rimorphis.org



PURDUE UNIVERSITY · IOWA · SAINT LOUIS UNIVERSITY · University of Colorado Boulder

Agenda

1. Referencing System

   NHDPlus High Resolution

2. Data Resources

   Database Specification and External Resources

3. Rimorphis API

   Communicating w/ Platform Data and Services

4. Data Exploration

   UI and Visual Browsing

5. Data Visualization

   UI – Map-based 3D Geospatial Representation

6. Data Analytics

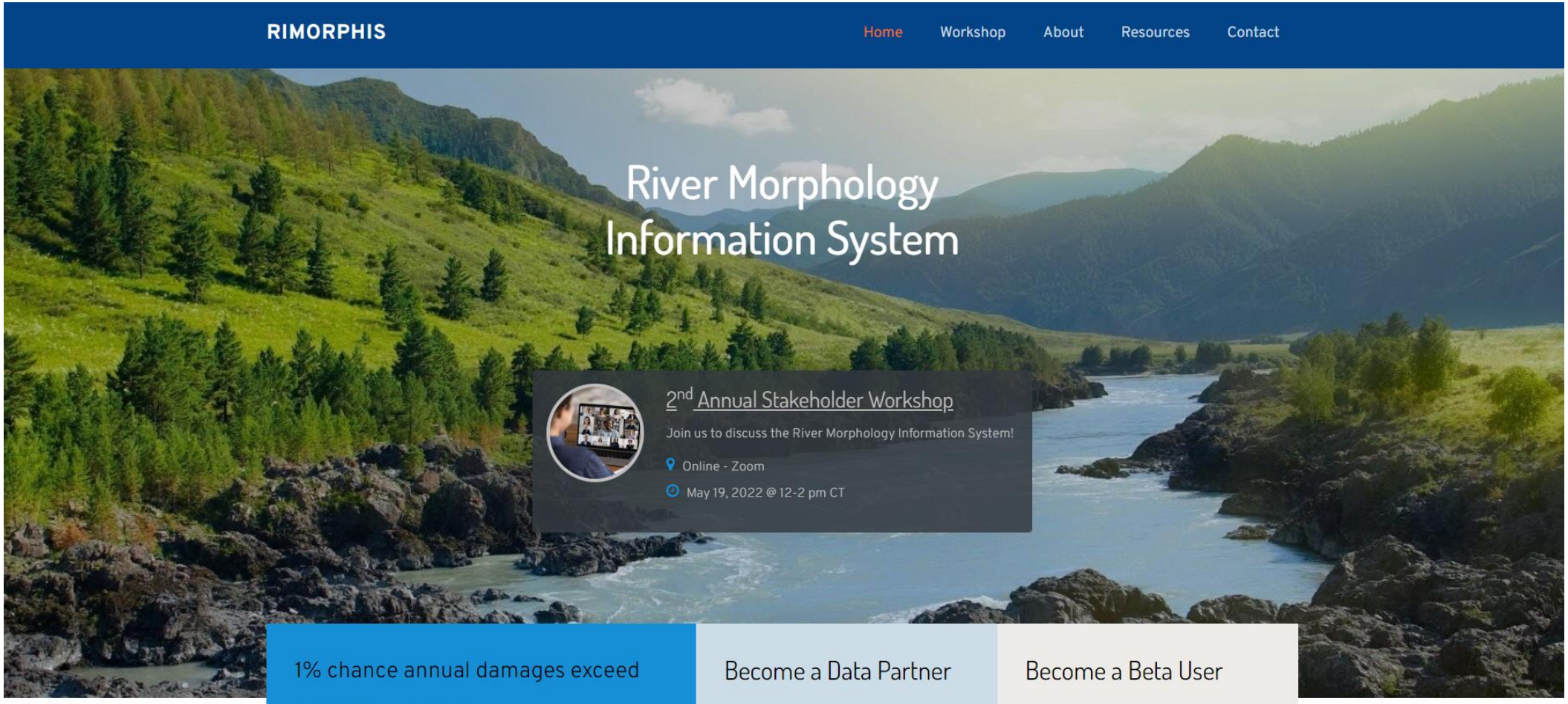
   Cross-Section Processing (Automatic and Manual)

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Project Website

RIMORPHIS Project Website

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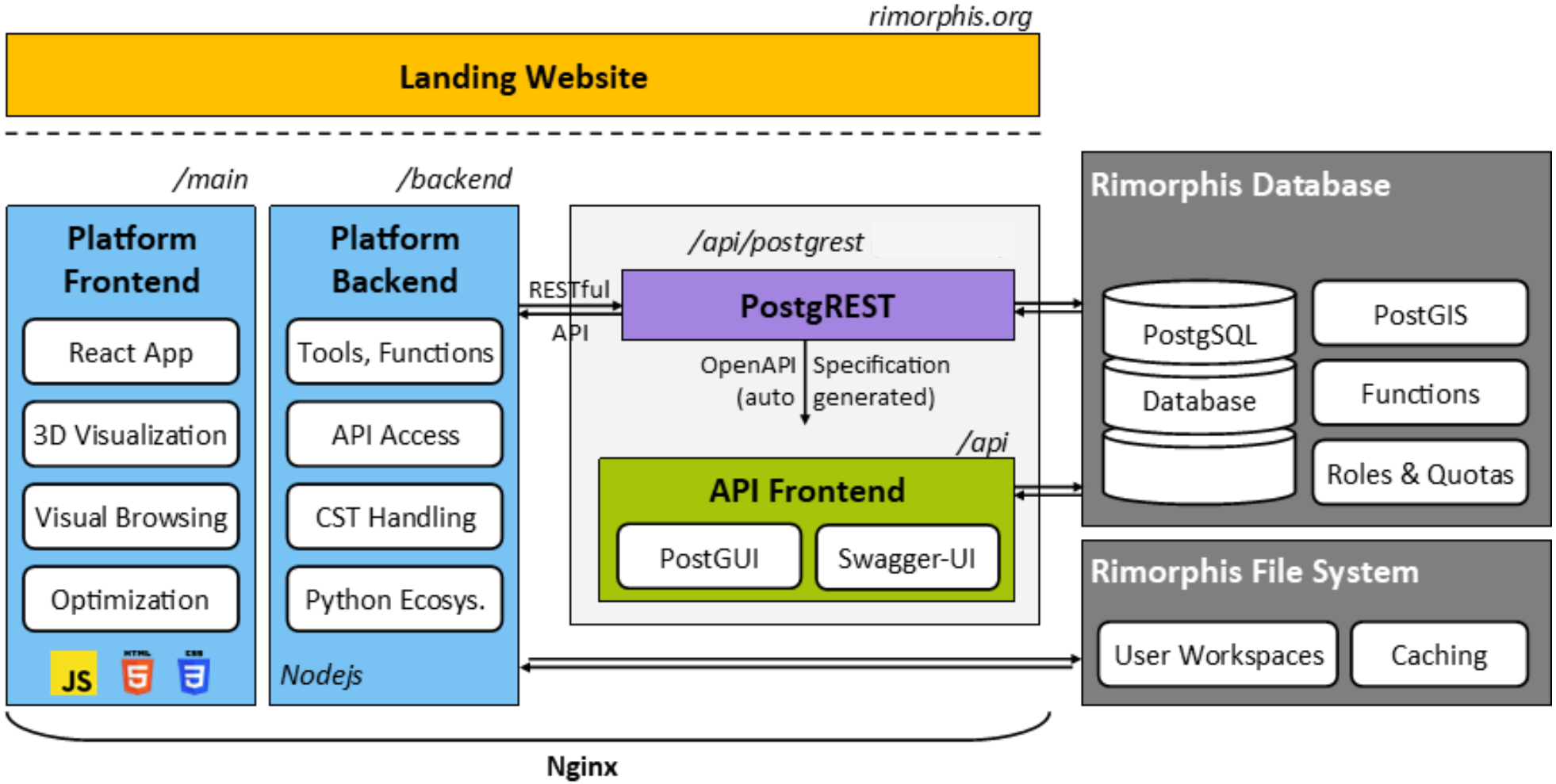


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Cyberinfrastructure

RIMORPHIS System Architecture

Overview - Version 1



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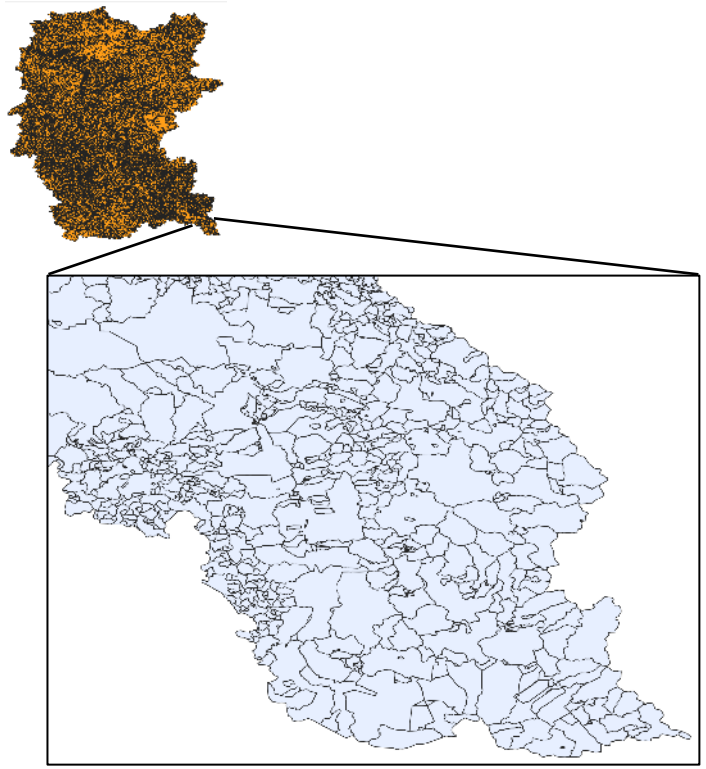
Referencing System

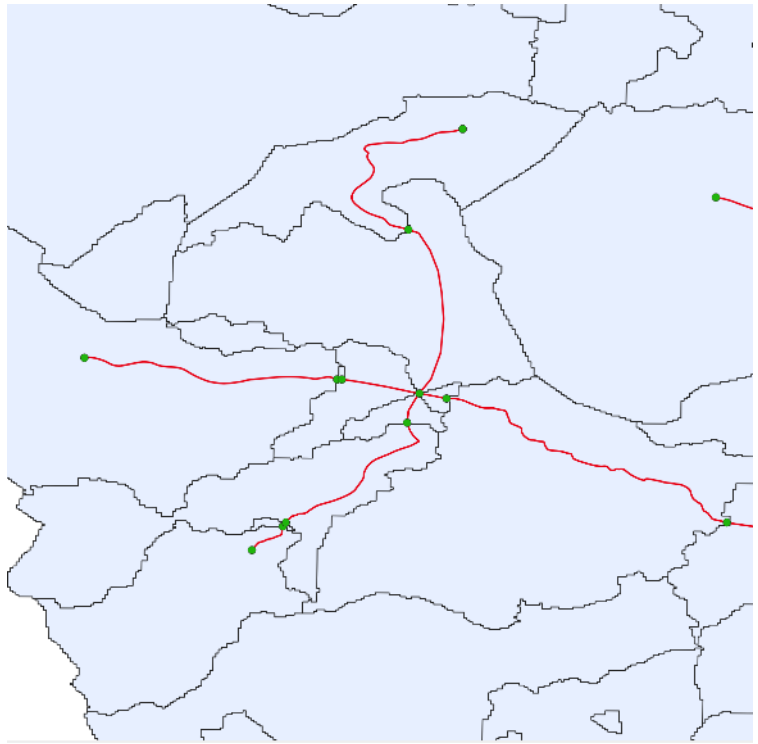
RIMORPHIS Referencing System

NHD Plus HR Data Organization

HUC4 Catchment → NHD Catchments → Flowlines & Junctions







RIMORPHIS Referencing System

NHD Plus HR Data Organization

NHD Plus Catchment

- NHD developed this system by further partitioning HUC 12 areas in a way that each catchment will at most contain one flowline, *ideally**.
- For more info, see pages 32-37 in the NHD Plus HR documentation.

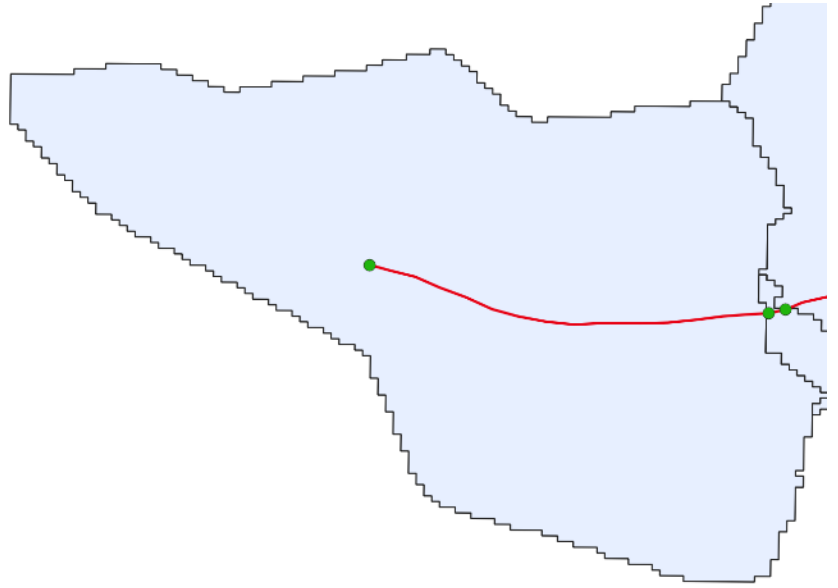
NHD Plus Flowline

- A flowline is defined in connection to its NHD Plus catchment.
- It has a bunch of associated data available in multiple tables.

NHD Plus Junction (i.e., *Node*)

- A node is the uppermost point of the flowline geometry. (Source)
- Node types: Within network, Network start, Network end, Nonflowing. (For more info, see page 42 of documentation)

NHD Geographical Unit



*There can be various kinds of outliers in NHD data.

RIMORPHIS Referencing System

NHD Plus HR Data Organization

See Table 16

Catchment	Flowline	FlowlineVAA	Flow	Junction
NHDPlusID	NHDPlusID	NHDPlusID	NHDPlusID	latitude
Geometry	Reach Code	Reach Code	Direction	longitude
Area (Km^2)	Geometry	Up & Down Flowline	From Flowline	
	Length (Km)	Slope	To Flowline	
		Path Length	Node ID	
		...		

HUC 2,4,6,8,10
shape

HUC 12
shape
downstream

RIMORPHIS Referencing System

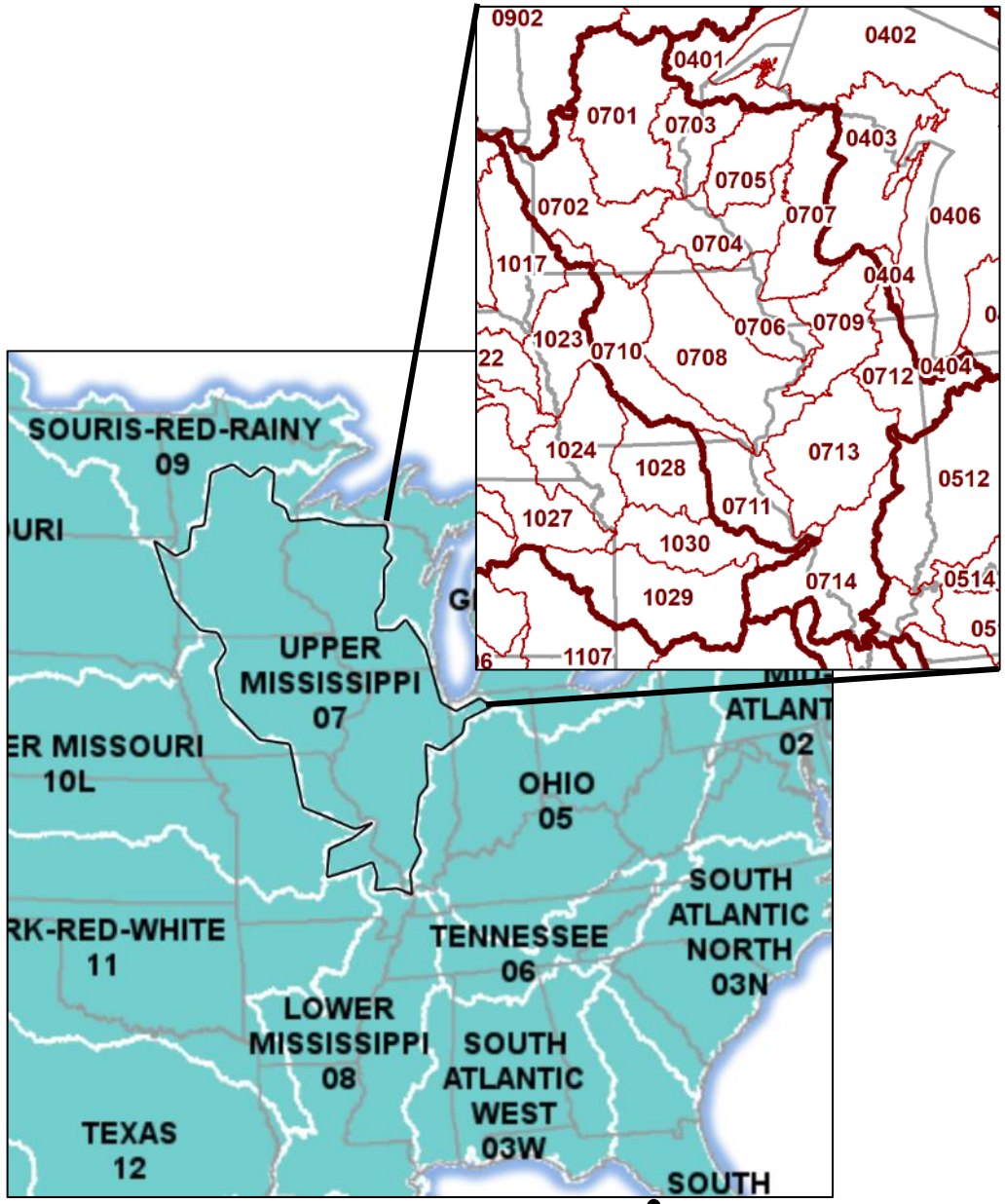
Data Statistics for NHD Plus HR

~Data Size for HUC 07 (Upper Mississippi)

	CATCHMENT	FLOWLINE	JUNCTION
Data Size	4.47_{gb}	462_{mb}	14_{mb}
# of Records	1,148,826	627,746	623,616

~Data Size for HUC 05 (Ohio)

	CATCHMENT	FLOWLINE	JUNCTION
Data Size	8.55_{gb}	1.96_{gb}	60_{mb}
# of Records	2,194,880	2,214,488	2,182,492



HUC2 Watersheds

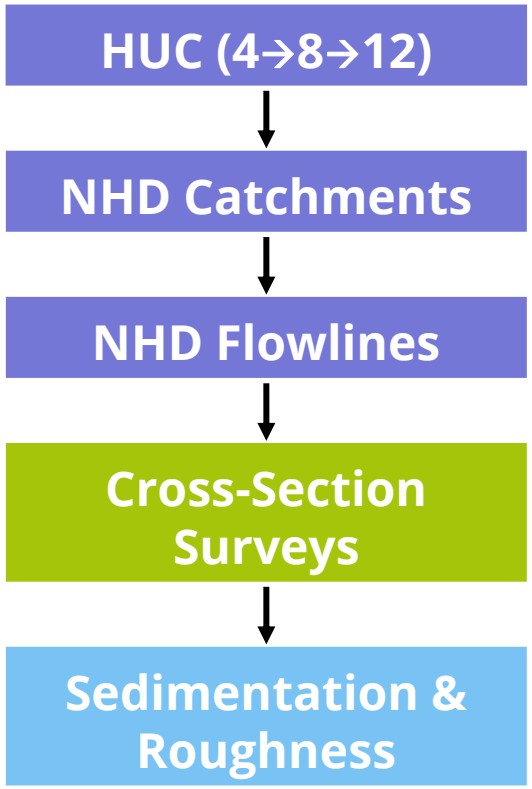
RIMORPHIS

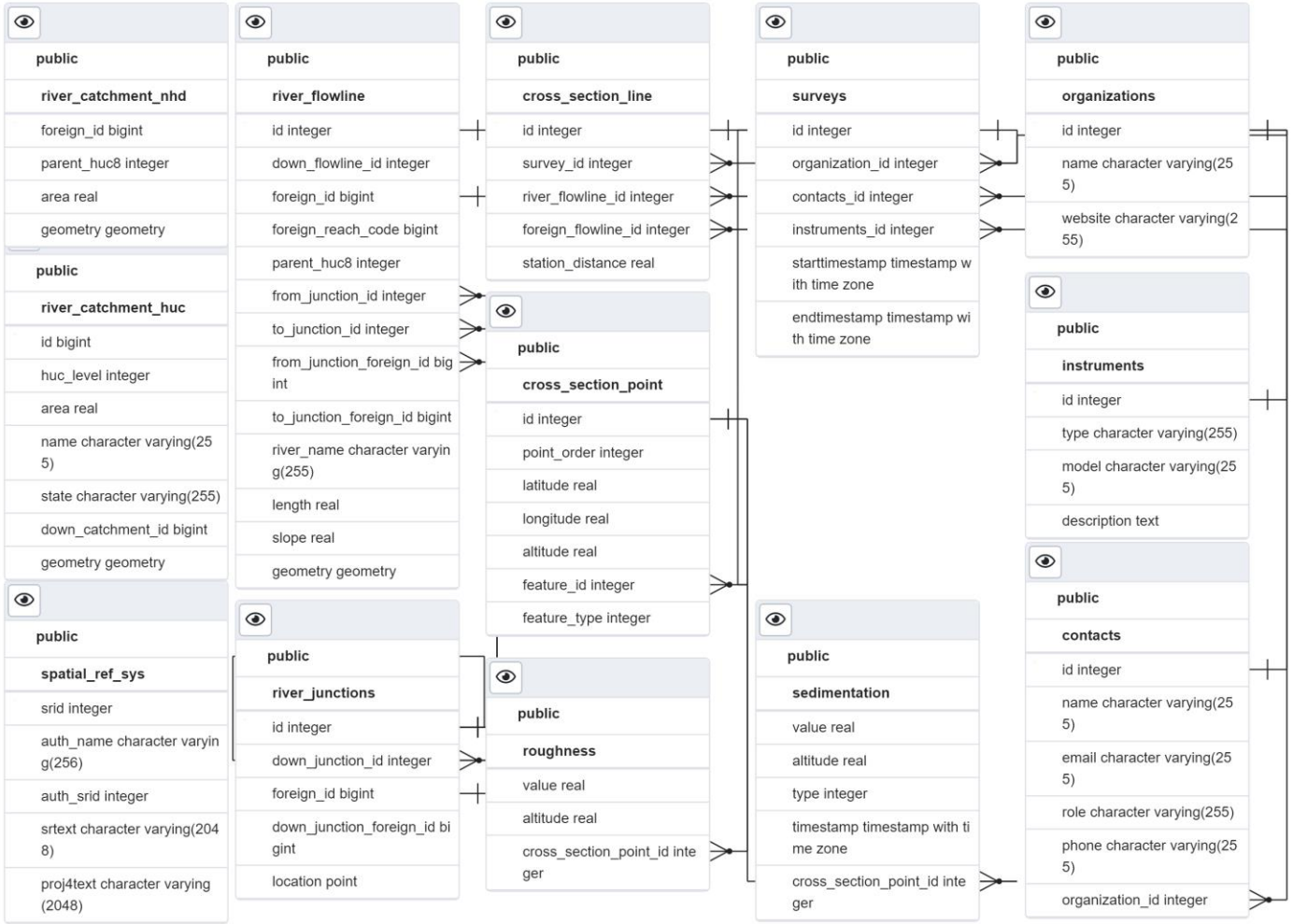
API & Data Resources

RIMORPHIS Data Model

Our database structure

RIMORMPIS Hierarchy - v1



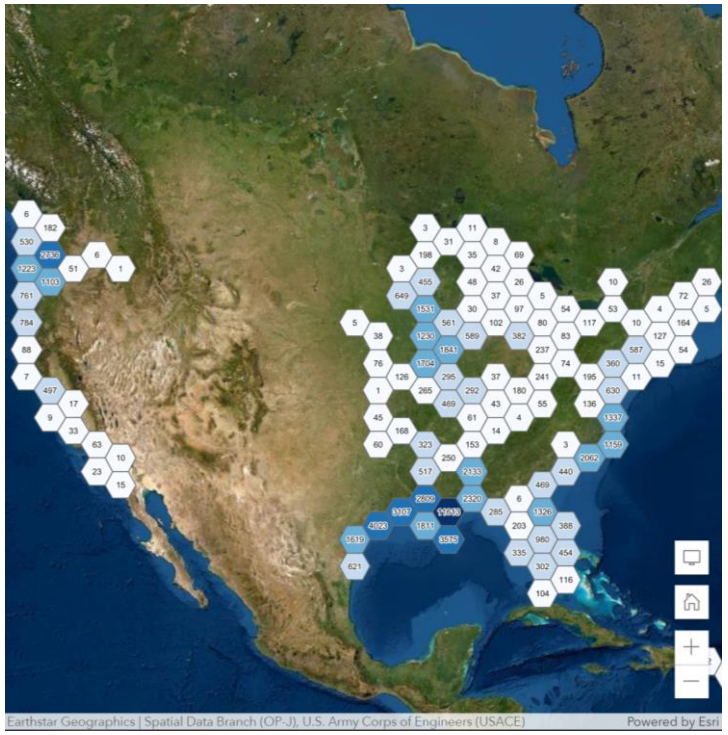


* Some relationships, tables, and functions have been omitted for brevity.

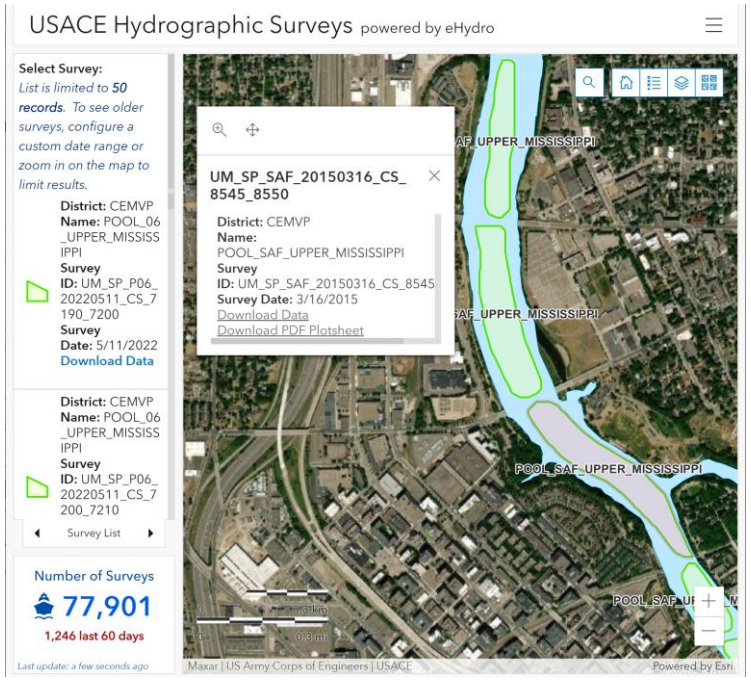
RIMORPHIS External Resources

eHydro Cross Section Surveys

Coverage



Survey



Survey Data

SurveyJob

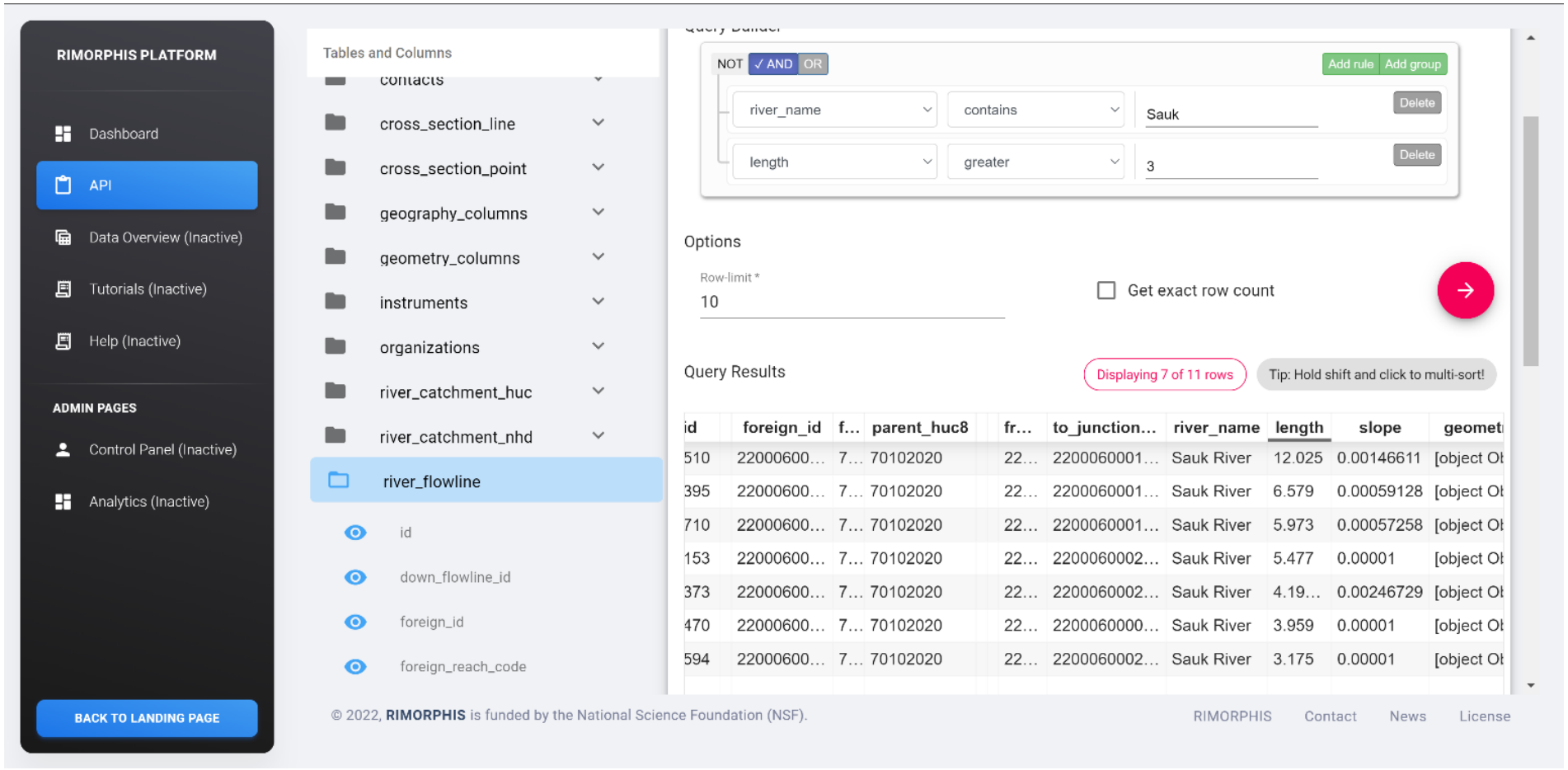
Columns:	Sample data:	Descriptions:
OBJECTID	45539	primary key for a SurveyJob
SURVEYJOBIDPK	UM_15_MVR_20121017_CS_48334880_12A	unique key for a SurveyJob
SDSID	{094152C5-D47B-407E-89F6-B9BF8ADA4F83}	Unique identifier for all features and objects in the SDSFIE
SDSFEATURENAME	Upper Mississippi River Pool 15	Textual description of the data location
SDSMETADATAID	UM_15_MVR_20121017_CS_48334880_12A	Metadata identifier
SURVEYTYPE	CS	Survey Type (e.g. Condition Survey)
CHANNELAREAIDFK	CEMVR_UM_15_MVR	Channel Area Identifier Key
DATEUPLOADED	12/19/2019 5:27	
USACEDISTRICTCODE	CEMVR	Abbreviation of USACE DistrictCode.
SURVEYDATESTART	10/17/2012 12:00	
SURVEYDATEEND	10/17/2012 12:00	
SOURCEDATALOCATION	https://ehydro.blob.core.windows.net/ehydro-surveys/CE	URL for the actual data in a compresse
SOURCEDATACONTENT	UM_15_MVR_20121017_CS_48334880_12A.DAT,UM_15_	Schema of the source data
SOURCEPROJECTION	NAD_1983_StatePlane_Illinois_West_FIPS_1202_Feet	Projected coordinate system
PROJECTEDAREA	2038717	
SDSFEATUREDESCRIPTION	Upper Mississippi River Pool 15	Feature Description (i.e. part/all of the
DATELOADEDENTERPRISE	12/20/2019 7:58	
DATENOTIFIED		
PLOTSHEETLOCATION	https://ehydro.blob.core.windows.net/ehydro-surveys-pd	
SOURCEAGENCY	CEMVR_DIS	District ID and office code
GlobalID	{E869C7E5-8872-4690-8634-40508634A132}	
SHAPE_Length	0.49894288	Perimeter of the polygon
SHAPE_Area	2.04E-05	Area of the polygon
geometry	*json object {}*	Lat/Longs of the sounding locations. Th

GDB, Esri TIN, XYZ, KMZ

* eHydro Disclaimer: “The hydrographic surveys provided by this application are to be used for informational purposes only and should not be used as a navigational aid. Channel conditions can change rapidly and the surveys may or may not be accurate.”

RIMORPHIS API

Overview - Version 1



Query Example: /api/river_flowline?and=(foreign_id.eq.2200600016702)&select=geometry

RIMORPHIS Demo

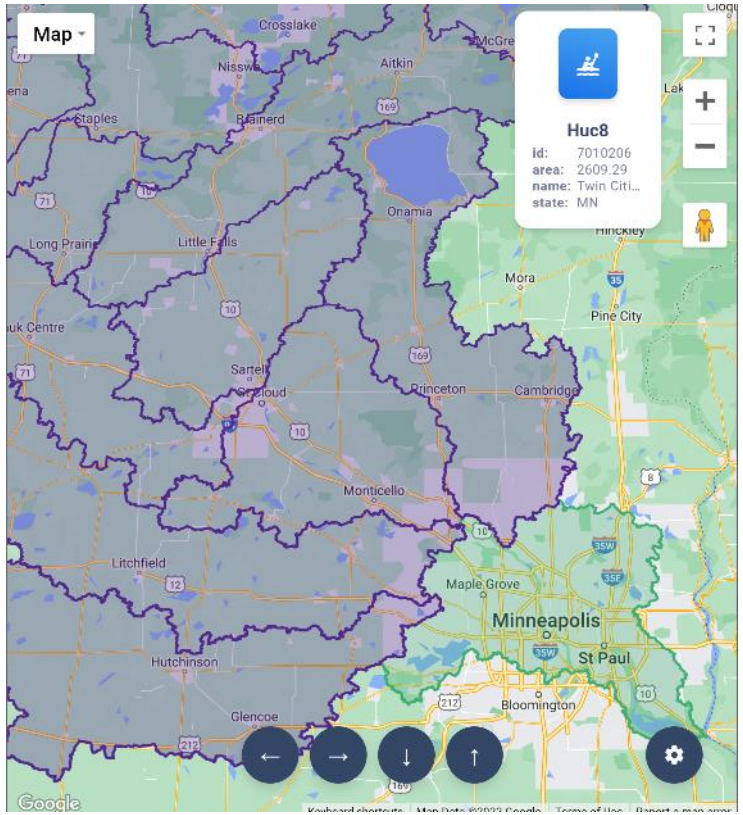
RIMORPHIS Demo

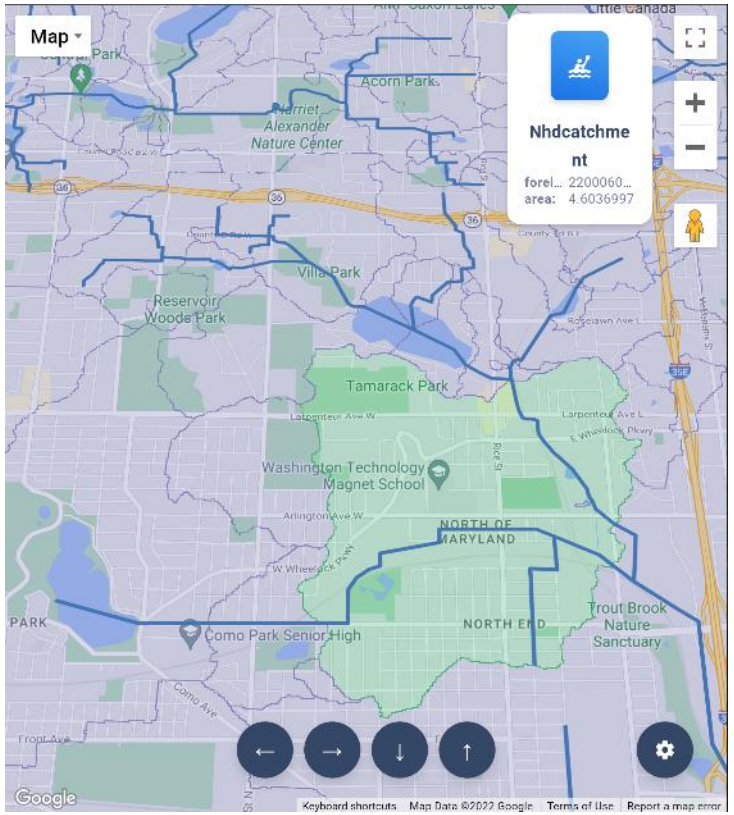
Data Exploration & Visualization

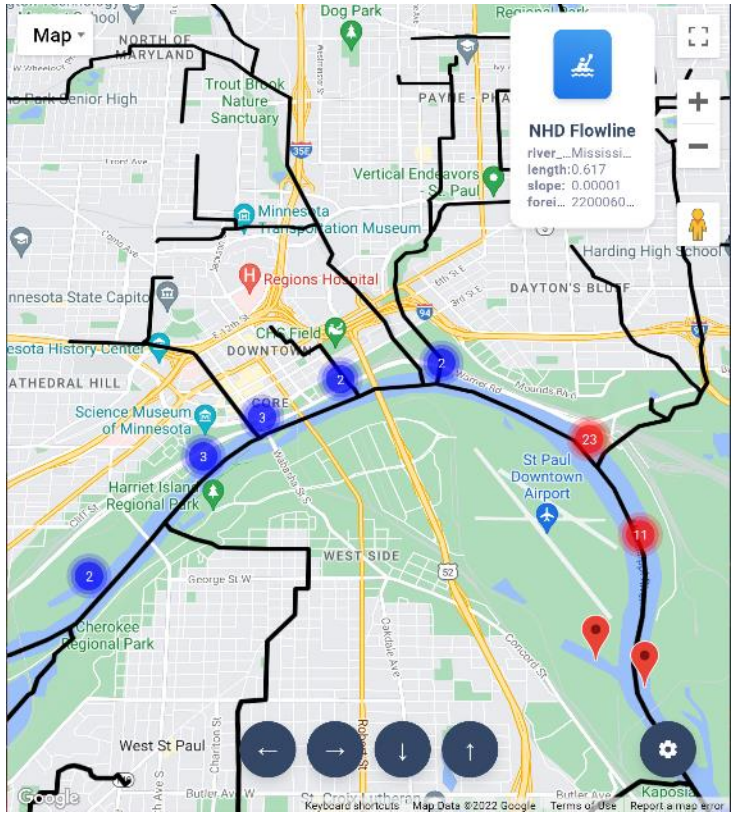
RIMORPHIS UI

Map-based Visual Browsing

HUC Level → Flowline Level → Survey Level

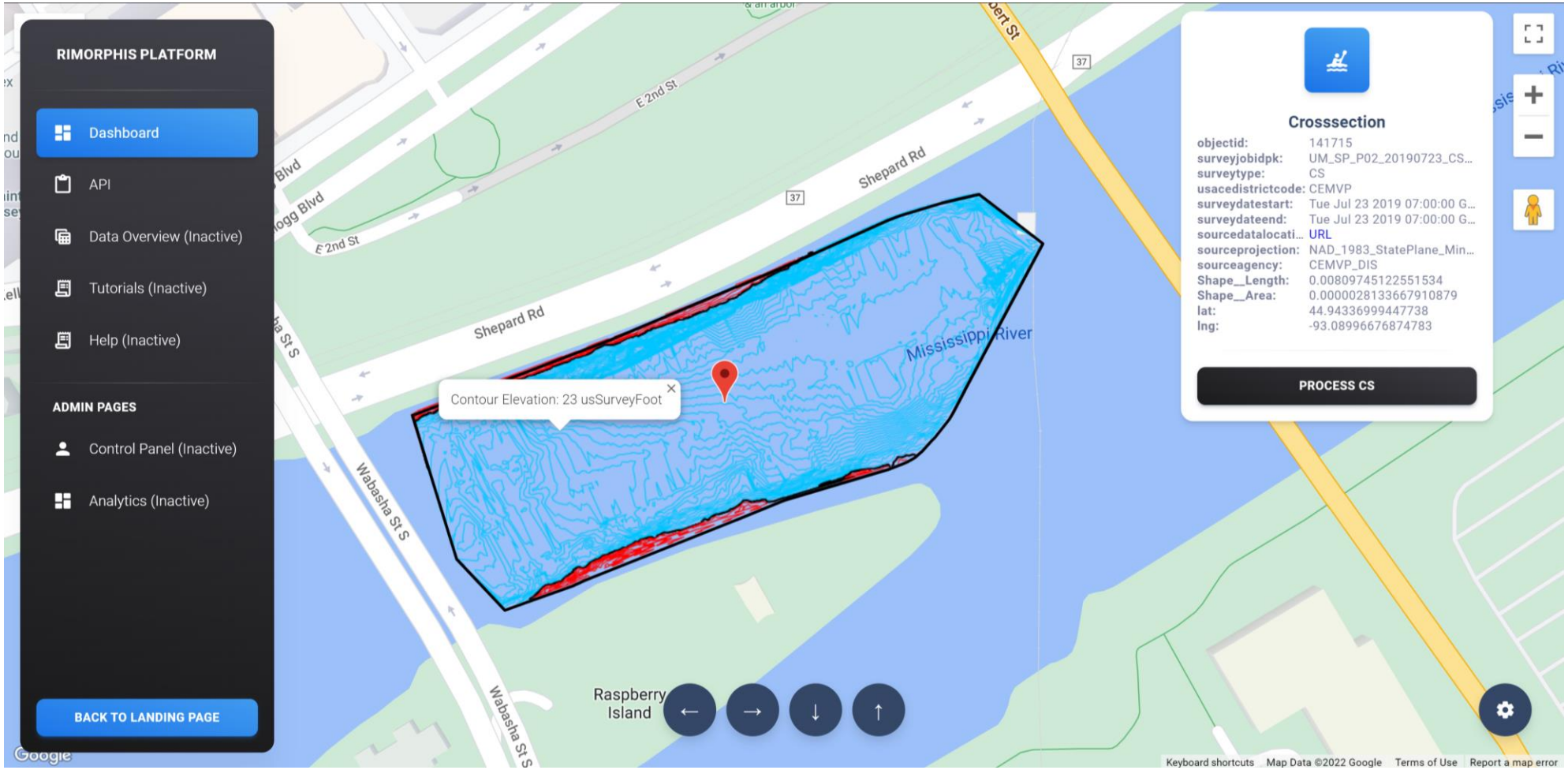






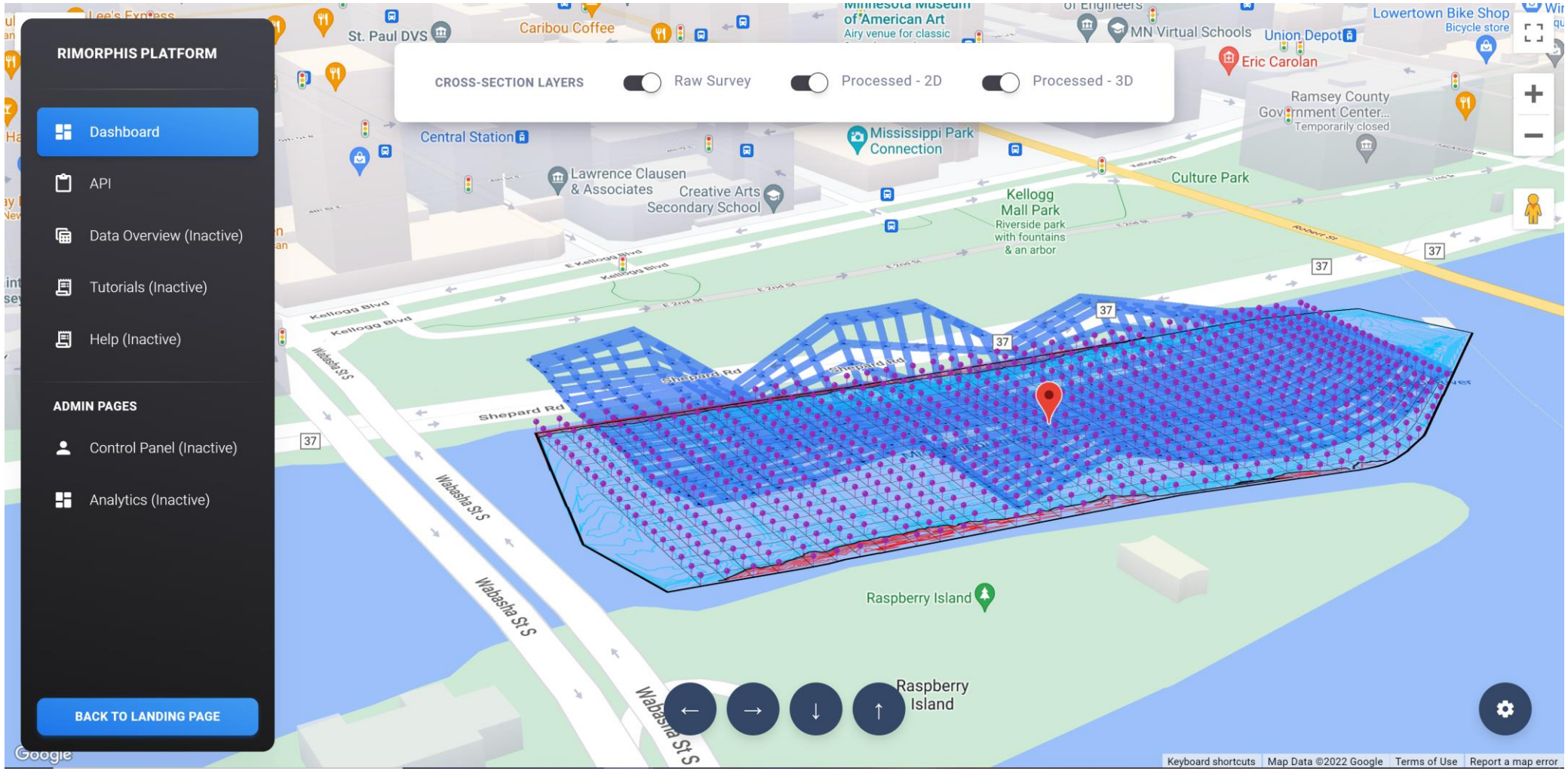
RIMORPHIS UI

Geospatial Data Visualization – 2D



RIMORPHIS UI

Geospatial Data Visualization – 3D

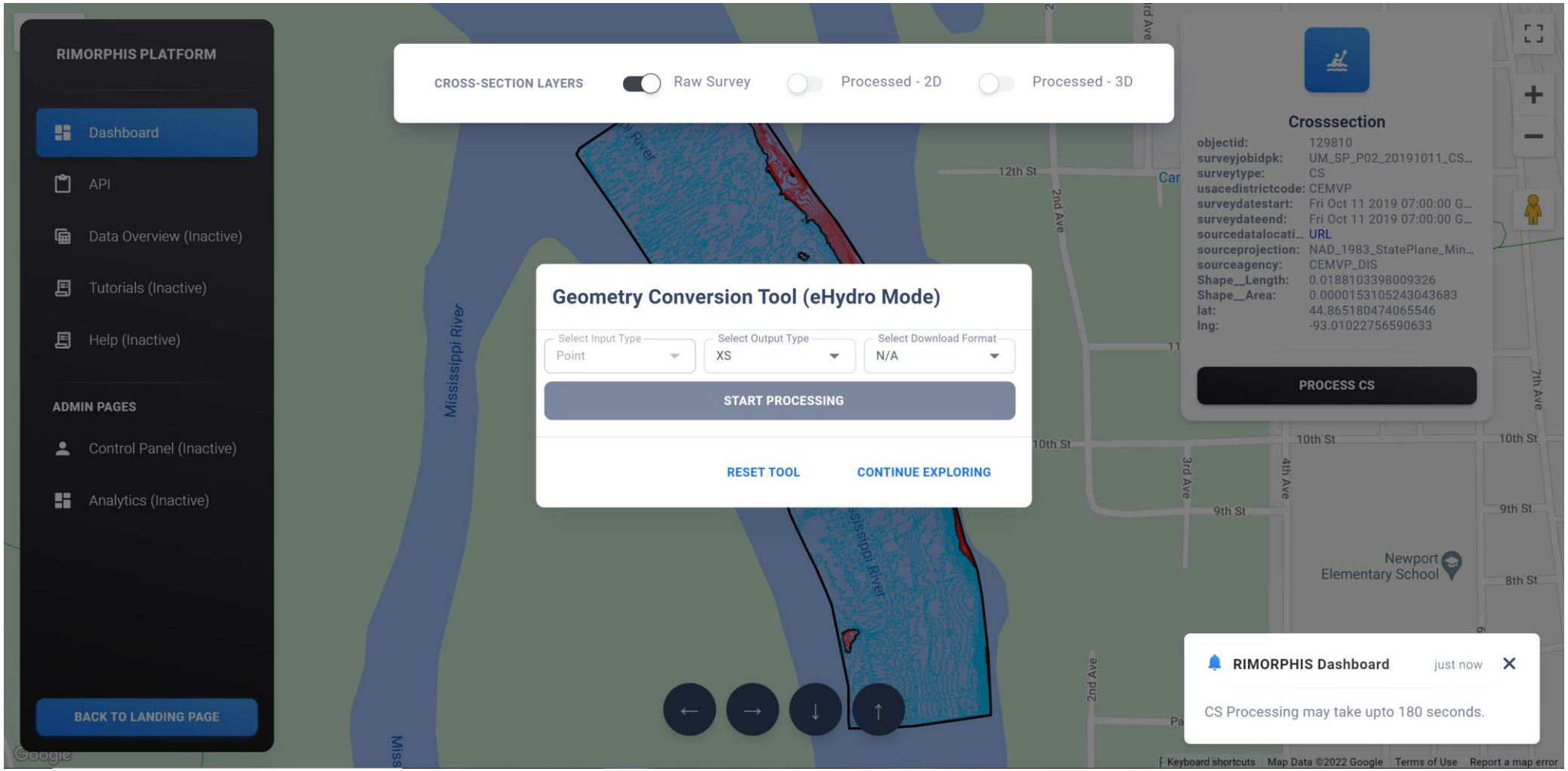


RIMORPHIS Demo

Data Analytics
Cross-Section Processing

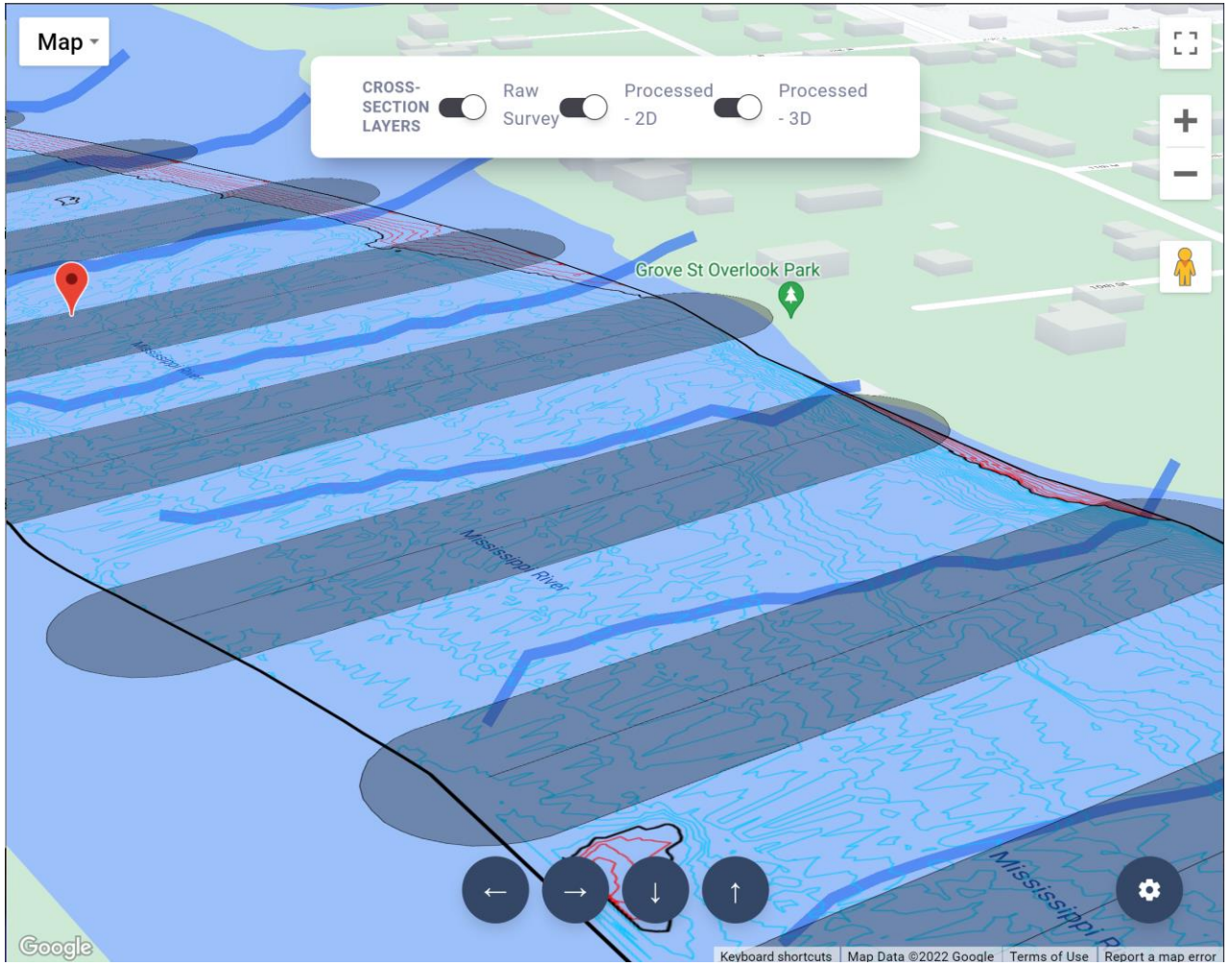
RIMORPHIS Data Analytics

Cross-Section Processing Tool – Fully Automatic



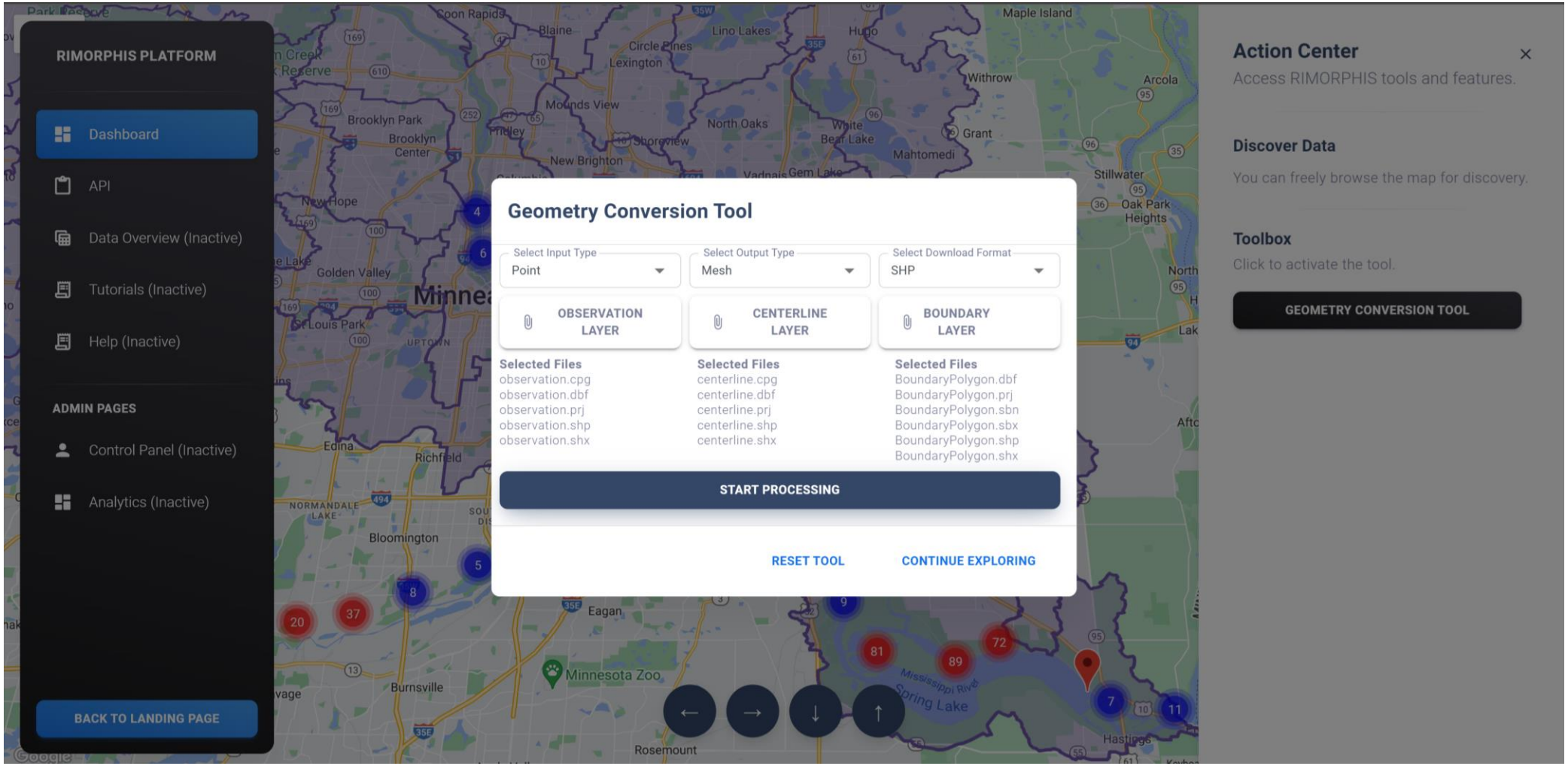
RIMORPHIS Data Analytics

Cross-Section Processing Tool – Fully Automatic



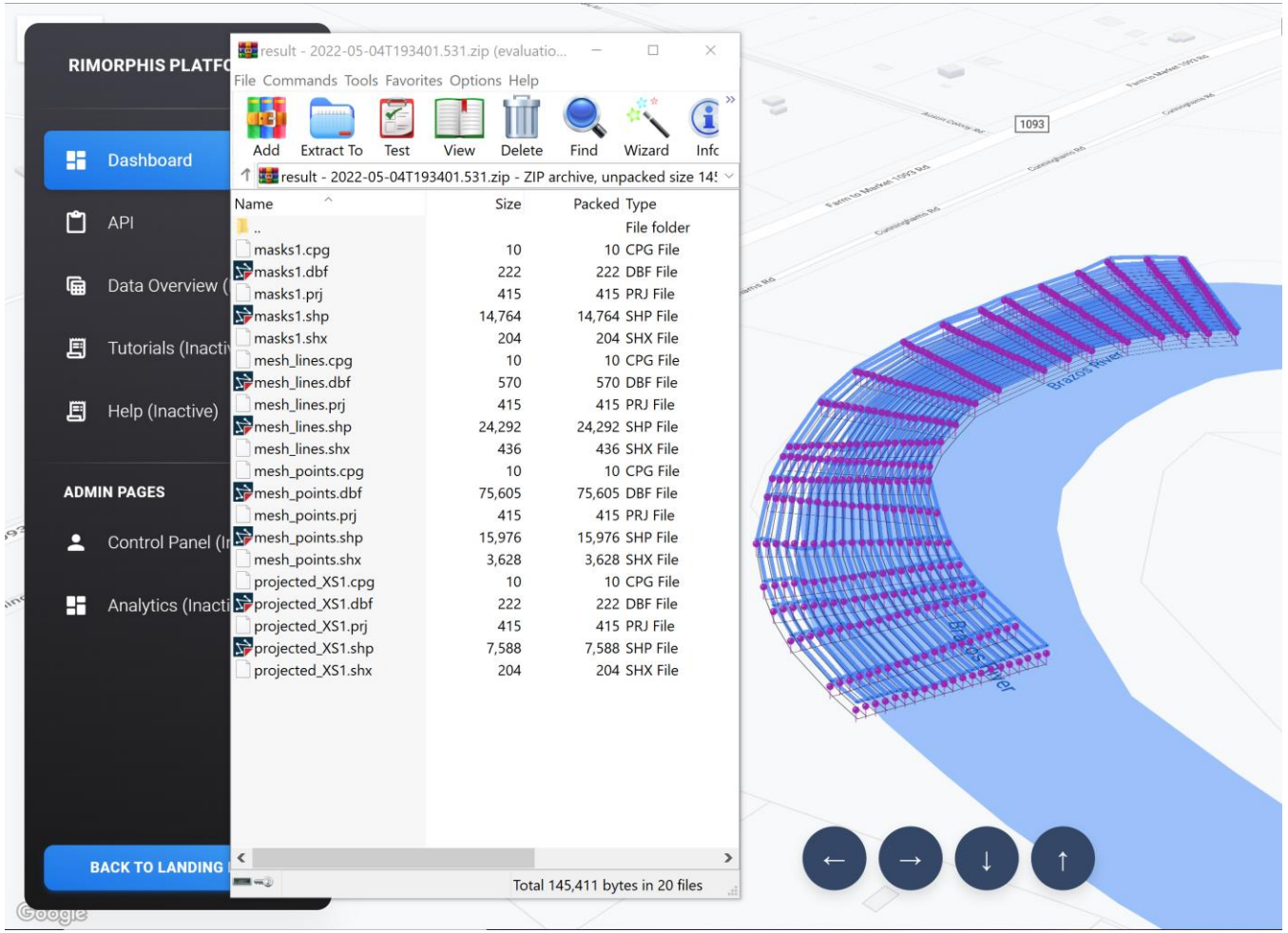
RIMORPHIS Data Analytics

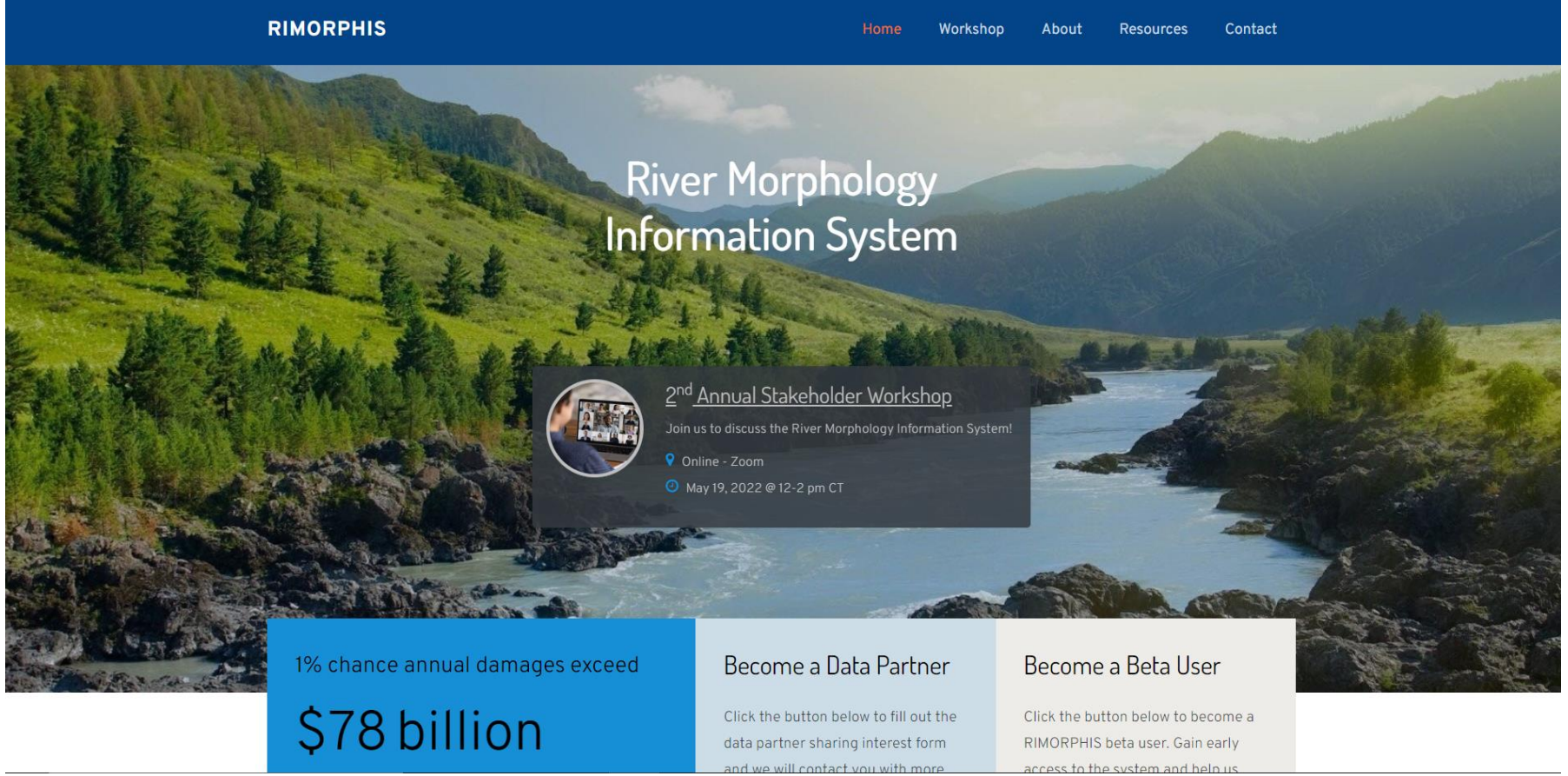
Cross-Section Processing Tool – Manual



RIMORPHIS Data Analytics

Cross-Section Processing Tool – Manual





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