# Integrated Information Management System, Development of Web Interface, a.k.a. Online Data Portal (ODP)

## USBR Science and Technology Project ID 3625

Eric Peterson, May 2014.

**Duration:** Fiscal Year 2010 through Fiscal Year 2011

## Project Abstract

We regard the development of IIMS prior to this proposal as highly successful, yet several limitations were identified that endangered the purpose of IIMS as information repository for intergovernmental restoration partnerships.

Proposed Solution. Implementing full IIMS capabilities through the web would solve the limitations identified AND would improve data stewardship.

The completed project, now called the Online Data Portal (ODP) has been implemented as a "cloud server", with a replicable server image that can be implemented by other programs on demand. The ODP continues to grow beyond the original S&T proposal with added funding from the Trinity River Restoration Program. TRRP's ODP implementation is publicly accessible at http://odp.trrp.net.

## Research Question

Starting in 2006, the Science and Technology (S&T) Program provided a 3-year grant to develop IIMS (Proposal No. 165 IIMS--an Information and Data Management System for Science Based River Management, 2009). Combined with additional funds from partners, this produced a system for data maintenance and access that has improved river management. However, limitations were identified that this project sought to overcome.

Original IIMS highlights:

- Centralized database
  - Modular data structure for multiple data types
  - Automated import of select data types
- Desktop application with access to centralized database
  - Data query and extraction for external analysis
  - Time series analyst (TSA) to graphically view data
  - Document library
  - Preliminary data management tools including upload capabilities
- ArcGIS extension for spatial query of data
- Realty module for land access agreements
- Web portal with simplified versions of:
  - Document Library
  - TSA

    - A geospatial viewer

Limitations identified included:

- Maintaining links between desktop software and centralized databases was IT-intensive
- Deployment to additional area offices required customized SMS packaging
- These limits endangered the utility of IIMS for river management by making it difficult to deploy!

Proposed solution. Implementing full IIMS capabilities through the Web would solve the limitations identified AND would improve data stewardship (data management and documentation) by:

- Simplifying interface-database connections by restructuring to a single dedicated link.
- Eliminating need for desktop installs.
- Equilibrating data access for river restoration partnerships.
- Leveraging Web access for more robust data stewardship.

## Lessons Learned

Database technologies have expanded considerably over the years in parallel with the Trinity River Restoration Program's (TRRP's) efforts with the Integrated Information Management System (IIMS), now called the Online Data Portal (ODP). If the project were to begin completely anew today, there might be several off-the-shelf options to consider.

However, we began the endeavor in 2006, with this proposal in 2010 being another major point of advancement, when alternatives were still weak, if they existed at all. Development of the IIMS / ODP has thus provided additional years of collaborative information resources for the Trinity River Restoration Program than would have otherwise been possible!

The result is an online information database system very well tuned to the needs of multiagency restoration programs, and which is available as needed for other collaborative programs.

## Conclusion

TRRP's implementation of ODP is at http://odp.trrp.net. See figures below for examples.

The implementation includes:

- An Amazon-based Cloud Server
- Modular data structure
- Extensive data importation and management features
- Libraries for:
    - Documents
    - Data Packages
    - Meeting Materials
- Data visualization with the Time Series Analyst
    - Locations over time such as streamgages, reservoir data, temperature monitoring
    - Depth profiles for data such as temperature at various depths in reservoirs
    - Longitudinal profiling of data along stream networks, including tributaries
- Geospatial viewer for exploration of both raster and vector data services from ArcServer
- A separately funded Project proposal and management system
- Web-services for interacting with external websites through secure pre-established data queries

An image of the ODP cloud server suitable for standing up within the Amazon Cloud services is available upon request to the TRRP Data Steward: Eric Peterson.

## Future

The TRRP is continuing development of the ODP. The current focus is on refinement of an Investigation Planning module and enhancements of the ODP Map.

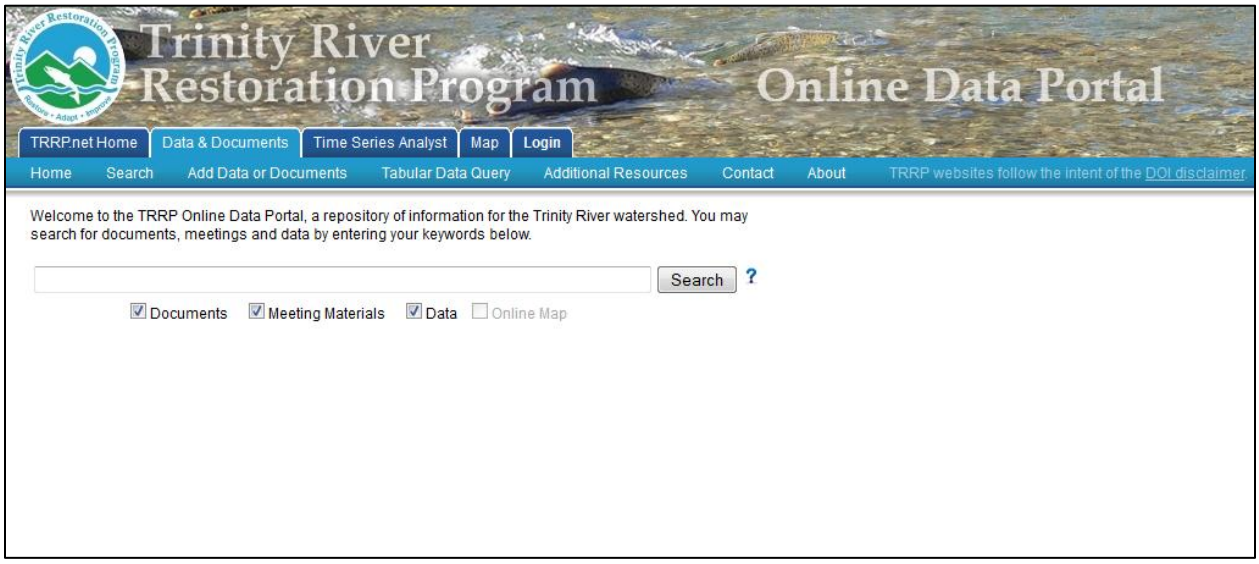



Figure 1: Clean and simple search interface on home page.

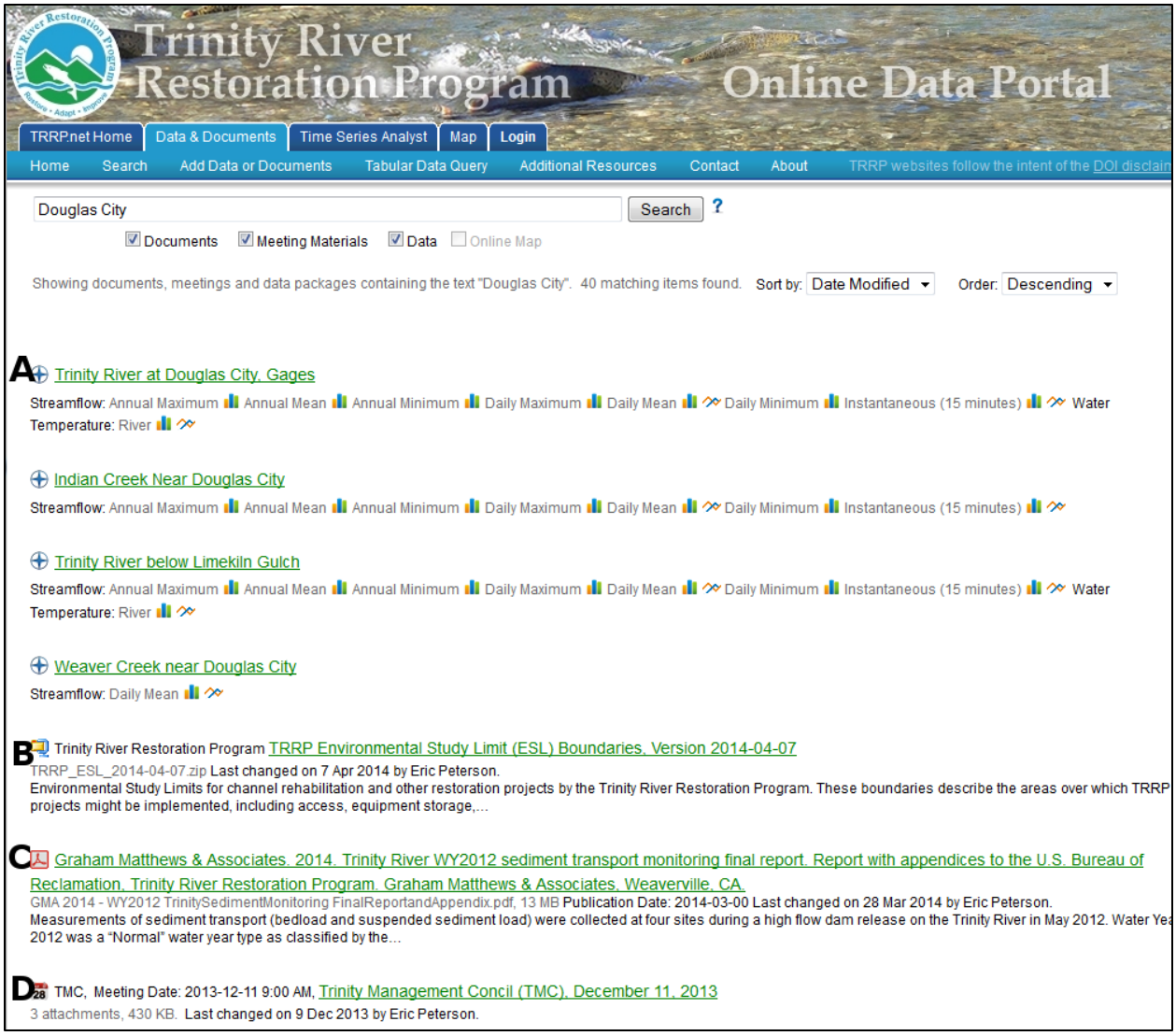



Figure 2: Results from a search at the home page, showing (A) time series data, (B) a "Data Package" from the Data Package Library, (C) a document from the Document Library, and (D) a meeting from the separately funded meeting management module.

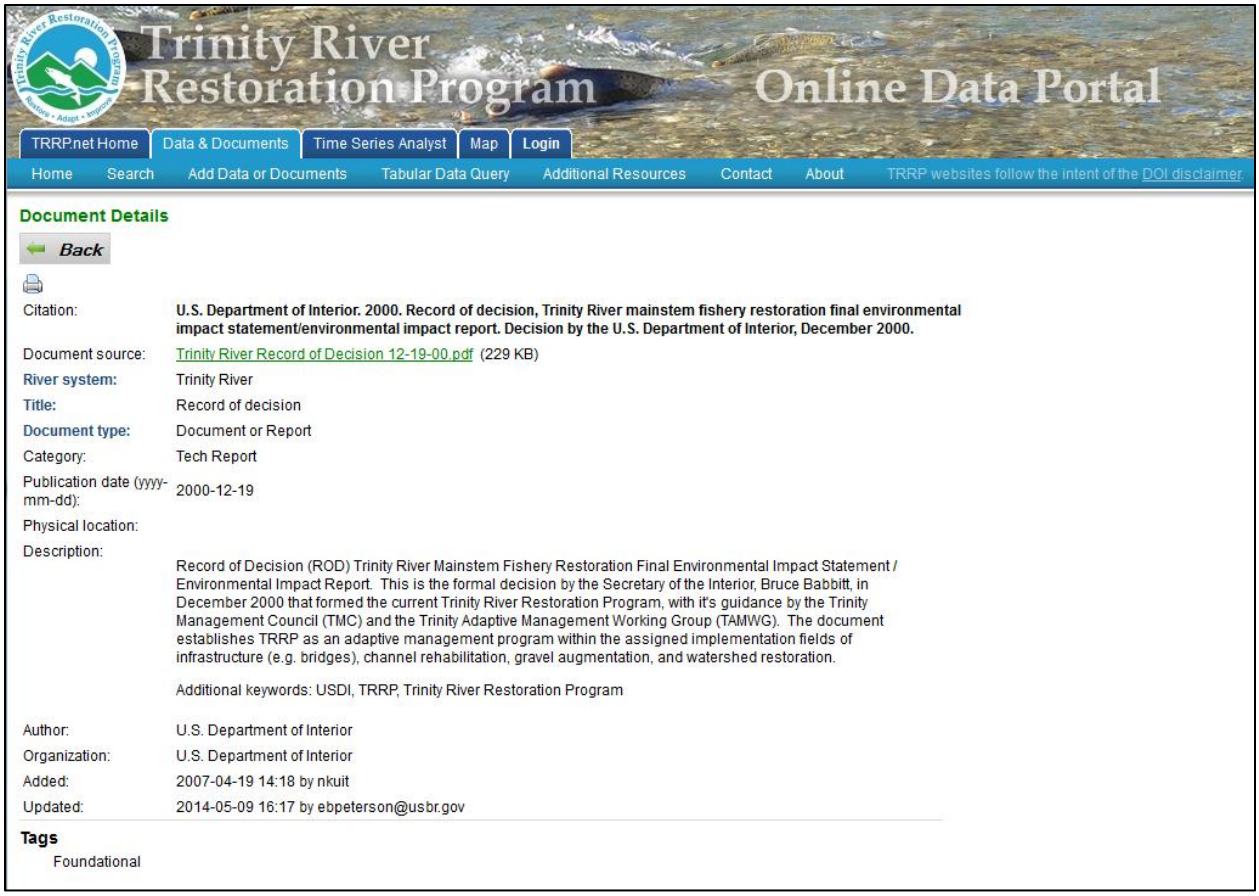



Figure 3: Details page for a document in the Document Library.

Figure 4: Details page for data in the Data Package Library. Note inclusion of a metadata file, which is included in the search on the ODP home page.

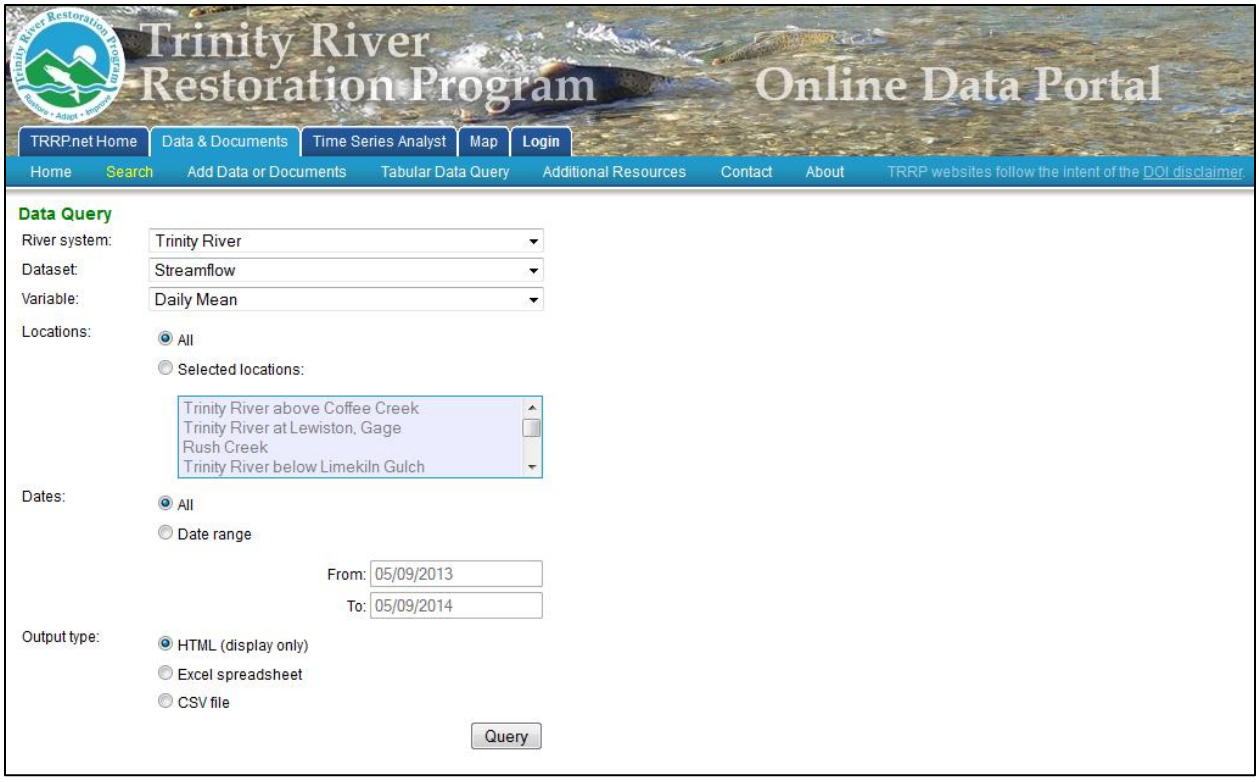



Figure 5: Simple query interface for time series data.

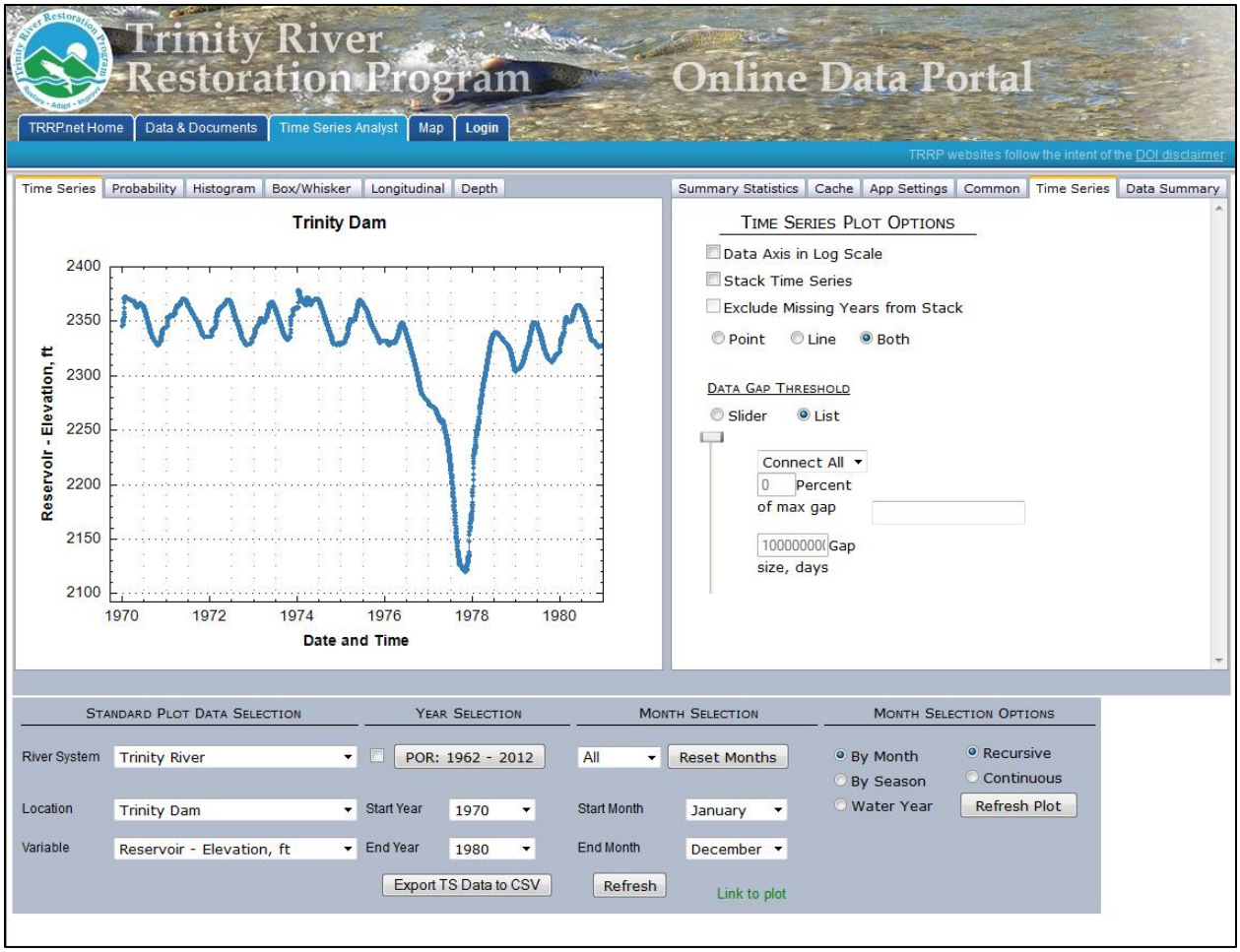



Figure 6: Time Series Analyst demonstrated showing data for the surface elevation of Trinity Reservoir, 1970-1980.

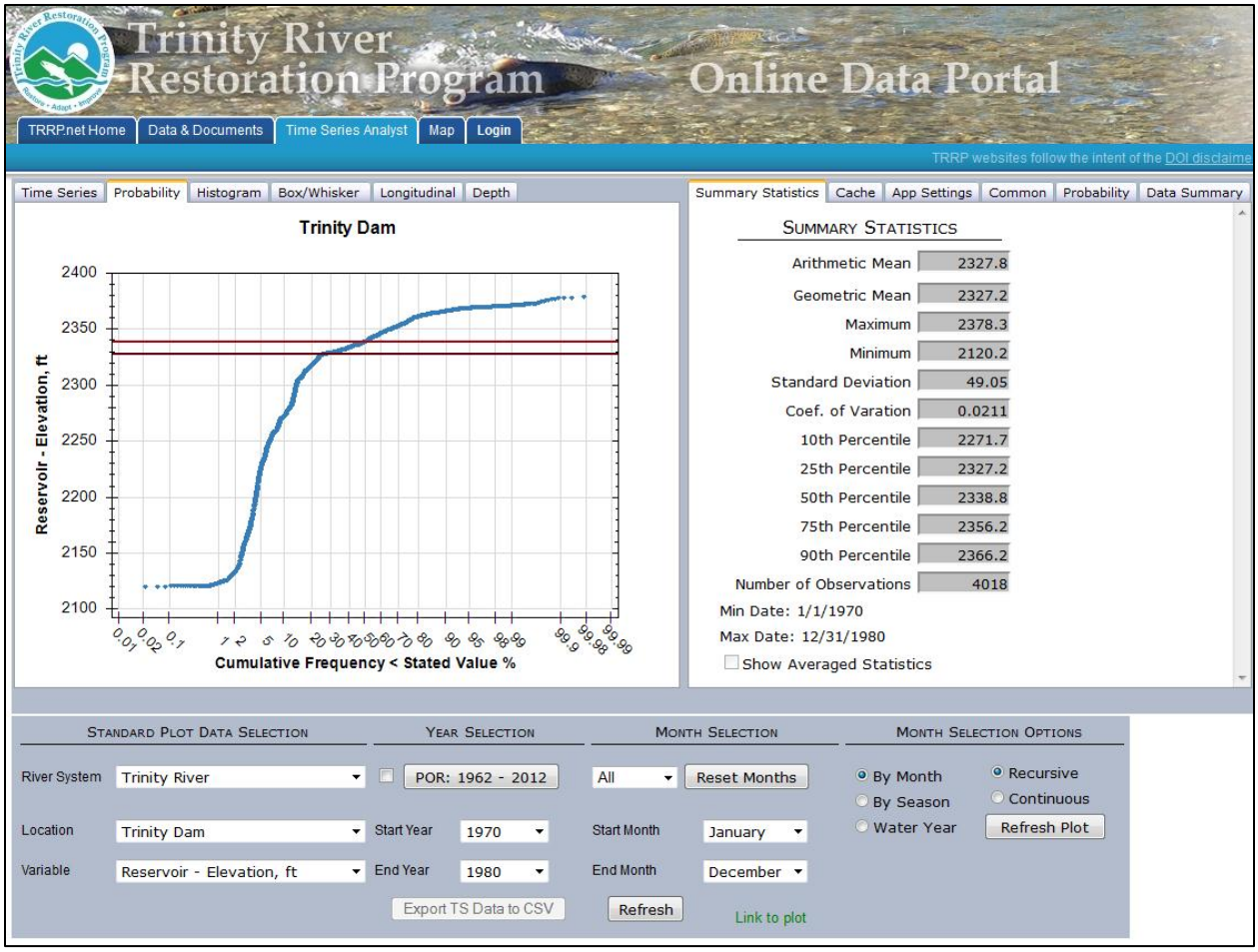



Figure 7: Time Series Analyst showing the same data as Figure 6, but as a probability plot, and with control lines interactively added for the mean (red) and median values (orange).

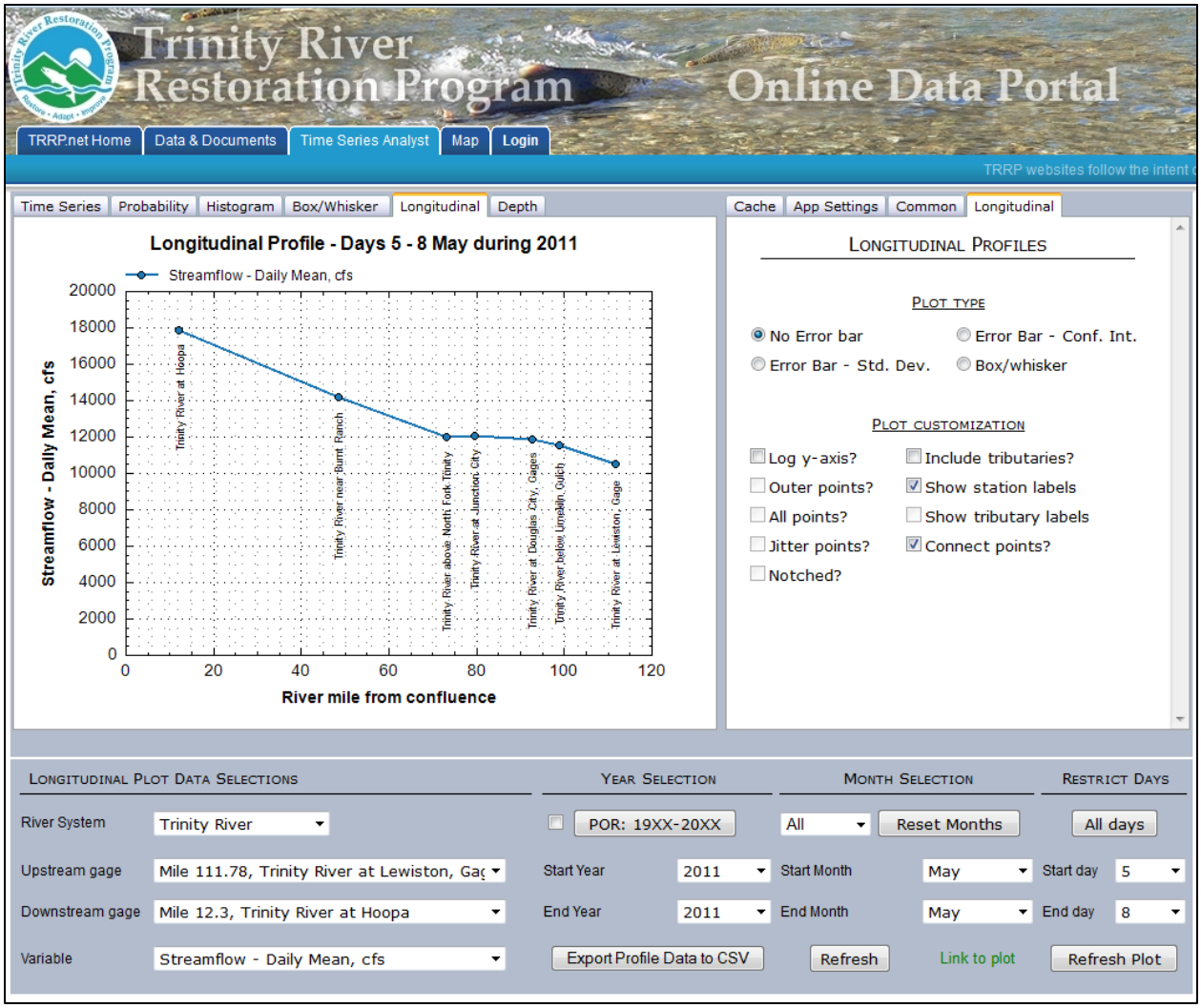



Figure 8: Time Series Analyst showing a longitudinal plot of seven streamgages during a restoration flow release in 2011.

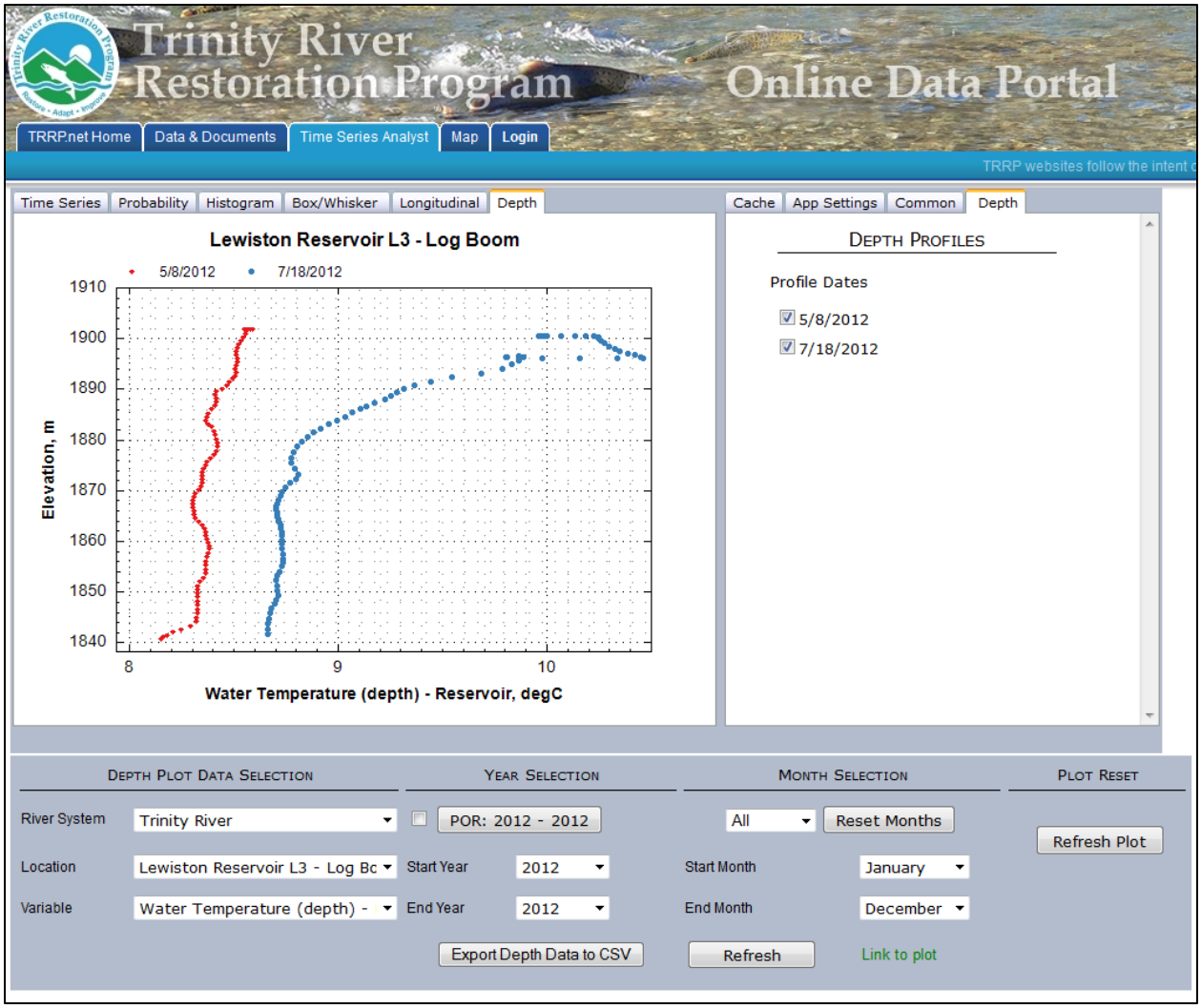



Figure 9: Time Series Analyst showing depth profile plots of temperature in Lewiston Reservoir.

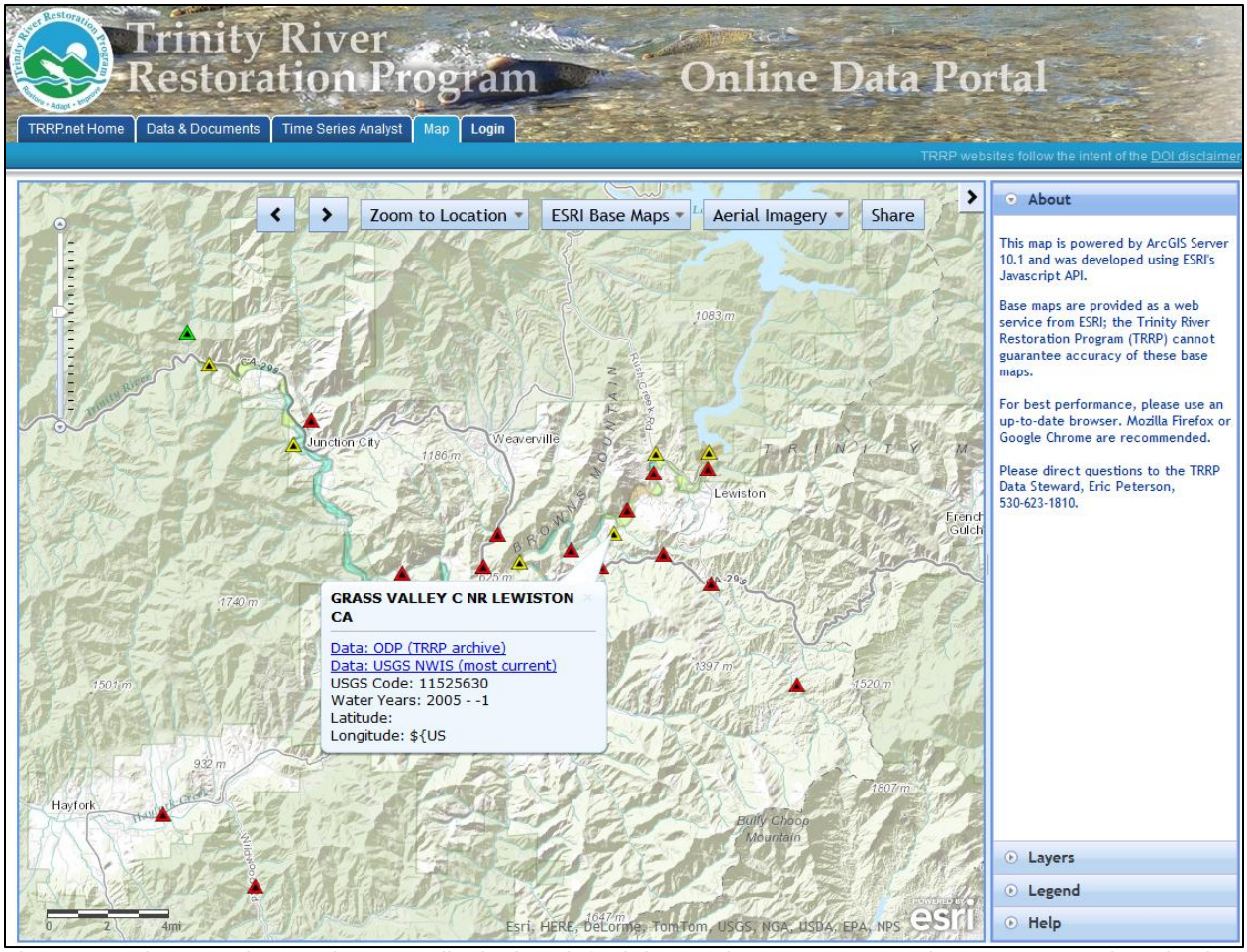



Figure 10: The ODP interactive map displaying default layers (streamgages and TRRP restoration sites) with the call-out box displayed for one streamgage. Note the hyperlinks within the call-out that link to the streamgage data values both within the ODP and from the USGS NWIS database (The ODP includes streamgage data from other sources not available in NWIS).

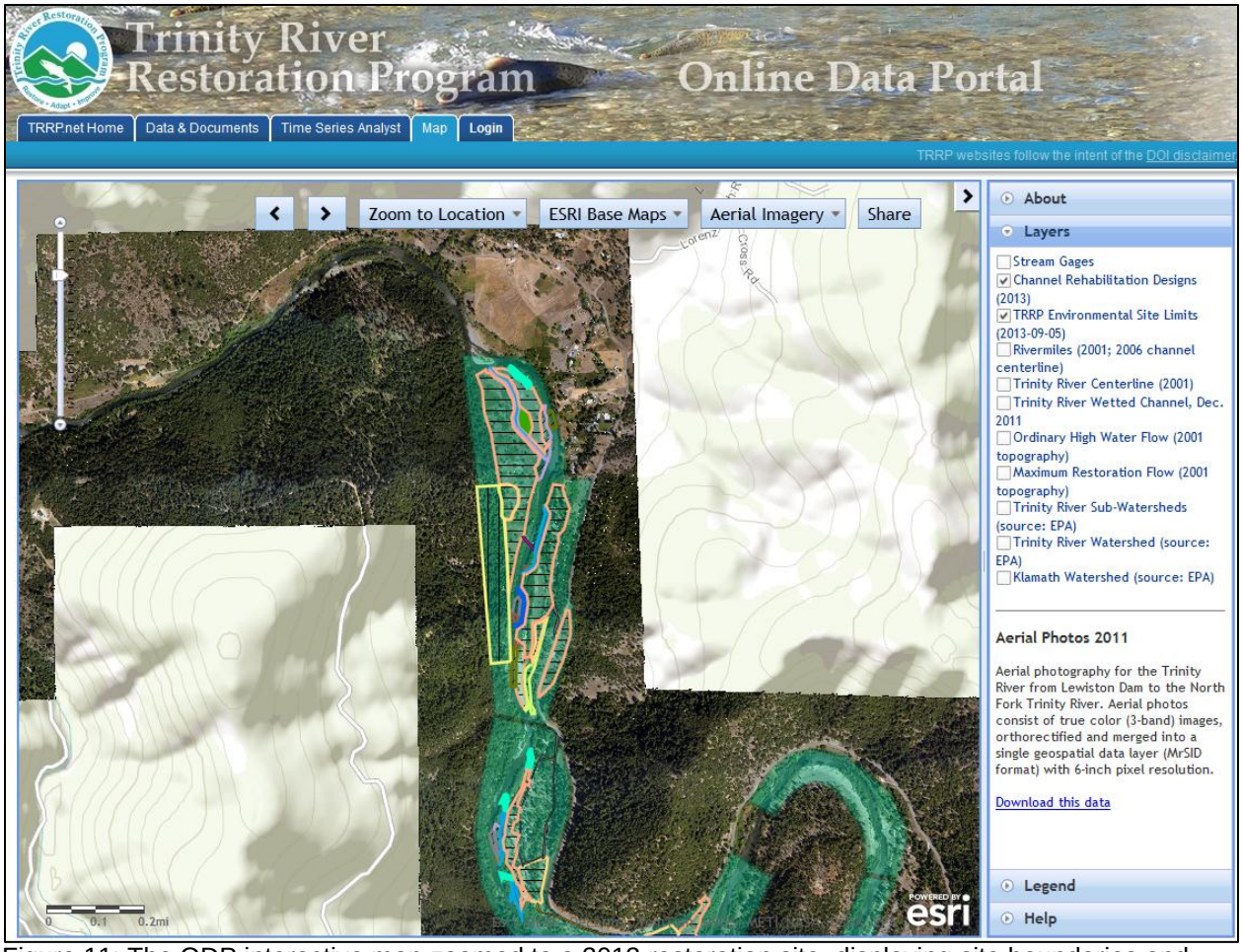



Figure 11: The ODP interactive map zoomed to a 2013 restoration site, displaying site boundaries and restoration features within the site, overlaying high resolution aerial photography from 2011. Note layer controls on right, a description of the most recently clicked on layer, and a link to download the data from the ODP Data Package Library.

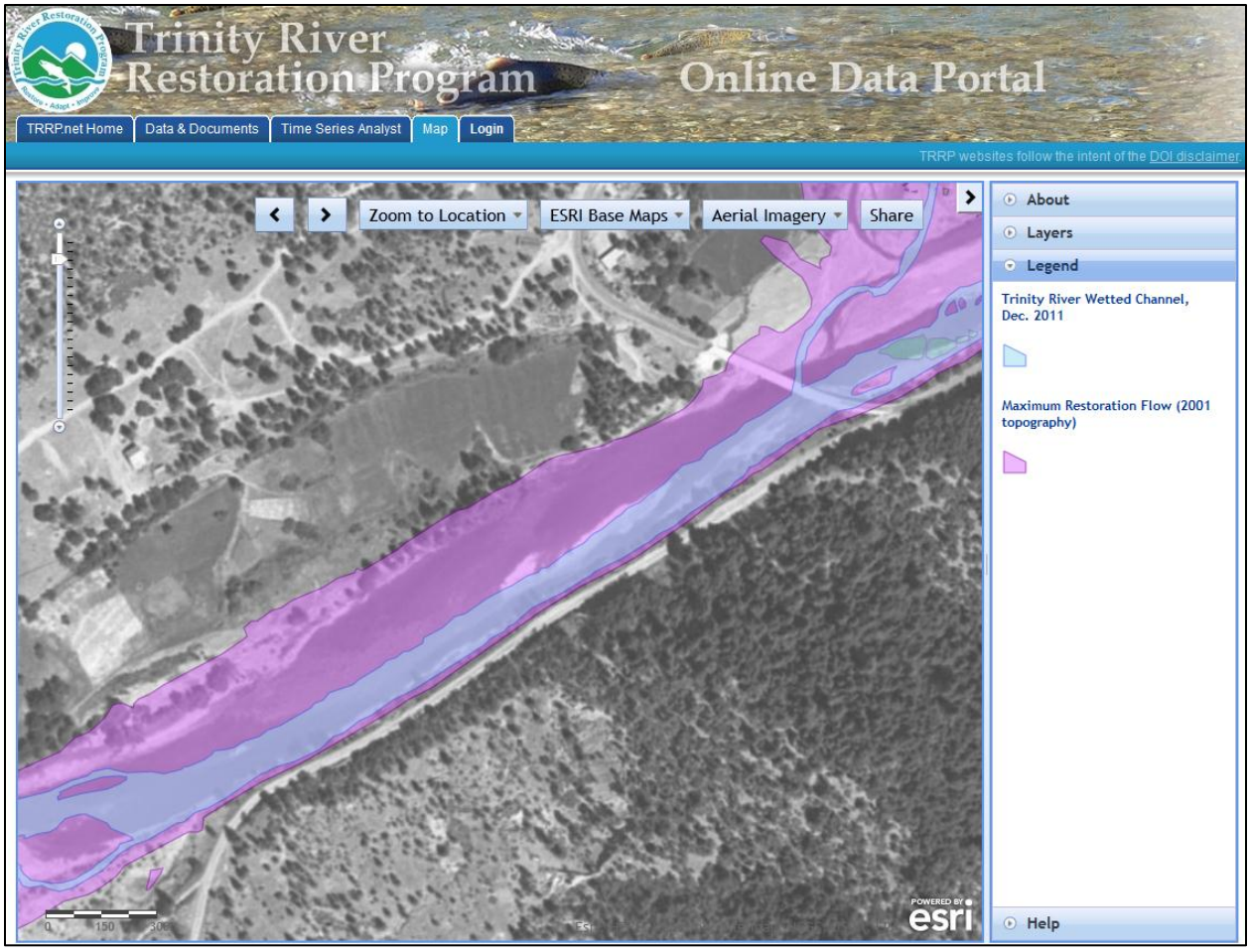



Figure 12: The ODP interactive map showing 1944 aerial photography overlain by the 2011 wetted channel and the modeled maximum restoration flow. Note display of map legend in this figure.

Figure 13: Data and Document upload page.

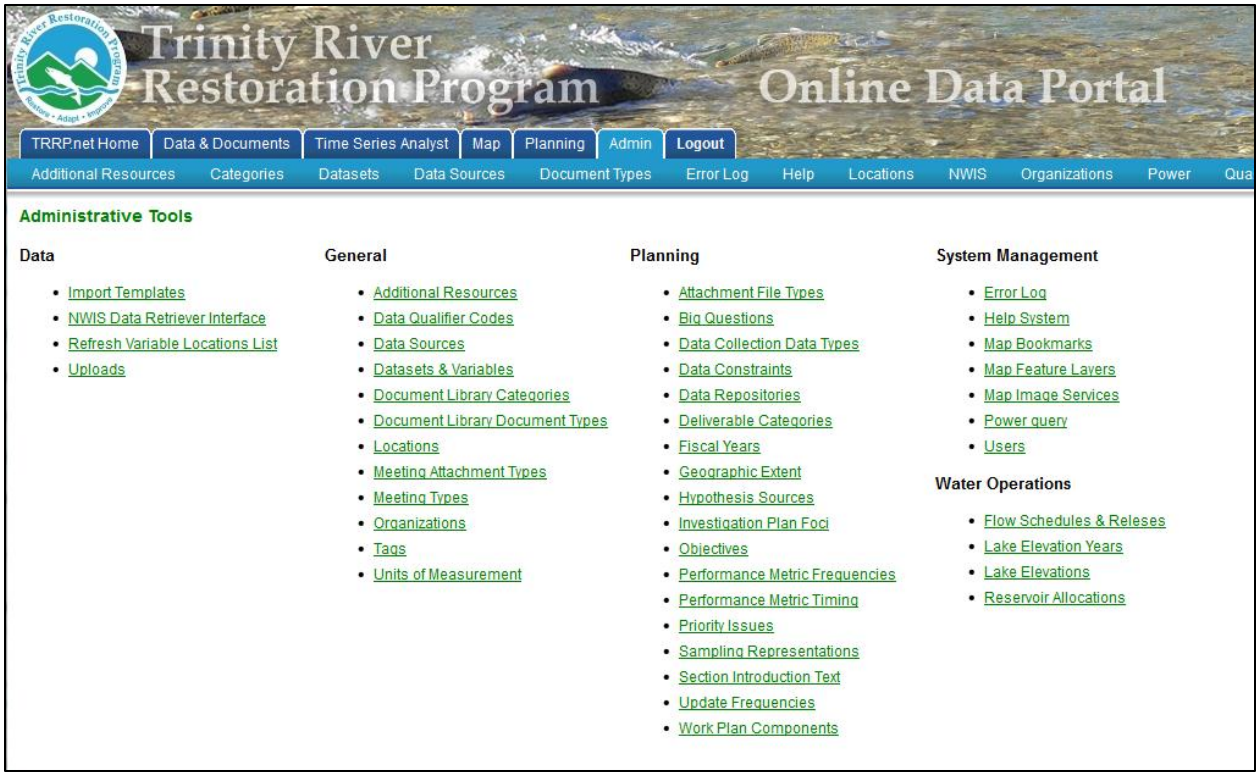



Figure 14: Administrative Control Panel.

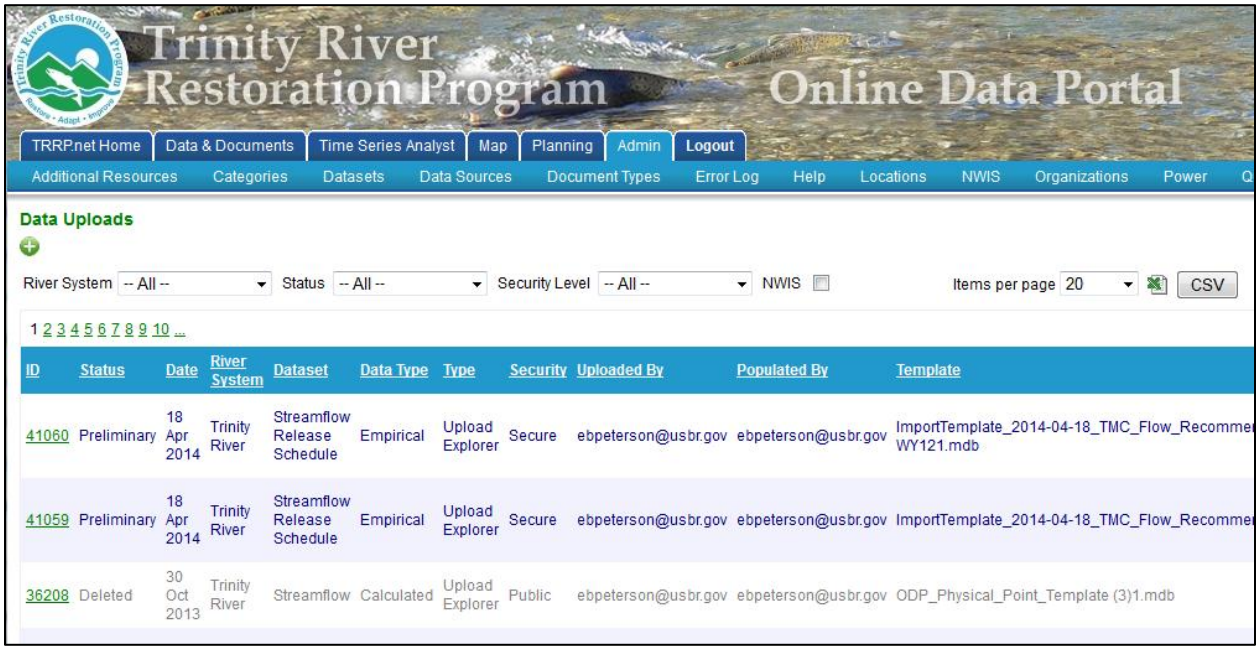
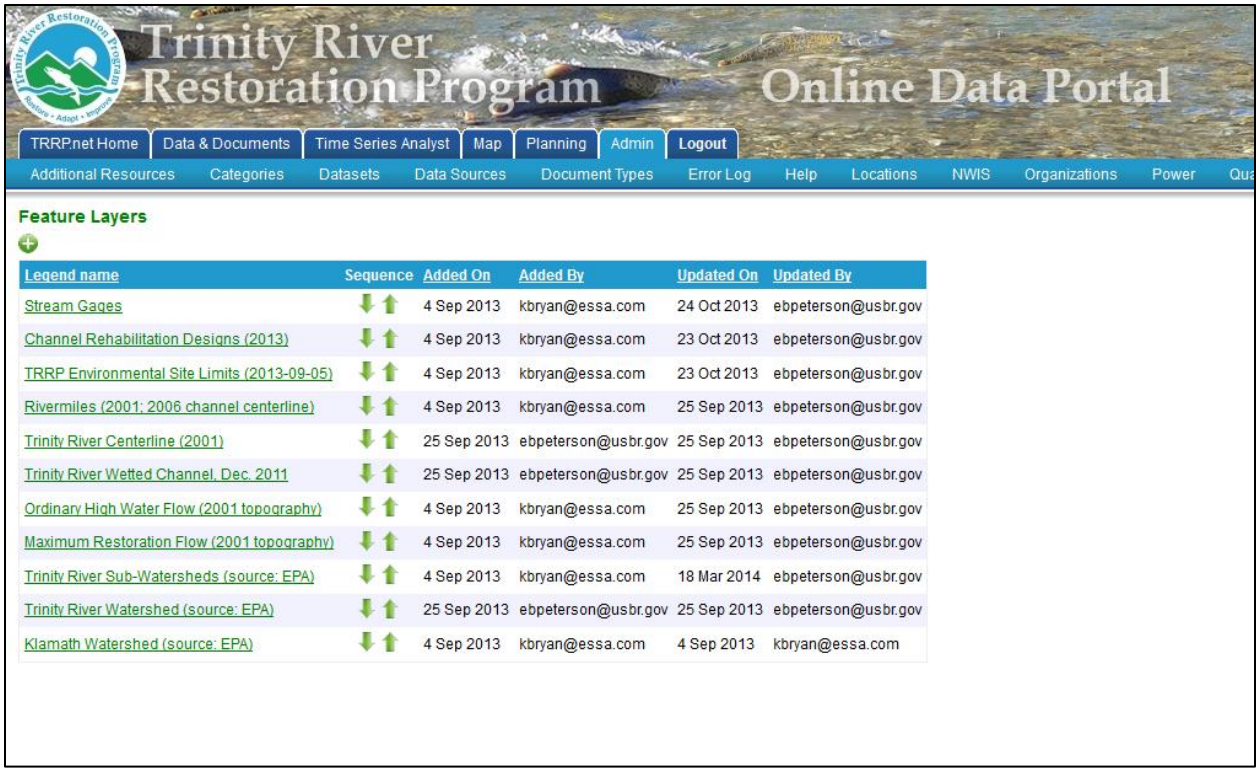



Figure 15: Data uploads management page.

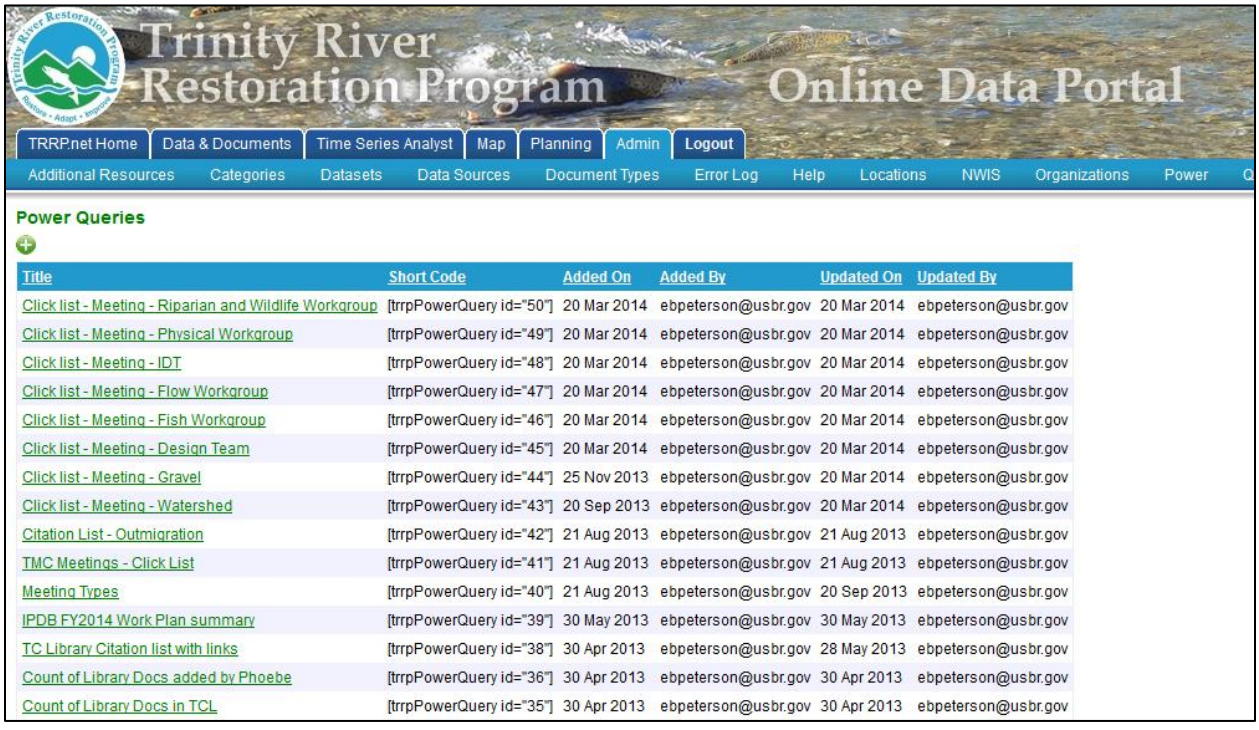
| Name | Official Name | County | Easting | Northing | UTM Zone | Elevation | River Miles | Added On | Added By | Updated On | Updated By |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Klamath River at Orleans | KLAMATH R A ORLEANS | Humboldt | 455254.11 | 4572582.65 | 10 | 108.502704 | | 11 Jul 2006 | dbo | 11 Jul 2006 | dbo |
| Klamath River near Klamath | KLAMATH R NR KLAMATH CA | Del Norte | 418260.16 | 4595943.42 | 10 | | | 11 Jul 2006 | dbo | 11 Jul 2006 | dbo |
| Klamath River below Iron Gate Dam | KLAMATH R BL IRON GATE DAM CA | Siskiyou | 546083.01 | 4641922.56 | 10 | 2162.44 | | 3 Aug 2006 | dbo | 3 Aug 2006 | dbo |
| Carr Power Generation Facility | | Shasta | 531532.85915 | 4499627.513769 | 10 | | | 13 Oct 2006 | dbo | 11 Sep 2012 | ebpeterson@usbr.gov |
| Klamath River near Seiad Valley | KLAMATH R NR SEIAD VALLEY CA | | 480719.7 | 4633563.2 | 10 | | | 24 Jan 2007 | dbo | 24 Jan 2007 | dbo |
| Salmon River at Somes Bar | SALMON R A SOMES BAR CA | | 460112.41 | 4580664.92 | 10 | 482.97 | | 5 Aug 2009 | dbo | 5 Aug 2009 | dbo |
| Shasta River near Yreka | SHASTA R NR YREKA CA | | 533585.75 | 4630194.35 | 10 | 2000 | | 5 Aug 2009 | dbo | 5 Aug 2009 | dbo |
| Klamath River below Fall Creek near Copco | KLAMATH R BL FALL C NR COPCO CA | | 552265.45 | 4646869.39 | 10 | 2310 | | 5 Aug 2009 | dbo | 5 Aug 2009 | dbo |
| Klamath River below John C. Boyle Powerplant | KLAMATH RIVER BLW JOHN C.BOYLE PWRPLNT, NR KENO,OR | | 576641.98 | 4659583.41 | 10 | 3274.82 | | 5 Aug 2009 | dbo | 5 Aug 2009 | dbo |
| Klamath River at Spencer Bridge near Keno | KLAMATH R AT SPENCER BRIDGE NR KENO,OREG. | | 579797.46 | 4665016.3 | 10 | 3774.72 | | 5 Aug 2009 | dbo | 5 Aug 2009 | dbo |
| Klamath River at Keno | KLAMATH RIVER AT KENO, OR | | 585766.56 | 4665086.42 | 10 | 3961 | | 5 Aug 2009 | dbo | 5 Aug 2009 | dbo |

Figure 16: Data location management page.




| Legend name | Sequence | Added On | Added By | Updated On | Updated By |
|---|---|---|---|---|---|
| Stream Gages | | 4 Sep 2013 | kbryan@essa.com | 24 Oct 2013 | ebpeterson@usbr.gov |
| Channel Rehabilitation Designs (2013) | | 4 Sep 2013 | kbryan@essa.com | 23 Oct 2013 | ebpeterson@usbr.gov |
| TRRP Environmental Site Limits (2013-09-05) | | 4 Sep 2013 | kbryan@essa.com | 23 Oct 2013 | ebpeterson@usbr.gov |
| Rivermiles (2001; 2006 channel centerline) | | 4 Sep 2013 | kbryan@essa.com | 25 Sep 2013 | ebpeterson@usbr.gov |
| Trinity River Centerline (2001) | | 25 Sep 2013 | ebpeterson@usbr.gov | 25 Sep 2013 | ebpeterson@usbr.gov |
| Trinity River Wetted Channel, Dec. 2011 | | 25 Sep 2013 | ebpeterson@usbr.gov | 25 Sep 2013 | ebpeterson@usbr.gov |
| Ordinary High Water Flow (2001 topography) | | 4 Sep 2013 | kbryan@essa.com | 25 Sep 2013 | ebpeterson@usbr.gov |
| Maximum Restoration Flow (2001 topography) | | 4 Sep 2013 | kbryan@essa.com | 25 Sep 2013 | ebpeterson@usbr.gov |
| Trinity River Sub-Watersheds (source: EPA) | | 4 Sep 2013 | kbryan@essa.com | 18 Mar 2014 | ebpeterson@usbr.gov |
| Trinity River Watershed (source: EPA) | | 25 Sep 2013 | ebpeterson@usbr.gov | 25 Sep 2013 | ebpeterson@usbr.gov |
| Klamath Watershed (source: EPA) | | 4 Sep 2013 | kbryan@essa.com | 4 Sep 2013 | kbryan@essa.com |

Figure 17: Map layers management page. Note arrows providing controls to move layers up or down in the drawing order.




| Title | Short Code | Added On | Added By | Updated On | Updated By |
|---|---|---|---|---|---|
| Click list - Meeting - Riparian and Wildlife Workgroup | [trrpPowerQuery id="50"] | 20 Mar 2014 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - Physical Workgroup | [trrpPowerQuery id="49"] | 20 Mar 2014 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - IDT | [trrpPowerQuery id="48"] | 20 Mar 2014 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - Flow Workgroup | [trrpPowerQuery id="47"] | 20 Mar 2014 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - Fish Workgroup | [trrpPowerQuery id="46"] | 20 Mar 2014 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - Design Team | [trrpPowerQuery id="45"] | 20 Mar 2014 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - Gravel | [trrpPowerQuery id="44"] | 25 Nov 2013 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Click list - Meeting - Watershed | [trrpPowerQuery id="43"] | 20 Sep 2013 | ebpeterson@usbr.gov | 20 Mar 2014 | ebpeterson@usbr.gov |
| Citation List - Outmigration | [trrpPowerQuery id="42"] | 21 Aug 2013 | ebpeterson@usbr.gov | 21 Aug 2013 | ebpeterson@usbr.gov |
| TMC Meetings - Click List | [trrpPowerQuery id="41"] | 21 Aug 2013 | ebpeterson@usbr.gov | 21 Aug 2013 | ebpeterson@usbr.gov |
| Meeting Types | [trrpPowerQuery id="40"] | 21 Aug 2013 | ebpeterson@usbr.gov | 20 Sep 2013 | ebpeterson@usbr.gov |
| IPDB FY2014 Work Plan summary | [trrpPowerQuery id="39"] | 30 May 2013 | ebpeterson@usbr.gov | 30 May 2013 | ebpeterson@usbr.gov |
| TC Library Citation list with links | [trrpPowerQuery id="38"] | 30 Apr 2013 | ebpeterson@usbr.gov | 28 May 2013 | ebpeterson@usbr.gov |
| Count of Library Docs added by Phoebe | [trrpPowerQuery id="36"] | 30 Apr 2013 | ebpeterson@usbr.gov | 30 Apr 2013 | ebpeterson@usbr.gov |
| Count of Library Docs in TCL | [trrpPowerQuery id="35"] | 30 Apr 2013 | ebpeterson@usbr.gov | 30 Apr 2013 | ebpeterson@usbr.gov |

Figure 18: Custom query management page.

Figure 19: TRRP's primary website with a reference citation list built dynamically from the ODP Document Library. All documents given the "outmigration" tag will be identified by a custom query (Figure 18) for display on this page, with links to take end users to the documents themselves.