



**NOAA Fisheries Southwest/Northwest Region (SWR/NWR)
JOINT PILOT TRACKING SYSTEM
For
SALMON AND STEELHEAD RECOVERY PLANS**

Introduction and Background

Salmon and Steelhead Recovery Action Plans have been developed by NOAA Fisheries Southwest and Northwest Regions pursuant to the Endangered Species Act of 1973 (ESA) for implementing a variety of actions necessary to achieve recovery of listed species and their ecosystems to a point that species protection under the ESA are no longer needed.

The Pilot Tracking System was a collaborative effort between the NWR and SWR to develop an online geospatial tool for tracking the implementation of recovery plan actions and enabling required reporting on the status of salmon species recovery plans. The project involved creating a spatially-explicit action tracking database that could be accessed online with a map viewer to interactively visualize and track actions. The system was designed to allow users to edit information concerning recovery actions and provide a user-friendly map interface with which public stakeholders, collaborating agencies and decision-makers could create custom action queries and reports.

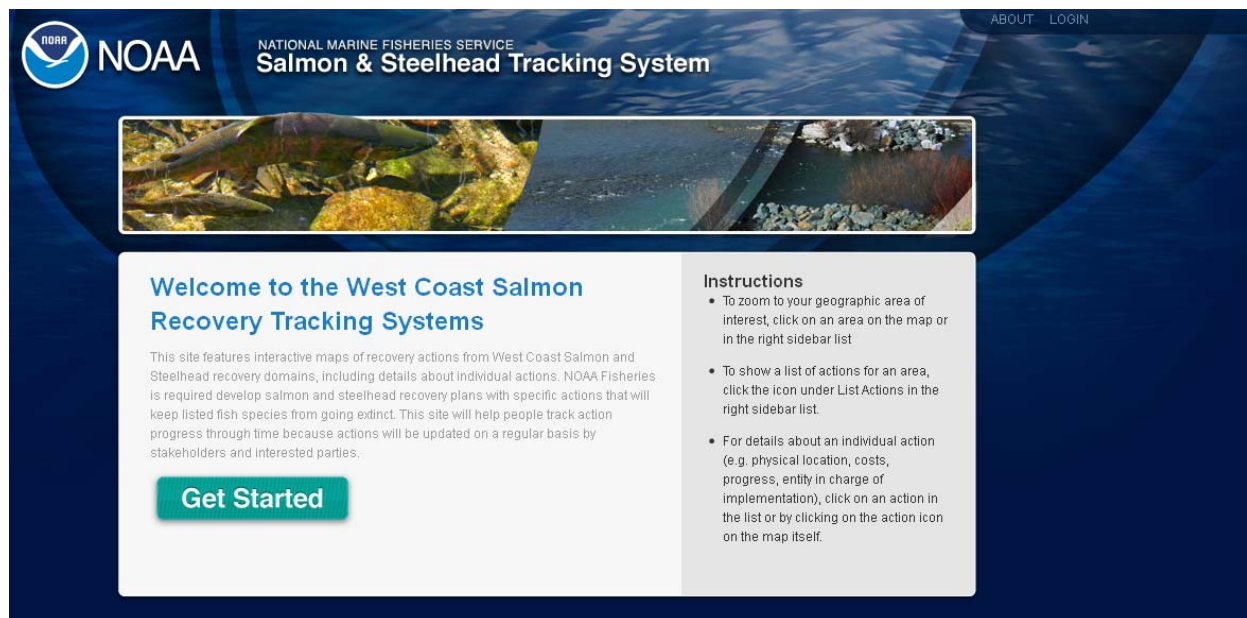


Fig. 1 Screenshot of entry page for Action Tracking System

Spatial Database and Data Layers

The salmon and steelhead recovery plans have all identified an array of recovery actions together with an extensive set of fields with repeating linkages to other data records. A normalized relational database was designed by Kier Associates to provide a uniform format for the data that enables efficient access to the data and related information. In addition, USGS National Hydrography Dataset (NHD) geodatabase layers are used to provide basin, sub-basin, watershed and sub-watershed details for map navigation and orientation. Rivers and other waterbodies are included in the map detail based on the various zoom levels. The background map layers are provided by ESRI.

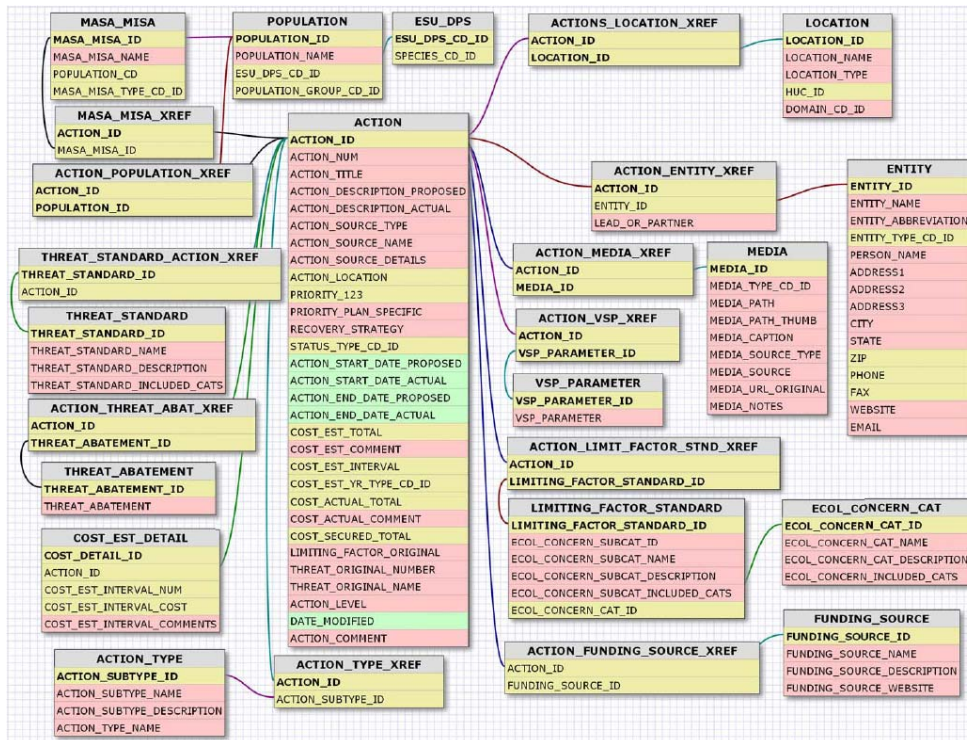


Fig. 2 Data Model for Action Tracking Database

The initial (and subsequent) bulk data loading for the system was automated using python scripts developed by Kier Associates. The scripts extract the data provided by NOAA in Excel spreadsheet format, and transform it into a relational database format, loaded into an ESRI ArcSDE/PostgreSQL geodatabase. The Action Tracking geodatabase consists of spatial shapefiles of the action locations, database tables, and relationship classes for 1-1, 1 to many (1-M) and many-to-many (M-M) relationships. Domains are used to provide select lists for several of the fields.

Architecture

The map layers are created with ESRI ArcMap and published to ArcGIS Server as web services, in particular, MapServices (for read-only map layers) and FeatureServices (for editable data).

The system is hosted on Amazon Elastic Compute Cloud with one virtual machine running ArcGIS Server, and a second virtual machine running ArcSDE/PostgreSQL.

The web-based portal is developed using HTML/CSS/Javascript and ESRI ArcGIS Javascript APIs and Dojo Javascript Framework.

Features

The Salmon and Steelhead Action Tracking System is a convenient and easy to use tool to locate information on recovery actions and to provide data updates to the actions as they occur. The online mapping tool provides spatial context and drill-down navigation to the area of interest. Navigation is also enabled through a contextual table that displays relevant details in sync with the information on the current map. A user can click through the map and see the table update, or click through the table and see the map update. This methodology creates a simple and intuitive way to navigate and search for the action data of interest.

Recovery Domains

There are 12 recovery domains in the NOAA Fisheries Northwest/Southwest Region. These domains are presented to the user upon entering the website.

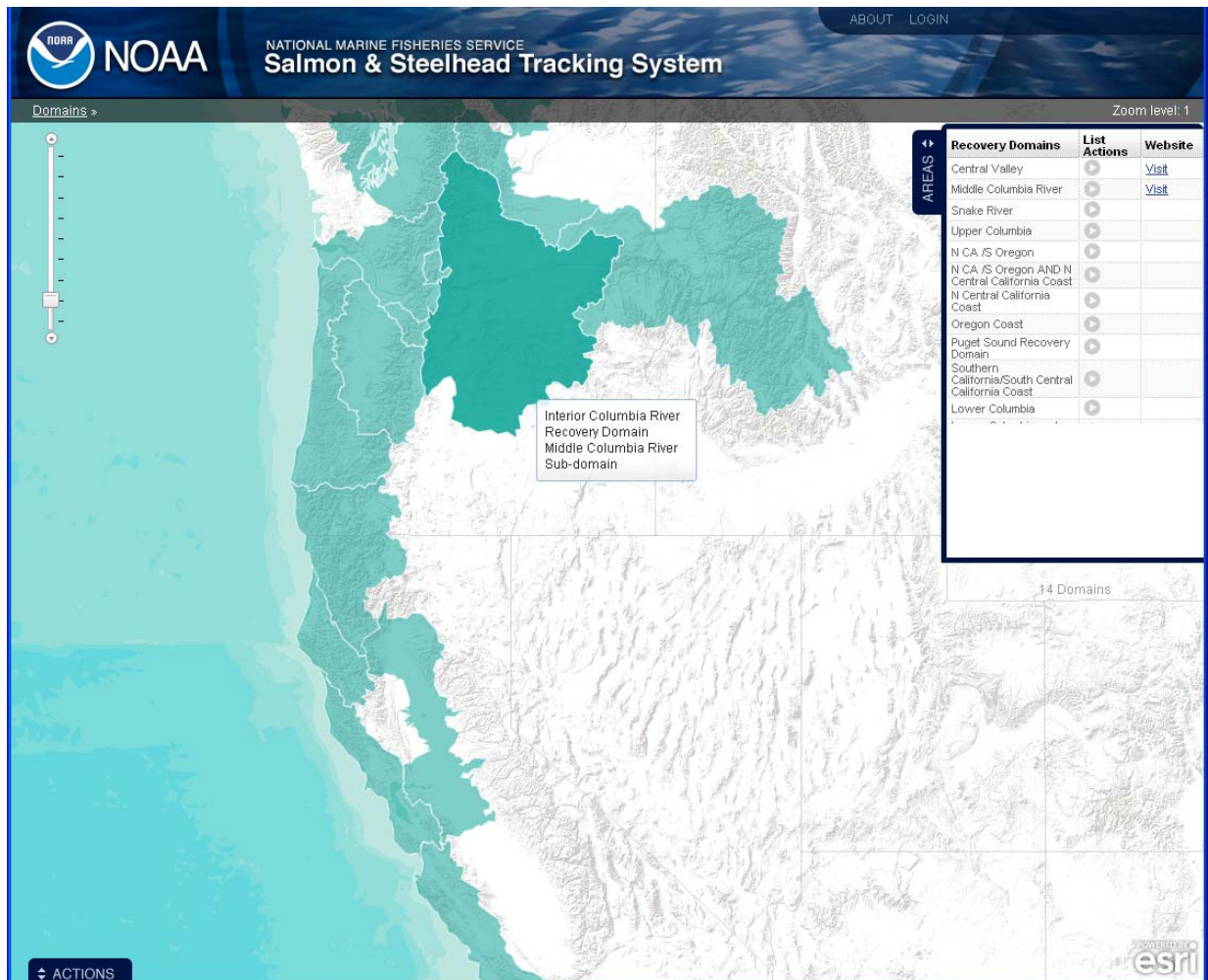


Fig. 3 Recovery Domains for the PNW/PSW Region

Moving the mouse over each domain highlights the area and pops up an informational dialog for the domain. The table on the right is a sortable, clickable list of all of the domains. A user can drill into a domain by clicking on the domain polygon on the map, or by clicking on the domain in the table.

Navigation Map Drill Down

Clicking on the domain on the map or on the right-hand table will update both the map to display zoomed-in detail of the area and the table to list the next level of detail of Hydrologic Unit Code (HUC). The user can move the mouse over the various sub-basins to determine the name of each. Subsequent clicks on the sub-basin on the map or on the table result in a similar drill-down effect as before.

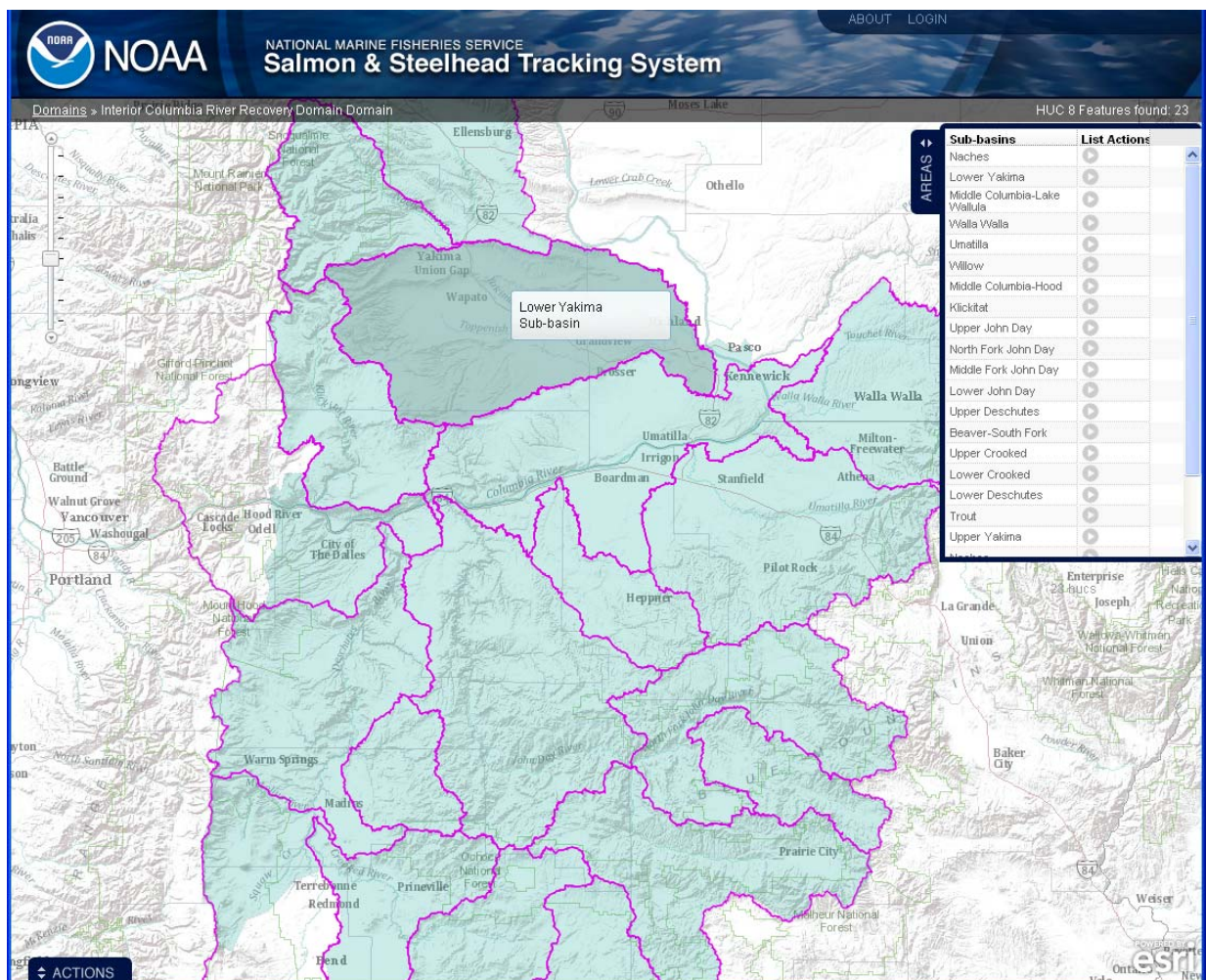


Fig. 4 Sub-basin map of the Interior Columbia River Recovery Domain

Action Locations

Once the map is zoomed into the sub-basin level, the recovery action locations are displayed on the map, with symbology related to action type or area type. Mouse movement over any of the symbols pops up information as to how many actions are found in the location.

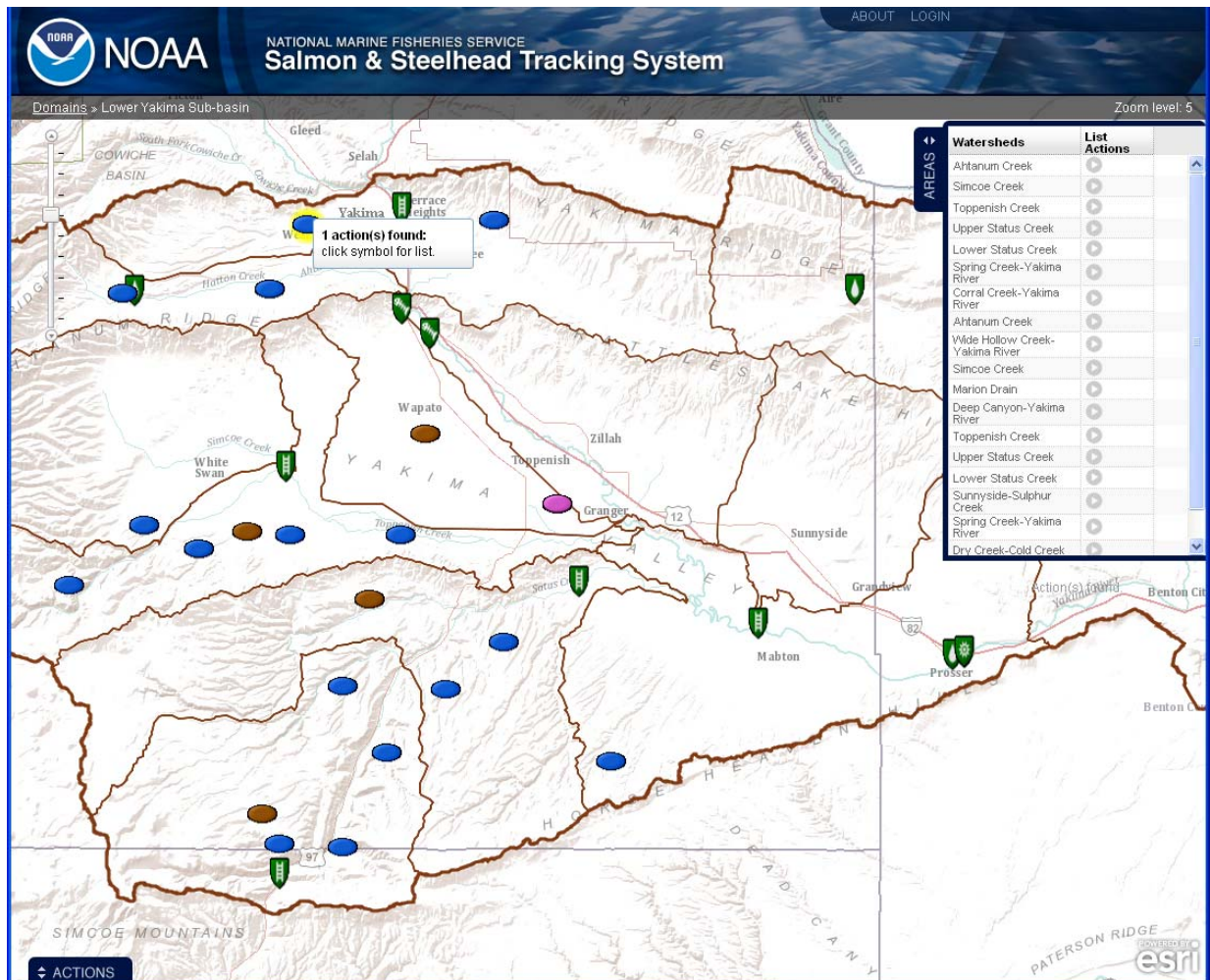


Fig. 5 Action mouse-over popup and watershed listing

While displaying the map zoomed into a sub-domain, the table will list the watersheds located there. Again, the user can drill into a watershed by clicking on the name in the table or clicking on the map.

Selecting an Action to View Details

Often there are many actions occurring in one location. Clicking on the location will display a list of possible actions to choose from.

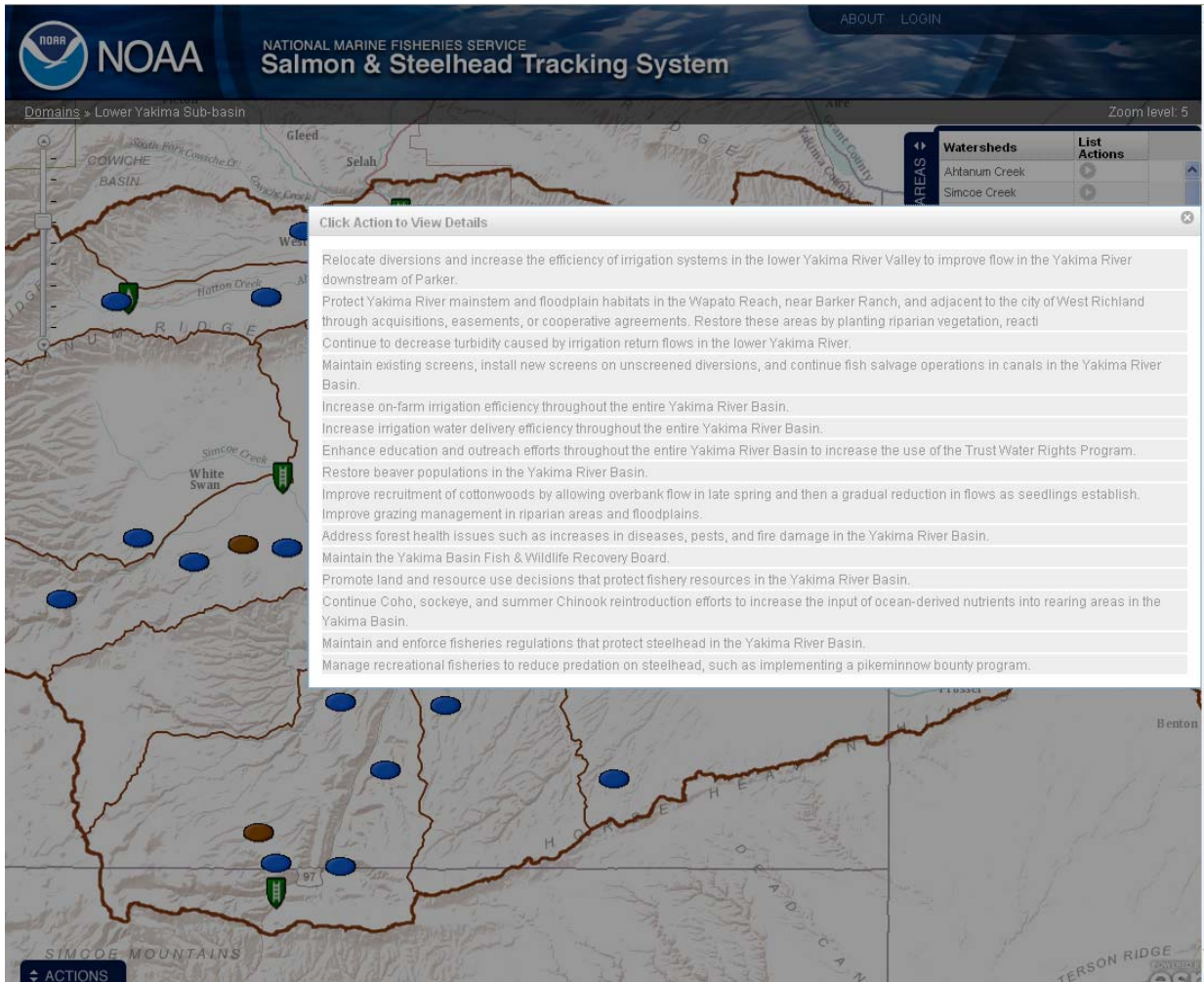


Fig. 6 Action Detail Selection Dialog

Each line item in the list is clickable, resulting in a detailed display of the selected action data.

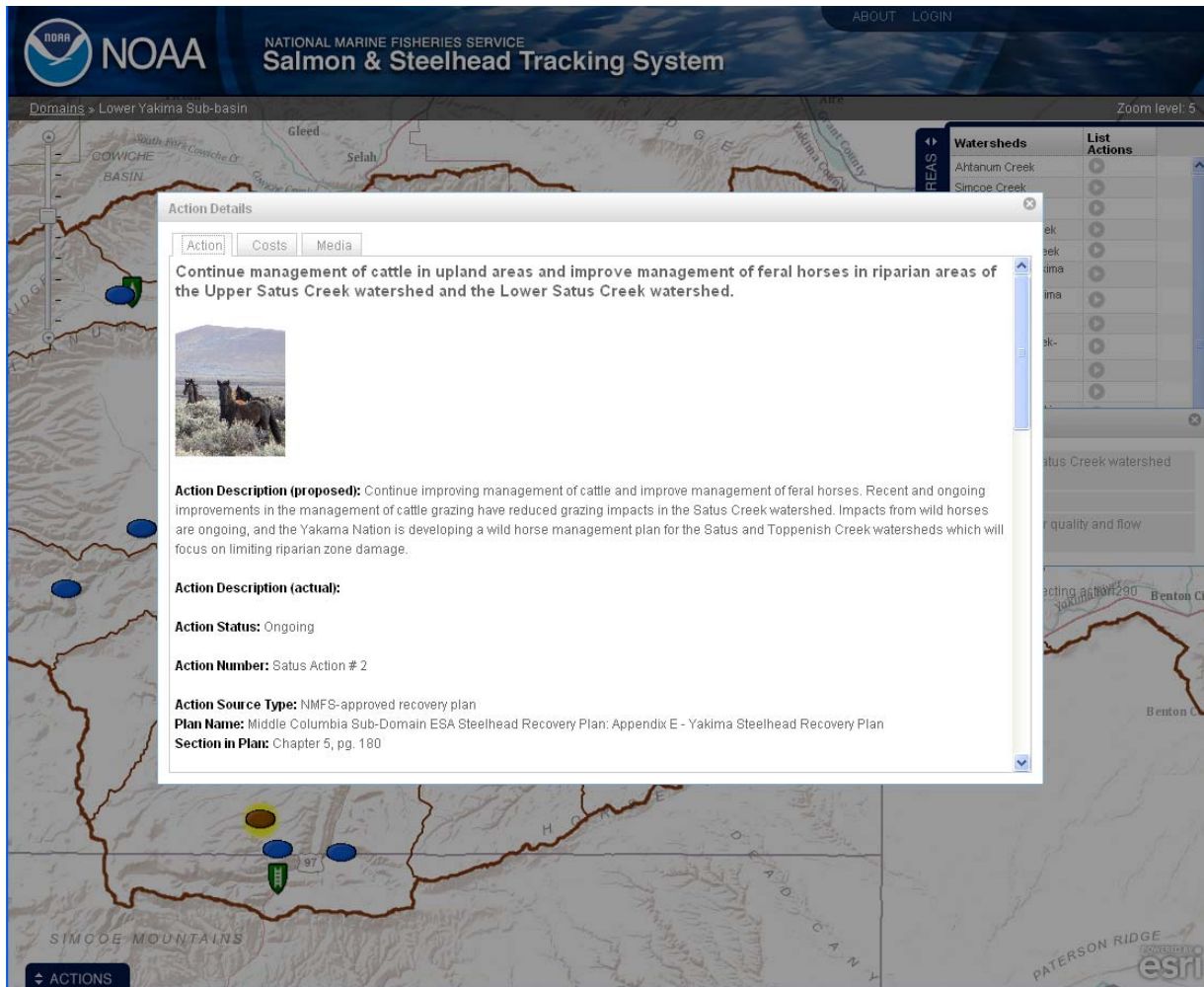


Fig. 7 Action Detail Dialog

Editing Actions

At any time during the navigation process, the user can display all of the actions for a HUC by clicking on the List Actions icon in the table associated with the current area. A table will be displayed with summary data for all of the actions in the area. The user can filter the results or sort the table based on any of the columns. One can click on the item to display the detail as shown in Fig 7, or one can click on the pencil icon to bring up the editing dialog (Fig. 8).

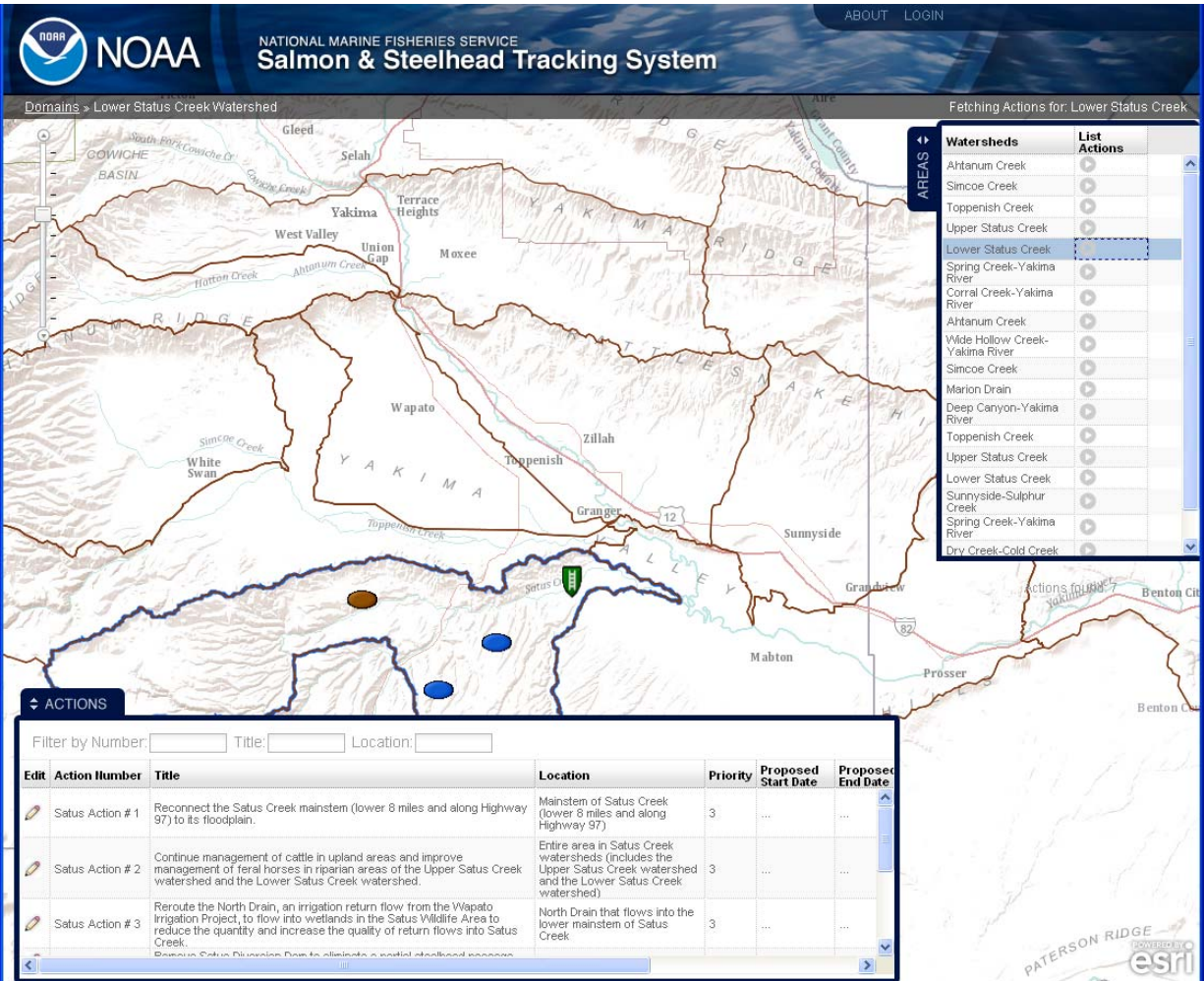


Fig. 8 List Actions for an Area of Interest

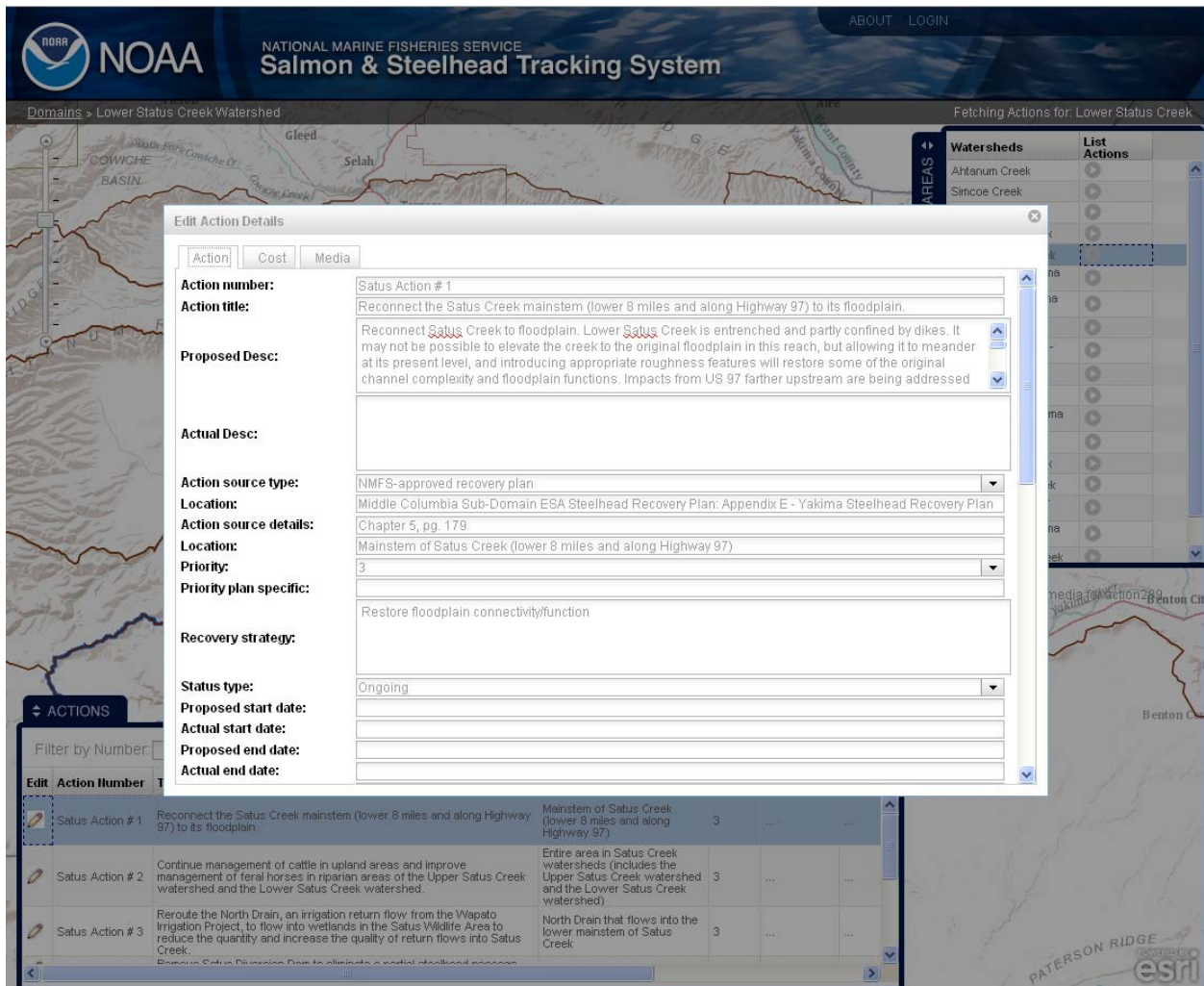


Fig. 8 Edit Action Dialog

Demo

The following video clips are live demonstrations of the Action Tracking System Pilot.

http://www.krisweb.com/ftp/01_intro_down_to_watershed.swf

http://www.krisweb.com/ftp/02_action_editing_lower_satus.swf

http://www.krisweb.com/ftp/03_middle_columbia_website.swf

Conclusion

System development is still in progress and the system's public debut is scheduled for later this year.